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EFFECT OF SOME PEPTIDES AND THEIR METAL COMPLEXES ON WHEAT GERMINATION

EFFECTUL UNOR PEPTIDE ȘI COMPLECȘI METALICI AI ACESTORA ASUPRA GERMINAȚIEI GRÂULUI

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Abstract. *Recently, the antitoxic effect of glutathione, a well-known tripeptide against heavy and radioactive metal ions was proved in wheat germination experiments. This work aims at presenting new results concerning some other peptides, such as tetraglycine and histidine-containing ones. The biological activity of various metal ions as well as their complexes with peptides was followed using lots of 50 seed samples of wheat. The concentrations of treatment solutions ranged from 10^{-4} M to 10^{-2} M. After a 7 day period of germination in the presence of the investigated compounds, the wheat plantlets were cut from the seeds and their height and weight measured. Higher concentrated solutions of mercury, silver, copper and other heavy metal ions exhibited highly inhibitory activity on the wheat germination, while the less concentrated solutions, below 10^{-3} M, had a moderate effect. The peptides P9 and P10 proved to be toxic by their selves, whereas their complexes with silver and mercury reduced the metal toxicity. Toxicity risk of both newly synthesized peptides and heavy metal ions was discussed.*

Key words: metal-peptide complex, peptide toxicity, wheat, germination.

Rezumat. *Recent, efectul antitoxic al glutationului asupra ionilor metalelor grele și radioactive a fost demonstrat în experimente de germinație a grâului. Lucrarea prezintă noi rezultate obținute cu alte peptide, cum ar fi tetraglicina și unele cu resturi de histidină. Activitatea biologică a mai multor ioni metalici, precum și a complecșilor acestora cu peptidele a fost studiată folosind loturi de câte 50 semințe de grâu. Concentrația soluțiilor de tratament a variat de la 10^{-4} M la 10^{-2} M. După 7 zile, plantulele au fost tăiate, determinându-se înălțimea și greutatea. Soluțiile cu concentrații relativ mari de mercur, argint, cupru, etc. au avut o acțiune inhibitoare asupra germinației grâului, iar concentrații mai mici de 10^{-3} M au avut o influență moderată. Peptidele P9 și P10 au prezentat toxicitate proprie, iar complecșii lor cu argint și mercur au redus toxicitatea. Potențialul de toxicitate al peptidelor nou sintetizate, dar și a ionilor metalelor grele a fost, de asemenea, discutat.*

Cuvinte cheie: complecși peptido-metalici, toxicitate peptide, grâu, germinație.

INTRODUCTION

Very low concentrations of micro-elements are either toxic, or stimulants, whereas they proved to be very harmful at high concentrations due to the formation of reactive oxygen species or their interaction with cellular proteins [5]. Metal ions interact with peptides and proteins and affect the conformation and hence their activity. The investigation of the relationship between proteins and metals led to the emergence of a new science, namely *Metallomics* within the Life Science area [12,7].

Therefore, the purpose of this paper is the synthesis of peptides with high affinity toward heavy metal ions, as well as metal-peptide complexes, their characterization by mass spectrometry and circular dichroism and testing their biological activity. Since germination experiments are simple, inexpensive, rapid and spectacular, as well as easily to be performed [1-3,6,8,10], the action of the known substances or newly synthesized ones on living organisms can be tested using wheat seeds being germinated. We show here only a few results of the measurements due to reduced printing space. It was found that cysteine-containing peptides may play an important role in decreasing the heavy metal toxicity.

MATERIALS AND METHODS

Instrument. Spectrophotometric measurements were made with a spectrophotometer UV/VIS model Libbra S35 PC with 1-cm quartz cells. Mass spectra of peptides and their metal complexes were performed at the University Konstanz, Germany, with a mass spectrometer Esquire 3000Plus (Bremen, Germany). Circular dichroism studies for the interaction of these compounds and proteins and were made on a JASCO-715 spectropolarimeter, in quartz cuvettes of 0.5 mm. Studies of atomic force microscopy were performed with a microscope SPM Solver PRO-M AFM (NT-MTD Co., Zelenograd, Moscow, Russia). AFM images were obtained at a resolution of 256×256 pixels at the $10 \mu\text{m} \times 10 \mu\text{m}$ and $40 \mu\text{m} \times 40 \mu\text{m}$.

Reagents. Tetraglycine (EGA Chemie, Steinheim, Germany), glutathione, cystine, N-acetyl cysteine (Merck), cadmium acetate, sodium and copper sulfate (Chimopar Bucharest) were used. The synthesis of the two peptides with high binding capacity of heavy metal ions, P9 and P10, with the sequences Cys-His-Gln-Tyr-His-His-Asn-Glu-Arg, and Arg-Cys-His-Gln-Tyr-His-His-Asn-Arg-Glu was described previously [4,9].

Biological material. Samples of wheat (*Triticum aestivum*), Henika variety, were purchased from Agricultural Research Station Suceava.

Treatment solutions. Various solutions with concentrations ranging from 10^{-4} M to 10^{-2} M were prepared. The solutions of glutathione had the following concentrations: $3 \cdot 10^{-3}$ M, $5 \cdot 10^{-3}$ M and 10^{-2} M, respectively.

Germination test. Four lots, each consisting of 100 seeds were taken and germinated on filter paper at 20°C . The first count took place at 3 days (germination energy, EG) and the second one at 7 days (germination rate, GR).

Wheat growth. The 10^{-4} M - 10^{-2} M solutions of substances being investigated from the biological point of view were prepared. Lots of 50 seeds in three replicates, were treated with 5 mL of treatment solution or distilled water (control). Treatment lasted for one hour; afterwards the seeds were arranged uniformly in Petri dishes, on

double filter paper with the treatment solutions. The seeds were regularly wetted with 5 mL of redistilled water. After 7 days, the plantlets were cut from the seeds, measured and weighed (height H, in cm and mass m, in grams). Due to the reduced amounts of available peptides, volumes of only 1 ml of 10^{-3} M for lots of 10 seeds were used.

Statistics. The results were processed using the Tukey test [11].

RESULTS AND DISCUSSIONS

All the investigated peptides showed binding properties of metal ions, leading to metal-peptide complexes highlighted by mass spectrometry. For example, P10, with 1377.5 molecular weight showed characteristic signals at m/z 276.7 (5+); 345.6 (4+), 460.2 (3+) and 689.7 (2+), while its mixture with silver nitrate in 2:1 molar ratio led to the formation of complexes with one to three silver ions bound to a single molecule of P10 (fig. 1). P10 showed the highest binding capacity toward silver ions, followed by that for nickel and copper ones. The lead and cadmium ions were weakly bound by peptides.

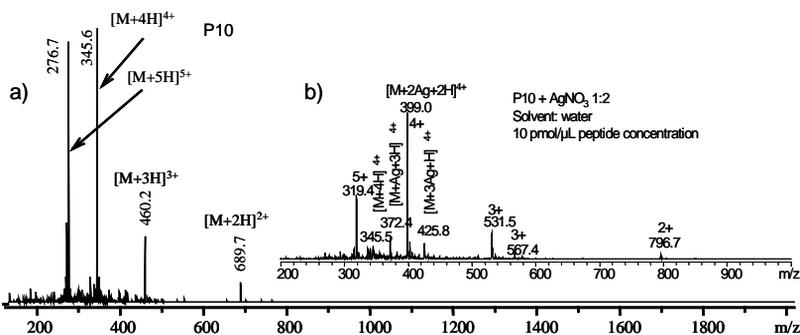


Fig. 1. Mass spectra of P10 peptide (a) and its complexes with silver ions (b).

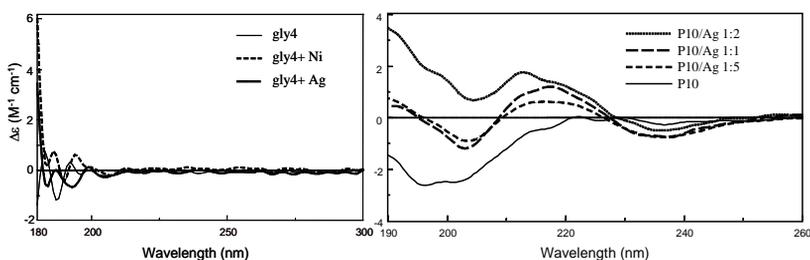


Fig. 2. CD spectra of tetraglycine, P10 peptide and their metal complexes.

Tetraglycine bound copper ions although contains only one pair of free amino and carboxylate groups. The oligomerization of these peptides under the action of metal ions, especially copper was also found. Metallic ions altered the secondary structure of peptides (fig. 2) and led to the formation of molecular aggregates as revealed by atomic force microscopy (fig. 3 and fig. 4).

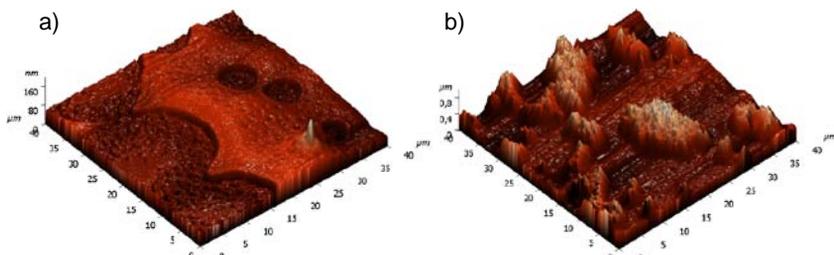


Fig. 3. AFM images of glutathione (1 mg/mL) and its complex with Cu^{2+} ions (b).

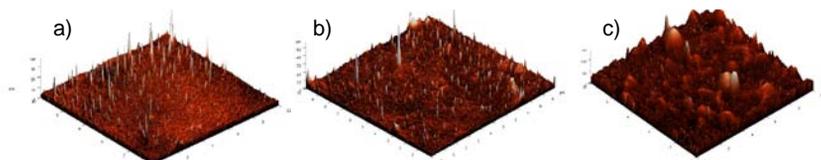


Fig. 4. AFM images of a) P10, b) P10 complex with copper ions (1:10 molar ratio) and c) Cu-P10 complex in the presence of sodium dodecylsulfate (1:10:10 molar ratio).

Atomic force microscopy (AFM) can be used to directly observe the conformational changes of proteins and peptides, showing their interaction with their environment, also including the formation of metal ion assemblies. Thus, glutathione formed a thin film (fig.3, a), whereas its complex with copper produced microscopical formations with heights of several hundred nanometer (fig. 3, b). On the contrary, P10 formed an area which became coarse after treatment with copper ions (fig. 4). On adding a surfactant substance (SDS), with the role of dispersion the peptidic molecules (fig. 4, c), the formation of large nanostructures was observed (fig. 4, c). Glutathione has a powerful protective action against heavy metal ions, reducing virtually all toxicity of copper, silver, nickel ions. Other peptides with cysteine or cystine had the same effect.

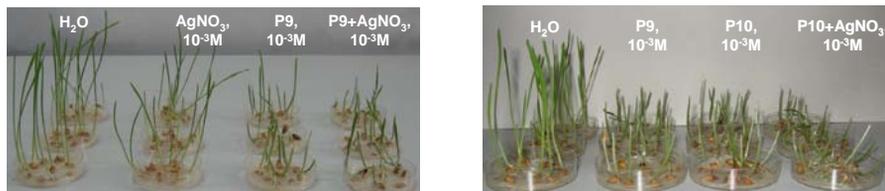


Fig. 5. Effect of silver ions, P9 peptide and P9-silver complex (left), that of P9 and P10 peptides, and P10-silver complex (right) on wheat germination

Silver ions inhibit the germination of wheat (fig. 5) and the cysteine-containing peptides P9 and P10 strongly inhibit this process. The binding of silver ions on both peptides resulted in the reduction of their toxicity, possibly due to silver-induced conformational changes. P9 and P10 decreased germination

parameters by about 50%, the length of radicles being more strongly influenced by the silver ions and these two peptides.

Table 1

The effect of Gly4 peptide and its complexes with metals in wheat germination experiments (Concentration, 4×10^{-3} M).

Treatment	The total height of plantlets in the lot (H, cm)	Mean height of plantlets (h, cm)	Mass of plantlets in the lot (m, g)	Average mass of plantlets (m, mg)
Control, H ₂ O	449.5±17.1	9.7±0.5	2.7±0.1	57.0±3.8
Gly4	354.4±14.8	8.1±0.3	2.7±0.2	48.3±2.6
Gly4+Hg ²⁺	386.7±24.2	8.1±0.2	2.4±0.3	49.0±2.9
Gly4+Cu ²⁺	101.8±17.6	2.8±0.1	0.9±0.2	23.7±2.2
Gly4+Ag ²⁺	250.0±20.4	5.5±0.2	1.6±0.1	35.7±1.1
Gly4+Pb ²⁺	419.9±27.5	8.8±0.5	2.6±0.3	54.3±3.4
D	73.5	1.5	0.5	1.1

A significant difference between tetraglycine activity and the control was found, as well as its activity and that of the complex with copper and silver ions (table 1). Interesting is that the lead ions decreased inhibitory effect of tetraglycine, while mercury ions seem to lose their toxicity in the presence of Gly4.

The toxicity of heavy metal ions is related to the formation of reactive oxygen species and the formation of complexes with biologically active molecules, such as certain enzymes, peptides, nucleic acids, etc. This paper showed that metal-protein interaction is much deeper and that conformational changes of proteins and peptides may also play an important role in the toxicity of metal-protein complexes. Binding of metal ions at different chain polypeptides is different, depending on the type of metal, concentration, pH, etc.

CONCLUSIONS

The newly synthesized peptides as well as the known ones were characterized and their biological activity was demonstrated in wheat germination experiments. MS, CD and AFM techniques revealed the binding of metal ions on peptides and proteins as well as their structural changes. The newly synthesized peptides, P9 and P10, proved to be rather toxic. However, they reduced the toxicity of heavy metal ions. Though simple in structure, tetraglycine significantly affected the wheat germination and modulate the toxicity of heavy metal ions being investigated.

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REFERENCES

1. **Butnariu-Tucaliuc Roxana Risca I. M., Drochioiu G., Mangalagiu, I. 2008** - *Biological effect of some new pyridazine derivatives on wheat in germination experiments*. Roum. Biotechnol. Lett., vol. 13 pp. 3837-3842.
2. **Dumitras-Hutanu Cristina-Amalia, Pui A., Drochioiu G., 2008** - *Dinitrofenil derivati cu posibile aplicatii in medicina si biologie: mecanisme de actiune si toxicitate*. In *Materiale si procese inovative*. Simp. V, ZFICPM, Iasi, Editura Politehniun, pp. 61-66.
3. **Dumitras-Hutanu Cristina-Amalia, Pui A., Gradinaru R., Drochioiu G., 2008** - *Toxicity of dinitrophenyl derivatives used as pesticides and their environmental impact*. *Lucrări științifice USAMV Iași, seria Agricultură*, vol. 51, in press.
4. **Drochioiu G., Murariu Manuela, Petre Brindusa-Alina, Manea Marilena, Przybylski M., 2007** - *Synthesis and characterization of a nonapeptide with specific Cu-binding properties*. *Rev. Chim. (Bucharest)*, vol. 58, pp. 311-315.
5. **Finney L. A., O'Halloran T. V., 2003** - *Transition metal speciation in the cell: insights from the chemistry of metal ion receptors*. *Science*, vol. 300, pp. 931 – 936.
6. **Gradinaru R., Drochioiu G., Gradinaru Luiza, Ghisla S., 2007** - *Human medium chain Acyl-CoA dehydrogenase. Charge-transfer complexes studies with E99G-, E376Q- and E99G/E376Q-MCAD mutants*. *An. Univ. Al. I. Cuza Iasi, s. chim.* vol. 15, pp. 105-110.
7. **Haraguchi H., 2004** - *Metallomics as integrated biometal science*. *J. Anal. At. Spectrom.*, vol. 19, pp. 5 – 14.
8. **Molnar Ramona, Creanga Dorina, Ruscanu Raluca, Murariu Manuela, Ciobanu Catalina, Neica M. I., Pui A., Drochioiu G., 2006** – *Dinitrophenol pesticides: biological activity, toxicity, and a novel mechanism of action*. *Lucrări științifice USAMV Iași, seria Agricultură*, vol. 49, pp. 352-357.
9. **Murariu Manuela, Dragan E. S., Drochioiu G., 2007** - *Synthesis and mass spectrometric characterization of a metal-affinity decapeptide: Copper-induced conformational changes*. *Biomacromolecules*, vol. 8, pp. 3836-3841.
10. **Risca I. M., Zbancioc G., Moldoveanu C., Drochioiu G., Mangalagiu I., 2006** - *Effect of some new monoquaternary salts of diazine on germination and seedling growth of Norway spruce (Picea abies (L.) Karsten)*. *Roum. Biotechnol. Lett.*, vol. 11, pp. 2563-2568.
11. **Snedecor G. W., 1994** - *Statistical methods applied to experiments in agriculture and biology*. The Iowa Stat Univ. Press, U.S.A., pp. 255-274.
12. **Szpunar J., 2004** - *Sample preparation for identification of seleno-compounds in urine by electrospray-MS/MS*. *Anal. Bioanal. Chem.*, vol. 378, pp. 54-56.

EFFECT OF SOME PESTICIDE DINITROPHENOLS AND OTHER DINITROPHENYL DERIVATIVES ON WHEAT SEED GERMINATION

EFFECTUL UNOR PESTICIDE DINITROFENOLICE ȘI A UNOR DINITROFENIL DERIVAȚI ASUPRA GERMINAȚIEI SEMINTELOR DE GRÂU

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Abstract. *Dinitrophenols and their ester derivatives proved to be effective pesticides due to their multiple biological actions, being used as insecticides, ovicides, acaricides, fungicides, and herbicides. However, the toxicity mechanism remained unclear so far in spite of the fact that such compounds may have an anticancer activity or may be useful in the neurodegenerative pathologies. Consequently, we synthesized some new as well as well-known dinitrophenyl conjugates with amino acids and peptides, such as dinitrophenyl-glutathione, dinitrophenyl-glycine, dinitrophenyl-glycylglycine and dinitrophenyl-tetraglycine and tested their biological activity compared with simpler dinitrophenols and dinitrophenyl ethers or other chemical compounds. Dinitrophenyl moiety was suspected to induce toxicity, whereas lateral chains and groups modulate both the toxicity and its relationship with the solubility.*

Key words: dinitrophenyl conjugates, pesticide toxicity, wheat, germination.

Rezumat. *Dinitrofenolii și derivații lor eterici sunt utilizați drept pesticide, având multiple acțiuni biologice. Totuși, mecanismul lor de toxicitate a rămas nelămurit până în prezent, deși astfel de compuși pot fi agenți anticancerogeni sau pot fi utilizați în bolile neurodegenerative. În consecință, noi am sintetizat o serie de compuși dinitrofenil eterici și i-am testat în experimente biologice, comparative cu dinitrofenolii cunoscuți. Am folosit și conjugați cu peptidele și aminoacizii cum ar fi dinitrofenil-glutathionul, dinitrofenil-glicina, dinitrofenilglicilglicina și dinitrofenil-tetraglicina. Concluzia noastră a fost că nucleul dinitrofenilic determină efectul biologic al compușilor investigați, în timp ce catenele laterale doar modulează toxicitatea, precum și legătura acestora cu solubilitatea.*

Cuvinte cheie: dinitrofenil conjugați, toxicitatea pesticidelor, grâu, germinație.

INTRODUCTION

Dinitrophenyl derivatives are substances with high toxicity and multiple biological actions [1]. Their biological activity is partly based on blocking the oxidative phosphorylation. However, they may be involved in disruption of

electron transfer in the two photosystems of the photosynthesis. Since data from the literature are still inconclusive and do not endorse a specific mechanism of action of dinitroderivatives on living organisms, the synthesis of new dinitrophenols, dinitrophenyl conjugates and phenolic dinitroethers in order to study their biological activity is of paramount importance. For example, no one knows precisely the effect of the atom at position 1, which is linked to the dinitrophenyl moiety. It may be oxygen, nitrogen or sulfur. The investigation of the biological activity of some ethers dinitrophenyl compared to that of dinitrophenylthiols and dinitrophenyl-amino acids or amines could help the clarification of the mechanism of action of these dinitroderivatives [2-7].

The purpose of this work is the synthesis of a large number of dinitrophenyl derivatives and the study of their biological activity compared to that of the corresponding dinitrophenols. Comparative experiments using FTIR and fluorescence techniques are also performed. The research of the known dinitrophenols and derivatives or newly synthesized ones on living organisms is carried out using wheat seeds being germinated.

MATERIALS AND METHODS

Synthesis of the investigated compounds and the characterization of their physico-chemical and biological properties were performed with the methods described previously [2,3,6]. Biological material was wheat samples (*Triticum aestivum*), Henika variety.

Reagents were of analytic purity (Merck, Sigma, and Chimopar) and the solution and the water slurries were prepared using redistilled water, acetone or ethyl alcohol. A series of dinitrophenol ethers were synthesized, using dinitrochlorobenzene, with variants of the methods described in literature [9]. Dinitrophenyl-glutathione, dinitrophenyl-glycine, dinitrophenyl-glycylglycine and dinitrophenyl-tetraglycine were also synthesized. The reaction was performed classically or under microwave.

Apparatus. The infrared spectra were taken on a Jasco FT/IR 660 Plus Fourier spectrometer. The melting points and the elemental composition were also determined and ¹H-RMN (Bruker Advance DRx400, 400 MHz) spectra and mass spectra were performed using a Vestec 601 mass spectrometer. Mass spectra of dinitrophenyl-conjugates with peptides and amino acids were carried out at Konstanz University, Germany, on a Esquire 3000Plus mass spectrometer (Bremen, Germania). Circular dichroism studies indicated the interaction between these compounds and proteins and were performed on a Jasco-715 spectropolarimeter, in 0.5-mm quartz cuvettes, in the wavelength range 260 – 180 nm.

Treatment solutions and suspensions. Experiments and germination tests were made in Petri dishes, on Watmann no. 1 double filter paper, at the laboratory temperature (20 °C). Several solutions and suspensions of dinitrophenols, dinitrophenyl ethers and conjugates, with concentrations ranging between 10⁻⁴ M and 10⁻² M were used.

Procedure. Germination was determined according to ISTA rules (Seed Science and Technology, 1993). Separately, each lot of 50 seeds was treated for one hour with 5 mL of solution or suspension of treatment. Afterwards, the seeds were uniformly deposited on filter paper in Petri dishes, along with the treatment solutions. The resulted plantlets were cut from the seed 7 days after, weighed and measured

(the height, **H**, in cm and the mass **m** in grams). Radicles mass and length were also measured.

Statistics. The results were processed using the Tukey test [8].

RESULTS AND DISCUSSIONS

Dinitrophenyl-glutathione, dinitrophenyl-glycine, dinitrophenyl - glycyglycine and dinitrophenyl - tetraglycine were synthesized and characterized being used in further biological experiments. For comparison, we have used glutathione (a tripeptide composed of glycine, cysteine and glutamic acid, with a detoxification role in living cell), the corresponding amino acids and peptides, as well as dinitrophenols and dinitrophenyl ethers such as 2,4-dinitroanisole, 2, 4-dinitro-*o*-cresol, 2,4-dinitro-1-(octadecyloxy) benzene, 3-(2,4-dinitrophenoxy) propane-1,2-diol, named here dinitrophenyl glycerol (DNG) etc. We synthesized the glutathione conjugate knowing the detoxification properties of this tripeptide against dinitrochlorobenzene in the body in case of poisoning (Vaidya & Gerke, 2007).

In the mass spectrum, the molecular weight of 472.2 units of dinitrophenyl-glutathione was clearly visible ($M+H = 473.2$ amu). By fragmentation and elimination of a water molecule, a fragment with a mass of 455.2 units appeared, which denotes the peptidic structure of this conjugate (fig.1).

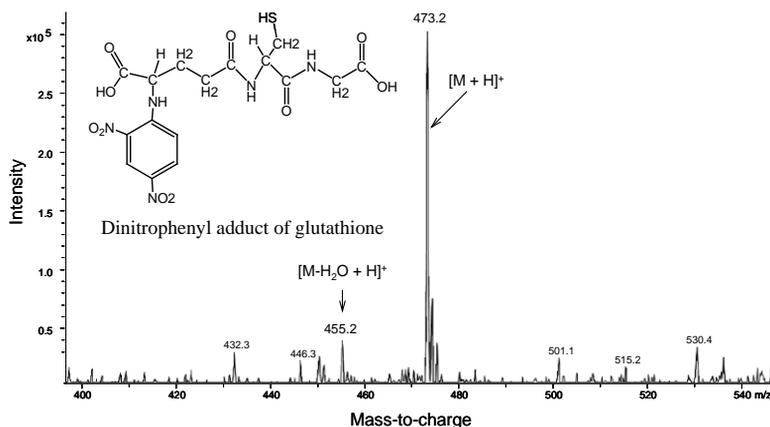


Fig. 1. ESI ion trap mass spectrum of dinitrophenyl-glutathione.

DNOC and 2,5-dinitrophenol showed a strong fluorescence extinction of tryptophan, vitamin B₂ and acyl-coenzyme A dehydrogenase, while compounds such as p-nitrophenol, p-nitrobenzoic acid or even 2,4-dinitrobenzoic acid which are not uncoupling agents did not behave as quenchers of fluorescence. Therefore, a close relationship between the two properties was established (fig. 2).

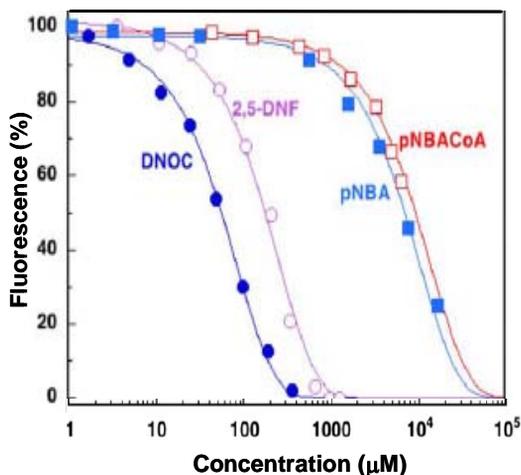


Fig. 2. Fluorescence quenching of E376Q mutant MCAD enzyme by 4,6-dinitro-*o*-cresole (DNOC), 2,5-dinitrophenol (2,5-DNF), *p*-nitrobenzoyl-acetyl-CoA (pNBA-CoA) and *p*-nitrobenzoic acid (pNBA) in phosphate buffer, pH 7.

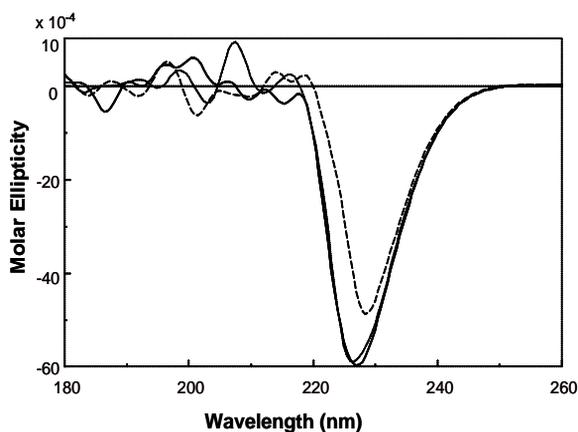


Fig. 3. CD spectra show the effect of 2,6-dinitrophenol on the conformation of the albumin molecule (continuous line: molar ellipticity of albumin, dotted line: ellipticity of 1/1 mole/mole adduct of 2,6-DNP with albumin; segmented line: 5/1 molar ratio adduct of 2,6-DNP with albumin).

2,6-Dinitrophenol influenced more strongly albumin conformation only in a high concentration, corresponding to a 5:1 molar ratio (fig. 3). A different behavior has the adduct of dinitrochlorobenzene with glycerin, which has shifted the absorption maximum from 228 nm to about 226 nm. At lower wavelength, the spectrum of 5:1 adduct of DNG has a completely different shape from that of

albumin, while wavelengths close to 180 nm, all spectra had different absorbances.

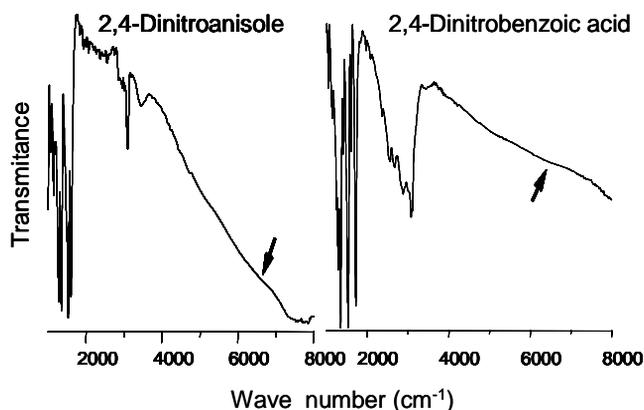


Fig. 4. FTIR spectrum of dinitroanisole (uncoupling agent) and that of dinitrobenzoic acid (with no such action).

Dinitrophenols and dinitrophenyl derivatives absorb mostly in the near infrared, while compounds without uncoupling activity e.g. 2,4-dinitrobenzoic acid, had no such optical properties (fig. 4).

A significant difference between the dinitrophenetole (DNF) action and dinitroanisole (DNA) one was found in spite of literature data which assign similar biological activities to both dinitrophenyl ethers.

It was assumed that, in order to manifest its action, dinitrophenetole hydrolyzes to afford the toxic dinitrophenol. However, on using thin layer chromatography, we demonstrated that dinitrophenetole is as toxic as dinitroanisole; previously, we found that these compounds act without being hydrolyzed [6].

Glutathione had no influence on the toxicity of dinitrophenols, whereas dinitrophenyl-glutathione and dinitrophenyl-conjugates of other peptides displayed specific biological activities, corresponding to their chemical structures.

The mechanism of toxicity is probably related to acido-basic properties of dinitrophenyl derivatives, with their solubility and spectral properties. It was found an interesting relationship between near infrared absorption, the fluorescence extinction, and the biological effect of dinitroderivatives. We suggest here that a more comprehensive approach of their toxicity is needed and not only the reducing the bioenergetics of ATP formation to proton translocation through mitochondrial membranes during the formation of the ATP molecules, as required by Mitchell's hypothesis [4.5].

CONCLUSIONS

The newly synthesized dinitrophenyl derivatives as well as the known ones were characterized by spectral techniques and tested within the wheat germination experiments. Experiments in which fluorescence quenching of dinitrophenyl derivatives have been measured as well as the strong absorption of these compounds at about 6000 cm⁻¹ in the near infrared, at energies approximately equal to those for the formation of the ATP molecule suggest a direct radiation-based energy transfer. Contrary to Macovschi's theory, Peter Mitchell (Nobel laureate) hypothesized that proton translocation through biological membranes is needed to form ATP. Alternative mechanism of toxicity is proposed to allow dinitrophenyl derivatives and pesticide-like compounds to be extensively used in the field as well as in human or veterinary clinic.

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REFERENCES

1. **Comăniță E., Șoldea C., Dumitrescu E., 1986** - *Chimia și tehnologia pesticidelor*. Edit. Tehnică, București, p. 188-195.
2. **Dumitras-Hutaru C. A., Pui A., Gradinaru R., Drochioiu G., 2008** - *Toxicity of dinitrophenyl derivatives used as pesticides and their environmental impact*. Lucrări științifice USAMV Iași, seria Agricultură, vol. 51, in press.
3. **Dumitras-Hutaru C. A., Pui A., Drochioiu G., 2008** - *Dinitrophenyl derivati cu posibile aplicatii in medicina si biologie: mecanisme de actiune si toxicitate*. In *Materiale si procese inovative*. Simp. V, ZFICPM, Iasi, Editura Politehniun, pp. 61-66.
4. **Mitchell P., 1961** – *Coupling of phosphorylation to electron and hydrogen transfer by a chemi-osmotic type of mechanism*. *Nature*, vol. 191, p. 144-148.
5. **Mitchell P., 1978** – *David Keilin's respiratory chain concept and its chemiosmotic consequences*. Nobel Lecture.
6. **Molnar R., Creanga D., Ruscanu R., Murariu M., Ciobanu C., Neica M. I., Pui A., Drochioiu G., 2006** - *Dinitrophenol pesticides: biological activity, toxicity, and a novel mechanism of action*. *Lucrări științifice USAMV Iași, seria Agricultură*, vol. 49, pp. 352-357.
7. **Roper W. L., 1992** - *Toxicological Profile for Nitrophenols*. Agency for Toxic Substances and Disease Registry, USA.
8. **Snedecor G. W., 1994** - *Statistical methods applied to experiments in agriculture and biology*. The Iowa Stat Univ. Press, U.S.A., p. 255-274.
9. **Willgerodt C., 1879** - *Einwirkung alkoholischer Kaliumhydroxydlösung auf α -Dinitrochlorbenzol, gelöst in derselben Alkoholat. Darstellung der α -Dinitrophenylethyläther, des α -Dinitrophenylallylglycerin- und -phenylethyläthers*. *Berichte*, vol. 12, p. 762-767.
10. **Snedecor G. W., 1994** - *Statistical methods applied to experiments in agriculture and biology*. The Iowa Stat Univ. Press, U.S.A., p. 255-274.

THE PLANT GROWTH DYNAMICS DURING LAYERED DOUBLE HYDROXIDES (LDH) ACTION

DINAMICA DEZVOLTĂRII PLANTELOR SUB ACȚIUNEA LDH

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Abstract. Layered double hydroxides (LDHs) known as anionic clays are an important class of ionic lamellar solids. The anionic clays exhibit anion sorption, anion diffusion and exchange properties together with surface basicity making them materials of importance for many modern applications. The LDHs clays are useful in agriculture due their physical and chemical properties, in order to obtain organic products. In this work, a study concerning the plant growth dynamics of corn plant during the LDH action. Seeds of wheat were put into Petri dishes on double filter paper together with suspensions from some anionic clay and they were kept here for 3 days. The dynamic of germination and the growth during the first phenophase of growth has been monitorized. After that the germinated seeds were planted in soil where they continued to growth. The content of photosynthetic pigments was obtained spectrophotometrically. Our results showed that the anionic clays could modify the plant growth, the clay containing magnetite having the most important effect on plant growth. A slow release of the active substance from nanocomposite material could be exploited for control release formulation of some pesticide or plant growth stimulator; this means the intercalation of pesticides or plant growth stimulator into layers of LDH is a feasible solution.

Key words: LDH, magnetite, salicylic acid, photosynthetic pigments

Rezumat. LDH, cunoscute ca argile anionice sunt o clasa importanta de solide ionice lamelare. Argilele anionice prezintă proprietăți de sorbție a anionilor, de difuzie a anionilor și de schimb și datorită bazicității superficiale sunt materiale cu importanță și aplicații în domenii moderne. Aceste argile pot fi folosite în agricultură datorită proprietăților fizice și chimice cu scopul obținerii unor produse agricole organice. În această lucrare este prezentat un studiu privind dinamica creșterii plantelor de grau sub acțiunea argilelor anionice. Semințele de grau au fost puse în sticle Petri cu hârtie de filtru și suspensia de argilă și au fost ținute aici timp de 3 zile. Apoi semințele germinate au fost plantate în sol unde au continuat să crească. A fost monitorizată dinamica germinăției și creșterea plantelor în timpul primelor fenofaze. Rezultatele noastre arată că argilele anionice pot modifica dezvoltarea plantelor, argila continand magnetita avand cel mai important efect în creșterea acestora. O eliberare lenta a substantei active din nanocompozita poate fi folosita pentru eliberarea controlata a unui pesticid sau a unui regulator de crestere; aceasta inseamna ca intercalarea unui pesticid sau a unui regulator de crestere în lamelele LDH este o solutie fezabila.

Cuvinte cheie: LDH, magnetite, acid salicylic, pigmenti fotosintetici

INTRODUCTION

Minerals that reversibly fix ions, in particular NO_3^- can be used as fertilizers and soil conditioners, as well as for the purification and treatment of water, particularly for the elimination of nitrate. Layered double hydroxides (LDHs) contain exchangeable fixed anions in the intermediary layers. Therefore methods for producing anion-exchanging minerals, particularly suitable LDHs, and usage them as fertilizers or soil conditioners and for the purification and treatment of water have been reported.

Layered double hydroxides (LDHs) known as anionic clays are an important class of ionic lamellar solids. LDH structure is described with formula $[\text{M}^{2+}_{1-x}\text{M}^{3+}_x(\text{OH})_2][\text{A}^{n-}_{x/n} \cdot z\text{H}_2\text{O}]$, where M^2 is a divalent metal ion such as Mg^{2+} , Ca^{2+} , Zn^{2+} , etc, M^3 is a trivalent ion such as Al^{3+} , Cr^{3+} , Fe^{3+} , Co^{3+} and A is an anion such as Cl^- , CO_3^{2-} , NO_3^- , etc.

The anionic clays exhibit anion sorption, anion diffusion and exchange properties together with surface basicity making them materials of importance for many modern applications (1), (2), (9), (14), (19). Anionic clays, have attracted increasing interest as nanovehicles for delivering genes, drugs, and bio-active molecules into cells. Due their capacity of ion exchangers, anionic clays have been used to remove the toxic compounds from water as arsenite (18) or chromate (7). Recent reports on the advantages of mesoporous materials as drug delivery vehicles have imposed research in novel applications and several materials with this purpose have been reported (15). The LDHs clays are useful in agriculture due their physical and chemical properties, in order to obtain organic products (10), (16). Luis Dorante presents evaluation of LDHs as a nitrate exchanger in soil in (5).

In this paper, the comparative effects of two composites containing anionic clay (MgAlLDH) and salicylic acid and Fe_3O_4 + salicylic acid (sal) on germination rate, root elongation, stem dimension and growth of *Triticum sativum* have been analyzed. Germination rate and root elongation, as a rapid phytotoxicity test method, possess several advantages, such as sensitivity, simplicity, low cost and suitability for unstable chemicals or samples (17).

MATERIAL AND METHODS

To study the effect of anionic clays on plant growth, many clays have been prepared (3), (4), but here we sorted the following variants:

1. control;
2. MgAl LDH+sal;
3. MgAl LDH+sal+ Fe_3O_4 ;

100 seeds of wheat were put into Petri dishes on double filter paper together with 5 mL treatment solution (a suspension that contains 0.5g of clay and 50mL bidistilled water). Here the seeds have been kept in dark and at optimal temperature (20-23°C) for three days. Every day we poured bidistilled water for control and treatment solution for the other variants to determine seed germination. After that the germinated seed were planted in soil where they developed in optimal conditions.

The soil was prepared from celery soil in proportion of $\frac{3}{4}$ and red peat (produced by Kekkilä Ozi from Tuusula, Finland) in proportion of $\frac{1}{4}$. The dynamic of

germination and the growth has been monitored during the first phenophase of growth.

Photosynthetic pigments were extracted in acetone (6), (13), measured spectrophotometrically using a spectrophotometer SPECORD 200 produced by Analytik lena and calculated according to Lichtenthaler formula (11).

RESULTS AND DISCUSSIONS

Figure 1 shows the wheat seed germination dynamics after 3 days and figure 2 the root dimension after 3 days.

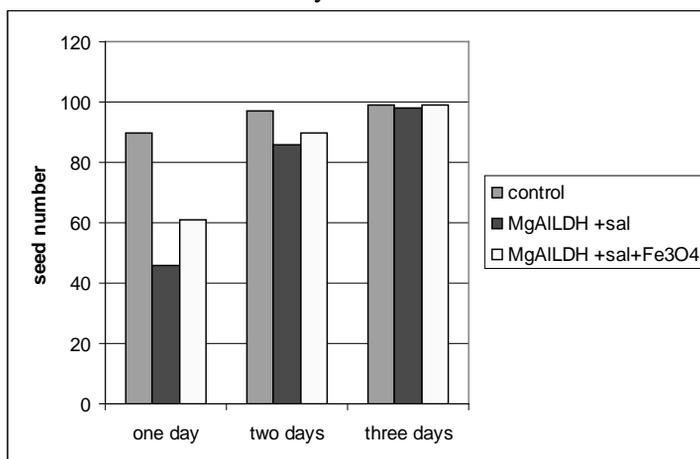


Fig.1. Wheat seed germination after 3 days of anionic clay treatments

Figure 1 shows that the control seeds germinated faster than the treated seeds but after three days the number of germinated seeds is the same.

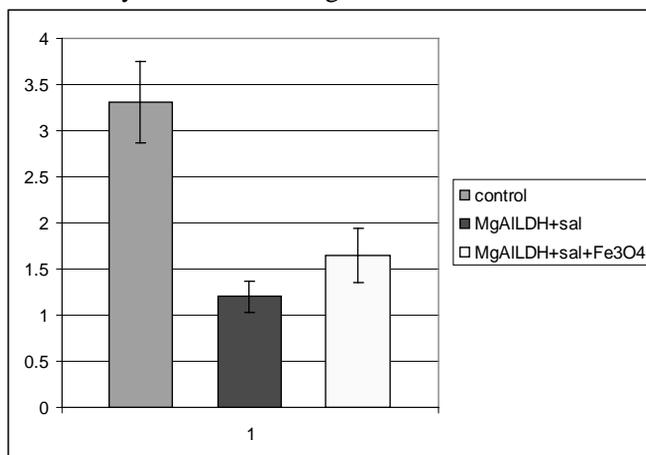


Fig.2. Wheat root dimensions after 3 days of anionic clay treatments. Error bars are confidence intervals (n=50) (12)

From figure 2 we can see that the wheat root of the control plants are better developed than the treated seeds but the root dimensions of treated plants with

composite containing magnetite are higher than those treated with anionic clay containing only salicylic acid.

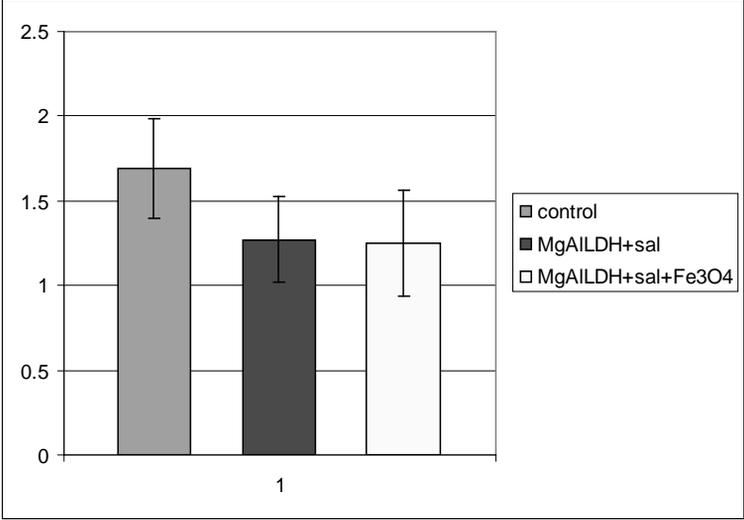


Fig.3. The stem dimensions, after 3 days of treatment with anionic clays

As the figure 3 shows, the wheat stems of the control plants are better developed than the treated plants.

Content of photosynthetic pigments, chlorophyll a (Chla), chlorophylls b (Chlb) and carotenoids (Car) from corn leaves are given in figure 4.

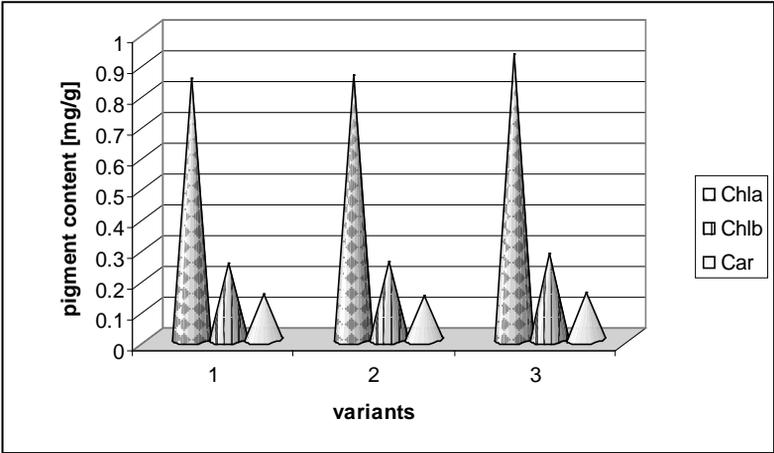


Fig. 4. The content of photosynthetic pigments (mg/g fresh tissue) from wheat leaves

From figure 4 we can see that the content of chlorophyll a (the most important photosynthetic pigment), for treated plant is meaningful higher than the control plant leaves, the content of chlorophyll b slightly increases and the carotenoid content remains the the same.

CONCLUSIONS

The anionic clays are useful in agriculture due their physical and chemical properties. Our results prove that there are differences between control plants and those treated with anionic clay suspensions. The best anionic clay from point of view of plant growth was the composite containing magnetite; despite the fact that the germination was faster for the control than the other variants, the content of the photosynthetic pigment for the treated plants was higher than the control plants. This means that the structure of LDH offers a good and controlled release of some active substances from nanocomposites to the plant cell. Our results are in concordance with C. Jiao et al. work, which recently reported the synergistic effects of Fe_2O_3 with layered double hydroxides (8).

Because are not toxic they can be materials of great interest especially in organic agriculture. Therefore, they can substitute some fertilizers or plant growth stimulators, (especially toxic chemical compounds) in order to obtain organic products.

REFERENCES

1. Auerbach S. M., Carrado K. A., Dutta P. K., 2004 - *Handbook of Layered Materials*. 261-311, New York
2. Carrado K.A.; Marshall C.L.; Brenner J.R.; Song K., 1998 - *Materials with controlled mesoporosity derived from synthetic polyvinylpyrrolidone-clay composites*. Microporous and Mesoporous Materials, 20(1-3), 17-26
3. Chiriac H., Oancea S., Gaburici M., Lupu N., 2008 - *Layered double hydroxide (LDH) as potential plant growth stimulator*. 7-th Int. Conf. on Global research and Education Inter-Academia, 2008, Sept. 15-18, Hungary, 87-93
4. Chiriac H., Lupu N., Gaburici M., Oancea S., 2008 - *Synthesis and Characterization of Layered Double Hydroxides With Induced Magnetic properties*. Proc.of Joint Int. Conf. Materials for Electrical Engineering, Bucharest, June 16th-17th, 221-224
5. Dorante L.O.T., 2007 - *Evaluation of a Layered Double Hydroxide (LDH) mineral as a long-term nitrate exchanger in soil*. Cuvillier Verlag.
6. Foca N., Oancea S., Condurache D., 2004 - *Growth and photosynthetic activity for tomato plants treated with different cations*. Molecular crystals and Liquid crystals Journal, 418, 971-981
7. Hourri B., Legrouri A., Barrou A., Forano C., Besse J. P., 1999 - *Removal of Chromate Ions from Water by Anionic Clays*. J. Chim. Phys., 96 (3), 455-463
8. Jiao C., Chen X., Zhang J., 2009 - *Synergistic Effects of Fe_2O_3 with Layered Double Hydroxides in EVA/LDH Composites*. Journal of Fire Sciences, Vol. 27, No. 5, 465-479
9. Klopogge J. T., Komarneni S., Amonette J. E., 1999 - *Synthesis of smectite clay minerals: a critical review*. Clays and Clay Minerals, 47(5), 529-55
10. Lakraimi M., Legrouri A., Barrou A., De Roy A., Besse J-P., 1999 - *Removal of Pesticides from Water by Anionic Clays*. J. Chim. Phys., 96 (3), 470-478

11. **Lichtenthaler H.K., Wellburn A.R., 1983** - *Determinations of total carotenoids and chlorophylls a and b of leaf extracts in different solvents.* Biochemical Society Transactions, 11, 591 - 592.
12. **Oancea S., 2007** - *Ghid de prelucrare rapidă a datelor experimentale.* Editura Performantica, Iasi
13. **Oancea S., Foca N., Airinei A., 2005** - *Effects of heavy metals on plant growth and photosynthetic activity.* Analele Univ. Al. I. Cuza, Tom I, s, Biofizica, Fizică medicală și Fizica mediului, 107-110
14. **Saber O., Tagaya H., 2005** - *Preparation of new layered double hydroxide.* Rev. Adv. Mater. Sci, 10, 59-63
15. **Salonen J., Laitinen L., Kaukonen A.M., Tuura J., Björkqvist M., Heikkilä T., Vähä-Heikkilä K, Hirvonen J. , Lehto V.-P., 2005** - *Mesoporous silicon microparticles for oral drug delivery: Loading and release of five model drugs.* Journal of Controlled Release 108, 362– 374
16. **Tsai W. T., Chen C. H., Yang J. M., 2002** - *Adsorption of paraquat on the physically activated bleaching earth waste from soybean oil processing plant.* Journal of Environmental Science and Health, Part B: Pesticides, Food Contaminants, and Agricultural Wastes, 37(5), 453-463
17. **Wang X., Sun C., Gao S., Wang L., Shuokui H., 2001** - *Validation of germination rate and root elongation as indicator to assess phytotoxicity with Cucumis sativus.* Chemosphere, 44(8), 1711-1721
18. **You Y.W., Zhao H.T., Vance G.F., 2001** - *Removal of arsenite from aqueous solutions by anionic clays.* Environ Technol, 22(12), 1447-1457
19. **Zhang J., Zhang F., Ren L., Evans D.G., Duan X., 2004** - *Synthesis of layered double hydroxide anionic clays intercalated by carboxylate anions.* Materials Chemistry and Physics, 85, 207-214

THE EFFECT OF THE MICROELEMENT COMPLEX MICROCOM ON GRAPE AND SUGAR BEET PRODUCING CAPACITY AND RESISTANCE

EFFECTUL COMPLEXULUI DE MICROELEMENTE MICROCOM ASUPRA PRODUCTIVITĂȚII ȘI REZISTENȚEI PLANTELOR DE VIȚĂ DE VIE ȘI A SFECLEI DE ZAHĂR

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***Abstract.** The complex of trace elements Microcom was elaborated in the Institute of Genetics and Plant Physiology ASM. It includes the necessary micronutrients in such relations and contents, which allow maintaining the metabolic processes in plants in dependence of corresponding culture and stressing factors with aim to mitigate the negative impact of the unfavorable conditions of environment. The test in conditions of green house and production showed that under the low temperature and drought foliar treatment of vine and sugar beet by that complex can serve as an effective procedure for mitigation of consequence of such stress-factors. Increase of plant resistance and productivity was marked.*

Key words: Microcom, stressing factors, productivity, resistance

***Rezumat.** Preparatul Microcom include microelementele necesare în combinații și raporturi care să corespundă menținerii proceselor metabolice din plantă la nivel înalt în dependență de cultura respectivă și de factorul stresogen concret în scopul diminuării la maximum a impactului factorilor nefavorabili. În condiții nefavorabile de mediu microelementele din complex determină utilizarea mai eficientă a metaboliților din plante și realizarea mai deplină a potențialului adaptiv și productiv al acestora. În condiții de producție acest complex poate servi ca un procedeu efectiv de atenuare a consecințelor factorilor nefavorabili și de majorare a rezistenței și productivității plantelor, manifestată prin sporirea productivității lor cu 10-15%.*

Cuvinte cheie: Microcom, factori nefavorabili, productivitate, rezistență.

INTRODUCTION

The plant capability to tolerate water or temperature stress increases while plants utilize water and nutrients in organic synthesis more efficiently and until the protoplasm is not exposed to significant destructive processes (1, 2). The respond of different plant varieties and species to the action of these factors depends on the ecological resistance. Plant resistance enhancement in these conditions is one of the predominant chains in solving the general problem of deriving stable yields with required qualities. Significant deviations in the intensity of absorption processes and involvement of nutritive elements into metabolism occur, in the first place, in

conditions of unfavorable soil humidity. These deviations can be reduced through exogenic regulation of macro- and microelement doses and ratios. Vegetative mass accumulation, yield volume and quality depend on the degree of macro- and microelement incorporation in metabolism (1, 3). The necessity of microelements for plants and human's health, deficit of these elements in different countries are well presented in the recent literature (1, 4-6). During the last years, a tendency has been well pronounced to develop and employ new nutritive substances that are complex, more efficient and can be integrated into new agricultural technologies.

The aim of these studies has been to disclose the impact of the trace element complex Microcom on formation and realization of the producing capacity potential and resistance of the crops that are important for Moldova agriculture – grape and sugar beet.

MATERIALS AND METHODS

The studies were carried out during the years 2005 to 2008 on grape (industrial cvs Aligote and Traminer). Grape plants were foliar treated with the complex of trace elements Microcom-V in three dates (1 – before flowering, 2 and 3 at the stage of intensive shoot growth with an interval of 12-14 days). Water treated plants were used as control. The shoot growth and ripening were determined according to the methods of Lazarevskii M.A. (1963) and Alexandrescu I. et al. (1998). The grape resistance to wintering was assessed in field conditions after their wintering according to the method developed by Cernomoreț M. V. specifically for the grape crop (1985, 2000). The productivity and yield quality were determined according to the recommendations worked out by Amirdjanov A.G., Suleimanov D.S. (1986) and Alexandrescu I. et al. (1998). The effect of the Microcom-T action on sugar beet was evaluated in the monitored conditions of temporary water stress (35% FWC, 10 days) in green house (soil – carbonated cernozem) and in production conditions. The studies in the monitored conditions of temporary water stress were performed on the autochthonous varieties Moldovenesc 41 and Victoria, in production conditions on the German cultivars Lenora, Georgina, and Merak in 2005 to 2008. The solution concentration was 0.25% ...0.30%. The nitrate reductase activity in leaves was determined in vivo after Mulder, the monosaccharide and saccharose content after Bertran.

RESULTS AND DISCUSSIONS

The content of photosynthetic pigments in leaves is one of the important indices that characterizes plant physiological condition during the vegetation period. The determination of these indices in plant leaves demonstrated a positive influence of trace element complex treatment on the plant photosynthetic activity. The chlorophyll *a+b* sum increased after the foliar 15,7% – 19,3% treatment in comparison with the control. The relationship between the chlorophyll types showed no significant change. The total carotenoids content increased significantly after the treatment with the trace element complex. A tendency of the carotenoids content decrease in leaves was observed after the treatment with the Fe chelate type present in the Microcom-V. The effect of Microcom was corroborated in the year 2007 characterized by an unusual drought. As the drought advanced (08.10.2007), the effect of the foliar treatment on the

pigment accumulation reduced but the content of photosynthetic pigments maintained at a higher level in comparison with that in the control plants.

The microelement content in leaves is one of the basic indices, which is indicative of the nutrition regime state and conditions a more complete realization of producing capacity potential and ecological resistance in plants. In the monitored conditions of the vegetative house, an increase of Fe, Mn, and Zn content was observed following the treatment in comparison with the control plants. The Cu content dropped in comparison with the witness. An antagonistic effect between the microelements of Fe and Cu is well pronounced and must be taken in consideration while utilizing the complex.

The importance of phosphorus in synthesis, activation, energy exchange, transport, as well as its impact on the reactions of formation and manifestation of the degree of frost and wintering resistance suggested an idea regarding quantitative studies on phosphoric compounds in grape plants in relation to foliar treatment with the complex of trace elements Microcom-V. The studies conducted on the Aligote cultivar revealed evident modifications in the content of acid-soluble phosphorus, as well as in its components: the fraction of inorganic phosphorus and that of organic one.

The determination of carbohydrate content in the tissues of grape leaves and shoots during the vegetation period demonstrated that the treatment with the Microcom-V product had a positive influence on the content of soluble saccharides. Simultaneously, the process of starch synthesis in shoots intensified, which indicated their higher resistance (fig. 1 and 2).

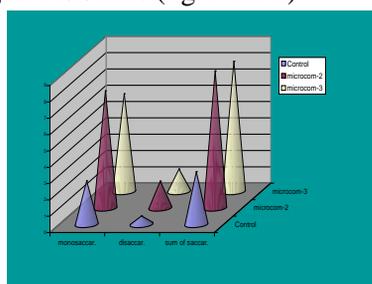


Fig. 1. The Microcom-V effect on the carbohydrate content in grape leaves, %

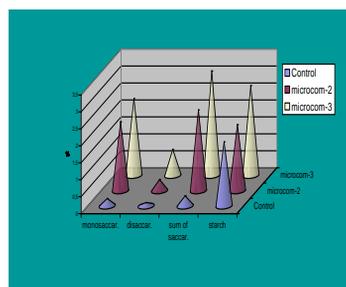


Fig. 2. The Microcom-V effect on the carbohydrate content in grape shoots, %

The foliar treatment of grape plants during the vegetation period with the Microcom-V product induced increase of mean shoot length and the degree of their ripening, which resulted in the enhancement of plant resistance to frost during the rest period. The foliar treatment during the vegetation period with Microcom-V has been found to enhance the degree of wintering resistance by 2.5% to 5.1%. In this treatment, 83.8% -9 1.9% of viable wintering eyes were found that also included injured ones in which the main bud died but at least one secondary bud developed. The evident increase in the degree of annual wood tissues in the treated plants is associated with the intensification of accumulation of reserve substances, especially protective ones. The foliar plant nutrition with Microcom-V increased grape

productivity. A beneficial action of the specific microelement complex on the yield volume and grape fruit quality has been detected. A mean weight of grape bunches increased in comparison with the control, the mean yields per bush grew. It is important that the production quality was higher (table 1).

Table 1

The influence of the microelement complex on the grape producing capacity, cv. Aligote, the district of Criuleni

Treatments	August 10, 2007		August 29, 2007		Yields per bush, kg
	sugar content, %	acid content, proml	sugar content, %	acid content, proml	
Witness	12.7	10.5	18.67	6.8	6.7
Microcom-V	13.2	10.6	19.30	6.0	8.2

The studies performed on sugar beet have demonstrated that in the monitored conditions of temporary water stress, the primary process of nitrate reduction in leaves decreased significantly. The foliar treatment with the trace element complex Microcom-T in such conditions results in the maintenance of the nitrate reductase (NR) activity in leaves at a higher level. Since the process of nitrate reduction is in a total direct dependence on the intensity of nitrogen metabolism, it may be concluded that the diminution of the nitrogen metabolism occurs in the unfavorable conditions of soil humidity followed by the decrease of organic mass accumulation by plants. It is also known that many nutritive elements, especially trace one, become partially inaccessible for plants in drought conditions. The Microcom-T product contains microelements which enter directly into the composition of NR enzyme (Mo) or are cofactors in activating it (Mn, Co). Probably, in the monitored conditions of temporary water stress, the plant foliar treatment with the Microcom-T product contributed to the increase of microelement accessibility and, consequently, to the maintenance of the NR activity at a higher level in comparison with the plants from the control-35% FWC. The product effect is also well pronounced in the optimal conditions of soil humidity. The maintenance of NR activity at a higher level is also followed by modifications in monosaccharide and saccharose content. As a rule, the content of monosaccharides and saccharose drops in leaves under the influence of the microelement complex. A tendency of monosaccharide and saccharose content diminution is also observed in optimal soil humidity conditions, but it is pronounced more weakly. It was found that after 10-day water stress, the plant treatment with the Microcom-T complex led to an increase in organic mass accumulation in comparison with the control -35% FWC by 14.1%, and in comparison with the combination of the BMnMo by 9.3% (the plant weight in the control -35% is 130.7 g).

The application of the microelement complex, as well as the BMnMo combination at the end of vegetation increased the root weight not only in comparison with that in the control -35% FWC but in the control -70% FWC. It is worthy to mention a more significant effect of the Microcom-T complex in comparison with the BMnMo combination. Simultaneously, the sugar content also

grew in roots. Thus, practically, if the duration of the water stress is relatively short (10-15 days), the foliar treatment with the microelements contributes, on the one hand, to a more efficient utilization of water in organic synthesis during the unfavorable factor action, and on the other hand, to an ulterior stimulation of the metabolic processes that improve the plant physiological condition manifested through diminution of the negative drought impact on the yield volume and production quality. It is noteworthy that at the end of vegetation, the root weight per plant in optimal conditions of soil humidity upon the plant treatment with the Microcom-T complex was higher in comparison with their weight in conditions of the monitored water stress.

The results of the NR activity evaluation in leaves in production conditions at the stages of intensive growth and sugar accumulation (as in the case of the experiments carried out in the monitored conditions of soil humidity in the vegetation house) demonstrated the same regularity – the maintenance of the enzyme activity at a higher level upon the plant treatment with the Microcom-T product and the BMnMo combination especially during the years with sufficient atmospheric precipitations for plant growth and development (2005 and 2006). During vegetation, the content of monosaccharides in leaves and roots and that of saccharose in leaves reduced insignificantly in the plants treated with the Microcom-T product and the BMnMo combination. The increase of the NR activity in leaves and the diminution of the monosaccharide and saccharide content in leaves was followed by an increase in root yields and sugar content.

The studies performed in production conditions allows us to compare the efficacy of the product in different growing conditions. In the year 2005, the Microcom-T product increased the root yields by 6.4% (cvs. Georgina, Germany) and the sugar content by 0.9% (71.3 M.T./ha and 15.6% in the control, respectively). In the year 2006, on the background of the root yields of 62.0 M.T./ha and sugar content of 19.2% in the control, the Microcom-T product contributed to an increase of root yields by 7.2 M.T./ha or by 11.6% and sugar content by 0.5%. The efficiency of the treatment with the microelement combination (BMnMo) was evident but less significant: in the year 2005, the root yields increased by 4.5% while the sugar content by 0.7%, and in the year 2006, the effect of the microelement combination application was pronounced even weaker – the root yields increased by 3.7% and the sugar content by 0.4%. The two-year experimental data of trials of the Microcom-T product and the BMnMo combination in production conditions confirmed a more significant efficiency of the complex as compared with the BMnMo combination for both root yields and sugar content. Therefore, in the following years (2007 and 2008) the microelement combination (BMnMo) was ruled out from the experiment.

The year 2007 was characterized by an acute, long and disastrous drought for plant growth and development. Due to the long-duration drought (from the second half of May to August), acute visual symptoms of soil humidity insufficiency were manifested in plants (a sharp drop of metabolic processes, vegetative mass accumulation, basal leaf drying) already at the stage of leaf unification in a row.

After atmospheric precipitation fell in the second half of August, nitrogen and carbohydrate metabolism (reduction of monosaccharide and saccharose content in leaves) intensified, mass and sugar content in roots increased in the plants, especially those treated with the complex microelements. The root yield records showed the degree of the negative environmental impact on the producing capacity of sugar beet. In 2007, the root yields made only 12.9 M.T./ha or 18.1% of the 2005 yields and 20.8% of the year 2006. Against this background, the Microcom-T microelement complex increased the root yields by 19.9% or 2.6 M.T./ha. It is noteworthy that the more intensive accumulation of root weight under the influence of the microelement complex was followed by increase of sugar content. In the year 2008, against the background of the root yields making 51.3 M.T. per hectare, the foliar treatment with the Microcom-T microelement complex resulted in the yield increase by 4.9 M.T./ha (56.2 M.T./ha in the control) or by 9.5% and an increase of sugar content by 0.5% (19.2% in the control). Thus, the production conditions have shown that the product effect depends on the duration of the unfavorable humidity factor. The effect of the complex application is even more significant if the drought is relatively short (10-15 days). Long-duration drought reduces the efficiency of the employment of the microelement complex Microcom-T significantly.

CONCLUSIONS

In conditions of natural calamities (short-duration drought, low negative temperatures), the employment of grape and sugar beet foliar treatment with the specific microelement complex may serve as an effective procedure to mitigate the consequences of stress factors and to enhance plant resistance and producing capacity. The utilization of the microelement complex Microcom improves the nitrogen and carbohydrate metabolism in plants in both optimal and unfavorable environmental growing conditions, increases plant producing capacity by 10-15%. The procedure developed is included in the grape and sugar beet cultivation techniques.

REFERENCES

1. **Alloway Brion, 2006** - *Micronutrient deficiencies around the world: current situation and outlook*. In: New Ag International. P. 26-41
2. **Bowley A.D., 1979**. - *Physiological aspects of desiccation tolerance*. Ann Rev. Plant Physiol., 30,195-339.
3. **Burzo I., Toma S. și al., 2000** - *Fiziologia plantelor de cultură*. Chișinău.
4. **Levitt J., 1980** - *Responses of plant to environmental stress*. New York-London. Acad. Press., 2, 607 p.
5. **Toma S., Veliksar S., Lisnic S., Lupan A., 2003** - *Rolul microelementelor în optimizarea nutriției minerale, formarea rezistenței și productivității plantelor agricole*. Conferința corpului didactico-științific al USM "Bilanțul activității științifice în anii 2000-2002". Chișinău. P.357-358.
6. **Toma S., Lisnic S, Veliksar S., 2004** - *Microelemente ca component al tehnologiile fitotehnice*. Bul. Academiei de Științe a Moldovei, 1(292), p. 70-74.

THE INFLUENCE OF ENVIRONMENTAL CONDITIONS ON THE FORMATION AND ACTIVITY OF FOLIAR APPARATE OF VINE PLANT

INFLUENȚA CONDIȚIILOR ECOLOGICE ASUPRA FORMĂRII ȘI ACTIVITĂȚII APARATULUI FOLIAR AL VIȚEI DE VIE

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Abstract. *The main body of vine plant, which plays a role photosynthetic, is a leaf. From its status, size and structure depends vine plant in total. Dependings of formation of leaf size depending on location, availability of moisture, insolation, etc.*

Key words: vine plant, leaf, sugarity, slope

Rezumat. *Principalul organism al viței de vie, care joacă un rol fotosintetic, este o frunză. De la starea ei, mărimea și structura depinde starea plantei în total. Au fost stabilite legile de bază ale formării mărimii farfurii de frunză în funcție de condițiile amplasării, de disponibilitatea de umiditate, expunere la soare etc.*

Cuvinte cheie: vița de vie, frunza, zaharitatea, pantă

INTRODUCTION

The leaves are the main body of the vine, showing the ability of the inorganic synthesizing organic substances under the action of solar energy. P.G.Tavadze and other researchers (1, 2, 3, 4) notes that to obtain the fruits of high need for optimal photosynthetic apparatus after its dimensions. In his research A.G.Amirdjanov has concluded that to obtain 10 tons of grapes with sugarity of 17-18% was needed to 1 ha approximately 10-15 thousand m² of leaf surface.

The foliage is reflected environment (ecological and agro-technical factors). That determine its production and quality, which is the main goal in vine cultivation.

MATERIAL AND METHOD

The research was conducted in major wine grape varieties, the most important regions of the Republic of Moldova. Registrations, analysis and monitoring carried out according to methodology of carrying out agrobiological research on the vine.

RESULTS AND DISCUSSIONS

Our research, spent the major wine regions of Moldova shows that of all ecological factors most influence on the formation of a foliar surface, water exercise and diet regime of the territory. On slopes with soils with more satiate

the productive moisture and nutrients to form a larger leaf surface. Depending on the location of plants on the slope (tab. 1) greater leaf area observed at plants located in the bottom.

Training area depends primarily foliar nutrition and water regime of the sector from other ecological factors. Satisfy the slopes with soil moisture and nutrients productive forms a larger leaf surface.

Table 1

Influence of plant location on the slope on the development of foliar surface of the vine. National Institute of Vine and Wine. Moldova. 2000-2008

The exhibition, the degree of inclination of the slope	Number of leaves on the block	Surface of a leaf, cm ²	Leaf area	
			a bloc, m ²	a hectare, thousands m ²
Variety Bastardo Magaraciskii				
SW, 3-5°, the top	631,5	82,5	5,21	11,57
SW, 8-10°, the middle	656,6	73,1	4,86	11,57
SW, 3-5°, the bottom	672,3	88,5	5,95	12,83
Variety Merlot				
SE, 5-8°, the top	570,5	80,1	4,57	10,15
SE, 5-8°, the middle	645,8	86,1	5,56	12,35
SE, 3-5°, the bottom	834,0	98,8	8,24	18,31

It is known fact that the character training of the vine harvest, especially an influence on the formation of generative organs essential to exercise some special areas of the leaf or leaves some special. Research this phenomenon showed that the leaf surface in different. The varieties studied was established that the higher leaf nodes are between 4 and 6. Plants with a well developed root system and growth were stronger in increased leaf area throughout the length string. At these plants the increased size of the leaf begins closer to the string and extended through most of its length.

Depending on the location of plants growing on the slope flatter leaf size in the middle. The plants located at the top and bottom of the slope there is a sudden increase in leaf area. With a larger surface area to leaf in these plants start closer to the shoot (Fig. 1)

Given that the very size of foliar surface does not reflect the full picture on photosynthetic productivity, we conducted research to test the optical properties (rejection and absorption solar energy).

Absorption of solar energy by vine leaves (fig. 2) the initial period of vegetation (flowering stage) tub of 69.5 up to 71.5%; less on slopes oriented on south-west, west, in those areas where the concentration of pigments increases than the same indices from other sectors. Then, with increasing volume foliar mass, improving and optical features of leaves, increased ability to absorb. This follows up to complete maturation of the leaves. During this period rates of absorb solar energy drops sharply.

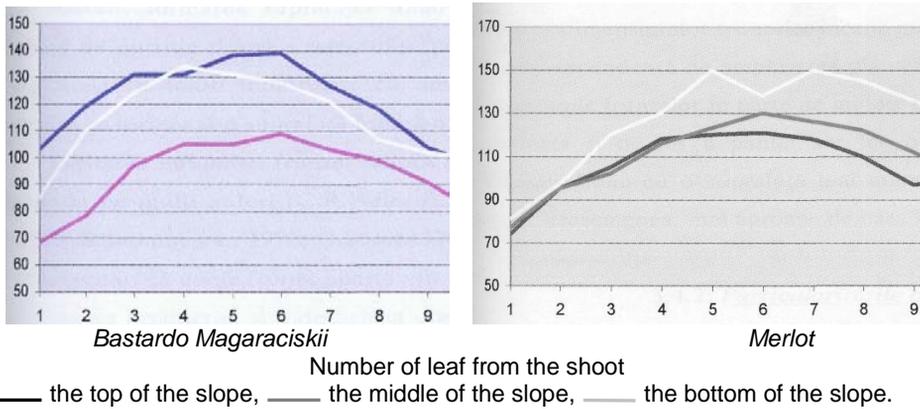


Fig. 1. Changing leaf area (cm²) along the length depending on the location shoot of plants on the slope. College planning and economy Bender.

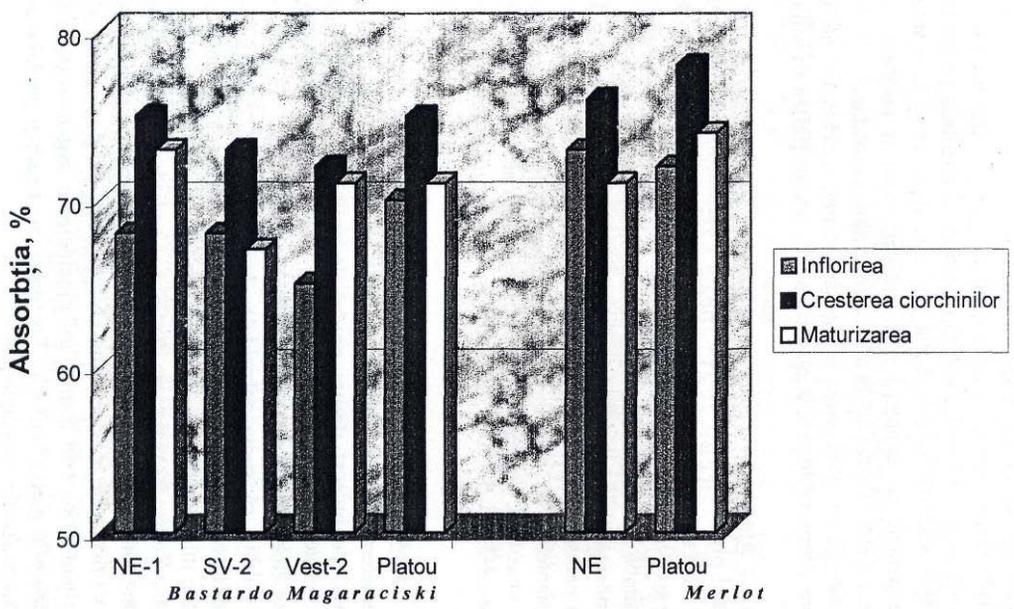


Fig. 2. Absorption RFA in vine leaves in dependence of environmental conditions. College planning and economy Bender.

The absorption of solar energy in the flowering period varies from 69.5% to 71.5%: more than the slopes located on the plateau and less on slopes with exhibitions southwest, west and north-east (fig. 2), in those areas where the concentration of pigments increases than these indices in other sectors. The ownership of the vine is the result of its ability to adapt to lighting conditions.

Then, in the development of the vine, there is increasing amount of mass from the surface, the result is improving optical properties of leaves, increase the absorption capacity.

Then, in the vine growth and development, rapid absorption of solar energy falls. It explains this by aging some of the leaves.

Depending on the location of plants on the slope are also differences, though not as large. In the initial period of vegetation with an increased activity of the absorption leaves characterized in location at the top and bottom of the slope. Then these indices are equals. The higher capacity to absorb solar energy plant was noted at the stage of grape growth and maturation chords. However, it must stressed that the greatest activity in the plants absorb is located in the middle of the slope (73%), then the top and bottom (corresponding to 70 and 69%).

It should stressed that during drought, with low humidity air and soil, absorbing solar energy slump, while most stands on slopes facing southwest, with the degree of inclination 8-10° (nearly 10%) and less on the plateau (around 5%).

CONCLUSIONS

Thus, knowing laws of training foliar surface and its photosynthetic activity, an agricultural technique can elaborate on more productive varieties in different growing conditions of the vine.

REFERENCES

1. **Amirdjanov A.G., 1992** - *Metodâ oțenki produktivnosti vinogradnikov s osnovami programirovania urojaev*. Ed. Știința, Chișinăov.
2. **Jacotă A.G., 1976** - *Opticeskie svoistva i sostojanie pigmentov listev vinograda v sveazi s urovnem mineralnogo pitania i vlajnosti pocivâ*. Culegerea de articole „Zimostoikost vinogradnoi lozâ v zavisimosti ot uslovii vârașcivania”. Ed. Știința, Chișinăov.
3. **Mihalache I., Chisili M., 1997** - *Usoverșenstvovanie agroăkologhiceskih izâskanii i ih znacenie v raionirovanii territorii Moldovâ dlea vinogradarstva*. Revista „Agricultura Moldovei”, nr. 5-6. Chișinău.
4. **Stoev C.D., T.Slavceva, 1979** - *O vlianii vajneișih âkologhiceskih faktorov na fotosintez listev vinograda*. Culegerea de articole „Fiziologhia rasteonii”, t. 26, vâp. 2. Chișinău.

VARIABILITY OF SEEDS AND DECORATIVE TRAITS AND THE CORRELATIONS AMONG THESE AT DIFFERENT CALENDULA GENOTYPES

VARIABILITATEA UNOR CARACTERISTICI ALE SEMINTELOR ȘI PLANTELOR ȘI CORELAȚIILE DINTRE ACESTEA LA DIFERITE GENOTIPURI DE CALENDULA

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Abstract: *Marigolds (Calendula) are considered one of the most versatile and easy to grow flowers in a garden, with ornamental and medicinal importance. In order to identify potential genitors for breeding works, there were studied 45 genotypes of Calendula, represented of six species and different cultivars. Most of them presented valuable ornamental traits and could be used as genitors for obtaining new decorative cultivars by hybridization. The seed's weight influenced positively the rising capacity and was phenotypic correlated with decorative characteristics of the plants, positive with plant height and number of stem per plant, and negative with number of petals per flower. The identified correlations, statistically assured, could be used as selection indices in marigold breeding.*

Key words: *Calendula, hybridization, seed's weight, decorative characteristics.*

Rezumat: *Gălbenelele (Calendula) fac parte dintre cele mai versatile și ușor de întreținut flori de grădină, cu deosebite proprietăți ornamentale și medicinale. În scopul identificării unor potențiali genitori pentru munca de ameliorare, au fost studiate 45 de genotipuri de Calendula, reprezentate de șase specii și diferite cultivaruri. Numeroase genotipuri au prezentat particularități ornamentale valoroase, astfel că pot fi utilizate ca genitori în lucrări de hibridare artificială, pentru obținerea unor noi cultivaruri cu valoare decorativă. Greutatea semințelor a influențat pozitiv răsărirea plantelor și a fost corelată fenotipic cu unele caracteristici decorative ale plantelor, pozitiv cu înălțimea acestora și numărul de tije pe plantă, și negativ cu numărul de petale din floare. Astfel de corelații, asigurate statistic, pot fi utilizate ca indici de selecție în ameliorarea gălbenelelor.*

Cuvinte cheie: *Calendula, hibridare, greutatea semințelor, caracteristici decorative.*

INTRODUCTION

Marigold is included in the *Calendula* gender, *Asteraceae* family, which outtakes approximately 25 annual and perennial species, the most widespread species being: *Calendula officinalis*, *C. arvensis*, *C. alata*, *C. stellata*, *C. tripterocarpa*, *C. suffruticosa* etc. In Romania, the most common species are *C. officinalis* L. and the less well known is *C. arvensis* L. Rustic specie *C. officinalis*

L. is poorly present in the spontaneous flora in the region of Banat, Iași, Cluj and on the Someș riverside (Cociu and Răcz, 1962).

Calendula officinalis L. is used for its decorative aspects in the landscape design, especially the plants with involutes flowers. As cut flowers, *Calendula officinalis* are used in different flower arrangements (Șelaru, 2007). For breeding purposes, it is intended to obtain new cultivars with a high ornamental capacity, with big involutes flowers, highly coloured, especially yellow colour, yellow-orange, or dark orange with compact growth (Gonceariuc, 2001).

Because of the therapeutically properties of *Calendula*, its content of essential oils and pigments, the plant is used in human medicine, veterinary medicine and food industry (Baciu and Sestraș, 2008). Following this aspects, the breeding purposes are to create new genotypes with involutes flowers that will obtain a large number of seeds and essential oils (Diaconu, 1992). *Calendula officinalis* showed good agronomic traits, including tolerance to drought and to high temperature; the seeds contained a mixture of fatty acids (Angelini et al., 1997). Consequently, increasing seed oil content and eliminating certain wild characteristics such as fruit dehiscence represents important further breeding aims work. After Zitterl-Eglseer et al. (2001), breeding work should focus on varieties with a greater number of ray florets in order to improve the quality of herbal medicinal products derived from marigold.

MATERIAL AND METHODS

In an experimental plot situated at the Botanical Garden of University of Agricultural Science and Veterinary Medicine Cluj-Napoca (UASVM Cluj-Napoca), Romania, 45 genotypes of *Calendula* gender where studied, belonging to six species, as follows: *C. officinalis*, *C. alata*, *C. arvensis*, *C. stellata*, *C. suffruticosa*, *C. tripterocarpa*.

The following characteristics where studied: weight of seeds (mg), emergence capacity of plants (%), height of the plants (cm), no. of stems, no. of flowers/plant and no. of petals in corolla (the traits of plants were analysed at mature plants when these showed their maximum decorative aspect).

The obtained data where computed as averages. The analysis of variance was performed using the ANOVA test, respectively „t” test (Ardelean et al., 2007).

RESULTS AND DISCUSSIONS

The medium values of seed's weight (mg), emergence capacity of seeds (%) and the height of mature plants (cm) are presented in table 1.

Regarding the studied genotypes, the seeds weight presented an ample variation, with values between 5.32 mg at *C. arvensis* F, and 21.06 mg at *C. alata* UK. The seeds with the lowest weight where observed at *C. arvensis* F, *C. arvensis* SLO, Bon Bon Mix, *C. officinalis* L.F.c, *C. officinalis* L.PL, *C. officinalis* I., cv. Prycosnovjenie, cv. Fiesta Hitana, cv. Rozovyi Sjurpriz, cv. Pacific, cv. Plamen, *C. officinalis* AZ, all with negative signification compared with the experiment average (12.27 mg).

Table 1

Mean values of analyzed traits and variability coefficient for *Calendula* genotypes

No.	Genotype	Seeds weight		Emergence capacity %	Plant height	
		mg	CV%		cm	CV%
1	122GE 2822-0002	12.02 ⁻	29.2	56.7 ⁻	33.56 ⁰⁰⁰	28.5
2	123GE Hortus Hudae	17.36 ^{xxx}	32.0	50.0 ⁻	37.60 ⁰⁰	19.0
3	121GE2822-0001	18.21 ^{xx}	46.9	68.6 ⁻	55.00 ^{xxx}	16.5
4	124GE2822-04	12.87 ⁻	41.3	51.4 ⁻	39.15 ⁰⁰	28.5
5	<i>C. officinalis</i> L.D.a	19.05 ^{xxx}	24.1	78.3 ^{xx}	36.13 ⁰⁰⁰	31.4
6	<i>C. officinalis</i> L.B	11.27 ⁻	26.4	78.0 ^{xx}	31.06 ⁰⁰⁰	48.0
7	<i>C. officinalis</i> F.a	14.06 ^x	20.3	76.7 ^{xx}	36.19 ⁰⁰⁰	28.8
8	<i>C. arvensis</i> F	5.32 ⁰⁰⁰	27.3	33.8 ⁻	44.35 ⁻	17.0
9	<i>C. officinalis</i> SLO	10.85 ⁻	27.2	63.3 ⁻	42.11 ⁰	18.9
10	<i>C. arvensis</i> SLO	9.17 ⁰⁰	46.1	65.0 ⁻	67.72 ^{xxx}	13.8
11	cv. prolifera Nr. 215	11.61 ⁻	41.9	56.7 ⁻	49.88 ⁻	34.2
12	cv. prolifera Nr. 214	12.74 ⁻	31.7	61.7 ⁻	59.65 ^{xxx}	35.2
13	Bon-Bon Orange	18.21 ^{xxx}	33.9	68.3 ⁻	52.12 ^x	30.3
14	Bon Bon Mix'	7.69 ⁰⁰⁰	31.4	51.8 ⁻	41.71 ⁻	38.2
15	<i>C. officinalis</i> UK	16.83 ^{xx}	33.8	61.1 ⁻	30.64 ⁰⁰⁰	40.5
16	<i>C. officinalis</i> L.D.b	11.69 ⁻	50.3	31.7 ⁻	44.95 ⁻	37.7
17	<i>C. officinalis</i> L.F.b	16.21 ^{xxx}	25.4	76.7 ^{xx}	50.54 ⁻	34.2
18	<i>C. officinalis</i> L.D.c	12.11 ⁻	48.6	56.7 ⁻	43.29 ⁻	48.5
19	cv. Pacific-Riesen	14.59 ^x	30.6	61.7 ⁻	41.43 ⁻	36.0
20	cv. Radio	16.32 ⁻	58.0	63.3 ⁻	45.89 ⁻	31.0
21	cv. Rech.f.	17.31 ⁻	68.3	66.7 ⁻	61.15 ^{xxx}	29.6
22	<i>C. arvensis</i> L.	9.79 ⁻	54.2	70.0 ^x	58.12 ^{xxx}	32.6
23	<i>C. stellata</i> Cav.	11.27 ⁻	54.7	53.3 ⁻	60.53 ^{xxx}	27.0
24	<i>C. suffruticosa</i> Vahl.	10.76 ⁻	58.3	60.0 ⁻	65.89 ^{xxx}	23.0
25	<i>C. tripterocarpa</i> Rupr.	11.04 ⁻	57.1	53.3 ⁻	84.06 ^{xxx}	12.6
26	<i>C. officinalis</i> L.F.c	10.20 ⁰⁰⁽⁰⁾	21.9	48.3 ⁻	51.45 ^x	29.7
27	<i>C. officinalis</i> L.D.d	13.25 ⁻	45.4	48.3 ⁻	71.24 ^{xxx}	14.0
28	<i>C. officinalis</i> L.D.e	11.60 ⁻	41.6	41.7 ⁻	31.72 ⁰⁰⁰	32.0
29	<i>C. officinalis</i> L.PL	8.74 ⁰	74.2	33.3 ⁻	43.85 ⁻	41.4
30	<i>C. officinalis</i> L.D.f	16.83 ^(x)	46.1	48.3 ⁻	46.87 ⁻	35.6
31	<i>C. officinalis</i> D.g	10.93 ⁻	33.2	50.0 ⁻	47.67 ⁻	38.5
32	<i>C. officinalis</i> I	8.60 ⁰⁰	54.4	37.8 ⁻	35.85 ⁰⁰	32.0
33	<i>C. officinalis</i> D.h	10.84 ⁻	59.8	18.7 ⁰⁰	29.00 ⁰⁰	49.5
34	cv. Prycosnovjenie	7.15 ⁰⁰⁰	65.7	17.1 ⁰⁰	38.88 ⁻	27.2
35	cv. Pacific Beauty	10.61 ⁻	46.3	40.0 ⁻	40.00 ⁻	46.9
36	cv. Gaicha Gril	9.70 ⁻	53.2	26.7 ⁰	43.16 ⁻	34.7
37	cv. Fiesta Hitana	9.41 ⁰⁰⁰	30.6	46.7 ⁻	28.79 ⁰⁰⁰	34.5
38	cv. Zelenoye Serdtse	9.93 ⁻	55.8	23.3 ⁰	31.57 ⁰	53.2
39	cv. Rozovyi Sjurpriz	8.59 ⁰⁰⁰	42.7	23.3 ⁰	22.00 ⁰⁰⁰	61.7
40	<i>C. alata</i> UK	21.06 ^{xxx}	34.0	31.1 ⁻	62.40 ^x	17.1
41	<i>C. suffruticosa</i>	19.12 ^{xxx}	32.5	33.3 ⁻	60.60 ⁻	27.3
42	<i>C. officinalis</i> A	10.18 ⁻	46.0	53.3 ⁻	29.44 ⁰⁰⁰	34.8
43	cv. Pacific	9.20 ⁰⁰	39.2	36.7 ⁻	55.91 ^x	24.9
44	cv. Plamen	8.19 ⁰⁰⁰	42.4	40.0 ⁻	26.00 ⁰⁰⁰	66.7
45	<i>C. officinalis</i> AZ	9.39 ⁰⁰⁰	29.8	30.0 ⁻	44.11 ⁻	34.2
Mean of experiment(Control)		12.27	42.6	49.8	45.63	32.8

Heavier seeds were obtained at 123GEHortus Hudaе, 121GE2822-0001, *C. officinalis* L.D.a, *C. officinalis* F.a, Bon-Bon Orange, *C. officinalis* UK, *C. officinalis* L.F.b, cv. Pacific-Riesen, *C. officinalis* L.D.f, *C. suffruticosa*, *C. alata* UK, with superior differences, and statistically assured related to the average of the experiment. The highest percent of seed emergence was recorded at *C. officinalis* L.D.a with the value of 78.3%, *C. officinalis* L.B with 78.0% and *C. officinalis* L.F.a, *C. officinalis* L.F.b with 76.7%.

The plant height oscillated between 22.00 cm (cv. Rozovyi Sjurpriz) and 84.06 (*C. tripterocarpa* Rupr.), the average height of the plants for experiment being 45.63 cm.

Table 2

Results obtained for important decorative traits analyzed at *Calendula* genotypes

No.	Genotype	No. of stems		No. of flowers		No. of petals	
		No	CV%	No	CV%	No	CV%
1	122GE 2822-0002	11.41 ^{xxx}	23.0	12.18 ^{ooo}	51.6	30.26 ^{ooo}	13.4
2	123GE Hortus Hudaе	9.33 ⁻	20.5	7.07 ^{ooo}	45.2	35.40 ^{ooo}	32.7
3	121GE2822-0001	10.37 ^{xxx}	22.9	20.60 ⁻	52.2	20.37 ^{ooo}	18.4
4	124GE2822-04	4.85 ^{ooo}	17.8	11.70 ^{ooo}	27.7	21.63 ^{ooo}	17.4
5	<i>C. officinalis</i> L.D.a	16.38 ^{xxx}	41.0	7.43 ^{ooo}	66.7	28.66 ^{ooo}	43.7
6	<i>C. officinalis</i> L.B	3.89 ^{ooo}	69.9	4.06 ^{ooo}	106.1	25.11 ^{ooo}	66.4
7	<i>C. officinalis</i> F.a	10.58 ^{xxx}	35.5	16.46 ⁻	51.0	38.17 ^{ooo}	8.0
8	<i>C. arvensis</i> F	4.59 ^{ooo}	19.0	32.24 ^{xxx}	27.5	20.06 ^{ooo}	13.9
9	<i>C. officinalis</i> SLO	8.97 ⁻	20.8	16.50 ^{ooo}	23.1	26.89 ^{ooo}	7.6
10	<i>C. arvensis</i> SLO	7.36 ^{ooo}	19.8	19.77 ⁻	28.7	15.87 ^{ooo}	7.7
11	cv. prolifera Nr. 215	5.59 ^{ooo}	22.5	5.50 ^{ooo}	51.9	42.85 ^{o(o)}	42.4
12	cv. prolifera Nr. 214	13.43 ^{xxx}	33.8	11.00 ^{ooo}	53.9	115.51 ^{xxx}	60.5
13	Bon-Bon Orange	11.95 ^{xxx}	36.6	16.83 ^{ooo}	36.5	41.66 ^{ooo}	25.8
14	Bon Bon Mix ⁷	6.79 ⁻	57.0	2.86 ^{ooo}	71.1	97.64 ^{xx}	54.4
15	<i>C. officinalis</i> UK	4.91 ^{xxx}	56.5	2.00 ^{ooo}	86.6	19.91 ^{ooo}	79.8
16	<i>C. officinalis</i> L.D.b	10.00 ⁻	47.8	6.00 ^{ooo}	78.6	26.47 ^{ooo}	45.8
17	<i>C. officinalis</i> L.F.b	10.50 ^{xx}	40.5	16.89 ^{o(o)}	63.5	27.89 ^{ooo}	32.6
18	<i>C. officinalis</i> L.D.c	9.18 ⁻	60.7	14.53 ^{o(o)}	77.0	24.44 ^{ooo}	52.0
19	cv. Pacific-Riesen	8.11 ⁻	38.9	10.24 ^{ooo}	91.2	51.35 ⁻	105.5
20	cv. Radio	7.89 ⁻	41.9	16.08 ^{oo}	64.0	49.29 ⁻	31.6
21	cv. Rech.f.	9.45 ⁻	34.4	32.10 ^{xxx}	48.1	25.65 ^{ooo}	4.9
22	<i>C. arvensis</i> L.	8.79 ⁻	36.6	73.07 ^{xxx}	33.4	24.83 ^{ooo}	6.0
23	<i>C. stellata</i> Cav.	9.22 ⁻	33.9	83.03 ^{xxx}	32.6	25.00 ^{ooo}	5.3
24	<i>C. suffruticosa</i> Vahl.	9.31 ⁻	29.4	98.00 ^{xxx}	26.7	25.06 ^{ooo}	8.1
25	<i>C. tripterocarpa</i>	11.53 ^{xxx}	19.2	96.53 ^{xxx}	19.0	24.66 ^{ooo}	6.3
26	<i>C. officinalis</i> L.F.c	9.14 ⁻	47.8	16.86 ^o	61.2	33.00 ^{ooo}	41.4
27	<i>C. officinalis</i> L.D.d	9.10 ⁻	31.3	17.24 ^{oo}	33.8	51.69 ⁻	18.0
28	<i>C. officinalis</i> L.D.e	7.44 ⁻	53.6	26.16 ⁻	60.2	22.88 ^{ooo}	46.2
29	<i>C. officinalis</i> L.PL	7.40 ⁻	55.7	13.85 ^{ooo}	65.6	176.30 ^{xxx}	43.8
30	<i>C. officinalis</i> L.D.f	9.52 ⁻	49.1	23.52 ⁻	65.5	31.52 ^{ooo}	61.0
31	<i>C. officinalis</i> D.g	7.50 ⁻	54.0	17.07 ^o	52.8	31.90 ^{ooo}	46.5
32	<i>C. officinalis</i> I	6.85 ⁻	50.5	8.69 ^{ooo}	64.3	60.31 ⁻	33.6
33	<i>C. officinalis</i> D.h	5.50 ^o	67.8	3.50 ^{ooo}	109.5	25.33 ^{ooo}	50.8

34	cv. Prycosnovjenje	10.75 ^x	24.2	13.75 ^o	63.1	14.00 ^{ooo}	62.6
35	cv. Pacific Beauty	7.58 ⁻	56.6	10.75 ^{ooo}	56.5	82.08 ^x	58.7
36	cv. Gaicha Gril	9.19 ⁻	44.3	12.61 ^{ooo}	52.2	194.00 ^{xxx}	41.5
37	cv. Fiesta Hitana	6.29 ^o	62.8	3.43 ^{ooo}	107.1	159.57 ^{xx}	78.7
38	cv. Zelenoye Serdtse	7.29 ⁻	48.7	3.00 ^{ooo}	101.8	181.86 ^(x)	97.0
39	cv. Rozovyi Sjurpriz	5.71 ⁻	83.8	3.14 ^{ooo}	90.8	107.00 ^(x)	68.8
40	<i>C. alata</i> UK	9.80 ⁻	19.6	54.20 ^{xx(x)}	40.4	23.20 ^{ooo}	3.6
41	<i>C. suffruticosa</i>	8.60 ⁻	39.9	58.00 ^{xxx}	36.2	22.80 ^{ooo}	3.7
42	<i>C. officinalis</i> A	8.69 ⁻	62.9	18.19 ⁻	55.5	24.25 ^{ooo}	50.2
43	cv. Pacific	8.00 ⁻	31.6	10.82 ^{ooo}	58.7	60.45 ⁻	36.7
44	cv. Plamen	5.50 ^{ooo}	40.7	2.17 ^{ooo}	103.8	126.75 ^{xx}	88.6
45	<i>C. officinalis</i> AZ	9.89 ⁻	49.4	15.89 ⁻	69.0	29.89 ^{ooo}	19.5
Mean of experiment (Control)		8.54	41.2	21.46	59.2	52.08	38.7

Compared with the experimental average, related statistical data for no. of stems was observed at 17 genotypes (table 2). The lowest no. of stems was observed at *C. arvensis* F. (4.59) and the highest no. of stems was recorded at *C. officinalis* L.D.a (16.38). In all the 45 studied genotypes, the highest no. of flowers was observed at *C. suffruticosa* Valh. (98.00) and the lowest no. of flowers/plant *C. officinalis* UK of 2.00, between the two values existing a large amplitude. Regarding the no. of petals in corole, 40 genotypes were statistically related, with a limits between 14.00 (at cv. Prycosnovjenje) and 194.00 (at cv. Gaicha Gril).

It was identified different genotypes, which could be used as genitors for obtaining new cultivars by hybridization: 122GE 2822-0002, *C. officinalis* L.D.a, cv. prolifera Nr.214, Bon-Bon Orange, *C. tripterocarpa* Rupr. (for high no of steams/plant); Rech.f., *C. arvensis* L, *C. stellata* Cav. (for a high no of flowers/plant); Cv. prolifera Nr. 214, *C. officinalis* L.PL, cv. Gaicha Gril (for high no of petals in corolla: 121GE2822-0001, cv. prolifera Nr.214, cv. Rech.f., *C. officinalis* L.D.d. (for height plants).

In the experiment, among the analyzed characteristics there were computed phenotypic correlations, majority of them being statistically assured, positive or negative (table 3).

Table 3

Phenotypic correlation between the main characteristics analyzed at 45 *Calendula* genotypes

Correlated characters	Seed germination	Plant height	No. of stems	No. of flowers	No. of petals
Seed weight	0.420 ^{xxx}	0.226 ^x	0.433 ^{xxx}	0.095 ⁻	- 0.337 ^{oo(o)}
Seed germination		0.220 ^x	0.294 ^{xx}	0.115 ⁻	- 0.362 ^{ooo}
Plant height			0.377 ^{xxx}	0.689 ^{xxx}	- 0.282 ^{oo}
No. of stems				0.234 ^x	- 0.156 ⁻
No. of flowers					- 0.325 ^{oo}

$$r\ 5\% = 0.205; r\ 1\% = 0.267; r\ 0.1\% = 0.338$$

Positive correlations, highly significant where identified between: seed weight and seed germination; seed weight and no. of seams; plant height and no. of steams; plant height and no. of flowers/plant. There was confirmed previous data (Baciu and Sestraș, 2008), that the seed's weight assures a better germination. The result illustrated that the seed's weight is positive correlated with the no. of steams per plant. In the experiment, no. of petals per flower was negatively correlated with the weight of seeds, seed germination, plant height and no. of flowers/plant.

CONCLUSIONS

The large variability recorded at the *Calendula* genotypes studied in the Botanical Garden of UASVM Cluj-Napoca, allowed identification of potential genitors for marigold breeding and obtaining new cultivars.

The identified correlations between different characteristics can be used as selection indices for different breeding purposes. The negative correlation between the no of petals and different plant characteristics suggests the fact that once with the rise of seed weight, germination capacity, plant height and no of flowers/plant, the no of petals in corolla is decreasing. These correlations could be an impediment in marigold breeding in order to create new cultivars with high ornamentals traits, as are many flowers per plant and with many petals per flower.

REFERENCES

1. Angelini L. G., E. Moscheni, G. Colonna, P. Belloni, E. Bonari, 1997 - *Variation in agronomic characteristics and seed oil composition of new oilseed crops in central Italy*. Industrial Crops and Products, 6(3-4), 313-323.
2. Ardelean M., R. Sestraș, M. Cordea, 2007 - *Tehnică experimentală horticola*. Editura AcademicPres, Cluj-Napoca.
3. Baciu A. D., Sestraș R., 2008 - *Study of the main characteristics of seed belonging to different genotypes of Calendula*. Bulletin UASVM Cluj, Horticulture, 65 (1), 116-121.
4. Brânzilă I., 2007 - *Capacitatea germinativă de câmp a semințelor de gălbenele (Calendula officinalis L.)*. Mediul ambient, 1(31), 1-2.
5. Diaconu P., 1992 - *Utilizarea variabilității induse în ameliorarea gălbenelelor (Calendula officinalis)*. Agronomie: Lucrări științifice, S.A., Vol. 34, 17-21.
6. Goncariuc M., 2001 - *Variabilitatea caracterelor morfologice ale antodiilor la Calendula L.* Analele științifice ale Centrului de Resurse genetice vegetale din Moldova, Seria B, No. 1, 65-71.
7. Racz G., A. Laza, E. Coiciu, 1976 - *Plante medicinale și aromatice*. Ed. Ceres București, p. 136-138.
8. Zitterl-Eglseer K., G. Reznicek, J. Jurenitsch, J. Novak, W. Zitterl, C. Franz, 2001 - *Morphogenetic variability of faradiol monoesters in marigold Calendula officinalis L.* Phytochemical Analysis, 12(3), 199-201.
- 9.***<http://www.defra.gov.uk/farm/crops/industrial/research/reports/Calendula%20Manual.pdf>

UPDATED DATABASE CONCERNING EVALUATION OF NATIVE SOUR CHERRY GENOTYPES FROM THE ROMANIAN NATIONAL GERMPLASM

ACTUALIZAREA BAZEI DE DATE PRIVIND EVALUAREA GENOTIPURILOR AUTOHTONE DE VIȘIN DIN FONDUL NAȚIONAL DE GERMOPLASMĂ

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Abstract. Romanian territory is located in the extended area limits of the geographic genetic center for cherry which grows wild or weedy in a high genetic diversity, all over the country. In the past, sour cherry has been propagated to a large extend by seeds or suckers, resulting in a wide range of variability. Subsequently, by selection and clonally propagation of valuable individuals within seedling population from different growing areas, many local cultivars were framed. Additionally, as a result of breeding programs started more than 50 years ago, 18 new varieties were released. Some of them are preserved in cherries collections which include 174 sour cherry (from which 60 are autochthonous biotypes, breeder's lines, old and new cultivars) accessions held in duplicate in two different locations (Pitesti and Iasi). To give new opportunities for conservation of cherry biodiversity and sustainable use of genetic resources, 60 native genotypes have been evaluated for some morphological and biological characteristics as well as agronomic traits like fruit use, plant use, status of sample, date of full blooming, harvest maturity, fruit shape, fruit size, fruit skin color, juice color, flesh juiciness, tree vigor, susceptibility to diseases, according to the numerical scale of IBPGR descriptors

Key words: Romania, *Prunus cerasus* L., evaluation, native germplasm

Rezumat. Geografic, teritoriul României se află în cadrul limitelor extinse ale centrului genetic de formare a speciilor cireș și vișin, acestea crescând în flora spontană sau semicultivată pe tot cuprinsul țării. În trecut, vișinul a fost înmulțit și diseminat pe scară largă, generativ prin sămburi sau vegetativ prin drajoni, ceea ce a condus la o mare dispersie teritorială și o largă variabilitate genetică. Ulterior, selecția și propagarea clonală a unor genotipuri valoroase din cadrul unor populații de pomi pe rădăcini proprii din diferite zone de cultură, a condus la formarea a numeroase soiuri locale. Relativ recent, ca rezultat al unui activ program de ameliorare început cu 50 de ani în urmă, au fost omologate sau înregistrate 18 soiuri noi. Unele dintre ele sunt conservate în colecția națională care cuprinde 174 de genotipuri (din care 60 sunt biotipuri autohtone, selecții rezultate din programul de ameliorare,

soiuri vechi și creații contemporane) fiind menținute în duplicat la Pitești și Iași. Pentru a oferi noi oportunități acțiunii de conservare a biodiversității și folosirii durabile a resurselor genetice la vișin, 60 de genotipuri autohtone au fost evaluate folosind o scală numerică, conform metodologiei prezentate în descriptorii IPBGR, în ceea ce privește unele caracteristici morfologice, biologice și agronomice, cum ar fi utilizarea fructului, a plantei, statutul probei, perioada de maximă înflorire, epoca de maturare a fructului, forma, mărimea, culoarea pieluței fructului, culoarea și suculența pulpei, vigoarea pomului, susceptibilitatea la boli.

Cuvinte cheie: România, *Prunus cerasus* L., evaluare, germoplasmă

INTRODUCTION

Sour cherry, one of the most important fruit tree species, owing to his economical and feeding value given by the nutritive fruit quality, meets in Romania good natural environmental conditions to express his agro-biological potential. Moreover, as a matter of fact, it is believed that some of the cherries have a secondary center of genetic origin in the Black Sea surroundings, including a significant part of the Romanian territory.

The weedy or naturalized sour cherry types grow abundantly all over the country in a high genetic diversity, in different fruit tree mixed populations up to 1600 m a.s.l.. So, tart cherry is a traditional crop in Romania, spread extensively for commercial purpose or in home gardens, for domestic consumption.

In the past, the richness in genetic diversity gave the possibility to generations of fruit growers to select valuable individuals from weedy populations, on the basis of fruit quality. Propagation was made vegetative (by suckers) and clonally (by grafting), and most of these so called „local varieties” have names derived from their local origin (Bizighești, Baneasa, Bucovina, Drobeta, Locale de Bistrita, Timpurii de Marculești, Timpurii de Pitesti, Timpurii de Osoi, Topoloveni, Leordeni, De Botosani, Topologu Tulcea, Crisana, Vrancean, Satmarean, etc.).

Collecting of the new varieties was an activity made as a hobby by rich landowners, enthusiast fruit growers, monks in the abbey orchards, or dispersed in different nurseries and research centers.

MATERIAL AND METHODS

Romanian cherry genetic resources have started to be methodically collected since 1967. At present there are a total of 174 sour cherry accessions held in duplicate at the Research Institute for Fruit Growing, Pitesti – Maracineni and Fruit Research Station, Iasi.

Five sour cherry trees per genotype grafted onto mahaleb seedlings are planted in each location.

Collections contain foreign or indigenous cultivars, selections, clones, local varieties and landraces. All accessions are evaluated for morphological and biological characteristics as well as agronomic traits according to the numerical scale of IBPGR descriptors. The main tasks are to estimate commercial value and to detect the possible useful sources of valuable genes for breeding program.

At this time, the target is to systematize collected data from the two institutions like fruit use, plant use, harvest maturity, blooming time, fruit skin color, fruit shape, fruit size, juice color, fruit taste, fruit cracking susceptibility, susceptibility to diseases, check and re-examine in order to update or adjust.

Under these circumstances, to give new opportunities for conservation of cherry biodiversity and sustainable use of local genetic resources, greater attention has been paid to characterize and preliminarily evaluate 60 *ex situ* collected wild genotypes and indigenous varieties.

Descriptors Used to Evaluate *Ex Situ* Collected Cherry Genotypes (scale steps and reference cultivars)

Fruit use: 1. Scion cultivar – dessert including distilling; 2. Scion cultivar – processing including distilling; 3. Dual or multipurpose use; 4. No use

Status of sample: 1. Wild; 2. Weedy; 3. Primitive cultivar / Landrace; 4. Breeders line; 5. Advanced cultivar; 6. Unknown; 7. Other.

Virus disease status: 1. Virus disease free from quarantine pest and disease; 2. Virus disease present; 3. Not tested; 4. Free from Sharka.

Blooming period: 1. Extremely early; 3. Early; 5. Mid-season; 7. Late; 8. Very late; 9. Extremely late.

Harvest maturity: 1. Extremely early; 3. Early (Ludwigs Fruhe, Meteor korai); 5. Mid-season (Heimanns Rubinweichsel, Erdi Botermo); 7. Late (Schattenmorelle, Ujfehertoi furtos); 8. Very late (Marasca types); 9. Extremely late (later than Marasca types).

Fruit shape: 1. Kidney-shaped; 2. Flat round; 3. Round; 4. Elongate; 5. Cordate.

Fruit size: 1. Extremely small; 3. Small; 5. Medium; 7. Large; 9. Extremely large.

Fruit skin colour: 1. Yellow; 3. Vermilion on yellow ground; 4. Light red (Montmorency, Favorit); 5. Red (Erdi botermo, Ujfehertoi furtos); 7. Dark red (Schattenmorelle); 9. Black

Juice colour: 1. Colourless (Montmorency); 3. Pink (Favorit); 5. Red (Schattenmorelle); 7. Purple (Meteor korai); 8. Brown red; 9. Black red (Marasca, Zahoracka)

Juiciness: 3. Dray; 5. Intermediate; 7. Juicy.

Tree vigor: 3. Weak (Kelleris 14); 5. Medium (Schattenmorelle); 7. Strong; 9. Extremely strong (Koroser).

Susceptibility to *Monilia laxa*: 1. None; 2. Very low - Erdi Jubileum; 3. Low - Erdi Botermo, Ujfehertoi furtos; 5. Intermediate - Schattenmorelle; 7. High - Montmorency; 9. Extremely high.

Susceptibility to *Blumeriella jaapii*: 1. None; 2. Very low - Csengodi; 3. Low - Meteor Korai, Montmorency; 5. Intermediate; 7. High - Schattenmorelle, Erdi Botermo, Pandy, Crisana; 9. Extremely high.

RESULTS AND DISCUSSIONS

As a first benefit of characterization and evaluation of at the time available germplasm fond, between 1950 – 2005, was facilitation of the knowledgeable use of different genitors in more than 300 cross combinations, from which over 8,000 seedlings were obtained and 10 new varieties as Bucovina, Nana, Dropia, Satmarean, Tarina, Timpurii de Cluj, Ilva, Pitic, Rival, Amada were released, (Budan et al., 2006). Certainly, in the breeding work have been used in the overwhelming scale foreign varieties but also, often, Crisana or Mocanesti a indigenous old cultivars and some advanced new breed Romanian cultivars as Satmarean, Dropia, Timpurii de Cluj, Rival, Tarina. Advanced selection made

between multitude indigenous local biotypes, with large fruit, red fruit and juice color, high juiciness, early harvest maturity, prevalent sour cherry taste and flavor, grown by amateurs for domestic purposes, especially for traditional delicious sweets, jam or alcoholic drinks making, gave the possibility for releasing and registering of an other 7 new varieties, recognized at the national level, as Timpurii de Pitesti, Timpurii de Osoi, Crisana 2, Mocanesti 16, Vrancean, Scuturator and De Botosani.

Evaluation made on 60 accessions, over several years, shows the great diversity of some morphological, biological and agronomical traits as blooming period, time of harvest maturity, fruit shape, size and skin color, juiciness and juice color, tree vigor, susceptibility to *Monilia laxa* (Aderh et. Ruhl) and *Blumeriella japii* (Rehm) Arx.

Table 1

Evaluation of some native sour cherry genotypes from the Romanian national germplasm

Genotype	Fruit use	Collection site*	Status of sample	Virus disease status	Blooming period	Harvest maturity	Fruit shape	Fruit size	Fruit skin color	Juice color	Juiciness	Tree vigor	Susceptibility to <i>Monilia laxa</i>	Susceptibility to <i>Blumeriella japii</i>
Baneasa 4/2	3	I	4	3	5	5	4	5	5	3	5	6	7	5
Baneasa 6/26	3	I	4	3	5	5	4	5	5	3	5	5	5	5
Baneasa 44/7	3	P,I	7	3	5	5	3	5	5	5	6	6	7	3
Baneasa 6/26	3	I	4	3	5	5	4	5	5	3	5	5	7	5
Bizighesti	3	P,I	3	3	5	5	2	5	5	5	5	5	5	3
Breznita	3	P,I	3	3	5	5	2	5	5	5	5	5	5	7
Bucovina	3	P	4	3	5	5	2	5	5	5	6	5	7	7
Crisana 11/6	3	I	4	3	7	7	2	9	7	8	5	7	5	5
Crisana 15/10	3	P	4	3	7	7	2	9	7	8	5	7	5	5
Crisana 15/20	3	I	4	3	7	7	2	9	7	8	5	7	5	5
Crisana 2	3	P	4	3	7	7	2	9	7	8	5	7	5	5
Crisana Cluj	3	P	4	3	7	7	2	9	7	8	5	7	5	5
Crisana Nazarcea	3	I	4	3	7	7	2	9	7	8	5	7	5	5
De Botosani	3	I	5	3	6	7	2	9	7	5	5	7	3	5
Drobeta	3	P,I	5	3	5	5	2	3	5	5	5	5	5	5
Drobia	3	P	5	3	5	5	2	5	7	9	3	5	5	7
Focsani 3	3	PI	4	3	5	5	4	7	5	5	5	5	5	5
HV 12/105	3	P	4	3	5	5	2	5	5	5	5	5	5	5
HV 13/21	3	P	4	3	3	5	3	7	7	5	5	5	5	5
HV 47/11	3	P	4	3	5	5	4	9	5	3	7	5	3	3
HV 45/40	3	P	4	3	3	3	3	9	7	8	5	7	3	2
HV 43/32	3	P	4	3	3	3	3	9	7	8	5	7	3	2
Japonica	3	P	4	3	5	7	3	9	7	8	5	7	5	5

Ilva	3	P,I	5	3	5	7	2	5	7	9	5	5	7	5
Leordeni	3	P	3	3	7	5	2	9	5	3	6	7	5	5
Locale de Bistrita	3	P,I	3	3	7	7	2	9	5	5	5	7	5	5
Marculesti 33/20	3	I	4	3	3	4	2	7	5	3	7	6	5	5
Mari timpurii	1	P	5	3	3	3	3	8	5	3	7	6	3	3
Mari timpurii cl.11	1	P	4	3	5	3	2	7	5	3	7	5	3	3
Mari timpurii cl. 93	1	P	4	3	5	3	2	7	5	3	7	5	3	5
Marculesti 33/13	3	P,I	4	3	5	7	4	3	5	9	5	5	7	5
Marculesti 33/21	3	P,I	4	3	7	7	4	3	5	5	5	5	7	5
Marculesti 4 Vie	3	P	4	3	7	5	2	3	5	5	5	5	4	5
Mocanesti 104/24	3	I	4	3	5	5	2	5	5	5	5	5	5	5
Mocanesti 15/2	3	P	4	3	3	5	2	5	5	5	5	5	5	5
Mocanesti 16	3	P,I	4	3	5	5	2	7	5	3	5	5	5	5
Mocanesti 10/24	3	I	4	3	3	5	2	5	5	3	5	5	5	5
Mocanesti 32/20	3	I	4	3	3	5	2	5	5	3	5	5	5	5
Mocanesti 6/7	3	I	4	3	3	5	2	5	5	3	5	5	5	5
Nana	3	P,I	5	3	5	5	2	5	5	5	5	5	7	7
Pitic	3	P,I	5	3	9	9	4	3	5	3	5	1	5	7
P 1 Vie	3	P	3	3	5	5	3	7	7	5	5	7	5	5
Rival	3	P	5	3	5	6	4	7	6	5	7	6	8	5
Selectie Cotea	3	I	3	3	3	4	3	5	5	5	6	5	5	5
Satmarean	3	P	5	3	6	3	2	5	5	9	7	5	7	5
Scuturator	3	P,I	5	3	5	5	2	7	7	5	5	5	5	5
Suraia	3	P,I	3	3	6	5	2	5	5	9	5	5	5	3
Targu Jiu 200	3	P,I	4	3	7	7	4	7	5	3	6	8	5	5
Targu Jiu 401	3	I	4	3	7	7	2	9	5	3	6	7	5	5
Targu Jiu 404	3	P,I	4	3	7	7	4	7	5	5	6	6	5	5
Targu Jiu 505	3	I	4	3	7	7	2	9	5	3	6	7	5	5
Timpurii de Cluj	3	P,I	5	3	3	4	2	7	5	5	5	7	3	3
Timpurii de Marculesti	3	P,I	4	3	3	3	2	3	5	5	7	5	5	5
Timpurii de Osoi	3	I	5	3	4	3	2	5	7	5	5	5	5	5
Timpurii de Pitesti	3	P,I	5	3	4	3	2	5	5	5	5	5	5	5
Topologu Tulcea	3	P,I	3	3	3	5	2	5	5	5	6	5	5	5
Topoloveni 6	3	P	3	3	6	7	2	6	5	5	6	6	5	3
Turcesti	3	P,I	5	5	5	7	5	5	5	5	5	5	5	5
Tarina	1	P,I	5	3	4	3	4	5	7	5	5	5	5	5
Vrancean	3	P,I	5	3	7	7	2	5	5	5	5	3	5	7

*P = Research Institute for Fruit Growing, Pitesti
I = Fruit Research Station, Iasi

Obtained results, as level of numerical scale for descriptors evaluation, range from 3 (Marculesti 33/20, Mari timpurii, Timpurii de Cluj, Timpurii de Marculesti cvs.) to 9 (Pitic cv.), for “blooming period” from 3 (Mari timpurii clones, Tarina, Timpurii de Marculesti, Timpurii de Osoi, Timpurii de Pitesti

cvs.) to 9 (Pitic cv.), for “harvest maturity” from flat round to elongate, for “fruit shape” from 3 (Drobeta, Marculesti 33/13, Marculesti 33/21, Marculesti 4 vie, Pitic, Timpurii de Marculesti cvs.) to 9 (Crisana clones, Leordeni, Locale de Bistrita, Tg. Jiu 401, Tg. Jiu 505 cvs.), for “fruit size” from red to dark red for “fruit skin color”, from pink to black red for “juice color”, from 3 (Drobia cv.) to 8 (Timpurii de Pitesti, Timpurii de Marculesti, Marculesti 33/20 cvs.), for “juiciness” from 1 (Pitic cv.) to 7 (Leordeni, Locale de Bistrita, Tg. Jiu 401, Tg. Jiu 505 cvs.).

Low susceptibility to *Monilia laxa* (Aderh et. Ruhl) was shown by De Botosani, HV 47/11, HV 45/90, HV 43/32, Timpurii de Cluj, Mari timpurii cl. 1, Mari timpurii cl.2 and P1 Vie genotypes. Observations made on Băneasa 44/7, Bizighesti, HV 45/40, HV 47/11, HV 43/32, Timpurii de Cluj, Mari timpurii cl. 1, Mari timpurii cl. 2, P1 Vie, Suraia and Topoloveni 6 accessions lead to the same level of evaluation concerning the susceptibility to *Blumeriella jaapi* (Rehm) Arx.. As “plant use”, all genotypes are of “dual or multipurpose use”.

Collected data offer new possibilities to select valuable genotypes useful by their characteristics for breeding program and also to register other interesting local landraces with fruit of quite importance to domestic market.

Unfortunately, the lack of coordination and limited financial support means that only limited results have been achieved in recent years.

At present, germplasm is preserved only by the research institution’s efforts, no other governmental or non-governmental organizations being involved, excepting, from time to time, some insignificant financial support given by short term research projects. Also, for weedy sour cherry trees, very common in some Romanian geographic area, there is no funding to support a national program or research projects for identification, evaluation, collection and *ex situ* conservation of these natural biodiversity, endangering and dramatically decreasing for the future the disposable native genetic resources. So, to avoid further losses, development of a national strategy and governmental and/or international financial support for cooperation program or research projects regarding the enhancement of germplasm by exploration and selection of natural and semi-natural ecotypes and agro-types, followed by *ex situ* preservation and complex evaluation of the most valuable native genotypes is required.

REFERENCES

1. Budan S., Gradinaru G., Petre L., Corneanu G., 2006 - *Some opinions about preservation, evaluation and utilisation of Romanian sweet cherry (Prunus avium L.) germplasm.* In Proceedings of XXXVI ESNA Annual Meeting: 435-438.
2. Budan S., Gozob T., Micu C., Ivan I., Petre L., 2006 - *Identification, conservation, evaluation and using of Prunus cerasus L. germplasm fond.* In: *Fondul de Germoplasma la Speciile Pomicele de Arbusti Fructiferi si Capsun din Colectiile din Romania.* Ed. Pamantul: 119-138 (in Romanian).

THE WAYS OF CONVERSION OF IMMATURE EMBRYOS INTO PLANTS FOR SEEDLESS STENOSPERMOCARPIC GRAPEVINE

CĂILE DE CONVERTIRE ÎN PLANTE A EMBRIONILOR IMATURI LA GENOTIPURILE APIRENE STENOSPERMOCARPICE DE VIȚĂ DE VIE

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Abstract. *The investigations for optimization the ways of preventing the embryos abortion and to ensure their development into plants for five genotypes of seedless stenospermocarpic grapevine has been done. Two ways of conversion of excised embryos into plants were chosen depending on genotype. It was established that for cultivar Apiren extratimpuriu the dissecting of ovules after 70-90 days of cultivation on recovery medium should be done, and the excised viable embryos should be transferred on the MS medium (1962) with addition of 0.45 mg/l of BA during 7 days for their conversion into plants, and then subcultivated on the same basal medium with 0.2 mg/l IBA. For I-15-15 genotype the time of cultivation on recovery medium consist of 150-180 days, and embryos excised from seeds should be transferred on MS medium (1962) with addition of 0.45 mg/l BA, with consequent transfer on the same basal medium without growth regulators. The plants cultivated in vitro at the stage of 4-5 leaves and 3-4 roots were transferred on soil substratum with subsequent adaptation to ex vitro conditions.*

Key words: grapevine, embryos abortion, genotype of seedless stenospermocarpic

Rezumat. *S-au efectuat lucrări în scopul optimizării căilor de prevenire a avortării embrionilor și de asigurare a dezvoltării lor până la obținerea plantelor pentru cinci genotipuri apirene stenospermocarpice de viță de vie. În funcție de genotip au fost trasate două căi de conversie a embrionilor excizați în plante. S-a stabilit că, pentru soiul Apiren extratimpuriu desecarea ovulelor trebuie efectuată după 70-90 zile de cultivare pe medii "de recuperare", iar embrionii viabili excizați se transferă pentru conversie în plante pentru 7 zile pe mediul MS (1962) cu adaos de 0,45 mg/l BA, iar apoi se subcultivă pe același mediu bazal ce conține 0,2 mg/l IBA. Pentru genotipul I-15-15 durata de cultivare pe medii "de recuperare" este 150-180 zile, iar embrionii extrași din semințe se transferă pe mediul MS (1962) cu adaos de 0,45 mg/l BA, cu transfer ulterior pe același mediu bazal fără reglatori de creștere. Plantele cultivate in vitro la stadiul de 4-5 frunzulițe și 3-4 rădăcini au fost transferate pe substrat sol și ulterior adaptate la condiții ex vitro.*

Cuvinte cheie: viță de vie, avortare embrioni, genotip apiren stenospermocarpic

INTRODUCTION

Obtaining the seedless descendents from breeding programs is a priority objective in countries with traditions in cultivation the grapevine (Agüero et al., 2000; Popescu, Teodorescu, 2004). Utilization of seedless genotypes in breeding programs implies the use of methods preventing the embryos abortion. The efficiency of obtaining plants in case of crossing even one genitor with stenospermocarpic trait depends of choosing the adequate techniques of immature embryos “rescue” for seedless cultivars. In case of seedless x seedless combinations the rate of rescued embryos come up to 2-15 % and depends on used methods (Spiegel-Roy et al., 1985; Bouquet, Davis, 1989). A favorable “recovery” medium could contribute in resolving the problems of embryos rescue and their converting into plants. The results obtained previously (Chiriac, Savin, Smerea, 2007) demonstrated that only several local stenospermocarpic genotypes could be used as maternal genitors: Apiren extratimpuriu, Apiren roz Basarabean and I-15-15. Later, the investigations of immature embryos rescue and particularly optimization of embryos recovery mediums depending on genotype were evaluated (Chiriac, Smerea, Savin, 2008). The reaction of immature embryos to the *in vitro* cultivation depends essentially on genotype and that is why it is necessary to state the ways of converting into plants the embryos recovered by “*in ovulo*” manipulations, taking into account the peculiarities of the varieties that were involved in the crosses (Goldy, Amborn, 1987; Cain, Emershad, Tarailo, 1983).

The aim of the present research was to reveal the impact of cultivation medium and genotype in optimization the ways of conversion the embryos into plants after 3-6 months of cultivation on “recovery” medium for 5 newly created seedless grapevine genotypes used as maternal genitors.

MATERIAL AND METHODS

The berries resulted from natural (free) pollination of the seedless genotypes Apiren extratimpuriu, Apiren roz, Basarabean and I-15-15 were harvested 35-40 days after anthesis. Collected berries were cold pretreated and then surface sterilized with 70 % ethylic alcohol followed by 5.2 % calcium hypochlorite and washed with sterilized distilled water. The ovules were aseptically extracted and inoculated on the same cultivation medium in Petri dishes with subcultivation every 30 days until seeds residuum were dissected to recover viable embryos. Three “recovery” medium were selected: Murashige Skoog (1962) supplemented with 2 mg/l of 3-indolil acetic acid (IAA), and 0.5 mg/l of 6-benzilaminopurina (BA) (MS); Nitsch, Nitsch (1969) supplemented with 1.5 mg/l of IAA, 1 mg/l of zeatin and 0.2 mg/l of giberilinic acid (GA₃) (NN1) and Nitsch, Nitsch (1969) with addition of 2.5 mg/l of IAA, 0.2 mg/l of GA₃ and 0.3mg/l of putrescine (NN2). Ovules were cultivated for 30 days in total darkness conditions at 25±2°C, and then transferred in culture room in the same temperature regime and period of 16 hours of light. The seeds were dissected beginning 10-15 days after first germinations. Viable embryos were placed on “recovery” mediums. The composition of mediums was different by incorporated hormones as well as concentration, meanwhile the basal medium was the same: half strength of macro- and microelements, and vitamins after Murashige Skoog (1962) with 15 g/l of sugar, 100 mg/l of mio-inositol, 3 mg/l of glicine and 6.8 g/l of agar.

The embryos that evolved creating roots and sprouts were considered converted into plants.

RESULTS AND DISCUSSIONS

Properly equilibrated composition of cultivation medium defines an adequate development of immature embryos until the maturation stage (Emershad, Ramming, 1984). In our previous publication we have presented the results of immature embryos rescue (Chiriac, Smerea, Savin, 2008). Increase of rate of viable saved embryos with 27.19 % and 19.37 % for I-15-15 and Apiren roz genotypes, respectively, has been attested in comparison with results presented in 2006-2007 (Chiriac, Savin, Smerea, 2007). The less significant increase of survived embryos rate was attested for the genotype Apiren Alb - 7.82 %. The results presented in Table 1 reveal that cultivation of zygotic embryos on “recovery” medium differing by mineral components as well as by growth regulators define an increase of viable embryos rate after dissection of seeds residuum, as well as the rate of embryos converted into plants.

Table 1

Influence of “recovery” mediums of immature embryos on the rate of ovules with viable embryos after dissection of seeds residuum and embryos converted into plants for various genotypes

Maternal genitor	“Recovery” medium	Viable embryos after dissection, %	Embryos converted into plants	
			%	Limits
Apiren roz	MS	19,70	22,14	16,67 ÷ 27,63
	NN 1	38,72	16,23	10,70 ÷ 21,71
	NN 2	33,99	17,76	12,28 ÷ 23,24
Apiren alb	MS	12,22	0,00	-
	NN 1	7,75	2,22	0 ÷ 7,71
	NN 2	17,82	9,72	4,24 ÷ 15,21
Apiren extratimpuriu	MS	30,00	25,76	20,27 ÷ 31,24
	NN 1	34,59	39,46	33,97 ÷ 44,94
	NN 2	29,23	42,13	36,65 ÷ 47,62
Perlon	MS	47,70	28,23	22,74 ÷ 33,71
	NN 1	48,89	68,05	61,57 ÷ 73,54
	NN 2	58,63	33,90	28,48 ÷ 39,44
I-15-15	MS	55,37	35,58	30,10 ÷ 41,06
	NN 1	43,00	31,42	25,94 ÷ 36,91
	NN 2	59,41	36,59	31,11 ÷ 42,08

It was established, that depending on genotype and medium used for cultivation of embryos until their excision, the rate of converted into plants embryos reached the maxim values for I-15-15 (35.59 %) and Apiren extratimpuriu (42.13 %) genotypes in case of NN2 medium in comparison with 13.33 and 21.11 %, respectively, for the same genotypes in 2006-2007 in case of cultivation on Nitsch, Nitsch (1969) medium supplemented with 2.5 g/l of active

carbon, 3 mg/l of IAA and 5 mg/l of GA₃ (Chiriac, Savin, Smerea, 2007). In the present investigation more efficient “recovery” medium for Apiren roz genotype which determine an increased embryos conversion into plants (22.14 %), was attested MS medium with addition of 2 mg/l of IAA and 0.5 mg/l of BA. Using of this medium contributed to increases with 14.37 % of converted embryos rate compared with results obtained previously in 2006-2007. An interesting moment represents the fact that for two genotypes - Perlon and Apiren alb, the rate of embryos converted into plants reached the maximal values in case of saving zygotic embryos on NN2 medium with addition of putrescine. Similar results have been obtained by other researchers (Ponce, Guiunazu, Tizio, 2002). Comparison of the results obtained in 2007-2008 with those obtained 2006-2007 regarding the reaction to *in vitro* culture of Apiren alb genotype reveal that this cultivar is not suitable to be used as a maternal genitor, although the rate of converted embryos into plants has been increased from 0.0 to 9.72 %.

The obtained results suggest the necessity to fix up the components of the “recovery” mediums for immature embryos of each crossing combination. ANOVA test was used to estimate the impact of recovery mediums (MS, NN1 and NN2) and genotype on the rate of converted into plants embryos. Dispersion analysis reveal that this index depends on genotype (68.47 %), interaction of genotype and medium factors (21.75 %) and cultivation medium (4.85 %). The contribution of variation sources was significant at 99.9 % level. Above mentioned facts confirm the maximal impact of genotype on the development of embryos *in vitro* that was established for viable embryos (81.03 %) at the stage of embryos excision as well (Chiriac, Smerea, Savin, 2008).

Table 2

Variation of embryos rate converted into plants (ANOVA test)

Source of variation	Square sum	DF	Source contribution, %	Dispersion, S ²	F factor	P
A genotype	9012,58	4	68,47	22,53	104,19	0,0000
B medium	638,564	2	4,85	319,282	14,76	0,0000
AB	2863,22	8	21,75	357,902	16,55	0,0000
Residual	648,789	30	4,93	21,626		
Total	13163,2	44				

Usually, excised embryos are transferred for conversion on MS medium (1962) without growth regulators (Valdez, Ulanovski, 1997; Aguero et al., 2000; Valdez, 2005). In our previous researches we related that considerable plants number were resulted through cultivation of viable embryos on MS medium with addition of cytokinin, and then transferred to the same medium without growth regulators (Chiriac, Savin, Smerea, 2007). The present investigations regarding the capacity of embryos to develop apical meristem demonstrated, that rate of embryos converted into plants has increased in case of cultivation embryos on “conversion ” medium supplemented with 0.45 mg/l of BA during 7 days and then transferred on MS medium with addition of 0.2 mg/l of IBA (Table 3).

Taking into account the “recovery” medium of cultivation embryos until dissection as well, the rate of embryos converted into plants has increased with 15.38-16.95 % in case of cultivar Apiren extratimpuriu and with 1.70-4.89 % for cultivar Apiren roz. The increase could be explained by the fact that rate of embryos without capacity to develop apical meristem on hormone-free medium could generate normal plants in case of addition IBA. As result, it was established a distinct dependence of IBA supplemented medium by genotype and this way of conversion could be used for cultivar Apiren extratimpuriu only. This fact suggests that the components of “conversion” medium should be established individually for each genotype, as well as in case of “recovery” medium.

Table 3

Modes of conversion of embryos into plants

Maternal genitor	“Recovery” medium	Tested embryos, Nr	Embryos converted into plants, %		Growing on MS medium with 0.2 mg/l IBA, %
			MS hormone free	MS with 0.2 mg/l of IBA	
Apiren extratimpuriu	MS	32	28,12	43,75	15,63
	NN 1	118	36,44	53,39	16,95
	NN 2	52	44,23	59,61	15,38
Apiren Roz	MS	143	20,28	25,17	4,89
	NN 1	118	15,25	16,95	1,70
	NN 2	72	16,67	20,83	4,16

In addition, it is important the moment of dissection begin as well, or surviving of embryos *in vitro* and ulterior plants formation depends on stage of the embryos have been placed on “conversion” medium (Liu, Sykes, Clingeffer, 2003). The results obtained in 2007-2008 suggest that the optimal period for dissection of seeds residuum begins within 10-15 days after appearance of first germinations.

For the cultivar Apiren extratimpuriu this term is situated within 90-100 days of cultivation on “recovery” medium and for genotype I-15-15 within 150-180 days. The rest of cultivars are situated between these terms.

The plants cultivated *in vitro* were transferred on soil substrate on the stage of 4-5 leaves and 3-4 roots and then adapted for *ex vitro* conditions.

CONCLUSIONS

The techniques used for *in vitro* recovery of immature embryos of stenospermocarpic grapevine are determined significantly by genotype particularities, which comprise 68.47 % of variation for embryos converted into plants. Taking into account obtained results two ways of conversion embryos into plants were established:

The most efficient term for cultivation of ovules on recovery medium was 90-100 day for Apiren extratimpuriu. The excised embryos are cultivated on MS

medium with addition of 0.45 mg/l BA during 7 days and then transferred on the same basal medium supplemented with 0.2 mg/l IBA.

For the genotype I-15-15 is recommended cultivation on “recovery” medium during 150-180 days. Embryos excised from the seeds is transferred on MS (1962) medium with addition of 0.45 mg/l BA, and then on the same medium without growth regulators.

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REFERENCES

1. Agüero C., Vigliocco A., Abdala G., Tizio R., 2000 - *Effect of gibberellic acid and uniconazol on embryo abortion in the stenospermocarpic grape cultivars Emperatriz and Perlon*. Plant Growth Regulation. 30, 9-16.
2. Bouquet A., Davis H.P., 1989 - *Culture in vitro de ovule et de vigne (V. Vinifera L.) appliquee a la selection de varietes de raisin de table sanssepins*. Agronomie. 9, 6, 565-574.
3. Cain D., Emershad R., Tarailo R., 1983 - *In ovulo embryo culture and seedling development of seeded and seedless grapes (Vitis vinifera L.)*. Vitis. 22, 9-14.
4. Chiriac Gh., Savin Gh., Smerea S., 2007 - *Embryo rescue in seedless genotypes*. Lucrări Șt. Univ. de Șt. Agricole și Med. Veter. Iași, România, Seria Horticultură V.I. (50), 99-104.
5. Chiriac Gh., Smerea S., Savin Gh., 2008 - *Cultivarea in vitro a embrionilor imaturi la vița de vie apirenă*. Conferința Naț. cu participare Internațională „Probleme actuale ale geneticii, fiziologiei și ameliorării plantelor” Chișinău. 46-51.
6. Emershad R.L., Ramming D., 1984 - *In ovulo embryo culture of Vitis vinifera L. cv “Thompson Seedless”*. Am. J. Bot. 71. 873-877.
7. Goldy R., Amborn U., 1987 - *In vitro culturability of ovules from 10 seedless grape clones*. Hortscience. 22. 952.
8. Liu S.M., Sykes S.R., Clingeleffer P.R., 2003 - *Improved in ovulo embryo culture for stenospermocarpic grapes (Vitis vinifera L.)*. Australian Journal of Agricultural Research 54, 9: 869-876.
9. Ponce M.T., Guinazu M.E., Tizio R., 2002 - *Improved in vitro embryo development of stenocarpic grape by putrescine*. Biocell. 26 (2), 263-266.
10. Popescu C.F., Teodorescu A., 2004 - *Biotehnologii. Recuperarea in vitro la vița-de-vie cu aplicații în ameliorarea sortimentului*. Editura CERES. București, 139 p.
11. Spiegel-Roy P., Sahar N., Baron J., Lavi U., 1985 - *In vitro culture and plant formation from grape cultivars with abortive ovules and seedes*. J. Amer. Soc. Hort. Sci. 110. 109-112.
12. Valdez J.G., 2005 - *Immature embryo rescue of grapevine (Vitis vinifera L.) after an extended period of seed trace culture*. Vitis. 44 (1). 17-23.
13. Valdez J.G., Ulanovsky S.M., 1997 - *In vitro germination of stenospermic seeds from reciprocal crosses (Vitis vinifera) applying different techniques*. Vitis. 36. 105-107.

CONTRIBUTIONS ON THE FLORA OF BOTESTI-CÂNDEȘTI PIETMONT AREA

CONTRIBUȚII PRIVIND FLORA COMUNEI BOȚEȘTI-ARGEȘ (PLATFORMA CÂNDEȘTI)

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Abstract: *The paper's aim is to present the floristic inventory of Botesti - Căndești Pietmont. The establish of the life forms, phytogeographic elements and ecological categories – in dependence of moisture (U), temperature (T) and soil reactivity (R) has been made on the basis of "Flora ilustrată a României" (Ciocârlan, 2000), and "Conspectul florei cormofitelor spontane din România" (Popescu, Sanda, 1998). An a result of the studies made in Boțești – Căndești Pietmont during 2007 and 2008, were identified 159 species and 5 subspecies of vascular plant. The life forms spectrum shows the high percentages of hemicryptophytes (53,4%), phanerophytes (18,2%) and geophytes (14,4%). Among the phytogeographical elements, the Eurasian species (42,76%), Central-European (16,98%) and European (16,98%) are prevalent. The ecological categories spectrum show the high total percentages of mesophyllous (59,7%), mesotherme (64,8%) and acid-neutrophile species (37%).*

Key words: flora, piemont, taxonomic analysis, bioforms analysis

Rezumat. *Scopul lucrării este de a prezenta inventarierea floristică de la Boțești – Căndești – Platformă. Ea stabilește formele de viață, elemente fitogeografice și categoriile ecologice – în dependență de umiditate (U), temperatură (T) și reactivitatea solului (R) și a fost elaborată pe baza lucrării "Flora ilustrată a României" (Ciocârlan, 2000) și "Conspectul florei cormofitelor spontane din România" (Popescu Sanda, 1998). În urma studiilor efectuate în Platforma Boțești – Căndești în cursul anilor 2007 – 2008, au fost identificate 159 de specii și 5 subspecii de plante vasculare. Spectrul formelor de viață arată mari procente de hemicryptophytes (53,4%), phanerophytes (18,2%) și geophytes (14,4%). Printre elementele fitogeografice s-au identificat specii din Eurasia (42,76%), Europa Centrală (16,98%) și Europa (16,98%) care sunt predominante. Spectrul categoriilor ecologice, arată un înalt procentaj de mezofile (59,7%), mezoterme (64,8%) și specii acid-neutrofile (37%).*

Cuvinte cheie: flora, piemont, analiza taxonomică, analiza bioformelor

INTRODUCTION

Located on the upper course of the Cărcinov river, Boțești area belongs to the Căndești Platform in terms of geomorphology, which, together with the Argeș, Cotmeana, Oltet, Jiu and Strehaiia Platforms lie in the Getic Plateau. The Căndești Platform lies between Dâmbovița and Argeș Rivers and has a significant thickness of gravels (over 60 m). It consists of a series of flat or slightly rounded heights, running differently from an altitude of 750 m in the north, on the Căndești Hill up to 300 m in the south. Hydrographic network is very dense. It has fragmented the Plateau, resulting

in hill-like forms of relief. The frequent landslides in the area have also contributed to the relief fragmentation. The main rivers form valleys by collecting water that is leaking from the slopes. The four main valleys crossing the area are: Carcinov Valley, Great Valley, Greeks Valley and Lenții Valley. Average annual temperature in the area ranges from 8.1° C in the north to 9.9 C in the south. Annual average rainfall is about 700 mm.

MATERIAL AND METHODS

Vascular cormophytes in the Boțești area identified through personal research during 2007-2008, or taken from the specialized literature are listed in phylogenetic order. Every cormophyte species contains the following elements: The nomenclature of Cormophyte species which uses data from *Flora Europaea* (TG Tutin et al., 1964-1980, 1993) and *Illustrated Flora of Romania. Pteridophyta and Spermatophyta* (V. Ciocârlan, 2000), *Organic forms* (Sanda V. et al., 2003 and V. Ciocârlan, 2000): MPh=megafanerophyte, Mph=mesofanerophyte, NPh=nanofanerophyte, E=epiphyte, Ch=camephyte, G=geophyte, Th=annual terophyte, Th=biannual terophyte, H=hemicryptophyte, Hh=helohydatophyte; Phytogeographic elements (V. Sanda et al., 2003 and V. Ciocârlan, 2000): Adv = adventive, Alp=alpine, Alp=alpine-European Anat=anatolic, ATL=atlantic, ATL-EUC=Atlantic-Central European, Balc=Balkan, Carp=Carpathian, Cauc =Caucasian, Circ=circumpolar, Cosm=cosmopolitan, End=endemic, Eur=European, EUC=Central European EJA=eurasian, Med=Mediterranean, Pan =Pannonic, Pont=Pontic, Sarm=Sarmatic, SMed=Submediterranean, Sudet=Sudeten; Ecology (V. Sanda et al., 1983 V. Sanda et al., 2003): *Moisture indices*: U1-U1, 5=xerophil species, U2-2, 5=xeromesophil species, U3-3, 5=mesophil species, U4-4, 5 = mesohydrophil species, U5-5, 5 = hydrophil species, U6 = hydrophil, U0 = amphitolerant species, *Temperature indices*: T1-1, 5 = cryophil species, T2-2, 5 =microtherm species, T3-3 , 5=mesotherm species, T4-4, 5=moderate-termophil species, T5-5, 5=termophil species, T0=amphitolerant species, *Soil reaction indices*: R1-1, 5=strongly acidophil species, R2 -2.5=acidophil species, R3-3, 5=acid-neutrophil species, R4-4, 5=weakly acid-neutrophil species, R5-5, 5=neutro-basiphil species, R0=amphitolerant species.

RESULTS AND DISCUSSIONS

The first botanical mention on the flora of this region was referred to in 1879-1883, by Dimitrie Brândză's *Prodromul Florei Române* and Dimitrie Grecescu's *Conspectul Florei României*. Some plants, recorded in these works are: *Euphorbia helioscopia*, *Viburnum opulus*, *Vicia sepium*, *Lathraea squamaria*. Given that the area is geographically located in the high hills, indicates the existence of a wide variety of flora while differences in height and average temperatures between the north and south as well as the various forms of relief, display and inclination of slopes, lead to the formation of specific topoclimates with their characteristic soils and differentiated vegetation. Following the personal field studies and the specialized literature, there were identified the following taxa:

Equisetaceae: *Equisetum arvense* L., G, Cosm, U3T3R0; *Equisetum fluviatile* L. Hh, Circ, U5T3R0; *Equisetum hyemale* L., G, Circ, U3,5T2,5R4. **Polypodiaceae:** *Polypodium vulgare* L., G, Circ, U3,5T3R4; Dennstaedtiaceae: *Pteridium aquilinum* (L.) Kuhn, G, Cosm, U3T3R0; **Aspidiaceae (Dryopteridaceae):** *Dryopteris carthusiana* (Vill.) H.P. Fuchs, H, Circ, U4T3R0; *Dryopteris filix-mas* (L.) Schott, H, Cosm, U4T3R0; *Polystichum aculeatum* (L.)

Roth, H, Eur, U3,5T3,5R3; **Woodsiaceae:** *Athyrium filix-femina* (L.) Roth, H, Cosm, U4T2,5R0; *Gymnocarpium dryopteris* (L.) Newman, G, Circ, U3T2,5R2; **Pinaceae:** *Abies alba* Mill., MPh, Euc, U3T3R0; *Picea abies* (L.) Karsten, MPh, Eur, U0T0R0; *Pinus sylvestris* L., MPh, Eua, U0T0R0; **Cupressaceae:** *Juniperus communis* L. subsp. *communis*, mPh, Circ, U2T0R0; **Aristolochiaceae:** *Asarum europaeum* L., H, Eua, U3,5T3R4; **Ranunculaceae:** *Actaea spicata* L., H, Eua, U3,5T3R3; *Anemone nemorosa* L. subsp. *nemorosa*, G, Circ, U3,5T3R0; *Anemone ranunculoides* L., G, Eur, U3,5T3R4; *Caltha palustris* L., H, Circ, U4,5T0R0; *Clematis vitalba* L., nPh-L, Euc-Med, U3T3R3; *Hepatica transsilvanica* Fuss, G, Carp, U3T2R4; *Ranunculus acris* L. ssp. *acris*, H, Eua, U3,5T0R0; *Ranunculus auricomus* L., H, Eua, U3,5T3R3; *Ranunculus ficaria* L., H-G, Eua, U3,5T3R3; *Ranunculus repens* L., H, Eua (Med), U4T0R0; **Papaveraceae:** *Chelidonium majus* L., H, Eua, U3T3R4; *Corydalis solida* (L.) Clairv., G, Eur, U3T3R0; *Corydalis cava* (L.) Schweigg. et Körte, G, Euc, U3T3R0; **Ulmaceae:** *Ulmus glabra* Hudson, mPh (MPh), Eua, U4T3R3; **Urticaceae:** *Urtica dioica* L. subsp. *dioica*, H, Cosm, U3T3R4; **Fagaceae:** *Fagus sylvatica* L. subsp. *sylvatica*, MPh (mPh), Eur, U3T3R0; *Quercus cerris* L., MPh (mPh), Med, U2T3,5R3; *Quercus frainetto* Ten., MPh, Balc, U2T4R3; *Quercus petraea* (Mattuschka) Liebl., MPh (mPh), Eur, U2,5T3R0; *Quercus robur* L., MPh, Eur, U3,5T3R0. **Betulaceae:** *Alnus incana* (L.) Moench, MPh (mPh), Eur, U4T2R4; *Betula pendula* Roth, MPh (mPh), Eua, U3T2R2. **Corylaceae:** *Carpinus betulus* L., MPh-mPh, Eur, U3T3R3; *Corylus avellana* L., mPh, Balc, U3T3R3. **Caryophyllaceae:** *Moehringia trinervia* (L.) Clairv., Th (TH), Eua (Med), U2,5T3R3; *Stellaria graminea* L., H, Eua, U2,5T3R3; *Stellaria holostea* L., H, Eua, U3T3R0. **Polygonaceae:** *Rumex acetosa* L., H, Cosm, U3T0R0; *Rumex acetosella* L. subsp. *acetosella*, H (G), Cosm, U2T3R2. **Rosaceae:** *Agrimonia repens* L., H, Atl-Euc, U3T0R4; *Aremonia agrimonoides* (L.) DC., H, Euc (Med), U3T4R3; *Crataegus monogyna* Jacq. subsp. *monogyna*, mPh, Eua, U2,5T3R3; *Filipendula vulgaris* Moench, H, Eua, U2,5T3R0; *Fragaria vesca* L., H, Eua, U3T2,5R0; *Geum urbanum* L., H, Med (Circ), U3T3R4; *Malus sylvestris* Miller, mPh, Eur, U3,5T3R4; *Potentilla argentea* L., H, Eua, U2T4R2; *Prunus avium* L., mPh-MPh, Euc (Med), U3T3R3; *Pyrus pyraeaster* Burgsd., mPh-MPh, Eur, U2T3R4; *Rosa canina* L., nPh, Eur, U2T3R3; *Rubus caesius* L., H-nPh, Eur, U4T3R4; *Rubus idaeus* L., nPh, Circ, U3T3R3. **Fabaceae:** *Astragalus glycyphyllos* L., H, Eua (Med), U3T3R4; *Lathyrus niger* (L.) Bernh., H, Euc, U2,5T3R3; *Lathyrus venetus* (Miller) Wohlf., H, Pont-Med, U3T4R3; *Lathyrus vernus* (L.) Bernh., H, Eua, U3T3R3; *Lotus corniculatus* L., H, Eua, U2,5T0R0; *Medicago lupulina* L., Th-H, Eua, U2,5T3R4; *Trifolium montanum* L., H, Eua (Cont), U2,5T3,5R4; *Trifolium pratense* L. subsp. *pratense*, H-TH, Eua, U3T0R0. **Onagraceae:** *Circaea lutetiana* L., G, Eua (Med), U3,5T3R4; *Epilobium montanum* L., H, Eua, U3T0R3. **Thymelaeaceae:** *Daphne mezereum* L., nPh, Eua, U3,5T3R3. **Cornaceae:** *Cornus mas* L., mPh, Pont-Med, U2T3,5R4; *Cornus sanguinea* L., mPh, Euc, U3T3R4. **Celastraceae:** *Euonymus europaeus* L., mPh, Eur, U3T3R3; *Euonymus verrucosus* Scop., mPh, Eur, U2,5T3R4. **Euphorbiaceae:** *Euphorbia amygdaloides* L., Ch, Eur-Med, U3T3,5R4; *Mercurialis perennis* L., G (H), Eur, U3,5T3R4. **Aceraceae:** *Acer campestre* L. subsp. *campestre*, MPh-mPh, Eur, U2,5T3R3; *Acer platanoides* L., MPh, Eur, U3T3R3; *Acer pseudoplatanus* L., MPh, Euc, U3,5T3R3. **Oxalidaceae:** *Oxalis acetosella* L., H(G), Circ, U4T3R3. **Geraniaceae:** *Geranium robertianum* L., Th-TH, Cosm, U3,5T3R3; *Geranium sanguineum* L., H, Eur, U2T3R4. **Balsaminaceae:** *Impatiens noli-tangere* L., Th, Eua, U4T3R4. **Araliaceae:** *Hedera helix* L., nPh-E, Atl-Med, U3T3R3. **Apiaceae:** *Aegopodium podagraria* L., H(G), Eua, U3,5T3R3; *Heracleum sphondylium* L. subsp. *sphondylium*, H, Eua, U3T2,5R0; *Sanicula europaea* L., H, Eua, U3,5T3R4; *Seseli annuum* L., TH-H, Eur (Cont), U2T3R3. **Hypericaceae:** *Hypericum perforatum* L., H, Eua, U3T3R0. **Tiliaceae:** *Tilia platyphyllos* Scop. subsp. *platyphyllos*, MPh, Euc, U2,5T3R4; *Tilia tomentosa* Moench (*Tilia*

argentea DC), MPh, Balc-Pan, U2,5T3,5R3. **Violaceae:** *Viola arvensis* Murray, Th, Cosm, U3T3R0; *Viola odorata* L., H, Atl-Med, U2,5T3,5R4; *Viola reichenbachiana* Jordan ex Boreau, H, Eua, U3T3R3; **Cistaceae:** *Helianthemum nummularium* (L.) Miller subsp. *nummularium*, Ch-H, Euc-Med, U2T3R4. **Brassicaceae:** *Arabis hirsuta* (L.) Scop., TH-H, Eua-Med, U1,5T3R4; *Capsella bursa-pastoris* (L.) Medik., Th-TH, Cosm (Med), U3T0R0; *Dentaria bulbifera* L., G, Euc, U3T3R4; *Dentaria glandulosa* Waldst. et Kit., G, Carp (End), U4T2,5R4; *Cardamine impatiens* L., Th-TH, Eua, U4T3R3. **Salicaceae:** *Populus tremula* L., MPh-mPh, Eua, U3T2R2; *Salix caprea* L., mPh, Eua, U3T3R3. **Primulaceae:** *Lysimachia vulgaris* L., H-Hh, Eua, U5T0R0; *Primula veris* L. subsp. *veris*, H, Eua, U3T2R5. **Gentianaceae:** *Gentiana asclepiadea* L., H, Euc, U4T2R4. **Apocynaceae:** *Vinca minor* L., Ch, Euc-Med, U3T3R3. **Oleaceae:** *Ligustrum vulgare* L., mPh, Eua (Med), U2,5T3R3. **Convolvulaceae:** *Convolvulus arvensis* L., G (H), Cosm, U0T0R0. **Boraginaceae:** *Echium vulgare* L., TH, Eua, U2T3R4; *Myosotis sylvatica* Hoffm., H, Eur, U3,5T3R3; *Pulmonaria officinalis* L., H, Eur, U3,5T3R3; *Symphytum tuberosum* L. subsp. *tuberosum*, G, Euc, U3T3R3. **Lamiaceae:** *Ajuga reptans* L., H, Eur, U3,5T0R0; *Calamintha sylvatica* Bromf. subsp. *sylvatica*, H, Euc-Med, U2,5T3,5R5; *Glechoma hederacea* LH-Ch, Eua, U3T3R0; *Lamium galeobdolon* (L.) L. subsp. *galeobdolon*; H-Ch, Euc, U3T0R4; *Melittis melissophyllum* L. subsp. *melissophyllum*, H, Eur, U2,5T3R5; *Mentha longifolia* (L.) Hudson, H, Eua, U4,5T3R0; *Salvia glutinosa* L., H, Eua (Mont), U3,5T3R4; *Stachys officinalis* (L.) Trev., H, Eua, U3T3R0; *Stachys sylvatica* L., H, Eua, U3,5T0R0; *Thymus pulegioides* L. Ch, Eur (Mont), U2,5T3R3. **Plantaginaceae:** *Plantago lanceolata* L., H, Eua, U0T0R0; *Plantago media* L., H, Eua, U2,5T0R4. **Scrophulariaceae:** *Digitalis grandiflora* Miller, H, Euc, U3T3R3; *Rhinanthus rumelicus* Velen., Th, Pont-Pan-Balc, U3T4R0; *Scrophularia nodosa* L., H, Eua, U3,5T3R0; *Verbascum phlomoides* L., TH, Eur, U2,5T3,5R4; *Veronica chamaedrys* L. subsp. *chamaedrys*, H (Ch), Eua, U3T0R0; *Veronica officinalis* L., Ch, Eua, U2T2R2. **Campanulaceae:** *Campanula patula* L. subsp. *patula*, TH, Eur, U3T2,5R3; *Campanula rapunculoides* L., H, Eua, U3T2R0; *Campanula trachelium* L., H, Eua (Med), U3T3R3. **Rubiaceae:** *Cruciata glabra* (L.) Ehrend., H, Eua, U3T2R2; *Galium album* Miller subsp. *album*, H, Eur, U2,5T2,5R3; *Galium aparine* L., Th, Circ, U3T3R3; *Galium odoratum* (L.) Scop., G, Eua, U3T3R3; *Galium schultesii* Vest., G, Euc, U2,5T3R3. **Caprifoliaceae:** *Lonicera xylosteum* L., mPh, Eua, U3T3R4; *Sambucus nigra* L., Mph-mPh, Eur (Med), U3T3R3. **Adoxaceae:** *Adoxa moschatellina* L., G, Circ, U4T3R3. **Valerianaceae:** *Valeriana officinalis* L., H, Eua (Med), U4T3R4; *Valeriana tripteris* L., H, Euc, U3T0R4. **Asteraceae:** *Achillea millefolium* L. subsp. *millefolium*, H, Eua, U3T0R0; *Aster amellus* L., H, Eua-Cont, U2T3R4; *Carduus nutans* L., TH, Eua, U1,5T0R4; *Carlina vulgaris* L., TH, Eua, U2,5T3,5R0; *Cirsium erisithales* (Jacq.) Scop., H, Euc, U3T3R4; *Cirsium oleraceum* (L.) Scop., H, Eua, U4T3R4; *Conyza canadensis* (L.) Cronq., Th, Adv, U2,5T0R0; *Doronicum austriacum* Jacq., H, Euc, U3,5T2R3; *Erigeron annuus* (L.) Pers. subsp. *annuus*, Th-TH-H, Adv, U4T0R4; *Hieracium rotundatum* Kit. ex Schultes, H, Carp-Balc, U3T0R0; *Inula conyza* DC., H, Euc, U2T3R4; *Lapsana communis* L. subsp. *communis*, Th-TH-H, Eua, U2,5T3R3; *Mycelis muralis* (L.) Dumort., H, Eur, U3T3R0; *Gnaphalium sylvaticum* L. subsp. *norvegicum* (Gunnerus) Rouy, H, Eua (Circ), U3T1,5R1; *Petasites hybridus* (L.) P.Gaertn., B.Mey. et Scherb., H, Eua, U5T3R3; *Prenanthes purpurea* L., H, Euc, U3T2,5R0; *Senecio ovatus* (P. Gaertner, B. Meyer et Schreb.) Willd., H, Euc (Med), U3,5T2R3; *Tanacetum corymbosum* (L.) Schultz Bip. subsp. *corymbosum*, Th, Eua, U2,5T3,5R3; *Taraxacum officinale* Weber ex Wiggers, H, Eua, U3T0R0. **Dioscoreaceae:** *Tamus communis* L., G, Med, U3T3,5R4. **Trilliaceae:** *Paris quadrifolia* L., G, Eua, U3,5T0R4. **Liliaceae:** *Erythronium dens-canis* L. subsp. *dens-canis*, G, Euc-Med, U3,5T3,5R4; *Gagea lutea* (L.) Ker-Gawl., G, Eua, U3,5T0R3. **Alliaceae:** *Allium ursinum* L. subsp. *ucrainicum* Kleopow et Oxner, G, Pont-Med,

U3,5T3,5R4. **Colchicaceae:** *Colchicum autumnale* L., G, Euc, U3,5T3R4. **Asparagaceae:** *Maianthemum bifolium* (L.) F.W.Schmidt, G, Eua (Cont), U3T3R0; *Polygonatum verticillatum* (L.) All., G, Eur, U3T2,5R2. **Amaryllidaceae** *Galanthus nivalis* L., G, Eur, U3,5T3R4. **Orchidaceae:** *Platanthera bifolia* (L.) L.C.M. Richard, G, Eua (Med), U3,5T0R3. **Juncaceae:** *Luzula campestris* (L.) DC., H, Cosm, U3T0R3; *Luzula luzuloides* (Lam.) Dandy et Willmott subsp. *luzuloides*, H, Euc (Mont), U2,5T2,5R2; *Luzula sylvatica* (Hudson) Gaudin, H, Euc, U3,5T2,5R2. **Cyperaceae:** *Carex hirta* L., G, Circ, U0T3R0; *Carex sylvatica* Hudson, H (Hh), Circ, U3,5T3R4. **Poaceae:** *Agrostis capillaris* L., H (G), Circ, U0T0R0; *Anthoxanthum odoratum* L., H, Eua, U0T0R0; *Briza media* L., H, Eua, U0T3R0; *Cynosurus cristatus* L., H, Eur, U3T3R3; *Dactylis glomerata* L. subsp. *glomerata*, H, Eua, U3T0R4; *Festuca drymeja* Mert. et Koch, H, Carp-Balc, U4T2R3; *Festuca pratensis* Hudson subsp. *pratensis*, H, Eua, U3,5T0R0; *Festuca rubra* L. subsp. *rubra*, H, Circ, U3T0R0; *Lolium perenne* L., H, Cosm, U2,5T4R4; *Melica uniflora* Retz., H (G), Euc-Med, U2,5T3R4; *Poa nemoralis* L., H, Circ, U3T3R0; *Poa pratensis* L., H, Cosm, U3T0R0.

Taxonomic analysis: There have been identified 159 species and 5 subspecies, belonging to 50 families, most of them belonging to the following families: *Asteraceae*, *Poaceae*, *Rosaceae*, *Lamiaceae*, *Fabaceae*, *Scrophulariaceae*, *Violaceae*, *Rubiaceae*, *Brassicaceae* etc.

Bioforms analysis: The area investigated consists of therophytes (53.45%), followed by phanerophytes (18.24%), geophytes (14.47%) and hemicryptophytes (11.32%). The high percentage of therophytes suggests strong antropozoo influences in the area (fig. 1).

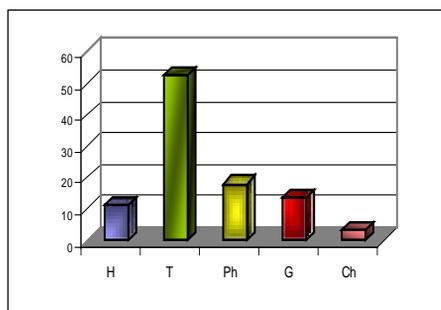


Fig. 1. Bioform spectrum

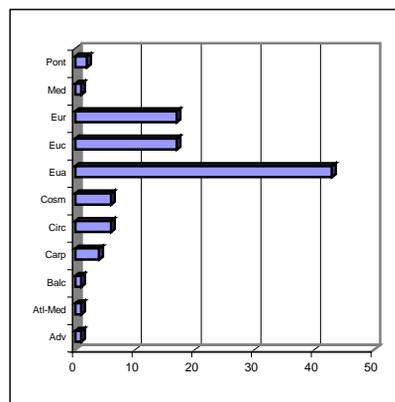


Fig. 2. Geoelements spectrum

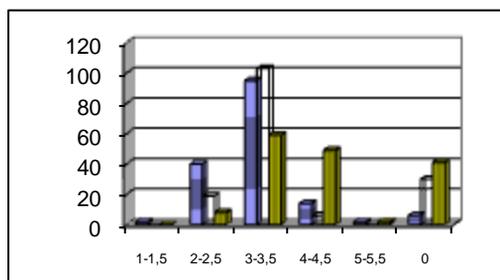


Fig. 3. Ecological spectrum

Phytogeographic analysis: Due to the geographical position, eurasian (42.7%), european and central european phytoelements (16.9%) are prevalent, followed by the cosmopolitan and circumpolar phytoelements (6.29%). As regards phytoelements specific to this part of Europe, of great importance is the presence of a large proportion of Carpathian (3.77%) and Balkan (1.26%) elements (fig. 2). The study of ecological plant species indicates the prevalence of mesophyl, xeromesophyl and mesothermophyle, strongly and weakly acidophyl, species characteristic of the local topoclimate (fig. 3).

Tree vegetation is approximately 45% of the total area. The main species that form the forest are: *Quercus petraea* and *Fagus sylvatica*. They form pure forest (common oak or beech forest), or a mixture of species such as *Carpinus betulus*, *Tilia platyphyllos*, *Ulmus glabra*, *Prunus avium*, *Acer pseudoplatanus*. Common oak prevails in the south area of the territory, on heights and sunny slopes and beech oak, which prefers lower temperatures, prevail in the west, north and northwest slopes, as well as in the northern part of the territory.

In terms of the current type of forest, only 56% is natural. A high percentage is represented by artificial forest (27%) and the partial derivatives are of 11%. The main reasons which led to the emergence of large areas of artificial forest are: the need to stop landslides, which are dangerous on the slopes near the village (*Robinia pseudacacia* having a great power of regeneration, formed acacia with a valuable protection against damage from ground), also the afforestation of areas resulting from the cuts with resinous species, aiming to create blocks of wood to produce wood for cellulose and rosin. The project was not successful, the cost of planting and maintenance of these types of wood.

CONCLUSIONS

The study results show that although trees cuts have increased in recent years, forest area is expanding by occupying those neglected agricultural areas and offering protection to develop a diverse herbaceous layer. There are changes of ecological balances, degradation of land by the destruction of natural ecosystems due to anthropogenic activities and overexploitation of natural resources in the area, as demonstrated by the high percentage of terophyte species.

REFERENCES

1. Alexiu V., 2008 – *Cormoflora județului Argeș*. Ed CERES, București.
2. Ciocârlan V., 2000 – *Flora ilustrată a României*. Ed CERES, București.
3. Grecescu D., 1898 – *Conspectul Florei României*. București.
4. Sanda V., Popescu A., Doltu M. I., Doniță N., 1983 - *Caracterizarea ecologică și fitocenologică a speciilor din flora României*. St. și Com., Muzeul Brukenthal, Sibiu 25, supliment.
5. Sanda V., Nicolae Biță Claudia, Barabaș N., 2003 - *Flora cormofitelor spontane și cultivate din România*. Ed. Ion Borcea, Bacău.
6. Tutin TG, 1991 - *Flora Europaea*, 1. Ed II, Cambridge University Press.
7. Tutin T.G. et al. (eds.), 1964-1980 - *Flora Europaea*, 1-5. Cambridge University Press.

CONTRIBUTIONS TO THE FLORISTIC RESEARCH IN SOME SYNANTHROPIC MEADOWS ECOSYSTEMS OF THE MOLDAVIAN PLAIN

CERCETĂRI FLORISTICE ÎN UNELE ECOSISTEME PRATICOLE ANTROPIZATE DIN CÂMPIA MOLDOVEI

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Abstract. *In the recent years we made some comparative studies about the biodiversity preservation in some synanthropic meadows of the Moldavian Plain. The investigations and observations on site were developed in 6 illustrative biotopes from Botoșani and Iași county. From all the species of cormophytes from the studied forest-steppe meadows, 46 are sporadical or rare, and 11 there are in the red lists of the vascular plants of Romania.*

Key words: phytodiversity, the Moldavian Plain (Romania).

Rezumat. *În ultimii ani s-au efectuat unele studii comparative privind conservarea biodiversității în unele pajisti antropizate din Câmpia Moldovei. Cercetările și observațiile efectuate în teren s-au derulat în 6 stațiuni ecologice reprezentative din județele Iași și Botoșani. Din totalul speciilor de cormofite identificate în pajistile de silvostepă studiate, 46 sunt sporadice sau rare, iar 11 specii se găsesc în listele roșii ale plantelor vasculare din România.*

Cuvinte cheie: fitodiversitate, Câmpia Moldovei (România).

INTRODUCTION

Within a research contract, we performed a series of studies on the synanthropic meadows of the Moldavian Plain. The studies and the observations on site were made in the next ecological stations, that will be numbered as follows: 1 - Sărata-Românești (the Botoșani county), 2 – Deleni, 3 - Vulturi-Popricani, 4 – Horlești, 5 - Valea lui David, 6 - Uricani-Lețcani (the Radio Station), all from the Iași county.

C. Burduja and collab. have published in 1976 year some aspects of the vegetation from Vulturi-Popricani (Iași).

Other contributions on the flora and vegetation of the hayfield near Vulturi were published by Mariana Huțanu in 2004 year.

The *Rezervation Valea lui David* near Iași was studied by C. Burduja in 1959 year and by D. Mititelu and collab., that published a paper about its flora and vegetation in 1969.

Another study, about some characteristics of this meadow was published in 1970, by A. Grâneau and collab.

MATERIAL AND METHOD

The plant species have been identified and then put into a floristic list. The percentage of bioformes and phytogeographic elements was calculated. Afterwards, the plant species were integrated into vegetal associations according to the Braun-Blanquet method. In the following we will enumerate just the more interesting species of the floristic list.

Cormophytes (the scientific names after V. Ciocârlan, 2000). *Apiaceae*: *Pastinaca graveolens* Bieb. (1, 4, 5); *Peucedanum latifolium* (Bieb.) DC. (6); *Silaum silaus* (L.) Schinz & Thell. (3), rare (R), but out of danger in Moldavia; *Trinia glauca* (L.) Dumort. (1, 3, 4); *Trinia ramosissima* (Fischer ex Trev.) Koch (5). *Asteraceae*: *Stemmacantha serratuloides* (Georgi) M. Dittrich (6), vulnerable (V). *Boraginaceae*: *Anchusa barrelieri* (All.) Vitman (3, 4); *Echium maculatum* L. (3, 5); *Lithospermum purpureocaeruleum* L. (3). *Brassicaceae*: *Crambe tatarica* Sebeók (3, 5), rare (R); *Hesperis tristis* L. (3); *Sisymbrium polymorphum* (Murray) Roth (5), rare (R); *Sisymbrium strictissimum* L. (4). *Euphorbiaceae*: *Mercurialis ovata* Sternb. & Hoppe (3), rare (R). *Fabaceae*: *Lathyrus lacteus* (Bieb.) Wissjul. (3, 5); *Lathyrus pallescens* (Bieb.) C. Koch (5); *Lathyrus pannonicus* (Jacq.) Garcke (3, 5), rare (R); *Oxytropis pilosa* (L.) DC. (3); *Trigonella procumbens* (Besser) Reichenb. (6). *Iridaceae*: *Iris aphylla* L. (3, 5); *Iris brandzae* Prodan (5), rare (R). *Lamiaceae*: *Ajuga laxmannii* (L.) Bentham (1, 3, 5); *Scutellaria hastifolia* L. (4). *Linaceae*: *Linum hirsutum* L. (1, 3). *Plantaginaceae*: *Plantago schwarzenbergiana* Schur (5, 6), rare (R). *Poaceae*: *Agropyron cristatum* (L.) Gaertner ssp. *pectinatum* (Bieb.) Tzvelev (1, 4); *Hierochloë repens* (Host) Simonkai (3, 4, 5), rare (R); *Stipa joannis* Celak. (3, 5); *Stipa lessingiana* Trin. & Rupr. (1). *Polygonaceae*: *Rumex tuberosus* L. (3), rare (R). *Ranunculaceae*: *Anemone sylvestris* L. (3); *Clematis integrifolia* L. (3, 4, 5); *Clematis recta* L. (3); *Myosurus minimus* L. (6); *Pulsatilla montana* (Hoppe) Reichenb. (3,5); *Ranunculus pedatus* Waldst. & Kit. (3, 6). *Rosaceae*: *Amygdalus nana* L. (3, 4, 5), rare (R). *Scrophulariaceae*: *Linaria genistifolia* (L.) Miller (1).

RESULTS AND DISCUSSIONS

The floristic list includes 192 taxa of cormophytes (183 species and 9 subspecies), that belongs to 136 genus and 40 botanic families (fig. 1).

From all species, 46 are sporadical and rare, the other been frequent (V. Ciocârlan, 2000). The families with the most species are: *Asteraceae* (25 species), *Fabaceae* (19 species), *Brassicaceae* (17 species), *Lamiaceae* (16 species), *Poaceae* (14 species), *Rosaceae* (12 species), *Boraginaceae* (11 species), *Apiaceae* and *Ranunculaceae*, with 9 species each of them. Thus, 9 plants families totalize 132 species, that represents 72.5% from all of them.

11 species are find in the red lists of the vascular plants from Romania (M. Oltean, G. Negrean and collab., 1994; I. Sârbu & T. Chifu, 2003): *Amygdalus nana* (R), *Crambe tatarica* (R), *Hierochloë repens* (R), *Iris brandzae* (R), *Lathyrus pannonicus* (R), *Mercurialis ovata* (R), *Plantago schwarzenbergiana* (R), *Rumex tuberosus* (R), *Silaum silaus* (R), *Sisymbrium polymorphum* (R), *Stemmacantha serratuloides* (V).

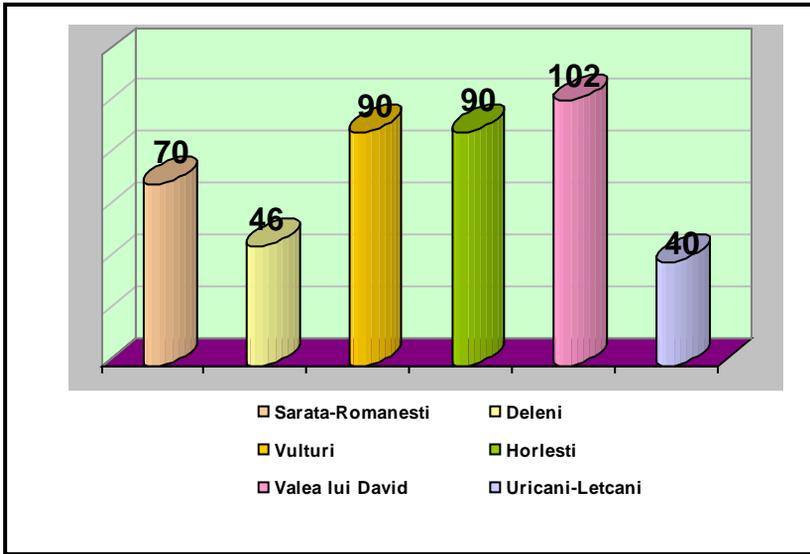


Fig. 1 – The number of the cormophytes species

From the *life formes*, there prevail the *hemicytrophytes*, the *therophytes* and the *hemitherophytes*, beside a low percent of *geophytes* and *phanerophytes* (fig. 2).

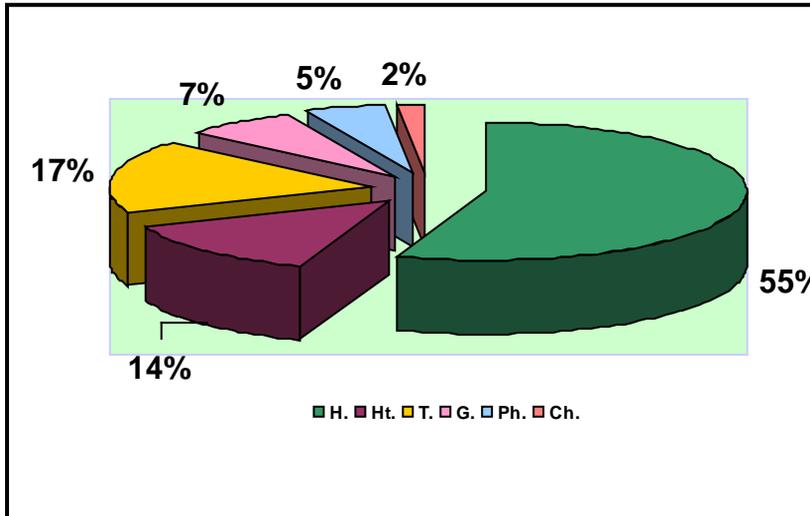


Fig. 2 – The percentage of the life formes (%).

We find that in some meadows (for example, Vulturi, Horlești) there are some forest plants, that also find protection under bushes, which proves that such meadows remained after forest retreat, even in recent times.

From the *phytogeographic elements*, there prevail the *Eurasian and European species*. The *cosmopolites and adventive species* are in low number, that means the anthrop pressure is low enough. Nevertheless, there are some ruderal and field-weeds species too, but they do not have a considerable influence over the general flora composition.

These forest-steppe meadows have a various number of plant species, but surfaces they occupy are reduced more and more under the assault of man. A specific note is given by the *Pontic, Pontic-Mediterranean and Pontic-Panonic species*, into a significant percent, also some *Pontic-Panonic-Balkan species* (fig. 3). This mixture is very interesting, proving a varies provenance of the cormophyte species of these ecosystems, that, although looking alike, group together very diverse plants, which also means various environment conditions. A high diversity also means a high stability of these types of ecosystems, as they are very well defined phytocenotically.

The vegetation. In our sites, the main vegetal groups identified belong to 8 *vegetal associations and a subassociation*, integrated into the following coenosystem:

Festuco-Brometea Br.-Bl. et R. Tx. ex Klika et Hadac 1944; *Festucetalia valesiaca* Br.-Bl. et R. Tx. ex Br.-Bl. 1949; *Festucion valesiaca* Klika 1931; *Medicagini-Festucetum valesiaca* Wagner 1941 - Sărata-Românești, Deleni, Vulturi-Popricani, Horlești, Valea lui David, Uricani-Lețcani; *Artemisio austriaca-Poëtum bulbosae* Pop 1970 - Sărata-Românești, Valea lui David; *Stipion lessingiana* Soó 1947; *Stipetum lessingiana* Soó (1927 n.n.) 1947 - Sărata-Românești.

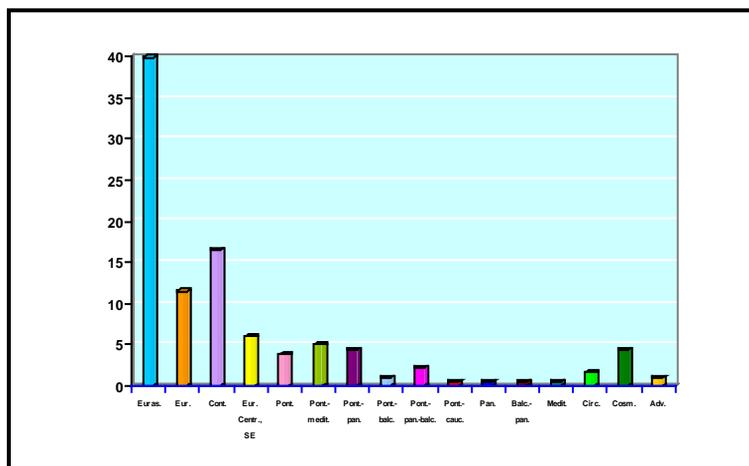


Fig. 3 – The percentage of the phytogeographic elements (%).

Molinio-Arrhenatheretea R. Tx. 1937; *Potentillo-Polygonetalia* R. Tx. 1947; *Potentillion anserinae* R. Tx. 1937: **Rorippo austriacae-Agropyretum repentis** (Timár 1947) R. Tx. 1950 - Uricani-Lețcani.

Puccinellio-Salicornietea Țopa 1939; *Puccinellietalia* Soó 1947 em. Vicherek 1973; *Puccinellion limosae* Soó 1933: **Puccinellietum limosae** Rapaics ex Soó 1933 - Uricani-Lețcani; **Leuzeetum salinae** (Borza 1931 n.n.) Răvărut 1958 - Uricani-Lețcani; *Puccinellion peisonis* Wendelbg. 1943 corr. Soó 1957; *Festucion pseudovinae* Soó 1933; *Artemisio santonici-Festucetum pseudovinae* Soó in Máthé 1933 corr. Borhidi 1996 **plantaginetosum schwarzenbergianae** Sanda et al. 1999 - Uricani-Lețcani.

Quercetea pubescenti-petraeae (Oberd. 1948) Jakucs 1960; *Prunetalia* R. Tx. 1952; *Prunion spinosae* Soó 1950: **Pruno spinosae-Crataegetum** Soó (1927) 1931 - Sărata-Românești, Vulturi-Popricani; *Prunion fruticosae* R. Tx. 1952: **Amygdaletum nanae** (Soó 1927 p.p.) 1959: Vulturi-Popricani, Horlești, Valea lui David.

The coast hayfields are generally well maintained, only sporadically we find patches of halophyte vegetation or some ruderal plants. The vegetation coverage is generally maximal and there is a significant number of fodder plants, which jeans higher productivity. It is not to be neglected their attractive aspect in the landscape, mostly for the vernal and summery flowers. At Uricani (the Radio Station), there are at least two different species, that need protection: *Stemmacantha serratuloides* (vulnerable) and *Plantago schwarzenbergiana* (rare), both species prevailingly halophyle, which participate in the building of typical associations of wet and salty areas.

CONCLUSIONS

The floristic list includes 192 taxa of cormophytes (183 species and 9 subspecies), that belongs to 136 genus and 40 botanic families. From all species, 46 are sporadical and rare. 11 species are find in the red lists of the vascular plants from Romania.

From the life formes, there prevail the hemicryptophytes, the therophytes and the hemitherophytes, beside a low percent of geophytes and phanerophytes.

From the phytogeographic elements, there prevail the Eurasian and European species. A specific note is given by the Pontic, Pontic-Mediterranean and Pontic-Panonic species, into a significant percent, also some Pontic-Panonic-Balkan species.

In our sites, the main vegetal groups identified belong to 8 vegetal associations and a subassociation.

The coast hayfields are generally well maintained, only sporadically we find patches of halophyte vegetation or some ruderal plants. The vegetation coverage is generally maximal and there is a significant number of fodder plants, which jeans higher productivity. It is not to be neglected their attractive aspect in the landscape, mostly for the vernal and summery flowers.

REFERENCES

1. **Burduja C., 1959** – *O rezervație științifică care trebuie înființată "Fânețele din Valea lui David"-Iași*. Ocrot. Nat., București, 4.
2. **Burduja C., Mihai Gh., Sârbu I., 1976** – *Aspecte de vegetație de la Vulturi-Popricani (jud. Iași)*. Stud. Cercet. Biol., Ser. Biol. veget., 28, 2.
3. **Chifu T., Mânzu C., Zamfirescu Oana, 2006** – *Flora și vegetația Moldovei (România)*, I, II, Edit. Univ. "Al. I. Cuza" Iași.
4. **Ciocârlan V., 2000** – *Flora ilustrată a României, Pteridophyta et Spermatophyta*. Edit. Ceres, București.
5. **Huțanu Mariana, 2004** – *Contribution to the study of the vascular flora and the vegetation from some forest-steppe meadows of Moldavia (Romania)*. An. Șt. Univ. Iași, II. a. Biol. veget., L.
6. **Mititelu D., Chifu T., 1994** – *Flora și vegetația județului Botoșani*. Stud. Com. 1980-1993, Compl. Muz. Șt. Nat. Bacău, 13.
7. **Mititelu D., Chifu T., Scarlat A., Aniței Liliana, 1995** – *Flora și vegetația județului Iași*. Bul. Grăd. Bot. Iași, 5.
8. **Mititelu D., Moțiu Tamara, Dăscălescu D., Teșu C., Vițalariu Cristina, 1969** – *Flora și vegetația rezervației Valea lui David-Iași*. Stud. Com., Muz. Șt. Nat. Bacău.
9. **Oltean M., Negrean G., Popescu A., Roman N., Dihoru G., Sanda V., Mihăilescu Simona, 1994** – *Lista roșie a plantelor superioare din România*. Stud., sint., document. de ecol., Inst. de Biol., Acad. Rom., București.
10. **Sârbu I., Chifu T., 2003** – *Lista roșie a plantelor vasculare din Moldova*. Mem. Acad. Rom., IV, XXIV (2001), București.

AMANITA ECHINOCEPHALA (VITT.) QUÉL. IN ROMANIA

AMANITA ECHINOCEPHALA (VITT.) QUÉL. ÎN ROMÂNIA

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Abstract: The paper refers to *Amanita echinocephala* (Vitt.) QuéL., that is a less frequent species in Romania. This species has been identified in Iași city, for three years, in August 2004, September 2005 and August 2006. We have also found in the Exhibition Park from Iași city, in 2005 year, some specimens of *Phallus hadriani* Vent.: Pers., a rare species in Romania [12], that was cited for the first time on 1995 and 1996 in Iași city, by the author [7].

Key words: chorology, macromycetes, rare species.

Rezumat: Lucrarea se referă la *Amanita echinocephala* (Vitt.) QuéL., care este o specie puțin frecventă în România. Această specie a fost identificată în Iași, timp de trei ani consecutiv, în august 2004, septembrie 2005 și august 2006. De asemenea, în anul 2005 s-au identificat în Parcul Expoziției din Iași, câteva exemplare de *Phallus hadriani* Vent.: Pers., o specie rară în România [12], care a fost citată prima dată din Iași, în 1995 și 1996, de către autoare [7].

Cuvinte cheie: corologie, macromicete, specii rare.

INTRODUCTION

The paper refers to *Amanita echinocephala* (Vitt.) QuéL., that is a less frequent species in Romania. We have also found in the Exhibition Park from Iași city some specimens of *Phallus hadriani* Vent.: Pers., another less common species in Romania.

MATERIAL AND METHOD

We made some pictures of the material we collected on the ground to emphasize the macroscopic characteristics. We also made pictures of the spores under the optic microscope Krüss. The material is in the personal collection.

RESULTS AND DISCUSSIONS

The taxonomic classification of the species *Amanita echinocephala* (Vitt.) QuéL. is the following: the family *Amanitaceae*, the order *Agaricales*, the subclass *Agaricomycetidae*, the class *Basidiomycetes*, the phylum *Basidiomycota*, the kingdom *Fungi* [13]. The cap of the mushroom is like a puffball in the beginning, then it becomes convex, 6-20 cm in diameter, white and covered with conic and sharp pits, more frequent in the centre than on the edges. The edge is surrounded by a membrane that hangs on, delicate laced. The cuticle is shiny and sticky. The stalk of the mushroom is spindle-like, 10-20 cm high, white, sturdy, sometimes with a ruffled thick base. The ring is large, with wavy edges, placed directly under cap. The gills are white, very thin and dense. The spores are white, 10 x 7 μm, of

an oval shape (fig. 1). The trama is white, with faint smell and taste. The colour of the cap may be change in time with age, in the young specimens the cuticule is purely white, but it gets older, it gets browner [2, 3, 6]. The habitat of this species is the dry decidous and coniferous forests. It is a species met in summer and autumn, from August to October. The edibility of the mushroom is doubtfoul. Species with similar colour and aspect are *Amanita vittadinii* (Moretti) Vitt. and *A. strobiliformis* (Vitt.) Bertill. [3].



Fig. 1. The spores of the species *Amanita echinocephala* (Vitt.) Quél. under the optic microscope (600 x)

The chorology of the species in Romania. The species *Amanita echinocephala* (Vitt.) Quél., is less frequent in Romania, being known in the following sites:

- the Bârnova forest - Iași [5, 8];
- the Botanical Garden of Bucarest, on the soil, under lime trees, on 7.X.1963 and 31.X.1963 [10].

It is also mentioned in the paper of the authors *K. Laszló and D. Pázmány*, after *Vera Bontea* [4]. This species has been identified also in the Iași city, in Copou district, where many specimens has been founded on the soil, under the decidous trees, on 2004 year (23 and 25 August), 2005 year (20 September) (fig. 2 and 3) and 2006 year (23 and 25 August). In the places where the mushrooms were identified, we have noticed the following species of cormophytes: *Fraxinus excelsior* L., *Acer platanoides* L., *Acer pseudoplatanus* L., *Tilia cordata* Miller, *Tilia tomentosa* Moench., *Quercus robur* L., *Aesculus hippocastanum* L., *Cornus sanguinea* L. On 2005 year (21 August) we also found on the soil, under *Aesculus hippocastanum* L., in the Exhibition Park, the same city and the same district, some specimens of *Phallus hadriani* Vent.: Pers., a rare species in Romania [12], that was cited for the first time on 1995 and 1996 in Iași city, by the author [7].



Fig. 2. *Amanita echinocephala* (Vitt.) Quél., general image (Iași, September 2005).



Fig. 3. *Amanita echinocephala* (Vitt.) Quél., general image (Iași, September 2005).

CONCLUSIONS

1. The paper refers to the species *Amanita echinocephala* (Vitt.) Quél. Another species that we have found in the same district is *Phallus hadriani* Vent.: Pers.
2. On complete the chorology of some species less frequent in Romania with new informations.
3. We consider that the presence of these species in Iași city is a little surprising, as they found propitious life conditions in such seminatural habitats.

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REFERENCES

1. **Albert L., Locsmándi C., Vasas Gizella, 1995** - *Ismerjük fel a gombakát!*. Gabo, Budapest.
2. **Bielli E. (edit.) (trad. de R. Gâdei), 1999** - *Cunoașterea, recunoașterea și căutarea celor mai cunoscute specii de ciuperci*. Ed. All Educational, București.
3. **Bon M., 1988** - *Champignons de France et d'Europe occidentale*. Arthaud, Paris.
4. **Bontea Vera, 1986** - *Ciuperci parazite și saprofite din România*. II, Ed. Acad. Rom., București.
5. **Eliade Eugenia, 1965** - *Conspectul macromicetelor din România*. Acta Bot. Horti Bucurest. (1964-1965): 185-324, București.
6. **Grünert H., Grünert Renate, 1984** - *Pilze (Gombák)*. Budapest, ed. 1995.
7. **Huțanu Mariana, 1997** - *Phallus hadriani, une macromycète rare pour la Roumanie, dans une nouvelle station*. Anuar. Muz. Naț. Bucov., Suceava, Șt. Nat., XIV: 121-124.
8. **Popovici Al., 1902** - *Contribution à la flore criptogamique de la Roumanie*. Ann. Sci. Univ. Jassy, II, 1: 31-44.
9. **Sălăgeanu Gh., Sălăgeanu Anișoara, 1985** - *Determinator pentru recunoașterea ciupercilor comestibile, necomestibile și otrăvitoare din România*. Ed. Ceres, București.
10. **Săvulescu Olga, Eliade Eugenia, Bănescu-Tudosescu Veronica, 1965** - *Macromycete din Grădina Botanică din București*. Acta Bot. Horti Bucurest. (1964-1965): 165-176, București.
11. **Șesan Tatiana Eugenia, Tănase C., 2004** - *Ghid de recunoaștere a ciupercilor comestibile și toxice*. Ed. Gee, București.
12. **Tănase C., Bîrsan C., Chinan V., Cojocariu Ana, 2009** – *Macromicete din România*. Ed. Univ. „Al. I. Cuza”, Iași.
13. **http://www.eukarya.ro/taxon.**

PLANT ASSOCIATIONS FROM QUERCO-FAGETEA Br.– Bl. et Vlieger 1937 CLASS IN THE LEAOTA MASSIF

ASOCIAȚII VEGETALE DIN CLASA QUERCO-FAGETEA Br.– Bl. et Vlieger 1937 ÎN MASIVUL LEAOTA

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Abstract. *From the phytocoenotic point of view in Leaota Massif have been identified three plant associations characteristic to beech forests: Symphyto cordato – Fagetum sylvaticae Vida 1959, Pulmonario rubrae – Fagetum sylvaticae (Soó 1964) Täuber 1987 and Phyllitidi – Fagetum sylvaticae Vida (1959) 1963. The plant associations are characterized from the syntaxonomical point of view, floristic composition, types of bioforms, geoelements, ecological and cariological indices.*

Key words: plant association, bioforms, geoelements, ecological index, cariological index, Leaota Massif

Rezumat. *Sub aspect fitocenotic, în Masivul Leaota au fost identificate trei asociații vegetale caracteristice fâgetelor: Symphyto cordato – Fagetum sylvaticae Vida 1959, Pulmonario rubrae – Fagetum sylvaticae (Soó 1964) Täuber 1987 și Phyllitidi – Fagetum sylvaticae Vida (1959) 1963. Asociațiile vegetale au fost caracterizate din punct de vedere sintaxonomic, al compoziției floristice, tipurilor de bioforme, geoelemente, indicilor ecologici și cariologici.*

Cuvinte cheie: asociații vegetale, bioforme, geoelemente, indici ecologici, indici cariologici, Masivul Leaota

INTRODUCTION

The geographic area of Leaota Massif is delimited by Dâmbovița river at the West; the Northern limit is represented by Rucăr-Bran Passage. The Eastern limit is marked by Brătei Valley, which has on the left side the western part of the Bucegi Mountains (Strunga Peak). The Leaota Massif is in connection with subcarpathian zones in the Southern part. The majority of peaks are sculptured in crystalline series of Leaota, corresponding to the facies with green schists. The climate of this mountaineous zone is temperate central-european.

MATERIAL AND METHODS

The plant associations have been studied using the research methods of Braun-Blanquet, in the spirit of the Central-European School from Zürich-Montpellier and adapted by Borza to the particularities of the vegetal layer of our country. Denomination of plant associations is conformed with syntaxonomical provisions established in the International Code of Phytosociological Nomenclature [1, 7]. The plant associations have been described on the basis of edifying, dominant and differential species. The surveys, quantitative and qualitative appreciations were effected after recommendation of Al. Borza, N. Boșcaiu, V. Cristea and Gh. Coldea [3,4,5,6]. The surveys realized for each association

have been affiliated in the synthetic table which included: species of cormophytes, constancy for each species from these associations.

RESULTS AND DISCUSSIONS

The phytocoenological investigation effected in this territory had permitted the identification of three plant associations characteristic to beech forests belonging to *Quercus-Fagetum* class.

***Symphyto cordato* – *Fagetum sylvaticae* Vida 1959**

The beech forests from this association are presented frequently in the North-West part of Leaota Mountains (the quays around Ghimbav Mountains – Rudărița, Ghimbav Quays), but also in Andolia Valley (Secări). This grouping vegetates at 560-740 m altitude in the inferior mountaineous layer on little inclined lands, with brown and feeble skeleton soils, rich in humus, with high trophicity.

The trees stratum is dominated by *Fagus sylvatica* (80-90% coverage). The floristic composition presents sporadically dissemination with *Acer pseudoplatanus* and *Picea abies*. The vegetal layer is dominated by *Symphytum cordatum* with 20% coverage and other taxons of *Symphyto-Fagion* alliance and *Fagetalia* order. These phytocoenoses present a big conservative value, both through the populations with *Symphytum cordatum*, which are very closed and through the vegetal layer with Carpathian-Balkan and Endemic species (*Dentaria glandulosa*, *Pulmonaria rubra*, *Hepatica transsilvanica*, *Silene heuffelii*, *Hieracium rotundatum*, *Campanula patula* ssp. *abietina*). In the floristic composition of this grouping are presented characteristic species to *Vaccinio-Piceetalia* order (*Sorbus aucuparia*, *Picea abies*, *Luzula sylvatica*, *Vaccinium myrtillus*, *Moneses uniflora*), because it is at the limit of spruce forests.

The bioforms spectrum is dominated by hemicryptophytes followed by the phanerophytes, geophytes, camephytes and therophytes. Concerning the phytogeographical elements, the principal components of the studied coenoses are Euroasian, European, Central-European and Circumpolar species. The Balkan and Carpathian-Balkan element is represented by *Silene heuffelii*, *Corylus avellana*, *Pulmonaria rubra*. A peculiar note from the phytogeographical point of view is given by Endemic element: *Symphytum cordatum*, *Dentaria glandulosa*, *Hepatica transsilvanica*.

These phytocoenoses present a mesophilic, micromesotherm, acid-neutrophilous and low acid neutrophilous character with euryionic valences. The cariological study reveals a high number of polyploid species (45) and the index of ratio is 0,688.

***Pulmonario rubrae* – *Fagetum sylvaticae* Soó (1964) Täuber 1987**

The forests with beech, fir and spruce from the middle mountaineous layer vegetate between 500-1500 m altitude being identified in Rudărița, Brătei Quays, Românescu Mountain. This association occupies the sunny and less inclined slopes with variable exposition, developing on brown and acid brown soils, rich in mull humus. The tree stratum is characterized by *Fagus sylvatica* and *Abies*

alba (in codominance ratio) with sporadically dissemination of *Acer pseudoplatanus* and *Picea abies*. The floristic composition is represented by characteristic species from *Symphyto-Fagion* alliance, *Fagetalia* order and *Quercu-Fagetea* class. Besides of these are presented transgressive species from *Vaccinio-Piceetalia* order.

After the analysis of the surveys we noticed the following: from the bioforms spectrum, the hemicryptophytes are dominated, followed by the phanerophytes, geophytes, camephytes and therophytes, from the phytogeographical spectrum we observe preponderance of Euroasian, European and Central-European elements. The autochthonous element is emphasized by the presence of Carpathian-Balkan and Endemic species: *Hieracium rotundatum*, *Campanula patula* ssp. *abietina*, *Leucanthemum waldsteinii*, *Silene heuffelii*, *Pulmonaria rubra*. The spectrum of ecological index shows us that the majority of taxons are mesophilous, micromesotherms and acid-neutrophilous. The diploid species are preponderanted (38), while the polyploids are represented by 38 taxons, index of ratio is 1,652.

***Phyllitidi – Fagetum sylvaticae* Vida (1959) 1963**

This plant association vegetates on limestone rocks, between 460-700 m in Ghimbav, Românescu Mountains and forms a type of intrazone vegetation inside of beech forest, installing in shaded stations where maintains a climate with sufficient atmospheric humidity. The edifying species are *Fagus sylvatica* and *Acer pseudoplatanus* which realized a coverage of 70-90%. The *Asplenium scolopendrium* is dominated in the vegetal layer with abundance-dominance values of 35%. The vegetal layer presents characteristic species to *Symphyto-Fagion* alliance and *Fagetalia* order. The higrophilous species characteristic to *Adenostyletalia* order (*Valeriana sambucifolia*, *Polygonatum verticillatum*, *Milium effusum*) are presented in these coenoses as increase of altitude. The hemicryptophytes are the bioforms with a high weight, besides of these are presented phanerophytes, geophytes and therophytes. The basic fund of floriferous elements in these phytocoenoses is formed by European, Central-European and Euroasian species. The Endemic, Carpathian and Carpathian-Balkan species are represented in the floristic structure by: *Symphytum cordatum*, *Ranunculus carpaticus*, *Pulmonaria rubra*, *Dentaria glandulosa*, *Hepatica transsilvanica*, *Silene heuffelii*. Analyzing the ecological indices we find out that the mesophytes, micromesothermophytes and lean acid neutrophilous, acid neutrophilous species are well represented. The caryolic spectrum emphasizes preponderance of diploids (64,58%) and index of ratio is 1,82.

Table 1

Plant associations from *Quercu-Fagetea* Br.– Bl. et Vlieger 1937 class

Plant association	1	2	3
Number of surveys	10	6	6
Altitude (m)	560-750	530-1500	460-700
Char.ass.			
<i>Symphytum cordatum</i>	V	-	IV

<i>Pulmonaria rubra</i>	IV	V	IV
<i>Asplenium scolopendrium</i>	-	-	V
<i>Fagus sylvatica</i>	V	V	V
Lathyro hallersteini-Carpinion			
<i>Carpinus betulus</i>	-	-	V
<i>Galium schultesii</i>	-	II	III
<i>Stellaria holostea</i>	-	-	V
Moehringio-Acerenion			
<i>Acer pseudoplatanus</i>	-	II	IV
<i>Polystichum aculeatum</i>	-	II	III
Symphyto-Fagion et Fagetalia			
<i>Dentaria glandulosa</i>	V	-	III
<i>Hepatica transsilvanica</i>	III	-	II
<i>Silene heuffelii</i>	III	II	III
<i>Euphorbia amygdaloides</i>	IV	II	-
<i>Euphorbia carniolica</i>	I	I	IV
<i>Oxalis acetosella</i>	IV	V	V
<i>Veronica urticifolia</i>	IV	III	V
<i>Myosotis sylvatica</i>	IV	IV	IV
<i>Geranium robertianum</i>	IV	III	V
<i>Cardamine impatiens</i>	III	-	-
<i>Neottia nidus-avis</i>	III	-	-
<i>Anemone ranunculoides</i>	III	-	-
<i>Actaea spicata</i>	III	V	IV
<i>Paris quadrifolia</i>	III	-	II
<i>Galium odoratum</i>	III	IV	IV
<i>Daphne mezereum</i>	I	III	III
<i>Mycelis muralis</i>	III	II	II
<i>Salvia glutinosa</i>	III	-	III
<i>Mercurialis perennis</i>	III	III	-
<i>Lamiastrum galeobdolon</i>	III	II	-
<i>Epipactis helleborine</i>	II	I	-
<i>Prenanthes purpurea</i>	II	-	-
<i>Polystichum setiferum</i>	I	-	-
<i>Rubus hirtus</i>	I	-	-
<i>Epilobium montanum</i>	I	I	-
<i>Lilium martagon</i>	I	-	-
<i>Carex sylvatica</i>	I	-	-
<i>Scrophularia nodosa</i>	I	-	-
<i>Corydalis solida</i>	-	II	-
<i>Fraxinus excelsior</i>	-	III	II
<i>Corydalis cava</i>	-	-	II
<i>Melica nutans</i>	-	-	III
<i>Asarum europaeum</i>	-	-	IV
<i>Primula veris</i>	-	-	IV
<i>Ranunculus carpaticus</i>	-	-	III
Querco-Fagetea			
<i>Dryopteris filix-mas</i>	IV	I	V
<i>Impatiens noli-tangere</i>	III	-	IV
<i>Poa nemoralis</i>	III	V	III
<i>Corylus avellana</i>	III	IV	V

<i>Hedera helix</i>	III	-	-
<i>Evonymus verucossa</i>	II	-	III
<i>Athyrium filix-femina</i>	II	IV	III
<i>Adoxa moschatellina</i>	I	-	-
<i>Crataegus monogyna</i>	-	III	-
<i>Glechoma hirsuta</i>	-	II	-
Adenostyletalia s.l.	-	-	-
<i>Valeriana sambucifolia</i>	-	-	IV
<i>Polygonatum verticillatum</i>	-	-	III
<i>Millium effusum</i>	-	-	III
Vaccinio - Piceetalia			
<i>Picea abies</i>	III	IV	II
<i>Abies alba</i>	-	V	III
<i>Sorbus aucuparia</i>	III	III	-
<i>Luzula sylvatica</i>	III	IV	-
<i>Moneses uniflora</i>	I	-	-
<i>Vaccinium myrtillus</i>	I	-	-
<i>Hieracium rotundatum</i>	I	III	-
<i>Huperzia selago</i>	I	I	-
<i>Campanula patula</i> ssp. <i>abietina</i>	I	II	-
<i>Soldanella hungarica</i> ssp. <i>major</i>	-	I	-
Variae syntaxa			
<i>Fragaria vesca</i>	IV	V	-
<i>Rubus idaeus</i>	IV	-	
<i>Spiraea chamaedrifolia</i>	III	I	V
<i>Aegopodium podagraria</i>	III	-	-
<i>Urtica dioica</i>	III	III	III
<i>Ajuga reptans</i>	III	-	III
<i>Cardaminopsis arenosa</i>	III	-	-
<i>Polypodium vulgare</i>	III	-	IV
<i>Hypericum maculatum</i>	III	III	-
<i>Campanula persicifolia</i>	II	-	-
<i>Valeriana officinalis</i>	II	-	-
<i>Ribes uva crispa</i>	II	-	-
<i>Asplenium trichomanes</i>	II	-	III
<i>Glechoma hederacea</i>	II	-	-
<i>Clematis alpina</i>	II	-	-
<i>Betula pendula</i>	II	-	-
<i>Rosa pendulina</i>	II	I	-
<i>Lapsana communis</i>	I	-	-
<i>Stachys sylvatica</i>	I	-	-
<i>Veronica chamaedrys</i>	I	-	-
<i>Digitalis grandiflora</i>	I	-	-
<i>Campanula rapunculoides</i>	I	-	-
<i>Thalictrum aquilegiifolium</i>	-	-	II
<i>Chrysosplenium alternifolium</i>	-	-	I
<i>Geum urbanum</i>	I	-	-
<i>Galeopsis speciosa</i>	I	-	-
<i>Leucanthemum waldsteinii</i>	-	V	-
<i>Geranium phaeum</i>	I	-	-
<i>Gentiana asclepiadea</i>	I	I	-

<i>Cystopteris fragilis</i>	I	-	-
<i>Campanula rapunculoides</i>	-	III	-
<i>Circaea lutetiana</i>	-	II	-
<i>Stellaria media</i>	-	III	-
<i>Luzula luzuloides</i>	-	III	-
<i>Prunella vulgaris</i>	-	II	-
<i>Sambucus nigra</i>	-	II	-
<i>Cruciata laevipes</i>	-	II	-
<i>Cirsium waldsteinii</i>	-	I	-
<i>Equisetum arvense</i>	-	I	-
<i>Festuca drymeia</i>	-	I	-
<i>Tussilago farfara</i>	-	I	-
1 - <i>Symphyo cordato</i> – <i>Fagetum sylvaticae</i> Vida 1959			
2 - <i>Pulmonario rubrae</i> – <i>Fagetum sylvaticae</i> Soó (1964) Täuber 1987			
3 - <i>Phyllitidi</i> – <i>Fagetum sylvaticae</i> Vida (1959) 1963			

CONCLUSIONS

The beech forests from Leaota Massif form seminatural forestry biocoenoses with a reduced modifications of the structure and functions of these ecosystems. In these forests are preserved Carpathian and Carpathian-Balkan elements having a prominent part of biocoenological matrix which had conserved the structure of autochthonous populations.

The conservation of these vegetal groupings is necessary to elucidate the phytohistory, chorology, coenology of forestry phytocoenoses which conserve an important coeno-components for Carpathian beech forests.

REFERENCES

1. Barkman J. J., Moraveç J., Rauschert S., 1986 - *Code der Pflanzensoziologischen Nomenklatur*. Vegetatio, Upsala, **67** (3): 145-195.
2. Borza Al., 1934 - *Studii fitosociologice în Munții Retezat*. Bul. Grăd. Bot., Muz. Bot., Cluj, **16**: 1-84.
3. Borza Al., Boșcaiu N., 1965 - *Introducere în studiul covorului vegetal*. Ed. Acad. R.P.R., București.
4. Coldea Gh., 1991 - *Prodrome des associations végétales des Carpates du sud-est (Carpates Roumaines)*. Documents Phytosociologiques, Camerino, **13**: 317-539.
5. Cristea V., 1993 - *Fitosociologie și vegetația României*. Univ. „Babeș-Bolyai”, Cluj-Napoca.
6. Cristea V., Gafta D., Pedrotti F., 2004 – *Fitosociologie*. Ed. Presa Universitară Clujeană, Cluj-Napoca.
7. Weber H.E., Moravec J., Theurillat J.P., 2000 - *International Code of Phytosociological Nomenclature*. J. Veg. Sci., **11**: 739-768.

MORPHOLOGICAL AND HISTO-ANATOMICAL CHARACTERISTICS OF CULTIVATED *MELISSA OFFICINALIS* L. PLANT

CARACTERISTICI MORFOLOGICE ȘI STRUCTURALE LA PLANTA CULTIVATĂ DE *MELISSA OFFICINALIS* L.

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Abstract. *Melissa officinalis* L. (lemon balm) is a perennial herb of Lamiaceae family, with culinary and medicinal use. This paper analyzes the developmental stages of *Melissa officinalis* cultivated plant. The successive ontogenesis stages of seedling, including the development of root, hypocotyl, epicotyl, cotyledons and nomophylls are described. The histo-anatomical characteristics of mature organs (root, stem and leaf) are identified. Peculiar attention is given to the morphology and distribution of glandular and non-glandular hairs on the vegetative organs.

Key words: ontogenesis, morphology, anatomy, *Melissa officinalis*

Abstract. *Melissa officinalis* L. este o plantă perenă din familia Lamiaceae cu importanță culinară și medicinală. Lucrarea de față reprezintă un studiu amplu asupra creșterii și dezvoltării plantei cultivate, fiind analizate morfologia și structura organelor vegetative în evoluție ontogenetică, o atenție deosebită acordându-se distribuției și morfologiei perilor secretori, producători de uleiuri volatile.

Cuvinte cheie: ontogeneză, morfologie, anatomie, *Melissa officinalis*

INTRODUCTION

Melissa officinalis L. (lemon balm) is a perennial herb of Lamiaceae family, grown spontaneous in Romania, only on limited areas in south-west of the country, and cultivated in gardens and monachal places.

The numerous phytochemical researches revealed the importance of this species as aromatic, melliferous and medicinal plant (Heitz et al., 2000; Gille et al., 2004; Blank et al., 2005).

The present paper is an ample study of grown and development of cultivated plant, being analysed the morphology and the structure of the vegetative organs in successive ontogenesis stages. Peculiar attention is given to the morphology and distribution of glandular and non-glandular hairs on the vegetative organs.

MATERIAL AND METHODS

Seeds belonging to *Melissa officinalis* plant obtained from „Stejarul” Researches Station of Piatra Neamț, were planted in soil under normal environmental conditions. Individu of different age were crop and fixed in 70% ethylic alcohol for histo-anatomical reserches.

The cross-sections of the vegetative organs were performed using a manual microtome, coloured with iodine green and ruthenium red, analysed and photographed at photonic microscope Olympus BX51 with a photo camera Olympus E-330.

RESULTS AND DISCUSSIONS

The seed germination is epigeous. The 35-day-old seedling presents: primary root with few secondary roots, short hypocotyl, two cotyledons and four nomophylls. The cotyledons have different morphology comparing to authentic leaves (fig. 1).



Fig. 1. Successive stages of *Mellisa officinalis* seedling ontogenesis

The seedling root presents primary structure. The stele is of diarch type and is protected by a Casparyan endodermis. At the mature plant, secondary roots result from the activity of both lateral meristems, the cambium and the phellogen.

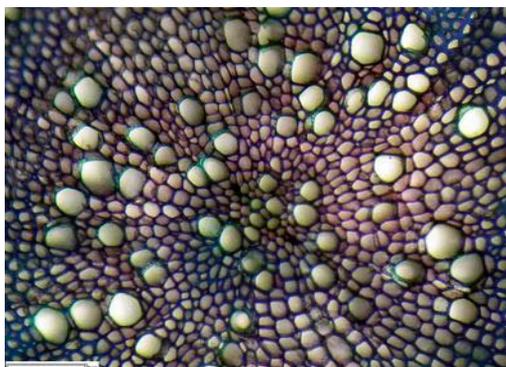


Fig. 2. Cross-section through the mature root of *Mellisa officinalis* (detail from the stele)

Most part of xylem corpus is lignified. A few islands of parenchymatous cellulosic cells in external part and in the inner of the xylem mass may be observed. The central part of the root is occupied by primary xylem vessels. The cambium is thick. The parenchymatous cells of the secondary phloem ring are numerous, the vascular elements being grouped in small islands.

The root is protected by the peridermis; the phellogen is formed from the pericycle. The phellodermis comprises 12-13 layers of collenchymatous cells comparatively to the cork, which is thin (2-3 layers).

The hypocotyl (fig. 3) presents circular contour in transverse section and is protected by epidermis, with numerous, multicellular, short trichomes. The passing from the primary structure of the root to the primary structure of the stem takes place along the hypocotyl and could be explained by the desmogenesis theory (Chauveaud, 1911) according to which three stages in vascular transition are distinguished, as follows: 1) alternate stage (characteristic to the root); 2) intermediary (tangential) stage (characteristic to the hypocotyl); 3) overlapped stage (characteristic to the stem)



Fig. 3. Cross-section through the hypocotyl of *Mellisa officinalis* 35day-old seedling.

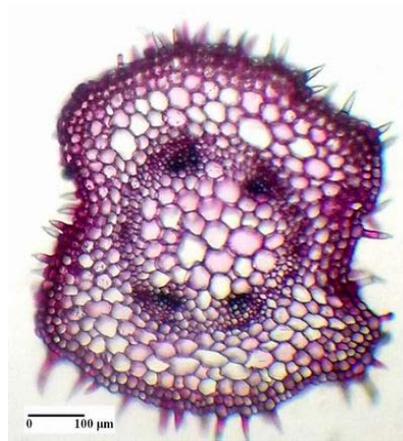


Fig. 4. Cross-section through the epicotyl of *Mellisa officinalis* 35 day-old seedling.

The epicotyl (fig. 4) presents primary structure with quadratic contour in transverse section, and four prominent ribs. The mechanic tissues are in developing; a tangential hypodermic collenchyma may be observed.

At the mature plant, **the stem** presents different contour in transverse section depending of the level taken into study (fig. 5, 6); four pronounced ribs in the upper third of the stem may be observed. The secondary structure of the aerial stem results only from cambium activity.

The primary vascular tissues are organised vascular bundles of open collateral type (in ribs) and small islands of phloem (in depressions). The cambium produces more vascular secondary elements in the ribs than in the depressions. The secondary xylem ring is entire lignified. Vessels of primary

xylem surrounding by parenchymatous cellulosic cells are present at the periphery of xylem corpus.

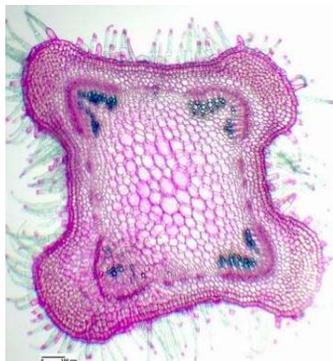


Fig. 5. Cross-section through the upper third of the aerial stem of *Melissa officinalis* mature plant

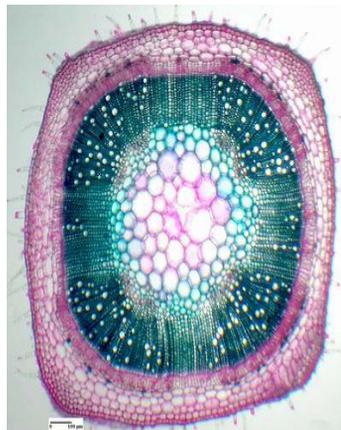


Fig. 6. Cross-section through the lower third of the aerial stem of *Melissa officinalis* mature plant

The pith is of parenchymatous cellulosic type (in the upper third of the stem) and lignified towards its periphery.

The mechanic tissues are represented by cordons of angular (in ribs) and tangential (in depressions) collenchyma.

At the external part of the phloem, isolated or grouped sclerenchymatous fibers are in developing, especially in the ribs.

On its entire surface, the stem is protected by the epidermis covered by a striated cuticle. Numerous multicellular non-glandular trichomes may be observed. The cotyledons present the same structure as the nomophylls; the mesophyll is differentiated in one layer of palisade tissue (at the adaxial face) and 2-3 layers of lacunous tissue (at the abaxial face).

The stomata are of anomocytic type and are disposed on the both face of the foliar. The median and the secondary nervures are prominent at the abaxial face of the limb (fig. 7).

The glandular hairs are early formed during plant ontogenesis. in hypocotyl there are secretory hairs with unicellular gland. Fahn (1988) notes that glandular hairs of *Lamiaceae* can be classified in two types: capitate and peltate glandular hairs.

According to this classification at *Melissa officinalis*, are distinguished the following types of glandular hairs: 1. capitate glandular hairs with unicellular secreting head (fig. 8); type 2. capitate glandular hairs with 2-cellular secreting head (fig. 9); type 3. peltate glandular hairs with 8-celled secreting head (fig. 10).

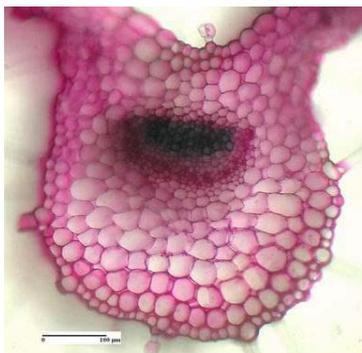


Fig. 7. Cross-section through the median nervure of *Mellisa officinalis* foliar limb

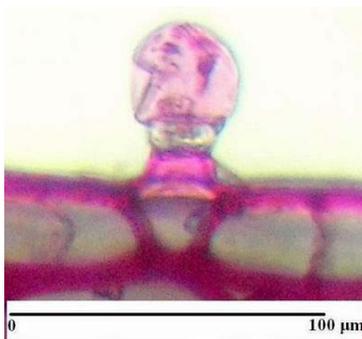


Fig. 8. Glandular hair with unicellular secreting head in the stem of *Mellisa officinalis* (cross-section).

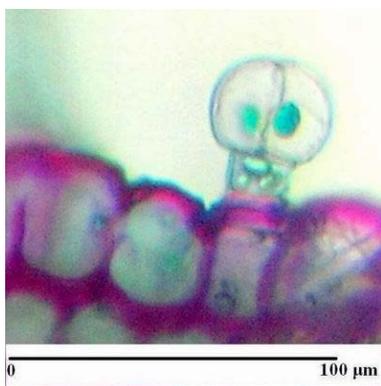


Fig. 9. Glandular hair with 2-cellular secreting head in the stem of *Mellisa officinalis* (cross-section).

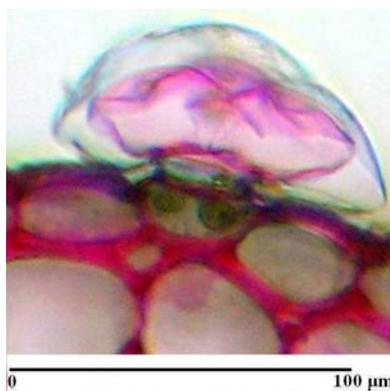


Fig. 10. Glandular hair with multicellular secreting head in the stem of *Mellisa officinalis* (cross-section).

CONCLUSIONS

The evolution of vascular system could be explained by the desmogenesis theory (Chauveaud, 1911) according to which three stages in vascular transition are distinguished. The cotyledons have a different morphology and the same structure as the nomophylls. At the mature plant the axial vegetative organs have secondary structure, with the exception of the upper third of the stem.

The glandular hairs with uni- or multicellular glands are early formed during plant development and are numerous in mature vegetative organs (the upper third of the stem and leaves).

REFERENCES

1. **Blank A. F., Fontes S. M., Oliveira A. Dos S., Mendonça M. Da C., Silva-Mann R., Arrigoni-Blank M. De F., 2005** - *Seedling production, cutting height and harvest interval in Melissa officinalis L.* Horticultura Brasileira, 23: 780-784
2. **Chauveaud G., 1911**- *L'appareil conducteur des plantes vasculaires et les phases principales de son évolution.* Ann. Sci. Nat., Bot., sér. 9, 13:114-438
3. **Fahn, 1988** – *Secretory tissues in vascular plants.* New Phytol., 108:229-257
4. **Galeş Ramona, Toma C., Preotu Ana, Gille Elvira, 2008**– *Structural peculiarities of the vegetativ apparatus of spontaneous and cultivated Origanum vulgare L. plants.* An. Univ. Craiova, XIII (XLIX): 273-278
5. **Gille E., Ghiorghita G., Danila D., Cutas F., Burla R., 2004** - *Comparative phytochemical investigations in melissa officinalis species of different proveniences.* 3rd Conference on Medicinal and Aromatic Plants of Southeast European Countries, Nitra
6. **Heitz Annie, Carnat Andrée, Fraisse Didier, Carnat André-Paul, Lamaison Jean-Louis, 2000** - *Luteolin 3-glucuronide, the major flavonoid from Melissa officinalis subsp. officinalis.* Fitoterapia, 71: 201-202.

MORPHO-ANATOMICAL STUDIES OF *VERONICA FILIFORMIS*

STUDII MORFO-ANATOMICE LA *VERONICA FILIFORMIS*

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Abstract: *The Veronica filiformis is a rare taxon within the Romanian flora. The anatomical and morphological studies regarding this taxon are quite sporadically elaborated. This paper is part of a more extensive work putting forward as object of study: The morphology, anatomy, taxonomy and corology of the Veronica species with solitaire flowers from Romania, paper that represent the doctoral dissertation of the author. Within the spectrum of the species studied only Veronica filiformis is perennial. A remarkable feature of this species is constituted by the frequent sterility, which is apparently associated with the vigorous development of a single exemplary. From the anatomically point of view we can ascertain that the adventive root has a primary structure, the stem present a primary structure at the bark level and a secondary structure at the central cylinder level and the leaf has a simple structure, with an homogenous mesophyll between the two epidermis. This morphological and anatomical composition explains the stationary conditions where this plant is encountered.*

Key words: *Veronica filiformis, anatomy, morphology.*

Rezumat. *Veronica filiformis Sm. este un taxon rar în flora României. Studiile de anatomie și morfologie referitoare la acest taxon sunt cu totul sporadice. Lucrarea de față face parte dintr-o lucrare mai mare ce are ca studiu: Morfologia, anatomia, taxonomia și corologia speciilor de Veronica cu flori solitare din România, studiu ce reprezintă teza de doctorat a autoarei acestei lucrări. Dintre speciile luate în studiu doar Veronica filiformis este perenă. De remarcat la această specie este sterilitatea frecventă, care este aparent asociată cu dezvoltarea viguroasă a unui singur exemplar. Din punct de vedere anatomic se poate spune că rădăcina adventivă are structură primară, tulpina structură primară la nivelul scoarței și secundară la nivelul cilindrului central iar frunza are o alcătuire simplă, prezentând între cele două epiderme un mezofil omogen. Această alcătuire morfologică și anatomică explică condițiile staționale în care este întâlnită planta.*

Cuvinte cheie: *Veronica filiformis, anatomie, morfologie.*

INTRODUCTION

The *Veronica* genus is regarded as the most widespread genera among volunteer plants growing wild in Romania (and not only). Within the Europaea Flora (Tutin T.G. & al. 1964-1980) 62 species are set out with numerous botanical infraspecific taxons while the Romanian Flora – vol. VII – reveals 41 species and 3 hybrids (Ghița E. 1960). Recent works related to Romanian Flora (Ciocârlan V. 2000) report only 40 species.

The *Veronica* species are herbaceous, non-perennial or perennial plants, with aerial or underground stems, erect or procumbent stems. The leaves are opposed to one another or verticillated and the flowers are solitary or grouped into axillary or terminal inflorescences. The floral sheath has 4 and sometimes 5 united elements.

The important feature of *Veronica* species among *Scrophulariaceae* is provided by the androecium composed of two epipetals stamens.

MATERIAL AND METHODS

In order to carry out the morphological and anatomical study of this species we took into account the information and references provided by the published literature. Subsequent to the bibliographical documentation numerous inspections on site have been initiated. As this species is characterized by a very limited habitat at the national level, the research stations where it was recorded have been first checked; afterwards, searches have been extended in several places.

The plant material subject to all development stages was collected from the "Al. Borza" Botanical Garden located in Cluj Napoca in order to allow for its further accurate identification; then, all the characteristics of the respective biotype have been marked down.

The collected and stored material was determined using references within the published literature (Ciocârlan V. 2000).

The collected material was brought to the laboratory where the following step consisted in its preservation by pressure (on blotting paper) or in a liquid environment (into a mixture composed of equal amounts of absolute ethyl alcohol, glycerine and distilled water).

The anatomical studies were executed under a Nikon microscope.

RESULTS AND DISCUSSIONS

Veronica filiformis Sm. – a herbaceous climbing plant characterized by thin and soft stems; the leaves margins are slightly crenated, the basal leaves are opposed and the other cary alternate flowers under their axilla; solitary flowers located at the leaves' axilla, with pedicels up to 4 cm long.

The calyx has 3-5 mm lacinias, oblanceolate or elliptical, obtuse; the corolla has a diameter of 10-15 mm and it is light blue-mauve.

The capsule is 4-5 mm wide and forms an acute angle at the level of margins. It is a subglabra species (with long and rare hairs) and reveals a long style of about 3 mm, much longer than the margins of the capsule. The seeds are 1.5 x 1 mm in size, elliptical and slightly concave on one side.

Anatomical studies carried out on vegetative organs reveal the following:

The adventitious root has a primary structure and a thickness of 261 μm . The root epidermis is damaged, noticeable only under the form of fragments (fig. 3). Beneath these fragments lies the unistratified exodermis with an average thickness of 20.25 μm .



Fig. 1. Overview of the place where this species was identified



Fig. 2. A flower detail of *Veronica filiformis*



Fig. 3. Overview of the root structure of *Veronica filiformis* Sm. (Ob. 20 x Oc. 10) – orig.

The external shell is 33.75 μm thick and it is composed of 2-3 layers of large cells, tangentially elongated and provided with sclerenchymatic walls.

The internal shell is composed of smaller cells provided with heavily thickened walls by means of sclerenchymatic phenomena. It is as thick as the external shell.

The core cylinder has a diameter of 83.25 μm ; it does not exhibit a medular parenchyma and the woody beams almost reach the centre of the root.

The stem has a primary structure at the level of the shell and a secondary structure at the level of the core cylinder (fig. 4). Its thickness reaches 828 μm . The epidermis is unistratified, composed of slightly tangential elongated cells,

provided with lined walls. Its outer section reveals a thick cuticle of 1.575 μm . Several elongated pluricellular hairs, usually formed of 3 cells, 63 μm long, are to be found among the epidermal cells.

The shell is 225 μm thick and brings forward for examination the first layer of small cells, provided with support collenchymatous walls. The remaining part of the shell is composed of large ovoidal and spheroidal cells arranged with spaces between. The chloroplasts are perceived inside the shell's cells.

The starched theca is unistratified, composed of tangentially elongated cells and provided with thin walls.

The pericycle is unistratified, constituted of cells formed of thin walls and slightly more elongated than the liber cells.

The liber is less developed, it is 27 μm thick and it is formed only of liberian vessels.

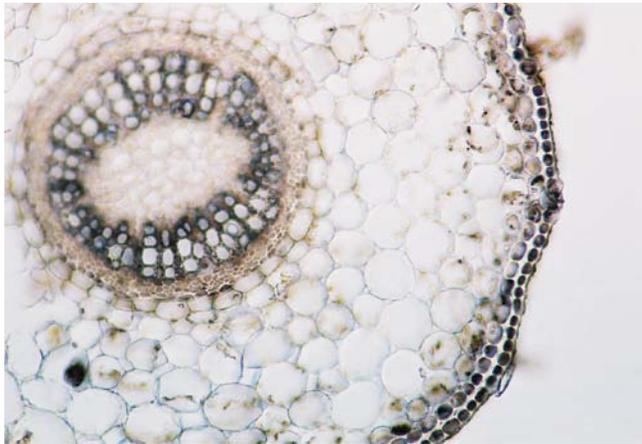


Fig. 4. The stem: Overview of the epidermis, the shell and the core cylinder (Ob. 20 x Oc. 10) – orig.

The woody fibrous vessels are disposed in radial rows and their diameter increases from the medullary parenchyma towards the liber. No difference can be established between the primary and the secondary wood. The thickness of the wood is 72 μm . The central section of the stem is occupied by the medullary parenchyma.

The leaf reveals a homogenous 40.5 μm thick mesophyll between the two epidermises. It has a thickness of 69.075 μm . The upper epidermis is unistratified and it is formed of tangentially elongated cells and it is 15.75 μm thick. The outer part exhibits a thick-0.9 μm cuticle.

The cells of the upper epidermis have strongly sinuous side walls (fig. 5); they do not include inserted stomata but contain elongated pluricellular sharp-edged hairs.

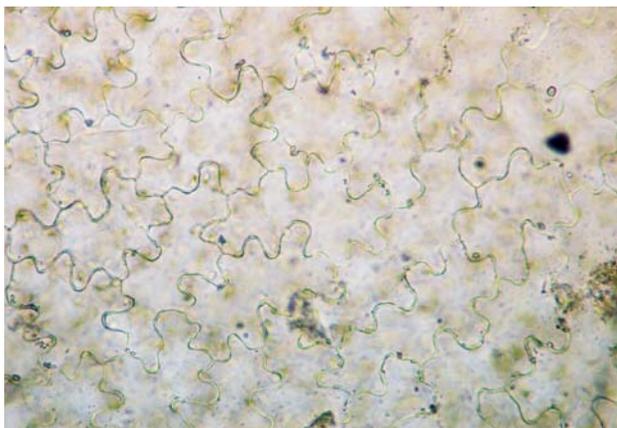


Fig. 5. Strongly sinuous side walls at the level of the upper epidermis (Ob. 40 x Oc. 10) – orig.

The composition of the lower epidermis is similar to that of the upper epidermis; unlike it, both the lower epidermis and the cuticle are thinner: the epidermis is 11.25 μm thick and the cuticle is 0.675 μm thick; among the epidermal cells there are anomocytic stomata.

Within the Romanian Flora, volume VII, this botanical taxon is not mentioned. *Veronica filiformis* Baumg. et auct transs., non Sm. is to be found among the synonymies of the species *Veronica persica* Poiret, but in this case another botanical taxon is mentioned.

The presence of this botanical taxon within the Romanian flora might have been doubtful until that time. After several years, Al. Beldie indicates the presence of this botanical taxon within the Romanian flora – Illustrated Determinative Manual of Vascular Plants, vol. II (1979).

The Europaea Flora states that this botanical taxon is located in the North-West and in the central part of Europe; România is not specified under the chorology column.

It could be easily mistaken for *Veronica persica* Poiret. The main recognition character is as follows: *V. filiformis* represents a perennial species, a chamaephyte plant while *V. persica* is a non-perennial plant. La acestea se mai adaugă:

1a. Vigorous stems, crenated, tooth-like leaves particularly on the edges; a wide corolla between 7 and 15 mm, the capsule is 7 to 10 mm wide and forms an obtuse angle at the level of the boundary **Veronica persica** Poiret

1b. Thin and soft stems. The leaves present slightly crenated edges; the corolla has 5 to 8 mm in diameter and the capsule is 4 to 5 mm wide and forms an acute angle at the level of the boundary **Veronica filiformis** Sm.

CONCLUSIONS

Subsequent to the morphological and anatomical analysis of the species *Veronica filiformis* Sm. the following conclusions can be drawn:

- the embryonic root of this plant is ephemeral, its place being taken by adventive roots;

- the absence of varieties which flower and fructify is compensated by the high percentage of vegetative regeneration of the respective species.

- the adventive roots have a primary structure, the root epidermis is damaged in contact with the soil particles and it is characterized by the absence of medular parenchyma;

- the stems are procumbent, with a primary structure at the level of the shell and with a secondary structure at the level of the core cylinder;

- the leaves are constituted of a homogenous mesophyll and the epidermal cells exhibit strongly sinuous side walls.

- the analysis of reproductive parts is becoming more and more difficult as very few species reach the stage of blooming and fructification.

REFERENCES

1. **Andrei M., 1978** - *Anatomia plantelor*. 388 pag. Edit. Did. Şi Ped. Bucureşti.
2. **Andrei M. & al., 1981** - *Lucrări practice de biologie vegetală*. Edit. Did. şi Ped. Bucureşti.
3. **Andrei M., 1997** - *Morfologia generală a plantelor*. 247 pag. Edit. Enciclopedică, Bucureşti.
4. **Brummitt R.K., Powell C.E., 1992** - *Authors of plant names*. 732 pag. Royal Botanic Gardens, Kew. (EDS.)
5. **Ciocârlan V., 2000** - *Flora ilustrată a României. Pteridophyta et Spermatophyta*. 1038 pag. Edit. Ceres, Bucureşti.
6. **Fernández-Alonso J. L., 2001** - *El género Veronica L. (Scrophulariaceae) en Colombia*. *Caldasia* 23:105.
7. **Ghişa E., 1960** - *Veronica*. Pp. 505-565. In Tr. Săvulescu & al. (ed.). *Flora României. Vol. VII*. Bucureşti: Edit. Academiei Române.
8. **Peev D., 1975** - *Genus Veronica in Bulgaria - some new taxa and chromosome numbers*. *Fitologiya* 2:46.
9. **Tutin T. G., Heywood V. H., Burges N. A., Valentine D. H., Walters S. M., Webb D. A. & al., 1964 -1980** - *Flora Europaea*. Vol. I-V. Cambridge University Press. Cambridge.
10. **Váczy C., 1980** - *Dicţionar botanic poliglot*. 1017 pag. Edit. Ştiinţifică şi Enciclopedică. Bucureşti.

THE BEECH FOREST FROM THE CERNA OF OLTET BASIN-ROMANIA

FĂGETELE DIN BAZINUL CERNEI DE OLTET - ROMÂNIA

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Abstract. *The beech forest from the Cerna Basin of Olteț are included in the Symphyto cordati - Fagetum sylvaticae Vida 1959, Pulmonario rubrae - Fagetum sylvaticae (Soó 1964) Täuber 1987, Carpino betuli - Fagetum sylvaticae Paucă 1941 and Luzulo albidae - Fagetum sylvaticae Zólyomi 1955 (Mucina L. (1997)). They are met on moist to wet fields, rich in mull type humus and with an acid to weak basic reaction of the soil. Although the diversity of the ecological conditions in which the beech forests are vegetating from the studied terrain is big, yet their floristic composition is unitary. Among the recognition species: Fagus sylvatica, Daphne mezereum, Asarum europaeum, Carex sylvatica, Sanicula europaea, Hepatica nobilis, Lathyrus vernus, Anemone ranunculoides, are present some carpathian endemits and carpatho-balkans: Symphytum cordatum, Dentaria glandulosa and Pulmonaria rubra.*

Keywords: beech forest, Cerna of Olteț.

Rezumat: *Făgetele din Bazinul Cernei de Olteț sunt încadrate la Symphyto cordati – Fagetum sylvaticae Vida 1959, Pulmonario rubrae – Fagetum sylvaticae (Soó1964) Täuber 1987, Carpino betuli – Fagetum sylvaticae Paucă 1941 și Luzulo albidae – Fagetum sylvaticae Zólyomi 1955 Ele sunt întâlnite pe terenuri reavene până la umede, bogate în humus de tip mull și cu o reacție a solului de la acid la slab bazic. Deși diversitatea condițiilor ecologice în care vegetează făgetele din teritoriul cercetat este mare, totuși compoziția lor floristică este unitară. Printre speciile de recunoaștere: Fagus sylvatica, Daphne mezereum, Asarum europaeum, Carex sylvatica, Sanicula europaea, Hepatica nobilis, Lathyrus vernus, Anemone ranunculoides, sunt prezente și câteva endemite carpatice și carpato-balcanice: Symphytum cordatum, Dentaria glandulosa și Pulmonaria rubra.*

Cuvinte cheie: păduri de fag, Cerna de Olteț.

INTRODUCTION

The Cerna of Olteț Basin is located in the SW part of Romania and it has an area of approximately 750 km². The mesophyle deciduous forests from the studied territory form the nemoral inferior and superior levels. It are vegetating on mesotrophic and eutrophic soils and occupie the east, west or south slopes. On the north side there are only at the level of the valleys. The limits of the beech forests are various: 500-600 m at the inferior part where is situated the carpino-fagetum forest and 1000-1200 m at the superior limit where the pure beech forests begin.

From among the recognition species we remember: *Quercus robur*, *Acer platanoides*, *Corylus avellana*, *Ligustrum vulgare*, *Athyrium filix-femina*, *Dryopteris filix-mas*, *Brachypodium sylvaticum*, *Dactylis glomerata*, *Melica*

uniflora, *Polygonatum latifolium*, *Cephalanthera longifolia*, *Neottia nidus-avis*, *Digitalis grandiflora*, *Scrophularia nodosa* and other.

MATERIAL AND METHODS

The first stage in the investigation of the vegetation of the Cerna of Olteț River Basin was researching of the bibliographic material Ivan Doina (1979), Popescu G. (1974), Pop I. et al. (2000), Sanda V. (2002), Sanda V. et al. (2005), Sanda et al. (2007). Thus, a part of the publications in the bibliography was a reference material due to the similarity of the geographic area with our study area.

Then, there was the field stage where we studied, as much as possible, the present phase of the vegetation, the time and space dynamics and the successive directions of the most important phytocoenoses within some areas where man's influence is strong. To classify the associations, we have used synthesis papers on the Romanian vegetation written by various authors or groups of authors from the country and abroad (Sanda (2002), Mucina (1997), Borhidi (1996)).

RESULTS AND DISCUSSIONS

The beech forests that have been identified within the research area are part of the following coenotaxonomic system:

QUERCO – FAGETEA Br.-Bl. & Vlieger in Vlieger 1937

Fagetalia sylvaticae Pawlowschi in Pawlowschi & al. 1928

Symphyto – Fagion Vida 1959

1. *Symphyto cordati* – *Fagetum sylvaticae* Vida 1959

2. *Pulmonario rubrae* – *Fagetum sylvaticae* (Soó 1964) Täuber 1987

3. *Carpino betuli* – *Fagetum sylvaticae* Paucă 1941

Deschampsio – Fagion Soó 1962

4. *Luzulo albidae* – *Fagetum sylvaticae* Zólyomi 1955

1. *Symphyto cordati* – *Fagetum sylvaticae* Vida 1959 (table 1)

A part of the mountain beech forests of the Cerna of Olteț Basin we include it in this association. They are presented on the slopes with eastern and north-eastern exposure, rarely on the slopes with western exposure. The beech forests of this type are vegetating on the forest brown soils, deep or weak skeleton-like, wet, with high troficity. The tree layer is dominated by *Fagus sylvatica*, together with isolated samples of *Acer pseudoplatanus*.

The arborescent layer is absent or very weakly represented by juvenile samples of the dominant species. The herbaceous one is remarked by a strong presence of the consound - *Symphytum cordatum*, and from the characteristic species for order and alliance *Anemone nemorosa*, *Dentaria glandulosa*, *Galium odoratum*, *Geranium robertianum*, *Epipactis helleborine* etc.

Because this beech forests are not in contact with the spruce fir forests, in their floristic composition the species characteristic of the *Piceetalia excelsae* order are very weakly represented. Economically speaking these beech forests are superior in quality, having a very high biomass (Sanda V. et al. (2005)).

In the frame of the association, the bioforms are represented by a high percentage of hemicryptophytes, followed by geophytes and therophytes, the others having a reduced representation. The geoelements with bigger weight are the Eurasiatics, followed by the Central European and European ones.

Table1

Symphyto cordati – Fagetum sylvaticae Vida 1959

Biof.	Geoel.	Releve number	1	2	3	4	5	K
		Altitude (m)	1000	1150	1000	1000	1200	
		Exposure	N-E	-	-	N-E	V	
		Inclination (°)	5	-	-	15	10	
		Vegetation covering (%)	95	100	100	95	100	
		Releve area (m ²)	1200	1200	1200	1200	1200	
Characteristic species of the association								
H.	Carp. Rom.	<i>Symphytum cordatum</i>	+	+	1	+	+	V
Ph.	Eur.	<i>Fagus sylvatica</i>	5	5	4	5	5	V
Symphyto-Fagion & Fagetalia sylvaticae								
H.	Eur. Centr. (Mont.)	<i>Gentiāna asclepiādea</i>	+	+	+	-	+	IV
Ph.	Euras.	<i>Ácer platanoídes</i>	+	-	+	+	+	IV
G.	Eur.	<i>Anemóne nemorósa</i>	+	+	+	-	+	IV
G.	Euras.	<i>Epipáctis helleboríne</i>	+	+	+	-	+	IV
G.	Carp.	<i>Dentária glandulósa</i>	+	-	+	+	+	IV
T.-HT.	Cosm.	<i>Geránium robertiánum</i>	+	+	-	+	+	IV
H.	Eur.	<i>Carex sylvática</i>	+	+	+	+	-	IV
G.	Euras.	<i>Gálium odorátum</i>	+	-	+	-	+	III
H.	Carp. Balc.	<i>Pulmonária rúbra</i>	+	+	-	+	-	III
H.(G.)	Circ.	<i>Óxalis acetosélla</i>	-	-	+	+	+	III
H.	Cosm.	<i>Polýstichum setíferum</i>	+	-	+	-	+	III
G.	Eur. Centr.	<i>Dentária bulbífera</i>	-	+	+	-	+	III
G.	Eur.	<i>Corýdalis sólida</i>	+	-	+	-	+	III
Ph.	Euras.	<i>Dáphne mezereum</i>	+	+	+	-	-	III
H.(G.)	Euras.	<i>Ásarum europæum</i>	-	+	+	-	+	III
H.	Euras.	<i>Epilóbium montánum</i>	-	+	-	+	+	III
Ch.	Eur. Centr.	<i>Euphórbia amygdaloídes</i>	+	-	+	-	+	III
G.	Eur. Centr.	<i>Isópyrum thalictroídes</i>	+	-	+	-	+	III
H.(Ch.)	Eur. Centr.	<i>Lámium galeóbdolon</i>	-	+	+	+	-	III
H.	Eur.	<i>Lúzula luzuloídes</i>	+	+	-	+	-	III
H.	Eur.	<i>Digitalis grandiflora</i>	-	+	-	+	+	III
H.	Euras.	<i>Sálvia glutinósa</i>	-	+	-	+	+	III
H.	Euras.	<i>Campánula rapunculoídes</i>	+	+	-	-	-	II
Ph.	Atl. Medit.	<i>Hédera hélix</i>	+	-	+	-	-	II
H.	Euras.	<i>Actáea spicáta</i>	+	-	+	-	-	II
H.	Eur.	<i>Mycélis murális</i>	+	-	+	-	-	II
H.	Eur. Centr. (Mont.)	<i>Verónica urticifólia</i>	-	+	-	+	-	II

Querco – Fagetea								
H.	Cosm.	<i>Dryopteris filix-mas</i>	+	+	+	-	+	IV
H.	Cosm.	<i>Athyrium filix-femina</i>	+	+	-	+	-	III
G.	Eur.	<i>Anemone ranunculoïdes</i>	+	+	-	+	-	III
H.	Euras.	<i>Scrophularia nodosa</i>	+	-	+	-	+	III
T.-H.	Euras.	<i>Moehringia trinervia</i>	+	+	-	+	-	III
H.	Euras. (Submedit)	<i>Brachypodium sylvaticum</i>	+	-	+	-	-	II
Piceetalia excelsae								
Ph.	Eur.	<i>Picea abies</i>	-	+	-	+	+	III
Ph.	Eur. Centr.	<i>Abies alba</i>	-	+	-	+	+	III
G.	Circ.	<i>Gymnocarpium dryopteris</i>	+	-	+	-	-	II
H.	Eur. Centr.	<i>Luzula sylvatica</i>	-	+	-	+	-	II
Variae syntaxa								
HT.	Eur.	<i>Myosotis sylvatica</i>	+	+	+	-	+	IV
H.	Centr. Eur. Submedit.	<i>Senecio ovatus</i>	-	+	-	+	+	III
T.-HT.	Euras.	<i>Cardamine hirsuta</i>	-	+	-	+	-	II
H.	Cosm.	<i>Asplenium trichomanes</i>	-	-	+	+	-	II
H.	Circ.	<i>Chrysosplenium alternifolium</i>	-	-	-	+	+	II
H.	Cosm.	<i>Cystopteris fragilis</i>	+	-	+	-	-	II

Species present in one survey: H., Carp.-Balc.-Cauc.-Anat. *Telékia speciosa* (1); HT.-H., Euras. *Alliaria petiolata* (3); *Plagiothecium undulatum* (1); T., Euras. Cont. *Galeopsis speciosa* (4); H., Cosm. *Urtica diodica* (5); H., Euras. *Petasites hybridus* (3); H., Eur. Centr. *Geranium phaeum* (3); G., Circ. *Asplenium scolopendrium* (1). Place and date of performing the surveys: 1, 3. Buciumu Peak (13.08.2003; 28.07.2005); 2. Stânișoara Peak (31.08.2003); 4, 5. Corșoru Peak (08.09.2004; 28.07.2005).

2. *Pulmonario rubrae* - *Fagetum sylvaticae* (Soó 1964) Täuber 1987

The association contains mixed coppices of beech with spruce and fir met between 700 – 1200 m altitude, in a regular manner above the pure beech forests (*Symphyto cordati* - *Fagetum sylvaticae*). The edifying species of this phytocenose (*Fagus sylvatica* and *Abies alba*) can get under rapports of codomination on certain areas. In the grassy layer next to the numerous elements typical to the alliance *Fagion sylvaticae* is met constantly *Pulmonaria rubra*. It is frequently mentioned from almost all the Romanian Carpathes (Sanda V. et al. (2005)).

If it's made an analysis from the viewpoint of the requests towards the humidity factor it can be observed that it is a mesophyle association. From the bioforms prevail the hemicryptophytes, followed close by the phanerophytes and the geophytes, and among the geoelements the Eurasiatics, Central-European, European and Circumpolars. It is remarked the presence of some Romanian Carpathian and Carpatho-Balkan species.

From the economic viewpoint we can talk about a high importance, because of the beech fir and mountain sycamore maple, that provide high quality

wood. From these forests can be used the alimentary, melliferous, medicinal and industrial plants.

3. *Carpino betuli - Fagetum sylvaticae* Paucă 1941

The hillock beech forests with hornbeam are present in the studied territory starting from the superior part of the Getic Piedmont and ending at the level of the subcarpathian depression. Representative phytocenoses have been identified at the level of the localities Roești, Stroești, Cernișoara, Lăpușata, Copăceni, Slătioara and Miloștea. At the level of the locality Valea Mare they occupy limited areas.

Within this mixture, the modification of the competitive rapports of the species of recognition has as a result the realisation of a big diversity as for consistency and their composition. The soil of the studied stations is rich in humus. It occupies almost in all the cases the slope with northeren exposure, the ones with southeren exposure being occupied by durmast forests.

In their floristic composition are present numerous species characteristic to the alliance and to the order: *Euphorbia amygdaloides*, *Asarum europaeum*, *Galium odoratum*, *Carex digitata*, *Dentaria bulbifera*, *Sanicula europaea*, *Neottia nidus-avis*, *Dryopteris filix-mas*, *Geranium robertianum*, *Hedera helix*, *Viola reichenbachiana*, *Lamium galeobdolon*, *Ajuga reptans*, *Pulmonaria officinalis*, *Symphytum tuberosum*, *Tamus communis*, *Melica uniflora*, *Athyrium filix-femina*, *Cardamine impatiens*, *Tilia platyphyllos*, *Carex sylvatica*, *Aremonia agrimonoides*, *Actaea spicata*, *Luzula forsteri*, *Digitalis grandiflora* etc.

The regeneration layer is very active. Except the recognition species are met saplings of other species, but these remain only at the state of sapling: *Acer platanoides*, *A. pseudoplatanus*, *A. campestre*, *Tilia tomentosa*, *Fraxinus excelsior* etc. In Oltenia and at national level the asociation is well known (Sanda V. et al. (2005)).

From the analysis of the specters results the predominance of 3 categories of bioforms: hemicryptophytes, phanerophytes and geophytes, and from the geoelements the Eurasiatics, Central European and European. The rest are in small quantities.

4. *Luzulo albidae - Fagetum sylvaticae* Zólyomi 1955

The asociation rejoins the mountain acidophyle beech forests that are present on slopes with very big inclination. The soils are brown acid forestlike. The grassy layer is well represented unlike the layer of the asociations extreme acidophyle: *Luzula luzuloides*, *L. multiflora*, *Rumex acetosella*, *Veronica officinalis*, *V. urticifolia*, *Calamagrostis arundinacea*, *Neottia nidus-avis*, *Cardamine impatiens*, *Dentaria bulbifera*, *Festuca drymeia*, *Geranium robertianum*, *Pulmonaria rubra*, *Campanula rapunculoides*, *Cruciata glabra*, *Cephalanthera longifolia*, *C. rubra*, *Mycelis muralis*, *Moehringia trinervia*, *Poa nemoralis*, *Melica uniflora*, *Hieracium murorum*, *Circaea alpina*, *Aremonia agrimonoides*, *Epilobium montanum*, *Dryopteris filix-mas* etc. In the researched areas are missing from the floristic composition species extremely acidophyle: *Vaccinium myrtillus* and *V. vitis-idaea*. Although this asociation is frequently mentioned from the Romanian Carpathes (Boșcaiu N. (1971), Popescu Gh. (1974),

Dihoru Gh. (1975), Coldea Gh. (1990), Sanda V. et al. (2007) and other) from the coenotaxonomical viewpoint it is not clarified.

From the analysis of the bioforms it can be observed the predomination of the hemicryptophytes, followed by the geophytes. The rest have a reduced presence. Among the geoelements are predominating the Eurasiatics ones, and in smaller proportions the Central European and European ones.

CONCLUSIONS

In conclusion we can tell that the pure beech forests or the one in mixture with hornbeam, mountain sycamore, fir or spruce are framed in *Symphyto-Fagion* Vida 1959. Because of the high productivity that these forests have, their extension is considerably reduced lately, because of the irrational forest exploitation. The association framed in *Deschampsio-Fagion* Soó 1962 is met on acid soils, with high inclination. That emerges from the floristic structure of the association too.

REFERENCES

1. **Borhidi A., 1996** - *Critical revision of the Hungarian Plant communities*. Janus Pannonicus University. H-7601: 43-129. Pécs.
2. **Boşcaiu N., 1971** - *Flora și vegetația munților Țarcu, Godeanu și Cernei*. 494 pag. Edit. Acad. R.S.R., București.
3. **Coldea G., 1990** - *Munții Rodnei. Studiu geobotanic*. 183 pag. Edit. Acad. Române, București.
4. **Danciu M., 1974** - *Studii geobotanice în sudul Munților Baraolt*. Rezumatul tezei de doctorat. 27 pag. București.
5. **Dihoru G., 1975** - *Învelișul vegetal din muntele Siriu*. 216 pag. Edit. Acad. Române, București.
6. **Ivan Doina, 1979** - *Fitocenologie și vegetația R.S.R.* 332 pag. Edit. Did. Ped.. București.
7. **Mucina L., 1997** - *Conspectus of Classes of European Vegetation*. Folia Geobotanica Phytotaxonomia. 32: 117-172.
8. **Paucă Ana, 1941** - *Studiu fitosociologic în munții Codru și Muma*. Acad. Rom. St. cerc., 2. București.
9. **Pop I., Cristea V., Hodișan I., 2000** - *Vegetația județului Cluj (Studiu fitocenologic, ecologic, bioeconomic și ecoproductiv)*. Contribuții Botanice. Cluj Napoca: 5-255.
10. **Popescu G., 1974** - *Studiul floristic și geobotanic al Bazinului hidrografic al Bistriței-Vilcii*. 303 pag. Teza de doctorat, București.
11. **Sanda V., 2002** - *Vademecum cenostructural privind covorul vegetal din România*. 331 pp. Editura Vergiliu. București.
12. **Sanda V., Barabaș N., Biță-Nicolae Claudia, 2005** - *Breviar privind parametrii structurali și caracteristicile ecologice ale fitocenozelor din România*. Partea I. 255 pag. Edit. "Ion Borcea", Bacău.
13. **Sanda V., Răduțoiu D., Burescu P., Blaj-Irîmia Irina, 2007** - *Breviar fitocenologic*. Partea a IV-a. 245 pag. Edit. Sitech, Craiova.

PHYTOCENOLOGICAL STUDIES IN TREE PLANTATIONS AND VINEYARDS OF S.D.E. BANU MĂRĂCINE – DOLJ COUNTY

STUDII FITOCENOLOGICE ÎN PLANTAȚILE POMI-VITICOLE DIN S.D.E. BANU MĂRĂCINE - DOLJ

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Abstract: *This presentation will put forward the results of the researches conducted over a period of 3 years. The floral structure of the analysed area, as well as the number of individuals and seeds in the orchards of SDE Banu Mărăcine, reflects the agricultural level on these lots. In spring, on the rows of vineyards and between them there are the phytocenoses of the Lamio-Veronicetum politae and Stellarietum mediae associations whose floral composition contains numerous vernal and annual species. Instead of these phytocenosis, on parcels where the cultural methods have not been appropriately applied, grow phytocenosis which include perennial species in their floral composition, with a strong rhizomial system which allows them to withstand the enviromental conditions and the applied agrotechnical tackings. (Convolvulo-Agrophyretum repentis, Aristolochio-Convolvuletum arvensis). Along these plantations, on the boundary lands between them and the surrounding weeded meadows the association Hordeo murini-Cynodontetum dactyloni – trailing grass is encountered.*

Key words: segetal associations, Banu Mărăcine.

Rezumat: *În această lucrare se prezintă rezultatele cercetărilor efectuate în decursul a 3 ani de zile. Structura floristică din terenurile analizate, precum și numărul indivizilor și al semințelor din plantațiile pomi-viticole ale SDE Banu Mărăcine, reflectă nivelul agriculturii din parcele. Primăvara, pe rândurile de vie și între acestea se află fitocenozele asociațiilor Lamio-Veronicetum politae și Stellarietum mediae, ce au în compoziția floristică numeroase specii vernale, anuale. În locul acestor fitocenoze, în parcelele care sunt slab întreținute, se instalează fitocenoze ce au în compoziția floristică specii perene, cu un sistem rizomal puternic, ce le permit să reziste la condițiile vitrege de mediu și la măsurile agrotehnice care se fac (Convolvulo-Agrophyretum repentis, Aristolochio-Convolvuletum arvensis). Pe marginea acestor plantații, la limita între acestea și pajiștile înțelenite înconjurătoare se află asociația de pir gros (Hordeo murini-Cynodontetum dactyloni).*

Cuvinte cheie: asociații segetale, Banu Mărăcine.

INTRODUCTION

The Banu-Mărăcine Didactic Centre, within which the researches of the present report have been carried out, is located in the Eastern part of Craiova town, to a distance of approximately 8 km, on the right side of Craiova-Pitești-București Highway. The area of the research haul is confined by the territory of Cârcea locality in the East and by Craiova Agricultural Company in the South and

West; the area is bounded on the North by Craiova-Pitești motorway. An intense scientific research activity is being carried out within the didactic centre, performed by academic educators, doctoral candidates and students, in order to solve priority problems demanded by the agricultural practice within the respective area.

From a geomorphological point of view, the territory under research is located at the southern boundary of Getic Piedmont, crossing towards the elevated plane known as Leu-Rotunda.

The territory of Banu-Mărăcine Didactic Centre is located on an extension of the Getic Plane, revealing the features of a plateau situated at an average altitude of approximately 200 m, without any irregularities; the existing irregularities are small and of minor importance. The South-East part of this territory is represented by an extended heading of the Getic Plane, known as Câmpul Leu-Rotunda, with an absolute altitude ranging between 110 and 170 m, with slight irregularities.

The formation of a hillock-like microrelief in the area, characterized by slight irregularities, is attributed to the high and changing variations of the soil volume, determined by the high content of montmorillonite forming clay identified into parental materials. The geological drills executed in the respective area support the idea that materials encountered would belong to the Quaternary and the Levantin.

A tight relation generally arises between the soil, the climate and the vegetation; this relation is often denominated as pedo-phyto-climatic parallelism.

MATERIAL AND METHODS

For the purpose of studying the vegetation existing within the tree plantations and vineyards of Banu Mărăcine Didactic Centre, several research methods of the Central European School have been used; these methods have been elaborated by Braun-Blanquet. We adopted the vegetal association as a sintaxonomic basic unit.

The classification of associations has been accomplished according to the most recent classification systems set forth by local and international experts: Sanda (2002), Mucina (1997), Borhidi (1996). The description of associations has been effected by means of the characteristic, edifying, dominant and differential species.

RESULTS AND DISCUSSIONS

The vegetal associations identified within the tree plantations of Banu-Mărăcine Didactic Centre are further defined by the following cenotaxonomic system:

- Cl. Stellarietea mediae R.Tx., Lohm. et Preising in R. Tx. 1950
- Ord. Centauretalia cyani R.Tx., Lohm. et Preising in R. Tx. 1950
- Al. Veronico-Euphorbion Sissingh ex Passarge 1964
- 1. *Stellarietum mediae* Prodan 1939, Hadać 1969.
- 2. *Lamio - Veronicetum politae* Prodan 1939, Krusem. et Vlieg. 1939
- Ord. Atriplici-Chenopodietalia albi (R. Tx. 1937) Nordhagen 1950

Al. *Scleranthion annui* (Kruseman & Vlieger 1939) Sissingh in Westhoff. et al. 1946

3. *Digitario-Setarietum pumilae* Felföldy 1942 corr. Borhidi 1996

Ord. Sisymbrietalia R. Tx. in Lohm. et al. 1962

Al. *Sisymbrium officinalis* R. Tx., Lohm. et Prsg. in R. Tx. 1950

4. *Hordeo murini – Cynodontetum* (Felföldy 1942) Felföldy ex Borhidi 1999

Cl. Artemisietea vulgaris R. Tx. 1937

Ord. Agropyretalia repentis Oberd. et al. 1967

Al. *Convolvulo-Agropyron repentis* Görs 1966

5. *Convolvulo-Agropyretum repentis* Felföldy 1943

6. *Aristolochio – Convolvuletum arvensis* Ubrizsy 1967

1. *Stellarietum mediae* Prodan 1939, Hadać 1969. (table 1). The association found in the Transylvanian gardens has been briefly described by I. Prodan (1939). The characteristic species, a genuine vernal plant, vegetates on soils rich in decomposing organic substances where it forms an almost continuous belt. Among the accompanying species the following are mentioned: *Lamium amplexicaule*, *Capsella bursa-pastoris*, *Geranium pusillum*, *Veronica polita*, *Veronica persica* etc.

Table 1

***Stellarietum mediae* Prodan 1939, Hadać 1969**

Surveying	1	2	3	4	5
Altitude (m.s.m.)	120	100	110	110	110
Exposure	SE	SW	-	SW	SW
Gradient (°)	5	5	-	5	5
Vegetation coverage (%)	90	95	95	100	90
Surface (sqm)	20	30	50	30	40
Car. ass.					
<i>Stellaria media</i>	4	4	4	5	4
<i>Sonchus oleraceus</i>	+		+	+	+
<i>Cirsium arvense</i>	+	+		+	
Polygono-Chenopodion					
<i>Lamium purpureum</i>	+	+	+	+	+
<i>Veronica persica</i>		+	+	+	
<i>Setaria viridis</i>	+				+
Chenopodietea					
<i>Erodium cicutarium</i>	+	+		+	
<i>Chenopodium album</i>		+	+	+	
<i>Euphorbia helioscopia</i>	+		+		+
Stellarietea mediae					
<i>Cardaria draba</i>	+			+	+
<i>Convolvulus arvensis</i>		+	+		+
<i>Cynodon dactylon</i>	+			+	+
<i>Galium aparine</i>	+		+		
<i>Senecio vulgaris</i>		+		+	
<i>Urtica dioica</i>	+		+		

2. *Lamio - Veronicetum politae* Prodan 1939, Krusem. et Vlieg. 1939. (table 2). It represents a pioneer association whose floristic composition is formed of numerous vernal and annual species. The spectrum of bioforms reveals the prevalence of terrophytes largely exceeding the percentage of hemiterrophytes coming on the second place and geophytes. The hemicryptophytes are represented by a reduced percentage.

Within the vineyard plantations where the maintenance works are deficient, the phytogenesis of this association last until summer; on the contrary, the respective plants disappear towards the end of May on the parcels where pest control works are carried out appropriately, as they are smashed by cultivation works (Răduoiu D. 2008).

The respective association is ascribed to Kornas in 1952 by some people, but according to the Cenotaxonomic Nomenclature Code the priority is awarded to the association described by Prodan, Krusem. et Vlieg. in 1939.

Table 2

***Lamio - Veronicetum politae* Prodan 1939, Krusem. et Vlieg. 1939**

Surveying	1	2	3	4	5
Altitude (m.s.m.)	150	100	100	100	100
Exposure	S	E	SW	SE	SE
Gradient (°)	5	10	5	10	3
Vegetation coverage (%)	80	85	80	75	75
Surface (sqm)	40	50	30	30	40
Car. ass.					
<i>Lamium purpureum</i>	1	1	1	+	+
<i>Lamium amplexicaule</i>	+	+	+	+	+
<i>Veronica polita</i>	3	3	3	3	3
Veronico-Euphorbion & Centauretalia cyani					
<i>Veronica hederifolia</i>	+	+	+	+	+
<i>Thlaspi arvense</i>	-	-	+	+	+
<i>Thlaspi perfoliatum</i>	-	-	+	+	+
Stellarietea mediae					
<i>Cirsium arvense</i>	+	+	-	+	+
<i>Stellaria media</i>	+	-	+	-	+
<i>Capsella bursa-pastoris</i>	+	+	-	+	-
<i>Matricaria perforata</i>	+	-	+	+	-
<i>Conyza canadensis</i>	+	-	+	+	-
<i>Geranium pusillum</i>	+	-	+	+	-
<i>Senecio vernalis</i>	+	-	+	-	+
<i>Viola arvensis</i>	+	+	-	+	-
<i>Papaver dubium</i>	-	-	-	+	+
<i>Chenopodium album</i>	+	-	+	-	-
<i>Descurainia sophia</i>	-	-	+	+	-
<i>Bromus sterilis</i>	-	-	+	+	-
Molinio-Arrhenatheretea					
<i>Taraxacum officinale</i>	+	-	+	+	-
<i>Rumex crispus</i>	-	+	+	+	-
<i>Plantago lanceolata</i>	+	-	-	+	-

Variae syntaxa					
<i>Lamium amplexicaule</i>	1	+	+	-	-
<i>Polygonum aviculare</i>	-	-	+	+	+
<i>Senecio vulgaris</i>	+	+	-	-	+
<i>Calamagrostis epigejos</i>	-	+	+	+	-
<i>Aristolochia clematitidis</i>	-	+	+	+	-
<i>Erodium cicutarium</i>	+	-	+	-	+
<i>Sonchus arvensis</i>	+	-	-	-	+
<i>Hordeum murinum</i>	+	-	-	-	+

3. *Digitario-Setarietum pumilae* Felföldy 1942 corr. Borhidi 1996

The phytocenosis of this association are to be found on the intervals between the vineyard rows, in sunny places where the soil exhibits a clayey-sandy texture (Sârbu C. 2003). The floristic composition of phytocenosis comprises numerous non-perennial species. Within the spectrum of geo-elements, three categories are deemed to prevail: cosmopolite, adventive and Eurasian plants, the first being widely spreaded on the soil.

4. *Hordeo murini - Cynodontetum* (Felföldy 1942) Felföldy ex Borhidi 1999

It covers large surfaces within the plantations studied. They grow on semi-battered degraded or brown-reddish forestry chernozem soils.

It vegetates in ruderal habitats, along the margin of roads where the two species *Cynodon dactylon* and *Hordeum murinum* cover a large area (85-100%) of the land. The accompanying species, elements of *Sisymbrium* for the most part, are very few in number due to the territorial domination of *Cynodon dactylon* species.

5. *Convolvulo – Agropyretum repentis* Felföldy 1942

The following characteristics species *Elymus repens* and *Convolvulus arvensis* are perennial plants which preferably grow at the end of cultivated fields, on lands where ploughing works are carried out at larger time intervals.

The usual accompanying plants of these cenoses are: *Cardaria draba*, *Setaria pumila*, *Hibiscus trionum*, *Stachys annua*, *Cirsium arvense*, *Sinapis arvensis*, *Polygonum aviculare*; in the event the fields have been unreclaimed for larger periods some perennial lawn elements might appear, such as: *Poa pratensis*, *Medicago sativa*, *Agrostis stolonifera*, *Festuca pratensis*.

6. *Aristolochio - Convolvuletum arvensis* Ubrizsy 1967

The association has been indentified by Gh. Vițalariu (1974) to be growing on fallows, in the stubble fields, in virgin vineyards, on sloping chernozem soils (Sanda et al. 2007). The characteristic and probative species for the association, *Aristolochia clematitidis* and *Convolvulus arvensis* are more usually accompanied by: *Fumaria schleicheri*, *Sinapis arvensis*, *Hibiscus trionum*, *Fallopia convolvulus*, *Solanum nigrum*, *Senecio vernalis*, *Sonchus arvensis*, *Stellaria media*, *Thlaspi arvense*, etc.

CONCLUSIONS

The segetal phytocenosis encountered within the tree plantations and the vineyards of the Banu Mărăcine Didactic Centre comprise various non-perennial, biennial, mesophyll or mesoxerophyll species. They prefer luminous places, meso-thermophyll up to moderate thermophyll.

The large number of adventive and cosmopolite elements, both in terms of species and specimen is therefore noticed.

On parcels where the maintenance works are not carried out or improperly executed the probative phytocenosis of the trailing grass, the couch grass, the bindweed and the bottle grass experience a luxuriant development.

Prior to the entering into vegetation of cultivated plants, the probative phytocenoses of chickweed and purple deadnettle grow fast to disappear towards the end of summer due to maintenance works carried out on plantations.

REFERENCES

1. **Borhidi A., 1996** - *Critical revision of the Hungarian Plant communities*. Janus Pannonicus University. H-7601: 43-129. Pécs.
2. **Mucina L., 1997** - *Conspectus of Classes of European Vegetation*. Folia Geobotanica Phytotaxonomia. 32: 117-172.
3. **Pop I., Cristea V. & Hodișan I., 2000** - *Vegetația județului Cluj (Studiu fitocenologic, ecologic, bioeconomic și ecoproductiv)*. Contribuții Boanice. Cluj Napoca: 5-255.
4. **Prodan I., 1939** - *Flora pentru determinarea și descrierea plantelor ce cresc în România. Vol. II. Noțiuni generale de fitogeografie. Fiziografia generală a României. Fitogeografia României*. 713 pag. Tipografia "Cartea Românească " Cluj.
5. **Răduțoiu D., 2008** - *Flora și vegetația Bazinului Cernei de Olteț*. 407 pag. Edit. Sitech Craiova.
6. **Sanda V., 2002** - *Vademecum cenostuctural privind covorul vegetal din România*. 331 pp. Editura Vergiliu. București.
7. **Sanda V., Răduțoiu D., Burescu P., Blaj-Irimia Irina, 2007** - *Breviar fitocenologic*. Partea a IV-a. 245 pag. Edit. Sitech. Craiova.
8. **Sârbu C., 2003** - *Podgoriile Cotnari, Iași și Huși. Studiu botanic*. 372 pag. Edit. "Ion Ionescu de la Brad" Iași.

ANATOMICAL PECULIARITIES OF STEM AND LEAF IN *EUPHORBIA SPLENDENS*

PARTICULARITĂȚI ANATOMICE ALE TULPINII ȘI FRUNZEI LA *EUPHORBIA SPLENDENS*

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Abstract. Also known as the crown of thorns, Christ's thorn, *Euphorbia splendens* is an Euphorbiaceae native of Madagascar, mostly spread on desert. In Romania it is grown in greenhouses and apartments. The latex produced by the plant gives medicinal, molluscicidal properties and some researches indicate its potential to cause cancer. From all the anatomical peculiarities of the stem and leaf that emphasize the xerophytic origin of the species, we mention: chlorophyllous and water-storing stem cortex, poorly developed vascular and mechanical tissues, epicuticular wax.

Key words: *Euphorbia splendens*, anatomical peculiarities, xerophilous plants

Rezumat. Cunoscută sub numele de coroana de spini sau coroana lui Hristos, *Euphorbia splendens* este o Euphorbiaceae originară din Madagascar, cu răspândire în zonele deșertice, în România fiind cultivată în sere și apartamente. Latexul produs îi conferă plantei proprietăți medicinale, moluscicide, iar unele cercetări indică un potențial cancerigen al acestuia. Dintre particularitățile anatomice ale tulpinii și frunzei, particularitățile ce relevă originea xerofitică a speciei, menționăm: scoarța caulinară cloroplastică și acviferă, țesuturile conducătoare și mecanice reduse, ceara epicuticulară pe frunze.

Cuvinte cheie: *Euphorbia splendens*, particularități anatomice, plante xerofile

INTRODUCTION

Euphorbia is a cosmopolitan genus that includes approximately 2,000 herbaceous and shrub species, spread all over the Earth. The species of *Euphorbia* have been studied from an anatomical point of view especially due to the presence of the non-articulated laticifers (Galeș & Toma, 2006).

Known by the name of "crown of thorns", or "Christ's thorn", *Euphorbia splendens* is an Euphorbiaceae whose origins can be traced back to Madagascar, and is spread in desert areas, while in Romania it is grown in greenhouses and apartments.

Numerous researches have demonstrated the fact that the milky latex produced by the laticifers in the body of the plant has a molluscicidal action, and it can be used to fight the species which are intermediate hosts for *Schistosoma* (Zamith et al., 1996) and *Fasciola hepatica* (Vasconcelos & Amorim, 2003).

Similarly, the latex has anti-inflammatory properties (Bani et al., 1999) and some researches suggest that it contains substances that induce the formation of tumours (Cruz et al., 1996).

MATERIAL AND METHOD

The vegetable material represented by fragments of young stems and leaves of *Euphorbia splendens* was cross-sectioned, javeled and coloured with Geneva reagent.

The pictures were taken with an Optika microscope with a digital Canon camera. Part of the pictures were devoted to the unprocessed sections.

RESULTS AND DISCUSSIONS

Anatomy of the stem. The fleshy stems are covered with epidermis in the young parts, localized towards the apex. At a small distance from the apex it can be noted that the protection role of the stem is taken over by the suber (fig. 1).

The latter is formed from phellogen wich is localised in hypodermic position. The multi-layered cortex is differentiated into outer, middle and inner cortex. The outer cortical strata are collenchymatized and chloroplastic.

The middle cortex is made up of bigger cells than those in the outer cortex, having small intercellular spaces, and fewer chloroplasts (fig. 1).

That area represents an aquiferous parenchyma, characteristic of xerophilous plants. In the inner part of the aquiferous middle cortex collateral bundles can be seen (fig. 2), a situation that can be also found in many genera of cactaceae (Mauseth, 2006).

The inner cortex, placed round the central cylinder, is made of small cells. In the middle cortex and in the inner cortex can be noticed the presence of the non-articulated laticifers (fig. 2), characteristic of the genus *Euphorbia* (Esau 1965; Metcalfe & Chalk, 1983; Galeş & Toma, 2006).

In the cross-section it can be noticed that the laticifers' shape is round or oval, with a cell wall thicker than that of the neighbouring cells, of a cellulose nature. In the latex were revealed halter-shaped starch grains; in fact, these starch grains of various shapes are often found in the latex of the genus *Euphorbia* (Fahn, 1982; Toma & Gostin, 2000).

The central cylinder of the stem exhibits collateral vascular bundles, less developed, as a result of the adaptation to the xerophytic environment (fig. 2) (Fahn, 1982; Şerbănescu-Jitariu & Toma, 1980).

The primary medulla rays situated between the vascular bundles, are narrow, and made up of 1-2 rows of parenchymatous cells, elongated radially.

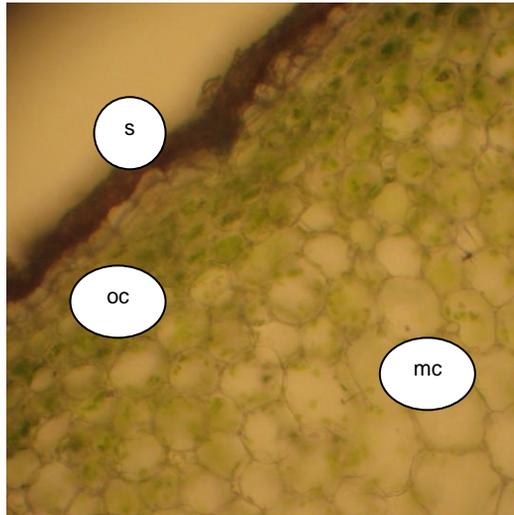


Fig. 1. Cross-section through the stem: mc-middle cortex, oc-outer cortex, s-suber (x 200, orig.).

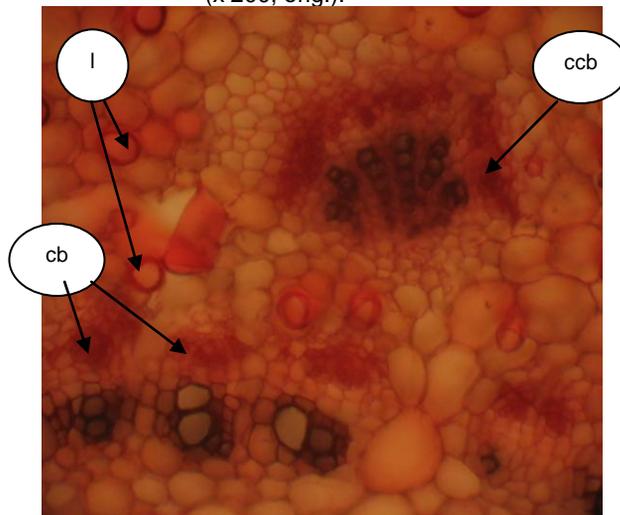


Fig. 2. Cross-section through the stem: cb-collateral bundles in the central cylinder, ccb-cortical collateral bundles, l-laticifers (x 200, orig.).

The pith is made by parenchymatous cells, with small intercellular spaces. In the old areas, in the central cylinder is formed the cambium, which generates secondary xylem and phloem.

Anatomy of the leaf

The petiole has, in the cross-section, a flat-convex, and its upper side is flat. It is protected on the outside by a one-layered epidermis, covered with a cuticle. The first cell layers of the fundamental parenchyma are collenchymatous, and the remainder of the parenchyma is made up large cells with thin walls and small intercellular spaces. The vascular tissues are organized in collateral bundles

lying in the shape of an arch, and encompassed by a parenchyma made up of small parenchymatous cells (fig. 3). Towards the upper side of the petiole there are a few reduced bundles, which have a reverse orientation of the vascular tissues. In the inner part of the fundamental parenchyma, as well as inside the arch made by the vascular bundles, non-articulated laticifers can be observed.

The lamina of the leaf is delimited by upper and lower one-layer epidermis, the latter also exhibiting stomata. Macroscopically, on the surface of both epidermes can be observed the epicuticular wax in the shape of a very thin layer, which appears, when seen through the microscope, as spherical little grains (fig. 6). The wax that can be found on the surface of the cuticle drastically reduces permeability, limiting the material exchanges between the plant and its environment, and increasing its resistance to drought (Burzo et al., 2004). The mesophyll is differentiated into palisade parenchyma and spongy parenchyma; the leaf has a bifacial-heterofacial structure. The palisade parenchyma is localized under the upper epidermis; it is one-layered, being made of chloroplastic prosenchymatic cells (fig. 5). Under it there is a layer of collecting, isodiametric cells. The spongy parenchyma is multi-layered, made up of heteromorphous cells between which there are lacunae; the cells of the spongy parenchyma contain fewer chloroplasts. In the mesophyll are encompassed the veins: middle and lateral, and the non-articulated laticifers are localized mainly round the veins, very much as with other species of *Euphorbia* (Galeş & Toma, 2006). The middle vein, encased in a hyaline parenchyma, is made up of a large collateral bundle, which has the xylem strand towards the upper face, and the phloem strand towards the lower face, and a smaller collateral bundle situated above the large one, having a reverse orientation of the vascular tissues (fig. 4). Very much as in the petiole, in the stem the vascular tissues (the veins) are encased in a parenchyma made of small cells.

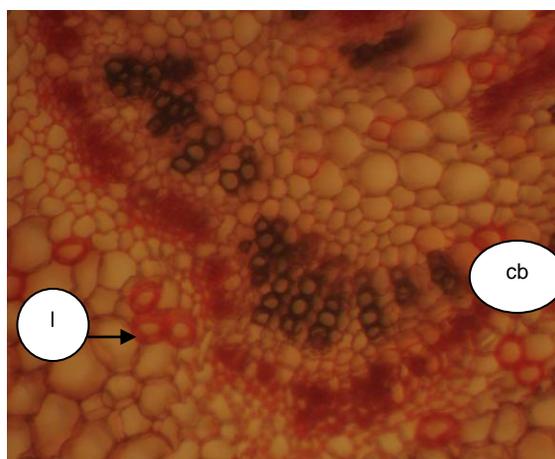


Fig. 3. Cross-section through the leaf petiole: cb-collateral bundles, l-laticifers (x 400, orig.).

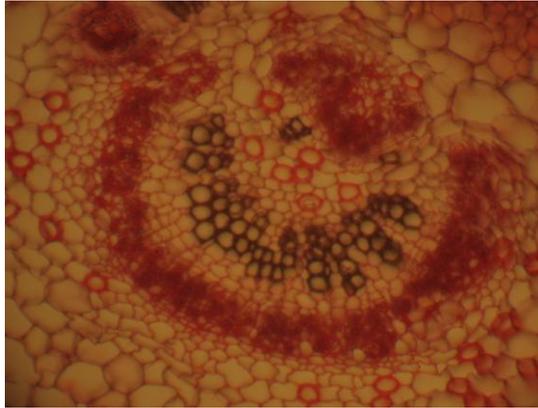


Fig. 4. Cross-section through the leaf lamina – middle vein (x 200, orig.).

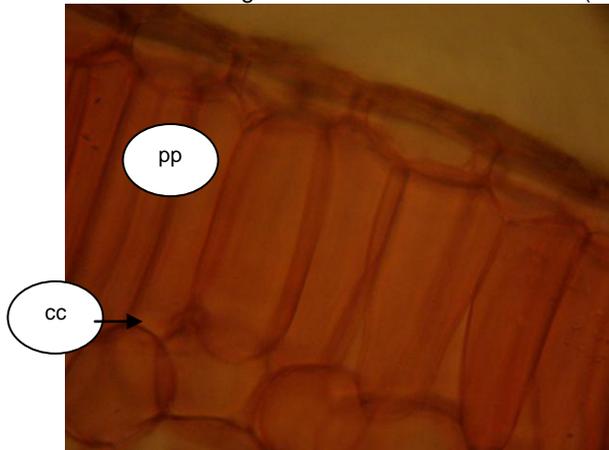


Fig. 5. Cross-section through the leaf lamina: pp-palisade parenchyma, cc-collecting cells (x 600, orig.).

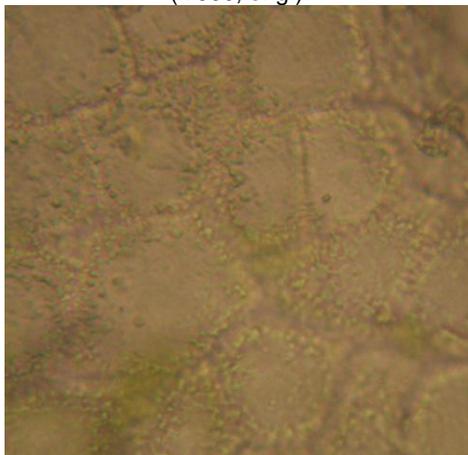


Fig. 6. Wax grains on the surface of the leaf epidermis (x 1600, orig.).

CONCLUSIONS

The anatomical peculiarities of the stem and leaf of the species *Euphorbia splendens* bear witness of its xerophytic origin. Thus, the fleshy stems of the plant have a well-developed cortex, whose outer area is photosynthetic, because in conditions of drought the leaves fall, and only a small number of leaves are maintained in the top of the stems. The middle area of the cortex is the best developed part, representing an aquiferous parenchyma, characteristic of xerophilous plants. In that area the presence can be noted of a number of cortical vascular bundles; these are considered to have had a special importance in the evolution of the well-developed cortex characteristic of cactaceae (in special in *Cactoideae*), plants of a similar xerophytic origin. The vascular tissues in the stem are reduced, and the mechanic ones are represented by the subepidermic collenchyma. The leaves are covered by epicuticular wax in the form of little grains.

REFERENCES

1. Bani S., Singh S., Singh G. B., Banerjee S. K., 1999 - *Antiinflammatory actions of Euphorbia splendens extract*. *Phytotherapy Research* 11(1): 76–78.
2. Burzo I., Delian E., Dobrescu A., Voican V., Badulescu L., 2004 - *Fiziologia plantelor de cultură* (Vol. I) – *Procesele fiziologice din plantele de cultură*. Editura Ceres, București.
3. Cruz C.M., Kasper P., Cataldo A., Zamith H.P.S., Paumgarten F.J.R., 1996 - *Tumor promoter-like activity of the molluscicidal latex of Crown-of-Thorns (Euphorbia milii var. hislopilii) in the V79 metabolic cooperation assay*. *Braz.J.Med.Biol.Res.* 29(11): 1519-1523.
4. Esau K., 1965 - *Plant Anatomy* (ed. 2). John Wiley and Sons, New York, London, Sydney, 318-337.
5. Fahn A., 1982 - *Plant anatomy*, 3rd ed., Pergamon Press, Oxford.
6. Galeș R.C., Toma C., 2006 - *Morfologia și distribuția laticiferelor în organele vegetative ale unor specii de Euphorbia din flora României*. 21-26 *Lucrările Științifice USAMV Iași, Seria Horticultură, anul XLIX(49)*: 21-26.
7. Mauseth J.D., 2006 - *Structure–Function Relationships in Highly Modified Shoots of Cactaceae*. *Annals of Botany* 98: 901–926.
8. Metcalfe C.R., Chalk L., 1983 - *Wood structure and conclusion of general introduction*, 2. Clarendon Press, Oxford, 75-77.
9. Șerbănescu-Jitariu G., Toma C., 1980 - *Morfologia și anatomia plantelor*. Editura Didactică și Pedagogică, București.
10. Toma C., Gostin I., 2000 - *Histologie vegetală*. Editura Junimea, Iași, 214.
11. Vasconcellos M.C, Amorim A., 2003 - *Molluscicidal Action of the Latex of Euphorbia splendens var. hislopilii N.E.B. ("Christ's Crown") (Euphorbiaceae) against Lymnaea columella (Say, 1817) (Pulmonata: Lymnaeidae), Intermediate Host of Fasciola hepatica Linnaeus, 1758 (Trematode: Fasciolidae)*. 1-Test in Laboratory. *Mem Inst Oswaldo Cruz, Rio de Janeiro*, Vol. 98(4): 557-563.
12. Zamith H.P.S., Paumgarten F.J.R., Speit G., 1996 - *Evaluation of the mutagenicity of the molluscicidal latex of Christ's Crown (Euphorbia milii var hislopilii) in mammalian cells in vitro and in vivo*. *Mutagenic Res* 368: 15-20.

THE PHENOMENON OF ABSENCE OF APPARENT PHOTORESPIRATION IN C₃ - PLANT REPRODUCTIVE ORGANS

FENOMENUL ABSENȚEI FOTORESPIRAȚIEI APARENTE ÎN ORGANELE REPRODUCTIVE ALE PLANTELOR DE TIP C₃

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Abstract. *It has been found for the first time that the reproductive organs (spikes, pods) of C₃- plants lack the phenomenon of absence of apparent photorespiration. The absence of CO₂ elimination at postillumination stage has been established for 31 genotypes, including 18 ones of four cereal species (Triticum aestivum L., Tr. durum L., Secale cereale L., and Triticale); six genotypes of two species from the Leguminosae family (Pisum sativum L. and Glycine max L.), and seven wild and slightly cultivated cereal species such as Tr. boeoticum Boiss; Tr. dicocoides L; Koern; Tr. dicoccum Shuebl; Tr. spelta L; Tr. compactum L; and Tr. monococcum Tr. sphaerococcum Persiv. For the first time, it has been established that concomitantly with the absence of apparent photorespiration, the photorespiration cycle is present and active in the reproductive organs (spikes, pods) of C₃ - plants demonstrated by a high activity of glycolate oxidase - a key enzyme of the glycolate cycle. In this context, the phenomenon of absence of apparent photorespiration in the reproductive organs (spikes, pods) of C₃ - plants is not a result of inactive glycolate metabolism or its inhibition by endo- and exogenous factors. These facts (absence of apparent photorespiration, presence of glycolate cycle, high activity of glycolate oxidase) indicate the existence of two different mechanisms of carbon metabolization for C₃ - plants: one is located in leaves and the other in reproductive organs.*

Key words: photorespiration, glycolate oxidase, reproductive organs, C₃ plants.

Rezumat. *Lucrarea evidențiază în premieră fenomenul absenței fotorepirației aparente în organele reproductive (spice, păstăi) la plante de tip C₃. Absența eliminării de CO₂ în faza post iluminare a plantelor a fost stabilită pentru 31 genotipuri: 18 - de cereale din cadrul a 4 specii - Triticum aestivum L., Tr. durum L., Secale cereale L., Triticale; 6 - de leguminoase din cadrul a 2 specii - Pisum sativum L., Glycine max L și 7 specii sălbatice și puțin cultivate de cereale - Tr. boeoticum Boiss; Tr. dicocoides Koern; Tr. dicoccum Shuebl; Tr. spelta L; Tr. compactum L; Tr. monococcum L; Tr. sphaerococcum Persiv. S-a stabilit în premieră că în organele reproductive (spice, păstăi) ale plantelor de tip C₃, concomitent cu absența fotorepirației aparente, este prezent și activ ciclul fotorespiratoric, care a fost demonstrat prin activitatea înaltă a glicolat oxidazei - enzimă cheie a ciclului glicolatic. În acest context, fenomenul absenței fotorepirației aparente în organele reproductive la plante de tip C₃ nu rezultă dintr-un metabolism inactiv al glicolatului sau inhibiția sa de către factorii endogeni sau exogeni. Aceste fapte (absența fotorepirației aparente, prezența ciclului glicolatic și activitatea înaltă a glicolat oxidazei) indică existența a două*

mecanisme diferite de metabolizare a carbonului la plante de tip C₃: unul – localizat în frunze, celălalt – localizat în organele reproductive.

Cuvinte cheie: fotorespirația, glicolat oxidaza, organe reproductive, plante de tip C₃.

INTRODUCTION

Photosynthesis is a well known process and in spite of this a lot of problems remain still unelucidated. The photorespiration (glycolate cycle) represents one of them as its role is not still definitively established (2). But it is well known, that about 50 % of C₃ plants photosynthesis products are consumed in photorespiration. In this context, it is hypothesized that if the lost of energy and the products, synthesized in photosynthesis could be reduced, the productivity of C₃ plants would be doubled ((5, 16, 7, 4, 15). The scientific investigations carried out in this direction during 30 years with the scope to increase productivity of C₃ plants at the expense of photorespiration level decrease did not succeed (16, 7, 6, 15). But these investigations have arrived at a conclusion that photorespiration is an essential component part of the production process (6) and acts as a physiological mechanism of photosynthetic apparatus protection. Experimental data on the presence of photorespiration and glycolate cycle activity in reproductive organs have not been described in the literature.

This work reports new results concerning the photorespiration phenomenon in reproductive organs of C₃ plants.

MATERIALS AND METHODS

Thirty one genotypes of thirteen species from *Poaceae* family, including *Tr. aestivum* L. (three genotypes), *Tr. durum* L. (five genotypes), *Secale cereale* L. (two genotypes), *Triticale* (eight genotypes), *Tr. boeoticum* Boiss, *Tr. dicoccum* Schuebl, *Tr. diccoides* Koern, *Tr. monococcum* L., *Tr. compactum* L., *Tr. spelta* L., *Tr. sphaerococcum* Persiv and six genotypes of *Fabaceae* family, including three genotypes of *Glycine max* L. and other three of *Pisum sativum* L. were used to study CO₂ exchange for C₃ plants. The above-mentioned genotypes were grown under field conditions during 2007 and 2008. A part of the investigated genotypes, including three ones of *Tr. aestivum* L., three genotypes of *Glycine max* L., three ones of *Pisum sativum* L. and seven wild and slightly cultivated cereal species were cultivated under control conditions of greenhouse and used in comparative analysis with those from field conditions.

Studies on CO₂ exchange and activity of key enzyme of photorespiratory cycle were performed for field cereals at heading complete – flowering period, for cereals of greenhouse control conditions at the heading complete – flowering stage, ripening (milky – wax development in kernel) stages and for *Fabaceae* plants at the flowering and pod formation stages. CO₂ exchange (photosynthesis intensity, respiration, apparent photorespiration) measurements were done for cereal flag leaves and leguminaceae leaves, and for reproductive organs – cereal spikes and leguminaceae pods

CO₂ exchange was studied on the basis of a novel monitoring technology (3) of this process using a modern apparatus – monitor of photosynthesis and transpiration (PTM-48A) of Bioinstruments SRL company, Chisinau, Republic of Moldova. Resolution capacity of the apparatus is 0, 0002 μmoli CO₂ · g⁻¹ · s⁻¹.

The presence and activity of photorespiratory cycle (glycolatic) was detected on the basis of activity determination of the glycolatic cycle key enzyme - glycolate

oxidase (10) in the leaves and components of reproductive organs: spikes – glume, lemma, awns; pods – intact pods, valves and seeds.

RESULTS AND DISCUSSIONS

With the discovery of Calvin (C_3) and Hatch - Slack (C_4) (C_4) (7, 9, 13) cycles, the vegetal world was divided into plants with C_3 – and C_4 - types of photosynthesis and CAM (crassulacean acids metabolism) plants. These plant groups differ not only on the mechanisms of CO_2 assimilation by photosynthetic apparatus, but on the presence or absence of photorespiration. C_3 plants are characterized by the release of CO_2 at the post-illumination stage (photorespiration), which is provided by carbon metabolism in the glycolate cycle. CO_2 elimination under the influence of light is absent in C_4 plants. The CO_2 released during malate decarboxylation in Kranz anatomy cells is included again in Calvin cycle. The specialty literature explains the photorespiration absence suggesting that the glycolate cycle is not characteristic of C_4 plants, or its activity is reduced by the endogenous factors that lead to inhibition of this cycle (7) in spite of the fact that glycolate oxidase - the key enzyme of the glycolate cycle is active in C_4 plant leaves and has the same function as in the cells of C_3 plants (8, 11).

The photosynthesis process accompanied by photorespiration in C_3 plants is also characteristic of reproductive organs, especially those of wheat, the photosynthesis level of which achieves 60 % of leaf photosynthesis intensity. From this point of view, the photosynthesis of reproductive organs have been studied in details (14, 13, 7, 1, 12), while photorespiration of reproductive organs is not recorded and described in specialty literature.

The results of our studies on CO_2 exchange for thirty one genotypes of C_3 plants, including thirteen cereal species of the *Poaceae* family and two ones of the *Fabaceae* family demonstrate the absence of CO_2 elimination under the light influence (apparent photorespiration) in reproductive organs – spikes, pods.

Reliability of this new fact is determined by the resolution capacity of the apparatus PTM-48A, which is, as mentioned above, $0.0002 \mu\text{moli } CO_2 \cdot g^{-1} \cdot s^{-1}$, that is, if carbon metabolism in the glycolate cycle resulted in release of any quantity of CO_2 , its value is so low, that practically, it can be considered that the CO_2 elimination in the glycolate cycle does not occur – the apparent photorespiration is absent. It should be mentioned for comparison, that apparent photorespiration for the leaves of the genotypes studied is recorded at a quite wide range from 0.15 to 1.55 $\mu\text{moli } CO_2 \cdot g^{-1} \cdot s^{-1}$. Results on the photosynthesis share in the intact spikes of wheat plants of the photosynthesis in leaves present another argument in favor of the reliability of the absence of apparent photorespiration in reproductive organs. As mentioned, this part can achieve a level of 60 %. Our data confirm this fact: the photosynthesis share in spikes of the photosynthesis level of cereal plant leaf (*Tr. aestivum* L., *Tr. durum* L., *Secale cereale* L., *Triticale* and seven wild and slightly cultivated) varies from 6.8% to 64.2%. This fits for the genotypes of the *Glycine max.* L. and *Pisum sativum* L species: the photosynthesis share in pods of that in leaves ranges from 3.6% to 43.4%.

The phenomenon of apparent photorespiration absence in the reproductive organs of C_3 plants is demonstrated and by the comparative studies of kinetic registrations of CO_2 exchange components (CO_2 assimilation – photosynthesis, typical mitochondrial respiration, apparent photorespiration) for the leaves and reproductive organs of C_3 plants.

The data presented in fig. 1 (a, b, c) show that leaves of C_3 plants (fig.1a) are characterized by registration of CO_2 assimilation – photosynthesis (A), apparent photorespiration (PR) and typical mitochondrial respiration – R, while for reproductive organs – intact spike and pod (fig. 1b, c) only photosynthesis (A) and typical mitochondrial respiration (R) are registered. So, apparent photorespiration (PR) in reproductive organs is not evidenced, that means that the CO_2 elimination during the post-illumination period does not take place – it is absent.

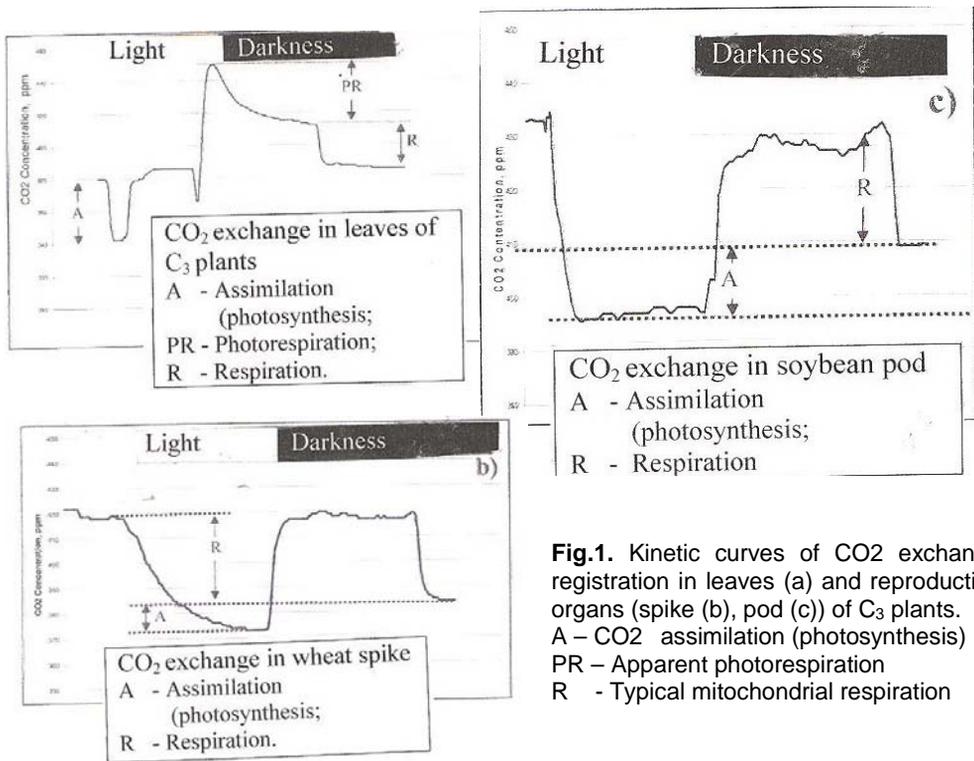


Fig.1. Kinetic curves of CO_2 exchange registration in leaves (a) and reproductive organs (spike (b), pod (c)) of C_3 plants. A – CO_2 assimilation (photosynthesis) PR – Apparent photorespiration R – Typical mitochondrial respiration

The evidence of apparent photorespiration phenomenon absence in the reproductive organs of C_3 plants has led to the necessity to study the key enzyme of photorespiratory cycle – glycolate oxidase for establishment whether this phenomenon is connected with the absence or limitation of glycolate cycle activity, or the phenomenon is based on other mechanisms (ways) of carbon metabolism.

The results on glycolate oxidase activity presented in table 1 show a considerable enzyme activity in both leaves and reproductive organs. The glycolate oxidase activity in spike is much higher in comparison with that of cereal leaves.

In pods of legume plants, the activity level of glycolate oxidase is high enough

and does not differ so much from that of leaves. So, we can conclude that the high activity of glycolate oxidase in the reproductive organs of C₃ plants demonstrates that the absence of apparent photorespiration is not a result of glycolate metabolism inactivity or its inhibition by the endogenous and exogenous factors.

These results (the absence of apparent photorespiration, presence of glycolate cycle, high level of glycolate oxidase) indicate the existence of two different mechanisms of carbon metabolism for C₃ plants: one is located in leaves, and the second - in reproductive organs.

Table 1

Glycolate oxidase activity in leaves and the reproductive organs of C₃ plants

№	Species, cultivars	Character of reproductive organs	Activity of glycolate oxidase; $\mu\text{moli glioxilic acid} \cdot \text{g}^{-1} \cdot \text{min}^{-1}$		
			leaves	spikes	pods
1	<i>Tr. Aestivum</i> L.	spikes			
1.1	<i>Balada</i>	awned	224,4±3,1	393,4±6,4	-
1.2	<i>Dana</i>	awned	178,4±5,3	253,2±591	-
1.3	<i>Beliŕcaia</i>	awned	162,4±1,7	417,7±11,4	-
1.4	<i>Belicanca 7</i>	awnless	238,8±4,0	120,3±3,8	-
2	<i>Glycine max</i> L.	pods			
2.1	<i>Aura</i>	pods	440±3,8	-	390,0±2,7

Totalizing the presented results we mention that regarding the description, for the first time, of phenomenon of apparent photorespiration absence in reproductive organs we insist on the necessity to introduce in scientific circulation the précised term for photorespiration – the formula “apparent photorespiration”, which characterizes only the CO₂ elimination during the post-illumination stage of CO₂ exchange comparing to the term “photorespiration”, which includes both CO₂ elimination and the oxidation reactions under the light influence, carbon metabolism in glycolate cycle and whole metabolism of photosynthesis products.

CONCLUSIONS

A new phenomenon has been detected, which previously was not known for C₃ plants: the phenomenon of absence of apparent photorespiration at the presence of the glycolate cycle in the reproductive organs of C₃ plants, characterized by the fact that in the leaves of C₃ plants as a result of glycolate metabolism, synthesized in photosynthesis process and subsequently oxidized in peroxisomes by glycolate oxidase, the release of CO₂ takes place under the light influence, while in the reproductive organs of C₃ plants (spikes, pods) at the presence of glycolate and high glycolate oxidase activity level, CO₂ elimination does not take place under the light influence – the apparent photorespiration is absent.

REFERENCES

1. Balaur N. S., Copît M. I., 1989 - *Ontogeneticeskaia adaptația energoobmena rasteii*. Kişiniev, „Știința”, 146 s.
2. Balaur N., 2006 - *Expresia fotorespirației in conditii optimale si stresogene*// Buletinul Academiei de Științe a Moldovei. Științele vietii, N, p. 66-72.
3. Balaur N.S., Vorontov V.A., Cleiman E.I., Ton Yu. D., 2009 - *Novel technique for component monitoring of CO₂ exchange in plants*. Russian Journal of Plant Physiology (English version), v. 56, №3, p.423-427.
4. Bohinski P., 1987 - *Modern concepts in biochemistry*. Fourth edition, Allyn and Bacon Inc., Boston-London Sydney-Toronto, 530p.
5. Boldor O. și al., 1981 - *Fiziologia Plantelor*. Editura Didactică și Pedagogică, București, 275 p.
6. Cikov V.N., 1996 - *Evoluția predstavlennii o sviazi fotosinteza s productivnostiu rasteii*. Fiziologia rasteii, t. 55, s.140 -154.
7. Edwards G., Walker D., 1986 - *C₃, C₄: mechanisms, and cellular and environmental regulation, of photosynthesis*. Blackwell Scientific Publications, Oxford-London-Edinburgh-Boston-Melbourne, 570 p.
8. Epifanțev A.T., Ivantiev A.N., Popov V.N., 2005 - *Raspredelenie I svoistva izoform glycolat oxidazi iz kletoc obkladki I mezofila listiev amaranta (Amaranthus retroflexus)*. Fiziologia rasteii, t. 52, №4, s.622 – 627, (în limba rusă).
9. Hatch MD and Slack CR., 1966 - *Photosynthesis in sugarcane leaves: a new carboxylation reaction and the pathway of sugar formation*. Biochem J., v. 101, p. 103–111.
10. Kolesnikov P.A., 1962 - *Koloremtricheskie metodi opredelenia aktivnosti oxidazi glikolevoi kisloti i reduktazi glioksalovoi kisloti*. Biohimia, t.27, v.2. (in Russian), s.193-196.
11. Martineli T., Whittaker A., Masclaux-Daubresse C. et al., 2007 - *Evidence for the presence of during photorespiration in desiccation-sensitive leaves of the C₄ 'resurrection' Sporobolus stapfianus dehydration stress*. Journal of Experimental Botany, v.58, p. 3929 – 393.
12. Martinez D.E., Luquez V.M., Bartoli C.G. Guamet J.J., 2003 - *Persistence of Photosynthetic components and photochemical efficiency in ears of water-stressed wheat (Tr.aestivum)*. Fiziologia Plantarum, B, 119, p.519-525.
13. Todd G. W., 1982 - *Photosynthesis and respiration of vegetative and reproductive parts of wheat and barley plants in response to increasing temperature*. Proc. Okla. Acad. Sci., 1982, B.62, p.57-62.
14. ***, 1969 - *Fiziologia selischoziastvennih rasteii*. T. IV, *Fiziologia pșenițf*, otvestvennii redactor Genkeli P.A., Iz - vo Moscovscogo Universiteta, 555s.
15. ***, 2008 - *Fotosintez*. <http://www.bronka.org./index.php?>.
16. ***, 1982 – *Photosynthesis*. Ed. Govindjee, Academic Press Inc. A Subsidiary of Harcourt Brace Jovanovich, Publishers, New York--London-Paris-San Diego-san Francisco-Sao Paulo-Sydney-Tokyo-Toronto, 680p.

PHYSIOLOGICAL IMPLICATIONS OF THE ALTERNATIVE FERTILIZATION TECHNOLOGY OF VINEYARD

IMPLICAȚII FIZIOLOGICE ALE TEHNOLOGIILOR ALTERNATIVE DE FERTILIZARE A PLANTAȚIILOR VITICOLE

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Abstract. *Due the fact that ecosystem viticulture have a long period of life, it could have a lot of inconvenient: hydric erosion of soil, reduced the organic material from soil, degradation of biological, chemical and physic features which representing the base of the soil fertility. The alternative technology regarding protection against weed and biological fertilization in the vineyard have as a main target the eliminated this advantages of viticulture monoculture, in sense that through it application will have a new equilibrium at the level of ecosystem components with improving aspects for the environment. Experimental lot contains nine variants, with agro technical systems for soil maintaining in vineyards, witch may be included in alternative maintaining systems, witch can be replace classic soil maintaining system. We determinate physiological processes on leaves and grapes: rate of photosynthesis, rate of respiration, assimilatory pigments. We observe stimulating role of green fertilizers and organic fertilizers.*

Key words: alternative fertilization technology, physiology, vineyard.

Rezumat. *Ecosistemul viticol se confruntă cu o serie de inconveniente: eroziunea hidrică a solurilor, reducerea materiei organice din sol, degradarea însușirilor fizice, chimice și biologice (care reprezintă baza fertilității solului) etc., datorită faptului că reprezintă o monocultură îndelungată. Tehnologiile alternative propuse privesc atât combaterea buruienilor, cât și fertilizarea biologică din plantațiile viticole, cu principal țarghet eliminarea dezavantajelor monoculturii viticole, în sensul că, prin aplicarea lor se va stabili un nou echilibru la nivelul componentelor ecosistemului, mult mai generos cu mediul înconjurător. Blocul experimental este compus din nouă variante experimentale, cu sisteme agrotehnice de întreținere a solului din plantațiile viticole care pot fi incluse în categoria sistemelor alternative de întreținere, sisteme care pot înlocui sistemele clasice de întreținere. S-au efectuat determinari fiziologice la nivelul frunzelor și strugurilor, care au avut în vedere procesele de fotosinteză, respirație, cantitatea de pigmenți asimilatori. Rezultatele obținute evidențiază rolul stimulator pe care l-au avut înnierbarea și fertilizarea cu gunoi de grajd.*

Cuvinte cheie: tehnologie alternativă de fertilizare, fiziologie, viță-de-vie.

INTRODUCTION

Vine plant, the main element of viticulture ecosystem is confronting with a lot of inconvenient: hydric erosion of soil, reduced the organic material from soil,

degradation of biological, chemical and physic features which representing the base of the soil fertility. The alternative technology regarding protection against weed and biological fertilization in the vineyard have as a main target the eliminated this advantages of viticulture monoculture, in sense that through it application will have a new equilibrium at the level of ecosystem components with improving aspects for the environment. Treatments of weeds from insensitive vineyards will be made by conservation and improving the biological, chemical and physic features of soil: rational of herbicides using, without major risk for environment by directional herbicides on nutritive organic stabile content of soil; maintenance of interval between rows plant with vegetal annual carpet; soil mulching on interval from rows plants with biologic material.

MATERIAL AND METHODS

This research is part of researches studies from CNMP Project no. 51009/2007.

Biologic material is representing by Aligoté cultivar. In the vineyard was made 9 experimental variants (fig. 1):

- V1 – unfertilized, without herbicides;
- V2 – fertilized with 40 t/h garbage without herbicides;
- V3 - fertilized with 40 t/ha garbage with herbicides;
- V4 – permanent grass with perennial plants (trefoil and lolium) on interval between rows plants, herbicides on rows;
- V5 – green fertilization (annual grass with pea and barley) on interval between rows plants, herbicides on rows;
- V6 – green fertilization of autumn in alternation with green fertilization of springtime on interval between rows plants, herbicides on rows; these green fertilizers are cutting and eliminated;
- V7 - green fertilization of autumn in alternation with green fertilization of springtime on interval between rows plants, herbicides on rows; these green fertilizers are cutting and keeping as mulch on the interval;
- V8 – permanent mulch on the intervals rows and rows plants, composed by straws cereals;
- V9 – unfertilized with total herbicides on the intervals rows and rows grape plants.

These nine experimental variants have elements from agro technical maintenance systems of vineyards that can be including in the system categories of maintenance alternative systems, that can unplaced the classic maintenance systems (fig. 2).

For all variants we made a lot of determinations: photosynthesis, respiration, content of assimilatory pigments.

Photosynthesis and respiration intensity was made by carbon dioxide analyzer. The results was expressing by $\mu\text{mol CO}_2/\text{dm}^2/\text{s}$.

Assimilatory pigments were determinate by spectrophotometer method. The results was expressing by fresh substance mg/g.

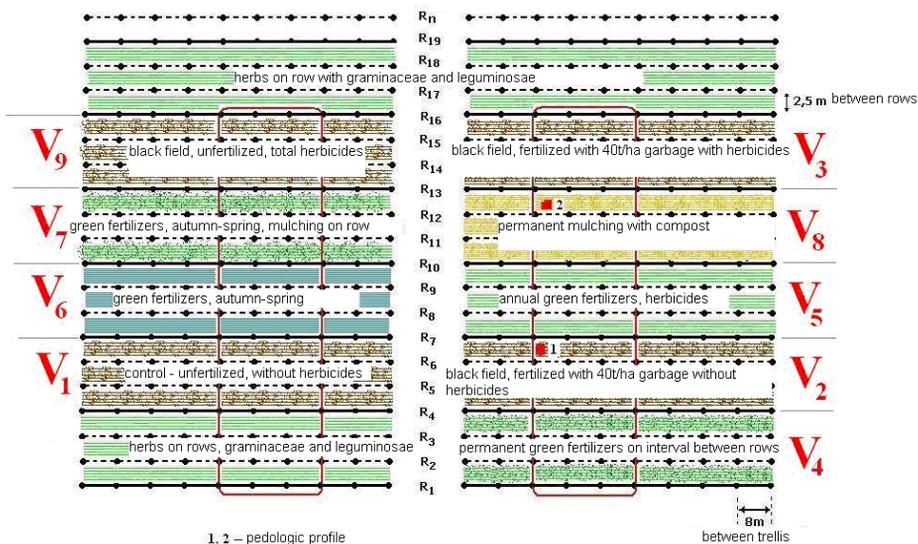


Fig.1. Experimental scheme of research



Fig. 2- Permanent mulching on interval rows with straws hashed

RESULTS AND DISCUSSIONS

In figure 3 are presenting the achieved results regarding photosynthesis intensity at leaves level of vine for all 9 experimental variants. The results are between $0,324 \mu\text{mol CO}_2/\text{dm}^2/\text{s}$ (V3) and $0,54 \mu\text{mol CO}_2/\text{dm}^2/\text{s}$ (V6). The higher values of photosynthesis intensity was registered in variant fertilized with 40 t/ha garbage (V2 – $0,523 \mu\text{mol CO}_2/\text{dm}^2/\text{s}$) and in variant V6 – green fertilization of autumn in alternation with green fertilization of springtime on interval between

rows plants, herbicides on rows; these green fertilizers are cutting and eliminated (V6).

In figure 4 are presenting the achieved results for respiration intensity at leaves vine level. Low values were determinate for variant V3 (fertilized with 40 t/ha garbage with herbicides) and variant V5 (green fertilization (annual grass with pea and barley) on interval between rows plants), herbicides on rows, while variant V2 (fertilized with 40 t/h garbage without herbicides) registered the bigger values regarding respiration intensity.

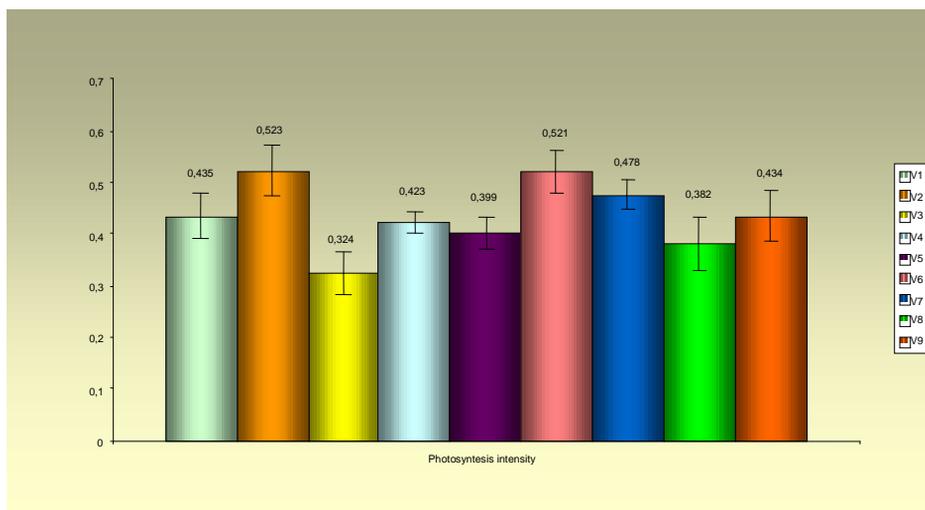


Fig.3. Determination of photosynthesis intensity (µmol CO₂/dm²/s) – September 2009

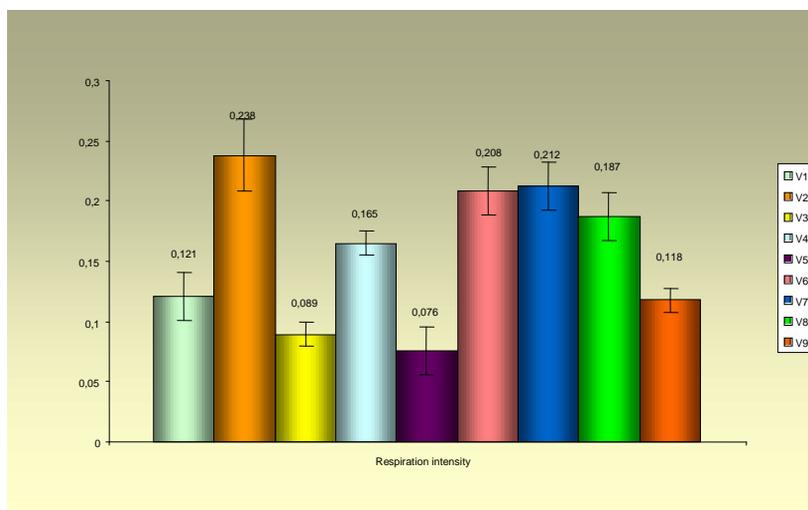


Fig.4. Determination of respiration intensity (µmol CO₂/dm²/s) – September 2009

Regarding quantity of assimilatory pigments the bigger values of chlorophyll a and b was registered for variant V6. Carotenoids pigments had maximum values for variant V2. The lower values of chlorophyll a were registered in variant V2 while variants V4 had the smaller values for chlorophyll b and carotenoids.

The results of respiration and photosynthesis intensity are in correlation with production achieved in experimental variants. The production of grapes registered the higher values for V2, V4 and V6.

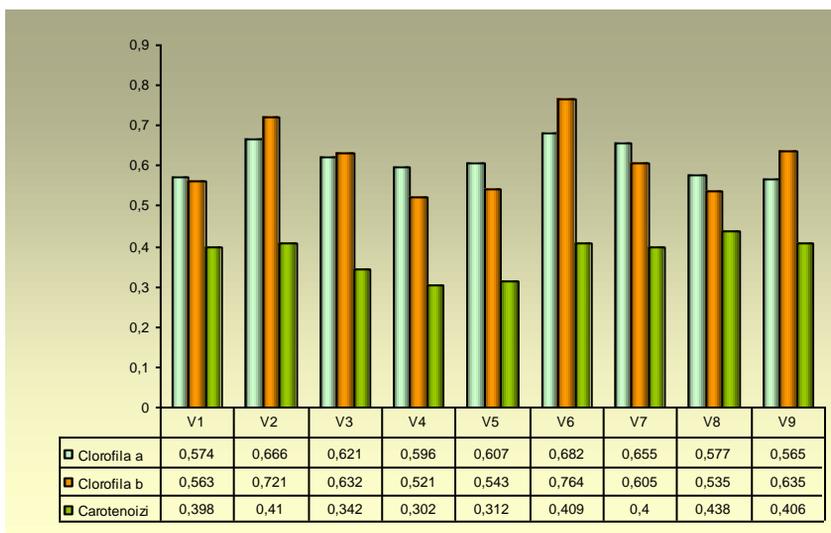


Fig.5. Determination of assimilatory pigments quantity from vine leaves (mg/g fresh substance)

Table 1

Production of grapes

Variant	Production (kg/ vine plant)
V1	2,8
V2	3,23
V3	3,15
V4	3,34
V5	2,85
V6	3,25
V7	2,6
V8	2,9
V9	2,75

CONCLUSIONS

Bigger values of physiological studied parameters were achieved in variant fertilized with 40t/ha garbage without herbicides and in variant with green fertilizers from autumn or spring.

The values of photosynthesis, respiration intensity and assimilatory pigments are correlating with grape productions.

To achieve a significant results that will establish an alternative technology for fertilize of vine, the experiment will be analyzed in the next two years.

REFERENCES

1. Băbeanu Narcisa, Berca M., Borza I., Coste I., Cotigă C., Dumitrescu N., Olteanu I., Penescu A., Hortensia Rădulescu, Șchiopu D. (coordonator), Șchiopu T., Știrban M., Vîntu V. (coordonator), 2002 - *Ecologie și protecția mediului*. Editura Ion Ionescu de la Brad, Iași.
2. Berca M., 2004 - *Managementul integrat al buruienilor*. Editura Ceres, București.
3. Burzo I. și colab., 2004 - *Fiziologia plantelor de cultură*. Întreprinderea Editorial-Poligrafică Știința, Chișinău.
4. Dumitriu I.C., 2008 – *Viticultură*. Editura Ceres, București.
5. Șelaru E., 2002 - *Culturi pentru flori tăiate*. Editura Ceres, București.

ALTHAEA ROSEA, AN OPPORTUNITY IN THE INDUSTRY OF FOOD COLORANTS

ALTHAEA ROSEA, O OPORTUNITATE ÎN INDUSTRIA COLORANȚILOR ALIMENTARI

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Abstract. *In this paper, Althaea rosea was analyzed both from the physiologic viewpoint and the biochemical one. During the growing and development of the plant we determined: the number of leaves/plant, the plant height, the number of flowers/plant, the flower production with and without calyx/plant. From the biochemical viewpoint we determined: the soluble dry substances, titrating acidity, reducing glucides and the anthocian contents.*

Key words: natural pigments, flowers, *Althaea rosea*

Rezumat. *În prezenta lucrare, Althaea rosea a fost urmărită atât din punct de vedere fiziologic, cât și din punct de vedere biochimic. Pe parcursul creșterii și dezvoltării plantei s-au determinat: numărul de frunze/plantă, înălțimea plantei, numărul de flori/plantă, producția de flori cu (și fără) caliciu/plantă. Din punct de vedere biochimic au fost determinate: substanța uscată solubilă, aciditatea titrabilă, glucidele reducătoare și conținutul de antociani.*

Cuvinte cheie: pigmenți naturali, flori, *Althaea rosea*

INTRODUCTION

The research themes focused on the putting to good use of some raw materials insufficiently studied so far to extract natural colorants represent a priority domain at world level, so much the more at national level for the following reasons: it may determine the increase of health benefits by consuming healthier products colored with natural pigments, it may ensure the obtaining of some new natural products of the type of anthocian pigments useful in coloring foodstuffs, one may improve the nutritional value of some specific foodstuffs having a superior protective effect on the body, unlike the use of synthesis colorants that may cause certain diseases (cancer, allergies); we will investigate the local potential from Romania's NE economic area.

The orientation of consumers' demands towards products as ecologic as possible led to the extension of researches on plants with tinctorial proprieties. Among these, the specialized literature presents *Althaea rosea* as a plant with widely colored flowers that has been recently studied for the extraction of natural pigments and their use in the food industry. At present, the flowers are used as a colorant to correct wine color, to colour and flavour vinegars, to color liquors and syrups.

MATERIAL AND METHOD

Althaea rosea was cultivated on the didactic experimental field. In 2007, we seeded: **Black Hollyhock** (with simple black flowers), **Chateris Double Scarlet** (with red double flowers) and **Violet Queen** (with purple double flowers).

The cultivation technology was the one recommended by the specialized literature.

The flower harvest was made gradually, in 3 stages, during blooming. After each harvest, the flowers were weighed with and without chalice and then they were dried. For the biochemical analyses we used the dried flowers without a chalice.

In the first year of culture we made the following observations: the date of spring (when 75% of plants came out from the earth) and the number of leaves in rosette at the end of the 1st year of culture. In the 2nd year we watched: the medium height of plant, the average number of leaves/plant, the average number of flowers/plant, the average yield of flowers with (and without) a chalice/plant.

In the 2nd ear of culture we also analysed flowers from the biochemical viewpoint and determined: the soluble dry substance, titrating acidity, reducing glucides and the anthocian content.

The soluble dry substance was determined by the refractometric method, using the Zeiss handheld refractometer.

The determination of titrating acidity was base don the reaction of neutralization with alkaline solutions up to the equivalence point. Since we talked about some acidity due first to the organic acids that are weak acids, we used an indicator the thymol blue, a special indicator for colored extracts. The result was expressed in milliliters of sodium hydroxide n/10 entered in titration.

The reducing glucides were determined by Schoorl titrimetric method, by hot extraction, liming with basic lead acetate and titration with a solution from sodium tiosulphate.

The anthocian content was determined by the pH variation method. The variation of the coloring intensity between tow values of pH is proportional to the anthocian content. We chose pH=0.6 and pH=3.5. By this variation, the phenolic function is not affected and it is admitted that the other phenolic compounds do not interfere with the determination. The expression of anthocian content is made by means of the calibrating plot traced on the basis of the difference of absorbance between the two solutions analysed.

RESULTS AND DISCUSSIONS

Althaea rosea is a biennial plant, in the first year it has a leaf rosette and in the second year it has flowery stems, flowers, fruits and seeds. Despite being a biennial plant, in conditions of culture it may be transformed in a perennial plant, but with a decrease of the flower yield.

The results of the phenological and biometric observations are presented in table 1.

From the analysis of the phenological and biometric observations, we may characterize the three species under study (table 2).

The results of the biochemical analyses for dry flowers without chalice were registered in table 3.

Form the analysis of the biochemical results under study, species may stand out depending on the average of these results (table 4).

Table 1

Phenological and biometric observations

Observations	Black Hollyhock	Violet Queen	Chateris Double Scarlet
Germinative capacity (%)	73	89	76
Spring	17 VI	14 VI	19 VI
Number of leaves per rosette in the 1 st year	12	8	11
Medium height of plant (cm)	185	173	197
Average number of leaves per plant	54	38	61
Average number of flowers per plant	30	21	32
Average yield of fresh flowers with chalice per plant (Kg)	0.35	0.19	0.37
Average yield of fresh flowers without chalice per plant (Kg)	0.28	0.15	0.31

Table 2

Characterization of the cultivars under study from the viewpoint of biometric observations as compared to the culture average

Biometric observations	Black Hollyhock (%)	Violet Queen (%)	Chateris Double Scarlet (%)
Average of plant height: 185	100	93.51	106.48
Average number of leaves per plant: 51	105.88	74.50	119.60
Average number of flowers per plant: 27	109.52	73.80	116.66
Average yield of fresh flowers with chalice per plant: 0.33 Kg	108.75	76.25	116.25
Average yield of fresh flowers without chalice per plant 0.24 Kg	107.93	82.53	111.11

From the results recorded in Tables 1 and 2 we can say that variety Chateris Double Scarlet has a vigorous growth, with the greatest number of flowers and leaves and the highest production.

At the other extreme, has been the variety Violet Queen. With an average height less than 30 cm and a number of leaves almost half that of the variety Chateris Double Scarlet, it recorded the lowest indices of production, as 20% compared to the average of varieties studied.

We can say that the variety Blak Hollyhoc noted that standard, the values recorded biometric determinations are very close to the average of the three species taken in culture.

Table 3

Results of the biochemical analyses for dry flowers without chalice

Biochemical analyses	Black Hollyhock	Violet Queen	Chateris Double Scarlet
Soluble dry substance (°Brix)	19.6	18.9	18.3
Titrating acidity (ml Na OH)	0.7	1.2	1.1
Reducing glucides (g/100g product)	31	34	28
Anthocian content (g/100g product)	2.35	2.27	1.98

Table 4

Characterization of the cultivars under study from the viewpoint of the biochemical analyses effectuated on the dry flowers without a chalice

Biochemical analyses	Black Hollyhock (%)	Violet Queen (%)	Chateris Double Scarlet (%)
Soluble dry substance Average = 18,93	103.53	99.84	96.51
Titrating acidity Average = 1	70	120	110
Reducing glucides Average = 31	100	109.67	90.32
Anthocian content Average = 2,17	108.29	104.60	91.24

Analyzing tables 3 and 4 we can say that flowers were harvested at the optimum moment, the signs of aging results from the three varieties studied joining in the literature data.

Of biochemical results are seen as the ratio between the three varieties are changing. Variety Chateris Double Scarlet passes last place in terms of content of anthocyanins, the first being the Black Hollyhock variety and variety Violet Queen in second place.

CONCLUSIONS

From the analysis of the results of the biometric and phenological observations, we may draw the following conclusions:

1. Violet Queen breed had the highest germinative capacity (89%) and sprang 3 days before Black Hollyhock breed and 5 days before Chateris Double Scarlet breed.

2. Chateris Double Scarlet breed registered the highest values above averages for all the biometric observations effectuated: medium height of plant (106.48%), average number of leaves per plant (119.60%), average number of flowers per plant (116.66%), average yield of flowers with chalice per plant (116.25%) and average yield of flowers without chalice per plant (111.11%), what recommends it in terms of flower yield.

3. Black Hollyhock breed also integrates a little above the averages of the values accumulated, being recommended for the flower yield.

From the analysis of the results of the biochemical analyses effectuated on the dry flowers without a chalice, we may draw the following conclusions:

1. Violet Queen breed registered values above average in terms of the content of reducing glucides and titrating acidity.

2. Black Hollyhock breed registered values above average in terms of the content in soluble dry substances and anthocian accumulation.

Due to the accumulation of a large quantity of anthocians (as compared to other cultivated plants), especially in altheine (a mixture of delphinidine and malvidin, lacking toxicity) and the large flower yield, we should study in detail this species to recommend its use on a larger scale in the food and pharmaceutical industry.

REFERENCES

1. Banu C. și colab., 1982 – *Produsele alimentare și inocuitatea lor*. Editura Tehică, București
2. Banu C., 1992 - *Progrese tehnice, tehnologice și științifice în industria alimețtar* Editura Tehnică, București
3. Bordea Mariana și colab., 1998- *Vitaminizarea naturală a organismului și sănătatea*. Editura Sport- Turism, București
4. Cheffel J.C. și colab., 1992 - *Introduction a la biochimie et a la technologie des aliments*. vol.I, Editura Tec&Doc- Lavoisier, Paris
5. Dejica D. și colab., 2001 -*Antioxidanți și terapie antioxidant* . Editura Casa Căji de Știință, Cluj-Napoca
6. Derache R, 1986 – *Toxicologie & securite des alimentaires*. Editura TEC&DOC, Lavoisier, Apria, Paris
7. Dimitriu C., 1980 – *Metode și tehnici de control ale produselor alimentare și de alimentație publică*. Editura CERES, București
8. Gherghi A. și colab. 2001- *Biochimia și fiziologia legumelor și fructelor*. Editura Academiei Române, București
9. Gherghi A., 1999.- *Prelucrarea și industrializarea produselor horticole*. Editura Olimp, București
10. Gilles A. Și colab., 1997 – *Ecolochimie. Chimie appliquee a l'environnement*. Editura Cultures et Technoloques, Nantes
11. Grădilă M., 1998 – *Cultura plantelor tehnice și medicinale*, Editura M.A.S.T., București
12. Luca C., Duca Al., Crițan I. Al., 1983 - *Chimie analitică și analiză instrumentală*, Editura Didactică și Pedagogică, București
13. Magearu V., 1988 – *Controlul analitic al produselor biotehnologice*. Editura Tehnică, București

14. **Neamțu G., 1997** – *Biochimie alimentară*. Editura CERES, București
15. **Păun C., 2004** – *Enciclopedia plantelor (vol.III). Plante din Flora României*. Editura Tehnică, București
16. **Segal B. și colab., 1982**- *Analiza senzorială a produselor alimentare*. Editura Tehnică, București
17. **Segal Rodica și colab., 1985** – *Determinarea calității produselor alimentare*. Editura CERES, București
18. **Temelie Mihaela, 2005** – *Enciclopedia plantelor medicinale spontane din România*, Editura Rovimed Published, Bacau
19. **Thomson R.H, 1993** – *The Chemistry of natural products*. Editura Blackie Academia & Professional, London, New York, Tokyo, Melbourne
20. **Toma Liana-Doina, 1998** – *Fiziologia plantelor ornamentale*. Editura Ion Ionescu de la Brad, Iași
21. *****, 2008** - Colecția de stasuri ASRO pentru analize chimice și biochimice.

PLANT NUTRITION AND BIOMASS PRODUCTION OF SOYBEAN PLANTS UNDER UNFAVORABLE MOISTURE CONDITIONS

NUTRIȚIA MINERALĂ ȘI PRODUCEREA BIOMASEI LA PLANTELE DE SOIA ÎN CONDIȚII NEFAVORABILE DE UMIDITATE

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Abstract. *The interactive effect of phosphorus (P) and iron (Fe) on the growth of soybean (Glycine max.L Merr) plants under drought conditions was studied in pot experiments. In the experiments it was used soil cernoziom carbonated with deficiency in availability forms of P and Fe. Two levels of P and Fe supply were investigated. Control pots were kept at 70% of field capacity (FC) and water stressed pot were maintained at 35% FC during 14 days after initiation of flowering stage. P soil deficiency as well as temporal drought conditions significantly reduced plants growth. Adequate P nutrition increased biomass accumulation and nutrient uptake in water stress environment. Supplemental Fe nutrition also stimulated the plant growth but its effect was less pronounced. Responses of plant biomass production and P use efficiency were relative greater in treatments with both nutrients application. The experimental results confirmed that adequate mineral nutrition of plants could attenuate the negative impact of drought on crop production.*

Key words: biomass accumulation, nutrients, soybean, water stress

Rezumat. *În experiențele vegetative s-a studiat interacțiunea fosforului (P) și fierului (Fe) asupra nutriției minerale și creșterii plantelor de soia (Glycine max. L., Merr) în condiții de secetă. Plantele de soia au fost crescute pe solul de cernoziom carbonatic care s-a caracterizat printr-un conținut inferior de forme accesibile pentru plante de P și Fe. S-a studiat influența a două niveluri de nutriție cu fosfor și fier. Productivitatea maximă a plantelor s-a constatat în varianta control, unde umiditatea solului a constituit 70% din capacitatea de câmp pentru apă. La plantele supuse secetei în faza înfloritului (perioada a fost de 14 zile) s-au înregistrat indici mai inferiori în absorbția elementelor nutritive și creștere. Nutriția adecvată cu P în condiții de stres hidric a intensificat procesul de acumulare a masei organice și achiziționare a fosforului și azotului. Nutriția suplimentară cu Fe a avut un impact mai puțin pronunțat decât aplicarea P. Reacțiile producerii biomasei și eficacitatea de utilizare a P au fost mai evidente în cazul aplicării concomitente a ambelor nutrienți. Rezultatele experimentale au dovedit că efectuarea nutriției minerale adecvate contribuie la atenuarea impactului negativ al secetei asupra plantelor de cultură.*

Cuvinte cheie: acumulare biomasă, nutrienți, soia, stres hidric.

INTRODUCTION

Plant productivity depends on a wide range of environmental factors. It was established that adequate mineral nutrition of crops with macronutrients and micronutrients plays a major role in sustainable plant metabolism. Hence nutritional imbalance could affect the tolerance of plants to environmental stresses. Many experiments have been shown that legumes respond significantly to phosphorus application (Al-Karaki G. et al 1996, Andreeva T.F., et al 1970). Its effect has a particular importance on soil with low available forms of phosphorus. Studies performed by Andries (2006) revealed that soils of republic of Moldova are characterized by low level of mobile forms of this nutrient. Phosphorus deficiency is more pronounced on carbonate cernoziom soils. In such type of soils the available forms is estimated around 0.5% of total phosphorus. However, the application of P fertilizers affects the pattern of absorption of others nutrients, in particular iron (Fe). Iron is involved in many physiological processes, such as electron transport in photosynthesis, it is a component of chlorophyll, Fe participate in CO₂ fixation, activates the function of nitrogenase enzyme (Tang C.X., et al 1992). Sufficient supply with Fe stimulates a wide range of physiological processes that in turn lead to produce yields of crops. In some investigations it was established that the supply of P is critical under moisture stress conditions. Also some experiments have been shown that application of phosphorus increased drought tolerance of cotton and white clover (Radin J.M., and M.P. Evidenbock, 1984, Singh D.K., and P.W.G. Sale, 2000). However, it is should be mentioned that such investigations were performed as a rule under normal water regime. There is a lack of information regarding the influence of both nutrients P and Fe on crop development under water stress.

The purpose of this study was to examine the effect of combined application of P and Fe on plant growth and nutrient absorption of soybean plants under water stress conditions.

MATERIAL AND METHOD

To accomplish the purpose of the study an experiment was laid out with two varieties of soybean, namely Zodiac and Licurici, in greenhouse conditions. There were used pots with 5 L capacity.

The soil was cernoziom carbonate which had low available forms of phosphates.

The effect of P and Fe interaction was examined in two water regimes: 70% water holding capacity (WHC), considered as optimal and 35% WHC - as water stress. Nitrogen (N) fertilizer was applied to all pots at rate 50 mg kg⁻¹ soil, P at 100 mg kg⁻¹ soil as KH₂PO₄. A concentration of 5 mg Fe kg⁻¹ soil as FeEDTA was used to study its interaction with phosphorus.

Each treatment had 8 replications. Drought stress was imposed at the beginning of flowering and lasted 14 days. Soybean plants were harvested at the end of drought period. Vegetative plant parts were analyzed for N and P concentrations. Phosphorus was determined by the method of Murthy and Raley (Mineev V.G., 1989).

RESULTS AND DISCUSSIONS

The examination of experimental results revealed that biomass accumulation at the end of water stress period decreased substantially by the insufficiency nutrient supply as well as by water deficit. It should be noted that low P supply affected more evidently the plant productivity than shortage of moisture.

The maximum plant production was obtained in treatment with adequate P nutrition under normal moisture of soil where biomass in Licurici was 8.1 g/plant. Results of present study demonstrated that P fertilization of Licurici increased biomass production by 42.3% in normal water conditions and by 44.3% under drought conditions. Similar trend was denoted in soybean plants of Zodiac. It was observed a genotypic difference in biomass accumulation in relation to soil moisture levels. As regard the influence of iron the experimental data noted that it was observed a positive effect of micronutrient application on soybean plants, but the extent of biomass increase was lower than in treatments with P. Iron supplemental nutrition had a more significant effect under water stress conditions (table 1).

Abiotic factors changed the ratio between roots and shoots. The highest value of this parameter was observed in Zodiac. The combined application of both nutrients favorable affected the rate of P use efficiency. The process of nodulation was more sensitive to water stress and P deficiency than other vegetative organs. The symbiotic process responded positively in both cultivars to supplemental nutrient nutrition. In addition, the plant performance increased due to adequate nutrition irrespective of water regime. Similar effects have been established in other species (Tang C.X. et al. 1992, Al-Karaki, G.N. et al. 1996). Analyses of rates of P absorption demonstrated a positive correlation between P acquisition and plant productivity. Experimental results confirmed that nutrient application as well as soil moisture level implied the pattern of nutrient absorption (fig. 1).

There was established a genotypic difference in absorption of N and P under low soil fertility. This result is related of root development and their physiological activity. It is necessary to emphases that sufficient P supply increased N content in soybean leaves and nodules by 38% and 16% respectively. Supply of iron also stimulated N accumulation in leaves and stems, but had a little impact on roots and nodules. The maximum N concentration was denoted in treatment NPFe its value was 3.60%, while in control variant nitrogen level decreased to 2.87%. Drought reduced P accumulation and its negative effect was evident in treatment without fertilizer application.

Table 1

The influence of phosphorus and iron on biomass accumulation of soybean plants in relation to soil moisture, g DW/plant

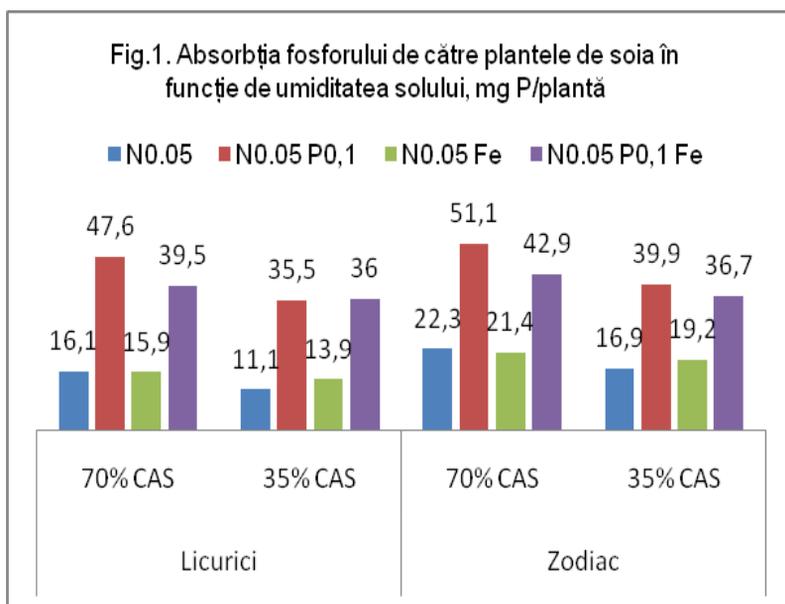
Treatments	70% WHC					35% WHC				
	leaves	stems	roots	nodules	plant	leaves	stems	roots	nodules	plant
LICURICI										
N_{0.05} g/kg sol		1,38	0,81	0,04	3,88	1,06	1,26	0,59	0,02	2,93
N_{0.05} P_{0,1}	2,74	2,62	1,20	0,16	6,72	1,70	2,49	0,93	0,14	5,26
N_{0.05}Fe	1,86	1,62	0,81	0,04	4,33	1,53	1,62	0,55	0,03	3,73
N_{0.05} P_{0,1} Fe	3,21	3,35	1,26	0,28	8,10	2,70	2,73	0,85	0,15	6,43
ZODIAC										
N_{0.05} g/kg sol	2,00	1,72	0,95	0,05	4,72	1,24	1,35	0,67	0,02	3,26
N_{0.05} P_{0,1}	2,84	2,74	1,15	0,22	6,95	1,76	2,34	1,02	0,10	5,22
N_{0.05} Fe	1,90	2,10	0,74	0,05	4,75	1,35	1,78	0,66	0,03	3,82
N_{0.05} P_{0,1} Fe	2,95	2,80	1,02	0,41	7,18	2,45	2,55	0,95	0,20	6,15

Probably, low growth rate of leaves decreased plant demand in P and this nutrient is involved in expression of fed-back mechanism of regulation.

Evaluation of the effects of P supply shown that P application in sufficient dose facilitated P accumulation more significantly than N accumulation. Perhaps, nitrogen assimilation is more sensitive to environmental stresses. This trend was established irrespective of water regimes. Leaf P content at the end of drought period increased markedly when the P supply increased from P0 to P100 mg/kg soil. Adequate P nutrition increased the content of P in leaves, stems and roots by 34, 46 and 53% respectively

Phosphorus contents in nodules were less changed by fertilizer application. Therefore, nodules had a tolerance to P deficiency. Our results were confirmed in other studies (Tang C.X. et al. 1992, Al-Karaki, G. N., et al. 1996).

In contrast, P content in the plant parts was reduced by P deprivation in both cultivars. Total P amount in Zodiac was lower than in Licurici. Supplemental Fe nutrition together with N application had a trend to increase the plant capacity to acquire more nutrients from soil under water stress conditions. But micronutrient application with P in normal water conditions reduced the P concentration in plant parts (fig.1). Therefore, it has observed an antagonism between these nutrients.



The same results were observed in other investigations (Shahandeh H. et al., 2003). It is important to note that higher P efficiency was observed in treatment with application of P and Fe. Hence, the adequate soybean nutrition with P positively marked metabolic processes that maintained plant production at normal level.

CONCLUSIONS

Drought stress reduced significantly the production of plant assimilates and its negative impact is more evident in low soil P fertility. There was a significant response of plant production to increasing phosphorus nutrition at both water regimes. Adequate phosphorus and iron supply diminished partially the negative influence of drought and increased soybean productivity.

REFERENCES

1. **Al-Karaki G. N., R.B.Clark, C.Y. Sullivan, 1996** - *Phosphorus nutrition and water stress effects on proline accumulation in sorghum and bean*. Journal of Plant Physiology 148, 745-751.
2. **Andreeva T.F. and Persanov B.M., 1970** - *Effect of duration of phosphorus deficiency on photosynthesis and leaf growth in connection with productivity of horse beans*. Fiziol. Rastenii 17, 78-84.
3. **Andrieş S., 2006** - *Regimul de fosfor în solurile Moldovei și eficacitatea îngrășămintelor cu fosfor*. Chișinău 48p.
4. **Garg B.K., U. Burman, S. Kathju, 2004** - *The influence of phosphorus nutrition on the physiological response of moth bean genotype s do drought*. Journal of Plant Nutrition and Soil Science 167 503-508.
5. **Gutierrez-Boem F., G. W. Thomas, 1998** - *Phosphorus nutrition affects wheat responses to water deficits*. Agronomy Journal 90 166-171.
6. **Mineev V.G.** Practicul la agrochimie. M., 320p.
7. **Radin J.W., M.P. Eidenbock, 1984** - *Hydraulic conductance as a factor limiting leaf expansion of phosphorus deficient cotton plants*. Plant Physiology 75 372-377.
8. **Payne W.A., M.C. Drew, L.R. Hosner, R.J. Lascano ,A.B. Onken, C. W. Wendt, 1992** - *Soil phosphorus availability and pearl millet water use efficiency*. Crop Science 32, 1010-1015.
9. **Shahandeh H., Hossener, L.R., Turner, F. T., 2003** - *Phosphorus relationships to manganese and iron in rice soils*. Soil Science, 168, 7, 489-500.
10. **Singh D.K., P.W.G. Sale, 2000** - *Growth and potential conductivity of white clover roots in dry soil with increasing P supply and defoliation frequency*. Agronomy Journal 92, 868-874.
11. **Tang C.X., Robson A.D., Dilworth M.G., 1992** - *The role of iron in the Bradzrhzobium legume symbiosis*. Journal of Plant Nutrition 15, 10, 2235-2252.
12. **Tongmin S., Israel D., 1998** - *Phosphorus deficiency effects on response of symbiotic N₂ fixation and carbohydrate status in soybean to atmosferic CO₂ enrichment*. Journal of Plant Nutrition 21, 2207-2218.

ACCUMULATION OF HEAVY METALS BY DIFFERENT PLANT SPECIES IN CONDITIONS OF COPPER EXCESS

ACUMULAREA METALELOR GRELE DE CĂTRE DIFERITE SPECII DE PLANTE, ÎN CONDIȚII DE EXCES DE CUPRU

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Abstract. Trace element content has been determined in the plants of *Vitis vinifera*, clover, alfalfa, mixture of cereal grass crops, growing under Cu excess. It has been shown that Cu excess leads to its accumulation in the roots, which inhibits plant growth and some metabolic processes, retards the transport of trace elements to the above-ground organs of plants, and reduces Fe content in plants. A higher Cu content was accumulated in the plants of clover and mixture of cereal grasses. These crops can be used for phytoextraction of Cu excess. The study was conducted by the financial support of FEN of Moldova, grant #316 and RFFR 08-04-90111.

Key words: trace elements, Cu excess, plants

Rezumat. A fost determinat conținutul de microelemente în organele plantelor de vița de vie, trifoi, lucernă și amestec de ierburi cerealiere, în condiții de exces de Cu. S-a demonstrat că excesul de Cu în sol contribuie la acumularea lui în cantități superoptimale în organele plantelor, ceea ce influențează negativ asupra creșterii și altor procese metabolice, la micșorarea conținutului formelor accesibile ale unor microelemente în plante. Cu reduce transportul Fe către organele aeriene, contribuie la apariția simptomelor de cloroză. Cultivarea plantelor acumulative de Cu (trifoi, graminee furajere) după defrișarea plantațiilor multianuale, poate constitui unul din elementele de perspectivă ale tehnologiei de fitoextragere a acestui element din sol. Cercetările au fost efectuate cu ajutorul financiar din Fondul Ecologic Național, grant 316 și FCFFR 08-04-90111.

Cuvinte cheie: microelemente, exces de Cu, organele plantelor

INTRODUCTION

Anthropogenic environmental pollution is one of the main current problems. Heavy metal pollution of soil presents a great hazard. Accumulation of heavy metals in the superficial soil strata leads to a dynamic disbalance in the soil-plant-atmosphere system, to multiple deviations in the nutritive system, aggravation of population's health. The literature data report that the toxicity of heavy metals due their action on root growth and mitotic activity is represented in the following descendent order: Cu>Cd>Ni>Pb>Al>Zn. Soil pollution with heavy metals in Moldova is caused mostly by the orchards and viticulture

plantations in the agriculture structure. The plantations are repeatedly treated with different pesticides along with copper- and zinc-containing products during the whole agricultural year. A growing tendency towards copper (Cu) pollution has been observed in the Tohatin silvan ecosystem (1). The earlier studies have revealed soil accumulation of copper, fluorine, and lead in super optimal amounts (4, 5 etc.). Cu is especially hazardous since its accumulation in some soils of Moldova by 10-15 times exceeds its concentration in comparison with the normal soils (background). Cu is an indispensable for plants element, it is a component part of a series of enzymes. However, the interval of the positive action of the microelement is very short. In comparison with other microelements, Cu accumulated in relatively small but super optimal amounts may have a toxic effect. The total copper toxicity effect is manifested through the following: tissue injury, decrease of membrane permeability, and loss of soluble substances by roots, reoxidation of lipids and deviations in photosynthesis, production of Cu surplus containing complexes. The aim of the research was to study the influence of Cu surplus on the growth and mineral status in different plants that present an interest for monitoring soil conditions and development of efficient techniques and procedures of their improvement, prevention and avoidance of pollutant penetration in the human's alimentary chain.

MATERIAL AND METHOD

The experimental work was conducted in laboratory and in the vegetative complex of the Institute of Genetics and Plant Physiology, Mold. Acad. Sci. Growing Cu doses (150, 300, 450, and 600 mg/kg soil, concomitant treatments of Cu-1, Cu-2, Cu-3, and Cu-4) were administered in soil in the experiment carried out in the vegetal complex, Grape (cv. Codrinschi), alfalfa (cvs. Polis and Martum), mixture of cereal grass crops, clover (cv. Polis and Avanta) were used. The content of copper and other microelements were measured in soil and plants according to an atom absorption spectrophotometry method.

RESULTS AND DISCUSSIONS

Biomass accumulation by plants is an important index of their state in different growing conditions. The data obtained in monitored conditions report that Cu has a stimulating effect on plant growth up to a certain concentration threshold. This tendency has also been observed by L. Y. Jiang et al. (2008). Further increase of Cu concentration in soil results in reduction of biomass quantity in comparison with the control. It is noteworthy that the growth diminution is more significant at the last dose – Cu-4 for annual plants. Grape is more sensitive to this element: biomass grew by 31,5 % in comparison with the control at the first Cu dose, while at Cu-3, it decreased by 19%.

Inhibition of plant growth under the influence of growing Cu doses is associated with the changes occurring in plant metabolic processes. Evaluation of chlorophyll content in leaves showed that it drops with the Cu dose increase in the nutrient medium.

The content of Cu accessible forms in soil varies significantly and is higher under grape plants (table 1). Intensive accumulation of acid-soluble forms of microelements is observed under the plants that are occasionally treated with different pesticides and fertilizers. Evaluation of Cu content in the soil of experimental pots demonstrated that it grew linearly with the increase of Cu dose introduced in soil. The Cu content was higher (327.5 mg/kg) in the Cu-4 pots where nothing was planted (plantlets' pots).

Absorption of heavy metal ions by plants depends on their concentration in soil. Cu penetration in plants is directed by plant biological particular features: there are plants sensible to copper major concentrations in the environment, tolerant plants and plants that are accumulators of this microelement. Copper quantity in the plant above-ground part, as a rule, varies within lower limits as compared with other heavy metals. However, Cu concentration can reach major values in roots. Detection of Cu-accumulating plants is one of the promising procedures of phytoextraction of toxic element amounts.

Examination of the plants pot grown in the vegetative house has demonstrated a difference between the plants studied and plant organs in view of accumulation of Cu and other microelements (table 2). The element concentration lifted in the high Cu dose treatments in comparison with the control, in the first place, in roots. The highest Cu concentration was revealed in the roots of annual plants, a lower one in grape roots. The Cu content grows simultaneously with the increase of exogenic Cu dose in the roots of cereal grass crops from the beginning, while in Cu-4 it decreases. Alfalfa accumulated quite a large amount of Cu in the above-ground part, as well. Alfalfa has been already mentioned in literature as a Cu-accumulating plant. Our data demonstrate that the Cu concentration in alfalfa aerial organs is 130.4 mg/kg d.w. The total Cu content in roots + aerial organs made 361,42 mg/kg d.w. The roots of this type of plants, in our opinion, do not have the so called threshold of sensibility to Cu.

Evaluation of the content of other microelements in grape organs showed disorders in the plant mineral status caused by Cu surplus. The correlation between the dose of Cu incorporated in soil and Cu and Fe content in the roots of grape grafts is well pronounced. The increase of Cu dose is accompanied by a linear accumulation of this element in roots and decrease of Fe content in this organ. Decrease of Zn content was observed in sprouts, which is likely to be caused by transport inhibition by the above-ground organs. Cu had no significant influence on Mn content in graft organs. Super optimal Cu concentration in soil does not only decrease the content of the Fe accessible for plants but impedes its transport by the above-ground organs.

Table 1

Content of trace elements in soil under the different plants, mg/kg soil

Plant selection	Cu		Zn		Fe		Mn		Ni	
	Acidosol ubile	bufer of acetat	Acidosol ubile	bufer of acetat	acidoso lubile	bufer of acetat	acidoso lubile	bufer of acetat	acidoso lubile	bufer of acetat
Stauceni, ploughed field	2.20	1.80	2,0	0.16	55,0	7,19	65,80	1,20	2,20	0,70
Stauceni – 1, vineyard	68.70	9,90	5,00	1,70	158,00	3,40	114,80	50,50	3,30	1,50
Stauceni – 2, vineyard	69,0	12.00	4,00	0,50	170,00	6,6	110,00	54,10	3,30	1,56
Anenii Noi – 1, vegetable garden	17,20	0,70	6,80	0,17	215,00	7,8	169,9	1,20	5,10	0,80
Anenii Noi – 2, vegetable garden	13,20	0,50	7,60	0,07	255,00	6,7	147,40	2,10	5,00	1,60

Table 2

Content of trace elements in plants under the different doses of CuSO₄ in soil, mg/kg d.w.

Tip of plants	Doze of Cu, introduced in soil	Plant organs	% of ashes	Cu	Fe	Mn	Zn	Ni
Grape	Control	roots	9,43	3,65	101,75	40,54	1,71	3,21
		above-ground parts of seedlings	7,8	2,42	18,25	54,21	1,28	1,60
	Cu - 4	roots	9,55	28,32	67,23	31,03	1,30	2,01
		above-ground parts of seedlings	7,34	2,46	10,20	49,91	1,12	1,92
mixture of cereal grass crops	control	above-ground parts	12,48	5,61	79,75	119,80	1,74	4,24
		roots	26,86	34,91	381,14	286,05	4,20	5,70
	Cu - 4	above-ground parts	6,34	74,17	39,24	51,98	2,21	1,77
		roots	30,79	437,21	162,87	130,85	3,68	6,92
clover (cv. Polis)	control	above-ground parts	9,24	10,62	24,39	62,83	3,23	2,22
		roots	29,64	48,15	154,85	160,25	3,14	2,12
	Cu - 4	above-ground parts + roots	9,27	361,42	66,65	144,14	2,97	2,08

It may be caused by the competition between the two elements by phytosiderophores and/or at xylem loading. Comparison of the data on Fe content in plant organs reliably evidences about the antagonism existing between the two elements. A similar tendency is also observed in annual plants. Reduction of microelement transport from roots to aerial organs in the stress conditions provoked by Cu toxicity is also underlined by other authors (3, 6).

The Cu content was recalculated in plants and the biomass accumulated was recorded. The data confirmed that Cu extraction from soil by annual plants was much higher than that by grape plants. Evaluation of the Cu content remained in the pot soil after experiment termination and calculation of the element extracted from soil by plants permitted us to assess what part of the element introduced in soil was immobilized, in other words, transferred in the forms inaccessible for plants. The calculation showed that about 50% of the Cu introduced in soil was transferred in inaccessible forms.

The current scientific works make it possible to take a series of measures to contribute to decontamination of soil from the accumulate Cu and to avoid penetration of the toxic element into food products. Different measures are utilized in modern agriculture to detoxicate the heavy metal polluted soil: lime treatment of acid soils, phosphoric fertilizer application, soil chiseling, screening for tolerant plants etc. One of the promising procedures is phytoextraction of heavy metals from soil. The plants that accumulate elevated element amounts and produce quite a volume of biomass may be used for extraction. Presently, biological bases and technical conditions are being prepared to develop a procedure of heavy metal excess phytoextraction from soil. The data presented confirm that the problem regarding development of efficient soil decontamination after perennial plantation uprooting is urgent.

Thus, the findings reported demonstrate that Cu surplus in soil contributes to its excessive accumulation in soil and the organs of annual plants and grape, which has a negative impact on plant growth and other metabolic processes, decrease in the content of the accessible forms of some elements in soil, in the first place, Fe and Zn. Cu impedes Fe transport by above-ground organs, decreases Fe content in grape sprouts and leaves and contributes to appearance of visual chlorosis symptoms. Utilization of Cu-accumulating plants (alfalfa, cereal grass crops) after perennial plantation uprooting may serve as one of the promising elements in the technology of Cu phytoextraction from soil.

REFERENCES

1. Calugareanu N., A. Begu. 2004 - *Poluarea cu metale grele a unor ecosisteme silvice din regiunea de Centru a Republicii Moldova. Mediul Ambient*, N 2 (13), 2004, p.11-12.
2. Jiang L. Y., Yang X. E., Chen J. M., 2008 - *Copper Tolerance and Accumulation of Elsholtzia splendens Nakai in a Pot Environment. Journal of Plant Nutrition*, Volume 31, Issue 8, pages 1382-1392

3. **Prasad M., Freitas H., 2000** - *Removal of toxic metals from solution by leaf, stem and root phytomass of Quercus ilex. L. (holly oak)*. Environ. Pollut. 100, #2: 277-283.
4. **Veliksar Sofia, Toma S., 1996** - *Ecologически безопасные методы применения удобрений на виноградниках и в садах*. Chishinau, 45 p.
5. **Veliksar Sofia, Toma S., 2001** - *Vzaimosvrazi mezshdu soderzshaniem microelementov v organah vinogradnih rastenii i v pochve*. Intern. Conference „Soil, climate, crop” Chishinau, p. 12-17.
6. **Zhao Shu-Lan, Duo Li-An, 2002** - *Initial growth effect and ecological threshold of Festuca arundinaceae L. under progressive stress of Cu²⁺ and Zn²⁺*// Shengtai xuebao=Acta Ecol. Sci, 7:1098-1105.

IDENTIFICATION OF PRIMARY PHOTORECEPTORS ADJUSTING THE PHOTOSYNTHETIC APPARATUS BIOENERGETICS TO UV-B RADIATION THROUGH THE CONTROL OF PHOTOSYSTEM II LIGHT HARVESTING COMPLEX

IDENTIFICAREA FOTORECEPTORILOR PRIMARI RESPONSABILI DE AJUSTAREA BIOENERGETICII APARATULUI FOTOSINTETIC LA RADIATIA ULTRAVIOLETĂ B PRIN CONTROLUL COMPLEXULUI DE COLECTARE A LUMINII DIN FOTOSISTEMUL II

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Abstract. Action spectra (from 410 to 730 nm) of the photosynthetic apparatus bioenergetics upon UV-B exposure and during recovery were constructed for the wild type (wt) and a chl-b less mutant (wt-lhc) of *Scenedesmus obliquus*. Our results indicated three primary photoreceptors, specifically the active and inactive protochlorophyllide (620-640/442 nm), a carotenoid absorbing at 535 nm and the reaction center of photosystem I (690-730 nm) as responsible for the tolerance of the photosynthetic apparatus to stress by decreasing the excitation pressure exerted by UV-B on PSII. In contrast, the chlorophylls appeared as primary photoreceptors responsible for the enhanced sensitivity of the photosynthetic apparatus to UV-B. These data suggest that the photosynthetic apparatus sensitivity or tolerance to UV-B radiation could be modulated through the excitation of certain photoreceptors which alters the antenna size and, subsequently, the amount of energy used in photosynthesis or dissipated as heat or fluorescence. In addition, our results indicate the LHCII as a key element for the restoration of the photosynthetic apparatus functionality after UV-B stress.

Key words: photosynthetic apparatus; UV-B stress; *Scenedesmus obliquus*

Rezumat. Spectre de actiune (de la 410 la 730 nm) ale bioenergeticii aparatului fotosintetic au fost construite pentru tipul salbatic si o mutanta deficitara in clorofila b de *Scenedesmus obliquus*, atat pe parcursul cat si dupa expunerea la radiatia ultravioleta B (UV-B). Rezultatele obtinute indica trei fotoreceptori primari si anume: protoclorofilidul activ si inactiv cu absorbtie la 620-640/442 nm, un carotenoid ce absoarbe la 535 nm si centrul de reactie al fotosistemului I cu absorbtie la 690-730 nm ca fiind responsabili pentru toleranta aparatului fotosintetic la UV-B prin scaderea presiunii de excitatie exercitata asupra fotosistemului II. In contrast, clorofilele sunt responsabile pentru senzitivitatea crescuta a aparatului fotosintetic la UV-B. Aceste date sugereaza ca senzitivitatea sau toleranta aparatului fotosintetic la UV-B poate fi modulata prin excitarea anumitor fotoreceptori care altereaza marimea complexului de colectare a luminii (antena) din fotosistemul II si, in consecinta, cantitatea de energie ce poate fi folosita in fotosinteza sau disipata sub forma de caldura sau fluorescenta. In plus, rezultatele noastre indica antena ca fiind un element cheie pentru restaurarea functionalitatii aparatului fotosintetic dupa expunerea la stresul cauzat de UV-B.

Cuvinte cheie: aparat fotosintetic; UV-B stres; *Scenedesmus obliquus*

INTRODUCTION

Ozone depletion due to the pollution of stratosphere by CFC (chlorofluorocarbons) had stimulated the interest for the study of the increased UV-B radiation (280-320 nm) impact on the photosynthetic apparatus. The photosynthesis sensitivity to UV-B or other abiotic stresses depends on the regulation of the balance between the energy absorbed and that used in photochemistry or dissipated as heat. In these processes the light-harvesting complex of PSII (LHCII) has a primordial role. Its role is not only restricted to the capture of photons but it also protects the photosynthetic apparatus against excessive energy flow by dissipating it through a mechanism called non-photochemical quenching (NPQ). Recently, we demonstrated that UV-B tolerance can be induced by decreasing the LHCII size (Sfichi et al., 2004). However, this does not mean that a photosynthetic apparatus lacking the LHCII is more tolerant to UV-B than one characterized by a big antenna. During the investigations of UV-B responses in two strains of green algae *Scenedesmus obliquus*, the wild type (wt) and a mutant lacking the LHCII (*wt-lhc*) we found that the LHCII is absolutely required for the recovery from UV-B effects (Sfichi-Duke et al., 2008). Interesting is also the influence of visible light intensity used as background during UV-B irradiation experiments on photosynthetic responses. For instance, in low-light conditions, the LHC size and energy dissipation rate are high and the photosynthetic efficiency is low. Inverse responses are obtained in high-light conditions (Sfichi et al., 2004). Since the response to UV-B radiation is affected by the photoadaptation status to visible light, the investigation of the primary photoreceptors involved in these responses could provide additional information regarding the contribution of antenna to UV-B sensitivity. For this reason, action spectra (from 410 to 730 nm) of the photosynthetic apparatus bioenergetics in UV-B stress conditions and after additional recovery were constructed for two strains of *Scenedesmus obliquus*, the wild type (wt) and a chlorophyll *b*-less mutant (*wt-lhc*).

MATERIALS AND METHODS

Organism and growth conditions

Cultures of the unicellular green alga *Scenedesmus obliquus*, the wild type and a *wt-lhc* mutant were autotrophically grown in liquid culture medium (Bishop and Senger, 1971) into a temperature-controlled water bath (30°C).

UV-B treatment and recovery

The wild type and *wt-lhc* cultures were exposed for 3 h in dark (D), white light (WL) or in 20 different wavelengths of monochromatic light (ML) of equal intensity (15 $\mu\text{mol m}^{-2} \text{s}^{-1}$). After 3 h of photoadaptation, the UV-B treatment was performed for 90 min using a dose of 0.420 mW cm^{-2} at the surface of the culture. After the cessation of UV-B treatment, the cultures were let for recovery in the same light conditions as those used during UV-B treatment. The UV-B effect was assessed by expressing the values obtained after 90 min of UV-B irradiation as % of the corresponding control values (measured prior to UV-B irradiation). To quantify the LHCII contribution the values obtained for the *wt-lhc* mutant cultures were extracted from those obtained for the wild type. The calculated difference ("Δ") indicated the primary photoreceptors, responsible for the attenuation or amplification of the UV-B effect on the

photosynthetic apparatus by sensing the LHCII. Similarly, the recovery ability regulation after UV-B exposure was also investigated.

Chlorophyll a fluorescence measurements

Rapid Chl a fluorescence transients were recorded at room temperature with high time-resolution PEA (Plant Efficiency Analyzer) fluorometer (Hansatech Ltd., King's Lynn, Norfolk, UK) as previously described by Sfichi et al. (2004). Chl fluorescence kinetics was analyzed with PAM (Pulse Amplitude Modulated) fluorometer (P200, Heinz Walz). The fluorescence F_0 was measured by using a modulated light (ML) with a low intensity ($1 \mu\text{mol m}^{-2} \text{s}^{-1}$). The maximal fluorescence yield, F_m , was induced by a short saturating pulse (SP) of white light ($3000 \mu\text{mol m}^{-2} \text{s}^{-1}$). The maximal fluorescence yield F_w was induced by SP given periodically a t every 30 s during continuous exposure to AL. At the steady state of electron transport, the AL was turned off and a far-red light (FR) was applied to ensure rapid oxidation of Q_A and the fluorescence F_0' was measured. Parameters such as q_P , q_N and Φ_{PSII} have been calculated according to Maxwell and Johnson (2000). Q_B non-reducing centers were calculated according to Melis and Homann (1976).

Determination of the packed cell volume (PCV)

The PCV of a cell suspension was determined as described in Sfichi et al. (2004).

RESULTS AND DISCUSSIONS

Figure 1 shows the polyphasic kinetics of the Chl fluorescence rise from F_0 (O level) to F_m (P level) of a Kautsky curve (Strasser and Strasser, 1995) under white light. Both wild type and *wt-lhc* mutant UV-B irradiated cultures exhibited a significant decrease of the J-P phase. In the wild type, the fluorescence yield recovered within 4 h after the cessation of UV-B treatment. In contrast, there was an irreversible lost of fluorescence yield in the *wt-lhc* mutant.

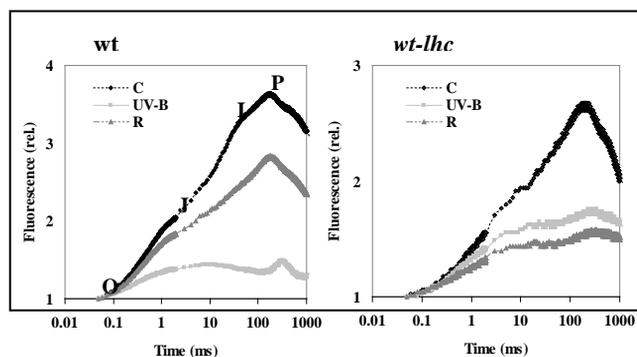


Fig.1. Changes in the shape of OJIP transients in the wild type and *wt-lhc* mutant prior to UV-B irradiation (C), after 3h of UV-B irradiation (UV-B) and after 4 h of additional recovery (R)

The action spectrum obtained for the maximum quantum yield of PSII (F_v/F_m) showed 3 negative peaks (430, 550 and 656 nm) suggesting that mainly chlorophylls (Chl, 656/430 nm) and some carotenoids (Car, 550 nm) from the LHCII could be responsible for this down-regulation. The negative effect of UV-B on the F_v/F_m was reversed at 442, 535 and 620-640 nm. Probably, the two forms of protochlorophyllide (PChlide): free PChlide (620/442 nm) and active PChlide

(640/442 nm) (POR-PChlide-NADPH complex) were involved in the reduction of UV-B effect on the Fv/Fm. There was no significant effect on the Fv/Fm in the (far)red region of the spectrum, suggesting that neither the reaction centers of PSII nor the PSI were involved in the regulation of UV-B effect on the Fv/Fm (Fig. 2A).

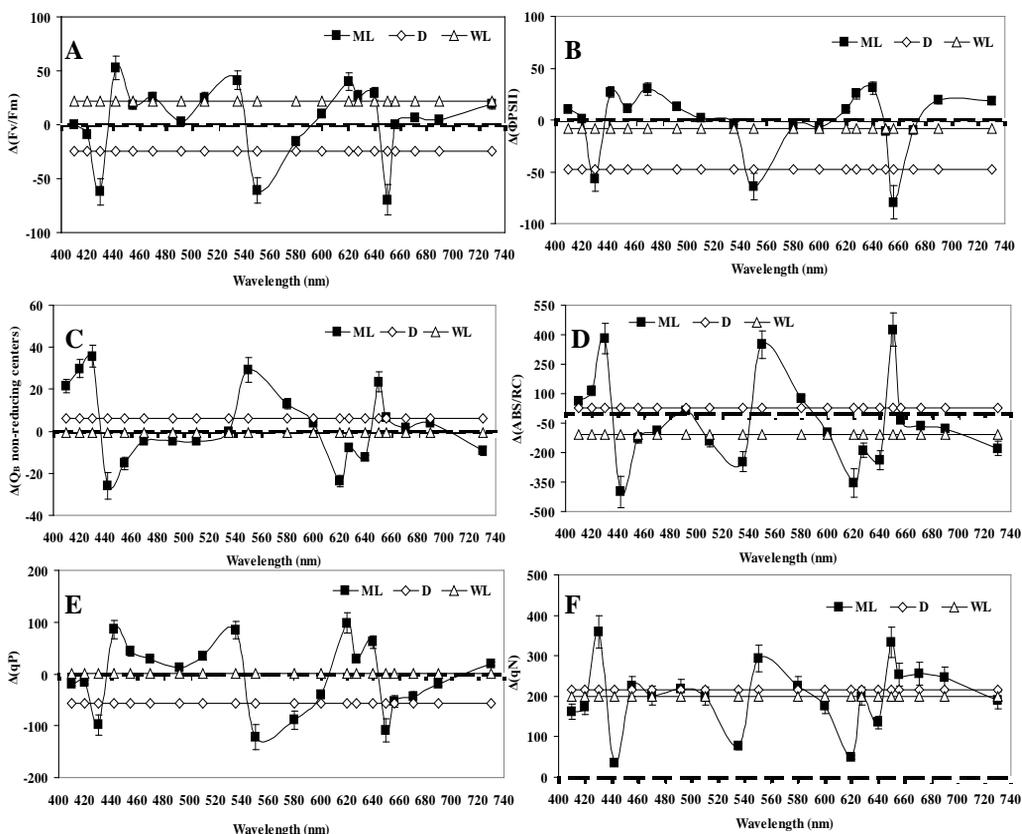


Fig. 2. Action spectrum of the (A) maximum quantum yield of PSII (Fv/Fm), (B) effective quantum yield of PSII (Φ_{PSII}), (C) QB non-reducing centers, (D) functional antenna size (ABS/RC), (E) photochemical quenching (qP) and (F) non-photochemical quenching (qN) after exposure to UV-B radiation.

UV-B radiation also induced the decrease of the operational quantum yield efficiency of PSII (Φ_{PSII}). Upon excitation of PChlides, there was a reduction of the UV-B effect. In contrast, a strong decline in the Φ_{PSII} was found upon irradiation with 656 and 430 nm, suggesting that Chls enhanced the UV-B effect. Reduction of UV-B induced down-regulation of Φ_{PSII} was also seen upon excitation with far red (730 nm) light, suggesting the involvement of PSI in the stimulation of LHCII efficiency (Fig. 2B). In parallel to the down-regulation of quantum yield efficiencies (Fv/Fm and Φ_{PSII}) by UV-B there was an increase in the amount of Q_B non-reducing centers. The action spectrum showed clearly that Chls (656/430 nm) were the primary photoreceptors mediating this effect. In contrast, the stimulation of PChlides (620-

640/442 nm) and PSI (730 nm) preserved the functionality of reaction centers (Fig. 2C).

Light absorbed by Chls (656/430 nm) also increased the functional antenna. As result, there was a decrease in the photochemical quenching (qP) of light energy. Inverse effects were obtained for wavelengths absorbed by PChlides (620-640/442 nm) (Fig. 2D-E) when the qN capacity was decreased (Fig. 2F). Recovery occurred only in the wild type cultures; exception was found for the cultures incubated in light of 656 and 550 nm, which did not recover (data not shown).

The action spectra confirmed our previous finding about the correlation existent between the antenna size and the sensitivity to UV-B (Sfichi et al., 2004). At wavelengths where antenna is small, the photosynthetic efficiency is increased and *vice-versa*. By altering the antenna size, the balance between light energy absorbed versus energy utilized in photochemical reactions (qP) or dissipated as heat (qN) could be regulated. For instance, upon excitation with ML of 442 nm and 620-640 nm there is an increase in the qP in parallel to the diminution of qN. The photoreceptors sensitized by these wavelengths are the free protochlorophyllide (inactive PChlide absorbing in 620/442 nm) and the “active” Pchlide (absorbing in 640/442 nm). Probably, they are involved in the capture of the excitation energy but they do not transfer this energy to chlorophylls of the LHCII (because they are not constituents of the LHCII) and therefore, they contribute to the minimization of the PSII over excitation. Also, it is possible that at least a part of the excitation light energy absorbed by the active PChlide is used for its conversion to chlorophyllide (Chlide) (Kotzabasis et al., 1990). In this way, the PSII excitation pressure (described as $1-qP$) is decreased and the quantum yield efficiencies of PSII increased. Additionally to PChlides, the action spectra revealed the possible involvement of a carotenoid, which by excitation at 535 nm leads also to an increase in the photochemical quenching capacity, probably due to the efficiency of light capture. A high qP also expresses a high ability to produce energy sources that can be used for repair and the cell can further cope with the enhanced UV-B. As result of excitation pressure decreasing, the antenna size also decreased in order to minimize the energetic losses through the non-photochemical quenching. Consequently, upon the excitation of certain photoreceptors (PChlides, PSI and Car) with adequate ML (620-640/442, 535 and 700 nm) the photosynthetic apparatus became more tolerant to UV-B radiation.

According to our previous works (Sfichi et al., 2004) two mechanisms may contribute to the increase in the antenna size upon UV-B irradiation: i) the increase in the LHCII size and ii) the transformation of the Q_B non-reducing centers in dissipative sinks for the excitation energy. While in the wild type culture, both mechanisms are found upon UV-B irradiation, in the *wt-lhc* mutant only the second one is present (Sfichi-Duke et al., 2008). However, this mechanism could not offer enough protection to UV-B since the mutant did not recover after the treatment. As previously demonstrated (Sfichi-Duke et al., 2008), recovery requires the participation of the LHCII which upon UV-B treatment increases its oligomerization state. The LHCII trimers have a high potential for energy dissipation (Pascal et al., 2005). Probably, the changes in the LHCII upon UVB treatment contribute to conformational re-adjustments of

PSII units within the thylakoid membranes that assure not only the dissipation of excess energy but also to the repair of damage. It seems that the importance of LHCII in the mechanism determining the degree of sensitivity to UV-B consists not only of its capacity to keep the balance between energy captured and used at reaction centers, but also it may be involved in structural re-adjustments that stabilize the thylakoid membranes in UV-B stress conditions.

CONCLUSIONS

Based on the preceding data, the main conclusions that can be drawn here are:

1. A higher excitation pressure is compensated by an efficient system of photochemical/non-photochemical energy quenching that is assured in the presence of LHCII.

2. A photosynthetic apparatus without LHCII has no potential to recover the damage induced by UV-B.

3. Three primary photoreceptors (active and inactive PChlide, carotenoids absorbing at 535nm and the reaction center of PSI) increase the tolerance of the photosynthetic apparatus to UV-B by decreasing the excitation pressure exerted on PSII by UV-B.

4. Chlorophylls (Chl *a* and *b*) are primary photoreceptors responsible for the enhanced sensitivity of the photosynthetic apparatus to UV-B radiation.

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REFERENCES

1. Bishop N.I., Senger H., 1971 - *Methods in Enzymology*, vol 23, Part A. Acad Press, New York, 53-66.
2. Kotzabasis K., Senge M., Seyfried B., Senger H., 1990 - *Preparation and photosynthetic properties of synchronous cultures of Scenedesmus*. Photochem. Photobiol. 52, 95-101.
3. Maxwell K., Johnson G.N., 2000 - *Chlorophyll fluorescence - a practical guide*. J. Exp. Bot. 51, 659-668.
4. Melis A., Homann P.H., 1976 - *Heterogeneity of the photochemical centers in system II of chloroplasts*. Photochem Photobiol 23, 343-350.
5. Pascal A.A., Liu Z., Broess K., van Oort B., van Amerongen H., Wang C., Horton P., Robert B., Chang W., Ruban A., 2005 - *Molecular basis of photoprotection and control of photosynthetic light-harvesting*. Nature 436, 134-137.
6. Sfichi L., Ioannidis N., Kotzabasis K., 2004 - *Thylakoid-associated polyamines adjust the UV-B sensitivity of the photosynthetic apparatus by means of light-harvesting complex II changes*. Photochem Photobiol 80, 499-506.
7. Sfichi-Duke L., Ioannidis N.E., Kotzabasis K., 2008 - *Fast and reversible response of thylakoid-associated polyamines during and after UV-B stress – a comparative study of the wild type and a mutant lacking chlorophyll b of unicellular green alga Scenedesmus obliquus*. Planta 228, 341-353.
8. Strasser B.J., Strasser R.J., 1995 - *Photosynthesis: from Light to Biosphere*, Vol V. pp 977-980. Kluwer Academic Publishers, The Netherlands.

STUDIES REGARDING THE MITOTIC DIVISION AND CHROMOSOMAL ABERRATIONS AT *ECHINACEA ANGUSTIFOLIA* D.C.

STUDII PRIVIND DIVIZIUNEA MITOTICĂ ȘI ABERAȚIILE CROMOSOMIALE LA *ECHINACEA ANGUSTIFOLIA* D.C.

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Abstract. Native to North America, *Echinacea* species have an important place in herbal medicine. *Echinacea* has long been used by Native Americans to treat many conditions, including venomous bites, rabies, cold, headache, and stomach cramps (Foster, 1991; Kindscher, 1989; Li, 1998). Its non-selective, immune-enhancing properties have promoted the use of and demand for *Echinacea* products in recent years and, consequently, its field production. Understanding the cytogenetics of the plant has a key role for controlling the „in vitro” behavior of different explants by a better understanding of the influence of these peculiar conditions over the growth processes. *Echinacea angustifolia* plants are diploids with a somatic chromosome number of $2n = 22$. The study focused toward the determination of the main cellular indexes (mitotic index, prophase index, metaphase index, telophase index and anaphase index) as indicators of growth and development processes speed. In order to have more accurate results, the studies were accomplished in the root meristematic tips on three different plants, originated from Vegetable Research and Development Station Bacău, Romania.

Key words: anaphase, telophase, metaphase, genotype, development.

Rezumat. Native în America de Nord, speciile de *Echinacea* au o importanță majoră în medicina naturistă. Utilizarea plantelor de *Echinacea* are rădăcini adânci, fiind folosită prima dată de indieni pentru tratarea diferitelor boli, inclusiv mușcăturile veninoase, rabie, răceală, dureri de cap și crampe stomacale (Foster, 1991; Kindscher, 1989; Li, 1998). Proprietățile lor de stimulare a imunității au determinat creșterea popularității acestor plante, cererea de produse pe bază de *Echinacea* fiind din ce în ce mai crescută, ceea ce a condus în mod firesc la creșterea suprafețelor destinate producerii lor. Determinarea aspectelor citogenetice ale unei plante joacă un rol crucial într-o mai bună înțelegere a principiilor care stau la baza dezvoltării lor, precum și a modului în care condițiile specifice de cultivare „in vitro” afectează aceste procese de creștere și dezvoltare. După cum este bine cunoscut, plantele de *Echinacea angustifolia* D.C. sunt plante diploide, cu un număr de cromosomi somatici $2n=22$. Prezentul studiu se referă la determinarea principalilor indici celulari (indicele mitotic, indicele profazic, metafazic, anafazic și telofazic), ca indicatori ai vitezei proceselor de creștere și dezvoltare. Pentru o mai mare acuratețe a rezultatelor testele au fost realizate în meristemele radiculare aparținând la trei plante diferite provenite de la Stațiunea de Cercetare Dezvoltare pentru Legumicultură Bacău, Romania.

Cuvinte cheie: anafază, telofază, metafază, genotip, dezvoltare.

INTRODUCTION

Cultivation of *Echinacea* has gained a great importance at international level and it is more and more cultivated in many countries, including the United States, Canada, Germany, Norway, Romania, Finland, Australia, Poland, Russia, New Zealand, Egypt, and China (Dou et al., 2001). The importance of the plant is due to its multiple therapeutic utilities: including venomous bites, rabies, cold, headache, and stomach cramps. But, even most important is its utility in enhancing the immunity of the organisms.

In addition to its medicinal uses, *Echinacea* has enormous ornamental potential. *E. purpurea*, the only species for which ornamental cultivars have been bred, is both productive and profitable as a field grown specialty cut flower (Starman et al. 1995). In fact, *E. purpurea* is the only species of the genus which has been domesticated thus far. It is interesting to note that the cultivars of *E. purpurea* that are now in production as source materials for herbal extracts were actually developed for ornamental purposes. Commercial field plantings of the other species in the genus have been sown from generally unimproved, wild seed. Plant breeders have an important task and a number of challenges before them.

Echinacea species are hardy, herbaceous perennials with either simple or branched stems. The terminal single flowering heads have fertile disc florets that terminate in spines (paleae). These are surrounded by infertile drooping or spreading ray flowers that have 2 or 3 teeth at each end. The leaf shape varies from lanceolate to ovate, its margin may be dentate and the leaf may be pubescent or smooth. Roots are either single taproot or fibrous in form (6–11).

Since the increasing development of genetic methods, the chromosomal data has become a valuable tool both for cytogenetic specialists and for breeders. These studies focused on chromosomes are often employed for suggesting taxonomic and phylogenetic relationships (Stuessy, 1990). Until now, at *Echinaceae* species, few information are available regarding the main cellular indexes like: mitotic index, prophase, metaphase, anaphase, telophase index, the incidence of abnormalities in normal cells, chromosome features and behaviour, phylogenetic of the cultivars, etc. The rate of cell division has been depicted to reflect the rate of increase in size and weight. In addition, good mitotic indexing will generate information available for a better characterization of *Echinacea angustifolia* germplasm collections. In generally, good knowledge of the *Echinacea* genomes is a quite important goal for the establishment of a sound approach to its improvement.

MATERIAL AND METHODS

Root tips from germinating seeds were used for chromosome preparation. *Echinacea angustifolia* var. *angustifolia* seeds were provided by Vegetable Research and Development Station Bacau, Romania.

The cytogenetic studies were accomplished in meristematic root cells, stained in Carnoy fixing solution for 24 hours at 4°C then hydrolyzed with HCl for 7 minutes and colored with the basic coloring solution Carr. The root meristems were displayed using squash technique and for each genotype and variant 2000 cells were counted.



Fig. 1. The biological material utilized in our experiments (seeds – before and after the germination)

Chromosome slides were then observed microscopically. Numbers of dividing cells at different levels of mitosis were recorded. Mitotic data were subjected to statistical analysis by calculating the mitotic index (% cells in division per total number of examined cells), prophasic index (% cells in prophases per total number of examined cells), metaphasic index (% cells in metaphases per total number of examined cells), anaphasic index (% cells in anaphase per total number of examined cells) and telophasic index (% cells in telophase per total number of examined cells). In the same time we monitored the incidence of abnormalities in ana-telophasic stage.

RESULTS AND DISCUSSIONS

The main indexes (mitotic index, prophasic index, metaphasic index, anaphasic index, telophasic index) calculated for each plant are shown in table 1, 2.

Table 1
The number of cells identified in different phases of mitotic cycle at *Echinacea angustifolia* D.C. plants

Variant	Total no of cells analyzed	Interphase	No. of cells in active division	Repartition of cells in different division phases			
				P*	M*	A*	T*
Plant 1	2010	1623	387	209	108	43	27
Plant 2	1980	1589	391	206	104	47	34
Plant 3	2045	1629	416	221	116	45	34
Media	2012	1614	398	212	109	45	32

* P – prophase, M – metaphase, A – anaphase, T - telophase

Table 2
The values of the main indexes registered in the meristematic cells of *Echinacea angustifolia* D.C. plants

Variant	IM	Repartition of cells percentage/phases of division			
		%P	%M	%A	%T
Plant 1	19,25	54,00	27,90	11,11	6,97
Plant 2	19,75	52,68	26,59	12,02	8,69
Plant 3	20,33	53,12	27,88	10,81	8,17
Media	19,78	53,27	27,46	11,31	7,94

At all the three plants utilised in our research the values obtained are similar, which denotes the fact the values of media calculated for each type of index are the correct one that represents the characteristic of the repartition of cell phases in the experimental condition tested in the present study.

As it is shown also in table 1 and 2 most of the cells are in prophase (53.27%), followed by metaphase (27.46%), anaphase (11.31%) and telophase (7.94%) - fig. 3-8. The value of the mitotic index was 19.78, which denotes that the plant was in a phase of active growth.

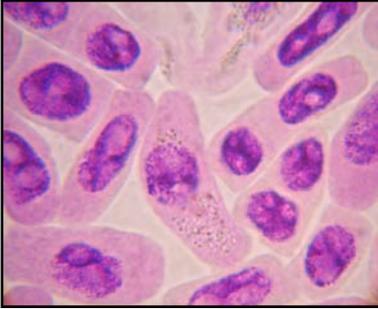


Fig. 3. Cells in interphase



Fig. 4. Cells in prophase



Fig. 5. Cells in methaphase



Fig. 6. Cells in anaphase

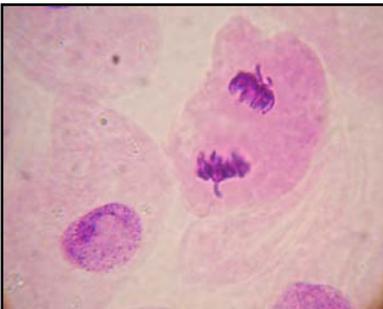


Fig. 7. Cells in telophase

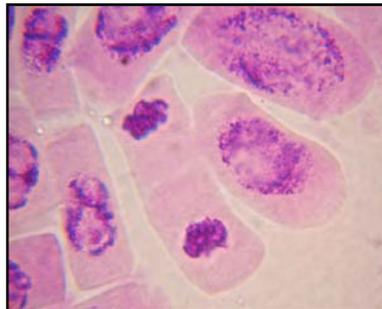


Fig. 8. Cells in late telophase

In what concern the main types of abnormalities observed in the root cells of *Echinacea*, most of them were ana-telophases with simple or multiple bridges

and ana-telophases with fragments, but also expelled or late chromosomes and multipolar ana-telophases – table, 3 and figure 9 - 12.

Table 3

The frequency of cells with chromosomal aberrations and their spectrum identified in the ana-telophase of *Echinacea angustifolia* D.C. plants

Variant	Total studied	A-T	A-T aberrance %	$\bar{x} \pm s$	from which	
					A-T with bridges%	A-T with fragments%
Plant 1	158		4,43	4,96±0,07	54,2	36,8
Plant 2	192		2,60	2,84±0,06	48,1	51,8
Plant 3	153		1,57	1,57±0,05	50,3	49,5

All the three plants had the same cytogenetic behaviour, the frequency of chromosomal aberrations in ana-telophase being relatively low. The main types of abnormalities were A-T with bridges.

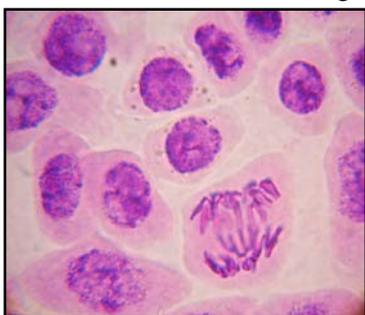


Fig. 9. A-T with multiple bridges

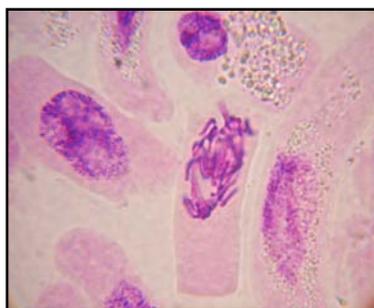


Fig. 10. Disorganised ana-telophase



Fig. 11. A-T with multiple bridges

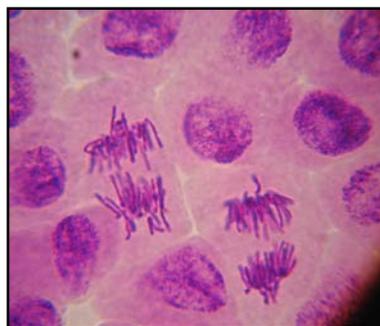


Fig. 12. A-T with delayed chromosomes

But we also observed metaphases with lagging chromosomes, expelled chromosomes or ring chromosomes, multipolar ana-telophases, as well as binucleate cells and interphases with micro-nucleuses – fig. 13 and 14.

In a smaller number we detected prophases that presented different types of chromosomal aberrations like late prophases, with ring chromosomes, expelled chromosomes etc.

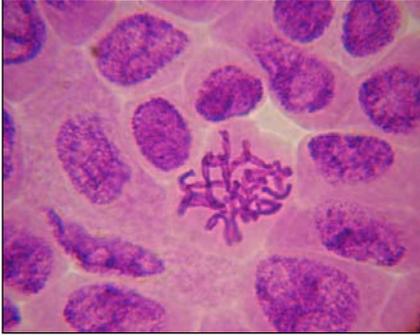


Fig. 13. C-metaphase

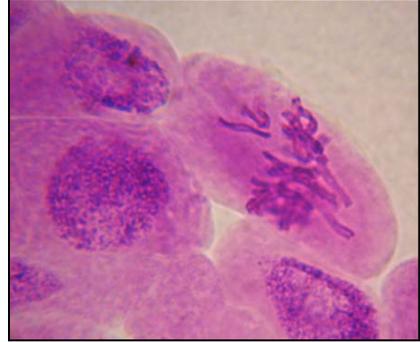


Fig. 14. Metaphase with expelled chromosomes

CONCLUSIONS

The study focused toward the determination of the main cellular indexes (mitotic index, prophase index, metaphase index, telophase index and anaphase index) as indicators of growth and development processes speed. In order to have more accurate results, the studies were accomplished in the root meristematic tips on three different plants, originated from Vegetable Research and Development Station Bacău, Romania.

The results obtained in our study showed that most of the cells are in prophase (53.27%), followed by metaphase (27.46%), anaphase (11.31%) and telophase (7.94%) - fig. 3-8. The value of the mitotic index was 19.78, which denotes that the plant was in a phase of active growth.

In what concern the main types of abnormalities observed in the root cells of *Echinacea*, most of them were ana-telophases with simple or multiple bridges and ana-telophases with fragments, but also expelled or late chromosomes and multipolar ana-telophases. But we also observed metaphases with lagging chromosomes, expelled chromosomes or ring chromosomes, multipolar ana-telophases, as well as binucleate cells and interphases with micro-nucleuses. In a smaller number we detected prophases that presented different types of chromosomal aberrations like late prophases, with ring chromosomes, expelled chromosomes etc.

REFERENCES

1. **Kindscher K., 1989** - *Ethnobotany of purple coneflower (*Echinacea angustifolia*, Asteraceae) and other *Echinacea* species*. Econ. Bot.;43:498–507.
2. **Li M., M. Zhang, 1991** - *Technology for plant chromosome research*. Northwest Forest Univ. Press, Shenyang, China. p. 31–39.
3. **Tuna M., Gill K.S, Vogel K.P., 2001** - *Karyotype and C-banding patterns of mitotic chromosomes in diploid bromegrass (*Bromus riparius* Rehm)*. Crop Sci.;41:831–834.

INVESTIGATION OVER THE IN VITRO MORPHOGENETIC REACTION OF LAVANDER (*LAVANDULA ANGUSTIFOLIA* L.) EXPLANTS

INVESTIGAȚII PRIVIND REACȚIA MORFOGENETICĂ “IN VITRO” A EXPLANTELOR DE LAVANDĂ (*LAVANDULA ANGUSTIFOLIA* L.)

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Abstract. *Lavander (Lavandula angustifolia L.) is a perennial semi-bushy herb that belongs to Lamiaceae family with a mediterranean origin. The plant is grown in Romania for its active principles contained in its inflorescences, more specific for its volatile oil. The importance of this plant is due to its antiseptic, carminative, sedative, antispastic, diuretic, colagogue effect. Due to the fact that lavender cultures can be accomplished with generative or vegetative multiplied plants (though cuttings) the “in vitro” multiplication is quite an important and challenging task. In our study, different combinations of growth hormones were tested in order to achieve regeneration structures from young tissues of lavender. Kinetin (KIN) and α -naphthaleneacetic, Kinetin (KIN) and indolilacetic acid (IAA), or benzilaminopurine (BA) and NAA or IAA, zeatine were added to basic medium composed of full strength MS salts, MS vitamins, 3% sucrose and 0,8% agar-agar. Young explants (shoot tips, binodal explants and leaves), derived from mother plants grown in controlled conditions, were cultivated on these media. The morphogenetic response is highly dependent on the initial explants, hormones used in the media, genotype, and environmental conditions.*

Key words: micropropagation, uniformity, stability, homogeny, BAP.

Rezumat. *Lavanda (Lavandula angustifolia L.) este o plantă ierboasă semi-arbustă, perenă care aparține familiei Lamiaceae, având o origine mediteraneeană. Planta este cultivată în România datorită principiilor sale active conținute în inflorescențe, mai specific datorită uleiurilor sale volatile. Importanța plantei este datorată proprietăților sale antiseptice, carminative, sedative, antispastice, diuretice, cu efect colagog. datorită faptului lavanda poate fi cultivată pe cale generativă și vegetativă (prin butași) multiplicarea „in vitro” este un obiectiv important fiind de-a lungul timpului scopul a numeroase cercetări. În studiul nostru au fost testate diferite combinații de hormoni de creștere în scopul regenerării de plante noi pornind de la explante tisulare de lavandă. Astfel diferite concentrații și combinații de kinetină (KIN) și α -naphthaleneacetic, kinetină (KIN) și acid indolilacetic (IAA), sau benzilaminopurină (BA) și NAA sau IAA, zeatină au fost adăugate mediului de cultură de bază MS, vitamine MS, zaharoză 3% și agar 0,8%. Explantele de tip apex, explante uninodale și frunze au fost recoltate de la plante mamă crescute în condiții controlate și apoi au fost cultivate pe aceste medii. Răspunsul morfogenetic a depins atât de explantul inițial cât și de hormonii utilizați, genotip sau condițiile de mediu.*

Cuvinte cheie: micropropagare, uniforme, stabile, omogene, BAP.

INTRODUCTION

Lavender species of commercial importance are native to the mountainous regions of the countries bordering the western half of the Mediterranean region of Europe. The name "lavender" comes from the Latin verb *lavare* "to wash" or "to bathe." There are approximately 20 species of lavender with hundreds of various genotypes differentiated by variations ranging from growth form to chemical composition of essential oil. The traditional uses of lavender range from use as a perfume to an antimicrobial agent. This powerful and potent herb has been utilized throughout antiquity and is still retained as a common household ingredient today. Recent studies have found that essential oils from this extraordinary species can replace chemical methods currently in use to suppress sprouting in potato tubers for storage (Vokou, 1993). In bioactivity studies in India, *lavandula* species have been proven to show potent activity against insect pests (Sharma et al., 1992). Another study in Austria provided evidence of the sedative effects of the essential oil of lavender after inhalation (Buchbauer et al., 1992). Currently, the majority of lavender products are utilized for essential oil production and for their aromatic properties.

The growing demand for natural products has intensified studies on the selection of native *Lavandula* plants and their economic exploitation. *In vitro* cultures have been employed for the production of secondary metabolites, medicinal and aromatic compounds of a number of *Lavandula* species (Segura and Calvo, 1991).

Micropropagation is used routinely to generate a large number of high-quality clonal agricultural plants, including ornamental, medicinal and vegetable species. Micropropagation has significant advantages over traditional clonal propagation techniques. These include the potential of combining rapid large-scale propagation of new genotypes, the use of small amounts of original germplasm (particularly at the early breeding and/or transformation stage, when only a few plants are available), and the generation of pathogen-free propagules.

Plant regeneration *in vitro* is dependent on the manipulation of the inorganic and organic constituents in the medium, as well as the type of explant and the species. In most plants, successful regeneration from the callus or directly from the explants takes place after a series of subcultures in various media, in a sequence which is often specific to the species, variety, or the newly introduced genotype. The determining factors are the combination of the concentration in relation to medium volume and the composition of growth promoting and retarding regulators in the medium, the physiological status and competence of the cells and their capability for morphogenetic expression.

Although *Lavandula* species can be vegetatively propagated, the poor rooting ability of stem cuttings, as well as the lack of selected clones, limits its industrial exploitation (Segura and Calvo, 1991).

In order to achieve these important goals, a primordial condition is the establishment of a viable and rapid multiplication technology, specific for each species, which should allow the regeneration of a sufficient number of plants in the shortest period of time.

MATERIAL AND METHODS

The source of explants utilised for the initiation of the “in vitro” cultures of *Lavandula angustifolia* is represented by plants supplied by Vegetable Research and Development Station Bacau.

For initiating the “in vitro” culture, the lavender explants were sterilized for 15 minutes in 0.1 % mercury chloride solution; subsequently, they were washed three times with sterile distilled water and inoculated on the ground nutritive medium Murashige-Skoog (1962) - fig. 1 and 2.



Fig. 1. Explants excised from mother plants



Fig. 2. Sterilization of explants

For testing the morphogenetic reaction, mature plants grown under controlled conditions (temperature, humidity, light, etc) were used as mother plants. Different types of explants were excised: shoot tips, binodal explants and leaves.

Explants were cultivated on MS medium solidified with 8.0 g/l of agar, having succrose (30 g/l) as carbon source; the medium was supplemented with growth regulators in various concentrations and combinations (table 1).

The pH was adjusted to 5.8 prior to the addition of the agar and autoclaved at 121°C (1.06 kg/cm²) for 25 min.

Cultures were then incubated at 26±1°C, a 16-h photoperiod, and 5000 lx light intensity.

Table 1

Variants of nutritive medium with different hormonal factors utilized for “in vitro” cultivation

Components	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈
Macro elements	Murashige and Skoog, 1962							
Microelements								
Vitamins	Murashige and Skoog, 1962							
KIN	2.0	2.0	2.0	-	-	-	-	-
BAP	-	-	-	2.0	2.0	-	-	-
Zeatine	-	-	-	-	-	2.0	2.0	2.0
NAA	-	0.5	-	0.5	-	-	0.5	-
IAA	-	-	0.5	-	0.5	-	-	0.5

The rooted plantlets obtained on different nutritive medium were transferred to hydroponics conditions in bottles for acclimatization. The pots with the hydroponic solution (that contained Previcur 0.15%) were covered with clear bags to provide 100% relative humidity. They were placed in an acclimatization room under a 16/8 h photoperiod at 20 - 23°C. The acclimatized plants were planted in a potting mixture of

sterilized sand + vermiculite (1:1 ratio) in plastic cups, hardened in a mist chamber (80% relative humidity) for 2 weeks before transfer to green house.

RESULTS AND DISCUSSIONS

The morphogenesis potential of shoot tips, binodal explants and leaves of lavender cultivars was estimated. Occurrence of the first regenerated shoots was observed 13 - 18 days after cultivation.

We investigated the morphogenetic reaction of the shoot tips, under different hormonal formulae. Not all the inoculated explants had the same morphogenetic reaction, due to the fact that there are functional differences between the similar morphologic explants. In this stage of ontogenetic development there are different particularities in the organogenesis reaction of the explant, particularities that lies on the specific totipotence of each explant.

On the other hand, a part of the tips were eliminated due to their gradual degeneration (reaching to necrosis), or to the secondary contamination of the recipients. The morphogenetic reaction of *Lavandula angustifolia* explants was favorable, the initiation and development of the regenerative structures were followed by the rapid development of the neopropagules.

On the medium supplemented with KIN, the explants did not show a remarkable response. At the contact of the stem with the nutritive medium that contains NAA a small, compact, cream-coloured callus sporadically appeared. In spite of the increasing size of the apexes, L1 and L2 medium, characterized through the presence of kinetin inhibited the organogenesis.

The medium L7 (zeatine – 2 and NAA – 0.5), determined shoot development and the appearance of the true leaves, but the process of caulogenesis is still weakly represented. The leaves became white-yellowish and they dried in time. On all these variants, the size of the shoots, at the same age, is smaller than on medium with BAP alone or in combination with IAA.



Fig. 3. Explants inoculated on the culture medium with zeatine

The nutritive medium supplemented with 2 mg/l⁻¹ zeatine (L6) – fig.3, provided a good growth and development of the shoots, which present a vigorous aspect. On all medium variants that contained benzilaminopurine as the main growth regulator the morphogenetic reaction is focused toward the regeneration of new shoots that evolutes rapidly in fully formed plants.

The shoots regeneration was accomplished through the neoformation of adventive shoots (at the basis of the inoculated tips) as well as through the multiple axillary sprouting (through the development of pre-existent meristematic centers). A part of the regenerated sprouts were cultivated on fresh cultivation mediums in order to continue the regenerative processes. Gradually the shoots that were at the best stage of development were inoculated on rooting medium, which should allow the initiation and development of roots.

The morphogenetic reaction of binodal explants fragments on the medium MS supplemented with several hormonal formulae was mainly oriented toward the obtaining of new shoots. Contrary to expectations based on the results obtained on other plant species the weakest reaction of this type of explants was recorded on the MS medium supplemented with 2.0 mg/l^{-1} kinetine. The best morphogenetic reaction showed the binodal explants grown on nutritive medium supplemented by BAP and zeatine alone or in combination with 0.5 mg/l^{-1} IAA. The green colour of the explants became more intense and none of the explants presented at this time callus.

The leaf explants placed on MS medium supplemented with 2 mg/l^{-1} kinetin formed a quite friable callus, cream-coloured, with reduced proliferation. IAA induced, on the other hand, an intense root generation. The supplementation of the nutritive medium with zeatin influenced callus generation processes and organogenesis processes. On all the tested nutritive variants the morphogenetic reaction of leaf explants was low and is not recommended for the initiation of an “in vitro” culture focused toward the regeneration of true to type plants.

Regarding the influence of the hormonal formulæ, the best morphogenetic reaction was obtained on the variants that contained as growth regulators the BAP and IAA. These hormones allowed both in tips and hypocotyls the development of meristematic centres that rapidly evolved in shoots. Direct bud formation was observed in explants cultured on MS medium added with BAP – fig. 4. The combination of BAP with IAA increased the percentage of regeneration and the development of the explants. The substitution of IAA with NAA was not active in a medium added by BAP. While, the substitution of BAP with KIN (associated with NAA or IAA) determined the initiation of callogenesis without bud formation.

Optimum values for shoot induction, both from shoot tips and uninodal explants were obtained on MS medium, supplemented with BAP - 3 mg/l^{-1} and 1 mg/l^{-1} IAA – fig.5. One hundred percent of explants cultured on this medium turned green and showed a good differentiation.

Regenerated plants were transferred on hydroponics medium and kept about four days covered with a plastic foil, in the culture room. Subsequently, they were day by day acclimatized to room atmosphere.



Fig. 4. Morphogenetic reaction on medium with BAP

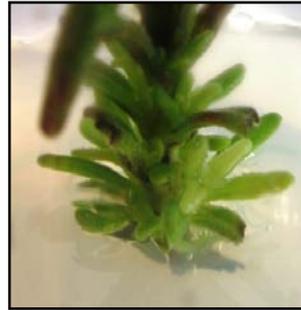


Fig. 5. Direct regeneration of shoots from binodal explants

CONCLUSIONS

Our investigation regarding the “in vitro” morphogenetic reaction of *Lavandula angustifolia* showed that the best explant for the initiation of the cultures are the shoot tips.

The researches finalize through the obtaining of viable plants through direct organogenesis. The capacity of regeneration is strongly depending on the type and quantity of exogenous hormones. The best morphogenetic reaction was obtained on the variants that contained as growth regulators the BAP and IAA. These hormones allowed both in tips and hypocotyls the development of meristematic centres that rapidly evolved in shoots. Optimum values for shoot induction, were obtained on MS medium, supplemented with BAP - 3 mg/l⁻¹ and 1 mg/l⁻¹ IAA. One hundred percent of shoot tips cultured on this medium turned green and showed a good differentiation. Good results were also obtained on medium variants supplemented with zeatin alone or in combination with IAA.

The obtained experimental results encourage the continuation of the researches for the determination of all the factors that can influence the regeneration process (genotype, explant etc). This should allow the establishment of a rapid and efficient propagation technology that permit the regeneration of a large number of plants, in short term, plants that have the same genetic background as the parental plants.

REFERENCES

1. **Dias M.C., Almeida R., Romano A., 2002** - *Rapid clonal multiplication of Lavandula viridis L'Hér through in vitro Axillary shoot proliferation*. Plant Cell Tissue and Organ Culture 68: 99-102.
2. **Echeverrigaray S., Basso R., Andrade L.B., 2005** - *Micropropagation of Lavandula dentata from axillary buds offield-grown adult plants*. Biologia Plantarum 49(3): 439-442.
3. **Gorge E.F., 1996** - *Plant Propagation by Tissue Culture*. Exegetics Ltd, Edington, Wilts, England, pp 937-954.
4. **Murashige T., Skoog F., 1962** - *A revised medium for rapid growth and biossay with tobacco tissue culture*. Physiol. Plant. 15: 473-497.

NEW ACHIEVEMENTS IN PEACH BREEDING AT RESEARCH STATION FOR FRUIT GROWING CONSTANTA

NOI REALIZĂRI ÎN AMELIORAREA PIERSICULUI LA STAȚIUNEA DE CERCETARE-DEZVOLTARE PENTRU POMICULTURĂ CONSTANȚA

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Abstract. *In the last 15 years more 1,100 peach and nectarine cultivars have been released worldwide. A complex peach breeding program taken place at Research Station for Fruit Growing Constanta more then 30 years. The main objectives of this program focus on two important fruit traits in the broadest sense of the term: quality and resistance to diseases, pests and environmental stress. Annually, the researchers selected the best genitors and made many hybridations, self pollinations and clonal selections in the experimental fields, in order to obtain new cultivars. So, 27 new peach, paviu, nectarine and brugnone cultivars were registered at R.S.F.G. Constanta, which grow rich and improve the actual assortment. This paper presents four new valuable peach and nectarine cultivars with flat fruit: Monica, Creola, Marina and Liana. We recommend these new cultivars for extending in production and for family orchards. The fruits are very good as for fresh consumption, as for processing, too.*

Key words: peach breeding, cultivar, flat fruit, fruit quality

Rezumat. *În ultimii 15 ani în lume s-au realizat circa 1100 de soiuri noi de piersic și nectarin. Un program complex de ameliorare a piersicului se desfășoară la S.C.D.P. Constanța de peste 30 ani. Obiectivele principale sunt calitatea fructelor și rezistența soiurilor atât la boli și dăunători, cât și la condițiile de stress ale mediului ambiant. În fiecare an au fost selectați cei mai buni genitori și s-au realizat numeroase combinații hibride, autopolenizări, selecții repetate în câmpurile de hibrizi și selecții clonale în câmpurile experimentale. Rezultatele obținute de echipa de amelioratori s-au concretizat în obținerea a 27 soiuri de piersic, pavii, nectarine și brugnone, care îmbunătățesc și diversifică actualul sortiment. În această lucrare sunt prezentate patru soiuri noi valoroase de piersic și nectarin cu fructul plat: Monica, Creola, Marina și Liana. Recomandăm cultivatorilor aceste soiuri, ale căror fructe sunt destinate atât consumului în stare proaspătă, cât și procesării.*

Cuvinte cheie: ameliorarea piersicului, soi, fruct plat, calitatea fructului.

INTRODUCTION

A complex peach breeding program taken place at Research Station for Fruit Growing Constanta having as aim the peach culture improvement as well as by obtaining new cultivars and by planting new orchards with these new obtained varieties, too.

MATERIAL AND METHOD

The best genitors were been selected from National Peach Collection located in Valu lui Traian, Constanta. This contents 855 genotypes; hybrids fields; seven comparative trials with 93 valuable genotypes etc. Annually, the reserchers made many hybridations and selections in the experimental fields, in order obtain new cultivars.

The biological material was observed from the phenological point of view.

The valuable genotypes obtained were used to organize competition crops, and were tested by ISTIS.

RESULTS AND DISCUSSIONS

The „flat fruit” character is dominant, as well as it arises in heterozigot in homozigot form. They were studied about 20 genotypes with flat-peach, clingstone, nectarine, which have the rippening time from June to September. The most valuable are presented in Table 1.

Table 1.

Varietal conveer (Valu lui Traian)

No.crt.	Genotype / Group	Rippening time (multiannual data)
1.	C4R1T14 / clingstone	28.VI -18.VII
2.	Marina / nectarine	5 – 20.VII
3.	Florin / peach	9 – 25.VII
4.	Stark Saturn / peach	10 – 25.VII
5.	Filip / peach	17 – 31.VII
6.	Creola / nectarine	23.VII – 10.VIII
7.	Liana / nectarine	18.VII – 10.VIII
8.	Monica / peach	28.VII – 13.VIII
9.	Baneasa 1 turtite / peach	8 – 26.VIII
10.	V.T. Ptt clon tardiv 03 / peach	20.VIII – 3.IX

There were made biometric measurements on fruits and physiochemical analysis, appreciations on productivity of the trees, descriptions of fruits and trees were made using the international descriptors of species. So, were omologated three varieties in 2007 and one in 2008 – these are:

MONICA (sinonym H.SS Sel.10 AP) - fig.1

Peach cultivars with flat fruit, obtained by self pollination of Stark Saturn, follow by selections in the hybrid fields. Autors are: Cociu Vasile, Dumitru Liana Melania and Ionescu Preda. It was registered in 2007.

Principales characteristics:

The blossom is abundance and the flowering time is in April. The flowers are big, pink and rozaceae type. The ripening time is medium (last of July-beginning of August). It is necessary to make the thinning of fruits and the irrigation of trees. It is an autofertil cultivar, with high productivity (31,0 kg/tree), tolerant at diseases. The vigour of the tree is medium. The shape of crown is vase.

The planting distances are 4/4 m or 4/3 m and the density is 625 trees/ha, or 833 trees/ha.

Fruit appearance: very attractive; epiderme is beige-pink, with 90% red-carmin; 75-100 g/gruit. Flesh quality: white, very sweet, juicy and flavoured. The size of fruit is between 75-100 g. Ripening time: VII/2-3.



Fig.1. Monica

MARINA (synonim 85T Sel. 2.9N) – fig. 2.

Nectarine cultivar with flat fruit, created at RSFG Constanta and registered in 2007. Autors: Liana-Melania Dumitru, Cociu Vasile and Ionescu Preda.



Fig. 2. Marina

Principales characteristics

The blossom is abundance and time flowering is in April. The flowers are small, dark-pink and campanulaceae-type. It is an autofertil cultivar, with high productivity (28.5 kg/tree); tolerant to diseases. Ripening time: VII/1-2.

Fruit appearance: flat; shining (glossy); orange. The size of fruit is between 95-115 g; the dry matter is 13% and the acidity is 0.94% (mg. malic acid/100 g). The flesh is orange, with a good teste and flavour.

CREOLA (synonim A 164 – A.P. V.T.) – fig.3

It is a nectarine cultivar with flat fruit, obtained at RSFG Constanta and omologated is 2007. Autors: Dumitru Liana Melania, Cociu Vasile and Ionescu Preda.

Principales characteristics

The blossom is in April and there are many flowers by offshoots (branch). The flowers are small, campanulaceae type; simple and dark-pink.

The tree has medium vigour. It is an autofertil cultivar, with high productivity (30.0 kg/tree).

The fruit is very attractive, flat, glossy, orange. The size of fruit is about 65-75 g. The flesh is yellow-orange; sweet, juicy. The dry matter is 13.5% and the acidity is 0.88 mg%. Ripening time is VII/3 – VIII/1.



Fig. 3. Creola

LIANA (synonim V.T.-LMV/97) – fig.4.

It is a nectarine cultivar with flat fruit, obtained at R.S.F.G. Constanta and registered by I.S.T.I.S., in 2008.

Autor: Liana-Melania Dumitru.

The vigour of tree is small-medium, with autofertility and a good productivity (25.5 kg/tree) and precocious.



Fig. 4. Liana

CONCLUSIONS

The peach and nectarine cultivars with flat fruit (Monica, Marina, Creola and Liana), improve and rich the fruit yield for fresh consumption and for processing (compot, confiture, jam etc.).

We recomand these new cultivars for extending in production and for family orchards.

REFERENCES

1. **Dumitru Liana Melania, 2005** - *Considerații privind piersicul cu fructul plat*. Vol.1, Lucrări științifice, SCDP Constanța, :69-71.
2. **Dumitru Liana Melania, 2007** - *Some results of Peach Breeding in Romania*. First Balkan Symposium on Fruit Growing, Plovdiv, Bulgaria.
3. **Sansavini S., 2007** - *New Challenges in Fruit Industry from Advances in Breeding and Biotechnology*. First Balkan Symposium on Fruit Growing, Plovdiv, Bulgaria.

**INFLUENCE OF GROWTH REGULATORS ON CALLUS
INDUCTION, GROWTH AND BIOMASS ACCUMULATION
FROM DIFFERENT EXPLANTS OF LENTIL
(*LENS ESCULENTA* MOENCH.)**

**INFLUENȚA UNOR REGULATORI DE CREȘTERE ASUPRA
INDUCERII PROCESULUI DE CALUSOGENEZA ȘI ACUMULAREA
DE BIOMASĂ A DIFERITOR EXPLANTE DE LINTE
(*LENS ESCULENTA* MOENCH.)**

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Abstract. Callus cultures were induced starting from excised small pieces of hypocotyl and cotyledon from plantlets obtained through aseptic germination of *Lens esculenta* Moench ssp. *microsperma* seeds, cv *Oana*. Several combinations of different concentration of 2,4D, AIA and kinetin were tested for callogenesis intensity evaluation. On a medium containing a high level of auxin, a first primary callus was induced which was friable, unorganized and capable of somatic embryogenesis. This callus type was characterized by fast growth and high morphological variability. Biomass accumulation was determined after 4 weeks of subcultivation. A clear influence of growth regulator balance and combination was observed in promoting callus growth and morphogenesis. The highest biomass accumulation was observed on MS medium supplied with 1:2 auxine / cytokinines ratio, but a highest mean of responsive explants percentage was on the medium supplied with 2:1 auxine / cytokinines ratio.

Key words: *Lens esculenta* Moench., callogenesis, biomass.

Rezumat. Cultura de calus a fost inițiată pornind de la explante de hipocotil și cotiledoane excizate de la plantule obținute din seminte de linte, *Lens esculenta* Moench ssp. *microsperma*, cv *Oana*, germinate aseptice. Pentru evaluarea intensității procesului de calogeneză s-au testat câteva combinații de 2,4D, AIA și kinetină în diferite concentrații. Pe mediul cu concentrații sporite de auxine calusul obținut a fost friabil, de culoare deschisă, cu potențial embriogen. Acest tip de calus s-a caracterizat printr-o creștere rapidă și variabilitate morfologică mare. Acumularea de biomasă s-a determinat după 4 săptămâni de subcultivare. S-a constatat o influență clară a balanței fitohormonale asupra intensității calusogenezei și a proceselor de morfogeneză. Cea mai mare acumulare de biomasă s-a constatat pe mediile suplimentate cu un raport auxine citochinine de 1:2, pe când cel mai mare procent de explante care au avut un răspuns morfogenetic a fost înregistrat la suplimentarea mediilor cu un raport auxine /citochinine de 2:1.

Cuvinte cheie: *Lens esculenta* Moench., calusogeneză, biomasă

INTRODUCTION

The lentil (*Lens esculenta* Moench) is an important seed legume widely cultivated in the Middle East, Southern Asia and throughout the tropical and subtropical regions, where it provides a large proportion of the dietary protein requirements. It also improves soil fertility by fixing atmospheric nitrogen, thereby providing an excellent break crop, profitable in its own right to the intensive cereal farmer. However, lentil production is threatened by many insects, diseases and weeds. Because of its potential usefulness for human consumption it is interested in biotechnological methods to improve this important plant. Development of an efficient regeneration system would substantially assist breeding of this crop for improvement. Tissue culture and regeneration studies on lentil are very restricted and there is a limited report on lentil regeneration when compared to other species. First report about lentil tissue culture is regeneration from cultured shoot tips (Bajaj, 1979). This study is followed by culturing portions of shoot meristems and epicotyls on a medium containing kinetin and giberlic acid to induce the formation of callus tissue which is then regenerated shoots and rooted in a mist chamber to yield whole, fertile plants (Williams and McHughen, 1986). Polanco et al (1988) reported the influence of some growth regulators and explant type on callus and shoot formation. It was reported that, 2,4D induced callus formation in all explants, but no organ regeneration obtained from this calli. Callus production can be of interest in a crop improvement program as a propagation tool through organogenic and somatic embryogenic induction. Inductive callus lines are also useful for genetic manipulation practices such as transformation, protoplast isolation and fusion, and polyploid induction.

MATERIALS AND METHODS

Oana varietie of lentil (*Lens culinaris* Medik.) develop by prof. Gh. Tardea and characterized by high yield potential and proteine content were used in the present investigation. Seeds were first soaked in 70% ethanol for one minute and then they were surface sterilized with a 5 % hypochlorid solution for 20 min and there after washed with sterilized distilled water 3 - 4 times. The surface sterilized seeds were then cultured on 0.4% (w/v) water-agar medium and kept in the dark up to their germination in a growth room at 21 ± 2 °C in the darknes.

Collected cotyledons and hypocotyls from germinating seeds (3-4 days old) were cut into pieces and were placed on MS medium supplemented with different concentrations of 2,4-D for callus induction. Induced calli were subcultured into fresh media after a 21-28-day interval for developing an organogenic nature. Watery, spongy, very compact, brown and dead portions of calli were discarded during every subculture. Friable, nodular calli were assumed potentially organogenic and were selected for maintenance and regeneration. As the carbon source 3% sucrose was used in all media. After adjusting the pH to 5.7 ± 0.01 prior to gelling with 0.8% agar (w/v), the medium was sterilized by autoclaving at 121 °C for 20 min (1.06 kg/cm²). Sterilized medium was poured into 100-ml flask (40 ml of medium) for use.

A different kind of auxin and cytokinin-supplemented MS medium was used in the present investigation. All explants were cultured on MS medium with various concentrations of hormonal supplements presented in Table no.1. The culture vessels were incubated in the growth room under 16/8 hrs light/dark cycle at 25 ± 2 °C.

Table 1

Phitohormone type and concentration used in callus induction and growing experiment

No.	Variant	2,4D (mg/l)	AIA (mg/l)	K (mg/l)
1	A1	0	0	1
2	A2	0.5	0	1
3	A3	1	0	1
4	A4	2	0	1
5	A5	1	0	0
6	B1	0	1	0
7	B2	0	0.5	1
8	B3	0	1	1
9	B4	0	2	1

RESULTS AND DISCUSSIONS

In our study eight different medium in their growth regulator compositions, were employed to examine the callus induction potency of cotyledonary and hypocotyls explants. Callus induction results after 4 weeks of incubation (table 2) showed that each growth regulator combination except A1 and A5 variants of medium gave high percentage of callus induction of both explants were we used. Callus was induced on medium containing 2,4-D, but not on auxines-free medium. The highest frequency of callus induction, 100%, was observed in MS medium containing 2:1 ratio from both explants. The proliferation efficiency of callus of hypocotyls explants was significantly higher than that of cotyledon explants for four to five weeks incubation of culture. The highest mean of responsive hypocotyls percentage was 100% in compare with highest mean of responsive cotyledons percentage when was 91%. 2mg/l^{-1} level of auxines was optimum for morphogenesis response induction on hypocotyls explants. Levels below this gradually decreased the frequency of callus induction. When we used cotyledon explants for callus induction we can observe the same reaction to the AIA supplement, but maximum mean of responsive explants at 1 mg/l concentration of 2,4D.

Each combination of plant growth regulations showed different calli formations. Explants incubated on medium with 1:2 ratio of auxine/ cytokinines go into a callogenesis and develop a hard, compact and smooth callus, which is probably because of auxine influence on cell elongation. Medium with increased content of auxines showed a watery and very soft, friable calli development that is probably the first stages of embryogenesis.

Both the color and texture of the callus derived from the studied explants varied. Calli derived from hypocotyls were mostly friable and creamy in color (figure 1), with very few brownish exceptions. Cotyledon derived calli were mostly watery and pale brown and had less potential for further organogenesis. It was further observed that the presence of light affected callus induction and proliferation.

2,4-D is among the most widely used auxins for *in vitro* callus induction in a wide range of plant species. In our study, successful induction of potentially organogenic callus from hypocotyl and cotyledons was achieved using 2,4-D.

Table 2

Effect of different growth regulator concentrations on callus biomass accumulation from hypocotyls explants

No	Media variant	Explant no	% of explants	Initial mass of explants(g)	Biomass (g)	Relative biomass (%)
1	A1 0/1	0	0	0.22	0.31	40,91
2	A2 1/2	15	55	0.35	3.75	971,43
3	A3 1/1	21	70	0.27	1.37	407,41
4	A4 2/1	30	100	0.26	0.9	246,15
5	A5 1/0	7	23	0.21	0.42	100,00
6	B1 1/0	25	83	0.21	0.66	214,28
7	B2 1/2	29	98	0.1	0.51	410,01
8	B3 1/1	21	70	0.29	0.85	193,10
9	B4 2/1	30	100	0.12	0.4	233,33

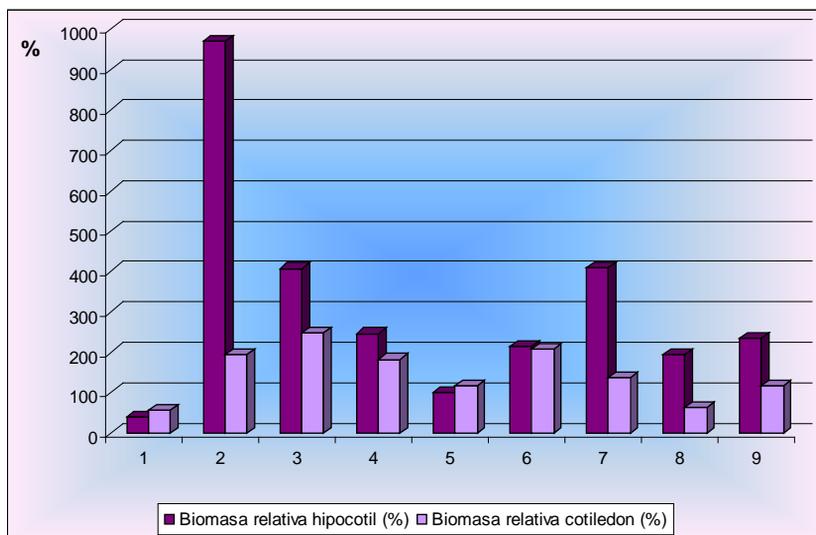


Fig.1. Effect of different growth regulator concentrations on callus biomass accumulation from hypocotyls and cotyledonary explants

Similar results were reported previously in this species (Lejcek-Levanic et al., 2004). Moreover, Srivastava et al. (1989) obtained organogenic calli using a combination of BAP and NAA. We showed that friable and creamy calli derived from hypocotyl can be used to initiate organogenic calli. Calli induced from hypocotyl explants were larger in size than those from the cotyledon (table 3), and when transferred to a basal medium at low levels of PGRs it can promoted shoot organogenesis.

Table 3

Effect of different growth regulator concentrations on callus biomass accumulation from cotyledonary explants

No	Media variant	Explant no	% of explants	Initial mass of explants(g)	Biomass (g)	Relative biomass (%)
1	A1 0/1	0	0	0.09	0.14	55,55
2	A2 1/2	10	33	0.15	0.44	193,33
3	A3 1/1	21	84	0.15	0.52	246,66
4	A4 2/1	16	64	0.17	0.48	182,35
5	A5 1/0	2	10	0.11	0.24	118,18
6	B1 1/0	20	66	0.13	0.4	207,69
7	B2 1/2	26	87	0.16	0.38	137,5
8	B3 1/1	11	44	0.24	0.39	62,5
9	B4 2/1	27	91	0.22	0.48	118,18

In order to analyze the interaction of cytokinines tested with 2,4D and AIA, fresh weights were evaluated. Results of average calli weight in both explants after fourth week are given in fig. 1. According to these results the best responding medium was medium A2 and B2 for hypocotyls explants and A3 for cotyledonary explants. Based on the results the maximum growth of callus was obtained from hypocotyls explants in MS medium amended with 2,4-D at 0.5 mg/l. and 1 mg/l K (table 2). We can observe an indirect dependence between increasing of 2,4D concentration above this level and biomass accumulation. The maximum callus growth of hypocotyls explants cultivated on the AIA supplied media was found also at 0.5 mg/l concentration of this phytohormone. We can also observe that hypocotyls was been found as a suitable explant to induce a high biomass accumulation with auxins such as 2,4-D and AIA, and also with K among the cytokinins. Callus in 2,4-D supplemented medium was well developed, albino, spongy, and loosely arranged (figure 1). The moisture content of callus was high as compared to other auxins supplemented media. In AIA supplemented medium, the callus was pale, yellowish green in colour more friable, hard and granular (figure 1). Based on the obtained results, the high biomass was induced on only AIA supplemented media then only 2,4-D supplemented media. Exogenous application of auxin is indispensable for initiating callus formation of the tissue, but kinetin is not necessarily required. Kinetin serves to maintain the callus development, indicating that the stimulation

of callus growth due to exogenous auxin would presumably be mediated by the addition of kinetin to the medium.

CONCLUSIONS

1. Callus was induced on each medium containing 2,4-D and AIA, but not on auxines-free medium.

2. Despit the fact that callus appears in all growth regulators combination tested, the consistency was different and those was well developed, albino, spongy, and loosely arranged in 2,4-D supplemented medium and in AIA supplemented medium, the callus was pale, yellowish green in colour more friable, hard and granular.

3. Medium with increased content of auxines (2:1 ratio) gave the best callus quality (frible, loose, white and abundant).

4. The maximum growth of callus was obtained from hypocotyls explants in MS medium amended with 2,4-D at 0.5 mg/l. and 1 mg/l K.

REFERENCES

1. **Bajaj YPS, Dhanju M.S., 1979** - *Regeneration of plants from apical meristem tips of some legumes*. Current Sci. 48: 906–907
2. **Khanam R., 1994** - *Study of in vitro morphogenesis in lentil (Lens culinaris Medik)*. M. Sc. thesis, Department of Botany, University of Dhaka, Bangladesh.
3. **Polanco M.C., Pelaez M.I., Ruiz M.L., 1988** - *Factors affecting callus and shoot formation from in vitro cultures of Lens culinaris Medik*. Plant Cell, Tissue and Organ Cult. 15(2): 175-182.
4. **Srivastava D.R., V. M. Andrianov, E.S. Piruzian, 1989** - *Tissue culture and plant regeneration of lentil (Lens culinaris Medik)*. Plant Cell Rep. 8: 300-302.
5. **Williams D.J., McHughen A, 1986** - *Plant regeneration of the legume Lens culinaris Medik. (lentil) in vitro*. Plant Cell, Tissue and Organ Cult. 7: 149-153.

A COMPARATIVE STUDY ON THE GERMINATION FACULTY OF THE TOMATO SEEDS TREATED WITH SULFONAMIDIC CHLORO-PHENOXYACETIC BIODEGRADABLE GROWTH STIMULATORS

STUDIU COMPARATIV ASUPRA FACULTĂȚII GERMINATIVE LA SEMINȚELE DE TOMATE TRATATE CU BIOSTIMULATORI SULFONAMIDO-CLOR FENOXIACETICI BIODEGRADABILI

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Abstract. *The paper represents the first stage of an extended study regarding the effect of new biodegradable and non-toxic compounds from the substituted sulfonamido phenoxyacetic acids' class, conditioned as potassium salts, on the development and production of the tomato plants. The considered products (potassium salts of 4-chloro, 2- sulfonic-amido – phenoxyacetic acid and 2-chloro, 4-sulfonic-amide – phenoxyacetic acid) are used alone or with an input of zinc, a microelement whose positive effect in the plants' development is also studied here. The treated biological material is an autochthonous semi late tomato breed, Buzău 1600, with a mean production of 70 – 90 t fruits/ha, created at Vegetable Research Center Buzău in 1972. The treatment variants use the two growth stimulators in two dilutions (20 ppm and 25 ppm), with and without the combined effect of zinc; the seeds are treated by soaking in solutions for 3 and 6 hours, after which the germination process is observed in controlled conditions of light, temperature and humidity, compared to the untreated control, whose seeds are soaked in distilled water the same period.*

Key words: growth stimulators, tomatoes, biodegradable, phenoxyacetic, germination

Rezumat. *Lucrarea reprezintă prima etapă a unui studiu extins privind efectul unor noi compuși biodegradabili și netoxici din clasa acizilor sulfonamido fenoxiacetici substituiți, condiționați ca săruri de potasiu, asupra dezvoltării și producției la plantele de tomate. Produsele considerate (sărurile de potasiu ale acidului 4-clor, 2-sulfonamido-fenoxiacetic și acidului 2-clor, 4-sulfonamido-fenoxiacetic) sunt folosite atât singure cât și cu adaos de zinc, microelement al cărui efect pozitiv în dezvoltarea plantelor este de asemenea studiat. Materialul biologic luat în studiu este un soi semitârziu autohton de tomate, Buzău 1600, cu o producție medie de 70 – 90 t fructe/ha, creat la Stațiunea de Cercetări Legumicole Buzău în 1972. Variantele de tratare utilizează cei doi biostimulatori în două diluții (20 ppm și 25 ppm), cu și fără efectul combinat al zincului; semințele sunt tratate prin înmuiere timp de 3 și 6 ore, după care se urmărește germinația în condiții controlate de lumină, temperatură și umiditate, comparativ cu martorul netratat, ale cărui semințe sunt înmuiate cu apă distilată aceeași perioadă de timp.*

Cuvinte cheie: biostimulatori, tomate, biodegradabil, fenoxiacetic, germinație

INTRODUCTION

Lately, technologies which emphasize on respecting the ecological conditions, but also on the use of the organic fertilizers, growth stimulators and auxinic active compounds are adopted, in order to increase, quantitative and qualitative, the agricultural production. The synthesis and experimentation of new chemical structure with low toxicity, biodegradable and non-polluting is a preoccupation for many research teams. From these chemical structures, we notice the sulfonamides' class, which includes sulfonamides, sulfonanylides and sulfonylureides characterized by low toxicity, biodegradability and economical accessibility.

We can frame into this class the sulfonamidic derivatives of the chlorophenoxyacetic acids, synthesized in our country [1, 3-7] with a proven action as bio stimulators for sugar-beet culture [2] and some vegetable cultures [8]. From these derivatives we especially notice the ASFAC series which includes the 4-chloro-2- sulfonamido - phenoxyacetic acid (ASFAC-4 or BCO-4) and the 2-chloro-4- sulfonamido - phenoxyacetic acid (ASFAC-2 or BCO-2). The ASFAC series, besides the remarkable bio stimulating qualities of its compounds, lacks toxicity for humans, animals, bees and fish, features offered by the sulfonamidic group introduced into the aromatic nucleus of the substituted phenoxyacetic acids.

MATERIAL AND METHOD

The biological material considered in the study is an autochthonous semi late tomato cultivar, Buzău 1600, with a mean production yield of 70 – 90 t fruits/ha, created at the Vegetable Research Center Buzău in 1972. The considered compounds (potassium salts of the 4-chloro-2- sulfonamido - phenoxyacetic acid and 2-chloro-4- sulfonamido - phenoxyacetic acid) are used alone or in combination with zinc, microelement whose positive effect in plants' development is also studied.

Preliminary tests have been made to choose an optimal dilution interval in which the growth stimulating effect to occur, avoiding to surpass the concentrations from which the herbicide effect of these compounds may appear. The treated variants use these two growth stimulators in two dilutions (20 ppm and 25 ppm), with or without the combined effect of the zinc.

Also, we studied the effect of the soaking period of the seeds into the growth stimulators' solutions al (or distilled water, for the untreated control variant), choosing two time intervals, 3 and 6 hours. The treated seeds were dried and used for the germination power and faculty determination experiments.

We established the following treated variants:

- m_{3-H₂O} – control for 3 hours treatment in distilled water;
- m_{3-Zn} – control for 3 hours treatment in zinc acetate solution 5 ppm;
- m_{6-H₂O} – control for 6 hours treatment in distilled water;
- m_{6-Zn} – control for 6 hours treatment in zinc acetate solution 5 ppm;
- v₃₋₁ – treatment for 3 hours with BCO-4 K 20 ppm;
- v₃₋₂ – treatment for 3 hours with BCO-4 K 25 ppm;
- v₃₋₃ – treatment for 3 hours with BCO-4 K 20 ppm + Zn 5 ppm;
- v₃₋₄ – treatment for 3 hours with BCO-4 K 25 ppm + Zn 5 ppm;
- v₃₋₅ – treatment for 3 hours with BCO-2 K 20 ppm;
- v₃₋₆ – treatment for 3 hours with BCO-2 K 25 ppm;

- v₃₋₇ – treatment for 3 hours with BCO-2 K 20 ppm + Zn 5 ppm;
- v₃₋₈ – treatment for 3 hours with BCO-2 K 25 ppm + Zn 5 ppm;
- v₆₋₁ – treatment for 6 hours with BCO-4 K 20 ppm;
- v₆₋₂ – treatment for 6 hours with BCO-4 K 25 ppm;
- v₆₋₃ – treatment for 6 hours with BCO-4 K 20 ppm + Zn 5 ppm;
- v₆₋₄ – treatment for 6 hours with BCO-4 K 25 ppm + Zn 5 ppm;
- v₆₋₅ – treatment for 6 hours with BCO-2 K 20 ppm;
- v₆₋₆ – treatment for 6 hours with BCO-2 K 25 ppm;
- v₆₋₇ – treatment for 6 hours with BCO-2 K 20 ppm + Zn 5 ppm;
- v₆₋₈ – treatment for 6 hours with BCO-2 K 25 ppm + Zn 5 ppm;

The experiment was conducted in Petri dishes, and the tomato seeds were placed in number of 20 per dish, on a germination bed made of filter paper moisturized daily with boiled and cooled water, 2 – 3 ml per dish. The mean temperature during the experiment was of 18^oC, with 10 hours of light/day.

RESULTS AND DISCUSSIONS

We observed the number of germinated seeds per dish, the appearance of the rootlets, the gemula and the two leaves plantlets, for the variants treated with these two growth stimulators, in two concentrations, compared to the untreated control. Two measurements were made (I, II) at four, respectively seven days from the beginning of the experiment. We obtained the following results (tab. 1):

Table 1

Experimental observations regarding the germination power

Treatment variants		m _{H2O}	m _{zn}	v ₁	v ₂	v ₃	v ₄	v ₅	v ₆	v ₇	v ₈
Hours of treatment		3 hours									
I	No. germinated seeds/20	12	17	20	18	19	17	17	18	15	17
	Rootlets length (cm)	0.96	0.3	0.23	0.29	0.48	0.45	0.33	0.4	0.23	0.37
Hours of treatment		6 hours									
I	Nr. germinated seeds/20	17	17	11	15	17	16	15	17	16	16
	Rootlets length (cm)	0.48	0.4	0.24	0.16	0.23	0.44	0.35	0.3	0.38	0.37
Hours of treatment		3 hours									
II	No. germinated seeds/20	16	19	20	20	20	17	18	19	20	17
	No. gemula under 1 cm	4	7	5	6	11	7	1	3	9	5
	No. gemula 1 – 2 cm	2	6	2	3	1	4	1	2	3	3
	No. 2 leaves plantlets	6	4	8	8	8	6	16	13	4	8
Hours of treatment		6 hours									
II	No. germinated seeds/20	17	17	19	19	20	17	17	17	17	18
	No. gemula under 1 cm	3	1	8	3	12	4	8	1	7	3
	No. gemula 1 – 2 cm	2	2	3	3	3	4	3	3	6	3
	No. 2 leaves plantlets	9	13	1	10	4	9	1	13	4	9

After four days from the beginning of the experiment we measured the number of germinated seeds on each dish and the length of the rootlets formed by the germinated seeds.

For the variants treated for three hours, excepting just one variant, v₃₋₇ – BCO-2 K 20 ppm + Zn 5 ppm, the germination was superior compared to both control variants. In exchange, for the seeds treated for six hours, only two of the

treated variants reached at this date at the germination percentage of the controls, the rest of them having a slower germination process (fig. 1).

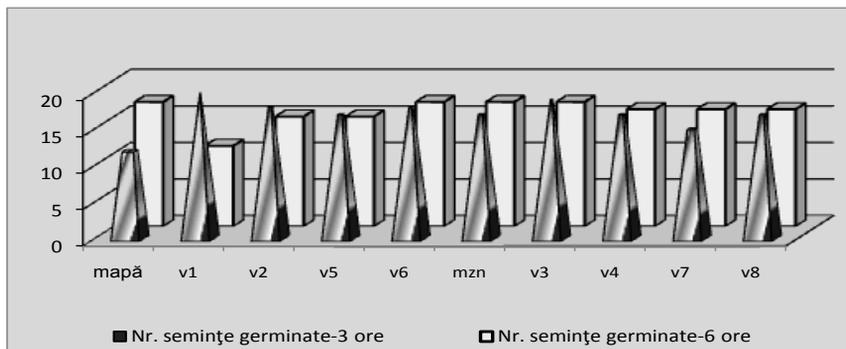


Fig. 1. The variation of the germinated seeds' number with the treatment after 4 days

In general, the rootlets were longer for the controls compared to the treated variants (fig. 2).

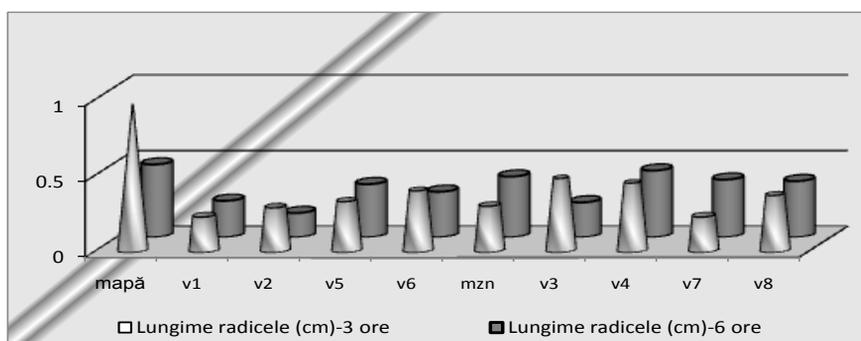


Fig. 2. The variation of the rootlets' length with the treatment after 4 days

As final observations, in what regards the germinated seeds' number from all for each variant, five variants had a 100% germination: v_1 – treated 3 hours with BCO-4 K 20 ppm; v_2 – treated 3 hours with BCO-4 K 25 ppm; v_3 – treated 3 hours with BCO-4 K 20 ppm + Zn 5 ppm; v_7 – treated 3 hours with BCO-2 K 20 ppm + Zn 5 ppm and v_8 – treated 6 hours with BCO-4 K 20 ppm + Zn 5 ppm.

In what regards the different developing stages for the plantlets in each dish related to the treatment variant, we observed that for most of the variants the acceleration of the plantlets' developing rhythm, increasing the number of two leaves plantlets, both for three as well as for six hours treatment; the effect of added zinc occurred differently for the two used dilutions, leading to a more rapid development of the plantlets only for the m_{Zn} control compared to the m_{H_2O} control, also for the variants treated with 20 ppm + Zn compared to the variants treated only with the same dilution of the growth stimulator, especially for a longer treatment of the seeds.

We registered the following distribution for the treated variants (fig. 3, 4).

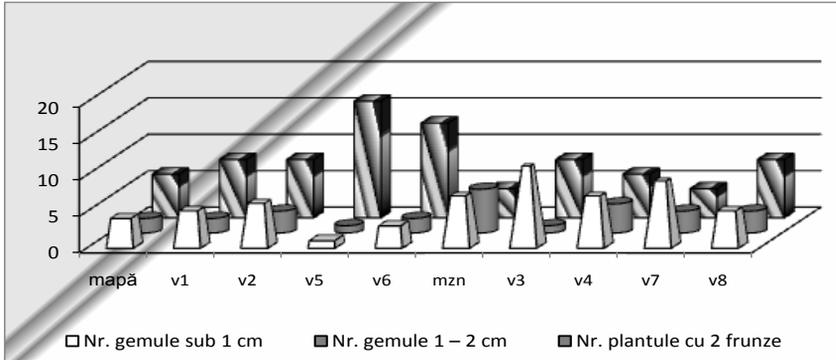


Fig. 3 The distribution of the evolving stages of the tomato plantlets related to the applied treatment for 3 hours

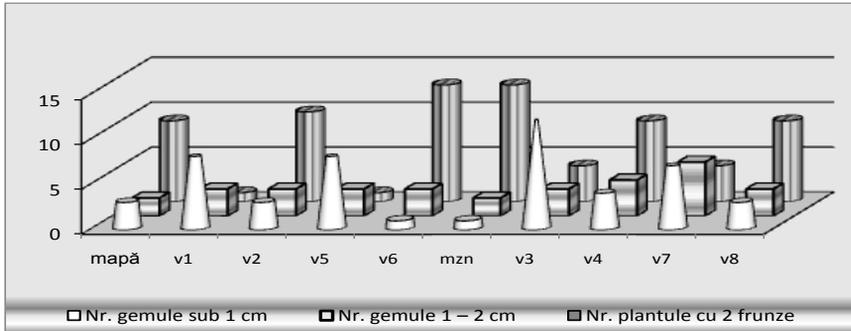


Fig. 4. The distribution of the evolving stages of the tomato plantlets related to the applied treatment for 6 hours

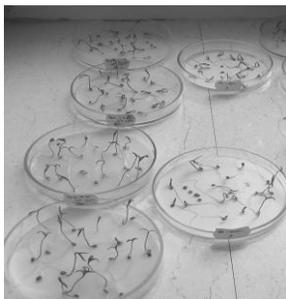


Fig. 5. Variants treated with BCO-4 K compared to controls- 3 hours



Fig. 6. Variants treated with BCO-2 K compared to controls - 3 hours

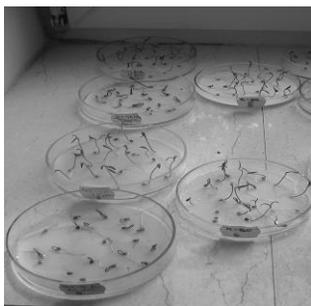


Fig. 7. Variants treated with BCO-4 K compared to controls - 6 hours

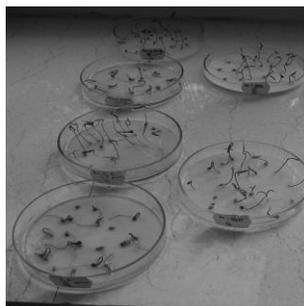


Fig. 8. Variants treated with BCO-2 K compared to controls - 6 hours

CONCLUSIONS

1. The seeds treated for three hours with the two dilutions for both growth stimulators register a slightly higher percentage of germinated seeds on a dish compared to the variants treated for 6 hours;
2. BCO-4 K salt, in both used dilutions, had a better effect on the germination faculty both for three and six hours treatment period;
3. The influence of the 5 ppm zinc acetate solution added conducted to a more balanced distribution between different developing stages of the plantlets;
4. The variants treated with growth stimulators with or without zinc added conducted to almost the same mean percentages of germinated seeds in a dish;
5. We suggest further observations for the effect of these treatment combinations in the next developing stages of the seedlings in order to appreciate correctly the influence of the growth stimulators, with or without zinc added, on the general development of the tomato plants.

REFERENCES

1. Antochi A., Oniscu C., Nistor I., Miron D., 2008 - *Roum. Biotech. Letters*, 13,(6)
2. Boghian A., Oniscu C., Răscănescu M., Horoba E., 1994 - *Brevet RO 104226*
3. Mocanu A., Curteanu S., Cernătescu C., Dumitrașcu A., Oniscu C., 2007 - *Roum. Biotechnol. Letters*, 12(4)
4. Mocanu A., Odochian L., Cârjă G., Oniscu C., 2008 – *Roum. Biot. Lett.*, 13,(6)
5. Oniscu C., Botez Gh., 1978 - *Brevet RO 69149*
6. Oniscu C., Dumitrașcu A., Mocanu A., Diaconescu R., 2005 - *Roum. Biotechnol. Letters*, 10,(3)
7. Oniscu C., Horoba E., Băncilă V, 1993 - *Brevet RO 109646 C 1/1993*
8. Oniscu C., Trofin A., 2002 – *Influența tratamentului cu biostimulatori din clasa acizilor sulfamoil-fenoxialchil carboxilici asupra procesului de germinație la semințe de tomate*. Cercet.Agronom. în Moldova, vol.3-4 (120), ISSN 0379-5837

THE EFFECTS OF THE TREATMENTS WITH SUBSTITUTED PHENOXYCARBOXYLIC ACIDS AND ZINC SALTS ON THE GERMINATION PROCESS AT TOMATO PLANTS

EPECTELE TRATAMENTELOR CU ACIZI FENOXIACETICI SUBSTITUIȚI ȘI CU SĂRURI DE ZINC ASUPRA PROCESULUI DE GERMINAȚIE LA PLANTELE DE TOMATE

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Abstract. *The paper is part of a series of researches on the stimulating effects produced by some compounds from the substituted phenoxy-carboxylic acids' class on the tomato plants in different stages of growth. In this part of the study we observe the influence of two growth stimulators, conditioned as dimethyl-amine salts, on the germination process of the tomato seeds. The control variants are using distilled water for soaking the seeds, for three and six hours, while the treated variants use seeds soaked in different dilutions of the two considered growth stimulators (20 ppm and 25 ppm), the same period of time, with or without zinc salt added, in concentration of 5 ppm. The periods of treatment were chosen after some previous tests on seeds from the same tomato breed used in this experiment, Buzău 1600. The considered dilutions were also selected after previous experiments, thus to obtain the growth stimulating effect without exceed the concentration from which the herbicide effect of this class's compounds occur.*

Key words: growth stimulators, tomatoes, zinc, phenoxyacetic, germination

Rezumat. *Lucrarea se încadrează într-o serie de cercetări asupra efectelor stimulative produse de unii compuși din clasa acizilor fenoxi-carboxilici substituiți asupra plantelor de tomate aflate în diferite stadii de dezvoltare. În această parte a studiului se urmărește influența a doi biostimulatori, condiționați ca săruri de dimetilamină, asupra germinației la semințele de tomate. Se folosesc variante martor, în care se utilizează apa distilată pentru înmuierea semințelor, timp de trei și șase ore, și variante tratate, cu semințe înmuiate aceeași perioadă de timp cu diferite diluții a celor doi biostimulatori (20 ppm și 25 ppm), cu sau fără adaos de sare de zinc, soluție de concentrație 5 ppm. Timpul de tratare a fost ales în urma unor testări prealabile pe semințe din același soi utilizat în acest experiment, Buzău 1600. Diluțiile utilizate au fost selectate de asemenea în urma unor experimente anterioare, astfel încât să se obțină efectul stimulator de creștere fără a depăși concentrația de la care se manifestă efectul erbicid al acestor compuși.*

Cuvinte cheie: biostimulatori, tomate, zinc, fenoxiacetic, germinație.

INTRODUCTION

Studying the agriculture's development is a real interest for researchers in all domains, especially due to the fact that there are increased demands for agricultural prime matters in the processing industry. Very developed countries

which conduct an intensive agriculture apply large amounts of chemical fertilizers, especially based on nitrogen, inducing the pollution of the environment with nitrites and nitrates. As an alternative to chemical fertilizers in agriculture, bio fertilizers are more and more often used. Sulfonamides represent an important class of chemical products characterized by herbicide or growth regulating auxinic type effect, by lack of toxicity towards the environment and living organisms; these structures contain as support for the sulfonamidic group chloro derivatives of the phenoxyacetic acids because they are biodegradable, do not accumulate in the organism and have no side effects.

The participation of the growth stimulators in the germination and plant development processes intensifies plant's respiration which precedes and makes possible the reserve carbohydrates' hydrolysis in the seeds, their transport and use in the plant's development. Seeds' germination and plant development in a shorter period of time have an important role in plant's further development and obtaining production increases.

MATERIAL AND METHOD

The structures synthesized and tested for their growth stimulating effect are the dimethyl aminic salts of the 4-chloro-2-sulfonamido - phenoxyacetic acid and 2-chloro-4- sulfonamido - phenoxyacetic acid; we also studied, into the frame of the same experiment, the influence of a zinc input, conditioned as zinc acetate solution 5 ppm. We considered an autochthonous semi late tomato cultivar with a mean production yield of 70 – 90 t fruits/ha and multi step ripening period.

As following the preliminary tests we chose an optimal dilution interval in which the growth stimulating effect to occur, avoiding to surpass the concentrations from which the herbicide effect of these compounds may appear. The treating variants use the two bio stimulators in two dilutions (20 ppm and 25 ppm), with or without zinc added. The period of the seeds treatment with the bio stimulators' solutions (or distilled water, for the untreated controls) varied, choosing two time intervals, of 3 and 6 hours. The treated seeds were used in the experiment after a previous air-dry process, at room temperature, on filter paper.

We established the following treated variants:

- m_{3-H₂O} – control for 3 hours treatment in distilled water;
- m_{3-Zn} – control for 3 hours treatment in zinc acetate solution 5 ppm;
- m_{6-H₂O} – control for 6 hours treatment in distilled water;
- m_{6-Zn} – control for 6 hours treatment in zinc acetate solution 5 ppm;
- v₁ – 3 hours treatment with BCO-4 DMA 20 ppm;
- v₂ – 3 hours treatment with BCO-4 DMA 25 ppm;
- v₃ – 3 hours treatment with BCO-4 DMA 20 ppm + Zn 5 ppm;
- v₄ – 3 hours treatment with BCO-4 DMA 25 ppm + Zn 5 ppm;
- v₅ – 3 hours treatment with BCO-2 DMA 20 ppm;
- v₆ – 3 hours treatment with BCO-2 DMA 25 ppm;
- v₇ – 3 hours treatment with BCO-2 DMA 20 ppm + Zn 5 ppm;
- v₈ – 3 hours treatment with BCO-2 DMA 25 ppm + Zn 5 ppm;
- v₉ – 6 hours treatment with BCO-4 DMA 20 ppm;
- v₁₀ – 6 hours treatment with BCO-4 DMA 25 ppm;
- v₁₁ – 6 hours treatment with BCO-4 DMA 20 ppm + Zn 5 ppm;
- v₁₂ – 6 hours treatment with BCO-4 DMA 25 ppm + Zn 5 ppm;

- V₁₃ – 6 hours treatment with BCO-2 DMA 20 ppm;
- V₁₄ – 6 hours treatment with BCO-2 DMA 25 ppm;
- V₁₅ – 6 hours treatment with BCO-2 DMA 20 ppm + Zn 5 ppm;
- V₁₆ – 6 hours treatment with BCO-2 DMA 25 ppm + Zn 5 ppm;

The seeds were set for germination at a mean temperature of 18°C, with 10 hours light/day, in Petri dishes containing each 20 seeds/dish, on a germination bed of filter paper moist daily with boiled and cooled water, 2 – 3 ml per dish.

RESULTS AND DISCUSSIONS

The measured parameters in this experiment were the number of germinated seeds on a dish, the rootlets, gemula and two leaves plantlets' length, for the variants treated with growth stimulators, in two concentrations, compared to the untreated control. We made two measurements (I, II) at four and seven days from the beginning of the experiment. The obtained results were synthesized in table 1:

Table 1

The influence of the growth stimulators on tomato's germination process											
No. of treatment hours		3 hours									
Treatment variants		m _{H₂O}	m _{zn}	V ₁	V ₂	V ₃	V ₄	V ₅	V ₆	V ₇	V ₈
I	No. germinated seeds/20	12	17	15	17	18	19	16	16	16	17
	Rootlets length (cm)	0.96	0.3	0.26	0.42	0.42	0.51	0.37	0.32	0.54	0.34
No. of treatment hours		6 hours									
Treatment variants		m _{H₂O}	m _{zn}	V ₉	V ₁₀	V ₁₁	V ₁₂	V ₁₃	V ₁₄	V ₁₅	V ₁₆
I	No. germinated seeds/20	17	17	14	9	16	15	15	18	13	17
	Rootlets length (cm)	0.48	0.4	0.17	0.18	0.32	0.48	0.35	0.3	0.4	0.34
No. of treatment hours		3 hours									
Treatment variants		m _{H₂O}	m _{zn}	V ₁	V ₂	V ₃	V ₄	V ₅	V ₆	V ₇	V ₈
II	No. germinated seeds/20	16	19	19	18	18	20	17	16	19	19
	No. gemula under 1 cm	4	7	9	3	8	6	1	4	7	6
	No. gemula 1 – 2 cm	2	6	3	3	4	4	5	5	4	3
	No. 2 leaves plantlets	6	4	3	11	5	8	11	5	7	8
No. of treatment hours		6 hours									
Treatment variants		m _{H₂O}	m _{zn}	V ₉	V ₁₀	V ₁₁	V ₁₂	V ₁₃	V ₁₄	V ₁₅	V ₁₆
II	No. germinated seeds/20	17	17	15	15	18	20	17	19	19	18
	No. gemula under 1 cm	3	1	4	4	10	6	4	1	7	4
	No. gemula 1 – 2 cm	2	2	2	2	4	2	2	3	3	6
	No. 2 leaves plantlets	9	13	6	11	3	5	10	15	6	6

The first conducted measurements (I) observed the effect of the applied treatment on the number of the germinated seeds in each dish and on the length of the rootlets developed by the germinated seeds. In what regards the three hours treatment variants, all had superior values compared to the control treated with distilled water, two of the variants having a better behavior: v₃ – 3 hours treatment with BCO-4 DMA 20 ppm + Zn 5 ppm and v₄ – 3 hours treatment with BCO-4 DMA 25 ppm + Zn 5 ppm; the positive effect of the zinc occurred this time only for the combinations with BCO-4 growth stimulator.

For the six hours treatment variants, only two of them (v_{14} – 6 hours treatment with BCO-2 DMA 25 ppm and v_{16} – 6 hours treatment with BCO-2 DMA 25 ppm + Zn 5 ppm) reached the germination percentage of the controls, the rest of the variants having a slower germination process (fig. 1).

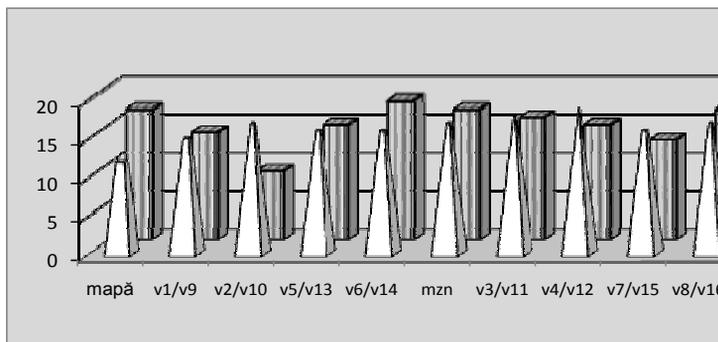


Fig. 1. The variation of the germinated seeds' number with the treatment after 4 days

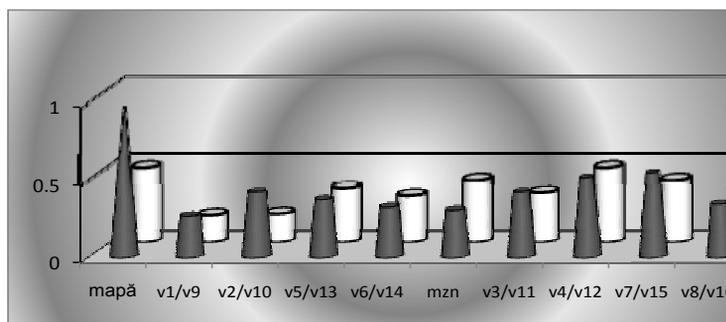


Fig. 2. The variation of the rootlets' length with the treatment after 4 days

As mean values, the treated variants developed shorter rootlets than the controls, no matter the applied growth stimulator's type (fig. 2).

At the end of the experiment, in what regards the number of germinated seeds from a total of 20 for each variant, only two variants had a 100% germination: v_4 – 3 hours treatment with BCO-4 DMA 25 ppm + Zn 5 ppm and v_{12} – 6 hours treatment with BCO-4 DMA 25 ppm + Zn 5 ppm, variants which used the same combination of growth stimulator with a zinc input. In what regards the different development stages of the plantlets related to the treating variant, we observed for the most of the variants the acceleration of the development rhythm, increasing the number of two leaves plantlets, both for three and six hours treatment period, with no zinc input. The effect of the two growth stimulators when zinc was added to their solutions for the six hours treatment did not lead to a more rapid development of the plantlets compared to the zinc control m_{Zn} or to the water control m_{H_2O} .

For the variants treated three hours with both growth stimulators' dilutions combined with zinc, we registered values slightly superior to zinc control m_{Zn} for the germinated seeds' percentage as well as for the plantlets development. We registered the following distribution on treatment variants (fig. 3, 4).

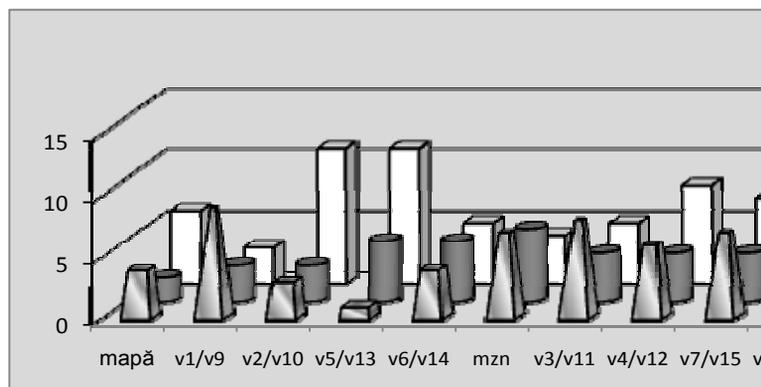


Fig. 3. The distribution of the evolving stages of the tomato plantlets related to the applied treatment for 3 hours

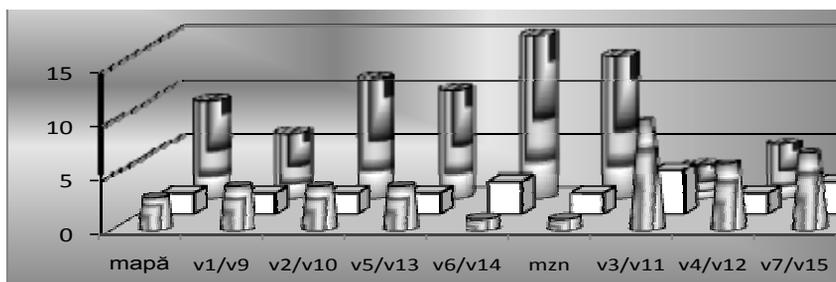


Fig. 4. The distribution of the evolving stages of the tomato plantlets related to the applied treatment for 6 hours

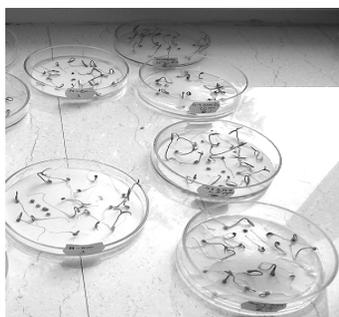


Fig. 5. Variants treated with BCO-4 DMA compared to controls- 3 hours

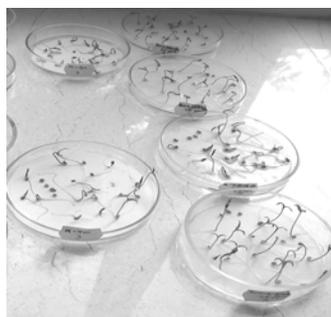


Fig. 6. Variants treated with BCO-2 DMA compared to controls- 3 hours

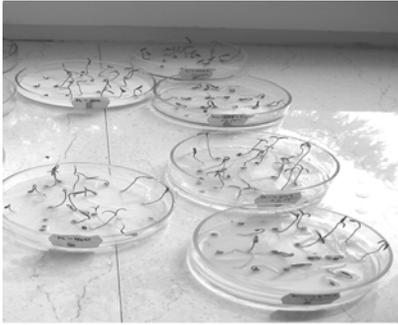


Fig. 7. Variants treated with BCO-4 DMA compared to controls- 6 hours

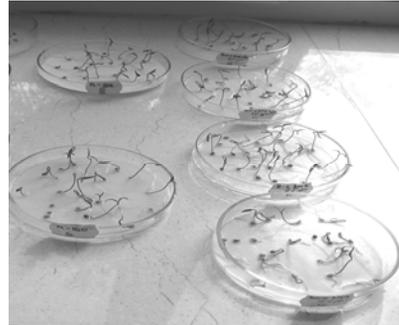


Fig. 8. Variants treated with BCO-2 DMA compared to controls- 6 hours

CONCLUSIONS

1. For the variants with seeds treated for three hours with the two dilutions of the considered growth stimulators, we noticed a slightly higher percentage of germinated seeds on a dish compared to the variants treated for 6 hours;

2. The growth stimulator BCO-4 DMA, in both used dilutions, had a better effect on the germination faculty for the three hours treatment, but BCO-2 DMA lead to better results for the variants treated for six hours;

3. The influence of the zinc salt solution 5 ppm, added to the growth stimulators' dilution, conducted to a more balanced distribution between plantlets' different evolving stages, while at the variants with no zinc added, the plantlets developed more rapidly almost for all combinations;

4. The variants treated with growth stimulators and zinc input conducted to higher percentages of germinated seeds than the variants treated with the same growth stimulators' dilution, even if the plantlets developed slower.

5. Further observations for the effect of these treatment combinations in the next developing stages of the seedlings are necessary, in order to appreciate correctly the influence of the growth stimulators, with or without zinc added, on the general development of the tomato plants.

REFERENCES

1. Antochi A., Oniscu C., Nistor I., Miron D., 2008 - *Roum. Biotechnol. Letters*, 13,(6)
2. Boghian A., Oniscu C., Răscănescu M., Horoba E., 1994 - *Brevet RO 104226*
3. Mocanu A., Curteanu S., Cernătescu C., Dumitrașcu A., Oniscu C., 2007 - *Roum. Biotechnol. Letters*, 12(4)
4. Mocanu A., Odochian L., Cârjă G., Oniscu C., 2008 - *Roum. Biotechnol. Letters*, 13,(6)
5. Oniscu C., Botez Gh., 1978 - *Brevet RO 69149*
6. Oniscu C., Dumitrașcu A., Mocanu A., Diaconescu R., 2005 - *Roum. Biotechnol. Letters*, 10,(3)
7. Oniscu C., Horoba E., Băncilă V, *Brevet RO 109646 C 1/1993*
8. Oniscu C., Trofin A., 2002 – *Influența tratamentului cu biostimulatori din clasa acizilor sulfamoil-fenoxialchil carboxilici asupra procesului de germinație la semințe de tomate*. Cercet.Agronom. în Moldova, vol.3-4 (120), ISSN 0379-5837

MULTILINGUALISM POLICIES - A WAY TO THE PROFESSIONAL AND ECONOMIC SUCCESS OF COUNTRIES IN EUROPE

POLITICILE MULTILINGVISMULUI – O CALE CĂTRE SUCCESUL PROFESIONAL ȘI ECONOMIC AL ȚĂRILOR DIN EUROPA

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Abstract. *The current paper aims to present the EU policies promoting multilingualism and the concrete ways in which these are made operational in a number of EU projects. The projects presented as case studies are all being run in Iasi, having the EuroEd Foundation as a coordinator from the Romanian side and demonstrating the partnership abilities of important partners from the academic, educational and economic fields in Iasi.*

Key words: lifelong learning, intercultural communication skills, non-formal education, online learning

Rezumat. *Lucrarea de față prezintă politicile europene care promovează multilingvismul precum și modalitățile prin care acesta poate să se manifeste în cadrul unui număr de proiecte europene. Proiectele prezentate drept studii de caz se derulează toate în Iași, sub coordonarea Fundației EuroEd, responsabil pe partea română; ele demonstrează capacitatea de parteneriat a unui număr de instituții educaționale, universitare sau cu profil economic din Iași.*

Cuvinte cheie: învățare pe tot parcursul vieții, abilități de comunicare interculturală, educație non-formală, învățare online

INTRODUCTION

The European Commission has worked since 2002 with Member States towards the Barcelona objective of enabling citizens to communicate in two languages in addition to their mother tongue, in particular, by developing an indicator of language competence (1), by setting out strategic action and recommendations, and by including skills in foreign languages among the key competences for lifelong learning (2).

Building on the progress of earlier years, the latest communication on Multilingualism aims to achieve a qualitative shift, by presenting a policy that is widely shared and comprehensive, going beyond education to address languages in the wider context set by the EU Agenda for social cohesion and prosperity, the two central objectives of the Lisbon strategy.

MATERIALS AND METHODS

Today's European societies are facing rapid change due to globalisation, technological advances and ageing populations. The greater mobility of Europeans - currently 10 million Europeans work in other Member States - is an important sign of this change. Increasingly people interact with their counterparts from other countries while growing numbers live and work outside their home country. This process is further reinforced by the recent enlargements of the EU. The EU now has 500 million citizens, 27 Member States, 3 alphabets and 23 EU official languages, some of them with a worldwide coverage. Some 60 other languages are also part of the EU heritage and are spoken in specific regions or by specific groups. In addition, immigrants have brought a wide range of languages with them: it is estimated that at least 175 nationalities are now present within the EU's borders (3). Due to these and other factors, the life of Europeans has become more international and more multilingual.

Without adequate policies this increased linguistic diversity presents challenges. It can widen the communication gap between people of different cultures and increase social divisions. The current challenge is to minimise the obstacles that EU citizens and companies encounter and to show that languages can work as an asset for the benefit of the European society as a whole.

The idea of facilitating the communication and integration of ethnic minorities within a wider host community was at the basis of the Lingua project ***Learning by Moving***: Romanians travelling to Italy by coach for a job were given flyers with basic Italian vocabulary and useful phrases for a job interview and listening drill. In the same project in Hamburg, the local tube trains displayed basic Turkish phrases and vocabulary as the city has a big Turkish minority working there.

In projects such as ***Facelt! (Grundtvig)*** the international partnership educated international trainers to address families at risk either because they are a minority in a host country or, specifically in Romania, because many children are left behind with relatives or neighbours while their parents work abroad. These trainers are equipped with the skills, attitudes, and teaching materials and procedures adequate for communicating to these families' ways to better cope to become integrated citizens, active in the reception country.

The main objective is therefore **to raise awareness of the value and opportunities of the EU's linguistic diversity and encourage the removal of barriers to intercultural dialogue**. The projects ***Vivace (Lingua)***, ***Facelt! (Grundtvig)*** and ***NoChild Left Behind (Comenius)*** have found innovative ways to open ways to disadvantaged categories to non-formal education opportunities which include elements of foreign language training associated to practice of other skills.

A key instrument in this respect is the Barcelona objective - **communication in mother tongue plus two languages**. More effort is needed towards achieving this objective for all citizens. To start doing this at an early age has more chances of success than beginning later in life. Projects that sensitise young children about the diversity of languages in Europe, about comprehension abilities in related languages with one's mother tongue are very useful.

Thus, the Lingua projects ***Chain stories, Eat-Eating Abroad Together and Dinocrocs Travelling to the Balkans*** show how to teach young learners about the EU linguistic and cultural diversity and about how interesting it is to communicate with representatives of other languages and cultures. Non-formal ways are being used to do so: in the first project young children whose mother tongues are Romanian, French, Portuguese, Spanish, Catalan and Italian interact online, creating together a common story with chapters written in turn in their mother tongues. Inferencing and prediction are being encouraged to guess the meaning and the developments

proposed by each team. A multilingual dictionary with terms is gradually created while the children develop creative writing skills as well.

In **EAT** language and communication skills and new cultural information are all being passed over to 5-10 year olds from Bulgaria, Romania, UK, Holland and Germany through a variety of non-formal and informal activities all connected to the culture of healthy eating. The project benefits from a wide partnership aiming at educating young children and their families about healthy eating while teaching communication in a foreign language on a life scene. **Dinocrocs Travelling to the Balkans** creates a pool of well trained tutors and teachers able to use recent psycholinguistic findings about how a foreign language may be taught and learned efficiently using mime, drama, role play, videos and songs at a very early age.

In the project **Vivace** adults in difficult circumstances (criminals in prisons, adults with Down syndrome, women in shelters against abuse, school dropouts) benefitted from exposure to foreign languages in nonconventional settings and through informal practices. New learning solutions are called for to reach these specific groups. More work is necessary to facilitate language learning for adults and young people in vocational education and training (VET). Projects such as **Office InterActors** and **European Languages for Secretaries (Leonardo Transfer of Innovation)** and **LaProf (Key2-Languages)** deal with this issue.

These projects are dedicated to specific professional categories: assistant executives in the first two, and professionals in the field of agricultural sciences and computing sciences in the third project. Language online courses with innovative touches are being developed to meet the professional communication expectations in a foreign language.

A concerted effort is required to *ensure* that, within existing resources, multilingualism is 'mainstreamed' across a series of EU policy areas, including lifelong learning, employment, social inclusion, competitiveness, culture, youth and civil society, research and the media. The above mentioned projects outline key aspects of this **inclusive approach** aimed at widening the scope of multilingualism to social cohesion and prosperity. In this respect the Leonardo projects **ELSTI**, **LaProf**, **InterAct** intertwine goals relevant to SMEs, to professionals from the agricultural fields, to the hospitality industry and health care with a partnership that can contribute to the sustainable development of the respective industries in the region.

RESULTS AND DISCUSSIONS

Multilingualism for Intercultural Dialogue and Social Cohesion: Valuing all languages

In the current context of increased mobility and migration, mastering the national language(s) is fundamental to integrating successfully and playing an active role in society. Non-native speakers should therefore include the host-country language in their 'one-plus-two' combination. The **Learning by Moving** project and its follow ups are oriented towards this goal. The teaching of Turkish in Hamburg was directly linked to the idea of sensitising the host country to the linguistic context of the Turkish minority in Germany.

There are also untapped linguistic resources in our society: different mother tongues and other languages spoken at home and in local and neighbouring environments should be valued more highly. For instance, children with different mother tongues — whether from the EU or a third country — present schools

with the challenge of teaching the language of instruction as a second language (4), but they can also motivate their classmates to learn different languages and open up to other cultures. The projects *EAT* and *Chain stories* are applications of this desideratum into classroom life. To familiarise young kids to the idea of the richness of languages around them is an asset which will accompany them in adult life and develop skills which could later be expended or re-practised.

With a view to allowing closer links between communities, the Commission's advisory group on multilingualism and intercultural dialogue (5) developed the concept of a 'personal adoptive language', which could usefully benefit from a further reflection (6).

Overcoming language barriers in the local environment

A basic feature of citizenship is that people living in a local community can benefit from the services available and are able to contribute to the life of their neighbourhood. Tourists, foreign workers or students, and immigrants often come to local communities with limited proficiency in the national language. To ease access to services and ensure a smooth integration, some communities make basic necessary information available in different languages. In particular, metropolitan areas and tourist resorts in Europe have gained considerable experience in coping with the needs of foreigners who do not speak the local language. The Commission attaches great importance to this and will support the dissemination of good practices in this area - "a language which should be learned intensively, spoken and written fluently (...) learning that language would go hand in hand with familiarity with the country/countries in which that language is used, along with the literature, culture, society and history linked with that language and its speakers." The Lingua projects *ALL –Autonomous Language Learning* –and *TOOL –Online and Offline Language Learning* address this concrete objective by creating an online platform with 9 LWULT language courses accompanied by face-to-face materials for blended learning contexts. People travelling abroad for leisure or work have the possibility to get acquainted with the host languages of Romania, Holland, Estonia, Lithuania, Malta, Turkey, Bulgaria, Hungary, Slovenia and practise everyday communication phrases online, try their usefulness in the immersion situations and ask for clarifications in their tutor-based meetings.

The Commission will make strategic use of relevant EU programmes and initiatives (7) to bring multilingualism closer to the citizen:

run awareness-raising campaigns on the benefits of linguistic diversity and language learning for intercultural dialogue.

An interesting project meant to do this was the Lingua project called *Learning by Moving*, hosted in Romania by the EuroEd Foundation where the Romanians travelling by coach to Italy for work were given free Italian/English input on the way to Italy in the format of flyers with useful vocabulary and listening exercises.

The Member States are invited to: *facilitate access to targeted courses of the host country's language(s) for non native speakers.*

In this respect the projects *TOOL (Tool for Online and Offline Language Learning)* and *ALL (Autonomous Language Learning)* offer a portfolio consisting of 9 less widely used languages in an accessible format for both learners and tutors. Web2.0 applications (social sites, learning and reflective forums, wikis, blogs, learners-centred learning goals) are approaches developed by these courses.

Multilingualism for Prosperity

Languages can be a competitive advantage for EU business. Multilingual companies prove how linguistic diversity and investing in language and intercultural skills can be turned into a real asset for prosperity and a benefit for all. Some European languages are widely spoken around the world and can be a valuable communication tool for business.

The Business Forum for Multilingualism made recommendations to boost competitiveness and improve employability through better management of linguistic diversity. The Forum pointed out that emerging markets such as Brazil, Russia, India and China are increasingly important for EU companies and adequate language skills are needed to compete there. The challenge, therefore, is to root multilingualism in all strategies aimed at developing human capital (8).

Languages and competitiveness

A Commission study on the impact on the EU economy of shortages of foreign language skills in enterprise estimated that 11% of exporting EU SMEs may be losing business because of language barriers. Although English has a leading role as the business language of the world, it is other languages that will provide EU companies with a competitive edge and allow them to conquer new markets. When you want to buy something English is enough but when you want to sell something the orientation in the language of the buyer makes the difference among the sellers. Better language skills are an asset across all activities, not only for sales and marketing. However, in many cases, businesses — SMEs in particular — lack the know-how and the resources to incorporate languages into their business plans. *All* and *TOOL* projects fill in a gap of resources in this direction for 9 languages.

Multicultural workforces need adequate training in the language of their company, but companies need to go further, and find creative ways of using the language resources that exist, but are often hidden, in their multicultural workforces. The project *Office InterActors* meets this need by offering minority languages to the native speakers of the majority language in countries such as Lithuania, Romania and Spain.

Languages and employability

Linguistic and intercultural skills increase the chances of obtaining a better job. Those mastering more languages can choose among a wider range of job offers, including jobs abroad: lack of language skills is reported as the primary barrier to working abroad (9). There is empirical evidence that skill in several languages fosters creativity and innovation: multilingual people are aware that

problems can be tackled in different ways according to different linguistic and cultural backgrounds and can use this ability to find new solutions.

Mobility schemes should be made widely available to EU citizens (10). Studying or working abroad is one of the most effective ways of learning other languages and making contact with other cultures. Erasmus students ranked the improvement of language skills as the foremost benefit of their period abroad. Education and training curricula should make the most of exchanges, partnerships and E-twinning with schools in other countries.

The project *LaProf* is an interesting example of the way in which professional mobility linguistic needs are being met: the project develops online language courses with addressees in the field of agricultural and computing science who travel for professional/academic reasons to Greece and Nordic countries, respectively.

CONCLUSIONS

The current paper has aimed to encourage the active involvement of various partners from all the walks of life to identify ways in which their agendas could be better served by the policies of multilingualism for the sake of increased chances for each and every citizen. Approached in this spirit, linguistic diversity can become a precious asset, increasingly so in today's globalised world.

REFERENCES

1. ***, **2005, 2007** - COM (2005) 356; COM(2007) 184. 2006/962/ec., Commission of the European Communities
2. ***, **2003-2006** - COM (2003) 449, 2004-2006, *Promoting language learning and linguistic diversity: an action plan*
3. ***, **2005, 2007** - COM (2005) 596, COM (2007)554. *A new framework strategy for multilingualism*
4. ***, **2007** - Europe in figures: Eurostat yearbook 2006-2007, Luxembourg.
5. ***, **2008** - COM, 2008, 423 final, *Migration & mobility: challenges and opportunities for EU education systems*
6. http://ec.europa.eu/education/languages/archive/languages_en.html,
7. http://coropinions.cor.europa.eu/coropiniondocument.aspx?identifier=cdrleduc-iv\dossiersleduc-iv-022\cdr6-2008_fin_ac.doc&language=en
8. http://ec.europa.eu/education/languages/news/news1669_en.htm
9. http://ec.europa.eu/education/policies/lang/key/studies_en.html.
10. ***, **2007** - COM (2007) 773 final, 2007-2010, *Mobility, an instrument for more and better jobs: the European job mobility action plan*).

LIFELONG LEARNING FOR VET: PROFESSIONAL LANGUAGE LEARNING IN EUROPEAN PROJECTS (LAPROF AND ELSTI CASE STUDIES)

ÎNVĂȚAREA PE TOT PARCURSUL VIEȚII PENTRU VET: ÎNVĂȚAREA LIMBILOR STRĂINE ÎN CONTEXT PROFESIONAL ÎN PROIECTELE EUROPENE (STUDII DE CAZ LAPROF ȘI ELSTI)

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Abstract. *This article aims to present the efforts and means of putting into practice and of promoting trans-national mobility for vocational training and education, especially in connection to language learning, in the context of the present European economic shifting background. We will concentrate on two European projects: LaProf (Key Activity 2: Languages) and ELSTI (Leonardo da Vinci – Transfer of Innovation), both focused on foreign language learning meant to improve professional development and support company progress.*

Key words: administrative staff, immigrants, agriculture, on-line language learning resources

Rezumat. *Acest articol prezintă eforturile și mijloacele prin intermediul cărora este aplicată în realitate și promovată mobilitatea formării și a educației vocaționale, mai ales în ceea ce privește învățarea limbilor străine, în contextul actualului fundal marcat de schimbări al economiei europene. Ne vom concentra asupra a două proiecte: LaProf (Key Activity 2: Languages) și ELSTI (Leonardo da Vinci – Transfer de Inovație), ambele axate pe învățarea de limbi străine direcționată către îmbunătățirea procesului de dezvoltare profesională și către promovarea progresului companiilor.*

Cuvinte cheie: personal administrativ, imigranți, agricultură, resurse de învățare a limbilor străine online

INTRODUCTION

This article is intended to share valuable information on the development of two European Union co-financed projects: Leonardo da Vinci – Transfer of Innovation and Key Activity 2 (Languages) project, both coordinated by the EuroEd Foundation, Iasi.

The first one, entitled **ELSTI: Eurobusiness Language Skills – Transfer of Innovation** (or, as called in the official documents, *European Languages for Secretaries*), aims at enabling office staff working in SMEs and students or pupils studying economics, business administration or accounting to improve their linguistic and intercultural communication needs so as to enhance personal

professional evolution and successful integration into the office working environment. The project is also aimed at raising the small and medium companies' rates of success in the light of a smoother channel of business communication. The ELSTI project offers modules of *business culture*, built to reflect the national business environments of ten European countries and a module of *personal development*, which works on building confidence for reaching higher levels of proficiency in terms of both job and linguistic performance.

The second project presented here is ***LaProf: Language Learning for Professionals in ICT and Agriculture***. The main objective of *LaProf* is to equip its target public with a series of tools for learning general and specific vocabulary and for acquiring cultural and social information much needed when going to work abroad. The intended users are ICT teachers in Estonia (and the Baltics in general) who want to relocate and work in Finland, and agricultural professionals in Romania who want to move and work in Greece. The project addresses the training institutions and decision makers in this field, providing them with working tools (online learning platforms including language courses); the main idea is how to tie up language learning and cultural acclimatization into the training and immigration processes.

Reflections on Language Learning and Work Mobility in the EU Context

It has been proven that small and middle enterprises from newly joining countries into the European Union experience difficulties with business interaction worldwide due to the lack of language, cultural interaction and IT skills. This was the starting point of the above mentioned study called ELAN - Effects on the European Economy of Shortages of Foreign Language Skills in Enterprise- which gathered information from 100 Romanian SMEs working in exporting goods or services, related to the importance of language and intercultural skills of the staff.

The EuroEd Foundation is familiar with the results of this study, as it was directly involved in the gathering of information and data processing; results indicate the importance of acquiring the skills mentioned above, not only from the personal development point of view, but also from the business success perspective. The respondents said that they could clearly identify moments of business loss (such as failing to close contracts) because of language related difficulties and that they considered language skills as an important criteria when hiring new staff. It is all the more so with the multinational companies which practise "selective recruitment" in a percentage of 94%. Aside from being a selection criterion, language skills are also monitored during employment, as participant companies in the study declared.

These two projects are also concerned with work mobility within the EU, as many professionals from countries like Romania or Estonia find it difficult to fit into the new working and social environment, because they were not previously exposed to the language and culture of the destination country. Moreover, office

staff from Baltic countries cannot meet their full potential and are not sufficiently qualified in the European working context either when it comes to language, IT and intercultural communication skills.

LaProf aims to help specific categories of professionals to qualify for, find and adapt to new jobs in their field of activity across the borders. EuroEd strongly supported the choice of the two target groups from Romania and Estonia: ICT teachers and young agriculture professionals, both categories wanting to find work in EU countries. Young agriculture professionals from Romania seek relocation in EU countries more and for a longer time concerned with an approach to agriculture connected to ecology (for example Greece) and ICT Estonian teachers seek relocation in Finland or other Nordic countries.

ELSTI project on the other hand is finding a way to transfer innovation from more experienced countries in the EU towards the less experienced ones and also to add new practical value to previous project findings and results.

MATERIAL AND METHOD

LaProf project is oriented towards two professional areas – ICT education and agriculture – and its final product is planned to be an online environment called the *LaProf Web portal*, with language learning exercises and much needed info on cultural matters in the countries where users wish to immigrate.

The project is focused on two specific types of professionals: ICT teachers (or students/unemployed graduates with this specialisation) from the Baltic region, who wish to find work in Finland and agriculture professionals (either unemployed, or freshly graduated in this field of activity) from Romania who wish to find work in Greece.

People working as ICT teachers or in agriculture and residing in Eastern European countries have little access to foreign language learning, especially if we should take into consideration the following aspects: a) they are located in rural areas (which might be the case for agriculture professionals); b) the foreign language they need to learn is not one of large circulation (such as Greek, Finnish, Hungarian, Romanian, and Russian); c) they need to use a specific portion of vocabulary, namely the professional terminology. Therefore, it seems as absolutely necessary to create language learning and teaching tools for the particular sectors of teacher and vocational education.

A secondary issue was that of promoting under-represented languages (mentioned at b), along with the specific language skills in wide circulated European languages. On *LaProf Web portal* there will be exercises for learning terminology of their sectors in both the languages of the destination countries (i.e. Finland and Greece) as well as in two widely spoken EU languages (i.e. English and French).

RESULTS AND DISCUSSIONS

The partners involved in LaProf project needed to identify first the learning needs of the selected groups and the connection between these needs and the requirements of the Common European Framework for Languages (CEFL) of the Council of Europe, so as to equip learners with skills and knowledge relevant for the European frame. The proceedings of the project are planned to meet the trainers' need for particular VET tools, applicable to this situation. The resulted

methods and learning/teaching materials will be evaluated by means of having actual sample users experience the developed platform.

The goal is to embed the tested methods into the educational system, so that people who wish to relocate in other countries may have a background of cultural knowledge about those countries, and into the immigration process, so that along with the generic conversational language skills, professionals who want to find jobs elsewhere in the EU may acquire specific terminology in the language of the destination country. It is important to forward a set of policy recommendations to language teachers, professional associations and decision makers that deal with both language learning, teachers' education, as well as vocational education and training around Europe.

ELSTI aims at taking a step further the findings of ELS, which means developing new content based on the existing patterns and making available for the public (and especially for the target public, administrative office staff) the final results materialized in modules on **business culture** and on personal development of **office staff**, contents that can be accessed on <http://www.eurobusinesslanguageskills.net/>.

For the ELSTI project, the targeted users are intended to be employees of SMEs all around the European Union who deal with secretarial/administrative tasks on a daily basis, but also student and pupils in the process of training/education enrolled in technical, economic and professional educational institutions.

Integrating all the resources mentioned above into the teaching systems of the newly added countries of the EU will enhance professional achievement too. This is important for the feasibility of the project and it addresses the students and pupils from technical, professional and economic educational institutions.

The platform of the project is meant as a valid and challenging alternative for the already set institutionalised means of teaching/learning languages and IT skills and as an interesting path to getting acquainted with the **business culture** of 10 European countries: France, Germany, Greece, Italy, Lithuania, Norway, Romania, Slovakia, Spain and UK.

Both projects also address the trainers and educational institutions as far as teaching tools and methods are concerned.

The most important products of *ELSTI* are business language courses, business culture modules and a module on personal development. The business language courses are available in four languages, but the platform which is designed as a challenging learning environment (www.eurobusinesslanguageskills.net) is translated into nine languages: English, French, German, Greek, Italian, Norwegian, Romanian, Slovak and Spanish.

The business language courses are organised into ten units on different topics and also include four types of follow-up activities. Aside from developing the language skills, these units are designed to familiarise the user with cultural issues in connection with each topic and to encourage language practice. All units are available in English, French, Italian and Spanish and for two levels: basic

users and independent users (A2 and B1 respectively). The business culture modules reflect the specificity of the business environment in ten European countries: France, Germany, Greece, Italy, Lithuania, Norway, Romania, Slovakia, Spain and UK. The organisation of these modules is given by business activities related topics, such as Making Appointments, Telephone Etiquette, Receiving Clients, Business Dress Code, Addressing Others, Negotiating, Entertaining, Public Behaviour, Regional Differences and How to Start a Business in ... and the users may evaluate their intake after getting through the modules by doing the Final Test (each module ends with such a test).

The module on personal development entitled *No Limits To Success: Create Your Own Personal Future* is available online and it helps users to develop their own personal vision on. It includes references to bibliographical resources on various subjects and active links, so that each individual should find his/her own way to achieving professional success.

All these elements combined with the interactive method offered by the use of an internet platform as support for the structured modules build on the users' confidence not only in gaining language and office behavior proficiency, but also in making use of the Internet and in acquiring ICT skills, on top of becoming familiar with the cultural issues of the countries mentioned.

The modern approach of creating learning materials directly linked to the learners' personal needs is being found at the basis of the development of the contents of these two interactive e-learning environments: the *LaProf* project starts with a thorough investigation and workshops meant to spotlight areas of professional content relevant for the target audience alongside previous successful learning experiences useful at the moment when decisions are being made regarding the development of the new materials.

CONCLUSIONS

The Ongoing Mechanism

For European Member States, promoting lifelong learning is a way to move forward towards the so-called "Lisbon objective", that is to make the EU become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion.

In this light, both projects presented in this paper work on the "Lisbon objective" and the way to get there is by empowering individuals to better fit in new surroundings: social, political, economical, cultural. The two-way directioning of effects and results of *LaProf* and *ELSTI* address the targeted public (professional individuals from the fields of activity presented above) and the relevant decision-making bodies, educational institutions and interested companies (stakeholders), which is why the activities and the results of the projects will be - after the initiation phase – self-sustaining, as they will trigger a set of measures in the line of officially filling in the gaps identified at the initial stages of the projects.

An interesting way of identifying these gaps and of also finding solutions is the concept of “user generated content”, as stakeholders will be enabled to further develop and maintain existing content. Based on this approach, a refined sustainability model will be worked out during the project, as *LaProf* is designed the way it does not need many resources and the emphasis is on networking and target groups learning and working together.

For the ELSTI project, the means to the same end is including the language courses and accompanying learning resources currently available on the project portal (www.eurobusinesslanguageskills.net) in the professional training public system of at least one country represented in the project partnership. The Academy of Economic Studies in Bucharest, the Faculty of Economy in Iasi, the Economic High School in Iasi are all engaged in piloting these courses and finding ways of harmonising their implementation within the national or institutional curriculum for language learning.

REFERENCES

1. www.elsti.eu
2. www.laprof.eu
3. <http://eacea.ec.europa.eu/index.html>
4. <http://www.anpcdefp.ro/>

THE MANAGEMENT OF EDUCATIONAL CRISIS SITUATIONS IN THE SCHOOL GROUP

MANAGEMENTUL SITUAȚILOR DE CRIZĂ EDUCAȚIONALĂ ÎN GRUPUL ȘCOLAR

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Abstract. *The paper emphasizes a series of theoretical and methodological aspects regarding the management of educational crisis situations in the school group. There is an axiom in education which says that it is easier to prevent a conflict than solving it later. Understanding by a situation of educational crisis the appearance of an event or a series of unexpected and unplanned events, considered to be dangerous for the climate, health and security of the respective class and its members, then it is advisable to resort to all stages of crisis management, among which we mention: their identification and knowing, the etiology of the crisis situation, the intervention program, the control and evaluation. The conflict management from the school environment through negotiation is a sine qua non condition for reestablishing the climate adequate for didactic activities in the educational group. For the correct adaptation to each specific situation, it is necessary to know the negotiation styles, as well as the types of negotiators. Negotiation is the procedure belonging to the methods of efficient, yet "honorable" solving of conflict situations, inherent to the management of school classes.*

Key words: educational crisis, educational group, negotiation

Rezumat. *În această lucrare sunt evidențiate o serie de aspecte cu caracter teoretic și metodologic a managementului situațiilor de criză educațională în grupul școlar. În educație, există o axiomă care susține că este mai ușor să se prevină un conflict decât să fie dezamorsat ulterior. Înțelegând prin situație de criză educațională - apariția unui eveniment sau un complex de evenimente inopinante, neașteptate dar și neplanificate, generatoare de pericolozitate pentru climatul, sănătatea ori siguranța clasei respective și a membrilor acesteia - atunci este bine să se apeleze la toate etapele de gestiune a crizei, printre care: identificarea și cunoașterea acestora, etiologia situației de criză, programul de intervenție, controlul și evaluarea. Managementul conflictelor din mediul școlar prin negociere este o condiție sine qua non pentru restabilirea climatului propice activităților didactice în cadrul grupul educațional. Pentru adaptarea corectă la fiecare situație specifică, este necesară cunoașterea stilurilor de negociere precum și a tipurilor de negociatori. Negocierea este procedura care nu poate lipsi din arsenalul metodelor de rezolvare efectivă dar și „onorabilă” a situațiilor conflictuale, inerente conducerii claselor școlare.*

Cuvinte cheie: criză educațională, grup educațional, negociere

INTRODUCTION

There is much talk nowadays about the conflict situations in the school group, about the teachers' complaining about the inappropriate behaviour of

pupils, aspect that seems to deepen from generation to generation. Therefore it appears that it is necessary to lay emphasis on certain concrete modalities to cope with these behaviour deficiencies without greatly interfering with the instructive and educational process.

MATERIAL AND METHOD

In the attempt to define a crisis situation a justified call for elements of theoretical management is made: it would be defined as an *event or complex of unforeseen, unexpected and unplanned events, which pose a danger to the climate, health or security of the class concerned and the members thereof.*

Understanding by a situation of educational crisis the appearance of an event or a series of unexpected and unplanned events, considered to be dangerous for the climate, health and security of the respective class and its members, then it is advisable to resort to all stages of crisis management, among which we mention: their identification and knowing, the etiology of the crisis situation, the intervention program, the control and evaluation.

RESULTS AND DISCUSSIONS

The first step of the management activity of crisis situations lies in:

1. *Identifying and knowing the situations concerned:* at the beginning of the analysis it is appropriate to particularise the crisis situations at the level of the school environment by determining the school phenomena within the class of pupils that may constitute genuine crises, conflicts and relational situations hard to control that occur between: teachers and pupils, teachers and parents.

2. *Etiology of the crisis situation:* generated by the development according to atypical forms of manifestation, the necessity to thoroughly know the situation and the causes thereof constitutes the second step in the management processes of school crises. Identifying causality must be a necessary beginning of the analysis operations.

2.a. Conflicts between pupils may be generated by:

- competitive environment – the pupils have long been used to working individually, thus preventing them from growing accustomed to working in groups, to communicating more intensely with their colleagues and therefore from trusting each other;
- intolerant environment – within the class the so-called “cliques” are formed and the absence of support between pupils leads more often than not to loneliness and isolation;
- low level of communication – most conflicts may be attributed to misunderstandings or to misperceptions of intentions, feelings, needs and actions of the others;
- inappropriate expression of feelings – conflicts will escalate when pupils have feelings uncalled for, when they do not know how to express sorrow or discontent in a non-aggressive manner;

2.b. Conflicts between teachers and pupils may occur against the background of several aspects of which we specify:

- little attention given to causes of some behaviours that precede or exemplify a psychological stress;
- failure to provide the smallest support in coping with critical situations;
- subjective evaluation of knowledge and affective and attitudinal behaviour;

2.c. The main causes of **conflicts between teachers and parents** are as follows:

- defective communication due to misunderstandings or to the small number of contacts over the course of a school year;
- value conflicts and fight for power;
- parents have prejudices based on previous experiences or it is not clear to them what role teachers play into their children's life.

3. Intervention programme. The management of crisis situations by means of *negotiating* has become an indispensable condition for restoring a climate favourable to didactic activities within the class. Negotiating is the procedure that may not miss from the arsenal of methods of effective and "honourable" solving of conflict situations, inherent to running a school class group.

Generally, negotiation may be defined as interaction between groups and / or persons having initial divergent interests and objectives that after discussing and confronting positions aim at reaching an agreement and at taking joint decisions ("Educational Management" Laboratory 2001, p. 120).

In the opinion of Hassan Souni (1998) the main negotiation styles are as follows:

3.a. Avoidant style.

- This conflict management style is characterised by the reduced capacity to support own interests and on the other hand by very reduced collaboration with the negotiation partner.
- It may also be called the "head-in-sand ostrich" strategy. Although it is not the most indicated strategy, it may constitute a good policy if it is followed by practical situation improvement measures.

In other words it is the most indicated method of buying time provided that this time is well used.

3.b. Obliging style.

- An obliging management style involves a minimum achievement of personal interests and a maximum achievement of cooperation. Thus the bases of a partnership are laid, if this is the intent, and such partnership is very likely to continue.
- This style may be explained as follows: A helps B without requesting anything for the time being, given that A has more to gain in the future.
- Some authors deem that such management is a sign of weakness, but it may be construed as a good cooperation model, but also a way to become obliged.

3.c. Competitive style.

- Through this management method own interest is imposed and any form of cooperation is reduced. A dictatorship is thus formed, performed by the strongest party that is not interested in any kind of collaboration with the lower rank partners.
- Teachers who resort to this manner of resolution of possible conflicts occurred at the level of the class of pupils will create a stressful atmosphere that is exerted on the pupils and this atmosphere will create conflicts in its turn, but these will be latent.

3.d. Collaborative style.

- This final conflict management style is the most indicated because it involves the maximisation of both personal interests as well as communication.
- It is the most indicated style between two basic school actors – teacher and pupils – who have joint goals. Thus the issue of consent of the two parties is raised.
- Through this collaboration method, the efficiency of achieving goals may be increased.

Types of negotiators

➤ *Cooperative negotiator*: involves the observance of a certain number of rules such as: transparency, loyalty to the partner, respect for objectives, determination to reach a positive arrangement. As far as efficiency is concerned, he or she is an organiser of short, medium and long-term positive states;

➤ *Affective negotiator*: acts and negotiates according to his or her feelings at the time. He or she is not at all pragmatic in their negotiation, acts according to situational affectivity and to the intensity degree of the relationship with the partner. His or her reaction is based on wish, subjectivity, friendship and rejection. The ideal fighting manner is to enter his or her affective universe;

➤ *Conflictual negotiator* is a person who gives priority to force and diplomacy, uses blackmail or threat, easily gives up to dialogue and abuses the force ratio. Strategically, in order to cope with a conflict, this type of negotiator must be more “conflictual” than his or her interlocutor or to bring the same into an “affective” or “cooperative” field;

➤ *Demagogue negotiator* is the type of negotiator who hides behind lies, manipulation, stimulation and duplicity. The manner to counteract such managerial manifestation lies in using the other types of negotiation.

Four stages may be distinguished within the negotiation process:

a. Negotiation preparation

The first step is represented by the determination of the next elements of negotiation: initial position; objective of negotiation and breaking point, beyond which we are willing to renounce.

b. Negotiation opening

The starting point in a negotiation is very important because the first impression that the interlocutor forms with respect to the discussion partner has a great impact on the negotiation process. Consequently, it is recommended that the negotiator:

- rely on reality;
- lay emphasis on active listening;
- ask questions and explore the situation;
- make known his or her points of view, but without trying to “destroy” the negotiation partners: positive intents must prevail over negative ones.

c. Actual performance of negotiation

During this stage the negotiation techniques may be successfully applied. Some of the best known negotiating techniques are the ones specified below, which use already acknowledged names:

- “Taking the temperature” – preliminary informal meeting (useful with a view to testing points of view, adopted positions).
- “Early negotiations” – technique that attempts to find out the point to which the negotiation partners are willing to go; hard feelings are thus avoided when someone is forced to pass over the limit represented by the braking point.
- “Foot-in-the-door technique” – aims at breaking the ice with an initially small demand, which is difficult to refuse, and after involvement is produced, a higher demand may be put forward highly likely to be accepted.
- “Door-in-the-face technique” – a higher demand is followed by a smaller one. The principle lies in demanding the interlocutor to make higher concession, which cannot be accepted, before asking for a second compromise, with smaller implications.
- “Silence” – is a gap that the people feel obligated to fill, if one asks a questions and an unsatisfactory reply is given, the best option is to say nothing; be keeping silent a signal is sent that one requests more information.

d. Negotiation conclusion

The conclusion of negotiation is the last stage where the assessment of what may be obtained through conditioned concessions, where a brief summary of the agreement is given and where the final position is established.

4. Control: must accompany any actional procedure. Its importance lies in the concern for the exact location of the phenomenon, for the avoidance and prevention of further effects of the crisis or even the prevention of parallel micro-crises. The fluency of interventions, the homogeneity and coherence degree are checked and optimised by means of control.

5. Assessment: aims at measuring and assessing the final state of the class following the completion of resolution procedures. It is recommended to design sets of relevant indicators in order to avoid assessment distortions and in order to certify the final level. A critical objective of the assessment stage lies in inferring

conclusions following the impact of the crisis state and engaging all those involved in knowing and preventing future situations of this kind. A good experienced teacher who also has obvious manager qualities will be able to exploit the entire extent of the events and thus to favour the future development of organisation, to render his or her personal actions more efficient and also to increase the output of the class.

CONCLUSIONS

In order to succeed over time and to be efficient within the social, group interaction process, the final compromise requested by conflict resolution must not be viewed by neither of the parties as a sign of weakness and must not be speculated within the conciliation process by neither of them, but it must be appreciated for its positive – integrative function.

The attempt to create a totally homogeneous organization or group, which has no controversies or disputes whatsoever results usually in weak performances and finally, in group disintegration. But it is necessary to make a difference between productive disagreements and conflicts and to reiterate the possibility of creating an environment in which disagreements may be solved through collaboration.

REFERENCES

1. **Froyen L.A., Iverson A.M., 1999** - *School wide and classroom management. The reflective educator-leader* (third edition). Upper Saddle River, N.J: Prentice Hall;
2. **Iucu R., 1999** - *Managementul clasei de elevi. Gestionarea situațiilor de criză educațională în clasa de elevi*. Editura Polirom, București;
3. **Nicola I., 2000** - *Tratat de pedagogie școlară*. Editura Aramis, București;
4. **Potolea D., Profesorul și strategiile conducerii**, studiu în Jinga, Ioan, Vlăsceanu, Lazăr (coord.), 1989 - *Structuri, strategii și performanțe în învățământ*. Editura Academiei R.S.R., București;
5. **Potolea D., Iucu R., Neacsu I., Pânișoară O. (coord.), 2008** - *Pregătirea psihopedagogică. Manual pentru definitivat și gradul didactic II*. Editura Polirom, Iasi;
6. **Souni H., 1998** - *Manipularea în negocieri*. Editura Antet, București.
- 7.*****Institutul de Științe ale Educației, 2001** - *Management educațional pentru instituțiile de învățământ*. Laboratorul Management Educațional, București.

OFFICE INTERACTORS - INNOVATION IN MOTIVATING ADULT LEARNERS

OFFICE INTERACTORS – INOVAȚIE ÎN MOTIVAREA CURSANȚILOR ADULȚI

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Abstract. *Updating the teaching/learning process is probably one of the most important means of motivating learners, especially adult learners. The Office InterActors project transfers the experience and the products of a previous project, InterAct, with the purpose of offering beneficiaries a motivating learning experience. The methodology developed focuses on valorizing participants' personal experience to support the learning process. The use of ICT elements provides a wide variety of activities. The blended approach implemented by the project involves both face to face meetings and other diverse types of online communication with the international partners thus taking into consideration the learning needs and affordances of all the groups activating within this programme.*

Key words: in-service training, motivation, blended approach, ICT, professional development.

Rezumat: *Actualizarea procesului de predare/învățare constituie probabil unul dintre cele mai importante mijloace de motivare a beneficiarilor, mai ales a cursanților adulți. Proiectul Office InterActors transferă experiența și produsele unui proiect anterior, InterAct, cu scopul de a oferi participanților o experiență de învățare motivantă. Metodologia dezvoltată este bazată pe valorizarea experienței personale a celor implicați cu scopul de a susține procesul de învățare. Utilizarea elementelor ICT oferă o mare varietate de activități. Abordarea mixtă din cadrul proiectului implică atât ședințe de lucru tradiționale precum și alte diverse tipuri de comunicare online cu partenerii internaționali. Sunt astfel luate în considerare necesitățile de studiu precum și disponibilitățile tuturor grupurilor care activează în acest program.*

Cuvinte cheie: învățare la locul de muncă, motivare, abordare mixtă, ICT, dezvoltare profesională

INTRODUCTION

Today's society has clearly modified its requests towards practitioners, irrespective of their field of activity. There is the need of identifying an opportunity to mould professional affordances so as to update them to the market request. These kinds of experiences have to address a much wider range than that of professional skills and abilities. Success in all professional fields includes research and work within a complex frame that offers individuals the chance of

having a holistic view on the entire activity field, including more than the strictly professional aspects.

The present project reaches in-service courses using a methodology previously developed within the InterAct project (the result of a Leonardo da Vinci project awarded the European Label in 2007), proven successful and adaptable to learning at the workplace. The principle at the basis of this method considers the fact that the beneficiaries of these courses need to be integrated or reintegrated in the present society making relevant links to their professional domains. This includes activities meant to widen the multicultural and multilingual horizon within which the target groups are either active or with which they are about to interact.

MATERIAL AND METHOD

As mentioned before there is a clear need of handling complex information in diverse ways for different results that would approach matters from various perspectives for a holistic view. This can only be accomplished through innovative methodologies implemented on the basis of needs analysis to ensure their relevance and coherence in relation to the target groups. In this sense Office InterActors brings along a new set of experiential learning strategies aimed at raising awareness, developing skills and offer opportunities to practice them. Beyond the soft skills, ICT and intercultural knowledge load the project includes aspects related to the professional field the course is addressed to – in this case that of economics. This leads to another important aspect, the fact that on the basis of this methodology and strategic structure the Office InterActors courses can very easily be adapted and transferred to other areas of interest simply by customizing the Moodle platform with a new scenario dedicated and specially developed for a certain group of students.

There are two rounds of courses. The first round is planned to be implemented in Autumn 2009 and the second one in spring 2010. Participants from Spain, France, Lithuania, Bulgaria and Romania are organized in national groups which communicate online by the help of a moodle platform to accomplish collaborative tasks developed on the idea of role play and problem solving. The scenarios created offer an authentic and relevant support for the acquisition of all aspects that have to do with participants' professional domain. Tutors are encouraged to adapt the original work model to the target groups they are to work with. The first tutors training was delivered in Iasi and the second will take place within the international conference (Sofia Feb.2010). This creates the possibility of dissemination towards other parties interested in the specific methodology and structure of this type of courses. The site of the project will be used to support this approach as it offers a resource data base for the delivery of the courses (<http://www.officeinteractors.eu/about-us.html>).

The target groups in the project are structured on three levels:

1. Educational / VET professionals and institutions interested to include the Office InterActors model in their educational offers
2. Employers and umbrella organizations representing employers, interested to invest in the training of their staff, apprentices or new recruits,
3. Students studying Business & Administration, recently graduated employees and would-be employees.

RESULTS AND DISCUSSIONS

A very important aspect is the structure these courses are built on. All activities are developed to meet both the level of knowledge and level of the learning needs participants have. Thus, within the same group, individuals with a lower knowledge level in the IT area will be supported by the other group members who possess this knowledge, all being monitored by the tutor.

Within the same groups individuals with a longer work experience will become the “coordinators” of the activity in those stages that are focused on the above mentioned aspect. Activities will alternate these basic and advanced levels to allow, and more than that, to encourage authentic and useful communication amid all participants in order to consolidate their collaboration. Motivating participants is also implemented through valorizing personal experience. This is done firstly by the individual who has to select from his own experience those aspects only that could contribute to the learning process of the entire group. This is turned into a reflection exercise upon personal experience. Secondly, all the group members benefit from these ideas and from the shared experience especially by reflecting on how this shared data could be adapted to their own environments.

Innovation in motivating adults participating in this training programme is also imbedded in the format and the structure of the courses. These have been developed to include beneficiaries within an authentic and relevant process suitable for the professional area within which the participants activate. Using scenarios allows identifying common aspects for all the international groups offering thus the possibility of transferring abilities in an international frame. Cultural awareness and the multilingual medium help widen the cultural horizon of the beneficiaries in a natural way allowing at the same time to share work experience with the international partners. Along professional abilities, another aspect included in the activities developed is promoting foreign widely used and less widely used languages. The use of the linguistic component offers another possibility to acquire the elements that have to do with the professional environment through facing the local specificity with the international one through the international partners.

The need to introduce less widely used languages as part of the training of office workers who may work internationally either in multinational companies or in national companies involved in international trade is reflected in the results of the ELAN study commissioned by the European Commissioner for Multilingualism, Leonard Orban, in an attempt to analyse the impact of foreign languages on the development of trade and commerce. The study has shown that when one wants to buy, English or another widely spread language is enough, but when one wants to sell, speaking the language of the potential buyer makes a significant difference.

Another innovative aspect that allows beneficiaries a continuous processing of the knowledge they gain is including in all activities the concepts of team work, negotiation and time management. All these help raising awareness upon

individual professional needs and also structure an individualized path for each beneficiary to follow in order to attain the knowledge and abilities that would correspond to the individual professional portrait. All these constitute a motivational kit for the participants who have the chance to look beyond the relatively narrow space of the local professional frame. International communication and collaborative actions in which participants are activated are at the basis of future development of team work abilities.

Using this methodology with adults assures a high degree of involvement on the part of all participants due to the communicative approach implemented both in the relations amid beneficiaries and in transferring information.

CONCLUSIONS

The activities created focus on developing abilities starting with the transfer of information and continuing with personalizing, adapting and further developing it to suit the professional needs of each participant. Including work mediums that promote international communication and offering a course support in the shape of a moddle platform (<http://www.euroed.ro/online/>) equipped with all the necessary material for the successful implementation of the activities is a motivating factor for both tutors and participants.

Gathering all these Office InterActors proposes a viable alternative for the in-service training of specialists from all the domains, at the same time promoting intercultural communication, multilingualism and ICT elements as resources for an updated training of the beneficiaries.

REFERENCES

1. Office InterActors website: <http://www.officeinteractors.eu/about-us.html>
2. Moodle platform: <http://www.euroed.ro/online/>
3. Office InterActors, project proposal

INTERDISCIPLINARY CORRELATIONS USED IN THE FORMATION AND DEVELOPMENT OF SOME CONCEPTS SPECIFIC TO THE BIOLOGICAL SCIENCES

CORELAȚII INTERDISCIPLINARE UTILIZATE ÎN FORMAREA ȘI DEZVOLTAREA UNOR CONCEPTE SPECIFICE ȘTIINȚELOR BIOLOGICE

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Abstract. *Within lessons of biology, it is aiming at the formation and development of some concepts specific to the various biological disciplines studied during preuniversity education. The example we are presenting in this paper, regarding to the formation and development of the concept of „functions of nutrition in plants”, over several school years, emphasizes the importance of realizing some correlations between biology and physics when studying the suction force of the roots and influence of light on photosynthesis, as well as between biology, physics and chemistry, when studying the leaf functions, such as photosynthesis, respiration and transpiration.*

Key words: concepts, interdisciplinary correlations, lessons of biology

Rezumat. *În cadrul lecțiilor de biologie, se urmărește formarea și dezvoltarea unor concepte specifice diferitelor discipline biologice studiate în învățământul preuniversitar. Exemplul prezentat în articol, referitor la formarea și dezvoltarea conceptului „funcții de nutriție la plante”, pe parcursul mai multor ani școlari, evidențiază importanța realizării unor corelații între biologie și fizică cu ocazia studierii a forței de sucțiune a rădăcinii, a influenței luminii asupra fotosintezei, precum și între biologie, fizică și chimie în momentul studierii funcțiilor frunzei (fotosinteza, respirația, transpirația).*

Cuvinte cheie: concepte, corelații interdisciplinare, lecții de biologie

INTRODUCTION

At the beginning of the 5th class, the students have numerous notions about plants, animals and humans, some of them correct, and other incorrect. These empirical concepts (notions) have been formed before entering the school, in the most various situations and circumstances, with the help of adults, and within the primary education, following the study of “Knowledge about nature and humans” as a school subject. Together of the systematical study of Biology during the gymnasium education, begins the process of formation of scientific concepts specific to biological sciences. However, the empirical notions does not disappear concurrently with the study of this school subject, but they are restructured, reconsidered, enriched and transformed into scientific notions. “The level of abstractization and generalization to which there is the content of an empirical notion is highly important within the education process”, because “it can indicate the various methods and procedures which should be used by the teachers in order to form the scientific notions to the students” (Zlate, M., 1973, p.174). In

gymnasium and high school, the volume of scientific knowledge of the students is progressively increasing, following the study of living matter, of some processes and phenomena specific to it, as well as of the structure and functions of some living organisms, within the school subjects included in “natural sciences”.

MATERIAL AND METHOD

The scientific concepts formed and developed to the students within the class of biology are concepts of systematics, physiology, ecology, genetics, biochemistry, biophysics, etc. Most often, the formation and development of a scientific concept, concret or abstract, is carried out within a series of lessons, studied during the same school year or in consecutive years, considering the relationships which can be established either with other biology concepts, or with concepts specific to other school subjects (chemistry, physics, geography, mathematics, etc). “The interdisciplinarity enhances productivity of the thinking processes, forming functional habits of generalization and analysis of the phenomena; it express and activates, in the same time, the conections between the school subjects, leading to the enhancement of pedagogical efficiency of learning [...]” (Copil, V., 1994). The establishment of these intra- and interdisciplinary relationships between concepts allows the knowledge and complex characterization of organisms, processes and biological phenomena. For emphasizing the possibility of carrying out interdisciplinary correlations in order to form and develop concepts, we selected and analyzed the mode of formation and development to the students of the concept “function of nutrition in plants”, within some themes, studied in gymnasium and high school.

RESULTS AND DISCUSSIONS

The formation of concept “function of nutrition in plants” is conditioned by formation of many other concepts of lower level of generality, such as: “plant nutrition”, “circulation in plants”, “respiration in plants” and “excretion in plants”. Also, formation of the concept of “plant nutrition” is conditioned by the formation of concepts of “autotrophic nutrition” and “heterotrophic nutrition”, formation of the concept of “circulation” is conditioned by the formation of concepts of “absorbtion”, “circulation of crude sap” and “circulation of elaborated sap”, and formation of the concept of “excretion” is conditioned by the formation of concepts of “transpiration” an “gutation”. The formation of these concepts begins in 5th class, but the study of biology before physics and chemistry does not allow the establishment of interdisciplinary correlations. Within themes concerning the organs of flowering plants it is aimed at the formation of concepts of “absorbtion”, “circulation of crude sap”, “circulation of elaborated sap”, “photosynthesis”, “respiration” and “transpiration”. By carrying out of some practical works and laboratory experiments when studying the functions of vegetative organs and seed, observation and analysis of the obtained results, favor the acquiring of knowledge about absorbtion of water and mineral salts by the root, about the conductive role of stem, about the synthesis of organic substances by photosynthesis in leaf, about respiration, transpiration, about the storage of nutritional substances in various plant organs, and about the consumption of storage substances from the seed during plant germination. For the corect

formation of the concepts of “photosynthesis” and “respiration”, and for preventing the wrong belief that plants respiration takes place only in the night, and during the day they are realizing photosynthesis, “it is necessary the comparative study of these two processes” (Csengeri, E., Iacob, M., 1961, p.34). Formation of the concept of “plant nutrition” continues within theme “Various relationships between plants”, aiming at the formation of the concepts of “parasite plant” and “semiparasite plant”. At the high school, in the 9th class, it is aiming at the enrichment of student’s knowledge about the functions of nutrition in plants, at the same time with the development of the concept of “cell”, by acquiring of knowledge about the structural and functional particularities of all components of plant and animal cells, within chapter “The cell – structural and functional unit of living world”. For the development of concepts “cell membrane”, “chloroplast” and “mitochondria” there are considered both the knowledges of biology acquired by student during the 5th class, and those of physics and chemistry, acquired during the 7th and 8th class. The establishment of some correlations between knowledges of biology and chemistry, within theme “Cell membrane”, contributes to the development of concept “cell membrane”, by acquiring knowledge about the membrane structure and its selective permeability, and also of chemistry concepts “proteins” and “lipids”, concerning the functions carried out of them at the level of cell membrane. Within theme “Exchanges of substances through the cell membrane”, can be realized correlations between the concepts of biology, physics and chemistry. Thus, the concepts of “osmosis” and “diffusion”, formed to the students when studying physics, in the 8th class, and the concept “concentration”, formed when studying chemistry, in the 7th class, are fixed and applied to biology, for explaining the passive and active transport of various substances through the plasma membrane. The scientific understanding of semipermeability of the membrane of rhizoderm and of the phenomenon of osmosis, is a prerequisite of formation and understanding of the concept “suction force”, as passive mechanism of water absorption. Also, the understanding of semipermeability of cell membrane and mechanisms used by the transporter proteins allows the understanding of the passive and active mechanism of mineral salts absorption. The correlation of knowledge in biology with those in chemistry can be realized also within theme “Plastids”, when is developed the concept of “photosynthesis”, by writing and analysis of the photosynthesis formula, of the reactions produced in the phase of light, as well as by mentioning of chemical reactions which are produced in the phase of darkness. The concept of “respiration” is developed within theme “Mitochondria”. Schematizing and analysis of chemical reactions produced within the two phases of cell respiration, without mentioning of the chemical formulas of glucose and pyruvic acid, stands at the base of correlation of knowledges in biology with those in chemistry. In the 10th class, within chapter “The structure and basic functions of living organisms”, it is aiming at the fixation and development of all the concepts formed in the previous school years, concerning to the mode of carrying out the functions of nutrition, relationship and reproduction of living organisms belonging

to the five kingdoms, as well as the relationships structure-function and organism-environment, by the comparative study of the concepts. At the same time with development of the concept of “photosynthesis” within theme “The influence of environmental factors on photosynthesis intensity”, can be realized correlations between biology and physics, aiming at the fixation and applying of concept of “light”, formed by studying physics, during 7th and 9th classes, by putting up-to-date the knowledge about light intensity, reflection, refraction, and spectrum and by experimental study of its influence on photosynthesis. Writing the general chemical equation of photosynthesis and the symbols of different mineral ions which participate to the synthesis of organic substances allows the establishment of some correlations between biology and chemistry. Formation of the concept of “circulation in plants” is conditioned by fixation of concepts “absorbtion”, “circulation of crude sap” and “circulation of elaborated sap”. Fixation of the concept “circulation of crude sap” can be carried out taking into consideration the concept of “concentration”, formed by studying chemistry, the concept of “osmosis”, formed by studying physics and the concept “suction force”, formed by studying biology. Based on some interdisciplinary correlations between these concepts, the students can explain the variation of vacuolar juice concentration in leaf cells, the occurrence of suction force at the level of leaves due to transpiration, the mechanism by which this force is transmitted up to the level of absorbent hairs of the root, and finally, the mechanism of passive water absorbtion. Formation of the concept “excretion in plants” is conditioned by fixation of the concept “transpiration” and formation of the concept “gutation”.

CONCLUSIONS

By analyzing the mode of formation and development of the concept of great generality “functions of nutrition in plants”, is seen the formation of concepts of lower generality (absorbtion, circulation of crude sap, circulation of elaborated sap, respiration and transpiration) during the 5th class. The development of these concepts is carried out progressively, during 9th and 10th classes, by studying the cell components at the level of which are realized these processes, and the mechanisms and factors which are influencing them, taking into consideration the correlations which can be established between the concepts of biology, physics and chemistry.

REFERENCES

1. Ariniş I., Mihail A., 2004 – *Biologie: manual pentru clasa a IX-a. Bucureşti.* Ed. liceALL2000, p.55-78.
2. Copil V., 1994 – *Abordarea aplicativ-interdisciplinară a curriculum-ului de Biologie.* Revista de pedagogie, nr. 3-4.
3. Csengeri E., Iacob M., 1961 – *Lecţii de Botanică pentru clasele V şi VIII. Bucureşti.* Ed. de Stat Didactică şi Pedagogică.
4. Ene S., Sandu Gh., Gămănesci Gh., 2005 – *Biologie. Clasa a X-a.* Ed. LVS. Crepuscul. Bucureşti. p.16-70.
5. Zlate M., 1973 – *Empiric şi ştiinţific în învăţare – însuşirea conceptelor de biologie.* Bucureşti. EDP. p.174.

OPTIMIZED DEVELOPMENT OF COMPETENCES SPECIFIC TO THE PROFESSION OF BIOLOGIST AND HORTICULTURIST

OPTIMIZAREA FORMĂRII COMPETENȚELOR SPECIFICE PROFESIILOR DE BIOLOG ȘI HORTICULTOR

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Abstract. *The great majority of seminars related to the disciplines included into the education curriculum of the faculties of biology and horticulture are actually practical and experimental activities, called practical work. By the activity carried out within practical work either in the laboratory or outdoor, it is aimed at the development of certain competences, needed to be a good specialist. We are considering that, besides the specific competences which are aimed to, within various speciality disciplines, there is necessary to pay a great attention to the development of meta-competences and attitude-behavioral competence, which are expected to be preserved during whole life.*

Key words: competences, practical work, biology, horticulture, students.

Rezumat. *Marea majoritate a seminarilor disciplinelor de studiu incluse în planul de învățământ al Facultăților de Biologie și Horticultură sunt activități practico-experimentale, numindu-se lucrări practice. Prin activitatea desfășurată în cadrul lucrărilor practice din laborator sau în aer liber se urmărește formarea anumitor competențe necesare unui bun specialist. Considerăm că, pe lângă competențele specifice ce se urmăresc a fi formate prin parcurgerea diferitelor discipline de specialitate este necesară accentuarea formării și dezvoltării metacompetențelor și a competențelor atitudinal-comportamentale, care să se păstreze pe tot parcursul vieții.*

Cuvinte cheie: competențe, lucrări practice, biologie, horticultură, studenți.

INTRODUCTION

Formation of the future experts on biology and horticulture, who have professional competences according to the description of occupation groups, namely specialists who have to carry out professional duties which requires high level knowledge in biological sciences, who must carry out investigations on theories, concepts and methods with a view to their improvement, who must apply in practice the knowledge acquired following the studies carried out on human animal and plant life, who should be able to study the diseases which affects plants, animals and humans, and to approve the prophylactic or curative treatments, who should be able also to elaborate and present scientific communications and reports on speciality subjects, is realized within universities. (www.mmuncii.ro/pub/imagemanager/images/file/COR/grupa2.pdf)

Thus, within the Faculty of Sciences at the University of Pitesti, the program of studies in Biology is aiming at the formation during the three years of

studies (day course of lectures) of specialists having competences in the following domains: scientific research in biology, agriculture, human health, and environment protection; food industry; biotechnology; drugs industry; laboratory medical analyses; plant protection and phytosanitary quarantine; control of the quality of agricultural and food products. The program of study in Horticulture, within the same faculty, is aiming at the formation during the four years of studies (day course of lectures) of specialists having competences in: scientific research, food industry, horticultural production (viticulture, fruit growing, vegetable growing, floriculture), horticultural technologies, dendrology and landscape architecture, plant protection and phytosanitary quarantine, control of the quality of horticultural products. (<http://www.upit.ro>)

MATERIAL AND METHOD

In the speciality literature there are numerous definitions of the concept "competence", belonging to various pedagogues.

The competence is defined by the Belgian researcher X. Roegiers as "an integrated assembly of knowledge, abilities and attitudes, practiced spontaneously, which allows conveniently exercising of a role, function or activities", the term "conveniently" meaning that the treating of situations can lead to a minimal expected result or to an optimal result (Sclifos, L., 2007, p.19). J. M. De Ketele (1996) defines the concept of competence in the same integrator vision as X. Roegiers and emphasizes the three components of a competence, considering that the interdependence between a capacity and a content will lead to the formulation of a specific objective (Roegiers, X., 2001, p.71, Stanciu, M., 2008, p.306): competence = (capacities x content) x situations; competence = specific objective x situations. The same point of view concerning the competence, as an assembly of qualities and capacities required to activate in a domain is found in the paperworks of D. Salade and C. Cucuș. After D. Salade, the competence is identifying with the ability to do something, involving both knowledge, meaning the capacity to do something well, and the result of activity in a domain of work (Salade, D., 1999, p.72). C. Cucuș consider the competence as all of the abilities and capacities of a which a student is able, in other words his/her potential, the process being influenced by internal and external causes (Cucuș, C., 2002, p.337). Approaching the competence as purpose of the education process, beginning with the 90 of XX century and transition from the education based on knowledge to the education based on competences is emphasized by the New National Curriculum Național elaborated in 1998. The competences, mentioned exclusively for high school education, are defined as "structured assemblies of knowledges and abilities acquired by learning, which allows identification and solving, in various conditions, of some problems characteristic to a certain domain". The school curricula of all the school subjects, including those of Biology, are stating precisely the two categories of competences: general competences and specific competences. At the level of the university education, the formation of competences specific to the profession of biologist and horticulturist is acquired within the activities of lectures and seminars corresponding to the school subjects included in the curriculum for the faculties of Biology and Horticulture, respectively.

For knowing the level of formation of competences to the students in Biology and Horticulture, in order to optimize the process of their formation, it was carried out an empirical research based on the methods of interview and questionnaire. The interview comprised questions concerning the mode of carrying out the laboratory

practical works (forms of organization, place of carrying on, didactical methods used) and the questionnaire comprised a frame for self-evaluation of competences acquired during the three, respectively four years of university studies. In carrying out the research, we started from the following hypothesis: the mode of organizing and carrying out of practical works, by combining activities carried out into the laboratory and outdoor, by combining of frontal activity with that carried out with groups, by using of the most adequate didactical methods, influences the formation of all categories of competences. The population sample used in our research comprised 26 students in Biology, and respectively 17 students in Horticulture, all of the in the third year of studies in the academic year 2008 - 2009. It should be mentioned that 20 students in Biology and 15 students in Horticulture have known the pedagogical terminology used in carrying out the research, as they are registered for the psychopedagogical module. For the Biology programme of studies, the school subjects considered within our research were: First year: Plant morphology and anatomy, Invertebrates zoology, Lower plant systematics, Vertebrate zoology; Second year: Comparative anatomy of vertebrates, Human anatomy and hygiene, Microbiology, Plant physiology, Animal physiology, General genetics, and Third year: Phytopathology, Hydrobiology. For the Horticulture programme of studies, the school subjects considered within our research were: First year: Pedology, Plant morphology and anatomy, Genetics, Microbiology; Second year: Plant physiology, Phytopathology, Entomology, Floriculture, Agrophytotechnics, and Third year: Fruit growing, Viticulture, Vegetable growing.

RESULTS AND DISCUSSIONS

The analysis of answers given by the students revealed the following:

1. The great majority of practical works corresponding to the school subjects considered, are carried out into laboratory. In Biology, within the practical works carried out for the school subjects Plant morphology and anatomy, Invertebrates zoology, Lower plant systematics, and Hydrobiology, are organized 1-2 activities outdoor, into the "Strand" Park and/or into Trivale forest, in which the activity with students is carried out frontal and in groups formed from 2-3 students. In the case of school subjects such as Comparative anatomy of vertebrates, and Vertebrate zoology, are organized 1-2 activities at the Arges District Museum, the activity with student being carried out frontally. In Horticulture, within the practical works is carried out a single activity outdoor as follows: for the Plant morphology and anatomy into the "Strand" Park, and for the Phytopathology, and Fruit growing, at the Research and Development Institute for Fruit Growing Pitesti-Maracineni, for the Viticulture, at the National Research and Development Institute for Biotechnology in Horticulture - Stefanesti, for the Agrofitehnie at the Research Station for Agriculture Albota, the activities with students being carried out frontally and/or in groups formed from 2-3 students. For the Pedology are organized 2-3 activities outdoor, and for the Floriculture are organized 3-4 activities at the Public Domain Administration - Pitesti, being combined the frontal activity with that carried out in groups or individually.

2. Regarding the mode of organizing the laboratory practical works, were distinguished the following types of activities:

A. Laboratory works in which isnot used the laboratory experiment

There are three possibilities of organizing of didactical activity:

a) *Laboratory work based on observation.* This mode of organizing a didactical activity is applied for majority of laboratory works carried out within both programmes of study, at the following school subjects: Plant morphology and anatomy, Invertebrates zoology, Vertebrates zoology, Lower plant systematics, Comparative anatomy of vertebrates, Human anatomy and hygiene, Microbiology, Phytopathology, Hydrobiology, Pedology, Entomology, Floriculture, Agrophytotechnics, Fruit growing, Viticulture, and Vegetable growing. It is given importance to independent analysis and graphical representation by the students, under the form of drawings, of the biological material, and as didactical methods are used: observation, modeling, learning by discovery, conversation, demonstration, explanation, PC assisted instruction.

b) *Laboratory activity based on practical works.* This is used within school subjects such as: Plant morphology and anatomy, Microbiology, General genetics, Pedology, Floriculture, Fruit growing, and Viticulture. It is given importance to carrying out the laboratory work independently by the students, after its demonstration by the teacher and/or based on the information material distributed, analysis of the obtained results and formulation of conclusions. As didactical methods are also used: observation, demonstration, explanation, conversation.

c) *Laboratory work based on demonstration assisted by the computer.* It is used in some Genetics laboratory works. The teacher is giving importance to the fragmentation of scientific information in order to systematically organize the teaching-learning processes. Together with demonstration are also used: modelation, explanation, observation, heuristic conversation, and exercise.

B. Laboratory works using the laboratory experiment

There are two possibilities of organizing the didactical activity:

a) *Laboratory work based on the experiment intended to form motorical abilities.* It is carried out sometimes in Plant physiology, Animal physiology, and Pedology. Importance is given to the realization of the experiment by the students, after the realization of a demonstrative experiment by the teacher, analysis and graphical representation of the obtained results, and formulation of conclusions. As didactical methods are used: observation, demonstration, conversation, and explanation.

b) *Laboratory work based on the experiment differentiated by the working task.* It is used within some laboratory works in Plant physiology, and Animal physiology, importance being given to the realization of experiment independently by the students of each group, analysis of the obtained results and formulation of conclusions with the group. As didactical methods are also used observation, conversation, explanation, and demonstration.

3. Knowing the level of competences formed at the students in Biology (*Table 1*) and Horticulture (*Table 2*), after three years of study, should be of great importance for the academic staff, as a prerequisite for increasing the quality of their own activity with the students, and for the enhancement of their chances to find jobs according to their qualification.

Table 1

The level of competences specific to profession of biologist, revealed by the self-evaluation of students in Biology

Category of competences	Specific competences	a %	b %	c %
1. Global competences	1.1. to reflect on the great diversity and variability of the living world;	19.23	42.31	38.46
	1.2. to reflect on the impact of new discoveries from the field of biology.	23.08	46,15	30.76
2. Cognitive competences	2.1. to operate correctly with the concepts, laws and principles specific to the studied school subjects;	15.38	38.47	46.15
3. Procedural competences	3.1. to use techniques specific for biology, in order to study the biological organisms, processes and phenomena;	-	23.08	76.92
	3.2. to use correctly the laboratory equipment and instruments;	-	30.77	59.23
	3.3. to describe and compare the structure and functions of living organisms / organs/ tissues / cells / cell organelles analyzed within the didactical activity;	15.38	50.00	34.62
	3.4. to identify and classify living organisms;	7.69	50.00	42.31
	3.5. to process the results obtained following activities carried out into the laboratory, representing them graphically as schematical drawings and graphs;	-	38.46	61.54
	3.6. to interpret the results obtained within the laboratory practical work;	-	26.92	73.08
4. Attitudinal - behavioral competences	4.1. to assume responsibilities concerning their own professional development;	-	38.46	61.54
	4.2. to adopt a flexible attitude in relationship established within the students group.	23.08	46,15	30.76

a – to a lower extent; b – to some extent; c – to a higher extent
(after Petruța, G.P., 2009, p. 102 – Frame for self-evaluation of intended competences)

Table 2

The level of competences specific to profession of horticulturist, revealed by the self-evaluation of students in Horticulture

Category of competences	Specific competences	a %	b %	c %
1. Global competences	1.1. to reflect on the great diversity and variability of the living world;	29.41	41.18	29.41
	1.2. to reflect on the impact of new discoveries from the field of horticulture.	23.52	35.29	41.18
2. Cognitive competences	2.1. to operate correctly with the concepts, laws and principles specific to the studied school subjects;	23.52	47.06	29.41
3. Procedural competences	3.1. to use techniques specific to horticulture (techniques for fruit tree grafting, techniques for fruit tree and grapevine pruning);	-	17.65	82.35
	3.2. to use correctly the laboratory equipment and instruments;	-	41.18	58.82
	3.3. to describe and compare the structure and functions of living organisms;	17.35	58.82	23.53
	3.4. to identify and classify living organisms;	11.76	47.06	41.18

	3.5. to process the results obtained following activities carried out into the laboratory, representing them graphically as schematical drawings and graphs;	11.76	23.52	64.71
	3.6. to interprete the results obtained within the laboratory practical work;	-	29.41	70.59
4. Attitudinal - behavioral competences	4.1. to assume responsibilities concerning their own professional development;	-	35.29	64.71
	4.2. to adopt a flexible attitude in relationship established within the students group.	17.35	23.53	58.82

a – to a lower extent; b – to some extent; c – to a higher extent

CONCLUSIONS

Analysing the mode of carrying out the laboratory practical works and the frame for students self-evaluation, it was found that the students consider that they formed themselves to a great extent the competences to use the laboratory equipment, the working techniques specific to biology, and to process and interpret the obtained results (the percentages ranging between 59.23% and 76.92% for the students in Biology and between 58.82% and 82.35% for the students in Horticulture), and to some extent the competences to identify, clasify, compare and describe (the percentages being of 50% for the students in Biology, and ranging between 47.06% and 58.82% for the students in Horticulture). We consider that the use, within both programmes of studies, of some modalities of organizing the practical works at indoor and outdoor laboratory, diversified and adequate to the individual particularities of students, has contributed to the formation to a great extent of the procedural competences to the most students, and to some extent of the cognitive competences. For optimizing the formation of global competences and to adopt a flexible attitude, competences considered to be formed to a great extent by a lower percentage of students, is needed the use of some methods based on internal language (personal reflection) and modification of the working groups composition, in order to be able to develop cooperation and mutual assistance relationships among the students from a programme of study.

REFERENCES

1. **Cucoş C., 2002** – *Pedagogie*. Ed. Polirom. Iași. p. 337.
2. **Petruța G.P., 2009** – *Seminar Didactica științelor biologice, în „Caiet de practică pedagogică(nivelul II)”* (coord. Ezechil, L., Dănescu, E.) Ed.Paralela45.Pitești.p.102.
3. **Salade D., 1999** – *Dimensiuni ale educației*. E.D.P. București. p. 72.
4. **Sclifos L., 2007** – *Repere psihopedagogice ale formării competențelor investigaționale la liceeni*. www.cnaa.acad.md/files/theses/2007/6569/ia_sclifos_thesis.pdf, p.19.
5. **Soare E., 2008** – *Tendințe noi în proiectarea curriculară în „Calitate în mentoratul educațional”* (coord. Ezechil, L.). Editura V&I Integral. București. p. 74-86.
5. **Stanciu M., 2008** – *Aspecte metodologice ale formării competențelor specifice profesiei de cadru didactic*, în „Lucrări științifice”, nr. 51.Seria Agronomie.Iași.p. 306.
6. www.mmuncii.ro/pub/imagemanager/images/file/COR/grupa2.pdf
7. <http://www.upit.ro>

ELEMENTS REGARDING ENTREPRENEURSHIP EDUCATION INTEGRATION IN SCHOOL CURRICULUM

ELEMENTE PRIVIND INTEGRAREA EDUCAȚIEI ANTREPRENORIALE LA NIVELUL CURRICULUMULUI ȘCOLAR

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Abstract. *The present paper focuses on the concept of entrepreneurship education, presenting its impact on school curriculum and philosophy. The author proposes an innovative approach which argues the fact that entrepreneurship education can become a new vision of postmodern education. The opportunities of realizing the activities proposed by this model of entrepreneurship education will contribute to the development of a new profile of students' personality, in accordance with the challenges of today's society and the educational ideal of our society. We propose that entrepreneurship education must be seen as an innovative way of projecting and organizing the school curriculum; it presupposes the realization of a certain type of personality, with an unique configuration of traits, model called entrepreneurship personality. In our vision, entrepreneurship education constitutes itself in a new paradigm of education which has the strength to restructure the entire school curriculum by capitalizing, at a formal level, non-formal and informal contexts. The aim of entrepreneurship education is developing entrepreneurs both among students and teachers. In order for the teachers to become an entrepreneurship model desirable to be followed by students, they have to become entrepreneurs themselves. The paper presents some strategies to integrate education for values into realization of entrepreneurship education. This way, entrepreneurship becomes a new value that must be present in today's school priorities.*

Key words: entrepreneurship education, curriculum, postmodern education, values

Rezumat. *Lucrarea de față se centrează asupra conceptului de educație antreprenorială, prezentând impactul acesteia asupra filosofiei și curriculumului școlar. Autorul propune o abordare inovatoare care argumentează faptul că educația antreprenorială poate deveni o nouă viziune a educației postmoderne. Oportunitățile de realizare a activităților propuse de acest model al educației antreprenoriale vor contribui la dezvoltarea unui nou profil al personalității elevilor în concordanță cu provocările societății de astăzi și ale idealului educațional al societății noastre. Propunem ca educația antreprenorială să fie văzută drept o modalitate inovatoare de a proiecta și organiza curriculumul școlar; ea presupune realizarea unui anumit tip de personalitate, cu o configurație unică a trăsăturilor, model numit personalitate antreprenorială. În viziunea noastră, educația antreprenorială se prezintă drept o nouă paradigmă a educației cu puterea de a restructura întreg curriculumul școlar prin integrarea, la nivel formal, a contextelor non-formal și informal. Scopul*

educației antreprenoriale este de a dezvolta antreprenori atât în rândul elevilor cât și în rândul profesorilor. Pentru ca profesorii să devină un model antreprenorial demn de a fi urmat de elevi, aceștia trebuie să devină ei înșiși antreprenori. Articolul prezintă și o modalitate de integrare a educației pentru valori la nivelul realizării educației antreprenoriale. Astfel, antreprenoriatul devine o nouă valoare ce trebuie integrată la nivelul priorităților școlii de astăzi.

Cuvinte cheie: educație antreprenorială, curriculum, educație postmodernă, valori

INTRODUCTION

In our opinion, entrepreneurship education can be seen as:

1. a study discipline (already included in school curriculum, a not quite sufficient variant)
2. a module of specific courses and activities (sometimes present within formal and non-formal programs)
3. an innovative way of projecting, organizing and developing the entire school curriculum (a restructuring of school and extra-school curriculum from the perspective of the requirements of entrepreneurship education, desired to be implemented)

These ways of applying entrepreneurship education at the level of school curriculum emphasizes the stages it follows in order to attain its specific objectives, in a determined socio/historical environment.

MATERIAL AND METHOD

The research was carried out using qualitative strategies, combining the method of content analysis, data quality analysis and studies of specialty document.

Choosing a way consecrated at the pedagogical level in order to delimit the evolution of a study area (see the stages followed by the concept of curriculum proposed by S. Cristea, 1998, 2000, 2004 etc.), we propose the following classification as regards the evolution of the curriculum meanings:

1. The classic – traditional stage. It is a phase of entrepreneurship education foundation, as a curricular discipline. In Romania, it is present in school curriculum, the Technological group, “Technology” curricular area, 12th grade and, later, at all profiles, the curricular areas “Man and Society”, 10th grade and VET profile, 11th grade.

2. The modern stage – the extension one. Entrepreneurship education extends and generalizes itself at a formal and non-formal level under the form of multiple courses especially organized and of modules integrated in various study programs. At a non-formal level it is represented by this type of training initiative. At a formal level it realizes through optional, out-of-school activities, social partnerships, integrated, cross-curricular themes etc.

3. The post-modern stage – of reconceptualization. Entrepreneurship education is conceived as an innovative way of projecting, in inter-dependence, according to the curriculum paradigm (launched by R. Tyler in 1949) the formal – non-formal – informal curriculum. *It restructures curriculum, representing a new paradigm of education*

Education fulfills an important role related to the disseminating of the society's values-structured assembly. It proposes itself, especially in the periods of crises as regards the socio-cultural values of the society, a system of values.

Education for values has countless correspondences and applications at the level of entrepreneurship education.

According to I. T. Radu and L. Ezechil (2006), education for values presupposes unfolding the education activity on several levels, namely:

- Knowing and understanding the principles, norms and rules which govern the social life, which presupposes the assimilation of cultural values and a moral-civic instruction of the members of the communities, which means achieving an axiological competence and developing the skill in order to discern values from non-values.
- Developing the capacity of observing the appearance of new norms and values, along with the ability of adapting one's behavior to them
- Developing beliefs correspondent to the socially-acknowledged values, which means he adhesion to the values system.
- Developing the usage of adopting attitudes and developing behavior in harmony with the system of the values socially accepted, as well as developing a militant attitude as regards obeying the norms by the whole community.

These levels mentioned above and aimed at by the axiological function of education can find a correspondent in realizing the entrepreneurship education. They can be treated as levels of education performance and success.

RESULTS AND DISCUSSIONS

Therefore, we propose the model of entrepreneurship education as a whirling process, with the following level (stages):

1. knowing the social problems
2. developing the entrepreneurship personality
3. identifying the opportunities
4. starting and developing the initiative
5. getting involved in entrepreneurship education

Graphically, the levels of entrepreneurship education realization present themselves in figure no. 1, as follows:

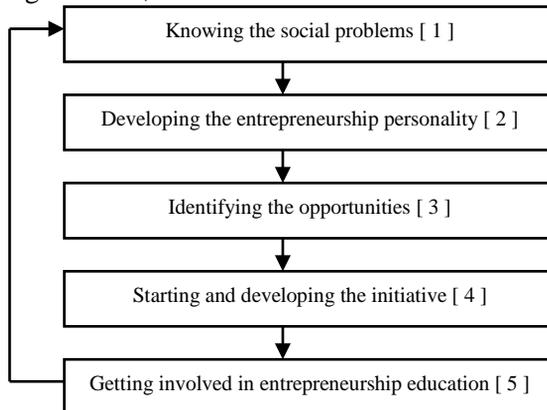


Fig. 1. Levels of entrepreneurship education

The process of entrepreneurship education starts from a good knowledge of the social life problems and the community in which the individuals activate. This is the first stage. Following the development of an image concerning the individual and social training needs, the process of developing the entrepreneurship personality begins.

This should be the answer the school might offer to the challenges presented by the social environment. The entrepreneurship personality leads to identifying the opportunities for change, as regards individuals' internalization of society's values and challenges.

The internalization of these realities is manifested under the form of entrepreneurship. Due to identifying the opportunities for action and innovation a new form of organizing (from an economic, social, school perspective) the resources necessary to their capitalization is created. The result of this type of education is materialized at a social level under the seven hypostases of the entrepreneur, identified at the beginning of the course.

The next step would lead to involving the successful entrepreneurs in implementing the entrepreneurship programs offered to school and community.

From an educational perspective, we are interested in the entrepreneur seen as an exclusive product of an educational system, not in the type of the entrepreneur who is created due to other configuration of factors.

The cycle of entrepreneurship education ends in the moment in which the entrepreneurs, who are created due to the process of educational entrepreneurship return to the educational system and get involve in realizing the entrepreneurship education. This is the final aim pursued by any program of entrepreneurship education.

In this way, entrepreneurship education presents itself as a process of whirling steps, starting from promoting an education program, following which the new-created personality initiate, in its turn, a program of education etc.

Between entrepreneurship education and curricular disciplines there can be an interdependence relation. Therefore, the competences specific of entrepreneurship education can be developed with the help of all basic disciplines included in the school curriculum. In this way, every discipline can contribute, by specific activities and contents, to the development of the entrepreneurship education.

On the other hand, including (and extending, from the perspective of the post-modern stage) entrepreneurship education in school curriculum can facilitate the transfer of the competences to all disciplines.

We present, as follows, several disciplines and the way they can contribute to fulfilling the objectives of entrepreneurship education (see also A. Ojala, 1995):

Communication, mother tongue: elaboration of business letters, advertising materials, sells, business presentations, negotiation etc.

Mathematics:

- the calculus of costs, investments and profits
- establishing the prices

- money circuit
- budget design etc.

Foreign languages:

- business customs
- negotiation techniques
- telephone communication
- types of behavior in public etc

Geography:

- commercial partnerships
- activities of import and export

Socio-humanistic studies:

- the European context
- international partnerships and collaborations
- labor market globalization etc.

Arts disciplines:

- exhibitions on entrepreneurship themes
- advertising, promotion
- messages and language in advertisement

Practical disciplines:

- producing and selling various goods
- aesthetic property of various articles
- simulations of handicraft
- hand-made objects
- design of different objects

Diverse optionals such as:

- applied economy
- basic entrepreneurship abilities
- starting small businesses
- business management etc.

We can observe ways of integrating entrepreneurship education at the level of school curriculum. To the extent to which there cannot be included new disciplines at the level of study programs, we can provide a new orientation to the taught contents.

CONCLUSIONS

Synthetically, we can estimate that education is a process which is realized according to some finalities projected before launching the processes, it has an intentional sense and aims at a clearly-configured result. Depending on the anticipated finalities, there are subsequently selected the values which are to be transmitted, there are chosen the most adequate methods and means for this

transmission, there is provided a satisfactory organization of the activity, for the pursued result to be obtained.

The main results pursued in the educative action are those anticipated at the level of the finalities. Therefore, the finalities, the values, the methodological system and organization forms constitute themselves in the fundamental premises of the educational success.

Neglecting any of these components orientates the formative action towards educational contexts, stressing the conditions of manipulation, indoctrination, training, instructive-formative dimensions of the human actions, sometimes attached to the educational one.

REFERENCES

1. **Bygrave W. D., Hofer C. W., 1991** - *Theorizing about entrepreneurship. Entrepreneurship Theory and Practice*, 16 (2), 13-22, Winter
2. **Ciolan L., 2001** - *Educația antreprenorială*, ISE, București
3. **Cristea S., 1998** - *Dicționar de termeni pedagogici*. Editura Didactică și Pedagogică, București
4. **Cristea S., 2004** - *Studii de pedagogie generală*. Editura Didactică și Pedagogică, București
5. **Ojala A., 1995** - *First steps of entrepreneurship education at school*, National Board of Education, Finland
6. **Outcalt Ch., 2000** - *The Notion of Entrepreneurship: Historical and Emerging Issues*, CELCEE Digest. Kauffman Center for Entrepreneurial Leadership
7. **Radu I. T., Ezechil L., 2006** - *Pedagogie. Fundamente teoretice*, (ed. III) Editura V&I Integral, București
8. **Soare E., 2008** - *Educația antreprenorială. Ultima provocare a școlii*. Editura V. & I. Integral, București.

POSTMODERN PERSPECTIVES ON CURRICULAR METHODOLOGIES

PERSPECTIVE POSTMODERNE ASUPRA METODOLOGIILOR CURRICULARE

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Abstract. *The present paper aims at realizing an analysis of curricular methodologies from a postmodern perspective. It deals with the postmodern curricular perspective on the didactic activity. The synchronic and diachronic approach underlines the specificity of the postmodern impact on the educational system and especially on curricular methodologies. Curriculum post-modernity is analyzed from a historical and axiomatic perspective. The authors propose the socio-cultural model of the society, with profound implications on the curriculum. There are reviewed the deconstruction and reconstruction theories, as methods specific of post-modernity which validate different models of organizing curricular methodologies. There are proposed several ways of realizing the didactic activities from this perspective.*

Key words: curriculum, historical perspective, methodology, postmodern education

Rezumat. *Lucrarea de față își propune realizarea unei analize a metodologiilor curriculare dintr-o perspectivă postmodernă. Este avută în vedere perspectiva curriculară postmodernă asupra activității didactice. Abordarea sincronică și diacronică realizată de autori evidențiază specificitatea demersului postmodern asupra procesului de învățământ și, în mod special, asupra metodologiilor curriculare. Postmodernitatea curriculumului este analizată dintr-o perspectivă istorică și axiomatică. Ca și determinantă asupra curriculumului este propus modelul socio-cultural al societății cu implicații profunde la nivelul curriculumului. Sunt trecute în revistă perspectiva deconstrucției și cea a reconstrucției, ca metode specifice postmodernității ce validează modele diferite ale organizării metodologiilor curriculare. Sunt propuse o serie de modalități de realizare a activităților didactice din acest punct de vedere.*

Cuvinte cheie: curriculum, perspectivă istorică, metodologie, educație postmodernă.

INTRODUCTION

Post-modernity, regarded as a cultural model, promotes a new way of understanding the report between knowledge and experience, between theory and practice at the level of human action. It means permanent reconstruction of the correlations between the main actions at the level of educational processes and their individualized development in extremely various and diversified psycho-social contexts and situations (S. Cristea, 2004, p.4).

With implications on the curriculum paradigm, post-modernity “designates a *model* of approaching the activity of personality’s permanent development and training, applicable in a certain stage of pedagogical theory evolution” (S. Cristea, 2004, p.3). This concept with a *paradigm* value presents two types of conditioning:

- *Historical* (post-modernity as a variant of post-modernism). A “repositioning of the pedagogical theory” in the context of post-modern culture takes place

- *Axiomatic* (post-modernity as a (re)analysis – (re)synthesis of a reference system).

We can better understand post-modernity in education by considering it a “rupture” from modernity. Unlike post-modernity which treats separately/differently the report between knowledge and human experience, post-modernity “promotes a new way of understanding the report between knowledge and experience, between theory and practice at the level of human action” (S. Cristea, 2004, p.4). This integrative report is capitalized at the level of the general theory of curriculum as being specific of the instruction theory. It capitalizes the interdependences between its main activities: teaching, learning and evaluation, actions which are contextualized by the specificity of the didactic relation.

On the other hand, post-modernity contributes to “consolidating the strong epistemic nucleus” of the sciences of education. It justifies and capitalizes, at the theoretical and methodological levels, the main ways of theoretical and practical fundamentation of curriculum paradigm.

MATERIAL AND METHOD

The present paper assumes a historical, diachronic and synchronic perspective on researching the curriculum area. From an epistemological perspective, history must be considered a way of knowledge. Crossing it, the curriculum theory, methodology and praxiology gets in the profound area of its axiomatic dimension, emphasizing the continuities and discontinuities for consolidating the basic principles and their social promotion, at a paradigmatic level. This type of approach is specific of socio-human sciences and proposes solution at least as valuable such as the empiric research applied to the field.

In post-modernity, curriculum paradigm validates two different perspectives at the educational level (cf. S. Cristea, 2004, p.8-10):

1. The perspective of deconstruction which “encourages the detachment of several elements of the whole considered more important in a certain determined social and pedagogical context” (such as the educational reform, lesson curricular projection, evaluation theory). This tendency is also manifested at the level of “dissemination of fundamental pedagogical sciences to the benefit of other research areas, considered a priority in a certain historical stage”.

It leads to the impossibility of satisfying the essential needs of curriculum paradigm regarding “the necessity of the unitary approach of the education system and of the education / instruction activities, at the level of the interactions between objectives-contents-methodology-evaluation, between teaching-learning-evaluation” (*ibidem* p.8).

Deconstruction represents the post-modernity *method* of edifying a comprehensive theoretical construction, which can lead to equalizing post-modernism and relativity (E. Stan, 2007, p.33).

2. *The reconstruction perspective* which “assures the permanent recreation of the whole (education, instruction, education/instruction projection) enriched following the integration of disparate analyses in the new structure of the reference system”.

Such a perspective justifies the curriculum paradigm which, once with R. Tyler's works (see: *Basic principles of curriculum and instruction*, 1949), unifies the efforts in an axiomatic framework with a strong formative and functional role. It concerns the optimization of the reports between:

- a) Diversification-unification,
- b) (theoretical) knowledge-(empirical) experience,
- c) Fundamental research–applicative research,
- d) Hermeneutical research-experimental research.

The analyses formed by integrating these components can contribute (cf. S. Cristea 2006, p.20) to reducing/essentializing the research area of the curriculum theory at a very clear and easily recognizable epistemic object at the level of functioning/organization structures of education in the context of post-modernity.

RESULTS AND DISCUSSIONS

The socio-cultural model proposed at a post-modern level requires renouncing the generalizing narrations, proposing the multiplication of styles and diverse solutions for solving some contradictions of the post-industrial society between the tendency of transformation-stabilization, homogeneity-heterogeneity etc. It leads to the capitalization of the codes favorable of communication from the repressive one to the reproductive and creative one in an open space from a formal, non-formal and informal point of view (E. Stan, 2007, p. 5).

It presents multiple determinations on curriculum by:

- Stabilizing the fundamental concepts in the context of de-centered and intensive mobility of the information and communication networks specific of post-industrial society,
- Recognizing the coexistence of the diversity of opinions and interests multiplied at a global level,
- Affirming the main directions of evolution on a medium and long term from the perspective of curricular projection of education (S. Cristea, 2004, p.5).

Referring to an argumentation of an axiomatic type, S. Cristea (2003, p.221) analyzes the paradigm of curricular projection as representing a fundamental direction of evolution in education. It requires an area of concentration and extension which can be reduced to the level of the following components (*The International Encyclopedia of Education*, 1994, p. 1147):

1. theoretical fundamentals which sustain the development of the correlation educator-educated in an open social context,
2. educational finalities assumed at the level of the system (ideal, goals) and process (objectives),
3. the contents selected and organized pedagogically,

4. instruction/learning methodology,
5. methods and techniques of evaluation/self-evaluation (integrated in the instruction/learning methodology).

That is why, as a fundamental direction of evolution in education, curricular projection presents an axiomatic value which is available at the level of the entire educational system, allowing for the orientation of the proposed activities towards permanent education and self-education, the premises of full capitalization of the educability potential of every individual.

In the work *The logic of education* (1970) P.H. Hirst și R.S. Peters present a post-modern vision on curriculum. When approaching the ways of curriculum organization, the authors present two forms: *modular* (disciplinary) and *integrative*.

The content units and activities modules can be organized around a set of objectives (with or without connection, as a puzzle) or can be approached from an integrative perspective (cross-curricular) when the objectives have a larger area of applicability.

The former variant can produce an artificial atomization of the experiences types the child is to have access to, whilst the latter variant can better correspond to the complex interactions present at the level of social experience. According to Hirst and Peters, it can be argued as follows: “the nature of the educational objectives requires a special attention offered to the systematic development of child’s understanding of the experience and knowledge ways which are independent and interconnected at the same time” (*ibidem* p.73).

Curriculum organization has to be based on the content units realized by grouping the objectives. The basic idea of these authors is that in the rational planning of curriculum we must have in view the way its context is structured, according to the objectives and not necessarily the methods or activities which can be realized. When curriculum organization can take place by grouping the contents in distinct disciplines or integrated units, the problem raising does not refer only to the efficiency of the means for attaining the objectives, but also to regarding objectives at a general level.

Positively, according to these authors, curriculum organization on the basis of integrated units, due to their complexity, represents the means for producing a significant and diverse learning. Therefore, it appears a relation of interdependence between the curricular objectives and their organization. Experience and knowledge cannot be assimilated unless the content units and the activities are created in close dependence to the public ways consecrated at a social level.

In curricular organization, following the clarification of the objectives which are to be pursued after establishing the ways of contents structuring, an important role is played by the activities methodologically described which are to be unfolded in order to attain the proposed objectives. It is important to see which are the activities unfolded inside the curriculum and how they contribute to attaining the final goals.

The perspective proposed by Hirst and Peters on defining the curricular activities is a very interesting one, enrolling the curriculum paradigm. They are represented by:

- learning activities (based on talent and experience),
- teaching activities (subordinated to learning),
- contents and methods,
- personal relations teacher-student.

All the component elements, regarding the objectives, represent the curricular model proposed by the two authors. In order for an activity to be described as an efficient learning process it should possess an object and a subject. They are represented by the student and the object of his learning. Such a process unfolds for attaining a standard defined at the level of the objectives in terms of final, intermediate or immediate realization. The learning standards are defined/determined by the pursued objectives.

According to P.H. Hirst and R.S. Peters, the teaching activity, as premises of learning, can represent a logical condition for learning realization if it is conceived without any connection with instruction. In the context of curriculum centering on learning activities, teaching can be necessary when experience and knowledge must be effectively transmitted in a systematic, deliberate and efficient way. Therefore, teaching activity is directly linked to institutionalized education.

As regards formal education, teaching appears as necessary. The same requests are not compulsory in the case of other forms of curriculum realization. The main function of school institution is the intentional and systematic teaching of the contents. All the forms of curriculum organization closely connected to school are intentionally planned both from the perspective of teaching objectives and activities and of teachers and school authorities.

CONCLUSIONS

In the process of curricular projection, there must be established the most adequate activities generically called teaching, as well as the necessary conditions it should satisfy. Choosing these activities is made following two philosophical considerations: the distinction between the sequences of learning activity and the extent of their determination.

A very important aspect concerns the absolutely necessary distinction we must make at the level of *what will be learned* following the planned activities of teaching and learning, *the content* of the disciplines which will lead to what must be learned, as well as *the methodology* level of presentation form used for transmitting the content.

The first condition stipulates the necessity of clarifying the objectives pursued. The other two conditions reflect the complementary ways the objectives can be attained with. Once established the objectives which are to be attained, the learning activities, the contents which do not refer to attaining the objectives can vary, depending on certain contexts and can present and develop alternative forms of realization. Moreover, once the contents established, the ways of their

presentation can also vary. The same contents can be transmitted and processed by using a multitude of methods and forms of organization and realization.

On the other hand, in education planning, *the methods* have a double acceptation, integrating, besides their *utilization*, the exercising of *skills* with immediate educational value. Due to these reasons, although the methods used in the educational activity can be limited, curriculum rational planning does not presuppose changing the objectives, but finding, at any costs, the most proper methods for attaining the objectives. The objectives of the instruction, once defined, present a stable value attributed by the actors of the education involved in the process.

REFERENCES

1. **Cristea S. (coord.), 2006** - *Curriculum pedagogic*. Vol. I. Editura Didactică și Pedagogică, București,
2. **Cristea S., 2003** - *Fundamentele științelor educației: Teoria generală a educației*. Editura Litera Educațional. Chișinău,
3. **Cristea S., 2004** - *Studii de pedagogie generală*. Editura Didactică și Pedagogică. București.
4. **Hirst P.H., Peters, R.S., 1970** - *The logic of education*. Routledge & Kegan Paul. London,
5. **Petruța Gabriela-Paula, 2008** – *Metode interactive utilizate în cadrul orelor de Biologie în Strategii alternative de instruire, învățare și evaluare*. Ed.Risoprint. Cluj Napoca. p. 335-340,
6. **Soare E., 2008** - *Axiomatic Dimensions of Curriculum. Some Effects of the Socio-Cultural Model of Postmodern Society în Scientific Bulletin – Education Sciences Series*, No. 2/2008, Editura Universității din Pitești.pp. 171-182,
7. **Stan E., 2007** - *Educația în postmodernitate*. Institutul European. Iași,
8. **Tyler W. R., 1949** - *Basic principles of curriculum and instruction*. Chicago. London,
9. ***** 1994** - *The International Encyclopedia of Education*. Pergamon. Oxford. England.

LANGUAGE LEARNING AS MEANS TO AN END

ÎNVĂȚAREA LIMBILOR STRĂINE: MIJLOC ÎN LOC DE SCOP

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Abstract. *One of the most important goals of the European Union is to promote and sustain lifelong learning and learning strategies for life and it is a challenge to implement this attitude with young children. The aim of this article is to describe a project co-financed by the European Union, called EAT (Eating Abroad Together), project that aims at achieving these goals. The main goals of the EAT project are to sustain language learning and to promote multilingualism and cultural awareness. As language learning is more efficient when it takes place in a context relevant to the learner, all the activities of the project are based on a communication tool created for children in different countries, communication centered on the idea of healthy eating.*

Key words: healthy eating, language learning, CLIL, family learning

Rezumat. *Unul din principalele scopuri ale Uniunii Europene este promovarea și susținerea învățării pe tot parcursul vieții. Implementarea unor strategii de învățare pe tot parcursul vieții constituie o provocare și când vine vorba de copiii de vârstă mică. Scopul acestui articol este să descrie un proiect co-finanțat de Uniunea Europeană, intitulat EAT (Eating Abroad Together – Să mâncăm sănătos împreună), proiect care urmărește aceste scopuri. Principalele sale obiective sunt să sprijine învățarea pe tot parcursul vieții și să promoveze multilingvismul și toleranța. Deoarece învățarea de limbi străine este mai eficientă când se desfășoară într-un context care este relevant pentru student, toate activitățile proiectului se bazează pe un instrument de comunicare creat pentru copiii din diferite țări, instrument care are la bază ideea de promovare a obiceiurilor nutriționale sănătoase.*

Cuvinte cheie: alimentație sănătoasă, învățare de limbi străine, CLIL, învățare în cadrul familiei

INTRODUCTION

The project EAT focuses on developing and instilling healthy eating habits for the young age. To create a more motivating and user friendly approach the project partnership has decided to include elements that would contextualize learning activities and thus create an authentic space for children to activate within. Encouraging children to acquire a foreign language is one of the elements meant to enrich the fundamental focus of the project- healthy eating. By engaging children in multilingual tasks and providing them with a virtual support in this sense (the project website: www.eatingabroadtogether.eu) the project has created a flexible and yet coherent structure easily adaptable to country specificities allowing national and international groups to express themselves and at the same

time following a prior set path. This also helps children improve their attitude towards different cultures and see differences not as interesting facts they can themselves benefit from.

MATERIAL AND METHODS

The partnership - Italy, Romania, the Netherlands, the UK and Bulgaria - has selected a total of twenty schools (four from each country) to take part in the project activities. The activities were structured on thematic projects for the children to create – all centered on the idea of promoting healthy eating. Thus, they have presented their country, school, home town to their foreign partner, they have wrote diaries on their national traditions and they have discussed via blogs and emails about what is healthy and what it is not. The main communication tool created is the website of the project: www.eatingabroadtogether.eu. The website is a collection of the blogs the children wrote to each other, of healthy and traditional recipes that they have uploaded, and an extensive database made of words related to eating and healthy food, of frequent words and phrases, of basic expressions that are necessary for understanding a foreign language at an elementary level. All the words are translated into the five languages of the project: English, Romanian, Dutch, Bulgarian, Italian and French and German as added value.

These less widely used and widely used languages are introduced to children in a friendly and relaxed manner. They do not have to study the languages but simply select the vocabulary they might be interested in for various activities (holidays abroad, communicating with the international partners etc) and valorise it in the manner they consider most appropriate. All the words have an audio recording – made by the children themselves – that help the potential learner to pronounce the words correctly, and a picture is attached to each word.

The coordinates of the project were to promote language learning by offering a relevant framework to motivate and sustain the learning process. As on a wider global context it has become very important to raise awareness on the dangers of an unhealthy lifestyle among young people, the framework chosen was healthy eating. More precisely, the children attended sessions with nutritionists, school doctors and nurses, teachers that taught them about the benefits of a healthy diet and that encouraged them to share the facts learned at school, with their families and colleagues.

On the platform and with its help the children have done many activities that facilitated their language learning. On the one hand, they have improved their English, as all the communication (translation of words for the website, writing letters to the partner school, writing blogs) has taken place in this language, but they have also acquired basic knowledge of less widely used less taught languages such as Bulgarian, Romanian, and Dutch.

This project has brought an important contribution to raising awareness of intercultural matters and to helping children become more comfortable and tolerant in a multicultural environment. A lot of the activities developed within the project have focused on the children sharing cultural differences and similarities.

The cultural component is equally emphasised and it is actually the structure around which all the other activities are developed. The entire process is framed by the intercultural dialogue within which all partners promote their countries and cultural identities. It is in the best interest of the children to acquire as much as possible from what they are particularly interested in. Some of the children might be interested in the similarities between a certain foreign language and their mother tongue especially

because their parents are working abroad and they feel connected to that certain language. Some other might be interested in finding out more about a certain foreign culture simply because they have already visited or because they plan to visit that country. Whatever their reasons, the basic rule remains that long term constructive motivation comes from within and only this way children's needs are fulfilled in order to make a real change and develop real life skills.

The activities in the project are decided together with the teachers. There is an efficient communication and collaboration channel between the teachers and the coordinators. These all are the premises of a successful process. Transferring information between the different levels of the project, coordinators, teachers, children, parents, local community, is the key to creating a feasible product which all the elements of the target groups can access and use.

RESULTS AND DISCUSSIONS

Through the *EAT* project teachers valorise the use of a cross curricular approach and integrated learning activities raises the chances of building a more efficient learning process for the children participating in this project. First of all this manner of work addresses more types of intelligence which allows children to particularise and internalise new information in their own ways. Secondly children are not set on learning a certain piece of information. By using various topics, like healthy eating in our case, they have the chance to explore so many other aspects of their own language and culture and also of their own habits.

The activities in the project raise children's awareness on the importance of a healthy and balanced eating diet. Besides the linguistic component the activities also involve cultural elements from each participant country. The final product is therefore in the shape of a communication channel between European countries and information exchange on cultural issues. The added value is the linguistic component of the project. Just like in the previous project children are only focused on learning foreign languages, not in a formal setting anyway. The learning process here is focused on practical and useful activities that would help children develop the skills they most need to personalize and take on their own learning process. Acquiring a set of words in the foreign languages, vocabulary they can then use when going abroad is but a survival kit that would motivate learners to find out more about the target languages and their cultural background.

During the entire implementation of the project there have been a series of achievements extremely important for focusing on the key issues of the project. Through experiential learning children were involved in hands-on activities relevant for more than their eating diets. Language skills were improved, LWUL were disseminated and children were encouraged to spread the information themselves as they were going back to their families. All this resulted in a smooth communication with the families of the children involved in the project. Parents responded much more easily to all the activities organized by the schools providing the necessary ingredients for the cooking classes and participating in a number of meetings and events such as the BIG EAT – the final event of the project each of the partners had to organize for the schools involved in their country.

CONCLUSIONS

Teaching foreign languages will always be a challenge and even a greater challenge is to sustain motivation for learning. Providing a context that is relevant to the learner, context in which language learning can take place by achieving other goals besides language learning *per se* has proven to be an efficient means to an end.

The context that the EAT project has created has proven to be attractive for the young learners for mainly two reasons: on the one hand, the children had the curiosity of exploring the culture of a foreign country and, on the other hand, they had a modern and attractive tool to do that, namely the project website which is interactive, easy to use and attractive to the targeted age group.

Therefore, language teachers and language course developers should try to focus on the value of language learning as it is: a means to an end and not a goal in itself. Getting involved and making use of the ideas already present on the site of the project is a way of transferring ready-made, tested and validated products with a European wide guarantee directly into your classes. No matter what the level to which the material is adapted, the emphasis will always be on intercultural communication as a premise for disseminating national values and cultures. It is after all only fair to let the young ones in on maximizing their national specificities at a global level.

REFERENCES

1. www.eatingabroadtogether.eu
2. http://ec.europa.eu/education/languages/language-teaching/doc236_en.htm

EVOLUTION OF ECONOMIC THINKING ON THE BALANCE SHEET

EVOLUȚIA GÂNDIRII ECONOMICE CU PRIVIRE LA BILANȚUL CONTABIL

APOSTOL C.

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Abstract. For today generations, and for those to come, past research constitutes a wellspring of rich documentation and guidance. With the socio-economic developments recorded during the history of mankind, the study of balance sheet was a real interest to specialists in the field, who established the theoretical bases of it, revealing the it's pragmatic functions, process currently no outstanding. Scientific research a balance sheet has developed in time eminent doctrines, clarifications or innovations, leaving open the art and science to any honest test for the truth and light to continue the search, secure source of progress. Knowledge in the balance sheet as a universal and necessary in any system of accounting, regardless of time and space, there are objective and purpose and value of this knowledge depends on economic and social system which they legitimize. The requirement elaboration of the balance sheet is shown by mathematician Luca Paciolo, with crystallisation of the accounting system. But, although the balance sheet is known and used for centuries in accounting practice, it becomes the subject of special investigations at the end of the century just past.

Key words: balance sheet, financial statements, accounting

Rezumat. Pentru generațiile de astăzi, ca și pentru cele ce vor urma, cercetarea trecutului constituie un izvor neseecat de bogată documentare și orientare. Odată cu evoluția social-economică înregistrată pe parcursul istoriei omenirii, studiul bilanțului a constituit un real interes pentru specialiștii în domeniu, care au stabilit bazele teoretice ale acestuia, dezvăluindu-i totodată funcțiile pragmatice, proces neîncheiat nici în prezent. Cercetarea științifică a bilanțului a dezvoltat în timp eminente doctrine, deslușiri sau inovații, lăsând deschis teritoriul de artă și știință pentru orice încercare onestă de punere în lumină a adevărului și de continuare a căutărilor, izvor sigur al progresului. În cunoașterea bilanțului, ca instrument universal și necesar în orice sistem de contabilitate, independent de timp și spațiu, există temeieri obiective, iar sensul și valoarea acestei cunoașteri depind de sistemul economic și social pe care îl legitimează. Cerința întocmirii bilanțului este arătată de matematicianul Luca Paciolo, odată cu cristalizarea ca sistem a contabilității. Dar, deși bilanțul este cunoscut și utilizat de veacuri în practica contabilă, el devine obiectul unor cercetări deosebite abia la sfârșitul secolului trecut.

Cuvinte cheie: bilanț contabil, situații financiare anuale, contabilitate

INTRODUCTION

Balance analysis presupposes referring to a multitude of meanings and significations, differentiated according to the nature of the methodological

references that can be used for acquiring, understanding, judging, and interpreting the terms that explain, motivate, and legitimize the object under research, the interested subject, the social process that lays at the center of human action that formalizes and prioritizes principles, norms, and basic rules, starting from which a model for reality representation ensures appropriate co-operation and understanding of the dominant characteristics in relation to the environment, space, and time.

MATERIAL AND METHOD

The mathematician Luca Paciolo presents in his work “Summa de l’Arithmetica, Geometria, Proportioni e Proportionalita” (1494) the necessity of drawing a balance sheet, as it became an accounting system based on double records. However, although the balance sheet has been known and used for centuries in accounting practice, it became the object of dedicated research only at the end of the previous century (Horomnea E., 2004). The Belgian Simon Stevin “is important as the first author who has scientifically posed the problem of the necessity for an annual balance sheet” (Demetrescu C. G., 1972). Research regarding the role and functions of the balance sheet has multiplied heavily ever since, resulting in a large number of balance sheet theories.

To achieve this article were undertaken studies on various documentation describing the form and content of balance sheet, following the evolution in the context of changes that have occurred over time on economic, financial, political and social.

RESULTS AND DISCUSSIONS

The term *balance* comes from the Italian original *bilancia* (balance, scale), which originates in the Latin words *bis* and *lanx*, meaning a scale in balance.

At the origin of the traditional accounting system, the balance did not have any explicit determination, separate and distinct from the statements system. Closing the accounts presupposed an inventory, and the inventory summary, as a statement, has led certain researchers to the interpretation that, historically, the balance sheet appeared relatively late.

In Italy, considered the motherland of accounting, there appeared for the first time issues regarding the balance sheet. The 1408 records of the Bank of St. George of Genoa contain the note “Bilantium creditorium debet nobis in billantio debitorium in CXIII”. Also, Desimoni mentions that in the General Ledger of the commune of Genoa, in 1340, the name of *billantium* was used to refer to the balance sheet.

The notion of balance was used by Cotrugli in his work, and later by Domenico Manzoni in 1554, by the authors Miossa and Radonichi in 1581, as well as by Louis Flori in 1636, who showed that the balance sheet cannot be considered a verification statement, as it was thought by certain authors of his time.

Also, in Netherlands, in feudal times, there appeared accounting papers characterized by a strong resemblance with the works of the Italians.

Jean Ympyn (1485) is considered one of the authors with the greatest influence, after Luca Paciolo, on accounting literature in the 16th century. Before him, the accountant would not consider forecast and therefore the balance sheet was incomplete, as it only contained what was certain, without being based on evaluations.

In Netherlands, an important contribution to the balance sheet was brought by the Dutch Claes Pietersz de Deventer and the Belgian Simon Stevin. Claes Pietersz de Deventer's importance is due to his improvements to the work regarding the closing of accounts and relating the balance sheet to the closing balance. The new papers also express for the first time the almost faultless rules for drawing a real balance based on the inventory and a correct re-evaluation of the existing goods. Simon Stevin poses scientifically for the first time the problem of the annual statement (in his work published in 1608), which was practically accomplished in the second half of the 17th century.

In France, there appeared papers on centralizing accounting data and using journals.

Pierre Savonne published in 1567, in Anvers, the work "Instruction et manière de tenir les livres de raison et des comptes en parties doubles" and presents the technique of writing statements, placing an accent on drawing the balance sheet using the General Ledger data, trying to define its contents. However, his theory is not complete, as he reduces the balance sheet to the roles of debtors and creditors.

Claude Irson published in 1678 the paper "Méthode pour bien dresser toutes sortes de comptes à parties doubles", having an important contribution on result statements, also using the term "balance" instead of "closing statement".

Before the French author Mathieu de la Porte, the balance sheet is cited only as a necessary instrument for closing the accounts. In 1685, he defines the contents of the balance sheet, indicating what should be presented on the left side, which he calls "Doit" ("Debt", assets) and what should be written on the right side, named "l'Avoir" ("Owned", liability).

Bertrand Francois Barreme published in 1682 "Livres des comptes faites" (Keeping Books), and he is the first author who envisions the use of the flyer balance (Bilan en l'air), a balance based on documents and drawn before the inventory, on a separate sheet and not in a book with attached pages, its only purpose being that of discovering errors.

Drawing the balance sheet becomes a systematic activity only starting with the 19th century, when the great industrial and commercial enterprises start to analyze and measure periodically their asset base, using the balance sheet and the profit and loss account.

In capitalist accounting literature, the problem of the balance sheet has been treated by numerous authors from different points of view, without reaching a unitary conclusion.

Among the French authors, Eugen Leautey and his collaborator, Adolph Guibault, in their work "La science des comptes", consider that they have

designed a fixed balance model. Concerning the balance sheet, Guibault shows that “it is the expression of an equation destined to make known the results of an industrial or commercial operation, that is, of profit or loss, computed daily, monthly, or annually, and that influences the capital involved” (1).

Another French author worth mentioning is L. Barrachin, who in 1898 published in Paris the paper “Comptabilité personnelle”, where he reaches the conclusion that the balance sheet should not include the final result of the enterprise.

In 1919, the French engineer Edouard Julhiet published in Paris the work “Cours de finance et comptabilité dans l’industrie”, mentioning that the purpose of accounting is to faithfully record the entire activity of the enterprise, by writing down in the statements all the movements that take place through the systematic grouping of these notes and by synthesizing them in the balance sheet.

Gabriel Faure, another French author, explains the notion and the contents of the statement and of the balance sheet, also making a critical analysis of a balance sheet, as well as references to inappropriate terms used in the balance sheet, such as: suspense accounts, sundries account, etc. An interesting problem that he approaches is that of unifying the balance sheets, concluding that there is a possible solution, however conditioned by setting certain rules, among which cost price evaluation of specific assets.

In 1927, L’Quesnot published in Paris the paper “Administration financière – Méthodes comptables et bilan”, examining the balance sheet as a basis for financial analysis, which he characterizes as “the expression of the situation of a company”, “a conventional statement” or a “balance account”.

Still in 1927, Albert Calmes published in Paris the work “La comptabilité industrielle”, where he also described the theory of general accounting, starting from the balance sheet. In this author’s view, “the balance expresses the same capital twice: on the left, according to the forms under which this capital is used, and on the right, according to the sources it comes from. The balance displays on the left the values that the company possesses, and on the right, the assets in excess compared to the liabilities, respectively for the creditors, so that this excess represents the net capital.” (1)

Another French author, Ed. Folliet, published in 1927 the paper “Le bilan dans les sociétés anonymes du point de vue juridique et comptable”, where he demonstrates the necessity for drawing the balance sheet, and shows that its components combine into the equation $A = L + C$.

In France, accounting normalization becomes more rigorous starting from 1939, acquiring new valences in time, and having at the center the conditions and ways of drawing financial statements.

During the development of capitalism, the German School imposes itself both in what concerns the development of accounting thought in general and in what concerns the development of economic thought on the balance sheet. Within this School, important contributions concerning the balance sheet have been

brought mainly by H. Nicklisch, W. Osbahr, and last but not least, E. Schmalenbach.

H. Nicklisch was concerned with problems related to opening and closing statements, the organic statement, the dynamic statement, as well as to the analysis of the causes that determine drawing periodical statements for values and financial statements.

W. Osbahr published in 1918 the work “Die Bilanz vom Standpunkt der Unternehmung”, in which he notices the existence of different types of statements, with different titles, contents, and purposes, grouped into two distinct categories: main statements and secondary statements. Osbahr also mentions the importance of evaluating the balance sheet.

E. Schmalenbach elaborates the dynamic theory of the balance sheet, which he treats in the work “Dynamische Bilanz” (Georgescu N., 1999).

After 1950, in USA, management accounting has generated the necessity for statements as “reporting”, a combination of professional skills and rapid computer processing techniques for synthesized accounting information, seen as a unit.

Accounting papers have also been published in Romania; at the beginning, these were mere translations from German and French, but other works, besides the theories of foreign authors, contain personal ideas of Romanian authors, marking the beginning of Romanian accounting thought. The first publications are issued in our country only after 1800. In 1817, “Didăscălia” is published in Iași, a paper that also included accounting rules, which had been translated from German into Greek.

In the Romanian states, balance sheets have evolved from the “Treasury codex” that recorded the state income and expenses, to balance models similar to those used in the German states in the 19th century, presented for the first time in the work of Emanoil Ion Nechifor, “Pravila Comerțială” (The commercial rules) published in 1937 in Brașov. This paper demonstrates that its author was familiar with the principles of drawing a balance sheet according to the Venetian method. E. I. Nechifor recommends writing the balance sheet once a year (Robu M. D.).

Dimitrie Jarcu published the work “Doppia Skriptura”, a translation of H. Jaclot’s “La teme des livres enseignée en vinght et une leçons sans maetre” (1828), but makes a confusion between balance and balance sheet.

Theodor Ștefănescu published the paper “Curs de contabilitate în partidă dublă” (Accounting course in double correspondence), defining accounting as a science and the art of keeping books, and the balance sheet as a mirror of the past and a guide for future operations.

Constantin Petrescu published in 1901 the work “Contabilitate și administrație” (Accounting and Administration), where he defines the balance sheet, poses the problem of the universality of its application, and shows the conditions the balance sheet must meet, concerning clarity and honesty.

Spiridon Iacobescu approaches the problem of the balance model and of regulating accounting. Other authors with a rich scientific activity include

Professor C.G. Demetrescu, who has published around 150 accounting papers and studies, Professor Dumitru Voinea, who has shown that between inventory and the balance sheet there is only a formal difference, Professor I. Evian, who has used for the first time the term of “unitary balance” and who considers the initial balance to be the basis of accounting, since it ensures the assets and liabilities for which accounts are opened (Evian I., 1947).

A special contribution to the theoretical and practical solution to accounting problems, in Romania, has been that of accounting magazines, as well as of the former Body of Authorized Accountants and Accounting Experts that functioned between 1921 and 1950. After a period of monism (1950 – 1993) specific to centralized and over-centralized economies that use flow accounting, where the role of accounting synthesis documents was marginalized, the start of the accounting reform in Romania with the Accounting Law no. 82/1991, with several developmental stages and with the purpose of harmonizing accounting legislation with the European Directives and with the International Accounting Standards, a context in which the creation and writing of financial statements have been regulated through a series normative acts, restores the leadership of the annual statements over the system of current statements.

CONCLUSIONS

Scientific thought concerning the different epistemological theories born over time in relation to the balance sheet presupposes an attempt to synthetically and appropriately characterize the meanings and signification of the notions and categories defined historically and structured according to the methodological reference on which they are based.

The trajectory of socio-economic dynamics of a few hundred years, many minds are inclined to put the field on a balance sheet of theoretical and revealing the pragmatic functions.

Literature today shows that there is not a closed process, because analysis of balance sheet remains focused for the recovery potential in the management of human activity.

REFERENCES

1. Demetrescu C. G., 1972 - *Istoria contabilității*. Științifică Publising House, București
2. Evian I., 1947 – *Bilanțul unitar al întreprinderii*. Brașov
3. Georgescu N., 1999 - *Analiza bilanțului contabil*. Economic Publising House, București
4. Horomnea E., 2004 - *Bazele contabilității. Concepte și aplicații*. Sedcom Libris Publising House, Iași
5. Robu M. D., - *Bilanțul contabil*. <http://www.biblioteca-digitala.ase.ro/biblioteca/carte2>

INVENTORY - IMPORTANT TECHNIQUE PRECEDING THE ACCOUNTING BALANCE SHEET

INVENTARIEREA – IMPORTANT PROCEDEU AL CONTABILITĂȚII PREMERGĂTOR ÎNTOCMIRII BILANȚULUI

APOSTOL C.

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Abstract. *The accounting should provide a fair, clear and complete image of the entity, reflecting correctly in the chronologic, systematic evidence and the trial balance all economic and financial operations. Sometimes, however, could appear differences between the data from the accounting and those from reality, due to certain economic, natural processes, negligence, errors, embezzlements etc. The concordance between the writing information and those real it could verify through the process named inventory. Inventory is request by the accounting law, republished in 2008, which presents in Article 7 also the accounting registrations of it results according to the applicable accounting rules. More, the details regarding the inventory procedure, the valuation of all assets and liabilities and specific documents are settled by the Ministry of Public Finance Order no. 1753/2004 for the approval of Standards regarding organization and making inventory of assets and liabilities. An important law in terms of inventory is the Ministry of Public Finance Order no. 1752/2005 for accounting rules approval according to European directives, as amended by Order of the Ministry of Economy and Finance no. 2374/2007.*

Key words: inventory, balance sheet, accounting

Rezumat. *Contabilitatea trebuie să ofere o imagine fidelă, clară și completă a entității, reflectând corect în evidența cronologică, cea sistematică și apoi în bilanța de verificare toate operațiunile economice și financiare. Uneori, însă, pot apărea discrepanțe între datele din contabilitate și cele din realitate, din cauza anumitor fenomene economice, naturale, neglijențe, greșeli, delapidări etc. Concordanța dintre informațiile scriptice și cele reale se poate verifica cu ajutorul procedurii numit inventariere. Inventarierea generală este cerută de Legea contabilității, republicată în 2008, care la articolul 7 prevede și înregistrarea în contabilitate a rezultatelor acesteia potrivit reglementărilor contabile aplicabile. În plus, detaliile privind procedura de inventariere, modul de evaluare a tuturor elementelor de activ sau pasiv și documentele ce se întocmesc sunt reglementate de Ordinul Ministerului Finanțelor Publice nr. 1753/2004 pentru aprobarea Normelor privind organizarea și efectuarea inventarierii elementelor de activ și de pasiv. Un act normativ important din punctul de vedere al inventarierii este și Ordinul Ministerului Finanțelor Publice nr. 1752/2005 pentru aprobarea reglementărilor contabile conforme cu directivele europene, modificat prin Ordinul Ministerului Economiei și Finanțelor nr. 2374/2007.*

Cuvinte cheie: inventariere, bilanț contabil, contabilitate

INTRODUCTION

Accounting should provide a faithful, clear, and complete image of the asset base, correctly reflecting all economic and financial operations in the chronological and systematic statements, and then in the verification statement. However, sometimes there may appear discrepancies between accounting and real data, caused by certain economic or natural phenomena, by carelessness, errors, defalcations, etc. The correspondence between real information and that on paper can be verified through the inventory process.

MATERIAL AND METHOD

Drawing and filing the annual financial statements means completing the accounting evidence corresponding to one year, both from a managerial and from a fiscal point of view. If in the course of the year, accounting information has been recorded chronologically and systematically, according to the requirements of the Accounting Law, at the end of the year, the statements need to be verified and part of the information gathered during this year needs to be processed.

Actually, before drawing the financial statements, the requirements of the applicable accounting regulations need to be verified (Accounting Law no. 82/1991, re-published in 2008 and OMPF no. 1752/2005 for the approval of accounting regulation in conformity with the European directives, modified by OMPF nr. 2374/2008). This means that before certain operations, such as computing and recording legal reserves, computing the accepted limits in the case of protocol expenses and regulating the corresponding value added tax, recording the expenses and income belonging to the closing fiscal year, but for which no bills have arrived or whose date is after December 31st, etc., the first step should be inventorying the assets and liabilities owned and capitalizing on their results.

To accomplish this article have studied accounting rules related to inventory, it was aimed to capture aspects of inventory accounting results, which have as their purpose a fair reflection of the information in the company's financial statements.

RESULTS AND DISCUSSIONS

Inventorying refers to the totality of operations that establish, following counting, measuring, weighing, or, when these measures cannot be attained directly, through tallies and confirmations based on documents, the real quantitative, qualitative and value measure, at the respective moment, of the category of means and resources subject to this approach. (Petriș R., 2002)

Inventorying is at the basis of drawing a real balance, contributing to ensuring a faithful image and to applying accounting prudence (Horomnea E., 2004). The inventory is different from the balance sheet, although both present assets at a given moment, for the following reasons:

- The balance sheet is a synthetic general document based on accounting data, while the inventory is the result of measuring and evaluating operations of the *de facto* reality;
- The balance sheet presents the assets and liabilities synthetically and in numeric expression, while the inventory describes in detail, quantitatively

and numerically, each individual element of the asset base (each type of material goods, each provider, customer, etc.);

- The balance sheet is the result of the entire cycle of data processing using the procedures of the accounting method, while the inventory is merely the result of factual accounting of the existence and state of the assets and liabilities.

Companies have the obligation to perform a general inventory of the assets and liabilities owned at the beginning of the activity, at least once a year during their functioning, in the case of a merger or when stopping their activity, as well as in other situations mentioned by the law.

As a fact-finding procedure, inventories are made at the locations where goods exist, are deposited or preserved, by the company's own staff or by authorized natural or legal outside persons.

The main documents that record the results of the operations specific to inventorying are: the inventory list (code 14-3-12) – according to O.M.P.F. no. 1.753/2004; the protocol regarding the inventory results – no model exists, and its contents are set by the commission; the inventory register (code 14-1-2) – according to O.M.P.F. no. 1.850/2004.

Drawing the inventory register according to accounting rules and inventory norms is compulsory, and incompliance to this request is a contravention punished by a fine.

As an accounting procedure, inventorying fulfills the following functions (Pântea I. P., Bodea G., 2007):

- *The function of controlling the correspondence between factual and written data:* it verifies the integrity of the asset base, comparing the factual data recorded upon inventorying with the accounting information. From this comparison there may result a positive or a negative difference in goods or values, and measures can be taken to establish a correspondence between the written balance and the reality;

- *The function of updating the recorded value of the assets:* in order to obtain a faithful image with the help of annual financial statements, it is necessary to update the accounting values of the assets and liabilities, establishing their real or inventory values. By comparing the recorded (accounting) values with the actual (inventory) values, there may result positive or negative differences in value, according to the relation:

$$\text{ACTUAL VALUE} - \text{RECORDED VALUE} = \text{NEGATIVE or POSITIVE VALUE DIFFERENCES}$$

Positive differences, according to the prudence principle, are not recorded by accounting, while negative differences are recorded as adjustments for depreciation or supplementary amortization.

- *The function of determining the net situation and the result of the fiscal year:* the inventory helps determining the real situation of both assets and liabilities. Therefore, the net situation of the asset base can be computed according to the relation:

NET SITUATION (NET ACCOUNTING ASSET) = INVENTORY
ASSETS – INVENTORY DEBT

If during the fiscal year there are no increases or diminutions of the social capital, the result of the fiscal year according to the net situation variation is computed as follows:

RESULT OF THE FISCAL YEAR = Net situation at the end of the fiscal
year – Net situation at the beginning of the fiscal year

- *The function of computing and recording stocks, consumption, and sales:* it is specific to enterprises that use the periodic inventory method for recording their stocks, when the stocks bought are directly included in the expenses, following that at the end of the period, based on the inventory, to compute the total balances that will be recorded in the stock accounts. At the beginning of the next period, these balances will be again included in the expenses. The closing stock resulted through consumption or sales, during the month, are computed as follows:

CLOSING INVENTORIES = INITIAL INVENTORIES + INCOMING
INVENTORIES – FINAL INVENTORIES

Considering the performance order and succession, as well as the nature of performance, inventorying implies the following stages: preparing the inventory, the inventory activity, establishing the inventory results, and recording the inventory differences.

The suppositions formulated by the inventory commissions in the inventory protocols help the accounting department correlate the accounting data with the reality observed and recorded in inventory lists.

There is a possibility to compensate certain positive differences with certain negative differences, but only under the conditions presented in inventory norms:

- *There should exist a risk of confusion* between the types of the same material goods because of their resemblance in the outer appearance: color, design, model, dimensions, package, or other elements;

- The observed positive or negative differences should concern the same *inventory period and the same inventory;*

- *The lists with the types of products, merchandise, packages, and other material goods that meet the requirements for compensation due to the confusion risk should be approved (annually) by the administrators.*

This compensation is granted for equal quantities of the positive and negative differences noticed (irrespective of their value).

The positive differences observed during inventorying are recorded as a growth of the assets by debiting the asset accounts as follows:

1. Positive differences in tangible and intangible assets:

2xx “Tangibles accounts” = 134 “Inventory excesses of
tangible nature”

Subsequently, the amortization and incomes from grants at the amortization level will be recorded monthly (or annually) as follows:

6811 "Exploitation expenses regarding the = 28xx "Amortizations regarding
amortization of tangibles tangibles"

134 "Inventory excesses = 7582 "Incomes from donations and received
of a tangible nature" grants"

2. *Stock excesses* (Dumitrean E., 2008):

- *Excess in raw materials:*

301 "Raw materials" = 601 "Expenses for raw materials"

- *Excess in consumables:*

302 "Consumables" = 602 "Expenses for consumables"

- *Excess in materials of the nature of inventory objects:*

303 "Materials of the nature = 603 "Expenses with materials of the nature
of inventory objects" of inventory objects"

- *Excess in end products:*

345 "End products" = 711 "Stock variation"

- *Excess in merchandise:*

371 "Merchandise" = 607 "Expenses for merchandise"

- *Excess in packages:*

381 "Packages" = 608 "Expenses for packages"

Recording stock excesses in the expenses accounts credit alters their rollover, and therefore it is recommended to rectify their consumption.

The negative differences noticed during inventorying are treated differently, according to their causes, as follows:

1. In the case of non-imputable lacks, their deletion from the inventory or management discharge is recorded (Ristea M., Dumitru C. G., 2005):

- *For entirely amortized intangibles:*

281 "Amortizations regarding intangibles = 21xx "Intangibles accounts"

- *For intangibles not entirely amortized:*

% = 21xx "Intangibles accounts"

281 "Amortizations regarding intangibles"

6583 "Expenses regarding ceded assets and other capital operations"

- *For intangibles not entirely amortized, but lacking because of natural disasters:*

% = 21xx "Intangibles accounts"

281 "Amortizations regarding intangibles"

671 "Expenses determined by disasters and other extraordinary events"

Non-imputable stock lacks mainly appear as a result of allowed outage and natural disasters. In the case of allowed *outage*, they are recorded as an inventory discharge by crediting stock accounts and debiting the corresponding expenses accounts.

In the case of lacks caused by natural disasters, account 671 "Expenses determined by disasters and other extraordinary events" is debited according to the credit of the stock accounts.

From the above are excepted finished products that are recorded by the accounting formula:

711 "Inventory change" = 345 "Finished products"

2. In the case of imputable lacks, first the discharge of the asset inventory is recorded, and then the guilty parties are imputed to pay the cost for the acquisition of the tangibles and for the missing items in the inventory, as follows:

4282 “Other staff-related debts” =	%
(461 “Various debtors” for imputing third parties)	7581 “Incomes from compensations, fines, and penalties”
	4427 “Collected VAT”

CONCLUSIONS

Accounting information that constitutes the basis for financial statements needs to be clear, complete, and reflect reality. Therefore, based on the verification balance drawn on December 31st, and on the inventory, the balance is drawn, whose data must correspond to the values recorded in accounting, according to the real situation of the assets and liabilities, established by inventorying. If the real situation of assets or liabilities, observed during the inventory, differs from the one in the accounting records, then accounting record these differences, in compliance with the accounting principles applicable on the date when the operation is performed.

Following the study we noticed that most practicing accountants are faced with a dilemma regarding the addition to inventory stocks (many of them resort to cancellations, while others recorded addition to income). However the law is clear in this respect (OMFP no. 2374/2008) and, as presented in article, the positive differences of the inventory of inventories to look at the credit of the expenses (except make the production).

REFERENCES

1. **Dumitrean E., 2008** - *Contabilitate financiară*. Sedcom Libris Publishing House, Iași
2. **Horomnea E., 2004** - *Bazele contabilității. Concepte și aplicații*. Sedcom Libris Publishing House, Iași
3. **Pântea I. P., Bodea G., 2007** - *Contabilitatea financiară românească conformă cu Directivele Europene*. Ediția a II-a, Intelcredo Publishing House, Deva
4. **Petriș R., 2002** - *Bazele contabilității*. Gorun Publishing House, Iași
5. **Ristea M., Dumitru C.G., 2005** - *Contabilitate aprofundată*. University Publishing House, București
6. *****, 2006** - *Standardele Internaționale de Raportare Financiară 2006*, CECCAR Publishing House, București
7. *****, Legea contabilității nr. 82/1991**, republicată în M.O. nr. 454 din 18.06.2008
8. *****, 2005** - O.M.F.P. nr. 1752/17.11.2005 pentru aprobarea *Reglementărilor contabile conforme cu directivele europene*, publicat în M.O. nr. 1080 din 30.11.2005
9. *****, 2004** - O.M.F.P. nr. 1753/22.11.2004 pentru aprobarea *Normelor privind organizarea și efectuarea inventarierii elementelor de activ și de pasiv*, publicat în M.O. nr. 1174/13.12.2004

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE CENTRAL MOLDAVIAN PLATEAU IN THE POST- ADHERENCE STAGE

CARACTERISTICI SOCIO-DEMOGRAFICE ALE PODIȘULUI CENTRAL MOLDOVENESC ÎN ETAPA POST -ADERARE

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Abstract. *The Moldavian central plateau relief is abrupt and predominantly hilly, offering favourable conditions for people living since the most ancient times. In this area there has been assured continuity for inhabitants, which is more evident than in the low territories, favourable to migrants' passing. In this part of Moldova the free peasants' life has been felt to the full, with traces of ancient habiting in abundance, to the most difficult accessible points within the plateau. The central Moldavian plateau is an ethnic and cultural traditional establishment which falls entirely ethno-cultural of Moldova and of the whole territory inhabited by Romanians, but it is remarkable and elaborate-cultural and economic nuance of the geographical natural sub-units.*

Key words: Central Moldavian Plateau, socio-demographic characteristics, rural localities, distribution on rural population on localities

Rezumat. *Podișul Central Moldovenesc are relieful accidentat și predominant deluros, oferind oamenilor condiții favorabile de trai din cele mai vechi timpuri. În această zonă s-a asigurat o continuitate pentru locuitori, care este mai evidentă decât în teritoriile joase, deschise, favorabile trecerii migratorilor. În această parte a Moldovei răzășia țăranilor liberi s-a simțit din plin, urme de locuire străveche găsindu-se din abundență, până în cele mai greu accesibile puncte din interiorul podișului. Podișul Central Moldovenesc prezintă o unitate etnică și culturală tradițională ce se încadrează în ansamblul etnocultural al Moldovei și al întregului teritoriu locuit de români, dar se remarcă și o nuanțare etno-culturală și economică pe subunitățile geografice naturale.*

Cuvinte cheie: Podișul Central Moldovenesc, caracteristici socio-demografice, localități rurale, distribuția populației rurale pe localități

MATERIAL AND METHOD

For gathering information on the identification of the main socio-demographic characteristics of the central Moldavian plateau, there have been consulted documents with the existing statistical character at the Statistics County Directions of the four counties (Iasi, Vaslui, Bacau and Neamt), the official data available at the General Departments of Agriculture and Rural Development, the County Offices of Consultancy, chambers of commerce and industry, County Agencies of Employment, etc.

Of the procedures used in data collection, we remember: the questionnaire, the interview, direct data extraction and processing there were used: comparison, indexes and indicators specific analysis, monograph, etc.

RESULTS AND DISCUSSIONS

The network of settlements is highly conditioned by the relief characteristics and their kind, the types of towns and households reflect the long process of grubbing for the lands necessary for the agrarian economy. Thus, along the main valleys of Prut and Barlad rivers there are settlements on the terrace.

In Barlad Plateau and thus implicitly in a central Moldavian, predominate the villages small (less than 1000 residents) which are numerous, most villages having less than 800 inhabitants. The presence of small localities is connected to the way of the fragmentary relief, lifted by sources of water, the possibilities of setting up large domains. The vast majority of localities have dominant agricultural economic functions and only some of them are agri-industrial (Raducaneni, Ciocanesti). In more important localities, small towns or centres of polarization, there are also present other functions: local commerce, craft, industry.

The cereal, vine and stockfarming villages are located in north-east (between Raducaneni and Husi). In South-West of central Moldavian Plateau, the localities have a cereal profile, production and livestock farming (north of Raducaneni).

The Central Moldavian Plateau has in its component 68 communes and 3 urban centers (Vaslui, Husi, Negresti) related to Vaslui, Iasi, Bacau and Neamt counties thus: 26 the common in Iasi, 28 Vaslui county, and 7 communes in Neamt and Bacau counties.

The last census in 2002, in comparison with the previous census, the population of the Central Moldavian Plateau increased by 7.3%. The data analysis shows that in urban areas there has been registered an increase of more than 40% (especially through the development of Vaslui city), in the rural, although the natural accession is high (over 20%), the population dropped by moving to cities from the area or in other regions with shortage of labour.

The rural population has dropped in the pre-town areas of Vaslui and Negresti and especially in the those that are to become cities (Raducaneni, Codaiesti). In some areas of the West or central Moldavian Plateau the birth rate is maintained around 30%, and in eastern or central Moldavian Plateau around 20%. The population density varies between 50 and 70 inh/ km².

We consider that the Central Moldavian Plateau constitutes a reservoir of labour, in which young people is the most numerous group.

The mobility balance presents a negative migratory balance of the largest in the country. The most intense definitive departures (over 30% of the inhabitants of this territory) occurred especially in the south-west of Central Moldavian Plateau and with more moderate values in places with more developed agriculture in the east and south-eastern of Central Moldavian Plateau (with orchards and vineyards) and the valleys with vegetable crops. Most of those who left work in industry and constructions.

The oscillations of labour within the territory are especially towards Vaslui and only a small part to Iasi.

Urban population ratio is below the average of the country and is more than 32% in the south of Central Moldavian Plateau, where there are 3 of the 6 cities (Vaslui, Husi and Negresti).

The extent and pace of the territorial mobility of people have led to a steady reduction in the demographic size of the villages of the Central Moldavian Plateau, in parallel with their tendency to focus (table 1).

Table 1

Distribution of communes and population at the level of the Central Moldavian Plateau

Number of inhabitants	Number of communes		Number of inhabitants	
	Absolute	Relative	Absolute	Relative
Under 1000	0	0,0	0	0,0
1000-1999	5	7,4	9284	3,8
2000-4999	49	72,1	173095	70,2
5000-9999	13	19,1	52161	21,2
10000 and over	1	1,5	11899	4,8
TOTAL	68	100,0	246439	100,0

The number of communes in the Central Moldavian Plateau is 68. We found a concentration on section 2000-4999 of inhabitants of a number of 49 communes (72.1% of the total, with a number of 173095 inhabitants and a proportion of 70.2% of the total number of inhabitants.

It is found that the national there are approximately the same level of indicators mentioned above.

Table 2

The distribution of communes and population from Romania 2006

Number of inhabitants	Number of communes		Number of inhabitants	
	Absolute	Relative		Absolute
Under 1000	68	2,4	50321	0,5
1000-1999	568	19,9	899130	9,3
2000-4999	1769	62,0	5735237	59,3
5000-9999	428	15,0	2654269	28,5
10000 and over	21	0,7	231470	2,4
TOTAL	2854	100	9670427	100,0

In a period of 40 years there constantly dropped the proportion of rural communities and obviously the population related to them that the range of up to 5000 inhabitants, therefore, increased degree of concentration of rural settlements with over 5000 inhabitants and to those with more than 10000 people. Consistent growth is noticed essentially the communities within the range of the assembly from 5000 to 9999 inhabitants.

The concentration process of rural communities and implicitly the population growth which generally returns to a settlement showing differences at provincial level. In this respect there has been operated a group with small intervals of the population in rural areas, according to data from Census in 1992.

The concentrating of the rural population within the range with values of over 5000 inhabitants has more results in the counties of Iasi and Neamț than in Vaslui and Bacau counties.

The total rural population of the Central Moldavian Plateau at the census of 2002 was of 246439 inhabitants. The population density of the Central Moldavian Plateau varied between 50 and 70 inhabitants/km². The birth rate in the area is in average of 30%, but due to the negative migratory balance sheet the population growth is slow.

In the rural areas more than half of the active population is represented by the social status of employees, and almost 20% is composed of workers on their own, characterizing mainly the category of private farmers (table 3).

The share of the professional status of members of farming associations is only 0.23% and the family workers in households are 25%. In rural communities owners effective in the area of Central Moldavian Plateau is an average of 2%, what is a negligible share in the conditions under which we expect to restore a functioning market economy.

Table 3

Distribution of rural population occupied according to the professional status in 2002

County	Occupied population		Professional status													
	N	%	Employees		Patrons, private businessmen		Free lancers		Members of agricultural associations		Workers in family households		Other situation		Indecided	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%
Vaslui	163218	100.0	77060	47.2	2603	1.6	33402	20.5	881	0.5	48394	29.6	878	0.5	0	0.0
Bacău	308149	100.0	166819	54.1	5433	1.8	54346	17.6	121	0.0	77797	25.2	3633	1.2	0	0.0
Iași	306581	100.0	180226	58.8	4812	1.6	62060	20.2	797	0.3	56615	18.5	2068	0.7	3	0.0
Neamț	191450	100.0	114040	59.6	5404	2.8	19550	10.2	169	0.1	51651	27.0	636	0.3	0	0.0
PCM	969398	100	538145	55	18252	2	169358	17	1968	0,23	234457	25	7215	0,675	3	0

According to the share of the active rural population with professional status of workers on their own, microzonele can be ranked as follows: Vaslui, Iasi, Bacau, Neamț.

The proportion of active population of rural area which is occupied in agriculture present differences between the micro-zones and are determined by the total effect of the population of peasant communities, the degree of socio-economic development of the micro-zone (fig. 1).



Fig. 1. Distribution of rural population occupied according to the professional status in 2002

The smallest stocking density (less than 80 inhabitants/km²) are in the communes with reduced arable areas, forested region of the Central Moldavian Plateau (Schitu Duca, Dobrovat, Madarjac).

Table 4

Situation of labour force on localities that belong to the Central Moldavian Plateau

Nr. crt	County	Total population		Employees - total		Employees in agriculture		Employees in industry		Employees in other branches	
		Nr.	Relative	Nr.	Relative	Nr.	Relative	Nr.	Relative	Nr.	Relative
1	Vaslui	215814	54,67	35312	16,36	995	2,82	16168	45,79	18149	51,40
2	Bacău	22587	5,72	2465	10,91	383	15,54	278	11,28	1808	73,35
3	Iași	124604	31,56	5723	4,59	319	5,57	135	2,36	5269	92,07
4	Neamț	31753	8,04	970	3,05	73	7,53	126	12,99	771	79,48
	TOTAL	394758	100,00	44470	11,27	1770	3,98	16707	37,57	25997	58,46

The total population (rural and urban) of the Central Moldavian Plateau is the papers of individual localities of 394758 inhabitants. The structure of counties population of Central Moldavian Plateau shows us that the share is held by Vaslui

county with 54.67%, Bacau county has lowest population with 5.72%. Of the total population Vaslui county 16.36% are employees. Compared with other counties, it has the highest share due to the fact that Vaslui county is the only one with urban population of the 4 constituent of the Central Moldavian Plateau (table 4.).

Regarding the number of employed in agriculture, the highest level is recorded in Bacau county with 15.54% and the lowest in Vaslui county with 2.28%, due to higher level drainage.

CONCLUSIONS

From the population analysis of The Central Moldavian Plateau we found the following characteristics:

- increasing mobility of permanent population of rural communities;
- dropping of the natural level of the population rate determined by general and child mortality;
- change of reproductive behaviour of the rural population;
- reduce of average value of life hope indicator;
- steadily reduced condition of family dissolution;
- constant remaining or enlarging discrepancy in the educational level of rural population, compared with urban population
- the tendency to return to the occupation of farmer at the young population.

In rural communities there have appeared and is developing a variety of types of social-economic households and families, according to sources of origin and volume of income, of education and the status of professional and their descendants.

The demographic restriction of rural family, and stabilizing the type of a single nucleus is the consequence of lifting the cultural educational level and the intensifying professional mobility.

REFERENCES

1. **Brezuleanu S., 2008** – *The human investment in the equation of the performance quantification to the level of the agricultural entities*. Buletinul USAMV Cluj Napoca, seria Horticultură, vol 65-(2) /2008, ISSN 1843-5394.
2. **Brezuleanu S., Carmen Oliguța Brezuleanu, Ungureanu G., Iașco C., 2008** – *Apreciation of the adaptable capacity of agricultural exploitation to the exigencies of its activity domain*. Buletinul USAMV Cluj Napoca, seria Horticultură, vol 65-(2) /2008, ISSN 1843-5394.
3. **Ciurea I. V., Brezuleanu S., Ungureanu G., 2005** – *Management*. Editura Ion Ionescu de la Brad, Iași.
4. *****, 2002** – *Prelucrare Recensământul Populației*.

THE ANALYSIS OF AGRICULTURAL ZONAL SYSTEMS OF THE CENTRAL MOLDAVIAN PLATEAU IN ORDER TO IDENTIFY THE POSSIBILITIES OF SETTING UP GROUPS OF AGRICULTURAL PRODUCERS

ANALIZA SISTEMELOR ZONALE DE AGRICULTURĂ DIN PODIȘUL CENTRAL MOLDOVENESC ÎN VEDEREA IDENTIFICĂRII POSIBILITĂȚILOR DE ÎNFIINȚARE A GRUPURILOR DE PRODUCĂTORI AGRICOLI

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Abstract: *Agricultural companies with legal personality of Central Moldavian Plateau will become specialized cooperatives in services (sectors of mechanization, supply means for mechanical parts, fertilizers, seeds, biological material and medicines for animals, herbicides, insecto-fungicides) or will be gradually dropping forms of activity-, weak productive. The provincial system of agriculture is composed of a complex of production structures, with certain types of intensification, techniques and technologies agricultural, differentiated the territory and in time, as compared with the natural and economic conditions. The zonal systems of agriculture have as objective the conservation and increasing the productive potential of the earth, the generalization of specific systems for agriculture, zonal involving varied production structures depending on natural conditions and requirements of socio-economic agri-food market.*

Key words: agricultural systems, Central Moldavian Plateau, groups of agricultural producers, agricultural exploitations.

Rezumat: *Societățile agricole cu personalitate juridică din Podișul Central Moldovenesc vor deveni nucleul cooperativelor specializate în prestări de servicii (sectoare de mecanizare, aprovizionare cu piese pentru mijloacele mecanice, îngrășăminte, semințe, material biologic, medicamente pentru animale, erbicide, insecto-fungicide) sau se vor desprinde treptat de formele nediferențiate de activitate, slab productive.*

Cuvinte cheie: sisteme agricole, Podișul Central Moldovenesc, grupuri de producători agricoli, exploatații agricole

MATERIAL AND METHOD

For gathering information regarding the diagnostic survey of zone agricultural systems in the Central Moldavian Plateau, we have consulted the documents with the statistical character existing at Statistics County Directions of the four counties (Iasi, Vaslui, Bacau and Neamt), official data available at the General Departments for Agriculture and Rural Development, the County Offices Consultancy, Chambers of Commerce and Industry, etc.

Of the procedures used in data collection we remember: the questionnaire, the interview, direct data extraction and processing were used: comparison, indexes and specific indicators analysis, monograph, etc.

RESULTS AND DISCUSSIONS

The Central Moldavian Plateau falls in the northern part of Barladului Plateau. It is bounded on the north with the Coast of Iasi continued with the Coast of Racova. At west, it is limited from Siret valley. In the south, it is limited with the hills of Tutova and in the East with Prut River and Falcui Hills.

The Central Moldavian Plateau has as component 68 communes and 3 urban centres (Vaslui, Husi, Negresti) related to Vaslui, Iasi, Bacau and Neamt counties thus: 26 the common in Iasi, 28 in Vaslui county, and 7 commons in Neamt and Bacau counties. (4).

Most of the individual farms from the Central Moldavian Plateau have a character of subsistence being dominated by underdevelopment, lack of capital and scientific organization.

The dimensions and peculiarities of agricultural farms allow the implementation of their own ideas, whose originality can provide special results but they must strengthen on scientific management fundament. (1).

The offer of agricultural products from the Central Moldavian Plateau has a fluctuant character little, often of low quality, the main cause being the low number of commercial, strong farms of a certain size.

At the beginning of the demand for agricultural products, the farmers must orient the production efforts to meet the demands of the consumers.

The political frame influences the work of the agricultural exploitations from the Central Moldavian Plateau components of the economic and social policy. The decisions on economic policy aimed at setting the directorates of sustainable development of national economy and the agro-food, i.e. increase of the production (through subsidies on product), making investments, concentration and quality control on the marketed products, etc.

A part of measures taken by the Romanian units do not have the expected results but the consistency, and the involvement of the European institutions may improve the inefficiency and can create a favourable climate for the agricultural development in the Central Moldavian Plateau .

The ratio between supply and demand for labour, employment figure of the population, the unemployment rate, the level of preparation for the working population in Central Moldavian Plateau determines level wage for the workers in agriculture, availability for reorientation training by this branch of activity and competent workforce available.

Forms farms in the Central Moldavian Plateau are as follows: private households, family holdings of commercial type, family-type marketing associations, agricultural companies with legal personality;

In the private sector, central place is occupied by the individual household which owns restricted areas (1-5 ha) and do not have a well-defined agricultural profile.

The individual household in the Central Moldavian Plateau has the following characteristic: growing a small number of species of plants (production of subsistence) and the lack of operating capital with commercial character.

The family subsistence exploitation in the Central Moldavian Plateau mainly produces for self-consumption, but has its role in rural community because it creates rural stability and ensures environmental protection.

Individual household has a subsistence character, produces mainly for self-consume, but has its role in rural community because it creates rural stability and ensure environmental protection.

Family holdings with commercial character of the Central Moldavian Plateau grow a larger number of animals, cultivates a vast range of plants, mainly technical plant, which bring large income from the unit of the area, has a moderate capital, using employment and produce market in particular for the purpose is getting a higher income.

Family holdings constitutes the perspective form of agriculture organization in Central Moldavian Plateau, and hence of the Romanian agriculture.

The family associations have been forged on the basis of free understanding between families related, neighboring or friends, aiming: exploitation of agricultural land, stockfarming, processing, packaging and selling products or services.

The agricultural companies with legal personality of a Central Moldavian Plateau are represented on the basis law 36/1991, have as objective: operation Earth, animals and achieving agricultural investment interest (table 1).

Table 1

Farms and the area, on the categories of service of used agricultural area, unused agricultural area and other areas-ha

County		Vaslui	Bacău	Iași	Neamț
Used agricultural area	Arable field	102525	130979	127872	112494
	Family gardens	84841	99079	112582	84916
	Natural meadows and grass lands	39607	72558	52724	62609
	Permanent cultures	66738	54123	49031	13929
	TOTAL	118698	158187	145724	133166
Unused agricultural area	Agricultural area used for reactionary activities	66	87	30	49
	Other unused agricultural lands	6284	6502	3752	2396
	TOTAL	6343	6586	3778	2444
Other areas		108279	141528	130300	119038
TOTAL		120892	162753	148115	135945

*Processing agricultural census 2002

Agricultural companies with legal personality of he Central Moldavian Plateau will become the core of specialized cooperatives in services (sectors of mechanization, supply means mechanical parts for, fertilizers, seeds, biological material and medicines for animals, herbicides, fungicides insecto-fungicides) or will be gradually dropping forms of activity, weak productive.

The number of individual farms in the Central Moldavian Plateau is predominant (about 99%) in comparison with the number of units with legal personality (about 1%). (table 2).

Table 2

Structure farms after their legal status in the Central Moldavian Plateau

Nr. crt.	County	Total agricultural exploitations		Individual agricultural exploitations		Units with legal status		Used agricultural area ha
1	VASLUI	50215	49879	99,33%	336	0,67%	169910,5	
2	BACĂU	8836	8781	99,38%	55	0,62%	24705,13	
3	IAȘI	38948	38773	99,55%	175	0,45%	75939,38	
4	NEAMȚ	11660	11624	99,69%	36	0,31%	23676,86	
	TOTAL	109659	109057	99,45%	602	0,55%	294231,87	

Law enforcement 18/1991 determined through the content, a process of varying the individual economic households. That was taken as a basis for setting up and replenishing the ownership situation at 31.XII.1990 so cooperative the property, which virtually no moment corresponded setting up these units and then holding the size of the households a clothing held, the area and fixing the maximum 10 ha, regardless of number of owners, encouraged spraying land ownership in the area analyzed.

We consider the way in which has been implementing the Law 18/1991, which led to an excessive landdivision, reducing the economic efficiency of individual farms of the Central Moldavian Plateau (table 3).

Table 3

The individual farms structure on size of classes of surface used

County	Vaslui		Bacău		Iași		Neamț	
	Nr.	%	Nr.	%	Nr.	%	Nr.	%
< 0,1	10738	9.10	16263	10.33	12654	8.73	12924	9.74
0.1 – 0.3	11066	9.38	21362	13.56	17722	12.22	18539	13.98
0.3 – 0.5	7061	5.99	17457	11.08	12676	8.74	14508	10.94
0.5 – 1	18344	15.55	35550	22.57	28635	19.75	29349	22.12
1 – 2	29521	25.02	36350	23.08	36517	25.18	32395	24.42
2 – 5	34932	29.61	25786	16.37	32360	22.32	22150	16.70
5 – 10	5701	4.83	4024	2.55	3967	2.74	2408	1.82
10 – 20	420	0.36	428	0.27	332	0.23	252	0.19
20 – 30	64	0.05	104	0.07	50	0.03	43	0.03
30 – 50	45	0.04	83	0.05	37	0.03	31	0.02
50 – 100	60	0.05	70	0.04	33	0.02	44	0.03
Over 100	15	0.01	30	0.02	17	0.01	14	0.01
TOTAL	117967	100.00	157507	100.00	145000	100.00	132657	100.00

In Vaslui county we could notice that it is found a concentration of individual farms within the range of size 2-5 ha with a total of 34932 holdings. In Bacau county we could find a concentration of individual farms within the range

of size 1-2 ha with a total of 36350 holdings. In Iasi there was found a concentration of individual farms within the range of size 1-2 ha with a total of 36517 holdings. In the county Neamt it finds a concentration of farms individual within the range of size 1-2 ha with a total of 32395 holdings.

The size of agricultural companies with legal personality of a Central Moldavian Plateau is reduced in view of economic optimal size of the agricultural holdings (table 4).

Table 4

Structure of units with legal personality on the size of classes utilised

County	Vaslui		Bacău		Iași		Neamț	
	Nr.	%	Nr.	%	Nr.	%	Nr.	%
10 – 20	31	4.24	39	5.74	46	6.35	32	6.29
20 – 30	39	5.34	17	2.50	11	1.52	11	2.16
30 – 50	18	2.46	20	2.94	13	1.80	7	1.38
50 - 100	49	6.70	35	5.15	24	3.31	36	7.07
Over 100	184	25.17	159	23.38	221	30.52	148	29.08
TOTAL	731	100.00	680	100.00	724	100.00	509	100.00

In Vaslui county it is found a concentration of units with legal personality with the size of over 100 ha with a total of 184 holdings. In Bacau county we found a concentration of units with legal personality with the size of over 100 ha with a total of 159 holdings. In Iasi was found a concentration of units with legal personality during the size of over 100 ha with a total of 221 holdings. In the county Neamt it is a concentration of units with legal personality with the size of over 100 ha with a total of 148 holdings.

The farm size must make possible the crop rotation and reconciliation branches, with the best quantitative effects and the economic efficiency of agricultural production (table 5).

Table 5

Limits on private farms dimensions profiles of production and pedo-climatic areas in the sector vegetable

Production profile	Pedoclimatic area	Rational dimensions - ha
Cereal culture	Field	500-1000
	Hill	100-300
Vegetables	Proper for the intensive vegetable cultures	30-50
Fruit trees	Proper for the intensive fruit tree cultures	50-100
Vine	Proper for the intensive vine cultures	50-100

In the Central Moldavian Plateau the optimum size of farms is 100-300 ha for cereals and technical plants, 50-100 ha for growing and the 50-100 ha for viticulture. These limits have informative nature but they can guide farmers to bring the production to the highest technical and economic standards.

The national level, units' dimensions of agricultural production are very different, and their trends is difficult to predict.

CONCLUSIONS

Equipping the agriculture from the private sector with tractors and farm machines, not only that it falls to low rates, but their acquisition by the majority of rural population is practically reduced, because of the very high price and total lack of capital.

We believe that the private sector of agriculture will be stimulated by economic levels such as subsidies system in the selling price of vegetable production, acquisition or support of the agrarian capital through the co-financing of EU funds for projects of investment.

Stimulation of the growth of the farms dimensions that can be achieved through:

- granting of facilities and logistical support through actions of consultancy farmers who lease agricultural land to increase farm family in the system of rent.
- stimulating the organization owners of land in forms of associative exploitation;
- supporting the producers to concentrate the ownership through buying some areas and in particular to acquire competitive factors of production;

The association in groups of producers reinforces the economic power of farmers, by negotiating prices of products, reducing transport costs and obtaining profits -usually charged by intermediaries.

REFERENCES

1. **Brezuleanu S., Sârbu R., Ungureanu G., Brezuleanu Carmen Olguța, 2004** - *Unele aspecte privind diagnosticul economico-financiar al unei exploatații agricole din Podișul Bârladului*. Universitatea de Științe Agricole și Medicină Veterinară, Facultatea de Agricultură, Lucrări Științifice 2004, ISSN 1454-7414.
2. **Brezuleanu S., Brezuleanu Carmen Olguța, Ungureanu G., Iașco C., 2008** - *Apreciation of the adaptable capacity of agricultural exploitation to the exigencies of its activity domain*- Buletinul USAMV Cluj Napoca, seria Horticultură, vol 65-(2) /2008, ISSN 1843-5394.
3. **Brezuleanu S., 2008** - *Research regarding optimization of production branches joint in agricultural Iasi county in order to increase their profitableness* - Universitatea de Științe Agricole și Medicină Veterinară a Banatului Timișoara, Facultatea de Management Agricol, Lucrări Științifice, Seria I, vol X (2), Editura Agroprint Timișoara, ISSN 1453-1410
4. **Ciurea I, Brezuleanu S, Ungureanu G., 2005** – *Management*. Editura Ion Ionescu de la Brad Iași.
5. *****, 1982** – *Enciclopedia geografică a României*.
6. *****, 2002**– *Recensământul agricol*.

STUDY OF HACCP SYSTEM IMPLEMENTATION IN WINE AND CHEESE MANUFACTURING IN ROMANIA

STUDIUL DE IMPLEMENTARE A SISTEMULUI DE SIGURANȚĂ ALIMENTARĂ HACCP ÎN DOMENIUL ÎNȚREPRINDERILOR VITIVINICOLE ȘI DE BRÂNZETURI ÎN ROMÂNIA

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Abstract. *The management system of food safety, globally recognized, proved its efficiency in all sectors of alimentary analysis and on all steps of the food circuit. HACCP represents a scientific, systematic and interactive method of verification, evaluation and risk control associated to alimentary products. The HACCP strategy is centered on setting up prevention, reduction or even elimination of potential risks that could affect aliment safety. The WINDAIR project, set up by Leonardo da Vinci program transfer of innovation, represents a collaboration between France, Hungary and Romania, with the aim of transferring modular training courses on Quality Systems and Production in medium and small-size enterprises within the wine and cheese domain. The objective of the project is transmitting the HACCP methodology through real case studies in the wine and cheese making production. It is also very important to analyse the aspects of the University's involvement in both the theoretical and academic procedure as well as in the operational field.*

Key words: wine, cheese, HACCP implementation

Rezumat. *Sistemul de management al siguranței alimentare, recunoscut pe plan internațional, care și-a dovedit eficiența în toate sectoarele analizei alimentare și pe tot circuitul alimentar este HACCP (Hazard Analysis Critical Control Point). Acesta reprezintă o metodă științifică, sistematică și interactivă de verificare, evaluare și control a riscurilor asociate produselor alimentare. Strategia HACCP în domeniul alimentar este axată pe instituirea unui sistem de prevenire, eliminare sau reducere la niveluri acceptabile a riscurilor potențiale care afectează siguranța alimentelor. Proiectul WINDAIR, program Leonardo da Vinci transfer de inovație, reprezintă o colaborare între Franța, Ungaria și România, ce urmărește transferul instrumentelor de formare în scopul implementării sistemelor de calitate și HACCP în întreprinderile mici și mijlocii cu specific vinicol și de procesare a laptelui. Obiectivul proiectului este transmiterea metodologiei HACCP prin demonstrații aplicative în aceste ramuri alimentare. Dacă în prima etapă studiul constă în centralizarea metodologiei de instruire, proiectul se va defini definitiv prin exemplificarea implementării acestui sistem de siguranță în două unități de procesare. Dimensiunea europeană în abordarea managementului calității privind siguranța alimentară este un atu considerabil al acestei intervenții.*

Cuvinte cheie: vin, branzeturi, implementare HACCP

INTRODUCTION

This study has as main aim disseminating information and sensitizing the public on an transfer of innovation program that has taken place in some

European countries and is now put into action by Romania and Hungary, run by France. The project deals with improving the capacity of the latter countries of developing formation programs for food safety certification in wine and cheese production firms.

Implementation of the sectorial program Leonardo da Vinci in Romania, for 2008, has as **thematic national priorities:** promotion of quality in teaching and initial and long-life professional formation; stimulation of work force in rural areas; adaptability and flexibility promotion on the work market; developing human resources in education and professional formation; access to quality education and initial professional formation and facilitating transition from school to active life; entrepreneurial stimulation by supporting persons initiating new business; developing partnerships and encouraging social partnerships initiatives.

Transfers of innovation projects Leonardo da Vinci address the following target groups:

– IVT (Initial Vocational training) – apprentices, pupils in professional training;– PLM (Persons on the Labor Market) – workers, free-professionals, persons available for occupying a job (including those with a degree), that participate for a certain period of time to a training in a foreign country, in a professional training system;– VETPRO (Vocational Educational Training Professionals).

Projects of this nature, that aim at education and vocational training professionals concentrate on transferring, developing and bring up to date competences and/ or methods and innovative practices in the training domain.

At national level, the following objectives have been drawn:

1) facilitating the insertion of the young on the labor market; 2) promotion of education quality and initial and life-long professional training; 3) developing the quality assurance systems in institutions involved in initial professional training; 4) supporting the development and diversification of the educational offer in education and initial professional formation; 5) promoting the entrepreneurial culture and quality assurance and work productivity; 6) supporting life-long training of professors, trainers, human resources managers; 7) offer support for innovation and tools and mechanisms development for optimizing education and initial professional training access.

In the above described pattern, this project comes to answer a significant number of the above mentioned objectives, prioritizing those that mention an European quality standard; creation of specialists in this domain contribute to a better insertion on the labor market, encouraging the entrepreneurial spirit in certified quality and last but not least, development of partnerships between the production sector, the labor market and Universities as resource for training activities.

In Romania, analysing the local context in wine and cheese domain was realized by using a set of questionnaires. The main conclusions are: agrolimentary institutions are forced to take into consideration their clients' demands in the domain of quality and hygiene. The market shows that if the client isn't

satisfied with the quality of the supplier, then the market doesn't exist. To respect the wishes of their clients and resist the competition, agro-alimentary firms must apply food safety norms corresponding to European and international standards. Still, there is a huge discrepancy between the laws appliance in Community countries: knowledge very well mastered by some become serious needs, proved by field tests in Romania and Hungary.

In these countries exists a real need of developing a strategy for training and applying competences of the HACCP system in all domains. Therefore, as first objective, the necessity of creating a formation consortium appears, perfectly adapted to local needs that can be then modulated on all axes of the project: theoretical bases, adult formation techniques, technological promotion, alimentary safety and future users.

Operational objectives of the project:

The objective of this project is to create self-sustained European food branches by exchanging good-practices in the viticultural and cheese sector. Thanks to this project, the same working tool will be accessible in 7 European countries. Within this project, 3 countries will gather their knowledge of HACCP, developed in a former project called SECUPROD. The developed system from SECUPROD was based on competences and applications in the following European countries: France, Belgium, Portugal, Poland, the Czech Republic.

The new project, where UA Iasi is partner, is called WINDAIR and has Romania, Hungary and France as members. The program is totally adapted to answering the needs of SMEs while bringing forth constant in production processes by risk assessment. To construct strong branches, especially in the food domain, it is extremely important that all the stages of a production process respect a set of already existent rules in hygiene and food safety.

WINDAIR partners:

–formation organism: M2A Technologies, France – deals with project's coordination;

–two technical institutes: Campden, Hungary and ENTAV ITV, France – adapt the content and tests to national requests;

–one University: University of Agricultural Studies and Veterinary Medicine Iasi, Romania – is the landmark of the most modern wine- and cheese making, being at the same time in contact with SMEs throughout the country, has as aim adapting the contents, tests and delivering training activities.

–two disseminating partners: Chamber of Industry and Commerce Budapest, Hungary and CRIMM Foundation, Bucharest, Romania, that are in direct context with the final users.

Target groups in WINDAIR: the targeted sector is composed of firms that produce wine and cheese. The two target groups are:

–SMEs leaders, their employees, students and young people being professionally inserted, adults in professional reconversion;

–trainers, syndicates, administrative-operational group of institutions

can use this tool to ease the transition between European norms and Romanian and Hungarian production processes.

MATERIAL AND METHOD

This project needs, in its first stage, the organization of case studies for evaluating the situation of HACCP implementation in Romania, in wine and cheese domain. Therefore, after identifying the possible beneficiaries, a questionnaire set was elaborated based on questions negotiated with the coordinator. The questionnaires were drawn up in such a way that, in the end CRIMM Foundation, Bucharest, can realize a rapport concerning the food safety norms in Romania. The feedback received was that food safety norms are in course of implementation in the majority of firms, HACCP being seen as a necessity on the present market.

The work plan achieves its objectives in four phases:

- WP1 – Adaptation: transforming the SECUPROD instrument in WINDAIR, which will be considered successful when a product that will be consequent to known specification in transfer Romania and Hungary will be obtained. This tool will be checked by an independent expert and will be translated in Romanian and Hungarian.
- WP2 – Appropriation: creation of the work tools (web site and CD)
- WP3 – Valorization: this objective aims at keeping the project and its actions sustainable on the long run. WINDAIR will be disseminated for its entire duration, at national and international fairs, symposiums and conferences, so that professionals can beneficiate from its learning structures.
- WP4 – Coordination.

RESULTS AND DISCUSSIONS

In the table below there are summarized the key elements of the questionnaire regarding knowledge of the official food safety regulations, national and EU Good practices guides within the respondents companies.

Table 1

Knowledge of official regulations on Food Safety / Pack Hygiene	
Question	%
Knowledge of national guides on food safety	
National guides are known	60
Companies using national guides	46
Guide utility: improving quality of products/services	94
National Guides are very useful for the specific field of activity	84
National guides might be used as working manuals	71
Knowledge of EU guides on food safety	
EU guides are known	44
Guides are insufficiently promoted	49
Guide utility: commercial advantage, more power on market	71
Knowledge of food safety regulations	
Knowing regulations must be an internal wish of the company	83
Problems appear due to insufficient knowledge of regulations	69
Training on Food safety regulations	
Creation of a responsible and qualified quality team	57
More knowledge on food safety	54
Skills to overcome problems	71

In the table below, key elements of HACCP implementation from the answers of the SMEs can be found.

Table 2

HACCP implementation	
Question	%
<i>Launching stage</i>	
The most difficult issue: to inform and motivate personnel	50
Production plan/diagrams in the organization exist	81
Have written and validated procedures	79
Initiation of the implementation: general manager	46
<i>Preparation stage</i>	
Food risk Control systems already exist	60
Dysfunctions are noted	73
Preventive measures to limit dysfunctions taken	70
Persons responsible are trained in quality management	51
The organization has a quality team responsible	58
Quality team is structured by competencies	50
Internal auditor assessing the system	39
<i>Implementation stage</i>	
Internal quality control exists	71
Evaluation system of suppliers exists	60
Evaluation of Economic impact of dysfunctions is done	32
Have Quality management follow-up documents	56
Have Quality manuals	60
Have documents registering corrective actions	57
<i>Verification stage</i>	
Supplier audit requested	28
Internal audit performed	46
External audit performed	24
Corrective actions taken	72
<i>Finalization and maintenance stage</i>	
Maintenance help control dysfunctions	94
Person responsible with maintenance exists	53

In conclusion, based on the general findings resulting from questionnaire analysis, the Romanian food processing sector:

- needs to be made more aware of their legal obligation in relation to food safety regulation in force since many dysfunctions are caused by a lack of knowledge of these regulations;
- needs to be assisted in overcoming the barriers they encounter in terms of acquiring knowledge through intensive training on legal aspects;
- needs to be improved as to try to motivate all employees in order to maintain a safe food environment;
- is requiring assistance for monitoring the food environment and the critical limits in which the management systems of food quality and safety exist.

Small businesses need the greatest assistance since due to lack of knowledge and financial possibilities they pose the greatest risk on food safety; the respondents said that collegial monitoring is more efficient than an inspection by external controls. This can be supported by food safety training, on-the job coaching and engaging interactive training for executive staff.

WINDAIR answers this situation sustained by local tests, creating a training tool in HACCP quality standards domain in food SMEs (Brochure and CD ROM). Its aim is to transmit the working methodology through practical cases using two modules:

1. Methodological module contains integration of the food quality and food safety system, objectives and legal context.

2. Practical module represents the essential part of the tool, developing application examples of HACCP implementation in wine and cheese making industries.

This project transfers the results obtained by SECUPROD and will moderate the training tool in the designated countries.

CONCLUSIONS

For the agricultural producer, one main aim is to be represented by food quality and food safety. Through its policies, the European Union recommends monitorization of food products starting with the obtaining of raw matter and ending with the final consumer. This strategy has as objective consumers' protection by adopting legislative practices and even practical measures that have as base point the principle of precaution.

WINDAIR is disseminated both online, through a web site, www.windair.org, which describes each step of a HACCP system in the winery and in the cheese business, and by brochures. The methodological modules give general info on the market and its rules, quality assurance and its standards, ISO 9000, advantages of quality management, traceability, different tools used in quality management, metrology and quality. The practical modules describe the main steps of a technological process concerning wine and cheese production. Risks and their maintenance are described. Several national and European norms in food safety are also mentioned.

UA Iasi fundamental role is to elaborate courses on quality management and food safety, which will structure the implementation of this system in the wine and cheese production firms. These lectures will be run on two directions, theoretical and practical, based on the already existent modules, taking as example institutions where the HACCP system is already in motion.

REFERENCES

1. Costin Gh. M. (coord.), Florea T., Bahrim Gabriela Elena, 2003 – *Știința și ingineria fabricării brânzeturilor*. Ed. Academica, Galați.
2. Pomohaci N., Stoian V., Gheorghită M., Sîrghi C., Cotea V.V., Nămoșanu I., 2000 – *Oenologie (vol. I + II)*. Ed. Ceres, București.
3. www.windair.org
4. www.m2atechnologies.com

THE OPTIMISATION OF PRODUCTION CAPACITY TO THE S.C. HUȘI VINEYARD S.A.

OPTIMIZAREA CAPACITĂȚII DE PRODUCȚIE LA S.C. PODGORIA HUȘI S.A.

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Abstract. *The aim of the paper is to analyze the capacity of production for economic agents, importance that is given by the the resources that is operating this function. It is appreciate Also, the study on the efficiency of studied societies has allowed the identification of solutions for improving the economic results from farms. The quantitative and qualitative increase of production is possible only by capitalizing the national productive potential and promoting systems of perform production, stimulating the growth of farmers' performance and the competitiveness of Romanian agro-food products on internal and international market.*

Key words: optimization of production, efficiency, production capacity.

Rezumat. *Scopul lucrării este de a analiza capacitate de producției pentru unitățile economice, capacitate care decurge din ponderea mare a resurselor cu care operează această funcțiune. De asemenea studiul eficienței unității analizate a permis identificarea soluțiilor de îmbunătățire a rezultatelor economice în fermele de profil. Creșterea cantitativă și calitativă a producției agricole este posibilă doar prin valorificarea potențialului productiv național și promovarea unor sisteme performante de producție stimulându-se creșterea performanțelor producătorilor agricoli și a competitivității produselor agroalimentare românești pe piața internă și internațională.*

Cuvinte cheie: optimizarea producției, eficiență. capacitate de producție.

INTRODUCTION

The production importance for the economic units results from the large share of economic resources with which operate this function. It is estimated that 70% of employment, wages paid and the assets of the company's works in the production function. In addition the operations of technological transformation are the argument of existence of any productive enterprise.

Husi vineyard is a limited liability company located in the village Pogonesti, Stanilesti commune, county Vaslui, having as registration number from the Office of Trade Register: J37/617/1994; Fiscal Code: R 6242445.

The vineyard of Husi city comprises approximately 3000 Ha of life with average production of 10.000 Kg/ha. The products quality has recorded a continuous ascendance, an in term of competitiveness of wineries managed in superiority, towards originality, both in price and quality.

The great wine yard – from the glorious Busuioaca Bohotin – Husi got, expressing metaphorically, the emblem of wine bit – flavored, roe-colored and oragnoleptic – fully – optimized. Starting from the product quantity for that can be achieved the disjunction, must be determined the production capacity of the company.

The production capacity can be defined as being the maximum production realized by a firm in a given period, in the condition of efficient using of all the production factors, in a certain regime of work and for a pre-established structure of the production, quantitatively and qualitatively.

MATERIAL AND METHODS

To determine the production capacity at enterprise level, is starting ascending at level of employment, sector, workshop or production unit and, finally, is getting at enterprise level. In order to estimate, the general production capacity of Husi vineyard we look into consideration the evolution the production, rate of sales and the utilization of material resources during the last four years.

RESULTS AND DISCUSSIONS

The calculation of production capacity can be done in different ways, depending on the specific activity of production. Over the size of production capacity of production enterprises are acting the following influence factors:

- a) the number of existent machines in the enterprise and the size of production surfaces that influences directly proportional the size of production capacity
- b) the use of technical equipment and of production machinery and of production surfaces. This rules are of two types:
 - norms of intensive use
 - norms of extensive use
- c) the optimum range of fabrication. The norm of intensive use is the production that can be obtained in a unit time per characteristic dimensional unit of a machine of surface of production.

In the conditions of profound changes which may occur in the processes of production, due to continuous improvement of the fabrication technology and of the level of professional training of the staff, these norms, must be modified to suit the existing situation at a given moment in the production units.

From methodological point of view, the production units are divided into:

- enterprises in which the product is obtained after processing the materiality and materials on a single machinery or installation;
- enterprises in which the product is obtained after processing at several machines, equipments or facilities.

For the enterprises from the first group, the production capacity at level of enterprise is obtained from adding to production capacity of all subunits of production components (sections and workshops).

For the enterprises from the second group, the production capacity at enterprise level is given by the production capacity of the leading link.

The leading link of a production unit is established depending on the following criteria:

- may be leading link the production subunit with the largest share in the manual labor of the enterprise;
- can be the leading link the production subunit the largest share in total value of the production means of the enterprise.

In general, at the calculation of production capacity must be taken into account the following factors:

- total of direct productive machinery;
- work regime of the company, which determines the productive effective time;
- the degree of specialization of the production;
- existence of narrow places and the technical organizational measures for their removal;
- technical and economical norms of use of the machines;
- the possibility of introduction in production of some machineries or/and of some procedure or algorithms of advanced work

Given the presence of the productive capacity in the double aspect, both in size concretely calculable and as a degree of use, we will have factors that act on the size of production capacity and factors that acts on the degree of production capacity use.

The factors acting on the size of production capacity are:

- a) the value of investment funds for development and reusing productive units
- b) respecting the deadline of putting in function of the new objectives
- c) the size of the machinery park, rhythm of replacing the machine tools used physical and moral;
- d) the mechanization and automation the production processes;
- e) introducing and extending the new technological processes;
- f) concentrating, profiling and specialization of production;
- g) the structure on assortments of the productive unit of production

The factors that acts on the degree of use of the production capacities are:

- working schedule (working days annually, the number of exchanges, duration of exchange);

The degrees of using the production capacity.

A high degree of using the production capacity leads to:

- reducing the unit cost of products by lowering the rate of absorption conferred per unit product;
- increasing the production volume realized; increasing the benefits, on the reducing costs, which leads to an increased profitability

The utilization degree of the available production capacities must be higher, ideally 100%. But in our society the utilization degree of production

capacity is somewhere around 50%. Making an analysis of the utilization degree of the production capacity in the years 2005 -2008, can be observed (table 1) that in 2006 this indicator had the highest, obtaining an average production of 9 t/ha. in the conditions in which from a surface of 20 hectare of vineyard was harvested a smallest production being affected by the hail.

The optimal level of production capacity is given by the value of production capacity for which the total effort on the unity of production capacity is minimal. From the total effort are making part the investments made for putting in function and the afferent expenses to using the production capacity.(table 1).

Table 1

Utilization degree of the production capacity

Year	Production of grapes (kg)	Total capacity of the production	Degree of utilization the production capacity - %
2005	752000	2000000	37,6
2006	1208000	2000000	60,4
2007	985000	2000000	49,25
2008	858120	2000000	42,91

In determining the optimal level of the production capacity may be taken into account several criteria, including:

- reducing the specific investment;
- decreasing the unitary cost of production;
- obtaining a high productivity labor;
- optimization of transport costs of raw materials and of finished products;
- the forecasted demand for a period at least equal to the normal operation of investment to ensure a proper sale of the production.

Knowing the size of production capacity presents a great practical importance because it serves primarily to:

- elaborating and underlying the production and investment plan;
- sizing the production units and establishing the necessary or overplus of machineries
- preparing the development plan;
- discovering and correction evaluating of the internal production reserves;
- choosing the optimum solution of concentration, profiling, specialization and cooperation in production, technical –economic substantiation of the various types of reconstruction, re-equipment and development of the production units;
- comparison and assessment of the results obtained by various units of production on the increasing line of economic efficiency.

The company is developing its activity in a single point of work where can be found both the administrative and production space and storage.

The technical and functional status of the tangible assets is generally good, and the average degree of physical and moral wear was assessed at 48, 85%.

The production equipments are divided into the following categories:

- equipments for the culture of the grape;
- equipments for wine making;
- auxiliary equipment transport, utilities, office equipment etc).

Table 2

Lands according to the title deed

Nr. crt.	Objective name	Afferent surface -mp-	Destination	Accountable value thousand lei	Juridical situation
1	Society headquarter	12.088	administrative	84 950	In propriety

S.C. Husi vineyard are in exploitation 133,6 ha grape plantations from which 24 ha young plantation and 7 ha arable land.

Table 3

Main buildings

Nr. crt	Location	Surface mp		Old years	Accountable value thousand lei	Juridical situation
		Constr.	Desf.			
1.	Heat central	67	67	15	50.100	In property
2.	Surface wine cellar	759	759	20	149.090	In property
3.	Subterranean wine cellar	870	870	20	643136	In property
4.	Laboratory	36	72	20	4.397	In property
5.	Subterranean wine cellar	621	621	13	359.024	In property
6.	Shed station wine	198	198	27	5.728	In property
7.	Social group and eating house	792	792	15	169.775	In property
8.	Chemical fertilizer warehouse	27	27	11	1.319	In property
9	Annex building and laboratory	93	186	13	185.438	In property

Table 4

Variation of turnover in S.C. Vineyard Husi S.A. in the period 2005 -2008

Year	2005	2006	2007	2008
Turnover	5125032	3455178	1651172,8	6720127,92

Having in view the market at which refers the firm (namely Moldova), the company decided to adopt the competitive strategy based on the products offer at a reduced price. Such performance can be achieved by granting a special attention to the methods of production costs and indirect costs as trough materialization the costs generated by the marketing activity. Of course this does not mean neglecting the issues of promotion, especially in what concerns the export (which brings the biggest actual profit to the company)

The plantations are generally aged, having a length of 25 – 30 years. As a result of aging and frosts from the previous years the average density of the plantations is about 2800 logs/ha. The average production at hectare is less than 6500 kg grapes (table 5).

Table 5

Variation of average production at ha

Years	2005	2006	2007	2008
Grape production (t)	752	1208	985	858.12
Average production at ha (kg/ha)	5230	9000	7350	6550

CONCLUSIONS

This work aims to analyze the production capacity at S.C. Vineyard Husi S.A., of the activity that this carries it, as well as of the efficiency of wine production. Although the vineyard is old, the machines are old over 20 years; the society obtains an average production per hectare of over 5000 tons. The financial situation in 2008 shows an improvement beside 2007. This aging is due tit the better price obtained at the assessment of the wrack wine. In this year, the society benefited of an exemption of payment of some debts at the state budget in the amount of 1.181.523 lei, which is making not to have debts to the state and can focus its financial resources towards investments. There is a reconversion plan of sorts of surface of 30 hectares in which the state gives 40000 Ron/ha, and the difference is supported by the beneficiary.

REFERENCES

1. Ciurea I.V., Brezuleanu S., Ungureanu G., 2007 – *Management*. Editura “Ion Ionescu de la Brad”, Iasi.
2. Pop Cecilia, 2006 – *The science of agricultural products*. Publishing Tipo Moldova.
3. Steward G., 1993 – *Success in sales management. How to make a team to be the best?*, Publishing Alternative, București.

THE ACCOUNTING OF STOCKS IN NON-PROFIT ORGANISATIONS

CONTABILITATEA STOCURILOR LA PERSOANELE JURIDICE FĂRĂ SCOP LUCRATIV

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Abstract. *The stocks represent most frequent meteed categories of elements in the any bookkeeping entities. The goods held for sale in the ordinary course of business or goods in the process of production, preparation or conversion for such sale as well as goods in the form of materials or supplies to be consumed in the production of goods or services available for sale it represents current assets of the nature of the stocks. The non-profit organisations can unfurl three types of activities: the activities objectless patrimonial, activities with special destination and economic activities. This thing presupposes the use of analytic accounts to the accounts of stocks on types of activities. Also, certain categories of stocks can be used or can be output except economic activities, while another I can be used regardless of the activities unfurled. This article shall present a structure of the elements of stocks on types of activities to the non-profit organisations.*

Key words: stocks, merchandise, products, materials, activities objectless patrimonial, analytic accounts.

Rezumat. *Stocurile reprezintă cele mai des întâlnite categorii de elemente în contabilitatea oricărei entităţi. Bunurile deţinute pentru a fi vândute pe parcursul desfăşurării normale a activităţii sau cele în curs de producţie în vederea vânzării în procesul desfăşurării normale a activităţii, precum şi bunurile sub formă de materii prime, materiale şi alte consumabile care urmează să fie folosite în procesul de producţie sau pentru prestarea de servicii, reprezintă active circulante de natura stocurilor. Persoanele juridice fără scop lucrativ au drept caracteristică faptul că pot desfăşura trei tipuri de activităţi: activităţi fără scop lucrativ, activităţi cu destinaţie specială şi activităţi economice. Acest lucru presupune folosirea conturilor analitice la conturile de stocuri pe tipuri de activităţi. De asemenea, anumite categorii de stocuri pot fi folosite sau pot fi rezultatul numai activităţilor economice, în timp ce altele pot fi folosite indiferent de activităţile desfăşurate. Acest articol va prezenta o structurare a elementelor de stocuri pe tipuri de activităţi la persoanele juridice fără scop lucrativ.*

Cuvinte cheie: stocuri, mărfuri, produse, materiale, activităţi fără scop lucrativ, conturi analitice.

INTRODUCTION

The rich of a entities consists in assets. An asset is a resource controlled by the non-profit entity as a result of past events and from which future economic benefits are expected to flow to the entity and it has a cost or value that can be measured with reliability [4, pct. 18 alin (2)].

The assets are split in fixed assets or in current assets depending on the aim whom am it fated. The fixed assets including the active destine that use on a contiguous base, in the aim development activities of non-profit organizations.

MATERIAL AND METHODS

An entity shall classify an asset as current when (4, pct. 104):

(a) it expects to realise the asset, or intends to sell or consume it, in its normal operating cycle (the operating cycle of an entity is the time between the acquisition of assets for processing and their realisation in cash or cash equivalents);

(b) it holds the asset primarily for the purpose of trading;

(c) it expects to realise the asset within twelve months after the reporting period; or

(d) the asset is cash or a cash equivalent (cash equivalents are short-term, highly liquid investments that are readily convertible to known amounts of cash and which are subject to an insignificant risk of changes in value) unless the asset is restricted from being exchanged or used to settle a liability for at least twelve months after the reporting period.

An entity shall classify all other assets as non-current.

Current assets include:

1) stocks, inclusively the value services for which not drew up invoice;

2) trade receivables;

3) financial assets held for trading;

4) cash and bank accounts.

Stocks are assets (1, pag. 83):

- held for sale in the ordinary course of business;

- in the process of production for such sale; or

- in the form of materials or supplies to be consumed in the production process or in the rendering of services.

In the sight to realization of this article I have studied the accounting settlements applied in Romania with relate to assets and followed to is overtaken the appearances incident to structure of the stocks, which have as the finality faithful reflection of informations afferent of the utilization of the stocks on types of activities unfurled of the non-profit entities.

RESULTS AND DISCUSSIONS

Stocks include (4, pct. 110):

a) The merchandise, namely goods purchased and held for resale or the manufacture hand overed toward sale of own shops;

b) the raw materials, which participates directly to the realization activities and found in good material achieved wholly or partial, or their initial, either transformed shape;

c) The consumable materials (auxiliary materials, fuels, materials for packed, spare part, seeds and planting material, foddors and another material consumable), what participates or helps with the realization activities without are found, as a rule, in achieved materials;

d) The materials of nature of the inventory's object

e) products, scilicet:

- Semiproducts, where through is understood the products which the technological process were closed in a section (manufactural phase) and goes afterwards in the technological process of another section (manufactural phase) or is delivered the third persons;

- Finished goods produced, that is products which they went through integrally the phases of the manufactural process and don't need more the subsequent processings in the entity, can be store in the sight his delivery or sended directly to customers;

- The rejects, recoverable materials and the residues

f) The animals and the bird, respectively the born animals and those young any the kinds (calves, lambs, shoats, soil and another) breded and used for labor and reproduction, the animals and the bird to fattened for capitalization, the colonies of bees, as well as the animals for procurance of the wool, milk and fur in the sight capitalization in the activities unfurled;

g) The packings which comprise the packings reused, buied or made, fated activities unfurled and which temporarily can be kepted of third persons, with the obligation of the restitution in the conditions foreseed in contracts;

h) The unfinished production, representing the production which not passed through all the phases (the stages) of processing, foreseed in the technological process, as well as products disobediently the proofs and the technical reception or that imperfect in integrality. Also, as part as unfinished production contained the works and the jobs, as well as in course of execution or unfinished studies.

Also, as part as the stocks are included good finded out in custody, for processing or in consignment to third persons, which is registered distinctly in accounting on categories of stocks.

From viewpoint of participation to cycle of production, the stocks are split in:

1) properly stocks - containing those stocks which comes in on materialization of the cycle of production. Here contained:

- the raw materials;
- the consumable materials;
- the materials of nature of the inventory's object
- he merchandise;
- the packings;
- the animals and the bird;
- the stocks of this nature finded out to third persons.

2) Stocks related to production – containing those stocks which be output of the cycle of production. This category contains:

- the unfinished production;
- the products;
- the animals and the bird;
- the stocks of this nature finded out to third persons.

According as is observed a category of stocks - animals and bird - has the dual character. This category of stocks is can used to the realization cycle of

production, but by reason of peculiarities of the animals can be this output to the cycle of production.

The non-profit juridical persons (such as: the associations, the foundations, the federations, unions, the politic parties, employers, the Mutual Aid Fund and so on) can carried on many types of activities: activities tied of purpose for which were set up (the one non-profit), which activities lead to the formation of what funds shall be used to the realization propose object (the one economically) and which activities can unfurl to certain entities (the one with special destination).

From the viewpoint of the applicability to (or as the result of) ***these types of activities***, the stocks are split in:

1) *The stocks used only to economic activities* (or as the results of these). From this structure do the part: the merchandises, the unfinished production and the products.

2) *General stocks* - containing those elements of the nature of stocks which can used in any types of activity. In this structure enters the remainder stocks.

CONCLUSIONS

Up to 1 January 2008, in Romania, the accounting settlements don't delimitate the stocks on types of activities but is permitted the development on analytic without as this appearance to strictly regulated.

From the study undertaken results that for a good accounting reflection, the accounts which hold the evidence of the elements of the nature of the stocks are due to developed through the system of analytic on types of activities, because:

- the non-profit entities can unfurl many types of activities;
- these activities presuppose the use certain categories of good of the nature of the stocks;
- a certain stock can be an used in the more types of activities;
- the result of the exercise is established on types of activities.

This expatiation is not needful to the merchandise, the unfinished production and the products because these stocks are binded only to the economic activity. For these structures of stocks is applied the accounting settlements valid for economic agents, that is those entities with profit purposes.

REFERENCES

1. Haliga I., 2008 - *Contabilitatea persoanelor juridice fără scop lucrativ*. Editura Universității „Al. I. Cuza”, Iași.
2. ***, *Legea contabilității nr. 82/1991*, republicată în M. Of. nr. 454/2008.
3. ***, 2007 - *O MEF nr. 1969/2007 privind aprobarea Reglementărilor contabile pentru persoanele juridice fără scop patrimonial*, publicat în M. Of. nr. 846/10.12.2007.
4. ***, 2007 - *Reglementările contabile pentru persoanele juridice fără scop patrimonial*, aprobate prin O MEF nr. 1969/2007, publicate în M. Of. nr. 846 bis/10.12.2007.

RISK MANAGEMENT IN THE NEW INTERNATIONAL CONTEXT. METHODOLOGICAL APPROACHES

MANAGEMENTUL RISCULUI ÎN NOUL CONTEXT INTERNAȚIONAL. ABORDĂRI METODOLOGICE

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Abstract. Risk is a natural component of economic and social life, relying on multiple causes and taking various forms. Along with the evolution of globalization, the implementation of new technologies, the increasing competition on the capital market, various risk and uncertainty situations have emerged in the business world. Simultaneously, an ever-growing number of specialists in the area of finance, financial analysis, management, and applied statistics have shown interest in designing integrated models for risk analysis, monitoring and counterbalancing. The present paper sustains the fact that integrated risk management proves to be fundamental for business success. Starting from the idea that risk directly influences value generation for shareholders, the paper presents a series of methodologies for assessing risk causes and measuring the effect of risk factors, oriented towards the objectives that shareholders consider vital for good company performance.

Key words: risk management, globalization, company performance

Rezumat. Riscul este o componentă firească a vieții economico-sociale, care are la origine cauze multiple și îmbracă forme foarte variate. Paralel cu avansarea procesului globalizării, cu promovarea noilor tehnologii, cu creșterea competiției pe piața de capital s-a asistat la diversificarea situațiilor de risc și incertitudine în lumea afacerilor. Concomitent, s-a constatat preocuparea specialiștilor în domeniul finanțelor, analizei financiare, managementului, statisticii aplicate etc. pentru elaborarea modelelor integrate de analiză, monitorizare și contracarare a riscului. Prezenta lucrare susține faptul că managementului integrat al riscului este fundamental pentru succesul întreprinderii. Plecând de la considerentul că riscul influențează direct crearea de valoare pentru acționari, sunt prezentate o serie de abordări metodologice de evaluare a cauzelor și măsurare a efectelor factorilor de risc orientați spre obiectivele pe care acționarii le consideră vitale pentru succesul întreprinderii.

Cuvinte cheie: managementul riscului, globalizare, succesul întreprinderii

INTRODUCTION

The financial crisis in the USA, whose echoes on European markets threaten to trigger recession in the economies of these countries, brings risk management to the forefront, as a decision-making art in a world governed by uncertainty. There are numerous ways to define risk, but most of the times the notion of risk is associated with the probability of the occurrence of events with unfavorable consequences for a person, organization, or the entire society. A definition specific to the field of insurance, where only risks that imply the

probability of losses without any possibility for gains are involved, considers risk as the difference between real and foreseen loss (Anastasiu B., 2004). Financial theory where taking a risk implies both loss and gain probabilities, presents risk as a cause for the possible variation of the results of a certain activity. Result variation, meaning the disparity between the hypotheses accomplished *ex-ante* and what has been actually achieved, *ex-post*, can be either negative or positive (Mironiuc M., 2009). As a result, in financial theory, risk has a double meaning: an opportunity to obtain more than was hoped and a possible damage or loss. Risk increases with the magnitude of the variation of the result in comparison with the value of the expected result. In common language, no distinction is made between risk and uncertainty. In financial theory, uncertainty derives from the fact that it is impossible to anticipate exactly what will happen in the future. In the opinion of some authors, risk refers to the uncertainty “that matters”, meaning that is able to influence the results expected by capital owners (financial assets) (Dallochio M., Salvi A., 2004). Any risky situation is uncertain, but there can exist, uncertainty without risk. The management of events, potentially negative or positive, is a fundamental element of risk management in organizations. Peter Drucker, a famous American management consultant, claims that the ability of a company to manage risk is one of the basic characteristics that differentiate wealthy countries from developing countries.

MATERIAL AND METHOD

This paper is the result of an investigation approach and of a critical and comparative interpretation of studies developed at a national and international level regarding the researched topic. The main method used for creating this paper is the analysis of the current theoretical frame, the bibliographical synthesis referring to the methodology of integrated risk management, and to the specificity of risk management in crisis conditions.

RESULTS AND DISCUSSIONS

Risk as a variable contrary to favorable results and the aversion towards the brutal changes that certain events or situations can determine in our everyday life has determined the concern of numerous specialists in the field of finances, financial analysis, management, applied statistics, mathematics, etc. with drawing evaluation models and techniques (identification, analysis, quantification) and risk treatment (applying measures for reducing the impact of risk factors).

Risk management in any organization is a strategic process through which risks are identified and estimated, and then management strategies are designed for these risks, so that the organizational objectives can be attained. Risk management also implies problems related to resource allocation and diminishing the costs of risks. The resources used in order to reduce the negative effects of risk could be used for capitalizing upon certain activities. Therefore, we can speak of the opportunity cost of resource usage. Risk costs include the cost of losses, of uncertainty (tension, anxiety, fear) and the cost of risk management, which

includes all the expenses made for diminishing the first category of costs, respectively the costs for risk control and the costs of financing risks. This way, through risk management, every risk factor is aimed to be transformed into an opportunity for the organization to grow and develop. Traditionally, risk management focuses on treating the risks derived from physical or legal causes (natural disasters, fires, lawsuits etc.), named pure risks. These imply a loss probability not accompanied by any possibility for gain, but in most cases, pure risks can be insured. Even at present there are viewpoints that claim that risk management should not abandon its function of *insurance buying*, respectively of transferring risks by buying insurance (Anastasiu B., 2004). Large organizations have noticed that many risks (market risks, insolvency risks, operational risks, financial risks, fraud risks, the risks of work conflicts, etc.) cannot be covered by insurance companies. At present, there is a tendency to move from an approach based on avoiding and reducing risks to a non-traditional approach based on the integrated management of risks, using: benchmarking instruments (“*benchmark*” - means “to measure according to a reference”), which allow comparing the risk exposure of the organization to a reference model; scenario simulation and analysis instruments; risk maps (graphics, diagrams) used for determining risk sources and typology. Integrated risk management is a systematic, proactive, and continuous process, meant to ensure the understanding of the nature of risks, the management of risks, and communication in order to adopt strategic decisions, so as to contribute to achieving the organization’s global objectives. Risk management demands a multidisciplinary approach, an overall risk view, innovative actions that should be included in the global strategy of the organization. Integrated risk management practically implies a methodology in a succession of steps (table 1).

Table 1

Integrated risk management

Stage		Specific activities
Creating the risk profile of the organization	Identifying potential risks and their potential causes	Determining threats based on symptoms, in relation with the available resources and the organizational objectives
	Risk analysis and preliminary evaluation	Estimating the probability of risk occurrence, quantifying the impact of risk factors on the organization, establishing the measures for fighting and limiting the action of risk factors, designing the strategy for risk management
	Controlling the application of the risk management strategy	Verifying the results of the application of the risk management strategy and applying corrections in managing risk factors
Creating an integrated risk management function		Inserting into the organizational structure an integrated risk management function, of their specific responsibilities, of the risk communication system
Continuous learning in integrated risk management		Developing the competences of the organization’s staff regarding risk prediction, solution design, and capitalizing on experiences

The definition of the risk profile of the company is a logical starting point for applying integrated risk management, which presupposes diagnosing future dangers and opportunities, in order to indicate the main risk sectors, events, activities that may influence performance and meeting the organizational objectives. This is done through continuous evaluation and analysis of the internal and external environment of the organization (its values and competences, its organizational structure, its strategic and operational objectives, the quality of its relationships with third parties, the degree of observance of the legal frame, the influence of new technologies, the influence of macroeconomic policies, etc.). A first stage in defining the risk profile is identifying the types of potential risks based on the symptoms that predict risk occurrence, the causes and origins of risk factors, the impact area, and the degree of risk control (high, medium, weak). Specialized literature recommends focusing management on approximately 5-10 risk types, according to the organizational objectives, to the available resources, and to the ability to ensure their integrated management. Risk identification methods depend on risk management culture and practice. The most commonly used methods are: identifying risk based on objectives (any event that may endanger the partial achievement of a company objective is identified as a risk factor); identifying risk based on scenarios (scenarios can be alternatives to achieving objectives, and any event that activates an unwanted alternative scenario is identified as a risk factor). Risk analysis and evaluation, as a second stage in drawing the risk profile, presupposes classifying risks according to the probability of occurrence of the risk range and their impact, evaluated following the application of quantitative and qualitative ways of quantifying them. According to the accepted risk tolerance of the organization, the possible actions to avoid are decided upon, as well as the main interventions for limiting the impact of risk factors, their treatment, and risk transfer actions. Based on the information derived from the preliminary risk analysis, the integrated risk management strategy is created and applied. The level of risk tolerance increases as the management team has rigorous abilities to control risk factors. In order to obtain an answer to the actions taken in the second stage, the application of the risk management strategy is evaluated. The information gathered following this analysis should be recorded and communicated to the responsible persons. The entire risk management process should be continually monitored in order to allow, if necessary, the application of corrections to risk management.

The concepts of integrated risk management have to be applied at all hierarchical levels of the organization. At the upper level, the risk profile of the organization is defined. Usually, certain risk factors and the measures necessary for limiting them are best known at lower hierarchy levels. Therefore, ensuring staff participation at these management levels is essential for capitalizing their experience in developing risk management solutions. The integration of the risk management function into the strategic management of the organization is achieved through different means, such as: urging managers to improve and

acquire risk management competences; including risk management competences in the recruiting and evaluation criteria of the company's staff; establishing a program of bonuses and stimulating measures for those who prove competent in integrated risk management. Since efficient risk management demands quality information, besides integrating risk management into the global organizational strategy, it is necessary to create a risk communication system designed to inform the staff about: the main risk factors, the ways of overcoming them, and emergency measures.

Continuous learning in what concerns risk management is part of integrated risk management and helps: capitalizing on the results and experiences accumulated following risk management; encouraging innovation and the continuous of this practice; making investments in training the staff and organizing educational seminars for developing the competences of risk anticipation. Integrated risk management requires financial and educational resources in the field. The difficulty comes from the fact that under normal conditions, the people responsible with risk management request resources in order to implement measures for controlling events not relating to the present and unsure to occur.

The economical-financial crisis that affects world economy at present determines new views on integrated risk management. The malfunctions of the financial market, the collapse of crediting through the significant growth of the cost of debt and roughening the conditions for accessing credits, the uncertainty related to fiscal regulations and pressures in crisis situations and the accentuation of recession are all threats to the sustainability of organizations, which negatively influence value creation for shareholders [9]. In this time of crisis, the guilty are searched for the excessive debts from the previous years, among the debtors that have made loans without ensuring that they can refund the credits, and among the credit institutions that have encouraged their clients, thus contributing to creating a climate of "risk neglect" or risk transfer, especially towards the credited. Risk analysts tend to point towards the creditors, who have disobeyed the principles of business ethics in the desire to opportunistically increase their profits. It can be noticed that, worldwide, the financial institutions that will survive the crisis will be those that apply the principles of business ethics and impose rigorous analyses of social and environmental risks before financing any project. The crisis determines an "economic Darwinism", meaning that the position of certain companies is consolidated on the bankruptcy of others.

In this context, financial risk, the risk of liquidity absence, the risk of crediting and protecting the credit substance through investments that create jobs represent important dimensions of risk management in the view of organizations, financiers, and governments. Managing these risk categories by promoting strategies that generate liquidity, designing and applying fiscal measures that stimulate work, savings, and investments, reducing the real interest rate and re-launching the crediting ability, is essential for ensuring business continuity. However, in financial crisis situations, risk is managed by intensifying

communication within and outside the organization. For instance, the organization needs to know its clients well in order to foresee the malfunctions caused by their insolvency. In crisis situations, the negative information thrown on the market, the rumors related to layoffs, staff reductions, or salary reductions can be devastating for work productivity. Therefore, by providing correct information to the employees, providers, customers, investors, and communicating the efforts made in order to overcome the unfavorable situation, in order to rethink the social responsibility policies, the organizational image can improve.

CONCLUSIONS

Integrated risk management is a systematic, proactive, and continuous process meant to ensure the understanding of the nature of risks, risk management and communication in the view of adopting strategic decisions, so as to contribute to achieving the global objectives of the organization. Risk management demands a multidisciplinary approach, a holistic vision on risks, and innovative actions that should be included in the global organizational strategy. The financial crisis that currently affects world economy determines new views on integrated risk management. In financial crisis situations, risk is managed by intensifying the internal and external organizational communication. Communicating the efforts made in order to overcome risk situations aimed at redesigning social responsibility policies can improve the image of the organization.

REFERENCES

1. **Albouty M., 2003** - *Décisions financières et création de valeur*. Economica, Paris.
2. **Anastasiu B., 2004** - *Managementul riscului organizațional*, Tehnopress Publishing House, Iași.
3. **Dallocchio M., Salvi A., 2004** - *Finanza d'azienda*. EGEA, Milano.
4. **Mironiuc M., 2009** - *Analiză economico-financiară. Performanțe-Poziție financiară-Risc*. The Publishing House of "Alexandru Ioan Cuza" University, Iași.
5. **Pivato S., Misani N., Ordanini A., Perrini F., 2004** - *Economia e gestione delle imprese*. Egea, Milano.
6. **Prunea P., 2003** - *Riscul în activitatea economică, Ipoteze. Factori, Modalități de reducere*. Economică Publishing House, Bucharest.
7. **Zazzeron S.** - *La gestione del rischio e il valore per gli azionisti*. <http://www.uni.com> (accessed in December 2007).
8. *** *Creating Value Through Enterprises Risk Management - A Practical Approach for the Insurance Industry*. Tillinghast-Towers Perrin, <http://www.tillinghast.com> (accessed in December 2007).
9. *** www.standard.ro/articol_71146

THE ASPECTS CONCERNING APPLICATION OF H.A.C.C.P SYSTEM TO THE NICOREȘTI VINEYARD

ASPECTE PRIVIND APLICAREA SISTEMULUI H.A.C.C.P LA PODGORIA NICOREȘTI

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Abstract. *Every responsible wine producer is concerned with food safety and, increasingly, legislation exists to sharpen this interest. When there is a failure in food safety, it is almost invariably discovered too late. The impact on the consumer is considerable, and results in the loss of confidence in the supplier. Each producer should determine when, why and how wines should be evaluated by chemical, microbiological and sensory analysis. Implementing a HACCP or ISO 22000 forms the basis of the European Commission Hygiene Directive (93/343/EEC) incorporating the Codex Alimentarius guideline, commonly known as the HACCP principles as it applies to the food and drink industry. It is a requirement in most countries and rapidly being established as legislation for the food and drink industry to demonstrate ‘Due Diligence.’ The creation of a HACCP plan involves making a flow chart of each and every step from vineyard to wine release.*

Key words: implementing H.A.C.C.P, food safety, legislation

Rezumat. *Fiecare producător de vinuri este preocupat de siguranța alimentelor precum legislația existentă în creșterea acesteia. Când există eșecuri în siguranța alimentelor, acestea sunt invariabil descoperite mult prea târziu. Impactul consumului este considerabil, rezultând pierderi și scăderea încrederii în producător. Fiecare producător trebuie să determine când, de ce și cum va fi evaluat vinul din punct de vedere chimic, microbiologic și analiza senzitivă. Implementarea sistemului de control al siguranței alimentului ISO 22000 s-a bazat pe un plan HACCP sistematic în conformitate cu principiile HACCP din Codex Alimentarius. Acest plan este caracteristic pentru fiecare produs și/ sau proces analizat. Participarea la implementarea și menținerea sistemului integrat de management al calității și siguranței alimentare a produselor fabricate și livrate este sarcina fiecărui angajat al societății.*

Cuvinte cheie: implementarea H.A.C.C.P, siguranța alimentelor, legislație.

INTRODUCTION

Nicorești vineyard is located in the eastern part of Romania, between the rivers Siret and Barlad. Administrative, the vineyard is located in the northwest county Galati, at a distance of some km from the city Tecuci and from 50 km of Galati. Mathematically the vineyard area falls between the geographical coordinates 45°52' and 45°06' north latitude and 27°19' and 27°28' east longitude.

The concrete objectives of the Nicoresti vineyard are established annually and will be reviewed periodically with the analysis made by the management.

MATERIAL AND METHODS

To creation of a HACCP plan are taken into account the client, team work, satisfying the customer requirements, improving the quality on long term, solutions for specific situations, the involvement of the entire staff, the spirit of commitment to top level management in a logical sequence.

RESULTS AND DISCUSSIONS

The importance of management quality is resulting at least from the following considerations:

- for any enterprise. to achieve an maintain the quality desired by the client in terms of efficiency, is a business necessity;
- the client wishes to have confidence in the ability of the enterprise to provide the required quality and to maintain this quality;
- the enterprise must take more into account of the company requirements, which aims the life protection of the individual wealth and the environmental protection.

Table 1

Defining TQM as a bicomponent system

The total management of TQM quality	
Social subsystem	Technical subsystem
The people get the quality, the worker represents the central point of all the processes from the enterprise	The TQM principles (customer focus)
Management engaging and promotion of a participatory management	The general policy of the company and the policy in the quality domain
Countinous improving of quality	Techniques of solving the problems
The worker becomes executor, a participant in the processes	Different responsibilities and documented
Teamwork and personal responsibility for results	Quality system, according to international standards ISO 9000
Open work environment, partnership relationships based on trust with the customers and subcontractors	Communication and training, integration of customers and subcontractors in the quality system of the enterprise

The standard ISO 8402 defines TQM, as a management system of an organization, centered on quality, based on the participation of all its members, trough which is aimed to ensure the success on long term, by satisfying the client and obtaining of advantages for all the organization members and for the society.

Application of the H.A.C.C.P system at the VINEYARD NICORESTI

A. Preliminary Steps

HACCP is a preventive system of keeping under control the potential hazards and thus to ensure the food safety. It is a modern system of check and documented, which allows:

- identification of critical points, for taking under control the hazards;
- implementation of surveillance system

Before starting the HACCP study it was necessary to ensure that in the organization are applied:

- Code of good hygiene practices;
- Code of Good Manufacturing Practices;

As well as actions of training of the staff, which has as purpose the awareness of it to understand the objective of self-control

B. The stages of implementing the safety of the food safety

Implementation of the control system of food safety was based on a systematic HACCP plan in accordance with the principles of HACCP Codex Alimentations This plans is characteristic for each product and/ or analyzed process. The projection process and implementation of the system were the following:

1. Defining the food security policy;
2. Team formation and organization of the food safety HACCP;
3. Description of the products and intended use of identification;
4. Developing the flow chart and checking on the ground;
5. Identifying hazards;
6. Hazard assessment;
7. Determination of critical control points (PCC);
8. Establish critical limits;
9. Establish the monitoring system for each PCC;
10. Establish corrective actions;
11. Establish of procedure of verification;
12. Establish of documentation and records.

C. The objective of policy in the quality domain and safety of food of the NICORESTI is wine production and marketing of products based on wine, distillates, spirits, plum brandy and fruit spirits, to satisfy the explicit and implicit needs of the customers, in accordance with the Code of general principles of good food hygiene practices (GHP), Code of good manufacturing practice (GMP) with the legislation in force for quality and food safety and the achievement of profit.

The main objectives of the policy in the domain of quality and safety of food of the vineyard Nicoresti are:

- Increasing of the satisfaction level of the final customers;
- Increasing of the satisfaction level of the distributors;
- Increasing the number of sales;
- Increasing of net profit;
- Increasing of labor productivity;
- Reducing non-conformities referring to the quality and safety of aliment;
- Reducing the number f complains;

- Continuous improvement of quality and safety of the aliment for the manufactured products by the company.

Participating at the implementing and maintaining the integrated quality system of management and food safety of the manufactured products and delivered is the task of each employee of the society.

Responsibility for the quality and safety of alimentary products manufactured, handled and commercialized by the company is of all the employees and of each employee individually.

D. Establishing and organizing the team of aliment safety

It was designated the safety aliment team consisting of 18 persons responsible with the projection, implementing, maintaining and continuous improvement of management system of aliment safety.

The team leader has demonstrated competence in understanding and applying the HACCP principles. The safety team of the aliment:

- has the permanent support of management at the highest level;
- communicates with all the organization staff;
- the team members were trained and have experience to demonstrate the knowledge of the production process and analysis of hazards;
- is multidisciplinary and includes operational personnel;
- had the opportunity to appeal to a consulting firm during the design and implementation of food safety;
- and in the future will have possibility to appeal at an expert from outside the organization, in the case in which that doesn't have sufficient power to resolve issues concerning aliment safety.

Quality standards for bottled wine

1. Washing and sterilizing the route to the bottling line. Washing and sterilizing the route that connects between the conditioning wine sector and bottling sector trough circulation of cold water.

2. Streaming the routes and buffer vessel in the bottling room for sterilization for 30 min. The wine transfer in the buffer recipient at the bottling line. The transfer of the wine to bottling is done by fixed routes, washed and sterilized properly. Getting the wine from the conditioning sector is done by reading at mira of the wine quantity and creating the transfer note to bottling.

3. Preparation and sterilization of sterile filter at the bottling line. The filter is washing for 30 min. with hot water at 85⁰C filtered at 1,2 u. Is streamed the filter in term of sterilization with steam at 160⁰C for 30 min, after which is made the test of integrity (special device from endowment) to see if it's not broken. Printing is done on paper of the result of direct device.

4. The sterile filtration of the wine. Sterile filtration of the wine at the bottling line is done in two phases by filtering trough consecutive rounds of different porosity, so the first cartridge is realizing a filtration to 0,8 u, and the second to 0,65 u.

5. Filling the bottles of wine at the filling machine before filling the bottles of wine, the filling machine is washed and sterilized with hot water at 1000C, filtered trough filter plates for 30 min.

Filling the bottles of wine is made under pressure of CO₂ as follows:

- air removal and replacement of glass with CO₂
- CO₂ removal from the bottle and filling the bottle with wine;
- achievement the level of 750 ml or 1000 ml ;
- introducing a jet of CO₂ in the mirror glass of wine and the mouth of the bottle;
- transport of bottles at the machine of stopper with the help of transporting belt.

6. The float process of filled bottles. It's prepared first the adduction system of the stoppers and of float process machine by disinfecting them with a substance based on alcohol. The machine of float process has a tank of closures, a guide for bringing the stoppers, a compression stopper system and a pusher of the stopper into the bottle neck.

7. Settling the full bottles in the box. In the case in which the wine isn't delivered immediately or is a subject to the process of aging in the bottle, the filled bottles are stored in the wine cellar. For this after the float process the bottles of wine are taken form the transporting band by the operators from the bottling section and are placed horizontally in the boxes of 500 bottles capacity, with the help of which is transported in the collecting wine cellar.

8. The transport of the pallet box with bottles at the collecting wine cellar. The transport of the pallet boxes are made by the motto-forklift.

9. Depositing the pallet boxes at the collecting wine cellar. Depositing the wine at the collecting wine cellar is done with the purpose of wine aging in the bottle, fact which brings and added quality to the respective wine. The storage conditions are: lack of large variations of temperature, of the direct light and excessive atmospheric humidity.

10. Applying the termocontractible capsules. Applying the termocontractible capsules are made by automatic blowing on the bottle neck of the hood and passing the bottle trough the oven with resistance for termocontracting of those.

11. Labeling bottles. Applying the set of labels is done automatically by the labeled machine.

12. Packing the bottles in cardboard boxes. Packing bottles in cardboard boxes behave two phases:

- automatic box forming at the making boxes machine and sending them on the transporter machine at the packaging machine;
- automatic settlement of the labeled bottles in boxes and automatically closing of the boxes.

After closing the boxes it will be applied a label on the box automatically with the assortment of bottling wine.

13. Stacking the boxes on euro-pallet. Stacking the boxes on euro-pallets is performed automatically and sent to packaging.

14. Packaging the euro-pallets. Automatic fixing of the boxes on the euro-pallets is realized by packaging around a sheet of polyethylene.

15. The transport of euro-pallets at the warehouse of finished products. The euro-pallets transports at the warehouse of finished materials are made with the help of electro-forklift.

16. Depositing the bottled wine until delivery. Short-term storage until the delivery of wine to the customer.

17. Delivery of bottled wine. Delivery is made in the base of delivery disposition and of a firm order.

CONCLUSIONS

Increasing the level of satisfaction of the distributors can be achieved through the development of all and training in permanence of those that are serving this department, by purchasing a sufficient number of machines so that the orders to be respected at time, this can be realized by accessing European funds grants.

Increasing of the sales number can be realized by choosing a marketing prescription based on advertising in the mass media and promoting the products in hypermarkets by offering for tasting to their clients.

Continuous improvement of quality and safety of the aliment for the produced products by the company; all these objectives can be achieved through accessing European funding grant to purchase a competitive technological line that will get to lower production costs automatically leading to increasing the net profit obtained, and through implementing the HACCP system, system HACCP is the ideal tool for risk prevention and risk control this being created for the alimentary sector by Codex Alimentarius Commission. By implementing the HACCP system can be achieved, and the objective which consists in increasing the share of products exported by satisfying the requirements for quality.

REFERENCES

1. **Banu C., 2002** – *Manualul inginerului de industrie alimentară*, vol II, Ed. Tehnică, București.
2. **Bășanu Gh., Pricop M., 1996** - *Managementul aprovizionării și desfacerii*. Editura Economică, București.
3. **Bulgara M., 1992** - *Starea de criză a agriculturii românești și posibilele căi de redresare*. CIDE, București.

THE MUSHROOM – AN INVESTMENT OPPORTUNITY

CULTURA CIUPERCILOR – O OPORTUNITATE DE INVESTIȚIE

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Abstract. *The purpose of the work is to arrange a mushroom nursery with an incubation area of 320 sqm and a harvest area of 480 sqm. For the presentation of the investment project, was identified the amount of USD 192,500, reasoned as it follows: 1 RON 126,000 investment; 2 RON 66,500 for working capital; According to the table, out of the total investment value, 47% of the amount invested will be allocated for the acquisition of the air conditioning system, absolutely necessary for carrying out the manufacturing process. The arrangements' value results from the estimate pre-calculated by the company which runs the main works and from the costs of materials to be used for finishing in own administration.*

Key words: production, mushroom nursery, investment opportunities

Rezumat. *Scopul lucrării este amenajarea unei ciupercării cu o suprafață de incubare de 320 mp și o suprafață de recoltare de 480 mp. Pentru prezentarea proiectului de investiții, s-a identificat suma de 192500 RON, argumentată astfel: 126000 RON pentru investiții; 66500 RON pentru capital de lucru. Conform tabelului din valoarea totală a investiției, 47% din totalul sumei de investit va fi alocat pentru achiziționarea instalației de climatizare, absolut necesară pentru desfășurarea procesului de producție. Valoarea amenajărilor rezultă din devizul antecalculat de firma care va executa lucrările principale și din costul materialelor ce vor fi utilizate pentru realizarea finisajelor în regie proprie.*

Cuvinte cheie: producție, cultura de ciuperci, oportunități de investiție.

INTRODUCTION

It is description of management organisational and total budget to provide *investment and economic efficiency analysis of cultivation of Pleurotus mushrooms.*

It was elaborated recommendations and strategies of investment and development of this kind of crop.

MATERIAL AND METHOD

The cultivation of mushrooms is an art, but it is based on science and technology.

However, those who plan to grow mushrooms can be split into groups based on several factors. Maybe the most useful way to split them is to consider what they want to use:

1. Expertise – a person who has worked on a mushroom farm.
2. Waste materials he sees.
3. Waste materials from his own farm or other business.
4. A building he owns, or can get cheaply.

Mushroom cultivation has many facilities requirements. There are no shortcuts to those requirements. If the requirements are not met, failure, or at least poor production is assured. The facilities must provide the environment required for mushroom growth. The facilities must also provide the primary protection against insects, other pests and disease. Without the environment and protection provided by the facilities, management can not protect the crop or obtain good yields.

RESULTS AND DISCUSSIONS

The place where the substrate is pasteurized, cooled, or sterilized must be maintained with greater sanitation than the growing area. It will probably be the best place to spawn as well. The air needs to be reasonable for those working there.

The sums needed to procure the plant, machinery and equipment result from the selection of proposals and marketing studies performed.

Mode of funding

Financing needs will be provided by own sources. The expected rate of net profit is higher than the interest on bank deposits in long term. The term of investment recovery is two years.

The production type chosen for analysis in this plan, is the multi-intensive type, with heating, as shown in the investment programme.

The culture area is 480 sqm, composed of 6 rooms with dimensions of 2 x 40 sqm each, and the number of culture cycles is 6. Incubation lasts 20 days.

The nourishing substratum is, in general, being reused for 3-5 months. Under the conditions of the present planning, the nourishing substratum is entirely replaced in April, August and December.

Given the investment programme required, in the first quarter of the first year there will be no production obtained. The first incubation will take place in April, and the first harvest in May.

Table 1

Investment necessity

Alocari de fonduri	Type	Total (RON)	Period of depreciation (Years)
Infrastructures	D	7350	5
Instalation of climatization	D	58800	5
Equipemnt	D	29400	5
Cars	I	29400	5
Bureau expenses	I	1050	2
Total		126000	
Own sources		126000	

The quantity of mushrooms harvested annually per room will be of 9 t, so 54 t/year for all the 6 rooms. The monthly average of mushrooms harvested will be 4.5 tons. Mushrooms' selling price is 5.6 RON/kg. The purchasing price of the nourishing substratum (cellulose substratum plus supplements, plus mycelium) is 210 RON/t.

The cellulose substratum acquisition price is 90 RON/t. The price rise tendency, both, in sales, as well as purchasing is 5% per year. Forecast situation

regarding production and sales volume is presented in table 2.

From the next table result the following aspects: the production of mushrooms is lower in the first year compared to the coming years due to the fact that at the beginning of the year early investments and arrangement works are carried out, and the number of cultivation cycles is lower; the income earned in the first year of exploitation is reduced, in line with the obtained production; The revenues from the third year exceed those from the second year, even if the mushroom production is constant because of the 5% increase coefficient applied to the selling price; Within the framework of the income obtained, the greatest weight is possessed by the income from the sale of mushrooms. The revenues obtained from the sale of the substratum represent 3.6% out of total income obtained in the first year and 3.61% out of the total income acquired in years 2 and 3.

Table 2

The forecast structure of expenses for raw material and materials

Explanations/Month		1	2	3	4	5	6	7	8	9	10	11	12
Cellu- losed substra- tum	Cantitate (t)	-	24	-	60	-	24	-	60	-	24	-	60
	Unitary price(RON)	-	70	-	70	-	70	-	70	-	70	-	70
	Value (RON)	-	2100	-	5250	-	2100	-	5250	-	2100	-	5250
More Substra- tum	Quantity (t)	-	60	-	60	-	60	-	60	-	60	-	60
	Unitary price(RON)	-	122,5	-	122,5	-	122,5	-	122,5	-	122,5	-	122,5
	Value (RON)	-	7350	-	7350	-	7350	-	7350	-	7350	-	7350
Total raw materials and materials (RON)		-	9450	-	12600	-	9450	-	12600	-	9450	-	12600
Total annual expenses on raw materials and materials (RON)		66150											

In the substantiation of costs anticipation there were taken into account the average prices prevailing on the market nowadays, to which was applied a rise tendency of 5% during one year. The cost of products added at one tone of cellulose substratum is of 122.5 RON/tone.

The cellulose substratum is reused in proportion of 60% for 3-5 months per year, respective February, April and August, when we will buy only 40% of the necessary substratum.

The forecasts summary for annual requirement of raw materials and materials is presented in table 3. The expenditure in the first year will be of RON 56,700 since the first quarter is just for investments. The expenses in the second year will be of RON 69,457.50, and in the third year of RON 72,929.50, due to the forecast tendency of price increase with 5% per year. As part of exploitation

expenses, the largest share is held by the costs of raw material, energy, fuel. These are followed by staff costs which represent a significant percentage out of the total exploitation expenses.

Fixed assets and their liquidation

On drawing up the plan, the company had the following fixed assets:

- land: 1000 sqm = 17,500 RON;
- construction: 600 sqm = 17,500 RON

The arrangements done while constructing are valued RON 7350. The building liquidation is realized in 20 years. Installations, machinery and equipment are liquidated in 5 years. The project is financed by own sources, the capital at the beginning of the period being of 140,000 RON.

The dividends will be reinvested up to 70% in the first year, 50% in the second year and 30% in the third year, so that the stability indicators at the end of the forecast period to place the company in a situation favourable to obtain a credit for development. The provisions for wages are of 5250 RON in the first year, of 5950 in the second year and of 7000 RON in the third one. The amounts obtained in the first year are lower compared to the sums of the following years, because of the lower production obtained after performing the investment activities. The share of net profit in the rate of sales is increasing.

The annual evolution of income and costs is presented in table 4. From table 4 it can be seen an increasing process of income and expenses. The most pessimistic scenario possible to imagine is a reduction of revenue with maximum 20%, reduction generated by the decrease of annual average production. In this situation, the company would record, in the first year, a sales volume of 159,145 RON, with an operating profit of 3.54%, and per total project will record a sales volume of 699,412 RON, with a rate of operating profit of 20%. In this case, the term of investment recovery will be 3 years.

Estimation indicators of the investment project

From calculations resulted the following indicators:

- present net value = 3159274 RON, taking into account a 7 years duration of investment and an update rate of 0.1;
- period of investment recovery = 2 years;
- return index = 28.58;
- the internal rate of return (IRR) = 59.9%;
- the firm value at the end of the 3 years forecast = 108,875 RON.

In the first year of exploitation, the value of gross operating surplus is half of the next year's value due to a reduced period of exploitation, the first period of the year being allocated to investments. Also, the expected maximum production was reached in the fourth quarter of the first year.

In terms of economic and financial indicators, the image of the company is presented in table 3.

Table 3

Economic and financial indicators

Indicators				Company's situation		
				YEAR I	YEAR II	YEAR III
A. INDICATORS OF PROFITABILITY						
Return on equity (financial)	Net Profit/ Capital	%	10%-20% in a normal market economy	28,57	28,57	28,57
Return on assets (economic)	Net Profit/ Total assets	%	5%-10% depending on the profile of activity	12,15	33,54	30,36
Net profit margin	Net Profit / Turnover	%	Higher than average interest rate on the interbank market	13,60	28,44	27,80
Gross profit margin	Gross Profit / Turnover	%	Higher than the average interest rate	16,20	33,86	33,10
Current rate	Circulating assets / circulating liabilities	%	Over 100%	288,20	719,31	1053,95
Rapid rate (acid test)	Circulating assets - Stocks) / Circulating liabilities	%	Over 100%	235,7	670,31	1001,56

As the above table shows, in terms of economic and financial indicators, both indicators of profitability as well as indicators of liquidity show that the company is profitable. The values are in line or even over the values in a normal, functional market economy. The company does not record deficiencies in terms of profitability, nor in terms of liquidities, the rapid rate and the current rate having values over 100% and an upward trend.

CONCLUSIONS

Horticultural products represent an important source of foreign exchange in order to equilibrate the external balance, as Romania is a country which exports vegetables, fruits, grapes, and flowers because it has the natural conditions that few countries in the world have. The quality of fruits, vegetables and grapes produced in this temperate continental climate is unsurpassed.

The cultivation of Pleurotus mushrooms is a rather recent activity. It has only a few decades, compared with the hundreds or thousands of years that other mushroom cultivations have. Its novelty is an asset, and the spectacular development shows that the world market welcomed a modern, simple, cheap, and accessible technology, of an alimentary product so valuable in human nutrition and so wanted in the whole world.

The natural resources for cultivation of Pleurotus are available in Romania in an unbelievable amount.

Regarding the internal mushroom market, the supply is situated far below the actual demand, without discussing about the potential demand, much higher,

which can be activated by means of advertising. At the moment, the consumption of mushrooms is 10 times lower than the normal consumption. This proves how much the domestic market can absorb, and how far away are the times when we could discuss about competition in this field.

In addition to the numerous possibilities offered by the domestic market, export possibilities are multiple, especially for products derived from fresh mushrooms: canned, rough-wrought, mushroom powder, etc.

The establishment of a mushroom nursery proves to be a very profitable investment. The amount needed to start the business is relatively small, as an agricultural land is not necessary. The term of investment recovery is very low. The profit is ensured by the potential of a safe and sure sale market.

Due to the relatively low level of initial investment, the business is permissive and permeable, open to continuous competition.

REFERENCES

1. **Ciurea I.V., Brezuleanu S., Ungureanu G., 1998** – *Posibilități de dezvoltare a spațiului rural din zona Oituz – județul Bacău, sat Poiana-Sărată*. Lucrări științifice, U.A.M.V. Iași, seria Agronomie, vol. 40.
2. **Ungureanu G., Vasilescu N., Brezuleanu S., 2004** – *Analiza cifrei de afaceri a exploatațiilor agricole din zona de luncă și colinară a județului Bacău*. U.S.A.M.V. Iași. Lucrări Științifice, Suport CD, ISSN 1454-7414.
3. **Ungureanu G., 2004** – *Contribuții la studiul organizării și rentabilității exploatațiilor agricole private din zonele de luncă și colinară a județului Bacău*. Teza de doctorat: U.S.A.M.V. Iași. Lucrări Științifice, Suport CD, ISSN 1454-7414.

ECOLOGICAL AGRICULTURE – PRESENT AND TENDENCIES OF FUTURE DEVELOPMENT

AGRICULTURA ECOLOGICĂ – PREZENT ȘI TENDINȚE DE DEZVOLTARE ÎN PERSPECTIVĂ

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Abstract. *The segment that is occupied by the ecological agriculture has an ascending trend, both worldwide and in Romania. The positive evolution is determined, both by the increase of demand from the consumers of ecological products, and by the EC regulations regarding the increase of quality standards of the agricultural products. Worldwide, the largest areas occupied by ecological cultures are in Australia and Oceania with 39% of the total area, followed by Europe with 23,0% (about 8 million ha). Of the European countries, Italy has the largest area with 1,2 million hectares, followed by Great Britain and Germany, both with almost 0,7 million hectares. At the level of the European Union, the ecologically cultivated areas represent over 4% of the total agricultural area. In Romania the percent is over 1% (1,32). At present, in Romania, there are ecologically cultivated cultures on an area that exceeds 200 000 hectares, registering an average rhythm of areas growth of 36,8%. Of the former socialist countries, Poland occupies the first role, with almost 300 000 hectares, followed by Ukraine with 280 000 hectares.*

Key words: agriculture, ecology, development, perspectives, ecological products

Rezumat. *Segmentul pe care îl ocupă agricultura ecologică are un trend ascendent atât pe plan mondial cât și în România. Evoluția este determinată pe de o parte de creșterea cererii consumatorilor de produse ecologice, cât și de reglementările CE privind creșterea standardelor de calitate a produselor agricole. Pe plan mondial cele mai întinse suprafețe ocupate cu culturi ecologice le deține zona Australia – Oceania cu 39% din suprafața totală urmată de Europa cu 23% (circa 8 milioane hectare). Dintre țările europene Italia deține cea mai mare suprafață cu 1,2 milioane hectare, urmată de Marea Britanie și Germania, ambele cu aproape 0,7 milioane hectare. La nivelul Uniunii Europene terenurile cultivate ecologic reprezintă peste 4% din totalul suprafeței agricole. În România procentul depășește 1% (1,32). În prezent în România există culturi ecologice cultivate pe o suprafață ce depășește 200 000 hectare, înregistrându-se un ritm mediu de creștere a suprafețelor de 36,8%. Dintre fostele țări socialiste, Polonia ocupă primul loc, cu aproape 300 000 hectare urmată de Ucraina cu 280 000 hectare.*

Cuvinte cheie: agricultură, ecologie, dezvoltare, perspective, produse ecologice

INTRODUCTION

The segment that is occupied by the sector of the ecological agriculture has an ascending trend, both worldwide and in Romania. The evolution is determined

both by the increasing demand of consumers of ecological products as well as the content of recent reforms within the EU regarding the increase of quality standards of agricultural products where the ecological part is a priority.

Although there is a positive tendency at the EU level, the ecological agriculture has at present a reduced weight of the total cultivated areas (4,17% in 2007). The maximum level can be found in Austria, 13, 37%, but not far behind it is Germany which has proposed for the following years to reach at 20% the cultivated area.

In comparison, in Romania, at the level of 2000, only 0,12 % of the agricultural areas were exploited by means of ecological agriculture and at the level of 2007, 1,3 % (190 129 ha).

The study has in view an evaluation of the agricultural situation within the European area and also to identify the factors that bring forward or stop the development of this sector and to set the tendencies of the evolution and accomplishment of ecological products.

MATERIAL AND METHOD

In order to do the study there were used official sources with statistic character of the specialty literature. They refer to statistic yearbooks, some information data are with close circuit and also the information sources got from direct investigation. In order to identify the development tendencies and the factors of influence, the interpretation was done taking into consideration the dynamic evolution of products and phenomena using comparison, specific index, graphics and monographers. Some data have in view the situation of agricultural ecological production of Bacău County.

RESULTS AND DISCUSSIONS

According to the definition of FAO and OMS in Food code, ecological agriculture represents an integrated system of managing the production process, which contributes to the supporting and fortifying the agri-echo-system resistance, including the biodiversity, biological cycles and biological activity of the soil. This type of agriculture means a returning to the values of traditional agriculture, but not to its methods. The main objective of this type of agriculture is to protect the human health, together with insuring the biosphere protection and planet's natural resources, excluding the use of chemical fertilizers and herbicide, the prevention methods having an important role against pest, diseases and weeds.

In the EU there have been applied a series of regulations, starting with 1991, the latest being EC no 834/2007, regarding the ecological production and ecological products' labelling starting its application with 1st January 2009. In Romania there regulations come together with other juridical regulations with specific character.

Worldwide, the ecological agriculture is ascending, being present in more than 100 countries situated on six continents and occupying an agricultural area of almost 31 million hectares. The repartition on continents of the ecological areas and farms is presented in table 1.

Table 1

The worldwide situation of ecological agriculture

Areas with ecological management on continents					%
Europe	Oceania Australia	Latin America	North America	Asia	Africa
23,0	39,0	19,0	7,0	9,0	3,0
Weight of ecological farms					
37,7	0,5	30,9	2,3	13,3	15,3
The average area of an ecological farm					
36,9	4405,0	32,8	182,3	22,2	7,1

The largest areas can be found in Australia (Oceania) with 11,8 million hectares, followed by Europe with 6,9%. We have to mention the reduced position of North America, continent with a powerful agricultural potential, but with few areas occupied with ecological plants, which represent 0,56% of the total agricultural area of the continent.

As regards the number of ecological farms, they are not in direct correlation with the cultivated areas. The smaller number can be found in Australia (Oceania) followed by North America and Asia. But there are large discrepancies between the sizes of ecological farms on continents. As regards Australia, the size of a farm exceed 4400 ha, followed by North America, at a great distance, with 182,3 ha. In Europe, the ecological farm has an average size of 36,9 ha.

At an European level, the situation of the areas destined for the ecological structures had a tendency of increase between 2003-2007. If we take into consideration all the European countries, in comparison with 2003 when there were cultivated 6 177 587 ha, after 5 years, in 2007 the area cultivated with ecological cultures increased with about 29% (7 976 935 ha). It is significant increase, having in view that the trend has been constant every year.

Table 2

Evolution of the ecological agriculture in Europe

Year	Indicators			
	Area		Producers	
	Ecological (organic)	% Ecological	Ecological (organic)	% ecological
2003	6.177.587	1,32	151.381	1,03
2004	6.377.623	1,34	164.126	1,08
2005	6.873.649	1,46	187.766	1,26
2006	7.444.619	1,62	204.080	1,38
2007	7.976.935	1,73	213.217	1,44

In 2003 there were cultivated about 5,0 million hectares, and this area increased to 7,34 million hectares; thus there was registered a grow of 46,8%. Related to the total cultivated area, the weight of the areas with ecological

cultures increased from 4,03% to 4,17%. At the same time there increased the number of producers with almost 50 thousand within the analyzed period.

As regards the countries belonging to the European Union the increase was even more spectacular in the same period. (table 3)

Table 3

Evolution of ecological agriculture in European Union

Year	Indicators		
	Area		Producers
	Ecological (organic)	% ecological	Ecological (organic)
2003	5.054.373	4,03	137.301
2004	5.774.379	3,71	140.666
2005	6.257.799	4,05	160.750
2006	6.858.588	3,92	179.453
2007	7.341.695	4,17	186.424

The ecological areas in Europe in 2003 showed that Austria occupied the first place of the cultivated area, followed by Switzerland and Italy. In absolute size, the largest ecological area was in Italy (1.230.000 ha), Great Britain (679.631 ha), Germany (632.165 ha). The number of ecological farms was of 56.440 in Italy, 18.292 in Germany, 15.608 in Spain. The average size of an ecological farm was the largest in Great Britain (170,7 ha), followed by Portugal (77,3 ha) and Sweden (53,9 ha).

Starting with 1990, the fastest growth of the ecologically exploited areas took place in Scandinavia, Italy, Austria, Germany, Great Britain and the Mediterranean countries.

In 2007 in the European Union the ecologically cultivated areas represent about 4,17% of the total agricultural area. Austria has the highest level of organic fields in the national agricultural area – 13,37% in 2007, but Italy is the country with the most extended ecologically cultivated areas of the European Union, more than 1,2 million hectares, which represent 18%-20% of the total organic fields in the European union. It is followed from a great distance by Germany (865.336 ha), Spain (988.323ha), Great Britain (682.196 ha) and France (557.133 ha). But the chart changes if we rapport the organic surface of a state to the total agricultural area of that state. From this point of view Austria is leader, the ecological cultures (371.000 ha in 2007) occupying in this country 13,37% of the national agricultural surface. On the second place is Italy with 9%, followed by Sweden 7% (225.385 ha). But the best clue on the evolution of the ecological sector of the near future is given by rapport between the area in conversion from the conventional agriculture to the ecological one and the area already certified. According to the study “Models of ecological agriculture in EU 25” in Cyprus, Leetonia, Lithuania, Malta and Slovakia the areas in conversion represent 70-100% of the organic certified fields. In these countries the growth potential of ecological agriculture is high, according to the specialists’ opinion. Ireland,

Greece, Italy, Hungary and Slovenia have a moderate potential of development, as these countries have areas in conversion which represent about 30% of the ecological ones. Denmark is in the last place as the conversion area represents only 1,4% of the total ecologic fields.

The most important organic cultures are the annual ones. Greece, France, Italy, Cyprus and Portugal are the only countries of EU which have significant areas covered with permanent cultures, generally fruit trees, olive trees and vine. But only Cyprus has a larger area of olive trees and vine. In Greece and Portugal the “cote” of annual cultures and that of permanent cultures is very close – about 20% of the total certified organic surface. On the other hand, in Denmark, Finland and Leetonia the annual plants are cultivated on 80% of the certified field. Ecological meadows and grass lands occupy large areas in the Union. For example, in the Czech Republic and in Slovenia they represent 90% of the ecological cultures. At the other end there are Cyprus and Finland, where “eco” meadows and grass lands are an insignificant category. We can mention Italy, which has an important organic surface in the EU, has only 23% “eco” meadows, while Great Britain has over 70%.

As regards the situation of the ecological agriculture in Romania, there is an ascending tendency of the areas occupied with cultures belonging to this category. We will present in Table 4 this tendency in comparison with the existing one in the countries belonging to the geographical area where Romania is situated. The reference period is the time segment 2003-2007.

Table 4

The evolution of ecologically cultivated agricultural areas in countries near Romania

		AREAS									
		2003	%)	2004	%	2005	%	2006	%	2007	%
Bulgaria	Ha	650	0,01	1.114	0,02	2.432	0,05	4.692	0,09	166.741	3,21
	%	100,0		171,4		374,2		721,8		25.652	
Hungary	Ha	113.116	4,62	133.009	3,6	128.574	3,01	122.765	2,88	121.300	2,76
	%	100,0		117,6		113,7		108,4		107,3	
Moldova	Ha	7.721	0,30	10.755	0,42	11.075	0,44	11.405	0,45	11.405	0,45
	%	100,0		139,2		143,4		147,7		147,7	
Poland	Ha	76.252	0,53	82.730	0,57	159.709	1,08	228.009	1,55	285.875	1,94
	%	100,0		108,6		209,5		299,2		374,9	
Romania	Ha	57.200	0,41	73.300	0,53	92.770	0,67	107.582	0,77	190.129	1,32
	%	100,0		128,1		162,2		188,0		332,4	
Serbia	Ha	430	0,01	542	0,01	591	0,01	906	0,02	906	0,02
	%	100,0		126,0		137,4		210,6		210,6	
Ukraine	Ha	164.449	0,46	240.000	0,58	241.980	0,59	260.034	0,630	280.000	0,68
	%	100,0		145,9		147,2		158,2		170,3	

*) % of the agricultural area

In 2003, the areas occupied with ecological cultures were of 57200 in Romania. With an average annual rhythm of growth, which every years was of

36,8%, Romania has reached in 2007 an area of 3,32 times larger than the basic year (57.200 ha).

In comparison with the limitrophe or near countries, the situation shows that the largest areas are in Poland (285.875 ha) and Ukraine (280.000 ha). From the point of view of areas, Bulgary (166.741 ha) and Hungary (121.300 ha) are close to one another.

From the point of view of the increase tendency, the most spectacular changes are in Bulgaria, which increased its surface with 250 times in the last five years. The other countries have registered important increases but not at the level of Bulgaria. Poland has increased its surface with 3,7 times, Serbia with 2,3 times and Ukraine with 1,7 times.

CONCLUSIONS

1. Ecological agriculture in Europe presents an ascending trend in the last years, being favoured by the increasing preferences of the consumers for the ecological products, as well as the recommendations and regulations of EC. In this domain, in Europe there were cultivated almost 8 million ha with ecological cultures in 2007.

2. Worldwide, the largest areas (39%) are in Australia and Oceania, followed by Europe (23%).

3. Romania situates on an ascendant trend having cultivated more than 200.000 ha with ecological cultures, with an annual average rhythm of increase of 36,8%.

REFERENCES

1. **Toncea I., 1999** - *Agricultura ecologică în contextul agriculturii durabile*, în volumul "Agricultura durabilă performantă". Editura Agris, București.
2. ^{xxx}, **2007** – *FIBL. Research Institute of organic Agriculture*.
3. ^{xxx}, **2007** – *Regulamentul CE 834/2007 privind producția biologică și etichetarea produselor biologice*.

STUDIES REGARDING THE DEVELOPMENT OF ECOLOGICAL AGRICULTURE IN ROMANIA

STUDII PRIVIND DEZVOLTAREA AGRICULTURII ECOLOGICE ÎN ROMÂNIA

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Abstract. *In Romania the consumers' interest for the ecological products appered later, fater 1990, when also increased the volume and diversity if food products in parallel with the appearance of some ideas regarding the negative effect of some chemical products and genetic modifications of the human organism. After 1997 there has been registered an accentuated dynamism regarding the ecological certification on areas growth and animal effectives which brought on the market some significant quantities of "bio" products. The statistical data shows that in the period 2001-2007, in the biological agriculture, the certified areas multiplied by 110 times, registering an area of almost 200 000 hectares, with an annual rhythm of growth of 41,3%. As regards the animal effective (cows, sheep), the increases were more reduced than in the case of milk cows, at present being registered about 6500 heads and more for sheep and goat whose effective reached 78 000 heads. As for the fowls, the effectives are insignificant. The biological certified products (169 000 tones) have a large variety. At the vegetal products, the weight is held by the cereals, oleaginous, proteic and medicinal plants and those which are harvested from the spontaneous flora, as for the animals, the honey and "cascaval".*

Key words: agriculture, ecology, rural development, "bio" products, certificate

Rezumat. *Interesul consumatorilor din România pentru produsele ecologice a apărut târziu, după 1990, când a crescut volumul și diversitatea produselor alimentare în paralel cu apariția unor idei privind efectul negativ al produselor chimice și a modificărilor genetice asupra organismului uman. După anul 1997 s-a înregistrat un dinamism accentuat privind creșterea suprafețelor și a efectivelor de animale cu certificare ecologică, fapt ce a dus la apariția pe piață a unor cantități semnificative de produse „bio”. Datele statistice ne arată faptul că în perioada 2001-2007, suprafețele certificate în agricultura biologică s-au multiplicat de peste 110 ori, înregistrându-se o suprafață de aproape 200 000 hectare cu un ritm anual de creștere de 41,3%. În ce privește efectivele de animale (vacii, oi mame), creșterile au fost mai reduse în cazul vacilor de lapte, în prezent fiind înregistrate circa 6500 capete și mai ridicate în cazul ovinelor și caprinelor a căror efective au atins 78 000 capete. În cazul păsărilor, efectivele sunt ne semnificative. Produsele cu certificare ecologică (169 000 tone) au o varietate mare. La produsele vegetale, ponderea o dețin cerealele, plantele oleaginoase, proteice, medicinale și cele care sunt colectate din flora spontană, iar la cele animale, mierea de albine și cașcavalul.*

Cuvinte cheie: agricultură, ecologie, dezvoltare rurală, produse "bio", certificate

INTRODUCTION

At present both worldwide and in Romania there is a large preoccupation for the future environment. Its quality largely influences the human health through the consummated products, through the breathed air and the environmental comfort.

The rational agriculture is one of the factors that generate the negative effects on the environment, having direct influences on the quality of the agricultural products.

Starting from Toffler's idea that "the land, we didn't inherited it from our parents, but we borrowed it from our children", we naturally ask what kind of agriculture we have to do in order to keep or even to improve the quality of the soil and of the environment for the future generations.

In Romania, the first preoccupations with scientific character regarding the vegetal ecology appeared in the period between the First and Second World Wars, through the conquests of the botanists Prodan and Borza. They gradually amplified gathering all the components that belong to this domain and extending on agriculture, especially when there were noticed some negative effects regarding irrational chemistry on agriculture. Papacostea P. proposed "agriculture projected as a harmony of biochemical and agro-economic laws, which have to base on the agro-biological farm, complexly organised, with closed or semi-closed biological circuits". More than 25 years ago, Gh. Lixandru showed that the term of "ecological agriculture" appeared as an answer to the pollution phenomenon which was favoured by the processes of mechanization and intensive chemistry on agriculture, by the possibility of contaminating the agricultural products with different substances, having a noxious effect on human organism.

The increased interest on the development of ecological agriculture imposes studies meant to stabilize the present stage of this sector for establishing an adequate policy of promotion and accomplishment of ecological products.

MATERIAL AND METHOD

In order to accomplish the study there were used bibliographical sources from the specialized literature, as well as official statistic documents. Some information was obtained through proper investigations from the local units.

Of the used methods, the most important were comparison, monograph, questionnaire using dynamic and structure indicators as well as index with fix base and in chains.

RESULTS AND DISCUSSIONS

Preoccupations regarding the accomplishment of the agricultural production in an ecological system in Romania appeared late, after 1990, when the consumers started to manifest an interest for this type of products.

In 1997 there appeared the first associations which promoted the ecological agriculture (Bioterra, Agroecologica), and after 2000 there was registered an accentuated dynamism that could be noticed in the increase of the agricultural

areas cultivated in an ecological system; diversification of the cultures ecologically certified; increase of vegetal productions ecologically certified; increase of the effective of some raised animals and ecologically certified; successful appearance and evolution of large ecological farms.

1997 can be considered the beginning of the ecological agriculture in Romania as there was registered a large certified area (332 ha) of cultures in the ecological system. In the following years that areas gradually increased: 778 ha – 1998, 944 ha – 1999, 11405 ha – 2000.

Table 1

The evolution of certified areas in the ecological agriculture in Romania

Specification	U.M.	Accomplished							
		2001	2002	2003	2004	2005	2006	2007	2008
Total area d.c.i.	Ha	17.438	28.800	43.850	57.200	73.800	110.130	143.194	190.129
	%	100,0	165,2	251,5	328,0	423,2	631,5	821,2	1090,3
Cereals	Ha	4.000	8.000	12.000	16.000	20.500	22.100	16.310	32.222
	%	100,0	200,0	300,0	400,0	512,5	552,5	407,7	805,5
Fodder cultures, meadows and grass lands	Ha	9.300	14.000	20.000	24.000	31.300	42.300	51.200	57.600
	%	100,0	150,5	215,0	258,1	336,6	458,8	550,5	619,4
Oleaginous and proteic plants	Ha	4.000	6.300	10.000	15.600	20.100	22.614	23.872	26.491
	%	100,0	157,5	250,0	390,0	502,5	565,3	596,8	662,2
Vegetables	Ha	38	100	700	200	300	440	720	310
	%	100,0	263,2	1.842,1	526,4	789,4	1.157,8	1.894,7	815,8
Fruits	Ha	-	-	50	100	200	432	292	650
	%	100,0	-	100,0	200,0	400,0	864,0	584,0	1300,0
Forest fruits	Ha	50	100	300	400	500	17.360	38.700	58.728
	%	100,0	200,0	600,0	800,0	1.000,0	34.720,0	77.400,0	117.456,0
Other cultures	Ha	50	300	800	900	900	4.884	12.100	14.128
	%	100,0	600,0	1.600,0	1.800,0	1.800,0	9.768,0	24.200,0	28.256,0

After 2000 these areas have had the same positive trend of growth. We present in the table 1 the evolution of the certified in the ecological agriculture in Romania.

In 2001, in Romania there were registered 17438 ha of certified ecological areas. Of these 8000 ha (45,8%) were occupied with field crops (cereals, oleaginous and proteic plants), 9300 ha (53,3 %) fodder culture and natural meadows, 100 ha (0,6 %) areas occupied with spontaneous flora, the differences being with vegetable crops.

After a period of seven years, in 2007, the area increased of almost 110 times, reaching 190.126 ha.

All fields with ecological cultures grew, the proportion being different. The field crops (cereals, oleaginous and proteic plants) have increased their surface with 7 times, and the vegetable cultures with 8,1 times. The largest

growths were registered on the ecologically certified fields on which there are planted forest fruits and medicinal plants which registered a growth from 100 ha in 2001 till 72856 ha.

On the whole, the increase of areas is spectacular as the calculus of the index with chain base shows an average annual rhythm of growth of 41,3%. As regards animal husbandry domain, there was progress, even if then growth rhythm was not so high as in vegetal production. Table 2 we present in the evolution of mother bees effectives at the main species with ecological certificate.

Table 2

Evolution of ecologically certified animal effectives in Romania

Specification	U.M.								
		2000	2001	2002	2003	2004	2005	2006	2007
Milk cows	Cap	2.100	5.300	6.500	7.200	7.200	8.100	9.900	6.265
	%	100,0	252,4	309,5	342,8	342,8	385,7	477,4	298,3
Sheep and goats	Cap	1.700	3.700	3.000	3.200	3.200	40.500	86.180	78.076
	%	100,0	217,6	176,5	188,0	188,0	2.382,4	5.069,4	4.592,0
Laying Hens	Cap	-	-	-	2.000	2.700	7.000	4.300	4.720
	%	-	-	-	100,0	135,0	350,0	215,0	236,0
Bee families	nr	400	820	3.800	5.000	-	-	-	-
	%	100,0	205,0	950,0	1.250,0	-	-	-	-

In 2000, there was an effective of cows with ecological certificate of 2100 heads. In the following years this effective increased, reaching in 2006 at 9900 heads, the growth being of 4, 7 times bigger. Further, in 2007 there was a back stroke, the effective dropping to 6265 heads.

As regards sheep and goats, the same growth process manifested itself in the number of heads; al first there was a reduced start, 1700 heads in 2000 and 3200 heads in 2004. In the following two years the increase was powerful, the effectives reaching 86180 heads in 2006. The registered drop of cows in 2007 also manifested at sheep and goats, the effectives going down with 8000 heads.

Starting with 2003 there were ecological registrations even for good layer hens, but the effective was reduced (2000 heads in 2003), and the increase was insignificant, in 2007 being only 4720 heads.

As regards the situation of bee families, there are some data, but they have an incomplete character. We mention the fact that in 2003 there were 5000 families of bees with ecological certificate, but some problems that appeared after the EU integration created dysfunctions in evidencing their real number.

As regards the volume of products with ecological certification, it has a heterogeneous character, determined by the insurance sources.

Table 3

Evolution of vegetal products in ecological agriculture – Romania

Specification	Accomplished					
	2000		2003		2007	
	tones	%	tones	%	tones	%
Total quantity d.c.	13.502	100,0	30.400	100,0	169.312	100,0
Cereals	7.200	53,3	14.400	47,3	65.127	38,5
Oleaginous and proteic plants	5.500	40,7	12.480	41,0	52.982	31,3
Vegetables	600	4,4	2.000	6,6	3.410	2,0
Fruits	-	-	300	1,0	1.255	0,7
Spontaneous Flora	200	1,5	320	1,1	35.236	20,8
Other cultures	2	0,1	900	3,0	11.302	6,6

The total registered volume in 2000 was of 13.502 tones. Of these the largest quantity weight are the cereals (53,3 %) and oleaginous plants (40,7 %), the difference being the vegetables, fruits and plants of the spontaneous flora. After 3 years the weight of cereals dropped, slightly growing the quantity of oleaginous and proteic plants and especially the medicinal plants and those of the spontaneous flora.

2007 presents a totally different situation from 2000. So, to all categories of products there was an important growth, for example at cereal cultures the growth was of over 9 times, as weight these products dropped, representing 38,5 % in comparison with 53,3% in the 2003. Even at oleaginous and proteic plants the cultures dropped, in favour of plants of the spontaneous flora which represent 20,8% of the total harvested quantity. We mention that if in 2000 there were certified only 200 tones of products of the spontaneous flora, in 2007 these ecologically certified products are over 35 000 tones.

As regards the ecological products of animal origin and their quantity, there have been a resembling evolution (table 4).

Table 4

Evolution of ecological animal productions – Romania

Specification	U.M.								
		2000	2001	2002	2003	2004	2005	2006	2007
Telemea oaie	tone	18	46	36	45	48	480	520	510
Schwaitzer	tone	23	23	100	110	116	268	576	580
Caşcaval	tone	-	121	250	220	253	330	642	640
Tinned vegetables and fruits	tone	-	-	-	-	35	50	42	40
Honey	tone	10	20	80	110	320	610	1.242	1.950

We noticed the existence of a threshold in 2005 from which the quantities 'of the zoo technical products have significantly increased. Thus, for "telemea de oaie" the growth was of 10 times, in case of "cascaval" the quantity almost doubled and the honey increased from 320 tones in 2004 to 1950 tones in 2007.

This positive evolution shows the increasing interest of the internal and external consumers for the ecologically certified products and impose an adequate policy for helping the agricultural managers from this domain.

CONCLUSIONS

1. In Romania, the interest for the ecological products has increased in the last two decades. The consumers' preferences orientate more and more to that products that are "clean" from the biological point of view.

2. The statistical data shows that in the period 2001-2007, in the biological agriculture, the certified areas multiplied by 110 times, registering an area of almost 200 000 hectares, with an annual rhythm of growth of 41,3%. As regards the animal effective (cows, sheep) and fowls the increases were more reduced than in the case of milk cows and more for sheep and goat whose effective dropped by 50 times in the last 8 years.

3. At the vegetal products, the weight is held by the cereals, oleaginous, proteic and medicinal plants and those which are harvested from the spontaneous flora, as for the animals, the honey and "cascaval".

REFERENCES

1. **Borza A. și col., 1965** – *Introducere în studiul covorului vegetal*. Editura Academiei, București.
2. **Davidescu D și col., 1994** – *Agricultura ecologică*. Editura Ceres, București.
3. **Lixandru Gh., 2006** – *Sisteme integrate de fertilizare în agricultură*. Editura Pim, Iași.
4. **Papacostea P., 1994** – *Ferma biodinamică*. Editura Enciclopedică, București.
5. **Prodan I., 1950** – *Flora pentru determinarea și descrierea plantelor ce cresc în România*, ed. a III-a. Buletin Academic, filiala Cluj.
6. **Vîntu V., 2000** – *Ecologie și protecția mediului*. Editura „Ion Ionescu de la Brad”, Iași.
7. **xxx** – *Anuarul statistic MAPDR*. București.

THE ANALYSIS OF THE TECHNICAL-ECONOMICAL RESULTS OBTAINED AT S.C.A. BUCIUM S.A. IASI

ANALIZA REZULTATELOR TEHNICO-ECONOMICE OBTINUTE LA S.C.A. BUCIUM S.A. IAȘI

BADII I.

S.C.A. Bucium S.A. Iasi, Romania

Abstract. *The present paper has as a purpose the determination of the technical-economical results obtained at S.C.A. BUCIUM S.A. IASI. From their analysis, it results that the average grape production was in 2004 of 9547 kg/ha and in 2005 of 1797 kg/ha. The maximum level of the capital registered at the researched level was of 23457870 lei.*

Key words: production of grapes, technical-economical results

Rezumat. *Lucrarea de față are ca scop determinarea rezultatelor tehnico-economice obținute în cadrul S.C.A. BUCIUM S.A. IAȘI. Din analiza acestora a rezultat că producția medie de struguri s-a cifrat în anul 2004 la 9547kg/ha iar în anul 2005 la 1797kg/ha. Nivelul maxim al capitalului înregistrat de unitatea cercetată a fost de 23457870 lei.*

Cuvinte cheie: producția de struguri, rezultate tehnico-economice

INTRODUCTION

The commercial company „Agroindustrială Bucium” S.A. Iasi was formed after the reorganization of the former State Agricultural Enterprise IAS Bucium, agricultural unit formed in 1949.

The quantity of wine products offered for sale comes from the vine cultivated surfaces at the Bucium, Pietrarie, Doi Peri, Ciurea, Visani farms.

The vine cultivated surfaces dropped due to the retrocession of terrains to the old owners, but the quantity of wine products grew because of the production policy adopted by the firm.

MATERIAL AND METHOD

For the analysis of the factors that influence positive or negative the total offer of wine products, we had in mind the following indicators:

- The dynamic of the vine cultivated surface;
- The dynamic of the average grape production per surface unit;
- The total production in physical units;
- The turnover evolution;
- The evolution and structure of the capital;
- Workforce utilized;

RESULTS AND DISCUSSIONS

The evolution of the total production of grapes at S.C. Agroindustrială Bucium S.A. presents a high variability index generated mainly by the modifications of the cultivated surfaces and also by the level of the average production realized per surface unit.

Table 1

The evolution of grape production and its main influence factors in the 2004-2007 period S.C.A. Bucium S.A. Iasi

Specification	U.M.	YEARS			
		2004	2005	2006	2007
Average production	Kg/ha	9547	1797	8099	3951
	%	100	19	85	41
Total grape production	Tones	4754	879	3750	1517
	%	100	19	79	32
The wine processing rate	%	65	64	65	64
	%	100	98	100	98
Total wine offer	hl	24191	10336	23483	15667
	%	100	43	97	65
Total sparkling wine offer	hl	150	177	185	180
	%	100	118	123	120
Total brisk wine production	hl	2	2	2	2
	%	100	109	113	112

The biggest grape production has been obtained in 2004 with 9547 kg/ha, followed by 2006 with 8099 kg/ha. (tab.1) In the other two years in which research have been made, the productions have been much smaller, 8099 kg/ha in 2006 and 3951 kg/ha in 2007. From here results a total multiannual amplitude of 7750 kg/ha and average amplitude of 1937, 5 kg/ha.

Table 2.

The domestic sales volume and external market sales of wine products in the 2004-2007 at S.C.A. Bucium S.A. Iasi

Specification	U.M.	YEARS				% /Total
		2004	2005	2006	2007	
Turnover resulted from the sale of wine products, from which:	lei	17306629	16126563	24372794	21197742	100,0
- turnover resulted from the domestic sales of wine products	lei	15749032	14675172	22179242	19289945	91,0
- turnover resulted from the sales of wine products on the external market	lei	1557597	1451391	2193552	1907797	9,0

SOURCE: Internal documents SCA BUCIUM SA

In 2007, in the food industry, at a national level, the turnover was of 860,4 mil. lei, as S.C.A. Bucium S.A. Iasi registered, in the same year, from domestic sales of wine products a turnover of 19,3 mil. lei. In these conditions, the market share of the firm in 2007 was of 2,24% in the food industry market of Romania (tab.2). From the analysis of the turnover results that 91, 0% is realized from the domestic sales and 9, 0% from sales to external partners. The share of exports in the total turnover in the 2004-2007 period was constant.

Instead, from the quantitative evolution we can observe that the export evolution in the analyzed period is growing continuously, what pictures that the products obtained at SCA BUCIUM SA are looked up and sold with success abroad, in countries like: Germany, USA, Japan etc. (tab.4)

Table 3.

The evolution of the wine delivery price obtained at S.C.A. Bucium S.A. in the 2004-2007 period

Wine assortments	Years											
	2004			2005			2006			2007		
	Bottled wine	Bulk variety wine	Bulk superior wine	Bottled wine	Bulk variety wine	Bulk superior wine	Bottled wine	Bulk variety wine	Bulk superior wine	Bottled wine	Bulk variety wine	Bulk superior wine
Muscat Ottonel	5,26	2,52	-	5,85	3,02	-	6,34	3,34	-	7,11	3,65	-
Fetească albă	5,02	2,35	-	5,43	2,96	-	5,98	3,29	-	6,8	3,79	-
Aligote	4,43	2,01	-	4,91	2,54	-	5,28	2,85	-	5,94	3,45	-
Sauvignon blanc	4,43	-	-	4,84	-	-	5,25	-	-	5,78	-	-
Colinele Iaşului	-	-	1,42	-	-	2,47	-	-	3,05	-	-	3,45

SOURCE: Internal documents SCA BUCIUM SA

The price represents the evaluation of a good at a given time and is the only economic variable that produces income. All other variables don't generate nothing than expenses or investments. This way, the price is pretty important for production, given the factor that generates the increase of the economic efficiency and its profitability.(1)

The prices of agricultural products, in the systems specific to the market economy, are formed on the basis of the legality of this type of economy, respectively the law of demand and offer and the law of competition. (tab.3)

The prices at which the firms wine products have been commercialized registered increases in the 2004-2007 period, increases due, mostly, to their

liberalization, the inflation and, in some measure, to an increase in production costs.

Table 4

The wine export realized by S.C.A. Bucium S.A. in the 2004-2007 period

Nr.crt.	Countries	Exported quantity in the years: (thousand hl)			
		2004	2005	2006	2007
1.	Germany	1,75	1,83	2,18	2,43
2.	Japan	0,94	0,97	1,02	1,21
3.	USA	-	-	0,44	0,48
4.	Other countries	0,22	0,32	-	-
5.	Total export	2,91	3,12	3,64	4,12

Due to the political and juridical conjuncture, the economic unit registered important decreases in terrain fund due to the retrocedation to the population. In 2005, it has been lost approximately 2% of the surface (9ha) followed by another 5% (35ha) and in 2007 the surface is being reduced at approximately 77%, resulting a total loss of 23% (114 ha). This phenomenon determined important changes in the units` evolution. (fig.1)

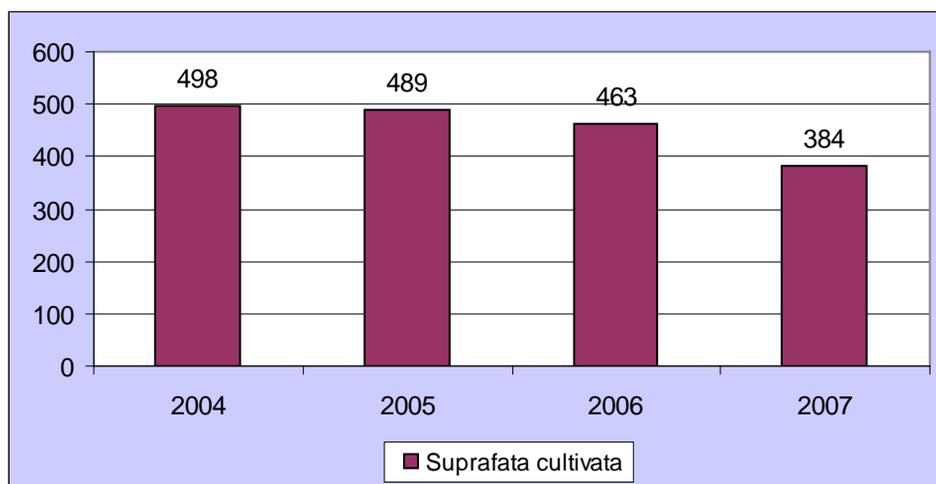


Fig.1. The evolution of the cultivated surface at S.C. AGROINDUSTRIALA BUCIUM S.A. IASI (ha)

The maximum level of the capital registered at the researched unit is of 2347870 lei of which the immobilized capital is 5576840 lei and the circulated capital of 17881030 lei.

Its variation is of 16415534 lei determined by a variation of 2607786 lei and, respectively, 13807748 lei, depending on the socio-economical situation of which the economic unit has benefited. (fig.2)

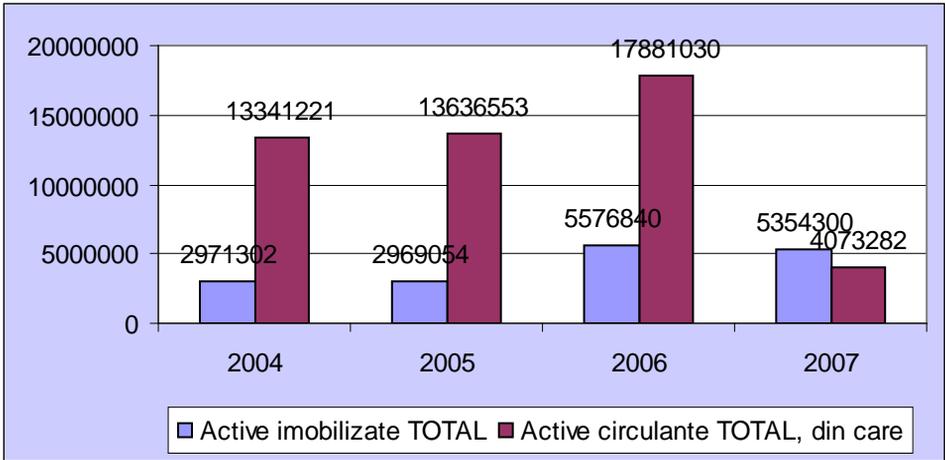


Fig. 2. The evolution of capital at S.C. AGROINDUSTRIALA BUCIUM S.A. IASI (lei)

From the analysis of the number of employees in the researched unit, an important variation is shown from one year to another, the maximum variation being of 134 persons and the multiannual average becoming of approximately 307 persons (fig.3). This variation is due to the activity volume variability due to grape productions, cultivated surfaces and the increase in the capitalization level.

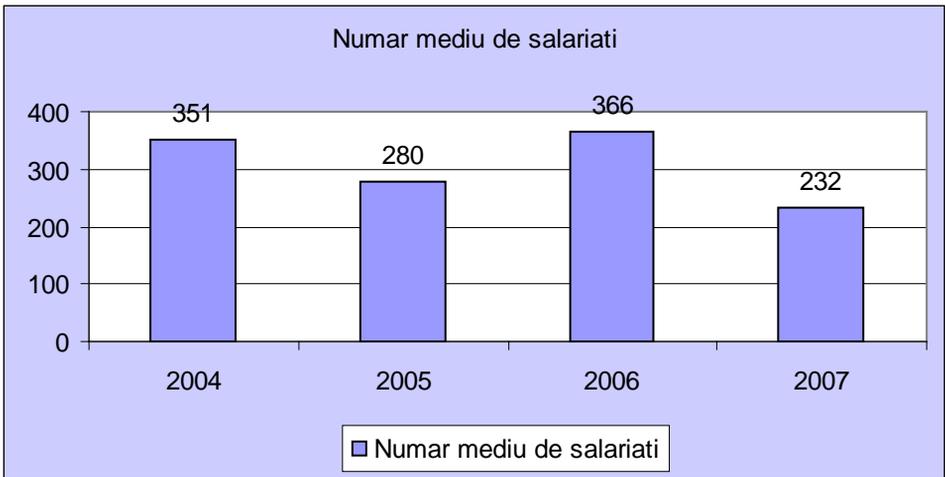


Fig.3. The evolution of number of employees at S.C. AGROINDUSTRIALA BUCIUM S.A. IASI

CONCLUSIONS

From the analysis of the evolution of the number of employees of the researched unit, results an important variation from one year to another, the maximum variation being of 134 persons and the multiannual variation of approximately 307 persons. This variation is due to the variability of the volume

of activity owed to the grape productions, cultivated surfaces and the increase of the capitalization level.

The researched economic unit registered total terrain fund decreases of 23% (114 ha).

The average grape production was in 2004 of 9547 kg/ha and in 2005 of 1797 kg/ha recording a total multiannual amplitude of 7750 kg/ha.

The prices at which wine products have been commercialized registered increases due to their liberalization, inflation and to the increase in production costs.

The maximum level of the capital registered by the researched unit was of 23457870 lei from which the immobilized capital 5576840 lei and the circulated capital of 17881030 lei.

The number of employees registered a maximum variation of 134 persons and a multiannual average of approximately 307 persons.

REFERENCES

1. **Cojocaru C., 1994** - *Models of economic and financial analysis on farms*. ASE București.
2. **Gavrilescu D., 1994** - *The State of Agrarian Reform. Paper presented at the COST WORKSHOP „The impact of CEE Agricultural Reform on Domestic and international Markets“*, Licos, Louvain, Belgia.

THE MATERIALITY AND SURVEY IN THE FINANCIAL AUDIT

PRAGUL DE SEMNIFICAȚIE ȘI PROCESUL DE EȘANTIONARE ÎN AUDITUL FINANCIAR

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Abstract. *We know that the product of accounting is the information provided to all those interested, and its quality certification is the responsibility of financial auditors. Planning the financial audit requires taking into consideration of a threshold of significance, because there is an inversely proportional relationship between the materiality and extent of the audit process. In other words, the cost of the audit varies inversely with the level of materiality. In addition, to increase the efficiency the financial audit, one of the techniques used in collecting samples is the survey technique. By using the techniques of sampling, an auditor reduces the time needed to conduct an audit and the audit costs. In this article, we prove that determining the correct materiality and sampling in the audit have an important role in reducing the costs of the audit in its entirety.*

Key words: financial audit, materiality, survey technique, audit cost.

Rezumat. *Știm că produsul contabilității este reprezentat de informația contabilă furnizată tuturor celor interesați, iar atestarea calității acesteia cade în sarcina auditorilor financiari. Planificarea auditului financiar impune, printre altele, luarea în considerare a unui prag de semnificație, deoarece există o relație invers proporțională între nivelul pragului de semnificație și amploarea activităților procesului de audit. Altfel spus, costul auditului variază invers proporțional cu nivelul pragului de semnificație. În plus, pentru eficientizarea auditului financiar, una din tehnicile utilizate în colectarea probelor are în vedere tehnica sondajului. Prin utilizarea tehnicilor de eșantionare, un auditor reduce atât timpul necesar desfășurării unei misiuni de audit, cât și costul auditului. În acest articol, dorim să demonstrăm că stabilirea corectă a pragului de semnificație și eșantionarea în audit au un rol important în reducerea costurilor procesului de audit, în ansamblul său.*

Cuvinte cheie: audit financiar, prag de semnificație, tehnica sondajului, costul auditului.

INTRODUCTION

The activities performed by the financial auditor aim at limiting *the risk of issuing an erroneous opinion on the accounts subject to certification, within the limit of the significance threshold*. It is known that the information supplied by a company substantiates the decisions made by a multitude of users.

The beneficiaries of the information provided by the accounting office sometimes display *a lack of confidence* in relation to the fair image of the financial position, of the outcomes and modifications of the financial position of the company.

*The guarantee of providing accurate and quality information should be ensured by the **financial auditor** via the opinion issued in relation to the validity and accuracy of the annual financial statements.* But, in order to form an opinion about the balance sheet, the auditor makes use of procedures that enable him to obtain *a reasonable degree of certainty* regarding the fact that the financial statements are accurately elaborated.

Inevitably, it is possible for inexactitudes (calculation, registration errors, imprecise numbers) or even significant irregularities (actions or omissions that violate statutory laws and provisions) not to be discovered. In fact, financial audit is planned depending on *risk factors* and their *relative significance*.

MATERIAL AND METHOD

In order to prove that the accurate determination of the significance threshold and audit sampling play an important role in the reduction of the costs of auditing, we have commenced our research with the analysis of the international auditing standards which regulate these aspects.

Moreover, we have studied the minimal auditing norms issued at a national level, and which represent a simplified modality of approaching the significance threshold and audit sampling.

The research method was interdisciplinary, as long as we resorted to the technique of the statistical poll used for the sampling process.

We further present the obtained results and conclusions in relation to this topic.

RESULTS AND DISCUSSIONS

As an accounting principle that must be observed for the assessment of the columns comprised in the financial statements of a company, *the significance threshold* is defined in the general Framework for the elaboration and presentation of financial statements as follows: *“all elements that have a significant value must be presented distinctly in the financial statements. Elements with unimportant values, of the same nature or with similar functions, must be summed up, their separate presentation being unnecessary”*. IAS 10 *“Subsequent events to the fiscal closing date”* makes comments on the review of the values of some estimates (for those elements whose value is unsure and which are not included in the financial statements) in order to reflect the subsequent events to the closing date of the fiscal year, circumstances changes, but *only if these values are significant*. Surely, this aspect is valid before the approval of the financial statements. For example, a customer's bankruptcy after the fiscal closing date is a significant event.

From another perspective, *the significance threshold* is considered in the context of the qualitative features of the information provided by the financial statements, respectively: *intelligibility, relevance, credibility* and *comparability*. The significance threshold rather provides a *limit* than representing a qualitative feature that the information should have in order to be useful. This statement is

justified by the following comment: “*the information is significant if their omission or erroneous presentation could influence the economic decisions of the users, made based on the financial statements; and the significance threshold depends on the size of the respective element or error*”. According to point 21 of the financial audit and certification norms of balance sheet no. 1/1995, “*a significance threshold represents the level, the size of an amount beyond which the auditor considers that an error, inexactitude or omission may affect the regularity and honesty of the annual accounts*”.

Thus, the significance threshold expresses *the relative significance or importance of a problem in the context of the financial statements*. What matters is the **knowledge of the significance threshold**, respectively of the level beyond which it is appreciated that *the omission or the erroneous declaration* of some items of information could influence the users’ economic decisions, made based on the financial statements. The main problem in relation to the significance threshold refers to *the determination of its size*. International auditing standards constantly refer to the importance of professional reasoning in this aspect. A simple and mathematical method for determining the significance threshold is presented in the minimal auditing norms, recommending that it be established by applying a percentage between 0.5% and 15% to various reference bases, such as: *turnover, net profit, total assets or equity*. The 0.5% - 10% interval constitutes *the zone of uncertainty*. Nevertheless, we must state that this is an indicator and not an absolute rule, especially when the equity or the profit of a company is insignificant (registers low values).

There is a reverse relation between *the significance threshold* and the level of the *audit risk*, that is, the higher the level of the significance threshold, the lower the audit risk, and conversely. Usually, a global significance threshold is established, but one can also establish thresholds for each section of the annual audited accounts, which are no longer called tolerable errors. After determining the significance threshold, the auditor must determine the size of the sample from which will be extracted the elements that are to be tested.

This happens because the auditor cannot exhaustively verify transactions and must study the conclusive elements on a representative sample, by using the **technique of the poll**. Seen as an auditing technique, **the poll** is defined, in the auditing norms, as *a procedure consisting of the selection of a certain number of elements from the ensemble of operations and accounts that form the set to be checked, the application of the techniques for obtaining conclusive elements to these elements and the expansion of the results obtained for the sample for the ensemble of the studied set*.

The use of the poll is justified by the fact that, in case all the operations were part of the verification, the auditing costs would be too great in comparison with the utility of the obtained information following the inspection of some insignificant operations.

Depending on *feature and objective*, we can distinguish between:

- *polls regarding prerogatives*, used when the elements that constitute the set have a common feature;
- *polls regarding the value*, when the analyzed feature represents the value of the heritage elements and of the operations registered in the flow and balance of the accounts.

Polls can also be classified according to the *auditor's professional training* and to the *degree of credibility* he wishes to confer upon his conclusions. Thus, we will have:

- *statistical polls*;
- *non-statistical polls*.

The latter are based on the auditor's experience and intuition, and do not provide a rigorous extrapolation of the results obtained on a set to the entire mass.

Regardless of the type of poll, several **stages** must be observed in order to guarantee the requested strictness.

The precise definition of the objectives implies the idea that the auditor must clearly establish *what it is that he wants to prove*, that is he must define the features of the elements considered errors or anomalies. For example, by comparing the delivery notes and the invoice, the auditor may find deliveries on the point of being invoiced or deliveries that have not been invoiced. At the same time the auditor must establish the *maximal error margin* accepted for internal checks to operate.

Stating the nature of the elements and the time limit of the poll implies, for example, for the verification of the purchases, the analysis of the reception notes that are numbered in the company and not of the bills from the supplier, whose order number are discontinuous.

We mention that the *key elements* in a set are those elements that, either due to their nature (misnamed or unnamed accounts), or to their value (exceeding of the fixed significance threshold) have risks and, consequently, the auditor may decide to fully check them.

After defining the objectives of the poll and choosing the elements that constitute the basis of the poll, the auditor will proceed to the ***de facto execution of the poll***. There are six stages of the poll execution: ***selection of the techniques, determination of the sample size, selection of the sample, study of the sample, evaluation of the results, conclusions of the poll***.

1. *The selection of the techniques* is influenced by the nature of the control to be performed (polls regarding prerogatives or polls regarding values) and by resorting or not to statistical techniques and depends on the size of the respective

set, on its capacity of fulfilling the objectives of the poll, on the cost/efficiency ratio of the chosen technique.

2. *The determination of the sample size* will be made depending on several different factors, such as whether the polls focus on prerogatives or on values.

3. *The selection of the sample* implies the fact that this sample must be representative. The selection can be random or systematic, the first element being selected at random or in an empirical manner.

4. *The study of the sample* implies the fact that all the selected elements must be controlled. If this cannot be achieved, then the auditor can resort to alternative control procedures that enable him to express a motivated conclusion regarding the controlled elements.

5. *The evaluation of the results* consists in the examination and appreciation of each anomaly in order to discover whether it is or not representative for the selected set. Exceptional anomalies are analyzed separately.

6. *The conclusions of the poll* comprise the conclusions related to: the key objects that were the object of the control; the registered exceptional anomalies; the rest of the set.

In case the noticed anomalies exceed the fixed threshold, the auditor can draw the conclusion that the internal control procedures do not function in a satisfactory manner and re-discuss its appreciation.

CONCLUSIONS

To conclude, we may say that the method for the determination of the significance threshold is *subjective* and that the auditor's experience, professional training and reasoning are extremely important.

For the determination of the significance threshold one will take into account the necessities of the users of the financial statements, the characteristics of the company (gross margin, in trade; in other fields of activity, the net profit can be taken as a reference point) the characteristics of the elements that are considered to be significant (an error is more important if it occurs in a column of the balance sheet where precision is essential, than an error referring to a column determined via appreciation; for example, an error in the column with the provisions is not as important as an error in a column referring to financial means).

Moreover, in order to make the financial audit efficient, as I have mentioned from the very beginning, one of the techniques used for gathering evidence is the technique of the poll. By using sampling techniques, an auditor reduces the time spent on an auditing mission, as well as the cost of the audit.

REFERENCES

1. **Arens A. A., Loebbecke J. K., 2003** - *Audit – o abordare integrată*. Editura Arc, Chişinău.
2. **Bătrâncea I., ş.a., 2007** - *Controlul şi auditul financiar al entităţii economice*. Editura Risoprint, Cluj-Napoca.
3. **Brezeanu P., ş.a., 2008** - *Audit financiar: repere metodologice, etice şi istorice: reglementări internaţionale (ISA): extrase*. Editura Cavallioti, Bucureşti.
4. **Dănescu T., 2007** - *Proceduri şi tehnici de audit financiar*. Editura Irecson, Bucureşti.
5. **Dănescu T., 2007** - *Audit financiar. Convergenţe între teorie şi practică*. Editura Irecson, Bucureşti.
6. **Florea I. ş.a., 2008** - *Introducere în expertiza contabilă şi auditul financiar*. CECCAR, Bucureşti.
7. **Tătaru V., 2007** - *Auditul financiar*. Editura Cavallioti, Bucureşti.
8. **Toma M., 2005** - *Iniţiere în auditul situaţiilor financiare ale unei entităţi*. Editura CECCAR, Bucureşti.
9. *** **CAFR, 2001** - *Norme minimale de audit*. Editura Economică, Bucureşti.
10. *** **Federaţia Internaţională a Contabililor, 2007** - *Manualul pentru Standarde Internaţionale de Audit, Certificare şi Etică*. Editura CECCAR, Bucureşti, (traducere).

ACCOUNTING TREATMENT FOR RECOGNITION AND ESTIMATION OF RISKS IN CRISIS SITUATIONS

TRATAMENTE CONTABILE PRIVIND ESTIMAREA ȘI RECUNOAȘTEREA RISCURILOR ÎN SITUAȚII DE CRIZĂ

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Abstract. *It is known that the wealth of the owners of an enterprise is represented by its equity. This is defined in the IASB Framework for the Preparation and Presentation of Financial Statements as the residual interest of shareholders in the assets after deducting liabilities. Therefore, in determining net assets of shareholders, as owners of a business, must be taken into account all debts, including those uncertain or insecure. In other words, from too much caution, its assets must be presented at the lowest possible value to be realized. In the category of debt, are distinguished by their particularities, provisions for risks and expenses. In addition, there may be liabilities and assets that do not meet all the conditions to be recognized in the balance sheet, but which may affect the financial position of the company in the future. This information should be presented in the notes to financial statements. In this article, we try to demonstrate the importance of estimating and recognition provisions to protect shareholders' wealth.*

Key words: equity, provisions, assets, liabilities, financial position.

Rezumat. *Se știe că averea proprietarilor unei întreprinderi este reprezentată de capitalul propriu al acesteia. Acesta este definit în Cadrul General ca fiind interesul rezidual al acționarilor în activele întreprinderii după deducerea datoriilor. Așadar, pentru determinarea averii nete a acționarilor, ca proprietari ai unei întreprinderi, trebuie luate în calcul toate datoriile acesteia, inclusiv cele incerte sau nesigure. Altfel spus, din prea multă prudență, averea entității trebuie prezentată la cea mai mică valoare posibil a fi realizată. Din categoria datoriilor, se disting, prin particularitățile lor, provizioanele pentru riscuri și cheltuieli. În plus, pot exista datorii și active care nu îndeplinesc toate condițiile pentru a fi recunoscute în bilanț, dar pentru că pot influența poziția financiară a firmei în viitor, este necesar să fie prezentate informații relative la acestea în notele la situațiile financiare. Încercăm, în acest articol, să demonstrăm importanța estimării și recunoașterii provizioanelor în scopul protejării averii acționarilor.*

Cuvinte cheie: capital propriu, provizioane, active, datorii., poziție financiară.

INTRODUCTION

The topic of provisions, contingent liabilities and contingent assets is the subject of the International Standards of Financial Reporting, respectively of IAS 37, with the same title. The objective of IAS 37 „Provisions, Contingent Liabilities and Contingent Assets” is to prescribe on the one hand the accounting treatment regarding the evaluation base and the adequate recognition criteria

affluent to provisions, contingent liabilities and contingent assets and on the other hand, the requirements of financial status representation (by notes included) of these structures, so that the users may understand their nature, opportunity and value. To be more practical, this standard is a guide to draft financial statements and for trade operators to decide upon the moment when, for a certain obligation: *they will make provisions, will submit only information in the notes to the financial reports or will not make any reference to this.*

Considering the introduction to the matter, after the presentation of the material and of the used method, we will tackle the problem of the provisions for detailed risks and expenses, in order to understand their necessity especially in this time of crisis, characterized briefly by the term “financial crisis”.

MATERIAL AND METHOD

In this paper, we started from the study of the national accounting regulations, of the international regulations of financial reporting and of the specialized literature centered on the subject of provisions, contingent assets and debts. The study method assumed first of all the comparison of the national provisions and of the international ones with regard to the regulation of the risk and expense provisions. Furthermore, we analyzed the way in which national companies recognize these provisions in their balance sheets, in order to protect them in subsequent periods in which the estimated risks occur. The financial statements of a BVB-quoted company (Bursa de Valori București – Stock Market of Bucharest) laid at the basis of this documentation. The achieved results and the conclusions regarding this subject are presented hereinafter.

RESULTS AND DISCUSSIONS

In IAS 37 „Provisions, Contingent Liabilities and Contingent Assets” we can find a series of concepts that are worth explaining, to better understand the applied accounting treatments.

Table 1

Definition of the key concepts of IAS 37

Concept	Definition and explanation
Provision	<i>It is an unsure due debt. The debts of this kind are distinguished from other debts because there is an uncertainty on the moment and/or the value of the future expenses necessary to extinguish them.</i>
Debt	<i>It is a current obligation of the entity that results from past events and the extinguishment of which is expected to generate an output of resources that incorporate entity-related afferent economic benefits.</i>
Committed event	<i>It is an event that generates either a legal obligation, or an implicit obligation, that should be honored.</i>
Legal obligation	<i>It is the obligation that results from a contract, from legislation or from another effect of the law (court orders).</i>
Implicit obligation	<i>It is the obligation that results from the actions of an entity in</i>

	<i>the case in which by determining a previous practice, by the written policy of the company or by a specific statement, the entity indicated the partners that it assumes and will honor certain responsibilities.</i>
<i>Contingent debt</i>	<i>It is a potential/possible debt that occurs further to past events and the existence of which will be confirmed only by the occurrence or the failure to occur of one or several unsure events, that may not be totally under the control of the entity of a current obligation, that occurred further to past events but that is not recognized because: it is not sure if other resources will be necessary that would include the economic benefits necessary to extinguish this obligation or the value of the obligation may not be evaluated with sufficient accuracy (for instance: granted warranties).</i>
<i>Contingent asset</i>	<i>It is a possible asset that appears further to previous events and the existence of which will be confirmed only by the occurrence or the non-occurrence of one or several unsure future events that may not be totally under the enterprise's control (for instance: a notice of paying damages to an entity that has an unsure result).</i>
<i>Onerous (deficient) contract</i>	<i>It is the contract in which the unavoidable costs involved by the fulfillment of contractual obligations exceed the economic benefits expected from such contract.</i>
<i>Restructuration</i>	<i>It is a program planned and monitored by the management that significantly changes either the sphere of the activity performed by the entity or the way in which the activity is run.</i>

In a large sense, all provisions are contingent as they are uncertain from the viewpoint of their payability or value. Nevertheless, we have to say that in this standard, the term “contingent” is used for the debts and assets that are not recorded in the balance sheet, as not all recognition criteria are met. Therefore, *a provision will be recognized only when the following criteria are cumulatively met: an entity has a current obligation (legal or implicit) generated by a previous event; it is likely that an output of resources that incorporate economic benefits should be necessary to cover for that obligation; a reliable estimation of the value of such obligation may be made.*

If one of these obligations is not met, then *the provision (debt) will not be recognized.* It is considered that a past event generates *a current obligation* if a likelihood of such obligation to exist upon the balance sheet day of over 50% is determined. As we can see from the definition of the *contingent debt*, it will not be recognized (represented in the balance sheet), because its existence will be confirmed by unsure and uncontrollable future events or because it does not meet the recognition criteria. Moreover, information on contingent debts will not be presented when the likelihood of economic benefit output is low.

For instance, the enterprise A guarantees a credit contracted by the enterprise B during the N exercise. The financial status of the enterprise B is considered good, considering the last years. In the financial exercise N+1, the

financial status of the entity B is getting deteriorated, and from 30 October N+1, it cannot reimburse the outstanding installments.

Which is the situation presented by enterprise A?

To 31.12.N:

- There is a current obligation generated by a previous event: *the guarantee that generates a legal obligation*;
- It is not probable any resource output, because *the financial status of the enterprise B is good*;
- The provision is not recognized, *the guarantee being presented as a contingent debt* (in the notes to the financial statements).

To 31.12.N+1:

- There is a current obligation generated by a previous event: *the guarantee that generates a legal obligation*;
- It is likely that resource outputs will be necessary to extinguish the obligation: *the status of the debtor company worsened*;
- The provision will be recognized *for the best estimation of the obligation*.

The value recognized as a provision must be the best estimation of the expenses necessary to extinguish the current obligation upon the date of the balance sheet. The estimation of the costs takes into consideration the experience of similar transactions and, in some cases, reports drafted by independent experts. Moreover, the calculated elements include *any evidence supplied by events that occurred prior to the date of the balance sheet*, but before they were signed and submitted.

For instance, a company that produces home appliances grants customers 2-year guarantees upon the date of sale, according to the stipulated contracts. From previous operations, there results that 60% of the assets sold did not require repairs, 30% required minor repairs and 10% required major repairs. The company estimates that, if all the products sold would require minor repairs, expenses would be 50 000 lei and if all the sold products would require major repairs, expenses would be 100 000 lei. *Are the recognition criteria of a provision met and if yes, what is its value?*

Solution:

1. There is a *current obligation* assumed by the contracts concluded with the clients (a legal obligation).

2. An *output of resources* is probable, incorporating economic benefits to perform the repairs or to replace the sold assets.

3. *The value of the provision* is determined by weighting all the possible estimations with the associated risks, as follows: $60\% \cdot 0 + 30\% \cdot 50\,000 + 10\% \cdot 100\,000 = 15\,000 + 10\,000 = 25\,000$ lei and is recorded as expense: 6812 = 1512.

The obligation for which a provision is made up may be *legal* (see the previous example) or *implicit*, in the sense that by the policy of the company, this assumes certain responsibilities and induces to clients the expectancy of meeting

all obligations (for instance, the policy of reimbursing the discontented customers with the value of the returned products).

We know that financial statements present the financial position of an entity at the end of the reporting period and *not the financial position of an entity in the future*. Therefore, provisions afferent to the costs incurred by future company operations shall not be admitted. In other words, in the balance sheet of an entity, *the only obligations admitted are those existing at the date of the balance sheet (current, not future)*.

From the definition of the contingent debt, there results that this may be a current obligation, but it does not meet the condition of provision recognition (for instance: its value may not be reliably estimated). Moreover, contingent debts are continuously analyzed in order to determine either whether it became a resource outcome, or whether the evaluation may be made accurately.

When the financial statements are drafted, a company may ascertain that it also has *contingent assets*, not only contingent debts. An example may be the litigations in which a company is involved and in which the gaining chances are high. They are not recognized in the balance sheet, but reference is made in the explanatory notes. *Why are not contingent assets recognized in the balance sheet?* Their recognition in the financial statements would lead to the recognition of an income that may never be made. In this case, conditions are even more restrictive than in the case of debts, because we have to consider the principle of caution. In other words, a contingent asset shall always be presented in notes and only it becomes a fact it will be presented in the balance sheet and in the profit and loss account.

We have to say that neither in the case of debts, the uncertainty issues do not justify registering excessive provisions, only to diminish profit and implicitly taxes (when they are deductible, from a fiscal point of view).

There are situations when a part or all the expenses necessary for the liquidation of a provision *should be reimbursed on the other hand* (for instance, by means of insurances or guarantees provided by suppliers). Such a reimbursement is recognized when it is sure it will be received, if the entity meets its obligation. Moreover, the value of the reimbursement should not exceed the value of the provision. In accounting, the reimbursement is treated *as a separate asset*, and in the profit and loss account the expenses afferent to the provision *may be presented without the amount recognized as reimbursement*.

At every date of the balance sheet, the provisions are revised and adjusted, so as to reflect the best current estimation. In case in which for extinguishing a current obligation it is not probable to have a resource outcome that comprises economic advantages, the constituted provision should be cancelled. In case in which updating is used, the accounting value of a provision increases in every period to reflect the time elapsing and the growth is recognized as *financing cost*.

A set provision cannot be used but for the purpose for which it was initially made. Covering expenses in a provision recognized initially for another purpose hides the impact of two different events.

CONCLUSIONS

As for the *presentation of the information regarding the provisions in financial statements*, IAS 37 requests that a company should present for every provision class the following: the accounting value at the beginning and at the end of the period; provision supplementation during the period and their consumption or cancellation; the increase of the net present value during the period and changes owed to the evolution of the net present value rate.

From the presentation of the financial information supplied by the Romanian companies by the consulted financial reports, we saw that very few entities that operate in our country estimated and constituted such provisions. The most often met provisions were the guarantees granted to customers for assets sold for which guarantee contracts were concluded. This is and will be a fact as long as companies are run by financial reasons. In other words, many Romanian companies do not constitute such provisions, as they are not deductible and the interest to recognize them is not high. We think that things will change when the companies having losses will be taxed as well (if this project will actually be implemented).

REFERENCES

1. **Epstein B., Jermakowicz E., 2007** - *IFRS 2007: interpretarea și aplicarea Standardelor Internaționale de Contabilitate și Raportare Financiară*. BMT Publishing House, (traducere)
2. **Feleagă L., Feleagă N., 2007** - *Contabilitate financiară. O abordare europeană și internațională*. vol. I, ediția a II-a, Editura Economică, București
3. **Feleagă N., Malciu L., 2005** - *Reformă după reformă: Contabilitatea din România în fața unei noi provocări. Eseuri și analiza standardelor IAS-IFRS*. volumul I, Editura Economică, București
4. **Gîrbină M. M., Bunea Ș., 2007** - *Sinteze, studii de caz și teste grilă privind aplicarea IAS (revizuite) – IFRS*. volumele I și II, ediția a III-a, Editura CECCAR, București
5. **Greuning H. V., 2005** - *Standardele internaționale de raportare financiară: ghid practic*, (traducere). Editura Irecson, București
6. **Horngrén C. T., Harrison Jr. W. T., 2007** – *Accounting*. Pearson, Prentice Hall
7. **Nobes C. W., 2004** - *Developments in the International Harmonization of Accounting*. Published by Edward Elgar Publishing Limited, UK
8. **Rodgers P., 2007** - *International Accounting Standards from UK Standards to IAS – an accelerated route to understanding the Key principles*. CIMA Publishing
9. *** **CECCAR, 2008** - *Întrebări și studii de caz pentru obținerea calității de expert contabil și de contabil autorizat (cadru general)*. Editura CECCAR, București
10. *** **DFCG Collection, 2005** - *Normes IAS/IFRS. Que faut il faire? Comment s'y prendre?* Editions d'Organisation, deuxième édition, Paris

THE QUALITY OF LIFE IN THE RURAL ENVIRONMENT OF THE MOUNTAIN AREA IN ROMANIA

CALITATEA VIEȚII ÎN SPAȚIUL RURAL AL ZONEI MONTANE DIN ROMANIA

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***Abstract.** This section has as primary objective determining the coordinates of the standard of living in the Mountain Area of Romania. Achieving this goal involved the identification of the available information off/from specialty literature and the public documents developed by the national authorities empowered in this issue. The methodology used consisted in selecting and processing the information obtained after which it proceeded to interpreting the results and identify solutions. The results obtained represent bench-marks for developing national, regional and local policies and on the other hand, a base for applicative research.*

Key words: poverty, mountain area

***Rezumat.** Această lucrare are ca obiectiv principal stabilirea coordonatelor nivelului de trai în Zona Montană a României. Atingerea acestui obiectiv a presupus identificarea informațiilor disponibile din literatura de specialitate și documentele publice elaborate de instituțiile naționale abilitate în această problematică. Metodologia utilizată a constat în selectarea și prelucrarea informațiilor obținute după care s-a procedat la interpretarea rezultatelor și identificarea unor soluții. Rezultatele obținute reprezintă repere pentru elaborarea politicilor naționale, regionale și locale iar pe de altă parte un fundament pentru cercetarea aplicativă.*

Cuvinte cheie : sărăcie, zona montană

INTRODUCTION

Welfare is an essential component of the human situation and it defined in simple terms as an optimal state to which aspires the individual, through it methods of producing, consuming and saving.

It requires a distinction between **individual welfare and collective well-being.**

Individual welfare – reflects a system of needs, correlated with the socio-economic context in which everyone is included, from the perspective of property, the level of consumption, the material and financial status, the social and cultural hierarchy. [1]

Collective well-being is that "type of welfare understood as meaning that all members of the community must have a minimum stock of economic assets to be considered decent, normal" [2].

At the opposite side of the concept of welfare is the concept of **poverty.**

Defining poverty is important for knowing the proportions of the phenomenon, the causes and factors that generate it, as a basis for proper combat of the poverty. [1]

In the specialty literature there are many demarcations of this concept:

It is believed that people in poverty are individuals and families whose income or other resources, especially in the form of educational and vocational training, conditions of existence and material heritage, are below a medium level of the society in which they live. [2]

MATERIAL AND METHOD

The methodology used to define the dimensions of life quality in the rural environment of the Mountain area was based on results provided by the use of public documents of the Ministry of Agriculture, Forestry and Rural Development. These studies used as a reference the World Bank’s method of measuring the poverty.

After that, it is considered a poor person, the one who does not have the minimum amount required per month to a person to provide a caloric consumption of 2550 calories per day.

The socio-economic indicators used were:

- the number of poor people,
- the rate of poverty,
- the depth of poverty (consumption deficit),
- the severity of poverty.

RESULTS AND DISCUSSIONS

The total number of poor people there are in the rural environment of the Mountain Area is 699.159 poor persons registering an average of 65.223 poor persons per county (figure 1).

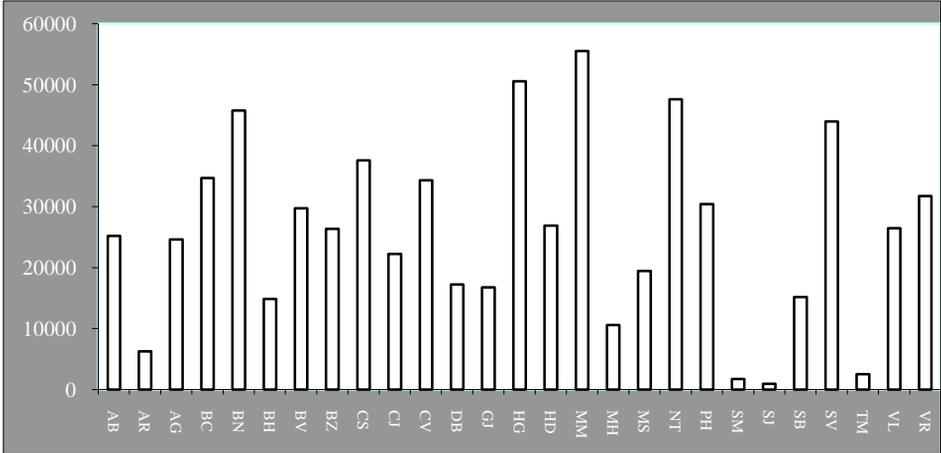


Fig. 1. The number of poor people

The most poor people are in the rural mountain area of the counties Maramureș with 55.496 poor persons, Harghita with 50.547 poor persons and

Neamț with 47.594 poor persons. The minimum value of this indicator it's possessed by the county Sălaj with 959 poor persons.

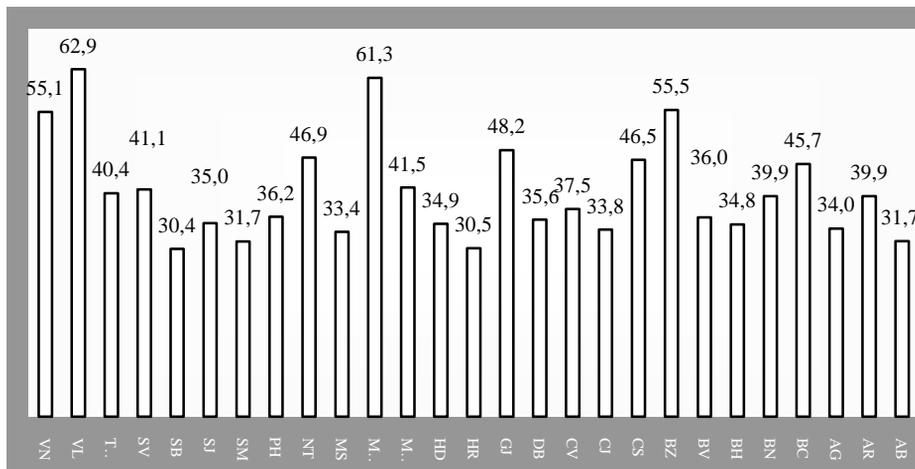


Fig. 2. The rate of poverty

The total number of poor people from the rural space of the Mountain Area represents 17,2% from the total number of poor people at national level.

This indicator has a value of 39,7% in the researched area with 2,8% smaller than the national level (figure 2).

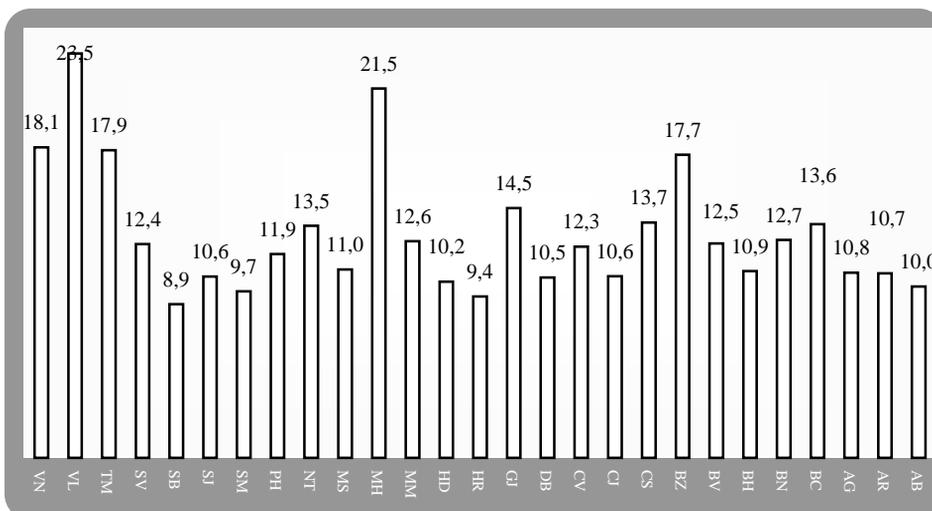


Fig. 3. The depth of poverty (consumption deficit)

The highest concentration of powerness is in Valcea county with a value of 62,9%, Mehedinți with 61,3% and Buzău with 55,5%. The poverty degree with the lowest values are being registered in the Sibiu, Harghita and, evenly, Salaj and

Alba counties with 30,4%, 30,5% and respectively, for the last two counties 31,7%.

The depth of the poverty of the indexed deficit of consumption has an average value of 13,0%, with 1,8% higher than the same indicator at national level. The deepest poverty in the researched area is proven to be also in the Valcea county with 23,5% followed by Mehedinti county with 21,5% and Vrancea county with 18,1% (figure 3). The minimum values of this indicator are being registered in Sibiu county with 8,9%, Harghita with 9,4% and Satu Mate with 9,7%.

The severity of poverty is with 2,2% higher in the Mountain Area than at national level having an average value of 5,9%. This phenomenon registers maximum values in the mountain area of Valcea county with 10,1%, Mehedinti with 10,0% and Timisoara with 8,7%. The minimum value are represented in the Sibiu, Harghita and Hunedoara counties.

CONCLUSIONS

The total number of poor persons that are in the rural zone of the Mountain Area is of 699.159 persons.

The average of the depth of poverty has an average value of 13,0%.

The poverty ratio is of 39,7%.

The average poverty severity is of 5,9%.

REFERENCES

1. **Varjan Daniela, 2005** – *Economie și politici sociale*. Editura ASE, București, Capitolul 1, p. 5-23;
2. **Zamfir C., Vlăsceanu L., 1993** – *Dicționar de sociologie*. Editura Babel House, București;
3. *****, 2008** - MAPDR. *Applicant guide to access measure 322*. București, Capitolul 4, p. 48+81.

MOUNTAIN POPULATION IN ROMANIA

POPULAȚIA MONTANĂ DIN ROMÂNIA

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***Abstract.** The aim of this approach consists in determining the demographic size of the Mountain Area. This was done to determine the population of the mountain villages of each county both rural and urban places. To supplement the primary information has been made the correlation between the specific indicators of the demographic analysis with economic indicators to highlight their influence on population dynamics.*

Key-words: population, mountain area

***Rezumat.** Scopul acestui demers constă în determinarea dimensiunii demografice a zonei montane. Pentru aceasta, s-a procedat la determinarea populației localităților montane a fiecărui județ, atât pentru mediul rural cât și pentru mediul urban. Pentru completarea informațiilor primare s-a realizat corelația între indicatorii specifici analizei demografice cu indicatori de natură economică pentru a se evidenția influența acestora asupra dinamicii populației*

Cuvinte cheie: populație, zona montană,

INTRODUCTION

Identifying policies and social measures leading to improvement of living conditions in the Mountain Area makes necessary to know the population profile which lives in this area. The information available has allowed the achievement of an analysis based on basic and specific socio-economic indicators correlate to the economic situation.[2]

MATERIAL AND METHOD

Determining the demographic size of the Mountain Area was performed by using statistical data at a village level using information from the Population Census of 2002. This information represents some of the few which have been obtained through field research and a high degree of detail, at a village level.

Previous researches have been done by selective socio-economic methods, in the best cases based on sampling.

Socio-economic indicators that were determined are:

- the total population of the mountain area;
- the rural population of the mountain area;
- the urban population of the mountain area;
- the average number of persons per household;
- the total of the agricultural exploitations

All these indicators were compared with equivalent nationally indicators to know the importance of mountain areas in Romania and the comparative level of development.

RESULTS AND DISCUSSIONS

The total population of the Mountain Area is 3.341.024 persons with an average of 123.742 persons per county representing 15,4% of the Romanian population in the Population Census of 2002.

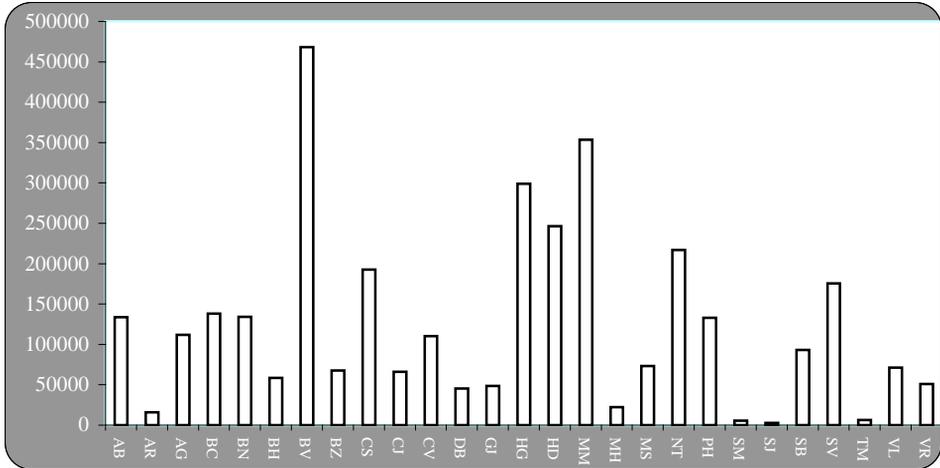


Fig. 1. The total population of the mountain area

The county with the most populated area is Brașov where are living 468.129 persons and the lowest population is in the county Sălaj – 2.737 persons. (fig. 1)

The rural population from the mountain area totalizes 1.729.583 persons, representing 17,1% from the rural population at national level. The average rural population per county is 65.170 persons with the maximum recorded in Harghita county with 164.380 persons and the minimum recorded in the county Sălaj with 2.737 persons. The mountain area of the county Sălaj includes nothing else than rural settlements.

The rural population share from the total population of the Mountain Area is 52,7%, with 12,2% bigger than the share of the rural population from the total population of Romania. The distribution of this indicator is given by the interval with the minimum share of 17,7% in the county of Brașov to 100,0% in the counties Vrancea, Timiș, Satu Mare, Dâmbovița, Cluj and Oradea. The average share of the rural mountain population per county is 52,7%.

The highest density of population per county at a village level is in the county Bacău where live 6.796 persons as the average population per village. The minimum level of this indicator is recorded in the mountain area of the county Sălaj where the average of the population per village is 1.369 persons.

The rural settlements from the mountain area are distributed unevenly per counties due to the relief conditions and other aspects with historical character.

In this area there are 575 rural settlements, having an average share of 21,3% villages per county.

The average population per village is 3.060 persons with 19,6% lower than the average population per village at national level.

The urban population from the Mountain Area is 1.581 persons, with a share of 13,9% of Romanian urban population.

The average of the urban mountain population per county is 58.572 persons with the highest value in Brasov county without being represented in Vrancea, Timiș, Sălaj, Satu Mare, Dâmbovița, Cluj and Arad because the mountain area in these counties comprises urban settlements. At the same time, the Maramureș, Hunedoara and Harghita counties hold in the Mountain Area 8 cities each.

The average mountain population per city is of 19.286 persons, with 54,7% smaller than the average population per city at national level. The most populated mountain cities are in Brasov county with 64.195 persons /city and Neamț with 36.651 persons/city. The counties that holds the least populated urban settlements are Bihor and Valcea county with 3.913 persons / city and, respectively, 5.615 persons/city.

The mountain Area of Romania comprises 82 cities with an average per county of 3,0 cities and a share of 30,6% of the urban settlements at national level.

Following, the results obtained from the direct correlation (expressed through primary statistical indicators) with information held about the agricultural exploitations, the animal mountain exploitations, the livestock and the turist activity will be presented.

In the Mountain Area, the utilized agricultural surface is of 0,8 ha / persons with 17,3% higher than the national level, registering the highest level in the Cluj county - 1,9 ha / person and the lowest level in the Brasov county - 0,3 ha / person because the share of the urban space is the highest.

The average number of persons per livelihood in the Mountain Area is of 3,0 persons, with 0,1% higher than the average number of persons per livelihood at national level. The amplitude of this indicator is given by 2,5 persons/livelihood in the Vrancea county and 3,4 persons/livelihood in the Bistrita Nasaud and Bacau counties.

Regarding the situation of the agricultural exploitations in comparison with the total population it is being noticed that at 1000 persons are 248,1 agricultural exploitations (individual and with legal personality) with 20% more than at national level. In the mountain area of the Cluj county the highest report is 488,6 agricultural exploitations at 1000 persons and the lowest report is being registered in Brasov county with 72,9 agricultural exploitations at 1000 persons due to the high share of urban mountain population in the total of mountain population.

The average of individual mountain agricultural exploitations at 1000 persons is of 247,0 per county with 20,0% higher than the average at national level with the maximum in Cluj county with 485,7 exploitations and the minimum in Brasov county with 72,5 exploitations.

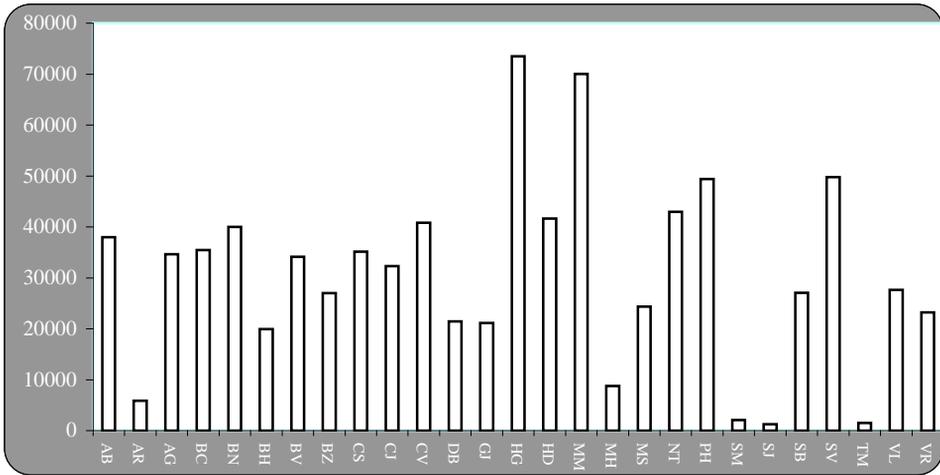


Fig. 2. The total of the agricultural exploitations

The entrepreneurial capacity of the population in the Mountain Area and the attractiveness degree as an economic activity indicates an average of 1,1 exploitations with legal personality reported per 1000 persons. This indicator surpasses with 8,8% the national average and is justifiable through the historical continuity of the sense of ownership even in the communist era. This phenomenon determined the conservation of the population's capacity to administer private propriety (fig. 2).

The maximum number of mountain agricultural exploitations with legal personality reported at the population is in Salaj county – 3,4 exploitations/ 1000 inhabitants, Timiș – 3,3 exploitations/1000 inhabitants and Cluj – 3,0 exploitations/1000 inhabitants. Moreover, this indicator shows minimums in Satu Mare and Brasov counties with 0,4 exploitations/1000 inhabitants.

CONCLUSIONS

The total population of the Mountain Area is of 3.341.024 persons with an average of 123.742 persons per county representing 15,4% of the Romanian population.

The rural mountain population sums 1.729.583 persons, representing 17,1% of the rural population at national level.

The urban mountain population is of 1.581 persons, with a share of 13,9% from the Romanian urban population.

REFERENCES

1. ***, 2007 – *Programul Național de Dezvoltare Rurală*. București, Capitolul 1, p. 11-37;
2. *** - 2002 – *Recensământul general agricol*. București, Capitolul 2, p. 48-77;

NECESSITY AND VARIOUS FACTORS OF CORPORATIVE STRATEGIES DEVELOPMENT

NECESITATEA ȘI FACTORII VARIAȚI AI DEZVOLTĂRII STRATEGIILOR CORPORATIVE

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Abstract. *Corporate strategy refers to the main direction of orientation of an organization into the future: purpose, aspirations and resources of the organization and how it interacts with the environment in which they operate. Every aspect of the organization plays a role in this strategy: staff, finance, production methods and its operational environment. Corporate strategy represents a system formed from objectives, goals and basic aspirations and essential policies and plans, formulated so to define the actual or potential field of activity of the company and its actual or potential profile.*

Key words: foreign investments, international financial flows, competitive advantages

Rezumat. *Strategia corporativă se referă la principală direcție de orientare a unei organizații spre viitor: scopul, aspirațiile și resursele organizație, precum și modul în care aceasta interacționează cu mediul în care își desfășoară activitatea. Fiecare aspect al organizației joacă un rol în această strategie: personalul, finanțele, metodele de producție și mediul ei operațional. Strategia corporativă reprezintă un sistem format din obiective, scopuri sau aspirații de bază și din politici sau planuri esențiale, formulate astfel încât să definească domeniul de activitate actual sau potențial al companiei și profilul actual sau potențial al acesteia.*

Cuvinte cheie: investiții străine, fluxuri financiare internaționale, avantaje competitive

INTRODUCTION

As it will come out from the present paper, the postwar period experienced a considerable increase regarding the international component of business, the national economies intensifying their mutual links due to the increasing volume of the transfrontier transactions, the latter implying not only goods and services, but also production factors and financial assets. These evolutions were made possible by the context of the deregulation and liberalisation of the international trade and financial flows, the result being the amplification of the markets' degree of integration at a global level.

As far as the trade is concerned, the globalisation tendency is noticeable in the increase in the exports and imports all throughout the world, both as absolute value and as weight in the global gross domestic product. Simultaneously with the evolutions manifested at the trade level, we can also notice a process of globalisation of the financial activity that surpassed in scope and rhythm the

similar process in the trade domain. As a consequence, the investment opportunities are no longer restricted to the national capital markets, the international competition determining, for these markets, the explosive increase in the international financial flows, as will be shown in the present paper.

The intensification of the international competition gave rise to a sudden and powerful increase in the international flows of financial assets, one of the remarkable development directions being based on the so-called emerging markets, the latter becoming more and more accessible to the international investors, based on performances that were generally superior to the ones recorded on the mature financial markets.

The unification of financial markets, continuing upward trend of investments, financial and economic expansion, increase of productivity, diversification of trade of goods and services, facilities provided by IT within the domain of vehicle of information and communication have allowed the increase of number and value of transactions of multinational customer and increase of sphere of specialisation services in areas of accounting, financial - fiscal, audit and internal control. Financial scandals from Enron, WorldCom, Parmalat, and more recently the crisis of mortgage credits of high risk, have seriously affected the credibility of good management of companies, their financial situation and the image itself of the accounting profession.

International financial markets are an integral part of modern life. These markets reflect the major changes of the economic conditions. Markets are both a symbol and a key instrument of globalization (Hafner, I., 2002). Globalization process determines the integration of financial markets around the world, in a single market, international one. *We can say* that any bank or financial national market of a given scale is part of the international financial market. *In our view*, globalization designates the ensemble of phenomena resulting from the increasing openness of economies to foreign goods and capital. Search by entities of the best opportunities for profit, organization of production globally and speed of movement of information stimulates trade between nations. In the latter case we speak of financial globalization.

MATERIAL AND METHOD

Globalization is based primarily on intensity of international economic relations, which have increased by 7% per year, versus 2.3% increase in production (www.worldbank.org). Such an increase in trade is due largely to multinational companies from the most industrialized states. In the context of intensification of international trade exchanges, activities in the real economy (production, consumption, investment, use of labour) have evolved in recent decades to a physical separation process, of dispersion in different countries or regions able to offer maximised competitive advantages.

New multinational companies have appeared, and the one with tradition have expanded the business globally through acquisitions and mergers, creating global networks of production and distribution. Local brands were selected and potentiated to external marketing, brand of goods and services devoted internationally have

expanded the territory of distribution, or have been promoted on national markets through direct production or local franchising.

Economic integration is a process of development of economic ties or interdependences that are set between different geographical areas. Such areas may be sub-national regions, countries or groups of countries. *We can specify that economic links or interdependences include development of trade (exports or imports), of capital (either direct investment or portfolio investment), of labour and technology (including innovation of products and technological processes).* International economic integration tends to become rather a regional phenomenon than a global one (O'Neil, T., 2004).

Dislocation and respective relocation of activities of the real economy had initially sought access to natural resources, use of labour at costs comparing more lower, the access to markets in formation or with potential in development, capitalisation of the regulatory framework propitious to direct investment. Interdependences from the real economy had determined the appearance of the phenomenon of cross-border financing, which in tandem with the financial liberalization generated mobile reserves of capital and liquidity.

Remaining still valid on a global scale, the arguments presented above are currently potentiated by new phenomena of physical separation of production and consumption from the tertiary sector, namely the migration of some different categories of services, based on the dynamics of technological and the impressive progress of telecommunications and information systems. The output generated by the real economy – expressed as level of income per head - may influence the inclination of engagement in transactions with international financial assets. To the extent that a higher income per capita - as an expression of the level of economic development - is associated with a predisposition to greater risk, and international investments are perceived as more risky than local alternatives, this may lead to greater levels of involvement in operations with international financial assets. Equally, empirical record shows that the savings - even those in developing countries - with a growth rate sensibly higher compared to the average shows a trend of financial integration-oriented higher than the states without noticeable performance of economic growth.

RESULTS AND DISCUSSIONS

Globalization refers to the company's activity, to trade, to services and to internationalization of capital (financial globalization). Internationalization process of firms was due on the one hand to the development of trade, on the other hand to the possibility to invest directly in any other country. Thus, the formation and development of multinational groups, the protagonists of the process of globalization, and efforts taken in the sphere of trade and markets liberalization, has brought the issue to the attention of economists the problem of international investment.

Foreign direct investment are complex international flows which include financial, technological resources, managerial and organizational expertise, which is introduces the lasting interest and entrepreneurial control of the company or business person investing in order to pursue productive activities in an economy other than in which the person or company is resident (P. Rivoli and E. Salorio, 2005). This form of international economic involvement of companies is made by

surrendering to the market as a means of transaction and by integration of organizational structures in firms of some assets and activities developed abroad. Such integration can be done horizontally, by the formation in other national areas of some firms performing the same kind of economic activity as the parent company, or vertically, in which case the structures of firms are integrated activities in upstream or downstream to its object of activity.

Foreign direct investment, besides the investment in production assets, may take also the form of portfolio investments. The difference between the two categories of investment is that the portfolio investments are purely financial capital flows, about which the involvement of the investor does not exceed the realisation of initial investment and assuming the risk of losing the game in financial markets, while realisation of a direct investment, under a form of complex transfer of resources, in which, sometimes, financial component is the least important, attracts the involvement of foreign investor in management and control of developed productive assets. In other words, appears as much less involved for investors and therefore more easily be adopted, the decision to make a portfolio investment rather than a direct investment. And from the host - economic point of view, things are different across the inputs of foreign direct investment and portfolio investment. It is about the impact on their productive resources and structures. While direct investment is likely to influence them strongly, in a positive way, the portfolio investment can not propose more than additionally for an uncertain term the financial capital resources (without guaranteeing their mobilisation for productive purposes), with possible sudden movements (return of capital) and destabilisation.

End of the Cold War and economic globalization have coincided with a new industrial revolution. Computers and information economy, of the Internet or knowledge bring a change in almost all aspects of economy, politics and social (George Gilder, 2000).

In our conception, the development of network of information and telecommunications has created to participants in market and regulatory authorities important advantages:

- collecting and processing of necessary information for measuring, monitoring and managing financial risk;
- pricing and trading operations through complex new financial instruments;
- control of some extensive records of transactions carried out 24 hours of 24 in major financial centres in Asia, Europe and American continent.

Communications and instant access to information represented a key factor in the development and integration of financial markets, from the operations of the ring to the back-office. Even in subjective terms, traders had the opportunity to learn each other and see easier the inter-market opportunities, and the level of confidence and financial technical knowledge of market participants has increased significantly.

Whether or not there has been a true technological revolution based on computing power, technological change caused by it had a major impact on the global economy, being also an important factor in the financial globalization process. Of these, we can enumerate the most important:

a. *Increase the rhythm of technological innovation.* In many areas, there was a real flood of scientific and technological developments, during the past 30 years appeared more discoveries than five millennia earlier. There are certain factors which are due particularly the acceleration of technological development. Intensification of international competition between great powers has stimulated scientific and technological innovation, and acceleration of the pace of change made that technology to become the key factor of economic growth and international competitiveness.

b. *Wide area of application of new technologies.* New technologies, especially from science and electronics, are relevant to a wide range of economic processes and other activities from many sectors of the economy. Financial transfers control, automation and data processing revolutionize both production, and services from any industrialized economy.

c. *Shortened life-cycle of economic processes and activities.* This compression of time caused a greater degree of internationalization of technological discoveries and led to new competitive strategies, and strategic and technological alliances more extended between multinational corporations from many countries.

Extraordinary extension of communications led to the disappearance of stock rings as traditional physical places to conduct the transactions with values, these being replaced by a global system, integrated in virtual markets formed from networks of computers and terminals that allow online trading of a bigger number of shares and bonds listed on the international market, regardless of the currency of reference.

CONCLUSIONS

Throughout the last years, the financial markets have been the object of attention of many controversies, stirring the interest of innumerable investors, with a violence that had once been characteristic to the fields of politics and religion.

As proved by the present paper, at the world level, a particular importance is attached to the international flows of capital, the governments looking for the best solutions meant to favour the goods, investments and information exchanges. The intensification, in the last years, of the international financial flows is the result of a combination of governmental policies, but also of the interest and actions of the investing companies.

Although the growth in synchronization of financial markets is clear and consistent, the evidences of parallel increasing synchronization of national economies are confusing and controversial. While, for example, stock markets from advanced countries can move in parallel in most occasions, the degree of

synchronization of real economies is substantially lower. A similar phenomenon becomes apparent also in developing countries, where the correlations between stock markets are growing continuously, while synchronizing real savings rate remained at relatively stable share over the last decade due to advances in technology, policies and ideas, the global relations have long competed those of previous periods in terms of the degree, intensity, speed, volume and the geographical situation (Bosworth, B., Gordon, P., 2004).

Improving the system of corporate governance can constitute a strategy of increase the overall performance of companies, respective of increase of stock price of their shares and, thus, of increase of the value of firms.

In conclusion it is obvious the fact that technological advances have implications in the international economic and financial actions, and the nature and importance of these implications are highly controversial. Some critics of technological progress mean that rapid technological advancement has a devastating impact on highly industrialized countries, linking the speed of this process with technological unemployment, but others argue that the technological progress means and will mean forward new and better jobs for everybody.

REFERENCES

1. **Bosworth B., Gordon P., 2001** - *Managing a Globalizing World: An Overview*. The Brookings Review, Vol. 19, No. 4, pp. 2-5
2. **Dahlman C., 2002** - *The Third Industrial Revolution, Trends and Implications for Developing Countries*. Institute for Economics Institute for International Economics, Washington, DC, USA.
3. **Farrell Diana, Remes K. Jaana, Schulz H., 2003** - *New Horizons: Multinational Company Investment in Developing Economies*. McKinsey Global Institute research, Harvard Business School Press, London
4. **Gilder G., 2000** - *Microcosm: The Quantum Revolution in Economics and Technology*. New York: Simon and Schuster Inc. Blackwell Publishing Ltd 1990, pp.426
5. **Hafner I., 2002** - *Schatten der Derivate– Das Schmutzige Geschäft der Finanzelite Mit der Geldwasche*. Eichborn Verlag, Frankfurt.
6. **O’Neil T., 2004** - *Globalization: Fads, Fictions and Facts*. The Journal of The National Association for Business Economics, Volume XXXIX, Number 1, January, New York.
7. **Rivoli P., Salorio E., 2005** - *Foreign direct investment (FDI) theories explaining the emergence of Multinational Enterprises*. Published by Elsevier Science Ltd., Helsinki University of Technology, Finland

APPROACHES AND DEVELOPMENTS REGARDING USE OF FINANCIAL-ACCOUNTING INFORMATION IN THE PROCESS OF DECISION ASSISTANCE

ABORDĂRI ȘI DEZVOLTĂRI PRIVIND UTILIZAREA INFORMAȚIEI FINANCIAR - CONTABILE ÎN PROCESUL DE ASISTARE A DECIZIILOR

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Abstract. *Information, in general, and economic one, in particular, is the main sources used in the management process, which allow critical examination of the use of material, human and natural resources, in order to take decisions that are required. Optimum capitalisation of economic information is possible only in the information systems whose basic function is to vehicle a rational quantity of information, on which base to make well-reasoned economic decisions in all organizational stages. The main data source of economic information system of the entity and, also one of its basic components, is accounting.*

Key words: financial decision, economic information, decisional process, information system

Rezumat. *Informația, în general, și cea economică, în special, sunt principalele surse folosite în procesul de management, care permit examinarea critică a modului de utilizare a resurselor materiale, umane și naturale, în vederea luării deciziilor care se impun. Valorificarea optimă a informației economice este posibilă numai în cadrul sistemelor informaționale a căror funcție de bază este de a vehicula o cantitate rațională de informații, pe baza cărora să se ia decizii economice bine argumentate pe toate treptele organizatorice. Principala sursă de date a sistemului informațional economic al entității și, totodată, una din dintre componentele de bază ale acestuia, este contabilitatea.*

Cuvinte cheie: decizia financiară, informație economică, proces decizional, sistem informațional

MATERIAL AND METHOD

In order to attain the objectives of the scientific research, we have oriented our research on two directions, using both methods of fundamental research and applied research. The research strategy follows the approach staging, comprising methodological elements specific to particular stages of the research in question:

- a) *data search and collection* (scientific observation): methods, techniques and instruments of observing and investigating the reality;
- b) *data processing*:
 - preliminary analysis: methods, techniques and instruments of data processing, of logical analysis and interpretation;

- hypotheses formulation: construction devices of the proposed enunciations and solutions, of a provisional nature, with a purpose to be checked;
- c) *construction, hypotheses checking and model testing*: qualitative and quantitative techniques, formal and logical principles of model construction and solving;
- d) *generalisation and theoretical construction* (the conclusive part of the research)

To locate more precisely accounting within the economic information system should begin by its definition. Therefore, *the economic information system (Noyelle, D., Westercamp G, 2001) is an organized set of complex economic information, which is obtained by processing data from certain sources and that are needed to organize, lead and conduct business.*

RESULTS AND DISCUSSIONS

1. From personal decision, to management decision

From the pragmatic perspective, the management is exercised, respective, is applied currently in more plans at the business organizations level; one of the major plans in which we find management applied by firm is given by the activity of adoption and implementation of decisions (Burciu, A., & al., 2008). By its very nature, the decision, as a rational choice between two or more versions to follow, is a specific act of human activity. Therefore are permanently taken or adopted decisions in daily life to solve various problems that occur at random or with repetitive nature.

The decision lies in the mode of action that a governor elected to realize one or more objectives. So, it implies the coexistence of three elements:

- the objective (goals);
- identification of alternatives to achieve the objective;
- choice of final variant, as a result of a conscious process of selection between the existing possibilities.

Of course, we will not stop in this work on personal decision, that each day, each of us adopt them, but we will try to highlight the specific problems of management decision, which is manifested in two forms:

- as decision-making act, and
- decision-making process.

Since there are many decision-making situations, and involved decision-making processes are heterogeneous, is necessary the analytical approach of the main primary elements of managerial decision: *the governor and decision-making environment*. Adoption of managerial decisions is determined by various factors which influence the current evolution of the business entity; between such factors which require the adoption of decisions by firms are included two categories of factors (Cooper, C., 2005):

- *intern factors* of business organization, such as proposed objectives, the directions set by stakeholders, the qualification of employees, available resources etc.

- *external factors*, such as market conditions which enable, the globalization of business, current economic and financial situation, activity of competitors, legal restrictions etc.

In the decision-making process are encountered three situations:

- *certainty*, characterized by the highest probability of achieving the followed objective using the planned way. In this case, the variables are controllable, their characteristics known, and their evolution can be anticipated with high accuracy;

- *uncertainty*, when the probability of achieving the objective is high, but on the way of action are reserves. This situation is characterized by a large number of variables, largely controllable, some poorly studied, so, which anticipation of the development is approximate;

- *risk*, when the objective is possible to achieve, with an appreciable probability, but the most appropriate ways to forward present high uncertainty.

Economic agents face decision situations of certainty, uncertainty and risk, their occurrence and finalization in decisions being inevitable and necessary. *Example for such a situation can be the risk, generated by the large number of uncontrollable or difficult to control variables, which is manifested in the case of some actions which aims at increasing efficiency, through the introduction of scientific and technical progress, in the case of some penetration activities into new segments of the market or into new international markets, and in the case of privatization and restructuring.* The period within which such a decision may be taken and can expect its effectiveness, is limited. Once it was over the optimum period, predetermined in terms of existence of some exogenous and endogenous influence factors of managerial system, this decision will be tardy and with lack of efficiency.

In our opinion the planning may be associated with decision-making at all hierarchical levels that comprise the overall managerial system.

2. Preconditions of decision-making

To do its mission, management turns to *financial-accounting decisions*, they representing the final product of the management process done in the financial operations of the entity. They are diverse and are taken in accordance with the concrete situation in which an enterprise is functioning.

A financial decision always has an immediate connection with the economic decision with which interpenetrates and influences each other. This requires an effort of thinking of managers with such responsibility to choose a preferred variant of action of several possible, in order to ensure its adaptation to the environment.

To participate in the substantiation and adoption of a decision, in general, must be identified some *preconditions* to determine the manager, through the impact that they have, to make a new effort of thinking, at substantiation and adoption of a new decision. These preconditions can be played so (Trenca, I., 2007):

1. *Registering a gap* between the achievements and objectives proposed earlier by a strategy: existence of a gap may be a factor positively or negatively in

the action of an entity, as appropriate. Regardless of their nature it is good to record a lower spread because only in such a context we can say that the management is done in terms of efficiency.

2. *Assessing of the impact which the registered gap makes* on the future development of the entity. Are specified in particular the aspects of financial nature, those relating to:

- The volume of existing capital;
- Return table;
- Financial credibility that the entity presents to the business partners.

3. *Motivation eliminating the gap*, especially when it may have negative influence on economic and financial situation. This precondition must be based on real arguments, must be substantiated by the use of quality information. Usually recorded spreads refers to reduced or increased capital needed to revive economic activities. In the case of fewer resources, to maintain the pace of activity, to sustain the favourable recorded trends, it is necessary to seek new resources of capital, including the need to attract them from the market.

4. *Assessing the company's access to additional capital* to be used in an effective action. The access to new resources of capital is allowed only to the extent that the company records and meets certain performance and responds to some criteria of financial quality. Non-access to new resources of capital is synonymous with the progressive collapse of a business of firm, of reconsidering the parameters within which it evolves.

5. Once set these preconditions and evaluated the aspects of the need for adoption and *substantiation of new decision*, as follows the financial manager to identify the specific model in order to decision adoption.

Use of a specific accounting rules allow for changes in an artificial level the outcome. Managers watch the presentation of a more flattering image, favourable to their establishment, use of legal voids within the accounting rules or omissions, not-representing explicitly how to form the results.

“Accountable vagabondage” makes only to support the informational asymmetry, such directing the functioning of markets. Management of the company is used by all the subunits and opportunities to meet market requirements and expectations. Reliability of financial information, relying largely on the relevance and validity of accounting documents, is relative. Accounting creative, tool in information shaping for external users, aims undeniably changing their expectations. This technique, situated at the borders of legality, has as objective optimization of the image from the accounting point of view of the entity, to the detriment of the idea to be rigorously faithful. It is the basis of communication and becomes a real weapon.

Enterprises make use of opportunities offered by the accounting rules, being difficult to users of information to quantify the impact of accounting policies and accounting options. Financial communication has become an element of excellence, masking such a strategic goal.

Current researches in the field of marketing have shown that “*a good product is not necessarily a sold product*”. Extrapolating, one can say that “*a good accounting is not necessarily a sold accounting*”. Accountants turn so, through creative accounting, in luxury atypical merchants. Cornerstone of communication is to trade information.

In the paper “*Financial Information*” (CPC, Ernst & Young, Mazard & Associates, 2001) are found the annual reports of 100 listed groups, and strategies adopted by each in their submission. Following the study made, noted that some companies do not recall the outcome, but to convince shareholders and staff, focuses on past and future evolutions. Others focus on the presidents’ speech where the result is mentioned, stating, discreet, and other key figures. For other groups, the results are of an annex, is not the centre of situation presented. When the results are contrary to expectations, to alleviate the consequences, are outlined the evolutions only in certain sectors of activity or in some markets. The rules of presentation are adapted to the requirements of shareholders and investors.

Study of Mai and Tchameni (Mai, M., Tchameni, E., 1996) through the agency theory and investor expectations adjustments stops on the supply of voluntary information offer, foreseeable. Using data from 163 companies, the authors have shown that, according “*the hypothesis of expectations adjustment*”, company management present foreseeable information to change investors' expectations regarding the future benefits. As a result of investigations made, the authors have found that the forecasts are published, as usual, at 3.07% from the companies, while the estimates of 6 years are developed of 49.70% of companies.

Communication is seen rather as a restrictive element. It is not watching to disclose the whole truth, but to familiarize users of information what they want to understand, in order to harmonize with their expectations. When the enterprise obtains good results, it aims to make them known. Not the same can be said about the less sanctimonious stories that prefer to be hiding, omit them. Bad news has always attracted the curiosity. Similarly, the markets react to bad news more than to the best ones. Creative accounting is to help to achieve the key figures to be communicated.

Sometimes, the first reading of the accounting documents, being unclear, imprecise and away of their basic qualitative feature, *the faithful image*, “reader” cannot find the real economic performance of companies (Watts, R., Zimmerman, J., 2000). Information superiority is given by the knowledge of the formation way of accounts and the eventual “*manipulations*”.

Communication, in certain circumstances, may be misleading. Creative communication, based on accounting intelligence, is hidden, silent and “painless”. Most of the companies they called, more or less to this “tool”, to favourably influence the perception of users of information; eyes are often drawn to what glitters. But be sure, not all that glitters is gold. Because of the misleading appearances, disgusts of such communications remain present. The accounting must remain the guarantor of a proper functioning of the market, the interests of the company and its partners.

CONCLUSIONS

By studying the objectives we have set to ourselves within this paper, we can conclude that the financial – accounting information has oriented the interest of diverse normalisators towards:

- the users of the financial situations;
- the informational needs of these users;
- the information provided by the accounting administration and its adjustment to the users' needs;
- the conceptual framework of this accounting information.

The information supply necessary to the decision-making process, comes mainly from the entity accounting, having three main sources of documentation:

- Unprocessed sources, represented by primary documents, which are addressed mainly to the internal users of information and less to the external ones;
- Sources processed by the entity and presented according to certain rules and techniques of the data in the primary documents, providing information for the elaboration of the synthesis documents;
- Synthesis sources, providing information to the external users and are based on information sources processed in entity.

In a market economy, the accounting information represents a force which endows with decision-making attributes the people holding it, even if it does not represent the absolute truth.

REFERENCES

1. **Burciu A. & al., 2008** - *Introducere în management*. Editura Economică, București.
2. **Cooper C., 2005** - *The Blackwell Encyclopedia of Management*. 2nd edition, vol. IX, Operation Management, edited by N. Slack, Lewis Blackwell Publishing, USA.
3. **CPC, Ernst & Young, Mazard & Associes, 2001** - *L'information financière: 100 groupes industriels et commerciaux*". Meylan, années 1995 à 2001.
4. **Colasse B., 1997** - *Encyclopedia de gestion*. 2^e edition. Editura Economica, article 142.
5. **Mai M., Tchameni E., 1996** - *Publication de prévisions par les dirigeants*. Economies et Sociétés, Série "Sciences de Gestion"
6. **Noyelle D., Westercamp G., 2001** - *Cele trei componente ale unui sistem informațional*. Informatique et gestion, Franța, nr. 30/1971, citată în I. Oprean (coordonator), *Bazele contabilității agenților economici din România*. Editura. Intelcredo, Deva
7. **Pop A., 2002** - *Contabilitatea financiară românească, armonizată cu directivele contabile europene, standardele internaționale de contabilitate*. Ed. Intelcredo, Deva
8. **Trenca I., 2007** - *Fundamente ale managementului financiar*. Casa Cărții de Știință, Cluj-Napoca.
9. **Watts R., Zimmerman J., 2000** - *Positive Accounting Theory: A ten Year Perspective*. The Accounting Review, Vol. 65.

THE BALANCED SCORECARD – BETWEEN STRATEGIC PLANNING AND IMPROVEMENT OF COMPANY’S PERFORMANCE

TABLOUL DE BORD – ÎNTRE PLANIFICAREA STRATEGICĂ ȘI ÎMBUNĂTĂȚIREA PERFORMANȚELOR ÎNTEPRINDERII

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Abstract. *The Balanced Scorecard is a management system that enables organizations both to clarify their vision and strategy and translate them into action. It is not only a measurement system, it is a complex instrument which provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. When fully deployed, the balanced scorecard transforms strategic planning from an academic exercise into the centered point of an enterprise. Working through the balanced scorecard process enables management to define those key perspectives that will drive the business to success, as well as to define how to measure their impact on the performance and the results of the enterprise. The balanced scorecard helps organizations align multiple strategies, from various centers, to the organizational strategy by linking their deliverables to those key perspectives that drive the business. Balanced scorecard provides a clear understanding of the company strategy, and how it is supported by the commitment to objectives from various functional units of the organization.*

Keywords: balanced scorecard, performance, strategy, indicators, customer management, organization capital, human and information capital.

Rezumat. *Tabloul de bord este un sistem de management care sprijină întreprinderile atât în clarificarea viziunii și strategiei proprii, cât și în transpunerea lor în practică. Acesta nu este doar un sistem de măsurare a activității, ci este un instrument complex care oferă informații referitoare la procesele interne ale întreprinderii și la raportările cu exteriorul, în scopul de a îmbunătăți în mod continuu performanțele strategice și rezultatele acesteia. Când este complet implementat, tabloul de bord transformă planificarea strategică dintr-un simplu exercițiu de strategie în punctul central al unei întreprinderi. Prin utilizarea acestui instrument modern de management, este permisă definirea perspectivelor cheie care vor conduce afacerea la succes, precum și modalitatea de măsurare a impactului acestora în performanța și rezultatele viitoare ale întreprinderii. Tabloul de bord ajută organizațiile să alinieze multiple strategii, din diverse centre de lucru, cu strategia de bază a organizației-mamă, prin conectarea punctelor lor forte cu punctele cheie care definesc conduita de afaceri. El oferă o înțelegere mai profundă a strategiei, precum și a modului în care aceasta este susținută de obiectivele specifice ale unităților funcționale ale unei organizații.*

Cuvinte cheie: tablou de bord echilibrat, performanță, strategie, indicatori, gestiunea clienților, capital organizațional, capital uman și informațional

INTRODUCTION

Balanced Scorecard (BSC) is a tool for strategic planning and management system, used extensively in business and industry, government and nonprofit organizations worldwide to align their activities to business strategy and vision, to improve internal and external communication and to monitor the performance of the organization in the context of achieving strategic objectives. It was created by Robert Kaplan (Harvard Business School) and David Norton as a framework for measuring performance and it evolved over time, adding indicators of strategic non-financial performance to the traditional ones and providing to the managers balanced information about the performance of the organization. Although the term was imposed only in the 1990s, the roots of this approach of the performance and strategy are deep, including General Electric's methodology for reporting financial performance in the 50's, and reporting the results of the enterprises from France under the name "Tableau de bord" in the first part of the twentieth century.

MATERIAL AND METHOD

To demonstrate the importance of the Balanced Scorecard to strategic orientation, we started from a theoretical substantiation of this concept and a representative model. The proposed approach requires a formalization of the strategy, aiming the determinant factors of the performance and not just financial issues. We propose to detail several categories of indicators: financial (in order to assess economic performance); level of customer satisfaction (economic performance depending on the answers provided by consumer expectations); internal processes (process improvement and innovation, production and maintenance expressed by lower costs); organizational experience (training, skills development). Controlling the Balanced scorecard clarifies some non-financial objectives which must be carried in order to achieve financial goals; highlighting the sense of cause-effect relationship between operational performance and strategic outcome; monitoring and control of the operations.

Next we will present the results and conclusions on this matter.

RESULTS AND DISCUSSIONS

The Scorecards with strategic orientation are systems of indicators that seek to measure the overall performance (and evolution) in different sizes constituents (Gervais M., 2005). They allow clarifying the strategic objectives and their expression in specific target values. They also provide a general development policy within the organization and a return to strategy for the gradual completion of it. There are three possible system analyses:

- Balanced Scorecard, imagined by R. Kaplan and D. Norton. This instrument remains focused on the financial performance and on the shareholder's value. Operational evaluations are based on customer satisfaction, experience and organizational development. Once the relationship is established, one can identify correct means to measure those business drivers in order to achieve desired economic and financial performance (Kaplan R., D. Norton, 1998);
- A scoreboard that focuses on the intangible capital of the company

(experienced by L. Edvisson) envisages the development of individual and organizational competences;

- A system which is based on the criteria used to accomplish the ISO standards, or to compete for the awards which promote quality (Malcolm Baldrige Award, the European Foundation for Quality Management Award). It is aimed at providing more value to the customer. Next we will focus on the model of the Balanced Scorecard. To obtain the highest possible global outcome, it is first necessary to provide quality services that will be reflected in a series of indicators. They are reporting to key strategic issues and determine the following:

- *Financial indicators* – depend on the adopted strategy. For example, a growing industry will indicate the increase in turnover according to the percentage of sales from new products or new markets. Table 1 provides a guide for choosing the option (R. Kaplan, D. Norton, 2001).

Table 1

Identification of specific financial indicators

	Withdrawal Strategy	Maintenance Strategy	Growth Strategy
<i>Optimizing revenues</i>	Return on product line or category of customers. The percentage of unprofitable customers	Return on product line or category of customers, taking into account new applications of existing products	The increasing rate in turnover per segment. Part of the turnover generated by new products or new customers
<i>Productivity</i>	Unit costs	Cost compared with that of the competitors. The rate of cost reduction. Indirect expenses (from sales)	Turnover per employee
<i>Asset utilization</i>	Return on investment. Rate of asset utilization	The need for working capital. Return on equity. Rate of asset utilization	Investment. Expenditure on research and development (as a percentage of sales)

- *Customer indicators* - are relatively classics: the market level of satisfaction and the loyalty of customers, number of new customers, profitable customers by category. Monitoring indicators are given treats attributes: those relating to product or performance (functionality, price, and quality), the relationship with customers, and those related to brand image and reputation. The selected criterion depends on the strategy of prices and quality service.

- *Indicators of “internal business processes”* - are limited to key processes. For example, if the speed of innovation is essential, the company may choose to follow the development and expect the percentage of sales achieved with new products. It will be taken into consideration the processes of product development and after sales service, because they have an increasingly important role in the current competitive context.

- *Indicators of “organizational experience”* - refer to the level of satisfaction and competence of the staff, level of functionality and performance of information and quality management systems. The decisions generate a training

exercise, a change in the payment system and making available to officials a tool to access information in real time.

- *Monitoring indicators* are deviation between the level of competence and the current situation, the percentage of customers' expenditures, whose remuneration corresponds to the new rules and the appropriate IT equipment.

They allow the identification of practical indicators for measuring the outcome (lagging indicators) whose output intervenes after completion of the action and advanced indicators (leading indicators), located further upstream in time, which play an alarm signal before the performance gets to lower. For example, if the result is the satisfaction of customers, according to the criteria and the rates of error or response time to customer requests, the company can react more quickly to abatement.

By using these indicators, the Balance scorecard is a tool that provides an operational representation of the overall company performance, while enabling guidance and evaluation of the strategy. The Balanced Scorecard offers a model of consistent performance. But he turned from a simple system of measuring performance into a complex system of strategic management is the year of 2001, when Kaplan and Norton published their paper "The Strategy-Focused Organization". They proposed the creation of adjacent instruments, called strategic maps. These are diagrams that describe how an organization creates value by connecting in explicit cause-and effect relationship with each other in the four BSC objectives (financial, customer, processes, learning and growth), using the cause-effect relationship (R. Kaplan, D. Norton, 2001). A model of such a map is shown in figure 1. Following the information contained in the map, the financial perspective looks at creating long-term shareholder value, and builds from a productivity strategy of improving cost structure and asset utilization and a growth strategy of expanding opportunities and enhancing customer value. These four elements of strategy are supported by cost, price, service, quality, functionality, etc., which internally is being translated into improved attributes of products / services, or into an improved brand image of the organization. All these processes are based on the exploitation of human capital, information capital and organization capital. In this way, the Balanced Scorecard facilitates the implementation of the strategy and allows a reflection on the relevance of options (Nobes C., Parker R., 2004).

By working with indicators and using organizational tools, the balanced scorecard allows better communication between strategy units. Managers often limit their messages to their strategic intentions. This attitude is insufficient to transmit clear guidelines. The BSC indicates the strategy by using specified objectives and cause-and-effect linkages between them (Ryals L., McDonald M., 2008).

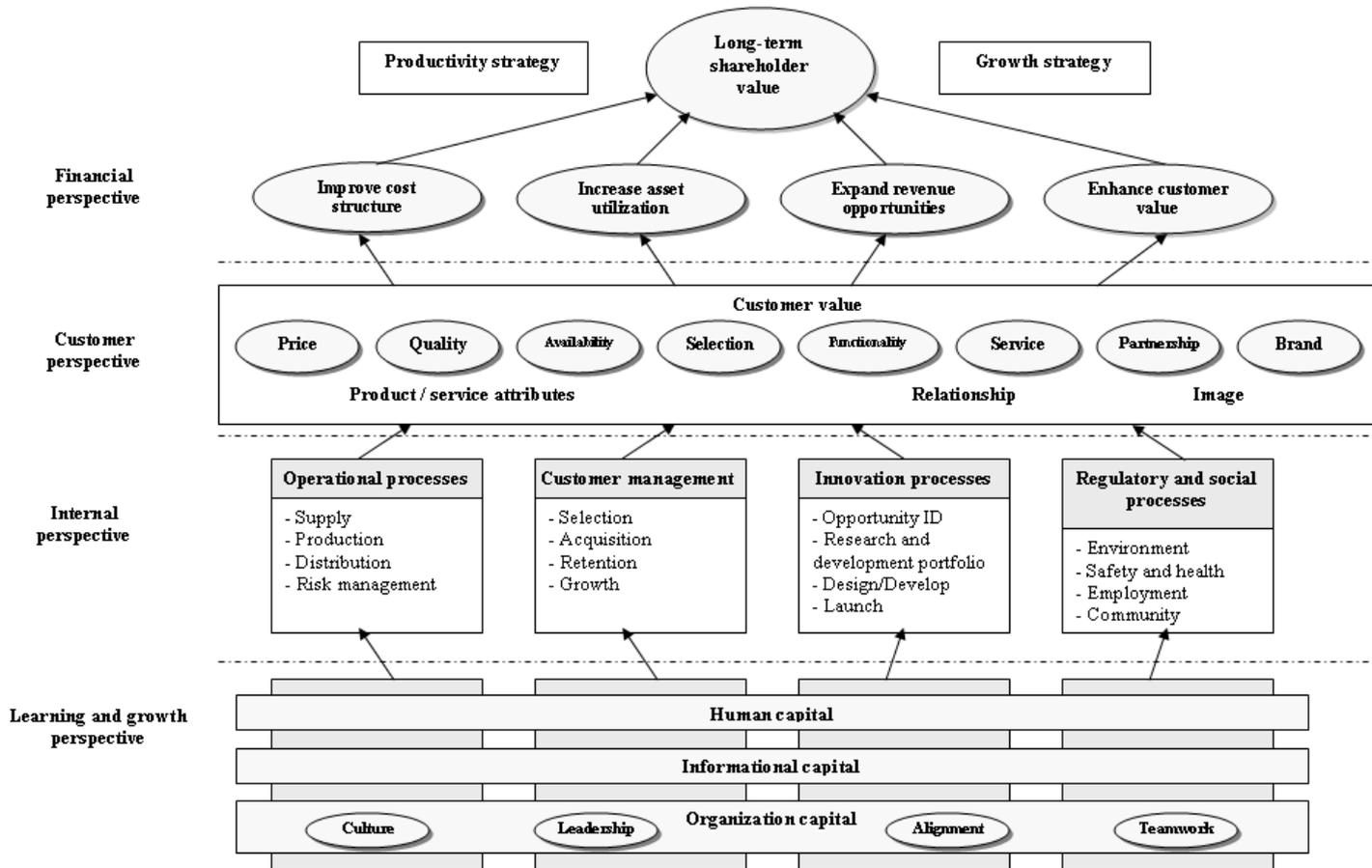


Fig. 1 - Strategy map

CONCLUSIONS

The Balanced scorecard provides a framework to focus on key perspectives that will lead to success, and to constantly assess performance against targets. It helps align key performance measures with strategy.

By connecting such things as shareholder value creation, customer management, process technology, organizational design and learning with one another in one graphical representation, strategy mapping help greatly in describing the strategy and to communicate the strategy among executives and to their employees. In this way alignment can be created around the strategy, which makes a successful implementation of the strategy easier. No small thing, bearing in mind that often, the implementation of a constructed strategy is the biggest challenge.

Although the BSC provides management with a comprehensive picture of business goals and strategies at all levels of an organization, there are limitations of this instrument. The distinction between indicators of action and the ones of result is often ambiguous. Also, the implementation of the strategies implies some difficulties [Glynn J.J., Murphy M.P., Perrin J., Abraham H., 2003]:

- The strategic objectives are insufficiently expressed in operational objectives;

- The resources are not always allocated according to strategic objectives;

- Managers are concerned with short-term objectives against strategy (e.g. the obligation to maintain a price of stocks to meet investors' interest).

The BSC provides a common language for enterprise's business partners. The future will validate its priority by way of relevance, efficiency and potentiating the performance of the organization.

REFERENCES

1. **Gervais M., 2005** - *Contrôle de gestion*. 8^e édition. Economica, Paris
2. **Glynn J.J., Murphy M.P., Perrin J., Abraham H., 2003** - *Accounting for Managers*. 3rd edition. Thompson Learning, London
3. **Guedj N., 2000** - *Le contrôle de gestion. Pour améliorer la performance de l'entreprise*. Troisième édition, Editions d'Organisation, Paris
4. **Hussey J., Hussey R., 1999** - *Business Accounting*. Macmillan Press Ltd., London
5. **Kaplan R., Norton D., 1998** - *Les tableaux de bord prospectif*. Les éditions d'Organisation, Paris
6. **Kaplan R., Norton D., 2001** - *The strategy-focused organization*. Harvard Business School Press, USA
7. **Nobes C., Parker R., 2004** - *Comparative international accounting*, Eight Edition. Prentice Hall, Edinburgh
8. **Ryals L., McDonald M., 2008** - *Key Account Plans The Practitioners. Guide to Profitable Planning*. Elsevier Ltd., BookAid, Sabre Foundation, Oxford UK

HARMONIZATION OF ACCOUNTING REGULATION AND PRACTICE IN ROMANIAN ENTERPRISES

ARMONIZAREA REGLEMENTĂRILOR ȘI PRACTICILOR CONTABILE ÎN ÎNTRINDERILE DIN ROMÂNIA

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Abstract. *The harmonization of financial accounting is seen as a mean of facilitating the circuit of capital and the globalization of financial markets by enhancing investors' ability to make informed decisions regarding investment alternatives. Currently situated between IAS/IFRS and European Directives, Romanian accounting follow two major approaches: studies of international accounting standards and other regulations, to their gradual assimilation into the Romanian specialty law (de jure harmonization) and studies analyzing the accounting practices of corporations within a given regulatory framework (de facto harmonization), in order to report an understandable, relevant and comparable information, under the changed regulatory environment. The ultimate goal is to facilitate access of Romanian companies to European and international capital markets, with direct implications on improving the Romanian economy and the increasing infusions of foreign capital in the enterprises. In the context in which accounting is the formalized language of communication in the business world, it aims to overcome the crisis faced by the Romanian economy, at 20 years from the transition to market economy.*

Keywords: globalization, de jure harmonization, de facto harmonization, European directives, International Financial Reporting Standards

Rezumat. *Armonizarea contabilității are drept scop facilitarea circuitului capitalurilor și a globalizării piețelor financiare, prin sprijinirea capacității investitorilor de a lua decizii informate privind alternativele de investiții. Aflată în prezent între IAS/IFRS și Directivele europene, contabilitatea românească urmărește două obiective: de pe o parte, studierea standardelor și reglementărilor internaționale în domeniu, în vederea asimilării lor treptate în legislația de specialitate din România (armonizare de jure), iar pe de altă parte studierea celor mai bune practici (best practice) ale companiilor (armonizare de facto), în scopul de a raporta o informație inteligibilă, relevantă și comparabilă, în condițiile unui mediu de reglementare în continuă schimbare. Scopul final este facilitarea accesului întreprinderilor românești pe piețele de capital europene și internaționale, cu implicații directe asupra îmbunătățirii economiei românești și asupra sporirii infuziilor de capital străin în întreprinderi. În contextul în care contabilitatea este limbajul formalizat de comunicare în lumea afacerilor, ea urmărește astfel depășirea mai rapidă a situației de criză cu care se confruntă economia românească, la 20 de ani de la trecerea la economia de piață.*

Cuvinte cheie: globalizare, armonizare de jure și de facto, Directive europene, Standardele Internaționale de Raportare Financiară

INTRODUCTION

In the construction of financial information, the accountant has to harmonize many interests, often divergent, related to its use: manager's interest (linked by the image of the company and by his own image and, last but not least, by taking long-term decisions), his own interest (which is limited more to the professional prestige) and general interest, represented by all other users of accounting information (investors, employees, state, public, etc.).

But this goal can be achieved with reference to a framework, seen as a set of rules, principles, methods and techniques, plus accountant's judgments resulting from the experience, moral values and discussions with other specialists (Dicu R.M., 2004). All these converge to one indisputable fact: the link between economic activities and policy makers is provided by accounting - an essential component of economic information - and its product, the account information, obtained in terms of true and fair view. In addition, dissemination of information must be made before it loses its ability to influence decisions. The movement of global information changes investors' experience. The companies able to provide this information will have an advantage because they will reduce the risk. The question is to know what impact instantaneous information has on press releases and analysts' reports.

MATERIAL AND METHOD

In this study, we started our research from the national accounting regulations, the accounting regulations applicable in Europe (EU Directives), the International Financial Reporting Standards and the literature focused on the topic of harmonization of Romanian accounting. First, the method of research involved making comparisons between the national and international regulations, as regards the rules applicable in financial reporting of companies.

The results and conclusions regarding this topic are presented below.

RESULTS AND DISCUSSIONS

Facing the international challenges, Romanian accounting could not remain without reflexes. She has adapted to the processes of normalization, harmonization and convergence, both through national institutions and the supervisory bodies of the equity market, with the participation of the organisms representing accounting profession (CECCAR and CAFR). Romanian accounting is currently in the implementation phase of European Directives (OMPF no.1752/2005), in parallel with actions for the implementation of International Financial Reporting Standards (IAS/IFRS).

In this context, the trends and prospects for Romanian accounting normalization are aligning to the European and global context, continuing their development in the following directions: on the one hand, the extended application of IFRS in the preparation of the annual financial statements and the

conformity with them, and, on the other hand, further transposition into national accounting standards of European directives as they are developed or modified, both in the elaboration of rules and their proper application.

Romania's adherence to the EU legislation required the compliance of Romanian accounting and auditing regulations with the community acquis. Once the regulations were under European Directives and developed, the problem was continuing to maintain such compliance in the context of the current quality of EU membership of Romania. We consider that the regular updates and changes of European Directives have to be taken into consideration in Romanian legislation.

The Order of the Minister of Public Finance (OMPF) no.1752/2005 is one of the Rumanian regulations that has caused significant changes in accounting according to European directives. This order is an integral part of the acceptance of the community acquis. Through OMPF no.1752/2005, Romanian supervisory bodies first brought the compliance of accounting with European Directives (Popescu L., 2007).

The fourth Directive (78/660/CEE) has been fully transposed into national regulations, through the Accounting Law no.82/1991, the Rules for applying it (Government decision no. 704/1993), OMPF no. 94/2001 and, recently, OMPF no. 1752/2005.

Overall, the application of this Directive seeks the coordination of the guarantees required from the Member States of the European Union and, of course Romania, regarding the structure, contents and publication of annual accounts (name used for the financial statements in the fourth EU Directive).

The seventh Directive (83/349/CEE) was taken into Romanian legislation by developing the Methodological Norms on the consolidated accounts, rules approved by OMF no. 772/2.06.2000, for then to be included in OMPF no.1752/2005. Preparation of consolidated accounts is conditioned, in accordance with the provisions of this Directive, by the fulfillment of some performance criteria of the parent company, the criteria relate to: holding the majority of the voting rights of shareholders in the subsidiary, the right to appoint and dismiss members of the administrative board, the management and control of the subsidiary, the right to exercise a dominant influence over a subsidiary that is a shareholder or member, etc.

The eighth Directive (84/253/CEE) on financial audit has been replaced by Directive 2006/43/CE, to better respond to the need for certification of the annual financial statements of the economic entities through the methodology offered by financial audit.

The fourth and the seventh Directives have been modified by Directive 2006/46/CE. The deadline for transposition of this directive into national and administrative regulations was the 5th of September 2008. The first step in including it in Romanian regulations was made by OMPF no. 2001/2006, amending and supplementing OMPF no.1752/2005. By this order, there was a partial transposition of Directive 2006/46/EC in accounting rules applicable to companies as follows: new requirements on the information presented in the notes

concerning commercial commitments that are not included in the balance sheet, transactions with related parties (OMPF no.2001/2006, pt.5-6); requirements for inclusion a statement on corporate governance in the annual report (OMPF no.2001/2006, pt.8), including the obligation and the responsibility for preparation and publication of the annual financial statements and annual report. In the same order, penalties for inobservance of the accounting rules are presented in the Accounting Law no.82/1991.

See that the importance accorded to corporate governance brings changes in the financial reporting, including the reports relating to the annual financial statements. The objective of any governance is to ensure balance of powers between the various participants and their instruments for control, both for shareholders participating in intangible capital and for other participants in the capital (Feleagă L., Feleagă N., 2005). In this context, to cope with uncertainty and complexity of the modern world, a new mode of governance has appeared, that takes into account not only the need to inform shareholders and their satisfaction, but also the ability to respond positively to the new market restrictions set by external bodies, the staff and their representatives, public opinion etc.

Thus, an enterprise will not be judged only according to criteria of economic profitability, but also by the ability of adaptation and reactivity, the ability to meet the aspirations of people, the exemplary attitude towards the topics of general interest (environment, ethics, rejection of any discrimination, etc.), in a word, by the ability to become a citizen of the world (Chorafas D.N., 2006). Significant issues relating to this process are required to be included in the annual financial statements or adjacent acts.

Turning to the issue of adoption of European directives into national accounting rules, although the deadline for transposing the Directive above ended, Romanian regulators have not updated threshold values established for preparing the simplified financial statements, which were increased as follows: total assets, from 3650000 to 4400000 euro and net turnover, from 7300000 to 8800000 euro (Directive 2006/46/CE, art.1. pt.1, a and b). It is expected that such an update to be done, however, to achieve compliance of national accounting regulations with the European Directives.

Another current directive is Directive 2006/43/EC (the new eighth directive about the audit) with the implementation by member states starting with the 29th of June 2008 (Directive 2006/43/CE, art.53). It is applying into Romanian legislation with the endorsement of Government Emergency Ordinance (GEO) no.90 on statutory audit of annual financial statements and consolidated accounts. Was also established the Council for Public Oversight of Statutory Audit, created to fulfill the objectives of supervision and coordination resulting from the requirements of Directive 2006/43/EC. This leads to ensure conformity of Romanian statutory audit requirements with European Directives.

Also, given the need to ensure compliance of national accounting rules with the EU regulations, since the financial year of 2006, there is a process of gradual implementation of IAS/IFRS in Romania, being necessary to ensure sufficient

time for changes in infrastructure, but also in the behavior and mentality of Romanian accountant.

In this context, is important to note that, in order to improve financial reporting and successful application of the accounting regulations, the Accounting Law has undergone many changes, especially concerning the authorities responsible for organizing and directing the application of accounting rules and accounting authorities responsible for the normalization of accounting, introduction of financial audit, updating the terminology, all concerning general methodological issues.

CONCLUSIONS

Accounting is strongly influenced by the economic, social, legal, political and religious developments of the states. In this context, it becomes an important means of information and its use should be subject directly to a set of rules which have to correspond to the training and the needs of accountants. On the other hand the Romanian accounting has to align to the standards required at European and international level.

The current trend that govern the process of standardization and harmonization of Romanian accounting with the regulations applicable at the European and international level should take into consideration two coordinates which complement each other.

First, both accountants, those who prepared the annual financial statements, and the supervisory body of normalization process, should endeavor to ensure compliance with regulations applicable worldwide, be it European Directives or IAS/IFRS. So, there should be a preoccupation for the improvement of accounting rules to create the appropriate framework, in order to obtain reliable and relevant information, comparable to European and international level. At present there are Romanian accounting regulations which require clarification or require improvements in many aspects and a number of issues not yet resolved by the Romanian accountants.

Secondly, accounting professionals must continuously improve their training. In this sense, they have a professional framework within the regulatory bodies (CECCAR and CAFR), in line with international guidelines, and they must pay attention on the importance of applying appropriate accounting regulations, of the quality of information and of its presentation form.

Since the accounting practices must be permanently aligned to the regulations, it is recommended that the accounting rules would consider a conceptualization of the accounting, and professional reasoning would be the guarantee for the application of best practices in the field.

REFERENCES

1. **Chorafas D.N., 2006** - *IFRS, Fair Value and Corporate Governance. The impact on Budget, Balance Sheets and Management Accounts*. Elsevier, CIMA Publishing, Oxford
2. **Dicu Roxana-Manuela, 2004** - *Raportarea financiară în secolul XXI și impactul în fundamentarea deciziilor economice*. în Volumul *Normalizare și armonizare în contabilitatea românească*, Editura Sedcom Libris, Iași
3. **Feleagă Liliana, Feleagă N., 2005** - *Contabilitate financiară: o abordare europeană și internațională*, Vol.I, Editura Infomega, București
4. **Popescu L., 2007** - *Contabilitatea românească între standardele internaționale și directivele europene*, în revista *Contabilitatea și Gestiunea firmei*, nr.2
5. *****, 2006** - *Directiva 2006/46/CE a Parlamentului European și a Consiliului din 14 iulie 2006*, publicată în Jurnalul oficial al Uniunii Europene L224/1 din 16.08.2006
6. *****, 2006** - *Directive 2006/43/CE of the European Parliament and of the Council of 17 May 2006*, publicată în Official Journal of the European Union L157/87 din 09.06.2006
7. *****, 2008** - *OUG nr.90/24.06.2008 privind auditul statutar al situațiilor financiare anuale și al situațiilor financiare consolidate*, publicată în MOR Partea I nr.481/30.06.2008
8. *****, 2005** - *OMFP nr.1752/2005 privind reglementările conforme cu Directivele europene*, publicat în MOR Partea I nr.1080/2005
9. *****, 2006** - *OMFP nr.2001/2006 privind modificarea și completarea OMFP nr.1752/2005*, publicat în MOR nr.994/13.12.2006
10. *****, 2008** - *Legea contabilității nr.82/1991*, republicată în MOR Partea I nr.454/18.06.2008

ASPECTS ON ENTREPRENEURSHIP AND ENTREPRENEURS

ASPECTE ALE ÎNTREPRINDERII ȘI ALE ÎNTREPRINZĂTORULUI

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Abstract. *The paper is reviewing the characteristics of entrepreneurship presenting several indices that measure aspects of entrepreneurial attitudes, activity and aspirations, related to the phases of economic development. Phases of economic development are decided on the level of GDP per capita and the extent to which countries are factor driven in terms of the shares of exports of primary goods in total exports. Perceptions about entrepreneurship may affect the supply side and the demand side of entrepreneurship. On the supply side, or the “pool” of potential entrepreneurs, important perceptions include both willingness and perceived ability to become an entrepreneur. Education levels and the availability of entrepreneurship training programs are possible determinants of perceived skills. On the demand side, or “space for” entrepreneurship, there needs to be opportunities for entrepreneurship, but equally important is that entrepreneurs perceive that there are opportunities for starting a business. There are several assessments to be made; First, there is the assessment of opportunity costs, which involves comparing the expected returns of entrepreneurship to the expected returns of an alternative occupation. Then, there is a risk-reward assessment: even if the expected returns from entrepreneurship are considerably higher than the best alternative, the (perceived) risks involved may be too high for a person who is thinking about starting a business.*

Key words: entrepreneurship, economic development, opportunities

Rezumat. *Lucrarea analizeaza caracteristicile întreprinzătorului și prezintă câțiva indicatori care măsoară aspecte privitoare la atitudine, activități și aspirații antreprenoriale în concordanță cu fazele dezvoltării economice. Aceste faze sînt determinate de nivelul PIB pe locuitor și de cota exporturilor de bunuri primare în total exporturi prezentate de țări. Percepțiile asupra actului de a întreprinde pot afecta oferta și cererea acestui act. În ceea ce privește oferta sau bazinul de potențiali întreprinzători importantă este atît dorința dar și capacitatea percepută de a deveni întreprinzător. Nivelul de educație și existența programelor de pregătire a întreprinzătorilor reprezintă posibili determinanți abilităților percepute. În ceea ce privește cererea sau spațiul necesar pentru actul de a întreprinde, atunci trebuie să existe oportunități pentru întreprindere, dar la fel de important este ca întreprinzătorii să vadă că există oportunități de inițiere de afaceri. Există mai multe evaluări ce trebuie luate în considerare: a costurilor de oportunitate, a recompensării asumării riscului.*

Cuvinte cheie: întreprinzător, dezvoltare economică, oportunități

INTRODUCTION

There are different and interesting historical views of entrepreneurship in the recent literature, as well as over time. These are reflecting the roles of the entrepreneurship in each of the three economic phases according to Porter's typology of "factor-driven economies", "efficiency-driven economies" and "innovation-driven economies". It is considered to be the first who defined the entrepreneurship as someone who identified the willingness to bear the personal financial risk of a business venture. This definition is related more to the static notion of entrepreneurship as being a "business owner" than to dynamic notion of starting new ventures. The Marshall's view at the end of the 19th century focused on the importance of entrepreneur in a market economy. His view is related to the economic view of scale-intensive entrepreneurship as a reflection of the efficiency-driven stage. Another scholar, Schumpeter in the 40's of the 20th century linked the dynamic aspect of entrepreneurship to innovations and economic development. The concept of "creative destruction" can be directly linked to the role of entrepreneurship in innovative-driven countries.

MATERIAL AND METHOD

Some authors presents seven phenomena associated with entrepreneurship, while others are talking about thirtheen differnet concepts of entrepreneurship. In recent studies were identified three main components: entrepreneurial attitudes, entrepreneurial activity and entrepreneurial aspiration (Acs and Szerb, 2008). So, a positive attitude towards entrepreneurship may increase entrepreneurial activity and aspiration, which in turn positively affect attitudes as more positive role models appear. Positive aspirations may change the nature of activity.

Entrepreneurial attitudes represents attitdes towards entrepreneurship. If there are good opporntunities to start business or the degree of attaching high status to entrepreneurs, then the result will be a high entrepreneurial attitudes. Besides, we can include the assmed level of risk, personal skills perception, experience in business.

Entrepreneurial attitudes can be inflenced by entrepreneurial activity, but it can influence entrepreneurial activity.

The importance of entrepreneurial attitudes consists in expression of the general feeling of the population about entrepreneurs and entrepreneurship, about people who can recognize profitable business opportunities, and think that they have skills to exploit them. If the people attitude for entrepreneurship are positive, then this will generate cultural support, help, financial resources.

Entrepreneurship in Factor-Driven Economies has several characteristics approached by different authors. Economic development consists of changes in the quantity and character of economic value added (Lewis, 1954). These changes result in greater productivity and rising per capita incomes, and they often coincide with migration of labor across different economic sectors in society (Gries & Naude, 2008). Countries with low levels of economic development typically have a large agricultural sector, which provides subsistence for the majority of the population who mostly still live in the countryside. As extractive industry starts to develop, this triggers economic growth, prompting surplus population from agriculture to migrate toward extractive and emergent scale-intensive sectors, which are often located in specific regions.

Speaking about entrepreneurship in Efficiency-Driven Economies, also there are some things to discuss. As the industrial sector develops further, institutions start

to emerge to support further industrialization and the build-up of scale in the pursuit of higher productivity through economies of scale. Typically, national economic policies in scale-intensive economies shape their emerging economic and financial institutions to favor large national businesses. As increasing economic productivity contributes to financial capital formation, niches may open in industrial supply chains that service these national incumbents. This, combined with the opening up of independent supply of financial capital from the emerging banking sector, would expand opportunities for the development of small-scale and medium-sized manufacturing sectors.

The third type is entrepreneurship in Innovation-Driven Economies. As an economy matures and its wealth increases, one may expect the emphasis in industrial activity to gradually shift toward an expanding service sector that caters to the needs of an increasingly affluent population and supplies the services normally expected of a high-income society. Such a development would be typically associated with increasing research and development and knowledge intensity, as knowledge-generating institutions in the economy gain momentum. Often, small and innovative entrepreneurial firms enjoy an innovation productivity advantage over large incumbents, enabling them to operate as “agents of creative destruction”. To the extent that the economic and financial institutions created during the scale-intensive phase of the economy are able to accommodate and support opportunity-seeking entrepreneurial activity, innovative entrepreneurial firms may emerge as significant drivers of economic growth and wealth creation (Henrekson, 2005).

RESULTS AND DISCUSSIONS

The countries, in fact their economies, are grouped into three phases of economic development. Phases of economic development are decided on the level of GDP per capita and the extent to which countries are factor driven in terms of the shares of exports of primary goods in total exports. Perceptions about entrepreneurship may affect the supply side and the demand side of entrepreneurship. On the supply side, or the “pool” of potential entrepreneurs, important perceptions include both willingness and perceived ability to become an entrepreneur. Education levels and the availability of entrepreneurship training programs are possible determinants of perceived skills. On the demand side, or “space for” entrepreneurship, there needs to be opportunities for entrepreneurship, but equally important is that entrepreneurs perceive that there are opportunities for starting a business. There are several assessments to be made. First, there is the assessment of opportunity costs, which involves comparing the expected returns of entrepreneurship to the expected returns of an alternative occupation. Then, there is a risk-reward assessment: even if the expected returns from entrepreneurship are considerably higher than the best alternative, the (perceived) risks involved may be too high for a person who is thinking about starting a business.

An individual’s risk-avoidance preference may be a significant factor in the transition from potential (or latent) entrepreneurship to entrepreneurial activity. At the same time, the individual may also be influenced by demographic characteristics such as age, gender, origin, or ethnicity and also by institutions. Intrinsic assessments, may ultimately lead to a proclaimed intention (and subsequent action) to start a business with opportunity-related entrepreneurship in

mind. This holds for the bulk of entrepreneurs, particularly in innovation-driven countries. It is also possible that people decide to start a business when a very specific business opportunity comes into view unexpectedly. They may act on this even though, before the business opportunity came their way, they did not see opportunities to start a business in their area. These people had not considered setting up a business until the opportunity was presented to them.

CONCLUSIONS

Some countries have favorable perceptions of entrepreneurship combined with low rates of intentional entrepreneurship. This is the case for many innovation-driven economies in Europe. In other words, the attractiveness of becoming involved in entrepreneurship appears to be low for many Europeans compared to other possible sources of income. A variety of national characteristics could be underlying this phenomenon. It could be that there are a lot of administrative burdens attached to starting a business, reducing the attractiveness of entrepreneurship or that employment protection is high. Fear of failure is often considered an important cultural component that is detrimental to new firm activity. However, so far this asserted effect has not been fully confirmed. If fear of failure is prevalent among those who in principle see good opportunities to start a business, this may justify intervening to reduce fear of failure. For many countries with factor-driven and efficiency-driven economies, it seems that the difference between entrepreneurial perceptions and entrepreneurial intentions is relatively small, or even negative. This suggests lower opportunity costs for entrepreneurial activity and higher degrees of necessity-driven entrepreneurship. In countries with mainly efficiency-driven economies, attention should begin to be paid to attitudes. Looking at innovation-driven countries, some anomalies are apparent. These could provide governments with clues as to what they could do to encourage entrepreneurial activity.

REFERENCES

1. **Acs Z. J., L. Szerb, 2008** - *Gearing Up to Measure Entrepreneurship in a Global Economy*. Mimeo, Faculty of Business and Economics, University of Pecs.
2. **Gries T., W. Naude, 2008** - *Entrepreneurship and Structural Economic Transformation*. UNU-Wider Research Papers. Helsinki,
3. **Henrekson M., 2005** - *Entrepreneurship: A Weak Link in the Welfare State?* *Industrial and Corporate Change*, 14(3), 437-467.
4. **Lewis W. A., 1954** - *Economic Development with Unlimited Supplies of Labour*. The Manchester School, 28(2), 139-191.
5. *****, 2009** - *Global Entrepreneurship Monitor 2008. Executive Report*.

CONSIDERATIONS ON THE ROLE OF ACCOUNTING RULES IN THE CURRENT FINANCIAL CRISIS

CONSIDERAȚII PRIVIND ROLUL CONTABILITĂȚII ÎN CRIZA FINANCIARĂ ACTUALĂ

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Abstract: *The current financial crisis has started on the US subprime mortgage market in the summer of 2007, reaching unexpected levels by 2008, rapidly spreading all over the world and disrupting the global financial system. The losses sustained by the American financial giants on complex structured securities triggered the collapse of other markets such as the housing market or the auto market. In less than a year, the balance-sheets of the biggest financial companies reported impaired assets and major declines in value due to the lack of liquidity of certain markets or assets. The investors' confidence in the financial markets and institutions has reached a new historical low and the financial crisis has triggered the economic crisis. This context has lead to strong debates among bankers, insurers, auditors and politicians about who is to blame for the crisis, but also about finding the solutions for surpassing the crisis and reducing the likelihood that this situation would recur. The paper aims at determining the role of accounting rules in causing and spreading the crisis, at assessing the recommendations and resources developed by the standard-setters and their results so far.*

Key words: fair value accounting, standard-setters, financial crisis, derivatives

Rezumat: *Criza financiară declanșată pe piața creditelor ipotecare din Statele Unite ale Americii încă din vara anului 2007 a atins cote neașteptate în 2008 și s-a răspândit cu repeziciune în toată lumea, producând haos pe piețele financiare globale. Pierderile suferite de giganții financiar americani au generat blocaje și pe piața imobiliară sau pe cea auto. În mai puțin de un an, bilanșurile marilor companii financiare au arătat active puternic depreciate și pierderi importante datorate lipsei de lichiditate a anumitor piețe sau active. Încrederea investitorilor s-a redus simțitor iar criza financiară a declanșat criza economică. În acest context, discuții aprinse s-au purtat în rândul bancherilor, asigurătorilor, auditorilor sau politicienilor în legătură cu găsirea vinovaților de producerea actualei crize și, desigur, cu soluțiile de urmat pentru depășirea sa și prevenirea unor situații asemănătoare pe viitor. Lucrarea de față își propune să stabilească care este rolul contabilității în declanșarea crizei și perpetuarea acesteia, să evalueze măsurile luate de organele competente și rezultatele vizibile ale acestora.*

Cuvinte cheie: contabilitate la valoarea justă, normalizatori, criză financiară, derivate

INTRODUCTION

Despite the fact that the whole world became aware of a massive financial crisis only by September 2008, the specialists could read its signals at least a year before. The first clue was the collapse of the two hedge funds owned by Bear Stearns after an important investment on the sub-prime market. During 2007, many other financial institutions found out that their normally safe securities were tainted by the so-called “toxic mortgages”.

The beginning of 2008 was marked by the action took by the Federal Reserve in order to stave off the bankruptcy of Bear Stearns (the Fed assumed 30 billion \$ in liabilities and engineered its sale to JP Morgan Chase). In September 2008 the events taking place on the American markets became of international interest, spreading their consequences all over Asia and Europe. The rescue of Fannie Mae and Freddie Mac which were placed under government control, the bankruptcy of Lehman Brothers, the sale of Merrill Lynch to Bank of America, the 85 billion \$ injection got by AIG from the Treasury were extraordinary events that lead Bush administration to the decision of drafting a plan to fight the crisis – the already famous 700 billion \$ bail-out plan. By October 2008 the crisis had already crossed the ocean. The European officials decided that bail-out packages were needed for the banking sector and governments promised to guarantee private savings accounts to prevent massive withdrawals. In a matter of weeks, the financial crisis affected economies all over the world.

It became very clear that the economic consequences of the financial crisis were very significant and the plans drafted as a response were very expensive. All this lead to debates concerning the causes of these events and the people/rules to be blamed for. Opinions were divergent, but many bankers and insurers accused fair value accounting of the actual crisis and its propagation.

MATERIAL AND METHOD

This paper aims at determining the role played by accounting and financial reporting during the present crisis by analyzing and discussing the numbers reported in the interim financial statements (quarterly statements) of some American financial institutions. We considered that these reports were the most relevant to establish the impact of fair value accounting on the balance-sheets because the American institutions were the most affected by the crisis. We underline that the annual financial statements for 2008 are still in preparation, a small number an entities having them already published, therefore the analysis is made upon the quarterly reports of 2008.

Moreover, our examination takes into consideration the most important measures adopted by the accounting standard setters as a response to all the critics and as part of the plan of improving the financial reporting used by investors and creditors.

For the first part of our analysis we used mainly three studies conducted by different bodies (such as Securities Exchange Commission – SEC, Merrill Lynch and Financial Accounting Standards Board - FASB) in order to assess the impact of fair value accounting on financial institutions. The results of these studies are, in our opinion, important to respond the critics of mark-to-market accounting (as part of the fair value accounting).

The report published by SEC analyzed a sample of 50 financial institutions of which 27 were banks, 12 insurance companies and 5 broker-dealers and highlighted:

- the weight of the assets and liabilities measured at fair value in the total assets and liabilities reported on the balance-sheet;
- the effects of changes in fair value upon the income statement;
- the use of fair value option (that is the voluntary election to measure certain assets and liabilities at fair value);
- the impact of the adoption of SFAS 157 and SFAS 159 (both dealing with fair value) on the balance-sheet;
- the nature of assets and liabilities measured at fair value;
- the impact of fair value accounting on bank failures in 2008.

Merrill Lynch's report analyzed the recent bank failures and losses recorded by this industry and identified the main causes of these evolutions. The FASB staff also examined institutions that did not survive the crisis and, in addition, compared the market value of some important commercial banks to their book value.

For the second part of our study, we took into consideration the recommendations made by different prudential, banking regulators and supervisory agencies (Committee of European Banking Supervisors, Financial Stability Forum, Institute of International Finance, Basel Committee, International Banking Federation, International Organization of Securities Commissions etc.) for the accounting standard setters. Therefore, we analyzed the measures adopted by the accounting bodies (the round-tables, the amendments of old rules dealing with recognition and measurement of financial instruments or disclosures on fair value, the exposure drafts and additional guidance issued), underlining the promptness and the quality of their responses to the recommendations received.

RESULTS AND DISCUSSIONS

After studying the aforementioned reports, we came to the conclusion that the numbers clearly showed that fair value accounting did not cause the current financial and economic crisis. It did not play a meaningful role in bank failures which were caused, more likely, by credit losses due to fraudulent lending, by lack of appropriate management risk and excessive leverage, by creation of complex financial instruments and by the absence of prudential regulations.

We support our opinion on the following results taken from the US SEC's report:

- only a minority of 45% of total assets and 15% of total liabilities were measured at fair value by the companies in the sample;
- on industry basis, banks reported only 31% of total assets as measured at fair value;
- 25% of the total balance-sheet assets of the financial institutions were reported at fair value through profit and loss (for banks the percentage was 22%);
- 4% of total assets were reported using fair value option, respectively 5% of total liabilities;
- the adoption of SFAS 157 and SFAS 159 did not significantly change the percentage of assets/liabilities measured at fair value (for assets: 42% as of year-end 2006 – before the adoption to 45% as of first-quarter year-end of 2008 – after

the adoption, for liabilities: 8% as of year-end 2006 – before the adoption to 15% as of first-quarter year-end of 2008 – after the adoption)

-the main types of assets measured at fair value were: investment securities, trading instruments and derivatives recognized as assets, derivatives and trading accounts liabilities respectively;

-76% of total assets measured at fair value and 84% of liabilities belonged to the 2nd level of the fair value hierarchy, 15% of total assets (11% of total liabilities) were included on the 1st level and 9 % (5% respectively) were level 3 instruments.

Therefore, the conclusions are: less than half of the assets held by financial institutions were measured at fair value according to the relevant accounting standard and the percentage of the liabilities recorded at fair value was quite small. Moreover, an even smaller percentage of assets/liabilities were reported at fair value through profit and loss, the changes in the fair value being recorded into other comprehensive income rather than into the income statement. We also noticed that the main types of assets/liabilities measured at fair value were the trading ones (that is, the instruments held for short-term profits) and the derivatives for which there were no regulated markets with transparent information to be used in determining their fair value. That is why we do not find anything surprising in the fact that the majority of the assets/liabilities reported at fair value do not fit on the 1st level of the fair value hierarchy (which includes the most liquid instruments whose value stems from quoted prices in active markets), but on the 2nd level, where fair value is calculated using observable market data other than quoted market prices (that is, data that require adjustments involving a certain degree of subjectivity).

The report published by Merrill Lynch upholds the anterior affirmations and states that the main cause of the failures and losses were the poorly performing loans which were not accounted for at fair value but on an accrual basis of accounting. This means that losses were gradually recognized and added to the income statement (and not immediately, as in fair value accounting) as they (the losses) actually incurred. And yet, the financial institutions came close to bankruptcy. This could only mean that credit loss provisions had a greater impact on banks' financial position than the impact of mark-to-market losses.

It is nonetheless important that securities issued by many banks affected by the crisis were traded on the market below their book value. This situation suggests that investors do not trust the financial reports and view the banks' net asset as overstated and not understated as many of the fair value critics imply. They argue that fair value irrationally reduces the value of a business without taking into consideration its intrinsic value. It seems that the investors, as the main users of the financial statements, do not agree.

As regards the measures taken by accounting bodies (Financial Accounting Standards Board – FASB and International Accounting Standards Board – IASB), we noticed both the joint efforts of the two standard-setters and the individual responses to the recommendation made by the Financial Stability Forum or the G-20 during the Summit on Financial Markets and the World Economy in

November 2008. The measures were prompt and lead to long-term projects meant to improve fair value accounting and financial reporting.

On the whole, the American accounting body – FASB- took the following actions:

- monitored the implementation of SFAS 157 on fair value measurements by establishing the Valuation Resource Group which provided information on implementation issues pointed out by practitioners, auditors and valuation experts;
- issued, in September 2008, alongside the SEC staff, a news release addressing additional fair value measurement clarifications;
- issued, in October 2008, additional guidance to clarify the application of SFAS 157 in inactive markets;
- completed deliberations on two projects amending the existing standards on transfers for financial assets and consolidation of special-purpose entities;
- initiated a project to improve the application guidance used to determine fair value and disclosure of fair value estimates due to release by the end of the second quarter of 2009;
- undertook four short-term projects regarding impairment, fair value disclosure requirements, embedded credit derivatives and reversal of previous recognized impairment.

The international body – IASB – had its own agenda including:

- the amendment of IAS 39 “Financial instruments: recognition and measurement” and IFRS 7 “Financial instruments: disclosures” in order to allow reclassification of some financial instruments out of the fair-value-through-profit-and-loss category and out of the available-for-sale category;
- the amendment of IFRS 7 to require additional disclosure similar to the one requested by the American standard (SFAS 157);
- the issuance of an exposure draft to amend IAS 27 “Consolidated and Separate Financial Statements” (redefining the term of control of an entity).

The two bodies jointly held three round-tables to gather views on most urgent accounting issues and to establish a way of approaching them in order to restore the investors’ confidence. IASB and FASB also created the Financial Crisis Advisory Group to assist them in evaluating the problems and identifying the improvements necessary in financial reporting.

In our opinion, the effects of all these actions would be better quantifiable when the quarterly reports for 2009 are released.

CONCLUSIONS

After analyzing the published research reports and examining the opinions on the role played by the accounting rules during the current crisis, we came to the following conclusions:

- although they can be improved, the accounting rules (especially the ones regarding fair value) are not to blame for the crisis and its spreading for which other profound causes can be identified. Placing the blame on accounting is a lot

like shooting the messenger for bringing bad news about the situation of certain financial institutions that did not take the most basic precautions;

-the main critics of fair value accounting who turned out to be exactly those responsible for the crisis were silenced by the results of the aforementioned studies;

-accounting is hardly responsible for enhancing financial stability (which is a task for the market regulators), its role consisting of providing useful and neutral information to the users of financial statements (even though it may expose the deterioration of the financial condition of an institution). Therefore, accounting should not be used as a means of providing financial safety and soundness because this could affect its transparency and cannot be used as a tool to fight against procyclicality because this could affect its neutrality;

-fair value accounting should not be eliminated or suspended, not even during a crisis, because the investors consider it the best existing valuation method for financial instruments even though it could still be improved through further guidance and disclosures.

REFERENCES

1. **Deloitte Touche Tomatsu, 2007-2009** - *Credit Crunch in the Global Financial Markets*. available at www.iasplus.com/crunch/creditcrunch.htm, retrieved on 1st of March 2009
2. **Moszkowski G., Najarian E., Davitt M., Black C., 2008** - *Does TARP Point to Suspension of Mark-to-Market?* available at www.ml.com, retrieved on 1st of March 2009
3. **Saft J., 2009** - *Accounting change won't save banking*, available at www.reuters.com, retrieved on 13th of March 2009
4. *****, 2009** - **Securities Exchange Commission** - *Report and Recommendations Pursuant to Section 133 of the Emergency Economic Stabilization Act of 2008: Study on Mark-to-Market Accounting*, available at www.sec.gov, retrieved on 12th of March 2009
5. *****, 2008** - *Declaration of the Summit on Financial Markets and World Economy*, available at www.whitehouse.gov, retrieved on 20th of February 2009

PECULIARITIES OF PAWNSHOPS' ACCOUNTING

PARTICULARITĂȚI ALE CONTABILITĂȚII CASELOR DE AMANET

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Abstract: According to Romanian laws, the pawnshops are non-banking financial institutions that offer monetary loans in exchange for movable assets that are pledged by the customers. They are organized as commercial companies and are supervised by the Romanian National Bank, being recorded into the Entry Register held by this institution. Nonetheless, the pawnshops do not apply accounting rules available for credit institutions, but they prepare the financial statements according to the regulation applied by commercial companies. The paper addresses the peculiarities of the pawnshops' activities in terms of legal, fiscal and accounting aspects. By giving practical examples, the paper emphasizes the assessment of the pawned items (namely the condition and salability of the items) which is necessary in determining the amount of the loan and the upon-agreed interest. It also underlines the situations that are likely to appear by the end of the contractual period of time. The paper discusses the fiscal aspects (mainly the value added tax) that rise from the sell of the items or the cashing of the interest.

Key words: pawn contract, pawned items, loan, fee

Rezumat: Conform legislației românești, casele de amanet sunt instituții financiare nebankare ce se ocupă cu acordarea de credite în schimbul primirii de bunuri mobile spre păstrare. Acestea se organizează ca societăți comerciale și se află sub supravegherea Băncii Naționale a României, fiind înscrise în Registrul de evidență ținut de această instituție. Cu toate acestea, casele de amanet nu aplică prevederile contabile folosite de instituțiile de credit, ci întocmesc și depun situații financiare conforme cu reglementările aplicabile agenților economici. Lucrarea de față își propune să pună în evidență particularitățile activității de amanet ce sunt de natură juridică, fiscală și contabilă. Prin intermediul exemplelor oferite, lucrarea surprinde procesul de evaluare a bunurilor mobile amanetate (în funcție de care se stabilește valoarea împrumutului acordat și a comisionului perceput) și cazurile posibil a apărea la expirarea contractului de amanet. În plus, lucrarea surprinde și aspectele fiscale (legate de regimul TVA) de luat în seamă la vânzarea bunurilor amanetate și la încasarea comisioanelor.

Cuvinte cheie: contract de amanet, bun amanetat, împrumut, commission

INTRODUCTION

In any modern economy, the non-banking financial industry plays a significant role because it offers an alternative for the banking services, it multiplies the competition on the loan market and it diversifies the financial instruments. Among other non-banking institutions, such as leasing companies and mutual benefit societies, there are the *pawnshops*.

Despite being organized according to the rules applicable to the commercial companies, the pawnshops are supervised by the National Bank of Romania (as any financial entity) and recorded into the Entry-Register held by this institution. Their main business activity is *offering monetary loans in exchange for pledged items held for preservation*. “The act of pawning takes place between two parties – a company and an individual – that engage in a transaction based on an agreement between them, each of the party being creditor and debtor to the other at the same time” (Pătruț, Deju, Păcurari, 2005, p. 31). Basically, the pawnshops lend money to their clients on the security of pledged goods, after signing a contract. They are creditors for the money they lend but also debtors for the pledged items. Their gain consists of the daily fee they cash in during the contractual period of time, fee that is publicly displayed for the customers.

According to the Romanian Civil Code (art. 1685), the pawn is an accessory unilateral real agreement in which the debtor remits tangible or intangible items as collateral. Therefore, the collateral is a real object, much like the mortgage, but the main difference is that the pawn is always based on movable assets that are handed over to the creditor.

The pawnshop is strictly forbidden to use, mortgage, hire, sell, donate or lend the pledged item (except otherwise agreed upon in the pawn contract) and it is compelled to preserve it (without losing or damaging it) and return it to the original owner when the loan and the interest are paid. The rules provide that if the loan is not repaid on the expiration date or if the debtor does not require the extension of the expiration date, the debtor has to pay an extra-fee for the delay. The partial payment of the debt does not end the pledge which is indivisible, being ended only by the full payment of the loan, interests and fees. The lack of payment within the contractual period of time gives the creditor the right to become the owner of the pawned item, offering it for sale or keeping it for own purposes.

MATERIAL AND METHOD

The pawnshops are regulated through legal acts that we researched for this paper. These are:

- a) regulations regarding the incorporation, organization and operation of pawnshops:
 - Ordinance no. 28/2006 governing certain financial and fiscal measures, published in Monitorul Oficial no. 89/2006;
 - Commercial Companies Act no. 31/1990, republished as subsequently amended and supplemented in Monitorul Oficial no. 1066/2004;
 - Civil Code published in Buletinul Oficial no.1/1981;
 - Decree-law no. 2561/1936 for the incorporation of pawnshops, published in Buletinul Oficial no. 264/1936 supplemented through decree-law no. 3621/1937 that were partially repealed by Ordinance no. 28/2006.

Because the majority of the pawned items are golden jewelry and gemstones, it is important to follow the appropriate legislation:

Sale of merchandise	1080,00	
Revenues from sundry activities	108,00	
Collected VAT	20,52	
-the acceptance of the sold merchandise:		
Goods purchased for sale = %	<u>1208,52</u>	
Sundry debtors	944,00	
Sundry creditors	136,00	
Commercial margin	108,00	
VAT under settlement	20,52	
-the derecognition of the sold item:		
% = Goods purchased for sale	<u>1208,52</u>	
Merchandise expenses	1080,00	
Commercial margin	108,00	
VAT under settlement	20,52	
-the taking of the sold item off consignment: C: Assets held in custody - consignment		1080
-the payment due to the original owner: Sundry creditors = Petty cash		136
Nonpayment of the loan and fee (case C)		
<u>The sale of the jewelry</u>		<u>The keeping of the goods for own purposes</u>
-the selling price:		- the taking of the sold item off consignment C: Assets held in custody consignment 1080
market value –	1080 lei	} 1413,72
commercial margin–10%	108 lei	
VAT 19%	225,72 lei	
-the recognition of the jewelry:		-the recognition of the goods as working inventory at market value of 1100 lei:
Goods purchased = %	<u>1413,72</u>	Working inventory = % 1100
for sale		Sundry debtors 800
Sundry debtors	800,00	Other operating revenues 300
Other operating revenues	280,00	revenues
Commercial margin	108,00	
VAT under settlement	225,72	
- the taking of the sold item off consignment		
C: Assets held in custody - consignment		
1080		
-the sale of the goods:		
Petty cash = %	<u>1413,72</u>	
Sale of merchandise	1188,00	
Collected VAT	225,72	
-the derecognition of the goods:		
% = Goods purchased	<u>1413,72</u>	
for sale		
Merchandise expenses	1080,00	
Commercial margin	108,00	
VAT under settlement	225,72	

On the basis of this example, we would like to point out some things:

a) *accounting considerations*

-the pledged item is not recognized as an asset on the pawnshop's balance-sheet because the latter does not hold its ownership (that is why the pawn is recorded as an off-balance-sheet item). The only exception takes the form of the mutual agreement between the pawnshop and the pawner for the taking of the pledge on consignment. The pledge is recognized as a long-term or current asset

only when the pawnshop becomes its owner, that is when the lender may not recoup the loan.;

-the receivables created when offering a loan should be recorded as current receivables (using a “sundry debtors” account) and not as long-term financial assets, using the “Other long-term receivables” account because the loan is a short-term one. We noticed that many pawnshops’ accountants in our country used the latter account. In our opinion this is a mistake because it does not take into consideration the contract duration;

-the fees cashed in by the pawnshops, although representing the interest of a loan, are not financial revenues because the pawnshops are commercial companies in spite of the fact that they are recorded into the Entry-Register as non-banking financial institutions;

b) *fiscal considerations*

-the interests and fees earned by the pawnshops do not involve the VAT even though the pledged items are redeemed by the debtor (or not);

-when the loan is not paid on expiration date, the pawnshop calculates VAT for the revenues earned from the sale of the goods recognized as balance-sheet assets. If the sold item is one previously taken on consignment, VAT is calculated only for the commercial margin (the creditor keeps for itself the amount of the loan plus the interest plus VAT calculated on the commercial margin and hands over the rest of the money to the original owner. In this situation, the fee earned by the pawnshop consists of the interest of the loan plus the commercial margin and is recognized as “revenue from sundry activities”.);

-in order to record the VAT calculated for the consignment transactions, the pawnshops keep special books (VAT journal reports) that differ from the other VAT transactions;

c) *legal considerations*

-when offering a loan, the pawnshop completes two copies of a pawn contract which must include: the description of the pawned item, the item’s value, the lending amount, the lending interest rate, the pawn duration and mode of payment, the handling of the pawned goods upon the liquidation of the contract, the rights and obligations of the debtor and creditor, other stipulations. When the pawner requires an extension of the contract, the creditor completes a new contract;

-when receiving the pledge, a pawn ticket is to be completed but most of the pawnshops use a copy of the pawn contract as an acknowledgment for the item taken as pledge. The return of the pawned item to the debtor is made based on the pawn ticket;

-when taking an item on consignment, the pawnshop completes a consignment ticket used for the temporary recognition of the pledge and for its derecognition after sale.

Also, we would like to underline some of the *risks* that characterize this business. Some risks are the ones inherent to any business, such as the credit risk (due to the uncertainty in the debtor’s ability to meet its obligations). Others are

specific risks: the risk that the pledge is a stolen property (which can be hedged by requiring identification documents from the pawner, following the news about recent robberies in the neighborhood and requesting the police assistance whenever there are suspicions), the risk that the item is counterfeited or fake (against which the pawnshop can fight by hiring specialists to assess jewelry, gemstones, electronics or art). Another risk is that the pawnshop cannot sell the items not redeemed by their original owners (which can be reduced by accepting only items for which there is an active market). Reducing or eliminating those risks depends mainly on the management skills and ...on luck.

CONCLUSIONS

The peculiarities of the pawnshops' activities have significant consequences upon their accounting books. The most important aspect is, in our opinion, the fact that, although conducting lending activities, the pawnshops are financial institutions *only* because they are recorded into the Entry-Register held by the Romanian National Bank and are supervised by the same entity. But ultimately they are organized and they operate as *commercial companies*. Moreover, their clients are, most of the times, people with financial problems that run out of resources, do not have a bank account or do not qualify for a bank loan. They prefer the simplicity of a pawnshop loan which is a very short-term one (and bears lower interests than ones collected by other informal creditors), it is quick and convenient, does not require co-signers and the failure of payment does not ruin the debtor's credit score (the pawnshops do not report the defaulted loans to the Payment Incidents Register because they have the physical possession of the item and may recoup the loan value through outright sale of the item). These loans generally cover daily expenses and, therefore, there is a great demand for them during the current crisis. The present events turn out to be a blessing for many pawnshops that increase their business and the profits earned from the loans and from the sale of the items not reclaimed by their owners.

REFERENCES

1. **Pătruț V., Deju M., Păcurari D., 2005** - *Gestiunea și contabilitatea unor activități economice cu caracter deosebit*, Junimea, Iași
- 2.***, **2006** - *Ordinance no. 28 of 26 January 2006 governing certain financial and fiscal measures*, published in Monitorul Oficial no. 89/2006
- 3.***, **2005** - *Order of the Minister of Finance no. 1752/2005 for the approval of accounting regulations complying with European directives*, published in Monitorul Oficial no. 1080/2005 including subsequent amends
- 4.***, **2003** - *Law no. 571/2003 regarding the Fiscal Code*, published in Monitorul Oficial no. 927/2003 as subsequently amended and supplemented
- 5.***, **1990** - *Commercial companies act no. 31/1990*, published in Monitorul Oficial no. 1066/2004 as subsequently amended and supplemented

STUDY DIAGNOSIS REGARDING THE HUNTING POTENTIAL OF NO.1 PINU HUNTING FUND – D.S. SUCEAVA

STUDIU DIAGNOSTIC PRIVIND PATRIMONIUL CINEGETIC AL FONDULUI DE VÂNĂTOARE NR 1 PINU – D.S. SUCEAVA

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Abstract. *The No 1 Pinu Hunting Fond is managed by the Forestry Direction Suceava. From the administrative point of view it belongs to the Forestry District Broșteni (95,1%) and Townhall Broșteni (4,9). It is a fond of medium dimensions with a total area of 12.351 hectares of which the productive area for hunting is of 9895 hectares (71,1%). Of then total areas, the forests occupy 67,7%, the agricultural field 5,7%, mountain holes and waters 2,4%, the difference being represented by the nonproductive hunting areas. The nonproductive areas represent intravillan fields belonging to 6 rural localities. From the equipments point of view, this hunting fond has a proper number of constructions specific to the hunting areas, with a house, and a hunting hut, 6 skulking cabins 15 foodstuffs for deer, 2 hofstands, 22 bathing places and 27 salt places. In 2007, within the fond there was a great variety of hunting species represented by 16 species, of which the most numerous are the common deer – 110 head, roebuck – 50 head, roosters – 60 head, fox – 30 head, wild boar and hares between 5-25 head. Between 2001-2007, during the numerous hunting parties there were hunted 13 trophies most of them being obtained by foreign hunters (Germany, Hungary). A whole assessment shows a hunting equilibrium from the ecological point of view.*

Key words: hunting potential, hunting equilibrium, economic efficiency

Rezumat. *Fondul de Vânătoare nr. 1 Pinu este gestionat de către Direcția Silvică Suceava. Din punct de vedere administrativ aparține de Ocolul Silvic Broșteni (95,1%) și Primăria Broșteni (4,9). Este un fond de dimensiuni medii având o suprafață totală de 12.351 hectare din care suprafață productivă pentru vânat de 9895 hectare (71,1%). Din suprafața totală, pădurile ocupă 67,7%, terenul agricol 5,7%, golurile de munte și luciul de apă 2,4%, diferența reprezentând-o suprafețele neproductive cinegetic. Suprafețele neproductive reprezintă terenuri intravilane aparținând unui număr de șase localități rurale. Din punct de vedere al dotărilor, acest fond de vânătoare deține un număr corespunzător de construcții specifice realelor de vânătoare: câte o casă și o colibă de vânat, șase bordeie de pândă, 15 hrănituri pentru cervide, 2 hofstanduri, 22 scăldători și 27 săvării. În cadrul fondului, există în anul 2007 o mare varietate a speciilor cinegetice reprezentată de 16 specii, dintre care cele mai numeroase ca număr sunt speciile de cerb comun – 110 capete, câprior – 50 capete, cocoș de munte – 60 capete, vulpi – 30 capete, mistreț și iepure comun, câte 25 capete. Celelalte specii (râs, lup, urs, vidră etc.) dețin efective cuprinse între 5-25capete. În perioada 2001-2007 în cadrul a numeroaselor partide de vânătoare s-au obținut 13 trofee de vânătoare, majoritatea fiind dobândite de vânători străini (Germania, Ungaria). Aprecierea de*

ansamblu arată că în cadrul Fondului de Vânătoare nr. 1 Pinu există un echilibru cinegetic din punct de vedere ecologic.

Cuvinte cheie: patrimoniu cinegetic, echilibru cinegetic, eficiență economică

INTRODUCTION

The hunting patrimony represents one of the national riches of Romania. Due to some specific conditions, Romania has a large variety of wild species and in a significant number of exemplars. One of the richest areas in hunting species is the western zone of Suceava county which has a mountainous relief with dense tree vegetation, ensuring a protective habitat for hunting.

No.1 Pinu Hunting Fund belonging to Suceava Forestry Direction is the research object of this study and has a representative character for the mountainous zone of Suceava county. The underdone study has as aim the diagnosis of the evolution of the hunting fund along a significant period (2001-2007) and of its state from the point of view of its number and variety in the first year of Romania's adherence to the European Union.

MATERIAL AND METHOD

As study material, we have taken into consideration the Pinu 1 area, with a surface of 12,351 ha on which we have made direct investigations on a period of seven years, regarding the hunting species, the evolution of their number, death and trophies. Also we have identified the infrastructure specific to hunting areas.

In order to gain the information we have used specific methods of direct investigation on the hunting patrimony, as well as some statistic data with official character belonging to Suceava Forestry Direction.

RESULTS AND DISCUSSIONS

No.1 Pinu Hunting Fund belongs to Brosteni Forestry Domain (95,1%) and Brosteni Town Hall (4,9%), from the administrative point of view. It is situated in the southern part of Suceava County, occupying approximately equal areas of Bistrita and Stanisoara Mountains which are separated by Bistrita river. In the hunting zone there are 43 pastures belonging to the inhabitants of that area.

The predominant unit is the versant mostly covered by forest, allocated between the minimum altitude of 980 m and maximum 1650 m, generally having a sunny position.

The studied hunting fund is crossed by a rich hydrological network dominated by Bistrita River with its numerous affluents which ensure the necessary quantity of water along the year to the game. The climate is typically mountainous, favorable to a large number of wild species. However, there are climatic accidents such as early or late frosts which cause numerous deaths among the cubs. Long winters with massive snowfalls ask for supplementary food for certain species (especially deer). Moreover, the thick snow with crust favours the losses among deer, as they can easily be hunted by wolves and lynx, being also harmful to wild-boars.

The structure of the hunting fund on categories of use (Table 1) proves that, of the 12 000 hectares, the productive hunting area is of 80%, of which 70% is represented by forest, the rest of 400 hectares being occupied by arable fields, meadows, orchards, and 700 ha represent pastures and mountain holes. The unproductive hunting area occupies 20% respectively.

Table 1

The area of the hunting fund on categories of use

UM	Productive area hunting for						Unproductive hunting	General total
	Lake game			The rest of the hunting species				
	Water	Forest	Arable (meadow, orchards)	Pasture	Mountain holes	Total		
HA	95	8700	400	500	200	9895	2456	12351
%	1	70	3	4	2	80	20	100

From the administrative point of view, the productive hunting zone belong with 95,1 % to Borșteni IF, the difference belonging to Broșteni Town hall.

The infrastructure of the hunting zone is appropriate, being made up by a house, a hunting cabin and 6 skulk huts, 15 feeders, 2 hofstands, 22 bathing places and 27 salt places. In the latest 7 years there have not been registered significant modifications regarding this number. Within the fond, there have existed numerous actions in order to ensure food and especially starting with the 2002-2003 hunting season when they ensures 11 tones of lucerne and clover, 15 tones of seeds and fruits and 0,5 concentrated tones. In 2007-2008 season these quantities have raised with about 20%. At the level of 2007, within the fund there were 16 hunting species. The evolution of the spring effectives at the hunting species is presented in Table 2. From the data of this table there results that in the period 2001-2007 there has been a different evolution of the number of exemplars on species, which, at some species, has been maintained within the optimum limit.

Table 2

The evolution of wild species effectives

Species	Significance	2001	2002	2003	2004	2005	2006	2007
Common deer	Effective	90	85	85	90	95	110	110
Roebuck	Effective	60	50	45	45	45	50	50
Wild boar	Effective	25	20	20	20	25	25	25
Common hare	Effective	35	30	35	25	25	25	25
Bear	Effective	8	7	7	7	7	7	8
Lynx	Effective	5	4	4	4	4	4	4
Wolf	Effective	5	4	4	4	4	4	4
Wild cat	Effective	10	10	10	10	10	8	8
Black cock	Effective	40	45	45	50	55	60	60
Hazel grouse	Effective	30	30	30	30	30	30	30
Fox	Effective	30	20	20	20	20	30	30
Badger	Effective	10	10	10	10	10	10	10
Otter	Effective	5	4	5	5	5	5	5
Tree marten	Effective	20	15	15	15	15	15	15
Polecat	Effective	20	15	15	15	15	15	15
Weasel	Effective	15	15	15	15	15	15	15

The optimum density is represented by the number of animals that can cohabit on an area unit (100ha), so that, through efficient use of bio-stationary conditions, the wild animals might bring hunting maximum quantitative and qualitative production (trophies, meat, fur) and without bringing disadvantages to the other elements of biocenose.

At the other species, the effectives have been constant (wild, boar, bear, fox, badger, otter, weasel) or easily dropped (roeback, hare, wolf, wild cat, marten, polecat). Each year, there have been a number of exterminated arying according to the fecundity of females and to the small number of exemplars of the areal. These effectives have been captured on cotes. Thus, as regards the common deer and wild-boar, the exterminated annual cote was of 3 exemplars, at wolf and black-cock 2 exemplars, at fox and between 5 and 8. At the other species there have been exterminated an exemplary every 2-3 years.

The diminishing or lack of increase of the effective of some species has been determined by the existence of some harmful species to game of which we mention crows, rambling dogs and cats (Table 3), as well as poaching. Between 2001 and 2007 there were harvesting actions (eradication), especially of crows and rambling dogs, and in 2007 and 2008 also rambling cats.

Table 3

Harmful eradicated species

Species	Significance	2001	2002	2003	2004	2005	2006	2007
Crows	Eradicated	15	14	15	15	15	7	7
Grive	Eradicated	-	-	-	-	-	8	8
Magpies	Eradicated	-	-	-	-	-	-	-
Jay	Eradicated	-	-	-	-	-	-	-
Rambling dogs	Eradicated	20	15	10	10	15	10	10
Rambling cats	Eradicated	-	-	-	-	-	10	10

The damage caused by wild animals can be different, according to specie, density or existence of some unfavourable climatic conditions. For example, at deer, this damage appear when the maximum density was overcome or because of tranquillity's disorder. In winter they are the biting off the stalks and cover of trees, and in the spring by running over the crops and uprooting the tubers of potatoes.

The bears produce damage, especially in animal husbandry, to the plum orchards and more rarely, to young trees by tearing and uncovering.

As regards the damage made by game to the agricultural crops, in the studied hunting fund this damage has been minor and has been caused especially by wild boars in the maize culture or by grouting in the peasants' meadows. As regards the damage made by the game to the forest, the most frequent have been made by deer, but haven't damaged the ecological equilibrium. The management techniques of the forests directly influence the dynamics and development of game populations which do the specific processes of life within the forestry ecosystem. The treatments adopted and the ways of implementation are factors that influence the game populations. For a better understanding of the problem there

was analysed the evolution of age classes of trees of all the hunting fund in the period 1969-1999 and its influence on the development of game effective (table 4).

Table 4

Evolution of age classes of trees within the No 1 Pinu H. F., between 1969-1999

Year of arrangement	Age classes(%)						Total wood
	I (1-20 years)	II (21-40 years)	III (41-60 years)	IV (61-80 years)	V (81-100 years)	VI (101-120 years)	
0	1	2	3	4	5	6	7
1969	16	12	29	35	8	-	100
1979	13	14	26	35	12	-	100
1990	9	17	18	36	16	4	100
1999	8	15	20	32	19	5	100

From the analysis of the data in the table there results that in 1969, the trees in tree classes V and VI is 8% of the total. After 30 years, in 1999 their weight is of 24%. This change of structure is favourable to the game as old forests permanently offer the necessary food as a consequence of the numerous openings and clearings and of numerous fruit of old trees.

Economic efficiency of hunting activities

The hunting activities implies every year an important volume of expenditures which has to be absorbed in a certain period of time, at the same time following the gaining of a profit which can ensure its continuity. They refer to the food cost, transport expenditure, ammunition, wages for the personnel within the hunting fund. We present in Table 5 the structure of expenditure for the maintenance of game in 2007.

Table 5

The structure of expenditures for game maintenance

Specification	MU	Quantity	Value (lei)	
			Unitary	Totally
Lease hunting fund	lei	-	-	431.17
Salt	Kg	615	0,5	307.50
Maize –grains	Kg	2000	0,35	700.00
Repair feeding places	Pc	5	35	175.00
Building feeding places	Pc	10	50	500.00
Designing hunting paths	Km	1.5	100	150.00
Wages custodian	lei	12 months	420	5040.00
Wages contributions to the state	lei	13 months	136.5	1638.00
Ammunition	lei	-	-	458.72
Equipment	lei	-	-	150.00
TOTAL EXPENDITURE				9550.39

Of the total expenditures for hunting activities, the weight is held by the wages expenditures – 70%, followed by forage expenditures, 7,3%. The rest of the expenditures are under 4,5%.

The calculus of the income from hunting activities in the hunting season 2006-2007 is presented in Table 6.

Table 6

The structure of income obtained from hunting

Specification	MU	Quantity	Value (lei)		%
			Unit	Total	
Roebuck					
- males trophies (inland)	Pc	2	450	900	5,6
Black-cock (out-land)	Pc	2	3340	6680	41,6
Black-cock (inland)	Pc	2	1000	2000	12,4
Game meat					
Common deer					
- male	Pc	2	1000	2000	12,4
-female and youth	Pc	3	750	2250	14,0
Roebuck					
-female and youth	Pc	2	120.24	240.48	1,5
Wild boar	Pc	5	400.8	2004	12,5
Total income				16074.48	100,0

Of the total income, the weight is held by the black-cock (41,6%) as a consequence to the hunting actions with foreigners. There have been obtained income from deer trophies and black-cock with inland hunters. By capitalization of the game meat, the income represented about 40% of the total. The difference between income and expenditure represent the profit. As we can notice, it is not very big (6524,09 lei), the economy of the game representing a reduce weight of the total economic activity within No1 Pinu Hunting Fund.

CONCLUSIONS

1. No1 Pinu Hunting Fund found in the Broșteni Forestry District has an area of 12.351 ha occupied 80% of the productive hunting area. Of this area, 70% is largely covered with resinaceous species.

2. The studied area ensures vary favourable conditions for the game life. There have been identified 16 game species, of which the most numerous overcoming the optimum density are the common deer, wild boar, black-cock and fox.

3. From the economic point of view the income obtained from the capitalization of the game overcome the expenditure ensuring the efficiency of this branch. Nevertheless we consider that the gained profit from game management has a reduced weight within the economic activity of Pinu Hunting Fund, being imposed different activities for the increase of the profit.

REFERENCES

1. Cotta V., Bodea M., Micu I., 2001 – *Vânătorul și vânătoarea în România*. Editura Ceres, București;
2. ^{xxx} – *Legea vânătorii și a protecției fondului cinegetic nr. 407/2006*.

ANALYSIS OF THE ECONOMIC SIZE OF BEEKEEPING HOLDINGS IN ROMANIA

ANALIZA DIMENSIUNII ECONOMICE A EXPLOATAȚIILOR APICOLE DIN ROMÂNIA

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Abstract. *The proposed paper belongs to the objectives of the second implementation phase of the project PN II no. 51-058/2007, entitled "Development and implementation of models of beekeeping holdings that are viable in the European economic context" (APIMODEL). An average size of 21.1 bee families has been obtained after data processing.*

Key words: beekeeping, average production, economic dimension, Romania

Rezumat. *Lucrarea propusă face parte din obiectivele etapei a II-a de implementare a proiectului PN II nr. 51-058/2007, cu titlul „Elaborarea și implementarea unor modele de exploatații apicole viabile în contextul economic european” (APIMODEL). În urma prelucrării datelor a rezultat o dimensiune medie de 21,1 familii de albine.*

Cuvinte cheie: apicultură, producție medie, dimensiune medie, România

INTRODUCTION

The sampling method has been used to analyze the economic size.

For the regional development of beekeeping, important is to know the economic size of the beekeeping holdings in Romania. [2]

MATERIAL AND METHOD

For the policies concerning development policies, the starting point is represented by knowing the development level of these branch. [1]

The used method was the interview. In the field-applied version, the interview guide included 49 questions and it has been applied in 21 counties. The total number of filled-in questionnaires was 126.

RESULTS AND DISCUSSIONS

By data processing resulted the following:

In the year 2008, the largest number of bee-families belongs to Mureș County (38,6 thousand bee families), followed by Caraș-Severin County (37,7 thousand), Argeș (35,9 thousand), Arad (34,9 thousand), Vâlcea (33,3 thousand) and Iași with 31,8 thousand bee families (table 1).

At the opposite side is Ilfov County with 7,8 thousand bee families. Brăila County has 7.7 thousand bee families due to the large arable surface that may

offer in the bee season a rich harvest for the bee families; afterwards the honey-producing potential is very much reduced.

Within the territorial profile, the holdings' average size is 21,1 thousand bee families thousand bee families by county. [3] The number of bee families by county has equal distribution, being registered 22 counties with more than the average number and 20 counties with less than the average number. This phenomenon proofs that there are no very large discrepancies from a region to another.

Taking into account that the counties do not have the same areas, the number of bee families by area unit has been calculated.

Table 1

Distribution of bee families by county

Nr. Crt.	Counties	Bee families	Nr. Crt.	Counties	Bee families
0	Total	888.180	21	Harghita	16.642
			22	Hunedoara	19.873
1	Alba	26.802	23	Ialomița	12.273
2	Arad	34.915	24	Iași	31.774
3	Argeș	35.927	25	Ilfov	7.694
4	Bacău	24.080	26	Maramureș	22.494
5	Bihor	27.832	27	Mehedinți	20.210
6	Bistrița-Năsăud	16.118	28	București	9.590
7	Botoșani	20.346	29	Mureș	38.638
8	Brașov	15.039	30	Neamț	18.831
9	Brăila	7.724	31	Olt	17.679
10	Buzău	19.964	32	Prahova	21.526
11	Caraș-Severin	37.666	33	Satu Mare	12.853
12	Călărași	17.031	34	Sălaj	29.126
13	Cluj	14.725	35	Sibiu	25.311
14	Constanța	26.601	36	Suceava	15.890
15	Covasna	11.118	37	Teleorman	25.023
16	Dâmbovița	23.969	38	Timiș	14.690
17	Dolj	21.485	39	Tulcea	19.963
18	Galați	20.742	40	Vâlcea	33.267
19	Giurgiu	8.562	41	Vaslui	25.280
20	Gorj	24.782	42	Vrancea	14.125

This indicator illustrates the overspreading degree of the melliferous potential (table 2). The average of this indicator at national level is 4,7 thousand bee families. The average is very high due to Ilfov County; without it, the average will be 3,8 thousand bee families /100 ha.

Thus, the highest density of bee families is registered in Ilfov County with 40,3 bee families /100ha, with almost 33 families more than the next ranked county. This phenomenon is caused primarily by the large population volume, the

existence of some beekeeping exploitations of large size that are using moving beekeeping and the reduced area in comparison to the others territories.

Following Ilfov County, the largest density of bee family is registered in Sălaj County with 7,5 families /100ha, followed by Dâmbovița County with 5,9 families /100ha, followed by Iași, Vâlcea and Mureș Counties with 5,8 families /100ha.

Table 2

Honey production (tones)					
Nr. crt.	County	Extracted honey	Nr. crt.	County	Extracted honey
	Total	17704	21	Gorj	477
			22	Harghita	300
1	Alba	562	23	Hunedoara	550
2	Arad	552	24	Ialomița	254
3	Argeș	745	25	Iași	576
4	Bacău	467	26	Ilfov	185
5	Bihor	732	27	Maramureș	501
6	Bistrița-Năsăud	263	28	Mehedinți	414
7	Botoșani	285	29	Mureș	1113
8	Brașov	634	30	Neamț	394
9	Brăila	169	31	Olt	267
10	București	63	32	Prahova	283
11	Buzău	457	33	Satu Mare	203
12	Caraș-Severin	1003	34	Sălaj	408
13	Călărași	336	35	Sibiu	365
14	Cluj	300	36	Suceava	373
15	Constanța	450	37	Teleorman	406
16	Covasna	239	38	Timiș	304
17	Dâmbovița	501	39	Tulcea	456
18	Dolj	438	40	Vâlcea	353
19	Galați	437	41	Vaslui	459
20	Giurgiu	179	42	Vrancea	251

The lowest density with less than 2 bee families /100ha is characteristic for Suceava, Timiș and Brăila Counties.

The counties from the eastern border, namely Botoșani, Iași, Vaslui and Galați have a high favorable degree for beekeeping due to the micro-climate conditions in Lunca Prutului. This situation exists also in the pre-mountain zone of Podișul Transilvaniei.

In the year 2008, in România were 41.311 beekeeping holdings.

The counties with the largest holdings are Teleorman (1625 beekeeping holdings), Argeș (1577 holdings) and Vaslui (1576 holdings). The lowest number of holdings is registered in Ilfov County (326 holdings), followed by Covasna County with 335 beekeeping holdings.

The national average of the holding number by county is 993, with the highest value of 1299 holdings. Both the holding number, as well as the

distribution by county wouldn't worry if the size could be optimum. The average size by holding is 22,6 bee families, taking into consideration that the economic level of farm viability is 50 bee families.

The maximal size is registered in Constanța County with 43,1 bee families by holding, in Tulcea County with 32,8 bee families by holding and in Covasna County with 32,8 bee families by holding.

The smallest holdings are registered in Timiș County (10,1 bee families), Suceava County (10,8 families) and Cluj County with 11,7 families by holding. These units are not economic viable, a great part are used for leisure in a productive manner, or to use some reduced melliferous resources that do not allow the setting up of some large bee gardens or represents a subsequent activity for economic units with another profile of activity (mostly agricultural). In these conditions we don't talk about efficiency, but about the consumption of available and perishable resources.

In Romania it noticed that the farms or the holdings with the highest capacity of production are situated in the extreme South-East of the country, in the counties located near the Black Sea, in the Center and in North-West. The mountain and sub-mountain zone includes holdings of average size, and the counties with small holdings are relatively randomly located.

Another analyzed indicator is represented by the average production. The average production by country, in the year 2008, was 19,9 kg/bee family, higher than the previous years.

CONCLUSIONS

1. In the territorial profile, the average size of the beekeeping holdings is 21,1 thousand families by county.
2. The average size of the beekeeping holding is 22,6 bee families.
3. The honey average production by country in the year 2008 was 19,9 kg/bee family.

REFERENCES

1. **Bodescu D., 2007** - *Eficiența economică a apiculturii în Romania*. Editura Alfa, Iași, p. 33-61.
2. **Ștefan G., 2006** - *Economie Agrară*. Editura Junimea, Iași, p.284-311.
3. *****, 1990-2008** – *Anuarul statistic al României*. The National Institute of Statistics, București.

METHODOLOGICAL PROBLEMS CONCERNING THE ANALYSIS OF TECHNICAL-ECONOMIC RESULTS OBTAINED IN BEEKEEPING

PROBLEME METODOLOGICE PRIVIND ANALIZA REZULTATELOR TEHNICO-ECONOMICE OBTINUTE ÎN APICULTURĂ

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***Abstract.** The paper presents the main methodology elements regarding the quantitative and qualitative evaluation of the apiarian production factors in Romania. The first stage in implementing the project PN II n0. 51-058/2007, called „The elaboration and implementation of models of viable apiarian exploitations in the european economic context” (APIMODEL) has as a main objective the organization of the research infrastructure and the evaluation of the apiarian potential in Romania. This phase consists in establishing the research methods, quantification of the research materials and equipments which will be used for the development of the project.*

Key words: beekeeping, evaluation, factors, method

***Rezumat.** Lucrarea prezintă principalele elemente de metodologie privind evaluarea cantitativă și calitativă a factorilor de producție apicolă din România. Prima etapă de implementarea a proiectului PN II nr. 51-058/2007, având ca denumire „Elaborarea și implementarea unor modele de exploatații apicole viabile în contextul economic european” (APIMODEL) are ca obiectiv central organizarea infrastructurii de cercetare și evaluarea potențialului apicol din România. Această fază a presupus stabilirea metodelor de cercetare, cuantificarea necesarului de materiale și a echipamentelor care vor folosi pentru derularea proiectului.*

Cuvinte cheie : apicultură, evaluare, factori, metodă

INTRODUCTION

The complex diagnosis of the technical-economical results obtained in the Romanian apiculture involves following the next stages:

- establishing the methodology that makes possible the passing from analytical to synthetical information;
- defining the indicators aggregation algorithm and comparing the results with the scales method (above average, average, below the values average);
- choosing the utilized standard for measuring the performances;
- presenting the problems in the development of the apiarian sector. [2]

MATERIAL AND METHOD

The methodology of the technical-economical diagnosis is conceived to highlight and characterize the present situation through the utilization of the methods based on direct observation (non-economic enquiry based on questionnaire and interview). The data

base is constituted of apiarian units considered etalon and statistical data published an national level.

RESULTS AND DISCUSSIONS

1. Establishing the methodology that makes possible the passing from analytical to synthetical information has at the base the operational distinction between indicators that express situations and indicators that express resources. The utility of such a distinction is present considering the plan of the research direction because it expresses:

- the information that characterize the situation of the apiculture and mainly concern the evaluation of the level of development.
- the information which represents the resources to indicate the development policies and the commercialization ways as efficiently as possible of the specific potential of every area.

Depending on the importance that the indicators and criteria hold in the analysis, these can be integrated in the algorithm of calculus with different integration values. As a result of the mathematical aggregation operations, the apiarian exploitations are distributed on a relative extended scale. The minimum and maximum values of the new series of indexes, as they resulted from calculations, don't coincide in any case with the minimum and maximum hypothetical values determined for the situation in which a exploitation accumulates the maximum score possible and another the minimum score possible. The lack of coincidence between the two minimums and the two maximums signifies that in Romania there are no apiarian areas that hold just positive phenomena and others with just negative phenomena. In this purpose a conclusion can be drawn with a methodological value from the manifestation of the development policies: on the other hand, the fact that any apiarian area, as underdeveloped as it is, holds positive aspects in its development, as developed it is.

In phase 1, there are four operations:

- a. the selection of relevant indicators for constituting the index of aggregated criteria;
- b. establishing the share of each indicator, respectively each indicator, in the calculations of the index of aggregated criteria;
- c. the evaluation of the intensity of the behavior of indicators depending on the scale established for each indicator;
- d. the computerization of the obtained score by each criteria for indicator/criteria;

2. The definition of area with the help of criteria based on the aggregation algorithm and their integration into three categories. For two of these criteria: demographic and social depending on the characteristic indicators for the respective phenomenon exists intermediate aggregations: after the situation and potential (resources) indicators. In this case a global aggregation regarding the mentioned aspects must be achieved. Through the correlation of the characteristics of the apiarian zones with those of each county it has been established the structure of the sample group from a spatial point of view, formed from 21 counties (fig. 1). In every county, it was necessary the sampling of bee hives after group sizes of the bee

families for the dimension intervals: 0-50 families, 50-100 families and over 100 bee families.

This grouping has been realized according to the cotes procedure care assumes following two steps:

- the construction of a reduced mode of the population looked up by the research;
- establishing subjects cotes for each operator.

The model is defined by the sizes of the bee hives and their share in each group. The second stage is represented by the distribution of subject models per operators. [1] Once established the characteristics of the population in the sample group we proceeded to realize the enquiry plan which holds the interview technique, the type of interview, the moment, the interview guide and the means through which this is realized. The interview guide has been thoroughly checked in a pre-enquiry realized on a reduced number of subjects with the purpose of discovering the possible inadvertencies, the completion and modelation of question in report with the way in which this was perceived by the interviewed population and the measured in which in offered the proposed results.

3. Choosing the standard utilized for measuring the performances

When the scale of distribution for the values of aggregated indexes with which performance through criteria is measured, there are two options for answering this question: "what kind of standard will be utilized for measuring the performance?"

- the construction of a scale which has a hypothetical minimum and maximum or
- the construction of a scale which has as a maximum and minimum the actual values obtained from the calculated indexes. The difference between these two procedures is substantial and has a significant importance from many reference points:
 - first of all, the scale helps us appreciate the way in which it is positioned in comparison with the maximum possible for the respective criteria (searching the highest level possible);
 - second of all, the scale helps us appreciate the position of the apiarian area in comparison with a relative good level, searched during the analysis.

It is considered that the second solution is preferable because it is preferable to compare one apiarian area to another, to compare each apiarian area with itself during the analysis and not with an ideal situation that might be differently built. The processing and interpretation of data presumes the ordination stage and the classification after the criteria they have been collected and their placement in the data base to make possible their interpretation. It must be mentioned the fact that in the calculation of the average of phenomena it shall not be determined always the simple arithmetical average, but the average of their evolution in comparison with the share of the respective categories. The determination of these indicators permits a clear evaluation of the development level of the apiculture in the studied area in objective of identification of the unfavorable elements, the possible organizational and administrative lacks and also the ways of amelioration of the profitability and of the socio-economic efficiency of this activity. Utilizing the methodological scheme presented above, we proceeded to dividing the national territory in six favorability areas.



Fig. 1. The structure of the sampling group per counties

4. The presentation of the development problems of the apiarian sector

The results of the aggregated information shows that the apiarian area vary regarding their size and development degree, areas with adequate development base and areas with low development perspectives being identified. The final diagnosis represents a synthesis of the characteristics of apiculture that leads to its zonation by the variation degree of the variables considered as a multi-criterial system. The zonation of apiculture is the starting point for the formulation of principles, policies and strategic principles for apiarian development.

CONCLUSIONS

1. The complex diagnosis of the technical-economical results obtained in the Romanian apiculture implicates following the next stages:

- establishing the methodology that makes possible the passing from analytical to synthetical information;
- the definition of the aggregation algorithm of indicators and the comparison of results with the scales method (above average, average, below the values average);
- choosing the standard utilized for measuring performances;
- the presentation of problems in the development of the apiarian sector;

2. The field research has at the base the sociological interview technique realized on a representative sampling group on the basis of the main characteristics of the apiarian exploitations: the bee families, the average productions and the average melliferous potential.

REFERENCES

1. **Bodescu D., 2007** - *Eficiența economică a apiculturii în România*. Editura Alfa, Iași, Capitolul 2, p. 33-61
2. **Ștefan G. 2006** - *Economie Agrară*. Editura Junimea, Iași, Capitolul 8, p.284-311

PECULIARITIES REGARDING THE COST CALCULATION IN HORTICULTURE

PARTICULARITĂȚI PRIVIND CALCULAȚIA COSTURILOR ÎN HORTICULTURĂ

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Abstract: *The knowledge of the cost, as an expression of the consumptions, presents a major importance in the fundament the managerial decisions. The purpose of the paper is in establishing the peculiarities that the production process in horticulture presents and in determining the influences of these peculiarities over the cost calculation of the horticultural production. The method of research chosen starts from general aspects regarding the role of the costs in the managerial decision making and leads to the particular aspects of the types of specific production costs in horticulture. In the process of profitable leadership, besides knowing the costs, their structure, an important role comes to establishing the methods, procedures and techniques used in the production costs establishment. By analyzing the calculation methods of the complete cost in horticultural units, we consider that we can apply a calculation of the total costs on types of cultures. A defining characteristic of this method of cost calculation is in the activity delimitation of each subunit (agricultural farm, auxiliary sector) as to the production expenses, incomes and financial result. This delimitation is made at the level of the subunits through the system of operative records. We can conclude that, dividing the activities of the horticultural unit in production farms, auxiliary sectors and functional compartments represents the support for the delimitation and responsibility growth in accomplishing the agricultural unit's objectives as an economical entity.*

Keywords: cost, decision, strategy, performance, forecast.

Rezumat: *Cunoașterea costului, ca expresie a consumurilor, prezintă o importanță deosebită în fundamentarea deciziilor manageriale. Scopul lucrării constă în stabilirea particularităților pe care le prezintă procesul de producție din horticultură și în determinarea influențelor acestor particularități asupra calculației costurilor producției horticole. Metoda de cercetare aleasă pornește de la aspectele generale referitoare la rolul costurilor în decizia managerială și ajunge la aspectele particulare ale tipurilor de costuri specifice producției din horticultură. În procesul conducerii profitabile, în afară de cunoașterea costurilor, a structurii acestora, un rol important îl are stabilirea metodelor, procedurilor și tehnicilor utilizate în stabilirea costurilor de producție. Analizând metodele de calculație ale costului complet în unitățile horticole, considerăm că se poate aplica o calculație a costului complet pe tipuri de culturi. O trăsătură definitorie a acestei metode de calculație a costurilor o constituie delimitarea activității fiecărei subunități (fermă agricolă, sector auxiliar) sub raportul cheltuielilor de producție, veniturilor și rezultatului financiar. Această delimitare se realizează la nivelul subunităților prin sistemul evidenței operative. Putem concluziona că, împărțirea activității unității*

horticole pe ferme de producție, sectoare auxiliare și compartimente funcționale reprezintă suportul pentru delimitarea și creșterea responsabilităților în realizarea obiectivelor unității agricole ca entitate economică.

Cuvinte cheie: cost, decizie, strategie, performanță, previziune.

INTRODUCTION

The strategies and policies elaborated by managers have a crucial role in the conceiving and foundation process of the economical entity's activities. What characterizes the informational flow of the costs is the emphasis on operatively information. Without the cost calculation in real time and viable predictions on the costs evolution, it wouldn't be possible to adopt the most efficient managerial strategies and policies. The prediction function of the accountancy becomes more and more important. No matter the form they take, information regarding costs is one of the basic instruments of the modern firm's management.

Through costs we assure" the measurement of the necessary efforts made in accomplishing a product or a service" (Rayburn L. G., 1986). Knowledge of the costs is 'one of the basic imperatives in decision making, whether it's about the enterprise or not" (Bouquin H., 2003).

MATERIAL AND METHOD

The choice of a calculation of the costs method for production costs in horticulture is influenced by a series of particularities of the production process (Băviță I. and others, 2008). The term to which the production cost can be determined is the first particularity in determining the costs in horticulture. If in most industrial units the production cost can be established monthly, in horticultural farms, establishing a production costs at short time periods (a month) can be difficult because of the mismatch between the period when the consumption of resources takes place and the period when the production is obtained. The time gap, relatively long, between the date of the expenditure and the date of obtaining the production, the lack of rhythmicity under quantitative aspect of the obtained production, the expenses related to the administrative and managing of the farms processes, which take place after the production is obtained, are all criteria which must be taken into consideration when establishing the moment in which the calculation of the unit costs of the production can be made.

The unit cost of production can be determined monthly only if the expenses made and the production obtained in that month is known. Calculation of the monthly unit cost of production based on the reference data month of obtaining the production or on aggregate data should not be considered a final cost. Unit cost of production, being a size which must result from reporting the actual costs to the obtained production, requires farms to make at the end of the year the final calculation based on data representing the level of actual resources consumption.

Another feature of the production process in horticulture relates to the complexity of the production process that causes an exchange of activities between production farms or between production farms and ancillary sectors. The critical coordinate regarding the evaluation of the exchange activities that must be taken into consideration when calculating unit costs, should be the effective level of effort by each firm or sector production assistants.

Following the particular horticultural work, we intend to explore the possibility of applying calculation methods of costs in horticulture. In choosing the method of calculation of costs one must take into account the following factors generators of production costs (Budugan D., 2002): the specific technology of production, type of production and its organization, the size of the horticultural farm, organization structure of the horticultural farm, the production process, technical progress and the character of the production process. For horticultural farms, the production is generally seasonal in nature. In deseasonalization they can not make a proper calculation of costs, but they register expenses incurred by the maintenance of equipment, preparation for future production, etc. These costs are considered anticipated expenses.

Methods of calculation of the costs are divided into two broad categories: methods of calculating the full cost and method of calculating part of the cost. The best known method of calculating the full cost is: global method, the phase method, method based on order and the standard cost method. The best known methods for determining the partial costs are variable cost method and the method of direct costs. The method for determining the partial costs does not primarily calculate the unit costs, but calculates and analyzes profitability across economic units.

RESULTS AND DISCUSSIONS

Dividing the activities of the horticultural unit in production farms, auxiliary sectors and functional compartments represents the support for the delimitation and responsibility growth in accomplishing the agricultural unit's objectives as an economical entity.

Comparing the activity content of the production farm with the activity of other economical subunits in other branches, the quantification of the financial result on production farms is doable. If in industry the final product is the result of successive processing of the raw materials in more production sections or of the parallel processing of some materials in order to mechanically assemble them, in the case of horticultural units the final product is delimited for each production farm. In this situation the incomes and expenses of each agricultural farm are easily quantifiable.

In order to follow the way in which the production factors were consumed by the horticultural unit and in order to calculate correctly the production costs and therefore the financial results, accountancy must register in time and in full, the production expenses.

To determine the advantages and disadvantages of the methods of calculation of costs is necessary a comparative study of two methods: partial cost method and cost method complete.

The effects of the two categories of methods are highlighted by the following example:

We consider that at a horticultural farm, in the period under review, we obtain 30 tons from the product A. The structure of production costs is as follows: Direct production costs 60 000 RON, variable overheads 500 lei / tone, fixed costs of production 9 000 lei. From the production is sold a quantity of 27 tones. Marketing expenses have the following structure: fixed marketing expenses 6 000

lei and variable marketing costs 600 Euro / tone. General administration costs are fixed for 5 000 lei. We determine the unit cost of production, total production costs, the cost of goods sold, expenses recorded in the profit and loss balance of the final products.

Data presented and calculations are presented in Table 1 which compared the effects of variable cost methodology as a part of the costs and full cost methodology.

Table 1

Variable costs method and full cost method

Elements	Variable costs method	Full cost method
Unit cost		
Direct expenses (60 000 lei/30 tone)	2 000	2 000
General variable expenses (15 000 /30 tone)	500	500
Fixed production expenses (9 000 lei/30tone)		300
Unit cost of production	2 500	2 800
Total production expenses to be accounted 30 tone x 2 500 lei 30 tone x 2 800 lei	75 000	84 000
Deductible expenses in determining the profit		
Cost of the sold goods 27 tone x 2 500 lei 27 tone x 2 800 lei	67 500	75 600
Fixed production expenses	9 000	
Fixed marketing expenses	6 000	6 000
Variable marketing expenses 27 tone x 600 lei	16 200	16 200
Fixed general administration	5 000	5 000
Expenses that appear in the profit and loss balance	103 700	102 800
The balance of the final products 3 tone x 2 500 lei 3 tone x 2 800 lei	7 500	8 400

Analyzing data from Table 1 we find differences between the two methods both in terms of unit cost of production and the costs that appear in the profit and loss balance. These differences are generated by the fact that in the method of variable costs, fixed production costs are not charged on units produced, but are treated as period costs.

Variable cost method provides an essential economic judgment in the short term, in which the horticultural entity uses its existing production capacities. It allows the comparisons between the performances of the portfolio comprising agricultural entity. Performance brought by each product is given by gross margin per unit of the variable cost which is determined as the difference between the turnovers achieved from the sale of each product and the cost of the variable.

In using the variable costs method it should be taken into account its limits. Average profitability per product, only depending on the size of the unit gross

margin cost variable is not sufficiently relevant. Also, structure expenses are fixed only on periods of time, and their separation of the variable ones is often difficult.

Regarding the full costs, we can say that the phase method, the method on orders and the standard cost method are least applied in horticulture, but the overall method can be used successfully for crops and vegetable crops in open field which show a single product, for greenhouses if at it's level grows a single product and ancillary sectors serving a horticultural farm.

The global method is used by companies in the horticulture field who have an homogeny production, implying that the structure of the company or even the whole society is to achieve a single type of product or service work. Determining the cost is based on the collecting costs on responsibility centers (farms, areas of service) or the according to the nature of the expenditure (raw materials, wages, depreciation, electricity and water). All costs of production can be identified directly in the process in which they occurred or in the production process who has generated them.

The phase method may still be used in determining the cost of the wine production process because it involves going through several phases.

We believe that the method on orders is not suitable for horticultural production cost calculation. At most it can be used to determine the cost of ancillary sectors such as mechanical workshop.

The rigidity of standards and constraints imposed by these constitute the main drawbacks of using the standard cost method. In addition, in horticulture there are a number of factors that can intervene (temperature, humidity, etc.) which can not be quantified with precision for a long period of time

Costs and their calculation is a true instrument of leadership due to their forecast character. For managers of horticultural entity, the future is what counts and the present should be seen as a step towards the future.

CONCLUSIONS

Horticultural production cannot be accomplished without involving the fixed expenses, which become, by applying the complete costs method, a component part of the production cost.

In the case of businesses, in which there are stocks due to production seasonality, the presence of fixed expenses in the cost of these stocks is required and, therefore, the complete costs method cannot be avoided.

The variable costs method can be used for reporting in the decision making analysis, especially when we must choose between the continuations of a certain type of vegetal culture and introducing a new type of vegetal culture.

The best cost for a horticultural farm isn't necessarily the lowest, but the one that occurs at the right time and at the right place.

REFERENCES

1. **Băviță I. (coordonator), Calu D.A., Dumitru M., Popa A.F., Pitulice I.C., 2008** – *Contabilitatea în agricultură: abordări teoretice și practice*. Editura Contaplus, București
2. **Bouquin H., 2003** – *Comptabilité de gestion*. Economica, Paris
3. **Budugan D., 2002** – *Contabilitate și control de gestiune*. Editura Sedcom Libris, Iași
4. **Călin O., Cârstea Gh., 2002** – *Contabilitatea de gestiune și calculația costurilor*. Editura Genicod, București
5. **Dumitru M., Calu, D.A., 2008** – *Contabilitatea de gestiune și calculația costurilor*. Editura Contaplus, București
6. **Rayburn L.G., 1986** – *Principles of Cost Accounting: Managerial Applications*. Third Edition Irwin
7. **Ristea M., Possler L., Ebeken K., 2000** – *Managementul și calculația costurilor*. Editura Teora, București
8. **Yves B., Colli J. C., 1994** – *Vocabular economic și financiar*. Editura Humanitas, București

THE MAIN MEASURES OF FINANCING THE VINE AND WINE SECTOR

PRINCIPALELE MĂSURI DE FINANȚARE A SECTORULUI VITIVINICOL

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Abstract. *One of the sectors with an important recovery potential is the vine and wine sector. The representatives of our country have concluded an agreement with the representatives of the European Union in order to reform the joint organization of the vine and wine market. The reform will guarantee the preservation of the environment in the vine areas will safeguard the traditional quality policies and will simplify the labeling rules in the benefit of both the producers and the consumers. It is stipulated a quick reorganization of the vine and wine sector by including of a volunteer three year system of fallowing in order to eliminate the excess of production and the uncompetitive wine. These changes will balance the vine and wine market and will lead to the elimination of the inefficient and expensive actions of market intervention and the reorientation of the budget towards positive and proactive actions which will stimulate the competitiveness of the European wines. To support these reforms substantial funds have been allocated for restructuring and conversion of vineyards, on the basis of agricultural policy measures which were completed in 2008 within the frame of the wine market reform.*

Key words: structural funds, international funds, the vine and wine sector.

Rezumat. *Unul dintre sectoarele cu potențial important de redresare este sectorul vitivinicol. În aceste sens reprezentanții țării noastre au încheiat acorduri cu reprezentanții Uniunii Europene în vederea reformării organizării comune a pieței vitivinicole. Reforma va garanta protecția mediului în regiunile viticole, va salvarda politicile tradiționale și constante privind calitatea și va simplifica normele de etichetare, atât spre beneficiul producătorilor, cât și spre cel al consumatorilor. De asemenea, se prevede o restructurare rapidă a sectorului vitivinicol prin includerea unui sistem voluntar de desțelenire pe o perioadă de trei ani, în vederea eliminării excedentului de producție și a vinului necompetitiv de pe piață. Aceste schimbările vor permite echilibrarea pieței vitivinicole, eliminarea măsurilor ineficiente și costisitoare de intervenție pe piață și reorientarea bugetului spre măsuri pozitive și proactive, care vor stimula competitivitatea vinurilor europene. Totodată pentru sprijinirea acestor reforme s-au alocat fonduri substanțiale pentru restructurarea și reconversia viilor, pe baza unor măsuri de politică agricolă care s-au finalizat în 2008 în cadrul reformei pieței vitivinicole.*

Cuvinte cheie: fonduri structurale, finanțări internaționale, sector vitivinicol,

INTRODUCTION

The wine consumption in the EU has seen lately a steady decline, while the volume of wine exported from the EU since 1996 increased at a pace much slower than that of imports. This has led to a deterioration of the balance between supply and demand, which in turn has considerable consequences on prices and producers' incomes. However not all the tools provided by the EU have proved effective for targeting the wine sector to a competitive and sustainable development.

MATERIAL AND METHOD

The paper aims to emphasize the funding measures for the wine sector, who can access these grants, which are the conditions and the current legal framework under which this financial support is achieved. The study was carried out under effectual legal regulations valid for the wine sector, both at Community and national level, because wine market stabilization, the wine sector restructuring and increasing the competitiveness of wine producers in the EU can not be achieved only on internal financing. Given that, on the one hand, specific measures of market mechanisms were often mediocre from the cost-effectiveness point of view, to the extent that they encouraged structural surpluses without imposing structural improvements, and on the other hand, some of the existing regulatory have unduly restricted the activities of competitive producers in order to restructure the wine sector was appropriate, changing the fundamental rules of the Community sector, so as to achieve the proposed objectives, such as:

- increasing the competitiveness of wine producers in the EU;
- strengthening the reputation of quality wine in the EU as the best worldwide;
- regaining old selling markets and winning of new markets in the EU and worldwide;
- establishment of a wine regime that operates on the basis of clear rules, simple and effective, creating a balance between supply and demand, setting a wine regime that preserves the best traditions of Community wine production, reinforces the social structure of many rural areas and ensure that the entire production process is environment friendly.

During 2006 there were discussions between the Economic and Social Committee and the Committee of the Regions, as a result being adopted the reports on the possibility to reform the wine sector. In early 2007, the European Parliament adopted on its own initiative, a report on the issues mentioned above, the findings being considered in Regulation (EC). 1234/2007 establishing a common organization of agricultural markets and on specific provisions for certain agricultural products that should be finally applied to the vine and wine sector. The provisions of this Regulation on horizontal issues should be brought to a higher extent possible with the single CMO Regulation, which includes horizontal provisions, particularly in trade with third countries, competition rules, controls and sanctions, information exchange between Commission and the member countries. On this occasion, it is important to provide support measures likely to strengthen competitive structures. Although it is indicated that these measures to be defined and funded by the Community, the member countries should be free to choose the appropriate range of measures to meet the needs of regional organizations, taking into account the peculiarities, if necessary, and to integrate into the national support programs. The member countries should assume the responsibility for implementing these programs.

Concerning the support offered to the vine and wine sector, it should come from structural measures provided in the regulation on support for rural development from the European Agricultural Fund for Rural Development. According to the regulation adopted at the European level, the following measures should be considered a priority for the vine and wine sector: the establishment of young farmers, investments in technical equipment and improvements related to marketing, training, and support for information and promotion granted to producer organizations participating in a quality program, support for agricultural environment, early retirement of farmers deciding to permanently cease all commercial farming activity to transfer the holding to other farmers.

In cases where the amount of money are sufficiently important, in order to supplement the funds available should be established a progressive transfer of funds to the budget. On the other hand, regulatory measures should be applicable in the wine sector, in particular for reasons of health, quality, and for reasons related to consumer expectations.

RESULTS AND DISCUSSIONS

To support the wine sector for the period 2009 - 2014 The European Union has allocated funds for each country. The allocation of the community funds available and budget limitations for each country, expressed in millions of Euros are presented in Figure 1. One can note that the largest limitations in decreasing trend were allocated to Estonia (ES), France (FR), Italy (IT), and the smaller (few thousand Euros) to be allocated to Lithuania (LT) . Romania (RO) receives funds annually from the constant EU the limitations amounting to 42 million.

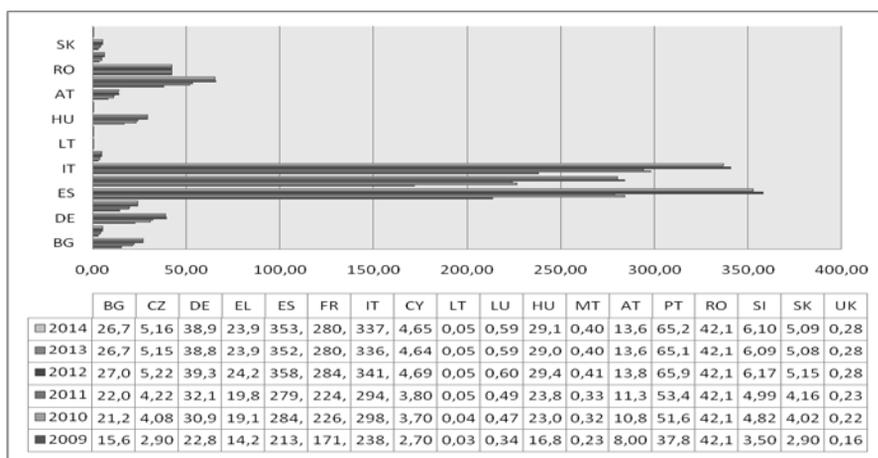


Fig. 1 Budget ceilings for each EU country for supporting the wine sector.

Community support is granted only for eligible expenses incurred after the support programs. The maximum level of aid is applied to the public global financing which includes both EU funds and national funds.

In accordance with EC Regulation on the common organization of the wine market our country adopted measures which are granting financial community support to the wine producers, natural or legal persons or organizations who

provide harvest vineyard with varieties of grapes for wine. Support is provided by the state budget through the Ministry of Agriculture and Rural Development and represents pre-financing by the European Agricultural Guarantee Fund. Payment is carried out from 1 January 2009.

Measures for which community financial support is granted to the wine producers are:

Promotion on the third countries markets of the wines with protected designation of origin or protected geographical indication for wines that show variety. The measures referred to in paragraph may contain only the following: public relations, measures to promote or advertise, which emphasize in particular the advantages of community products, especially in terms of quality, food safety or environmental compliance, attending various events, fairs or exhibitions of international importance, information campaigns, in particular those relating to the designation of origin, geographical indications and organic production, studies of new markets, necessary for the expansion of market outlets; studies evaluating the results of the promotion and information. For the promotion of third-country markets is granted financial aid from the state budget in the form of financing amounting to 30% of the eligible costs.

Restructuring and conversion of plantations of vineyards with noble varieties of grapes for wine. The goal of the measures on restructuring and conversion of plantations is increasing the competitiveness of producers of wine. The support for restructuring and conversion of plantations can only cover one or more of the following activities: varietal, including by means of repeated grafting; replanting plantations, improving management techniques plantations. The normal replacement of the plantations at the end of their natural life is excluded from support. The support for restructuring and conversion of plantations can only take the following forms:

- Indemnification of producers for loss of income as a result of implementing the measure;
- Contribution to the costs of restructuring and conversion. Compensate producers for their loss of income, may cover up to 100% of relevant losses and take one of the following forms: the authorization of the coexistence with the old vineyards for a period not exceeding three years, expiring at the end of the transitional regarding the planting rights or a financial compensation.
- The Community contribution to the costs of effective restructuring and conversion to plantations must not exceed 50% of them. In regions classified as convergence regions the contribution to the costs of restructuring and conversion does not exceed 75%. In our country support related plans in operation and approved by the Agency for Payments and Intervention for Agriculture is payable in 2008 and is ensured by the state budget through the Ministry of Agriculture and Rural Development.

Harvest grape insurance by the producers in the wine sector. Support for crop insurance to help safeguard producers' incomes when they are affected by

natural disasters, weather phenomena with adverse effects, disease or infestation by pests. Support for harvest insurance may be granted only if the payment of the insurance does not cover 100% of income suffered, taking into account any other compensation that they have obtained under other support schemes about the insured risk.

Use of concentrated grape must to rise the alcoholic strength of wine.

Investment to develop the wine sector.

Bonus paid to producers that are clearing vineyards in 2008-2009, 2009-2010 and 2010-2011 campaigns.

The annual financial support for the first 5 measures is 42.1 million Euros.

To receive financial assistance the payees must meet certain eligibility conditions, such as to prove that exploits an area planted with vine grape of least 0.1 ha; to provide the evidence of admission to the Vineyard Register of the area of vineyards with grape varieties for wine for which the policy of crop insurance was stroked and to conclude with an insurer an insurance crop policy mentioning at least: the grape quantity assured, the area involved, location and amount of insurance bonus.

The amount of financial assistance is either 80% of the cost of insurance premiums paid by producers to ensure against losses resulting from climate phenomena equivalent to adverse effects of natural disasters, or 50% of the cost of insurance premiums paid by producers to ensure against: losses mentioned above and against other losses caused by other climate phenomena, as well as losses caused by animals, plant diseases or infestations of pests. By climatic phenomena with adverse effects that can be assimilated to a natural disaster means weather conditions such as frost, hail, gilding, rain or drought, which are destroying over 30% of the average annual production of wine compared with the average production on 3 previous years or to the average of 3 years based on previous 5 previous years, excluding the highest and the lowest of the values. Finding the damage is done by the insurer in the agricultural producer affected.

Therefore, according to the regulation of wine producers, direct producers will not receive financial support for harvest insurance vineyard with table grapes, harvest insurance vineyard with hybrids (Noah, Othello, Isabelle, Jacquez, Clinton and Herbemont) and crop insurance vineyard subject to the research projects and measures to support such a project.

CONCLUSIONS

Through these financial support measures it was aimed to promote on the third markets, the restructuring and conversion of plantations, harvest insurance, the use of concentrated grape must, and the first deforestation.

Monitoring the trade flows is above all a matter of management, which should be approached with flexibility. The Commission should take a decision on the introduction of requirements in terms of licenses, taking into account the need to introduce licensing for import and export to manage the markets and in

particular, to monitor the imports of the products concerned. However, this regulation should provide the general conditions governing these licenses.

The proper functioning of the single market would be jeopardized by the granting of unqualified aid. Therefore, the provisions of the treaty governing the state aids should apply, in principle, to the products which are covered by the common organization of the vine and wine market. However, the dispositions regarding the first deforestation and some measures within the support programs should not be an obstacle to the granting of national aids with the same purpose.

REFERENCES

1. *** Ordinul 756 din 2008 *privind aprobarea Normelor metodologice de acordare a sprijinului financiar producătorilor din sectorul vitivinicol pentru asigurarea recoltei de struguri pentru vin*, M. Of. nr. 879 din 24 dec 2008.
2. *** Hotărârea nr.1228 din 2008 *privind stabilirea modului de acordare a sprijinului financiar comunitar producătorilor din sectorul vitivinicol*, M. Of. nr. 696 din 13 oct
3. *** Regulamentului (CE) al Consiliului nr. 479/2008 *privind organizarea comună a pieței vitivinicole*, Jurnalul Oficial al Uniunii Europene, seria L, nr. 148 din data de 6 iun 2008.

STRATEGIES REGARDING THE INCREASE OF FRUIT PRODUCTS IN THE NE REGION OF ROMANIA

STRATEGII PRIVIND CREȘTEREA PRODUCȚIEI DE FRUCTE ÎN REGIUNEA DE NE A ROMÂNIEI

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Abstract. *Orchards is an old human occupation which marks a special moment in the process of human communities stability, in the deepening of work social division and an important step in the evolution of human society. Along the 20th century, Romanian orchards met a few essential transformations. Thus, the surface occupied by fruit trees was of 340.100 ha in 1927, of 184.200 ha in 1950, of 428.400 ha in 1970 and of 239.900 ha in 1999. The total fruit production varied in these periods between 401.100 tones in 1950 and 2.183.000 tones in 1993. Despite the fact that in 1993 it was obtained the highest fruit production, the average fruit consumption / dweller was of only 35,7 kg, much lower than that considered to be the optimum for adults in temperate climate areas (62 kg / dweller). The main cause of this low consumption was the deficient variety structure in which the plum tree represented more than 40% of the total fruit trees in the country. Another cause could be represented by the low production on the surface unit at all the species and kinds of fruit trees planted in Romania in the past 30–40 years. Because of the continuous decrease of fruit trees surfaces, in the last years and taking in consideration the deficient variety structure, we can expect that, in the future, the average fruit consumption / dweller to decrease even more than the one recorded in 1993. The solutions to get over this situation are not numerous, but one of them is the substantial increase of average production / unit of surface, at all the tree species planted in Romania, at least up to the level of the productions obtained nowadays in the commercial orchards of the European Communion*

Key words: a strategies, fruit products, orchards

Rezumat. *Pomicultura este o veche îndeletnicire a oamenilor, care marchează un moment deosebit în procesul stabilității comunităților umane, în adâncirea diviziunii sociale a muncii și un pas important în evoluția civilizației societății omenești. Fiind o veche îndeletnicire a oamenilor, pomicultura marchează un moment deosebit în procesul stabilității comunităților umane, în adâncirea diviziunii sociale a muncii și un pas important în evoluția civilizației societății omenești. De-a lungul sec. XX, pomicultura României a cunoscut transformări fundamentale. Astfel, suprafața ocupată cu pomi fructiferi era de 340.100 ha în 1927, 184.200 ha în 1950, 428.400 ha. în 1970 și 239.900 ha în 1999. Producția totală de fructe a variat, în aceste perioade, între 401.100 tone în 1950 și 2.183.000 tone în 1993. În pofida faptului că în 1993 s-a realizat cea mai ridicată producție de fructe, consumul mediu de fructe/locuitor a fost de numai 35,7 kg, semnificativ mai scăzut decât cel considerat optim pentru indivizii adulți și, în zona temperată (62 kg/locuitor). Principala cauză a acestui consum scăzut a constituit-o structura varietală deficitară, în care prunul reprezenta mai mult de 40% din toți pomii fructiferi ai țării. O altă cauză ar fi*

reprezentată de producțiile scăzute la unitatea de suprafață la toate speciile și soiurile de pomi fructiferi cultivate în România în ultimii 30-40 de ani. Datorită scăderii accentuate a suprafețelor pomicole, în ultimii ani, și considerând în continuare structura varietală deficitară, ne putem aștepta ca, în viitor, consumul mediu de fructe/locuitor să scadă chiar și sub cel înregistrat în 1993. Soluțiile de ieșire din acest impas nu sunt multe, dar una din ele ar fi aceea a creșterii substanțiale a producțiilor medii/unitatea de suprafață, la toate speciile pomicole aflate în cultură în România, cel puțin până la nivelul producțiilor realizate în prezent în livezile comerciale din Comunitatea Europeană.

Cuvinte cheie: strategii, producția de fructe, livezi

INTRODUCTION

In the NE region of Romania, fruit tree growing is an economic activity with deep roots in history, and which, along the time, has experienced profound changes. Some of these mutations express the objective tendencies of fruit tree development at county and national level; others, on the contrary, mark a regression under the aspect of quantity, quality, and form of agricultural exploitation ownership.

From ancient fruit tree growing, associated with cultivation of other plants, with big distances between the rows of trees and between trees on the same row, it was proceeded, thanks to technical progress and requirements of fruit market as well as of fruit cost price, to specialized cultivation, orientated to thick plantations, using small trees, suitable for their intensive cultivation. In this context, it was necessary to move from parentstock coming from "wild" tree seeds of spontaneous flora or seeds from cultivated species (so-called "franc" parentstock) to vegetative parentstocks, clonally multiplied, characterized by little sap and a sensitive shortening of the period prior to their fructification process. Gradually, as social division of labour deepened, and products exchange appeared and distinguished itself, some peasant households developed the fruit tree growing for commercial purposes. Around the household and between the rural communities, fruit tree cultivation extended outside the rural areas, the surfaces occupied by fruit tree plantation increasing day by day.

The pomiculture crisis, deeper than in the other agricultural branches, affected the vital structural elements, such as: relations of ownership and dimensions of fruit tree exploitation; the economic and social structure of fruit tree exploitation owners; applied technologies; production, marketing relations, management and efficiency.

MATERIAL AND METHOD

Diagnostic and SWOT analysis proved the necessity to design a global strategy and strategies on fields of activity or organizational subdivisions (such as departments) so that the main strengths of fruit tree farms in the NE region and the main accessible opportunities not to be wasted.

RESULTS AND DISCUSSIONS

In general, the strategy of a fruit tree farm is a complex action which interpenetrates (associates) the business philosophy and its application on the market, taking as starting point the enterprise's objectives defined according to the market's characteristics, and as a final point, the identification of techniques and methods of action on the market in relation with the existing resources.

Table 1

TOWS matrix of fruit producer

	Strengths - S	Weaknesses - W
	1. Good management 2. Production guarantee 3. High quality products 4. Economic and financial situation 5. Organizational structure and organigrama 6. Labour and technical capacity of labour	1. A local weak market 2. Reduced storage capacity 3. High interest at lending 4. Weak production turn accounting
	SO Strategies	WO Strategies
1. Lifestyle of residents 2. Population's attitude regarding work 3. Consumers' loyalty 4. Unemployment rate 5. Productivity level 6. Number of fruit types 7. Influence of production technologies 8. Economic substantiation of soil maintenance works 9. Market and distribution of fruit tree products	S1/3- O4/6/8 Increase of production by a high productivity due to investment in research S2/4/5-O8/9/10- Development of business by selecting a professional manager who will rise the income level through an efficient strategy	O1/7-W2 Use of additional labour in order to develop new production capacities O3/9/10-W4 Increase of effective power that will turn account the fruit production by selling it near the area of production
	ST Strategies	WT Strategies
1. Influence of environmental factors 2. Life level of inhabitants 3. Government regulation 4. Credit's validity 5. Interest rates 6. Inflation rate 7. Price fluctuation 8. Fiscal policy 9. Legislative instability 10. Environmental law 11. Daily shopping 12. Diminution of leaseholders number	S3-T1 Finding new markets, possible export S1/3-T14 Production selling on new market niches S1/2/3/4/5-T1/12 It is preferred the direct competition due to higher general efficiency of an analysed farm	W1-T1/12 To maintain on the market, the solution is to reduce prices at the same time with costs W3-T6/7/14 The solution is finding alternative sources of income or liquidation of some assets that occur below the profitability level W4-T8/15 The urgent development of other activity sectors

The matrix allows the mapping at a time of interests crossing, likely to influence, in a more or less obvious manner, the strategy and the objectives of the industrial unit.

Regarding the products diversification, this can be applied on several levels:

1) product declension There are investigated other market segments for the same product;

2) range broadening. There are investigated other products for the same catalogue (for the same selling team or for the same product brand). The new products will have in common with the old ones, all or a part of the infrastructure of fruit tree farms, workshops, sale network, trade name, raw materials;

3) enterprise diversification. There is investigated another field of action where it will be possible to design and develop new activities based on farm's skills;

4) investment diversification. There are investigated other possible usage of capital, to reach the logic of conglomerate or reconversion.

Short-term objectives have as purpose the following aspects:

- growth and diversification of fruit production;
- endowment of company with new and modern equipment, to ensure the provision of some materials such as: labels, packaging;
- the analysis of economic and financial activity of the company and its image; participation in national and international fairs and exhibitions;

Medium-term objectives refer to:

- reduction of investment liquidation term;
- increase of company advertising level;
- increase of market share on internal and external market;
- increase of profit and its reinvestment;
- acquisition of a new printer in order to reduce the costs of labeling and packaging;
- improvement of staff labour efficiency and increase of its productivity;

Long-term objectives aim to:

- realize a durable fruit production;
- establish the market share by improving the fruit quality and to practice attractive prices; ensure an annual rate of profit of about 25%;
- increase the space destined to fruit marketing through establishment of shops and points of sale;
- establish new plantations with the species and varieties demanded by consumers;
- to diversify the way of presenting the products by pack quality improvement, by modulating the quantities on species, quality categories and varieties; with participation in national and international exhibitions.

Strategy formulation

After reviewing the general situation of fruit tree farms, there can be formulated several strategies including:

The synergy of fruit markets' clauses led to the need of investing in research in order to obtain products with absolutely outstanding qualities, that educates its new clients, proving to have characteristics that other product lacks.

Given the fact that labour market in the area is very favourable to business, cumulated with an increasing need of fruit storage capacities, it became necessary to build new deposits in order to ensure the fruit supply throughout the year.

Increasing the weaknesses of competitors, especially of external ones. Such a strategy involves the orientation of unit's business to geographical regions where the rivals have a low market and also a low competition level, to segments of customers which were not taken into consideration by the competitors, to fields or products' characteristics to which the rivals did not give much importance, although there is the ability of costumers to pay a supplementary price for facilities of this kind, or to cases in which the competitors offered less advantageous quality/price conditions.

If the fruit tree farm has the potential resources, but not a coherent strategy, then the business development can be realized by selecting a specialized manager who will, through an efficient strategy, rise the level of income.

Finding new markets is a strategic alternative which can be taken into consideration when the market will have too many competitors.

If competitors prove their inability on the market, then it is preferable to perform the direct competition due to higher general efficiency of the analysed enterprise.

Given the fact that access to credit is difficult, and investments are necessary, the solution is to find alternative sources of income or liquidation of some assets which are under the profitability level.

CONCLUSIONS

There were formulated theories that change the structure of the fruit tree farm, or, on the contrary, the strategy is chosen according to the existing structure, so that in the end to be agreed that the two elements of equation conditionate each other, and the structural adjustment can ensure the success of a strategically line, as a strategically line is more applicable to a distinct organizational structures.

To conclude, fruit tree growing as exploitation, regardless its dimension, must be designed and realized just as a modern factory, fact which involves engineering in its true sense. By its nature, fruit tree growing means and is, one of the most intensive agricultural activities. Compared with our way of operating, more or less traditional, with outturn of only 5,000- 10,000 kg of fruits/hectare, there must be, inevitably, adopted the European technology, with standardized harvest levels, which are constant year by year, of minimum 50,000-60,000 kg apples and pears, 25,000-30,000 kg peaches and apricots, 15,000-20,000 plums or cherries per unit of surface.

REFERENCES

1. **Vasilescu N., Filip C., Ciurea I., 1981-1982** – *Contribuții privind optimizarea tehnologiilor pomicele din C.U.A.S.C. Mircești, județul Iași*. Institutul Agronomic, Seria Horticultură, vol. 25-26.
2. **Vasilescu N., Ciurea I., Chiran A., Filip C., 1985** – *Optimizarea structurii de producție în unitățile pomi-viticele constituite prin asociere*. Lucrări științifice, seria A, vol.29 Institutul Agronomic Iași.
3. **Ungureanu G., 2008** – *The optimization of agricultural exploitation size thorough effect to adapt the agro-alimentary supply to the demand of trade*. Lucrări științifice U.S.A.M.V. Iași, vol. 51, "Ion Ionescu de la Brad" University Press, ISSN 1454-7414.
4. **Ungureanu G., Ungureanu Marinela, Brezuleanu S., 2005** – *Metodologia de optimizare economica a folosirii îngrasamintelor la cultura visinului prin metoda programarii liniare*. Lucrări științifice U.S.A.M.V. Iași, seria Horticultură, vol. 48. ISSN 1454-7376.

CONSUMERS' ATTITUDE TOWARDS THE ECOLOGIC VEGETABLE YIELD DEPENDING ON EDUCATION AND AGE

ATITUDINEA CONSUMATORILOR FAȚĂ DE PRODUȚIA LEGUMICOLĂ ECOLOGICĂ ÎN FUNCȚIE DE GRADUL DE INSTRUIRE ȘI VÂRSTĂ

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***Abstract.** The study of the attitude towards the ecologic vegetable yield was made on a population sample of 350 persons using our own questionnaire, elaborated according to the norms from the specialized literature. The obtained results show that consumers' attitude varied depending on the education level and the age of the interviewed persons.*

Key words: attitude, ecological vegetable, education, age

***Rezumat.** Studiul atitudinii față de producția legumicolă ecologică a fost realizat pe un eșantion format din 350 persoane, utilizându-se un chestionar propriu elaborat după normele prevăzute în literatura de specialitate. Rezultatele obținute ne relevă faptul că atitudinea consumatorilor a variat în funcție de nivelul de instruire și de vârsta persoanelor intervievate.*

Cuvinte cheie: atitudine, legume ecologice, pregătire, vârstă

INTRODUCTION

The pedoclimatic conditions of the Iasi County, the tradition and professional knowledge as well as the existence of a healthy sales market are favorable factors for the development and practicing of the ecologic vegetable growing (2,3,4), but the sustainable making of a vegetable yield is determined also by the consumers' attitude. The study of the consumers' attitude is a complex process that may be effectuated by the interview method using specific questionnaires related to the study goal. Such studies are made on relatively large samples comprising an as large as possible social-professional spectrum of the individuals expressing their attitude.

In this context, the goal of this paper is to highlight the consumers' attitude in terms of yield and consumption of ecologic vegetables depending on some elements of the social-professional profile of the interviewed people.

MATERIAL AND METHOD

The studies on the attitude were made by interviewing 350 individuals and using a questionnaire elaborated according to the norms mentioned in the specialized literature (1,6). The questionnaire comprises 51 questions referring to the respondents' social-professional status, their attitude and preference related to the

ecologic vegetable yield. Within the questionnaire, we took into account two criteria of social-professional grouping, the level of education and age, and four questions referring to the attitude towards: the level of pesticides, the manner of obtaining vegetables, certification of ecologic vegetables and the state intervention to sustain the ecologic vegetable production.

For the field investigation we selected the towns of Iași and Tg. Frumos, as well as communes Belcești, Bosia, Focuri, Golăești and Răducăneni, well known localities for their tradition of cultivating and consuming vegetables. Respondents' answers were checked, validated and processed by specific methods using the SPSS programme (Statistical Package for the Social Sciences), variant 16 (5). After validating answers, 316 questionnaires were processed to achieve the study. The answers regarding attitude were appreciated on a scale with five levels of answer from „I totally agree to that” up to „I totally disagree to that”.

RESULTS AND DISCUSSIONS

Depending on the level of education, the individuals who participated to this study may be grouped as follows: individuals who finished only the secondary school – 6.3%, individuals who finished only 10 grades/vocational school – 20.3%, 25.0% of respondents finished high school, and 48.4% of the interviewed people graduated from college (college/faculty/post-academic studies). It is important to mention that 93.7% finished at least 10 grades or a vocational school what will ensure a high percentage of pertinent answers.

As for the age groups of the interviewed people, it results the following: 17.4% were young people between 18-25, 36.7% of respondents were people between 25-40, 36.4% were people between 41-65, and 9.5% were people aged more than 65. The grouping by ages of the studied sample shows a structure close to the normal values of the population structure, the age groups in the middle of the interval, namely 26-40 and 41-65 years old, representing more than 75%.

The attitude of the interviewed people regarding the pesticide level („I am really concerned by the level of pesticides (chemical products) in vegetables”) determines a grouping of answers at the level of the interviewed sample. Thus, 81% from the interviewed people manifested their concern regarding the level of pesticides in vegetables, declaring that they totally agree to the affirmation above (table 1). As for their grouping by levels of education, the people who finished eight grades at most declared they agreed or totally agreed, in a percentage of 55%, the people who finished 10 grades/vocational school in percentage of 70.3%, people who finished high school – 78%, and those who graduated from college – 90.2%.

As for the answers received by age groups, the percentage of the people who manifested their agreement to the problem mentioned above is the following: 18-25 years old – 81.8%, people between 26-40 – 79.3%, people between 41-65 – 83.5% and people aged more than 65 – 76.6%. From the presented data, we may draw the conclusion that most answers are positive and similar to those of the entire group.

Table 1

**Attitude towards pesticide level in vegetables depending
on the respondents' level of education and age**

Education level	Age group (years)	„I am concerned by the pesticide level (chemical products) in vegetables”					Total
		I totally agree	I agree	I am not sure	I disagree	I totally disagree	
Eight grades school	18-25	0	1	0	0	0	1
	26-40	1	1	2	0	0	4
	41-65	3	3	3	0	0	9
	aged more than 65	1	1	4	0	0	6
Total		5	6	9	0	0	20
10 grades/ vocational school	18-25	3	2	2	0	0	7
	26-40	6	8	2	0	0	16
	41-65	5	11	7	4	1	28
	aged more than 65	5	5	3	0	0	13
Total		19	26	14	4	1	64
High school/ post high school education	18-25	3	8	3	0	1	15
	26-40	7	11	12	0	0	30
	41-65	13	12	1	0	0	26
	aged more than 65	4	4	0	0	0	8
Total		27	35	16	0	1	79
College/faculty/ post-academic studies	18-25	18	10	4	0	0	32
	26-40	41	17	6	2	0	66
	41-65	33	16	3	0	0	52
	aged more than 65	3	0	0	0	0	3
Total		95	43	13	2	0	153
TOTAL		146	110	52	6	2	316

The results of the analysis of people's attitude in terms of production manner of vegetables („I do not know the difference between the vegetable products obtained normally and those obtained by ecological, organic or biological means”) are grouped as follows: 40.8% of respondents know the difference between the products obtained by the two systems (conventional and ecologic), 31.6% and not sure, and 27.5% acknowledge they do not know the difference (table 2). As for the individuals knowing the difference, depending on the education level, 61.2% graduated from college and 26.3% finished high school; in terms of age, the people aged between 41-65 and 26-40 respectively, represent the majority (40.3%, 37.2% respectively). The answers of the individuals declaring themselves not sure in this respect determine a clear-cut segmentation depending on the education level: 36% people who graduated from college, 21% who finished high school, 33% individuals who finished 10 grades or a vocational school and 10% individuals who finished eight grades at most. As for the grouping by age categories, answers are grouped in the central area of the interval: 26-40 years old (36%), 41-65 years old (35%) respectively. The people who declared not knowing this difference represent 27.5%, and answers are clearly segmented both by education level and age grouping.

Table 2

**Respondents' attitude towards the different ways of the vegetables obtaining,
depending by the education level and age**

Education level	Age group (years)	„I do not know the difference between the vegetable products obtained normally and those obtained by ecologic, organic or biologic means”					Total
		I totally agree	I agree	I am not sure	I disagree	I totally disagree	
Eight grades school	18-25	0	1	0	0	0	1
	26-40	0	2	1	1	0	4
	41-65	1	2	5	1	0	9
	aged more than 65	0	2	4	0	0	6
Total		1	7	10	2	0	20
10 grades/ vocational school	18-25	0	1	4	2	0	7
	26-40	0	3	10	2	1	16
	41-65	1	6	15	5	1	28
	aged more than 65	2	4	4	2	1	13
Total		3	14	33	11	3	64
High school/ post high school education	18-25	1	3	4	6	1	15
	26-40	2	8	11	7	2	30
	41-65	2	4	4	14	2	26
	aged more than 65	3	1	2	2	0	8
Total		8	16	21	29	5	79
College/faculty/ post-academic studies	18-25	2	6	11	8	5	32
	26-40	0	18	13	19	16	66
	41-65	1	10	12	21	8	52
	aged more than 65	0	1	0	1	1	3
Total		3	35	36	49	30	153
TOTAL		15	72	100	91	38	316

The analysis of the respondents' attitude in terms of the certified ecologic vegetables („I consider that the marketing of the certified ecologic products would be desirable”) highlights a grouping of answers at the level of the interviewed sample; 82.9% declared that they agree or totally agree to the marketing of certified ecologic products, 15.5% declared they were not sure and a very small percentage 1.6% disagreed to this affirmation (table 3). Out of the people manifesting their agreement, 51.5% graduated from college, and 23.6% finished high school. At the level of all respondents with academic studies, 90.2% manifested their agreement in terms of marketing these vegetables and 78.5% of the high school respondents. As for the age groups, the individuals who agreed or totally agreed to the affirmation that „I consider the marketing of the certified ecologic products would be desirable”, we may notice a classification by two age intervals: 41-65 years old (37.8%) and 26-40 years old (35.5%). Analyzing the answers to the question „Do you think the state should support the ecologic vegetable yield?” we may notice a clear-cut grouping of the individuals, 84.8% of the interviewed persons agreeing or totally agreeing to this question.

Table 3

**Respondents' attitude towards the marketing of certified ecologic products
depending on education level and age**

Education level	Age group (years)	„I consider the marketing of the certified ecologic products would be desirable”					Total
		I totally agree	I agree	I am not sure	I disagree	I totally disagree	
Eight grades school	18-25	1	0	0	0	0	1
	26-40	0	2	2	0	0	4
	41-65	1	5	3	0	0	9
	aged more than 65	1	4	1	0	0	6
Total		3	11	6	0	0	20
10 grades/ vocational school	18-25	3	3	1	0	0	7
	26-40	1	11	4	0	0	16
	41-65	0	19	8	1	0	28
	aged more than 65	4	7	2	0	0	13
Total		8	40	15	1	0	64
High school/ post high school education	18-25	4	7	4	0	0	15
	26-40	5	16	9	0	0	30
	41-65	11	12	3	0	0	26
	aged more than 65	4	3	1	0	0	8
Total		24	38	17	0	0	79
College/faculty/ post-academic studies	18-25	9	17	5	1	0	32
	26-40	28	30	5	3	0	66
	41-65	26	25	1	0	0	52
	aged more than 65	2	1	0	0	0	3
Total		65	73	11	4	0	153
TOTAL		100	162	49	5	0	316

Table 4

**Respondents' attitude towards the state support in the ecologic vegetable yield
depending on the education level and age**

Education level	Age group (years)	„Do you think the state should support the ecologic vegetable yield?”					Total
		I totally agree	I agree	I am not sure	I disagree	I totally disagree	
0	1	2	3	4	5	6	7
Eight grades school	18-25	0	1	0	0	0	1
	26-40	1	2	1	0	0	4
	41-65	0	6	3	0	0	9
	aged more than 65	1	5	0	0	0	6
Total		2	14	4	0	0	20
10 grades/ vocational school	18-25	1	5	1	0	0	7
	26-40	4	9	2	0	1	16
	41-65	2	19	6	1	0	28
	aged more than 65	7	5	1	0	0	13
Total		14	38	10	1	1	64

Table 4 (continuation)

0	1	2	3	4	5	6	7
High school/ post high school education	18-25	6	6	3	0	0	15
	26-40	7	15	8	0	0	30
	41-65	13	10	1	2	0	26
	aged more than 65	5	2	1	0	0	8
Total		31	33	13	2	0	79
College/faculty/ post-academic studies	18-25	10	16	6	0	0	32
	26-40	26	35	3	2	0	66
	41-65	26	21	3	1	1	52
	aged more than 65	2	0	1	0	0	3
Total		64	72	13	3	1	153
TOTAL		111	157	40	6	2	316

Within this percentage related to the education level, the majority is represented by the people with academic studies (50.7%), and 23.9% is represented by individuals who finished high school. As for the age grouping, most answers received fall into the central area of the interval: 36.9% is represented by the age interval 26-40, whereas 36.2% is represented by people whose age ranges between 41-65 years old.

CONCLUSIONS

1. More than 80% of the interviewed people manifests their concern regarding the pesticide level in the Romanian vegetables, regardless of the education level or age.

2. More than 40% of the respondents know the difference between the vegetable products obtained normally and those obtained by ecologic, organic or biological means.

3. The marketing of the certified ecologic products is agreed to by 82.9% of the interviewed people, especially those with academic studies and age between 26 and 65 years old.

4. 84.8% of the interviewed people opine that the state should support the ecologic vegetable yield.

REFERENCES

1. **Buia Anuța și colab., 2003** – *Statistică, vol I*. Presa Universitară Clujeană, Cluj-Napoca.
2. **Munteanu N., 2008** – *Proiect PRODLECO - Raport final*. Contract cercetare nr. 31/2006.
3. **Munteanu și colab., 2008** – *Evaluarea potențialului pedoclimatic pentru legumicultura ecologică în județul Iași*. Lucrări științifice, seria Horticultură, anul LI, USAMV Iași.
4. **Munteanu și colab., 2008** – *Ghid de bune practici - Metode de conversie la producția legumicolă ecologică*. Editura „Ion Ionescu de la Brad”, Iași.
5. **Norusis J. Marija, 1994** – *SPSS 6.1 - Base System User's Guide, Part 2*. Copyright by SPSS Inc.
6. **Oppenheim A.N., 1997** – *Questionnaire Design, Interviewing and Attitude Measurement*. Biddles Limited, Guildford and King's Lynn.

LIGHT INTERCEPTION INTO APPLE TREE IN DEPENDANCE OF PRUNING SYSTEM

REGIMUL DE LUMINĂ ÎN COROANA POMILOR DE MĂR ÎN DEPENDENȚĂ DE SISTEMUL DE TĂIERE

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Abstract: *The test occurred in 2005 in the intensive apple orchard of the society of "Alfa - Nistru", the district of Soroca, Moldova Republic. The orchard was planted in 2000, in spring with grafted trees on the rootstock M9 of Pinova variety. The planting distance was of 3,5 x 1,2 m. The were investigated four pruning methods in drayed in the experiment. The obtained results shoved that the pruning system with the elimination of the branches aged of 4 years by pruning at the spigot, at the growing ring or at a young lateral branch improves the light conditions of the trees crown and limits the presence less lighted zones.*

Key words: light interception, apple tree, pruning system.

Abstract: *Experiența a fost fondată în anul 2005 în livada intensivă de măr a societății „Alfa-Nistru”, raionul Soroca, Republica Moldova. Livada a fost planată în primăvara anului 2000 cu pomi altoiți la masă pe portaltoiul M9 de soiul Pinova. Distanța de plantare 3,5×1,2 m. În cadrul experienței au fost cercetate patru sisteme de tăiere în uscat. Rezultatele obținute au demonstrat că sistemul de tăiere cu eliminarea ramurilor în vârstă de patru ani prin tăierea la cep, la inelul de creștere sau la o ramură tânără laterală ameliorează regimul de lumină din coroana pomilor și limitează prezența zonelor slab iluminate.*

Cuvinte cheie: regim de lumină, pom de măr, sistemă de tăiere.

INTRODUCTION

All pruning systems of trees aim to improve the quality and regularity of production. A key factor is the optimization of light interception in plantation. The pruning system trees affects the amount of solar energy received by the leaves. The light intensity increases once with increasing the volume of the crown of the tree. The main factors and determinations of the light are the shape and dimensions of the crown, the density and structure of the leaf area, affected by environmental conditions and technology applied gauge planting, pruning system etc. (1, 2, 3, 5).

MATERIAL AND METHOD

The tests were conducted in the orchard of the S.A. "Alfa-Nistru", district Soroca, Moldova Republic. The orchard was planted in 2000 at a spacing of 3,5 x 1,2 m with scions of 2 years. The trese are conducte as follows spindle slender type.

The rows were oriented N-S. The distribution of light was measured a variety Pinova at East, Central and West part of the crown, in bottom (1,0 m), middle (1,7 m) and high (2,4 m) of the surface soil. Measurements were made at the end of July, for a time clear, with abdelomètre M-69 and GSA-galvanometer to the base of the method described by V. Luk'anova and A. Denisov (1968).

The method of pruning as follows:

V 1 (control) - the elimination of the branches with the replacement cycle of 3-4 years; V 2 - the elimination of the branches of 3 years at a young lateral branch or at the growth ring;

V 3 - the elimination of the branches of 4 years at a young lateral branch or at the growth ring;

V 4 - the elimination of the branches of 3-4 years tangent to the bisector of the angle between the central axis of tree and axis of the branch removed.

The purpose of this study is to develop new methods wath improve the distribution of light in intensive orchards.

RESULTS AND DISCUSSIONS

The study of the light in the crown of the tree of the variety Pinova during the day, shows that the intensity of this indicator is conditioned by the intensity of incident solar radiation by the sun, the pruning etc. In vertical plane (fig. 1) the distribution of light at the base (1 m), middle (1,7 m) and at the top of the crown (2,4 m) increases once with the height of the surface soil, being in constant growth of 7⁰⁰ morning hours (0,18 cal/cm2.min) till 13⁰⁰ (0,56 cal/cm2.min), after that it is decreasing till 1900.

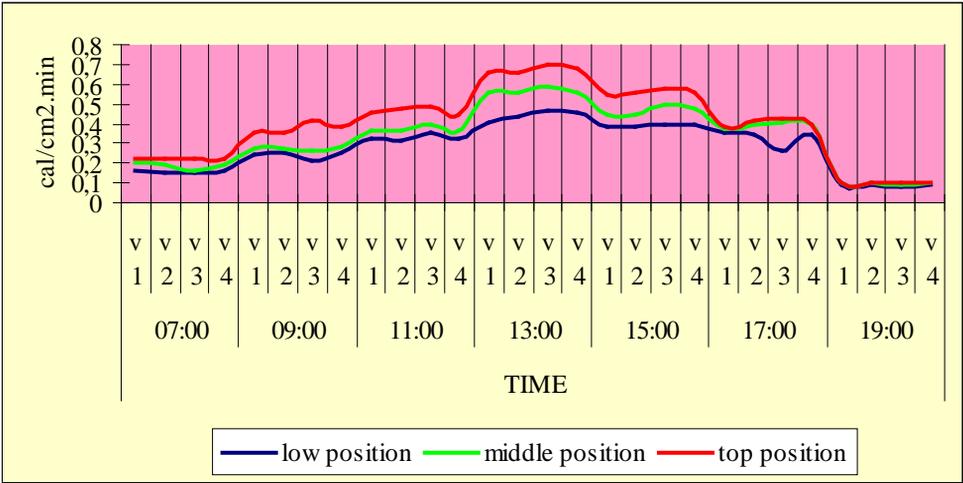


Fig. 1. Light penetration at 3 heights of Pinova apple tree in dependence of the pruning system

Among the three sectors of the crown, the top position (2,4 m) is in conditions of illumination more favorable throughout the day. In the middle of the crown enters a lower amount of light that to the top but greater than at the base of the crown.

Because the orientation of rows of the plantation is North to South the amount of sunlight received by that portion of the East and West of the crown is different. So in the morning (7⁰⁰) until 13⁰⁰, once height of sun above horizon increases, the crown of these receptions a larger quantity of sunlight, the more intensive illumination (0,21-0,61 cal/cm².min) remaining is to be at the East (fig. 2).

Starting from 15⁰⁰ the intensity of illumination of the West dominates (0,56 cal/cm².min) as part of the East and gradually decreases up to 19⁰⁰. During that time illumination of the crown is following in descending order: East, Central, West.

In dependence of pruning system studies we see that the gain of light intercepted is greater in the plantation where the pruning system was based on the elimination of branches of 4 years at a young lateral branch or at the ring growth.

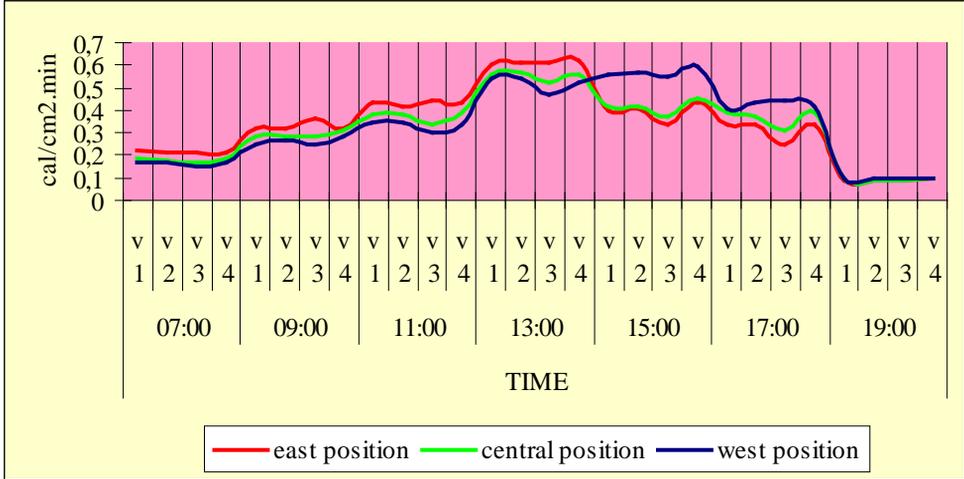


Fig. 2. Light penetration for 3 sides of Pinova apple tree in dependence of the pruning system

CONCLUSIONS

The light intercepted by the crown, at the bottom (1m) and middle (1,7 m) is quantitatively smaller than in top position of the tree (2,4 m), as in the first as well and during the second part of the day. The intensity of solar radiation is greatest until 13⁰⁰ in the East (0,61 cal/cm².min), while from 15⁰⁰ – in the West (0,56 cal/cm².min).

The pruning system with elimination of the branches of 4 years at a young lateral branch or at the growth ring improves the luminous atmosphere of a tree and limits the presence of low light zones.

REFERENCES

1. **Cimpoieș Gh., Boțan D., 2005** - *Regimul de lumină al coroanei în funcție de structura plantației*. Știința Agricolă, Chișinău, Nr. 1, p. 19–22.
2. **Henriot C., Monney Ph., Evequoz N., 2004** - *Réponse photosynthétique des feuilles de pommier a la lumière selon leur position dans la couronne et effet d'un ombrage induit*. Viticulture Arboriculture Horticulture, vol. 36 (1), p. 9-14.
3. **Jackson J., 1980** - *Light interception and utilisation by orchard systems*. Horticultural Reviews, p. 245-250.
4. **Luk`ănov V., Denisov A., 1968** - *Metodika opredeleniâ svetovogo rezima v kronah plodovyh derev`ev*. Sel'skhozâistvennaiâ bilogiâ, t. 3, Nr 4, p. 582-584.
5. **Șaganean R., 2009** - *Valorificarea potențialului de rodire la măr în sistem intensiv prin aplicarea rațională a tăierii pomilor în condițiile specifice zonei de nord*. Autoreferatul tezei de doctor în agricultură, Chișinău, 23 p.

THE INFLUENCE OF SUMMER PRUNING SYSTEM ABOVE THE GROWTH AND PRODUCTIVITY OF APPLE TREE

INFLUENȚA TĂIERII ÎN VERDE ASUPRA CREȘTERII ȘI FRUCTIFICĂRII POMILOR DE MĂR

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Abstract. *The investigation were effectuated in the apple intensive orchard of the „Alfa - Nistru” society of Soroca district, the Republic of Moldova. The orchard was planted in spring of 2000 year with grafted trees on the table on the rootstock M9 on Pinova and King Jonagold variety. The planting distance was of 3,5 x 1,2 m. The goal of this experiment was to study the processes of growing fructifying of the apple trees depending on 4 summer pruning systems. The researches results demonstrate us that the apple trees parameters reach optimum sizes the fifth year after plantation without significant modifications depending on the studied summer pruning systems the inclination of the vigorous branches without fruits with help of the loads and clips as well as the pinching of the vertical vigorous offshoot tops contributes to the acceleration of the fructifying processes.*

Key words: apple tree, variety, summer pruning.

Abstract: *Investigațiile au fost efectuate în livada intensivă de măr a societății „Alfa-Nistru”, raionul Soroca, Republica Moldova. Livada a fost planată în primăvara anului 2000 cu pomi altoiți la masă pe portaltoiul M9 de soiul Pinova și King Jonagold. Distanța de plantare 3,5×1,2 m. Scopul înființării acestei experiențe a fost de a studia procesele de creștere și fructificare a pomilor de măr în dependență de patru sisteme de tăiere în verde. Rezultatele cercetărilor ne demonstrează că parametrii pomilor de măr ating dimensiuni optime în anul 5 după plantare fără modificării semnificative în funcție de sistemele de tăiere în verde studiate. Înclinarea ramurilor viguroase fără rod cu ajutorul greutăților și a agrafelor precum și ciupitul vârfulor lăstarilor viguroși verticali contribuie la accelerarea proceselor de fructificare.*

Cuvinte cheie: pom de măr, soi, tăiere în verde.

INTRODUCTION

Summer pruning is practiced in arboriculture already ancient times, but once with implementation of intensive orchards, the importance of these measures agrotechnical increase.

Thanks to the summer pruning, it eliminates the surplus crown shoots, done that promotes normal development of those remains, accelerates the formation of the crown and therefore more rapid entry on fruit of young trees etc.

It is known that the response of trees to summer pruning varies depending on the time when they are applied: as far as we advance in the growing season (July) the growth of shoots is reduced (2,4). Summer pruning performed early (May) are welcome to eliminate the shoots with vertical position.

The formation of the crown using summer pruning operations contributed to increase the size of young tree (1,3).

MATERIAL AND METHOD

The investigations were carried out in intensive apple orchards of the farm "Alfa – Nistru, distict Soroca, Republic Moldova. The plantation was founded in 2000 with varieties of trees Pinova and King Jonagold grafted on M9 and planted at a spacing of 3,5 x 1,2 m (2380 trees/ha). The trees are conducted as follows spindle slender type. The trees studied were grouped into 4 variants with 4 repetitions each. For the study of the effects of summer pruning system was performed measuring of phytometriques characters and fruit production.

The summer pruning systems studied are:

V t. v. 1 - (control), the elimination of competitors shoots in the upper souscharpantes as well and on the central axis.

V t. v. 2 – the inclination of branches without fruit using a weights.

V t. v. 3 – the pinch of the tops of vigorous vertical shoots.

V t. v. 4 - disunity in the middle or at the base of the vertical branches from the destruction of 2 / 3 tissue.

RESULTS AND DISCUSSIONS

In the context of variants with different summer pruning systems, the trunk diameter of Pinova and King Jonagold variety (fig. 1) has evolved constantly, recording during the 3 years of study a increase of 23-24 mm.

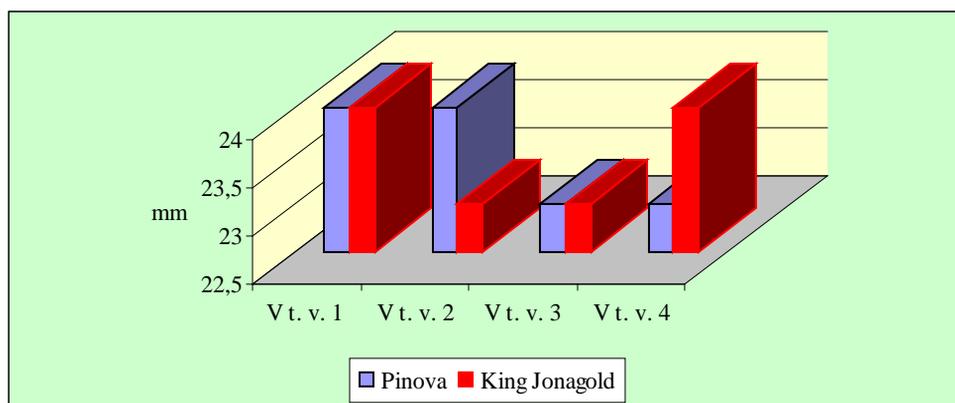


Fig. 1. Increase of trunk diameter in dependence of variety and summer pruning system

The rootstock M9, the distance of the planting 3,5 x 1, 2m, spindle slender type S. A. "Alfa-Nistru", in medium of the years 2005-2007

The tree height was maintained using a summer pruning systems studies in the limits 296-310 cm (table 1). The comparison of tree height with the control variant shows that the value of this indicator is smaller in the variant with the inclination of branches without fruit aids weights. In this variant the difference in tree height between the two varieties ranged from 292 cm up to 302 cm. The

diameter of crown on length of row is extinde on average up to 141-162 cm for the variety Pinova and up to 139-171 cm for the variety Jonagold King.

Table 1

The height of apple tree and the diameter of crown in dependence of variety and summer pruning system

The rootstock M9, the distance of the planting 3,5 x 1,2m, spindle slender type S. A."Alfa-Nistru"

Summer pruning system	Height of tree (2005-2007), cm	The diametre of crown, cm					
		On length of row			On breadth of row		
		2005	2006	2007	2005	2006	2007
Pinova							
V t.v. 1	303	141	162	158	156	160	155
V t.v. 2	297	153	158	161	171	174	151
V t.v. 3	310	147	160	159	157	171	149
V t.v. 4	306	150	162	150	164	165	152
DL _{0,05}	-	3,88	2,90	3,59	2,98	2,56	2,21
King Jonagold							
V t.v. 1	299	148	161	168	178	178	165
V t.v. 2	296	150	171	165	191	175	164
V t.v. 3	305	151	168	165	178	182	165
V t.v. 4	298	139	164	164	177	174	160
DL _{0,05}	-	2,97	2,56	2,11	2,87	3,15	2,74

The minimum diameter of crown on breadth of row was characteristic for the variety of trees Pinova (149-174 cm), followed by King Jonagold (160-191 cm). These dimensions of the crown ensure a free space between the neighboring row of about 160-170 cm, which is favorable to the regime of light and for the mechanized works in the orchard. In analyzing the data on extension of the crowns size, we can see that the trees have shown a moderate growth, wath is characteristic for the hereditary potential of varieties King Jonagold and Pinova conducted in the form of slender spindle crown.

The production of fruit depending on summer pruning system (figure 2) was on average higher in the plantation where we tilted the vigorous shoots without fruit using a weights (V t. v. 2) and pinched the tops of vertical vigorous shoots (V t. v. 3)

Thus the production of fruits in the two variants was also varies depending on years of 29,7 to 41,8 t / ha in the case of the variety Pinova and respectively of 30,9 to 42,2 t / ha for the variety King Jonagold. By analyzing global average production in the plantation with summer pruning systems (V t. v. 2) and (V t. v. 3), during the three growing seasons, the value of this indicator of the variety King Jonagold (34,6 t / ha) dominated the variety Pinova (33,7 t / ha).

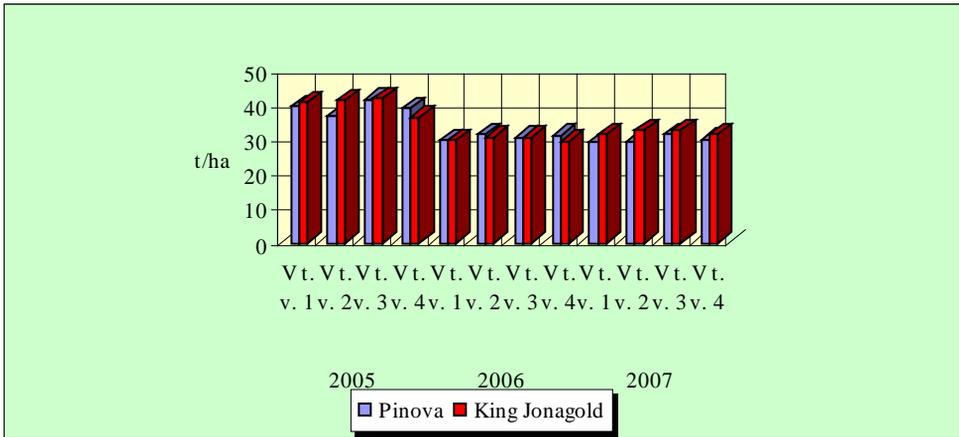


Fig. 2. The fruit production in dependence of variety and summer pruning system

The rootstock M9, the distance of the planting 3,5 x 1, 2m, spindle slender type S. A. "Alfa-Nistru", in medium of the years 2005-2007

CONCLUSIONS

The phytometriques parameters of apple trees grafted on dwarfing M9 rootstock and planted on a distance 3,5 x 1,2 m reached optimal dimensions in the fifth year of planting and does not affect essential in dependence on summer pruning system.

The inclination of branches without fruit and the pinch of the tops of vigorous vertical shoots accelerates the process of fructification, which is giving a good promise for better management of production in intensive apple orchard.

REFERENCES

1. Balan V., Cimpoieş Gh., Barbăroşie M., 2001 - *Pomicultura*. Chişinău: Museum, p. 335.
2. Burtoiu C., Septar L., 2005 - *Efectul tăierilor în verde asupra diferenţierii mugurilor de rod la cais*. Lucrări ştiinţifice, Universitatea de Ştiinţe Agricole şi Medicină Veterinară Iaşi, Anul XLVIII, Seria Horticultură, Iaşi, vol. I (48), p. 89-92.
3. Kopicinikova N. G. i dr., 2004 – *Vlianie otgibania vetvei na urojainosti iabloni razlicinix sorto podvoiniz combinații*. Plodovodstvo, Institut Plodovodstva Nacionalnoi akademii najk Belaruci, Samohvalovici, t. 16, s. 78-81.
4. Wustenberghs H., 1993 - *Taille d'été chez les arbres fruitiers a noyau: influence sur la croissance et la formation des boutons*. Le fruit belge, Nr. 443, p. 67-69.

MORPHOLOGICAL AND BIOCHEMICAL ASPECTS OF ROOTSTOCK-SCION INTERACTION DUE TO INCREASING BUDDING HEIGHT

ASPECTE MORFOLOGICE ȘI BIOCHIMICE ALE INTERACȚIUNII ALTOI PORTALTOI LA MĂR ȘI PĂR ÎN CONDIȚIILE MODIFICĂRII ÎNĂLȚIMII DE ALTOIRE

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Abstract. *The influence of budding height (10, 20 and 40 cm) on bud survival and performance of maiden trees was investigated in experiments conducted at S.D.E. "V. Adamachi" between 2006-2008. Apple rootstocks MM.106, M9 and pear rootstocks *Pirus sativa* and *Cydonia oblonga*, were tested with cv. *Florina* and *Untoasa hardy*. Neither rootstock nor budding height affected bud take. Buds on MM.106 and *Pirus sativa* survived the winter better than M.9 and *Cydonia oblonga*. There were significant differences in scions length during all growth periods. Height of grafting had an important effect on the accumulation of sugars and dry matter. Trees budded at 40 cm had a bigger dry matter content comparing with those grafted at 10 cm especially when M9 and *Cydonia oblonga* were used as rootstock.*

Key words: rootstock, scion, budding height, sugars, dry matter

Rezumat. *Lucrarea de față urmărește influența înălțimii de altoire (10, 20 și 40 cm) asupra rezistenței mugurilor altoi peste iarnă și a calității pomilor aflați în câmpul II al pepinierii în condițiile S.D.E. V. Adamachi în perioada 2007-2008. Portaltoii de măr (MM106 și M9) și păr (*Pirus sativa* și *Cydonia oblonga*) au fost altoiți cu soiurile *Florina* și respectiv *Untoasă hardy*. Indiferent de portaltoii folosiți, nu s-au constatat diferențe semnificative ale înălțimii de altoire asupra procentului de prindere, însă, s-a observat că pomii altoiți pe MM06 și *Pirus sativa* au rezistat mai bine peste iarnă comparativ cu cei altoiți pe M9 și *Cydonia oblonga*. În ceea ce privește lungimea lăstarilor altoi s-au constatat diferențe pe parcursul perioadei de vegetație. Înălțimea de altoire a influențat și dinamica acumulării de substanță uscată și glucide în frunzele altoilor. Astfel, pomii altoiți la 40 cm au avut un conținut mai mare de glucide și substanță uscată comparativ cu cei altoiți la 10 cm, mai ales când portaltoii utilizați au fost M9 și gutui.*

Cuvinte cheie: portaltoi, altoire, înălțime de altoire, glucide, substanță uscată

INTRODUCTION

Higher budding may be an effective way to reduce the vigour of trees and increase the productivity. Numerous trials show that increasing budding height increases vigour control and yield efficiency of apple trees in the orchard (Quamme et al., 1998; Webster, 1993). However, there are significantly less data that show the behavior of high budded rootstocks in the nursery.

After high budding, the scion bud may fail to grow in the nursery (Wertheim, 1998), despite the formation of a successful scion-rootstock graft union (Howard & Oakley, 1993).

The objective of our research was to study the effect of budding height of different apple and pear rootstocks on the quality parameters of planting material produced under S.D.E. “V. Adamachi” environmental conditions.

MATERIALS AND METHODS

The trial was performed at the S.D.E. “V. Adamachi” nursery between 2006-2008. Apple rootstocks MM.106, M.9 and pear rootstocks *Pirus sativa* and *Cydonia oblonga* were budded with apple cv. Florina (F/M9; F/MM106) and pear cv. Untoasa hardy (U.H/P.s.; U.H/C.o) in early August. Rootstocks were planted at a spacing of 0.9 x 0.2 m and budded at the height of 10, 20 and 40 cm. Rootstock diameter was 9-11 mm. The soil was deep fertile loam clay. Fertilization, mainly with nitrogen, was applied according to soil analysis. The following spring, rootstocks were cut just above the bud and bud survival was measured. During and at the end of the vegetative period, tree height (cm), length of scion shoot (cm) were measured and dry matter and sugars contained were analyzed. The trial consisted of three replicates with 50 trees in each. Variance analysis of main quality traits was done.

Dry matter content was obtained after drying 4hours fresh material at 105 °C and weighting at analytical balance. Soluble sugars content was determinate from leaves, by Schorll method and reported at fresh substance.

RESULTS AND DISCUSSIONS

Bud Healing

There was no significant effect of rootstock and budding height on bud healing in the autumn. There were also no interactions between rootstocks and budding height.

Bud Overwintering

Significant differences among rootstocks and budding height were observed when bud survival was evaluated in the following spring.

Irrespective of budding height, the highest percentage of live buds was found on vigorous rootstock MM.106 and *Pirus sativa* (up to 90%). The worse bud survival was recorded on M.9 and *Cydonia oblonga* (table 1).

Table 1

Bud overwintering at Apple and Pear Trees Grafted on Different Rootstocks at 10, 20 and 40 cm

Scion / rootstock	Budding height		
	10 cm	20 cm	40 cm
Florina / MM 106	97.58	92.70	91.80
Florina / M9	91.18	86.62	85.97
Untoasa Hardy / <i>Pirus sativa</i>	96.12	92.31	90.47
Untoasa Hardy / <i>Cydonia oblonga</i>	94.30	90.54	86.72

Increasing the budding height caused significant differences in the number of live buds. The genetic makeup of the rootstock's seemed to determine bud

survival. The cold sensitive M.9 rootstock and *Cydonia oblonga* which are sensitive to temperature fluctuations, had in average 14 % more winter damaged buds when budded at 40 cm than at 10 cm.

Growth

Differences in growth intensity appeared at the beginning of the growing season and depended on rootstock and budding height. A big influence of the rootstock on scion was observed on both species, grafting on less vigorous rootstock's (M9 and *Cydonia oblonga*) determinate an earlier bud opening.

Height budding had an important influence on the length of the scions both on apple and pear trees. The vigour of scions decreased with increasing budding height. Nevertheless it can be observed an increasing of total tree length as grafting height was increased (table 2)

Increasing budding height determine a decreasing of scions length with 20% when grafting was made on M9 and 14,7 % when MM106 was used as rootstock. At pear trees, high budding has determined a decreasing of scions length with 21.46 % when grafting was made on *Cydonia oblonga* and 13,45 % when *Pirus sativa* was used as rootstock.

These observations suggest that part of the vigour influence, at least with apple and pear, is associated with stem characteristics of the rootstock and is not entirely attributable to its root characteristics. This may involve differences in stem xylem or phloem anatomy and function, the production of inhibitors or the inactivation of promoters within this rootstock/ interstock stem piece.

Statistical significances of the shoots and tree length are noted in Table 2.

Dry matter content increased during vegetative period both apple and pear and it was influenced by rootstock and budding height (table 3)

Height of grafting had an important effect on dry matter accumulation in leaves of maiden trees. When M9 was grafted at 40 cm, dry matter percent (at the end of the growing season) was heigher with 21.4% than grafting at 10 cm. When grafting was made on MM 106, dry matter percent increased only with 18.3%. This fact can be explained by higher capacity of M9 rootstock to determine dry matter accumulation in leaves. At pear trees, dry matter percent increasing was 11.3% when grafting was made on *Pirus sativa* and 28,1 % when *Cydonia oblonga* was used as rootstock. It seems that increasing budding height determinate some modifications on scion level, leading to a bigger dry matter accumulation in leaves of the apple and pear trees.

Many researchers state that the amount and variety of carbohydrates found in plants differ in various plants organs and conditions (Smeekens, 1998; Gibson 2000). In our trails sugars content increased all throughout the growing season. In drought conditions sugars accumulations is intensive as a result of macromolecular compounds biodegradation and their transformation in compounds with smaller molecular weight (soluble sugars, aminoacids etc.) (Lasko, 1985). This can be the reason why in 2007 sugars content was higher.

Table 2

Average length of the scions and total tree length at apple and pear trees on the growing season

Scion / rootstock	2007						2008					
	Scion lenght (cm)			Tree total lenght (cm)			Scion lenght (cm)			Tree total lenght (cm)		
JUNE												
	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
F/ MM106	19.64 ^(Mt)	15.87 ⁽⁰⁰⁰⁾	14.18 ⁽⁰⁰⁰⁾	29.64 ^(Mt)	35.87 ^(****)	54.18 ^(****)	23.12 ^(Mt)	18.45 ⁽⁰⁰⁰⁾	16.25 ⁽⁰⁰⁰⁾	33.12 ^(Mt)	35.42 ^(****)	51.3 ^(****)
F/ M9	19.21 ^(Mt)	13.21 ⁽⁰⁰⁰⁾	11.89 ⁽⁰⁰⁰⁾	29.21 ^(Mt)	33.21 ^(****)	51.89 ^(****)	22.66 ^(Mt)	15.42 ⁽⁰⁰⁰⁾	11.3 ⁽⁰⁰⁰⁾	32.66 ^(Mt)	38.45 ^(**)	56.25 ^(****)
U. H./ P.s	19.3 ^(Mt)	15.38 ⁽⁰⁰⁰⁾	10.15 ⁽⁰⁰⁰⁾	29.30 ^(Mt)	35.38 ^(****)	50.15 ^(****)	22.77 ^(Mt)	19.64 ⁽⁰⁰⁰⁾	15.67 ⁽⁰⁰⁰⁾	32.77 ^(Mt)	39.64	55.67 ^(****)
U. H./ C. O.	18.04 ^(Mt)	12.01 ⁽⁰⁰⁰⁾	9.39 ⁽⁰⁰⁰⁾	28.04 ^(Mt)	32.01 ^(****)	49.39 ^(****)	22.47 ^(Mt)	15.33 ⁽⁰⁰⁰⁾	10.53 ⁽⁰⁰⁰⁾	32.47 ^(Mt)	35.33 ^(****)	50.53 ^(****)
JULY												
	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
F/ MM106	45.98 ^(Mt)	41.7 ⁽⁰⁰⁰⁾	36.55 ⁽⁰⁰⁰⁾	55.98 ^(Mt)	61.7 ^(**)	76.55 ^(****)	52.94 ^(Mt)	48.66 ⁽⁰⁰⁰⁾	37.24 ⁽⁰⁰⁰⁾	62.94 ^(Mt)	68.66 ^(**)	75.84 ^(****)
F/ M9	42.11 ^(Mt)	36.12 ⁽⁰⁰⁾	31.33 ⁽⁰⁰⁰⁾	52.11 ^(Mt)	56.12 ^(*)	71.33 ^(****)	48.42 ^(Mt)	42.13 ⁽⁰⁰⁰⁾	35.84 ⁽⁰⁰⁰⁾	58.42 ^(Mt)	62.13 ^(**)	77.24 ^(****)
U. H./ P.s	35.5 ^(Mt)	26.17 ⁽⁰⁰⁰⁾	22.05 ⁽⁰⁰⁰⁾	45.50 ^(Mt)	46.17	62.05 ^(****)	42.33 ^(Mt)	30.53 ⁽⁰⁰⁰⁾	25.25 ⁽⁰⁰⁰⁾	52.33 ^(Mt)	50.53 ⁽⁰⁰⁰⁾	65.25
U. H./ C. O.	35.15 ^(Mt)	22.74	20.74	45.15 ^(Mt)	42.74	60.74	41.92 ^(Mt)	26.5 ⁽⁰⁰⁰⁾	23.7 ⁽⁰⁰⁰⁾	51.92 ^(Mt)	46.5 ⁽⁰⁰⁾	63.7
AUGUST												
	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
F/ MM106	69.96 ^(Mt)	64.36 ⁽⁰⁾	63.01 ⁽⁰⁾	79.96 ^(Mt)	84.36	103.01 ^(****)	82.39 ^(Mt)	76.34 ⁽⁰⁰⁾	71.66 ⁽⁰⁰⁰⁾	92.39 ^(Mt)	96.34 ^(*)	111.66 ^(****)
F/ M9	68.9 ^(Mt)	64.86	59.25 ⁽⁰⁰⁾	78.90 ^(Mt)	84.86 ^(*)	99.25 ^(****)	78.33 ^(Mt)	72.05 ⁽⁰⁰⁰⁾	69.74 ⁽⁰⁰⁰⁾	88.33 ^(Mt)	92.05 ^(**)	109.74 ^(****)
U. H./ P.s	73.87 ^(Mt)	66.72 ⁽⁰⁰⁰⁾	51.21 ⁽⁰⁰⁰⁾	83.87 ^(Mt)	86.72	91.21 ^(**)	75.42 ^(Mt)	68.10 ⁽⁰⁰⁰⁾	59.25 ⁽⁰⁰⁰⁾	85.42 ^(Mt)	88.10	99.25 ^(****)
U. H./ C. O.	71.83 ^(Mt)	65.64 ⁽⁰⁰⁰⁾	49.01 ⁽⁰⁰⁰⁾	81.83 ^(Mt)	85.64 ^(****)	89.01 ^(****)	74.75 ^(Mt)	65.94 ⁽⁰⁰⁰⁾	57.83 ⁽⁰⁰⁰⁾	84.75 ^(Mt)	85.94 ⁽⁰⁰⁰⁾	97.83 ^(*)
SEPTEMBRE												
	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
F/ MM106	83.25 ^(Mt)	76.08 ⁽⁰⁰⁰⁾	71.02 ⁽⁰⁰⁰⁾	93.25 ^(Mt)	96.08 ^(**)	111.02 ^(****)	98.32 ^(Mt)	89.52 ⁽⁰⁰⁰⁾	80.71 ⁽⁰⁰⁰⁾	108.32 ^(Mt)	109.52	120.71 ^(****)
F/ M9	83.47 ^(Mt)	72.34 ⁽⁰⁰⁾	66.64 ⁽⁰⁰⁰⁾	93.47 ^(Mt)	92.34	106.64 ^(**)	94.65 ^(Mt)	82.21 ⁽⁰⁰⁰⁾	72.48 ⁽⁰⁰⁰⁾	104.65 ^(Mt)	102.21 ⁽⁰⁾	112.48 ^(****)
U. H./ P.s	91.29 ^(Mt)	85.28 ⁽⁰⁰⁰⁾	70.98 ⁽⁰⁰⁰⁾	101.29 ^(Mt)	105.28 ^(**)	110.98 ^(****)	107.1 ^(Mt)	98.4	86.28 ⁽⁰⁰⁾	117.1 ^(Mt)	118.4	126.28
U. H./ C. O.	80.56 ^(Mt)	77.668	63.42 ⁽⁰⁰⁰⁾	90.56 ^(Mt)	97.66 ^(****)	103.42 ^(****)	95.05 ^(Mt)	88.25 ⁽⁰⁰⁾	69.17 ⁽⁰⁰⁰⁾	105.05 ^(Mt)	108.25	109.17
OCTOBRE												
	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
F/ MM106	95.32 ^(Mt)	87.11 ⁽⁰⁰⁰⁾	81.32 ⁽⁰⁰⁰⁾	105.32 ^(Mt)	107.11 ^(*)	121.32 ^(****)	115.62 ^(Mt)	105.28 ⁽⁰⁾	94.91 ⁽⁰⁰⁰⁾	125.62 ^(Mt)	125.28	134.91 ^(*)
F/ M9	95.57 ^(Mt)	82.83 ⁽⁰⁰⁰⁾	76.30 ⁽⁰⁰⁰⁾	105.57 ^(Mt)	102.83	116.30 ^(****)	111.31 ^(Mt)	96.68 ⁽⁰⁰⁾	85.24 ⁽⁰⁰⁰⁾	121.31 ^(Mt)	116.68	125.24 ^(*)
U. H./ P.s	111.00 ^(Mt)	95.61 ⁽⁰⁾	82.54 ⁽⁰⁰⁰⁾	121.00 ^(Mt)	115.61 ^(*)	122.54 ^(****)	116.00 ^(Mt)	105.88	92.84 ⁽⁰⁰⁰⁾	126.00 ^(Mt)	125.88	132.84 ^(*)
U. H./ C. O.	96.41 ^(Mt)	88.93 ⁽⁰⁰⁰⁾	72.62 ⁽⁰⁰⁰⁾	106.41 ^(Mt)	108.93	112.62 ^(*)	111.45 ^(Mt)	94.96 ⁽⁰⁾	77.34 ⁽⁰⁰⁰⁾	121.45 ^(Mt)	114.96	117.34 ^(*)

Table 3

Dry matter content (%) during the growing season at apple and pear trees drafted on different rootstock at 10 cm (V1), 20 cm (V2), and 40 cm (V3)

Scion / rootstock	2007				2008			
	June	July	Aug	Sept.	June	July	Aug.	Sept.
Florina / MM106 (V1)	22,47	26,13	27,61	38,05	24,20	27,58	27,35	34,21
Florina / MM106 (V2)	26,72	31,07	33,33	37,39	28,77	32,80	33,01	33,61
Florina / MM106 (V3)	29,53	34,34	38,83	42,92	30,80	34,25	38,46	41,88
Florina / M9 (V1)	25,01	27,08	31,26	35,79	23,92	26,69	29,94	33,47
Florina / M9 (V2)	30,95	32,99	38,93	41,79	28,32	30,09	34,14	40,87
Florina / M9 (V3)	31,96	35,86	39,38	45,70	30,41	33,23	37,98	42,58
Untoasa Hardy / <i>Pirus sativa.</i> (V1)	21,98	25,56	32,95	36,05	23,67	26,98	30,68	34,72
Untoasa Hardy / <i>Pirus sativa.</i> (V2)	28,97	33,68	35,23	40,03	27,19	31,55	34,90	38,89
Untoasa Hardy/ <i>Pirus sativa</i> (V3)	28,56	33,21	39,19	42,70	30,75	35,05	38,82	41,78
Untoasa Hardy/ <i>Cydonia oblonga</i> (V1)	25,98	30,21	29,54	33,47	24,97	28,89	29,26	30,09
Untoasa Hardy/ <i>Cydonia oblonga</i> (V2)	26,98	31,37	31,04	37,96	26,04	33,11	30,75	34,13
Untoasa Hardy/ <i>Cydonia oblonga</i> (V3)	28,14	34,53	38,65	45,55	27,68	32,67	35,34	41,25

Table 4

Sugars content (mg/g f. m.) during the growing season at apple and pear trees drafted on different rootstock at 10 cm (V1), 20 cm (V2), and 40 cm (V3)

Scion / rootstock	2007				2008			
	June	July	Aug	Sept.	June	July	Aug.	Sept.
Florina / MM106 (V1)	10,52	14,34	20,15	23,40	9,39	12,75	17,82	20,62
Florina / MM106 (V2)	17,74	18,00	21,25	24,04	15,84	16,01	18,80	21,18
Florina / MM106 (V3)	19,32	20,13	21,40	24,35	17,25	17,90	18,93	21,45
Florina / M9 (V1)	10,75	14,96	22,94	23,84	9,60	13,30	20,29	21,00
Florina / M9 (V2)	16,36	19,58	25,99	25,80	14,61	17,41	22,99	22,73
Florina / M9 (V3)	19,03	20,81	26,40	27,43	16,99	18,51	23,35	24,17
Untoasa Hardy / <i>Pirus sativa.</i> (V1)	10,91	14,44	20,12	23,68	9,74	12,84	17,80	20,86
Untoasa Hardy / <i>Pirus sativa.</i> (V2)	17,90	19,55	21,42	25,48	15,98	17,39	18,95	22,45
Untoasa Hardy / <i>Pirus sativa</i> (V3)	18,66	21,30	23,08	25,76	16,66	18,94	20,42	22,70
Untoasa Hardy / <i>Cydonia oblonga</i> (V1)	10,93	13,12	19,26	23,12	9,76	11,67	17,04	20,37
Untoasa Hardy / <i>Cydonia oblonga</i> (V2)	15,58	17,46	22,03	23,99	13,91	15,53	19,49	21,14
Untoasa Hardy / <i>Cydonia oblonga</i> (V3)	18,12	19,31	23,64	25,64	16,18	17,17	20,91	22,59

Rootstock had a big influence on sugar accumulation. Irrespective of budding height more sugars were found in leaves of the maiden trees grafted on

M9 and *Cydonia oblonga* than MM 106 and *Pirus sativa*. Increasing grafting height lead to a bigger accumulation of sugars, both apple and pear trees (table 4).

It was a direct correlation between budding height and sugar content as well as between budding height and rootstock. Therefore trees budded at 40 cm on M9 had a better accumulation of sugars than trees grafted on MM106 at the same height. The same tendency was observed at pear trees too. When grafting was made at 40 cm on *Cydonia oblonga*, sugar content grew with 9.8% but when *Pirus sativa* was used as rootstock, sugar content was only with 8% higher.

CONCLUSIONS

1. Budding height influenced bud overwintering and decreased scions vigour mainly when M9 and *Cydonia oblonga* were used as rootstocks. Nevertheless it can be observed an increasing of total tree length as grafting height was increased.

2. Both rootstock and budding height influenced sugars and dry matter accumulation in leaves of the maiden trees. It seems that budding height determined increasing of rootstock effect on the scion, especially when weak vigour rootstock (as M9 and *Cydonia oblonga*) are used.

REFERENCES

1. Howard B.H., Oakley, W., 1993 - *The effect of rootstock shoots growth on the level of bud-grafting success in apple*. J. Hort. Sc. 68(6): 891-897.
2. Kviklys D., Lanauskas J., 2007 - *Effect of Budding Height and Rootstocks on the Quality of Apple Planting Material*. Acta Hort. 732
3. Lakso A.N., 1985 - *The effects of water stress on physiological processes in fruit crops*. Acta Hort. (ISHS) 171:275-290

THE EVALUATION OF THE ECOLOGICAL AND CLIMATE CONDITIONS FOR THE APRICOT TREE CULTURE IN BRĂILA PLAINS

ESTIMAREA PRETABILITĂȚII ECOCLIMATICE PENTRU CULTURA CAISULUI ÎN CÂMPIA BRĂILEI

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Abstract. *In order to establish the opportunity of cultivating different varieties of apricot trees on Brăila Plains, during 2005-2007, a scientific study has been made in a plantation located in the Cazasu Village, Brăila County, on a vernic mold, using a tree density of 625 trees per hectare (4/4). The biological material is made up of two varieties of apricot tree: NJA 19, with early ripening period, and Comandor with a late ripening period, grafted on wild apricot tree. Processing different authors' data, we can admit that for producing a ton of dry substance in optimal vegetation conditions, the value of the economic coefficient of plant evaporation (Q) is 250 mc of water. Calculating the plant evaporation reference at the place (ETPr) on monthly values taken for 25 years, in the vegetation period, and the plant's optimum water consumption, (ETp), for the studied area, we have the main elements to estimate the yearly agricultural productivity. According to the mathematical model established by Budan S, Grădinaru G. in 2000, two varieties of apricot trees were calculated and compared, NJA 19 with an early ripe, and Comandor, with a late ripe, the following agro-environmental main categories: Potential Bio-productivity (BP), Potential Harvest (RP), Potential Pedology Harvest (RPP), Potential Ecological Harvest (REP).*

Key words: apricot, Potential Bio-productivity (BP), Potential Harvest (RP), Potential Pedology Harvest (RPP), Potential Ecological Harvest (REP).

Rezumat. *Pentru stabilirea favorabilității cultivării unor soiuri de cais în Câmpia Brăilei, în perioada 2005-2007, s-a efectuat un studiu, într-o plantație situată în localitatea Cazasu - județul Brăila, pe un sol cernoziom vermic, cu o densitate de 625 pomi/ha (4/4). Materialul biologic îl constituie 10 soiuri de cais (Harcot, NJA 19, Royal, Goldrich, Cea mai bună de Ungaria, Mamaia, Umberto, Comandor, Sulina, Favorit), alături pe zarzăr. Prelucrând datele mai multor autori (Thompson, 1952 și Parker, 1963, citați de Constantinescu, 1967; Chiriță, 1974; Grumeza, 1979; Iancu, 1983) se poate admite că pentru producerea unei tone de substanță uscată în condiții optime de vegetație, valoarea coeficientului economic al evapotranspirației (Q) este de 250 m³ de apă. Calculând evapotranspirația de referință a locului (ETPr) lunară pe 25 de ani, în perioada de vegetație, precum și consumul optim al plantei (ETp), pentru zona de studiu, dispunem de elementele esențiale pentru estimarea potențialului agroproductivității plantației. Pe baza modelului matematic elaborat de Budan S. și Grădinaru G. în 2000, s-au calculat și comparat, pentru două soiuri de cais, NJA 19 cu coacere timpurie și Comandor cu coacere târzie, următoarele categorii agroecologice: bioproductivitatea potențială (BP), recolta potențială (RP), recolta pedologică potențială (RPP), recolta ecologică potențială (REP).*

Cuvinte cheie: cais, bioproductivitatea potențială, recolta potențială, recolta pedologică potențială, recolta ecologică potențială.

INTRODUCTION

Though climatically, our country joins the belt for favourable apricot culture, both in as far as the thermal and light resources are concerned and the humidity factors as well, it shows great differences regionally determined by climatic zoning.

Apricot production also varies much yearly, due to its extreme sensitivity to the changes that occur in the structure of meteorological conditions, the main variability factors being the late hoarfrosts and the return spring frosts (Cociu V., 1993). In order to appreciate the agricultural and productive potential, of the natural background, starting from apricot tree biological requirements, based on the studies made in the Braila Plains area, a region favourable to apricot culture, evaluations have been made and several crop agro-ecological categories have been compared in order to establish the limitative factor as well as to get high-quality and economical productions in the area under study.

MATERIALS AND METHODS

The study was made on an apricot plantation situated in the S-E of the Romanian Plains (Cazasu Village –Braila County) established in 1997 on a vermic chernozem soil, having a density of 625 trees per ha (4/4). Ten varieties of apricot tree are planted here, from which two have been used to demonstrate zone favourability for apricot culture, NJA19 with early ripening and Comandor with late ripening period. The observations concerning production and quality have been made during 2005 - 2007. This study was based on the idea that plant productivity may be developed according to helio-thermal, hydric and trophic resource parameters of a given area.

This paper has used data calculated for this particular place reference potential evaporation, Braila Plains- Cazasu Village, (ETPr) calculated after Thortwaite for 25 years as well as the optimum water consumption for apricot trees (ETPo) in the Braila Plains, calculated after data from several authors: Constantinescu, 1967; Grumeaza N. and Klepş C., 1979; Iancu, 1981 who point out that the value of optimum water consumption necessary to elaborate one unit of vegetal substance during evaporation (Q) under optimum culture conditions is about 250 m³ of water. The present study is based upon a mathematical model elaborated by S. Budan and G. Gradinariu in 2000 on which several agro-ecological standard categories for two apricot varieties (NJA19, early ripening and Comandor, late ripening) have been defined and calculated.

RESULTS AND DISCUSSIONS

From calculations made for Braila Plains, the place reference potential evaporation (ETPr) monthly on a vegetation period after the formula elaborated by Thortwaite for 25 years, as well as the water optimum consumption for apricot trees (ETPo) in the Braila Plains (calculated after the data of several authors who have established the optimum water consumption for the trees: Grumeza, 1979; Iancu, 1981, 1983; Adamov, 1979), are shown in Figure 1.

The plant optimum water consumption (ETpo) in relation to the place reference potential evaporation represents the type of culture relative evaporation coefficient ($K_c = ET_{po} / ET_{Pr}$).

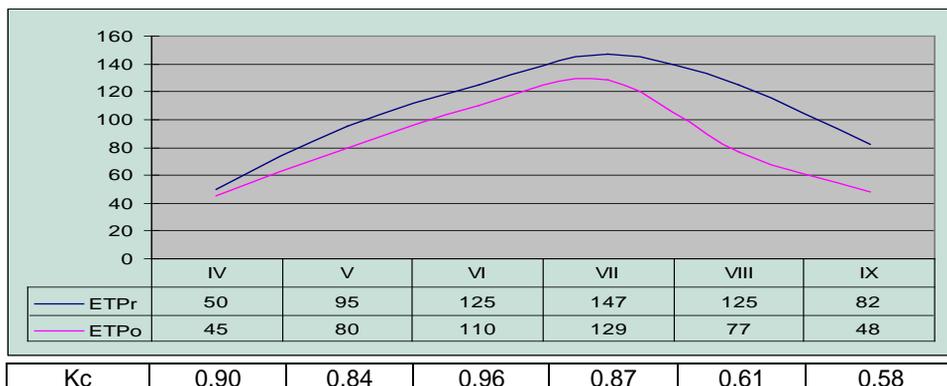


Fig. 1. Relation between reference potential and optimum evaporation for apricot trees, at Cazasu – Brăila

Potential bio-productivity (BP) of the culture has been estimated after the relation:

$$\mathbf{BP} = \sum \mathbf{ETPr} / \mathbf{Q} \times \mathbf{Kc} \text{ (t/ha, s.u. vegetal)}, \text{ where:}$$

BP = total phyto-mass which can be obtained under optimum weather and soil conditions coupled with perfect culture technology. The BP level, expressed in dry substance, is determined by the plant biological possibilities and by the evaporating force of the atmosphere.

Kc = apricot relative evaporation coefficient in the area under study;

$\sum \mathbf{ETPr}$ = the place reference potential evaporation taken from the moment of vegetation until the fruit full maturation, m³ of water per hectare;

Potential bio-productivity as a multi-annual average value (BPm) for the varieties under analysis is: for NJA19, 7,94 t/ha s.u. total phyto-mass BPm = 2614/250 x 0,76 = 7,94); for Comandor variety, 12,02 t/ha s.u. total phyto-mass (BPm = 4295/250 x 0,70 = 12,02).

The **potential crop** (agro-productivity) (RP) represents the potential biological production which is being used as an agricultural product (apricots) and it is obtained by including a transformation coefficient of that part of total potential biomass in the previous formula in the standard crop - **Kr**.

$$\mathbf{RP} = \mathbf{ETPr} / \mathbf{Q} \times \mathbf{Kc} \times \mathbf{Kr} \text{ (t/ha apricots)}, \text{ where:}$$

Kr – is obtained by relating the edible crop index in percentages (Ir) to the content of dry substance of the standard crop (S%), i.e. Kr = Ir/S.

The crop index for NJA19 is estimated to 21%, while the dry substance content is about 13%.

For the Comandor variety, the crop index is estimated to 35, while the dry substance content is estimated at 17%.

As a result: for NJA19 – Kr = 21/13 = 1.61 and for the Comandor variety - Kr = 35/17 = 2.05.

The potential crop (RP) is 12.78 t/ha apricots for the NJA19 (RP = 2614/250 x 0,76 x 1,61 = 12,78) and for the Comandor 24,64 t/ha apricots (RP =

4295/250 x 0,70 x 2,05 = 24,64).

The **potential pedological crop (RPP)** is the crop which can be obtained when the weather conditions are good, being determined only by the soil real fertility and expressing its limitative character.

$$\mathbf{RPP = RP \times Ktp = \sum ETPr / Q \times Kc \times Kr \times Ktp}$$

Ktp – the soil potential trophicity coefficient has been calculated by adapting Chirita (1974) formula to the plantation anthropogenized soil specificity.

$$Ktp = 0,002 \sum_{i=1}^n tpi = 0,002 \sum_{i=1}^n H2 \times Vi \times ri$$

where: H= the humus percentage related to the volume; V = the degree of base saturation pH=8.3 up to values reaching 95%; r = the relation between the fine earth volume (no skeleton) and the soil total volume; 0,002 = a coefficient resulted for some reasons: the soil layer thickness under analysis, whose tpi is always 20 cm, while 0,002 is a adaptation coefficient of size order with whom Ktp is used in the calculation of crop estimation.

For the soil type under study: vermic chernozem – Ktp = 658,48 x 0,002=1,31

The potential pedological crop (RPP) is 16,74 t/ha (RPP = 12,78 x 1,31 = 16,74) for NJA19, and 32,27 t/ha (RPP = 24,64 x 1,31=32,27) for Comandor.

The potential climatic crop (RCP) is interpreted as an average value of the crop meteorologically possible.

$$\mathbf{RCP = \sum ETPr / Q \times Kc \times Kr \times Kpa (1 - Kam)}$$

The most synthetic indicator which reflects the action of water and moreover the combined action of all meteorological factors upon vegetal productivity is considered to be the air-soil phyto-productivity coefficient (Kpa) which expresses for each value Iua and Iuex the plant productivity in tens of the whole to the maximum one (=1) corresponding to the humidity for plain value (Iua = 100).

Based on pre-calculated values, we determined the Kpa value for the vermic chernozem type of soil in accordance with the active humidity interval calculated for the Braila area for each month of vegetation period (Table1).

For each period under analysis the state of soil humidity has been determined on decades, on each month and on vegetation periods according to a survey.

To determine the water reserve in the soil on April 1st (Ra 1 IV) we used this formula:

$$\mathbf{Ra\ 1\ IV = (P_x > 40 + P_{XI} + P_{XII} + P_I + P_{II} + P_{III} - 100)}, \text{ where:}$$

P – monthly rainfalls in mm; 100 - ETPr between November 1st-April 1st; 1.2 – the coefficient of water accumulation in the upper layers as a result of water vapour condensation.

The value Ra 1 IV (multi-annual average value for Braila) = (38,2 + 27,8 + 31,3 + 28 + 23,9 - 100) 1,2 = 59,04 mm = 590 m³ / ha for a depth of 80-100 cm.

Table 1

Kpa Calculation for the period 1980 - 2007 for the Apricot in the Braila Plains

Month	IV	V	VI	VII	VIII	IV-VIII
ETPr (mm)	50	95	125	147	125	542
ETP (mm)	45	80	110	129	77	441
P (mm)	36	50	62	44	45	237
Af	14	35	59	76	62	246
ETR (mm)	45	80	110	129	77	441
Rai (beginning of month)	73	64	69	80	71	-
Ram (monthly average value)	99	78	95	88	80	88
lua %	53	42	51	47	43	47,2
Kpa	0,30	0,19	0,29	0,25	0,19	0,24

Over a climatically ensured crop(CEC) meteorological accidents have a negative influence – spring late frosts (i), hail (g), the physiological stress given by cold waves (f), by heat(a), by air dryness(u), situated above biological thresholds of pheno-phases, of those particularly important for the crop level, such as blossoming and fruit growth (Kolesnikov, 1975 quoted by Budan S. and Grădinariu G., 2000).When the meteorological accident irreversibly affects the fruit-bearing organs, such as the fruit-bearing bud freezing under the limit of 30-35 % for each percentage under the limit, the crop will diminish by 3,0 -3,5 %.

All these negative influences gets into the calculation of agro-productivity by summing up of all losses, in relative values generated by each phenomenon in the relation:

$$K_{am} = \sum_{i=1}^n X_i, \text{ where :}$$

K_{am} – loss coefficient whose calculus basis is from 0 to 1.

X – the relative value of crop diminution as a result of unfavourable meteorological factors already mentioned.

For the period under discussion the K_{am} value for NJA19 is 0,098, while for the Comandor variety, it is 0,183.

The potential climatic crop (RCP) for the NJA19 is 3.19 t/ha ($2614/250 \times 0,76 \times 0,61 \times 0,26 \times (1 - 0,098) = 3,91$), while for the Comandor, it is 7,25 t/ha ($4295 / 250 \times 0,7 \times 2,05 \times 0,25 \times (1 - 0,183) = 7,25$)

The **potential ecological crop** (REP) can be obtained under real soil conditions of the micro-zone. On high-fertility soils REP reaches or can be equal to the RCP (Jukovsky, 1989 quoted by Budan.S. and Grădinariu G., 2000).

$$REP = RCP \times K_{tp} = \sum ETPr / Q \times K_c \times K_{pa} (1K_{am}) \times K_{tp}$$

For the NJA19 variety, the potential ecological crop is 5,12 t/ha ($3,91 \times 1,31 = 5,12$), while for the Comandor it is 9,49 t/ha ($7,25 \times 1,31 = 9,49$).

From all the data we may notice a much greater production biological potential for the Comandor (24,64t/ha) as compared to the NJA19 with 12,78 t/ha, which explains the longer fruit growing period for the first variety (Table2).

The pedo-climatic conditions of the zone make the potential ecological crop represent 40% of the potential biological crop for the NJA19, while for the Comandor, the potential ecological crop represents 38,57% of the potential biological one.

Table 2

Apricot Crop Agro-Ecological Categories for the Braila Plains

Crop Agro-Ecological Categories	Variety	
	NJA 19	Comandor
Potential Bioproductivity (BP) - t/ha, s.u. vegetal	7,94	12,02
Potential Biological Crop (RP) - t/ha fruits	12,78	24,64
Potential Pedological Crop (RPP) - t/ha fruits	16,74	32,27
Potential Climatic Crop (RCP) - t/ha fruits	3,91	7,25
Potential Ecological Crop (REP) - t/ha fruits	5,12	9,49
Average Production Obtained (2005-2007) – t/ha fruits	15,13	23,28

CONCLUSIONS

The soil from the area under analysis, the vermic chernozem, which doesn't show elements of gleization or salinization, it has a high fertility, so that the fruit production is high, the potential pedological crop (REP) being certain.

This zone limitative character for the apricot culture is given by the high temperatures during the vegetation period (16,47 °C), associated with low-rate rainfalls (264 l/mp), which leads to a low potential climatic crop (RCP). This shortcoming is compensated by extensive irrigation.

As for the behaviour of the varieties used in the area under study, we notice the use of late-ripening varieties. The potential of the late-ripening varieties is superior to the early-ripening varieties and it can be appreciated not only as a genetic characteristic of this variety, but also as a favourable influence of the climatic conditions during the blossoming and fruition periods of the late varieties.

The mathematical model used here emphasized the influence of parameters such as the zone trophic, hydric and helio-thermal resources upon the productivity of the soils under analysis.

REFERENCES

1. Budan S., Grădinaru G., 2000 – *Cireșul*. Ed. Ion Ionescu de la Brad, Iasi.
2. Cociu V. and colab., 1993 – *Caisul*. Editura Ceres, București.
3. Grumeza N., Klepș C., 2005 – *Amenajările de irigații din România*. Editura Ceres, București.

THE ASSESMENT AF THE POTENTIAL PRODUCTION CAPACITY OF SOME VARIETIES OF APRICOTS GOWN IN THE S-E ROMANIAN PLAINS

ESTIMAREA CAPACITĂȚII POTENȚIALE DE PRODUCȚIE A UNOR SOIURI DE CAIS CULTIVATE ÎN PARTEA DE S-E A CÂMPIEI ROMÂNE

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Abstract: *The cultivation of apricot tree varieties, adapted to each apricot culture area, is an essential condition for the longevity of the tree. In the present document there are presented the results from the study made during 2005-2007, in the S-E side of the Romanian Plains (Cazasu Village, Brăila County), on a vernic mold, using a tree density of 625 trees per hectare on a plantation established in 1997. Its purpose is to establish the productive capacity of the varieties studied in the ecopedological conditions of the area. The varieties studied were: Harcot, NJA 19, Royal, Goldrich, The Best of Hungary, Mamaia, Umberto, Comandor, Sulina, Favorit) grafted on wild apricot. It is well known that the shape and volume of the tree crown is the result of anthropogenic interventions, while the thickness growth of the tree trunks is conditioned by: heredity (the biological particularities of the variety-graft carrier combination), age and the ecological and soil conditions, not being influenced by the applied technologies (Herman, 1970). For the expedite estimation of the potential capacity of production of the varieties under analysis, the productivity indicator was being used (kg of fruits/cm² of trunk section). From the analysis of the results, we may find a relationship between the tree trunk thickness and the quantity of the fruits obtained, the varieties studied showing different adaptation capacity to the ecological and climate conditions of the studied area.*

Key words: apricot, adaptation capacity, capacity of production

Rezumat: *Cultivarea soiurilor adaptate fiecărei zonă de cultură a caisului este o condiție esențială pentru longevitatea plantației. În lucrarea de față sunt prezentate rezultatele obținute în studiul efectuat în perioada 2005 – 2007, în partea de S-E a Câmpiei Române (localitatea Cazasu, Județul Brăila), într-o plantație înființată în anul 1997, pe un sol cernoziom vermic, cu o densitate de 625 pomi/ha. Soiurile studiate au fost: Harcot, NJA 19, Royal, Goldrich, Cea mai bună de Ungaria, Mamaia, Umberto, Comandor, Sulina, Favorit, altoite pe zarzăr. Este cunoscut faptul că forma și volumul coroanei sunt rezultatul intervențiilor antropice, în timp ce creșterea în grosime a trunchiului este condiționată de ereditate vârsta și condițiile ecopedologice, nefiind influențată de tehnologiile aplicate (Herman, 1970). Pentru estimarea expeditivă a capacității potențiale de producție a soiurilor studiate s-a utilizat indicele de productivitate (kg fructe/cm² secțiune trunchi). Din analiza rezultatelor obținute se constată o relație între grosimea trunchiului și producția obținută, soiurile studiate manifestând capacitate diferită de adaptare la condițiile ecoclimatice din zona de studiu.*

Cuvinte cheie: cais, capacitate de adaptare, potențial producție

INTRODUCTION

Although our country presents favorable eco-climatic conditions for apricot tree cultivation, fruit production oscillates yearly due to the extreme sensitivity of this species in relation to the structure of meteorological changes.

If we analyze the distribution of apricot trees all over Romania, we shall notice that the largest areas suitable for this fruit tree are to be found in the plains, particularly in the south.

Large, high-quality fruit crops can be obtained in those regions where the conjunction of the natural pedo-climatic factors are high enough to meet the requirements of both the apricot species and variety.

The study of apricot variety behaviour to the eco-climatic conditions of each cultivation micro-zone may eliminate low-adaptable varieties and the promoting of valuable varieties capable to obtain constant economic crops (Cociu V.,1993) and this is exactly the reason for the setting-up of this particular study for the Braila area.

The researches made under different eco-pedological conditions showed that the tree trunk thickness growth is determined not only by genetic factors and age, too, but also by eco-climatic factor variations. As scientists know the importance of trunks in translocating raw and elaborate sap as essential components for fruit production, all pomicultural researches have tried to highlight a relation between trunk thickness and the fruit production. (Voiculescu N., Popescu I., Teaci D. Puiu Șt., Amzâr Gh., 1983).

MATERIALS AND METHODS

This study unfolded between 2005-2007 on an apricot plantation established in 1997, situated in the S-E of the Romanian Plains (Cazasu Village, Braila County) on a vermic chernozem soil, having a density of 625 trees per hectare (4/4)

The biological material they used here were 10 apricot varieties(Harcot, NJA 19, Royal, Goldrich, The Best of Hungary (CMBU), Mamaia, Umberto, Comando, Sulina, Favorit), the variety graft carrier being the wild apricot, the leading method, the improved vessel (table 1), analyzed as a randomized block type experience.

We used observation, biometric measurements and we checked up the productivity and the growth vigor.

Other researches made by different authors show that there is a relationship between fruit production and trunk thickness, an essential element the whole study started from. In order to rapidly distinguish between the various adaptation capacities of the apricot varieties under analysis to the environmental conditions of the area under study, we used the productivity index as an expression of the relation between trunk thickness and fruit production (kg fruits/cm² trunk section).

The diameter of the trees has been measured on the plot on two perpendicular directions, then an average value was calculated for each tree at mid-height trunk. The measurements have been taken by using sliding callipers for 10 trees of each variety, then they calculated the trunk average surface for each variety.

Table 1

Biological material use

No.	Soil Name	Origin	Blossoming period	Ripening Time
1.	Harcot	Canada	early	II June
2.	NJA 19	SUA	early	II June
3.	Royal	Franța	average	I July
4.	Goldrich	SUA	average	II July
5.	The Best of Hungary (CMBU)	Romania	average	II July
6.	Mamaia	Romania	late	III July
7.	Umberto	Unknown	late	III July-I August
8.	Comandor	Romania	average	II-III August
9.	Sulina	Romania	late	III July
10.	Favorit	Romania	average	III July –I August

The production was calculated by weighing the crop for each variety in particular.

All the results have been registered according to statistical norms and interpreted by means of variation analysis.

The climatic data they have been using for three years were taken over from the Braila meteo station as well as the multiannual average values for the last 25 years.

RESULTS AND DISCUSSIONS

This area's yearly average temperature is 10,5°C, while the monthly average temperatures for the same period show the existence of great temperature variations for each month during the year. The maximum amplitude of the monthly average temperatures is 26,2°C, while the daily average temperatures of over 25°C are present on about 120 days a year; the temperatures over 30°C are to be met on 40-60 days a year, which points to a continental climate character.

The average number of freezing days (with temperatures under 0°C) represents 97 days, of which 72,1 days in winter, 9,7 days in spring and 15,7 days in autumn. The sum of temperatures during the vegetation period (March 1st – September 31st) is 3,976 °C with a daily average of 16,2 °C on interval, while the sum of temperatures during May 5th – October 31st is 3,489 °C.

The yearly rainfalls amount to 450 – 550 mm, the multi-annual average reaches 447 mm, out of which 198 mm during winter and 255 mm in summer. The heaviest rains fall in April, May, June, while the lowest quantities fall in February and March. Of the agricultural seasons, the richest in rainfalls are July and August. Still the yearly average temperature for the time span under analysis was 11,46 °C and during the vegetation period, it was 16,29 °C. Air relative humidity was 70,21 %, while during the vegetation period, it was 57,37 % (table 2). During these three years, rainfalls had the greatest variation levels to the multi-annual average of the area under analysis. (fig.1)

Table 2

The Main Climatic Elements Registered between 2005-2007

Climatic elements	Periods						Average 2005-2007	
	2005		2006		2007		Total	În veg.
	Total	În veg.	Total	În veg.	Total	În veg.		
Air Average Temperature (°C)	11,00	15,62	11,20	16,22	12,20	17,03	11,46	16,29
Air Relative Humidity (%)	69,33	61,87	72,91	59,00	68,41	52,00	70,21	57,62
Rainfalls (mm)	871,1	677,9	403,6	332,3	491,7	238,9	588,8	416,36

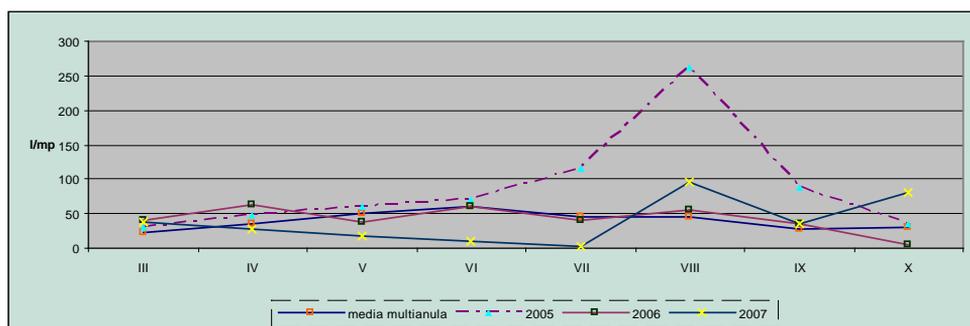


Fig. 1. Monthly average rainfall during vegetation periods 2005 -2007

In order to express the plantation's production potential capacity more easily researchers made trunk measurements. By knowing the diameter, the trunk transversal section has been calculated as a biometric indicator used for determining the productivity index (table 3).

Table 3

The Average Surface of Trunks in Apricot Varieties Studied between 2005-2007

No	Variety	Trunk Surface Section (cm ²)			Average 2005-2007 (cm ²)	Difference to average	Its signif.
		2005	2006	2007			
1.	Harcot	84,75	105,00	115,00	101,58	-3,20	00
2.	N.J.A. 19	96,75	110,00	123,50	110,08	+5,30	xxx
3.	Royal	95,00	108,25	120,70	107,98	+3,20	xx
4.	Goldrich	79,00	96,62	116,75	97,45	-7,33	000
5.	C.M.B.U.	77,00	98,17	119,00	98,05	-6,73	000
6.	Mamaia	91,00	109,75	124,00	108,25	+3,47	xx
7.	Umberto	89,00	104,82	119,50	104,44	-0,34	-
8.	Comandor	93,00	117,97	127,75	112,90	+8,12	xxx
9.	Sulina	79,00	112,12	123,00	104,70	-0,08	-
10.	Favorit	84,40	101,82	121,00	102,40	-2,38	0
	Average values	86,89	106,45	121,00	104,78		

DL 5% = 2,27; DL 1% = 3,06; DL 0.1% = 4,09

From the analysis of all the experimental data we got between 2005-2007, concerning trunk thickness for all the 10 apricot tree varieties, cultivated in the N-E of the Braila Plains – Cazasu Village by comparison with the variety average, we may notice strikingly positive differences for the NJA19 and the Comandor, while the Royal and the Mamaia varieties show distinctly positive differences. By analyzing the fruit production during the agro-ecological conditions of the period of study, we saw that Comandor, Sulina and Mamaia had significantly positive productions as compared to the average values, Umberto also showed a significantly positive production while the other varieties had productions under the average values (table 4).

Table 4

**Average production in Apricot Varieties
Cultivated between 2005-2007**

No.	Variety	Average 2005-2007 (t/ha)	Relative production to average values (%)	±d (t/ha) to average value	Difference significance
1.	Harcot	13,92	76,35	-4,31	000
2.	N.J.A. 19	15,13	82,99	-3,10	000
3.	Royal	17,16	94,13	-1,07	0
4.	Goldrich	13,96	76,57	-4,27	000
5.	C.M.B.U.	17,66	96,87	-0,57	-
6.	Mamaia	20,06	110,03	+1,83	xxx
7.	Umberto	19,06	104,55	+0,83	x
8.	Comandor	23,28	127,70	+5,05	xxx
9.	Sulina	23,12	126,82	+4,89	xxx
10.	Favorit	18,95	103,94	+0,72	-
	Average Value	18,23			

DL 5 % = 0,80; DL 1% = 1,09; DL 0,1% = 1,45

Table 5

**Productivity Index for Apricot Varieties
under Study between 2005-2007**

No.	Variety	Fruit production /tree	Trunk Section Surface (cm ²)	Productivity Index
1.	Harcot	22,27	101,58	0,21
2.	N.J.A. 19	24,20	110,08	0,21
3.	Royal	27,45	107,98	0,25
4.	Goldrich	22,33	97,45	0,22
5.	C.M.B.U.	28,29	98,05	0,28
6.	Mamaia	32,96	108,25	0,30
7.	Umberto	30,49	104,44	0,29
8.	Comandor	37,24	112,90	0,32
9.	Sulina	36,99	104,70	0,35
10.	Favorit	30,32	102,40	0,29

If we relate trunk average sections for the varieties under analysis between 2005 - 2007, under the ecopedological conditions of this area, we get a productive potential for the varieties under study varying between 0,21 kg/cm² for Harcot and NJA19 and 0,32 kg/cm² for the Comandor variety, then 0,35 kg/cm² for the Sulina variety. (Table 5)

CONCLUSIONS

The analysis of the data concerning trunk sections proved Comandor and Sulina as the best varieties that demonstrate a good adaptability to the ecopedological conditions of the area under study.

If we analyze the productivity of the varieties that have been studied here, the following varieties are the best: Comandor with 23,28 t/ha, Sulina with 23,12 t/ha and Mamaia with 20,06 t/ha.

As for the productivity index, the following varieties are better: Sulina with 0,35 kg/cm² and Comandor with 0,32 kg/cm², where we may find a relation between trunk thickness and the crop. The conclusion is that the varieties with thicker trunks have a superior productivity.

If in this area the other vegetation factors (temperature, humidity) are fit for apricot cultivation requests, the yearly average rainfalls of 447 l/m² are close to the inferior limit of apricot water request. As a result, to get high-quality and economical productions, irrigation is compulsory.

REFERENCES

1. **Cociu V., 1993** – *Caisul*. Editura Ceres, București.
2. **Voiculescu N., 1999** – *Ecopedologia speciilor pomicole*. Editura Academiei Române.
3. **Voiculescu N., Popescu I., Teaci D., Puiu Șt., Amzâr Gh., 1983** – *Exprimarea parametrică a influenței condițiilor ecopedologice asupra grosimii trunchiului la pomi*. Știința solului, nr.3.

FRUIT QUALITY EVALUATION OF SOME SWEET CHERRY CULTIVARS IN IASI, ROMANIA

ÎNSUȘIRI ALE CALITĂȚII FRUCTELOR LA UNELE SOIURI DE CIREȘE

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Abstract. *The consumer test are frequent met in public places, due the great importance of the point of view of sweet cherry's consumers for melioration works. In june 2008, Fruit Growing Research Station Iasi were organised a consumer test in the Central Market of City, were we presented four sweet cherry cultivars: Bucium, Van, Tereza and Ștefan. The parameters on test were the following: external aspects (colour and shine of skin), fruit size, pulp firmity and the taste. The judgement index for every parameter was expressed on a growing scale from minimum 1 to highest 5. We analized in laboratory the soluble substance content (SSC °Bx), the titrable acidity (TA %), average of fruit size (g), average of stone size (g) and pulp firmity through registering the average deformation of fruit (mm/kg). The results of consumer test was compared with quality analyses made on the same samples in laboratory and we observed the must appreciate was Bucium, with 7,4 g fruit weight, SSC 15.9 °Bx and 0,96 % malic acid/100 g fruit weight, followed very closely by Van.*

Key words: *Prunus avium L., cultivar, consumer test, sugar, acidity, preference, Bucium, Van, Tereza, Ștefan*

Rezumat. *Pentru amelioratori, este de mare importanță părerea consumatorului de cireșe, de aceea testele de degustare în spații publice sunt tot mai des întâlnite. SCDP Iași a organizat un test de degustare în luna iunie 2008, în Piața Centrală Iași, la care au fost prezentate patru soiuri de cireș: Bucium, Van, Tereza și Ștefan. Parametrii urmăriți în cadrul fișei de degustare au fost: aspectul exterior (culoarea și luciul epidermei), dimensiunile fructului, fermitatea pulpei și gustul. Indicele de apreciere pentru un parametru a fost exprimat pe o scară crescândă de la minim 1 la un maxim de 5. În același timp, în laborator s-au realizat analize privind conținutul în substanță uscată solubilă (SUS °Bx), aciditate titrabilă (% acid malic), greutatea medie a fructului (g), greutatea medie a sâmburelui (g) și fermitatea pulpei prin înregistrarea rezistenței la deformare (mm/kg). Rezultatele testului au fost confruntate cu analizele calitative realizate la aceleași probe. S-a observat că soiul Bucium a fost cel mai apreciat de consumatori, cu 7,4 g greutate medie a fructului, SUS 15.9 °Bx și aciditate titrabilă de 0,96 %, fiind urmat de soiul Van la mică diferență.*

Cuvinte cheie: *Prunus avium L., cultivar, test de degustare, zahar, aciditate, preferință, Bucium, Van, Tereza, Ștefan.*

Fruit quality evaluation by organoleptic test is commonly used when seeking widespread cultivar of new or want a confrontation on the quality of several cultivars (Lugli *et al.*, 2006). Studies by this method on sweet cherries are interesting results, but are still least widely. Cherry consumer opinion is very important for breeders, so taste tests in public places are increasingly common. In France, CTIFL (Centre Technique Interprofessionnel des Fruits et Légumes) and experimental area La Tapy, organized taste tests in French restaurants to businesses in the area of Paris and Provence-Alpes-Côte d'Azur (Charlot *et al.*, 2002). In Italy, Lugli *et al.*, 2006 presents the results of a taste test organized in a celebration of sweet and sour cherry of Vignola. In the UK, was asked opinion consumer cherry in a questionnaire to find out why they are consumed and are the quality (Wermund, 2005). Also in SUA were evaluated in a consumer sensory evaluation some sweet cherry cultivars (Turner *et al.*, 2008). It was found that aesthetically, sweet cherry are more appreciated when are with great size, bright color, very intense dark red, but not necessarily to black. In terms of taste qualities, is preferable to high sugar content and low acidity with a good balance that ensures pleasant taste (Lugli *et al.*, 2006, Wermund *et al.*, 2005).

MATERIALS AND METHODS

Test tasting of sweet cherries was organized in Central Market, in June 2008, by FGRS Iași, Romania. The test samples were presented to each of 4 kg of 4 different varieties of cherries: *Van*, *Tereza*, *Stefan* and *Bucium*. Attended by 61 persons of both sexes, aged between 14 and 70 years. Samples were collected at the first hours of the morning and transported immediately for tasting in the market (3 km distance) and for laboratory tests (at 6 km distance). Each tasters received a sample of 3-4 fruits from each cultivar and a charter noted that feedback. Sheet used to test tasting referred to the main parameters that characterize the quality of sweet cherries represented by the appearance (skin color and gloss), fruit size, flesh firmness, taste and an overall appreciation of the fruit. Index of appreciation for a parameter was expressed on a scale increasing from 1 minimum to a maximum of 5, as follows: 1 = unpleasant, 2 = liked least, 3 = neutral, 4 = pleasant, 5 = very pleasant. The results were subjected to analysis to check significance variant (Leonte, 1997), using Microsoft Excel. To determine the size of the fruit were weighed samples of 50 fruit and was determined average fruit weight (g) and average weight of stone (g), using an electronic precision balance Radweg, then based on these measurements to calculate the pulp / stone ratio. Titratable acidity (TA) was determined by neutralizing solution of sodium hydroxide 0.1 N to the point of equivalence using timolftalein as an indicator. Soluble substance content (SSC) was determined using a Zeiss refractometer. Determination of firmity pulp was achieved on 30 fruit samples by measuring the deformation resistance of the fruit, using a mechanical device (Sirbu *et al.*, 2007). And these data were verified by statistical analysis and determination variant meanings (Leonte, 1997).

RESULTS AND DISCUSSIONS

Organoleptic test organized by the FGRS Iassy, Romania into Central Market has shown significant differences between cultivars presented (Table 1) which allows diversification assortment of sweet cherry. Expressed general appreciation of the tasters, *Bucium* cultivar was most preferred, with an average score of 4.3.

On fruit appearance, the color and luster, *Bucium* was most preferences lead to all cultivars, with an average score of 4.7, while the lowest grade was obtained from *Tereza* with an average of 4.2, although the this parameter is not very different between cultivars. At all parameters follow, *Bucium* was most preferred, with highly significant statistical difference, compared to the alternatives, but also to the *Van* took witness is noted with an average of over 4.5 in every feature.

Cultivar taken as a control (*Van*) was appreciated by notes very close to those obtained with the cultivars *Stefan* and *Tereza*. Thus, the fruit size of *Van* obtain 3.7 also *Stefan* and *Tereza* notes similarly (3.5 and 3.6). In firmness and taste, *Van* was noted on average by 4.2, as well as cultivar *Tereza* (table 1).

Table 1

Consumer test results from Central Market Iassy, Romania (15 June 2008)

Sample	Average notes obtained at every parameter				
	Appearance	Fruit size	Flesh firmness	Taste	Overall appreciation
Van - control	4.3	3.7 ⁰⁰⁰	4.2 ⁰⁰	4.2 ⁰⁰⁰	3.8 ⁰
Ştefan	4.0	3.5 ⁰⁰⁰	3.9 ⁰⁰⁰	3.9 ⁰⁰⁰	3.6 ⁰⁰⁰
Bucium	4.7*	4.5 ^{***}	4.6 ^{***}	4.6 ^{***}	4.3 ^{***}
Tereza	4.2	3.6 ⁰⁰⁰	4.1 ⁰⁰⁰	4.2 ⁰⁰⁰	3.8
Media/parametru	4.3	3.83	4.21	4.2	3.87
DL 5%	0.33	0.027	0.014	0.004	0.010
DL 1%	0.47	0.039	0.019	0.006	0.014
DL 0.1%	0.66	0.054	0.027	0.008	0.02

In all samples, test results of tasting were confronted with the parameters determined in the laboratory and noted that *Bucium* was preferred by consumers. As physical features *Bucium* recorded an average weight of 7.4 g and an average deformation of the fruit of only 3.35 mm / kg (table 2), which means that the sweet cherries are preferred for large, with great firmness. Although *Tereza* has made the cultivar a great pulp / stone ratio, that the average weight was lower than in *Bucium*, has led to neglect by consumers to this issue. Biochemical characteristics were also less important for consumers, accounting for a variety *Bucium* content soluble solids (SSC) 15.9 ° Bx and a level of titrable acidity (TA) of 0.96% malic acid/ 100 g fruit. In these features, *Tereza* and *Van* had higher values, with a SSC / TA ratio balanced of 18.86 and 19.09 respectively (Table 3), but having fruit smaller, consumers preferred *Bucium*.

However, it can be said that taste is an important parameter in consumer preferences, *Stefan* had a low SSC (13.2 ° Bx) and titrable acidity (TA) of 0.81% and was noted for consumers with an average of only 3,9, compared to other cultivars which have been recorded on average more than 4th mark.

Table 2

Physical features of some sweet cherry cultivars (2008)

Cultivar	Average fruit weight (g)	Average stone weight (g)	Fruit/stone ratio	Average fruit deformation (mm/kg)
Van	6,4	0,34	18,75	4,3
Ștefan	6,0	0,36	16,45	6,02
Bucium	7,4	0,42	17,78	3,35
Tereza	6,1	0,29	21,32	4,25

Table 3

Biochemical features at some sweet cherry cultivars (2008)

Cultivar	SSC °Bx	TA (% ac. malic/100 g fruit)	SSC/TA
Van	16.6	0.88	18.86
Ștefan	13,2	0,81	16,3
Bucium	15,9	0,96	16,56
Tereza	16,8	0,88	19,09

CONCLUSIONS

Organoleptic analysis of cultivars of sweet cherry faced with qualitative parameters measured by laboratory tests have provided interesting indications on consumer preferences to these samples.

Cultivars studied where the conditions necessary marketing, accounting notes average over 3.5 (minimum necessary for extra quality class) for all parameters follow.

For consumers, the appearance is very important, the fruit size is a parameter determining their preferences, and taste, sweet cherries require a SSC exceeds 16 ° Bx and acidity of 0,8-0,9% (Predieri, 2005, Charlot et al., 2002).

Best appreciated by consumers was *Bucium*, which met an average of 4.54 characteristics points, followed by *Van* with 4.04 points.

REFERENCES

1. Buret M., Fils-Lycaon B., 1990 – *Maturation et qualité de la cerise. Recherches nouvelles, diversification et innovation dans le domaine des fruits et légumes*. Annales du colloque, Paris, Edit. Apria, p. 53-73.
2. Charlot G., Lespinasse Natascha, Scadella Danielle, Simard Valérie, 2002 – *Du sucre, un minimum d'acidité et une bonne fermeté*. Reussir fruits et légumes, n° 207, p. 38-39.
3. Leonte C., 1997- *Ameliorarea plantelor horticoale și tehnică experimentală (lucrări practice)*, Ed. „Ion Ionescu de la Brad”, Iași, 222 pp.
4. Lugli S., Donati F., Grandi M., Gaiani Anna, Sansavini S., 2006 – *Nuova cerasicoltura ad un bivio : continuare con i duroni o introdurre nuove varietà?*, Frutticoltura, n.9, p. 30-34.
5. Predieri S., 2005 – *Studiare la qualità per valorizzare la ciliegia*. Frutticoltura, n. 3, p. 36-39.
6. Sirbu Sorina, Beceanu D., Corneanu G., Palade I., 2007- *Preliminary research concerning deformation resistance of fruits at new sweet cherry cultivars created at Fruit Growing Development Station Iași – Romania*. Lucr. Șt. UȘAMV Iași, Seria Agricultură, vol. 50.
7. Turner J., Seavert C., Colonna A., Long L.E., 2008 – *Consumer sensory evaluation of sweet cherry cultivars in Oregon*. U.S.A., Acta Hort., ISHS, 795: 781-786.
8. Wermund U., Fearne A., Hornibrook S.A., 2005 - *Consumer Purchasing Behavior with Respect to Cherries in the United Kingdom*. Proc.4th IS on Cherry, Acta Hort., ISHS, 667: 539-544.

ADAPTNES CAPACITY OF RASPBERRY VARIETIES INTRODUCED IN REPUBLIC OF MOLDOVA

CAPACITATEA DE ADAPTARE A SOIURILOR DE ZMEUR INTRODUSE ÎN REPUBLICA MOLDOVA

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Abstract. *In the article were presented the results of our investigations during the 2002-2005 about the adeptness capacity of the 28 raspberry varieties introduced in Republic of Moldova on the new soil and climatic conditions, estimation its time of fruit formation, yield, fruit quality, substances accumulation appreciation. Among the studied raspberry varieties were distinguished: Meteor, Lloyd George, Taylor, Red Wadensvil, Malling Jewel, Malling Promiss, Kobfuller, Rubin bulgarian, Hibrid bulgarian, President, Kirjaci, Barnauliskaia.*

Key words: raspberry, varietie, adeptness, yield, fruit.

Rezumat. *În lucrare sunt prezentate rezultatele cercetarilor efectuate pe parcursul anilor 2002-2005 cu privire la studierea a 28 soiuri de zmeur introduse în Republica Moldova și evidențierea capacității lor de adaptare la condiții noi de sol și climă, aprecierea soiurilor prețioase după parcurgerea fazelor fenologice, formarea recoltei, calitatea fructelor și acumularea substanțelor nutritive. Printre soiurile studiate s-au evidențiat: Meteor, Lloyd George, Taylor, Roșu de Wadensvil, Malling Jewel, Malling Promiss, Kobfuller, Rubin bulgăresc, Hibrid bulgăresc, President, Chirjaci, Barnauliskaia.*

Cuvinte cheie: Zmeur, soiuri, adaptare, recolta, fructe.

INTRODUCTION

The raspberry is one of the most widespread crop of fruit bushes in the world. Raspberry varieties although vegetative propagation and relatively stable heredity, however, show a certain degree of ecological plasticity, that can adapt to some extent and the environmental conditions somewhat different from those they originally had to create [1]. Raspberry productivity depends largely of the cultivation conditions, the agricultural machinery and the resistance to unfavourable factors. But even in the most favourable conditions for development they have a variable productivity, which is due to genetic potential possibilities of raspberry varieties [2]. Raspberry fruit contain many calories, are rich in vitamins and minerals, which have great importance in digestion and recent research has established that a number of elements in their composition fight cancer [5, 4].

High atmospheric humidity during the months of June-July has a positive effect both in quantity production as well as the quality [3]. Lack of rainfall and high temperatures during the period between the end of flowering and early fruit

ripening or falling hail up to harvest climatic factors can reduce fruit production and its quality [6].

MATERIAL AND METHOD

Investigations on the study of 28 varieties of raspberries placed in culture, during the formation yield, productivity and fruit quality of raspberries in function of genetic varieties and climatic conditions, were conducted within the experimental field of Research Institute of Horticulture over the years 2002 - 2005, on a chernozem soil type of meadow alluvial, hard clay-sandy, non-irrigated land. Planting distances were 2.5 x 0, 5m. The main objectives of the investigation were: ability to adapt to new conditions of soil and climate, increased productivity obtaining high quality of raspberry fruit, with a high amount of organic matter accumulated nutrients.

RESULTS AND DISCUSSIONS

Investigations on the study of 28 varieties of raspberries placed in culture, during the formation yield, productivity and fruit quality of raspberries in function of genetic varieties and climatic conditions, were conducted within the experimental field of Research Institute of Horticulture over the years 2002 - 2005, on a chernozem soil type of meadow alluvial, hard clay-sandy, non-irrigated land. Planting distances were 2.5 x 0.5m. The main objectives of the investigation were: ability to adapt to new conditions of soil and climate, increased productivity obtaining high quality of raspberry fruit, with a high amount of organic matter accumulated nutrients.

Table 1

Climatic conditions during growth, maturation and harvest raspberry fruit

Year after planting	The main climatic factors, average			growth and fruits maturation (days)	Date of fruit harvest, began	Yield (t /ha)
	Temperature (°C)	Rainfall (mm)	Humidity (%)			
a.II- 2002	15,9	505,1	64,3	41	12,06	0,7
a.III-2003	13,9	249,1	63,8	29	6,06	2,8
a.IV- 2004	15,05	374,6	65,0	33	15,06	1,5
a.V- 2005	16,61	429,3	63,1	26	14,06	1,6
Average	15,37	389,53	64,1	32		1,7

It was studied the adaptability of new varieties of raspberries, the influence of climatic conditions on production, fruit ripening and quality depending on the accumulation of nutrients. The start, the development period and the duration of phenological phases depend on the biological features of the variety and soil conditions and climate of the early vegetation during flowering and fruit maturation. Annual temperatures during the growing season of 2002 and 2005, which was rainy, with high temperatures in 2003 and 2004 with less precipitation and colder influenced differently varieties studied (Tab. 1 and 2.). The largest amount of rainfall of 505.1 mm fell in 2002, and the longest training of raspberry fruit was 41 days. The average duration multi-annual of training raspberry fruits from flowering until maturity was 32 days. Average annual harvest of fruit

varieties studied by raspberry obtained in the second year after planting was 0.7 t / ha, the 3rd year - 2.8 tons / ha, the 4th year - 1.5 t / ha, in the 5th year - 1.6 tons / ha. Multi-annual average harvest of raspberry fruit was 1.7 t / ha.

Table 2

The chemical composition of variety of raspberry fruits, 2002-2005.

Variety	Dry substances, %	Sugars %	Acidity %	Tanning coloring substances mg%	Vitamin C mg%	sugar / acid	Tasting Note
1.Barnaulickaia	14,08	6,93	1,89	83,14	41,13	5,61	4,52
2.Indian Summer	12,83	8,34	1,47	56,11	8,06	5,87	4,58
3.President	15,00	7,32	2,37	66,51	44,00	3,09	4,80
4.Pathfinder	12,28	6,40	1,82	65,48	30,90	3,70	4,50
5.Chirjaci	12,15	7,87	2,09	54,04	41,27	2,94	4,73
6. Stolicinaia	12,67	5,93	1,88	60,97	29,98	3,21	4,67
7. Rubin bulgarian	11,97	5,35	2,19	110,71	17,31	2,40	4,52
8.Hibrid bulgarian	13,50	8,05	1,98	99,77	22,66	2,92	4,59
9.Marfilk	13,00	6,62	2,17	62,37	33,88	3,03	4,88
10.Kobfuller	14,10	6,74	2,55	83,14	39,60	2,55	4,46
11.Malling Promiss	13,50	7,85	2,56	94,59	31,17	3,01	4,59
12.Meteor	17,30	9,30	2,21	91,45	22,88	4,21	4,60
13.Lazarevskaia	12,63	6,39	1,60	30,14	30,47	4,09	4,68
14.Brigantina	13,53	6,64	2,09	84,97	27,61	3,16	4,66
15.Balzam	13,65	7,33	1,90	57,16	25,75	3,01	4,73
16.Solnășco	11,53	6,17	2,14	87,30	25,54	2,93	4,66
17.Lloyd George	15,58	9,75	2,47	69,63	28,45	3,72	4,72
18.Rubin	12,47	5,91	2,20	69,29	35,54	2,50	4,74
19.September	13,73	5,56	2,30	70,67	36,23	3,24	4,64
20. Walfriend	11,73	7,50	1,28	61,32	30,34	5,65	4,69
21.Taylor	15,43	9,87	2,02	87,31	43,27	5,20	4,66
22.The Latham	12,73	8,55	2,21	66,52	26,84	5,38	4,65
23.Malling Jewel	12,20	6,23	3,34	43,65	23,41	2,64	4,66
24.Red Wadensvil	15,67	8,38	2,21	48,50	35,49	3,94	4,55
25.Paul Camerzind	14,63	7,71	1,48	70,67	30,95	5,45	4,64
26.Delbard Magnific	12,45	5,54	1,76	62,36	40,70	3,26	4,55
27.June	14,50	9,11	1,94	20,80	28,16	4,70	4,52
28. Kuthbert	15,00	-	1,58	83,14	26,84	-	4,74
Average	13,57	7,31	2,06	69,35	30,66	3,76	4,64
Limit change	11,53-1730	5,35-9,87	1,28-3,34	43,65-110,71	8,06-44,00	2,40-5,87	4,46-4,88

The accumulation of nutrients in the fruit depends largely on variety and climatic conditions of the year, but especially those in training during the harvest. Vitamin C, acidity, tannins and colouring substances in raspberry fruits

accumulates in larger amounts over a period of training and growing colder, with rain and increased humidity, except under conditions of high temperatures and lower humidity. The research conducted established the amount of nutrients accumulated in the fruits of raspberry and the results are presented in table 2.

Analyzing the chemical composition of raspberry berries averaged over years 2002-2005 (tab.2) found that the amount of solids in fruit varieties reached maximum values Meteor (17.3%), Red Wadensvil (15.67 %), Lloyd George (15.58%), Taylor (15.43%); sugars in varieties Taylor (9.87%), Lloyd George (9.75%), Meteor (9.3%); titrate the amount of acid varieties Malling Jewel (3.34%), Malling Promiss (2.56%), Kobfuller (2.55%), Lloyd George (2.47%), the amount of tanning and coloring substances: Rubin Bulgarian - 110.71 mg%, Hybrid Bulgarian -99.77 mg%, Malling Promiss -94,59 mg %, after vitamin C were found varieties President (44,0 mg %), Taylor (43,27 mg %), Chirjaci (41,27 mg%), Barnauliskaia (41,13 mg%). Coefficient sugar / acid the more high, with both the variety has improved quality. The highest values were recorded at Indian Summer varieties (5.87), Walfried (5.65), Malling Jewel (5.64) and lowest values in variety Rubin Bulgarian (2.40).

CONCLUSIONS

According to research conducted and results achieved during the years 2002 - 2005 found that: during training of raspberry harvest has ranged from 26-41 days, the date when the harvest between 6-15 June, average fruit yield reached 1.7 t / ha and after taste quality and nutrient content were found varieties: Meteor, Lloyd George, Taylor, Red Wadensvil, Malling Jewel, Malling Promiss, Kobfuller, Rubin Bulgarian, Bulgarian Hybrid, President Chirjaci, Barnauliskaia with the coefficient sugar / acid which varied between 2,55-5,87 and tasting note between 4,46-4,88.

REFERENCES

1. **Cepoiu N., Chira A., Chira L., 1996** - *Curs de pomicultură biologică*. Editura CERES, București, p.21-22; 87-92.
2. **Chira Lenuta, 2000** - *Cultura arbuștilor fructiferi*. Editura M.A.S.T., București, p. 80-98.
3. **Kazakov I., Evdochimenco S., 2007** - *Malina remontantnaia*. M., Editura « Citai-gorod », p.4-5.
4. **Kazakov I., Atjanova S., 1982** - *Selectia malinai na visociuiu productivnosti. Iagodovodstvo v Necernozemie*. Sb.naucin. rabot, M., Izd-stvo Brianscoi Selihoz Academii, p.60-76.
5. **Mladin Gh., Mladin Paula, 1992** - *Cultura arbuștilor fructiferi pe spații restrânse*. Editura CERES, p.114.
6. **Voiculescu N., Cepoiu N., Ștefănescu S., Lazăr C., 1997** - *Condiții ecopedologice pentru cultura arbuștilor fructiferi*. Lucrări Științifice, Seria B, XL, Horticultura, București, 1999, Editura CERES, p. 87-92.

STUDIES CONCERNING THE INFLUENCE OF ROOTING SUBSTRATE AT *COLEUS BLUMEI* BENTH.

STUDII PRIVIND INFLUENȚA SUBSTRATULUI DE ÎNRĂDĂCINARE LA *COLEUS BLUMEI* BENTH.

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Abstract: *Coleus (Solenostemon) is a genus of perennial plants, native to tropical Africa, Asia, Australia, the East Indies, the Malay Archipelago and the Philippines. The most popular species from this genus is Solenostemon scutellarioides, and take part of Lamiaceae family. One of advantages to growing Coleus is that this genus is very easy to propagate. There are two ways to: by seeds and cuttings. In our experience we where observed three Coleus varieties: "Rainbow Volcano", "Velvet Lime", and "Solar Shade" which are rooted in two different substrates type (peat, perlite+peat).*

Key words: *Solenostemon scutellarioides, cuttings, rooting substrate*

Rezumat: *Coleus (Solenostemon) este un gen care cuprinde plante perene, originare din Africa tropicală, Asia, estul Indiei, din Arhipelagul Malaezian și din Filipine. Cea mai cunoscută specie din cadrul genului este Solenostemon scutellarioides, din familia Lamiaceae. Specia se înmulțește relativ repede și ușor, generativ prin semințe și vegetativ, prin butași. În experiențele efectuate, s-a urmărit comportarea a trei varietăți de Coleus "Rainbow Volcano", "Velvet Lime", and "Solar Shade" în două substraturi de înrădăcinare (turbă, perlit+turbă).*

Cuvinte cheie: *Solenostemon scutellarioides, butași, substrat înrădăcinare*

INTRODUCTION

Solenostemon scutellarioides, known as decorative nettle, a prevalent and loved species by amateur and professional growers, because the varied leaves and beautiful coloring. It had strong ramifications, leaves opposite, broadly oval or less deeply toothed. Plants have a very large color range can be unique (yellow, red, purple and green) or multicolored (or striated various spots). Stalk ramifications are edges and ends with floral spice with small flowers; pale blue-purple (Maria Cantor, 2008).

The aim of the research was to improve the current assortment of floricultural plants in Romania, with new varieties of ornamental species with different morphological characteristics, to be promoted and placed in production. Along with taking the study of new varieties, it has studying the improvement of the culture technology, too. In the present paper, we made some research's regarding the influence of rooting substrate on morphological characters of three varieties of *Coleus* cuttings and the influence of length on rooting.

MATERIAL AND METHOD

The subjects of our research were three *Coleus* varieties: 'Rainbow Volcano', 'Velvet Lime', 'Solar Shade' (Fig. 1.), which were followed the rootedness in different substrates (peat and peat + pearls).

The experience was established in 2008 in the didactical greenhouse of Floriculture Department from USAMV Cluj.

The cuttings were made on 24.01.2008 which was harvested from mother plants prepared in 2007-2008. The forming was performed at 1-2 mm below the base node and it was removed the third part of leaves to reduce the perspiration.

Length of cuttings used for rooting varied as follows: 4-5 cm; 5-6 cm; 7-8 cm.

From each variant were prepared 30 cuts.

Another important experimental factor was the rootedness substrate. Thus, they used two substrates, as follows:

a) perlite

b) perlite + peat (in equal proportions of 50%).

The cuts were prepared for rooting with Radistim.



Fig. 1. The studied *Coleus* varieties

RESULTS AND DISCUSSIONS

Both of establish the experience, and during the rootedness we have made a series of observations and calculations required for characterization of the used biological material. Thus, there were measurements on the number of rooted cuttings; the cuttings have formed only callus and number of unrooted cuttings (table 1).

Table 1

The influence of substrate on cuttings rootedness at the three *Solenostemon scutellaroides* varieties

Variety	Rooting substrate	Total no. of cuttings	No. rooted cuttings	No. of callused cuttings	Unrooted cuttings
„Rainbow Volcano”	Perlite	30	19	5	6
	Perlite+peat	30	25	2	3
“Velvet Lime”	Perlite	30	30	-	-
	Perlit+peat	30	30	-	-
“Solar Shade”	Perlite	30	27	-	3
	Perlit+peat	30	30	-	-

The best results were obtained at the variety 'Velvet Lime', which presented a rootedness of 100% of both rooting substrates. The 'Rainbow Volcano' and

'Solar Shade' varieties are rooting favorable in the substrate compound by perlite + peat (83,3%-63,3%) and less in perlite (60%-90%). At all studied varieties, the best rootedness occurs when the substrate was compound by peat + perlite.

In the table 2 are presented the results obtained regarding the number of rooted cuttings at different lengths for them.

Table 2

The influence of length of cuttings on rootedness, at the three *Coleus* varieties

Variety	Rooting substrate	Total no. of cuttings	The length of cuttings (cm)	No. rooted cuttings
„Rainbow Volcano”	Perlite	30	4-5	19
		30	5-6	20
		30	7-8	18
	Perlite+peat	30	4-5	26
		30	5-6	27
		30	7-8	22
“Velvet Lime”	Perlite	30	4-5	30
		30	5-6	30
		30	7-8	30
	Perlite+peat	30	4-5	30
		30	5-6	30
		30	7-8	30
“Solar Shade”	Perlite	30	4-5	27
		30	5-6	28
		30	7-8	26
	Perlite+peat	30	4-5	30
		30	5-6	30
		30	7-8	30

Regarding the influence of cuttings length on rootedness, at the three varieties of *Coleus*, it is found that the most favorable results are obtained when the length of cutting are between 5-6 cm in the mixed substrate, then followed by long range cuttings between 4-5 cm, rooted in perlite and perlite+ peat.

Concerning the influence of rootedness substrate on morphological characteristics of three varieties of *Coleus*, it is found that the total height of the cuttings were between 8,1-15,4 cm (at the varieties Rainbow Volcano and Solar Shade), and the cuttings width was between 7,6-11,0 cm (Rainbow Volcano and Solar Shade). The length of roots varied as follows: 1,9 cm at Rainbow Volcano variety and 4,2 cm at Solar Shade. The number of roots was between 8,0 and 11,2. The higher values were obtained when was used the perlite substrate, and the better rootedness was obtained in the mixed substrate (perlite + peat).

To describe the influence of rootedness substrate on total height of cuttings, rooted cuttings height, width and number of cuttings rooted, to be three varieties in the study were performed numerous observations and calculations. The average values of these characters are presented in table 3.

Table 3

The influence of rooting substrate on morphological characteristic at the three
Coleus varieties

Variety	Rooting substrate	Total height of cuttings (cutting+root) cm	The height of rooted cuttings cm	Diameter of leaves cm	The length of cuts cm	No. of roots
„Rainbow Volcano”	Perlite	12,6	9,0	8,8	3,8	9,8
	Perlite+peat	8,1	6,2	7,6	1,9	8,0
“Velvet Lime”	Perlite	13,6	9,8	9,8	3,8	10,2
	Perlit+peat	9,2	6,8	8,8	2,4	8,2
“Solar Shade”	Perlite	15,4	10,8	11,0	4,2	11,2
	Perlit+peat	9,4	6,6	8,6	2,8	8,4

CONCLUSIONS

Based on the obtained results the following conclusions and recommendations:

1. Analyzing the influence of substrate on rootedness at the three varieties of *Coleus*, it can be concluded that in the case of the 'Velvet Lime' variety using the perlite and perlite + peat the rootedness was 100%. At "Solar Shade" and "Rainbow Volcano" varieties are rooted favorable in the mix substrate compound by peat + pearl stone.

2. Characterizing the influence of cutting length on rootedness, it was found that the most favorable length of cuttings was the average (5-6 cm) length, which increased the number of rooted cuttings.

3. Regarding the influence of rootedness substrate on morphological characters of the cuttings, we can say that the height of the cuttings and the rest of the characters examined were affected favorable by both of the rootedness substrates.

To obtain a high quality of biological material for multiplication with a high rootedness percent it is recommended the cuttings with medium size and as the rootedness substrate the better is the mixture consisting in perlite 50% and peat 50%.

REFERENCES

1. Cantor Maria, Pop Ioana-Delia, 2008 - *Floricultură – Baza date*. Ed. Toderco Cluj.
2. Iraj Rouhani, Morteza Khosh-Khui, 1977 - *Variations in Photosynthetic Rates of Fourteen Coleus Cultivars*. ASPB Publication, Plant Physiology 59:114-115 (1977), Rockville, USA
3. Scott Croxton, J. Raymond Kessler, 2007 - *Greenhouse Production of Coleus*. ANR-1314, Auburn University, Alabama, USA
4. <http://www.britannica.com/EBchecked/topic/125319/Coleus>

STUDIES CONCERNING OF THE MAIN MORPHO- DECORATIVE CHARACTERISTICS OF SOME GLADIOLUS CULTIVARS FOR IMPROVING THE FLORAL ASSORTMENT

STUDII PRIVIND PRINCIPALELE CARACTERISTICI MORFO- DECORATIVE ALE UNOR SOIURI DE GLADIOLE, PENTRU ÎMBUNĂTĂȚIREA SORTIMENTULUI FLORICOL

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Abstract: *Today Gladiolus is one of the world's most important horticultural plants, valued both as an ornamental garden subject and as a cut flower crop for bouquets and arrangements. The modern gladiolus cultivars offer a diversity of colours, shapes, and sizes available in few other flowering plants. It is cultivated in almost countries of the world where spring and summer conditions are favourable. Introducing the most competitive foreign cultivars in the Gladiolus culture is the main way of increasing the Gladiolus production. For this reason at the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Department of Floriculture there are a continuous activity for improve and diversification the floral collection with new species, cultivars or hybrids. This paper describe the new Gladiolus hybridus varieties which were observed in our Transylvanian behaviours and recorded for the following morpho-decorative characteristics: blooming time, colour of florets, plant height, spike length, number of florets per spike, media florets diameter and number of florets open in the same time. The varieties were compared with the mean of experiment and data obtained were statistical interpretation.*

Key words: *Gladiolus hybridus, cultivar, morpho-decorative characteristics*

Rezumat: *Astăzi gladiolele sunt unele din cele mai importante plante horticole, valoroase atât ca plante pentru ornamentarea grădinilor cât și ca floare tăiată pentru buchete și aranjamente. Soiurile moderne de gladiole oferă o diversitate mare de culori, formă și mărime care sunt puțin întâlnite la alte plante floricole. Ele sunt cultivate aproape în toate țările din lume unde primăvara și vara au condiții favorabile. Introducerea în cultura gladiolelor a celor mai competitive soiuri străine este un mijloc de creștere a producției de gladiole. În acest scop, la Universitatea de Științe Agricole și Medicină Veterinară Cluj-Napoca, departamentul de Floricultură există o activitate continuă pentru îmbogățirea și diversificarea colecției de plante floricole cu noi specii, soiuri, hibridi. Această lucrare prezintă noi soiuri de Gladiolus hybridus care au fost observate în condițiile climatice din Transilvania și au fost înregistrate următoarele caracteristici morfo-decorative: perioada de înflorire, culoarea florilor, înălțimea plantelor, numărul de flori/spic, diametrul florilor și numărul florilor deschise simultan. Soiurile au fost comparate cu media experienței iar datele au fost interpretate statistic.*

Cuvinte cheie: *Gladiolus hybridus, cultivar, însușiri morfo-decorative*

INTRODUCTION

Gladiolus, *Gladiolus hybridus* L. is an herb perennial plant, geophyte semirustice belong to the Iridaceae Juss. family. Other important genera in this family are Crocus, Freesia and Iris.

Today *Gladiolus* is one of the world's most important horticultural plants, valued both as an ornamental garden subject and as a cut flower crop for bouquets and arrangements.

The modern gladiolus cultivars offer a diversity of colours, shapes, and sizes available in few other flowering plants. It is cultivated in almost countries of the world where spring and summer conditions are favourable.

Since the days of ancient Greece, the gladioli are said to be cultivated. History reveals that it is known since 1578, as evidenced by a record in *Lyte's Nieve Herball*, first were introduced into France and soon after that spread to England, Germany, Holland and North America. These were the only wild species as garden gladioli three hundred years ago.

There is record that 23 wild species have so far been used in the development of the modern garden cultivars of gladioli (Misra and Kaicker, 1986). It is thought that modern cultivars of *G* x *grandiflora* originated from a small number of wild species, viz. *G. cruentus*, *G. natalensis*, *G. oppositiflorus*, *G. papilio* and *G. saundersii* (Imanishi, 1989); thus, most *Gladiolus* species did not participate in the establishment of modern cultivars. These species may possess useful characters for plant breeders. A commercial cultivar must possess numerous horticultural qualities (Manley 1969, Wilfred 1971).

In Romania *Gladiolus* are grown by gardeners, hobbyists, and commercial growers and is an easy-to-grow flower, especially valued for use in floral arrangements or landscape.

Researching activity for diversification of *Gladiolus* assortment by introducing of the most competitive foreign cultivars is one of the principal objectives of the Floricultural Department at the U.S.A.M.V. Cluj-Napoca. Introducing the most competitive foreign cultivars in the *Gladiolus* culture is the main way of increasing the *Gladiolus* production (Cantor et al., 2008).

MATERIAL AND METHOD

The new *Gladiolus* varieties, the subject of the research in our experimental field during 2007-2008 periods, was 10 Holland *Gladiolus* varieties brought from commerce: **'Break a Dawn'**, **'Jester'**, **'My love'**, **'Mon Amour'**, **'Madonna'**, **'Princess Marg. Rose'**, **'Tradehorn'**, **'Blue Isle'**, **'Fiorentina'** and **'Espresso'** (Fig.1).

* The corms were planted in the period of 30.04.2007-26.04.2008. These were observed in our Transylvanian behaviours and recorded for the following morpho-decorative characteristics: blooming time, colour of florets, plant height, spike length, number of florets per spike, media florets diameter and number of florets open in the same time.

* The varieties were compared with the average of experiment of the cultivars. The observations were made for 20 plants from each variety.

* Data obtained were statistical interpretation. The results were calculated and analyzed, using the standard deviation (by limited differentiations method) and the coefficient of variability for each characteristic of the plants (Ardelean, 1986).

* For blooming season we used the follow earliness approximation:

VE (very early) - under 70 days; E (early) - 70-74 days; EM (early midseason) - 75-79 days; M (midseason) - 80-84 days; LM (late midseason) - 85-90 days; L (late) - 91-99 days; VL (very late) - 100 days or more.



Fig. 1. Experimental field of *Gladiolus hybridus* at USAMV Cluj

RESULTS AND DISCUSSIONS

The observation and the measurements of main characteristics of gladiolus cultivars are presented in the following tables (1, 2). Analyzing those tables we can conclude:

Colour of flowers

The cultivars studied have a rich range of colours of the flowers from white ('Break a Dawn', 'My Love'), yellow ('Jester', 'Mon Amour'), freeze - salmon ('Fiorentina'), dark red (Traderhorn) to blue-lavender (Madonna). The varieties with various stripped or different colours on lip petals or midribs are completing the range of the colours ('Mon Amour', 'Princess Marg. Rose', 'My love'). There is a large variation of varieties regarding the colour intensity and clarity of the flowers (fig. 2 a, b, c).

Blooming time (days)

It is a very important to know the blooming time of the cultivars for echelon the flowering on this species on a longer period. The flowering time depends by cultivars. The majority of *Gladiolus* varieties need for blooming over 80 days ('Blue Isle', 'Fiorentina', 'Espresso', 'Madonna', 'Princess Marg. Rose') having a midseason for blooming. Bloom very early: 'Break a Dawn' (68.6 days). The next varieties: 'My Love', 'Mon Amour' and 'Jester' blooming late after 91 days.

Table 1

Colors and other characteristics of the flowers

Variety	Colors	Characteristics
Jester	deep yellow with two intense red blotches on lower petals	- nice dark foliage good placement of florets; - very good health and propagation;
Traderhorn	bright red with prominent white throat	- good flower head length with very good mechanics; - extremely healthy and easy propagator;
Mon Amour	medium ruffled lemon with lightly pink brush mark on the centre petals	- ramrod straight spikes and stiff stems attributes to this well standing glad; - flowerheads are florets superior formal placement;
Break a Dawn	clean white ruffled outside of petals with three yellow inside petals	- very simply ruffled florets; - very straight, consistent and the good propagator of beautiful healthy corms;
Espresso	very dark red, deep velvety	- extremely healthy, nice dark foliage and a prolific propagator of beautiful corms and cornels;
Princess Marg. Rose	deeper yellow and ruffled with dark red lip edged	- a nice addition to it's color class; - can make an excellent show spike;
Madonna	blue lavender with prominent white blotches throat	- good formal and balanced placement, nice color; - has vigorous green foliage;
My Love	with cream with red lines on lip petals	- excellent green foliage and heat tolerant; - can be an excellent commercial variety for late in the season;
Blue Isle	dark blue-violet mark on a light with blotch on petals	- very formal placement and self dresser; - the spikes are borne on green healthy foliage;
Fiorentina	rose-salmon with dark red blotch in the lower petals	- very early and is a pleasure to grow; - impeccable cutflower and very healthy;



a. Fiorentina



b. Madonna



c. Princess Marg. Rose

Fig. 2. *Gladiolus* varieties

Plant height

Plants height of *Gladiolus* cultivars were over 100 cm, the most vigorous were the next: 'Mon Amour', 'Madonna' and 'Traderhorn', while variety 'My Love' are with less vigorous, less than 100 cm.

The value of average for this character is 109.7 cm.

Concerning the plant height 'Mon Amour' and 'Madonna' cultivars has a very positive significance of difference.

Spike Length

For cut flower it is very important to obtain varieties with long, rigid spike and that will conserves its elasticity characteristic during the storing.

The spike length has between 79 cm ('My Love') to 96.6 cm ('Mon Amour'). This property it is very important for cut flower and the vigorous cultivars would make an exceptional cut flower for exhibition, good for marketing, terrific arrangements and corsages. The value of average for this character is 53.2 cm.

Table 2
Morphological characters of the main characteristics of *Gladiolus* varieties

Variety	Blooming season (days)	Plant height (cm)	Floral stem (cm)	Spike length (cm)	No. of florets/spikes	Diameter of florets (cm)
Jester	91,1	111,1	87,1	51,0	17,8	9,4
Traderhorn	88,6	114,8**	94,4***	55,7	22,1**	12,1**
Mon Amour	97,9*	119,7***	96,6***	57,4*	18,4	9,3
Break a Dawn	68,6 ^o	112,9	95,5***	65,7***	17,0	9,0
Espresso	88,3	105,7 ^o	80,2**	49,8 ^o	19,6	9,8
Princess Marg. Rose	84,0	102,6 ^{ooo}	78,6 ^{ooo}	47,2 ^{oo}	15,4	7,2 ^{oo}
Madonna	82,4	117,9***	93,0**	57,5*	18,0	8,7
My Love	95,9	99,6 ^{ooo}	79,0 ^{ooo}	51,2	17,2	10,5
Blue Isle	70,0 ^o	106,0 ^o	82,5 ^o	45,5 ^{ooo}	14,0 ^o	8,9
Fiorentina	70,3 ^o	106,2 ^(o)	82,6 ^o	51,0	15,2	8,9
Mean of experiment (control)	83.8	109.7	87.0	53.2	17.6	9.4
DL 5%	13,1	3,6	4,2	3,3	2,9	1,5
DL 1%	18,0	4,9	5,8	4,6	3,9	2,1
DL 0,1%	24,5	6,7	7,9	6,2	5,3	2,9

Number of florets/spike

The varieties under study show a between 15 up to 22.1 florets per spike. We should mention the varieties, which are more florets per spike: Traderhorn (22.1 buds), and Espresso (19.6 buds). The majority of *Gladiolus* cultivars have more florets that Romanian varieties (Cantor and Euer, 2004). Generally the florets have a good placement and attachment and can make nice show spikes with commercial attributes.

The average value of this character is 17.6 florets. From statistical point of view 'Traderhorn' cultivar presents a distinct significant difference.

Diameter of florets

The florets studied have diameter between 7.2 cm ('Princess Marg. Rose') and 12.1 cm ('Traderhorn'). The flower with medium diameter gives an elegant aspect to spike ('Break a Dawn', 'Fiorentina', 'Blue Isle'). Traderhorn has a distinct positive significance.

CONCLUSIONS

The *Gladiolus* cultivars analyzed in experimental field belonging to U.S.A.M.V. Cluj-Napoca have a great diversity of their morphological characteristics.

✱ The studies of their characteristics behaviors under Romanian climatic conditions have an essential role concerning the ornamental value of *Gladiolus* species. These varieties can be used primarily for viewing where planted, in the cutting garden. They are very attractive, are very good qualities, very lovely and would blend beautifully or accent perennial garden and landscape.

✱ They can be special cutflower for any occasions or make beautiful in the vase ('Jester', 'Espresso', 'Madonna', 'Fiorentina').

✱ Most of them have a color very unique, beautifully sculptured recommended for show and excellent commercial glads ('Princess Marg. Rose', 'Mon Amour', 'My Love').

✱ The most representative of *Gladiolus* varieties can be also use in our future breeding program as parents for hybridizing in order to obtain new Romanian cultivars.

REFERENCES

1. **Ardelean M., 1986** - *Ameliorarea plantelor horticole și tehnică experimentală*. Tipografia Agronomia, Cluj.
2. **Cantor Maria, B. Euer, 2004** - *Contributions to the gladiolus assortment diversification in Romania*. Glad World, No 239, pag. 23-27, USA.
3. **Cantor Maria, Ioana Pop, 2008** - *Floricultură -Baza de date*. Ed. Todesco Cluj. pag. 142-144
4. **Imanishi H., 1989** - *Collected data of plant genetic resources*. In "Gladiolus"
5. **Manley T.R., 1969** - *The quality of a commercial variety (II)*. North American Gladiolus Council Bulletin 97: 96-99
6. **Misra R.I. and Kaicker U.S., 1986** - *Geostorical development of gladiolus*. NAGC Bull., No.165. pp. 43-45
7. **Wilfred, 1971** - *What makes a commercial glad in Florida?* North American Gladiolus Council Bulletin 106: 78-79
8. <http://en.wikipedia.org/wiki/Gladiolus>
9. <http://www.bsbi.org.uk/TooneGladiolus.pdf>

THE DIVERSIFICATION OF FLORAL STUDENT COLLECTION IN DAHLIA TYPE CACTUS

DIVERSIFICAREA COLECȚIEI STUDENȚEȘTI DE PLANTE FLORICOLE LA DAHLIA DE TIP CACTUS

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Abstract: *There are many attractive Dahlias cultivars available each year to be grown in the garden. Together with gladioli, lilies and begonias, the dahlias are one of the most important and popular summer-flowering bulbs. Dahlias are widely cultivated due to the huge range of colours and flower types available, its many uses, and fairly easy cultivation. Nowadays is about the more than 20.000 garden cultivars that have been created by hybridization and selection. In Romania, at University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, researching activity for improving and diversification of floral plants assortment by introducing of the most competitive foreign floral cultivars is one of the main objectives. This paper describes new cultivars Dahlia hybridus Cactus types which were monitories in Transylvanian behaviors and recorded for the following morpho-decorative characteristics: blooming time, colour of flowers, plant height, and circumference of plant, number of stems, number of flower, flower diameters and number of ligules.*

Key words: *Dahlia hybridus, cultivars Cactus types, morpho-decorative characteristics*

Rezumat: *În fiecare an există disponibile numeroase soiuri de Dahlia foarte atractive care pot fi cultivate în grădină. Împreună cu gladiolele, crinii și begoniile, daliile sunt unele din cele mai importante și cunoscute plante floricole „bulboase” de câmp. Daliile sunt cultivate în mare măsură datorită gamei largi de culori disponibile, a tipurilor de flori, a multiplelor utilizări și pentru că sunt ușor de cultivat. În zilele noastre există peste 20.000 de soiuri de grădină care au fost create prin hibridare și selecție. În România, la Universitatea de Științe Agricole și Medicină Veterinară Cluj-Napoca activitatea de cercetare pentru îmbogățirea și diversificarea sortimentului de plante floricole prin introducerea celor mai competitive soiuri străine este unul din obiectivele principale. Această lucrare prezintă noi soiuri de Dahlia hybridus de tip Cactus care au fost monitorizate în condițiile climatice din Transilvania și au fost înregistrate observații la următoarele caracteristici morfo-decorative: perioada de decor, culoarea florilor, înălțimea și diametrul plantelor, numărul de flori, diametrul florilor, numărul de ligule.*

Cuvinte cheie: *Dahlia hybridus, cultivare tip Cactus, caracteristici morfo-decorative*

INTRODUCTION

Dahlias are a native flower in Mexico. Some two hundred years ago the first Dahlia arrived in Western Europe from its native habitat in Mexico. Nowadays, it is

difficult to find this original dahlia among the current dahlia assortment as flower enthusiasts and growers have done much in the way of developing new types, shapes and colours.

Today, there are almost 30 species in the genus *Dahlia*, which is highly variable and even includes vinelike species, but this profile is about the more than 20,000 garden cultivars that have been created by hybridization and selection (Dole et al., 1999). Few of the wild species *Dahlias* are cultivated. It seems likely that many, if not most, of the modern dahlia cultivars came from hybridization and back-crossing *D. coccinea*, *D. rosea*, and/or *D. pinnata* with other wild *Dahlia* species (Huxley et al., 1992). The garden dahlias are bushy plants that grow from underground tubers. Most of *Dahlia* cultivars have strong, erect stems and attractive toothed or featherlike leaves. The larger cultivars can get 1-1.5 m height. Flower colors may be white, pink, yellow, orange, red or purple, and sometimes mixed (Bailey and Bailey, 1976). The many cultivars range from miniatures with flowerheads 5 cm in diameter to giants with flowerheads over 25 cm across (De Hertogh and Le Nard, 1993).

In the 20th century, Europeans learned to extract inulin from *Dahlia* tubers, and then convert the inulin to laevulose, a sugar substitute important to diabetics and useful in retarding crystallization in candy and other sugar products (Lukaszewska, 1980).

Dahlias are classified according to flower shape and arrangement of petals. Flowers fall into 11 categories, including: *Decorative*, *Cactus*, *Fimbriated*, *Ball*, *Waterlily*, *Anemone*, *Collarlette*, *Orchid*, *Peony*, *Single* and *Novelty*. Each variation of the dahlia petal is a beauty.

Known for their beauty and individuality, the Cactus Dahlias are some of the most unique flowers in the world. Growing up to 40" tall and producing very large blooms, the *Cactus Dahlia* will make an exotic addition to your garden.

MATERIAL AND METHOD

The subjects of the research in our experimental field at the USAMV Cluj-Napoca, Department of Floriculture (Fig 1.), during 2006-2007 periods were studied 6 new *Dahlia variabilis* varieties, **Cactus** type: 'Vuurvogel', 'Purple Gem', 'Sultane', 'Kennemerland', 'Colour Spectable' and 'Vulcan', which were bought from Holland.

The biological material was planted in the field in May 15, 2008 after a two month forcing period, in the greenhouse, in pots. These entire cultivars were monitoring and investigated in our Transylvanian for the main morpho-decorative characteristics: blooming time, colour of flowers, plant height, and circumference of plant, number of stems, number of flower, flower diameters and number of ligules.

The observations were made for 10 plants from each cultivars and were calculated the average.

RESULTS AND DISCUSSIONS

The observations and the measurements of main morphological characteristics of new 6 cultivars Cactus types of *Dahlia variabilis* studied at the U.S.A.M.V. Cluj-Napoca floral collection are presented in the following table (1). Analyzing the table, we can conclude the following:



Fig. 1. Experimental field of *Dahlia* cultivars

The *Dahlia* cultivars presented a large variety of color for the flower. The cultivars investigated are monochrome such as ‘Colour Spectable’ - salmon or ‘Vulcan’ - coral intense and there are also cultivars with different striped and spotted color: ‘Sultane’, ‘Kenmerland’ and ‘Vuurvogel’ (Fig. 2).

Concerning the vigor of the plants, we can show the different height between the cultivars of Cactus Dahlia and also between the forms of flowers.

Generally all the Cactus Dahlia varieties produce 3-4 stems per plant, only the cultivar ‘Vulcan’ had only 2 stems while ‘Purple Gem’ has 6 stems.

Regarding the number of flowers/plant, it is a great variability; all the cultivars are very productive, which give a very large decorative value of the Cactus *Dahlia* cultivars. The number of flowers/plant was between 15.0 (‘Vulcan’) and 32.0 (‘Vuurvogel’). Flower size varies from then 22.1 cm for Colour Spectable to less than 12.3 cm in diameter for Vulcan.

Table 1

Morphological observations of the main characteristics of Cactus *Dahlia* cultivars

Cultivars	Color of flower	Height of plant (cm)	Circumference (cm)	No. stem	No. of flowers/plant	Diameter of flower (cm)	No. ligules
Vuurvogel	Orange with red striped on the tip	114.1	112.0	4.0	32.0	15.2	136.0
Purple Gem	Red dark	153.0	120.0	6.0	30.0	17.4	210.0
Sultane	Yellow with red striped	115.9	114.8	3.0	26.0	15.7	138.0
Vulcan	Coral intense	110.2	104.0	2.0	15.0	12.3	104.0
Colour spectable	Salmon	128.4	137.0	3.0	29.0	22.1	156.0
Kenmerland	Yellow intense with very light red lines	132.3	127.8	4.0	24.0	18.2	151.0



Fig. 2. Durban cultivar



Fig. 3. Vuurvogel cultivar

The number of ligules is very big for Cactus type, up to 210.0 ligules/flower ('Purple Gem') while the 'Vulcan' has only 104.0 ligules/flower.

CONCLUSIONS

The knowledge of the morphology and biology of the new cultivars *Dahlia hybridus Cactus* type is very important because those can be recommended for new varieties that will be adequate to the Romanian local conditions.

These varieties can be primarily used in the cutting garden. Very appreciate for landscape designs, time for borders and also for individual groups.

They can be special cut flowers ('Purple Gem', 'Vuurvogel', 'Kennemerland', 'Sultane) for any occasions or make beautiful in the vase.

The results will be also used by a large number of commercial growers which will be able to obtain substantial profits from this research activity. The students of U.S.A.M.V. Cluj-Napoca can be using the researches obtained for their graduate thesis. The most representative varieties can also be used in our future breeding program as genitors for hybrid combinations.

REFERENCES

1. **Bailey L.H., E.Z. Bailey, 1976** – *Dahlias. Hortus Third: A Concise Dictionary of Plants Cultivated in the US and Canada.* Macmillan Publishing, New York, pp. 360-361.
2. **Cantor Maria, Ioana Pop, 2008** - *Floricultură -Baza de date.* Ed. Todesco Cluj, pag. 142-144.
3. **De Hertogh A. A., M. Le Nard, 1993** - *Dahlia, The Physiology of Flower Bulbs.* Elsevier, Amsterdam, pp. 373-283.
4. **Huxley A., M. Griffiths, M. Levy, 1992** - *Dahlia, The New Royal Horticultural Society Dictionary of Gardening,* vol. 2. Stockton Press, New York, pp. 4-7.
5. **John M. Dole, Harold F. Wilkins, 1999** - *Floriculture. Principles and Species.* Ed. Prentice Hall, NJ, SUA.
6. **Lukaszewska A.J., 1980** - *Effect of some chemicals on cut Dahlia flowers.* ISHS Acta Horticulturae 109: III International Symposium on Flower Bulbs.
7. <http://en.wikipedia.org/wiki/Dahlia>

STUDY REGARDING THE ACLIMATISATION OF SOME PLANTS OF DECORATIVE INTEREST FROM THE SPECIFIC FLORA OF OLTENIA

STUDIUL PRIVIND ACLIMATIZAREA UNOR PLANTE DE INTERES DECORATIV DIN FLORA SPONTANA A OLTENIEI

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Abstract. *Spontaneous flora is a source of plants with decorative qualities which can be cultivated, in respect of ecology, in the individual gardens and green areas around houses in urban and rural areas, having some special agro biological features (ecologic plasticity, high rustic character etc). The introduction of new ornamental species of the spontaneous flora represents an important purpose in the sustainable development context. This paper presents the partial results regarding the behaviour of some spontaneous species which have decorative features from the spontaneous flora, studied with a view to their possibilities of acclimatization in field (in different light conditions) and in greenhouses (in pots or directly in the ground). After a year, a big part from the species introduced in the study were maintained in the experimental field, and some of them acted as good both outside and inside. At the collected species there were made descriptive papers, were established the decorative elements, at the end of the study, there will be established the utilisation directions.*

Key words: spontaneous flora, decorative features, acclimatization

Rezumat. *Flora spontana este o sursa de plante cu calitati decorative, care pot fi cultivate, respectand ecologia, in gradinile individuale si in spatiile verzi din mediul urban si rural, avand unele caracteristici agrobiologice deosebite (plasticitate ecologica, rusticitate ridicata, etc). Introducerea de noi specii decorative din flora spontana in peisajul urban, reprezinta un obiectiv important in contextul dezvoltarii durabile. Lucrarea de fata prezinta rezultatele parțiale privind comportarea unor specii spontane cu potential decorativ din punct de vedere al posibilitatilor de acclimatizare în câmp (in diferite conditii de lumina) sau în spații protejate (in ghivece sau la solul serei). După un an, o mare parte din speciile introduse în studiu au fost mentinute in câmpul de experimentare, iar cateva s-au comportat bine atat in exterior cat si in interior. La speciile colectate s-au întocmit fișe de descriere, s-au stabilit elementele decorative în funcție de care, se vor stabili directiile de utilizare.*

Cuvinte cheie: flora spontana, potențial decorativ, acclimatizare

INTRODUCTION

An important direction in floriculture is the diversification of the assortment, the introduction of new species and cultivars; this can be done both by classical research programmes and by introducing new species from the spontaneous flora,

which have decorative features and high adaptability to environment conditions, an important feature in the sustainable development context.

Of the over 3000 spontaneous species existing in Romania's flora, more than 500 species can be used in green areas, along with plants already cultivated for decorative purpose. (Ciocarlan V., 2000).

On international level there are multiple studies regarding the diversification of the decorative plants assortment by introducing in culture of some herbaceous species from the spontaneous flora, as well as setting-up other ways to use them. (Heiko Koester - 2008, Maloupa E. si col.-2005, Noordegraaf C.V. -2005, Halevy A.H. -2005, Chimonidou D. si col.-2005).

Also in Romania, at the Horticulture Faculty from the main universities, it is shown a special interest to identify, preserve and development, with ornamental purpose, species from spontaneous flora, even if at present the researches undertaken in this direction are very few.

This paper has as a purpose the identification of some spontaneous species with decorative features and the research regarding their development in different crop conditions, for the assessment of their adaptation to the antropic and environment factors, specific to the urban aggregations.

MATERIAL AND METHOD

This paper presents the partial results, obtained in the first year, at the acclimatization in field or in protected spaces of some spontaneous species which have decorative features. The colecting, identification and description were made in collaboration with the collective from the Botany discipline as part of the Horticulture Faculty.

The biological material was represented by 10 species of spontaneous flora: *Arabis procurrens* Waldst. & Kit., *Asarum europaeum* L., *Asplenium adiantum-nigrum* L., *Asplenium ruta-muraria* L., *A. Scolopendrium* L., *A. trichomanes* subsp. *quadrialeans*, *Blechnum spicant* L., *Luzula luzuloides* (Lam) Dandy & Wilmott, *Polypodium vulgare* L., *Saxifraga cuneifolia* subsp. *Robusta*.

The plants were collected, together with their ground bed and were transplanted in the didactic station of the department of Floriculture in different conditions: in the field (rocks in different light conditions) and in greenhouse (in pots or directly in the ground).

The used substrates were determined on the basis of the soil tests performed according to plants' demands, indicated by the speciality literature.

RESULTS AND DISCUSSIONS

From June to September 2007 there were transplanted in the experimental field the following species from spontaneous flora:

I. Arabis procurrens Waldst. & Kit. - Fam. *Brassicaceae*.

Perennial plant; the stalk is upright or ascending, at the base with numerous **thin**, whitish, procumbent, finished in rosette of leaves procumbent stalks. The rosette's leafs are obovat elongated, at the top with a small mucron, stalk leaves, 2-8, are ovoid or lanceolate ellipticals, with the base narrow, without leafstalk.

The inflorescence is a bunch. White petals of 8-10 mm length. It prefers even grounds, but it also tolerates drought, sunny exposition or semi-shade.

The material has been collected from the stones, from Călimănești area (Vâlcea district).

It decorates through the white flowers and leaves' rosettes and it yields to rocky arrangements, alpine gardens, representing a great covering for small areas.

2. *Asarum europaeum* L. (Asarabacca) - Fam. *Aristolochiaceae*

Short perennial plant, of 8-30 cm height, with crawling rhizomes. The leaves are reniform, glossy, dark green, of 10 cm height. The leaves are produced in pairs and the small, greenish-brown drooping flowers are rarely noticed, being hidden by the foliage. It prefers soils full of nutritive substances, weak acid-neutrofil, full of humus, damp, and they allow the shading.

The material has been collected from the mezofil forrest from Lunca Jiului, Bucovat (Dolj).

It is decorative through its leaves, can be used for soil's garnishing in the dark places from the gardens, parks and, where it forms compact carpets (even in the cold season), easy to maintain. *A. europaeum* combines nicely with bleeding heart (*Dicentra*) and other shade-loving plants.

3. *Asplenium adianthum-nigrum* L. (Black spleenwort) - Fam. *Aspleniaceae*

Perennial plant, with rhizomes, of 10(40) cm height with fronds 2-3 pinnatisect, long acuminate, a bright green and a brown petiole. The primary segments are approximately straight, and the last ovate-elliptical segments have a round base. Siliceous rocks and walls, can be found in forests, rocky places; it prefers wet soils.

The material has been collected from the stones, Călimănești area (Vâlcea).

It decorates through its leaves, can be used for the rocky arrangements.

4. *Asplenium ruta-muraria* L. (Wall-rue) - Fam. *Aspleniaceae*.

Perennial species, with short rhizomes, of 5-15 cm height. The leaves, of 10 cm length, pinnately divided two or three times, green, glabrous. Pinnules spatulate, erose or just toothed at the apical margin. Frequent from the area of forest steppe till the subalpine level, it prefers partial shade, the moist soils and can grow in very alkaline soil.

The material has been collected from the stones, Călimănești area (Vâlcea).

It decorates through its leaves, can be used for the rocky arrangements.

5. *Asplenium scolopendrium* L. (Hart's Tongue Fern)-Fam. *Aspleniaceae*

Perennial species, with short scaly rhizomes. The plants are unusual in being ferns with simple, undivided fronds. The leaves are 20-60 cm long and 3-6 cm broad, with sori arranged in rows perpendicular to the rachis. The plants grow on neutral and lime-rich substrates, including moist soil and damp crevices in old walls, most commonly in shaded situations but occasionally in full sun; plants in full sun are usually stunted and yellowish in colour, while those in full shade are dark green and luxuriant.

The material has been collected from the stones, Călimănești area (Vâlcea).

Decorates through its leaves, can be used for the rocky and alpine gardens.

6. *Asplenium trichomanes* L. subsp. *quadrivalens* D. E. Meyer (Maidenhair spleenwort) - Fam. *Aspleniaceae*

Perennial species, 5-15 cm height, the leaves are simple pinnate divided, stems brownish-black, shiny and leaflets oblong-rounded, easy dental, mostly colored in green. Supports large oscillations of the water, prefers half-shade, soil reaction of strongly acid-acid, but also tolerates slightly calcareous soils.

The material has been collected from the stones, Călimănești area (Vâlcea).

It is a rustic fern, does not need winter protection, suitable for use in rock gardens and old walls.

7. *Blechnum spicant* (L.) Roth (Deer fern, Hard fern)-Fam. *Blechnaceae*

Perennial species of 25-60 cm height. Deer ferns are distinctive because they have two different types of fronds: fertile leaves more erect and longer than sterile leaves; frond evergreen sterile fronds, dimorphic, fertile leaves appearing later, more erect than sterile, blade/stipe ratio: 3:1 in the sterile fronds, but the fertile frond stipe is longer. It prefers the soils with low trophicity, moderate acid, calcifuge, with moderate humidity, from moist humid, of shade (sciophile), but also stands a partial shade.

The material has been collected from the stones from the Râncea Mountain.

It decorates by leaves, can be used in rock gardens.

8. *Luzula luzuloides* (Lam) Dandy & Wilmott (White Wood-rush)-Fam. *Juncaceae*

Herbs, perennial, usually cespitose, strongly rhizomatous and stoloniferous; erect stems, 30-60 cm tall. Leaves flat, linear, densely ciliate, bright green and grass-like, 10-25 cm long. Inflorescences terminal; the flowers are in clusters of two to eight and are whitish to pinkish in color. Flowering: late spring-summer. Most species prefer a moist position but are not fussy about soil type or aspect provided they are not in deep shade.

It decorates by leaves, it can be used in gardens combined with other perennial species.

9. *Polypodium vulgare* L. (Common polypody) - Fam. *Polypodiaceae*.

Perennial species, small, has a short rhizome, which develops compound leaves, pinnatisect to pinnatifid, 10-25 cm long, persistent, deeply divided, lacy, green. It is a rustic fern, prefers partial shade, a neutral or slightly acidic soils, increases especially among stones or on the rocks, at altitudes of above 600 m.

The material has been collected from the stones from Râncea Mountain and also from Călimănești (Vâlcea district)

It decorates by leaves, can be used in rock gardens, alpine gardens; may grow in large colonies, forming extensive, dark green ground cover.

10. *Saxifraga cuneifolia* L. subsp. *Robusta* D. A. Webb.-Fam. *Saxifragaceae*.

Perennial plants, evergreen rosettes of leathery leaves produce panicles of small white flowers in spring. It grows in shade to part shade in humus rich, moist soil. Frequent in the beech subfloor and the spruce fir floor, on shaded, siliceous, humid rocky zones.

The material has been collected from the stones, Călimănești area (Vâlcea).

Decorate by leaves, can be used rock gardens, alpine gardens, miniature gardens.

The acclimatization of the species described in different crop conditions.

The plantation of the ten spontaneous species, in the field and in protected places was made with an ballot of earth all around the roots. After an year from plantation, the percentage of rooting of all the species was established, depending of the conditions of the crop such as the directions of using in decorative purpose (Fig. 1). In the case of plants transplanted on the greenhouse soil the acclimatization occurred in 7 of the 10 species that have been studied; of which the best adapted species was *Arabis procurens* (95%) followed by *Asplenium trichomanes* (86%) and as *Asarum europaeum* (86%). Plant which have not acclimatized on the greenhouse soil are *Asplenium scolopendrium*, *Blechnum spicant* and *Luzula luzuloides*.

After transplanting into pots there have been obtained very good results, from this point of view, for the majority of the species - *Arabis procurrens* (100%), *Luzula luzuloides* (100%), *Asplenium trichomanes* (90%), *Saxifraga cuneifolia* (90%), *Asplenium ruta-muraria* (85%), with the exception of the *Asplenium adiantum-nigrum* species, whose acclimatization was difficult in all of the four locations.

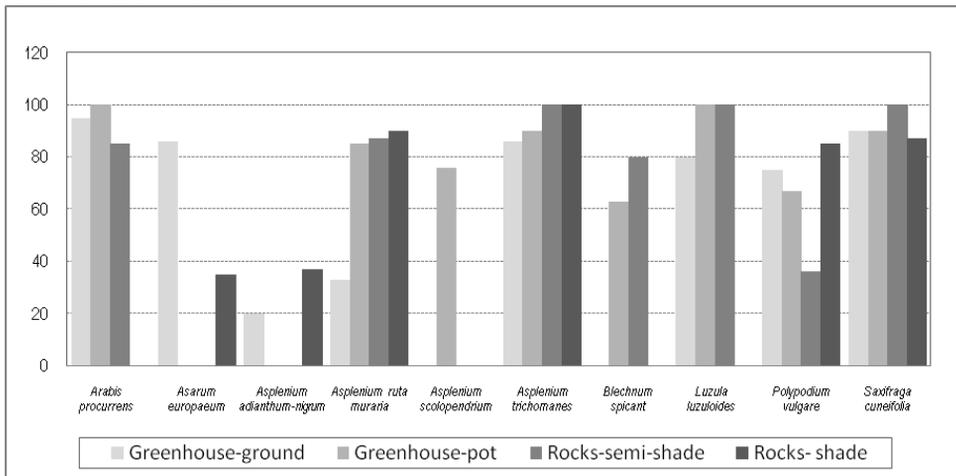


Fig.1. The acclimatization of some spontaneous species in different crop conditions (percentage of rooting)

In the field, according to the requirements of the plants, there have been chosen two exhibitions in the shade and semi-shade, in arranged rocks, it has been found that 7 from the 10 species have acclimatized to the low light, and 8 to the shade.

There are found, none the less, large differences regarding the percentage of acclimatization; thus, for both situations the behaviour was shown by *Asplenium trichomanes* (100%), *Saxifraga cuneifolia* (100% to 87%); *Asplenium Scolopendrium* has not maintained in none of the two locations, and species like as *Asarum europaeum*, *Asplenium adiantum-nigrum*, have acclimatized in low percentage in the arranged rocks in the shadow.

Based on the observations made in this stage, we consider that the species *Arabis procurrens*, *Asplenium ruta muraria*, *Asplenium trichomanes*, *Blechnum spicant*, *Luzula luzuloides*, *Polypodium vulgare*, *Saxifraga cuneifolia*, are suitable for arranged rocks in shade conditions or semi-shade; *Arabis procurrens* for borders, *Asplenium scolopendrium*, *Asplenium trichomanes*, *Luzula luzuloides*, *Saxifraga cuneifolia* can be used as pot plants or in different combinations, and the small size and low growth, as are *Asplenium ruta muraria*, *Saxifraga cuneifolia* and *Asplenium trichomanes* for container minigardens.

The presence of these plants in arranged rocks or container minigardens, can give a almost natural look to the composition.

CONCLUSIONS

From the description of the species taken into study it appears that they are perennial and the higher majority have in common modest requirements regarding temperature, light and soil fertility.

Most of the studied species have shown a good or very good behaviour in the field as well as in the greenhouse, in at least 2 locations.

Out of the analyzed species the best results came from *Asplenium ruta muraria*, *Asplenium trichomanes*, *Polypodium vulgare* and *Saxifraga cuneifolia*, which have acclimatized in all of the four crop conditions.

The weakest behaviour has been noticed at *Asplenium scolopendrium*, which has acclimatized in the greenhouse only as a pot plant, as well as from *Asplenium adiantum-nigrum*, species which resisted in low proportion only on the greenhouse soil and in the rocks, in shade conditions.

REFERENCES

1. **Beldie Al., 1977, 1979** - *Flora României - determinant ilustrat al plantelor vasculare*. Vol. I, II. București: Ed. Academiei Române.
2. **Ciocarlan V., 2000** - *Flora ilustrata a Romaniei. Pteridophyta et Spermatophyta*. Editura Ceres, Bucuresti.
3. **Heiko Koester, 2008** - *Native plants and urban sustainability*. Native Plants Journal, Vol. 9, No. 3, Pages 323-333
4. **Maloupa E., K. Grigoriadou, D. Zervaki, K. Papanastassi, 2005** - *Management of the balkan native flora for sustainable floricultural comercial use*. ISHS Acta Horticulturæ 683: V International Symposium on New Floricultural Crops.
5. **Noordegraaf C.V., 2005** - *An approach to select new ornamental crops*. ISHS Acta Horticulturæ 541: IV International Symposium on New Floricultural Crops.
6. **Halevy A.H., 2005** - *Introduction of native israeli plants as new cut flowers*. ISHS Acta Horticulturæ 541: IV International Symposium on New Floricultural Crops
7. **Chimonidou D., J.C. Vlahos, M. Odysseos, K. Georgiou, A. Dell, 2005**- *Evaluation of species from Cyprus flora for sustainable use in commercial floriculture*. ISHS Acta Horticulturæ 541: V International Symposium on New Floricultural Crops.

INFLUENCE OF THE SOWING DATE ON THE STAGE OF THE STOCK AND SEED PLANTS IN CARROT (*DAUCUS CAROTA* L.)

INFLUENȚA EPOCII DE SEMĂNAT ASUPRA FAZELOR DE PLANTE MAMĂ ȘI DE SEMINCER LA MORCOV (*DAUCUS CAROTA* L.)

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Abstract. *During the 2006-2008 period, on the experimental plots of R.I.V.F. G. Vidra, nine inbred carrot lines sown in three different sowing periods were studied in order to establish their influence on the stock plant stage and seed plants. Our studies aimed to establish the latest sowing dates in the carrot crop under the southern conditions of our country leading to getting of stock plants of optimum size (11-13 mm root diameter), which are able to vernalise in the winter field conditions. The latest sowing period was the period between the 15-25 September. By comparison with other two sowing dates (the last decade of August and the first decade of September, respectively) the latest sowing date led to getting of stock plants under optimum weight, which in about 30-40% couldn't be planted. In the seed crop field, the percent of plants which bore flower stems ranged between 60% (LFM86) and 26.5% (LFM14, LMP 14). The best results with the stock plants were well vernalised during winter field conditions and gave flower stems of over 98% were recorded for the sowing date from the decade of August. This sowing period affords obtaining of the planned seed stock under the southern conditions of our country.*

Key words: carrot, sowing date, development phase.

Rezumat. *În perioada 2006-2008, la ICDLF VIDRA, au fost studiate nouă linii consangvinizate de morcov în trei epoci de semănat și influența acestora asupra fazelor de plante mamă și de semincer. Studiul a avut ca scop stabilirea celei mai tardive epoci de semănat a morcovului, în zona de sud a țării, pentru obținerea de plante mamă, de mărime optimă, (11-13 mm diametrul rădăcinii în zona coletului), care să se vernalizeze în condițiile de iernare în câmp. Epoca de semănat, 15-25 septembrie, a fost cea mai tardivă. Comparativ cu celelalte două epoci (20 - 30 august și 1-10 septembrie), semănatul în această epocă, a determinat obținerea de plante mamă care nu au avut dimensiuni optime, în proporție de 30 - 40%, care nu au fost transplantate. În câmpul semincer, procentul de plante care au emis tije florale, a fost cuprins între 60% (LFM86) și 26,5 % (LFM 14, LMP 14). Cele mai bune rezultate (plante mamă care au întrunit condițiile pentru vernalizare în câmp și au emis tije florale în procent de peste 98%) s-au înregistrat în epoca de semănat 20-30 august, ceea ce face posibil obținerea cantității de sămânță planificată, pentru zona de sud a țării.*

Cuvinte cheie: morcov, epoca de semannat, faze de dezvoltare.

INTRODUCTION

Under the temperate conditions of our country carrots behave like a biennial species. Although the two stages of this plant development (both vegetative and generative) have a genetic determination, the environmental factors have a strong influence upon the behaviour of this species as a yearly and biennial plant (Meng, 1986; Atherton, 1990).

In our growing area, in order to pass to the generative phase the carrot plants have to pass through a vernalisation stage e.g. to be subjected to low positive temperatures for a 60 days period (Dowker, 1975). However, there is a stage of juvenile of the plants when these temperatures are not active. So, the plants which have a smaller age of 12 weeks from the sprouting and a diameter under 11-13 cm at the top root level do not accumulate the vernalisation threshold and do not pass in the generative stage in the next year (Elena Chira, 1996). In order to avoid the influence of high temperatures after the vernalisation upon the appearance of the flower stems and upon the sex expression, it is recommended as the vernalisation stage to be surpassed from 60 days to 70 days (Hiller and Kelly, 1979).

In carrot, like to the other biennial species, the quantity and quality of the obtained seeds are influenced by the mother plants used for the setting up of the seed crops. But their storage under vernalisation conditions in refrigerating spaces requires supplementary expenses. That is why, during the 2006-2008 period at the RIFDG – Vidra a study was developed in order to establish the best sowing date to get mother plants which are able to pass to the generative stage in a higher percent (over 95%) under the open field wintering conditions.

MATERIAL AND RESEARCH METHOD

The biological material used was represented by nine carrot inbred lines (both male sterile and male fertile lines) of near range which represent the genitors for some F_1 perspective hybrids.

During the 2006 and 2007 period mother stock fields were set up sowing in the open field in the frame of three epochs, as following 20-30 August, 1-10 September and 15-25 September. For each inbred line and each epoch 500 seeds were sown. In order to assure an optimum sprouting, the required water was assured by irrigation.

Seed crops were set up in 2007 and 2008 by planting of the selected biological material on the 30-31 of March in an isolated space under the hot house conditions, the roof being covered with a textile material of insect-proof type. For each line and each sowing date 200 mother plants were used.

The age of plants at the beginning of winter (30 November) was analysed, when the temperature level was lower, under 10°C (during the vernalisation range of $1-10^{\circ}\text{C}$). In spring, when winter was over (28-29 of March) the root diameter at the level of top root was measured for the plants which had survived in winter in open field conditions. In seed crop plots the number of plants which gave birth to flower stems was determined for each line and epoch of sowing. These data represent average values for the two years of experiments for the two plant stages. The difference significance was computed by the multiple comparison method.

RESULTS AND DISCUSSIONS

Depending on the sowing date and temperature which have influenced sprouting, growing and development of the plants on the date of 30th of November, their age was of 13.2 weeks for the first sowing epoch in 2006 and of only 9.2 weeks for the third epoch in 2007. The optimum temperature for sprouting of the carrot seed is of 15⁰C while for the plant growing and development in the first stages, it is required 18-22⁰C.

The higher temperatures recorded in August caused a longer period for the germination seeds and sprouting. Sowing in September made impossible production of mother plants having a minimum age of 12 weeks in the southern part of our country although the plantlets sprouted in 7-8 weeks after sowing (Table1).

Table 1

**The age of mother plants which came into winter
computed on 30 November**

No.	Specification	Epoch 20-30 August	Epoch 1-10 September	Epoch 15-25 September
1	Sowing date	22 August	5 September	17 September
2	Sprouting date	29 – 31 August 2006	11-14 September 2006	24-25 September 2006
		4 – 7 September 2007	16-17 September 2007	26-28 September 2007
3	Plant age	13,2 weeks 2006	11,2 weeks 2006	10,0 weeks 2006
		12,0 weeks 2007	10,7 weeks 2007	9,2 weeks 2007

Regarding the influence of the sowing date upon the mother plant size one could notice that the percent of plants having an optimum size for vernalisation ranged between 98.8 and 95.4% for the first epoch while for the third epoch it ranged between 60 and 70% (Table 2).

But concerning the percent of mother plants which formed flower stems passing through the generative phase, one could notice that for the plants derived from the first sowing stage, out of the total number of stock plants planted, the percent of those which formed flower stems ranged from 98 to 100% while in the case of the other two epochs the percent was smaller, it ranged between 60 to 26.5% for the third epoch (Table3).

Such results can be explained by the fact that plants have continued to grow in spring, reaching the optimum size, but they didn't accumulate the temperature for vernalisation during the winter, being small both by age and by size.

For each sowing epoch and development stage of the plants (vegetative and generative) were recorded significant differences among the genotypes (which couldn't be correlated among them). So it was proved the influence of the environment all factors upon these characteristics of the species.

Table 2

Influence of the sowing date upon the mother plant stage in carrot
during the 2006- 2007 period

No.	Inbred line	The first epoch (20-30 August)		The second epoch (1-10 September)		The third epoch (25-30 September)	
		% of mother plants having root diameter >13 mm	Significance*	% of mother plants having root diameter >13 mm	Significance*	% of mother plants having root diameter > 13 mm	Significance*
1	LMP14	98,8	a	87,6	b	60,0	e
2	LMP15	98,6	a	82,2	d	70,0	a
3	LMP53	98,5	a	88,5	a	64,6	c
4	LFM14	97,1	b	84,6	c	70,0	a
5	LFM15	96,8	b	84,2	c	69,4	a
6	LFM53	96,6	b	77,2	g	67,8	b
7	LFM74	95,3	c	79,2	f	60,9	d
8	LFM77	95,6	c	84,4	c	64,6	c
9	LFM86	95,4	c	81,9	e	60,3	e

* Variants having the same letter have not a significance difference for P 5= %

Table 3

**Influence of the sowing date upon the seed plant stage
in carrot during the 2007-2008 period**

No.	Inbred line	The first epoch (20-30 August)		The second epoch (1-10 September)		The third epoch (25-30 September)	
		% of plants which gave flower stems	Significance*	% of plants which gave flower stems	Significance*	% of plants which gave flower stems	Significance*
1	LMP14	100,0	a	71,6	a	26,5	f
2	LFM14	100,0	a	45,9	g	26,5	f
3	LFM 86	100,0	a	55,2	d	60,0	a
4	LFM74	99,4	ab	51,4	e	59,2	a
5	LMP53	99,2	b	49,5	f	54,4	b
6	LFM53	99,4	b	59,8	c	54,0	b
7	LMP15	98,4	c	65,3	b	44,2	c
8	LMP15	98,0	c	64,9	b	48,5	d
9	LFM77	98,0	c	70,8	a	39,6	e

* Variants having the same letter have not a significance difference for P 5= %

CONCLUSIONS

The research works carried on the influence of the sowing date upon the stage of mother plant and seed crop led to the following conclusions:

1. The sowing date and temperatures during germination and sprouting influenced the age of the carrot mother plants which came into winter;

2. The latest sowing date (25-30 September) revealed the lowermost percent of mother plants of optimum size, and in the seed crop field it caused the least percent of seed plants, for all the genotypes, ranging among 60% (LFM86) and 26.5% (LFM14, LMP14);

3. For the same sowing period among genotypes were recorded significant differences for the plant stages;

4. The highest percent of seed plants, were 98% for all the inbred lines were obtained in the two experimental years when were used mother plants got in the first sowing epoch (20-30 August). This percent of seed plants assure an optimum number of plants per ha and, it represented one condition for getting the amount of the planned seed.

REFERENCES

1. **Atherton J.G., Craigon J., Basher E.A., 1990** - *Flowering and bolting in carrot I. Juvenility, cardinal temperatures and thermal times for vernalization*. J. Hort. Sci., 60 (4), 423-429.
2. **Chira Elena, 1996** - *Cercetări privind inducerea înfloririi la morcov*. Anale I.C.L.F. Vidra, vol. XIV, 377-383.
3. **Dowker B.D., Jackson J.C., 1975** - *Bolting in some carrot populations*. Annals of Applied Biology, 79 (3), 361-365.
4. **Hiller L.K., Kelly, W., 1979** - *The effect of post – vernalisation temperature on seedstalk elongation and flowering in carrot*. J. Amer. Soc. Hort. Sci., 104 (27), 253-257.
5. **Meng F.J., Que Y.M., Zhang S.Q., 1986** - *Zearlenone-like substance in winter plants and its relation to vernalization*. Acta Botanica Ginica, 28 (6), 622-627.

GENERAL PRESENTATION OF THE TOMATO COLLECTION FROM „PORUMBENI” INSTITUTE OF KISHINEV REPUBLIC OF MOLDOVA

PREZENTAREA GENERALĂ A COLECȚIEI DE TOMATE DE LA INSTITUTUL „PORUMBENI” DIN CHIȘINĂU, REPUBLICA MOLDOVA

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***Abstract:** The paper presents a general characterization of the collection of about 250 tomato cultivars for industrialization from „Porumbeni” Phytotechnics Institute. The characterization, made by the UPVO method, highlighted the large diversity of the assortment from the viewpoint of productivity and earliness, as well as the main morphologic and physiologic features.*

Key words: tomato cultivar, tomato collection, tomato biodiversity

***Rezumat:** Lucrarea prezintă o caracterizare generală a colecției de circa 250 de cultivare de tomate pentru industrializare de la Institutul de Fitotehnie „Porumbeni”. Caracterizarea, realizată prin metoda UPOV, a scos în evidență marea diversitate a sortimentului din punct de vedere al productivității și timpurietății, ca și pentru principalele caracteristici morfologice și fiziologice.*

Cuvinte cheie: cultivare de tomate, colecție de tomate, biodiversitatea tomatelor

INTRODUCTION

The collection study intends to put at the disposal of the specialist from production and research, detailed information on the morphological, physiologic and yield characteristics for some tomato species and populations cultivated in the open field, in well-determined conditions of culture and environment (2,3,5).

In the Republic of Moldova, there are known more than 200 tomato cultivars. Within these, a large part is cultivated for fresh state consumption and another part for the processing and preserved food industry. To attain our goal, we proposed the following objectives: description of morphologic characteristics, description of physiologic and disease resistance characteristics and the yield evaluation.

MATERIAL AND METHOD

To attain the proposed objectives, at „Porumbeni” Phytotechnics Institute, we made a collection study using a number of 175 varieties and local populations from a collection of more than 250 tomato populations. The experimental researches for

tomatoes in the open field were made on the experimental field of „Porumbeni” Phytotechnics State Institute from the Republic of Moldova. During the vegetation period, we carried out some specific biometric observations and determinations, according to the UPVO standards (Union for Protection of Varietal Origin), highlighting the main characteristics of the studied cultivars (1,4). Taking into account these characteristics we make observations on the expression of characters and the UPVO mark, the number of cultivars corresponding to each UPVO mark and one typical example of cultivar for the presented character variant.

RESULTS AND DISCUSSIONS

The large biologic (genetic and plant breeding) diversity of cultivars from the collection results from the characterization according to the UPVO system (table 1).

Table 1

Characterization of collection according to the UPVO system

No. crt.	Character	Degrees of expression	UPVO mark	Cultivars in collection	
				No. of cultivars	Examples
0	1	2	3	4	5
1.	Nursery transplant. Anthocianic colour	absent	1	6	Delta
		present	9	169	Leana
2.	Type of growing	determined	1	171	Novicioc
		non-determined	2	4	Di-Di
3.	Determinate growth: number of knots on main stem (lateral offshoots are removed)	few	3	35	Gruzinca rozovii
		medium	5	104	Potoc
		many	7	36	Novinca Prednestrovia
4.	Indeterminate growth: growing speed (when the fastest variety is at least 1.5 m tall)	slow	3	4	Di-Di
		medium	5	-	-
		big	7	-	-
5.	Stem: Anthocianic colour in the upper third	absent or very weak	1	15	Strong
		weak	3	34	Veneț
		medium	5	97	Zagadca
		strong	7	21	Severeanin
		very strong	9	8	Crot
6.	Indeterminate growth: length of inter-knots between inflorescences 1 and 4	small	3	4	Di-Di
		medium	5	-	-
		large	7	-	-
7.	Foliage: position (at the medium third of plant)	semi-erect	3	69	Leana
		horizontal	5	34	Slava Moldavii
		hanging	7	72	Amulet
8.	Leaf: length	short	3	28	Gruzinca rozovii
		medium	5	123	Onix
		long	7	24	Onix
9.	Leaf: width	narrow	3	26	Novinca Prednestrovia
		medium	5	137	Balada

No. crt.	Character	Degrees of expression	UPVO mark	Cultivars in collection	
				No. of cultivars	Examples
0	1	2	3	4	5
		wide	7	12	Cuboc Moldovî
10.	Leaf: limb sectioning	pennate	1	-	-
		imparipennate	2	175	-
11.	Leaf: type	type 1	1	158	Bolgarscaia carnela
		type 2	2	5	Rif
		type 3	3	2	Cuboc Moldovî
		type 4	4	-	-
12.	Leaf: intensity of green colour	light green	3	38	Zagadca
		medium green	5	108	Peto-86
		dark green	7	29	Mihaela
13.	Leaf: position of leaves as compared to the central axis	oriented upward	1	26	Gruzinca rozovîi
		horizontal	2	69	Lerica
		downward	3	80	Onix
14.	Inflorescence: type (2 nd binding and 3 rd binding)	uniparous	1	39	Elvira
		intermediate	2	105	Venus
		multiparous	3	31	Orion
15.	Flower: fasciation (the first flower of inflorescence)	absent	1	-	-
		present	9	-	-
16.	Flower: pubescence of style	absent	1	-	-
		present	9	175	Leana
17.	Flower: colour	yellow	1	175	Alex
		orange	2	-	-
18.	Peduncle: abscission layer	absent	1	68	Novicioc
		present	9	107	Leana
19.	Peduncle: length (from the abscission point to calyx)	short	3	16	Solearis
		medium	5	114	Fakel
		long	7	45	Amulet
20.	Fruit: size	very small	1	-	-
		small	3	18	Rif
		medium	5	98	Mihaela
		big	7	34	Victorina
		very big	9	25	Crasnâi Velican
21.	Fruit: ratio length/width	very small	1	21	Primula
		small	3	32	Zagadca
		medium	5	77	Leana
		big	7	39	Novicioc
		very big	9	6	Di-Di
22.	Fruit: shape in longitudinal section	flattened	1	16	Santa-Maria
		weakly flattened	2	25	Solearis
		round	3	28	Leana
		rectangular	4	29	Viteazi
		cylindrical	5	15	Floran
		cordiform	6	4	Duask
		obovoid	7	29	Laguna
		ovoid	8	23	Roma
		pear-shaped	9	4	Novinca Prednestrovia

No. crt.	Character	Degrees of expression	UPVO mark	Cultivars in collection	
				No. of cultivars	Examples
0	1	2	3	4	5
		well-marked pear shape	10	2	Di-Di
23.	Fruit: presence of wrinkles (wrinkling from peduncle)	absent or very weak	1	58	Rif
		weak	3	41	Novicioc
		medium	5	39	Caterina
		strong	7	28	Santa-Maria
		very strong	9	9	Persei
24.	Fruit: transversal section	irregular shape	1	116	Solearis
		round	2	59	Luc
25.	Fruit: depression of scar left by peduncle	absent or very weak	1	26	Di-Di
		weak	3	36	Alex
		medium	5	78	Zagadca
		strong	7	26	Santa-Maria
		very strong	9	9	Solearis
26.	Fruit: sizes of suberified surface around the peduncle scar	very small	1	16	Luc
		small	3	37	Laguna
		medium	5	67	Leana
		big	7	29	Santa-Maria
		very big	9	26	Solearis
27.	Fruit: size of scar left by the flower	very small	1	57	Di-Di
		small	3	41	Novinca Prednestrovia
		medium	5	35	Viza
		big	7	32	Persie
		very big	9	10	Solearis
28.	Fruit: end shape	crushed	3	23	Santa-Maria
		from crushed to flat	4	41	Victorina
		flat	5	54	Leana
		from flat to pointed	6	43	Novicioc
		pointed	7	14	Di-Di
29.	Fruit: core sizes in transversal section	very small	1	12	Luc
		small	3	26	Prizior
		medium	5	75	Leana
		big	7	41	Victorina
		very big	9	21	Crupnoplodnâi
30.	Fruit: pericarp thickness	thin	3	34	Santa-Maria
		medium	5	72	Amulet
		thick	7	69	Novinca Prednestrovia
31.	Fruit: number of seminal channels	2	1	8	Di-Di
		2 or 3	2	29	Novicioc
		3 or 4	3	79	Nadejda
		more than 4	4	59	Victorina
32.	Fruit: peduncular green stain	absent	1	78	Novicioc

No. crt.	Character	Degrees of expression	UPVO mark	Cultivars in collection	
				No. of cultivars	Examples
0	1	2	3	4	5
	(up to maturity)	present	9	97	Leana
33.	Fruit: sizes of peduncular green stain before maturity	small	3	17	Meridian
		medium	5	51	Leana
		big	7	29	Mihaela
34.	Fruit: intensity of green colour of peduncular stain	weak	3	24	Leana
		medium	5	40	Novinca Prednestrovia
		strong	7	33	Mihaela
35.	Fruit: intensity of green colour of fruit up to maturity	light	3	29	Zagadca
		medium	5	107	Leana
		dark	7	39	Novinca Prednestrovie
36.	Fruit: colour at maturity	yellow	1	4	Slava Moldavii
		orange	2	3	Alex
		pink	3	2	Gruzinca rozovii
		red	4	166	Amulet
37.	Fruit: colour of pulp at maturity	yellow	1	4	Slava Moldavii
		orange	2	3	Alex
		pink	3	2	Onix roz
		red	4	166	Novicioc
38.	Blooming time	early	3	16	Leana
		medium	5	95	Mihaela
		late	7	64	Novinca Prednestrovia
39.	Maturation time	early	3	16	Zagadca
		medium	5	95	Novicioc
		late	7	64	Amulet
40.	Fruit: content of dry substance at maturity	small	3	23	Leana
		medium	5	91	Victorina
		big	7	61	Novinca Prednestrovie
41.	Silvery expression of leaf	absent	1	-	-
		present	9	-	-
42.	Resistance to <i>Meloidogyne</i>	absent	1	-	-
		present	9	-	-
43.	Resistance to <i>Verticilium</i>	absent	1	-	-
		present	9	-	-
44.	Resistance to <i>Fusarium</i>	absent	1	-	-
		present	9	-	-
45.	Resistance to VMT	absent	1	124	Amulet
		present	9	51	Rio-Grande
46.	Resistance to <i>Phytophthora infestans</i>	absent	1	28	Novicioc
		present	9	147	Leana
47.	Resistance to mycoplasmosis	absent	1	157	Lerica
		present	9	18	Solearis

If we take into account the character „anthocianic colour of nursery transplant”, this is present in 169 cultivars and absent in the remaining 6.

The determinate character „type of growing” is present in 171 cultivars and the one indeterminate one is present in four cultivars.

The pubescent style is present in all cultivars of the collection.

As for the fruit size, 25 cultivars have very big fruits, 34 have big fruits, 98 have medium fruits, 18 have small fruits and there is no cultivar with very small fruits.

The fruit shape in longitudinal section is flattened in 16 cultivars, weakly flattened in 25 cultivars, round (spherical) in 28, rectangular in 29, cylindrical in 15, cordiform in four, obovoid in 29, ovoid in 23, piriform in four cultivars and strongly piriform in two cultivars.

As for the fruit quality we are interested in the pericarp thickness and the number of seminal channels. Within the collection, 34 cultivars have thin pericarp, 72 cultivars have medium pericarp, and 69 have a thick pericarp. The number of seminal channels within the collection is „2” for eight cultivars, 2 or 3 in 29 cultivars, 3 or 4 in 79 cultivars and more than „4” in 59 cultivars.

The green peduncular stain is present in 97 cultivars and missing in 78 cultivars.

The colour of fruit at physiologic maturity is yellow in four cultivars, orange in three cultivars, pink in two cultivars and red in 166 cultivars.

From the viewpoint of earliness (maturation time), 16 cultivars are early, 95 are medium, and 64 cultivars are late.

The content in dry substance at fruit maturity is small in 23 cultivars, medium in 91 cultivars and large in 61 cultivars.

As for the resistance to certain pathogen agents, the UPVO study shows that 51 cultivars are resistant to tobacco mosaic virus, 147 cultivars are resistant to *Phytophthora infestans*, and 18 to mycoplasmosis.

CONCLUSIONS

The tomato collection from „Porumbeni” Institute comprises about 250 cultivars, out of which 175 are considered of a major importance, a real gene bank, with genetic resources of a great variability.

The collection was studied according to UPVO norms, highlighting the main characters of interest for the genetics and melioration studies.

REFERENCES

1. Atherton J.G., Rudich J., 1994 – *The Tomato Crop*. Ed. Chopman and Hall.
2. Munteanu N., 2003 – *Tomatele, ardeii și pătlăgele vinete*. Editura „Ion Ionescu de la Brad”, Iași.
3. Patron P., 1992 – *Legumicultură*. Editura Știința, Chișinău.
4. Sestraș R., 2004 – *Ameliorarea speciilor horticole*. Editura AcademicPres, Cluj-Napoca
5. Zeven, A.C., 1987 – *Plant Genetic Resources*. I. A. C., Wageningen.

PRODUCTIVITY OF A TOMATO ASSORTMENT FOR PROCESSING IN THE CONDITIONS FROM „PORUMBENI” INSTITUTE OF KISHINEV

PRODUCTIVITATEA UNUI SORTIMENT DE TOMATE PENTRU INDUSTRIALIZARE ÎN CONDIȚIILE DE LA INSTITUTUL „PORUMBENI” – CHIȘINĂU

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Abstract: *The paper presents the behavior in a comparative trial of an assortment of 20 tomato cultivars from the collection of „Porumbeni” Phytotechnics Institute of Kishinev, Republic of Moldova, in the period 2006-2008. The highest early yields were given by the cultivars: Zagadca (11.12 t/ha), Novicioc (8.76 t/ha) and Leana (8.53 t/ha). The highest total yield was given by the cultivars: Persei (29.31 t/ha), Novicioc (29.17 t/ha) and Nota (27.64 t/ha).*

Key words: tomato assortment, comparative trial, tomato collection.

Rezumat: *Lucrarea prezintă comportarea într-o cultură comparativă a unui sortiment de 20 de cultivare de tomate din colecția Institutului de Fitotehnie „Porumbeni” din Chișinău, Republica Moldova, în perioada 2006-2008. Cele mai mari producții timpurii au realizat cultivarele: Zagadca (11,12 t/ha), Novicioc (8,76 t/ha) și Leana (8,53 t/ha). Producția totală cea mai mare a fost realizată de cultivarele: Persei (29,31 t/ha), Novicioc (29,17 t/ha) și Nota (27,64 t/ha).*

Cuvinte cheie: sortimentul de tomate, cultură comparativă, colecție de tomate.

INTRODUCTION

Productivity represents one of the most important plant breeding objectives as well as one of the most important characters that gives value of use or market value (3,6).

In fact, productivity is determined by the genetic potential of the cultivar, but as we may know, this productivity may be highly influenced by the environment conditions; in other words, according to the norms of general genetics, phenotype (productivity) is the result of the interaction between genotype (cultivar, the gene fund) and the environment conditions (the cultivation technology).

So, productivity depends essentially on the genotype of each cultivar in certain environment conditions. If the environment conditions (the cultivation technology) are identical for all cultivars, it means that the differences among the

used cultivars is an expression of the differences between the genotype of these cultivars (1,3,6).

In the practice of plant breeding, productivity is most of the time the main criterion of selection among the variants of the biologic material under study (breeds, lines, hybrids, selections a.o.). At the same time, productivity is the most important character in the competition between the new creations (cultivars) obtained as a result of the plant breeding work or in the competition between the new cultivars (from other countries); that is why their introduction in the assortment specter of our country is desirable.

The appreciation of productivity consists concretely in knowing the harvest quantity that may be obtained from a plant or the surface unit cultivated with that plant (1,7).

When we study the productivity of an assortment made of several cultivars, we organize comparative trial where we compare among them, from the viewpoint of yield, the cultivars whose productivity we want to find out (5).

Thus, the goal of this research is to establish the agro-productive value of an assortment of twenty cultivars within „Porumbeni” collection. To attain our goal, we established two objectives: (1) analysis of the early (summer) tomato yield at cultivar level and (2) analysis of total tomato yield of all cultivars.

MATERIAL AND METHOD

To attain our objectives, we organized a series of experiments consisting in comparative trial, during 2006–2008, within the experimental vegetable-growing field from „Porumbeni” Phytotechnics Institute from the Republic of Moldova.

Research has been carried out in a comparative culture with tomato breeds for processing or processing and consumption. The comparative culture comprises 20 cultivars (free pollination cultivars) chosen from the existent collection of „Porumbeni” Institute. We took care that the assortment from the comparative culture to be representative for the collection from the viewpoint of productivity, earliness and certain characteristics giving it the agrobiologic value.

The experiment was organized in a design of randomized blocks with four replicates. Each replicate parcel had a surface of 7.0 m² (1.4 m x 5 m), being made of two rows of plants arranged at a distance of 70 cm, ensuring a distance of 30 cm, between the plants in a row and resulting a density of about 4.8 plants/m², 48 thousand plants/ha, respectively.

The establishment of crop was made every year by nursery transplant of about 50 days, corresponding to a phenophase of 6-7 leaves. The moment of planting occurred in the interval May 17th -20th, according to the meteorological conditions of the second decade of May.

During the vegetation period, we applied several care works afferent to the tomato crop with a determined growing, destined to be processed or having a mixed destination; we did not apply any special works (thinning out, tying up, debudding, application of bioactive substances etc.) (2,4). The land on which we placed the experiment is flat, arranged for irrigation and has a carbonated chernozemic soil with a clayish structure, a humus content of 3.1% and pH of 6.9-7.0.

In the experimental period, at the level of the three-year research series within the comparative trial, we carried out the observations and determinations necessary to appreciate the agro-productivity of the used cultivars. Harvesting was made in seven

stages to mark the staging and dynamics of yield; we mention that normally, we effectuate 2-4 harvestings, depending on the maturation dynamic and the duration of the maturation period of fruits. The harvesting was made only after the full (physiological) maturity of fruits. The primary data on the crops obtained in each replicated parcel were reported accordingly to one hectare surface.

The experimental data were processed by specific statistical-mathematic methods, of variance analysis (Fisher test) and comparison analysis using the Student test and the limit differences for three confidence degrees: 95% (LSD 5%), 99% (LSD 1%) and 99.9% (LSD 0.1%) (5). The comparison of yield results was effectuated against the arithmetic average of yields for each variant (experiment average). The significance of differences as compared to the experimental average was established by comparing these to the three levels of the limit differences (LSD).

RESULTS AND DISCUSSIONS

The summer crop yield registered on August 28th is presented in table 1.

Table 1

Analysis of summer crop (25.08) within the comparative culture (average 2006-2008)

no. crt	Variant		Yield (t/ha)	% as compared to	Differences as comp. to	Difference significance
		cultivar				
1.	Amulet		3.17	58	-2.34	00
2	Balada		5.04	91	-0.47	
3	Caterina		3.28	60	-2.23	0
4	Evrica		5.16	94	-0.35	
5	Fakel		5.92	107	+0.41	
6	Gruzinca rozovii		5.60	102	0.09	
7	Leana		8.53	155	+3.02	xxx
8	Mihaela		5.92	107	+0.41	
9	Nota		3.48	63	-2.03	0
10	Novicioc		8.76	159	+3.25	xxx
11	Novinca prednestrovie		3.30	60	-2.21	0
12	Persei		6.69	121	+1.18	
13	Potoc		3.47	63	-2.04	0
14	Sibirskii scorospelii		3.39	62	-2.12	0
15	Start		5.10	93	-0.41	
16	Svitanoc		6.91	125	+1.40	
17	Venus		5.09	92	-0.42	
18	Victorina		4.55	83	-0.96	
19	Viteazi		5.69	103	+0.18	
20	Zagadca		11.12	202	+5.61	xxx
\bar{x}	Experiment average		5.51	100	-	

LSD 5% = 1.69 t/ha

LSD 1% = 2.26 t/ha

LSD 0.1% = 2.97 t/ha

The yield of summer tomatoes varied between 3.17 t/ha (for Amulet cultivar) and 11.12 t/ha (for Zagadca cultivar), whereas the experimental average has the value of 5.51 t/ha. If we calculate the median of yields, this is 7.15 t/ha. By comparing the average to the median, it results that the median is much bigger than the average of yields what demonstrates that more cultivars give yields under the experimental average.

The highest yields, statistically ensured with a probability of 99.9% (LSD 0.1%) were obtained by cultivars Zagadca (11.12 t/ha), Novicioc (8.76 t/ha) and Leana (8.53 t/ha).

The lowest yield was registered by Amulet breed (3.17 t/ha) with a negative difference highly significant when to the experiment average. Low yields statistically ensured with significant negative differences were also registered by the cultivars: Caterina (3.28 t/ha), Novinca prednestrovie (3.30 t/ha), Sibirskii scorospelii (3.39 t/ha) and Potoc (3.47 t/ha). The other cultivars gave yields within the variation limits of the experimental average, with insignificant differences as compared to the average.

We mention that the average yield for the summer crop represents about 23% from the total yield. For some cultivars this represents a much higher percentage. If we take into account the cultivars with the highest yields, we may notice that the summer crop represents 52% from the total yield for Zagadca cultivar, 44% for Leana cultivar and only 30% for Novicioc cultivar. These data demonstrate the earliness of the cultivars Zagadca and Leana.

On the basis of the data presented, we may appreciate as early all cultivars that have yields superior to the average, namely with yields higher than 5.51 t/ha. By the table order these varieties are: Fakel (5.92 t/ha), Gruznică rozovii (5.60 t/ha), Leana (8.53 t/ha), Mihaela (5.92 t/ha), Novicioc (8.76 t/ha), Persei (6.69 t/ha), Svitanc (6.91 t/ha), Viteazi (5.69 t/ha) and Zagadca (11.12 t/ha). As we already showed, significantly superior yields to the experimental average are registered only by the three varieties already mentioned: Zagadca, Novicioc and Leana. In any case, in the group of early cultivars we must not include the cultivars with the lowest summer yields as compared to the experimental average: Caterina, Novinca prednestrovie and Sibirskii scorospelii.

The total tomato yield is presented and analyzed in table 2.

The total yield varied between large limits, from 16.26 t/ha (Gruznică rozovii variety) up to 29.31 t/ha (Persei variety); in the same conditions, the experimental average was 23.98 t/ha. From the extreme yield data it results an experimental median of 22.78 t/ha, relatively close to median, wherefrom results that the studied assortment is relatively balanced, from the viewpoint of total yield, with maximum and minimum yields approximately equally spaced out as compared to the experiment average. Thus, from the yield data (t/ha or % as compared to average) we may notice that 11 cultivars are situated above the experimental average from the viewpoint of yield and nine are under this average.

Table 2

**Analysis of total crop within the comparative culture
(average 2006-2008)**

No. crt.	Variant		Yield (t/ha)	% as comp. to	Difference as comp to.	Difference significance
	Cultivar					
1.	Amulet		23.35	97.37	-0.63	
2	Balada		25.54	106.51	+1.56	
3	Caterina		27.38	114.18	+3.40	X
4	Evrica		26.15	109.05	+2.17	
5	Fakel		22.19	92.54	-1.79	
6	Gruzinca rozovii		16.26	67.81	-7.72	000
7	Leana		19.33	80.61	-4.65	00
8	Mihaela		23.09	96.29	-0.89	
9	Nota		27.64	115.26	+3.66	x
10	Novicioc		29.17	121.64	+5.19	xx
11	Novinca prednestrovie		21.84	91.08	-2.14	
12	Persei		29.31	122.23	+5.33	xx
13	Potoc		25.73	107.30	+1.75	
14	Sibirskii scorospelfii		24.23	101.04	+0.25	
15	Start		20.75	86.53	-3.23	0
16	Svitanoc		21.55	89.87	-2.43	
17	Venus		26.64	111.09	+2.66	
18	Victorina		24.09	100.46	+0.11	
19	Viteazi		24.24	101.08	+0.26	
20	Zagadca		21.12	88.07	-2.86	
\bar{x}	Experiment average		23.98	100.00	0.00	

LSD 5% = 3.08 t/ha

LSD 1% = 4.12 t/ha

LSD 0.1% = 5.42 t/ha

From the analyzed data, it results that two cultivars, Persei (29.31 t/ha) and Novicioc (29.17 t/ha) registered yield increases of about 22% as compared to the experimental average and they were appreciated as highly significant. Significant yield increases were registered by the cultivars Nota (27.64 t/ha) and Caterina (27.38 t/ha), exceeding the experimental average by about 14-15%.

The yields below the experimental average were registered by nine breeds, but the yield differences are significant only for three cultivars. The lowest yield was registered by the cultivar Gruzinca rozovii with 16.26 t/ha, 67.81% respectively as compared to the experimental average; the difference as compared to the average is negative and highly significant. Yields below the experimental average were also registered by the cultivar Leana, with 19.33 t/ha, 80.61% respectively as compared to the average and with negative differences highly significant as compared to the experimental average.

In the same line of significant inferior yields as compared to the experimental average is the cultivar Start, with a yield of 20.75 t/ha, 86.53% respectively, from the experimental average of 23.98 t/ha. In these conditions, the Start variety registers

significant negative differences as compared to the average of yields of the comparative culture.

The appreciation of the agro-productive value from the angle of total yield must be corroborated with the early (summer) yield. Thus, the varieties registering the highest total yields - Persei, Nota and Caterina – had summer yields within the variation limits of average or significantly below the average of this yield. We may not say the same about Novicioc breed that registered significantly superior yields both at the level of total yield and at the level of summer yield. In the same way, the cultivars with the highest early yields - Zagadca and Mihaela give total yields below the experimental average (Zagadca) or distinctly significant below this average.

These considerations impose the appreciation of the agro-productive value separately for the early yield and the total one.

At the same time, for the cultivars specialized for industrialization and mechanized harvesting, the concentration of fruit maturation or the ripening (maturity) simultaneousness of fruits is a very important and appreciated characteristic being preferred the cultivars with simultaneous maturation of fruits on the same plant. This condition is positively correlated to the “specialization” of cultivars as early and late. In the same line, we must notice that the Novicioc variety, registering high yields both early yields and total (late) yields, has a too large spacing out of fruit maturation. Consequently, this variety is recommended for consumption in fresh state and a spaced out harvesting during a long period of time, from summer up to late autumn.

CONCLUSIONS

The highest early yields were registered by the cultivars: Zagadca (11.12 t/ha), Novicioc (8.76 t/ha) and Leana (8.53 t/ha).

The cultivars with the highest total yields were: Persei (29.31 t/ha), Novicioc (29.17 t/ha) and Nota (27.64 t/ha).

Novicioc breed is remarkable for both its summer yield and the total yield having a larger spacing out, what recommends it for consumption in fresh state and spaced out harvesting.

REFERENCES

1. Atherton J.G., Rudich J., 1994 – *The Tomato Crop*. Ed. Chopman and Hall.
2. Munteanu N., 2003 – *Tomatele, ardeii și pătlăgele vinete*. Ed. „Ion Ionescu de la Brad”, Iași.
3. Munteanu N., Fălticeanu Marcela, 2008 – *Genetica și ameliorarea plantelor ornamentale*. Editura „Ion Ionescu de la Brad”, Iași
4. Patron P., 1992 – *Legumicultură*. Editura Știința, Chișinău.
5. Săulescu N.A., Săulescu N.N., 1967 – *Cîmpul de experiență*. Ed Agrosilvică, București.
6. Sestraș R., 2004 – *Ameliorarea speciilor horticole*. Editura AcademicPres, Cluj-Napoca
7. Zeven, A.C., 1987 – *Plant Genetic Resources*. I. A. C., Wageningen.

YIELD STUDY ON SOME RUNNER BEAN (*PHASEOLUS COCCINEUS* L.) LOCAL POPULATIONS DEPENDING OF THE ESTABLISHMENT DATE

STUDIUL INFLUENȚEI EPOCII DE ÎNFIINȚARE ASUPRA PRODUCȚIEI UNOR POPULAȚII LOCALE DE FASOLE MARE (*PHASEOLUS COCCINEUS* L.)

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Abstract. *The establishment date has a major influence on runner bean crop yield, because of its high warmth requirements and long vegetation period. The research has been conducted in a runner bean crop, established at three different dates (1.05, 10.05 and 20.05), using 10 local populations from North-Eastern Romania. The results prove that the establishment culture in 10.05 provides significantly higher yields (2456 kg/ha), compared with other variants (2181 kg/ha).*

Key words: *Phaseolus coccineus* L., establishment date, yield

Rezumat. *Epoca de înființare are o influență majoră asupra producției la cultura de fasole mare, datorită termofiliei ridicate și perioadei lungi de vegetație. Cercetările au fost realizate la o cultură de Phaseolus coccineus L., înființată în trei epoci diferite (1.05, 10.05 și 20.05), utilizând 10 populații locale provenite din nord-estul României. Rezultatele obținute demonstrează că înființarea culturii în epoca a II-a asigură producții semnificativ superioare (2456 kg/ha) față de celelalte variante (2181 kg/ha).*

Cuvinte cheie: *Phaseolus coccineus* L., epoca de înființare, producție

INTRODUCTION

The runner bean species (*Phaseolus coccineus* L.) is well known in our country, but it is cultivated only in the peasant households since there is not any standard technology for this purpose (1,2,3,4). Its mentioning in the specialized Romanian literature are scarce and incomplete, the technical information rely on the traditional and local factor and is related to the environment conditions specific to the culture area (1,4).

The cultivation technology must comprise technological factors and their values as to ensure the satisfaction of plants' needs in terms of environmental factors (5). One way to regulate some environment factors (for example light, temperature) may be achieved by establishing some optimal setting up period.

Taking this into account, the goal of our researches was to optimize the establishment date of the runner bean culture by direct sowing. To attain this goal, we had as an objective the evaluation of the dry beans yield within a collection of 10 local populations established in three calendar periods.

MATERIAL AND METHOD

The material used was represented by a part of the collection of local populations, most of it coming from different areas of Moldavia. The experimental variants consisted in 10 local populations considered of perspective from the productive viewpoint, on the basis of the previous evaluations. The general characterization of the 10 local populations under study is shown in table 1.

Table 1

Experimental assortment of runner bean local populations

Variant		Source (city/county)	Reference data (flowers and seeds colour)
no.	local population		
1.	Coccineus 1	Great Britain	white flowers, white seeds
2.	Coccineus 2	Great Britain	white flowers, white seeds
3.	Coccineus 3	Galați	white flowers, white seeds
4.	Coccineus 4	Bacău	white flowers, white seeds
5.	Coccineus 5	Vaslui	white flowers, white seeds
6.	Coccineus 9	Bacău	white flowers, white seeds
7.	Coccineus 10	Iași	white flowers, white seeds
8.	Coccineus 12	Botoșani	red flowers with white wings, beige seeds with brown drawing
9.	Coccineus 16	Suceava	red flowers, lilac seeds with black drawing
10.	Coccineus 17	Iași	red flowers, lilac seeds with black drawing

The organization of the experiment took place in the experimental field of the subject Vegetable Growing, in the interval 2006-2008, in a field specially arranged with a supporting system necessary to plants. The soil type was represented by a medium levigated chernozem (cambic), an environment supplied with nutritive substances, with 3.8% organic substance and a pH=5.8. The evolution of the meteorological factors (average temperature and precipitations) in the vegetation period is presented in table 2.

Table 2

Meteorological data from experimental period (Iași, 2006-2008)

Month	Average temperature (°C)				Rain (mm)			
	2006	2007	2008	average	2006	2007	2008	average
April	11,4	11,0	11,4	11,3	53,0	29,6	124,0	68,86
May	16,0	19,6	15,8	17,1	62,6	33,4	94,4	63,46
June	19,7	23,1	20,6	21,1	82,4	22,0	87,8	64,06
July	21,6	25,2	21,4	22,7	98,8	45,0	164,2	102,66
August	21,2	22,6	22,2	22,1	87,8	112,6	65,9	88,76
September	16,8	16,0	14,9	15,9	15,2	87,8	59,6	54,2

The experiment was organized in a random block design, corresponding to the studied experimental factors, with three replicates. The crop was established by direct sowing during May 1st – 20th period in three dates: 1.05, 10.05 and 20.05. Sowing was made in holes, each of them containing three seeds, placed at a distance of 40 cm and equidistant rows of 80 cm. The general tending works applied were represented by weeding, phase fertilizations, sprinkling and treatments against ladybugs and the special works consisted in putting it to a simple trellis. During the experiment, it was, also, effectuated observations and determinations on the yield; experimental data were processed by adequate statistical-mathematical methods.

RESULTS AND DISCUSSIONS

As one may see from table 3, the total yield of dried beans ranged between 1372-3242 kg/ha for the three establishment dates, with an experimental mean of 2181 kg/ha.

Table 3

**Yield results for the three establishment dates
(average results 2006-2008)**

No.	Local population	May 1 st	May 10 th	May 20 th	Mean
1.	Coccineus 1 (C ₁)	2255	2709	2379	2448
2.	Coccineus 2 (C ₂)	2350	2983	2602	2645
3.	Coccineus 3 (C ₃)	1372	1750	1507	1543
4.	Coccineus 4 (C ₄)	1435	1768	1548	1584
5.	Coccineus 5 (C ₅)	2564	3242	2811	2872
6.	Coccineus 9 (C ₉)	2192	2794	2392	2459
7.	Coccineus 10 (C ₁₀)	2130	2601	2281	2337
8.	Coccineus 12 (C ₁₂)	1438	1800	1554	1597
9.	Coccineus 16 (C ₁₆)	1379	1857	1516	1584
10.	Coccineus 17 (C ₁₇)	2445	3056	2710	2737
Experimental mean		1956	2456	2130	2181

Analyzing the yields obtained in each period and comparing them to the experimental mean and among them (table 4), it results significant yield differences. In the 2nd date there was a yield of 2456 kg/ha, with the highest output both compared to the experimental mean and the other two dates. In the given experimental conditions, the 1st and 2nd periods of culture determined yields under the level of the experimental average. Thus, it may say that the 1st date is too early, since it registered the lowest yield (1956 kg/ha), as compared to other periods, whereas the 3rd date is too late giving yields (2130 kg/ha) under the level of the experimental mean.

Table 4

Comparative analysis of yield by dates

No. crt.	Establishment dates	Yield		Yield differences among dates and their significance			
		t/ha	% as comp. to \bar{x}	Date May 1 st	Date May 10 th	Date May 20 th	Mean (\bar{x})
1.	Date May 1 st	1956	89.7	-	-500 ⁰⁰⁰	-174 ⁰	-255 ⁰
2.	Date May 10 th	2456	112.6	+500 ^{xxx}	-	+326 ^{xx}	+275 ⁰⁰
3.	Date May 20 th	2130	97.7	+174 ^x	-326 ⁰⁰	-	-51
4.	Mean (\bar{x})	2181	100.0	+255 ^x	-275 ⁰⁰	+51	-

DL5% = 160 kg/ha
DL1% = 265 kg/ha
DL0.1%= 497 kg/ha

Analyzing the experimental data obtained in May 1st date (table 5), the highest yield was registered for the Coccineus 5 population (2564 kg/ha), having

a very positive significant difference as compared to the experimental mean (1956 kg/ha). At the same time, the lowest value was registered for Coccineus 3 (1372 kg/ha), with very significant negative differences as compared to the experimental mean. Positive differences statistically ensured were registered for the populations Coccineus 1, Coccineus 2, Coccineus 9 and Coccineus 17, whereas negative differences as compared to mean were registered for the populations Coccineus 4, Coccineus 12 and Coccineus 16.

Table 5

Yield results in the 1st of May

No.	Local population	Yield		Differences to \bar{x}	Differences significance
		kg/ha	% to \bar{x}		
1.	Coccineus 1 (C ₁)	2255	115	+299	X
2.	Coccineus 2 (C ₂)	2350	120	+394	XX
3.	Coccineus 3 (C ₃)	1372	70	-584	000
4.	Coccineus 4 (C ₄)	1435	73	-521	000
5.	Coccineus 5 (C ₅)	2564	131	+608	XXX
6.	Coccineus 9 (C ₉)	2192	112	+236	X
7.	Coccineus 10 (C ₁₀)	2130	109	+174	
8.	Coccineus 12 (C ₁₂)	1438	74	-518	000
9.	Coccineus 16 (C ₁₆)	1379	71	-577	000
10.	Coccineus 17 (C ₁₇)	2445	125	+489	XXX
Experimental mean		1956	100	0	

DL5% = 225,93 kg/ha

DL1% = 309,84 kg/ha

DL0,1%= 421,73 kg/ha

In May 10th date (table 6), the dried bean yield varied widely within the assortment. The highest yield was obtained for the Coccineus 5 population (3242 kg/ha), and the lowest was registered for the Coccineus 3 population (1750 kg/ha), whereas the experimental mean was 2456 kg/ha. Distinctly positive differences as compared to the mean were obtained by Coccineus 17 population, whereas the Coccineus 9 population registered a significantly positive difference as compared to the mean. Very significant negative differences were observed for two of the populations under study (Coccineus 4 and Coccineus 12).

In May 20th date (table 7), the dried bean yield was on mean 2130 kg/ha. Yield varied from 2811 kg/ha (Coccineus 5) to 1507 kg/ha (Coccineus 3). As we may notice, Coccineus 5 population achieved a superior yield to the mean level, with a very significant difference. Distinctly positive differences were obtained for Coccineus 17 and Coccineus 2 populations, whereas very significant negative differences were registered for the Coccineus 3, Coccineus 4, Coccineus 12 and Coccineus 16 populations.

Table 6

Yield results in the 10th of May

No.	Local population	Yield		Differences to \bar{x}	Differences significance
		kg/ha	% to \bar{x}		
1.	Coccineus 1 (C ₁)	2709	110	+253	
2.	Coccineus 2 (C ₂)	2983	121	+527	XX
3.	Coccineus 3 (C ₃)	1750	71	-706	000
4.	Coccineus 4 (C ₄)	1768	72	-688	000
5.	Coccineus 5 (C ₅)	3242	132	+786	XXX
6.	Coccineus 9 (C ₉)	2794	114	+338	X
7.	Coccineus 10 (C ₁₀)	2601	106	+145	
8.	Coccineus 12 (C ₁₂)	1800	73	-656	000
9.	Coccineus 16 (C ₁₆)	1857	76	-599	00
10.	Coccineus 17 (C ₁₇)	3056	124	+600	XX
Experimental mean		2456	100	0	

DL5% = 336,66 kg/ha

DL1% = 461,70 kg/ha

DL0,1%= 628,43 kg/ha

Table 7

Yield results in the 20th of May

No.	Local population	Yield		Differences to \bar{x}	Differences significance
		kg/ha	% to \bar{x}		
1.	Coccineus 1 (C ₁)	2379	112	+249	
2.	Coccineus 2 (C ₂)	2602	122	+472	XX
3.	Coccineus 3 (C ₃)	1507	71	-623	000
4.	Coccineus 4 (C ₄)	1548	73	-582	000
5.	Coccineus 5 (C ₅)	2811	132	+681	XXX
6.	Coccineus 9 (C ₉)	2392	112	+262	
7.	Coccineus 10 (C ₁₀)	2281	107	+151	
8.	Coccineus 12 (C ₁₂)	1554	73	-576	000
9.	Coccineus 16 (C ₁₆)	1516	71	-614	000
10.	Coccineus 17 (C ₁₇)	2710	127	+580	XX
Experimental mean		2130	100	0	

DL5% = 366,06 kg/ha

DL1% = 460,88 kg/ha

DL0,1%= 627,31 kg/ha

As for the mean of the yield results for the three establishment dates (table 8), the highest mean yield belongs to Coccineus 5 population (2872 kg/ha), in the conditions of an experimental mean of 2181 kg/ha. Thus, Coccineus 5 population obviously detached within the assortment under study giving during the experimental period yields considered statistically as very significant.

Table 8

Mean yield results in three different establishment dates

No.	Local population	Yield mean		Differences to \bar{x}	Differences significance
		kg/ha	% to \bar{x}		
1.	Coccineus 1 (C ₁)	2448	112	+267	
2.	Coccineus 2 (C ₂)	2645	121	+464	XX
3.	Coccineus 3 (C ₃)	1543	71	-638	000
4.	Coccineus 4 (C ₄)	1584	73	-597	000
5.	Coccineus 5 (C ₅)	2872	132	+691	XXX
6.	Coccineus 9 (C ₉)	2459	113	+278	
7.	Coccineus 10 (C ₁₀)	2337	107	+156	
8.	Coccineus 12 (C ₁₂)	1597	73	-584	000
9.	Coccineus 16 (C ₁₆)	1584	73	-597	000
10.	Coccineus 17 (C ₁₇)	2737	125	+556	XX
Experimental mean		2181	100	0	

DL5%=327,53 kg

DL1%=438,85 kg

DL0,1%=579,22 kg

CONCLUSIONS

1. The average yields registered the highest values in the May 10th date; these ranged between 1750-3242 kg/ha, with an average of 2456 kg/ha ensuring significant outputs as compared to the experimental mean (2181 kg/ha) and the other establishment dates.

2. In all the three establishment dates, the highest yields were ensured by the Coccineus 5 local population, with results between 2564-3242 kg/ha, registering thus very positive significant differences as compared to the experimental mean.

3. During the experimental period, the Coccineus 2 and Coccineus 17 populations gave yields obtained at statistic level as compared to the average, whereas Coccineus 3, Coccineus 4, Coccineus 12 and Coccineus 16 registered yields with negative differences as compared to the average.

REFERENCES

1. Munteanu N., 1985 – *Phaseolus coccineus*-o specie legumicolă care merită mai multă atenție. Horticultura, nr.4, București.
2. Munteanu N. și colab., 2007 – Valoarea agrobiologică a unor populații de fasole mare (*Phaseolus coccineus* L.). Lucrări științifice, seria Horticultură, anul L (50), USAMV Iași.
3. Munteanu N. și colab., 2007 – Pretabilitatea speciei *Phaseolus coccineus* L. pentru cultivare în sisteme de agricultură sustenabilă. Lucrări șt., seria Horticultură, anul L (50), USAMV Iași.
4. Popa Lorena-Diana și colab., 2008 – Studiul comparativ al producției unor populații locale de fasole mare (*Phaseolus coccineus* L.). Lucrări șt., seria Horticultură, anul LI (51), USAMV Iași.
5. Ruști Gr., Munteanu N., 2008 – Cultura fasolei de grădină urcătoare. Ed. „Ion Ionescu de la Brad”, Iași.

THE INFLUENCE OF CULTIVAR X FERTILIZER DOZE X MULCHING ON A SWEET PEPPER CROP FROM POLYTUNNELS IN A SUSTAINABLE SYSTEM

INFLUENȚA INTERACȚIUNII CULTIVAR X DOZA DE ÎNGRĂȘĂMÂNT X MULCIRE LA CULTURA DE ARDEI GRAS ÎN SOLARII ÎNTR-UN SISTEM SUSTENABIL

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***Abstract.** At this moment the sustainable agriculture is attractive for consumers too, as a result of the agricultural products: "clean", unpolluted, rich in nutritive compounds. Sweet peppers crop in sustainable system relies on biodegradable resources within the framework of vegetable systems. The using of poultry manure for organic fertilization has allowed obtaining early and entirely high-quality productions and has ensured economic efficiency and environmental conservation.*

Key words: cultivar, fertilizer, mulch, pepper, sustainable system

***Rezumat.** In prezent, agricultura sustenabila este atractiva si pentru consumatori, prin produsele agricole, "curate"- nepoluate, bogate in compusi nutritivi. Tehnologia de cultivare a ardeiului in sistem sustenabil se bazeaza pe resurse regenerabile in cadrul sistemelor legumicole. Gunoii de pasare folosit pentru fertilizarea organica a permis obtinerea unor productii timpurii si totale de calitate superioara si a asigurat eficienta economica si conservarea mediului.*

Cuvinte cheie: cultivar, îngrășământ, mulci, ardei gras, sistem sustenabil

INTRODUCTION

The fresh vegetables and especially solanaceous species for fruit whose edible parts are not missing from the daily diet people. The quality of these vegetables and especially of sweet peppers is given mainly by the high in bioactive principles of vitamins and nutrients necessary for the body. This is even more important as that known to obtaining early productions and high quantity in protected areas using large amounts of nutrients and pesticides. In this context, and integrates this paper which has to use the input of biodegradable and traditional cultivar of growing peppers in the polytunnels, to ensure that the healthy fruit, and improve or maintain soil fertility.

MATERIAL AND METHOD

The purpose of the researches was to evaluate the possibilities of promoting the cultivation technologies in a sustainable system of sweet pepper and improving some technological links in accordance with sustainable principles.

The researches were organized by SC Starwood Gropeni SRL, located in Romania, Braila county, in the period of 2006 – 2008 in polytunnels, complying with the sustainable agricultural principles.

The experiment was of polyfactorial type, organized in subdivided plots with 18 versions (3A x 3B x 2C) in three repetitions. Factor A was the cultivar (a₁- Galben superior (Superior Yellow), a₂- Ohad F₁, a₃-Bianca F₁), factor B was the fertilizing version (b₁-unfertilised, b₂- chicken manure of 4 years 18 t/ha, b₃-chicken manure of 4 years 30 t/ha), and factor C was the mulching method (c₁-unmulched, c₂-mulched with black plastic).

The experimental versions were set in single polytunnels of 380 m². The area of an experimental plot was 9.2 m², corresponding with 2.5 plants/m². The total number of experimental plots was 54.

The producing of seedling was done starting with January 15 in nutrient cubes with the side of 6 cm, being made up of milled and dehydrated peat. The setting up of the crop was done using the seedling of 55-57 days old.

The production of sweet pepper was observed since June to the end of September. The early yield, for the south-eastern part of Romania, is considered the one that is obtained until July 20.

The experimental data were processed through the analysis of variance (Saulescu, 1967), and the significance of differences was estimated through the limit differences.

RESULTS AND DISCUSSIONS

On the during of the experimental period (2006-2008), early production of sweet pepper ranged from 13,75 t / ha for Ohad hybrid , unfertilized and unmulched to 24,97 t / ha for Bianca F1 fertilized with poultry manure of 30t/ha and biodegradable mulch with black film .In this period the greatest productions were obtained in variants fertilized with 30 t chicken manure and mulched, regardless of cultivar (Ohad F1 - 22,42 t / ha, Yellow Superior - 22,66 t / ha, Bianca F1 - 24,97 t / ha).

The greatest yield of Galben Superior (table 1) was done by fertilising with 30 t/ha in mulched version (22.66 t/ha), getting very significant differences (7.92 t/ha), compared to the interaction of unfertilised factors x unmulched (14.74 t/ha). As regards the dose of manure, it was noticed that, in the case of the same cultivar, by fertilising it with 18 t/ha in the mulched version, there was obtained an yield of 20.63 t/ha, and the differences to the unmulched version was of 1.63 t.

The greatest early yield was obtained for the Bianca F1 hybrid, during the period when the study was carried on. The chicken manure fertilising version of 30 t/ha x mulched obtained the greatest early yield (24.97 t/ha).

Very significant differences were noticed in fertilised version with 30 t/ha x unmulched (23.17 t/ha), getting the differences of 10.73 t/ha and 8.93 t/ha respectively. Concerning Ohad F1 hybrid, the greatest early yield was obtained when it was fertilised with 30 t/ha chicken manure (22.42 t/ha).

The poorest early yields were obtained for the Ohad F1 cultivar, at the interaction of factors: unfertilised x unmulched (13.75 t/ha), unfertilised x mulched (14.65 t/ha).

The dates on the influence of the fertiliser system of the type of mulch on total production of sweet pepper are presented in table 2.

In the experimental period, total production increased from 27,44 t / ha on Galben Superior (unmulched and unfertilized) to 44,56 t / ha for hybrid Ohad, fertilized with 30 t / ha chicken manure and mulch with plastic.

The Galben Superior cultivar obtained the greatest total yield when it was fertilised with 30 t/ha chicken manure x mulched, (43.24 t/ha). Diferentele de productie prin compararea rezultatelor dintre variantele experimentale au variat de 0.65 t/ha pana la 15.80 t/ha. Very significant positive difference were obtained by comparing to the unfertilised x unmulched version (15.80 t/ha) and unfertilised x mulched version (14.50 t/ha).

The Bianca F1 hybrid, being fertilised with 30 t/ha of manure x unmulched got the biggest yield (44.26 t/ha) and the version fertilised with 30 t/ha x unmulched got 41.81 t/ha. Very significant differences are noticed when comparing the version fertilised with 18 t/ha x mulched with the version unfertilised x unmulched (15.56 t/ha).

In what concerns the influence of manure and mulch type hybrid Ohad, we can say that production ranged from 27.48 t / ha in unfertilized variant and unmulched to 44.56 t / ha in variant mulch and fertilized with 30 t / ha chicken manure. differences by comparing combination of production ranged from 1.56 t / ha (b1c2 - b1c1) to 17.08 t / ha (b3c2 - b1c1).

Very significant differences were obtained when comparing the version fertilised with 30 t/ha x mulched to the version unfertilised x mulched (15.52 t/ha).

CONCLUSIONS

Bianca F1 Hybrid obtained the biggest early yield during the period when the study was carried on variant fertilized with 30 t/ha chicken manure and mulched– 24.97 t/ha.

Ohad F1 hybrid obtained the biggest total yield when it was fertilised with 30 t/ha of chicken manure. The two hybrids that were studied obtained bigger yields, compared to the Galben superior variety.

The cultivars of the study obtained the poorest yields in the unfertilised versions for early and total yield

Table 1

The influence of the cultivar interaction x dose of compost x the version of mulching on the early yield of sweet pepper in a sustainable system, for the same graduation of the cultivar

The studied factors	The cultivar								
	Galben superior			Bianca F1			Ohad F1		
	The early yield (t/ha)	Difference (t/ha)	Significance	The early Yield (t/ha)	Difference (t/ha)	Significance	The early Yield (t/ha)	Difference (t/ha)	Significance
b ₁ C ₂ -b ₁ C ₁	15.38-14.74	0.64		15.33-14.24	1.09		14.65-13.75	0.90	
b ₂ C ₁ -b ₁ C ₁	19.00-14.74	4.26		20.85-14.24	6.61		18.97-13.75	5.22	
b ₂ C ₂ -b ₁ C ₁	20.63-14.74	5.89		23.38-14.24	9.14	**	20.73-13.75	6.98	*
b ₃ C ₁ -b ₁ C ₁	21.06-14.74	6.32	*	23.17-14.24	8.93	**	20.96-13.75	7.21	*
b ₃ C ₂ -b ₁ C ₁	22.66-14.74	7.92	*	24.97-14.24	10.73	**	22.42-13.75	8.67	**
b ₂ C ₁ -b ₁ C ₂	19.00-15.38	3.62		20.85-15.53	5.32		18.97-14.65	4.32	
b ₂ C ₂ -b ₁ C ₂	20.63-15.38	5.25		23.38-15.53	7.85	*	20.73-14.65	6.08	
b ₃ C ₁ -b ₁ C ₂	21.06-15.38	5.68		23.17-15.53	7.64	*	20.96-14.65	6.31	*
b ₃ C ₂ -b ₁ C ₂	22.66-15.38	7.28	*	24.97-15.53	9.44	**	22.42-14.65	7.77	*
b ₂ C ₂ -b ₂ C ₁	20.63-19.00	5.25		23.38-20.85	2.53		20.73-18.97	1.76	
b ₃ C ₁ -b ₂ C ₁	21.06-19.00	2.06		23.17-20.85	2.32		20.96-18.97	1.99	
b ₃ C ₂ -b ₂ C ₁	22.66-19.00	3.66		24.97-20.85	4.12		22.42-18.97	3.45	
b ₃ C ₁ -b ₂ C ₂	21.06-20.63	0.43		23.17-23.38	-0.21		20.96-20.73	0.23	
b ₃ C ₂ -b ₂ C ₂	22.66-20.63	2.03		24.97-23.38	1.59		22.42-20.73	1.69	
b ₃ C ₂ -b ₃ C ₁	22.66-21.06	1.60		24.97-23.17	1.80		22.42-20.96	1.46	

DL 5%= 6.27

DL 1%= 8.60

DL 0.1%= 11.71

Table 2

The influence of the cultivar interaction x dose of compost x the version of mulching on the total yield of sweet pepper in a sustainable system

The studied factors	The cultivar								
	Galben superior			Bianca F1			Ohad F1		
	The total yield (t/ha)	Difference (t/ha)	Significance	The total yield (t/ha)	Difference (t/ha)	Significance	The total yield (t/ha)	Difference (t/ha)	Significance
b ₁ C ₂ -b ₁ C ₁	28.74-27.44	1.30		29.14-27.51	1.63		29.04-27.48	1.56	
b ₂ C ₁ -b ₁ C ₁	36.72-27.44	9.28	***	37.88-27.51	10.37	***	37.94-27.48	10.46	***
b ₂ C ₂ -b ₁ C ₁	39.02-27.44	11.58	***	41.07-27.51	15.56	***	40.82-27.48	13.34	***
b ₃ C ₁ -b ₁ C ₁	39.67-27.44	12.23	***	41.81-27.51	14.30	***	42.03-27.48	14.55	***
b ₃ C ₂ -b ₁ C ₁	43.24-27.44	15.80	***	44.26-27.51	16.75	***	44.56-27.48	17.08	***
b ₂ C ₁ -b ₁ C ₂	36.72-28.74	7.98	***	37.88-29.14	8.74	***	37.94-29.04	8.90	***
b ₂ C ₂ -b ₁ C ₂	39.02-28.74	10.28	***	41.07-29.14	11.93	***	40.82-29.04	11.78	***
b ₃ C ₁ -b ₁ C ₂	39.67-28.74	10.93	***	41.81-29.14	12.67	***	42.03-29.04	12.99	***
b ₃ C ₂ -b ₁ C ₂	43.24-28.74	14.50	***	44.26-29.14	15.12	***	44.56-29.04	15.52	***
b ₂ C ₂ -b ₂ C ₁	39.02-36.72	2.30	*	41.07-37.88	3.19	**	40.82-37.94	2.88	*
b ₃ C ₁ -b ₂ C ₁	39.67-36.72	2.95	**	41.81-37.88	3.93	**	42.03-37.94	4.09	***
b ₃ C ₂ -b ₂ C ₁	43.24-36.72	6.52	***	44.26-37.88	6.38	***	44.56-37.94	6.62	***
b ₃ C ₁ -b ₂ C ₂	39.67-39.02	0.65		41.81-41.07	0.74		42.03-37.94	4.09	***
b ₃ C ₂ -b ₂ C ₂	43.24-39.02	4.22	***	44.26-41.07	3.19	**	44.56-40.82	3.74	**
b ₃ C ₂ -b ₃ C ₁	43.24-39.67	3.57	**	44.26-41.81	2.45	*	44.56-42.03	2.53	*

DL 5%= 2.06

DL 1%= 2.89

DL 0.1%= 3.96

REFERENCES

1. **Jitareanu G., 1994** – *Tehnica experimentală*, litographed course. U.A. Iasi
2. **Munteanu Leon Sorin and collab., 2005** – *Bazele agriculturii ecologice*. Editura Risoprint Cluj Napoca,
3. **Saulescu N.A., Saulescu N.N., 1967** – *Campul de experienta*. Editura Agro-Silvica Bucuresti;
4. **Stoian L., 2005** – *Ghid practic pentru cultura biologica a legumelor*. Editura Tipoactiv Bacau
5. **Stoian L., Ambarus Silvica, 2005** – *Cultura biologica a ardeiului*. Editat de SCDL Bacau

RESEARCHES REGARDING THE BEHAVIOUR OF SOME ONION CULTIVARS IN THE VEGETABLE AGRO-SYSTEM IN SOUTHERN ROMANIA

CERCETĂRI PRIVIND COMPORTAREA UNOR CULTIVARURI DE CEAPĂ ÎN AGROSISTEMUL LEGUMICOL DIN SUDUL ROMÂNIEI

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Abstract. *In order to introduce new onion cultivars in a vegetable agro-system, studies regarding their behavior in the respective pedoclimatic conditions are necessary. This document is presenting the results obtained after developing a study, in the south part of the country, at 13 onion cultivars with brown bulb, 5 cultivars of red onions and 5 onions cultivars that are planted in autumn. As regards the first group of cultivars, big differences in production have been recorded (9.4-28 t/ha). Among the early hybrids group the biggest production has been recorded by Musica F1 (82 t/ha) and from the midlate cultivars: Vaquero F1 (77.4 t/ha), Manas F1 78,6. t/ha), Sedona F1 (78.3 t/ha). As regards the red onion cultivars, there have not been recorded important differences in production (2.1-4.2 t/ha), the hybrids being more productive than the varieties, having a better capacity of storage. Among the onion varieties planted since autumn, the Swift (62.5 t/ha) and Radar (57.4 t/ha) varieties have been distinguished themselves. Diamant variety do not adapt to the autumn planting, over 75% of the plants have not resisted over the low temperatures during winter. The results obtained will be useful both for the farmers in order to make a decision in choosing a cultivar and for elaborating the List of recommended varieties.*

Key words: onion, vegetable agro-system, recommended varieties

Rezumat. *In vederea introducerii, in cadrul unui agrosistem legumicol, a noi cultivaruri de ceapa, este nevoie de efectuarea unor studii privind comportarea acestora in conditiile pedoclimatice respective. Lucrarea de fata prezinta rezultatele obtinute in urma efectuarii unui studiu, in partea de sud a tarii, la un numar de 13 cultivare de ceapa cu bulbul maro, cinci cultivare de ceapa rosie si cinci cultivare de ceapa care se seamana din toamna. In cazul primei grupe de cultivare au fost inregistrate diferente mari de productie (9,4 – 28 t/ha). Din grupa hibrizilor timpurii cea mai mare productie a inregistrat-o Musica F1(82 t/ha) iar din grupa cultivarelor semitardivi: Vaquero F1 (77,4 t/ha), Manas F1(76,6 t/ha), Sedona F1(76,4 t/ha). La cultivarele de ceapa rosie nu s-au inregistrat diferente mari de productie (2,1- 4,2 t/ha), hibrizii fiind mai productivi decat soiurile, avand si o capacitate mai buna la pastrare. Dintre soiurile de ceapa semanate din toamna s-au remarcat Swift (62,5 t/ha) si Radar (57,4 t/ha). Soiul Diamant nu corespunde pentru semanatul din toamna, peste 75% din plante nu au rezistat la temperaturile scazute din timpul iernii. Rezultatele obtinute vor folosi atat fermierilor pentru a lua o decizie privind alegerea cultivarurilor, cat si pentru intocmirea Listei soiurilor recomandate.*

Cuvinte cheie: ceapă, agrosistem legumicol, soiuri recomandate

INTRODUCTION

One of the measures concerning the continuously growing onion production is introducing the most performant cultivars in the culture, cultivars obtained at present by only few of the biggest seed producing companies in the world. It is known that a performant cultivar (especially the hybrids) can increase the production with over 30%. Once Romania joined the UE, the Romanian farmers can grow without difficulty any cultivar obtained in any part of the globe. This explains why at present we are introducing in the culture varieties/hybrids of onion obtained in Europe, USA, Japan taking into consideration only the publicity made by the authors and the seeds sellers. In the countries with performant agriculture there is the List of recommended seeds, list that have been made as a result of the study made regarding the cultivars in the pedoclimatic conditions from this country. At present, our farmers cultivate over 90% foreign onion varieties/hybrids. Part of these are suitable for the pedoclimatic conditions existing in our country, but many do not give the expected results. Some large companies, such as Bejo Zaden from Netherlands, offer for sale over 20 onion breeders this year, 30 of carrot and 49 of cabbage. At present we are trying with the help of the farmers from our country to make a continuous study regarding this great onion array. These large companies, that have real producing hybrids industry, change the array at short time periods, that is why this testing activity should be made continuously.

MATERIAL AND METHOD

The study of the array has been made at SC Oferta Bob SRL from Tartasesti, Dambovitza county. The array has included 13 varieties and hybrids of onion with brown bulb, five with red bulb and five varieties which are seeded in autumn. The testing has been made on a black earth soil, it has been made a basis fertilization with 600 kg/ha Cropcare complex, it has been seeded using the scheme: 4 rows (20 cm distance between the rows) on the bed each having 2 rows (8 cm between the rows), providing a number of 750 thousand plants/ha. All the maintenance works have been made, the irrigation has been made by dripping, providing a humidity level of 80% of IUA from seeding to cropping. There have been made biometric observations and determinations during the vegetation period, there has been determined the average production/ha for all the variants. There has been tested the conservation capacity of every breed.

RESULTS AND DISCUSSIONS

The 13 onion varieties and hybrids with brown bulb have been studied by comparison to the Diamant variety, the most productive Romanian variety for some decades (tab.1). In comparison to the witness it has been obtained great differences in production between 9,4 t/ha and 28 t/ha, which represents in percentage a growth in production between 17,4 % and 51,8%. The period of vegetation for these cultivars is different. The early hybrids Musica F1 and Exacta F1 are very productive, the production being sold easily in a period without fresh onion (the first half of June), for a much better price in comparison to the semilate or late cultivars. Among the hybrids with good production but also storage capacity we can mention: Vaquero F1 (77,4 t/ha), Manas F1 (78,6 t/ha), Sedona F1 (78,3 t/ha), Pandero F1 (76 t/ha), Daytona F1 (77,2

t/ha). The Leone variety has realized a production of 77,5 t/ha, but it doesn't provide a uniformity in the form and size of the bulbs as the hybrids have.

Table 1

The behaviour of a number of 13 onion cultivars with brown bulb in 2007 year in the conditions of the southern part of the country

Nr. crt	Variety/ hybrid	Prod. (t/ha)	Relative product (%)	Dif. of prod. (tons)	Maturity (days)	Origin
1.	Musica F1	82,00	151,85	28,00	90	Bejo-Holland
2.	Exacta F1	79,00	146,29	25,00	98	Seminis-Holland
3.	Columbia F1	74,40	137,77	20,40	105	Seminis-Holland
4.	Daytona F1	77,20	142,96	23,20	115	Bejo-Holland
5.	Manas F1	78,60	145,55	24,60	114	Bejo-Holland
6.	Tamara F1	71,80	133,96	17,80	110	Bejo-Holland
7.	Sedona F1	78,30	145,00	24,30	115	Bejo-Holland
8.	Leone	77,50	143,52	23,50	130	Bejo-Holland
9.	Vaquero F1	77,40	143,33	23,40	120	Nunhems-Holland
10.	Pandero F1	76,00	140,74	22,00	118	Nunhems-Holland
11.	Ariana	63,40	117,41	9,40	120	Romania
12.	Briliant	65,60	121,48	11,60	125	Romania
13.	Diamant Mt.	54,00	100,00	-	122	Romania

The Diamant variety has been exceeded by the current hybrids obtained by great companies that produce vegetable seeds (Bejo Zaden, Nunhems, Asgrow). Both the capacity of production that is lower than of the hybrids, and the quality of the bulbs make that this variety to be cultivated in our country on only 5% of the onion cultivated surface. Regarding the behaviour of the cultivars of red onion, the productions are lower than the ones of brown bulb. There have been taken into study two varieties and two hybrids, these being compared to the Romanian variety Delicioasa (tab.2).

Table 2

The behaviour of five cultivars of red onion under the conditions of the southern country – 2007

Nr. crt.	Cultivar	Prod. (t/ha)	Relative prod. (%)	Dif. of prod.	Maturity (days)	Origin
1.	Redwing F1	66,80	106,71	4,20	111	Bejo-Holland
2.	Red Zeppelin F1	65,70	104,95	3,10	110	Asgrow-USA
3.	Red Baron	64,7	103,35	2,10	110	Bejo-Holland
4.	Robin	59,90	95,68	-2,70	108	Bejo-Holland
5.	Delicioasa Mt.	62,60	100,00	-	115	Romania

The differences in production are not that big, the Redwing F1 hybrid realizes a production of 66,8 t/ha (with 8% in comparison to the witness), the hybrid Red Zeppelin F1 (65,7 t/ha) and the variety Robin has achieved a lower production than the witness variety Delicioasa. Both the Red baron and Delicioasa varieties have a greater production capacity but they don't have a good storage capacity. In order to stagger the onion production for a longer period of time there has been started the practice of seeding in autumn, the green onion being obtained in May and the bulbs in June. There

have been taken into study four varieties that are resistant to the low temperatures during the winter time. They have been compared to the variety Diamant, this being more sensitive to the low temperatures during winter (tab.3).

Table 3

The behaviour of 5 cultivars of onion seeded in

Nr. Crt.	Cultivar	Prod. t/ha	Relative prod. %	Dif. of prod. t/ha	Origin
1.	Swift	62,50	233,21	35,70	Bejo
2.	Radar	57,40	214,18	30,60	Bejo
3.	Sibir	51,20	191,04	24,40	Bejo
4.	Glob Yellow Danvers	41,80	155,97	15,00	Seminis
5.	Diamant Mt.	26,80	100,00	-	Romania

The Swift variety has given the best results in production, achieving a loss lower than 10% during winter, while the Diamant variety has had a loss of over 75%. The great productions that are possible to be achieved invalidate the productions of 25-30 t/ha that are quoted in the most vegetable growing studies, productions that have been obtained 20-25 years ago. With a production of 62,5 t/ha and with a good selling price, the Swift variety is achieving a great profit. The Radar variety follows Swift both in production and in resistance to the low temperatures during winter.

CONCLUSIONS

In order to obtain early productions (the harvest in May-June) the Swift and Radar varieties (with passing through winter) and the early hybrids Musica F1 and Exacta F1 have achieved very good productions.

The hybrids Vaquero F1, Manas F1, Sedona F1, Pandero F1, Daytona have given very high productions exceeding the Romanian variety Diamant with differences between 22 t/ha and 24,6 t/ha.

The Leone variety has obtained a very good production of 77,5 t/ha but it doesn't ensure a uniformity in shape and size of the bulbs as it is ensured by the hybrids.

Among the red onions cultivars, the Redwing F1 hybrid has obtained the greatest production (66,8 t/ha) also having a very good storing capacity. The Delicioasa variety is a productive variety (62,6 t/ha), has a good tolerance for high temperatures, being advised for consumption in pure state.

The great productions that are possible to achieve (over 75-80 t/ha) invalidate the productions of 25-30 t/ha that are quoted in the most part of the vegetable growing studies, productions that have been obtained 20-25 years ago.

REFERENCES

1. Popandron N., 1998 – *Emphasizing the heterosis phenomena for some F1 onion hybrids obtained at ICLF Vidra*. Annals ICLF Vidra, vol. XV, 1998.
2. Popandron N., M. Petrosu, C. Tudora, 2007- *Research concerning the influence of the cultivar and densenses on the onion production*. Bulletin of USAMV Cluj-Napoca, vol. 64
3. Suci Z., Rodica Margea, Gh. Neamtu, 1986 – *Results regarding some perspective onion hybrids behavior*. Annals ICLF Vidra, vol.VIII, 1986

THE RESULTS CONCERNING THE INFLUENCE OF VARIETY AND FERTILIZER TYPE ON THE TOTAL PRODUCTION OF WHITE CABBAGE, CULTIVATED ON ECOLOGICAL SYSTEM

REZULTATE PRIVIND INFLUENȚA CULTIVARULUI ȘI A AGROFONDULUI ASUPRA PRODUCȚIEI TOTALE LA VARZA ALBĂ CULTIVATĂ ÎN SISTEM ECOLOGIC

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Abstract. *The main purpose of the ecological vegetable system is to obtain healthy fresh products that have no contaminants. A contaminant of agricultural food refers to any substance which is added by purpose or by necessity as a result of production (fertilizer, pesticides etc) or contaminating the environment. The ecological system is sustainable only if it is also efficient from the economical point of view. This study presents the influence of variety and fertilizer type on total production of early, summer and late white cabbage that is obtained using an ecological system. From the achieved data, we can say that the production for the early crop varies between 21,8 and 32,4 t/ha; the production grew from 30,37 t/ha to 37,50 t/ha for the summer crop, and the total production varied between 43,07 to 54,57 t/ha for the autumn crop.*

Key words: cultivar, fertilizer, white cabbage, ecological system

Rezumat. *Scopul principal al sistemului legumicol ecologic este reprezentat de obținerea unor produse proaspete sănătoase fără contaminanți. Contaminantul din produsele agroalimentare reprezintă orice substanță care se adaugă în mod voit sau nevoit ca rezultat al producției (fertilizanți, pesticide etc.) sau contaminării mediului înconjurător. Sistemul ecologic nu poate fi sustenabil decât în măsura în care acesta este și eficient din punct de vedere economic. În lucrarea de față se prezintă influența cultivarului și a agrofondului asupra producției totale de varză albă timpurie, de vară și târzie, obținută în sistem ecologic. Din datele obținute putem afirma că producția pentru cultura timpurie a variat între 21,8 și 32,43 t/ha; pentru cultura de vară producția a crescut de la 30,37 t/ha la 37,50 t/ha iar pentru cultura de toamnă producția totală a variat de la 43,07 la 54,57 t/ha.*

Cuvinte cheie: cultivar, îngrășământ, varză albă, sistem ecologic

MATERIAL AND THE METHOD

The experiments that were done had the purpose to study the influence of variety x manure on some quantitative aspects at white cabbage, that is obtained using an ecological system. The experimental device was in accordance with the norms of experimental technique (Săulescu & Săulescu, 1967, Jităreanu, 1994), with randomized blocks, with three repetitions, where the harvesting area of a plot included 30 plants. Considering the importance of the studied factors for the technology of cultivation, their capacity of variation, the need of studying more repetitions of some experimental factors, and, at the same time, taking into account the possibilities of organizing the experiment, it has been established the

hierarchy of factors. For the series of experiments, there were used the following graduation: A- variety; B- manure type.

In accordance with the scientific literature, with the official list of varieties and taking into account the used praxis, there were studied the following varieties for the conditions of North-East region: a) The early crop: a₁ - Timpurie de Vidra; a₂ - Ditmark; a₃ - Golden Acre; a₄ - K001 F1; b) The summer crop: a₁ - Gloria; a₂ - Copenhagen Market; c) The autumn crop: a₁ - De Buzău; a₂ - Braunschweig; a₃ - Licurișcă (Lares).

For the three crop systems, there were used the following graduations for manures: b₁= chicken fermented manure – 25 t/ha; b₂= green fertilizer– Phacelia – 20 t/ha; b₃= chicken fermented manure – 15 t/ha + green fertilizer– Phacelia – 10 t/ha.

For the early and summer cabbage crop, the sowing was done in the first decade of March, and the planting of cabbage seedling was done by mobilizing the soil on the row at the mentioned distances in accordance with the way of organizing the experiments. When the Phacelia plants were 20 – 25 cm high (they began to bloom out), there was done a mowing at 4-5 cm above the soil and the Phacelia plants remained as mulch on the soil.

For the autumn crop, the sowing was done in the same period of time, but the Phacelia crop was mowed, minced and incorporated in the soil at 10 -12 cm depth. For the green fertilizer crop, no matter the cropping system, there was used 200 kg of seeds, that were sowed at 1-2 cm depth, in accordance with the scientific literature (Munteanu, 2008). The Crop requires for the seed to be well covered with soil.

The experimental crops in the field were managed in accordance with the technological norms from the scientific literature (Calin, 2005, Munteanu 2008; Stan, 1979), regarding the main technological links: choosing the field, preparing the ground, establishing the crop, managing the crop and harvesting.

The crops were done on a rather plain field, well flattened out for applying the dripping irrigation, using the installation and the equipment of Vegetable Cultivation field. The type of soil on which the experiments were established is chernozem of colluvial type, well supplied with nutritive elements, with a rich organic substance of 3.2-3.4 % and a pH of 6.5-6.8.

The soil preparation was done in stages, in autumn and in spring, in accordance with the scientific literature. At the autumn preparation, the field was fertilized each year with 25 t/ha of well fermented chicken manure, that was ploughed at 28-30 cm depth.

The seedling was made at UASVM Iași glasshouse, in socket pallets, having the shape of pyramidal trunk, with the side of 4x4 cm (for the early and summer crop) and 3x3 cm (for the autumn crop).

The harvesting was manually done, at optimum time for consumption, on June 10 for the early crop, on August 2 for the summer crop, and on September 16 for the autumn crop.

There were done observations and biometrical determinations for collecting the experimental data, in accordance with technical experimental norms that are applied in polyfactorial experiments. The results that were obtained in experimental versions were compared with the mean of the experiment, as relative and absolute values. The influence of the experimental factors was assessed through the analysis of variance, using the Fischer test (F test). The significance of differences was determined through the limited differences for three degrees of confidence (95%, 99%, 99.9%), using the Student test (t test).

RESULTS AND DISCUSSIONS

The influence of the variety and of the type of fertilizer on the total production of the early cabbage crop is presented in table 1. The results shown in the table confirm the interpretation of the analysis of variance through significant and discrete significant differences (table 2).

Table 1

The influence of the interaction of variety x fertilizer type on early cabbage total yield (2006 – 2008)

Crt. no.	The variant	The total yield			
		t/ha	% to the mean	Differences to the mean (t/ha)	The significance of the differences
1	a ₁ b ₁	23.97	90.79	-2.43	00
2	a ₁ b ₂	22.37	84.73	-4.03	000
3	a ₁ b ₃	21.80	82.57	-4.6	000
4	a ₂ b ₁	26.40	100	0	-
5	a ₂ b ₂	25.23	95.57	-1.17	-
6	a ₂ b ₃	24.33	92.16	-2.07	00
7	a ₃ b ₁	28.63	108.45	2.23	xx
8	a ₃ b ₂	27.20	103.03	0.8	-
9	a ₃ b ₃	26.00	98.48	-0.4	-
10	a ₄ b ₁	32.43	122.84	6.03	xxx
11	a ₄ b ₂	30.03	113.75	3.63	xxx
12	a ₄ b ₃	28.43	107.69	2.03	x
x	Mean	26.40	100	0	-

DL 5 % = 1.51 t/ha,

DL 1 % = 2.05 t/ha,

DL 0.1 % = 2.79 t/ha

Concerning the total production, this varied from 21.80 t/ha at Timpurie de Vidra variety that was fertilized with chicken fermented manure – 15 t/ha and green fertilizer – Phacelia – 10 t/ha to 32.43 t/ha at K001 variety that was fertilized with chicken manure - 25 t/ha.

The positive differences to the mean of the experiment were obtained at the K001 hybrid, no matter the fertilizer type used, and at the Golden Acre variety, that was fertilized with chicken fermented manure – 25 t/ha.

The discrete significant negative differences compared to the mean of the experiment were obtained at the Timpurie de Vidra variety that was fertilized with green fertilizer – 20 t/ha (- 4.03 t/ha) and chicken fermented manure – 15 t/ha + green fertilizer – Phacelia – 10 t/ha (- 4.6 t/ha).

Table 2

The analysis of variance for the interaction of variety x fertilizer type factors for the early cabbage cultivated using an ecological system (2006 – 2008)

The cause of variance	SP	GL	S ²
The total	344.2297	35	
Repetitions	1.235556	2	
Variety (A)	8425.23	3	2808.41
Fertilizer type (B)	-12263.5	2	-6131.75
Interaction AxB	4163.792	6	693.9653
Error	17.47778	22	0.794444

Concerning the influence of variety and of fertilizer type that was used for the total production of the summer crop, the results are shown in table 3. The results confirm the interpretation of the analysis of variance through significant and discrete significant differences between the different factor combinations of variety and of fertilizer type (table 4).

Table 3

The influence of interaction of variety x fertilizer type on the total yield (2006 – 2008) of summer cabbage that is cultivated on ecological system

Crt. no.	The variant	The total production			
		t/ha	% to the mean	Differences to the mean (t/ha)	The significance of the differences
1	a ₁ b ₁	34.00	100.47	0.16	-
2	a ₁ b ₂	30.37	89.75	-3.47	00
3	a ₁ b ₃	31.70	93.68	-2.14	0
4	a ₂ b ₁	37.50	110.81	3.66	xx
5	a ₂ b ₂	34.13	100.86	0.29	-
6	a ₂ b ₃	35.33	100.47	1.49	-
x	Mean	33.84	100	0.00	-

DL 5 % = 2.01 t/ha,

DL 1 % = 2.85 t/ha,

DL 0.1 % = 4.13 t/ha

Table 4

The analysis of variance for the interaction of variety x fertilizer type for summer cabbage that is cultivated using an ecological system

The cause of variance	SP	GL	S ²
The total	84.06	17	
Repetitions	0.28	2	
Variety (A)	43.60333	2	21.80167
Fertilizer type (B)	32	1	32
Interaction AxB	0.103333	2	0.051667
Error	8.073333	10	0.807333

Concerning the total production, this varied from 30.37 t/ha at Gloria variety, that was fertilized with green fertilizer (Phacelia) – 20 t/ha, to 37.50 t/ha at Copenhagen Market variety that was fertilized with chicken manure - 25 t/ha.

The discrete positive significant differences to the mean of the experiment were only obtained in the case of Copenhagen Market variety that was fertilized with chicken fermented manure – 25 t/ha.

The negative significant and discrete significant differences to the mean of the experiment were obtained at the Gloria variety that was fertilized with green fertilizer (Phacelia) – 20 t/ha (-3.47t/ha) and chicken fermented manure – 15 t/ha + green fertilizer (Phacelia) – 10 t/ha (-2.14t/ha).

The influence of variety and of fertilizer type that is used for the total production of autumn cabbage crop is presented in table 5. The results shown in the table confirm the interpretation for the analysis of variance through significant and discrete significant differences between the different combinations of variety and fertilizer type factors (table 6).

Table 5

The influence of the interaction of variety x fertilizer type on the total production (2006 – 2008) of autumn cabbage that is cultivated on ecological system

Crt no.	The variant	The total production			
		t/ha	% to the mean	Differences to the mean t/ha	The significance of differences
1	a ₁ b ₁	49.86	104.29	2.05	x
2	a ₁ b ₂	51.50	107.72	3.69	xxx
3	a ₁ b ₃	54.57	114.14	6.76	xxx
4	a ₂ b ₁	45.74	95.67	-2.07	0
5	a ₂ b ₂	46.50	97.26	-1.31	-
6	a ₂ b ₃	48.80	102.07	0.99	-
7	a ₃ b ₁	43.07	90.08	-4.74	000
8	a ₃ b ₂	44.06	92.16	-3.75	000
9	a ₃ b ₃	46.20	96.63	-1.61	-
x	Mean	47.81	100	0	-

DL 5 % = 1.62 t/ha, DL 1 % = 2.23 t/ha, DL 0.1 % = 3.06 t/ha

Concerning the total production, this varied from 43.07 t/ha at Lares variety, that was fertilized with 25 t/ha of chicken manure, to 54.47 t/ha at the De Buzău variety, that was fertilized with chicken fermented manure – 15 t/ha + green fertilizer (Phacelia) – 10 t/ha.

The positive discrete significant differences to the mean of the experiment were also obtained when the De Buzău variety was fertilized with green fertilizer – 20 t/ha Phacelia. The positive significant differences to the mean of the experiment were also obtained when combining the factors De Buzău chicken fermented manure – 25 t/ha (2.05 t/ha).

The negative discrete significant differences to the mean of the experiment were also obtained at Lares variety that was fertilized with green fertilizer (Phacelia) – 20 t/ha (- 3.75 t/ha) and chicken fermented manure 25 t/ha (- 4.74 t/ha).

Table 6

The analysis of variance for the interaction of variety x fertilizer type for autumn cabbage that is cultivated using an ecological system

The cause of variance	SP	GL	S ²
The total	345.2867	26	
Repetitions	2.515556	2	
Variety (A)	62.20667	2	31.10333

Fertilizer type (B)	264.02	2	132.01
Interaction AxB	2.606667	4	0.651667
Error	13.93778	16	0.871111

CONCLUSIONS

The highest level of the total production of early cabbage crop was obtained when K001 cultivar was used, on a fertilizer consisting of 25 t/ha chicken manure (32.43 t/ha).

For the summer cabbage crop, the highest level of production was obtained when Copenhagen Market cultivar was used, on a fertilizer consisting of 25 t/ha chicken manure (37.50 t/ha).

When De Buzau cultivar was used for the late cabbage crop, on a fertilizer consisting of 15 t/ha chicken fermented manure + 10 t/ha green fertilizer (Phacelia), there was obtained the highest level of the total production (54.57 t/ha).

REFERENCES

1. **Călin Maria, 2005** – *Ghidul recunoașterii și controlului dăunătorilor plantelor legumicole cultivate în agricultură biologică*. Editura Tipoactiv, Bacău.
2. **Dalby J., Michaud M., Redman M., 1998** - *Organic certification and the importance of organically produced foods, American Journal Agr. Econ. 80 (Number 5, 1998), pg. 1125-1129.*
3. **Jităreanu G., 1994** – *Tehnică experimentală*. (lithographed course). University of agricultural Sciences, Iași;
4. **Munteanu N., Stoian L., Stoleru V., Falticeanu Marcela, 2008** – *Baze tehnologice ale legumiculturii ecologice*, Editura "Ion Ionescu de la Brad" Iași
5. **Săulescu N.A., Săulescu N.N., 1967** – *Câmpul de experiențe*. Editura Agro-Silvică, București;
6. **Stan N., Savițchi P., 1979** – *Contribuții la stabilirea epocilor de plantare a verzei timpurii în adăposturi joase din polietilenă*. Hortiviticură - Institutul Agronomic, Iași.

THE RESULTS CONCERNING THE INFLUENCE OF VARIETY AND THE MEASURES TO FIGHT AGAINST PESTS ON THE TOTAL YIELD OF WHITE CABBAGE (PART I)

REZULTATE PRIVIND INFLUENȚA CULTIVARULUI ȘI A MĂSURILOR DE COMBATERE A DĂUNĂTORILOR ASUPRA PRODUCȚIEI TOTALE LA VARZA ALBĂ (PARTEA I)

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Abstract. *The cabbage crop is always under the incidence of a multitude of harmful organisms (weeds, diseases, pests) that can totally or partially affect the crop. Among these organisms, the pests are the ones that could generate the most important damages to the ecological crop of cabbage. The experiments that were made in the 2006 – 2008 period revealed that, no matter the crop system used, the pests that made the most important damages to the cabbage crop were: the cabbage flea beetle (*Phyllotetra* sp.), the cabbage fly (*Delia brassicae*), the cabbage moth (*Mamestra brassicae*) and the cabbage white fly (*Pieris brassicae*). Because of the fighting measures and means that are used, the cabbage white fly can be easily controlled using the same measures and means that are used for the cabbage moth.*

Key words: control pests, white cabbage, ecological system

Rezumat. *Cultura verzei se află sub permanenta incidență a unui complex de organisme dăunătoare (buruieni, boli, dăunători) ce pot afecta parțial sau uneori total cultura. Dintre aceste organisme dăunătorii pot produce cele mai mari pagube culturilor ecologice de varză. Din experiențele efectuate în perioada 2006 – 2008 dăunătorii care au produs cel mai ridicat grad de atac culturilor de varză, indiferent de sistemul de cultură au fost: puricii verzei, musca verzei, buha verzei și fluturele alb al verzei. Datorită măsurilor și mijloacelor de combatere folosite, fluturele alb al verzei poate fi controlat ușor prin aceleași măsuri și mijloace utilizate pentru buha verzei.*

Cuvinte cheie: controlul dăunătorilor, varză albă, sistem ecologic

MATERIAL AND THE METHOD

The purpose of the experiences that were done was to study the influence of variety x pest fighting measures on the total production of white cabbage, that was obtained using an ecological system. To this end, there were done a series of experiences that had the following graduations: factor A – the variety; factor B – pest fighting measures.

In accordance with the scientific literature, the official list of varieties, and the common practices of harvesting for the North-East cropping region, the biological material consisted of: - the early crop: a₁-Timpurie de Vidra, a₂- Ditmark; a₃ - Golden Acre, a₄ - K001 F1; - the summer crop: a₁- Gloria; a₂ - Copenhagen Market; - the autumn crop: a₁- De Buzău; a₂-Braunschweig; a₃- Licurișcă (Lares).

For the three cropping systems, there was used the following graduation for the pest

fighting measures:

- the early crop: b_1 -Neemazal T/S – 0.4% ; b_2 – the covering system ; b_3 - Neemazal T/S – 0.4% + Potassium soap 2%;
- the summer crop: b_1 -Neemazal T/S – 0.4% + 1x*Trichogramma evanescens* (120,000); b_2 –the covering system + Neemazal T/S – 0.4% + 1x*Trichogramma evanescens* (120,000); b_3 - Neemazal T/S – 0.4% + Potassium soap 2% + 1x*Trichogramma evanescens* (120,000) .
- the autumn crop: b_1 - Neemazal T/S – 0.5% ; b_2 - Dipel – 0.15%; b_3 - *Trichogramma evanescens* x 3 applications x 120,000 ex./ha.

The damages done by the cabbage crop pests were estimated by assessing the degree of attack that was done in the three crop systems. This was determined for each variety that was used and for the most important pests that make economical damages to cabbage crop in Iasi county.

The experimental field crops were managed in accordance to technological norms from the scientific literature (1, 4, 6).

Each year in autumn, the ground was fertilized using 25 t/ha of chicken compost well fermented, which was ploughed at 28-30 cm depth (2).

The harvesting was manually done, at the optimal moment of maturity for being consumed, starting with June 10 for early crop, continuing with August 2 for summer crop and September 16 for the autumn crop. There were done observations and biometrical determinations for experimental data collection, in accordance with experimental technical norms applied at polyfactorial experiments for cabbage crop. The experimental versions were compared to the mean of the experiment, using percentages and differences. The influence of experimental factors was estimated through the analysis of variance, using Fisher test (5). The significance of the differences was assessed on the basis of limited differences for three degrees of confidence (95%, 99%, 99.9%), using the student test (3).

RESULTS AND DISCUSSIONS

The degree of attack of the cabbage flea on the early crop had values between 0.8 at the K001 F1 hybrid, where the covering system (Agril) was applied, and 1.7 % at the Ditmark variety, where Neemazal T/S – 0.4% product was applied in the head binding phenophasis. The results shown in the table confirm the interpretation of the analysis of variance, through significant differences and distinct significant differences between the different factor combinations (table 1).

Concerning the degree of attack of the cabbage fly on the early crop, this had values between 7.8% at K001 F1 hybrid, where there was used a covering system (Agril) and 14.5% at the same variety, where Neemazal T/S – 0.4% product + Potassium Soap 2% were used in the head binding phenophasis .

The degree of attack of the cabbage moth was determined at larval stage in the harvesting phenophasis of the early crop and had values between 0.3% at K001 F1, Timpurie de Vidra and Ditmark varieties, where the covering system (Agril) was used, and 0.6% at Ditmark and Golden Acre varieties, where Neemazal T/S – 0.4% product was used (table 2).

Concerning the total production, this varied from 22.07 t/ha for the Ditmark variety, where Neemazal T/S – 0.4% was used in order to fight the complex of

pests, to 32.57 t/ha for the K001 variety, when covering (Agril) system was used as a protection measure. The production differences compared to the mean of the experiment varied from -4.69 t/ha (Ditmark x Neemazal T/S - 0.4%) to 5.81t/ha (K001 x covering system -Agril).

Table 1

The analysis of variance for the interaction of the factors variety x pest fighting measures, for early cabbage crop cultivated on ecological system

The cause of the variance	SP	GL	S ²
Total	364.2689	35	
Repetitions	0.793889	2	
Variety (A)	-12795.3	2	-6397.67
Fertilizer type (B)	8641.111	3	2880.37
Interaction AxB	4509.204	6	751.534
Error	8.499444	22	0.386338

The damages done by pests to the summer cabbage crops were estimated through the degree of attack done by cabbage fleas and moths.

The results from the table confirm the interpretation of the analysis of variance through distinct significant differences between the different factor combinations (table 3).

The degree of attack of the cabbage fleas on summer cabbage crops had values between 7.2 % at Copenhagen Market hybrid, where covering system (Agril) was used, and 13.7 % at Gloria variety, where Neemazal T/S - 0.4% product was used in rosette phenophasis (table 4).

The degree of attack of the cabbage moth was determined in larval stage in the rosette and binding phenophases. The degree of attack in the rosette phenophasis had values between 6.8 % at Copenhagen Market variety, where covering system + Neemazal T/S - 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) were used, and 12.3% at Gloria variety, where Neemazal T/S - 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) were used. The degree of attack in the head binding phenophasis had values between 8.7% at Copenhagen Market variety, where covering system + Neemazal T/S - 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) were used, and 15.1% at Gloria variety, where Neemazal T/S - 0.4% + Potassium soap 2% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) were used.

The total production varied from 32.13 t/ha at Gloria variety, when Neemazal T/S - 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) were used to fight the complex of pests, to 37.83 t/ha at Copenhagen Market variety when we used the covering system as a protection measure + Neemazal T/S - 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha).

Table 2

**The influence of pest fighting measures on total production
(2006-2008) of early cabbage cultivated on ecological system**

Nr cr t	Variant	Pheno- phasis	Damages done by cabbage flea			Damages done by cabbage fly			Damages done by cabbage moth			Total production			
			Adult /pl.	GA %	sig. dif.	Larvae /pl.	GA %	sig. dif.	Larvae /pl.	GA %	sig. dif.	t/ha	% to mean	dif. t/ha	sig. dif.
1	<i>a₁b₁</i>	<i>binding</i>	55,2	1,5	xxx	6-7	8,5	ooo	-	-	-	23,97	89,57	-	ooo
	<i>a₁b₁</i>	<i>harvest</i>	-	-	-	-	-	-	2-3	0,5	-			-	
2	<i>a₁b₂</i>	<i>binding</i>	25,1	1,1	ooo	5-6	8,9	ooo	-	-	-	26,07	97,42	-	-
	<i>a₁b₂</i>	<i>harvest</i>	-	-	-	-	-	-	1-2	0,3	-			0,69	
3	<i>a₁b₃</i>	<i>binding</i>	39,4	1,3	-	7-8	10,2	-	-	-	-	25,23	94,28	-	o
	<i>a₁b₃</i>	<i>harvest</i>	-	-	-	-	-	-	1-2	0,4	-			1,53	
4	<i>a₂b₁</i>	<i>binding</i>	57,1	1,7	xxx	7-8	13,2	xxx	-	-	-	22,07	82,47	-	ooo
	<i>a₂b₁</i>	<i>harvest</i>	-	-	-	-	-	-	1-2	0,6	x			4,69	
5	<i>a₂b₂</i>	<i>binding</i>	27,1	1,2	-	5-6	8,6	ooo	-	-	-	24,57	91,81	-	oo
	<i>a₂b₂</i>	<i>harvest</i>	-	-	-	-	-	-	1-2	0,3	-			2,19	
6	<i>a₂b₃</i>	<i>binding</i>	36,4	1,4	-	6-7	9,4	ooo	-	-	-	23,33	87,18	-	ooo
	<i>a₂b₃</i>	<i>harvest</i>	-	-	-	-	-	-	2-3	0,4	-			3,43	
7	<i>a₃b₁</i>	<i>binding</i>	41,9	1,3	-	10-11	14,2	xxx	-	-	-	26,00	97,16	-	-
	<i>a₃b₁</i>	<i>harvest</i>	-	-	-	-	-	-	2-3	0,6	x			0,76	
8	<i>a₃b₂</i>	<i>binding</i>	20,1	1,1	ooo	5-6	6,9	ooo	-	-	-	29,00	108,37	2,24	xx
	<i>a₃b₂</i>	<i>harvest</i>	-	-	-	-	-	-	1-2	0,4	-				
9	<i>a₃b₃</i>	<i>binding</i>	28,6	1,3	-	8-9	10,3	-	-	-	-	27,10	101,27	0,34	-
	<i>a₃b₃</i>	<i>harvest</i>	-	-	-	-	-	-	1-2	0,5	-				
10	<i>a₄b₁</i>	<i>binding</i>	36,7	1,2	-	8-9	12,4	xxx	-	-	-	30,10	112,48	3,34	xxx
	<i>a₄b₁</i>	<i>harvest</i>	-	-	-	-	-	-	1-2	0,4	-				

11	a_4b_2	<i>binding</i>	21,6	0,8	ooo	6-7	7,8	ooo	-	-	-	32,57	121.71	5.81	xxx
	a_4b_2	<i>harvest</i>	-	-	-	-	-	-	1-2	0,3	-				
12	a_4b_3	<i>binding</i>	26,4	1,2	-	9-10	14,5	xxx	-	-	-	31,07	116.11	4.31	xxx
	a_4b_3	<i>harvest</i>	-	-	-	-	-	-	1-2	0,4	-				
x	<i>Mean</i>	<i>binding</i>	-	1,3	-	-	10,4	-	-	-	-	26,76	100	0	-
	<i>Mean</i>	<i>harvest</i>	-	-	-	-	-	-	-	0,4	-				

Sig. dif. prod
DL5%=1,51 t/ha,
DL1%=2,05 t/ha,
DL0,1%=2,79 t/ha

Sig. dif. GA fleas
DL5%=0,11
DL1%=0,14
DL0,1%=0,19

Sig. dif. GA cabbage fly
DL5%=0,54
DL1%=0,73
DL0,1%=0,98

Sig. dif. GA cabbage moth
DL5%=0,19
DL1%=0,26
DL0,1%=0,36

Table 3

The analysis of variance for the interaction of the factors variety x pest fighting measures for summer cabbage crop cultivated on ecological system

The cause of the variance	SP	GL	S ²
Total	91.11778	17	
Repetitions	2.084444	2	
Variety (A)	72	1	72
Fertilizer type (B)	5.981111	2	2.990556
Interaction AxB	5.003333	2	2.501667
Error	6.048889	10	0.604889

Table 4

**The influence of the pest fighting measures on the total yield (2006-2008)
of summer cabbage cultivated on ecological system**

Nr. crt.	Variant	Pheno-phasis	Damages done by cabbage fleas			Damages done by cabbage moth			Total production			
			adults /pl	GA %	sig. dif.	adults /pl	GA %	sig. dif.	t/ha	% to mean	dif. (t/ha)	sig. dif.
1	<i>a₁b₁</i>	<i>rozetă</i>	10-15	13,7	xxx	4-5	12,3	xx	32,13	91.51	-2.98	ooo
	<i>a₁b₁</i>	<i>legare</i>	-	-	-	4-5	13,7	xx				
2	<i>a₁b₂</i>	<i>rozetă</i>	5-10	8,9	o	1-2	8,9	-	34,00	96.84	-1.11	-
	<i>a₁b₂</i>	<i>legare</i>	-	-	-	3-4	11,2	-				
3	<i>a₁b₃</i>	<i>rozetă</i>	10-15	12,8	xxx	2-3	11,6	x	33,20	94.56	-1.91	o
	<i>a₁b₃</i>	<i>legare</i>	-	-	-	4-5	12,6	-				
4	<i>a₂b₁</i>	<i>rozetă</i>	5-10	10,4	-	3-4	9,6	-	37,50	106.80	2.39	xx
	<i>a₂b₁</i>	<i>legare</i>	-	-	-	4-5	10,1	oo				
5	<i>a₂b₂</i>	<i>rozetă</i>	4-8	7,2	ooo	1-2	6,8	ooo	37,83	107.75	2.72	xx
	<i>a₂b₂</i>	<i>legare</i>	-	-	-	3-4	8,7	ooo				
6	<i>a₂b₃</i>	<i>rozetă</i>	8-10	9,1	o	2-3	10,4	-	36,00	102.54	0.89	-
	<i>a₂b₃</i>	<i>legare</i>	-	-	-	4-5	15,1	xxx				
x	<i>Media</i>	<i>rozetă</i>	-	10,35	-	-	9,93	-	35,11	100	0	-
	<i>Media</i>	<i>legare</i>	-	-	-	-	11,9	-				

Sig. dif. prod
L5%=1,42 t/ha,
DL1%=2,01 t/ha,
DL0,1%=2,91 t/ha

Sig. dif. GA fleas
DL5%=1,19 t/ha
DL1%=1,69 t/ha
DL0,1%=2,45 t/ha

Sig. dif. GA cabbage moth (R)
DL5%=1,24 t/ha
DL1%=1,76 t/ha
DL0,1%=2,55 t/ha

Sig. dif. GA cabbage moth (L)
DL5%=0,95 t/ha
DL1%=1,36 t/ha
DL0,1%=1,96 t/ha

THE RESULTS CONCERNING THE INFLUENCE OF VARIETY AND THE MEASURES TO FIGHT AGAINST PESTS ON THE TOTAL YIELD OF WHITE CABBAGE (PART II)

REZULTATE PRIVIND INFLUENȚA CULTIVARULUI ȘI A MĂSURILOR DE COMBATERE A DĂUNĂTORILOR ASUPRA PRODUCȚIEI TOTALE LA VARZA ALBĂ (PARTEA a II-a)

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RESULTS AND DISCUSSIONS (CONTINUATION)

The degree of attack of the pests on the autumn cabbage crop was estimated through the degree of attack of the cabbage fleas and moths (table 5).

The degree of attack of the cabbage fleas on the autumn crop had values between 10.6 % at Lares variety and 12.4 % at Braunschweig variety, where Neemazal T/S – 0.5% was used, in the planting phenophasis.

The degree of attack of the cabbage fleas in the rosette phenophasis for the autumn crop had values between 5.9% at De Buzău variety, where Neemazal T/S – 0.5% was used, and 10.4% at Braunschweig variety where, Dipel - 0.15% was used. The degree of attack of the cabbage moth was determined at larval stage in rosette and binding phenophases of the autumn crop. The degree of attack had values between 5.6 % at Lares variety in the rosette phenophasis, where *Trichogramma evanescens* x 3 applications x 120.000 ex./ha were used and 7.9 % at the same protection measures. The degree of attack in the head binding phenophasis had values between 7.9 % at De Buzau variety, where *Trichogramma evanescens* x 3 applications x 120.000 ex./ha was used, and 10.7 % at the same variety where Neemazal T/S – 0.5% was used.

The influence of variety and pest fighting measures used on the total summer crop is shown in table 5. The results shown in the table confirm the interpretation of the analysis of variance through distinct significant differences between the different factor combinations (table 6).

The total production varied from 43.60 t/ha at Lares variety when Dipel – 0.15 % was used to fight the complex of pests, to 54.47 t/ha at De Buzau variety when Neemazal T/S – 0.5% was used as a protection measure. The production differences compared to the mean of the experiment varied from –4.49 t/ha (Lares x Dipel - 0.15%) to 6.38 t/ha (De Buzău x Neemazal T/S – 0.5%). Distinct significant positive differences to the mean of experience were obtained when protecting De Buzau variety with Dipel - 0.15% (3.14 t/ha) + *Trichogramma evanescens* x 3 applications x 120,000 ex./ha (4.81 t/ha).

Table 5

**The influence of the pest fighting measures on the total production (2006-2008)
of autumn cabbage that is cultivated using an ecological system**

Nr. crt.	Variant	Phenophasis	Damages done by cabbage fleas			Damages done by cabbage moth			Total production			
			adults (ex/pl)	GA %	sig. dif.	larvae (ex/pl)	GA %	sig. dif.	t/ha	% to mean	dif. (t/ha)	sig. dif.
1	<i>a₁b₁</i>	<i>after planting</i>	1-2	11,9	-	-	-	-	54,47	113,27	6,38	xxx
	<i>a₁b₁</i>	<i>rosette</i>	4-8	5,9	ooo	1-2	6,4	-				
	<i>a₁b₁</i>	<i>binding</i>	-	-	-	3-4	10,7	xxx				
2	<i>a₁b₂</i>	<i>after planting</i>	1-2	12,1	-	-	-	-	51,23	106,53	3,14	xxx
	<i>a₁b₂</i>	<i>rosette</i>	5-9	6,2	ooo	2-3	7,9	xxx				
	<i>a₁b₂</i>	<i>binding</i>	-	-	-	4-5	9,6	-				
3	<i>a₁b₃</i>	<i>after planting</i>	2-3	10,7	-	-	-	-	52,90	110,00	4,81	xxx
	<i>a₁b₃</i>	<i>rosette</i>	6-10	8,7	xxx	1-2	5,8	oo				
	<i>a₁b₃</i>	<i>binding</i>	-	-	-	4-5	7,9	ooo				
4	<i>a₂b₁</i>	<i>after planting</i>	1-2	12,4	x	-	-	-	47,73	99,25	-0,36	-
	<i>a₂b₁</i>	<i>rosette</i>	4-5	7,6	-	1-2	6,4	-				
	<i>a₂b₁</i>	<i>binding</i>	-	-	-	3-4	9,7	-				
5	<i>a₂b₂</i>	<i>after planting</i>	7-8	12,1	-	-	-	-	46,50	96,69	-1,59	o
	<i>a₂b₂</i>	<i>rosette</i>	5-9	10,4	xxx	1-2	7,1	-				
	<i>a₂b₂</i>	<i>binding</i>	-	-	-	5,6	10,1	xxx				
6	<i>a₂b₃</i>	<i>after planting</i>	3-4	10,8	-	-	-	-	46,13	95,92	-1,96	oo
	<i>a₂b₃</i>	<i>rosette</i>	7-10	8,2	xx	2-3	6,8	-				
	<i>a₂b₃</i>	<i>binding</i>				4,5	9,5	-				
7	<i>a₃b₁</i>	<i>after planting</i>	2-3	10,6	o	-	-	-	45,73	95,09	-2,36	ooo
	<i>a₃b₁</i>	<i>rosette</i>	7,8	6,3	ooo	1-2	6,8	-				
	<i>a₃b₁</i>	<i>binding</i>	-	-	-	3,4	8,6	ooo				

8	a_3b_2	after planting	2-3	11,8	-	-	-	-	43,60	90,66	-4,49	ooo
	a_3b_2	rosette	10-12	7,1	o	1-2	7,3	x				
	a_3b_2	binding	-	-	-	3-4	9,7	-				
9	a_3b_3	after planting	3-4	10,7	-	-	-	-	44,53	92,59	-3,56	ooo
	a_3b_3	rosette	10-15	8,2	xx	2-3	5,6	ooo				
	a_3b_3	binding	-	-	-	3-4	10,4	xxx				
x	Media	after planting	-	11,5	-	-	-	-	48,09	100	0	-
	Media	rosette	-	7,6	-	-	6,7	-				
	Media	binding	-	-	-	-	9,6	-				

Sig. dif. prod.

DL5%=1,18 t/ha

DL1%=1,62 t/ha,

DL0,1%=2,23 t/ha

Sig. dif. GA fleas (ap)

DL5%=0,90 t/ha

DL1%=1,24 t/ha

DL0,1%=1,70 t/ha

Sig. dif. GA fleas (r)

DL5%=0,43 t/ha

DL1%=0,59 t/ha

DL0,1%=0,82 t/ha

Sig. dif. GA cabbage moth (r)

DL5%=0,55 t/ha

DL1%=0,75 t/ha

DL0,1%=1,04 t/ha

Sig. dif. GA cabbage moth (b)

DL5%=0,23 t/ha

DL1%=0,32 t/ha

DL0,1%=0,43 t/ha

Table 6

The analysis of variance for the interaction of the factors variety x pest fighting measures for autumn cabbage cultivated on ecological system

The cause of the variance	SP	GL	S ²
Total	365.7385	26	
Repetitions	2.76963	2	
Variety (A)	328.8141	2	164.407
Fertilizer type (B)	22.53852	2	11.26926
Interaction AxB	4.225926	4	1.056481
Error	7.39037	16	0.461898

CONCLUSIONS

The highest level of the total production of early crop was obtained in the case of K001 cultivar when it was used the covering system (Agril) as a defence measure (32.57 t/ha).

The total production of the summer crop varied from 32.3 t/ha (in the case of Gloria cultivar when it was used Neemazal T/S – 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) to fight against the complex of pests) to 37.83 t/ha in the case of Copenhagen Market cultivar, when it was used the covering system as a defence measure + Neemazal T/S – 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha).

The total production for the autumn crop varied from 43.60 t/ha, in the case of Lares cultivar, when it was used Dipel – 0.15% to fight against the complex of pests, to 54.47 t/ha in the case of De Buzau cultivar, when it was used Neemazal T/S – 0.5% as a defence measure.

REFERENCES

1. **Călin Maria, 2005** – *Ghidul recunoașterii și controlului dăunătorilor plantelor legumicole cultivate în agricultură biologică*. Editura Tipoactiv, Bacău.
2. **Dalby J., Michaud M., Redman M., 1998** - *Organic certification and the importance of organically produced foods, American Journal Agr. Econ. 80 (Number 5, 1998), pg. 1125-1129.*
3. **Jităreanu G., 1994** – *Tehnică experimentală*. (lithographed course). University of Agricultural Sciences, Iași;
4. **Munteanu N., Stoian L., Stoleru V., Falticeanu M., 2008** – *Baze tehnologice ale legumiculturii ecologice*. Editura "Ion Ionescu de la Brad" Iasi.
5. **Săulescu N.A., Săulescu N.N., 1967** – *Câmpul de experiențe*, Editura Agro-Silvică, București;
6. **Stan N., Savițchi P., 1979** – *Contribuții la stabilirea epocilor de plantare a verzei timpurii în adăposturi joase din polietilenă*. Hortivitecultură - Institutul Agronomic, Iași.

RESEARCHES ON THE ATTITUDES AND PREFERENCES OF THE CONSUMERS FROM IASI COUNTY TOWARDS THE ECOLOGIC VEGETABLE YIELD

CERCETĂRI PRIVIND ATITUDINEA ȘI PREFERINȚELE CONSUMATORILOR DIN JUDEȚUL IASI FAȚĂ DE PRODUCȚIA LEGUMICOLĂ ECOLOGICĂ

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Abstract. *The study was made by the interview method using our own questionnaire made of 51 questions grouped by three directions: social-professional analysis, interviewed persons' attitude and preference. The study focuses on the highlighting of consumers' attitude and preferences as determining factors for the development of the ecologic vegetable yield. The obtained results show that respondents have a favorable attitude towards the ecologic vegetable yield and prefer the consumption of fresh vegetables obtained by pesticide-free and synthesis fertilizer-free technologies.*

Key words: attitude, preference, consumers, ecological product

Rezumat. *Studiul a fost realizat prin metoda interviului, folosind un chestionar propriu, alcătuit din 51 de întrebări, grupate pe trei direcții: analiza socio-profesională, atitudinea și preferința persoanelor intervievate. Studiul are ca scop evidențierea atitudinii și preferințele consumatorilor ca factori determinanți ai dezvoltării producției legumicole ecologice. Rezultatele obținute relevă că respondenții au o atitudine favorabilă față de producția legumicolă ecologică și preferă consumul de legume proaspete, obținute în tehnologii fără ajutorul pesticidelor și îngrășămintelor de sinteză.*

Cuvinte cheie: atitudine, preferință, consumatori, producție ecologică

INTRODUCTION

Iasi county has high possibilities to cultivate vegetables and in time there have appeared several traditional micro areas such as those around Tg. Frumos town or those from Lunca Prutului. In these localities, the pedoclimatic conditions, the professional knowledge and the existence of a good market (Iasi, Pașcani, Tg. Frumos, Huși and Hîrlău towns) are favorable factors for the practicing of the ecologic vegetable growing (4,5,6,7). To obtain an ecologic yield, the producers must be willing to make the vegetable ecologic yield, but there is also the consumer's demand for ecologic vegetable products. Related to this condition, the specialized literature (2,3), shows that it is extremely important to know the consumers' options towards the ecologic yield. In this context, the goal of this paper is to highlight the consumers' attitude and preferences towards the ecologic vegetable yield from Iași County.

Such studies are made at the level of some relatively large samples so that the answers might represent average values as close as possible to the theoretic

average for the entire population participating in the survey. In the making of such studies, the following phases are highly essential to obtain credible results: elaboration of questionnaire, organization of interview, establishing the sample, unfolding the interview, processing the statistic data and their interpretation (1,8,9).

MATERIAL AND METHOD

In this study we used a questionnaire elaborated according to the norms stipulated in the specialized literature (1,9). The questionnaire comprises two sections: the first section contains 16 questions referring to the social-professional grouping of the interviewed people and the second one focuses on the consumers' attitudes and preferences.

For the field investigation we chose the towns of Iași and Tg. Frumos, as well as communes Belcești, Bosia, Focuri, Golăești and Răducăneni, localities having large surfaces and vegetable yields and a well known tradition (4,7). Respondents' answers were checked, validated and processed by specific methods using the SPSS programme (Statistical Package for the Social Sciences), variant 16 (8). Answers were graded on a five level scale from „I totally agree” up to „I totally disagree” (table 2).

RESULTS AND DISCUSSIONS

The results obtained after the analysis of respondents' answers were grouped in two categories: (1) results related to the respondents' social-professional grouping (2) results related to the respondents' attitude and preferences.

(1) Social-professional grouping highlighted the respondents' structure in terms of: sex, residence (urban/rural), age, number of family members, level of education, family income, family structure, marital status a.o. Form all respondents, 46% are male persons and 54% are female persons. The women' percentage is slightly higher than men's due to the fact that women are probably more cooperative and interested in expressing their opinions.

A ratio of 2/3 of the interviewed people belongs to the urban population whereas 1/3 belongs to rural population; justification of these values is given by the fact that the urban population was more cooperative and willing to participate in the interview.

The classification by age shows a structure close to the normal values of population structure, the age groups from the middle of the interval, namely 26-40 and 41-65 years old, representing more than 70%.

As for the number of family members, most respondents belong to 1-3 member families (47.8%) and 3-6 member families (46.2%).

As for the education level of the interviewed people, this was very diverse. It is important to mention that 93.7% finished at least 10 grades or a vocational school what ensures a high percentage of correct answers.

The classification of respondents by income highlights that most of the respondents fall into the group of those with small and medium income: 59.8% having an income up to 800 lei and 74.7% having an income less than 1200 lei.

Knowing that income is an important factor in defining attitude and preferences and that ecologic products are more expensive than the usual ones, we expect our respondents to be less interested in the ecologic vegetables.

The question „do you have children?” generated answers from where results that almost 60% from the interviewed people have children. The answers of these respondents are highly important since this status involves special responsibilities towards children and their health.

Married people are also more responsible and involved in the social life and they represented almost 70% from the number of the individuals who participated in the interview and their answers are very significant for this study.

The pleasure to eat fresh vegetables emerges, as we expected, from the fact that 98.1% of respondents said they eat vegetables. Thus, we may say that answers come from people experienced in what vegetable consumption means, including the quality of products. Referring to the frequency of fresh vegetable consumption, 39.6% declared that they use the fresh vegetables every day, 24.1% 2-3 times a week and 30.4% 3-4 times a week. These answers show a high consumption of fresh vegetables. The proportion in which the ecologic vegetable consumption takes place was highlighted by marking an „x” on a 100 mm long axis, each millimeter representing the percentage in which the interviewed person declares himself/herself as a consumer of ecologic vegetables. The answers to this question are given in table 1.

Table 1

**Frequency of answer variants for the question
„Are you an ecologic vegetable consumer and to what extent?”**

Analyzed interval	0	(0-10]	(10-20]	(20-30]	(30-40]	(40-50]	(50-60]	(60-70]	(70-80]	(80-90]	(90-100]
% respondents	5.4	7.0	4.7	6.3	7.6	10.4	7.3	9.2	11.7	18.0	12.3

From the answers to this question we may draw the conclusion that most interviewed people does not know well enough the concept of ecologic „vegetable growing”.

(2) Results regarding the respondents’ attitude and preferences

The questions addressed to the interviewed people, as well as their answers in terms of attitude and preferences for the ecological vegetable yield, are presented in table 2. The results of the field research show that vegetables are a very important segment in population’s consumption and consumer’s preferences are oriented more and more towards the quality of the vegetable products taking into account not only their size and commercial aspect but the guarantee that the product is clean without chemical and biologic polluting nutrients or products obtained by genetic engineering. Consumers want more and more a guarantee for the origin and quality of the respective products. The price element does not represent an argument in favor of giving up clean food and consumers (about 70%) accept the idea to buy ecologic products even if they are more expensive.

Table 2

**Frequency of answers pointing out respondents'
attitude and preferences**

No. crt.	Question on attitude and preferences	Respondents' answers				
		I totally agree (%)	I agree (%)	I am not sure (%)	I disagree (%)	I totally disagree (%)
0	1	2	3	4	5	6
1	Fresh vegetables are food products easy to procure	23.1	57.0	12.7	6.3	0.9
2	In my family, I buy vegetables for they are our favorite food products	27.5	58.5	10.8	2.5	0.6
3	I think that fresh vegetables are healthy for my family	62.3	36.1	1.6	-	-
4	Generally speaking, I am satisfied with the vegetable assortment existing on the market	17.1	55.4	16.8	10.1	0.6
5	When I buy vegetables I am interested in the place where they were grown (greenhouse, solariums, field)	19.6	46.8	18.0	13.9	1.6
6	I prefer the vegetables grown in the field to those grown in greenhouses	33.5	44.9	13.3	7.3	0.9
7	When I buy vegetables I am interested in their producer	18.0	34.5	22.8	20.6	4.1
8	Romanian vegetables are the best	43.7	43.0	10.8	2.5	-
9	The import vegetables do not taste like the Romanian ones	42.7	40.2	10.4	5.4	1.3
10	The import vegetables complete the market outside the season	22.2	60.4	13.9	2.5	0.9
11	Vegetables from the private producers are superior to those from the specialized farms	15.8	28.8	41.5	13.3	0.6
12	I buy vegetables only from the private producers	4.7	26.3	35.4	30.7	2.8
13	I do not buy import vegetables because I do not like them	7.0	24.7	35.4	31.3	1.6
14	I would enjoy a better presentation of the vegetable assortment	20.6	57.6	13.6	7.6	0.6
15	The price of vegetables depends on their quality	24.7	50.9	16.5	7.0	0.9
16	I appreciate the uniform aspect of vegetables when I buy them	20.9	54.1	9.8	13.9	1.3
17	I usually buy certain types, varieties and species of vegetables	10.8	59.8	17.1	11.4	0.9
18	Farmers should take into account the continuous change in consumers' demands and tastes	29.1	59.5	10.1	0.9	0.3
19	I am concerned by the pesticide (chemical product) level from vegetables	46.2	34.8	16.5	1.9	0.6

Table 2 (continuation)

0	1	2	3	4	5	6
20	I think that the pesticide (chemical product) level of import vegetables is high	38.6	31.0	27.8	2.5	-
21	I will never eat vegetables obtained by genetic engineering	20.6	22.8	42.4	11.7	2.5
22	I do not know the difference between the vegetable products obtained by using chemical products (fertilizers, substances to fight pests and diseases) and those obtained without these substances	5.1	19.6	30.4	28.8	16.1
23	I do not know the difference between the vegetable products obtained normally and those obtained by ecologic, organic or biologic means	4.7	22.8	31.6	28.8	12.0
24	For me there is no difference among the ecologic, organic or biologic products	7.0	16.8	31.6	33.2	11.4
25	Do you think that ecologic products are healthier?	41.1	42.4	13.3	3.2	-
26	I would buy ecologically obtained products	36.7	46.5	13.0	3.8	-
27	Would you buy ecologic products even if they are more expensive?	22.8	46.5	24.7	5.4	0.6
28	I think that it would be good to introduce certified ecologic products on the market	31.6	51.3	15.5	1.6	-
29	Do you think that ecologic products can be found in sufficient quantities on the market?	1.9	9.2	48.1	31.0	9.8
30	Do you think that the state should support the ecologic vegetable yield?	35.1	49.7	12.7	1.9	0.6
31	I do not buy ecologic products because they are too expensive	2.5	16.8	32.9	36.7	11.1
32	I do not buy ecologic products because, though believed to be healthier, they do not have an attractive aspect	1.3	8.5	28.2	48.4	13.6
33	If you were asked, would you support a firm (strong, severe) legislation on the ecologic growing of vegetables?	37.3	46.5	14.9	0.6	0.6

From our field research we notice that people know few things about the ecologic vegetable growing. However, more than 80% of consumers manifested their agreement for the ecologic growing of vegetables also saying that the state should support, by a firm legislation, the practicing of ecologic agriculture and the promotion of a large consumption of ecologic products as a component of „clean food for a healthy body”.

CONCLUSIONS

1. Generally speaking, growing and consuming ecologic products is a matter of interest for consumers, regardless of their social-professional structure (sex, age, income, education etc).

2. Vegetables are a food product preferred by consumers that are aware of their importance.

3. In general, consumers have a favorable attitude towards the yield and consumption of ecologic products that must be promoted and supported by adequate agricultural policies.

4. Population prefers, to a large extent, the ecologic products (products without synthesis fertilizers and pesticides and genetically modified organisms) with a guaranteed origin and quality.

REFERENCES

1. **Buia Anuța și colab., 2003** – *Statistică, vol I*. Presa Universitară Clujeană, Cluj-Napoca.
2. **Darnhofer Ika et al., 2005** – *Converting or not converting to organic farming in Austria. Farmer types and their rationale*. AHUM-A 367, Austria. Agriculture and Human Values 22.
3. **Munteanu N., Rominger O., 2001** – *Organic farming an increasing opportunity for romanien farmers*. Lucrări științifice U.A.M.V. Iași, seria Horticultură, vol 44.
4. **Munteanu N., 2008** – *Proiect PRODLECO - Raport final*. Contract cercetare nr. 31/2006.
5. **Munteanu N. și colab., 2008** – *Baze tehnologice ale legumiculturii ecologice*. Editura „Ion Ionescu de la Brad”, Iași.
6. **Munteanu N. și colab., 2008** – *Evaluarea potențialului pedoclimatic pentru legumicultura ecologică în județul Iași*. Lucrări științifice, seria Horticultură, anul LI, USAMV Iași.
7. **Munteanu N. și colab., 2008** – *Ghid de bune practici - Metode de conversie la producția legumicolă ecologică*. Editura „Ion Ionescu de la Brad”, Iași.
8. **Norusis J., Marija, 1993** – *SPSS for Windows: Base System User's Guide, Release 6.0*. Copyright by SPSS Inc.
9. **Oppenheim A.N., 1997** – *Questionnaire Design, Interviewing and Attitude Measurement*. Biddles Limited, Guildford and King's Lynn.

OPTIMIZATION OF CERTAIN TECHNOLOGICAL MEASURES FOR HYSSOP (*HYSSOPUS OFFICINALIS*) CROPS IN THE ECOLOGICAL CONDITIONS

OPTIMIZAREA UNOR VERIGI TEHNOLOGICE LA CULTURA DE ISOP (*HYSSOPUS OFFICINALIS*) ÎN SISTEM ECOLOGIC

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Abstract. *The main goal of the study was to optimize cultivation technology by variation of the establishment biological material, plant density and fertilization in the ecological conditions from the Biarom farm (Iași County). The highest fresh yield (10.54 t/ha) and dried one (3.45 t/ha) were obtained by seedling establishment, using a density of about 180 thousands plants/ha and two times fertilization with 500 l solution of Cropmax 0.2%.*

Key words: hyssop, crop technology ecological conditions.

Rezumat. *Studiul a avut ca scop optimizarea tehnologiei culturii de isop (*Hyssopus officinalis*), prin variația factorilor modul de înființare a culturii, densitatea și fertilizarea, în condițiile practicilor ecologice de cultivare, la ferma Biarom, județul Iași. Cea mai mare producție de masă vegetală proaspătă (10,54 t/ha) și uscată (3,45 t/ha) a fost realizată în varianta înființării culturii prin răsad, în condițiile unei densități de circa 180 mii plante/ha și a fertilizării cu produsul ecologic Cropmax 0,2%, aplicat de două ori în cantitate de 500 l/ha.*

Cuvinte cheie: isop, tehnologie de cultură, condiții ecologice

INTRODUCTION

Spice and aromatic plants present a special interest because they are used in the food domain to prepare salads, to spice dishes, in the canned food industry, the refreshment and alcoholic drink industry, in confectionery, cosmetics or medicine.

This study aimed at evaluating the profitability of hyssop cultivation and optimizing some technological steps for this culture in the circumstances of the ecologic agriculture from Iași County. To attain our proposed goal, we established the following objectives:

- the study of the possibilities to set up the culture by nursery transplant and by direct seeding;
- the study of the influence of culture setting up diagrams (densities) on the yield;
- the study of the fertilization pattern on the harvest quantity.

MATERIAL AND METHOD

The biological material used consisted in hyssop seeds and nursery transplants from De Ciorani breed.

Researches were conducted at Biarom farm near Iași, in the interval 2007-2008.

The meteorological data registered at the Copou, Meteorological Station, in the period when experiments were effectuated, are presented in table 1.

As for these data, we draw the conclusion that the values fall within the normal limits of the regional climate. The soil is a medium levigated cambic chernozem, well supplied with nutritive elements and a clayish texture (1,2).

Commenting on the meteorological and climatic conditions registered in the years when the study was conducted, we may say that these were favorable conditions for the hyssop culture.

Table 1

Data pattern in the interval 2007-2008 for the Copou-Iași meteorological station

Month	Year 2007			Year 2008		
	Average temperature (°C)	UR %	Precipitations (mm)	Average temperature (°C)	UR %	Precipitations (mm)
April	10.4	60	81.6	9.8	81.6	66.8
May	14.8	65	40.9	17.9	40.9	171.4
June	19.0	63	26.0	19.9	26.0	106.8
July	20.8	72	148.8	22.6	148.8	135.0
August	19.6	76	61.4	20.9	61.4	68.4
September	15.0	74	41.6	15.9	41.6	38.4
October	10.7	81	21.4	10.3	21.4	37.2

According to the established objectives, we took into account the following experimental factors with different graduations:

- factor A, manner of culture setting up with graduations: a₁- by direct seeding; a₂- by nursery transplant;

- factor B - setting up diagrams (densities) with graduations: b₁- four rows per 150 cm wide bed (180 thousand plants/ha); b₂- three rows per bed (130 thousand plants/ha); b₃- two rows per bed (90 thousand plants/ha). In all variants, the distance between plants in a row was 15

- factor C (fertilization pattern): c₁- unfertilized (blank test); c₂- Cropmax 0.2%; c₃ - Bionat 0.2%; c₄ - Bioforce 0.1%.

Treatments were administered by two foliar sprinklings in amount of 500 l/ha solution. The poly-factorial experiment of the type (2x3x4) was organized in parcels subdivided in three repetitions, the surface of the repetition parcel being 12 m².

The effects of the experimental variances and their factors and graduations respectively, were appreciated by the quantities of fresh and dry harvest. The determinations of vegetal mass were processed by statistic-mathematic methods (5), and the variance analysis (Fischer test) and the limit differences -LD (Student test).

RESULTS AND DISCUSSIONS

The results regarding the main elements of yield obtained for the hyssop culture are presented in table 2. The fresh vegetative mass varied between 7.66 t/ha (a variant set up by seeding, with the lowest density, blank test, unfertilized,

a1b3c1) and 10.54 t/ha for the setting up of culture by nursery transplant with the density of 180 thousand plants/ha, fertilized with Cropmax, a2b1c2. We may notice the superiority of the culture variant set up by nursery transplant with high density and fertilized with Cropmax. Very close values (10.46 t/ha) were also registered for the variant set up by nursery transplant with the density of 130 thousand plants/ha fertilized with Cropmax:– a₂b₂c₂.

Researches have proved that the determining factor in terms of yield is the manner of culture setting up, the variants set up by nursery transplant registering significantly higher values due to the fact that they benefited from a larger interval between seeding and harvesting and better growing conditions in the first vegetative state, namely in a protected space(fig. 1).



Fig. 1. Hyssop crop in the field

The influence of the culture setting up diagram on the vegetal mass yield was best highlighted when using the culture diagram with 4 rows /bed what demonstrates the fact that productivity in this case is directly correlated to a higher density.

From the viewpoint of the influence of “c” factor (fertilizer application) on the dry and fresh vegetative mass yield, researches have shown the superiority of Cropmax fertilizer as compared to others fertilizers used, all variants which used this product registering highly significant yield increases as compared to the experimental average. The variant a2b2c4 fertilized with Bioforce also registered distinctly positive values.

Table 2

Results regarding the fresh and dry hyssop yield obtained by the variant set up by direct seeding and nursery transplant

No crt	Variant Specification	Fresh vegetative mass				Dry vegetative mass			
		Yield		Difference as comp. to average	Difference signification	Yield		Difference as comp. to average	Difference signification
		t/ha	% as compared to \bar{x}			t/ha	% as compared to \bar{x}		
1	a ₁ b ₁ C ₁	8.37	90	-0.93	oo	2.99	93.73	-0.20	
2	a ₁ b ₁ C ₂	8.79	94.51	-0.51		3.13	98.11	-0.06	
3	a ₁ b ₁ C ₃	8.53	91.72	-0.77	o	3.03	94.98	-0.16	
4	a ₁ b ₁ C ₄	8.65	93.01	-0.65		3.07	96.23	-0.12	
x	b ₁ average	8.58	92.95	-0.72	o	3.05	95.61	-0.14	
5	a ₁ b ₂ C ₁	8.18	87.95	-1.13	oo	2.89	65.76	-0.30	o
6	a ₁ b ₂ C ₂	8.42	90.53	-0.88	o	2.91	91.22	-0.28	
7	a ₁ b ₂ C ₃	8.36	89	-0.94	oo	2.93	19.84	-0.26	
8	a ₁ b ₂ C ₄	8.39	90.21	-0.91	oo	2.94	92.16	-0.25	
x	b ₂ average	8.33	89.56	-0.97		2.91	91.22	-0.28	
9	a ₁ b ₃ C ₁	7.66	82.36	-1.64	ooo	2.39	74.92	-0.80	ooo
10	a ₁ b ₃ C ₂	8.77	94.30	-0.53		3.14	98.43	-0.05	
11	a ₁ b ₃ C ₃	8.51	91.50	-0.73	o	3.00	94.04	-0.19	
12	a ₁ b ₃ C ₄	8.58	92.25	-0.72	o	3.03	94.98	-0.16	
x	b ₃ average	8.37	90	-0.93		2.89	90.59	-0.30	
x	a ₁ average	8.42	90.66	-0.88		2.95	86.12	-0.24	
1	a ₂ b ₁ C ₁	9.79	105.26	0.49		3.45	108.15	0.26	
2	a ₂ b ₁ C ₂	10.54	113.33	1.24	xxx	3.79	118.80	0.60	xxx
3	a ₂ b ₁ C ₃	10.49	112.79	1.19	xxx	3.76	117.86	0.57	xxx
4	a ₂ b ₁ C ₄	10.39	111.72	1.09	xx	3.58	112.22	0.39	xx
x	b ₁ average	10.30	110.75	1.00		3.64	114.10	0.45	
5	a ₂ b ₂ C ₁	9.53	102.47	0.23		3.36	105.32	0.17	
6	a ₂ b ₂ C ₂	10.46	112.47	1.16	xx	3.72	116.61	0.53	xxx
7	a ₂ b ₂ C ₃	10.33	111.07	1.03	xx	3.62	113.47	0.43	xx
8	a ₂ b ₂ C ₄	10.43	112.15	1.13	xx	3.65	114.42	0.46	xx
x	b ₂ average	10.18	109.46	0.88		3.58	112.22	0.39	xx
9	a ₂ b ₃ C ₁	9.43	101.32	0.13		2.85	89.34	-0.34	o
10	a ₂ b ₃ C ₂	10.35	111.29	1.05	xx	3.01	94.35	-0.10	
11	a ₂ b ₃ C ₃	10.28	110.53	0.98	xx	3.20	100.31	0.01	
12	a ₂ b ₃ C ₄	10.31	111.72	1.08	xx	3.23	101.25	0.04	
x	b ₃ average	10.09	108.49	0.79		3.07	96.23	-0.12	
x	a ₂ average	10.19	109.65	0.89		3.43	107.64	0.24	
x	a ₁ + a ₂ average	9.30				3.19			

DL 5%=0.67
DL 1%=0.89
DL 0.1%=1.17

DL 5%=0.30
DL 1%=0.38
DL 0.1%=0.52

The **dry plant** yield was in direct correlation with the mass of fresh plant for the variants from which it was obtained. Thus the maximum yield of dry plant of 3.79 t/ha was obtained for the variant a2b1c2, and the lowest was signaled for the variant a2b3c1 –2.85 t/ha. Very close values to the maximum yield were registered by the variant a2b2c2 – 3.72 t/ha set up by nursery transplant with the density of 130 thousands plants/ha, fertilized with Cropmax. The culture diagram significantly influenced yield both in case of culture setting up by direct seeding and by nursery transplant. Thus the highest yield of fresh vegetal substances was signaled for the diagram with 4 rows/bed, 8.79 t/ha (a1b1c2) and 10.54 t/ha (a2b1c2), and the lowest for the diagram with rows/bed 7.66 t/ha (a1b3c1) and 9.43 (a2b3c1).



Fig. 2- Hyssop crop in the experimental plot

CONCLUSIONS

1. The meteorological-pedological conditions in which the experiments were effectuated at Biarom farm from county Iași were favorable to the hyssop culture, in the circumstances of ecologic agriculture.

2. In the first years of culture, the variants set up by nursery transplant register superior net yield as compared to those set up by direct seeding.

3. Due to the fact that the values of fresh and dry vegetal mass yield of the variants set up by nursery transplant with the density 180 thousands plants/ha and fertilized with Cropmax were close, we recommend the variant with 130 thousands plants/ha both for economic reasons (less quantity of material to be planted/ha) and a less disease frequency (due to the less plant density).

REFERENCES

1. Bireescu L., Stan N., Munteanu N., Stan T., 1998 - *Studiul potențialului de fertilitate a solului și al pretabilității sale pentru culturile legumicole*. Lucrări științifice U.S.A.M.V. Iași, seria Horticultură, vol 41.
2. Grădila Marga, 1998 – *Cultura plantelor tehnice și medicinale*. Ed. M.A.S.A.T, București.
3. Stan N., Stan T., 2006 – *Cultura plantelor aromatice, condimentare și mai puțin răspândite*. Ed. Ion Ionescu de la Brad, Iași.
4. Vârban D., Vârban Rodica, Imre A., 2005 – *Plante medicinale cltivate și din flora spontană*. Ed. Risoprint, Cluj-Napoca.

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INFLUENCE OF SOME TECHNOLOGICAL FACTORS AT THE LEMON BALM (*MELISSA OFFICINALIS*) CROP CULTIVATED IN ECOLOGICAL CONDITIONS

INFLUENȚA UNOR FACTORI TEHNOLOGICI LA CULTURA DE ROINIȚĂ (*MELISSA OFFICINALIS*) REALIZATĂ ÎN SISTEM ECOLOGIC

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Abstract. *The paper presents the experimental results regarding the influence of some technological factors on the yield of fresh and dry vegetal mass for a balm culture (*Melissa officinalis*) obtained in ecological conditions at Biarom farm from county Iași. The highest yield of fresh vegetal mass (17.2 t/ha) and dry (4.8 t/ha) was obtained for the variant achieved by nursery transplant with the density of about 180 thousand plants / ha and two times fertilized using 500l/ha of organic product Cropmax 0,2%.*

Key words: lemon balm, tehnological factors, ecological condition.

Rezumat. *Lucrarea prezintă rezultatele experimentale privind influența unor factori tehnologici asupra producției de masă vegetală proaspătă și uscată la o cultură de roiniță (*Melissa officinalis*) realizată în condiții ecologice la ferma Biarom din județul Iași. Producția cea mai mare de masă vegetală proaspătă (17,2 t/ha) și uscată (4,8 t/ha) a fost obținută în varianta înființată prin răsad, cu densitatea de circa 180 mii plante /ha și fertilizată de două ori cu Cropmax 0,2% în cantitate de 500 l/ha.*

Cuvinte cheie: roiniță, factori tehnologici, condiții ecologice.

INTRODUCTION

Many of the species of spice and aromatic plants, whose culture technologies have been developed only in recent years and whose markets are still in formation, have been less studied (1, 2, 3).

The opportunity to introduce balm in culture in the conditions of county Iasi, in the circumstances of the ecological agriculture (4) and the analysis of influence of some technological factors on the culture of *Melissa officinalis* represents the goal of this study. To obtain our goal, we have established the following objectives:

- the study of possibilities to set up culture by direct sowing and nursery transplant;
- the study of influence of the diagrams (densities) for culture setting up;
- the study of the fertilization pattern.

MATERIAL AND METHOD

Research was effectuated at the Biarom farm, near Iași, in the period 2007-2008, in conditions of ecological agriculture. The biologic material used consisted in balm seeds and nursery transplant from the breed De Dobroțești.

The meteorological data from the experimental period are given in table 1.

Table 1

Data pattern in the period 2007-2008 at the meteorological station Copou-Iași

Month	Year 2007			Year 2008		
	Average temperature (°C)	UR (%)	Precipitations (mm)	Average temperature (°C)	UR (%)	Precipitations (mm)
April	10.4	60	81.6	9.8	81.6	66.8
May	14.8	65	40.9	17.9	40.9	171.4
June	19.0	63	26.0	19.9	26.0	106.8
July	20.8	72	148.8	22.6	148.8	135.0
August	19.6	76	61.4	20.9	61.4	68.4
September	15.0	74	41.6	15.9	41.6	38.4
October	10.7	81	21.4	10.3	21.4	37.2

The nursery transplants were produced in a greenhouse having the age of 50 - 55 days. The culture was made in accordance with the requirements of the ecological agriculture, on a land arranged in beds, with canopy width of 150 cm.

According to the three objectives, we took into account the following technological factors in the following graduations:

- factor A (manner of crop establishment): a₁- by direct sowing; a₂- by nursery transplant;

- factor B (setting up diagrams and densities): b₁- four rows per bed (180 thousand plants/ha); b₂- three rows per bed (130 thousand plants/ha); b₃- two rows per bed (90 thousand plants/ha); in all variants, the distance between plants in a row was 15 cm;

- factor C (fertilization pattern): c₁- unfertilized (blank test); c₂- Cropmax 0.2%; c₃ - Bionat 0.2%; c₄ - Bioforce 0.1%; fertilizers were administered by foliar sprinkling in amount of 500 l/ha solution, according to the experimental protocol.

The poly-factorial experiment of the type 2x3x4 was organized in a split plot design, in three replicates, the surface of the repetition parcel being 12 m², in accordance with factors and graduations. The influence of the studied technological sequences was established on the basis of the yield of vegetal mass obtained, fresh and dry. The experimental data were processed according to the statistical-mathematical norms currently used in the poly-factorial experiments (4).

RESULTS AND DISCUSSIONS

The results regarding the yields obtained for the balm culture for the variants under study are presented in table 2.

The fresh vegetative mass varied between 10.99 t/ha, registered for the variant a₁b₃c₁, 16.46 t/ha, obtained for the variant a₁b₂c₂.

For the variants under study (fig. 1), the determining factor in terms of yield is the manner of crop establishment. For all the variants set up by direct

sowing, we registered smaller values as compared to the variant by nursery transplant, due to the fact that the latter benefited from a larger interval between sowing and harvesting.

The influence of diagram on crop establishment the vegetal mass yield was higher when using the culture diagram with four rows / bed.

Table 2

Results regarding the yield of fresh balm obtained for the variant made by direct sowing and nursery transplant

No crt	Variant specification	Fresh vegetative mass				Dry vegetative mass			
		yield		difference as compared to average	difference significance	yield		difference as compared to average	difference significance
		t/ha	% as compared to \bar{x}			t/ha	% as compared to \bar{x}		
1	a ₁ b ₁ c ₁	12.41	94.3	-0.75		3.87	92.36	-0.32	
2	a ₁ b ₁ c ₂	14.39	109.34	1.23		4.57	109.1	0.38	x
3	a ₁ b ₁ c ₃	12.96		-0.2		4.17	99.52	-0.02	
4	a ₁ b ₁ c ₄	13.78	104.70	0.62		4.34	103.57	0.15	
x	b ₁ average	13.38	101.67	0.22		4.24	101.19	0.05	
5	a ₁ b ₂ c ₁	13.43	93.16	-0.9		3.88	92.6	-0.31	
6	a ₁ b ₂ c ₂	16.26	102.05	0.27		4.26	101.67	0.07	
7	a ₁ b ₂ c ₃	12.27	93.23	-0.96		3.84	91.64	-0.35	o
8	a ₁ b ₂ c ₄	12.83	97.43	-0.33		4.04	96.42	-0.15	
x	b ₂ average	12.69	96.42	-0.47		4.01	95.70	-0.18	
9	a ₁ b ₃ c ₁	10.99	83.51	-2.17	oo	3.43	81.86	-0.76	ooo
10	a ₁ b ₃ c ₂	11.59	88.07	-1.57	o	3.61	86.15	-0.58	oo
11	a ₁ b ₃ c ₃	11.47	87.15	-1.69	o	3.58	85.44	-0.61	ooo
12	a ₁ b ₃ c ₄	11.56	87.84	-1.6	o	3.61	86.16	-0.51	oo
x	b ₃ average	11.40	86.62	-1.76	o	3.56	84.49	-0.63	ooo
x	media a ₁	12.49	94.90	-0.67		3.93	93.86	-0.26	
1	a ₂ b ₁ c ₁	13.27	100.8	0.11		4.34	103.58	0.15	
2	a ₂ b ₁ c ₂	16.46	125.07	3.3	xxx	4.8	114.56	0.61	xxx
3	a ₂ b ₁ c ₃	15.93	121.09	2.77	xxx	4.71	107.63	0.52	xx
4	a ₂ b ₁ c ₄	14.43	109.65	1.27		4.51	101.34	0.32	
x	b ₁ average	15.02	114.13	1.86		4.59	109.54	0.40	
5	a ₂ b ₂ c ₁	13.03	99.01	-0.13		4.07	97.13	-0.12	
6	a ₂ b ₂ c ₂	15.73	119.52	2.57	xxx	4.92	117.42	0.73	xxx
7	a ₂ b ₂ c ₃	13.67	103.87	0.48		4.26	101.67	0.07	
8	a ₂ b ₂ c ₄	15.20	115.50	2.04	xx	4.75	113.36	0.56	xx
x	b ₂ average	14.40	109.4	1.24		4.5	107.39	0.31	
9	a ₂ b ₃ c ₁	11.78	89.51	-1.38		3.67	87.58	-0.52	oo
10	a ₂ b ₃ c ₂	12.29	93.38	-0.87		3.83	91.40	-0.36	o
11	a ₂ b ₃ c ₃	12.02	91.26	-1.15		3.73	89.02	-0.46	oo
12	a ₂ b ₃ c ₄	12.25	93.08	-0.91		3.77	89.97	-0.42	o
x	b ₃ average	12.08	91.79	-1.08		3.75	89.49	-0.44	o
x	a ₂ average	13.83	105.09	0.37		4.45	101.41	-0.24	
x	a ₁ +a ₂ average	13.16				4.19			

DL 5%=1.46, DL 1%=1.96, DL 0.1%=2.56

DL 5%=0.34, DL 1%=0.45, DL 0.1%=0.59

From the viewpoint of the influence of “c” factor (fertilizer application), research has proved the superiority of fertilizer Cropmax by significantly distinct outputs as compared to the blank test. Significantly positive outputs were also registered for the variant a₂b₂c₄, fertilized with Bioforce.



Fig. 1. Lemon balm crop in the experimental plot

CONCLUSIONS

1. Following the research, we have noticed that in the first years of culture, the variants set up by nursery transplant give net superior yields to the ones obtained for the variants set up by direct seeding.

2. Balm reacts positively to fertilization registering significant yield outputs of fresh and dry vegetal mass.

3. The variants set up by nursery transplant with the density of 180 thousand plants/ha and 130 thousand plants/ha, fertilized with Cropmax registered the highest outputs of fresh and dry harvest.

REFERENCES

1. **Grădila Marga, 1998** – *Cultura plantelor tehnice și medicinale*. Ed. M.A.S.A.T, București.
2. **Săulescu, N.A., Săulescu, N.N., 1967** – *Câmpul de experiențe, ediția a lia*. Editura Agro-Silvică, București.
3. **Stan N., Stan T., 2006** – *Cultura plantelor aromatice, condimentare și mai puțin răspândite*. Ed. Ion Ionescu de la Brad, Iași.
4. **Vărban D., Vărban Rodica, Imre A., 2005** – *Plante medicinale cltivate și din flora spontană*. Ed. Risoprint, Cluj-Napoca.

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STUDY OF THE FOLIAR PIGMENTS OF SOME SPICE AND AROMATIC PLANT SPECIES

STUDIUL PIGMENȚILOR FOLIARI LA UNELE SPECII CONDIMENTARE ȘI AROMATICE

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Abstract. *The paper presents experimental results on the quantitative and qualitative content of foliar pigments, involved in the adaptability of the plants to environment. The study was carried out by spectrophotometry using a cell juice acetonc extract (1%). Chlorophyll a 663-664, chlorophyll a 434-435, chlorophyll b 453-454 and flavonoid pigments 320-322 were analysed for the following species: Echinacea purpurea, Thymus serpyllum, Mentha crispa, Melissa officinalis, Perovskia atriplicifolia, Agastache foeniculum, Hyssopus officinalis, Borago officinalis, Salvia officinalis and Origanum vulgare. Our results revealed the highest content of the chlorophyll pigments was determined for the Mentha piperita and Origanum vulgare, and the flavonoid pigments in the Salvia officinalis and Origanum vulgare.*

Key words: foliar pigments, spice species, spectrophotometry.

Rezumat. *Lucrarea prezintă rezultatele experimentale privind conținutul cantitativ și calitativ al pigmenților foliari, implicați în adaptabilitatea plantelor la condițiile de mediu din țara noastră. Studiul pigmenților a fost realizat prin metoda spectrofotometrică folosind un extract acetonc 1% de suc celular. Au fost studiate pigmenții clorofila a 663-664, clorofila a 434-435, clorofila b 453-454 și pigmenții flavonoizi 320-322 la speciile: Echinacea purpurea, Thymus serpyllum, Mentha crispa, Melissa officinalis, Perovskia atriplicifolia, Agastache foeniculum, Hyssopus officinalis, Borago officinalis, Salvia officinalis și Origanum vulgare. Rezultatele arată că cel mai ridicat conținut de pigmenți clorofilieni a fost determinat la speciile Mentha piperita și Origanum vulgare, iar pigmenții flavonoizi se găsesc în cantitate mai mare la speciile Salvia officinalis și Origanum vulgare.*

Cuvinte cheie: pigmenți foliari, plante aromatice, spectrofotometrie.

INTRODUCTION

Vegetal pigments fall into three categories: chlorophyll pigments, carotenoid pigments and flavonoid pigments (1). The chlorophyll pigments and the flavonoid ones, called foliar pigments, are formed and may be found in large quantities in leaves and, generally, in the green parts of plants (1, 2, 3).

The study of chlorophyll pigments may be made effectively by the spectrophotometric method based on the capacity of light absorption in characteristic wave lengths: *chlorophyll a* ($\lambda = 663-664$) offers information on the photosynthesis intensity; *chlorophyll a* ($\lambda = 434-435$) and *chlorophyll b* ($\lambda = 453 -$

454) appreciate the light quantity absorbed; the *flavonoid* pigments ($\lambda = 320 - 322$) give information on the resistance capacity of the plant organs to the hostile environment conditions (1, 4).

By this study we intended to analyze, qualitatively and quantitatively, the foliar pigments for some perennial species of spice and aromatic plants so as to appreciate their adaptability to the environmental conditions.

MATERIAL AND METHOD

The study focused on 10 species of aromatic and spice plants: *Echinaceae purpurea*, *Thymus serpillum*, *Mentha crispa*, *Mellisa officinalis*, *Perovskia atriplicifolia*, *Agastache foeniculum*, *Hysopus officinalis*, *Borago officinalis*, *Salvia officinalis* and *Origanum vulgare*.

The genetic material was represented by leaves and shoots from the species mentioned above, cultivated in the collection of the Faculty of Horticulture from Iasi.

The qualitative and quantitative analysis of the content in foliar pigments was effectuated by the spectrophotometric method analyzing light absorption in the visible and close UV specter by the acetonic extract (1%) of foliar pigments and expressed in absorbent units.

RESULTS AND DISCUSSIONS

The quantitative and qualitative analysis of the foliar pigment content revealed obvious differences between the pigment types within every species as well as among the species under study. Thus, for all the analyzed species we notice a much higher content in flavonoid pigments (320-322), as compared to the photosynthetic pigments. Among the photosynthetic pigments, the highest content is registered by *chlorophyll a 434-435*, and the lowest by *chlorophyll a 662-663* (table 1 and fig. 1).

Table 1

Foliar pigment content established by the spectrophotometric method (absorbent units)

No. crt.	Variant Species	Pigments category and wave length			
		Chlorophyll pigments			Flavonoid pigments ($\lambda = 320-322$)
		Chlorophyll a ($\lambda = 663-664$)	Chlorophyll b ($\lambda = 453 -454$)	Chlorophyll a ($\lambda = 434-435$)	
1	<i>Echinaceae purpurea</i>	0.80	0.96	1.54	4.82
2	<i>Thymus serpillum</i>	1.08	1.22	2,00	5.32
3	<i>Mentha crispa</i>	1.64	1.86	3.02	5.58
4	<i>Melissa officinalis</i>	1.22	1.38	2.26	5.40
5	<i>Perovskia atriplicifolia</i>	0.72	0.90	1.46	5.65
6	<i>Agastache foeniculum</i>	0.56	0.66	1.08	5.94
7	<i>Hysopus officinalis</i>	1.28	1.36	2.32	5.74
8	<i>Borago officinalis</i>	0.50	0.56	0.94	4.70
9	<i>Salvia officinalis</i>	1.20	1.54	2.46	6.62
10	<i>Origanum vulgare</i>	1.72	3.08	4.92	6.26

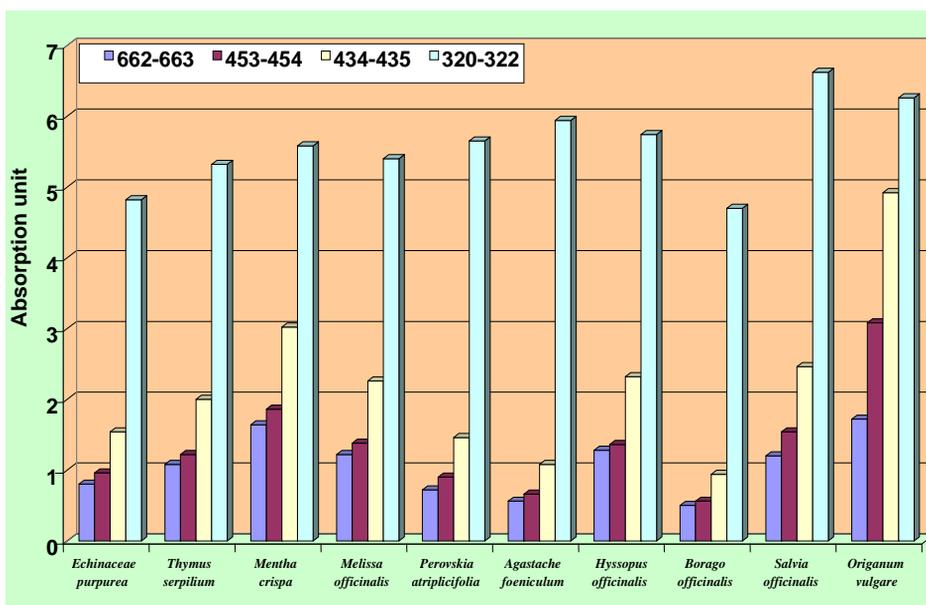


Fig.1. The capacity of light absorption by the extract of foliar pigments

It results that the analyzed species have a strong capacity to adapt to the environmental conditions characterized by thermal and hydric stress. At the same time, these species, strongly heliophile, are characterized by a high capacity to absorb light and a great biologic resistance to the hostile environmental factors.

The maximum content of *chlorophyll a* 662-663 is registered by the species *Mentha crispa* and *Origanum vulgare*, species well acclimatized to the conditions from Romania. The lowest values are registered by the allochthonous plants, - *Agastache foeniculum*, *Perovskia atriplicifolia* and *Echinacea purpurea*. The same ratios among species are kept for the *chlorophyll a* pigments 434-435 and *chlorophyll b* 453-454. The content in flavonoid pigments is maximal for the species of Mediterranean origin, *Salvia officinalis* and *Origanum vulgare*, and it is lower for the species coming from other areas.

Knowing that *chlorophyll a* pigment 663-664 appreciates the photosynthesis intensity, it results that the highest photosynthesis intensity takes place for the variant V₁₀, represented by the species *Origanum vulgare* – with an absorption value of 1.72, followed by the variant V₃ (*Mentha crispa*) – with a value of 1.64.

Determining *chlorophyll b* 453-454 showed that the highest value had been registered for the variant V₁₀ (*Origanum vulgare*) – 3.08. At the opposite end of the value scale is the variant V₈ (*Borago officinalis*) – 0.56.

The highest values of *chlorophyll a* 434-435 were registered for the variant V₁₀ (*Origanum vulgare*) with a value of 4.92. The lowest values were also registered by the variant V₈ (*Borago officinalis*).

The highest quantity of flavonoid pigments was determined for the species *Salvia officinalis* (6.62), *Origanum vulgare* (6.26) and *Agastache foeniculum* (5.94), demonstrating a great capacity to adapt to the environmental conditions. At the opposite pole were the species *Borago officinalis* (4.70) *Echinacea purpurea* (4.82) and *Thymus sepillum* (5.32).

CONCLUSIONS

- At the level of the collection, we notice a large diversity in terms of pigment quantity and quality.

- The highest content in chlorophyll pigments was registered by the species *Mentha piperita* and *Origanum vulgare*.

- A low content in chlorophyll pigments was registered by the species *Agastache foeniculum*, *Perovskia atriplicifolia* and *Echinacea purpurea*.

- A high content in flavonoid pigments was registered by the species *Salvia officinalis* and *Origanum vulgare*.

REFERENCES

1. Burzo I. ș.a., 1999 - *Fiziologia plantelor de cultură*. Vol. I-III, Ed. Știința, Chișinău.
2. Duke J.A., 1992 - *Handbook of phytochemical constituents of grass herbs and other economic plant*. Boca Raton, Florida, CRC Press.
3. Gherghi A. ș.a., 2001 - *Biochimia și fiziologia legumelor și fructelor*. Ed. Academiei Române.
4. Pengelly A., 2004 - *The Constituents of Medicinal Plants*. CABI Publishing, Cambridge.

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NEW TOMATO HYBRIDS DEVELOPED AT THE S.C.D.L. BUZĂU

HIBRIZI NOI DE TOMATE OBȚINUȚI LA S.C.D.L. BUZĂU

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Abstract. Between 2003–2008 there were studied in glasshouse, solarium and field conditions at S.C.D.L. Buzau, four early tomato hybrids F_1 (*Lycopersicon esculentum* – Mill.) comparing to $IH_{50}F_1$. To all four hybrids, created at S.C.D.L. Buzau, H_1Bz , H_2Bz , H_3Bz , H_4Bz , we can observe that the heterosis had noticeable manifested to the main studied characters H_1Bz , H_2Bz , H_3Bz , H_4Bz were dignified, because of their productivity and high quality fruits, exceeding to the parents and the control variant. According to the results obtained, it can be observed that the hybrids obtained, cultivated in glasshouse, solarium and open field, had different yields pertained to the control variants and yearly yields. From the earliness point of view, any analyzed hybrid did not surpassed H_3Bz hybrid in all three crop systems. According to the results obtained, H_1Bz was homologated in 2006, finally called SIRIANA F_1 . Nowadays H_2Bz hybrid is in homologation process.

Key words: tomato, hybrid F_1 , heterosis

Rezumat. În perioada 2003 – 2008 s-au studiat, în condiții de seră, solar și câmp, la S.C.D.L. Buzău, patru hibrizi F_1 de tomate timpurii (*Lycopersicon esculentum* – Mill) cu creștere nedeterminată (SP^+) comparativ cu $IH_{50}F_1$. La toți cei patru hibrizi creați la S.C.D.L. Buzău, H_1Bz , H_2Bz , H_3Bz , H_4Bz , se observă manifestat vizibil fenomenul heterosis la principalele caractere studiate. Din rezultatele obținute reiese că hibrizii obținuți, cultivați în seră, solar și câmp, au avut producții diferite atât față de martor, cât și de la un an la altul. S-au evidențiat prin productivitate și fructe de calitate față de genitori și martor H_1Bz , H_2Bz , H_4Bz . Din punct de vedere al timpurietății, nici un hibrid analizat nu a depășit hibridul H_3Bz în toate cele trei sisteme de cultură. În urma rezultatelor obținute, hibridul H_1Bz a fost omologat în anul 2006 sub denumirea definitivă de SIRIANA F_1 . În prezent se află în curs de omologare hibridul H_2Bz .

Cuvinte cheie: tomate, hibrid F_1 , heterosis.

INTRODUCTION

For higher valorization of the biological material sources that exists in the tomato amelioration program, there is necessary studying the genetic potential of this material in order to find the most efficient valorization methods to achieve new varieties and hybrids with superior qualities (Crăciun, T., 1981). Obtaining hybrid combination of tomatoes with a high productivity level is very important these days in tomato amelioration (Leonte, C., 1996). Until now, in our country there were made relatively little researches concerning variability and heredity of the quantitative aspects in tomatoes. Most knowledge about variability and

heredity of the quantitative aspects are inferences from the amelioration studies or researches made many years ago.

Lately, the surfaces cultivated with tomato hybrids have extended in all regions of our country, but over 95% of these are importation, the hybrid seeds being commercialized at very big prices. Even if these hybrids that are cultivated now in our country have indubitable qualities in what it concerns earliness, productivity, transport and keeping resistance, qualities that the varieties used until now lack, there has been observed that besides the high commercialization price of the seeds, the hybrids also have some inconveniences.

MATERIALS AND METHODS

During 1996 – 2005, at the S.C.D.L. Buzău, there were purchased and studied over 200 tomato genotypes. Each provenance introduced in the collection field had been first subjected to a preliminary study, in order to stocktake the helpful aspects and valorize it.

Nowadays, the collection field has over 200 derivatives, having as main objective their conservation, and the working field has 30 genitors SP⁺ (indetermined increase) and 30 genitors Sp (determined increase), many of these can be recommended as valuable varieties because of their advanced stage of amelioration.

In order to establish some productive and high quality hybrid combination, in selecting the lines in the working field there were followed up the principles of ensuring a genotype, ecological and geographical diversity, morphological diversity and also their economic value. There was pursued that the partners be averted from the genetic and geographic point of view, and also to be characterized by valuable biological properties in order to transmit them to the descendents.

The hybrids obtained, H₁Bz, H₂Bz, H₃Bz și H₄Bz, have been studied for six years in comparative cultures for orientation and competition, organized in field, solarium and glasshouse, using as a control variant the Romanian hybrid IH – 50. Also, the four hybrids had been compared with each ones genitors, considering the hybridizing formula: H₁Bz = L₁₀ × L₂₃; H₂Bz = L₆₆ × L₁₆₅; H₃Bz = L₁₉ × L₆₄; H₄Bz = L₂₂ × L₁₅. The researches were been made during the period 2003 - 2008, in the experimental field from S.C.D.L. Buzău.

The variants were organized in randomized blocks with four repetitions. The number of cropping plants from each holding was 60 in glasshouse and 120 in field.

Through successive harvests, there were obtained data concerning the early production and total production of hybrids.

The technology applied was generally the one specific to the early tomato crop from protected spaces and field.

Knowing the morphological and physiological characteristics of the tomato genitors is an essential condition in amelioration and especially in obtaining performing F₁ hybrids.

The researches were made considering the experimental technique norms for the number of plants, surface, number of holdings, varieties, placement etc.

Because of the absence of some hybrids produced in our country, the foreign firms are commercializing tomato seeds F₁ at high prices. The experiment had in view obtaining F₁ hybrids to correspond to the Romanian market demands and to favorably comport to the environmental conditions existent.

RESULTS AND DISCUSSIONS

The results obtained mark out that the hybrids obtained, cultivated in glasshouse, had different yields comparing to the control variant, but also comparing to the yields obtained in the last years. The IH 50 control variant reached the maximum yield of 57,7 t/ha in 2006, and the average yield during the six years of study was 55,2 t/ha (table 1).

H₁Bz reached the maximum yield of 88,9t/ha in 2006, the yield average being 84t/ha, 28,8t/ha more than the control variant.

Table 1

Means yields(t/ha) of tomatoes obtained in glasshouse							
HYBRID	2003	2004	2005	2006	2007	2008	Average
Control variant IH-50	52,8	55,2	55,6	57,7	56,4	53,5	55,2
H ₁ -Bz.	78,2	84	86,8	88,9	86,5	79,6	84
H ₂ -Bz.	87,8	93,6	96,4	98,5	94,1	91,2	93,6
H ₃ -Bz.	44,4	48,5	52,8	58,8	62,7	49,6	52,8
H ₄ -Bz.	68,7	72,9	79,2	89,9	85,9	78,6	79,2

H₂Bz reached the maximum yield of 98,5 t/ha in 2006, the yield average being 93,6t/ha, 38,4t/ha more than the control variant.

H₃Bz reached the maximum yield of 62,7 t/ha, in 2007, the yield average being 52,8 t/ha, 2,4 t/ha less than the control variant.

H₄Bz reached the maximum yield of 89,9 t/ha in 2006, the yield average being 79,2 t/ha, 24 t/ha more than the control variant (figure 1).

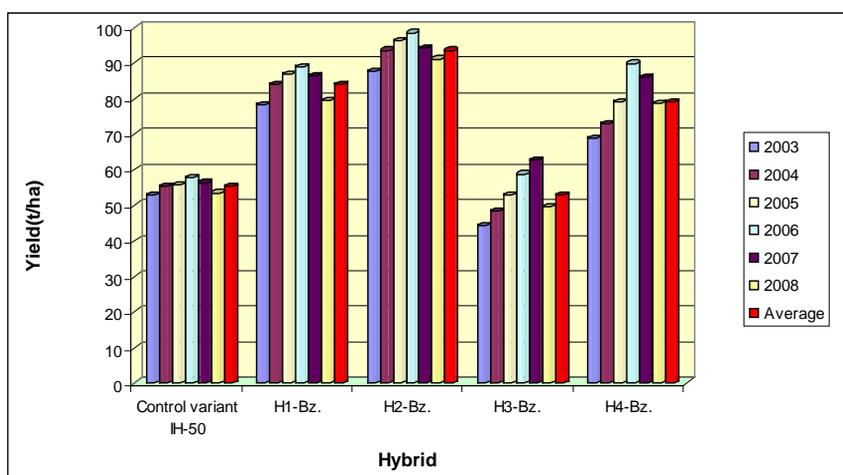


Fig. 1. Mean yields obtained in glasshouse at the tomatoes hybrids

The hybrids created, except H₃Bz, were superior in the yields obtained comparing to the control variant, reaching maximum yields in 2006. Thus, at the 2006 year level, the yield differences between the control variant and the other hybrids (H₁Bz, H₂Bz and H₄Bz) were very significant positive.

H₃Bz hybrid obtained smaller yield results than the control variant IH₅₀, surpassing this one only in 2006 and 2007, being remarked through other characteristics.

Considering the results obtained during 2003 – 2008 period, there can be observe the hybrids obtained had a different comportment in what it concerns the solarium yield (table2).

Table 2

Means yields(t/ha) of tomatoes obtained in solarium

HYBRID	2003	2004	2005	2006	2007	2008	Average
Control variant IH-50	59,4	62,4	62,9	64,7	64,2	60,8	62,4
H ₁ -Bz.	69,9	77,8	78,6	79,8	76,8	77,9	76,8
H ₂ -Bz.	78,6	84	85,3	87,2	88,6	80,3	84
H ₃ -Bz.	52,7	61,8	62,6	67,2	67,7	58,8	61,8
H ₄ -Bz.	69,7	72,3	74,4	76,9	78,6	74,5	74,4

The IH₅₀ control variant reached the maximum yield of 64,7t/ha in 2006 and the mean yield was 62,4 t/ha.

H₁Bz reached the maximum yield of 79,8t/ha in 2006, the yield average being 76,8t/ha, 14,4t/ha more than the control variant.

H₂Bz reached the maximum yield of 88,6 t/ha in 2007, the yield average being 84 t/ha, 21,6t/ha more than the control variant.

H₃Bz reached the maximum yield of 67,7t/ha in 2007 the yield average being 61,8t/ha, cu 0,6 t/ha less than the control variant. H₄Bz reached the maximum yield of 78,6 t/ha in 2007, the yield average being 74,4t/ha, 12 t/ha more than the control variant, IH₅₀.

In this culture system, except H₃Bz, all studied hybrids obtained significant yield increase comparing to the control variant, especially during 2003 – 2008 (figure 2).

In field, the hybrids obtained had a different comportment in what it concerns productivity, comparing to the control variant, but also they had a different comportment from one year to another.

The IH₅₀ control variant reached the maximum yield of 58,5t/ha in 2006 and the mean yield during the six years of study was 52,2t/ha.

H₁Bz reached the maximum yield of 68,2t/ha in 2006, the yield mean being 65,2t/ha, 10 t/ha more than the control variant.

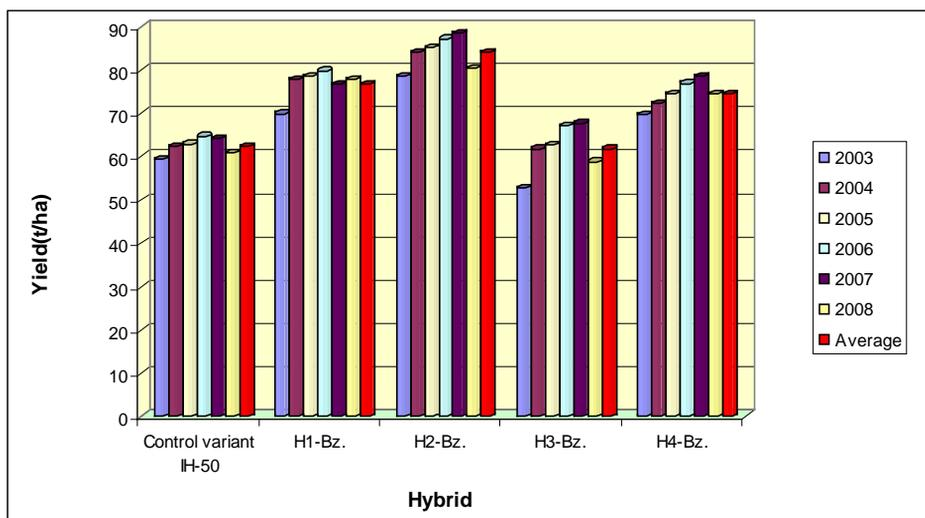


Fig. 2. Mean yields obtained in solarium at the tomatoes hybrids

H₂Bz reached the maximum yield of 70,5t/ha in 2007, the yield mean being 67,3t/ha, 12,1t/ha more than the control variant.

H₃Bz reached the maximum yield of 54,8 t/ha in 2006 the yield mean being 52,7t/ha, 2,5t/ha less than the control variant.

H₄Bz reached the maximum yield of 64,6t/ha in 2006, the yield mean being 62,8t/ha, 7,6t/ha more than the control variant (table 3).

Table 3

Means yields(t/ha) of tomatoes obtained in field

HYBRID	2003	2004	2005	2006	2007	2008	Average
Control variant IH-50	55,2	53,8	55,2	58,5	57,5	51	55,2
H ₁ -Bz.	62,8	65,2	64	68,2	67,1	63,9	65,2
H ₂ -Bz.	61,2	65,9	67,3	70,1	70,5	68,8	67,3
H ₃ -Bz.	49,3	52,7	53,3	54,8	54,6	51,5	52,7
H ₄ -Bz.	48,5	62,8	63,8	64,6	64,3	62,8	62,8

Except H₃Bz, that obtained yields smaller than 2,5t/ha comparing to the control variant in this culture environment, the other hybrids obtained significant bigger yields.

The result obtained during 2003 – 2008 period concerning the hybrids mean yield obtained at the S.C.D.L. Buzău clearly demonstrates that in all three culture systems(glasshouse, solarium and field) the mean yield obtained it is bigger in F₁ than the yield of the most valuable parent and it is also bigger than the mean values registered by genitors (table 4).

Table 4

Means yields(t/ha) of tomatoes obtained during 2003 – 2008 period

Culture system	Control variant IH50	P ₁	P ₂	H ₁ Bz	P ₁	P ₂	H ₂ Bz	P ₁	P ₂	H ₃ Bz	P ₁	P ₂	H ₄ Bz
		L10 ♀	L23 ♂		L66 ♀	L165 ♂		L19 ♀	L64 ♂		L22 ♀	L15 ♂	
Glasshouse	55,2	52,8	67,2	84	52,8	57,6	93,6	45,6	36	52,8	57,6	45,6	79,2
Solarium	62,4	48	62,4	76,8	55,2	62,4	84	48	38,4	60	55,2	48	74,4
Open field	55,2	50,4	60	65,2	55,2	45,6	67,2	38,6	50,4	52,8	40,8	50,4	62,8

H₁Bz surpassed the most valuable genitor with 16,8t/ha in glasshouse, 21,6t/ha in solarium and 5,2t/ha in open field. H₂Bz surpassed the most valuable genitor with 36t/ha in glasshouse, 22t/ha in solarium and 12t/ha in open field. H₃Bz surpassed the most valuable genitor with 17,8 t/ha in glasshouse, 12t/ha in solarium and 2,4t/ha in open field. H₄Bz surpassed the most valuable genitor with 22,6t/ha in glasshouse, 19,2t/ha in solarium and 12,4t/ha in open field.

CONCLUSIONS

To all four hybrid combinations, there visibly manifests the heterozis phenomena reproductive and adaptable in all three culture systems. The hybrid that highly manifests the heterozis phenomena is H₂Bz.

The hybrids obtained had demonstrated superiority to the control variant hybrid in what it concerns yield and environmental conditions adapting in all three culture systems where they were experimented (glasshouse, solarium and open field).

In concerns productivity, all hybrids demonstrated superiority, except H₃Bz. On the top there is H₂Bz hybrid that highly surpassed the hybrid control variant IH₅₀ obtaining a productivity increase of 38,3t/ha in glasshouse, 21,6t/ha in solarium and 12,1t/ha in open field.

REFERENCES

1. Ciofu R. și colab., 2003 – *Tratat de legumicultură*. Editura Ceres, București
2. Crăciun, T., 1981 – *Genetica plantelor horticole*. Editura Ceres, București;
3. Drăcea I., 1972 – *Genetica*. Editura Didactică și Pedagogică, București;
4. Dumitrescu I. și colab., 1998 – *Producerea legumelor*. București
5. Leonte C.; 1996 – *Ameliorarea plantelor horticole* București.

PRODUCTIVITY OF APPLE TREES DEPENDING ON DIRECTIONAL FORMATION OF ROOT SYSTEMS

PRODUCTIVITATEA POMILOR DE MĂR ÎN DEPENDENȚĂ DE FORMAREA DIRECȚIONATĂ A SISTEMELOR RADICULARE

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Abstract. *The article describes productivity of Golden Delicious, Idared, Spartan, Slava Pobeditelyam, Yanvarskoe and I-11-157 (grafted on MM-106 stocks) varieties depending on options of the directional formation of the root system of fruit trees. The directional formation of roots is ensured by limitation of their expansion by means of cutting.*

Key words: productivity, variety apple, cutting; directional formation of roots.

Rezumat. *Prezentul articol cuprinde date referitoare la productivitatea pomilor de măr de soiurile Golden Delicious, Idared, Spartan, Slava Pobeditelam, Ianvarskoe și forma de selecție I-11-175 (altoite pe portaltoiul MM-106) în dependență de caracterul formării direcționate a sistemelor radiculare. Formarea direcționată a sistemelor radiculare se asigură prin tăiere de limitare a rădăcinilor orizontale.*

Cuvinte cheie: productivitate, soiuri măr, tăiere, formare direcționată a rădăcinilor.

INTRODUCTION

Elaboration of agricultural methods intended to provide pomiculturists with assistance in avoidance of soil exhaustion in strips of land within operated orchards, where location of tree rows (following removal of old ones) of the new future orchards is envisaged, is considered to be the prospective direction of researches. As an approach in new researches, the procedure of directional formation of tree rooting system by limitation of radial distribution of horizontal roots is proposed.

In this context, experiments nos. 1 and 2 were carried out in order to study an impact of the character of radial distribution limitation of horizontal roots on apple trees.

MATERIAL AND METHOD

Field experiment no.1 with apple trees of Golden Delicious, Idared and Spartan varieties was set up in the year of 1987 on plantations established in 1985. Distance of tree planting – 5 m x 3 m. Stock – MM-106. Alluvial grassland soil of black color; loamy soil rich in clay. Level terrain.

In studies, following options were assumed:

- V1 (check) – without limitation of radial distribution of horizontal roots;

- V2 – radial distribution of horizontal roots from two adjacent rows of trees is oriented in direction toward common interval; limitation is performed by cutting using machine of „Vibrolaz 80-E” type;

- V3 - radial distribution of horizontal roots in strips within 2.5 m range from tree trunks; limitation is performed by cutting using Vibrolaz 80-E machine);

- V4 - radial distribution of horizontal roots from two adjacent rows of trees is oriented in direction toward common interval; limitation is performed by application of polyethylene film;

- V5 - radial distribution of horizontal roots is oriented into strips of lands from tree trunks with 2.5 m width; limitation is performed by application of polyethylene film;

- V6 - radial distribution of horizontal roots from two adjacent rows of trees is oriented in direction toward common interval; mixed limitation (by application of polyethylene film in the year of planting; subsequently, by cutting starting from third year following planting).

In second, third and sixth options, first cutting for limitation of rooting was performed in spring 1987, second one - in spring 1989, while third one - in spring 1991.

Filed experiment no.2 has covered apple trees of Yanvarskoe, Slava Pobeditelyam and 1-11-157 varieties and was set up in plantations established in the year of 1996. Distance of tree planting – 4.5 m x 3.0 m. Stock – MM-106. Soil – argillaceous carbonate black earth rich in clay. Relief – slope with small inclination (4°) and Southern-Eastern exposure. In studies, following options were assumed:

- V1 (check) – without limitation of radial distribution of horizontal roots;

- V2 - radial distribution of horizontal roots from two adjacent rows of trees is oriented in direction toward common interval; first cutting for rooting limitation - in 1998 (autumn); second one - in 2000; third one - in 2002; fourth one - in 2004; fifth one - in 2006;

- V3 - radial distribution of horizontal roots from two adjacent rows of trees is oriented in direction toward common interval; first cutting for rooting limitation - in 1998 (autumn); second one - in 2001; third one - in 2004; fourth one - in 2007;

- V4 - radial distribution of horizontal roots from two adjacent rows of trees is oriented in direction toward common interval; first cutting for rooting limitation - in 1998 (autumn); second one - in 2002; third one - in 2006;

- V5 - radial distribution of horizontal roots is oriented into strips of lands from tree trunks with 2.5 m width; limiting cutting is performed from both sides of tree row; first one - in 1998 (autumn); second one - in 2000; third one - in 2002; fourth one - in 2004; fifth one - in 2006 ;

- V6 - radial distribution of horizontal roots is oriented into strips of lands from tree trunks with 2.5 m width; limiting cutting is performed from both sides of tree row; first one - in 1998 (autumn); second one - in 2001; third one - in 2004;

- V7 - radial distribution of horizontal roots is oriented into strips of lands from tree trunks with 2.5 m width; limiting cutting is performed from both sides of tree row; first one - in 1998 (autumn); second one - in 2002; third one - in 2002.

In all options, agrofund in experiments was maintained just the same. Maintenance system - "black" fallow. Fertilizers were not applied from the moment of establishment of orchards. Studies were carried out under methods accepted for the performance of experiments with horticultural crops.

RESULTS AND DISCUSSIONS

Productivity of apple trees depending on the character of limitation of radial distribution of roots is presented in tables 1 and 2.

In experiment no.1 (table 1), with apple trees of Golden Delicious variety, the largest yield per tree (sum for the period of 1988 – 1997) was obtained in option V5 – 370.8 kg/tree amounting to more than 12.0 kg as compared with check option. Limit calculated difference amounts to 57.2 kg/tree.

Table 1

Productivity of apple trees depending on the character of limitation of radial distribution of horizontal roots. Agricultural holding „Fruktovyi Donbas”. Data for the period of 1988 – 1997 (Experiment no.1)

Option	Golden Delicious		Idared		Spartan	
	Yield/tree summarized for 1988-1997 (kg/tree)	Average yield (t/ha)	Yield/tree summarized for 1988-1997 (kg/tree)	Average yield (t/ha)	Yield/tree summarized for 1988-1997 (kg/tree)	Average yield (t/ha)
1. Check	358.8	23.9	310.8	20.7	292.8	19.5
2.	300.3	20.0	270.3	18.0	264.3	17.6
3.	321.3	21.4	274.7	18.3	268.8	17.9
4.	330.3	22.0	318.3	21.2	279.3	18.6
5.	370.8	25.0	294.3	19.6	288.3	19.2
6.	304.8	20.3	273.3	18.2	267.3	17.8
DL _{0.95}	57.2		39.9		23.8	

The smallest yield was obtained in option V₂ – 300.3 kg/tree, i.e. by 58.5 kg less as compared with check option. This difference is significant, since it exceeds the limit difference. By this index, options V3, V4, and V6 fall behind the check option with difference amounting from 28.5 kg to 54.0 kg. With Idared variety, largest yield was obtained from trees under option V4 (318.3 kg/tree) exceeding the check option by 7.5 kg. This difference is not significant. The smallest yield of fruits was recorded in option V₂. With regard to productivity, Spartan variety has demonstrated response to options of limitation of radial distribution of rooting being similar with one of Golden Delicious variety.

In experiment no.2 (table 2), the largest summarized yield for the period of 2000-2006 with selection form 1-11-157 was obtained in option V₂ (271.1 kg/tree) exceeding by 1.9 kg the yield in the check option. This difference is significant, since it exceeds the limit difference.

With Slava Pobeditelyam variety, the largest yield was obtained from trees under option V₃ (193.7 kg/tree), while the smallest one – under option V4 (178.5 kg/tree).

Table 2

Productivity of apple trees depending on the character of limitation of radial distribution of horizontal roots. Experimental holding of the Institute of Pomiculture. Data for the period of 2000 – 2006 (Experiment no. 2)

Option	1-11-157		Slava Pobeditelyam		Yanvarskoe	
	Yield/tree summarized for 2000-2006 (kg/tree)	Average yield (t/ha)	Yield/tree summarized for 2000-2006 (kg/tree)	Average yield (t/ha)	Yield/tree summarized for 2000-2006 (kg/tree)	Average yield (t/ha)
1. Check	269.2	28.5	191.8	20.3	253.2	26.8
2.	271.1	28.7	189.9	20.1	252.2	26.7
3.	248.5	26.3	193.7	20.5	239.0	25.3
4.	240.0	25.4	178.5	18.9	232.4	24.6
5.	261.7	27.7	186.1	19.7	243.7	25.8
6.	265.4	28.1	183.3	19.4	246.5	26.1
7.	235.2	24.9	182.3	19.3	223.9	23.7
DL _{0.95}	25.1		11.0		12.7	

With Yanvarskoe variety, the largest yield was obtained in the check option (253.2 kg/tree). Other options have demonstrated behavior similar with selection form 1-11-57.

CONCLUSIONS

Obtained experimental data demonstrate that, in plantations with apple trees grafted on MM 106 (with planting distances of 5.0 x 3.0 m and 4.5 x 3.0 m), it is reasonable to orientate radial distribution of horizontal roots of two adjacent rows of trees in the direction of common interval or in strip of land of 2.5 m width from tree trunks applying limitation by cutting using agricultural machines of „Vibrolaz-80E” type.

Limitation cutting of horizontal roots can be performed without consequences for trees in spring or autumn through one, two and three years starting from the third year following planting.

REFERENCES

1. Bogdan I., Donică I., Grițcan S., 2003 - *Limitarea răspândirii radiale a rădăcinilor la pomii fructiferi*. Simp. șt. internațional „70 ani ai UASM”, Chișinău, p.7
2. Bogdan I., Grițcan S., Donică I., Vițelaru O., 2006 - *Productivitatea pomilor de măr în dependență de caracterul limitării radiale a rădăcinilor*. Culegere de lucrări științifice „Cercetări în pomicultură”, vol.5. Tipogr. AȘM, Chișinău, p.177-184.

PHYSIOLOGICAL STUDIES REGARDING THE INCOMPATIBILITY TO GRAFTING OF SOME VARIETIES OF PEAR TREE GRAFTED ON QUINCE TREE

STUDII FIZIOLOGICE PRIVIND INCOMPATIBILITATEA LA ALTOIRE LA UNELE SOIURI DE PĂR ALTOITE PE GUTUI

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Abstract: *The aim of the researches was to carry out a study on the interaction between the scion and the stock on different varieties of pear tree grafted on quince tree with compatibility problems upon grafting. The physiological studies were performed on five varieties of pear tree in the third vegetation year (Triumf, Trivale, Contesa de Paris, Williams and Curé), having different compatibility degrees with the quince tree (Cydonia oblonga BN70). Thus, we monitored periodically both the content of assimilating pigments through the spectrophotometric method and the content of soluble glucides on the level of the grafting point through Schoorl method. Following the determinations done during the vegetation period, we found that the content of assimilating pigments increased in the case of all the studied varieties. For the varieties incompatible with the quince tree, we noticed a variation of the ratio chlorophyll a/chlorophyll b during the two vegetation months. The observations on the dynamics of the content of chlorophyll a/chlorophyll b during the two months emphasized a decrease of the content of chlorophyllian pigments from June to July. The shown incompatibility on the level of the Liberian vessels made more difficult the transport of glucides from the scion to the stock, which was emphasized by the lower quantity of glucides in the stock.*

Key words: incompatibility, assimilatory pigment, soluble carbohydrates

Rezumat: *Cercetările au avut ca scop realizarea unui studiu asupra interacțiunii dintre altoi și portaltoi la diferite soiuri de păr altoite pe gutui cu probleme de compatibilitate la altoire. Studiile fiziologice s-au efectuat la cinci soiuri de păr (Triumf, Trivale, Contesa de Paris, Williams și Curé) cu grade de compatibilitate diferite cu gutuiul (Cydonia oblonga BN70) aflate în anul trei de vegetație. În acest sens s-a monitorizat periodic atât conținutul de pigmenți asimilatori, prin metoda spectofotometrică, cât și conținutul de glucide solubile la nivelul punctului de altoire, prin metoda Schoorl. În urma determinărilor efectuate pe parcursul perioadei de vegetație, s-a constatat creșterea conținutului de pigmenți asimilatori la toate soiurile luate în studiu. La soiurile incompatibile cu gutuiul s-a constatat o variație a raportului clorofilă a /clorofilă b pe parcursul celor două luni de vegetație. Observațiile efectuate asupra dinamicii conținutului corofilă a /clorofilă b pe cele două luni evidențiază o scădere a conținutului de pigmenți clorofilieni de la luna iunie la iulie. Incompatibilitatea manifestată la nivelul vaselor liberiene a determinat o îngreunarea în transportul glucidelor din altoi spre portaltoi fapt evidențiat prin cantitatea mai scăzută de glucide în portaltoi.*

Cuvinte cheie: incompatibilitate, pigmenți asimilatori, glucide solubile

INTRODUCTION

Besides the morphological and anatomical changes, young trees are also subjected to a series of modifications during the physiological and biochemical processes. In 1954, it was stated the hypothesis that incompatibility between partners is caused by the different intensity of physiological processes developing within the scion and rootstock (Mosse, Garner, 1954). Schmid and collab. (1988) studied the leaves from the *Sam* and *Prunus cerasus* combination, as rootstock with incompatibilities, and they found a lower intensity of photosynthesis, the closing of stomas, reduced content of chlorophyll *a* and a high number of carbohydrates in opposition with compatible systems.

The rootstock and the degree of grafting of the scion also influence the number of carbohydrates. The shoots of quince-tree and of seedling pear and the varieties of pear-tree grafted on these rootstocks have a higher number of monosaccharides in the bark than in the wood and the amount of starch is higher in wood than in bark. Growth differences between the two partners might be determined by the different strength of the scion and the rootstock (Veber, 1962). The beginning of vegetation and the resting period of the partners occur at different dates and it triggers hypertrophy and early fall of leaves. The outcome of these incongruities was compared to that of a ring-shaped cut (M. Coutanceau), following which, part of the phloem sap is used by the graft, determining its thickening.

The concentration of water-soluble sugars at the grafting point is often related to the synthesis of pectic substances which obstructs the fusion of partners. The level of water-soluble sugar determined throughout the graft's growing on the rootstock is correlated to the intensity of the transportation of the photosynthesis' output and thus to the degree of vascular continuity restructure. Therefore, the concentration of water-soluble carbohydrates is a biochemical parameter worthy to be taken into account when studying the incompatibility phenomenon.

MATERIAL AND METHOD

The experiment was located in the experimental farm of "Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine, from "V. Adamachi" Educational Experimental Station. The biological material used comes from the collection of the Faculty of Horticulture and is represented by varieties of *Pyrus* incompatible with *Cydonia oblonga*. The studies were conducted during 2007-2008 on grafted trees, in the third year of growth. The experiment was carried out on a lot; in the spring of 2006, we planted rootstocks of *Cydonia oblonga* BN 70 at a distance of 90/20 cm and in August 2006 we bud-grafted incompatible pear-tree varieties Triumf, Trivale, Williams, Contesa de Paris. The Curé pear-tree variety was used as standard control as it has a good relationship with the quince-tree. We carried out physiological studies (dosage of assimilatory pigments through the spectrophotometric method) and biochemical studies (dosage of water-soluble carbohydrates through Schoorl method) for the scion - rootstock combinations with various degrees of compatibility.

RESULTS AND DISCUSSIONS

Graft compatibility represents a prerequisite for the yield of quality seeds and it is proved by fast fusion and vascularization at the grafting point, followed by vegetation and standard fructification of a new individual. For incompatible scion-rootstock associations, fusion and vascularization do not occur and therefore, no engraftment is carried out (local incompatibility), or these processes occur only partially and after a while the trees stop developing appropriately, fail to bear fruit, age very early and sometimes the grafting point gets peeled off, the crack being smooth (translocated incompatibility). Taking into account these facts we monitored periodically the content of assimilatory pigments and the level of soluble carbohydrates in various areas of the trunk, taking the grafting point as reference.

In 2008, throughout the vegetation period, we studied the contents of assimilatory pigments for certain varieties of pear-tree with various degrees of compatibility with quince-tree. In order to get edifying data about pigment content, samples were collected at the same time of day. We collected leaves which reached maximum ageing from the upper third part of the shoot approximately the 4-5th leaf, to get as accurate as possible information on pigment content. Following the determinations performed during the vegetation period, we noticed the increased content of assimilatory pigments in all grafted varieties.

Curé, the control variety, recorded in June the highest content of chlorophyll- α , followed by Trivale and Contesa de Paris varieties. The other varieties had lower chlorophyll- α content compared to the control variety. With respect to the chlorophyll-b content, the highest amount was recorded in Curé variety, followed by Trivale variety. Williams and Contesa de Paris varieties had intermediary amounts while Triumf had the lowest amount. The highest content of carotenoid pigments was found in Contesa de Paris and Trivale varieties. The lowest amount of carotenoid pigments was that of Triumf variety.

Following the observations reached during the studies from July, the highest chlorophyll- α amount was found in Curé, the control variety. Similar results were that of Contesa de Paris and Triumf varieties and the lowest amount was recorded by Williams variety. The highest chlorophyll-b content was that of the Williams variety followed closely by Curé and Contesa de Paris. And the lowest chlorophyll-b content was that of Trivale variety. The biggest number of carotenoid pigments was found in Curé variety, Contesa de Paris and Williams following in closely, and the smallest number was that of Trivale variety.

Studying the increase of chlorophyll *a* throughout the two months of vegetation, we observed the following: The most obvious increase was that of Contesa de Paris variety (from 1.477 mg/100g in June to 2.311 mg/100g in July) and of Triumf variety (from 1.345 mg/100g in June to 2.129 mg/100g in July). As far as Trivale and Williams varieties are concerned, we noticed a smaller increase of chlorophyll *a* throughout the vegetation period. Relative to the ratio of chlorophyll b content increase, it was much smaller than that of chlorophyll *a* content. The highest increase was recorded by Williams variety from 0.427 mg/100g in June to 0.949 mg/100g in July. Average increases were that of Curé and Contesa de Paris

varieties. The smallest increase of chlorophyll b content was of Trivale variety. We point out that summer varieties have smaller chlorophyll b contents in July compared to autumn varieties and the variation of this index depends on the features of vegetation phenophases of the various varieties. The highest content of carotenoid pigments was found in Curé variety from 0.463 mg/100g in June to 0.703 mg/100g in July. Close values were that of Triumf variety (from 0.399 mg/100g in June to 0.601 mg/100 g in July) and William variety (from 0.421 mg/100g in June to 0.627 mg/100 g in July). Comparing the values determined for the total number of chlorophyll pigments in the two months of growth, we noticed that the highest content of chlorophyll pigments was of Curé variety with 5.496 mg/100g followed by Contesa de Paris with 4.988 mg/100g. The lowest content of chlorophyll pigments was recorded by Trivale variety with 4.476 mg/100g. The observations on the dynamics of chlorophyll- α / chlorophyll- b ratio point out a decrease of chlorophyll pigments from June to July. The most obvious drop of the chlorophyll- α / chlorophyll- b ratio was that of Williams variety (from 3.23 mg/100g in June to 1.86 mg/100 g in July).

The decrease of chlorophyll-*a* concentration is balanced through the increase of chlorophyll-*b* share, phenomenon which determines the widening of light absorption spectrum and the improvement of the photosynthesis process. The results of assimilatory pigment content of the studied plants were also illustrated in fig. 1. and 2.

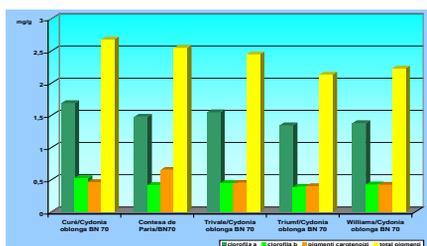


Fig.1. Assimilatory pigment content of Curé, Contesa de Paris, Trivale, Triumf and Williams varieties in June 2008

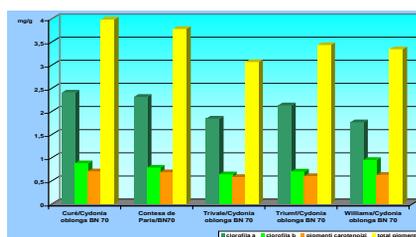


Fig. 2. Assimilatory pigment content of Curé, Contesa de Paris, Trivale, Triumf and Williams varieties in July 2008

Average values of the decreased chlorophyll ratio were determined in Contesa de Paris variety (from 3.54 mg/100g in June to 2.95 mg/100 g in July) and Trivale variety (from 3.45 mg/100g in June to 2.88 mg/100 g in July). However, the values of these varieties are comprised within the normal limits of variation of this index throughout the growth period. The Triumf variety did not show a big variation of the chlorophyll- α / chlorophyll- b ratio compared to other varieties (from 3.46 mg/100g in June to 3.04mg/100 g in July).

In the case of grafted plants, the continuity of vessels was blocked during engraftment and the capacity of water conductivity recovery is crucial for the good development of the symbiont body. The varieties which are compatible with the

rootstock have almost completely recovered water conductivity so that the transport of nutrients is basically identical with the one occurring in non-grafted plants. In the case of incompatible combinations, the transport vessels are obstructed in the grafting point and a large part of substances which were synthesized in leaves are gathered in the scion and are not deposited in roots.

The determinations performed in July regarding the content of water-soluble carbohydrates of pear-tree varieties grafted on quince-tree, highlighted the increased number of soluble carbohydrates of the rootstock in opposition with that of the scion. These data show the redirection of nutrient transport from the place of their synthesis to the deposit parts of the trees, which is carried out during the growth stagnation stages.

The results determined for the scion has less variations that the ones determined for the rootstock (fig. 3). The highest content of soluble carbohydrates at the level of the rootstock was found in Curé variety (6.719 mg/g), followed by Williams variety (5.966 mg/g) with amounts which are close to the one of the control variety. Contesa de Paris variety and especially Trivale and Triumpf varieties recorded small differences between rootstock and scion content of carbohydrates.

Taking into account the fact that Triumpf and Trivale are summer varieties, the delay in the reserve substance deposit is more abnormal than usual. These deteriorations may be related either to the influence of rootstock on the physiological processes of the scion, or to the emphasized abnormalities of the phloem at the grafting point which would prevent the migration of carbon hydrates towards the roots. This delay might cause difficulties in the frost resistance of fruit-trees during winter; this is confirmed by the fact that these three varieties also have an increased accumulation of carbohydrates in the grafting point.

Actually, retention of xylem flow in the grafting point is observed at all studied varieties, irrespectively of the partner's degree of compatibility, showing that engraftment is a stressful process determining deviation of transport vessels even in the context of joint growth, and the slowing down of transport through the grafting point.

Nevertheless, the increase of the carbohydrates' level in the grafting point for Williams and Trivale varieties is 1.85 and 1.45 times higher than in the scion, thus suggesting obvious structural anomalies. The highest share of carbohydrate retention in the grafting point was recorded by the Triumpf variety (63.41%). Intermediary values were that of Trivale variety (15.35%). The lowest shares were of Contesa de Paris (5.74%), Williams (9.69%) and Curé (8.79%).

The highest amount of dry matter was recorded at the level of the rootstock and the lowest amount at the level of the scion. At the level of the rootstock, the Williams variety had the highest amount followed closely by Trivale and Triumpf varieties.

The lowest quantity of dry matter was observed at Contesa de Paris variety. At the level of the grafting point, the highest content was that of Williams and Triumpf varieties and Curé had close values. The Triumpf variety has the largest amount of dry matter, followed closely by Curé variety (fig.4).

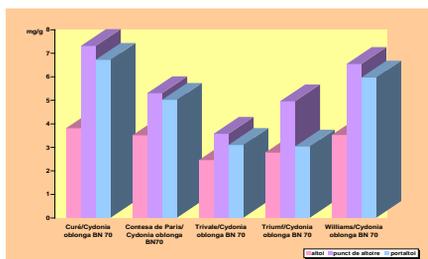


Fig. 3. Soluble carbohydrates content of Curé, Contesa de Paris, Trivale, Triumf and Williams varieties in June 2008

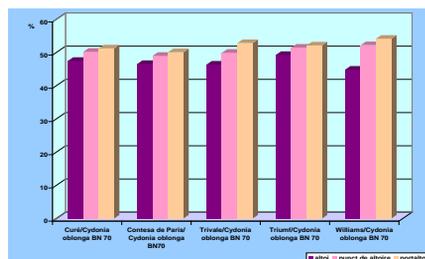


Fig. 4. Dry matter content of Curé, Contesa de Paris, Trivale, Triumf and Williams varieties in June 2008

CONCLUSIONS

1. We recorded different amounts of assimilatory pigment content according to the genetic features of the studied varieties and to the rootstock's degree of compatibility. For the varieties incompatible with the quince-tree we observed a decrease of chlorophyll a/chlorophyll b ratio.

2. The structural anomalies of transport vessels were biochemically confirmed through the disturbance of descending carbohydrate transport. Williams and Contesa de Paris varieties had a significant retention of carbohydrates in the grafting point accompanied by a low number of carbohydrates in the rootstock.

3. With respect to the amount of dry matter, it was relatively normal, all varieties recording a higher amount in the rootstock, an average one in the grafting point and a low one in the scion.

4. The higher is the photosynthetic intensity the higher is the content of soluble carbohydrates. The largest number of soluble carbohydrates and the highest content of pigments were observed in Curé variety, followed by Contesa de Paris variety.

REFERENCES

1. Burnea I., 1977 - *Chimie și biochimie vegetală*. Edi Didactică și Pedagogică, București.
2. Burzo I., 1999 - *Fiziologia plantelor de cultură*. Vol. I, Întreprinderea Editorial-Poligrafică, Chișinău.
3. Doina Vlădianu, K. Pattantys., 1989 - *Compatibilitatea unor soiuri de păr altoite pe portaltolul de gutui BN 70*, *Lucrări Științifice ale I.C.P.P. Pitești-Mărăcineni*, vol. XIII, Editura Tehnică Agricolă, Ministerul Agriculturii și Alimentației, Academia de Științe Agricole și Silvicultură, Direcția Generală Economică a Horticulturii, București, p. 203-208.
4. Moing A., G. Salesses, P. H. Saglio., 1987 - *Growth and the composition and transport of carbohydrate in compatible and incompatible peach/plum grafts*. *Tree Physiology* 3,345-354.

RESEARCH REGARDING THE CHEMICAL FERTILIZATION UPON THE GROWTH, FRUIT-BEARING AND PREMATURE DEATH OF THE APRICOT – TREE

CERCETĂRI PRIVIND INFLUENȚA FERTILIZĂRII CHIMICE ASUPRA CREȘTERII, RODIRII ȘI PIEIRII PREMATURE A CAISULUI

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Abstract. *In the period 1999 – 2008 in Oradea, on a brown soil silty texture with 2,11 per cent humus and 36,5 – 42,5 per cent clay, there was organized an experiment with 8 variants, with chemical fertilizers NPK, in order to observe, as well as the growth and fruitage of the trees. The results obtained show that the level of phosphorous and potassium in soil is positively and at significant rate influenced by the doses of fertilizers applied. The premature death is influenced by the doses of NPK and it is more frequent in the case of nitrogen applied in unilateral way or in double dose.*

Key words: apricot tree, chemical fertilization, fruitage, premature death

Rezumat. *În perioada 1999 – 2008 în zona Oradea, pe un sol cu textură aluvionară, cu 2,11 % humus și 36,5 – 42,5 % argilă a fost organizată o experiență cu 8 variante, folosindu-se fertilizatori chimici cu NPK, pentru a se observa dezvoltarea și rodirea pomilor, precum și efectul fertilizării chimice asupra pieirii premature a caisului. Pieirea prematură este influențată de dozele de NPK și este mai frecventă în cazul în care azotul se aplică singur sau în doză dublă.*

Cuvinte cheie: cais, fertilizare chimică, rodire, pieire prematură

INTRODUCTION

The importance of the apricot – tree in our country fruit – growing is small, mainly because as a result a higher sensitivity of the species towards the climatic conditions.

Reduction of these negative influence can be obtained by the use of proper technological measures, among them being the fertilization.

Taking into account the role of a proper fertilization in order to produce a balance apricot – tree orchard in Oradea region there were carried out researches in order to study the tree reaction when chemical fertilizers are used.

The apricot – tree plantation came into being in 1997, on brown soil with clay – texture, with an average content of clay of 40,2 % and 2,11% humus on the depth of the profile of 0 – 40 cm.

During the studied period of time, the pluviometric conditions were at 613,1 mm close to the normal, with the extremely lowest of 470,7 mm and highest of 799,7 mm.

From the point of view of the temperature, the values were lower than the normal ones, the average temperature was 10,0°C with an absolute minimum of -21,6°C.

MATERIAL AND METHOD

The plantation was made with the variety of The Best of Hungary engrafted on apricot – tree, the planting distance was 4x5 m and the top was freely flattened. Eight variants were taken into account, tables 1, 2, and 3 placed in blocks at random, with 4 repetitions and 5 trees in a repetition.

The maintenance system of the soil was cultivated field, with autumn ploughing and 3, 4 uses of the disk harrow during the vegetation period. The nitrogen, under the form of the ammonium nitrate was applied in spring, while the phosphorus and potassium were applied in autumn, by spreading it on the whole lot, except the variant no8, for which the phosphorus and potassium were applied once at every 5 years. Observations were made regarding the growing, fruit – bearing and premature death.

RESULTS AND DISCUSSIONS

The growing in thickness of the trunk is presented in table 1. The data presented point out the fact that for all the fertilized variants there are increases compared to the most fertilized trees, increase between 2 and 18%. Analyzing the contribution of each element to the increase, and having the average data for 10 years, it can be noticed that the nitrogen in a dosing of 100 kg/ha s.a. brings a fertilization increase of 14%, when phosphorus (P_2O) is added the increase is 2% and when potassium (K_2O) is added to both of them, the increase is 65. The importance of the nitrogen is pointed out when it also is applied in doses of 200 kg/ha s.a. obtaining an overfulfilment of growing between 8 and 18%.

As concerns the phosphorus and the potassium, table no.1 does not imply that these would positively influence the thickening of the trunk. It can also be underlined the diminishing of the trees grow older, and during the 8th – 10th year of planting there could be noticed a strong recovery of the trees on the lots which were not fertilized, while the trees fertilized with NPK, the increase of the trunk thickening proves reduced values, situated below the level of the witness.

This observation can be also made in the case of the fruit production which is positively related to the trunk thickening.

Table 2 shows that the trees started to bear fruit beginning with the third year from planting and, even if the level of the crop is low, the differences between the fertilized variant and the witness are obvious, with values statistically assured for the experiment.

Table 1

The diameter growth of the trunk at the apricot – tree (mm) under the influence of certain doses of NPK

Variant	Years										Average	
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	mm	%
V ₁ - witness	10,4	9,9	7,7	5,1	6,0	5,8	1,8	7,5	7,1	5,1	6,64	100
V ₂ - N ₁₀₀	12,0	12,6	10,8	9,2	5,3	7,3	1,4	8,7	3,6	5,1	7,60	114
V ₃ - N ₁₀₀ P ₈₀	10,8	13,3	8,3	6,2	4,9	6,1	1,1	6,5	5,6	5,3	6,81	102
V ₄ - N ₁₀₀ P ₈₀ K ₁₀₀	11,2	11,8	11,0	9,0	5,5	6,1	1,7	6,3	3,6	4,1	7,03	106
V ₅ - N ₂₀₀ P ₈₀ K ₁₀₀	14,7	15,4	10,2	8,8	7,9	8,3	1,3	5,2	3,9	3,0	7,07	118
V ₆ - N ₂₀₀ P ₁₀₀ K ₁₀₀	12,5	12,9	8,3	9,1	7,7	6,1	2,3	5,8	5,5	4,0	7,42	112
V ₇ - N ₂₀₀ P ₁₆₀ K ₂₀₀	12,1	13,5	9,8	7,6	6,6	5,9	1,1	4,7	6,7	3,8	7,19	108
V ₈ - N ₂₀₀ P ₄₀₀ K ₅₀₀ once every 5 years	19,5	8,8	9,3	8,4	5,7	7,9	1,8	8,8	3,7	8,3	7,42	112
Average for years:	12,9	12,3	9,4	7,9	6,2	6,7	1,6	6,7	4,9	4,8	7,24	-

Table 2

**The influence of certain doses of NPK upon the fruit production
(Oradea 1999 – 2008)**

Variant	Years																Average (1999 - 2008)	
	1999		2000		2002		2004		2005		2006		2007		2008			
V ₁ - witness	1,2	100	0,8	100	2,5	100	0,3	100	0,4	100	1,7	100	4,6	100	6,7	100	2,3	100
V ₂ - N ₁₀₀	1,3	113	1,3	173	2,7	108	2,1	700	9,0	203	5,8	341	11,0	239	4,9	73	4,1	178
V ₃ - N ₁₀₀ P ₈₀	1,6	135	1,8	233	3,0	120	2,4	800	11,3	256	5,0	294	11,7	125	7,9	118	4,9	213
V ₄ - N ₁₀₀ P ₈₀ K ₁₀₀	1,5	130	2,6	346	3,3	132	2,4	800	10,2	231	6,6	388	14,4	313	5,5	82	5,1	221
V ₅ - N ₂₀₀ P ₈₀ K ₁₀₀	1,9	165	1,5	200	3,8	152	2,5	833	10,4	239	3,8	223	8,8	191	3,1	47	4,0	174
V ₆ - N ₂₀₀ P ₁₀₀ K ₁₀₀	1,8	156	1,3	173	3,4	136	3,1	1033	8,5	193	8,4	494	7,6	165	3,9	100	4,2	182
V ₇ - N ₂₀₀ P ₁₆₀ K ₂₀₀	1,4	117	2,5	326	2,5	100	1,7	566	8,5	193	5,5	323	11,9	258	5,2	58	4,8	208
V ₈ - N ₂₀₀ P ₄₀₀ K ₅₀₀ every 5 years	1,9	161	2,0	266	3,3	132	2,6	866	10,9	245	2,8	164	13,7	298	6,7	100	4,9	213
Average for years:	1,5	-	1,7	-	3,0	-	2,1	-	9,2	-	5,0	-	10,5	-	5,5	-78	4,2	-
DL 5%	-		3,3		-		1,77		6,3		2,4		8,7		-		-	

Analyzing the production data on an average of 8 years, it can be noticed that the best results are obtained using the $N_{100}P_{80}K_{100}$ dosage of fertilizer, when the crop was 5,1 t/ha close results were obtained at the trees with a yearly application of the fertilization formula $N_{100}P_{80}$ or N_{200} yearly $P_{400}K_{500}$, applied every 5 years, which gave an average crop of 4,6 t/ha apricots per year.

It should also be mentioned that the nitrogen is a dosing of 100 kg increased the crop with 78 %, applied together with the phosphorus increased the growth to 113 % and all the three elements together ($N_{100}P_{80}K_{100}$) had an effect of production increase with 121 %.

In cases of using the phosphorus and potassium in larger doses and at larger periods of time (V_8) it should be noticed that this method proved to be better, raising the production with almost a ton of fruit per hectare compared to the V_5 variant which used the same dose of NPK but every year. The superiority of this variant is more obvious, if we take into account the easiness in fertilizing, work and fuel saving.

The premature death, a complex phenomenon which has partly been placed under control up to now, was present at all the variants of the experiment. Table no.3 shows that this phenomenon appears at the majority of them even during the first tree years from the planting, whereas after 12 years being registered dried trees from 16,6% to 50%.

Even the trees which were not fertilized present 20,8% dried trees this percentage appearing on the fifth year from the planting. Out of the three elements that were tried, the one which proves a favourable action is the phosphorus; for the combination $N_{100}P_{80}$ there are 16,6 % dead trees, while for the combination $N_{200}P_{160}K_{100}$ there are up to 20,8% death trees, the same percentage as the trees without fertilizers. The nitrogen doses (100 and 200 kg/ha) can encourage the drying of the apricot – tree with a higher percentage depending on the age, and it can be noticed that, during the first 6 years, the trees die at a yearly rate of 2,95%, while during the 6th and 12th year the rate drops to 1,56%.

Table 3

**Premature death of the apricot – tree related to the chemical fertilization
Oradea (1999 – 2008)**

Variant	Years of experimenting									
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
V_1 - witness	4,16	12,5	16,66	20,8	20,8	20,8	20,8	20,8	20,8	20,8
V_2 - N_{100}	8,33	8,33	8,33	16,66	20,8	20,8	20,8	25,0	25,0	25,0
V_3 - $N_{100}P_{80}$	4,16	8,33	8,33	8,33	12,5	12,5	12,5	12,5	16,66	16,6
V_4 $N_{100}P_{80}K_{100}$	4,16	4,16	4,16	12,5	16,66	16,66	20,8	20,8	20,8	20,8
V_5 - $N_{200}P_{80}K_{100}$	-	-	4,16	8,3	16,66	16,66	16,66	20,8	20,8	29,2
V_6 - $N_{200}P_{100}K_{100}$	4,16	8,33	12,50	12,5	16,66	16,66	20,8	20,8	20,8	20,8
V_7 - $N_{200}P_{160}K_{200}$	4,16	8,33	8,33	8,33	8,3	8,33	16,66	16,66	16,66	20,8
V_8 -	-	12,50	20,8	25,00	29,16	29,16	33,33	37,5	37,5	37,5

N ₂₀₀ P ₄₀₀ K ₅₀₀ once every 5 years										
Average V x A cumulated	3,64	7,81	10,4	14,1	17,7	17,7	20,3	21,8	22,2	23,9
Average yearly rate	3,6	4,2	2,6	3,7	3,6	0,00	2,6	1,5	0,4	1,5
Age average rate	2,95					1,56				

CONCLUSIONS

Thickening of the trunk was influenced by the doses of NPK with increases between 2 and 18%, the highest values being registered for the variants which were given bigger doses of nitrogen. The fruit production was better at all the fertilized variants compared to the witness, increases being registered between 78 and 121%. It should be noticed that for the application of 100 kg of nitrogen, the production increased with 78%, when using N₁₀₀P₈₀ the production overfulfilled the witness by 113% whereas the application of potassium N₁₀₀P₈₀K₁₀₀ the increase was of 121%. The best crops were obtained at the variants with the fertilizing levels of N₁₀₀P₈₀K₁₀₀ and P₄₀₀K₅₀₀ applied every 5 years.

The premature death is influenced by the doses of NPK, being increased at the doses of nitrogen applied individually or in double dose. In order to diminish the effects of premature death and to spread the apricot – tree growing it is necessary that during the first 10 years the gaps should be completed at a percentage of 3%.

REFERENCES

1. Bunea A. și colab., 1981 - *Unele aspecte ale pieirii premature a caisului în România*. Revista „Horticultura” nr.6.
2. Cociu V. și colab., 1993 – *Caisul*. Ed. Ceres, București.
3. Davidescu D., Davidescu Velicica, 1992 - *Agrochimie horticolă*. Ed. Acad. Române
4. Drăgănescu E., 1998 -*Pomicultură*. Ed. Mirton Timișoara.
5. Popescu M. și colab., 1993 - *Pomicultură generală și specială*. Editura Didactică și Pedagogică, București;

OBSERVATIONS REGARDING YIELD PHENOPHASES OF SOME DISEASES GENETIC RESISTANT APPLE CULTIVARS, IN THE CONDITIONS OF BISTRITA REGION

OBSERVAȚII PRIVIND FENOFAZELE DE FRUCTIFICARE A UNOR SOIURI DE MĂR CU REZISTENȚĂ GENETICĂ LA BOLI ÎN CONDIȚIILE DE LA BISTRITA

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Abstract. *Observations regarding yield phenophases and temperatures influence on starting and unfolding of these processes were made during 2006 - 2008, at the cultivars Auriu de Bistrita, Florina, Generos, Aura, Bistritean and Salva. The obtained data showed the correlation existing between the temperatures and the phenology of fructification organs, thus the bud burst and flowering start only than when the sum of the registered active temperatures surpasses the necessary minimum for the starting of these phenophases. Flowering interval of the studied cultivars overlap for a period of 4-6 days, this observation being very important in choosing the right pollinators and knowing the average number of the days from flowering until harvest. This method permits the estimation of fruits maturation for harvesting.*

Key words: cultivars, phenophase, temperature, flowering

Rezumat. *Observațiile privind fenofazele de fructificare și influența temperaturii în declanșarea și desfășurarea acestora au fost efectuate în perioada anilor 2006 - 2008, la soiurile Auriu de Bistrița, Florina, Generos, Aura, Bistrițean și Salva. Datele obținute au demonstrat corelația care există între temperatură și fenologia organelor de fructificare, astfel că umflarea mugurilor, dez mugurirea, înfloritul nu încep decât în acel moment când suma temperaturilor active înregistrate depășește minimul necesar pentru începerea fenofazei respective. Soiurile studiate își suprapun perioada de înflorire pe o durată de 4 - 6 zile, având însemnătate pentru alegerea corectă a polenizatorilor, iar cunoașterea numărului mediu de zile de la înflorit la recoltare, este o metodă care permite aprecierea maturității de recoltare a fructelor acestor soiuri.*

Cuvinte cheie: soiuri, fenofaze, temperatura, înflorit

INTRODUCTION

The establishment of a fruit plantation must take into account the meteorological factors (minimum and maximum temperatures, the frequency of frosts, pluviometric regime) and also differentiated technology elements, in terms of growth and development features of recommended varieties for each particular area.

Available studies in this region have shown that there are correlations between the climate elements and growth processes - fruit development and production.

As the main climatic factor, temperature acts on trees throughout the year, but temperature during flowering is critical on the fruit production. Also ensuring optimum fluid regime during the vegetation period, correlated with an appropriate agricultural technique, influences positively the process of fruit bud differentiation, shoot growth, production parameters, especially in the summer when evapotranspiration reach the highest intensity.

MATERIAL AND METHOD

The experience was located in a research plot created in 2000, belonging to S.C.D.P Bistrita and planted with varieties of Auriu de Bistrita, Generos, Florina, Idared, Aura, Bistrițean, Salva, William's Pride.

Observations regarding fructification phenophases were made during 2006 - 2008 (years 6 to 8 after planting), for the varieties Auriu de Bistrita, Florina, Generos, Aura, Bistrițean and Salva, using the method of stationary study.

The varieties studied were grafted onto M9 and M26 rootstocks.

To calculate the temperature required to trigger major fructification phenophases, the sum of active parameters were used as evaluation parameter, by adding temperatures higher then the thermal threshold (8°C).

The beginning of flowering was estimated in dates at the opening of 10% of the flowers. End of flowering, as well in dates at the fall down of 75 -80% of the petals, and the flowering period in days from the start until the end of flowering.

RESULTS AND DISCUSSIONS

1. Dates of the major growth and fructification phenophases

The data presented in Table 1 show that there are slight date differences between varieties, regarding the onset of the first vegetative and fructification phenophases, and the gaps between years are correlated with the development of temperatures before the installation of the stable thermal threshold (8°C).

Auriu de Bistrita, although it is considered an autumn variety, starts in the vegetation the latest, the Golden Delicios genitore having a determining role in this regard. Varieties Aura and Bistrițean begin their vegetation the fastest, followed by varieties Generos, Salva and Florina in this particular order.

The studied varieties have a calendar development of the first growth and fructification phenophases, very close to each other, the differences falling within 5 days maximum. Graphic representation, using the average of the analyzed 3 years, borders the mentioned varieties in the category of those with nearly simultaneously development of the phenophases in the range of bud swelling – flowering (fig. 1).

Significant differences occur in the range of flowering - early maturation of fruits- falling of the leaves, where the genotypic character is crucial in carrying out of the specific phenophases and also regarding the length of the vegetation period. Fruit maturation begins with Auriu de Bistrita and Aura, around

September 15, continuing with varieties Bistrițean and Salva about 4 days later. Generos and Florina varieties, which are considered winter varieties, reach harvest maturity in the conditions from Bistrita in the last decade of September (Generos variety) and the first decade of October (Florina variety). End of vegetation frequently occurs within the third decade of October - the first decade of November.

2. The influence of temperature in triggering and conducting of phenophases

Along with other factors (exposition, nature of soil, rainfall, duration of sunshine), air and soil temperature plays a decisive role in crossing the phenophases, especially flowering and fruit binding, both because it satisfies the heat necessity for the activation of biostimulators with the role of getting the buds out of the state of rest, as well as the satisfaction of heat needs to start vegetation and achieving the biological threshold of the species (8°C), required for the swelling of fruit buds.

The data presented in Table 2 shows that from the registration of the biological threshold until the swelling of the flower buds it is necessary a sum of active temperatures (Σta), 63.7°C for the Auriu de Bistrița variety, 58.1°C for the Florina variety, 49.5°C for Generos, 46.8°C for Aura, 46.8°C for Bistrițean and 49.5°C for Salva.

Active temperatures sum required to trigger flowering, is in average 308.7°C for Auriu de Bistrița which blooms with about 2 days later than other varieties of the group where the sum of active temperatures is between 227.8°C for the Aura variety and to 245.6°C for the Florina variety.

Daily average temperatures during flowering have fluctuated between $10 - 13,5^{\circ}\text{C}$, close to the biological optimum of the species ($15 - 17^{\circ}\text{C}$) and the number of days from onset of thermal threshold at the flowering was also influenced by the evolution of heat, also before and after installation of the heat threshold of between 41 to 46 days in 2008 and between 29 -38 days in 2006 and 2007.

The early or late characteristic of the variety stands out by comparing the number of days from flowering to harvest in conjunction with active temperature sum in the same period.

Although it blooms last of the studied varieties, the variety Auriu de Bistrița, presents in all years the shortest period of vegetation, reaching harvest maturity at 132.6 days from flowering, accumulating on average in 2376.4°C Σta . At 4 to 6 days later, follow the group formed from the varieties Aura, Salva and Bistrițean which accumulate between $2404.3 - 2441.1^{\circ}\text{C}$ Σta .

Generos variety is at the limit of transition between autumn and winter varieties, for the harvest maturity being necessary an average number of 145.3 days with accumulation 2484°C Σta , and Florina variety distinguishes as a typical winter variety, having the longest vegetation period between 156 to 158 days from flowering.

Tabel 1

Flowering characteristics of some apple varieties in Bistrița area according to climatic parameters in the period 2004 – 2008

Year	Stable thermal threshold installation date(8 °C)	Flowering onset date	Global temperature sum January-March (°C)	Relative average air humidity (thermal threshold-flowering (%))	Days until flowering, after thermal threshold
2006	27.03	25.04-28.04	- 189.7	77	29 - 32
2007	19.03	22.04-26.04	+ 340.9	55	34 - 38
2008	15.03	25.04-30.04	+ 166.0	69	41 - 46

Years 2007 -2008, had an unusual thermal evolution towards multi-annual average of the area, registering positive average temperatures throughout the period before the installation of thermal threshold. In these conditions it was expected the earlier onset of flowering compared to previous years, but this happened only in 2007, when flowering began with about 10 days earlier than the same period in 2006.

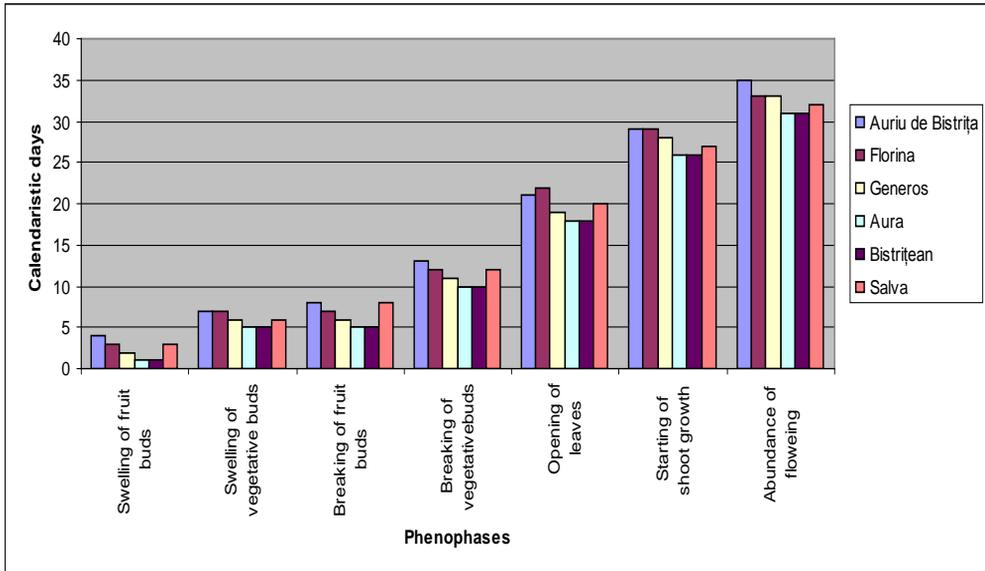


Fig. 1. Multi-annual average data on the onset of growth and fructification phenophases

Table 2

The influence of the temperature upon starting of some fructification phenophases

Variety	Year	Stable thermal threshold installation date 8°C	Active temperature sum		Days until flowering after thermal threshold	Σ t.a from flowering to harvest	Nr. of days from flowering to harvest
			Bud swelling	Starting of flowering			
Auriu de Bistrița	2006	27.03	65.3	373.2	32	2288.8	134
	2007	19.03	68.1	289.9	38	2435.4	131
	2008	15.03	57.9	263.0	46	2405.1	133
	Average		63.7	308.7	38.6	2376.4	132.6
Florina	2006	27.03	65.3	232.6	29	2645.4	158
	2007	19.03	59.8	252.1	35	2688.3	156
	2008	15.03	49.4	252.2	45	2644.1	157
	Average		58.1	245.6	36.3	2659.2	157
Generos	2006	27.03	56.1	246.6	30	2480.9	146
	2007	19.03	51.6	265.0	36	2522.5	144
	2008	15.03	40.9	243.1	44	2448.7	146
	Average		49.5	251.5	36.6	2484.0	145.3
Aura	2006	27.03	48.1	232.6	29	2346.3	139
	2007	19.03	51.6	242.2	34	2424.7	136
	2008	15.03	40.9	208.7	41	2441.9	137
	Average		46.8	227.8	34.6	2404.3	137.3
Bistrițean	2006	27.03	48.1	232.6	29	2383.7	139
	2007	19.03	51.6	252.1	35	2456.5	139
	2008	15.03	40.9	232.2	43	2483.1	140
	Average		46.8	238.9	35.66	2441.1	139.3
Salva	2006	27.03	56.1	232.6	29	2395.7	141
	2007	19.03	51.6	265.0	36	2436.4	136
	2008	15.03	40.9	243.1	44	2460.2	138
	Average		49.5	246.9	36.3	2430.7	138.3

CONCLUSIONS

1. Even if the weather observations, do not have a high degree of representativeness, because of the small number of years analyzed, the conclusion is that apple develops its biological processes with different intensities, after a characteristic rhythm as a result of adaptation to the periodicity of the climatic conditions and the onset of flowering period is a result of the cumulative action of genetical, meteorological, physiological and nutritional factors.

2. Calendar differences between varieties due to the triggering of flowering phenophases, reinforce the claim that this is genotypic controlled, but in terms of the multi-annual situation, it is also relevant the dependence on weather conditions, and mainly temperature.

3. The period of the onset and duration of flowering is important for proper choice of the pollinators. The growers option to include in the zonal range of varieties of one or more from the described varieties, in combination with other species, must take into account that the terms of flowering from the varieties of each neighboring group overlap with total 4 to 5 days and 2 to 3 days by mass flowering of the trees.

4. Knowing the number of days from flowering to harvest maturity in conjunction with the specific demands of the variety regarding the air temperature expressed in the sum of active temperatures, enable a method for estimating the date of fruit harvesting, in order to prepare the fruit harvesting company.

REFERENCES

1. **Bucarciuc V.F., 2005** – *Particularitățile înfloritului mărului în zona pomicolă centrală*. Cercetări în pomicultură ale I.C.P. Chișinău, pag.259 – 267.
2. **Burzo I., Elena Delian, Hoza D, 2005** – *Fiziologia plantelor de cultură*. Editura Elisavaros vol. IV . Bucuresti, pag 195-204.
3. **Grădinariu G., 2002** – *Pomicultura specială*. Editura Ion Ionescu de la Brad, Iasi, pag 31-59.
4. *****, 2004** – *Cultura soiurilor de măr cu rezistență genetică la boli în România*. I.C.D.P. Pitești.

RESEARCHES CONCERNING THE YIELD CAPACITY OF SOME APPLE CULTIVARS IN DIFFERENT TECHNOLOGICAL SEQUENCES IN THE PEDOCLIMATICAL CONDITIONS OF BISTRITA

CERCETĂRI PRIVIND PRODUCTIVITATEA UNOR SOIURI DE MĂR, ÎN SECVENȚE TEHNOLOGICE DIFERITE ÎN CONDIȚIILE PEDOCLIMATICE DE LA BISTRITA

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Abstract. *The study of the characteristic features of growing and yielding at Auriu de Bistrita, Florina and Generos cultivars grafted on M26, in an experience in which there were pursued the influence of the planting density, the training system of the trees and the influence of the irrigation, searched to find technological solutions in order to improve the productivity of these cultivars. The obtained results proved that the increasing of tree number at surface unit was correlated positively with the yields obtained at every studied cultivar, but the yield per tree was decreased at the density of 2500 trees/hectare with 17% at the cultivar Auriu de Bistrita, 9.4% at Florina and 4% at Generos. The canopy did not influence significantly the productivity of these cultivars, but the water supply conducted to yield increment with 12% opposite the non irrigated variants.*

Key words: apple varieties, density, irrigation, vegetative growths, yield

Rezumat: *Studiul particularităților de creștere și fructificare ale soiurilor Auriu de Bistrița, Florina și Generos altoite pe M26, într-o experiență în care s-au urmărit influența densității de plantare, a sistemelor de conducere a pomilor și a regimului de irigare, a căutat să precizeze unele soluții tehnologice pentru creșterea productivității acestor soiuri. Rezultatele obținute au demonstrat că creșterea numărului de pomi la unitatea de suprafață s-a corelat pozitiv cu producțiile obținute la toate soiurile, însă producția pe pom a fost diminuată la densitatea de 2500 pomi/ha cu 17% la soiul Auriu de Bistrița, 9,4% la Florina și 4% la Generos. Forma de coroană nu a influențat semnificativ productivitatea acestor soiuri în schimb aportul suplimentar de apă a produs sporuri de producție cu 12% față de variantele neirigate.*

Cuvinte cheie: soiuri mere, densitate, irigare, creșteri vegetative, producție

INTRODUCTION

The establishment of growth and fructification characteristics in order to substantiate some technological sequences specific to apple varieties with genetic resistance to disease, to achieve high quantity and quality yield is of great actuality. In the case of high density orchards due to high cost of planting

material, the investment per unit area is large, so that the assessment of economic implications of the creation of high-density plantations requires the establishment of indicators and parameters that characterize this culture system.

The objective of the present paper is to present the results obtained regarding the characteristics of growth and fructification of the Auriu de Bistrita, Florina and Generos varieties and to specify the agro-phyto-technical elements which ensure the yield of fruit trees at a high potential.

MATERIAL AND METHOD

The researches were effectuated in a high density apple orchard, established in 2000 with the varieties Auriu de Bistrita, Florina and Generos grafted on M26 rootstock. The trees were planted at 4m between rows, and 1-1.5 m between the fruit trees.

The plantation was located in the middle third of the slope with southern exposition on brown clay iluvial soil with a humus content of 2.5%, 30% clay and the pH in water from 6 to 6.5.

For these varieties the used training system was the slender spindle and the "V" Güttingen corresponding to the globular and flattened training concepts. The plantation was equipped with a drip irrigation system, the trees being irrigated during the periods of water deficit and when the physiological requirements of the trees depending on the vegetative stage and phenologic phase requires its implementation.

The researches have been conducted between the years 2005 -2008, organized by the following experimental plan:

- the A factor: the variety with the graduations a^1 =Auriu de Bistrita, a_2 = Florina, a_3 =Generos;
- the B factor: the planting density with the graduations b_1 =2500 trees/ha, b_2 =1666 trees/ha.
- the C factor: the canopy with the graduations c_1 = slender spindle, c_2 = "V" Guttingen;
- the D factor: the irrigation scheme with the graduations d_1 = non irrigated, d_2 = irrigated

The experience was organized in randomized blocks with three repetitions, three trees per plot repetition. The experience setting up was polifactorial, resulting in 24 variants, so that the observations have covered 216trees. For statistical processing of the results was used the Duncan test and as reference was used the average of the experimental results.

RESULT AND DISCUSSIONS

1. The surface of the sectional area of the trunk

Comparing the average of SST (years 5 to 8 after planting), with the annual average of the experience it 's confirmed the greater vigor of the variety Auriu de Bistrita which in all the years of the study had higher values whatever was the training system or the planting distances (45.2 - 47.1 cm).

The variety Florina present values close to the average experience (38.3 to 41.3 cm²) while the variety Generos has the lowest SST values (30.3 to 32.8 cm²).

The canopy and the irrigation system does not influence significantly the SST values, instead the increased planting distances induce a slight increase in all cases, fact explained by increasing the nutrition space allotted to each tree.

Unlike the SST values, where the genotypic character plays a crucial role in quantifying this parameter, the annual growth increase of SST is significantly positive influenced by the planting density showing values with 6% higher at 1666 trees/ha.

2. The canopy volume

In relation to the graduations of the factor density, all varieties in all the years analyzed, respond favorably to the density of 1666 trees/ha, where the values are higher by 29% for Auriu de Bistrita, 10% for Florina and 4.6% for Generos compared to the density of 2500 trees/ha.

The shape of the canopy does not influence significantly the canopy volume, the two training systems of trees compensate each other, the slender spindle by the thickness of the orchard fence and the "V" Güttingen by the width at a height of 2.6 to 3.2 m, maintained by the repeated transfer of the growth axis on a lateral branch. Nor the irrigation rules applied had no significant influence on the canopy volume values.

3. The level of annual shoot growth

The level of the annual growths both in number and average length fits the studied varieties within the normal parameters. The number of annual growths has an annual average of 122.3 shoots per tree in Florina variety, followed by Generos variety with 106.4 shoots and Auriu de Bistrita with 102.6 shoots.

The average length of the annual growths ranged from 36.9 - 41.1 cm at Auriu de Bistrita, 29 - 35.6 cm in Florina and 32.1-37 cm in Generos, the higher values being constantly resulted in the variants where was applied the irrigation.

The planting density did not influence the average length of annual growths, in turn it's observed an increase tendency of the number of shoots formed at the density of 1666 trees/ha to 2500 trees / ha as follows: Auriu de Bistrita 107/96, Florina 127/117 and Generos 115/98 shoots.

The average number of shoots formed on the tree grew in the year 8 of planting compared to the year 5, from 73.8 to 123.6 for the variety Auriu de Bistrita, respectively 67.4%, to the variety Florina from 101.2 to 133,5 shoots (31.9%), and at the variety Generos from 78.8 to 131.6 (67%)shoots.

The multi-annual average sum of the growth ranged from 3336.8 to 4514.2 cm at Auriu de Bistrita, 3253.4 to 4684.6 cm at Florina and 2854.4 to 4456.3 cm at Generos variety.

4. Foliar surface dynamics

Of all the organs of the trees, the leaves control the most the growth and the fructification. The foliar device through its role on the formation of the fruit harvest of the current year and the process of fruit bud differentiation from which depends the next year's production is a defining element in the ensuring of a greater efficiency of the orchards.

Table 1

**Particularities of growth and yield of the varieties Auriu de Bistrița, Florina and Generos
(the average of the years V – VIII from planting)**

Variety	Density (trees/ha)	Training system	Irrigation scheme	Trunk diameter		Canopy volume (m ³ /tree) Semnification	Amount of annual growths (cm)	Foliar surface/tree (m ² /tree)	Product on per tree (kg)
				S.S.T. (cm ²)	Annual average growth increase(cm ²)				
Auriu de Bistrița	2500	Slender spindle	Non irrigated	45,24 bc	7,63	5,89 a	3691,1	7,84a-f	14,18 fg
			Irrigated	45,58 bc	7,87	5,80 ab	3960,6	8,19a-f	15,29 f
		V Guttingen	Non irrigated	46,21 ac	7,61	5,23 ab	3336,8	7,24c-g	13,94 g
			Irrigated	46,21 ac	7,85	5,56 ab	3764,3	7,80a-f	15,05 fg
	1666	Slender spindle	Non irrigated	46,56 ab	8,10	7,14 a-c	4202,8	8,91 ab	16,65 ef
			Irrigated	47,13 a	8,30	6,85 a-c	4514,2	9,07 a	19,16 d
V Guttingen	Non irrigated	46,81 ab	8,07	6,86 a-c	3802,0	7,94 a-f	15,44 f		
	Irrigated	47,08 a	8,16	6,81 a-c	4350,5	8,80 ab	17,27 e		
Florina	2500	Slender spindle	Non irrigated	40,49 e	7,30	4,89 a-c	3933,1	7,90 a-f	19,62 c-e
			Irrigated	40,98 de	7,48	5,09 b-d	4095,9	8,30 a-e	21,79 bc
		VGuttingen	Non irrigated	38,35 ef	7,25	5,10 b-d	3253,4	6,99 d-g	19,74 c-e
			Irrigated	38,65 ef	7,51	5,21 b-d	3893,2	8,03 a-f	22,95 h
	1666	Slender spindle	Non irrigated	41,33 de	7,50	5,26 b-d	4270,8	8,53 a-d	21,95 bc
			Irrigated	42,03 d	7,92	5,26 b-d	4684,6	9,12 a	22,94 b
V Guttingen	Non irrigated	40,13 d-f	7,77	5,79 b-d	3695,5	7,69 a-f	22,07 bc		
	Irrigated	40,46 e	7,99	5,79 c-e	4290,4	8,67 a-c	25,08 a		
Generos	2500	Slender spindle	Non irrigated	31,57 gi	5,95	3,32 d-f	3349,5	6,80 e-g	20,72 c
			Irrigated	31,68 gi	6,14	3,30 ef	3828,1	7,56 a-f	22,18 bc
		V Guttingen	Non irrigated	30,31 gh	5,84	2,93 ef	2855,4	5,83 g	18,71 de
			Irrigated	30,61 gh	6,12	3,02 ef	3366,8	6,68 fg	21,63 b-d
	1666	Slender spindle	Non irrigated	32,58 g	6,30	3,24 ef	4172,2	7,43 b-f	20,57 cd
			Irrigated	32,82 g	6,49	3,32 ef	4456,3	7,99 a-f	24,43 ab
V Guttingen	Non irrigated	32,04 gi	6,27	3,46 f	3665,8	6,94 e-g	20,57 cd		
	Irrigated	32,46 g	6,43	3,56 f	4057,8	7,59 a-f	22,99 b		

The average leaf surface calculated by the "Leaf Area Measurement" (software to calculate leaf surface) created at Univ. Sheffield is 37.81 cm² at Auriu de Bistrita variety, 33.16 cm² at Florina variety and 28.72 cm² at Generos variety. The distance between the internodes for Auriu de Bistrita is on average 2.86 cm, 2.3 cm at Florina and 2.48 cm at Generos.

The medium values of the foliar surface at the variety Auriu de Bistrita range from 7.2 to 8.9 m²/tree, at the variety Florina between 7.0 to 9.1 m²/tree and at the variety Generos 5.8 to 8.0 m²/tree according to the adopted technological version.

The combinations with the greatest foliar surface values are for the studied varieties, at the density of 1666 trees/ha under irrigation.

Although the shape of the canopy does not produce significant effects, it leads to higher values as the slender spindle training system.

The tree leaf area is significantly influenced by the size of the distance between the trees at a time (increasing the area of individual development of the tree and the area of nutrition) and very significant by the supplementation of the irrigation water (it generates higher values of the length of the annual shoots and even of the leaves).

5. Results regarding the fruit yield

The fruit production is affected by the process of fruit binding, the ratio/fruits, varietal characteristics, planting distances, applied agrotechnique, soil and climatic conditions etc.

The production levels achieved in the years V - VIII of planting in the polyfactorial experience from SCDP Bistrita were oscillating, but suggestive in respect to the productivity character of the studied varieties.

The average yields achieved by the variety Auriu de Bistrita was significantly distinct negative comparing to the level of production obtained from the varieties Florina and Generos. Thus the average yield per tree at Auriu de Bistrita was according to the analysed technological variant from 13.94-19.16 kg, while the same indicator presented values ranging from 19.62 to 25.08 kg at Florina variety. The averages of the yield obtained at Generous variety have ranged between 18.71 and 24.43 kg/tree, which was noted in year 8 of the planting with the highest production of the experience, from 32.06 to 36.63 kg/tree.

The influence of the experimental factors on the yield does not highlight significant differences in the training system used instead at planting density of 1666 trees / ha the values of this parameter are significant, also the influence of irrigation especially during 2006-2008 was very significant statistically registering increases of production by 12% over the non-irrigated variants.

CONCLUSIONS

1. The varieties Florina and Generos confirms the good yield results, being adapted to the variability of the pedo-climatic conditions, instead the variety

Auriu de Bistrita, although with a low production potential, may complete the local area assortment through the quality of the fruits.

2. Increasing the planting density at 2500 trees/ha is recommended for the variety Generos, accepted for the variety Florina and totally non indicated for the variety Auriu de Bistrita in the conditions of grafting on M26, this variety being very difficult to control in terms of limiting the space of development.

3. The training system slender spindle induces a larger number of annual growths, respectively an increased leaf area which, through the intensity and the photosynthetic efficiency positively affects the productivity of trees, instead the "V" Guttingen training system through the inclined panels of vegetation, provides a top recovery of natural light and ventilation of the fruit bearing formations, leading finally to the high quality parameters of fruits.

4. The influence of irrigation, even if it has not produced large increases of yield, was obviously that the additional intake of water when the physiological needs of the plantation requires this measure is compensated by the higher levels of the achieved yield.

REFERENCES

1. **Chitu E., Păltineanu C., 2006** – *Perfecționări metodologice privind interpretarea indicatorilor ce caracterizează creșterea și rodirea pomilor*. Lucrări științifice ale SCDP Constanța, ed. II-A, pg. 87 – 95
2. **Croitoru A., 2005** – *Structura și productivitatea plantației superintensive de măr în funcție de soi și modul formării coroanei fus zvelt ameliorat*. Lucrări științifice USAMV Iași, vol.14, pg. 88 – 92.
3. **Sumedrea D., 2001** – *Cercetări privind intensivizarea culturii soiurilor de măr cu rezistență genetică la boli*. Teză de doctorat, pg.60 – 112.
4. **Șuta A., 1987** – *Rezultate obținute la soiul de măr Golden Spur/MM106, cu diferite forme de coroană, în condiții de mare densitate, având pomii dispuși în zig – zag pe direcția rândurilor, cu și fără mijloace de susținere*. Lucrări științifice ale ICPP Pitești, vol.XII, pg. 197 – 202.
5. **Tănăsescu N., 2002** – *Influența normei de irigare aplicată prin diferite metode de udare asupra unor parametri de creștere și fructificare la soiul de măr Golden Delicious în condițiile climatice de la Pitești – Mărăcineni*. Lucrări științifice ale I.C.D.P. Mărăcineni, Argeș vol.XXI, pg. 194 – 199.
6. **Tromp J., Webster A.D., Wertheim S.J., 2005** – *Fundamentals of temperate zone tree fruit production*. Backhuys Publishers, Leiden, 2005, Netherlands. pg. 300 – 308

THE INFLUENCE OF VARIETY AND ROOTSTOCK UPON CERTAIN PHYSIOLOGICAL PROCESSES AT SOME CULTIVARS OF PLUM TREE IN DIFFERENT PHENOPHASES

INFLUENȚA SOIULUI ȘI PORTALTOIULUI ASUPRA UNOR PROCESE FIZIOLOGICE LA UNELE SOIURI DE PRUN ÎN DIFERITE FENOFAZE

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Abstract. *Intensity of accumulation process of assimilates depends by the internal and external factors, the processes being different from one variety to another, from one rootstock to another and from one association cultivar-rootstock to another. The Miroval rootstock, which gives a bigger vigor, influences more intense the accumulation process of assimilates from leaves, being followed by the Otesani 8 rootstock. The phenophase SCSG (slowing and cessation of shoot growth) among the vegetative phenophases is held with greater intensity than ISG (intensive shoots growth). ERF (the entry ripe fruit) of the generative phenophases is noted with intensity lower than vegetative phenophases within the ratio chlorophyll a / b.*

Key words: plum tree, variety, rootstock, phenophase

Rezumat. *Intensitatea procesului de acumulare a asimilatelor depinde de factorii interni și externi, procesele fiind diferite de la soi la soi, de la portaltoi la portaltoi și de la asociație soi x portaltoi la asociație soi x portaltoi. Portaltoiul Miroval, ce imprimă o vigoare mai mare, influențează mai intens procesul de acumulare a asimilatelor din frunze, fiind urmat de portaltoiul Oteșani 8. Fenofaza ICL (încetinirea și încetarea creșterii lăstarilor) din cadrul fenofazelor vegetative se desfășoară cu o intensitate mai mare decât CIL (creșterea intensă a lăstarilor). IPF (intrarea în pârgă a fructelor) din cadrul fenofazelor generative, se remarcă cu o intensitate mai mică decât fenofazele vegetative, în cadrul raportului clorofilă a/b.*

Cuvinte cheie: prun, soi, portaltoi, fenofază

INTRODUCTION

Compared with other plant species grown, the rootstocks of trees species represent the source of synthesis, absorption and distribution processes, so between the processes of growth and fructification will be a close correlation. Physiological changes by passing trees are of great importance in the growth and development of trees during the vegetation season (Cichi M., 2002 and 2008). Among the internal factors that influence development are the variety of trees and rootstock (Botu I. and coll., 2007; Meland M. and coll., 2007).

In the interpretation of issues that affect physiological processes was initiated an experiment in an area located in central Oltenia.

The research objectives were: the effect of variety, rootstock, and interaction variety x rootstock on the accumulation of assimilates in leaves.

MATERIAL AND METHOD

The research was conducted during 2006-2008 in a plantation established in 1995 with 4 stocks and 20 varieties. The experience has been positioned as randomized blocks in 4 repetitions with 10 trees in repetition, returning to 40 trees per variant.

Trees grafted on those rootstocks were headed in the form of bowl overlapped, works being uniform.

The analysis of physiological processes has been to seven varieties grafted on three rootstocks and referred to the contents of carotenoids and chlorophyll in the leaves of plum.

These aspects were studied in three final phenophases of vegetative organs and fruits namely intensive shoot growth (ISG), slowing and cessation of shoot growth (SCSG), the entry of ripe fruit (ERF).

Plum leaves were harvested from the shoot located at the base, middle and top of trees, and leaves undergrowth of these were collected from the middle of the shoot.

Statistical processing of individual data (gross) was performed using CSS Statistics computer program.

The research has been located at S.D.E. Banu Maracine on a preluvosol red soil with a pH of 6,5-6,7 medium supplied with macro and microelements. The average annual temperature is between 10,4-12,4 ° C, absolute minimum temperature was -4.3 ° C. The annual quantity of rainfall amounts 640-752 mm, relative humidity not lower than 60%.

RESULTS AND DISCUSSIONS

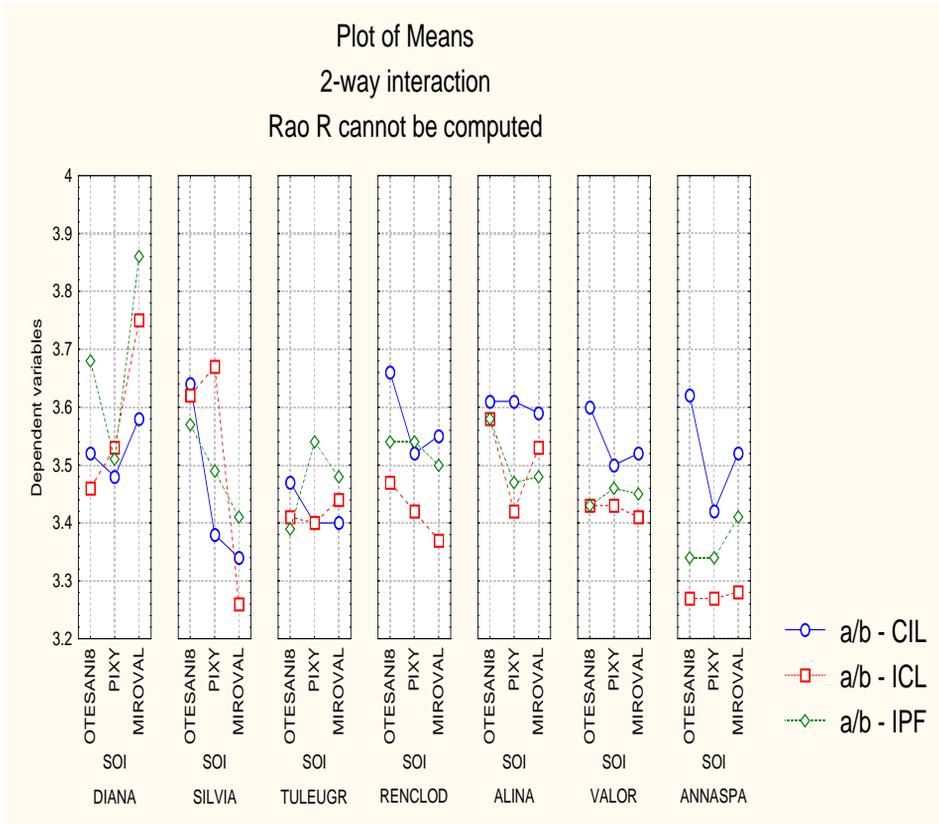
Content of leaf pigments vary by phenophase, species, varieties, rootstocks, light intensity etc.

We find that the average value of the report chlorophyll a / b varied to the varieties on the three rootstocks. Thus, three varieties on rootstocks in the years 2006 - 2008 showed that the average value of this report higher in Intense Growth of Shoot (ISG) phenophase, than SCSG phenophase (slowing and cessation of shoot growth).

This is due the biosynthesis in a higher proportion of chlorophyll a versus chlorophyll b. On the rootstock Oteşani 8, the average value of the chlorophyll report a / b carried out in seven varieties in phenophase ISG was 3.56 (2007) 3.46 (2008), slightly more than average of the same report on rootstock Miroval.

To the shoot growth cessation, the average value of this report was in 2008: 3.50 per rootstock Oteşani 8, 3.51 for Miroval rootstock and 3.47 on Pixy, actually was higher than in 2006 and 2007, (fig. 1).

On entering ripe fruit, this report was 2.14 mg/100g in 2008, being lower than in 2006 and 2007 (3.45 - 3.49 mg/100g).



CIL = ISG - Intense Growth of Shoot
 ICL = SCSG - Slowing and Cessation Of Shoot Growth
 IPF = ERF - the Entry of Ripe Fruit

Fig. 1 - Report Chlorophyll a / Chlorophyll din leaf of several plum varieties (Year 2008)

Analyzing separately the effect of variety on the chlorophyll a / b report, (Table 1), we see that the average ratio varied between 3.42 (ISG) in the variety Tuleu Gras (Haulm Fat) and 3.60 (ISG) in variety Alina.

Table 1

The effect of variety on Chlorophyll a/b report - year 2008

Rootstock	Variety	ISG	SCSG	ERF
....	DIANA	3.526667	3.580000	3.683333
....	SILVIA	3.453333	3.516667	3.490000
....	TULEU GRAS	3.423333	3.416667	3.470000
....	RENCLOD ALTHAN	3.576667	3.420000	3.526667
....	ALINA	3.603333	3.510000	3.510000
....	VALOR	3.540000	3.423333	3.446667
....	ANNA SPATH	3.520000	3.273333	3.363333

Varieties Tuleu Gras, Renclod Althan, Alina, Valor and Anna Spath had a decrease in this report in phenophase SCSG (slowing & cessation of shoot growth), until the senescence phase.

The influence of rootstock is varied, namely, during ISG (the intensive shoot growth) and SCSG (slowing & cessation shoot growth) of rootstock Oteşani 8 gives to the chlorophyll a / b report higher values (ISG = 3.58; ISG = 3.46) than the other rootstocks Pixy and Miroval, (Table 2). Oteşani 8 and Miroval rootstocks have greater influence on the ERF entry of ripe fruit (3.50 and 3.51).

Table 2

The effect of rootstock on Chlorophyll a/b report - year 2008

Rootstock	Variety	ISG	SCSG	ERF
OTEŞANI 8	3.588571	3.462857	3.504286
PIXY	3.472857	3.448571	3.478571
MIROVAL	3.500000	3.434286	3.512857

In Figure 2 we can see how the varieties Valor and Anna Späth presented the highest content in pigments carotenoids on all three rootstocks in phenophase ISG.

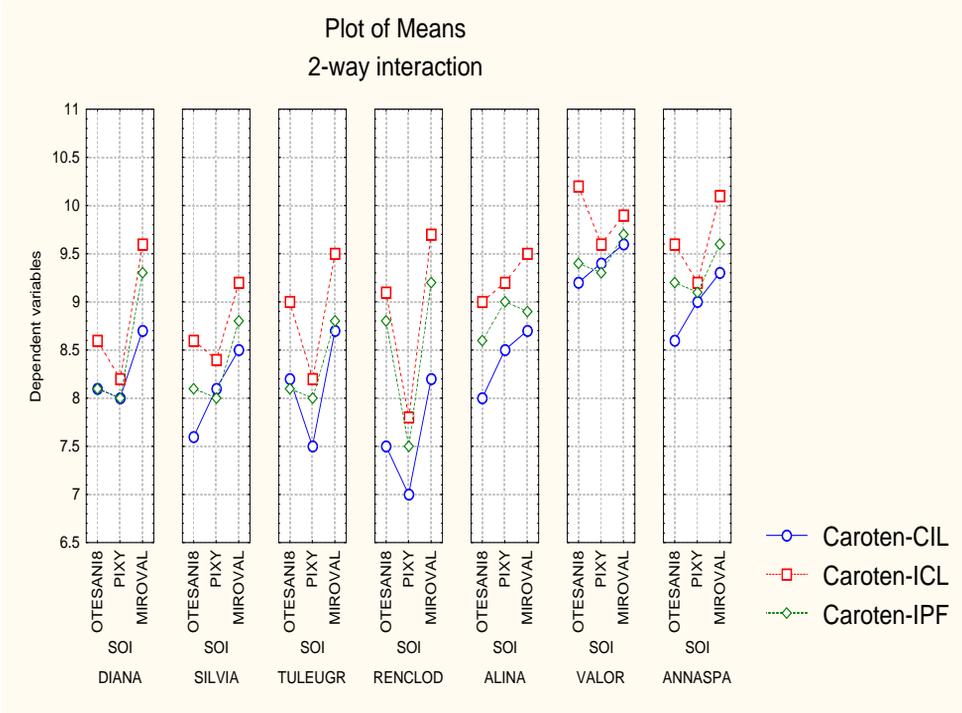


Fig. 2. Content of carotenoid pigments for various combinations variety/rootstock of plum (Year 2008)

Varieties Silvia, Alina, Anna Späth and Valor were observed with a decreasing content in pigments Carotenoids in the following order of rootstocks: Miroval, Pixy and Oteşani 8, during phenophase ISG (intense growth of shoot).

During phenophases ISG (slowing and cessation of shoot growth) and ERF (entry ripe fruit) the varieties Diana, Silvia, Tuleu Gras, and Renclod Althan and Anna Späth were revealed with a higher carotenoids content on rootstock Miroval, Oteşani 8 and Pixy.

Alina Variety had the largest content on rootstock Pixy (8.50 mg/100g) during phenophase ISG (intense growth of shoot) and 9.00 mg/100g in during phenophase ERF (entry ripe fruit).

Practically during SCSG (slowing and cessation of shoot growth) phenophase, is registered the highest growth in carotenoid pigments during three years of analysis and on all three rootstocks Oteşani 8, Pixy and Miroval.

A significant positive correlation is between SCSG (photosynthesis) and SCSG (carotene), where $r=+0.4509$, and ERF (carotene), where $r = + 0.5046$, (Table 3).

Table 3

Correlation between SCSG (photosynthesis-F) SCSG, ERF (caroten-K)		
VARIABLE	Marked correlations are significant at $p < .05000$	
	K – SCSG (slowing and cessation of shoot growth)	K – ERF (entry ripe fruit)
F – SCSG (slowing and cessation of shoot growth)	.4509*	.5046*
	N=21*	N=21*
	p=.040*	p=.020*

CONCLUSIONS

Miroval rootstock, which gives a greater vigor, influences more intense the accumulation process of assimilates of leaves, followed by rootstock Oteşani 8.

Phenophase SCSG (slowing and cessation of shoot growth) of the vegetative phenophases is held with intensity greater than ISG (intensive shoot growth).

ERF (entry ripe fruit) of the generative phenophases is noted with an lower intensity than to vegetative phenophases, regarding the chlorophyll a/b ratio.

REFERENCES

1. **Botu I., Preda S., Botu, M. and Achim G., 2007-** *Major issues in assuring the continuity of the on farm natural genetic variability in Romania.* Acta Hort. (ISHS) 734:327-331, ISBN-13:9789066051072.
2. **Cichi M., 2008 -** *Prunul (Biologie, Fiziologie, Tehnologie).* Editura Arves. ISBN 978-606-518-003-1. Craiova.
3. **Cichi M., 2002 –** *Contribuții la îmbunătățirea sortimentului de soiuri și portanți la specia prun în zona colinară a Olteniei.* Teză de doctorat, Craiova.
4. **Meland M., Moe M.E., 2007-** *Early performance of four plum rootstocks to six European plum cultivars growing in a northern climate.* Acta Hort. (ISHS) 734:235-241, ISBN-13:9789066051072.

EFFECTS OF IRRIGATION ON YIELD COMPONENTS AND QUALITY OF WALNUT CULTIVAR 'CHANDLER'

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Abstract: *In Italy walnut cultivation is mainly concentrated in Campania region, where traditional and new specialized orchards coexist and international cultivars are utilized for the new plantations. The growth and productivity of the international, high yielding cultivar 'Chandler' grown in the dry summer conditions of Naples province has been examined during a two year irrigation trial. Three treatments were applied: an un-irrigated control and two different levels of water supply, corresponding respectively to the restitution of 50 and 100% ET_0 by means of a drip irrigation system. Plant growth and nut and kernel weight increased at the highest irrigation volume, while nut fall at ripening was more concentrated in the un-irrigated control. The percentage of defected nuts was higher in condition of limited water availability. The restitution of 50% ET_0 assured satisfactory levels of production and saving of irrigation water.*

Key words: walnut, cultivar 'Chandler', irrigation

INTRODUCTION

Walnuts are important dry fruits in the world and the most important producers are China, USA, Iran, Turkey and France. In Italy, walnut cultivation is mainly concentrated in Campania region, often mixed with others fruit crops, as hazelnut, peach or apricot. At present some new specialised orchard are growing up and foreign cultivars, as Chandler, Hartley and Lara, are utilised for the new plantations [5]. Notwithstanding, an appropriate orchard management in this area is still lacking in particular for some agronomic treatments as the irrigation.

In general, the management of irrigation in this area is still based on a simplified soil water balance [3]. Furthermore, it has recently been observed that under conditions of low nitrogen and high water availability the oil in the kernel showed high amounts of some sterols, tocopherol such as saturated fatty acids, and oleic acid, confirming the influence of irrigation not only on growth and yield components but also on qualitative traits of the nuts [6].

Thus, in order to better understand the effects of irrigation on growth, productivity and some qualitative traits of walnut grown in areas characterised by dry summer and high temperature, common climatic conditions in the south of Italy, a trial has been carried out during 2007-2008 in Naples province, on a cv. Chandler orchard, comparing three different drop irrigation treatments.

MATERIAL AND METHOD

The observations on the effect of irrigation on growth, yield, technological and qualitative traits of the nuts were carried out in an orchard located in Naples province (Italy), from 2007 to 2008. The trees were thirteen to fourteen-years old plants cv. Sorrento, re-grafted with cv. 'Chandler' in 2002. The plants were spaced 8 x 8 m and trained to a free vase. The orchard was not irrigated until the beginning of the trial in 2007. Three treatments were applied: an un-irrigated control and two water levels, corresponding to the restitution of 50% and 100% ET_0 . The treatments were arranged in a complete randomized block design, with two replications. Four plants per plot were used for the experimental observations and measurements.

Water was supplied every three-four days by means of a drip irrigation system. Starting from the middle of June three different volumes of irrigation were applied, corresponding respectively to the restitution of 0, 50 and 100% ET_0 , calculated on the basis of Blaney-Criddle method [8].

Vegetative growth (trunk circumference) **and yield** (kg/plant) were measured annually and trunk cross-sectional area (AST) and yield efficiency (YE) were calculated. The nuts were harvested both year two times at a distance of about ten days, depending on time of natural drop.

Nut traits (nut and kernel weight, width, thickness and height and shell weight) **and defected nuts** were recorded on subsamples of 200 nuts for each treatment and year. Nut shape ((width + thickness/2)/ height) and seed/nut ratio were calculated according to Cristofori et al. [4]. Dry weight was determined by heating at $103 \pm 2^\circ\text{C}$ to constant weight.

Oil content in the kernel was determined by the Soxhlet method using light petroleum ether (boiling point $40\text{-}60^\circ\text{C}$). A 10 g of finely crushed kernels was placed in a cellulose thimble and extracted with 200 mL of petroleum ether for 6 h in a Soxhlet apparatus. After extraction the solvent was evaporated and the residual oil was weighed. A fraction of crashed kernels was used to determine the moisture content as previous reported.

Meteorological parameters, such as temperature and rainfall were also registered in the close meteorological station of Marigliano (NA).

For the statistical analysis all the collected data were processed by means of the analysis of variance, using the procedure SYSTAT MGLH [7], considering volume of irrigation, year and their interaction. Least significant difference (LSD $p=0.05$) for the comparison of the means was calculated.

RESULTS AND DISCUSSIONS

Climatic conditions and water applied during the experiment

The weather conditions from 2007 to 2008 are summarized in table 1. In both years July was the critical month, without or with very low rainfall, the highest average value of maximum temperature and a high daily evaporative demand. The irrigation period, which started at the middle of June, was characterized by a higher amount of rainfall in 2007 than in 2008, but mainly concentrated in May and September.

Yield components and nut quality

Water supply showed a positive effect on yield components (table 2). Yield increased as a response to water supply and the highest production of nuts was

obtained to 50% ET₀ for both years (table 2). A similar response was observed in other studies carried out on hazelnut [1,2]. The highest yield efficiency was observed in plants treated to 50% ET₀ with values on average of 0.66 and 1.07 in 2007 and 2008, respectively. The dynamic of nut drop was similar in irrigated and un-irrigated trees (table 2).

Table 1

Evaporation (*Blaney and Criddle*), rainfall, duration of the irrigation season and water applied during the two years of the experiment

Year	ET (mm) M-S	Rain (mm)		Ir duration	% ET ₀ Water applied (mm)		
		M-S	Ir		0	50	100
2007	495.7	156.0	31.4	73	-	143.2	286.4
2008	511.4	119.6	36.6	82	-	152.8	305.6
M-S : May-September Ir: irrigation season							

Table 2

Vegetative growth and yield components variates as a response to irrigation (Significance * P ≤ 0.05; ** P ≤ 0.01; * P ≤ 0.001).**

Year	% ET ₀	Production (kg plant ⁻¹)	YE (kg cm ⁻²⁻¹)	1 st harvest (%) (03 Oct)
2007	0	13.4	0.052	57.25
	50	23.5	0.066	56.15
	100	13.8	0.034	62.30
2008	0	24.5	0.086	27.51
	50	39.1	0.107	22.78
	100	27.0	0.064	34.25
Effects				
% ET ₀ (a)		*	n.s.	n.s.
Year (b)		***	*	***
a x b		n.s.	n.s.	n.s.

Nut and kernel weights were slightly greater in irrigated than in control plants, showing a positive effects of water supply and year (table 3). Contrariwise, shell weight showed the lowest value in 50% ET₀ thesis. The differences of percent kernel observed among irrigation treatments were statistically significant (table 3), and nuts collected in thesis 100% ET₀ showed values of about 47% in both years of the trial, versus values of 43% obtained in the un-irrigated control.

With the exception of mould, the incidence of defected nuts was influenced by irrigation and for poor fill also by year (table 4). In general, the incidence of defected nuts was higher in the un-irrigated plants than in the irrigated ones, and blank nuts were observed only in the control. High incidence of partially poor fill nuts was revealed for all thesis (fig. 1).

Table 3

Nut traits as affected by irrigation
(Significance * $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$).

Year	% ET ₀	Nut weight (g)	Kernel weight (g)	Shell weight (g)	Nut shape	Kernel %
2007	0	12.29	5.53	6.90	0.84	43.22
	50	12.14	5.61	6.53	0.86	46.03
	100	13.29	6.25	7.04	0.83	46.77
2008	0	10.84	4.91	5.93	0.81	43.11
	50	10.90	5.05	5.85	0.82	46.22
	100	11.70	5.63	6.07	0.80	47.69
Effects						
% ET ₀ (a)		**	***	*	*	**
Year (b)		***	***	***	***	n.s.
a x b		n.s.	n.s.	n.s.	n.s.	n.s.

Table 4

Defected nuts as affected by irrigation
(Significance * $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$).

Year	% ET ₀	Mould (%)	Poor fill (%)	Blank (%)
2007	0	5.0	45.0	2.5
	50	-	40.0	-
	100	2.5	35.0	-
2008	0	2.5	30.0	5.0
	50	-	17.5	-
	100	5	12.5	-
Effects				
% ET ₀ (a)		n.s.	*	*
Year (b)		n.s.	*	n.s.
a x b		n.s.	n.s.	n.s.



Fig. 1. In 2007 an high incidence of poor fill kernels was observed

In particular the incidence of poor fill was significantly affected by irrigation with the highest values (45%) observed in the un-irrigated control during 2007. Just during the first year of the experiment poor fill nuts were detected in higher incidence on all thesis probably because of the high temperature and dryness in July and August.

The oil content in the kernels ranged from 62.5% to 65%, depending on irrigation volume and year (fig. 2). Significantly higher oil content was detected in nuts collected in 2007. Contrariwise, irrigation volume had only a low, not statistically significant influence on the oil content in the kernel (fig. 2).

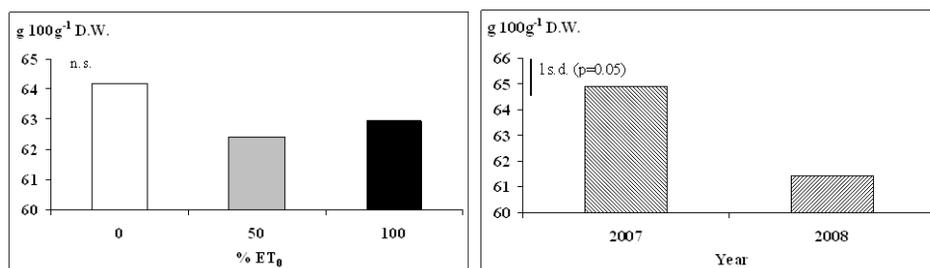


Fig. 2. Oil content in the kernel as affected by irrigation (left) and year (right)

CONCLUSIONS

In the environmental conditions of the trial, the recorded rainfall was not sufficient to assure good growth and production of adult and re-grafted plants of the cultivar 'Chandler'. Irrigation consistently improved plant performances in particular for nut traits and for the low incidence of defected nuts. The restitution of 50% ET₀ assured the best growth and production of the tested cultivar.

The irrigation strategy based on the estimation of crop evapotranspiration and water balance allowed a simple management strategy and good quantitative and qualitative results on walnut when compared to rainfed conditions.

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REFERENCES

1. Bignami C., Cristofori V., Catulli S., Bertazza G., 2005 – *Esperienze sull'irrigazione del nocciolo*. III° Convegno AISSA "Il Pianeta Acqua nel Continente Agricoltura". Reggio Emilia, 6-7 Dicembre. Atti, pp. 51-52.

2. **Bignami C., Cristofori V., Ghini P., Rugini E., 2008** – *Effects of irrigation on growth and yield components of hazelnut (Corylus avellana L.) in central Italy*. Seventh International Congress on hazelnut. Viterbo, Italy, 23th-27th June 2008. Acta Horticulturae, in press.
3. **Chauvin W., Ameglio T., Prunet J.P., Soing P., 2006** - *Irrigation of walnut trees managing the water potential*. Acta Horticulturae 705: 473-477.
4. **Cristofori V., Ferramondo S., Bertazza G., Bignami C., 2008** – *Nut and kernel traits and chemical composition of hazelnut (Corylus avellana L.) cultivars*. Journal of the Science of Food and Agriculture 88: 1091-1098.
5. **Piccirillo P., Bignami C., Cristofori V., De Luca A., 2008** – *Il noce in Campania: buone prospettive di mercato, ma serve innovazione*. Frutticoltura 1/2008: 49-54.
6. **Verardo V., Bendini A., Cerretani L., Malaguti D., Cozzolino E., Caboni M.F., 2009** - *Capillary gas chromatography analysis of lipid composition and evaluation of phenolic compounds by micellar electrokinetic chromatography in Italian walnut (Junglas regia L.): irrigation and fertilization influence*. Journal of Food Quality 32: 262-281.
7. **Wilkinson L., 1998** - SYSTAT 8.0 SPSS Inc., Chicago.
8. *****, 1998** - *Crop evapotranspiration - Guidelines for computing crop water requirements*. FAO Irrigation and drainage, paper 56.

VARIATION OF STRUCTURE AND XYLEM CONDUIT DIMENSIONS IN RELATION WITH INCOMPATIBILITY AT GRAFTED FRUIT TREES

VARIAȚII ALE STRUCTURII ȘI DIMENSIUNILOR VASELOR CONDUCĂTOARE XILEMICE ÎN RELAȚIE CU INCOMPATIBILITATEA LA POMII ALTOIȚI

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Abstract. To assess hydraulic architecture and limitations to water transport across scion – rootstock combinations we compared xylem anatomy and calculated relative surface area of stem in different zones toward grafting point. The grafting success percentage and variations in growth were also determined. The grafted combinations were: pears cultivars (Curé, Triumph, Trivale, Comtesse de Paris and Williams) grafted on *Cydonia oblonga* and plums cultivars (Stanley, Tuleu gras, Centenar, Pescarus and Record) grafted on *Prunus cerasifera*. The study showed a correlation between compatibility degree and differences of xylem architecture of scion and rootstock.

Key words: rootstock, scion, graft incompatibility, xylem vessel

Rezumat. Pentru definirea structurii anatomice a vaselor conducătoare și influența acesteia asupra circulației sevei la unele combinații altoi portaltoi, s-au comparat dimensiunile și aria vaselor xilemului în diferite zone ale tulpinii față de punctul de altoire. Datele obținute au fost corelate cu aspectele anatomo-morfologice ale incompatibilității apărute la combinațiile studiate. Au fost luate în studiu speciile păr (soiurile Curé, Triumph, Trivale, Comtesse de Paris și Williams) și prun (soiurile Stanley, Tuleu gras, Centenar, Pescarus și Record) altoite pe gutui și respectiv corcoduș. Rezultatele au pus în evidență existența unor corelații între gradul de compatibilitate la altoire și diferențele dintre dimensiunile vaselor xilemice ale partenerilor.

Cuvinte cheie: portaltoi, altoi, incompatibilitate la altoire, vase xilemice

INTRODUCTION

Fruit trees are usually formed by a combination of scion and rootstock. For that combination to be successful, a good union between a scion and rootstock is necessary (Errea et al., 2001 and Feucht, 1988). Graft-incompatibility is a widespread problem in fruit-tree production, grafted partners often belong to the same species or genus but the use of genetically divergent genotypes is also common.

Quince is a common rootstock for pear (*Pyrus communis* L.) because of size control, which makes high density orchards possible. However, quince is grafted incompatible with some of the major pear cultivars such as Bartlett (Tukey,

1978; Hartmann et al., 1997). Pear grafted to quince shows varying degrees of incompatibility depending on both scion and rootstock. This mechanism is not well known and few assumptions have been put forth to explain it (Gur et al., 1968; Yeoman & Brown, 1976; Musacchi et al., 1997). The earliest methods used to detect graft incompatibility relied on external symptoms such as graft union malformations, yellowing of foliage, decline in vegetative growth and vigor and marked differences in growth rate of scion and rootstock (Hartmann et al., 1997), or anatomical abnormalities after grafting. This requires waiting until the symptoms are visible, which may take years. Additionally, early anatomical observations may not always correlate with long-term graft survival (Andrews and Marguez, 1993). Incompatible graft unions are reported to have reduced hydraulic conductivity in the graft union. This impairment might explain the effect of some of the most widely used dwarfing rootstocks, such as Quince C in pear. The mechanism, in which incompatibility is expressed, is not clear and several hypotheses have been advanced in attempt to explain incompatibility. The majority of hypothesis referred to an early stage of development has been related to herbaceous systems. However, few studies have been made on early establishment in woody plants, where in many cases incompatibility is manifested by the breaking of the trees at the point of the union particularly when they have been growing for some years (apricot on *Prunus* grafts, pear on quince grafts). Early anatomical studies led to the hypothesis of rootstocks influencing tree water relations (Beakbane and Thompson, 1939; Beakbane, 1956). Since then, several other studies relating plant anatomy to growth have been conducted (e.g. Simons, 1986; Ussahatanonta and Simons, 1988; Soumelidou et al., 1994), reporting the presence of smaller and/or fewer vessels in the roots and/or graft tissue of plants grafted on low vigor rootstocks, and suggesting lower hydraulic conductivities of these plant regions.

This review provides a summary of the new advances in studies on the mechanism of graft compatibility focused on the early responses of grafting and how these studies can be correlated with the changes observed in some *Prunus* combinations at early stages.

MATERIAL AND METHODS

The experiment was carried out in the experimental field of „Ion Ionescu de la Brad” Agricultural Sciences and Veterinary Medicine University from Iasi from „V. Adamachi” S.D.E.

The used biological material was represented by varieties of the sort *Pyrus* (Triumph, Trivale, Williams and Paris Countess) incompatible with *Cydonia oblonga* and varieties of the sort *Prunus* (Pescarus, Centenar, Record, Tuleu Gras) incompatible with *Prunus cerasifera*. The studies were carried out on grafted trees in the third vegetation year. The varieties of the pear tree Curé and the plum tree Stanley were used as witnesses due to the fact that the first one held a good affinity with the quince tree and the second one was compatible with *Prunus cerasifera*.

In order to make the anatomical-morphological observations, the sections were cut with SLEE MAINZ CUT 6062 semiautomatic section cutter and the coloring was made with methylene blue and ruthenium red. The observations were made with the

help of MOTIC B SERIES optical microscope using the 10x and 4x lenses.

The cross sections were used to determine the radial and tangential diameter of the vessels. The diameter of the vessels was measured directly in the microscope with MOTIC image plus 2.0

RESULTS AND DISCUSSIONS

Morphological sections made it in three different stem zones and presented in figure no. was relived sundries grafting zone structural abnormalities for varieties with a low affinity capability. We can observe wood desultory, undifferentiated parenchyma layers between scion and rootstock and in some cases parenchyma with suber and necrosis. At compatible combinations Curé/*Cydonia oblonga* and Stanley/*Prunus cerasifera* the grafting zone has a satisfactory development, with wood tissue completely developed, but with deviations from radial structure of xylem vessel due to the engrafting process.

It was made measurements of xylem vessel in 3 stem parts and the results are presented in table 1, were could observe a significant differences of vessel diameter between pear and plum.

Table 1

Xylem vessels size at different plums and pears cultivars and stem zones (μm)

Variety	Diameter (μm)			Area (μm)		
	Scion	Rootstock	Engrafting point	Scion	Rootstock	Engrafting point
Curé	7,04	7,43	7,99	38,95	43,34	50,05
Contesse de Paris	8,70	6,33	6,89	59,35	31,45	37,21
Triumph	5,38	7,41	6,61	22,72	43,1	34,3
Trivale	8,03	6,05	6,72	50,62	28,73	35,40
Willams	8,21	7,11	7,68	52,85	39,67	46,30
Stanley	10,54	6,23	8,59	87,21	30,40	57,92
Record	9,81	6,34	9,89	75,55	31,41	76,78
Pescarus	9,64	6,14	10,18	72,94	29,59	81,35
Centenar	11,21	6,82	9,72	98,64	36,51	74,16
Tuleu gras	10,48	6,71	9,47	86,21	35,34	70,39

The highest diameter between pear varieties was recorded at Comtese de Paris 8.7 μm while for plum varieties the vessel diameter was more then 9.81 μm . The rootstock vessel diameter was smaller then scion, but with comparable values for both species (6.05 – 7.43 μm at pear and 6.14 – 6.82 μm at plum). The only exception is represented by the Triumf variety which has the xylem vessel smaller in scion then engrafting point and rootstock.

Making a comparison between xylem vessel from rootstocks and scions at pears with different compatibility grades we can see at Curé variety, compatible with quince, the difference between vessel diameter in all three stem parts are very small (0.39). The other varieties witch present grafting incompatibility

recorded differences are greater (1.1 – 2.37). At plum varieties that rule is unrepeatable: Stanley, compatible with *Prunus cerasifera*, has a difference between scions and rootstocks vessel diameter by 4.31, and for incompatible varieties difference is varied between 3.47 and 4.39. By the way, we observe higher values of xylem vessel in the engrafting points for all incompatible varieties at plum.

For understanding differences between xylem vessel at scions, rootstock level and their role in incompatibility phenomenon settlement it was made correlation coefficient between partners vessel dimensions and the results obtained is presented in table 2.

Table 2

Correlation coefficient between xylem vessel size in different stem zones at some compatibility degree combinations

Variety	Scion / Rootstock	Scion / engrafting point	Rootstock / engrafting point
Curé	0,2092	0,3599	0,3298
Contesse de Paris	-0,101	-0,1903	0,155
Triumph	0,4060	-0,0245	-0,1168
Trivale	0,0771	-0,2978	-0,3803
Williams	-0,2723	0,5291	0,1943
Stanley	-0,0688	0,5313	-0,2966
Record	0,0399	0,3447	0,1775
Pescarus	-0,0257	0,2781	0,1135
Centenar	0,0014	0,1274	0,1142
Tuleu gras	0,0781	0,2948	0,2124

The most studies regarding on morpho-anatomical manifestation of incompatibility phenomenon is looking for interweave and modification model at engrafting point level. Some authors (Matula, Richs, Hafehost, cited by M. Coutanceau, 1072) is considering the most anomaly of engrafting points structure are caused by disparity between conductivity vessel of the partners. As a result, some cambial involutions or phloem discontinuities (islands rounded by sponge death cells) could be observed. V. Kaimakan was considering the rootstock influence determines visible modifications at conductivity vessel level, especially of sieve tubes, medullar rases cells and parenchyma cells from wood and bark. For example at incompatible pear varieties with quince, xylem vessel has small dimensions and xylem and phloem vessel number from springs is higher in comparison with varieties engrafted on generative pear. The author explains that phenomenon as a result of metabolic disparity between scion and rootstock witch has an inhibitor influence on scion behavior. Our results it appears to confirm that hypothesis because we observe a significant difference between conductivity vessel of scion and rootstock at incompatible combinations in comparison with compatible once. In the other part, in plums cases it is not obtained the same rule, higher differences between conductivity vessel of scion and rootstock, at Stanley

variety grafted on *Prunus cerasifera*, could be a positive result in fully functional tissues obtaining.

In the other way's specific rootstocks can significantly influence the vegetative growth of fruit trees (Rogers and Beakbane, 1957; Lockard and Schneider, 1981; Webster, 1995). Evidence indicates that rootstocks can have an effect on tree vegetative growth by influencing the hormonal balance (Kamboj et al., 1999), mineral nutrition (Jones, 1971), and/or water relations (Olien and Lakso, 1986). It has been argued that the differences in rootstock effects on one or more of these processes account for the observed differences in vegetative growth of trees. Although there have been some improvements in understanding of rootstock effects on tree growth, there is no widely accepted explanation of the underlying physiological mechanism behind this phenomenon (Webster, 2004). Recent research conducted on peach trees with rootstocks that impart different tree growth potentials has shown significant differences in stem water potential (Basile et al., 2003) associated with rootstock-induced differences in growth potential. There was a direct positive relationship between stem water potential and shoot growth among peach trees on different rootstocks (Solari et al., 2006b). Similar results have been reported for apple rootstocks (Olien and Lakso, 1986; Cohen and Naor, 2002) but the differences in hydraulic conductance have been attributed to the graft unions rather than the rootstocks themselves (Atkinson et al., 2003). It appears therefore that the dwarfing effect of specific peach rootstocks on tree growth may be related to hydraulic limitation of the rootstocks involved.

In our experiments at pear varieties grafted on Quince it will observe morpho-anatomical abnormalities at union point more evident than plum varieties grafted on *Prunus cerasifera*. Those abnormalities could generate scion hydric limitations having as effect conductivity vessel dimension reduced. An increased hydraulic potential generate by a well conductivity system at plums has an effect in optimal development of scion.

CONCLUSIONS

1. A significant difference between conductivity vessel of scion and rootstock at incompatible combinations in comparison with compatible once has been observed.

2. In plums cases the higher differences between conductivity vessel of scion and rootstock, at Stanley variety grafted on *Prunus cerasifera*, could be a positive result in fully functional tissues obtaining.

3. At pear varieties grafted on *Cydonia oblonga* we observed morpho-anatomical abnormalities at union point more evident than plum varieties grafted on *Prunus cerasifera*. Those abnormalities could generate scion hydric limitations having as effect conductivity vessel dimension reduced.

4. A reduced dimension of xylem vessel size represents a symptom but not a cause of incompatibility phenomenon.

Acknowledgments

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REFERENCES

- 1. Basile B., Marsal J., DeJong T.M., 2003** - *Daily shoot extension growth of peach trees growing on rootstocks that reduce scion growth is related to daily dynamics of stem water potential.* Tree Physiol. 23, 695–704.
- 2. Beakbane A.B, Thompson E.C., 1947** - *Anatomical studies of stem and roots of hardy fruit trees. IV. The root structure of some new clonal apple rootstocks budded with Cox's Orange Pippin.* Journal of Pomology and Horticultural Science 23, 203±226.
- 3. Beakbane A.B, 1956** - *Possible mechanism of rootstock effect.* Annals of Applied Biology 44, 517±521.
- 4. Cohen S., Naor A., 2002** - *The effect of three rootstocks on water use, canopy conductance and hydraulic parameters of apple trees and predicting canopy from hydraulic conductance.* Plant Cell Environ. 25, 17–28.
- 5. Errea et al., P. Errea, L. Garay and J.A. Marín, 2001** - *Early detection of graft incompatibility in apricot (Prunus armeniaca) using in vitro techniques,* Physiol. Plant 112 (2001), pp. 135–141.
- 6. Feucht, 1988 W. Feucht, 1988** - *Graft incompatibility of tree crops: an overview of the present scientific status,* Acta Horticulturae 227, pp. 33–41
- 7. Hartmann T.H., Kester E.D., Davies T.F., Geneve L.R.** 1997. *Plant Propagation: Principles and Practices.* Prentice Hall, New Jersey. 770 p.
- 8. Hoover E.E., Hemstad P., Larson D., MacKenzie J., Zambreno K., Propsom F., 2004** - *Rootstock influence on scion vigor, hardiness, yield and fruit composition of st. pepin grape.* Acta Hort. (ISHS) 640:201-206

OXIDIZED MOLDSTIM UTILIZATION OF IN ON THE PEAR TREE (*PIRUS SATIVUS*)

UTILIZAREA MOLDSTIMULUI OXIDAT LA PĂR (*PIRUS SATIVUS*)

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Abstract. Oxidized Moldstim is an semi-synthesis compound obtained by selective oxidation of Moldstim (a natural furostanol glycoside). The emphasis of this work was to test the new obtained oxidized Moldstim as grow up factor for pear trees (*Pirus sativus*). The influence of the plant compound with steroidal glycoside structure was studied on the plantation of pear trees. The treatments consisted in spraying the aqueous solution of oxidized Moldstim, at different doses and ways of using. The results of the experiments pointed out the positive effects of the influence of treatments with steroidal glycosides on the growth and quality development of apple trees.

Key words: oxidized Moldstim, biostimulators of natural origin, oxidized Moldstim, pear tree.

Rezumat. Glicozidele furostanolice, reprezinta substanțe naturale ce aparțin clasei saponinelor. Moldstimul, una dintre aceste glicozide, este întâlnită în semințele de *Capsicum annuum* și se obține prin extracție alcoolică din semințe de ardei iute. Este o substanță bioactivă de origine vegetală, având numeroase proprietăți biologice, în special proprietăți hemolitice, membranolitice, hipocolesterinemice, antitumorale și antifungice etc. Scopul acestei lucrări constă în promovarea acestui compus bioactiv și evaluarea activității sale biologice. (ca biostimulator de creștere și dezvoltare a plantelor de păr *Pirus sativus*). S-a studiat influența compusului natural cu structură glicozid - steroidică asupra unei plantații de meri. Tratamentele au constatat în pulverizarea cu soluție apoasă de Moldstim oxidat, în diferite doze și moduri de folosire. Rezultatele au subliniat efectele pozitive ale influenței tratamentelor cu glicozide steroidice asupra creșterii și dezvoltării merilor.

Cuvinte cheie: compus bioactiv, glicozidă steroidică furostanolică, biostimulatori naturali, Moldstim oxidat, plantație de păr.

INTRODUCTION

It is well known that the substances of synthetic origin are limited within the system of conventional growing or even forbidden in the systems of sustainable agriculture. That is why it appear as a necessity for agriculture to carry out studies on discovering and applying new bioactive substances of natural origin or, as a second alternative, to obtain semi – synthetic compounds by slightly structural modification of the natural one.

The investigations conducted at earlier stages (Kintea, 1987; Bobeiko Chintea, 1991; Tschesche and Gudwinski, 1975; Tschesche and Wulff, 1972; Kofler, 1972; Hostettmann, Marson, 1995) pointed out that some bioactive substances of natural origin, extracted from different plant organs (fruits, leaves, seeds, etc.), have variously biological activity.

The effect of endogenous steroid glycosides of furostanol series (melangoside, capsicoside, tomatoside and its sulphurized form) on growth processes was studied before (Volynets et al, 2002, Gonckharik et al 2004). The possibility of their application for stimulating seed germination, biomass growth and accumulation, generative organs development, fruit yield and quality was showed (Matevosyan et al, 2001). Antimicrobial and antioxidant activity of capsicoside was also evidenced.

Having in view the above considerations, we decided to obtain a new class of semi – synthetic steroidal compounds, obtained by selective oxidation of Moldstim (Iurea, 1996; 1999), a natural furostanol glycoside and to test the new obtained oxidized Moldstim as grow up factor for pear trees.

The goal of the present investigations is to study some bioactive substances, their application ways optimization. In terms of their biological activity evaluation, some physiological aspects were analyzed. Parameters characterized in the present study include photosynthetic pigments and soluble solids content.

MATERIALS AND METHODS

Investigations have been conducted in the experimental field of the Faculty of Horticulture from the University of Agricultural Sciences and Veterinary Medicine of Iași, Centre of Horticultural Research. As biological material, three years old pear trees (*Pyrus sativa*) varieties Curé and Untoasa Hardy (U. Hardy), grafted on the *Cydonia oblonga* BN 70 rootstock were used.

The product that belongs to BAS is Capsicoside - furostanolic steroidal glycoside of vegetal origin – in the 0.01%, 0.005%, 0.001%, 0.0001%, 0.00001% concentration variants. The treatment was made on 21st of April, 2009 by foliar pulverization with 500-600 l solution/ha.

In order to emphasize the efficiency of Capsicoside the leaves were sampled at 4-weeks after treatment. The content of photosynthetic pigments was determined in 80% acetone by the method described by Wellburn (1994). The content of chlorophyll chl. *a* and *b* and the sum of carotenoids in the leaves were determined, and the obtained results were presented in mg /g fresh matter. The measurements were carried out in five replicates on material collected from various trees and the results were presented as arithmetic means with the standard deviation.

RESULTS AND DISCUSSIONS

In our experiment, foliar Moldstim sprays increase *chlorophyll a* and total chlorophyll content on both cultivars leaves (table 1). This increasing was observed at 4 weeks after application it was more evident at Curé cultivar than U. Hardy cv.

The same pattern was observed in total chlorophyll content. Analyzing the results presented in fig no. 2 it can be observed that all applied concentrations on Curé cv. determined a more or less significant increase of the total photosynthetic pigments content. At U. Hardy cv., no effect of the Moldstim on increasing on *chlorophyll a* and total chlorophyll content, was observed at maximum and minimum concentrations. This difference may indicate that absorption rate of foliar-applied Moldstim and/or its translocation in plant was different on this two cultivars. Taking into account that fruit trees have the different ability to move macromolecular compound in the phloem (Brown and Hu, 1996), it seems that a lack effect of foliar application on U. Hardy cv. was related to restricted absorption rate by leaves of spur trees. This is possible because leaf area of spur tree at the beginning of the growing season is reduce (Bramlage and Thompson 1962)

There were no marked increases on *chlorophyll a* content as increasing Moldstim concentration from 0.005% to 0.01%. However, 0.005% Moldstim treatment leads to significantly high values of *total chlorophyll* and *chlorophyll a* content at both cultivars. Since a slight reduction in all chlorophyll types was noticed with the 0.01% application, the 0.005% concentration might represent a physiological threshold level beyond chlorophyll deteriorates.

As was the case of chlorophyll, 0.0001%-0.005% concentrations had as result a significantly high accumulation of dry matter in compare with control. No significant difference between control and the highest (0.01%) and the lowest (0.00001%) Moldstim concentrations on dry matter content were observed. The reduction on moisture content with Moldstim indicates an increase of dry matter, which raises the possibility of higher leaves photosynthetic activity.

Improving photosynthesis efficiency might possibly lead to the accumulation of assimilates which might explain the increase in dry matter content (fig.1).

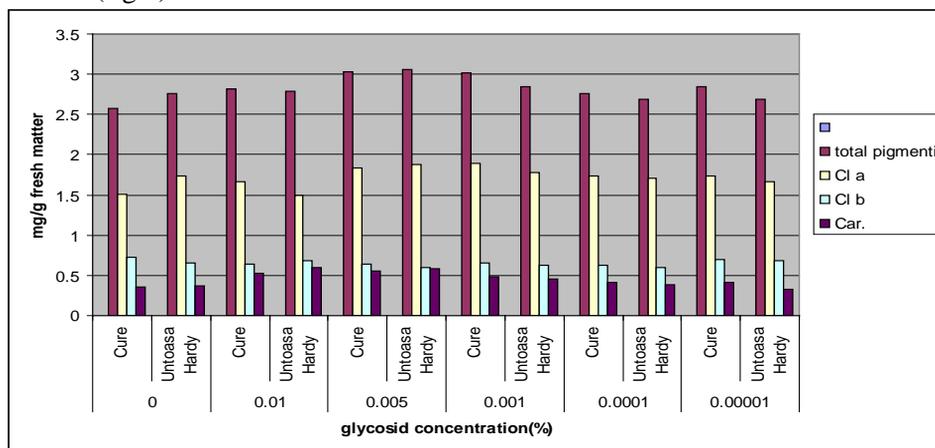


Fig. 1. The influence of Moldstim treatment on photosynthetic pigment and soluble solid content of Curé and U. Hardy pear cultivars

Table 1

Foliar chlorophyll, carotenoids and soluble solid levels in leaves of Pear cultivars treated with different concentration of Moldstim

Variant	Cultivar	Chl a (mg/g)	Chl b (mg/g)	Car. (mg/g)	Total pigm (mg/g)	Dif. to control (mg/g)	% and signif.	Chl a/ chl b	Dif. to control	% and signif.	Dry matter (mg/g)
0	Curé	1.51	0.72	0.35	2.58	0	100	2.10	0	100	21.987
	U. Hardy	1.73	0.66	0.37	2.76	0	100	2.62	0	100	23.971
0.01%	Curé	1.66	0.64	0.52	2.82	0.24	109 ^x	2.59	0.49	123 ^{xxx}	23.562
	U. Hardy	1.5	0.69	0.6	2.79	0.03	101	2.17	-0.45	83 ^{uu}	25.566
0.005%	Curé	1.84	0.64	0.55	3.03	0.45	117	2.88	0.78	130 ^{xxx}	33.687
	U. Hardy	1.88	0.6	0.58	3.06	0.3	111 ^x	3.13	0.51	119 ^{xx}	43.140
0.001%	Curé	1.89	0.65	0.48	3.02	0.44	117 ^{xx}	2.91	0.81	128 ^{xxx}	48.701
	U. Hardy	1.78	0.62	0.45	2.85	0.09	103	2.87	0.25	110 ^{xx}	41.039
0.0001%	Curé	1.73	0.62	0.41	2.76	0.18	107 ^x	2.79	0.69	124 ^{xxx}	42.552
	U. Hardy	1.71	0.6	0.38	2.69	-0.07	97	2.85	0.23	109 ^x	33.476
0.00001%	Curé	1.73	0.7	0.41	2.84	0.26	110 ^x	2.47	0.37	113 ^{xx}	25.984
	U. Hardy	1.67	0.69	0.33	2.69	-0.07	97	2.42	-0.20	92 ^u	26.980
		Cure: LSD 5% = 0,09 mg/g; LSD 1% = 0,18 mg/g; LSD 0,1% = 0,24 mg/g H. Hardy: LSD 5% = 0,14 mg/g; LSD 1% = 0,30 mg/g; LSD 0,1% = 0,38mg/g						Cure: LSD 5% = 0,29 mg/g; LSD 1% = 0,62 mg/g; LSD 0,1% = 0,56 mg/g H. Hardy: LSD 5% = 0,17 mg/g; LSD 1% = 0,33mg/g; LSD 0,1% = 0,38mg/g			

This hypothesis may be confirmed by the fact that Moldstim treatment improves the *chlorophyll a/chlorophyll b* ratio. In normal plant growth the efficient photosynthesis is at the approximate ratio of *chlorophyll a/chlorophyll b* in the order of 3:1. In our experiment the ratio of *chlorophyll a /chlorophyll b* of the control trees was 2,10 on Curé cv. and 2,62 on U. Hardy cv. This ratio was based on increased of *chlorophyll b* content at initial growing stage of the trees. A possible explanation for the elevated *chlorophyll b* content of the trees, in May, is that the trees were in such a stressful condition due of their intensive growth that only a small amount of new *chlorophyll a* were being produced. *Chlorophyll a* is the more unstable form and would decrease, while the more stable *chlorophyll b* would accumulate. The treatment with 0.005%-0.0001% concentration of Moldstim stimulated the *chlorophyll a* synthesis, and as consequence the ratio of *chlorophyll a/chlorophyll b* was improved.

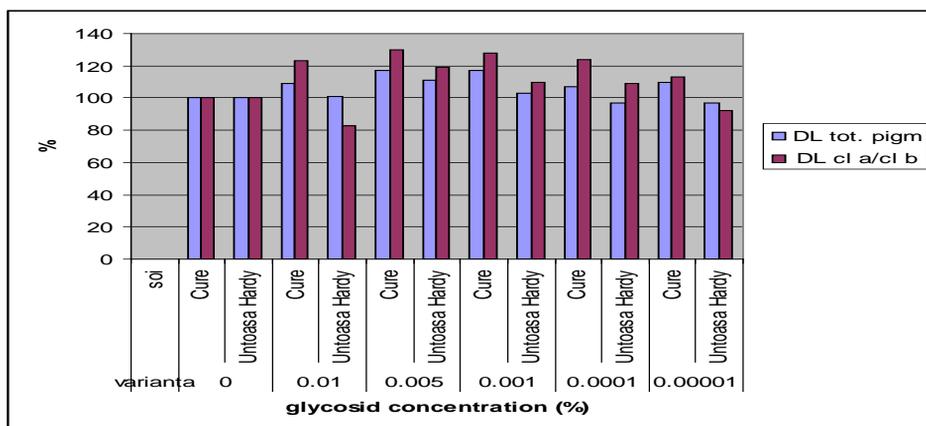


Fig. 2. Chlorophyll a/chlorophyll b ratio in the leaves of Curé and U. Hardy cultivars treated with Moldstim

CONCLUSIONS

1. Foliar Moldstim sprays increase *chlorophyll a* and total chlorophyll content on both cultivar's leaves and as a consequence improves the *chlorophyll a/chlorophyll b* ratio;
2. Treatments with 0.001%-0.005% concentration of Moldstim demonstrate the highest biological effect at both cultivars. There were no marked increases on total pigments or soluble solid content as increasing Moldstim concentration from 0.005% to 0.01%.
3. There are differences on the optimal concentrations of Moldstim treatment between studied cultivars. This differences may indicate that absorption rate of foliar-applied Moldstim is genotypic dependent process.

REFERENCES

1. **Bobeiko, V.A., Chintea, P.C., 1991** – *Spirosolanobăe Glicotidf. Știința Kisineb.*
2. **Bramlage W.J. and A.H. Thompson, 1962** - *The effects of early-season sprays of boron on fruit set, color, finish, and storage life of apples.* Proc. Amer. Soc. Hort. Sci. 80:64–72.
3. **Brown Patrick H., Hening Hu., 1996** - *Phloem mobility of compounds is species dependent: Evidence for phloem mobility in sorbitol-rich species.* Annals of Botany 77:497-505.
4. **Croitoru Florica et al., 1988** - *Biostimulatorii și influența acestora în cultura legumelor.* Ministerul Agriculturii, București
5. **Gonckharik N.N., Volynets A.P., Kintia P.K., 2004** - *The after –effect of steroid glycosides on seed quality and seedling growth on wheat (Triticum ae. stivum L.).* Vestsi Natsy Acad Belarus, Ser. Biyala Navuk 23-26
6. **Hostettmann K., Marston M., 1995** - *Saponins. Chemistry and Pharmacology of Natural Products,* Cambridge University Press, New York, 548 p.
7. **Iurea Dorina, Chintea P.C, Uglea C.V., 1996** - *Modified steroidal glycosides with potential Biological Activity, in Saponins Used in Traditional and Modern Medicine. Ed. by Waller and Yamasaki,* Plenum Press, New York, 404, p. 111 - 116.
8. **Iurea Dorina, Chintea Pavel, Panaitescu Luminita, Mereanu V., Uglea C., 1999** - *Oxidized Capsicozid with antitumoral properties.* Patent no.1435 / 16.II. MD.
9. **Kofler L., 1972** - *Die Saponine.* Julius Springer Verlag, Vienna, 527 p
10. **Shukanov V.P.; Volynets A.P.; Kintya P.K.; Prokhorchik R.A.; Pshenichnaya L.A.; Morozik G.V.; Manzhelesova N.E., 1997** - *Growth of clover vegetative organs treated with steroid glycosides* (National Academy of Sciences of Belarus, Minsk (Belarus). Institute of Experimental Botany) Publication Date (Oct-Dec 1997)
11. **Tschesche R., Wulff G., 1972** - *Chemie und Biologie der Saponine.* Prog. Chem. Org. Nat. Prods., 30, p. 462 - 606
12. **Tschesche R., Gudwinski H., 1975** - *Steroidsaponine mit mehr als einer Zuckerkette, X.Capsicozid, ein bisdesmosidisches 22-Hydroxyfurostanol- Glycosid aus dem Samen von Capsicum annum L.* Chem. Ber., 108, p. 265 - 272

THE INFLUENCE OF MANUAL THINNING UPON THE PRODUCTIVITY OF SOME APPLE TREE VARIETIES IN THE CONDITIONS OF BANAT'S PLAIN AREA

INFLUENȚA RĂRIRII MANUALE ASUPRA PRODUCTIVITĂȚII UNOR SOIURI DE MĂR ÎN CONDIȚIILE DE ȘES ALE BANATULUI

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Abstract. Fruit thinning is the most efficient method of controlling the fruits qualities being done in different development stages of fruits and by different means. Manual thinning is normally done after the physiological fall of fruits in order to improve the physical and chemical features of fruits. It is recommended to leave only one fruit in the fruit group, so that there will be a distance of 12 to 20 cm between the fruits and to have enough space of nutrition. This operation has to be done very carefully and there are always removed injured and damaged fruits, leaving the healthy ones on the branches. In this article there is presented the impact of manual thinning of three apple varieties cultivated in conditions of Timisoara: Generos, Florina and Jonathan, upon the fruits' weight and production. The thinning was done in June, after the physiological fall of apples, leaving only one apple in the group. Out of the collected data we can say that the manual fruit thinning definitely has an impact upon fruits' qualities (weight), but it does not influence too much the fruit production.

Key words: apple, fruit thinning, fruits' qualities, fruit production.

Rezumat. Rădirea fructelor este cea mai eficientă metodă de controlare a calității fructelor, fiind realizată în diferite stadii de dezvoltare a fructelor prin diferite procedee. Rădirea manuală se realizează în mod normal după căderea fiziologică a fructelor cu scopul de a îmbunătăți proprietățile fizice și chimice ale acestora. Se recomandă lăsarea unui singur fruct în inflorescență, astfel încât să rămână o distanță de 12 până la 20 cm între fructe și acestea să aibă spațiu de nutriție suficient. Această operațiune trebuie realizată cu mare atenție și se înlătură întotdeauna fructele vătămate sau atacate de boli și dăunători, lăsându-se pe ramuri doar fructele sănătoase. În lucrarea de față am prezentat influența răririi manuale a trei soiuri de măr cultivate în condițiile Timișoarei: Generos, Florina și Jonathan, asupra greutateii fructelor și a producției. Rădirea s-a realizat în luna iunie, după căderea fiziologică a merelor, lăsând doar un măr în inflorescență. După datele colectate putem afirma faptul că rădirea manuală a fructelor are influență asupra calității fructelor (greutatea), însă nu influențează prea mult producția de fructe.

Cuvinte cheie: măr, rădirea fructelor, calitate fructe, producție

INTRODUCTION

The fruit thinning is an important method of controlling and improving fruits' physical and chemical qualities, being done by different means. The manual thinning of apples is done normally in June, after the physiological fall of fruits, eliminating the damaged and injured fruits and leaving one healthy fruit in the group.

Luckwill (1978) did the correlation between the seasonal changes of gibberellins quantities extracted from seeds and the effect of flowering intensity decrease in the following year of thinning.

Zatyko (1970) concluded that in some years the harvesting moment of winter apple varieties has a significant impact upon flowering and fruiting of next year, being in favor of the fruit trees that were thinned (cited by Gonda I. 2003).

MATERIAL AND METHOD

The experiment was made in the Didactic Plantation of the Fruit Tree Culture Department in our University, in the specific ecological and pedological conditions of the area, during the years 2006-2008.

The biological material consisted in 3 apple tree varieties: Generos, Florina and Jonathan cultivated under identical technologies.

The varieties are in the didactic plot cultivated with apple tree varieties, established in 1997, and they are grafted on M106, planted at the distances of 4x2 m and they have a free palmed crown.

The research purpose consisted in observing the impact of apples manual thinning of different intensities upon the productivity of fruits.

The experimental variants were:

- V1 – 50% thinned fruits
- V2 – 25% thinned fruits
- V3 – 30% thinned fruits
- V4 – 40% thinned fruits
- V5 – not thinned (witness)

The collected data was statistically calculated and interpreted, using the variance analyses method.

RESULTS AND DISCUSSIONS

In this article we will present the results obtained concerning two studied parameters: fruits' weight and the medium production of fruits. At the same time, we will present the average values of the three studied years 2006-2008.

In 2007, the number of apples left on the trees was lower than in the other years, especially for Jonathan variety to which the alternance phenomenon was obvious. In the rest of the years, we can notice that in 2006 the number of fruits left on the trees for Generos and Florina varieties was lower than in 2008, while for Jonathan variety there were more apples in 2006 than in 2008 (table 1).

Table 1

Number of apples left on the trees

Variety	Variant	Year		
		2006	2007	2008
GENEROS	V ₁ –50% thinned	93,75	85,50	118,00
	V ₂ –25% thinned	140,60	122,60	175,00
	V ₃ –30% thinned	131,25	103,00	165,00
	V ₄ –40% thinned	112,50	92,00	142,00
	V ₅ – not thinned	187,50	143,00	195,00
FLORINA	V ₁ –50% thinned	98,00	76,00	102,00
	V ₂ –25% thinned	126,00	96,50	163,00
	V ₃ –30% thinned	116,00	88,50	136,00
	V ₄ –40% thinned	108,50	81,00	118,00
	V ₅ – not thinned	138,80	104,00	197,00
JONATHAN	V ₁ –50% thinned	128,00	50,00	83,00
	V ₂ –25% thinned	201,50	71,00	115,00
	V ₃ –30% thinned	172,00	62,00	98,00
	V ₄ –40% thinned	145,00	56,00	90,50
	V ₅ – not thinned	233,50	75,00	125,00

The average weight of Generos apples in the period 2006-2008 had a value of 120 g for the control variant (V₅ not thinned), as for the other variants it can be seen that variant 1 (50% thinned apples) registered a very significant positive difference to the witness (173,5 g – average weight) and variant 4 (40% thinned apples) registered a distinct significant positive difference to the witness (157,3 g – average weight). The average weight of apples in variant 3 was also higher than the witness (142,20 g), but it didn't register any difference to the witness, while variant 2 had the average weight value similar to the witness (122,27 g) (table 2).

Table 2

Average weight (g) of Generos apples 2006-2008

Variant	Medium value	Relative value	Difference to the witness	Significance
V ₁ –50% thinned	173,50	144,58	53,50	XXX
V ₂ –25% thinned	122,27	101,88	2,27	-
V ₃ –30% thinned	142,20	118,50	22,20	-
V ₄ –40% thinned	157,30	131,08	37,30	XX
V ₅ – not thinned	120,00	100	0	wt

DL 5% = 24,17

DL 1% = 35,16

DL 0,1% = 52,74

During the period of 2006-2008 the average weight of Florina apples registered values higher than the witness that was not thinned. Variant 1, where 50% of apples, were thinned had the biggest apples, which had an average weight of 151,20 g and a very significant positive difference to the witness V₁ (92,53 g). Variant 4 (40% thinned) had a value of 128,73 g and variant 3 (30% thinned) of

111,53 g, both of the variants having a very significant positive difference to the witness. In the variant where the thinning was done only in percentage of 25 (V2) the average weight of the three studied years was also higher than the witness (106,80 g), but it had only a distinct significant positive difference to the control (table 3).

Table 3

Average weight (g) of Florina apples 2006-2008

Varianta	Valoarea medie	Valoarea relativă	Diferența față de martor	Semnificația
V ₁ –50% thinned	151,20	163,40	58,67	XXX
V ₂ –25% thinned	106,80	115,41	14,27	XX
V ₃ –30% thinned	111,53	123,77	22,00	XXX
V ₄ –40% thinned	128,73	139,12	36,20	XXX
V ₅ – not thinned	92,53	100	0	wt

DL 5% = 9,23

DL 1% = 13,43

DL 0,1% = 20,15

For Jonathan apples the average weight in the period 2006-2008 had a value of 112,88 g (V5 the witness not thinned). Variant 1 (50% thinned apples) and variant 4 (40% thinned apples) registered a very significant positive difference to the witness (V1-158 g; V4-146,5 g average weight), while variant 3 (30% thinned apples) had significant positive difference to the witness (132,53 g). Though the average weight of variant 2 was higher than the witness, it did not register any difference to it (table 4).

Table 4

Average weight (g) of Jonathan apples 2006-2008

Variant	Medium value	Relative value	Difference to the witness	Significance
V ₁ –50% thinned	158,00	139,97	45,12	XXX
V ₂ –25% thinned	120,97	107,16	8,09	-
V ₃ –30% thinned	132,53	117,41	19,66	X
V ₄ –40% thinned	146,50	129,78	33,62	XXX
V ₅ – not thinned	112,88	100	0	wt

DL 5% = 14,27

DL 1% = 20,76

DL 0,1% = 31,14

Concerning the production of Generos variety, we can see in table 4 that variants 1 (50% thinned apples) and 2 (25% thinned apples), even though they had larger fruits than the witness, had a lower production than the witness registering a significant negative difference to the witness (V1 – 17,17 kg/tree; V2 – 17,65 kg/tree). The other variants had no difference to the witness (table 5).

Table 5

Average production (kg/tree) of Generos apple tree variety 2006-2008

Variant	Medium value	Relative value	Difference to the witness	Significance
V ₁ –50% thinned	17,17	82,77	- 3,57	0
V ₂ –25% thinned	17,65	85,11	- 3,09	0
V ₃ –30% thinned	18,91	91,19	- 1,83	-
V ₄ –40% thinned	18,14	87,44	- 2,60	-
V ₅ – not thinned	20,74	100	0	wt

DL 5% = 3,07

DL 1% = 4,47

DL 0,1% = 6,71

Florina variety had an average production in the studied period 2006-2008 of 13,45 kg/tree in the not thinned variant (V₅). The production of the other variants where thinning was done is close the one of the witness so there were no differences to it. Anyway, the highest average production was obtained for variant 1 (50% thinned apples) of 13,89 kg/tree, followed by variant 2 (13,60 kg/tree). Variants 3 and 4 had the lowest value for the average production, which is 13,18 kg/tree and 13,16 kg/tree (table 6).

Table 6

Average production (kg/tree) of Florina apple tree variety 2006-2008

Varianta	Valoarea medie	Valoarea relativă	Diferența față de martor	Semnificația
V ₁ –50% thinned	13,89	103,27	0,44	-
V ₂ –25% thinned	13,60	101,11	0,15	-
V ₃ –30% thinned	13,18	97,99	- 0,27	-
V ₄ –40% thinned	13,16	97,81	- 0,29	-
V ₅ – not thinned	13,45	100	0	wt

DL 5% = 1,71

DL 1% = 2,50

DL 0,1% = 3,75

The average production of Jonathan variety in the period 2006-2008 registered the highest value in the control variant (V₅ not thinned – 16,15 kg/tree) and it was followed by variant 2 (25% thinned apples – 15,39 kg/tree). The lowest production was obtained in variant 1 (50% thinned apples – 13,60 kg/tree). The other two variants (V₃ and V₄) had productions of over 14 kg/tree. Anyway, no variant registered any difference to the witness (table 7).

Table 7

Average production (kg/tree) of Jonathan apple tree variety 2006-2008

Variant	Medium value	Relative value	Difference to the witness	Significance
V ₁ –50% thinned	13,60	84,21	- 2,55	-
V ₂ –25% thinned	15,39	95,25	- 0,77	-
V ₃ –30% thinned	14,54	89,99	- 1,62	-
V ₄ –40% thinned	14,20	87,88	- 1,96	-
V ₅ – not thinned	16,15	100	0	wt

DL 5% = 3,49

DL 1% = 5,08

DL 0,1% = 7,63

CONCLUSIONS

Out of the presented data we can clearly see that the thinning of fruits does not influence too much the production, but it has a big impact upon the fruits physical qualities, that is the weight.

Even if in the control variant (V5 – not thinned) the number of apples left on the trees was higher they had a smaller weight, but the production was also higher. On the trees where there were left fewer apples they were larger, more attractive for the consumer, but the production was smaller than the one of the witness.

Only in the case of Generos apple tree variety we could notice that on the variants where the thinning was more severe and the apples had higher weights, the production registered negative significations to the witness.

Jonathan variety had an alternant production, which was larger in 2006 and 2008 than in 2007, while Florina variety had similar productions in each year.

The largest weight of apples was observed for all three varieties in case of variants 5 and 4 (V5 – 50% thinned apples; V4 – 40% thinned apples) that registered very significant positive differences to the witness.

REFERENCES

1. **Baciu A., 2005** – *Pomicultură generală*. Editura Universitaria, Craiova
2. **Ghena N., Braniște N., Stănică F., 2004** – *Pomicultură generală*. Editura MatrixRom, București
3. **Gonda I., 2003** – *Cultura eficientă a mărului de calitate superioară*. Editura Gryphon, Brașov
4. **Iordănescu Olimpia, 2008** – *Pomicultura*. Editura Eurobit, Timișoara
5. **Luckwill L.C., 1972** – *The Control of Growth and Fruitfulness of Apple Trees*. Physiology of Tree Crop, Academic Press, pp. 237-254

RECHERCHES CONCERNANT L'INFLUENCE DE LA SECHERESSE DE L'AN 2007 SUR L'ESPECE DE CERISIER DANS LA ZONE NE DE ROUMANIE

CERCETĂRI PRIVIND INFLUENȚA SECETEI DIN ANUL 2007 LA SPECIA CIREȘ ÎN ZONA DE NE A ROMÂNIEI

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Résumé. Ce travail présente quelques aspects enregistrés dans la zone d'influence de la Station de pour l'arboriculture Fruitière Iasi dans les années agricoles 2007-2008 sur les arbres de l'espèce cerisier. On peut caractériser l'année agricole 2006-2007 comme ayant des particularités climatiques singulières qui ont négativement influé sur le nombre de pousses annuelles, sur leur croissance en longueur et sur le rendement en fruits des arbres. On a analysé les facteurs météorologiques et le comportement des trois variétés prises à l'étude, à savoir le comportement vis-à-vis de la sécheresse de l'été 2007, la longueur des pousses annuelles, leur nombre sur l'arbre, la différence du nombre de pousses sur l'arbre en 2008 par rapport à 2007 et la différence des croissances en longueur des pousses en l'an 2008 par comparaison à 2007. Dans les conditions de l'an 2007, se sont fait remarquer par le plus grand nombre de pousses annuelles sur l'arbre les variétés: Iașirom avec 183 pousses/arbre et Bucium avec 143 pousses/arbre étant très significativement positives, Marina avec 112 pousses/arbre, Lucia et George avec 109 pousses/arbre, et avec le moindre nombre de pousses annuelles/arbre les variétés: Golia avec 42 pousses/arbre, Maria avec 53 pousses/arbre, Tereza avec 55 pousses/arbre et Ștefan avec 60 pousses/arbre étant très significativement négatives.

Mots clés: cerisier, facteurs météorologiques, sécheresse

Rezumat. Această lucrare prezintă unele aspecte consemnate în zona de influență a Stațiunii Pomicole Iași în anii agricoli 2006-2008 asupra pomilor din specia cireș. Anul agricol 2006-2007 se poate caracteriza ca un an cu particularități climatice deosebite ce a influențat negativ numărul lăstarilor anuali pe pom, creșterile acestora în lungime și producția pomicolă. S-au analizat factorii meteorologici, comportarea celor 13 soiuri luate în studiu față de factorii limitativi ai producției și anume comportarea la seceta din vara anului 2007, lungimea creșterilor anuale, numărul acestora pe pom, diferența numărului de creșteri pe pom în anul 2008 față de anul 2007 și diferența creșterilor în lungime a lăstarilor în anul 2008 față de anul 2007. În condițiile anului 2007, s-au remarcat prin cel mai mare număr de creșteri anuale pe pom soiurile: Iașirom cu 183 creșteri/pom și Bucium cu 148 creșteri/pom fiind foarte semnificativ pozitive, Marina cu 112 creșteri/pom, Lucia și George cu 109 creșteri/pom, iar cu cel mai mic număr de creșteri anuale /pom soiurile: Golia cu 42 creșteri/pom, Maria cu 53 creșteri/pom, Tereza cu 55 creșteri/pom și Ștefan cu 60 creșteri/pom fiind foarte semnificativ negative.

Cuvinte cheie: cireș, factori meteorologici, secetă.

INTRODUCTION

Le rôle du facteur eau est décisif dans la vie des plantes étant le principal constituant des organismes végétaux.

Dans la zone d'influence de la Station pour l'Arboriculture fruitière Iași, les faibles précipitations tombées pendant toute l'année causent des dégâts très considérables dans les cerisiers. Le manque d'eau détermine une moindre vigueur, des dérèglements dans la régularité de la production et du volume des récoltes, le vieillissement et la diminution des stades de croissance et de développement des plantes, des écoulements de gomme et le déséquilibre physiologique à aspect pathogène (Budan S., Grădinariu G., 2000).

On peut caractériser l'année agricole 2006-2007 comme ayant des particularités climatiques singulières qui ont influencé de façon négative, dans cette zone, la croissance des pousses annuelles et la production de fruits.

Ce travail-ci présente quelques aspects en ce qui concerne l'impact de la sécheresse des années 2006-2008, enregistré dans la région du département d'Iassy, sur la culture des arbres d'espèce de cerisier.

MATERIAU ET METHODE DE RECHERCHE

On a fait les études dans les années agricoles 2006-2008 sur un matériau de 13 variétés de cerisier créées à SCDP Iași, homologuées entre 1999-2007, dans leur 18 – 19-ième année depuis la plantation. Les arbres sont greffés sur mahaleb et conduits en palmette libre aplatie. On les a plantés dans un terrain situé dans la dépression Jijia-Bahlui, où la température moyenne annuelle a été de 12,4°C en l'an 2007 et de 9,4°C en 2008.

On a analysé les facteurs météorologiques, le comportement des variétés vis-à-vis des facteurs limitatifs de la production, à savoir le comportement à la sécheresse de l'été 2007, la longueur des pousses annuelles ainsi que leur nombre sur l'arbre.

Les années auxquelles se réfère notre étude ont comporté quelques particularités. L'hiver 2006-2007 fut totalement anormal. Après une période de faibles précipitations (53,7 mm aux mois de septembre-décembre), avec des températures qui ont dépassé 30°C (32,1°C le 4 octobre 2006), ont suivi les premières gelées enregistrées au mois d'octobre (-3°C à la date de 17.10 et -1 °C le 31.10. 2006).

Le début de l'an 2007 fut chaud avec des températures positives aux mois de janvier (moyenne 3,8°C) et février jusqu'au 22 quand on a enregistré la première neige de l'hiver (33,9 cm) suivie d'une chute brusque de la température (-20,5°C).

Le printemps a été sec, enregistrant 89,8 mm/m² par rapport à la normale de 126,2 mm/m², le déficit étant de -36,7 mm/m², (tab. 1).

L'année agricole 2007-2008 a été totalement anormale avec un excédent pluviométrique de 345,2 mm/m², vis-à-vis du normal de 517,8 mm/m².

Le début de l'an 2008 a été très froid (-6 -24°C) le 5 janvier enregistrant -24°C. A suivi une période de relatif redoux avec des neiges et des précipitations abondantes. Dans la période mars – septembre on a enregistré une quantité de 639,4 mm/m² (tab.1).

RÉSULTAT ET DISCUSSIONS

Chez le cerisier, les exigences en eau augmentent à partir du mois d'avril et deviennent maximums aux mois de mai-juin, période durant laquelle a lieu la croissance intensive des pousses (Milică C. et collab., 1982), puis, au mois d'août, quand cesse la croissance des pousses a lieu la synthèse des substances glucides, protéines etc, suivie de leur grossissement, et les bourgeons commencent en même temps à se différencier.

En l'an 2007, pendant cette période, avril, mai et juin, on a enregistré une quantité de précipitations de 78,4 mm vis-à-vis de 172,4 mm que représente la normale, le déficit étant de - 94,0 mm. Au mois d'août des années 2007 et 2008, quand la croissance des pousses a cessé (au sommet des pousses prend contour le bourgeon apical), on a compté le nombre et mesuré la longueur des pousses annuelles chez les 13 variétés de cerisier créées à SCDP Iași.

A la suite des observations et des déterminations faites en 2007, se sont fait remarquer par leur plus grand nombre de pousses annuelles sur l'arbre les variétés: Iașirom avec 183 pousses/arbre et Bucium avec 148 pousses/arbre étant très significatives positives, Marina avec 112 pousses/arbre, Lucia et George avec 109 pousses/arbre, et avec le moindre nombre de pousses annuelles/arbre les variétés: Golia avec 42 pousses/arbre, Maria avec 53 pousses/arbre, Tereza avec 55 pousses/arbre et Ștefan avec 60 pousses/arbre étant très significatives négatives. Chez les autres variétés (Cătălina, Radu et Oana) le nombre de pousses annuelles/arbre a été proche de la moyenne des variétés (tab. 2).

Table 2

Données concernant le nombre de pousses annuelles sur arbre

No. Crt.	Variété	Pousses annuelles			
		No moyen de pousses annuelles sur arbre	Calculées par rapport à la moyenne de la variété		
			%	Différence	Signification
1.	Iașirom	183	188,6	86	+++
2.	Bucium	148	152,6	51	+++
3.	Marina	112	115,4	15	
4.	George	109	112,4	12	
5.	Lucia	109	112,4	12	
6.	Cetățuia	108	111,3	11	
7.	Cătălina	102	105,2	5	
8.	Radu	100	103,1	3	
9.	X (moyenne)	97	100	0	
10.	Oana	84	86,6	-13	
11.	Ștefan	60	61,8	-37	0 0 0
12.	Tereza	55	56,7	-42	0 0 0
13.	Maria	53	54,6	-44	0 0 0
14.	Golia	42	43,3	-55	0 0 0

DL 5% = 15,9

DL 1% = 21,5

DL 0,1% = 28,2

Table 1

Caractérisation du climat des années agricoles 2006 – 2008

Mois	Somme mensuelle des précipitations atmosphériques (mm)						Température moyenne de l'air ° C					
	2006 – 2007			2007 - 2008			2006 – 2007			2007 - 2008		
	Somme mensuelle	Normale	Abattement	Somme mensuelle	Normale	Abattement	Moyenne mensuelle	Normale	Abattement	Moyenne mensuelle	Normale	Abattement
Octobre	27,9	32,0	-4,1	61,2	34,4	26,8	11,4	10,1	1,3	11,0	10,1	0,9
Novembre	8,6	36,2	27,6	55,2	34,6	20,6	6,5	4,0	2,5	2,7	4,1	1,4
Décembre	1,4	30,3	228,9	70,0	28,9	41,1	2,3	-0,9	3,2	-1,1	-0,8	0,3
Janvier	26,5	29,4	2,9	31,6	28,9	2,7	3,8	-3,3	7,1	-1,0	-3,6	2,6
Février	33,9	28,1	5,8	5,6	27,4	21,8	0,9	-1,5	2,4	2,7	-1,9	4,6
Mars	33,4	29,2	2,9	43,4	28,1	15,3	7,5	3,1	4,4	7,3	3,3	4,0
Avril	23,0	44,8	21,8	124,0	40,3	83,7	10,6	10,3	0,3	11,4	10,1	1,3
Mai	33,4	52,5	19,1	94,4	52,5	41,9	19,6	16,1	3,5	15,9	16,1	0,2
Juin	22,0	75,1	53,1	87,8	75,1	12,7	23,1	19,4	3,7	20,6	19,4	1,2
Juillet	45,0	69,2	24,2	164,2	69,2	95,0	25,1	21,3	3,7	21,4	21,3	0,1
Août	112,0	57,0	55,0	66,0	57,6	8,4	22,5	20,5	2,0	22,2	20,6	1,6
Septembre	87,8	40,8	47,0	59,6	40,8	18,8	16,0	16,3	0,3	14,9	16,3	1,4
Σ annuelle des précipitations	454,9	524,6	69,7	863	517,8	345,2	-	-	-	-	-	-
Moyenne annuelle	-	-	-	-	-	-	12,4	9,6	2,8	9,4	9,6	0,2

Table 3

Données concernant la longueur des pousses

No. Crt.	Variété	Longueur moyenne des pousses			
		Longueur moyennedes pousses -cm-	Calculée par rapport à la moyenne de la variété		Signification
			%	Différence	
1.	Radu	31	140,9	9	+++
2.	Marina	28	127,2	6	
3.	Lucia	27	122,7	5	
4.	George	26	118,2	4	
5.	Bucium	26	118,2	4	
6.	Maria	23	104,5	1	
7.	Iașirom	22	100	0	
8.	X (moyenne)	22	100	-	
9.	Cetățuia	20	90,9	-2	
10.	Tereza	19	86,4	-3	
11.	Oana	18	81,8	-4	
12.	Cătălina	16	72,7	-6	
13.	Golia	15	68,2	-7	
14.	Ștefan	13	59,1	-9	000

DL 5% = 8,5

DL 1% = 11,3

DL 0,1% = 15

Table 4

Observations et déterminations concernant les pousses annuelles sur les 13 variétés de cerisier

Variété/élite	Nombre moyen des pousses annuelles sur arbre			Longueur moyenne des pousses - cm -		
	2007	2008	Gain de croissance en 2008 vis-à-vis de 2007	2007	2008	Gain de croissance en 2008 vis-à-vis de 2007
Radu	100	120	20	30,8	41,0	10,2
Marina	112	157	45	28,2	38,1	9,9
George	109	149	40	26,4	33,5	7,1
Bucium	148	200	52	26,0	33,6	7,6
Iașirom	183	195	12	22,4	31,4	7,0
Maria	53	71	18	22,1	60,3	38,2
Cetățuia	108	131	23	20,2	42,9	22,7
Tereza	55	73	18	19,0	26,8	7,8
Oana	84	138	54	17,9	34,3	16,4
Ștefan	60	84	24	16,8	24,5	7,7
Cătălina	102	123	21	15,3	23,3	8,0
Golia	42	54	12	14,8	24,7	9,9
Lucia	109	60	49	26,4	36,5	10,1

On a enregistré les plus grandes croissances en longueur chez les variétés Radu, 31 cm étant très significatives positives, Marina 28 cm, Lucia, 27 cm George et Bucium, 26 cm et Maria, 23 cm, et les plus courtes chez les variétés Ștefan, 13 cm étant

très significatives négatives, Golia, 15 cm, Cătălina, 16 cm, Oana, 18 cm, Tereza, 19 cm et Cetățuia 20 cm (tab. 3).

Parce que, au mois d'août 2007, la quantité de précipitations a suffi (66 mm/m²), le grossissement des pousses et la différenciation des bourgeons se sont faits en bonnes conditions, ayant pour résultat les croissances obtenues en 2007 par rapport à 2008 (la différence du nombre de pousses sur arbre en 2008 vis-à-vis de 2007 a été comprise entre 12 et 53, et la différence de longueur des pousses en 2008 comparativement à 2007 a été comprise entre 7,0 și 38,2 cm), (tab 4).

CONCLUSIONS

1. Le manque d'eau diminue le nombre et la croissance des pousses annuelles, réduit la photosynthèse, le transport des substances à travers la plante et amoindrit la turgescence des cellules.

2. Sous l'aspect hydrique l'année agricole 2006-2007 peut être caractérisée comme très sèche, le déficit étant de 54,6 mm, et l'année agricole 2007-2008, une à excédent pluviométrique (345,2 mm/m²) par rapport à la normale de 517,8 mm/m².

3. Des 13 variétés de cerisier créées à SCDP Iași, se sont fait remarquer comme plus résistantes à la sécheresse Iașirom, Bucium, Marina, George et Lucia.

4. Dans les conditions de l'année 2007, se sont fait remarquer par le plus grand nombre de pousses annuelles sur arbre les variétés: Iașirom avec 183 pousses/arbre et Bucium avec 148 pousses/arbre étant très significatives positives, Marina avec 112 pousses/arbre, Lucia et George avec 109 pousses/arbre, et avec le moindre nombre de pousses annuelles sur arbre les variétés: Golia avec 42 pousses/arbre, Maria avec 53 pousses/arbre, Tereza avec 55 pousses/arbre et Ștefan avec 60 pousses/arbre étant très significatives négatives.

5. La différence du nombre de pousses sur arbre en 2008 par comparaison à 2007 a été comprise entre 12 et 54, et la différence des croissances en longueur des pousses en 2008 comparativement à 2007 a été comprise entre 7,0 et 38,2 cm.

BIBLIOGRAPHIE

1. Budan S., Grădinaru G., 2000 – *Cireșul*. Ed. „Ion Ionescu de la Brad”, Iași.
2. Milică C., Dorobanțu N. și colab., 1982 – *Fiziologie vegetală*. Editura Didactică și Pedagogică, București.
3. Petre L., 1987 – *Influența gerului din iarna 1984-1985, asupra cireșului și vișinului, în NE Moldovei*. Cercetări agronomice în Moldova, vol. 4, Iași.
4. Petre L. și colab., 1997 – *Rezultate ale ameliorării genetice la cireș obținute la SCPP Iași*. Cercetări agronomice în Moldova, vol. 2, Iași.
5. Petre L., 2006 – *Rezultate obținute în ameliorarea sortimentului de cireș, vișin și nuc la SCDP Iași*. Lucr. șt., ICDP Pitești-Mărăcineni, vol. XXII, Pitești.
6. Teaci D. și colab., 1978 – *Influența factorilor ecologici asupra creșterii cireșului și vișinului*. Lucr. Simpozion “Cultura cireșului și vișinului”, Caransebeș.

STUDIES REGARDING OPTIMIZATION PROTOCOL OF REGENERATION TO IN VITRO AT *RUBUS IDAEUS* AND *RIBES NIGRUM*

CERCETĂRI PRIVIND OPTIMIZAREA PROTOCOLULUI DE REGENERARE IN VITRO LA *RUBUS IDAEUS* ȘI *RIBES NIGRUM*

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Abstract. *Selection of biological material from grown plants for use in micropropagation often to be infected, therefore it is necessary to establish the optimal experimental protocol for preparing explants. This requires developing a protocol for regeneration of a particular variety on their experiments, using existing knowledge as guidelines. This study aimed to identify the most effective method of sterilization by studying the number of „clean” and live explants for each sterilisation method. Were used axillary buds explants of black currant, axillary buds explants of raspberry and leaves explants of raspberry red. Three sterilization methods were tested using 55 bleach solution with three time on exposure after prior treatment with Topsin 70 PU 0,1% or 70% ethanol. In the third method of sterilization used only 5% sodium bleach. The lowest percentage of 'clean' explants was provided by the method involving a preliminary treatment of biological material with ethanol, but the percentage of live explants was lower than the method with Topsin, so that there is the possible use of higher concentrations of fungicide, ultimately resulting in better sterilization.*

Key words: raspberry, blackcurrant, micropropagation, sterilization

Rezumat. *Materialului biologic recoltat din cultura mare este adeseori infectat, de aceea este necesar a se stabili prin experimentare protocolul optim de pregătire a explantelor. Astfel se impune elaborarea unui protocol de regenerare pentru fiecare soi pe baza propriilor experimente, folosind cunoștințele existente ca linii directoare. Acest studiu a urmărit identificarea modului optim de sterilizare a explantelor de coacăz negru și zmeur prin stabilirea numărului de plante contaminate și a numărului de plante viabile pentru fiecare variantă de sterilizare. S-au utilizat ca explante muguri axilari de coacăz negru, muguri axilari și limbul foliar de zmeur roșu. Au fost testate trei metode de sterilizare folosind hipocloritului de sodiu 5% cu trei graduări ale timpului de expunere (15', 20' și 30') după un tratament prealabil cu Topsin 70 PU 0.1% sau cu alcool etilic 70%. În cea de-a treia variantă de sterilizare s-a folosit doar hipocloritul de sodiu 5%. Rezultatele obținute demonstrează că decontaminarea explantelor se realizează mai bine prin spălare cu etanol, dar viabilitatea explantelor sterile este superioară în cazul utilizării Topsin-ului, astfel încât există posibilitatea utilizării unor concentrații mai mari de fungicid, în final rezultând o sterilizare mai bună.*

Cuvinte cheie: zmeur, coacăz negru, micropropagare, sterilizare.

INTRODUCTION

Sterilization of explants is a crucial step for induction and maintenance of the cultures *in vitro*. The loss caused by contamination *in vitro* is between 3 and 15% for every subculture and in most cases is likely bacterial or fungal (Leifert, et al 1994). The major risk factor for micropropagation is the use of the explants harvested directly from the plantations of fruit bushes and not in glasshouses or greenhouses, where is possible the phytosanitary control of the mother plant (also called donor plants). Therefore it is necessary for sterilization of biological material used to find the most effective and easiest to use for each type of species and explant.

In techniques of micropropagation all the disinfectants used are surface disinfectants substances, capable of destroying in short time the micro organisms adherents to the surface, but not into too much depth to them and destroy them.

MATERIAL AND METHOD

The researches were carried in Laboratory *in vitro* culture of the discipline of Genetics and Plant Breeding from U.S.A.M.V. lassy. Biological material, collected in September 2008, was axillary buds (Tsema variety), axillary buds of raspberry and leaf of raspberry (Williamete variety). In conducting research aimed to respect the general protocol making cultures meristems (Reed WB et al, 2004).

For to establish the most effective alternatives to sterilize of the explants, have used the 4 experimental variants in rehearsals by 3:

The first variant: treatment with antifungal Topsin PU 70 (0.1%) and sodium hypochlorite 5%

The second variant: washing with 70% ethanol and sodium hypochlorite 5%

The third variant: treatment with sodium hypochlorite 5% (control variant).

In all variants, were tested 3 times for the exposure of explants to the sodium chloride: 15 minutes (T 15), 20 minutes (T20), 30 min (T30).

Organization experience: 3 rehearsals [x 3 variants (5 x 4 explants)]. The explants after sterilization were introduced in 5 balloons Erlenmayer with 40 ml culture medium of Murashige & Skoog (MS). The explants were inoculated aseptically. The cultures were maintained at $25 \pm 2^{\circ}\text{C}$ under 16 h photoperiod. Subsequently, the cultures were maintained by regular subculture at four week intervals on fresh medium with the same composition.

At 7 and 14 days was determined the percentage of contamination identified visible reporting the number of infected to explant the initial explants. Also at 14 days was determined and the percentage of viable explants.

RESULTS AND DISCUSSIONS

The disinfection of plant material prior to sterilization effect increased in both species studied, but it was not possible a full decontamination of the explants. The efficiency was higher only at the disinfection with hypochlorite for 30 minutes. At the same time this version has a very pronounced phytotoxic effect, the number of viable explants was below 10%, leading to a reduced applicability of this method of sterilization. The use of Topsin in sterilization of biological material ensured the highest proportion for currant explants (table 1) and the raspberry explants (figure 1).

Table 1

Effect of the different sterilization methods on the blackcurrant explants

Sterilization method	Explants	Percentage of contamination (%)	Percentage of viable explants (%)
1. Topsin	T 15 axillary buds	57	69
	T 20 axillary buds	22	53
	T 30 axillary buds	2	12
2. Ethanol	T 15 axillary buds	34	56
	T 20 axillary buds	11	51
	T 30 axillary buds	0	8
3. Control variant	T 15 axillary buds	59	81
	T 20 axillary buds	38	62
	T 30 axillary buds	2	12

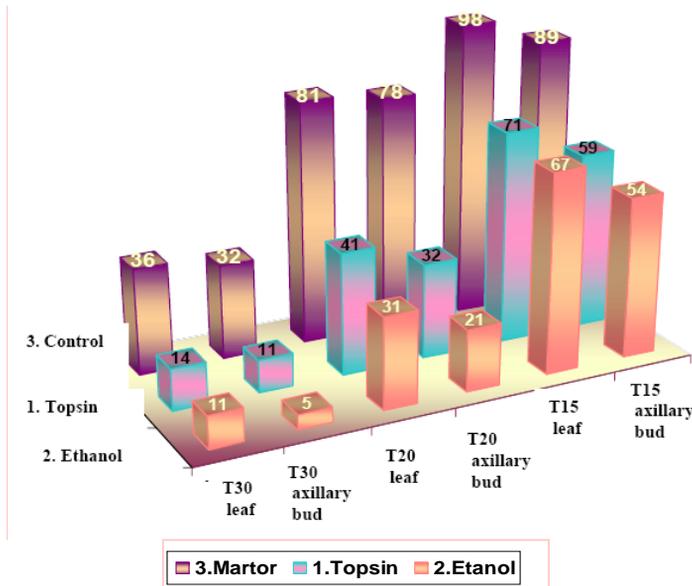


Fig.1. Variation of the percentage of contaminated explants of raspberry depending on sterilization

Decontamination of explants is performed better by washing with ethanol, but the percentage of viable explants in this case is small. The percentage of viable explants increased when used Topsin (fig 2) so that there is a possibility to use higher concentrations of fungicide, ultimately resulting in better sterilization.

The changes of time sterilization with sodium hypochlorite showed an increase in the degree of decontamination with increasing time of exposure, but also phytotoxicity inversely proportional to it. The reaction of explants at the action of sodium chloride depended on the type of the explant. The leaf blade presents an increased sensitivity to the sodium chloride so that the sterilization of these explants can't be achieved only by using pre-treatment with Topsin which allows for the use of a shorter exposure action of sodium chloride.

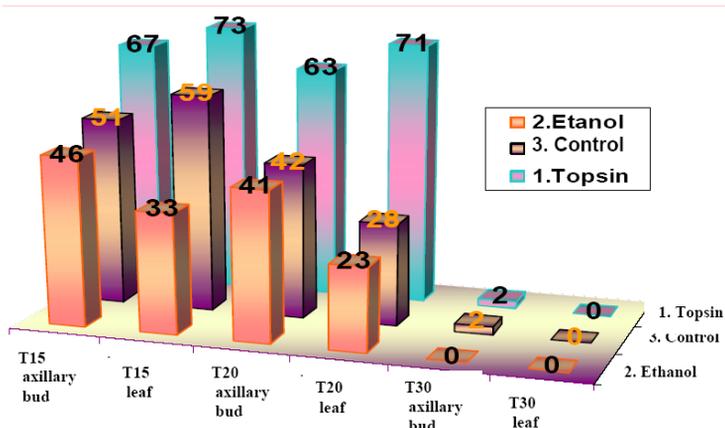


Fig.2. Changes in the percentage of viable explants of raspberry depending on sterilization

Decrease of the percentage of the viable explants in the experimental variants II and III can be caused by a number of endogenous pathogens that can not be removing used of the ordinary disinfectants.

CONCLUSIONS

The degree of contamination of the explants harvested directly from the field of culture was higher than that encountered in the literature for the explants collected from glasshouses or greenhouses.

Increasing exposure time of the explants to hypochlorite sodium from 15 to 30 minutes to ensure a greater number of uninfected explants, but decreases the number of viable explant.

The sterilization with the best results was when to use the disinfection prior Topsis 1% and treated with sodium hypochlorite 5% for 20 minutes.

REFERENCES

1. Badea Elena, Săndulescu Daniela, 2001 - *Biotehnologii vegetale*. Editura Fundația BIOTECH, București.
2. Cousineau J.C., Donnelly D.J., 1991 - *Adventitious shoot regeneration from leaf explants of tissue cultured and greenhouse-grown raspberry*. *Plant Cell, Tiss. Org. Cult.* 27: 249-255.
3. Leifert C., Morris E.C., Waites M.W., 1994 - *Ecology of microbial saprophytes and pathogens in tissue culture and field grown plants: reasons for contamination problems in vitro*. *Critical reviews in plant sciences* 13(2):139-183.
4. Matthews R., Duncan E.J., 1993 - *A method to reduce microbial contamination in in vitro culture*. Third Caribbean Biotechnology Conference 160-166.
5. Reed B.M., Engelmann F., Dulloo M.E., Engels J.M.M., 2004 - *Technical guidelines for the management of field and in vitro germplasm collections*. IPGRI Handbooks for Genebanks No. 7, Rome, Italy (<http://books.google.ro>)

THE EFFECT OF LOCALIZED IRRIGATION ON WATER RESERVES FROM SOIL IN THE SPECIAL CONDITIONS FROM DOBROGEA

EFFECTUL IRIGĂRII LOCALIZATE ASUPRA REZERVEI DE APĂ DIN SOL ÎN CONDIȚIILE SPECIALE DIN DOBROGEA

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Abstract. *Irrigated fruit tree growing is a special category of fruit tree growing, which is clearly superior, irrespective of the pedo-climate area in which practice. The main objective to be achieved through irrigation is to maintain the depth where the spread are the roots of trees, optimum water content. Special conditions of Dobrogea, for the supply of adequate water trees, maintaining the water content of soil above the minimum ceiling (over 50% of IUA) on the depth of 1.0 m in optimum can satisfy their requirements. The data obtained showed that since the end of May reserve of ground water from a depth of 0-1.0 m was close to the minimum ceiling. Consequently, it ordered the implementation rules of irrigation with different norm of wet, specific methods of application located water (drip and micro sprinkler). As such, during the study 2003 and 2004 by applying localized irrigation (drip and micro sprinkler) I wanted to keep the reserve of soil water in the upper part of the active interval humidity.*

Key words: drip irrigation, micro sprinkler irrigation, water content of soil

Rezumat. *Pomicultura irigată constituie o categorie specială de pomicultură care este net superioară, indiferent de zona pedoclimatică în care se practică. Obiectivul principal care trebuie realizat prin irigare este de a menține pe adâncimea unde sunt răspândite marea majoritate a rădăcinilor pomilor, un conținut optim de apă. În condițiile speciale din Dobrogea, pentru aprovizionarea corespunzătoare a pomilor cu apă, menținerea conținutului de apă din sol deasupra plafonului minim (peste 50% din IUA) pe adâncimea de 1 m poate satisface în optimum cerințele acestora. Datele obținute au arătat că încă de la sfârșitul lunii mai rezerva de apă din sol de pe adâncimea de 0-100 cm s-a apropiat de valorile plafonului minim. În consecință, s-a dispus aplicarea irigării cu norme diferite de udare, specifice metodelor de aplicare localizată a apei (picurare și microaspersiune). Ca atare, pe parcursul anilor de studiu 2003 și 2004, prin aplicarea irigării localizate (picurare și microaspersiune) am căutat să menținem rezerva de apă utilă din sol în partea superioară a intervalului umidității active.*

Cuvinte cheie: udare prin picurare, microaspersiune, conținut în apă al solului

INTRODUCTION

Water is an indispensable factor in vital activity of plants, without water is not possible to develop characteristic processes of life.

The main objective which is sought by irrigation of trees consists in maintaining the optimal humidity level for each phenophasis (Mureşan D. and collaborators -1992, Iancu M. and Popa C., 1989).

Researches conducted in Dobrogea (Grumeza N. and collaborators, 1979, P. Ionescu, 1986, Popa C., 1987, Septar L., 2003) highlight the importance and effectiveness of irrigation on the main species in the fruit-growing area (peaches and apricots). Experiments were performed on other species of new fruit-growing plantings outlining the requirements to water trees and favourable effects of irrigation.

Localized irrigation consists in wetting with controlled quantities of water, distributed near the plants, mainly in the root growing area.

Providing a fruit-growing plantation with optimum quantities of water in soil is a measure of maximum importance, but which must be applied taking, strict account of trees necessities.

The paper aims to highlight the effect of localized irrigation on water reserve from soil, in the special conditions of Dobrogea.

MATERIAL AND METHOD

Drip irrigation was performed with two types of drippings Tack (b2) and Tipaz (b3), norm of wet was 18 mm, and the dripping flow was 4l / h for the both types of drippers. Drippers were placed on the pipeline at a distance of 1 m between them.

Micro sprinkler irrigation was realized by two types of micro sprinklers, respectively micro sprinkler with a debit of 12l / h (b4) and a micro sprinkler with a debit of 27l / h (b5). Norm of wet was 30 mm for the first type of micro sprinkler and 60 mm for the second type of micro sprinkler. Micro sprinklers were coupled to the pipeline at different distances, respectively 3 m for the first type of micro sprinkler and 6 m for the second type of micro sprinkler.

To determine the water reserves from soil it was used the gravimetric method (Canarache-1964, quoted by Obrejanu and collaborators). Soil sampling was conducted using a soil probe on different depths, from 0.20 to 0.20 m to 1.0 m.

Moisture content of soil was determined as the weighted average on profile, being expressed as a percentage of dry soil weight.

RESULTS AND DISCUSSIONS

The effect of localized irrigation on water reserves from soils was followed over a period of 2 years, 2003 and 2004 respectively. Each year, the water content obtained in irrigated variants was compared to that obtained in non-irrigated variant witness (b1).

The data in fig.1 regarding water content of soil (% of AHI), in non-irrigated witness (b1) shows that in 2003, during the growing season, it represented 77.05% of AHI in the third decade of the April, then decreased until June, second decade (29.41%) when probably because the amount of precipitation fell, increased to 40.52%. In July and August, the water content of soil (% of AHI) ranged between 13.27 ÷ 24.58%, with a maximum recorded in July, II decade.

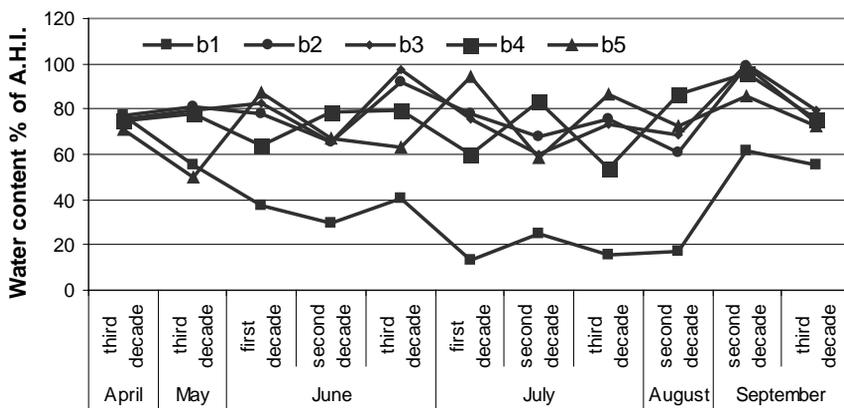
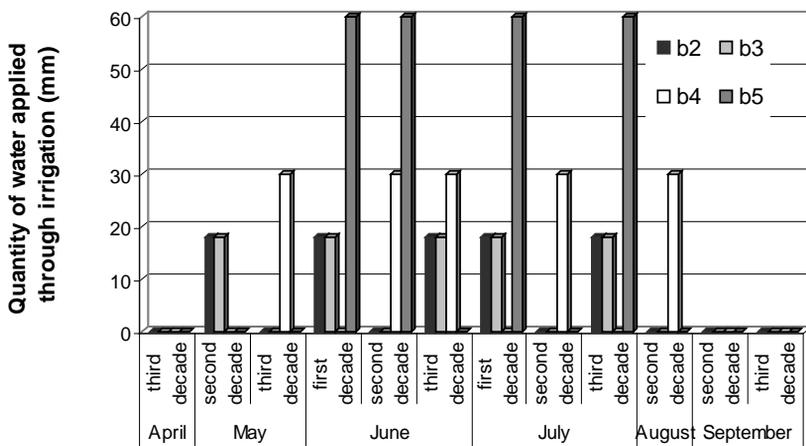
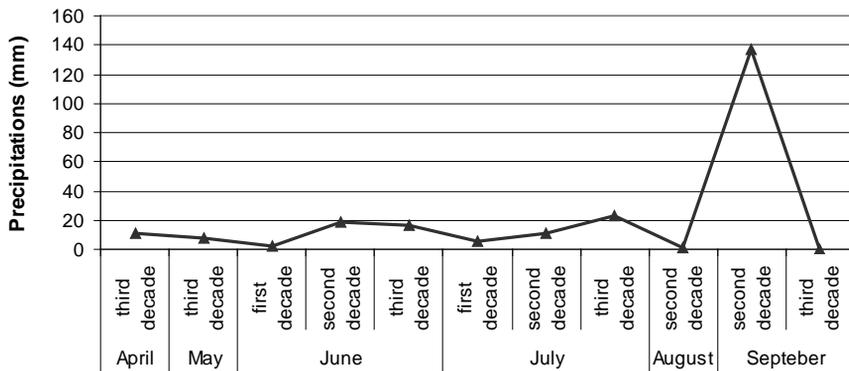


Fig.1. The water content of soil (% of A.H.I.) in irrigated variants compared with non-irrigated variant in 2003

Due to large amount of rainfall recorded in the second decade of the month of September, 136.9 mm respectively, the water content of soil increased to 61.7% of AHI then decreased.

For the drip irrigation variant with the dripper type "Tack" (b2), following the norm of wet (5x18mm) and rainfall fell during the growing season, the water content in soil ranged between 60.98% (second decade-August 2003) and 98.69% (II decade, September 2003).

In the case of drip irrigation with the dripper "Tipaz" (b3), under the same conditions, the water content of soil ranged between 59.67% (II decade, July 2003) and 99.93% (second decade, September 2003).

For the irrigation variant by micro sprinkler with the micro sprinkler with $q = 12 \text{ l/h}$ (b4), after applying the norms of wet (5x30 mm) and the amount of precipitation fell during the growing season, the water content in soil oscillated between 59,8% (I decade, July 2003) and 96,14% (II decade, September 2003).

In the case of micro sprinkler irrigation with $q=27 \text{ l/h}$ (b5), after applying the norms of wet (4x60 mm) and the amount of precipitation fell during the growing season, the minimum value of the water content of soil was in the third decade the month of May, respectively 50.06% and the maximum was 94.31% of AHI and was recorded in the first decade of July 2003.

In the year 2004 (fig. 2), in the witness variant (b1), the water content of soil (% of AHI) was influenced only by the amount of rainfall. This oscillated, in the growing season between 14.15% and (II decade, August 2004) and 64.44% (II decade, July 2004).

Under the influence of the rainfall during the growing season and the quantity of additional water applied by irrigation (54 mm), in the drip irrigation variant with the "Tack" type dripper (b2), the water content of soil ranged between 65.49% (II decade, August 2004) and 99.35% (I decade, June 2004).

As well as, in the drip irrigation variant with the "Tipaz" type dripper (b3), under the same conditions, the water content of soil (% of IUA) recorded a minimum of 62.88% (I decade, May 2004) and a maximum of 100% (I decade, June 2004).

The water content of soil (% of IUA) for the micro sprinkler irrigation with the micro sprinkler with $q = 12 \text{ l/h}$ (b4), the quantity of rainfall and the amount of additional water applied by this wetting method (90 mm), ranged between 42.2% (III decade, July 2004) and 101.11% (III decade, August 2004).

Dates from fig. 2 shows that in the case of micro sprinkler irrigation with $q=27 \text{ l/h}$ (b5), the water content of soil (% of IUA), after rainfall recorded during the growing season and wettings (2x60 mm) ranged between a minimum of 60.65% (I decade, May 2004) and a maximum of 99.15% (I decade, June 2004).

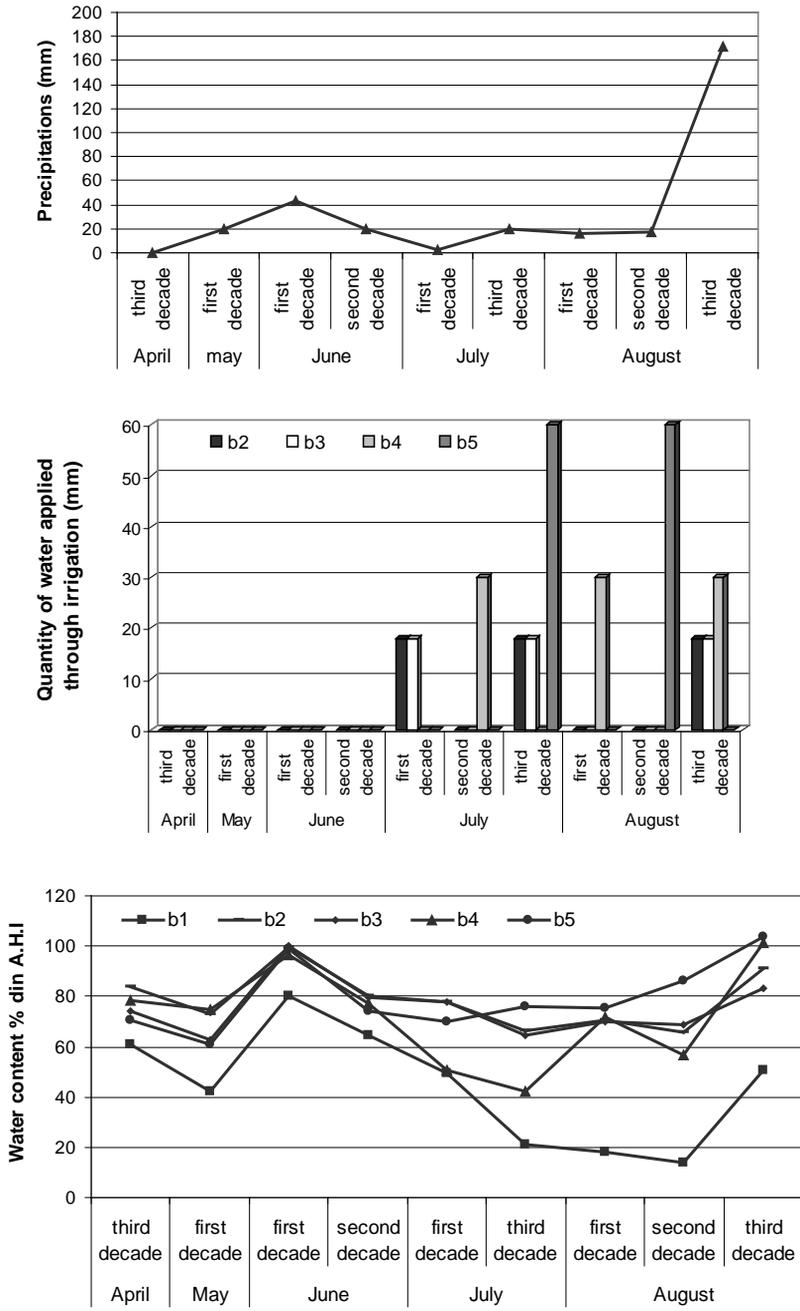


Fig.2. The water content of soil (% of A.H.I.) in irrigated variants compared with non-irrigated variant in 2004

Distribution of rainfall during 2004 has enabled the achievement and maintenance on the depth of 1 m in non-irrigated variant of water content superior to the minimum ceiling of moisture until early July. Decrease of the water content on the depth of 1 m below the ceiling in the first decade of July required first wet on 1 July 2004. However we have to specify that in the irrigation variants, even before the first wet, the values of water content on the depth of 1 m were higher than values recorded in non-irrigated variant, probably due to residual effects of the application of irrigation in the previous year (2003).

During the growing season of 2004, and during 2003, the as a consequence of application of irrigation, the water content of soil was achieved and maintained well above the minimum ceiling of humidity.

CONCLUSIONS

Irrigated fruit tree growing is a special category of fruit tree growing, which is clearly superior, regardless of the area in which pedo climatic practice. Regarding the content of the work was started on the desirability of irrigation, taking into account the specific natural area, characterized by some of its features, such as the precipitation. Researches have aimed to solve the need of irrigation in arid conditions of Dobrogea.

Irrigation of trees is one of the most important technological links. Results obtained by applying a different number of wettings, with wetting rules of 18 mm, 30 mm and 60 mm have highlighted the fact that the water reserve in the soil depth of 1 m, in the two years analyzed, was maintained in the upper humidity range assets (AHI), which provided optimal conditions for the development of fruit trees.

REFERENCES

1. **Grumeza N. and collaborators, 1979** - *Tehnica irigații culturilor hortiviticele*. Editura Ceres, București.
2. **Ionescu Pr., Grumeza N., 1986** - *Irigarea localizată a piersicului în condițiile din Dobrogea*. Lucrări Științifice I.C.P.P. Mărăcineni, vol. XI.
3. **Popa C., 1987** - *Influența irigații mărului în condițiile din Dobrogea*. Lucrări Științifice I.C.P.P. Mărăcineni, vol.XII.
4. **Septar Leinar, 2003** - *Irigarea localizată – un avantaj pentru pomicultura din Dobrogea*. Lucrări Științifice Vol.I (46) Ed.Ion. Ionescu de la Brad, Iași.

INVESTIGATION OF ANATOMICAL STRUCTURE OF GRAFT UNION IN SWEET CHERRY

INVESTIGAȚII ASUPRA STRUCTURII ANATOMICE A ZONEI DE ALTOIRE LA CIREȘ

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Abstract: *The research was aimed to determine the anatomical structure of graft union in some combination of sweet cherry. The study was carried out in the University of Agricultural Sciences and Veterinary Medicine experimental farm during 2007-2008. There were used four scion varieties (Germersdorf, Stella, Van and Boambe de Cotnari), two different rootstocks (Cerasus avium seedling and mahaleb). T budding grafting method was used. Tissue samples were taken twelve months after grafting and fixed in alcohol solution. It was observed from the anatomical structure of graft union area that new cambium, xylem and phloem tissues were formed and there was needed longer time for continuous cambial merging. Some abnormalities were seen at graft union area at some combinations and it was suggested that there could be a not very good compatibility for these graft combinations.*

Key words: grafting compatibility, sweet cherry, anatomical structure

Rezumat: *Scopul principal al lucrării a fost determinarea structurii anatomice a zonei de altoire la unele soiuri de cireș. Studiul s-a desfășurat în ferma experimentală a Universității de Științe Agricole și Medicină Veterinară Iași, în perioada 2007-2008. S-au folosit patru soiuri de cireș (Germersdorf, Stella, Van și Boambe de Cotnari), altoite pe doi portaltoi: cireș franc și mahaleb, sa metodă de altoire folosindu-se altoirea în T cu mugure dormind. Probele de țesuturi s-au prelevat după 12 luni de la altoire și au fost fixate în soluție alcoolică. Din observațiile privind stuctura anatomică a zonei de altoire s-a evidențiat faptul că noile elemente vasculare s-au format într-o anumită proporție și că a fost nevoie de mai mult timp pentru restabilirea continuității vasculare. S-au observat unele anomalii în structura zonei de altoire, ceea ce a condus la concluzia că soiurile au un anumit grad de incompatibilitate cu portaltoiul mahaleb.*

Cuvinte cheie: compatibilitate la altoire, cireș, structură anatomică

INTRODUCTION

Grafted plants are intensely used in fruit production and this is why choosing the best association scion-rootstock is vital. Knowing the changes that occurs at the grafting area makes us understand better the incompatibility mechanism and allowing us to engraft a larger number of varieties on a compatible rootstock.

Researches have long assumed that graft compatibility-incompatibility in plants is determined by a cellular recognition system [8,9]. However this assumption has been made without convincing data, and has been based primarily on evidence implicating cellular recognition in other compatibility responses in plants. The aim of this paper was to determine the anatomical structure of graft union in some combination of sweet cherry and find the implications that could

explain graft compatibility-incompatibility between some varieties and rootstocks. It was found that vascular redifferentiation is the final event that typically occurs in the formation of a compatible graft. At the analyzed combinations, from the anatomical structure of graft union area, was observed that new cambium, xylem and phloem tissues were formed and there was needed longer time for continuous cambial merging. Some abnormalities were seen at graft union area at some combinations and it was suggested that there could be a not very good compatibility for these graft combinations.

The applicability of this study could be the possibility to apply an early selection method that could predict the future of a determinate combination long before the external symptoms can be observed.

MATERIAL AND METHOD

Anatomo-morphologic observations were made using fresh material, taken during the vegetation period (July-August 2008). The probes consisted of 3-4 cm stem fragments of the grafting area, which were fixed afterwards in ethylic alcohol 70°.

In order to diagnostic some aspects of grafting incompatibility there were taken samples from grafted combinations. The sections were made using microtome CUT 6062 Slee Mainz, and there were performed transversal and longitudinal sections through the joining area. Sections thickness varied between 15 – 22µ. The sections were fixed in glacial acetic acid 1% time for 20 minutes. After colouring in metilene blue solution for 20 minutes, probes were washed with distillate water and included in gelatine glycerin. The probes we obtained were analyzed at Motic microscope with size unit 10x18 and objectives 4/0.10 and 10/0.25.

On micro sections there were made observations concerning: xylem vessels orientation; vessels way of arrangement, if they are linear or if they present involution and sinuous aspect, if xylem fascicle is continuous or if it's interrupted in the joining area; vessels frequency determination in transversal section in comparison with other anatomical elements (the was also determined the number of vessels in the grafting area); the presence of lacunars area; medullar rays width; medullar rays continuity or discontinuity; determination of histological elements size (average diameter of xylem vessels); determination of simbiants anatomical resemblance index (I.C.D.P. Piteşti-Mărăcineni).

For determination of simbiants anatomical resemblance index there were made measurements of xylem vessels number and diameter on sections took from combinations scion-rootstock that was studied. With the obtained data there was calculated the simbiants anatomical resemblance index using the formula elaborated by I.C.D.P. Piteşti-Mărăcineni [11]:

$$I. a. at. s. = \frac{\frac{Nr.v.a. / Nr.v.p. + Nr.v.a / Nr.v.p.alt. + Nr.v.p. / Nr.v.p.alt.}{3}}{\frac{\phi v.a. / \phi v.p. + \phi v.a / \phi v.p.alt. + \phi v.p. + \phi v.p. / \phi v.p.alt.}{3}}$$

where: I. a. at. s. = simbiants anatomical resemblance index;

Nr. v. a. = xylem vessels number at 10 cm above the joining area;

Nr. v. p. = xylem vessels number at 10 cm under the joining area;

Nr. v. p.alt. = xylem vessels number in the joining area;

Φ v. a. = vessels average diameter at 10 cm above the joining area

Φ v. p. = vessels average diameter at 10 cm under the joining area;

Φ v. p.alt. = vessels average diameter in the joining area.

RESULTS AND DISCUSSIONS

At sweet cherry varieties the most obvious symptoms of incompatibility were visible differences between scion and rootstock diameter. Grafting success percentage was high so, it can not be correlated with the presence of scion and rootstock's tissues hypertrophies in the grafting area. Analyzing the sections at sweet cherry/mahaleb associations there could be observed that tissues hypertrophy, most of the times, was not associated with serious abnormalities of the vessels. Data from literature presents situations when vessels normal trajectory can occur even years after grafting [7].

In figure 2, which represent transversal section through the grafting area, can be observed xylem vessels and in longitudinal section, from photo 1, there could be observed some areas with vessels discontinuity but on some areas vessels continuity was re-established, fact that drove to trees normal development in the first years after grafting. Also, there could be observed some necrotic spots and areas with undifferentiated parenchyma with small and irregular cells, which form a fragile structure weakening trees resistance in the grafting area.

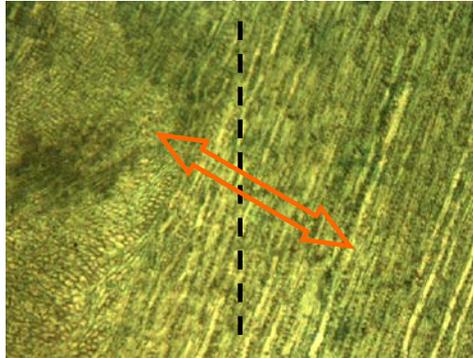


Fig. 1. Longitudinal section through joining area, can be observed vessels continuity (right) and areas with undifferentiated parenchyma and necrotic spots (left), Germersdorf variety

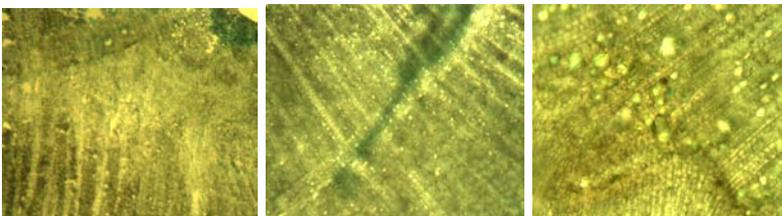


Fig. 2. Transversal section that indicates vessels discontinuity and necrotic spots, Germersdorf variety

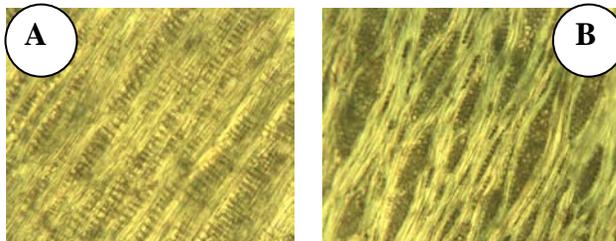


Fig. 3. Normal trajectory of the vessels in the joining area, longitudinal section, A-Stella, B-Van

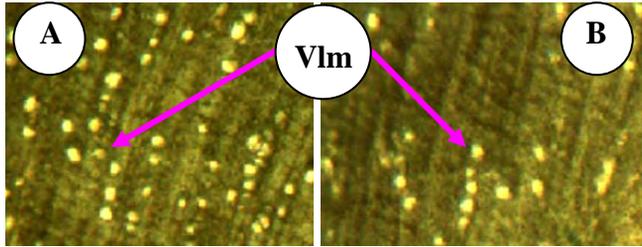


Fig. 4. Xylem vassels aspect in transversal section: A- scion, B – rootstock - Stella variety

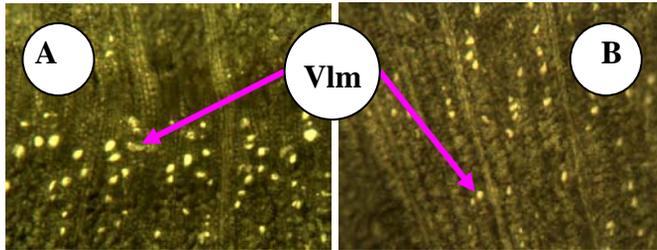


Fig. 5. Xylem vassels aspect in transversal section: A-scion, B-rootstock; - Boambe de Cotnari variety

In figure 3 at heterograft combinations Van/mahaleb and Stella/mahaleb we can see the parallelism and normal aspect of the vessels in the joining area, while in photo 6 are obvious the differences in vessels number determined above and under the grafting area at Boambe de Cotnari variety.

Data concerning sweet cherry varieties level of compatibility drove us to a series of anatomical resemblance index that allowed us to appreciate the varieties compatibility scale with the rootstock. This showed a good compatibility of the varieties grafted on mahaleb, limits of variation of this index varying between 0.98-1.18. Van and Stella varieties had a better compatibility, expressed by value of the index very close to the unit (0.98 respectively 1.01), (fig. 6.).



Fig. 6. Simbiotics anatomical resemblance index at sweet cherry varieties

Table 1

Statistical assurance of xylem vessels number in three analyzed areas at sweet cherry varieties grafted on mahaleb

Variety/Rootstock	Vessels nr. under the grafting area	Difference to the average \pm	Signif.	Vessels nr. in the joining area	Difference to the average \pm	Signif.	Vessels nr. above the grafting area	Difference to the average \pm	Signif.
Germersdorf	46.7	-2.3	0	42.8	-0.7	-	54.3	+2.3	-
Van	47.9	-1.1	-	47.2	+3.7	00	55.8	+3.8	-
Stella	42.8	-6.2	000	38.8	-4.7	00	39.1	-12.9	000
Boambe de Cotnari	58.5	-9.5	000	45.2	+1.7	-	57.5	+5.5	x
Average	49.0	-	-	43.5	-	-	52.0	-	-

DL 5% = 2.30
DL 1% = 3.49
DL 0.1% = 5.60 vessels

DL 5% = 2.06
DL 1% = 3.12
DL 0.1% = 5,01 vessels

DL 5% = 3.74
DL 1% = 5.67
DL 0.1% = 9.11 vessels

Table 2

Statistical assurance of xylem vessels number in three analyzed areas at sweet cherry varieties grafted on mahaleb

Variety/Rootstock	Vessels diameter under the grafting area	Difference to the average (μ)	Signif.	Vessels diameter in the joining area	Difference to the average (μ)	Signif.	Vessels diameter above the grafting area	Difference to the average (μ)	Signif.
Germersdorf	3.06	-0.04	-	2.88	-0.09	-	3.18	-0.01	-
Van	3.01	-0.09	-	2.89	-0.08	-	3.46	+0.27	-
Stella	2.99	-0.11	-	3.01	+0.04	-	2.98	-0.21	-
Boambe de Cotnari	3.32	+0.22	-	3.11	+0.14	-	3.15	-0.04	-
Average	3.10	-	-	2.97	-	-	3.19	-	-

DL 5% = 0.61
DL 1% = 0.92
DL 0.1% = 1.49 μ

DL 5% = 0.24
DL 1% = 0.37
DL 0.1% = 0.59 μ

DL 5% = 0.85
DL 1% = 1.30
DL 0.1% = 2.08 μ

From tables 1 and 2 could be observed that a high number of vessels were determined at Boambe de Cotnari variety (58.5 vessels above the joining area and 57.5 under the joining area) and less vessels at Stella variety (42.8 vessels above the joining area and 39.1 under the joining area). In the joining area of the scion with the rootstock the number of vessels decreased at all four variants but there were big variations at Boambe de Cotnari and Stella. Van and Germersdorf varieties registered less variation in vessels number in the joining area (figures 4 and 5). These negative differences may explain xylem vessels discontinuity between rootstock and scion. Vessels diameter in the grafting area was bigger at Boambe de Cotnari variety (3.11 μ) and smaller at Germersdorf and Van varieties (2.88 and respectively 2.89 μ), but the differences determined in those three analyzed areas were insignificant.

CONCLUSIONS

1. Our results confirm that grafting includes the formation of necrotic layer and its subsequent reduction or elimination. There were observed necrotic spots, but on some parts there was re-established vessels continuity in some proportion, fact that allowed assimilated satisfactory transport and thought, trees normal development and growth in first years after grafting.

2. The incompatible heterografts showed a marked delay in new vascular elements formation explained by the differences in diameter and number determined above and under the joining area.

REFERENCES

1. Aloni R., 1987 - *Differentiation of vascular tissues*. Annual Rev. Plant Physiol. No 38, pg. 179-204.
2. Budan S., Grădinaru G., 2000 – *Cireșul*. Editura Ion Ionescu de la Brad, Iași.
3. Buttner R., 1979 - *Possibilities of early diagnosis of graft incompatibility in fruit trees* Tag-Ber. Akad. Landwirtsch. Wiss. DDR, Berlin 174, pg. 263-267.
4. Cristoferi G. e Santucci A. 1965 – *Osservazioni sulla Conductibilita idrica e sulla struttura anatomica in alcune combinazioni di innesto di Pero*. Tipo Color Firenze. No. 42.
5. Dolgum Oguz, F. Ekmel Tekinatas and Engim Ertan, 2008 – *A histological investigation on graft formation of some nectarine cultivars grafted on Pixy rootstock*. World Journal of Agricultural Sciences 4 (5), pg. 565-568.
6. Ermel F.F., Poessel J.L., Faurobert M., Catesson A.M., 1997 - *Early scion/stock junction in compatible and incompatible pear/pear and pear/quince grafts: a histocytological study*. Annals of Botany (GBR), vol. 79 no. 5, pg. 505-515.
7. Errea Pilar, A. Filipe, M. Herrero, 1994 – *Graft establishment between compatible and incompatible Prunus ssp.* J. Exp. Bot., 45: 393-401.
8. Gulen Hatice 2005 – *Cambial isoperoxidase related to graft compatibility in pear-quince graft combinations*. Turk Journal Agric. For 29, pag. 83-89.
9. Gur A., Samish R.M., 1965 – *The relation between growth curves, carbohydrate distribution and compatibility of pear trees grafted on quince rootstocks*. Hortic. Rev. 5(2).
10. Gurrieri F., Olivier G., Faurobert M., Poëssel J.L., 2001 – *Influence of grafting technique on macroscopical graft incompatibility symptoms: comparison of chip budding and ring budding*. INRA, 12. Congrès International, Avignon (FRA), pg. 10-14.
11. Mladin Gh. Petrescu Silvia, Butac Mădălina, 2006 – *Rezultate preliminare privind unele elemente morfo-fiziologice implicate în conviețuirea simbiotică a soi-portaltoi la cireș*. Lucr. Șt. ICDP Pitești-Mărăcineni, Vol. XXII, pg. 182-189.

INCOMPATIBILITY ASPECTS THAT APPEAR IN SCION-ROOTSTOCK ASSOCIATION AT SOME PEAR AND PLUM VARIETIES

ASPECTE ALE INCOMPATIBILITĂȚII EVIDENȚIATE ÎN ASOCIAȚIA ALTOI-PORTALTOI, LA UNELE SOIURI DE PĂR ȘI PRUN

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Abstract: *It is known that fruit production is in a permanent interaction because of scion-rootstock association and because of this it is necessary to chose very carefully the varieties which have to be engrafted on the best rootstock adequate for the climatic zone where the new plantation will be set. The rootstock vigour has a very important role in variety's growing and fructification engrafted on it (4). This is why knowing the influences of physiological and biochemical processes upon association scion-rootstock has a major importance. Compatibility is a very important characteristic too because we could engraft a larger number of varieties on a compatible rootstock and this make it valuable.*

Key words: incompatibility, pear, plum, scion, rootstock.

Rezumat: *Este cunoscut faptul că producția este condiționată de permanenta interacțiune a asociației altoi-portaltoi și datorită acestui fapt este necesar a se alege cu foarte mare atenție combinația soi-portaltoi cea mai bună la altoire. În același timp, este foarte important ca materialul săditor să fie bine adaptat la condițiile de mediu specifice zonelor unde se vor înființa noile plantații. Vigoarea portaltoiului este un alt aspect ce influențează vigoarea de creștere a soiului și nivelul producției (4). Din acest considerent, cunoscând influența proceselor fiziologice și biochimice asupra asociației altoi-portaltoi rezultatele cercetărilor proprii ne-ar putea furniza mai multe informații în acest domeniu. Compatibilitatea este, de asemenea, o caracteristică foarte importantă, deoarece ne permite altoirea unui număr foarte mare de soiuri pe un portaltoi cu care soiurile au o afinitate foarte bună, obținând astfel, un material foarte valoros.*

Cuvinte cheie: incompatibilitate, păr, prun, altoi, portaltoi.

INTRODUCTION

Plants photosynthetic activity is determined by complex physiologic processes and an important role in first stages of trees development have growth processes. While studying some physiological aspects of scion-rootstock association we find necessary to took into consideration some biometric parameters also. These allowed us to analyze the photosynthetic apparatus and also the whole plant.

The activity of photosynthetic apparatus depends on metabolism intensity of the whole plant, donor-receiver relations, and environment adaptation (7). And photosynthetic activity is influenced by many exo and endogenous factors which could change photosynthetic apparatus structure and functions. This could be a premise of cellular metabolism modification, of which intensity depend the biologic productivity (9).

The present studies aim some aspects of the relations between photosynthetic apparatus and plant vital metabolism. A special attention was given to the assimilators pigments. There were analyzed the relations between grafting success percentage, shoots growing and thickness morphological index of the grafting zone as results of a good activity of photosynthetic apparatus.

MATERIAL AND METHOD

The researches were made during 2004 – 2007 and there were studied some pear and plum varieties. Pear varieties are Curé, Euras, Contesa de Paris and Williams and plum varieties are Stanley, Pescăruș, Centenar and Tuleu gras. Grafting method used was T budding. For pear was used as rootstocks a selection of *Pyrus sativa* Lam. and *Cydonia oblonga* Mill. and for plum a selection of *Prunus domestica* L. and *Prunus cerasifera* Ehrh. The studies were carried out in Iasi, in V. Adamachi Experimental Farm of the Fruit Growing Department.

The aim was observing the behaviour of those varieties grafted on two different rootstocks. There were made biometrical measurements and was determined dry substance content (Somogy Nelson method) and assimilators pigments content (spectrophotometric method) (1). Grafting compatibility was evaluated by using the thickness morphological index of the grafting zone introduced by ICDP Pitești Mărăcineni. The index is the ratio between scion transversal surface, rootstock transversal surface and grafting zone transversal surface. When the index has values higher than 0.33 varieties were appreciated as having very good compatibility, when the index is between 0.30 – 0.33 the compatibility is good and when the index is under 0.30 the compatibility is poor (2).

RESULTS AND DISCUSSIONS

Studying some growth and photosynthetic index at *Pyrus sp.* and *Prunus sp.* showed that those depends on variety biological characteristics and in the same proportion on rootstock used for grafting.

Table 1

Variety and rootstock mutual influence upon scion offshoot growth high

Variety	Rootstock	Scion offshoot high (cm)	Relative high (%)	± d (m)	Signification
Curé (control)	<i>Pyrus sativa</i> Lam.	142.20	-	-	-
Euras		156.50	110.0	+0.14	-
Countess of Paris		110.70	78.0	-0.31	0
Williams		102.30	72.0	-0.40	00
Curé	<i>Cydonia oblonga</i> Mill	102.00	72.0	-0.40	0
Euras		137.50	97.0	-0.05	-
Countess of Paris		77.00	54.0	-0.72	000
Williams		54.00	38.0	-0.88	000
DL 5% = 0.26		DL 1% = 0.36	DL 0.1% = 0.49		
Stanley (control)	<i>Prunus domestica</i> L.	131.00	-	-	-
Pescăruș		127.50	97.0	-0.04	-
Centenar		89.20	68.0	-0.42	000
Tuleu gras		87.70	67.0	-0.44	000
Stanley	<i>Prunus cerasifera</i> Ehrh.	143.50	110.0	+0.12	-
Pescăruș		133.00	102.0	+0.02	-
Centenar		67.60	52.0	-0.64	000
Tuleu gras		52.50	40.0	-0.79	000
DL 5% = 0.21		DL 1% = 0.29	DL 0.1% = 0.41		

The influence of scion-rootstock association upon the studied indexes is not the same, though; a moderate growth is in direct correlation with a good capacity of shoots formation, a medium trunk thickness, a balanced distribution of assimilates. All these show an optimum relation between root system and epigeous part.

Table 1 shows the biometric data of studied varieties depending on the used rootstock and variety and rootstock mutual influence upon scion offshoot growth high. As for the appreciation of varieties growth, grafted on two different rootstocks, this was made with the help of the biometric data concerning scion offshoot high, the thickness upper, under and in the joining zone. Using these data we could make some valuations of variety-rootstock mutual influence upon scion offshoot growing. Analyzing the offshoots growth high variation and the variety-rootstock mutual influence upon scion offshoot growing at studied pear varieties (comparing with the control, Curé variety grafted on a *Pyrus sativa* selection) we can see that this varied between 72 – 110% when varieties were grafted on *Pyrus* selection and 38 – 97% when *Cydonia* selection was used. The differences we found are statistically assured and there were very significative at Countess of Paris and Williams varieties grafted on *Cydonia* selection (table 1). At plum varieties we could observe the same negative influence on offshoot growth high at Centenar and Tuleu gras varieties. Concerning the grafting success percentage, there can be noticed differences between varieties grafted on the same rootstock and especially when there were used different rootstocks. And could be noticed varieties different compatibility when were grafted on those two rootstocks. Thus, Williams is the variety with the lowest grafting success, 69% grafted on *Pyrus sativa* and only 40% when grafted on *Cydonia oblonga*. At plum, Centenar and Tuleu gras registered the lowest grafting success percentage, 66 and 49%. Analyzing table 1 we could also observe that low grafting percentage success correlates with reduced scion offshoot high.

Researches concerning the thickness morphological index of the grafting zone regarding symbionts anatomical resemblance allowed us to make some valuations upon grafting compatibility. In order to determinate this index there was measured rootstock diameter at ten centimetres under joining zone, scion diameter at ten centimetres upper the joining zone and the diameter measured in the joining area. After the measures were made in all 3 zones of the tree there were obtained interesting data which could explain better the scion-rootstock affinity phenomenon. From the researches with pear and plum varieties grafted on different rootstocks results that there is a direct correlation between the morphological index of the grafting zone and grafting success percentage. When the morphological index of the grafting zone has a small value, the grafting success percentage is also small and when the index's value is high the success percentage is also high.

Chlorophyll determinations were made using leaves from varieties and rootstocks, during the period of vegetation and they showed some content differences depending on the specie and variety genetic heritage (6).

In table 2 can be observed the result of dry substance determination in pear varieties leaves. Though, when grafted on *Pyrus* selection the varieties had a higher content of dry substance comparing with the variant when the varieties were grafted on quince. The biggest amounts of dry substance were accumulated by Curé and Euras varieties at both variants of grafting. The bigger differences on dry substance content that appear at the grafting on *P. cerasifera* of Centenar and Tuleu gras shows a reduced capacity of dry substance synthesis and a lower flow of glucides through grafting zone (table 5). Also, these varieties registered a lower accumulation in chlorophyll and carotenes pigments (figure 2) comparing with Stanley and Perscăruș varieties which showed a better compatibility at grafting on both rootstocks.

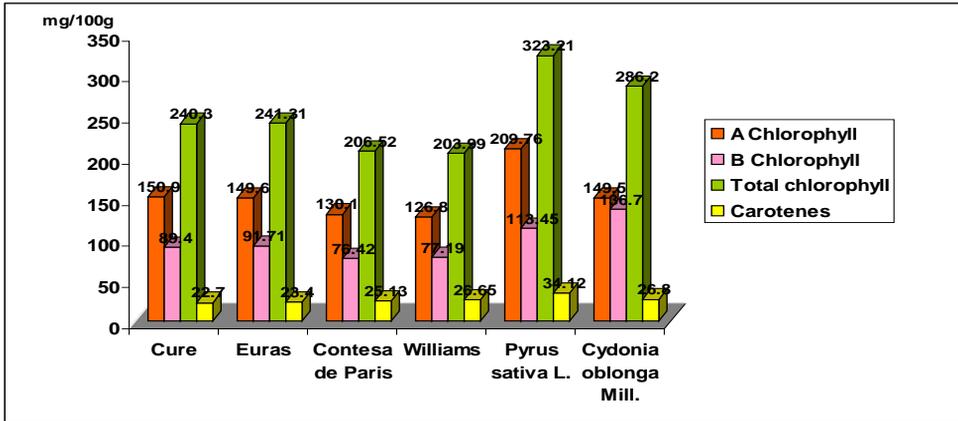


Fig. 1. Chlorophyll and carotenes pigments content of pear varieties and rootstocks used for grafting combinations (mg/100 g)

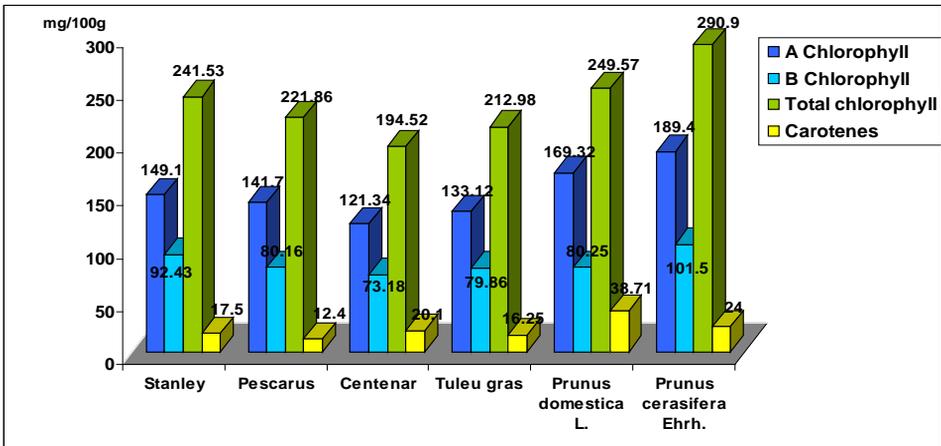


Fig. 2. Chlorophyll and carotenes pigments content of plum varieties and rootstocks used for grafting combinations (mg/100 g)

Table 2

Pear varieties dry substance

Variety	Rootstock	Dry substance (%)	Difference to the control	Signif.
Curé (control)	<i>Pyrus sativa</i> Lam.	57.89	-	-
Euras		57.58	-0.31	-
Countess of Paris		55.19	-2.70	0
Williams		54.27	-3.62	00

DL 5% = 2.67 DL 1% = 4.04 DL 0.1% = 6.49

Curé	<i>Cydonia oblonga</i> Mill.	54.57	-3.32	-
Euras		54.61	-3.28	-
Countess of Paris		52.33	-5.56	0
Williams		50.31	-7.58	00

DL 5% = 4.43 DL 1% = 6.71 DL 0.1% = 10.78

Table 3

Grafting zone morphologic evaluation of used pear varieties

Variety/Rootstock	Tree section area (cm ²)			Thickness difference between the scion and rootstock (cm ²)	The thickness morphological index of the grafting zone
	Upper the joining zone	Under the joining zone	In the joining zone area		
Curé/ <i>Pyrus sativa</i> Lam.	1.36	1.78	2.18	0.40	0.41
Euras/ <i>Pyrus sativa</i> Lam.	1.24	1.49	1.78	0.25	0.46
Countess of Paris / <i>Pyrus sativa</i> Lam.	1.60	2.13	2.45	0.52	0.30
Williams/ <i>Pyrus sativa</i> Lam.	2.21	2.62	3.10	0.41	0.27
Curé/ <i>Cydonia oblonga</i> Mill.	0.60	1.16	1.43	0.56	0.36
Euras/ <i>Cydonia oblonga</i> Mill.	0.65	1.05	1.49	0.42	0.35
Countess of Paris / <i>Cydonia oblonga</i> Mill.	1.20	1.72	2.80	0.52	0.24
Williams/ <i>Cydonia oblonga</i> Mill.	2.77	3.29	4.04	0.52	0.20

Table 4

Grafting zone morphologic evaluation of used plum varieties

Variety/Rootstock	Tree section area (cm ²)			Thickness difference between the scion and rootstock (cm ²)	The thickness morphological index of the grafting zone
	Upper the joining zone	Under the joining zone	In the joining zone area		
Stanley/ <i>Prunus domestica</i> L.	1.36	1.71	2.26	0.35	0.35
Pescăruș/ <i>Prunus domestica</i> L.	0.88	1.26	1.71	0.38	0.40
Centenar/ <i>Prunus domestica</i> L.	1.07	1.51	1.67	0.44	0.42
Tuleu gras/ <i>Prunus domestica</i> L.	1.60	2.13	2.95	0.53	0.25
Stanley/ <i>Prunus cerasifera</i> Ehrh.	1.28	1.81	2.34	0.53	0.30
Pescăruș/ <i>Prunus cerasifera</i> Ehrh.	0.70	1.13	1.83	0.43	0.33
Centenar/ <i>Prunus cerasifera</i> Ehrh.	0.55	1.15	1.98	0.60	0.24
Tuleu gras/ <i>Prunus cerasifera</i> Ehrh.	0.58	1.30	1.93	0.72	0.23

Table 5

Plum varieties dry substance

Variety	Rootstock	Dry substance (%)	Difference to the control	Signif.
Stanley (control)	<i>Prunus domestica</i> L.	55.26	-	-
Pescăruș		55.63	+0.37	-
Centenar		49.54	-5.72	0
Tuleu gras		50.32	-4.94	0
DL 5% = 4.94 DL 1% = 7.49 DL 0.1% = 12.03				
Stanley	<i>Prunus cerasifera</i> Ehrh.	53.73	-1.53	0
Pescăruș		52.82	-2.44	0
Centenar		43.92	-11.34	00
Tuleu gras		44.84	-10.42	00
DL 5% = 4.97 DL 1% = 7.53 DL 0.1% = 12.09				

CONCLUSIONS

The lack of affinity of incompatible associations could be observed by: localized forms of incompatibility, in the joining zone; lower percentage of grafting success; lower value of thickness morphological index of the grafting zone; the accumulation of big quantities of dry substance above joining zone.

Leaves content in dry substance is correlated with varieties and rootstocks synthesis potential (chlorophyll and carotenes pigments).

At the associations with poor compatibility and poor joining (*Centenar/Prunus cerasifera*, *Williams/Cydonia oblonga*) could be noticed a significant lower content in dry substance comparing with trees that had a normal development.

The disturbances that appear in assimilated circulation are the result of a low development of roots and glucides stagnation above joining line, fact that determines the scion growing in diameter and also the joining zone at incompatible associations or with a poor compatibility.

REFERENCES

1. Burzo I., Dobrescu Aurelia, Mihăiescu D., 2002 - *Fiziologia plantelor horticole*. Editura Ceres, București.
2. Braniste N., Khalil M. A., Popescu Irina, 1986 - *Aspecte morfo-anatomice ale compatibilității soi-portaltoi la unele combinații de altoire la păr*. Lucrări Științifice ale I.C.P.P. Pitești-Mărăcineni, vol. XI, Editura Tehnică Agricolă, Ministerul Agriculturii și Alimentației, Academia de Științe Agricole și Silvici, Direcția Generală Economică a Horticulturii, București, p.237-243.
3. Cepoiu N., 1968 - *Metode statistice aplicate în experiențele agricole și biologice*. Editura Agro-Silvică, București, România.
4. Cociu V., Botu I., Minoiu N., Pasc I., 1997 - *Prunul*. Editura Conphys, București, România.
5. Evans W. D., Hilton R. J., 1957 - *Methods of evaluating stock-scion compatibility in apple trees*. Canada Soc. of Plant Sci. No. 37.
6. Feucht W., 1988 - *Graft incompatibility of tree crops: an overview of the present scientific status*. Acta Hort (ISHS), 227.
7. Holubowicz R., Holubowicz T., 2003 - *Fruit trees and bushes nursery production*. Wydawnictwo Akademii Rolniczej im. Augusta Cieszkowskiego, Poznan, Poland.
8. Șișcanu Gh., Druță Ala, 1995 - *Investigații în domeniul fotosintezei ciresului*. Editura Știința, Chișinău, Rep. Moldova.

THE EXPLORATION OF KOREAN SPONTANEOUS FLORA FOR INTRODUCING SOME INTEREST SPECIES IN ROMANIA

EXPLORAREA FLOREI SPONTANE COREENE ÎN SCOPUL INTRODUCERII ÎN ROMÂNIA A UNOR SPECII DE INTERES

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Abstract: Republic of Korea enjoys similar climatic conditions to those in Romania; there are wide variations of temperature and precipitation. The mean temperature throughout the four seasons ranges from 5°C to 16°C and rainfall from 500 to 1.500 millimeters. Such an environment makes the land a diversified floral region. Lee Woo-tchul's *Lineaments Florae Korea* (1997) listed 190 families, 1.079 genera, 3.129 species, 8 subspecies, 627 varieties, 1 subvariety and 306 forms of higher plants, including pteridophytes. This means that more than 4.000 kinds of vascular plants, including about 570 endemics currently grow in the country. Known been do the diversity of flora in the both countries, namely Romania and Korea, a team of researchers from the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, and a team of researchers from the National Horticulture Research Institute Suwon, involved in the research project having the title "Investigation of ornamental plant germplasm and exchange of breeding technology" initiated shares knowledge and collection of spontaneous flora in the both countries, enabling them to conserve the novelties in collections and to recommend for use in some breeding programs. The present paper shows some areas of South Korea that have been explored and important species from this area.

Key words: germplasm, ornamental plant, spontaneous flora, South Korea, Romania.

Rezumat: Republica Korea beneficiază de condiții climatice asemănătoare celor din România, acolo există variații largi de temperatură și precipitații. Temperatura medie pe tot parcursul celor patru anotimpuri variază de la 5°C la 14°C și precipitații de la 500 la 1500 mm/an. Un astfel de mediu face posibil crearea unor condiții prielnice unei flore foarte diversificate. Lee Woo-tchul's *Lineaments*, în „*Florae Korea*” (1997) citează 190 familii, 1.079 genuri, 3.129 specii, 8 subspecii, 627 varietăți, 1 subvarietate și 306 de plante superioare, incluzând Pteridophyte, inclusiv 400 de plante endemice care cresc în această țară. Cunoscută fiind această diversitate a florei din cele două țări, respectiv România și Coreea, un colectiv de cercetători de la Universitatea de Științe Agricole și Medicină Veterinară Cluj-Napoca, și un colectiv de cercetători de la National Horticultural Research Institute Suwon în cadrul proiectului de cercetare cu titlul „Investigarea fondului de germoplasmă la plantele ornamentale și schimburi de tehnici de ameliorare” au inițiat acțiuni de cunoaștere și colectare a florei spontane din cele două țări, care să le permită conservarea acestora în colecții și recomandarea pentru utilizarea unora în lucrări de ameliorare. Lucrarea prezintă

câteva zone din Coreea de Sud care au fost explorate și speciile importante din arealul respectiv.

Cuvinte cheie: fond germoplasmă, plante ornamentale, flora spontană, Coreea de Sud, România.

INTRODUCTION

South Korea is located in the southern part of Korean Peninsula in East Asia and include an area predominant mountainous (73% of Korea), cumulate over 1100 plant species, of which over 150 species of trees, over 700 species of medicinal plants, 200 species of edible plants and 450 species used in industry. National flower of Korea is *Hibiscus syriacus*. Most species present medicinal properties and the most important species is *Panax ginseng*, the roots of ginseng the famous elixir of youth.

This paper presents some areas with prospected plants in South Korea, in the frame of international bilateral research project CB 18/06.06.2008 (project manager Prof. Dr. Maria Cantor), which was aimed to investigate spontaneous floral species from Korea, in order to improving the Romanian assortment.

The study visit took place between 14-24.11.2008 with a group of researchers from the USAMV, at the National Horticulture Research Institute Suwon, South Korea, in the following locations: Jeju Island, Seoul and Suwon. The visit was conducted under a program established by the Korean partners, leaded by project director Dr. Hyang-Young Joung, in collaboration with researchers Dr. Cho, Hae-Ryoung and Dr. Park Sang-Keune.

MATERIAL AND METHOD

For fulfill the aim of the project, the group of researchers from Romania made the first step of the visit (16.11.2008) in the area Hallasan Moorland (fig. 1) situated 1100 m altitude, at the foot of the volcano Halla, where grow 58 species of plants such as dwarf aquatic vegetation such as: *Allium*, *Iris*, *Orchis*, *Ilex crenata*, *Acer japonicum*, *Echinosophora koreensis*, *Sasa korean*, *Terauchi anemarrhenae folia*.



Fig. 1. Hallasan Moorland

Cymbidium is a basic genus of orchid industry from South Korea. The country has an area of 331,6 ha, which represent 25,7% of all plants grown in pots.

After followed a visit effectuated by the researcher's team at a private Orchid Farm, situated 30 km from the city of Jeju in Seogwipo, owned by Heo Jae Soon, which grow mostly genus like the above, in protected areas (fig. 2).

At this farm annually produces around 30.000 pots, using 20 varieties of orchids, with different colors, that are propagated in vitro. Cultures were set up for export to China and Japan. In the visit they had a discussion with Ki Seong-Cheol researcher, who works on improving the orchids breeding technology.

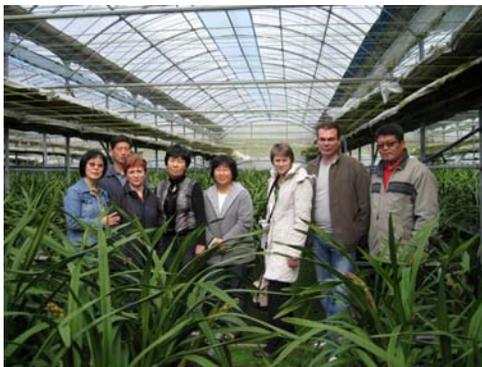


Fig. 2. Private orchid farm

The program were completed with the visit of Hallim Park (fig. 3), which was founded in 1971, and included the following sectors: Palm Tree Avenue (basic attraction of the park), Hyeopjae Cave, the Bonsai Garden, Village Museum, Birds Garden, exhibition of Jae - Am Stones, Water Garden (with many water lilies and lotus) and Subtropical Botanic Garden (including over 2000 exotic species), and the *Chrysanthemum* exhibition. Here we met many native species in Korea such as *Farfugium japonicum*, *Aster koraiensis*, *Cardamine violifolium* and *Hepatica maxima*.



Fig. 3. Hallim Park

Corresponding with the program, in 17.11.2008, the group visited and established new contacts, at the Rural Development Administration of the National Institute of Horticulture Subtropical Plants and the Center for Agricultural Research Plant.

The same day, the group had an impressive visit to a private Botanical garden "Banglimwon" with spontaneous plants which amounted to countless arrangements

with native plants from Halla Mountains area, a lot of orchids on tuff, fern and an exhibition of Bonsai. The president of the garden HanSuk Bang (fig. 4) has published a book with ferns from Korean flora which was presented and donated to the group of researchers from Cluj. The information about the 4000 species existing in this garden has been given by administrator of the garden, Song Pil, Lee.



Fig. 4. HanSuk Bang's the president of the Private Garden

Our visit continued on 18.11.2008, at the Botanical Garden Yeomiji (fig. 5) where the Romanian researchers were led by Ho Chang OH. This garden shows 2 major sectors: one with inside plants and one with outside plants.

The inside garden has an area of 12 ha, including 5 sectors: Floricultural plants garden, Water lily Garden, Garden of Cacti and succulent plants, garden with plants from the jungle and tropical garden species. The botanical garden offers space for 1200 species of plants and 800 inside and outside species.



Fig. 5. Yeomiji Botanical Garden

Here we encountered rare species such as *Cymbidium kauran*, *Hibiscus hambo*, *Neofinetia falcate* and over 1 million visitors come yearly in this garden, to see the gorgeous plants.

In the running program, the researchers from Cluj USAMV visited University of Jeju where they had a meeting and agree for a partnership bilateral agreement with the leadership of Jeju National University (fig. 6) and the teachers from the disciplines of the Floricultural and Biotechnologies. The following day (19.11.2008), they had a

meeting with the leadership of the National University of Horticulture and Medicinal Plants in Suwon.

On 20.11.2008, the group visited the headquarters of the Rural Development Administration (RDA) from Soeul, where they was greeted by the unit director Sang-Jo Kang, director Hyung Gwan Goh and many scientific researchers.

After that they went to visit the Wild Seed Center, which ended with a discussion at the Department of International Relations, RDA.



Fig. 6. Jeju National University

In the data of 21.11.2008 the group took part in the exchange of flowers and than they visited the largest flower market in Seoul "Yangae-Dong" (fig. 7).

In the last day, the Romanian group visit the laboratories and experimental fields for floral plant breeding: chrysanthemum, gerbera, carnations, freesia, lilies, cacti and some spontaneous species and they had meet and discuss with floral researchers about their research objectives, technology and the possibilities for the future collaboration.

Prospecting and monitoring the spontaneous flora of Suwon was carried out in 22.11.2008. In those visits were made some biological material exchanges and breeding techniques "*in vivo*" and "*in vitro*".



Fig. 7. Yangae-Dong flower market

CONCLUSIONS

During the visit, the group of researchers from UASVM Cluj Romania has received a lot of information consisting in books and leaflets of specialty CD with many floricultural plants.

There have been exchanges of biological material such as:

- 30 varieties of *Gladiolus*, some of which were created at NHRI Korea which will be studied and acclimatization in the didactical floral collection of UASVM Cluj;

- it was introduced a new floral specie - *Leucocoryne ixioides* (Glory of the Sun), which is native of Chile, scented and colored, that specie isn't cultivated in Romania yet;

- four species of orchids, multiplied *in vitro* - *Cymbidium virescens* var. Empero's Crown, *Cymbidium virescens* var. Golden Flower, *Calanthe syboldii*, *Lyparis* which were divided and acclimated at UASVM Cluj, to promote in horticultural production of Romania.

The received orchid species are endemic in Korea and will be multiplied for the first time in Europe.

REFERENCES

1. Cantor Maria, Pop Ioana-Delia, 2008 - *Floricultură – Baza date*. Ed. Todesco, Cluj.
2. Jung-Myung Lee, Geun-Won Choi, Jules Janick, 2007 - *Horticulture in Korea*. Korean Society for Horticultural Science, Korea
3. <http://minsok.chonbuk.ac.kr/eng/teuksan/index.html>
5. <http://en.wikipedia.org/wiki/Hallasan>

RESEARCH REGARDING THE INFLUENCE OF VINASSA FERTILIZATION ON *GOMPHRENA GLOBOSA* SPECIE

CERCETĂRI PRIVIND INFLUENȚA FERTILIZĂRILOR CU VINASSA ASUPRA SPECIEI *GOMPHRENA GLOBOSA*

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Abstract: *The paper presents the results of the experiments done at Gomphrena globosa specie, at which were applied fertilization with vinassa product (sub-product obtained after the evaporation of the residual waters from bakery yeast factories) in three doses as follows: 3 t/ha, 5 t/ha, 7 t/ha. Were made observations on morphologic and morph-anatomic behaviours of plants and on other side was made a study regarding biotic and enzymatic potential of soil. The height increase and flowering capacity were stimulated by application of vinassa no matter which was the utilised dose. Stem anatomic structure recorded modifications, mainly, at application of maximum doses, in the way of a better representation of the tissues from quantitative and quality point of view. At soil level, fertilization with vinassa leads to an increase of soil reaction to moderate alkaline domain.*

Key words: *Gomphreana globosa, vinassa, fertilization*

Rezumat: *Lucrarea prezintă rezultatele experiențelor efectuate la cultura de Gomphrena globosa, la care s-au aplicat fertilizări cu produsul vinassa (subprodus obținut în urma procesului de evaporare a apelor reziduale de la fabricile de producere a drojdiei de panificație) în trei doze și anume: 3 t/ha, 5 t/ha, 7 t/ha. S-au făcut determinări pe de o parte asupra însușirilor morfologice și morfo-anatomice ale plantelor, iar pe de altă parte, un studiu al potențialului biotic și enzimatic al solului. Creșterea în înălțime și capacitatea de înflorire au fost stimulate prin aplicarea vinasei indiferent de doza utilizată. Structura anatomică a tulpinii înregistrează modificări, îndeosebi, la aplicarea dozelor maxime, în sensul unei mai bune reprezentări a țesuturilor atât din punct de vedere cantitativ, cât și calitativ. La nivelul solului, fertilizarea cu vinasa a determinat o creștere a reacției solului spre domeniul moderat alcalin.*

Cuvinte cheie: *Gomphreana globosa, vinassa, fertilizare*

INTRODUCTION

Vinassa is a sub-product obtained from the residual waters resulted during obtaining of beer yeast. In Romania the product is processed at Yeast factory from Pașcani and was homologated as fertilizer in 2003. In other European countries vinassa results after the distillation process of sugar beet molasses, but in Central and South America is used molasses from sugar cane.

Vinassa product determined increases of production phytomass statistical assured (Ionel A. et al., 2000; Chelariu Elena-Liliana and Ionel A., 2005; Chelariu Elena-

Liliana, 2007) and influenced the chemical composition of the fodder obtained from the pastures by increasing content of crude protein, potassium, calcium and the decrease in crude cellulose content, phosphorus and magnesium (Vintu V. et al., 2003).

MATERIAL AND METHODS

Experience was set up at University of Agricultural Sciences and Veterinary Medicine, in the didactic field of Floriculture discipline, being organized in randomized blocks, with three repetitions. Researches were made regarding the influence of radicular fertilizations with vinassa on *Gomphrena globosa* L specie.

Vinassa product is presented as a dark-brown liquid, with a quite low viscosity, with caramel smell (unpleasant due to the presence of phenols) and with a sour-sweet taste. It have a complex chemical composition, being rich in total nitrogen (3.0-3.2%), very rich in potassium (5.0-7.0%) and poor in phosphorous (0.3-0.5%). Also it has quite great amounts of calcium, sodium, magnesium, iron, copper, zinc.

Fertilization with vinassa was made in three different doses, respectively 3 t/ha, 5 t/ha and 7 t/ha, so that were obtained the following experimental variants: Control – unfertilized; V₁ – fertilized with vinassa 3 t/ha; V₂ – fertilized with vinassa 5 t/ha; V₃ – fertilized with vinassa 7 t/ha.

Biometric determinations: evaluation of height growth, ramification degree and plants' flowering capacity. Recorded dates were statistical analysed and are presented in synthesis graphs and tables.

Morph-anatomical analyses were made observations which put in light some modifications appeared at the tissues and organs level, function of applied treatment and used concentrations. To observe structure details of the studied material (stem) were made microscopical samples (Toma C. and Gostin Irina, 2000).

Pedo-ecologic and bio-pedology researches were made during vegetation period on soil resources. The studies were achieved also in field, through stationary method, and also in laboratory on soil samples gathered form experimental variants placed on a hortoc antrosol.

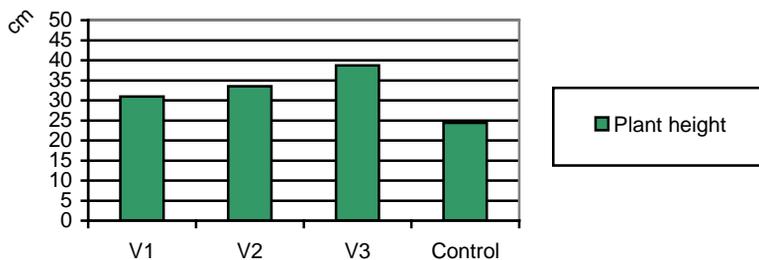
Were analysed the main features of the bio-type, regarding ecologic, areal and local context, by *studying the soil quality features* and by using the *form of specific ecologic of the eco-pedo-top*.

RESULTS AND DISCUSSIONS

Biometric determinations

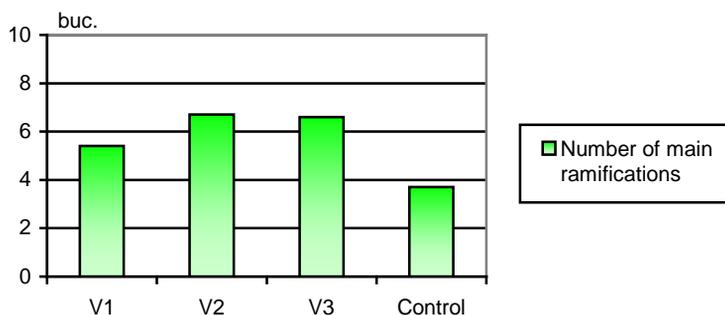
The height growth differences of plants record values from 58.6% (V₃) and 27.0% (V₁) face to control, with very positive significations (fig. 1).

Number of stem ramifications at fertilized variants overpass control with 45.9% at V₁, with 81.0% at V₂ and with 78.4% at variant V₃, at all of them the differences being very significant (fig. 2).



DL 5% = 2.5 cm; DL 1% = 3.7 cm; DL 0.1% = 6.0 cm

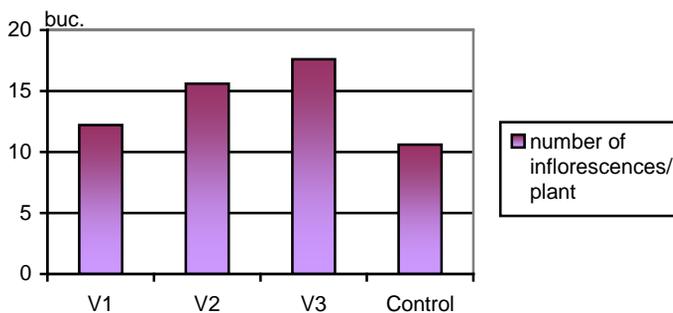
Fig. 1. Average height of *Gomphrena globosa* plants



DL 5% = 0.3 buc; DL 1% = 0.4 buc; DL 0.1% = 0.6 buc

Fig. 2. Average number of main ramifications/plant at *Gomphrena globosa*

The number of inflorescences per plant (fig. 3) is determined also by the applied fertilization. Variants V_2 and V_3 recorded very significant differences, and variant V_1 record significant differences.

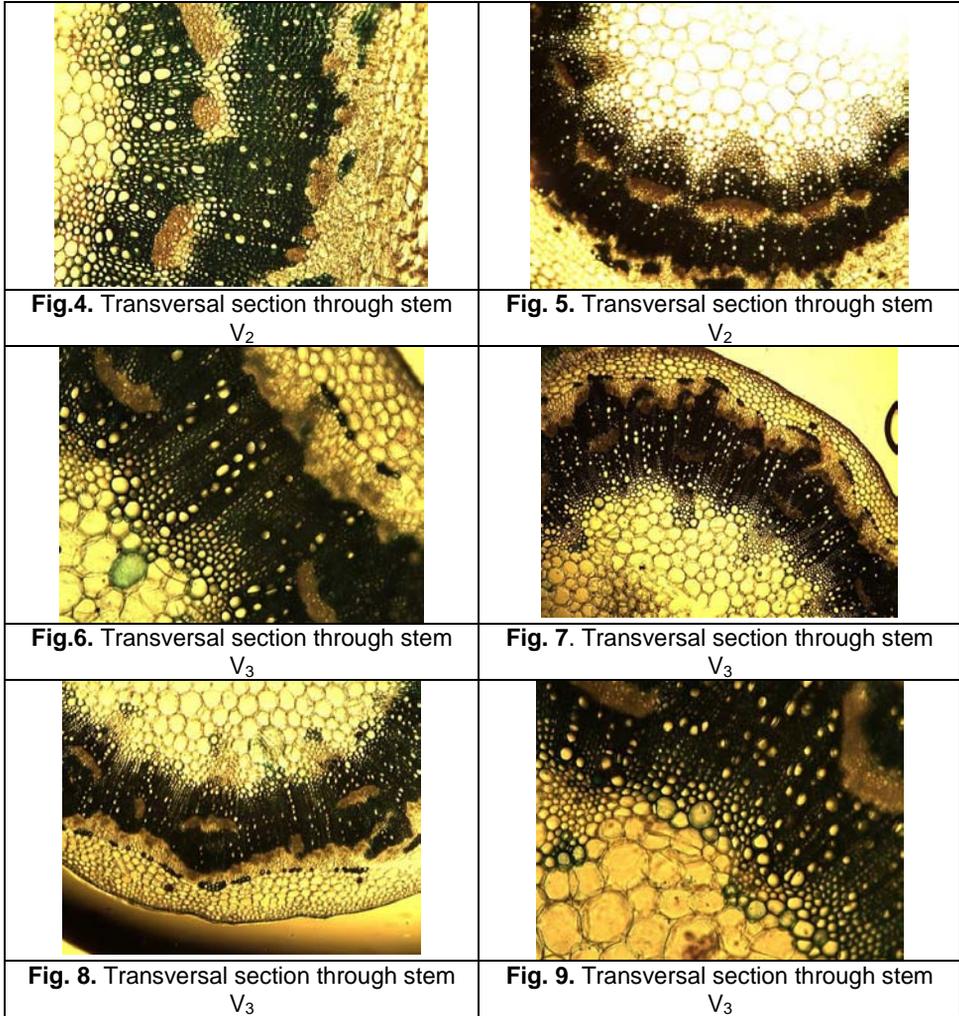


DL 5% = 1.6 buc; DL 1% = 2.4 buc; DL 0.1% = 3.8 buc.

Fig. 3. Average number of inflorescences/plant at *Gomphrena globosa*

Morph-anatomic studies

Stem structure at variants V_2 and V_3 is remarkable due to the fact that at variant V_2 (fig. 4, 5) the tissues are less quality and quantitative represented that at variant V_3 (fig. 6, 7). To the external part of marrow, from place to place, could be observed groups of well contoured cells with strong lignified walls, with an additional role in stem sustaining (fig. 8, 9).



Pedo-ecologic and bio-pedology studies

From the main 20 factors and ecologic determinants (5 climatic and 14 eco-pedological and 1 synthetic pedo-biologic indicator), the majority are from quantitative point of view in medium classes of size, and from quality point of view in medium classes of ecological favourability (table 1).

Table 1

Form of specific ecologic of eco-pedo-top (Experimental field – SDE UŞAMV İaşı)

Factors and ecologic determinants	Classes of ecological size							Classes of ecological favourability						
	0...m	I	II	III	IV	V	E ₁	E ₂	N...m	FS	S	M	R	FR
GROWTH FACTORS														
Content of total nitrogen (Nt)					x							x		
Content of mobile phosphorous (P ₂ O ₅)						x								x
Content of assimilable potassium (K ₂ O)						x								x
ECOLOGICAL CLIMATIC FACTORS														
Yearly average temperature (T)						x								x
Yearly average precipitations (P)				x									x	
Wind regime (V)				x									x	
Summer rains (Pe)			x							x				
Relative humidity of summer air (U _{er})			x							x				
SPACE TIME ECOLOGIC FACTORS														
Edaphic volume(Ve)						x								x
Length of bioactive period (LPB)						x								x
NEGATIVE ECOLOGIC FACTORS														
Hydrolytic alkalinity/acidity (Alc)						x					x			
Soil consistency (Con)							x			x				
ECOLOGIC DETERMINANTS														
Humus content (Hum)				x								x		
Soil texture (Tx)				x								x		
Aeration porosity (PA)			x							x				
Soil reaction (pH)				x							x			
Saturation degree with base (V)						x							x	
SYNETIC BIOLOGIC INDICATORS														
Biologic activity (Bio)				x								x		
SYNETIC PEDOLOGIC INDICATORS														
Potential trophicity (Tp)				x								x		
Effective trophicity (Te)				x								x		

X-experiments fertilization to soil with Vinassa

8 classes of ecological size (0 ... m, I, II, III, IV, V, E₁-extremely weak to moderate, E₂-extremely strong)

6 classes of ecological favourability (N ... m-negative to minimum, FS-very low, S-low, M-medium, R-high and FR-very high)

In small size class and very low and low favourability class are placed: aeration porosity, summer rains and relative humidity of summer air.

In excessive size class is placed hard consistency of soil in dry aggregation during summer (table 1).

Main physical and chemical properties of the soil from the experimental field (at a depth of 0-20 cm) are presented on experimental variations in table 2. Fertilization to soil with vinassa, especially in high doses, causes an increase of soil pH to moderately alkaline, increase of mobile phosphorous content, accessible potassium, the degree of saturation with base.

Table 2

Main physical and chemical features of horticultural soil from the experimental field

Variant	Deep (cm)	% coloid. clay	Text. class	PA %	pH H ₂ O	Hum %	Nt %	P _{AL} ppm	K _{AL} ppm	SB me	T me	V %
Control	0-20	34.8	T	10	7.28	3.312	0.202	55	218	31.5	33.7	91
V ₁ Vinassa 3t/ha	0-20	34.4	T	9	7.62	3.321	0.212	58	221	32.1	33.8	93
V ₂ Vinassa 5t/ha	0-20	36.1	T	7	7.96	3.352	0.224	57	234	32.8	34.2	95
V ₃ Vinassa 7t/ha	0-20	35.7	T	6	8.52	3.371	0.231	60	235	33.4	34.6	97

CONCLUSIONS

Experiments were focused on morphological and morph-anatomic features of plants, and on other side, was a study of biotic and enzymatic potential of soil.

Vinassa determined a stimulation of growth in height and flowering capacity no matter what was the used dose.

Stem anatomic structure record modifications, especially, at applying maximal doses, in the way that it is a better representation of the tissues both from quality and quantitative point of view.

At soil level, fertilization with vinassa leads to an increase of soil reaction to moderate alkaline domain.

REFERENCES

1. Chelariu Elena-Liliana, Ionel A., 2005 - *Results regarding the influence of fertilization with Vinassa Rompak upon the crop yield at Sante potato specie*. 4th International Symposium, Buletinul U.S.A.M.V. Cluj-Napoca, vol. 61, seria Agricultură.
2. Chelariu Elena-Liliana 2007 - *Studiul agroproductiv al pajiștilor permanente din bazinul superior al râului Slănic - Buzău*, Teză de doctorat, U.Ș.A.M.V. Iași.
3. Ionel A., Vintu V., Halga P., Iacob T., Samuil C., 2000 – *Vinassa, fertilizant și aditiv furajer*. Lucrări științifice USAMV Iași, seria Zootehnie vol 43.
4. Toma C., Gostin Irina, 2000 - *Histologie vegetală*. Ed. Junimea, Iași.
5. Vintu V. et al., 2003 - *Posibilități de îmbunătățire a pajiștilor permanente prin folosirea ca fertilizant a subprodusului vinassa*. Lucrări științifice USAMV Iași, seria Agronomie.

STUDIES REGARDING THE BEHAVIOUR OF CALLISTEPHUS CHINENSIS IN CONDITIONS OF UNCONVENTIONAL FERTILIZATION

STUDII PRIVIND COMPORTAREA SPECIEI CALLISTEPHUS CHINENSIS ÎN CONDIȚIILE FERTILIZĂRII NECONVENȚIONALE

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Abstract. *The paper presents the experimental results regarding the influence of unconventional fertilizers on Callistephus chinensis plants. Were made fertilizations in soil with vinassa (3 t/ha, 5 t/ha, 7 t/ha) and foliar fertilizations with Folisof F212 (0.2%; 0.4%; 0.6%). The obtained results show the fact that foliar fertilization and the ones with vinassa improve the development and flowering of Callistephus chinensis plants. Stem morph-anatomic structure prove the fact that treatments with Folisof F212 lead to an increase of stems' diameter proportional to concentration and fertilization with vinassa lead to an ample development of bark and marrow. At soil level application of foliar fertilizers indirectly leads, by stimulation of plants' metabolism, to an additional consumption from soil reserve.*

Key words: *Callistephus chinensis, fertilization, Folisof F212, vinassa*

Rezumat. *Lucrarea prezintă rezultatele experimentale privind influența fertilizantilor neconvenționali asupra plantelor de Callistephus chinensis. Au fost făcute fertilizări la sol cu vinassa (3 t/ha, 5 t/ha, 7 t/ha) și fertilizări foliare cu Folisof F212 (0,2%; 0,4%; 0,6%). Rezultatele obținute au demonstrat că fertilizările foliare și cele cu vinassa favorizează creșterea și înflorirea plantelor de Callistephus chinensis. Structura morfo-anatomică a tulpinii demonstrează faptul că tratamentele cu Folisof F212 determină o creștere a diametrului tulpinii proporțional cu concentrația, iar fertilizarea cu vinassa o dezvoltare mai amplă a scoarței și măduvei. La nivelul solului aplicarea fertilizării foliare a determinat indirect, prin stimularea metabolismului plantelor, un consum suplimentar din rezerva solului.*

Cuvinte cheie: *Callistephus chinensis, fertilizare, Folisof F212, vinassa*

MATERIAL AND METHODS

The experimental crops were set up at the University of Agricultural Sciences and Veterinary Medicine Iași, in the didactic field of Floriculture discipline. Experiences were organized as randomized blocks with three repetitions. Were tested root fertilizers and also foliar fertilizers which were applied at *Callistephus chinensis* specie.

As root fertilizer was use *vinassa* (obtained at Yeast factory from Pașcani), with a complex chemical composition: total nitrogen (3.0-3.2%), potassium (5.0-7.0%), phosphorus (0.3-0.5%), appreciable quantities of calcium, sodium, magnesium, iron,

copper, zinc. Fertilization with vinassa was made with three different doses, respectively 3 t/ha, 5 t/ha and 7 t/ha.

For foliar fertilizations was used Folisof F212 which is a Romanian complex foliar fertilizer, with macro and micro-elements: N - 90 g/litre, K - 90 g/litre, P - 45 g/litre, Ca - 0.4 g/litre, Mg - 0.5 g/litre, B - 0.2 g/litre, Zn - 0.1 g/litre, Fe - 0.2 g/litre. Treatments, in a number of four, were applied at periods of 10 days, using three concentrations (0.2%, 0.4% and 0.6%), resulting seven experimental variants (including control): Control – unfertilized; V₁ – treated with vinassa 3 t/ha; V₂ – treated with vinassa 5 t/ha; V₃ – treated with vinassa 7 t/ha; V₄ – treated with Folisof F212 0.2%; V₅ – treated with Folisof F212 0.4%; V₆ – treated with Folisof F212 0.6%.

To count the impact of using the fertilizers was evaluate the rate of height growth, ramification degree and flowering capacity of plants. The recorded data were statistical analysed and are presented in synthesis graphs and tables.

These dates were completed with a series of morph-anatomical analyses which put in light some appeared changes at tissue level, function of the applied treatment and used dose. To be able to observe structural details of the studied material (stem) were made microscopic samples. Biological material was preserved in ethylic alcohol of 70%, then divided into sections with a razor at hand microtome; were made transversal sections through stem.

Pedo-ecological research was done during vegetation period on soil resources. Studies took place in field using the stationary method, and also in laboratory, on soil samples gathered from experimental variants. Were analysed the main characteristics of the bio-top, in ecological, areal and local context, by studying the quality features of soil.

RESULTS AND DISCUSSIONS

Bio-metric determinations. Treatments with Folisof F212 and vinassa at *Callistephus chinensis* stimulated the height growth with values from 8.3% (V₄) and 40,7% (V₂). Differences face to control, at all variants fertilized, were very significant (fig. 1).

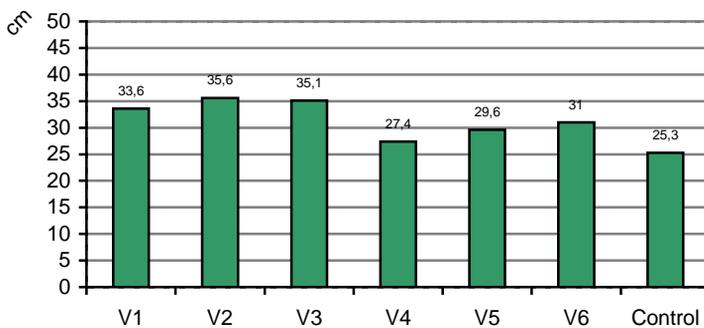


Fig. 1. Average height of plants

Also, ramification degree of stems from plants fertilized recorded positive differences face to control (distinct significant at V₁ and V₂ and very significant at V₃, V₄, V₅ and V₆ (fig. 2).

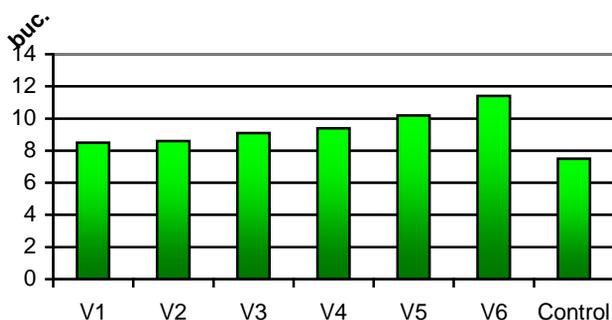


Fig. 2. Average number of ramification/plant

As regarding the flowering capacity, respectively average number of inflorescences/plant, all the variants overpass the control with very significant differences, but the highest values were recorded at variants treated with Folistof in 0.4 - 0.6 % (fig. 3).



Fig. 3. Average number of inflorescences/plant at *Callistephus chinensis*

Morph-anatomical studies. At variant V₁ (fig. 4) bark is less represented. Tissue leader is a ring type one, due to a strong process of sclerifications and lignifications of the radius bone marrow (fig. 5). Marrow is thick, with a lignified perimedular area. The line of posts of mechanical fibres has very strong thickened walls (fig. 6). Variant V₂ is quite similar with variant V₁, differences of anatomical structure being insignificant (fig. 7). Plants from variant V₃ presents a large development of bark and marrow, in prejudice of mechanic tissue and leading tissue (fig. 8, 9).

Transversal section through stem of plants treated with Folisof F212 show an increasing of the diameter proportional with dose. Unlike variant V₄ (fig. 10),

where mechanic tissue is less represented, at variant V_6 (fig. 11) mechanic and wooden tissues are well developed.

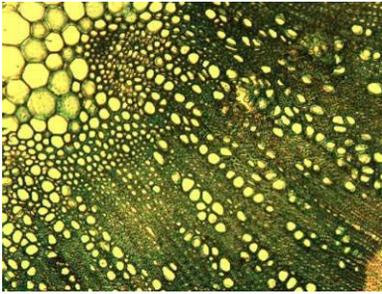


Fig. 4. Transversal section through stem V_1

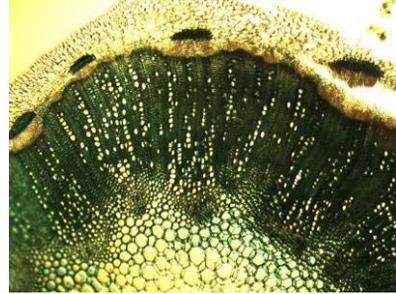


Fig. 5. Transversal section through stem V_1

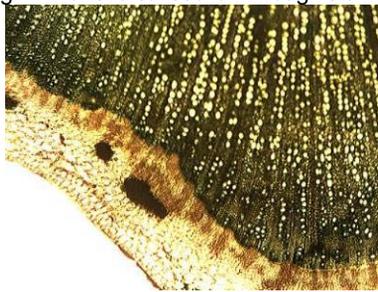


Fig. 6. Transversal section through stem V_1

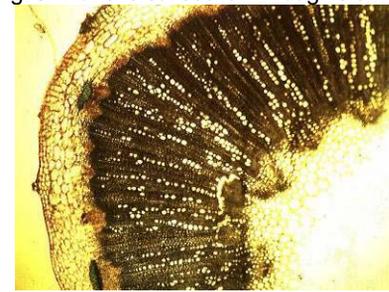


Fig. 7. Transversal section through stem V_2



Fig. 8. Transversal section through stem V_3



Fig. 9. Transversal section through stem V_3



Fig. 10. Transversal section through stem V_4

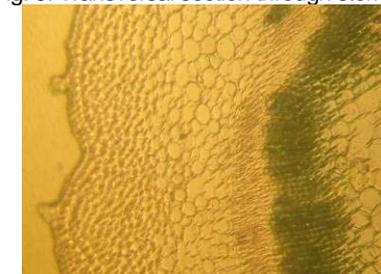


Fig. 11. Transversal section through stem V_6

Table 1

The main pedo-biological features of soil at fertilization with vinassa and Folisof

Enzymatic activity	Specification	Experimental variants						
		Control 0-20 cm	Vinassa 3 t/ha 0-20 cm	Vinassa 5 t/ha 0-20 cm	Vinassa 7 t/ha 0-20 cm	Folisof 0.2% 0-20 cm	Folisof 0.4% 0-20 cm	Folisof 0.6% 0-20 cm
Catalase DL 5% - 8 mg O ₂ DL 1% - 20 mg O ₂ DL 0.1% - 28 mg O ₂	mg O ₂	343	318	302	281	377	413	425
	diff.	-	-25	-41	-62	34	70	82
	%	100	96.95	92.07	85.67	109.9	120.4	123.9
	signification	-	0	00	000	xx	xxx	xxx
Sucrase DL 5% - 111 mg DL 1% - 138 mg DL 0.1% - 371 mg	mg glucose	1321	1164	931	867	1521	1648	1737
	diff.	-	-157	-390	-454	200	327	416
	%	100	88.65	70.91	66.03	115.1	124.7	131.5
	signification	-	00	000	000	xx	xxx	xxx
Urea DL 5% - 3 mg NH ₄ DL 1% - 5 mg NH ₄ DL 0.1% - 7 mg NH ₄	mg NH ₄	15	10	8	6	17	18	19
	diff.	-	-5	-7	-9	2	3	4
	%	100	71.43	57.14	48.86	113.3	120.0	126.7
	signification	-	0	000	000	xx	xxx	xxx
Total phosphatase DL 5% - 0.8 mg P DL 1% - 1.6 mg P DL 0.1% - 2.1 mg P	mg P	5.5	3.3	2.1	1.7	6.7	7.0	7.6
	diff.	-	-2.2	-3.4	-3.8	1.2	1.5	2.1
	%	100	71.74	45.65	36.96	121.8	127.3	137.5
	signification	-	0	000	000	xx	xxx	xxx
IPAE DL 5% - 1.83% DL 1% - 2.31% DL 0.1% - 4.44%	%	17.67	14.79	12.28	11.15	20.10	21.67	22.77
	diff	-	-2.9	-5.4	-6.5	2.4	4.0	5.0
	%	100	87.20	72.40	65.74	113.7	122.6	128.8
	signification	-	0	000	000	xx	xxx	xxx

Studies and analysis included also the enzyme potential of soil from experimental field. In table 1 are presented the values of enzyme potential (catalase, sucrase, urease and phosphatase) recorded during the vegetation period, from soil samples gathered from depth of 0-20 cm. Soil samples from control variant record medium values of enzymatic activity, while fertilization with vinassa decreases enzymatic activity proportional to the dose of fertilizers and by application of foliar fertilization increased the values of enzyme potential at the same time with doses increasing.

CONCLUSIONS

Both Folisof F212 and vinassa stimulated the growth in height and ramification degree and flowering capacity of *Callistephus chinensis* plants, differentiated, function of used concentration.

The incentive effect of root and foliar fertilizer was highlighted by morpho-anatomical analysis in the leaves and stems (changes indicating an increased activity and increased stem diameter).

Fertilization to soil with vinassa, especially in high doses causes an increase in response to field moderately alkaline soil, the content of mobile phosphorus, potassium assimilable, and degree of saturation in the base, but also a decrease of enzymatic activity.

Foliar fertilization with Folisof applied during the vegetation season in four rounds; provide nutrients, vitamins and growth stimulants that are totally soluble and rapidly falling in plant metabolism, stimulating plants to additional consumption of nutrients from the soil reserve.

REFERENCES

1. **Bireescu L., Bireescu Geanina, Teodorescu E., 2002** – *Cercetări ecopedologice asupra biotopurilor din sectorul mijlociu al culoarului Siretului*. Lucrări științifice UȘAMV, seria Horticultură, vol. 45, pg. 495-500.
2. **Bireescu L., Bireescu Geanina., Dorneanu Emilia, 2002** – *Rolul fertilizării foliare pentru echilibrarea nutriției minerale* – Simpozion Internațional CIEC, Brașov, Ed. Agris, pg. 301-306.
3. **Chelariu Elena-Liliana, Ionel A., 2005** – *Results regarding the influence of fertilization with Vinasa Rompak upon the crop yield at Sante potatoe specie*. 4th International Symposium, Buletinul U.Ș.A.M.V. Cluj-Napoca, vol. 61, seria Agricultură, pg. 408.
4. **Draghia Lucia, Chelariu Elena-Liliana, Delinschi Violeta, Grădinaru G., Bireescu L., 2008** - *Bio-fertilizer foliar application influences on growth and anatomical changes of *Tagetes patula**. Proceedings of „43rd Croatian and 3rd International Symposium on Agriculture”, University of Zagreb, Croatia, pg. 511.
5. **Nannipieri P., Ascher, J., Ceccherini M. T., Landi L., Pietramellara G., Renella G., 2003** – *Microbial diversity and soil functions*. European Journal of Soil Science, vol. 54, p. 655.
6. **Ștefanic G., 1994** – *Biological definition, quantifying method and agricultural interpretation of soil fertility*. Romanian Agricultural Research, 2: p.107-116.

RESEARCHES REGARDING THE PHOTOPERIODS INFLUENCE ON PHYSIOLOGICAL INDICATORS AT SOME CULTIVARS OF *EUSTOMA GRANDIFLORUM*, IN THE MULTIPLICATION PHASE OF *IN VITRO* CULTURE

CERCETĂRI PRIVIND INFLUENȚA FOTOPERIODISMULUI ASUPRA INDICATORILOR FIZIOLOGICI, ÎN FAZA DE MULTIPLICARE IN VITRO, LA UNELE SOIURI DE *EUSTOMA GRANDIFLORUM*

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Abstract. *This scientifically papers present the experimental results regarding the influence of photoperiod on physiological indicators, in multiplication stage of in vitro culture. Eustoma grandiflorum is flower specie that belongs to Eustoma genus from Gentianaceae botanic family. The experiment studied the main physiological parameters at three cultivars of Eustoma grandiflorum (Asenka, Magic blue, Echo White). We conclude that the influence of photoperiod don't present significant differences from statistic point of view. These aspects justify the decreasing of photoperiod to 12 hours, with positive influence on energetic costs during multiplication phase of in vitro culture.*

Key words: photoperiod, in vitro culture, physiological parameters, *Eustoma grandiflorum*

Rezumat. *Lucrarea prezintă rezultatele experimentale privind influența fotoperiodismului asupra indicatorilor fiziologici, în faza de multiplicare in vitro, la Eustoma grandiflorum. S-au studiat principalii parametri fiziologici la trei soiuri de Eustoma grandiflorum (Asenka, Magic blue, Echo white) în condiții de fotoperioadă de 12 ore și 16 ore. Rezultatele obținute arată că valorile principalilor indicilor fiziologici analizați, în funcție de cele două niveluri de fotoperiodism, nu prezintă diferențe semnificative din punct de vedere statistic. În acest sens, se justifică reducerea fotoperioadei de la 16 ore la 12 ore, cu implicații pozitive asupra reducerii consumului de energie și implicit a costurilor energetice din cadrul acestei faze tehnologice a procesului de multiplicare in vitro.*

Cuvinte cheie: fotoperiodism, cultura in vitro, parametrii fiziologici, *Eustoma grandiflorum*

INTRODUCTION

Eustoma grandiflorum is flower specie that belongs to *Eustoma* genus from Gentianaceae botanic family, Gentianales ordin, Dicotyledonates class (Bailey L.H., 1976; Șelaru Elena, 2002). *Eustoma* genus is contenting from 27 herbs and wood species meeting in special at south part of SUA and Mexic (Roh S.M. și Lawson R.H., 1988).

In the origin area, *Eustoma grandiflorum* is called blue bell (Elena Șelaru, 2002). In Europa is presenting from 1835.

By utilization of achieved *in vitro* plants the process of flowering is earliest and the period of harvesting is much bigger, due the increasing of flowers on the initial plant (Farina si Ruffoni, 1993). Griesbach R.J. et all (1988) used in the *in vitro* culture as a explants top of shoots, fragments of leaves and steam.

Most of researches achieved at the national and international level is referring at the cultivars behaviour on different nutritive media. Ördögh et all (2004) has studied the behaviour of four *Eustoma* cultivars in multiplication and rooting *in vitro* stages. The highest multiplication rate was registered on nutritive media M&S (1962) improving with 0.1 mg/l BAP.

MATERIAL AND METHODS

The research experiment was carrying out at vegetal biotechnologies laboratory from University of Pitesti.

The research experience have two factors using three cultivars of *Eustoma* (Asenka, Magic blue, Echo White) and two level of photoperiod (16 and 12 hours photoperiod).

Biological material was representing by shoots harvesting in the growing vegetative stage.

The experimental factors were:

- A factor - cultivar with three graduations: Echo White, Magic Blue, Asenka;
- B factor – duration of photoperiod with two graduations: 16 hours light photoperiod, 12 hours light photoperiod.

For studying of *in vitro* multiplication capacity of explants growing in the initial phase of *in vitro* process were used nutritive media based on Murashige and Skoog (1962) (fig. 1). The nutritive media were sterilized by autoclavation at one atmosphere, 20 minutes and 121°C. Work instruments were sterilized by etuve at 120°C and 20 minutes. During multiplication phase, the explants were keeping in the growing room at 22-24°C, 12 and 16 hours light photoperiod, 3000 lucs light intensity.

Physiological observations consist in:

- Determination of assimilatory pigments quantity by spectrophotometer method;
- Determination of dry substance by thermo balance;
- Determination of total water by thermo balance;
- Determination of photosynthesis intensity by Wartburg method;
- Determination of respiration intensity by Wartburg method.
-



Fig. 1. Aspects from *in vitro* multiplication phase

RESULTS AND DISCUSSIONS

During *in vitro* multiplication phase were studied the main physiological parameters. In this sense was establishing the impact of photoperiod influence on physiological indicators, in the *in vitro* multiplication phase.

Regarding photoperiod influence on assimilatory pigment content at *Eustoma grandiflorum*, (mg/g fresh weight), Asenka cultivar registered the bigger quantity in chlorophyll a (0,084 mg/g fresh weight) and chlorophyll b (0,086 mg/g fresh weight) for both variant of photoperiod with 12 and 16 hours light, the content being much more for 16 hours light photoperiod. The content of carotenoids was the highest at Magic Blue cultivar for both variants of photoperiod (0,026 mg/g fresh weight) (fig. 2).

Echo white cultivar registered a bigger quantity of chlorophyll a than chlorophyll b or carotenoids pigments. The same cultivar achieved at the lowest content of assimilatory pigments in comparison with Asenka and Magic blue cultivars for both level of photoperiod used in the research experiment.

Regarding the photoperiod influence on total water quantity and dry substance at *Eustoma grandiflorum* in the *in vitro* multiplication phase, the cultivars registered significant differences for both variants of photoperiod (fig. 3).

Asenka cultivar achieved the lowest quantity of total water (88,77 %) and the bigger quantity of dry substance (11,3 %). In the same time, Echo white cultivar had a bigger percent of total water (89,9 %) and the smallest percent of dry substance (10,1 %).

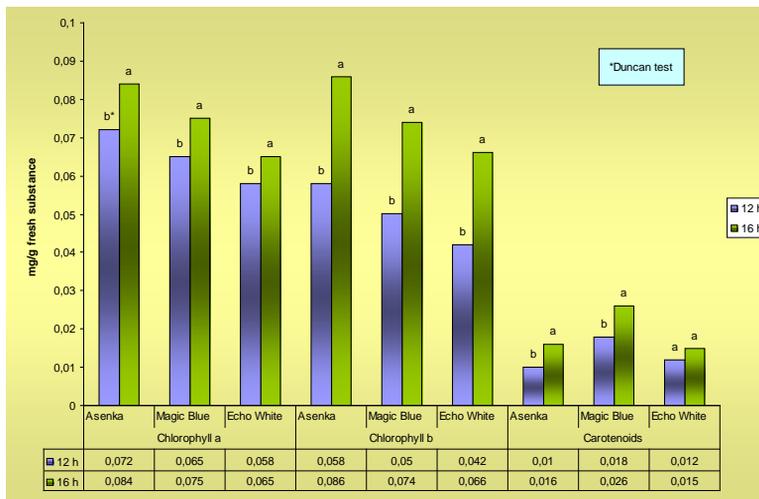


Fig. 2. Photoperiod influence on assimilatory pigments content at *Eustoma grandiflorum*

Magic Blue cultivar achieved the accumulation of 91, 3 % total water quantity for 12 hours light photoperiod respective 89,4 % total water quantity for

16 hours light photoperiod. Regarding the content of dry substance Magic blue cultivar registered 10,6 %.

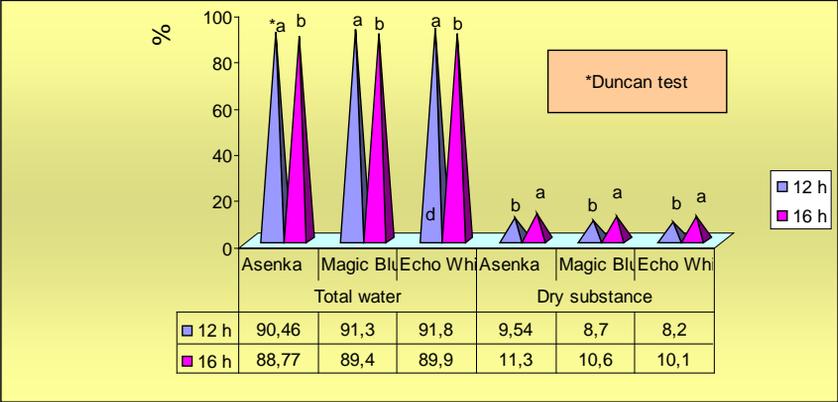


Fig. 3. Photoperiod influence on total water and dry substance quantity

Photoperiod influence on respiration intensity at *Eustoma grandiflorum* in the multiplication of *in vitro* culture expressing by $\text{cm}^3 \text{O}_2/\text{g/h}$ don't was conduct at significant differences, in conforming to statistic interpretation by Duncan test. Thus is confirming the published scientific paper where is emphasize the fact that the vitroplants have a weak expression of physiological indicators. Respiration intensity has the bigger value for Asenka cultivar respective Magic blue and Echo white (fig. 4).

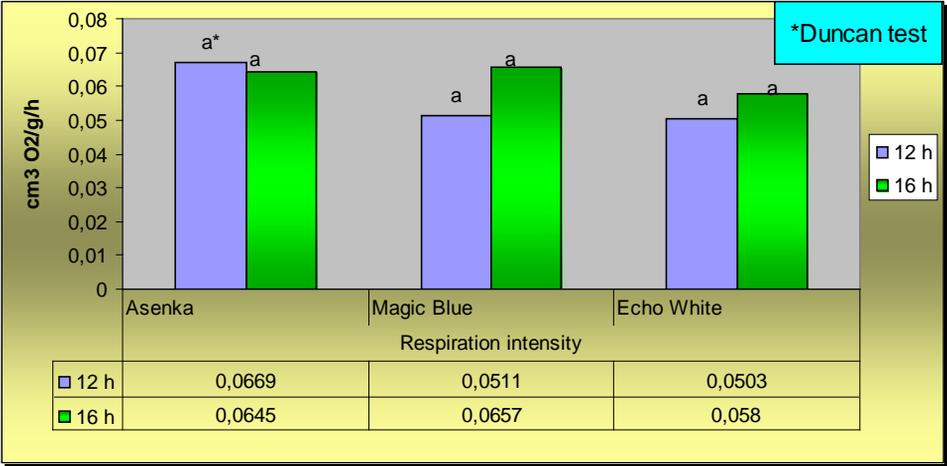


Fig. 4. Photoperiod influence on respiration intensity

The photosynthesis capacity has also expressing at the small values, without significant differences between values of photosynthesis achieved in conditions of 12 and 16 hours light photoperiod.

The photosynthesis capacity of Asenka cultivar for 16 hours light photoperiod has bigger in comparison with 12 hours light photoperiod (0,012 cm³ O₂/g/h respective 0,0092 cm³ O₂/g/h). The same trend is observed at Magic blue and Echo white cultivars. Echo white cultivar has a 0,0097 cm³ O₂/g/h photosynthesis capacity for 16 hours light photoperiod and 0,0084 cm³ O₂/g/h for 12 hours light photoperiod (fig. 5). Similar with respiration intensity, the photosynthesis level is going to the follow classification: Asenka, Magic blue, Echo white.

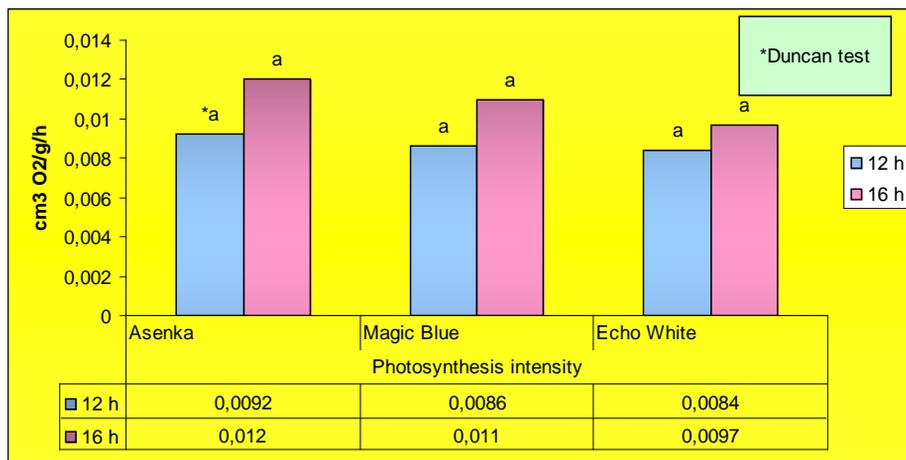


Fig. 5. Photoperiod influence on photosynthesis intensity

CONCLUSIONS

Asenka cultivar registered the bigger quantity of chlorophyll a and b for both variants of photoperiods with more quantity for 16 hour light photoperiod than 12 hours light photoperiod.

Photoperiod influence on respiration intensity at *Eustoma grandiflorum* in the multiplication of *in vitro* culture expressing by cm³ O₂/g/h don't was conduct at significant differences, in conforming to statistic interpretation by Duncan test.

The photosynthesis capacity has also expressing at the small values, without significant differences between values of photosynthesis achieved in conditions of 12 and 16 hours light photoperiod. Similar with respiration intensity, the photosynthesis level is going to the follow classification (growing graduation): Asenka, Magic blue, Echo white.

The values of physiological indicators analyzed in function of two level of photoperiod don't present significant differences from statistic point of view. In this sense is justify the reducing of light period from 16 hours to 12 hours with positive implication on reducing of energy consumption respective the energetic costs in the technological phase of *in vitro* multiplication stage.

REFERENCES

1. **Bailey I.h., Hortorium S., 1976** - *Hortus third, a concise dictionary of plants cultivated in the United States and Canada*. Macmillan Publishing Company, New York 1, 290 p.
2. **Farina E., Rufoni B., 1993** - *The effect of temperature regimes on micropropagation efficiency and field performance of Eustoma Grandiflorum*. Acta Hort., 337: 73-80.
3. **Griesbach R.J., Semeniuk P., Roh M.S., Lawson R.H., 1988** - *Tissue culture in the improvement of Eustoma*. HortScience, 23 (4): 790-791.
4. **Ohkawa k., Sasaki E., 1999** - *Eustoma (Lisianthus) its past, present and future*. Acta Horticulture, 482 : 423-426.
5. **Roh S.M., Lawson R.H., 1988** - *New floriculture crops. In: Advanced in new crops: proceeding of the first national symposium new crops research, development and economics*. Timber press, Portland.
6. **Şelaru Elena, 2002** - *Culturi pentru flori tăiate*. Editura Ceres, Bucureşti.

ASPECTS REGARDING THE ORNAMENTAL VALUE OF SOME ROSE VARIETIES IN „TUDOR NECULAI” NURSERY CONDITIONS - IASI COUNTY

ASPECTE PRIVIND VALOAREA ORNAMENTALĂ A UNOR SOIURI DE TRANDAFIRI ÎN CONDIȚIILE PEPINIEREI „TUDOR NECULAI” IAȘI

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Abstract. *The paper present aspects regarding the ornamental value of some rose varieties, in the Tudor Neculai nursery conditions. The observations were made at the next rose varieties: Foc de Tabără, Luchian, Betty Prior, Crimson Glory. There were studied six features defining the decorative value of these varieties, respectively: the foliage, the diseases resistance, the flowering intensity, the form of the flower, the color of the petals and the odor.*

Key words: rosa, estimation, decorative value

Rezumat. *În lucrare sunt prezentate aspecte privind valoarea ornamentală a unor soiuri de trandafiri în condițiile pepinierii „Tudor Neculai” din Iași. Observațiile au fost făcute la următoarele soiuri de trandafir: Foc de Tabără, Luchian, Betty Prior, Crimson Glory. Au fost luate în studiu șase însușiri ce definesc valoarea decorativă a acestor soiuri și anume: frunzișul, rezistența la boli, intensitatea înfloritului, forma florii, culoarea petalelor, parfumul.*

Cuvinte cheie: trandafir, bonitare, valoare decorativa

INTRODUCTION

One of the basic components of the green spaces ensuring the aesthetic aspect of the localities and which contributes to the health and good state of mind of people and to insuring a favourable work climate, is constituted by the floral and rose arrangements.

The rose has been considered ever since the past “The Queen of Flowers”, because of its multiple qualities and especially the richness and beauty, perfume and the different colours and shapes.

They are characterized through a series of characteristics, among which we mention:

1. the bush shape;
2. the vigour;
3. the leafage;
4. the resistance to diseases;
5. the shank and the floral peduncle;
6. the blooming intensity;
7. the rose bud shape;
8. the flower shape;

9. the durability of the flower in the field;
10. the colour at opening;
11. the colour at blossoming;
12. the manner of petals fall;
13. the perfume.

MATERIAL AND METHOD

The observations regarding the roses were made within the nursery "Tudor Neculai" Iași. The nursery is placed outside the built-up area of Iași on a land of Miroslava commune, being destined to production of the dendrological seeding material for decorating and embellishing the green spaces from the perimeter of Iași city.

The nursery also has a rich variety of roses, among which we mention: Foc de Tabără, Luchian, Betty Prior, Crimson Glory, Acapulco, Super Star, Karen Blixen etc.

The researches were made within the nursery, on 6 varieties of roses and namely: „Foc de Tabără”, „Luchian”, „Betty Prior”, „Crimson Glory”. They consisted in studying 6 more important characteristics that define to the greatest extent the decorative value of these varieties and namely: 1: the leafage, 2. the resistance to diseases; 3. the blooming intensity; 4. the flower shape; 5. the colour of petals; 6. the perfume.

The observations were made in six periods, starting with the date of June 5th approximately every two weeks. In the end, we calculated the arithmetical mean for each characteristic in part and the total of points for the characteristics analyzed in each variety.

RESULTS AND DISCUSSIONS

For the 4 varieties of roses studies we drew up quality evaluation sheets that comprise the reliability characteristics and the data regarding which we made the observations (tables no. 1, 2, 3, 4).

The results regarding the studied characteristics are the following:

1. The leafage: This characteristic was appreciated according to the density of leaves on the sprouts, the colour, the shininess, the manner it maintains on the bush during the vegetation period, the maximum grade being 10.

Among the varieties taken in the study the highest score was registered by the varieties „Foc de Tabără”, „Luchian”, „Betty Prior” with 54 points ,and the lowest score was registered by the variety „Crimson Glory” with 48 points.

2. Resistance to diseases: This represents one of the most important aspects in the culture of roses. The most frequent diseases are: the black spotting, (*Diplocarpon rosae*), the scab (*Phragmidium disciflorum*) and the mildew (*Sphaerotheca pannosa, var. rosae*), the maximum grade being 8.

The tolerance to these diseases is determined by dense, puckered, dark green foliage and with a thick cuticle.

The very good results were registered by three of the analyzed varieties, having the maximum score of 48 points, with the exception of the variety „Crimson Glory” which has proven sensitive to diseases, registering 42 points.

Table 1

The quality evaluation sheet for the
„Foc de tabără” variety

Crit. No.	Evaluated characteristic	Max. no. of points	Date of observations						Total points	Mean
			5 VI	26 VI	12 VII	30 VII	13 VIII	1 IX		
1.	Leafage	10	9	9	9	9	9	9	54	9.0
2.	Resistance to diseases	8	8	8	8	8	8	8	48	8.0
3.	Blooming intensity	10	10	10	10	10	10	10	60	10.0
4.	Bud shape	9	9	9	9	9	9	9	54	9.0
5.	Colour at blossoming	6	6	6	6	6	6	6	36	6.0
6.	Perfume	7	1	1	1	1	1	1	6	1.0
TOTAL POINTS									43.0	

Table 2

The quality evaluation sheet for the
„Luchian” variety

Crit. No.	Evaluated characteristic	Max. no. of points	Date of observations						Total points	Mean
			5 VI	26 VI	12 VII	30 VII	13 VIII	1 IX		
1.	Leafage	10	9	9	9	9	9	9	54	9.0
2.	Resistance to diseases	8	8	8	8	8	8	8	48	8.0
3.	Blooming intensity	10	10	10	10	10	10	10	60	10.0
4.	Bud shape	9	9	9	9	9	9	9	54	9.0
5.	Colour at blossoming	6	6	6	6	6	6	6	36	6.0
6.	Perfume	7	1	1	1	1	1	1	6	1.0
TOTAL POINTS									43.0	

Table 3

The quality evaluation sheet for the
„Betty Prior” variety

Crit. No.	Evaluated characteristic	Max. no. of points	Date of observations						Total points	Mean
			5 VI	26 VI	12 VII	30 VII	13 VIII	1 IX		
1.	Leafage	10	9	9	9	9	9	9	54	9.0
2.	Resistance to diseases	8	8	8	8	8	8	8	48	8.0
3.	Blooming intensity	10	10	10	10	10	10	10	60	10.0
4.	Bud shape	9	8	8	8	8	7	7	46	7.6
5.	Colour at blossoming	6	5	5	5	5	5	5	30	5.0
6.	Perfume	7	2	2	2	2	2	2	12	2.0
TOTAL POINTS									41.6	

Table 4

The quality evaluation sheet for the
„Crimson Glory” variety

Crit. No.	Evaluated characteristic	Max. no. of points	Date of observations						Total points	Mean
			5 VI	26 VI	12 VII	30 VII	13 VIII	1 IX		
1.	Leafage	10	8	8	8	8	8	8	48	8.0
2.	Resistance to diseases	8	8	8	7	7	6	6	42	7.0
3.	Blooming intensity	10	9	9	9	9	9	9	54	9.0
4.	Bud shape	9	8	8	8	7	7	7	45	7.5
5.	Colour at blossoming	6	6	6	6	6	6	6	36	6.0
6.	Perfume	7	7	7	7	7	7	7	42	7.0
TOTAL POINTS									44,5	

3. The intensity of blooming: This characteristic represents one of the most important qualities of the varieties of roses. In the case of this character, the maximum grade is 10.

The varieties „*Foc de Tabără*”, „*Luchian*”, „*Betty Prior*” distinguished themselves with a maximum score of 60 points.

The minimum score was registered by the variety „*Crimson Glory*” with 54 points.

4. The bud shape: It is a trait characterising all varieties of climbing roses; taking into account both the shape and the dimensions of the flowers.

The varieties „*Foc de Tabără*” and „*Luchian*”, distinguished themselves as having very beautiful flowers: registering a score of 54 points.

5. The colour at blossoming: It can be assessed rather subjectively according to the person executing the pre-operation.

The maximum grade for this characteristic is considered 6, and the maximum grade is given to the varieties whose petals have an intense colour, well emphasized and that remains for a longer period of time.

As regards the colour at flowering, the varieties „*Foc de Tabără*”, „*Luchian*” and „*Crimson Glory*” distinguished themselves.

6. Perfume: It is also a much appreciated characteristic, the maximum grade being 7.

Of the four varieties analyzed, as regards the most perfumed one, we noticed the flowers of the „*Crimson Glory*” variety with a maximum score of 42 points.

This variety represents the velvet red claret flower and with a strong perfume of damask roses.

The quality evaluation operation of the rose characteristics offers us a general, subjective orientation, from some points of view regarding the decorative value of roses. Through this we can thus emphasize the very decorative varieties of roses.

CONCLUSIONS

The analysis of the behaviour of the four varieties, regarding the most important decorative characteristics emphasized the following aspects:

1. The most decorative leafage was ascertained in the „*Foc de Tabără*”, „*Luchian*” and „*Betty Prior*” varieties.

2. All the varieties analyzed, with the exception of „*Crimson Glory*” variety that has proven to be sensitive to diseases, have proven most resistant to the attack of diseases.

3. The varieties „*Foc de Tabără*”, „*Luchian*” and „*Betty Prior*” distinguished themselves through a great intensity of blooming.

4. The most beautiful flowers have proven to be those from the varieties „*Foc de Tabără*” and „*Luchian*”.

5. As regards the colour of flowers the most valuable varieties distinguished were „*Foc de Tabără*” and „*Luchian*”

6. The most perfumed flowers, of the four varieties analyzed have proven to be the flowers of the variety „*Crimson Glory*”.

7. From the point of view of the total score, the most valuable variety is „*Crimson Glory*”, registering a score of 44.5 points), distinguishing itself through a medium vigour, semi-erected branches, medium-size, dense, normal mat-green leaves.

The flowers are of a red claret velvet colour with shades in blue and with a strong perfume of damask roses. The disadvantage of this variety is represented by the slight sensitivity to mildew and frost.

REFERENCES

1. Eckart H., 2003 – *Cultura trandafirilor*. Editura M.A.S.T., București.
2. Haenchen E., 2003 – *Cultura trandafirului*. Editura M.A.S.T. București.
3. Luban E., 1967 – *Cultura trandafirului*. Editura Agro-silvică, București.
4. Popescu Șt., 1986 – *Trandafirul*. Editura Ceres, București.
5. Preda M., 1979 – *Floricultura, Ediția a II-a*. Editura Ceres, București.
6. Rudolf C., 1978 – *The Rose and thre Kultur*. Stuttgart.
7. Rusu V., 1973 - *Cultura trandafirilor*. Editura Ceres, București.
8. Szekely I., Oană Șt., 1968 – *Combaterea bolilor și dăunătorilor plantelor ornamentale*. Editura Agrosilvică, București.
9. Wagner Șt., 2001 – *Soiuri noi de trandafir create la Stațiunea Cluj-Napoca*. Revista Hortinform X/2.
10. Wagner Șt., 2002 – *Trandafirul de la mit la mileniul trei*. Editura Echard et Co. SNC, Cluj-Napoca.

SOME ASPECTS ON THE MECHANIZED DRIED CUTTING VINE IN REPUBLIC OF MOLDOVA

UNELE ASPECTE PRIVIND TĂIEREA MECANIZATĂ ÎN USCAT A VIȚEI DE VIE ÎN REPUBLICA MOLDOVA

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Abstract. *The main problem in the Wine-growing is development of the perspective technologies based on improvement of the system of vines formation, plantation of the vineyards of a new type, adapted to the requirements of the complex mechanization. In the research, the first results in the mechanized cutting of vines. Formed according to the type "Umbrella" on the modernized espalier with free placing of rods and sprouts in the space. This form contributed to removing of the elements of the grapes above the limits of the row axe, so that the following operations are excluded: removing of the vine from the espalier, tying up of dries rods and green sprouts as well as carrying out of the mechanized cutting, obtaining the significant economic efficiency.*

Key words: sprouts, mechanized cutting, pillars

Rezumat. *Problema principală în viticultură este elaborarea tehnologiilor de perspectivă bazate pe perfecționarea sistemului de formare a butucilor, înființarea plantațiilor de tip nou, adaptate la cerințele mecanizării complexe. În lucrare sunt descrise primele rezultate la tăiatul mecanizat al butucilor, formați după tipul "Ombrela" pe spalier modernizat cu amplasarea liberă a coardelor și lăstarilor în spațiu. Această formă a contribuit la scoaterea elementelor de rod peste limitele axei rândului cu excluderea următoarelor operații: scoaterea viței de pe spalier, legatul în uscat al coardelor și lăstarilor în verde, precum și în efectuarea tăierii mecanizate cu obținerea eficienței economice semnificative.*

Cuvinte cheie: lăstari, tăiere mecanizată, spalieri

INTRODUCTION

An actual viticulture problem consists of reducing to the minimum the manual operations of vine surgery. The expenses in this field are quite considerable, and constitute about 880 man hours/ha. The most difficult and expensive are the following processes: the dried and green cutting of the sprouts, collection etc. In this field, a special perspective has the reduction to minimum of the vine surgery operations quantity, the creation of the optimal conditions for wide application of the mechanization.

MATERIAL AND METHOD

To study the touched problem, there was created an experimental field with two varieties (Cabernet Sauvignon and Muscat Ottonel) with the vine planting scheme – 4,0 m x 1,0 m, management system – Ombrela, mechanized cutting method for 3-4 bars (1.1) and mechanized for 3-4 bars with adjustment, manual for 3-4 bars (5.1) and manual for 7-8 bars (6.1). (tab.1)

At the mechanization department of the institute, there was elaborated a machine (OCC) that makes possible the mechanized cutting of the high stem types and vertical growing of with a free sprout placement (fig.1).

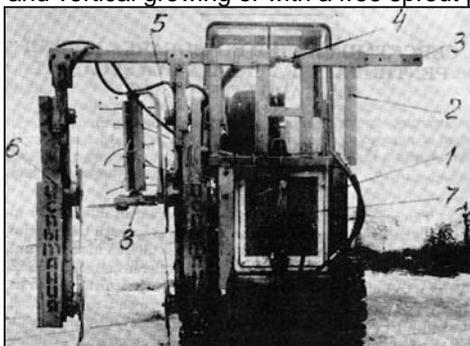


Fig.1. Preparatory cutting and vine turning machine OCC (canes cutting method): 1. frame; 2. portal; 3. horizontal bar; 4. adjustment mechanism; 5. hydraulic engine; 6. vertical cutting device; 7. hydraulic cylinder; 8. Horizontal cutting device.

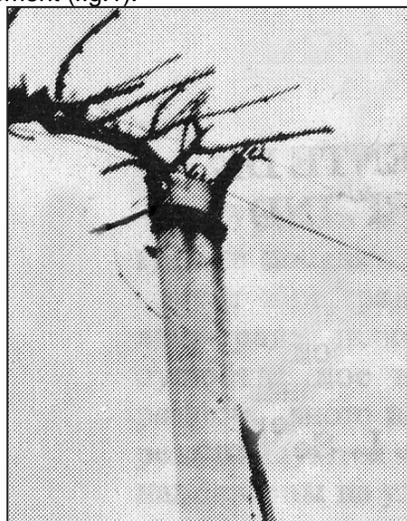


Fig.2. Mechanized cutting with no manual adjustment.

RESULTS AND DISCUSSIONS

Based on the many ears researches, there was elaborated and recommended for a wide use in production, with the purpose of excluding the above described disadvantages, a new vine administration method on high stem with the free placement of the sprouts, according to the Ombrela type (*Chisinau, 1989, L.Parfenenco and collaborators*) On the fundaments of this system was the modernization of the pillars upper part with the application of some special supports (fig.2) which gave us the possibility to place the wires in a single horizontal position at the altitude of 1,4 m from soil surface. This form contributed to the extraction of the productive elements out of the rows axes limits with the elimination of the following operations: the removal of the vine from the espalier, dried binding of the vine and green sprouts, permitting the mechanized vine cutting.

The first researches of the biological fundamentals elaboration of the dried vine cutting in the Republic of Moldova were made at the experimental farm of

the institute, for the varieties Rkatsiteli and Feteasca white, in condition of vine formation of high stem (1,0m) and vertical growing of the sprouts. The results of these researches demonstrated that the mechanized cutting vine with vertical growing, needs the elimination of the canes from the espalier. Except of this, the placement of the sprouts in a single plan will not insure the simultaneous cutting possibility on different altitude levels, the fact that imposes the necessity to perform the rejuvenation periodical cuttings, which lead to the productivity reduction during the year of their performance. In this way, for the implementations into production of the vine free placement, it was necessary to update the espalier. There were elaborated two new types of espaliers (Brevet nr.2571 from 31.10.2004) which were experimented at the State Station of Machines Testing, confirming that the espaliers correspond to the technical conditions, these are quite durable and can be proposed for production.

Table 1

The obtained results under the economical aspect

Variants	Cutting method	Average vine yield, t/ha	Sugar content, g/dm ³	Acquisition price, lei MD/t (year 2003)	Production value, thousands, lei MD/ha	Production expenses		Profitability level %
						Average, thousands lei MD/ha	Unitary lei MD/t	
Cabernet-Sauvignon variety								
1.1	Mechanized for 3-4 bars	17,7	161	2865	50,7	14,5	819,2	249,9
2.1	Mechanized for 3-4 bars with manual adjustment	15,0	173	3045	45,7	13,9	926,7	228,8
5.1	Manual for 3-4 bars	10,6	186	3240	34,3	12,5	1179	174,4
6.1	Manual for 7-8 bars	10,9	185	3225	35,2	12,6	1156	179,4
Muscat Ottonel variety								
1.1	Mechanized for 3-4 bars	20,8	151	2715	56,5	15,5	745,2	264,5
2.1	Mechanized for 3-4 bars with manual adjustment	16,2	161	2865	46,4	14,3	883	224,5
5.1	Manual for 3-4 bars	12,4	175	3075	38,1	13,1	1057	190,8
6.1	Manual for 7-8 bars	13,4	169	2985	40,0	13,4	1000	198,5

CONCLUSIONS

1. The analysis of the obtained information, demonstrates the significant influence of the dried cutting methods vine, on the vine production efficiency. The mechanized vine cutting and the mechanized cutting with manual adjustment, in comparison with the traditional manual cutting, experimented on the Cabernet Sauvignon variety, gives the majority of vine yield of correspondingly 62,3 and 41,5%.

2. The tendency is observed of the Muscat Ottonel variety – 67,7 and 30,6 %. The presented situation is explained by the fact that on the mechanized cutting is expanded the load of vine with bars.

3. From another point of view, the mechanized cutting offers the possibility to perform this operation in optimal period of time, the fact that also has a positive influence on the vine plantations' productivity and durability.

REFERENCES

1. **Botnarenco A., Cernomoreț M., Murzin S., Serbina L., Cudențov V., 1995** - *Perfecționarea unor elemente de conducere a viței de vie privind tăierea mecanizată*. Lucrări științifice, Chișinău, pp. 47-56
2. **Botnarenco A., 2003** – Noi stâlpi de spalier pentru cultivarea viței de vie. Simpozion științific internațional „70 ani ai Universității agrare de Stat din Moldova”, Chișinău.
3. **Cramarciuc F., Botnarenco A., Serbina L., 2004** – *Aspectul economic privind tăierea mecanizată în uscat a viței de vie*. Buletin Informativ, Institutul Național de Economie și Informație.
4. **Ciobanu A., Murzin S., Cebanu I., 1995** – *Cercetări privind elaborarea mașinii pentru tăierea prealabilă și cârnit lăstarii viței de vie*. Lucrări științifice ale Institutului Național al Viei și Vinului, Chișinău, pp. 157-164

CLIMATIC REQUIREMENTS FOR OPTIMUM DEVELOPMENT OF GRAPEVINE IN COTNARI VINEYARD

NECESITĂȚI CLIMATICE PENTRU DEZVOLTAREA OPTIMĂ A VIȚEI DE VIE ÎN ZONA PODGORIEI COTNARI

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Abstract. *In this paper some of the favourable climatic elements for the development of grapevine in Cotnari Vineyard (air temperature, the length of sun shining, the relative humidity) will be analysed. Monthly, seasonally and annual evolution of each climatic element will be analysed, taking into account the connection between these climatic elements and the grapevine requirements for this area.*

Key words: air temperature, the length of sun shining, the relative humidity

Rezumat. *În lucrarea de față se vor analiza câteva elemente climatice favorabile dezvoltării viței de vie din zona Podgoriei Cotnari, precum temperatura aerului, durata de strălucire a soarelui, umiditatea relativă. Evoluția lunară, anotimpuală și anuală a fiecărui element climatic va fi analizată, ținând cont de legătura existentă între aceste elemente climatice și necesitățile viței de vie din această zonă.*

Cuvinte cheie: temperatura aerului, durata de strălucire a soarelui, umiditatea relativă

INTRODUCTION

In many situations, the quality of viti-vinicole production is influenced by climatic elements. For pointing out the conditions of possibility as regards the obtaining of significant oenological performances, very important for us is to know the écart manifestation of climatic elements in Cotnari Vineyard.

MATERIAL AND METHOD

In this paper, some climatic elements will be analysed (air temperature, the length of sun shining, the relative humidity), reckoning on data from Cotnari and Botoșani meteorological stations and a correlation between these climatic elements and grapevine requirements will be realized for Cotnari Vineyard.

RESULTS AND DISCUSSIONS

Air Temperature

The main climatic factor that influences the physiological and biochemical processes of grapevine, restricting at the same time its cultivation, is air temperature. Analysing air temperature values between 1956-2006, we can remark that annual average temperature was 9.2 °C, both in Cotnari and Botoșani.

As regards the annual regime of monthly average temperature, we can observe that minimum value in January was higher in Cotnari than Botoșani by 0.6°C while maximum value in July was lower in Cotnari than Botoșani by 0.5°C (fig. 1).

The highest monthly average temperature between 1956-2006 has been registered in August 1992, both in Cotnari (23.9 °C) and Botoșani (23.6 °C). The lowest monthly average temperature for the same period has been produced in January 1963, at both meteorological stations: -11.4 °C in Cotnari and -12.2 °C in Botoșani.

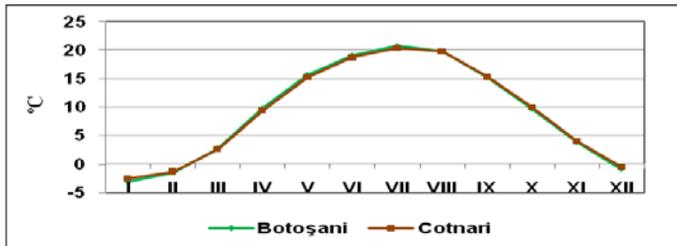


Fig. 1. The evolution of monthly average values of air temperature in Botoșani and Cotnari (1956-2006)

The long-term annual graphical representation of air temperature for the two meteorological stations marks out an evolutive course with clear fluctuations between some years (1956-1957; 1968-1969; 1975-1976; 1988-1989; 1990-1991; 1993-1994). Tropical air masses above our country made possible the producing of the highest annual average temperature between 1990 and 2000 in Cotnari (10.9 °C) and 1990 in Botoșani (10.9 °C). The lowest annual average temperature has been registered in 1956 (7.3 °C in Cotnari and 7.4 °C in Botoșani), as a result of arctic air masses influence (fig. 2).

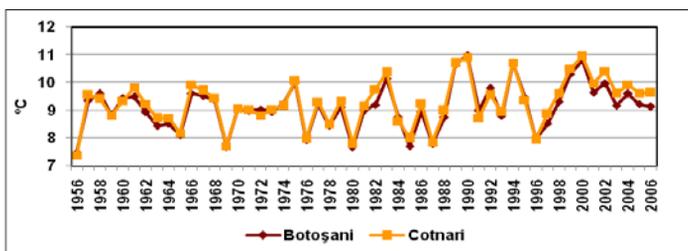


Fig. 2. The long-term evolution of annual average values of air temperature in Botoșani and Cotnari (1956-2006)

Analysing the monthly average temperature between 1956-2006, we observed from calculus that January was the coldest month of the year in 49 % of the cases in Cotnari and in 53 % of the cases in Botoșani. The warmest month of the year was July in 58,8 % of the cases in Cotnari and in 64,7 % of the cases in Botoșani. A certain quality of production needs a certain level of average temperature from the warmest month of the year. For middling productions, the

level of the average temperature from the warmest month of the year must be equal or it could exceed 16 °C; for good productions, temperature must be 18 °C and for the best productions, this must be 19-20 °C (Martin T., 1968). For Cotnari Vineyard region, the average temperature from the warmest month of the year was favorable for obtaining the best vintages (19-20 °C, sometimes even 21-22°C) in majority of analysed years, aside from some years (1969, 1974, 1978, 1979, 1984, 1999 in Cotnari and 1962, 1969, 1974, 1978, 1979, 1984 in Botoșani), favourable for obtaining good vintages (17-18 °C).

In winter, the average temperature was higher in Cotnari (-1.4 °C) than in Botoșani (-1.8 °C). More moderate temperature values during winter in Cotnari could be due to foehn influence. Cold winters in some years in Cotnari Vineyard region, such as 1969 in Cotnari (-6.0 °C) and 1963 in Botoșani (-7.7 °C), have been caused by an intensive anticyclonic activity, given by Siberian Anticyclone and, less, Greenland and Scandinavian Anticyclones (Topor N., 1965). In other years, winters have been warm: 1989 (2.8 °C) in Cotnari; 1989 (2.8 °C) in Botoșani.

In spring, the average temperature in Cotnari was 9.0 °C, but in Botoșani this was higher by 0.4 °C. Cold springs, produced by Greenland and Scandinavian Anticyclones, have been in: 1956 (6.7 °C), 1980 (6.2 °C) in Cotnari; 1980 (6.3°C), 1987 (6.4 °C) in Botoșani. Among the years with warmer springs we can mention: 1983 (11.9 °C), 1990 (11.5 °C), 2000 (11.5 °C) in Cotnari; 1983 (11.9°C), 1989 (11.2 °C), 1990 (11.6 °C), 2000 (11.4 °C), 2002 (11.1 °C) in Botoșani.

The average air temperature of summer in Cotnari (19.6 °C) was easily lower than that in Botoșani (19.9 °C). Easily lower temperatures during summer in Cotnari in comparison with those in Botoșani, could be explained through foehn influence. Cold summers, due to Greenland and Scandinavian Anticyclones influence, have been remarked in the next years: 1984 (17.6 °C) in Cotnari; 1976 (17.5 °C), 1984 (17.6 °C) in Botoșani. Warm summers have been in: 1963 (21.2 °C), 1999 (21.4 °C), 2003 (21.3 °C) la Cotnari; 1963 (21.4 °C), 1992 (21.1°C), 1995 (21.0 °C) 1999 (21.4 °C) in Botoșani.

In autumn, the average temperature in Cotnari (9.7 °C) was easily higher comparing with that in Botoșani (9.5 °C). Cold autumns, caused by Greenland and Scandinavian Anticyclones influence, have been remarked in: 1956 (7.9 °C), 1959 (7.6 °C), 1988 (7.7 °C), 1993 (7.3 °C) in Cotnari; 1993 (6.9 °C) in Botoșani. Years with warm autumns were: 1963 (12.6 °C), 1967 (12.1 °C) in Cotnari; 1960 (11.0 °C), 1963 (11.8 °C), 1967 (11.7 °C) in Botoșani.

The annual unrolling of grapevine phenological phases is imposed by a certain temperature level (*biological threshold*). Thus, biotermic threshold by 5°C, registered in Cotnari on 27 March, corresponds to „awakening” grapevine period from latent life; threshold by 10 °C, considered zero of growing or biological zero, which in Cotnari takes place on 19 April, corresponds with „cry” period; sprouting phenological phase is produced in a 12 ÷ 13 °C biological threshold; threshold by 15 °C coincides with blossoming period of grapevine, which in Cotnari takes place on 17 May; threshold by 18 °C, registered on 15 June in

Cotnari Vineyard, corresponds to growing grapes phenological phase; threshold by 20 °C corresponds to the beginning of the ripening grapes period, which starts on 10 July; the growing up of the wood phenological phase and the falling of the leaves stage take place in a biological threshold of 25 °C. Overtaking termic thresholds above mentioned determines stagnation of grapevine development processes, which can be resumed when thresholds come back to normal limits (Cotea Victoria și colab., 1996).

The length of sun shining

More important for viticulture is knowing of space repartition and time evolution of the length of sun shining because this climatic parameter could influence the quality and the quantity of viti-vinicole vintages from Cotnari Vineyard.

During the year, July was the month with the highest value of the length of sun shining (291.4 hours in Cotnari; 274.5 hours in Botoșani) and December was the month with minimum value of the length of sun shining (76.5 hours in Cotnari; 67.1 hours in Botoșani) (fig. 3).

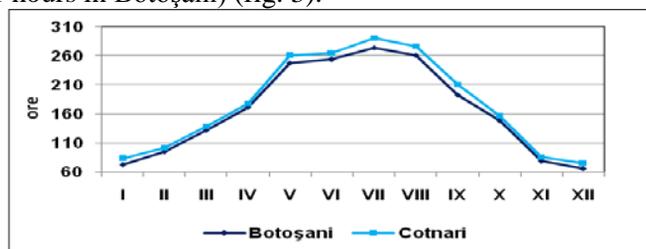


Fig. 3. The evolution of monthly average values of the length of sun shining in Botoșani and Cotnari (1975-2006)

On semesters, the length of sun shining is distributed in warm semester (April-September) in proportion of 69.7 % in Cotnari (1483.3 hours) and of 70 % in Botoșani (1401.5 hours), when grapevine requirements for light are higher. In cold semester (October-March), when grapevine requirements for light are lower, the length of sun shining registers a less percent (30.3 % in Cotnari – 645.9 hours and 30 % in Botoșani – 598.1 hours).

The long-term annual graphical representation of the length of sun shining marks out a maximum value in 2000 in Cotnari (2390 hours) and Botoșani (2347 hours), and a minimum value in 1984 in Cotnari (1754.5 hours) and in 1980 in Botoșani (1608.5 hours) (fig. 4). While in less sunny years, cyclonic activity was frequent, years with high values of the length of sun shining have been dominated by an anticyclonic regime.

In our studied period, the highest monthly average value of the length of sun shining has been registered in May 2000, both in Cotnari (379.8 hours) and Botoșani (355.2 hours). The lowest value of the same climatic parameter has been produced in February 1984, at both meteorological stations: Cotnari (32.2 hours) and Botoșani (34 hours).

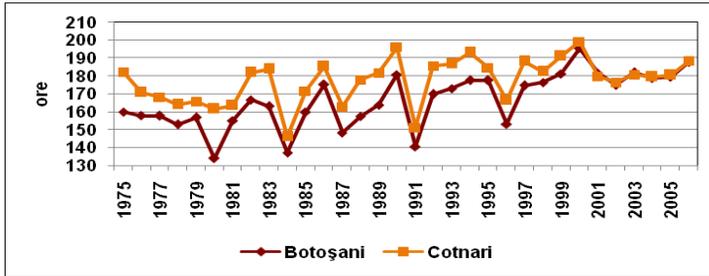


Fig. 4. The long-term evolution of annual average values of the length of sun shining in Botoșani and Cotnari (1975-2006)

The relative humidity

The annual average of the relative humidity has been calculated between 1970-2006, counting on the monthly average values obtained for Cotnari and Botoșani meteorological stations. The relative humidity was higher in Cotnari (78%) than in Botoșani (76.7%) because of higher altitude of Cotnari meteorological station (289 m).

During the year, the relative humidity has a fluctuating evolution, with a maximum value in January (82.6 % in Botoșani; 84 % in Cotnari), respectively in December (84 % in Cotnari) and a minimum value in May (72.4 % in Cotnari; 69.6 % in Botoșani) (fig. 5).

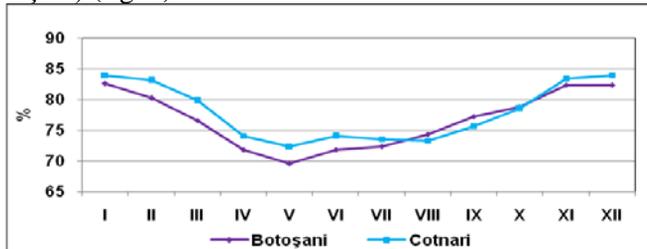


Fig. 5. The evolution of monthly average values of relative humidity in Botoșani and Cotnari (1970-2006)

Owing to a well developed root system and to a high hydrique absorption capacity, grapevine has a high adaptability to drought period. However, grapevine cannot live without water, but its hydric requirements became differentiated in accordance with specific phenological phases of vegetation period (75-80 % in the sprouting phenological phase, over 55 % in the blossoming phenological phase, 50-60% in the ripening grapes period) (Cotea Victoria și colab, 1996). The hydrique assimilation process will be getting on normal, if grapevine requirements for relative humidity are between 50-80 %, very well satisfied for Cotnari Vineyard region.

On seasons, the highest value of the relative humidity is registered in winter (83.7 % in Cotnari; 81.7 % in Botoșani) and the lowest value of the same parameter is produced in summer (73.6 % in Cotnari), respectively in spring (72.6% in Botoșani).

In the long-term annual profile, the poorest years in humidity were 1986 in Cotnari (72.4 %) and 2004 in Botoșani (68 %) because of continental air masses from

East and the richest years in humidity were 1978 in Cotnari (86.5 %) and 1996 in Botoșani (84.4 %) because of frequent humid air masses from Atlantic Ocean (fig. 6).

The lowest monthly average value of the relative humidity in Cotnari has been registered in May and June of 2003 (59 %), as well as in March of 2002 (59 %), and the highest monthly average value of the same parameter has been registered in February of 1978 and 1984 (98 %). In Botoșani, minimum value of the relative humidity has been produced in June of 2004 (51 %) and maximum value in December of 1996 (96 %).

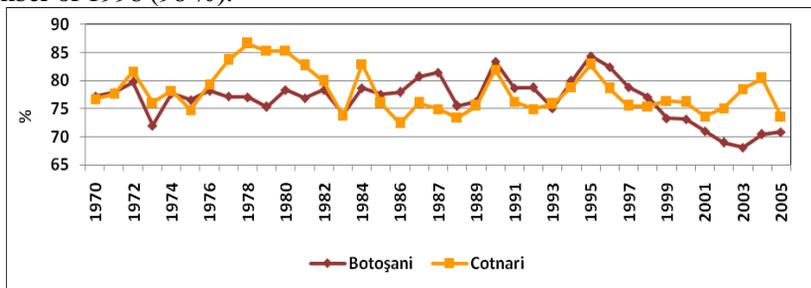


Fig. 6. The long-term evolution of annual average values of relative humidity in Botoșani and Cotnari (1970-2006)

CONCLUSIONS

The evolution of the three climatic parameters (air temperature, the length of sun shining, relative humidity) in our discussion concerning grapevine requirements for Cotnari Vineyard reflects the existence of a tight ecoclimatic interdependence. The average temperature from the warmest month of the year was favorable for obtaining of the best vintages (19-20 °C, sometimes even 21-22°C) in majority of the analysed years. The annual average of the length of sun shining between 1975-2006 was highest in Botoșani (1999.7 hours) than in Cotnari (2129.8 hours), because of foehn influence from that area. The length of sun shining is distributed in warm semester (April-September) in proportion of 69.7 % in Cotnari, respectively of 70 % in Botoșani, when grapevine requirements for light are higher, while in cold semester (October-March), the length of sun shining registers a less percent (30.3 % in Cotnari and 30 % in Botoșani).

As regards the relative humidity, this had annual average values of 78 % in Cotnari and of 76.7 % in Botoșani (1970-2006), suitable values for satisfying the hydric requirements of grapevine for Cotnari Vineyard.

REFERENCES

1. Cotea Victoria, Cotea V. V., 1996 – *Viticultură, ampelografie și oenologie*. Edit. Didactică și Pedagogică, București.
2. Topor N., Stoica C., 1965 – *Tipuri de circulație și centri barici de acțiune atmosferică deasupra Europei*. Inst. Meteorologic, București.
3. Martin T., 1968 – *Viticultura*. Edit. Agro-Silvică, București.

FAVOURABLE CLIMATIC CHARACTERISTICS FOR THE DEVELOPMENT OF GRAPEVINE IN COTNARI VINEYARD

CARACTERISTICI CLIMATICE FAVORIZANTE PENTRU DEZVOLTAREA VIȚEI DE VIE ÎN ZONA PODGORIEI COTNARI

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Abstract. *In this paper some of favourable climatic elements for the development of grapevine in Cotnari Vineyard will be characterized, such as soil temperature, atmospheric precipitations and foehn phenomenon. Monthly, seasonally and annual evolution of soil temperature and atmospheric precipitations will be analysed, taking into account the relation between these climatic elements and the grapevine requirements for Cotnari Vineyard.*

Key words: soil temperature, atmospheric precipitations, foehn phenomenon, grapevine, vegetation period

Rezumat. *În lucrarea de față se vor caracteriza câteva elemente climatice favorizante pentru dezvoltarea viței de vie în zona Podgoriei Cotnari, precum temperatura solului, precipitațiile atmosferice, foehnul. Evoluția lunară, anotimpuală și anuală a temperaturii solului și a precipitațiilor atmosferice va fi analizată, având în vedere relația dintre aceste elemente climatice și cerințele viței de vie pentru zona Podgoriei Cotnari.*

Cuvinte cheie: temperatura solului, precipitațiile atmosferice, fenomenul de foehn, vița de vie, perioada de vegetație

INTRODUCTION

Optimum ecoclimate for grapevine in Cotnari Vineyard is determined, in a large measure, among other climatic elements, by soil temperature and atmospheric precipitations. These climatic elements are very important for realizing a qualitative viti-vinicole production. Growing and blossoming processes of grapevine are influenced by soil temperature and atmospheric precipitations, whose normal unfolding is given by certain termic and hydric limits.

MATERIAL AND METHOD

Soil temperature, atmospheric precipitations and foehn phenomenon will be characterized, based on data from Cotnari and Botoșani meteorological stations and a correlation between these climatic elements and grapevine requirements will be realized for Cotnari Vineyard.

RESULTS AND DISCUSSIONS

Soil temperature. Optimum temperature for the growing of roots grapevine is about 25 °C, with the stopping of this process under 6-8 °C,

respectively over 30 °C (Oşlobeanu M., 1980). Nitrification process needs, for the beginning, a soil temperature of 5 °C (Cotea Victoria, 1996).

The graphic of monthly average soil temperature between 1970-2006 shows an uniforme evolution of this climatic parameter. Thus, soil temperature increases easily in January, when termic minimum is registered (-3.3 °C in Botoşani; -2.7 °C in Cotnari), but it remains negative also in February. Temperatures become positive starting with March, going on to grow until July, when termic maximum is registered (24.6 °C in Botoşani; 24.4 °C in Cotnari). A gradual termic decreasing is produced from July and until December when temperatures become again negative (fig. 1). The annual average of soil temperature was low, both in Cotnari (10.6 °C) and Botoşani (10.5 °C). In Botoşani, the annual average amplitude was easily higher (27.9 °C) than in Cotnari (27.1 °C).

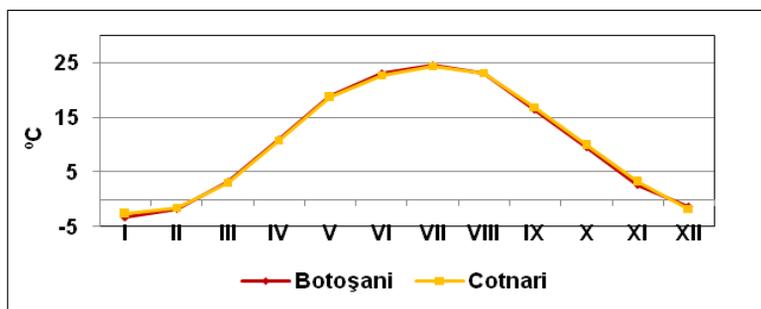


Fig. 1. The evolution of monthly average values of soil temperature in Botoşani and Cotnari (1970-2006)

In accordance with the depth, termic minimum is registered in 10 cm in January (under -2°C) and in 20 cm in February (under -1°C), while termic maximum is produced in July in 10 cm (over 24 °C) and in August in 20 cm (over 23 °C), the termic difference between the two levels of depth being caused by slower propagating in soil of warmth (Cotea D. V., 2006).

The average soil temperature of winter has been lower in Botoşani (-2.1°C) than in Cotnari (-1.9 °C). In spring, the average soil temperature has been 10.9°C in Cotnari and 11.1 °C in Botoşani. Dudnic M. A. and Hmelevskii K.K. (1971) have ascertained that during spring, the growing of grapevine roots is more intensive in superficial horizon of soil (0-20 cm) while in autumn this is more intensive in deeper horizons (40-60 cm), because of the cooling of soil in surface (Oşlobeanu M., 1980). In summer, the average soil temperature was 23.4 °C in Cotnari and 23.6 °C in Botoşani. The average soil temperature in autumn was 10.0°C in Cotnari and 9.5 °C in Botoşani.

In the long-term annual profile, the highest value of soil temperature (12.5°C) has been registered both stations: Cotnari (1990) and Botoşani (2000) (fig. 2).

The minimum monthly values of soil temperature for studied period have been registered in January 1985, both in Cotnari (-9.1 °C) and Botoşani (-10.3 °C).

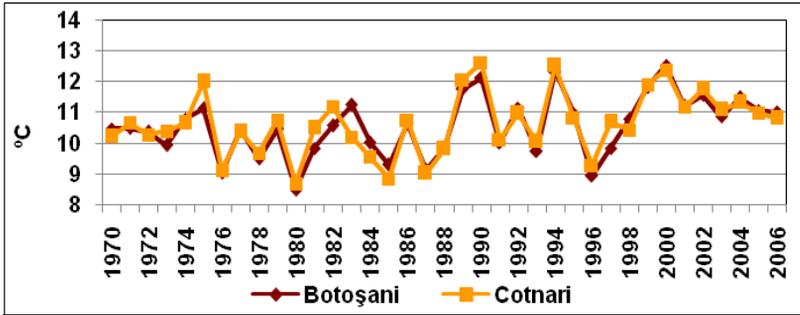


Fig. 2. The long-term evolution of annual average values of soil temperature in Botoșani and Cotnari (1970-2006)

Atmospheric Precipitations

Analysing the annual average of atmospheric precipitations between 1956-2006 we can observe a maximum value in July (76.3 mm in Cotnari and 87.8 mm in Botoșani) and a minimum value in January-February (21.6 mm in Cotnari in February; 23.2 mm in Botoșani in January) (fig. 3). The annual averages of atmospheric precipitations have been 569.9 mm in Botoșani and 515.2 mm in Cotnari. Lower annual average quantity of precipitations in Cotnari in comparison with that in Botoșani could be explained by foehn influence in this area.

Atmospheric precipitations during vegetation period had an ascending evolutive course from April (48.8 mm in Cotnari; 50.1 mm in Botoșani) until July (76.3 mm in Cotnari; 87.8 mm in Botoșani), when pluviometric maximum is registered. Starting with August, the quantity of atmospheric precipitations is diminished easily (61.4 mm in Cotnari; 64.2 mm in Botoșani), getting in September under 50 mm (43.0 mm in Cotnari; 44.6 mm in Botoșani). The sum of atmospheric precipitations from vegetation period (April-September) has been higher in Botoșani (401.7 mm) than in Cotnari (361.7 mm).

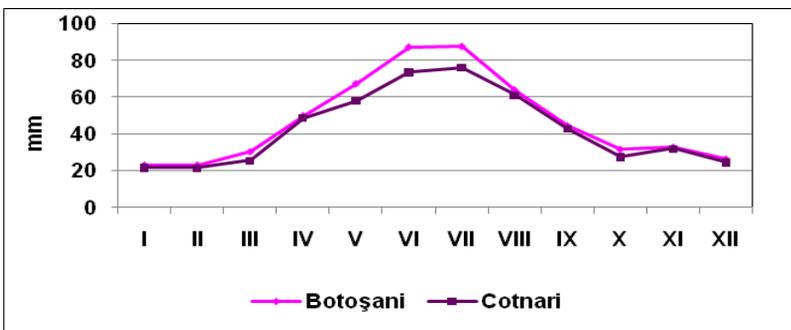


Fig. 3. The evolution of monthly average values of atmospheric precipitations in Botoșani and Cotnari (1956-2006)

The annual pluviometric minimum has been registered in Botoșani in 19.6% of the cases in February and in Cotnari in 23.5 % of the cases in October. The pluviometric minimum from February and October is determined, during

winter, by Siberian Anticyclon, which acts on Romania through Voeikov dorsal, and in autumn, this is produced by Azoric Anticyclon.

The annual pluviometric maximum has been produced in July in Botoșani in 33.3 % of the cases and in Cotnari in 27.4 % of the cases. The pluviometric maximum in July is due to richness in humidity of atlantic cyclons on the one hand and to Azoric Anticyclon, which is extending one of his flanks to the inside of our continent on the other hand.

On seasons, the smallest quantity of atmospheric precipitations during a year is registered in winter (73 mm in Botoșani; 68.1 mm in Cotnari) and the highest in summer (239.4 mm in Botoșani; 211.5 mm in Cotnari). In the seasons of transition we can remark higher quantities of atmospheric precipitations in spring (148.1 mm in Botoșani; 132.7 mm in Cotnari) than in autumn (109.4 mm in Botoșani; 102.9 mm in Cotnari).

The repartition of atmospheric precipitations on semesters marks out that in warm semester (April-September) falls the highest quantity of atmospheric precipitations (70.5 % of annual average in Botoșani; 70.2 % of annual average in Cotnari), because of an intensive anticyclonic activity. In cold semester (October-March), atmospheric precipitations represents almost a third of annual average (29.5 % of annual average in Botoșani; 29.8 % of annual average in Cotnari), because of high atmospheric pressure areas.

The grapevine requirements for humidity are high in the beginning of the vegetation period and in the stage of the growing of vegetative organs, then in the ripening and in the stage of „filling with water” of grapes. During the blossoming and in the ripening of grapes and of wood period, grapevine requirements are minimum. High humidity during the ripening of grapes affects negatively the quality of vintages, that is the sugar content becomes diluted, the peel splits and the grapes are rotting. If a rainy period follows after a drought one, grapes split more easily and inferior quality vintages will result (Martin T., 1968).

Analysing the distribution of atmospheric precipitations in the long-term annual profile we can distinguish the existence of some rainy periods and others drought periods. High quantities of atmospheric precipitations which fall in certain periods are due to persistence of low atmospheric pressure of baric system, as Mediterranean, whose influence feels, especially, in the second part of summer or in the beginning of autumn and in winter. Among rainy years we can remark: 1969 (787.3 mm), 1988 (701.7 mm), 1998 (823.7 mm), 2001 (729.3 mm), 2005 (719.5 mm) in Botoșani; 1991 (825.1 mm) and 1998 (715.2 mm) in Cotnari (fig. 4). Besides, the excess of the humidity determines the falling of grapevine flowers, the softening and the beading of grapes, the splitting and the rotting of these (Martin T., 1968). The poorest periods of atmospheric precipitations have, in origin, the persistence of anticyclonic areas, as Azore Islands, which acts, especially, in summer through its flanks whom push it on Mediterranean Sea and on Central Europe. The retreating of this baric system to North allow penetrating of tropical air masses from Small Asia, air masses responsible for installing of drought weather in Romania. Among drought years we can mention: 1963 (374.4

mm), 1967 (387.8 mm), 1986 (323.8 mm) in Botoșani; 1963 (389.8 mm), 1965 (349 mm), 1967 (355.2 mm), 1982 (361.1 mm), 1986 (313.7 mm), 1994 (393.4 mm), 2000 (361.9 mm), 2003 (377.4 mm) in Cotnari (fig. 4).

In the analysed period, the highest quantity of atmospheric precipitations has been registered in July 2002 (225.8 mm) in Botoșani and in July 1991 (225.0 mm) in Cotnari; the smallest quantity of atmospheric precipitations has been registered in September 1982 (0.0 mm) in Botoșani and in January 1978 (0.9 mm) in Cotnari.

The long-term annual regime of atmospheric precipitations for a long time period (51 years) could contribute to the contouring of an ensemble vision regarding the evolutive tendency of this climatic parameter, as and in realizing a short term prediction. Thus, atmospheric precipitations graphic indicates a succession of large fluctuations of ascending type (2003-2006 in Cotnari; 1963-1966 in Botoșani), marking out an evolutive trend in easy preponderant growing (fig. 4). As regards short term prediction, we can await, with some approximation, in keeping above mentioned tendency in the near future.

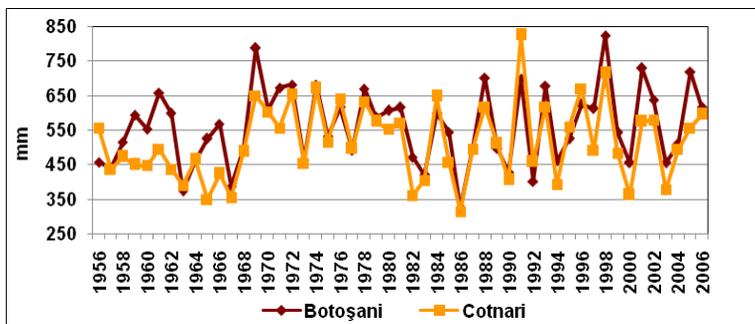


Fig. 4. The long-term evolution of annual average values of atmospheric precipitations in Botoșani and Cotnari (1956-2006)

Foehn phenomenon

In Cotnari Vineyard region, foehn appears when warm air masses from west slopes of Great Hill, in ascending movement, are cooling and descends warm on east slopes of Cotnari Coast. During ascension, the air is cooling, both after dry adiabatic gradient (until condensation level) and after humide adiabatic gradient (above condensation level); during descending, the air is warming only after dry adiabatic gradient (Posea Gr., 1986). Thus, on sheltered slopes of Cotnari Coast, temperatures are higher and nebulosness, relative humidity and atmospheric precipitations are lower than on those exposed to wind from Great Hill. In Cotnari Vineyard region, winds, which come from NV, contribute, in great measure, to the forming of foehn phenomenon, adding winds from V and SV. Maximum manifestation of this phenomenon can be remarked in July when the length of sun shining is high (291.4 hours) and the frequence of NV winds is large (40.9 %). This phenomenon favours the grapevine culture in Cotnari Vineyard region because warm air is canalized to the base of Cotnari Coast, in

long of the depression corridor, keeping a favourable microclimate for the ripening and even for the superripening of grapes.

CONCLUSIONS

Soil temperature and atmospheric precipitations influence the developing processes of grapevine whose normal unfolding is given by certain termic and hydric limits. Generally, these limits are satisfied in Cotnari Vineyard. Thus, the annual average of soil temperature between 1970-2006 was 10,6 °C in Cotnari and 10,5 °C in Botoșani. The quantity of atmospheric precipitations during vegetation period (April-September) has been higher in Botoșani (401.7 mm) than in Cotnari (361.7mm) between 1956-2006. The repartition of atmospheric precipitations on semesters marks out that in warm semester (April-September) falls the highest quantity of atmospheric precipitations (70.5 % of annual average in Botoșani; 70.2 % of annual average in Cotnari), while in cold semester (October-March), atmospheric precipitations represent almost a third of annual average (29.5 % of annual average in Botoșani; 29.8 % of annual average in Cotnari).

Foehn phenomenon favours the grapevine culture in Cotnari Vineyard region because warm air is canalized to the base of Cotnari Coast, in long of the depression corridor, keeping a favourable microclimate for the ripening and even for the superripening of grapes.

Finally, we can affirm that in Cotnari Vineyard region, ecoclimatic conditions are favourable for getting on normal of grapevine phenological phases, qualitative viti-vinicole production being an argument to which, among others, pedological conditions contribute. The two ecoviticole components of the concept „terroir” – climate and soils – contribute (in case of Cotnari Vineyard), in a large measure, in establishing of an intimate relation among the unrolling in optimum conditions of the grapevine phenological phases, the grapes composition, the wine characteristics and the viti-vinicole production.

REFERENCES

1. **Cotea Victoria, Cotea V. V., 1996** – *Viticultură, Ampelografie și Oenologie*. Edit. Didactică și Pedagogică, București.
2. **Cotea D. V. (coord.), Ciubotaru M., Barbu N., Cotea V. V., Magazin P. G., Grigorescu C. C., 2006** – *Podgoria Cotnari*. Edit. Academiei Române, București.
3. **Martin T., 1968** – *Viticultura*. Edit. Agro-Silvică, București.
4. **Oșlobeanu M., Oprean M., Alexandrescu I., Georgescu M., Baniță P., Jianu I., 1980** – *Viticultură generală și specială*. Edit. Didactică și Pedagogică, București.
5. **Posea G. (coord.), 1986** – *Geografia de la A la Z. Dicționar de termeni geografici*. Edit. Științifică și Enciclopedică, București.

THE USE OF GIS FOR THE STUDY OF THE LOCAL VARIATION OF THE ECOLOGICAL FACTORS IN THE AVEREȘTI VINE-GROWING CENTRE – HUȘI VINEYARD

UTILIZAREA GIS PENTRU STUDIUL VARIAȚIEI LOCALE A FACTORILOR ECOLOGICI DIN CENTRUL VITICOL AVEREȘTI – PODGORIA HUȘI

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Abstract. *The paper present the preliminary results of a research regarding the use of the Geographic Information Systems to evaluate the ecological suitability of the vineyards. To analyze the ecological factors variation, we used the satellite images of Averești vine-growing centre – Huși vineyard. The images were processed with the digitalelevation model SRTM – USGS (2004). Using this we obtained the maps with the local variation of the topographic and climatic factors. The maps reveal and explain the different ecological favorability of the terroirs composing Averești wine-growing area.*

Key words: vine, viticultural area, Geographic Information System, climatic maps, ecologic favorability.

Rezumat. *În lucrare sunt prezentate rezultatele preliminare ale unei cercetări privind evaluarea potențialului ecological al arealelor viticole, prin folosirea Sistemelor de Informații Geografice. Pentru analiza variației locale a factorilor ecologici s-au folosit imagini din satelit ale arealului viticol Averești din podgoria Huși. Imaginile au fost procesate folosind modelul numeric al terenului SRTM - USGS (2004). Pe baza modelului numeric al terenului s-au elaborat hărțile cu variația locală a factorilor ecologici. Acestea evidențiază și explică potențialul diferit al unităților de terroir care intră în alcătuirea centrului viticol Averești.*

Cuvinte cheie: vița de vie, areal viticol, Sistem de Informații Geografice, hărți climatic, favorabilitate ecologică.

INTRODUCTION

The establishment and the exploitation of wine plantations needs data, concerning the environment and the factors that compose it (*climate, topography, soil etc.*). The quality of the information determine the quality of the decisions, the yield and ultimately, the profitability of the vineyard. The climatic studies based on data provided by far weather stations, presents certain incertitude, because the station always gives the data for its own particular location. The use of these data leads to wrong decisions in the settlement of the appropriate grapevine varieties, in the establishment of the trellising systems, and in the settlement of the optimum winegrowing technologies. Therefore, in the viticulture were introduced, in the last years, some modern methods of research, that allows an exhaustive analyze of the

environment and procurement of the necessary data for implementing the precision viticulture principles.

Such a modern method is the use of *Geographic Information Systems* (GIS), tools of informational technologies created to “*captures, stores, edits, analyzes, shares, and displays geographic information*”. GIS offer the possibility to determine the local variation of the ecological factors from a vine area and to establish, accurately, the grapevine varieties, the trellising systems and the appropriate technologies.

MATERIALS AND METHODS

For the study of the ecological factors' variation was used the digital elevation model (DEM) (SRTM – USGS, 2004) for the Averești vine area and the adjacent sloping coasts, where is located the vineyard. The marked area represent the plantations in 2007. The surface of the vine area is approximate 600 ha. It include seven *sites (terroirs)* with distinctive characteristics. These sites are: *Bunești, Armășeni, Roșiori, Averești, Arsura, Pribeasca and Pâhnești* (fig. 1). For a detailed analyze of the vine area, the Averești *site* was divided in two distinctive subunits: *Averești Deal și Averești Plopi*. The digital elevation model (DEM) was resampled from the original 90 m resolution at 10 m, through bilinear interpolation, for an accurate reproduction of the land surface. Then, this was used to derive the slopes and their exposure. The spatial distribution of the air temperature (the *annual average temperature, the average temperature in the hottest month - July*) and of the *annual average precipitations*, were obtained using DEM, through statistical regression analyze. The characteristics of the radiation (*global radiation, the duration of the solar shining*) where, also, obtained using DEM, in two stages: derivation of the irradiative parameters, ignoring the nebulosity and second, correcting them using the solar shining.

RESULTS AND DISCUSSIONS

Topographic suitability. The vineyard is located in a hilly area, characteristic for the central part of the Moldavian Plate. The Averești hilltop is the element that dominates the entire relief of the region and is situated at the separation point of Crasna and Lohan hills from the Bunești hill.

The altitude. The vine plantations are located on the highest sector of the entire region. The planted area covers two distinctive subunits: a taller one, in the northern part, and a lower one in the southern part (fig. 2). At the northern limit of the planted area (*Bunești site*) the maximum elevation is by 338 m, while at the southern limit (*Averești site*) is 257 m. The relief amplitude in the planted area is not very significant (81 m), but it exerts a certain influence on the climate, knowing that the thermic gradient is 0.65°C for 100 m.

The slopes in the planted area are roughly uniform: 65% of the plantations are located on the flat terrain (0 – 5 % inclination), and 32.1% on the moderate slopes (5–15% inclination), the most favorable for the vine culture. These are located at the western (*Armășeni* and *Roșiori sites*) and eastern (*Arsura* and *Pâhnești sites*) limits of the planted area (fig. 3). The uniformity of the slopes assures a facile circulation of the cold air currents and prevents the freezing of the



Fig.1. The *terroirs* of Averești vine-growing area (satellite image): 1. Bunești; 2. Pribeasca; 3. Arsura; 4. Pâhnești; 5. Averești Plopi; 6. Averești Deal; 7. Roșiori; 8. Armășeni.

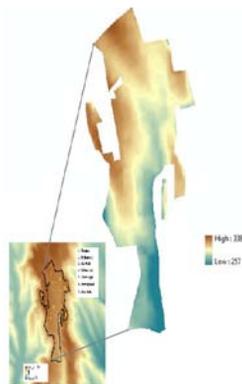


Fig. 2. The elevation map, Averești vinegrowing centre –Huși vineyard

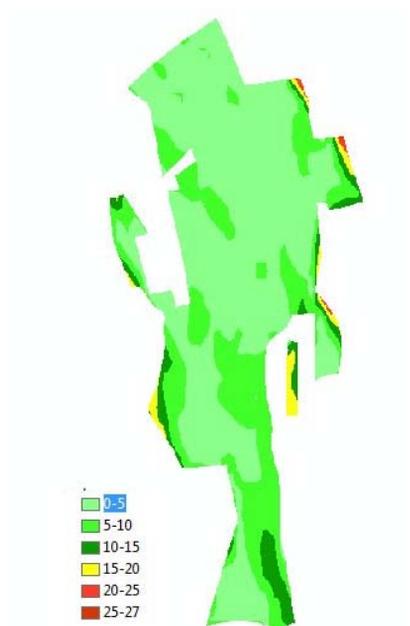


Fig. 3. The slopes map, Averești vinegrowing centre –Huși vineyard

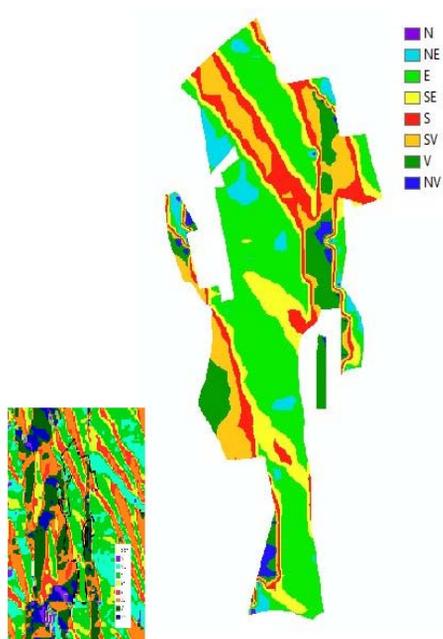


Fig. 4. The slopes direction map, Averești vinegrowing centre –Huși vineyard

vines in the cold seasons. An exception is the valley from the middle of the highland, which seems to be a collector of the cold air currents from de eastern and western slopes.

The slopes directions. Analytical study reveal that 9.9% of the slopes from the planted area has south exposure, and 25.3% has south-east to south-west exposure. These are located on the Lohan valley, on the lower part of the slopes that demarcate it (*Bunești* and *Pribeasca sites*) and in the *Averesti Deal* site. More than 53.2% from the planted area has east and west exposure, passable for the vine culture, but not enough to balance the lack of thermal resources that characterize this region.

Climate suitability. The study is based on the data provided by the Husi weather station, that make de recordings for this area. To illustrate the spatial variation in climatic factors, the analyses used a digital elevation model and a combination of point data sets to create estimates of annual climate variables.

Annual average temperature. The temperatures map reveal that the Averesti vine growing centre is situated in the coldest part of the region (fig. 5). The annual average temperature, by +8,34...+8,83°C is, according to the grapevine zoning specifications (Oșlobeanu et al., 1991), under the minimum



Fig. 5. The map of the annual temperature variation, Averesti vine growing centre

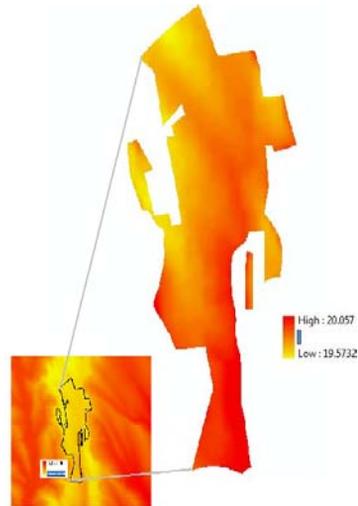


Fig. 6. The map of the hottest month temperature variation, Averesti vine growing centre

level (+ 9.0°C) for the economic efficiency of the grapevine culture. The northern part of the area (*Bunești*, *Armășeni* and *Roșiori sites*) is colder that the southern one. The lower values of the annual temperature, explain the 10 – 14 days delay of the beginning of the growing season, comparatively with the neighbored vine growing centers *Bohotin* and *Huși*.

The average temperature of the hottest month (July), an important indicator for the potential of a *terroir* to produce qualitative wines, vary between 19.5°C in the northern part of the plateau (*Bunești*, *Armășeni*, *Roșiori* and *Arsura*

sites) and 20.05°C at the southern limit (*Averești Plopi site*) (fig. 6). These values indicate the presence of the necessary thermal resources for producing white qualitative wines (Oșlobeanu et al., 1991). Thermal differences between the northern and the southern part of the area, own to the elevation factor.

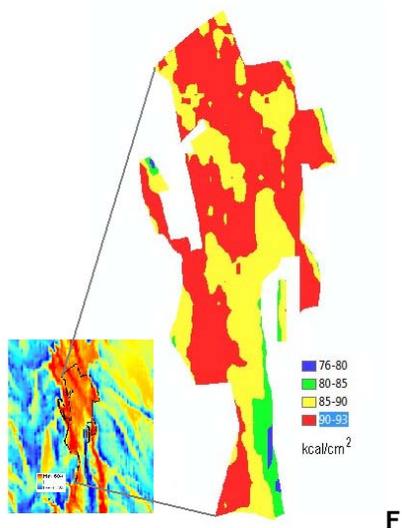


fig. 7. Solar radiation map (1.IV – 30.IX), Averești vine-growing centre

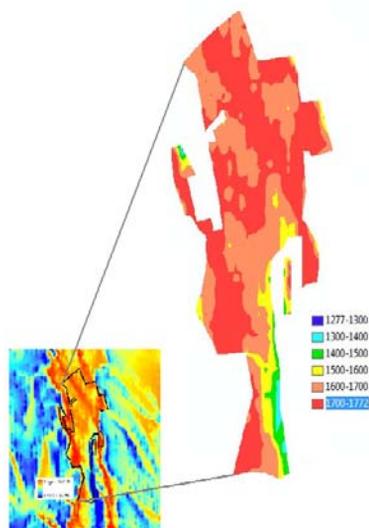


Fig. 8. Insolation map (1.IV – 30.IX), Averești vine growing centre

Solar radiation. The quantity of the solar energy received by the vine during the growing season (1.IV-30.IX) is presented in *fig. 7*. The vine plantations are located in the zone with the higher values of the solar radiation from the entire region, fact that compensates the lack of thermal favorability of the local climate. For 55.6% from the planted area, the solar radiation vary between 90 and 93 kcal/cm²/year, while the minimum value for vine culture is 80 kcal/cm²/year; for 39% of the surface, the solar radiation is 85 - 90 kcal/cm²/year. The solar radiation has an important seasonal variation, due to the incidence angle of the solar rays with earth surface; in the spring, the slopes are advantaged by the reduced angle of the rays, while in the summer, the flat surfaces benefit by bigger solar energy quantities.

The comparative analyze of the exposure and solar radiation maps, reveal that the abundant solar radiation is registered on the slopes with southern exposition, from the northern part of the area (*Bunești, Armășeni, Roșiori, Arsura and Pâhnești sites*) and at the southern limit (*Averești- Plopi site*). *Insolation.* For more than 89% from the planted area, the useful insolation (01 April - 30 September) vary between 1600 and 1773 hours/year, while the minimum requirements for the vine culture is 1200 hours/year. The major values of the useful insolation (1700-1773 hours/year) are registered on the slopes with

southern and eastern exposure from the Bunesti, *Armășeni*, *Roșiori*, *Arsura* and *Averești Plopi sites* (fig. 8).

Annual precipitations vary between 558.1 and 574.9 mm/year and they have a rather homogeneous distribution in the studied area (fig.9). The maximum values are registered on the northern limit of the area (*Bunesti*, *Armășeni*, *Roșiori*, *Arsura sites*), and the minimum ones at the southern limit (*Averești – Plopi site*). In the years with lack of precipitations, droughty stress could appear in the sloping areas from the southern part of the area (*Averești-Plopi site*).



Fig. 9. Precipitations map, Averești vine growing centre

CONCLUSIONS

1. Geographic Information System (GIS) allow an accurate analyze of the ecological factors from the vine planted areas.

2. Knowledge of the spatial variation of the ecological factors offer the possibility to evaluate the suitability of different areas (vineyards, wine-growing centers) for wine production, even of the little surfaces (*farms, parcels*).

3. The data regarding the values and spatial variation of the thermal and solar factors (*temperature, solar radiation, insolation*) are useful to select the suitable grapevine varieties and locate them in the most suiting locations.

REFERENCES

1. **Burgos S., Dakhel N., Docourt M., Schwarz J., 2008** – *Carte des sols viticoles genevois: vers une utilization pratique*. Revue Suisse Vitic. Hort. Arboric., vol. 40(2), 133-138.
2. **Oșlobeanu M., Macici M., Magdalena Georgescu, Stoian V., 1991** – *Zonarea soiurilor de vișă de vie în România*. Ed. Ceres, București.
3. **Patriche C.V., 2006** – *Modélisation de quelques variables agro-climatiques*, Actes du Colloque International: „Observation et analyse des territoires ruraux”, Simona Niculescu (editor), Edit. Sedcom Libris, Iasi, p. 102-120.
4. **USGS, 2004** – *Shuttle Radar Topography Mission*, 3 ArcSecond (90m), scene: SRTM_u2_n182e028, filled finished-B, Global Land Cover Facility (www.landcover.org), University of Maryland, College Park, Maryland, 2000.

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IMPROVING THE QUALITY OF LOOSE PERLETTE SEEDLESS GRAPE VARIETY THROUGH THE USE OF BIOLOGICALLY-ACTIVE SUBSTANCES

AMELIORAREA CALITĂȚII RECOLTEI SOIULUI APIREN DE STRUGURI PENTRU MASA LOOSE PERLETTE PRIN UTILIZAREA SUBSTANȚELOR BIOLOGIC ACTIVE

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Abstract. *The culture of table grapes has become a complex issue today; the settlement will depend on the correct choice of varieties for cultivation, harvesting, storage and selling of grapes. Worldwide, the vines' cultivation in the last decade, had subjected a changes of vine assortment but the high results obtain in developed countries now. Without knowing the basic laws of physiological growth and fruiting vines, and methods of adjustment can not be obtained high yields, stable and high quality with low cost and long-term use of the productive capacity of grapes. The objectives of the study include the identification of the influence of the treatment period, the optimal dose of gibberellin on the quantity and quality of grapes and efficiency of table grapes of Loose Perlette variety.*

Key words: Loose Perlette, Grapes, Gibberellic acid.

Rezumat. *Cultura soiurilor de masă a devenit o problemă actuală complexă, de soluționarea căreia va depinde de alegerea corectă a soiurilor, cultivarea, recoltarea, păstrarea și realizarea strugurilor-marfă. Pe plan mondial, cultura viței de vie în ultimul deceniu a suportat mari transformări privind sortimentul, atingând astăzi performanțe remarcabile în țările dezvoltate. Fără cunoașterea legităților fiziologice de bază a creșterii și fructificării viței de vie în cel mai larg înțeles al cuvântului, ca și a metodelor lor de reglare, nu se poate de obținut recolte înalte, stabile și de o calitate înaltă cu cheltuieli mici și prin folosirea cât mai îndelungată a potențialului productiv al butucului de viță de vie. Scopul investigațiilor include determinarea influenței termenului, dozei optime de aplicare a giberelinei asupra cantității, calității producției, și, ca rezultat a eficienței economice asupra soiului de struguri pentru masa Loose Perlette.*

Cuvinte cheie: Loose Perlette, Struguri de masă, giberelină.

INTRODUCTION

It is known from ancient times, viticulture and in the future will remain one of the main branches and economically efficient in Moldavian agriculture, but the grapes and their derived products - an important article for export.

Worldwide, Moldova is ranked among states with a traditional wine industry.

In our country, the natural conditions of climate and soil rather favorable for growth and enjoyment of the vine, viticulture is one of the main branches of agriculture.

From 600 thousand hectares (Rapcea M., 2002) of land in slope (with inclination between 5° and 15°), in Moldova every fourth, is occupied by vineyards.

Although in the nutrition may be used the table grapes and the wine varieties, however, the difference between them is considerable. It is based on specific qualities of these varieties - the grapes are higher, with a more beautiful appearance, large berries with a sharp color, crisp texture mainly, a lower acidity and a specific relation between the sugar and acidity content. The specific qualities of grapes in according with market preference evidenced that it is necessary to reflect them in a separate group.

Without basic knowledge of the physiological peculiarities of growth and fructification vine, and their methods of adjustment, can not be obtain high, stable and qualitative yields with low costs and to use a longer period the productive potential of vines.

The technological processes, which have a substantial contribution to improving the quality of grapes, are: use of foliar fertilizers, thinning inflorescences, use growth regulation substances, which unfortunately have a sporadic or does not applicate in current vineyards.

Using the growth biostimulators (Derendovskaia A., Perstnirov N. and others, 2003) in the vineyards is running to improve the appearance of grapes, to increase the plant productivity and improve their taste qualities.

The purposes of these investigations include - determining the optimal dose of influence of gibberellic acid on the quantity and quality of grapes, and also on the economic efficiency of grapes.

To achieve the objectives were outlined:

- the study of influence of gibberellic acid dose, on the main direct and indirect indicators of quantity and quality of grapes;
- the economic evaluation of vineyards in depending on the treatment term, applied doses and grape varieties.

MATERIAL AND METHOD

The studies object in our experience was the Loose Perlette seedless grape grafted on rootstock - Berlandieri x Riparia SO4. The vines are formed by fan unilaterally (evantai unilateral). Planting distance 3,0 m x 1,5 m.

The research was effectuated in 2008 year, with financial support of ASM in according to the financing contract nr.59/ind/2008. The vineyards founded in the spring of 2006 year in the "Sauron" Ltd. To study the dose of gibberellic acid was composed the scheme of experience with variants: 1) Control - H₂O, 2) GA₃ - 25 mg/l, 3) GA₃ - 50 mg/l, 4) GA₃ - 100 mg/l. Experience was held in three repetitions with five vines in each plot.

The air temperature, the sum precipitation and the relative air humidity were obtained from the meteorological station of Chisinau.

The soil conditions of the sector was obtained on the basis from experimental research materials by the project of organizing and establishing vineyards in "Sauron" Ltd..

The Application of gibberellic acid was effectuated by dipping inflorescences in solution with different concentration in according to the scheme experience. This method

of application ensures full coverage of the inflorescences with the solution and provides a maximum effect.

In the experiences were carried botanical and ampelographical observations, analysis and evidence, in according to the specialised methods and standards.

Statistical processing of the major indicators was effectuated by the method of dispersion analysis after Dospehov A. (1985).

RESULTS AND DISCUSSIONS

Loose Perlette - *Szölöketek kiralyznoje (care este Regina viilor) x Sultanina Marble*. Synonyms: *California 1253 F21, Perlet, Perletta, Szertendrei Magvatlon, Жемчужинка (Jemciujinka)*.

Loose Perlette – Californian seedless table grapes, obtained by Professor HP Olmo, 1946. The leaves are large, glabrous beneath. The petioles often painted in bright pink colour. The flowers are hermaphrodite. The bunches of medium sized, berries of medium size, slightly oval, almost round, the berries colour is white with a green tint. The skin is very thin and strong. Flesh crisp, juicy, with a special flavour (lightly muscat).

From bud to maturity is removable 149 days at the sum of active temperatures of 2000-2100°C. The early period of maturation variety. Ripening berries occurs in the second half of August. The Bushes are vigorous. Bountiful harvest. Aging shoots good. Variety has a weak resistance to downy mildew, powdery mildew and frost (-17°C).

The bunches have a good transportability capacity. Recommend thin out the clusters after flowering to reduce the density of the bunch. The berries are prone to cracking during maturation in rainy weather. To the best of their colour should be thinning of the leaves in the area of the bunches during their maturation

The grapes of Loose Perlette variety are used for fresh consumption, drying and canning.

The clone FPS 04 of this variety is characterized by the longer growing period - 149 days. In the years with favourable conditions (2008) may be obtain large bunch of grapes. The average weight of grapes was 656 g in the control variant, the berries per bunches - 640,8 (fig. 1, table 1). The bunch structure index - 42,2.

The dimensions of bunches was: length - 23,8 cm, wide at the top - 19,8 cm , middle - 9,5 cm and lower - 5.3 cm.

The number of normally developed berries per bunch - 619 pieces, undeveloped - 98,5, or 13,6%. The berries are of medium size and spherical in shape, white with green tints. The bunches obtained with the specific colour, in the part with the direct sun light. Weight of 100 berries was 138,4 g The composition index of berries (pulp weight / skin weight) was 8,69, the strength of the berries on the crushing is not very high - 784 g force.

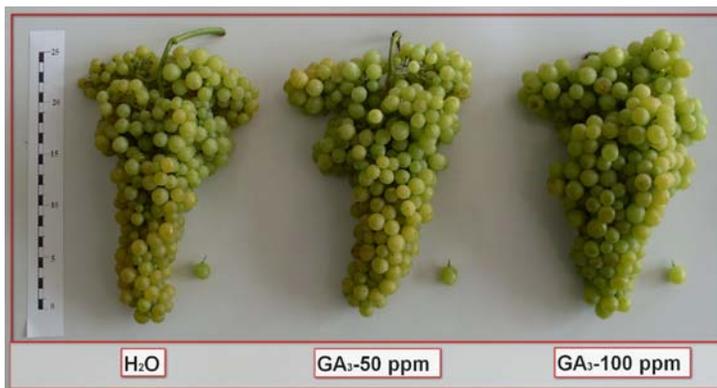


Fig. 1. Effect of gibberellin (GA₃) on the appearance of bunches and berries of Loose Perlette variety (cl. - FPS 04), "Sauron", Ltd. 2008.
Variants: Control - H₂O; GA₃-50 mg/l; GA₃-100 mg/l.

Table 1

The reaction of Loose Perlette variety for treatment of cauliflowers with gibberellic acid (GA₃) on the stage after fecundation period, 2008

Indicators	Variants					
	Control - H ₂ O		GA ₃ -50 mg/l		GA ₃ -100 mg/l	
	\bar{x}	%	\bar{x}	%	\bar{x}	%
1	2	3	4	5	6	7
Weight of bunches, g	656,0	100,0	663,8	101,2	929,6	141,7
berries, g	640,8	-	652,3	-	914,9	-
Bunches size, cm						
- length	23,8	-	23,3	-	25,0	-
- width / top	19,8	-	17,3	-	17,8	-
mid	9,5	-	10,3	-	10,3	-
bottom	5,3	-	5,5	-	6,0	-
Peduncle size, mm	6,4 ± 0,2	100,0	7,8 ± 0,1	121,9	8,1 ± 0,4	126,0
The number of berries in the bunch, (normal / abnormal), pieces	619,0 98,5	100,0 -	481,5 15,7	77,8 -	504,5 0,0	81,5 -
Berry size, mm						
- length	14,9	100,0	15,5	104,0	17,2	115,4
- width	14,2	100,0	15,2	107,0	15,3	107,7
Weight of 100 berries, g	138,4 ± 3,8	100,0 -	158,1 ± 10,1	114,2 -	221,6 ± 9,5	160,1 -
The index composition of berries (pulp weight / skin weight)	8,69	-	10,43	-	-	10,89
The strength of the berries on the crushing, g	784	100,0	1272	162,2	1272	162,2
Yield, kg per vine	5,00	100,0	5,10	102,0	7,10	142,0
content of sugars, g/dm ³	164	-	161	-	146	-
content of acids, g/dm ³	9,2	-	9,2	-	10,6	-

Until flowering was remained 7,8 inflorescences per vine. Average production in the control variant was 5 kg per vine. The sugar content - 164 g/dm³, the acidity – 9,2 g/dm³. In general, the vines are characterized by an increased harvest. The bunches are dense, therefore it necessary to apply berry thinning after flowering.

The treatment with gibberellic acid was effectuated in after fecundation phase (berries size 3-5 mm), the concentration of solution from 50 to 100 ppm. The method of treatment which we used was the dipping inflorescences.

It was established that under the influence of gibberellic acid weight increases with 41,7% (GA₃-100 mg/l), also the weight of berries per bunches increases, compared to controls. As a result there is increasing structure index of bunches by 1,5 times.

It was reduced the number of berries per bunch by 22,2 (GA₃-50 mg/l) and 18,5% (GA₃-100 mg/l) and relatively reduced the number of undeveloped grains. The berries becomes spherical-oval and increased their weight. The weight of 100 berries increase by 14,2 and 60,1%, respectively in comparison with control variant. The index composition of the berries increases, because the pulp weight was increased. The strength of the berries on the crushing increased by 1,6 times compared to control.

The treatment of inflorescences with GA₃ can lead to increased harvest per vine and change the chemical composition of berries. In the GA₃-100 mg/l variant the yield increased by 42%, the sugar content was 146 g/dm³, the titrated acidity content - 10,6 g/dm³. The increasing harvest directly influence on the berry maturation - leads to retention, also leading to reduction of sugar content by 1.9%. This fenomen can be removed if the grapes will be harvested later by 7-10 days. On the 9.09.2008 the sugar content increased by 1.6 times and amounted to 230 g/dm³.

Finally we can say that treatment of the inflorescences of Loose Perlette variety with GA₃ result in a number of positive effects, namely increased weight and size of bunches, reducing the number of berries per bunch and increase their size, the peduncle elongates, which result in bunches with a lower density, the strength of the berries on the crushing increased, the harvest increases.

CONCLUSIONS

1. The treatment with GA₃ of grape varieties showed that the influence of these substances on grapes depended on the biological particular of variety and concentration of solution

2. After treatment of inflorescences of Loose Perlette variety with GA₃, in the after fecundation phase takes place increasing weight of bunches, berries, can change the bunch structure index. The GA₃-optimal concentration was 100 mg/l. The production per vine increases by 42,0-92,3% and improves the quality of berries, compared with control.

REFERENCES

1. Burzo I., Toma S., Olteanu I., 1999 - *Fiziologia plantelor*. Vol. III Editura Știința, Chișinău.
2. Corobca V., Apruda P. Nicolaescu Gh., 2004 - *Afaceri în viticultură*. ACSA, Chișinău.
3. Cuharschi M., Botnarenco A. și a., 2005 - *Agrotehnica – baza culturii viticole*. Aspecte inovative în viticultură și vinificație. Chișinău: Litera, pp. 30 - 32.
4. Dass H. C., Randhawa G. S., 1968 - *Response of certain seeded Vitis vinifera varieties to gibberellin application at postbloom stage*. American journal of Enology and Viticulture, Vol. 19, pp. 26 – 56.
5. Kasimatis A., Weaver R. et al., 1971 - *Response of Perlette grape berries to gibberellic acid applied during bloom or at fruit set*. American journal of Enology and Viticulture, Vol. 22 (1), pp. 19 – 23.
6. Mănescu C., Georgescu M. și a., 1989 - *Controlul biologic al producției în pomicultură și viticultură*. Editura Ceres, București.
7. Perstnirov N., Surugiu V. și a., 2000 - *Viticultura*. FEP Tipografia centrală, Chișinău.
8. Weaver R., Pool R., 1971 - *Berry response of Thompson Seedless and Perlette grapes to application of gibberellic acid*. American Soc. Hort. Sci. Journal. Vol. 96 (2), pp. 162 – 166.
9. www.cnfa.md
10. www.inra.fr/la_science_et_vous/dossiers_scientifiques/ogm/questions_de_recherche/porte_greffe_transgenique_de_vigne
11. www.vine.com.ua
12. www.ccssu.crimea.ua
13. www.ngr.ucdavis.edu/varietyview.cfm

GIBBERELLIN - AS A DETERMINANT FACTOR OF GRAPE'S QUALITY OF MUSCAT DE HAMBURG VARIETY

GIBERELINA – CA FACTOR DETERMINANT AL CALITĂȚII RECOLTEI SOIULUI DE STRUGURI PENTRU MASA MUSCAT DE HAMBURG

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Abstract. *The vine area and volumes of production of table grapes in the country are not stable. In the last 15 years the vineyards decreased by 8 ha (from 28 thousand to 20 thousand ha). The harvest and total production of grapes decreased too. The quality of grapes and the structure of assortment are unsatisfactory. The technological methods, which have a substantial contribution to improving the quality of table grapes, represents: foliar fertilizer use; removal cauliflowers; growth regulators use, which are used little or not use in the vineyards. Growth regulator use in the vineyards, is used to improve the appearance of the grapes, increasing the productivity of plants and improve their taste. The purposes of investigations include the identification of the influence of the treatment period, the optimal dose of gibberellin on the quantity and quality of grapes and efficiency of table grapes of Muscat de Hamburg variety.*

Key words: Muscat de Hamburg, Grapes, Gibberelic acid.

Rezumat. *Suprafața viilor și capacitățile de producere a strugurilor de masă în țară nu sunt stabile. În ultimii 15 ani suprafața viilor s-a micșorat cu 8 mii ha (de la 28 mii până la 20 mii ha), s-a micșorat producția la ha și-n consecință - producția totală de struguri. Calitatea strugurilor și structura sortimentului la fel este nesatisfăcătoare. Secvențele tehnologice, care au o contribuție substanțială la îmbunătățirea calității strugurilor de masă, reprezintă: utilizarea îngrășămintelor foliare; rădirea înflorescențelor; utilizarea biostimulatorilor de creștere, care din păcate au o aplicare sporadică sau chiar lipsesc în plantațiile de vii actuale. Utilizarea biostimulatorilor de creștere la viile roditoare, se execută cu scopul îmbunătățirii aspectului comercial al strugurilor, majorării productivității plantei și ameliorării calităților gustative. În această lucrare se prezintă influența momentului aplicării, a dozei optime de aplicare a giberelinei, asupra cantității și calității producției, ceea ce are ca rezultat sporirea eficienței economice a soiului de struguri pentru masa Muscat de Hamburg.*

Cuvinte cheie: Muscat de Hamburg, Struguri de masă, giberelină.

INTRODUCTION

The production of grapes on vines is conducted over two growing seasons, separated by a rest period. Only in exceptional conditions of temperature, light,

nutrition, (Burzo I., Thomas S. and others, 1999), the flowering formed from the buds in the same year.

The phases of development of vine generative organs are: floral induction, floral differentiation, flowering, pollination and fertilization, maturation of berries etc. (Burzo I., Toma S., 1999, Tarhon P., Raianu O., 1993, Stoev C., 1981, Boss P., Buckeridge, and others, 2003).

In the first growing season held the first two stages (floral induction, evocation and floral bud differentiation), and other two - stages of finalization of forming and development berries (flowering, pollination and fertilization, growth, ripening fruit). The first period has an indirect link with our research, so its essence will be briefly exposed.

First, it must be pointed out that the phenomenon of alternation of vines' fructification does not exist, compared to fruit crops, (only if weather conditions caused by accidental - late spring frosts, high or very low humidity during flowering), therefore the floral induction and differentiation of buds that are studied more externally phenomena, certainly and from the inside, but internal factors of vine are stable unlike fruit trees (especially in species such as apple).

Therefore, external factors (Burzo I., Toma S., 1999, Tarhon P. and others, 1993) triggering floral induction and subsequent differentiation of buds are: temperature, acting on vegetal tissue, light intensity, humidity (water stress reduces number and size of floral primordial inflorescences), nutrients.

Internal factors are: genetical (number of flowering genes has not been determined definitively), hormonal (direct action - gibberellic acid, indirect action - given the important role in providing transport of assimilation).

Skene K. (cited by Mănescu C., Georgescu M. and others, 1989) reveal the physiological role of GA₃ action on the vine, saying it directly promotes cell division, have a protective action on auxin activity (favouring their accumulation in tissues) and a role of elongation phenomena in cell have direct action on the formation and development of phloem and xylem, and perhaps most important property for our research contributes mobilization of assimilation, especially in the early stages of berry development.

Gibberellins presence in the vine (Mănescu C., Georgescu M. and others, 1989) was highlighted in the leaves, berries, sprouts, buds, the primary inflorescences, roots.

The purposes of these investigations include - determining the optimal dose of influence of gibberellic acid on the quantity and quality of grapes, and also on the economic efficiency of grapes.

To achieve the objectives were outlined:

- the study of influence of gibberellic acid dose, on the main direct and indirect indicators of quantity and quality of grapes;
- the economic evaluation of vineyards in depending on the treatment term, applied doses and grape varieties.

MATERIAL AND METHOD

The studies object in our experience was the Muscat de Hamburg grape grafted on rootstock - Berlandieri x Riparia SO4. The vines are formed by fan unilaterally (evantai unilateral). Planting distance 3,0 m x 1,5 m.

The research was effectuated in 2008 year, with financial support of ASM in according to the financing contract nr.59/ind/2008. The vineyards founded in the spring of 2006 year in the "Sauron" Ltd. To study the dose of gibberellic acid was composed the scheme of experience with variants: 1) Control - H₂O, 2) GA₃ - 25 mg/l, 3) GA₃ - 50 mg/l, 4) GA₃ - 100 mg/l.

Experience was held in three repetitions with five vines in each plot.

The air temperature, the sum precipitation and the relative air humidity were obtained from the meteorological station of Chisinau.

The soil conditions of the sector was obtained on the basis from experimental research materials by the project of organizing and establishing vineyards in "Sauron" Ltd..

The Application of gibberellic acid was effectuated by dipping inflorescences in solution with different concentration in according to the scheme experience. This method of application ensures full coverage of the inflorescences with the solution and provides a maximum effect.

In the experiences were carried botanical and ampelographical observations, analysis and evidence, in according to the specialised methods and standards.

Statistical processing of the major indicators was effectuated by the method of dispersion analysis after Dosphehov A. (1985).

RESULTS AND DISCUSSIONS

Muscat de Hamburg (*Schiava Grossa (Trollinger) x Muscat of Alexandria*)

Synonyms: *Black Hamburg, Black Muscat, Black Muscat of Alexandria, Black of Alexandria, Chasselas Muscat Golden Hamburg etc.*

Muscat de Hamburg – the table grape variety, became widespread in France, Hungary, Romania, Greece, Tunisia, U.S., Argentina and other countries.

The leaves are medium and large size, heart-shaped, five-lobed, and wavy, with crimped edges. Pubescence of the lower leaf surface are rare arachnoid, the ribs are bristly. The flowers are hermaphrodites.

The bunches are medium or large size (length 18-20, width 11-17 cm), tapered, branched, sometimes there are winged, frail. The bunch peduncle is medium length (4-6 cm), grass-green. The weight of clusters is 168-267 g. There are different berries size, predominantly large (length 12-26, width 11-17 mm), often obtained parthenocarpic berries; the berries are round and oval, violet-blue, with a thick waxy coating. The skin is relatively thick. The berries are fleshy-juicy. The taste is very pleasant, with fine original muscat aroma. In berries there are 2-3 large seeds.

The vegetation period from bud burst to removable maturity is 148 days, with the sum of active temperatures of 2870 ° C. The medium period of maturation variety. The bushes are medium vigorous. Yield potential is high, but unstable for different years. The relative fertility coefficient is 1,06, the absolute fertility coefficient is 1,58. In years with unfavourable weather conditions observed shedding of flowers and the formation of a large number of seedless berries. The sugar content in the juice of berries is 16-22%, and the acidity - 6-8 g/dm³.

The variety is unstable to downy mildew, powdery mildew, *Botrytis cinerea* and phylloxera. The damaged by berries leaf roller weaker than other varieties of grapes. Unstable to frost. At a temperature of -18-19 ° C, there is damage of buds (over 50%). The bunches have a good transportability capacity, can be stored for 2-3 months, bear the separation of berries is 290 gr., but the crushing - 1265 gr. Berries different high taste (tasting score - 9), they are used fresh or for cooking juices, marinade, jam

In our experience the bunches are very large, but rarely medium size. There are a different forms of bunches, that as cone, but rarely cylinder-cone, disperse, winged, or compact. The average weight of bunches in control was 377.4 grams, but the berries in bunches - 372.5 grams (fig. 1, table 1). The bunch structure index (berry weight / weight of the bunch) was 76. Bunches have the following dimensions: length - 23.0 cm, wide at the top - 21.5 cm, the middle part - 10.6 and bottom part - 4.6 cm.

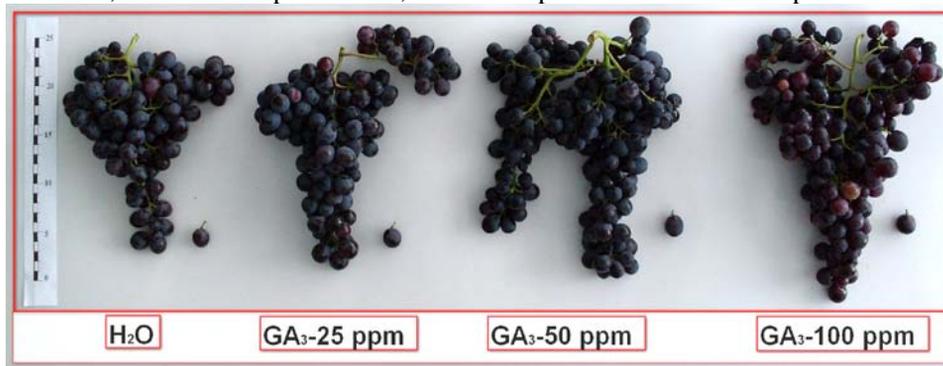


Fig. 1. Effect of gibberellin (GA3) on the appearance of bunches and berries of Muscat de Hamburg variety (cl. - FPS 04), "Sauron", Ltd. 2008. Variants: Control - H₂O; GA₃-25 mg/l; GA₃-50 mg/l; GA₃-100 mg/l.

The number of normally developed berries per bunches 244.3 pieces, and undeveloped 21.3 pieces. The berries are of different sizes, spherical or oval, violet-blue, covered with a layer of grey-blue wax. Weight of 100 berries is 155.8 gr. The composition index of berries is - 5.88 (relatively small - as a result of weight reduction of skin). The strength of the berries on the crushing is 1236 gr. force.

Until flowering was remained 14-16 inflorescences per vine.

Average production in the control variant was 5,66 kg per vine. The sugar content - 174 g/dm³, the acidity - 7,5 g/dm³.

The treatment with gibberellic acid was effectuated in after fecundation phase (berries size 3-5 mm), the concentration of solution 25, 50 and 100 ppm. The method of treatment which we used was the dipping inflorescences.

It was established that under the influence of gibberellic acid weight increases with 10,0 (GA₃-25 mg/l), 36,8 (GA₃-50 mg/l) and 20,1% (GA₃-100 mg/l), also the weight of berries per bunches increases, compared to controls. As a result there is a slowly reduction of structure indexes of bunches

Table 1

The reaction of Muscat de Hamburg variety for treatment of cauliflowers with gibberellic acid (GA₃) on the stage after fecundation period, 2008

Indicators	Variants								DEM _{0,95}
	Control - H ₂ O		GA ₃ -25 ppm		GA ₃ -50 ppm		GA ₃ -100 ppm		
	\bar{x}	%	\bar{x}	%	\bar{x}	%	\bar{x}	%	
Weight of bunches, g	377,4	100,0	415,0	110,0	516,5	136,8	453,1	120,1	-
berries, g	372,5	-	409,2	-	506,6	-	446,1	-	-
	4,9	-	5,8	-	9,8	-	7,0	-	-
Bunches size, cm									
- length	23,0	-	24,9	-	25,8	-	23,8	-	-
- width / top	21,5	-	19,7	-	24,6	-	20,9	-	-
mid	10,6	-	8,8	-	11,1	-	11,4	-	-
bottom	4,6	-	4,3	-	4,9	-	4,2	-	-
Peduncle size, mm	5,9		8,6		8,9		6,8		
	± 0,3	100,0	± 0,3	145,3	± 0,3	150,0	± 0,6	115,7	-
The number of berries in the bunch, (normal / abnormal), pieces	244,3	100,0	150,0	61,4	177,8	72,8	197,3	80,8	-
	21,3	-	3,8	-	1,5	-	5,0	-	-
Berry size, mm									
- length	19,8	100,0	19,0	96,0	20,0	101,0	20,3	102,5	0,45
- width	18,4	100,0	18,4	100,0	18,9	102,7	19,3	105,2	0,66
Weight of 100 berries, g	155,8	100,0	274,9	176,4	294,2	188,8	252,4	162,0	-
	± 7,6	-	± 7,3	-	± 20,6	-	± 23,3	-	-
The index composition of berries (pulp weight / skin weight)	5,88	-	5,02	-	4,65	-	6,26	-	-
The number of seeds per 100 berries	145,0	100,0	45,0	31,0	30,0	20,7	10,0	6,9	-
The seeds indexes	37,50	-	140,50	-	146,5	-	-	338,00	-
The strength of the berries on the crushing, g	1236	100,0	951	76,9	1199	97,0	1278	103,4	-
Yield, kg per vine	5,66	100,0	6,23	110,1	7,75	136,9	6,80	120,1	0,12
content of sugars, g/dm ³	174	-	189	-	194	-	206	-	-
content of acids, g/dm ³	7,5	-	6,5	-	6,4	-	6,7	-	-

The number of normally developed berries per bunch in according with treatment doses is reduced by 38.6 (GA₃-25 mg / l), 27.2 (GA₃-50 mg / l) and 19.2% (GA₃-100 mg / l) and sharply reduce the number of undeveloped berries. There are reducing the number of undeveloped berries to 14 times in the GA₃-50 mg / l variant. While treating in the earliest stages, during the mass flowering, leads to increasing the number of berries related (Kabbani Samer, 2001).

In experience, reducing the number of berries per cluster leads to greater weight of 100 berries, compared to control, with 62,0-88,8%, depending on the concentration of gibberellic acid. The berry composition index is similar with control variant. There are 1-2 seeds per berry. Under the influence of GB₃ There is a sudden reduction in the number of seed per berry on 3,2-14,5 times, especially at concentration of 100 mg / l. As a result the seeds index increased on

3,7-9,0 times. The variety is characterized by a high capacity to obtain a seedless berry when treating inflorescences with GB₃. The strength of the berries on the crushing is the similar to control variant, or slightly reduced. The treatment of inflorescences with GB₃ leads to increased production of grapes. So, in control variant, production was 5.66 kilograms per bunch. Under the influence of GB₃ in concentration of 25 mg / l are found to increase the harvest of grapes by 10.1%, 50 mg / l - by 36.9% and 100 mg / l - 20.1%, also the content the sugars on 1,5-3,2% (increase by 15-32 g/dm³) and reduce the acidity content in according with control.

In finally the treating of inflorescences of Muscat Hamburg variety with GB₃ can lead to increased weight and size of bunches and berries, increasing the weight of 100 berries and increasing the seedless berries. The yield of treated vines, increase by 1,1-1,4 times and also increases the sugar content in berries. Following observations and calculations we can say that the optimal concentration of treatment of GB₃ in the 50 mg/l variant.

CONCLUSIONS

1. Using GB₃ treatment on the Muscat Hamburg seed variety leads to increase the weight of bunches and berries and reduced the structure index of bunch.

2. The GA₃ - optimal concentration being 50 mg / l. The grape production increased by 31,4-85,6%., It is reduce the number of undeveloped berries and increases seed index.

REFERENCES

1. Burzo I., Toma S., Olteanu I., 1999 - *Fiziologia plantelor*. Vol. III Editura Știința, Chișinău.
2. Corobca, V., Apruda P. Nicolaescu Gh., 2004 - *Afaceri în viticultură*. ACSA, Chișinău.
3. Kasimatis A., Weaver R. et al., 1971 - *Response of Perlette grape berries to gibberellic acid applied during bloom or at fruit set*. American journal of Enology and Viticulture, Vol. 22 (1), pp. 19 – 23.
4. Mănescu C., Georgescu M. și a., 1989 - *Controlul biologic al producției în pomicultură și viticultură*. Editura Ceres, București.
5. Perstnirov N., Surugiu V. și a., 2000 - *Viticultura*. FEP Tipografia centrală, Chișinău.
6. Weaver R., Pool R., 1971 - *Berry response of Thompson Seedless and Perlette grapes to application of gibberellic acid*. American Soc. Hort. Sci. Journal. Vol. 96 (2), pp. 162 – 166.

THE DETERMINATION OF QUANTITY AND PURITY DNA TO SOME AUTOHTONOUS GRAPEVINE VARIETIES

DETERMINAREA CANTITĂȚII ȘI PURITĂȚII ADN LA UNELE SOIURI AUTOHTONE DE VIȚĂ DE VIE

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Abstract. *It was analysed the dezoxiribonucleic acid (DNA) to 12 autohtonous grapevine varieties. Total DNA was extrated from young leaves using a modified version from Pop Rodica si colab., 2003 of the protocol published by Lodhi et al., in 1994. After DNA extraction, the samples was quantified with BioPhotometer Eppendorf help's, was analysed the optic density and absorbance ratio at 260 nm and 280 nm. Under raport base between these two wave lengths was established the quantity and purity of DNA at study cultivars.*

Key words: DNA, autochtonous grapevine, vine, extraction, leaves

Rezumat. *A fost analizat acidul dezoxiribonucleic (ADN) la 12 soiuri de vita de vie autohtone. Extractia acidului s-a facut din frunze tinere , utilizandu-se versiunea modificata de Pop Rodica si colab., 2003,a protocolului publicat de Lodhi et. al., 1994. Dupa extractia acidului dezoxiribonucleic, probele au fost cuantificate cu ajutorul aparatului BioPhotometer Eppendorf, analizandu-se densitatea optica si absorbtia la lungimile de unda 260 nm si 280 nm. Pe baza raportului intre cele doua lungimi de unda s-a stabilit cantitatea si puritatea acidului dezoxiribonucleic la soiurile studiate.*

Cuvinte cheie: ADN, soiuri autohtone, viță de vie, extracție, frunze

INTRODUCTION

Studies ampelographic helps to compare morphological characteristics and the characteristics of technological varieties of grapes, to avoid confusion between close varieties and eliminate many synonyms. In time, the methodology used to describe varieties was improved continuously, the extent of accumulation of new knowledge and once with developments in molecular biology. In the current description of the botanical varieties based on morphological criteria is incomplete, being necessary to establish criteria that genetic composition genomes in the varieties of grapes. Along with the emergence of molecular markers, genome investigation was conducted at isoenzymes with protein and DNA-level methods by RAPD, RFLP, AFLP and SSR. In the case of vines, the isolation of DNA and then using it to obtain PCR products is very difficult due to abundance polyphenols, polysaccharides, the presence of RNA and other secondary products (Rout G.R. și colab., 2002).

MATERIAL AND METHOD

The biological material was represented by young leaves harvested from 12 varieties of grapes are in local ampelographic Collection of the Faculty of Horticulture in Iasi, as follows: Batuta neagra, Busuioaca de Bohotin, Coarna alba, Coarna neagra, Feteasca alba, Feteasca regala, Feteasca neagra, Furmint, Galbena de Odobesti, Grasa de Cotnari, Tamaioasa Romaneasca and Zghihara de Husi.

Technology categories:

1. Varieties for table grapes with late maturation: Coarna alba, Coarna neagra;
2. Varieties for white table wine: Galbena de Odobesti, Zghihara de Husi;
3. Varieties for white wine quality: Grasa de Cotnari, Feteasca alba, Feteasca regala, Furmint;
4. Aromatic varieties for wine: Tamaioasa Romaneasca, Busuioaca de Bohotin;
5. Varieties of red wine for dinner: Batuta neagra;
6. Red wine varieties for quality: Feteasca neagra.

Extraction protocol used is described by Lodhi et al., (1994) and modified (R. Pop et al. (2003)). The methods for isolation of DNA and have the basic criteria purity, integrity and quantity of DNA obtained. To obtain the DNA extract were the following stages:

Table 1

Solutions needed for DNA isolation

1.	2 x CTAB 2% - 100 ml	10.	5 M NaCl
2.	2 % CTAB	11.	Buffer TE 100 ml
3.	100 mM Tris HCl	12.	10 mM Tris HCl pH 8
4.	20 mM EDTA	13.	1 mM EDTA pH 8
5.	1,4 M NaCl	14.	Cloroform : alcool izoamilic 24 : 1 - 100 ml
6.	2% PVP	15.	Alcool etilic 95%
7.	10 mM acid ascorbic	16.	Alcool etilic 80 %
8.	4 mM DIECA	17.	RNA enzyme A 1 mg/1 ml
9.	Buffer for precipitation - 100 ml		

Is 0.5 g grind biological material in liquid nitrogen to obtain an important powder. Is important by grind not obtain a very fine powder. Add 700 μ L of extraction buffer. The PVP, DIECI and ascorbic acid are added to the extraction buffer only when it is used. Transfer about 100 mg of powder and mix thoroughly by reversing tubes Eppendorf. In next incubation tubes for 25 minutes at 65^oC and then leave to cool to room temperature. Add 700 μ L mixture of chloroform and izoamilic alcohol (24:1) and next well by reversing the tube 20-25 times to obtain an emulsions. It centrifugate for 15 minutes at 11000 r/min at room temperature. Transfer the aqueous phase and then into a new Eppendorf tube. For better extraction, and ensuring a higher purity of the solution of DNA repeat steps 5-6-7. Add 0.5 volume aqueous solution of 5 M NaCl and mix good. In continue to add two volumes of ethyl alcohol 95% cold (-20^oC) and keep the tubes in a refrigerator for 15-30 minutes (4-6^oC). The solution can be kept in a refrigerator an hour or more if necessary. It centrifugate 3 minutes at 3000 rot/min and then increase speed to 11,000 r/min for 5 minutes at room temperature. This difference helps centrifuge sedimentation of DNA in the centrifuge tube. The supernatant remove and add 700 μ L ethyl alcohol 80% cold (0-4^oC) for washing the pellets. Centrifugate is 5 minutes at 10000 r/min. Remove the supernatant. Wait until the complete evaporation of alcohol - 20-30 minutes. Pellet is the solution in hydration TE - 50 μ L/tube and treated with 1 μ L RNA-enzyme/100 μ L DNA solution and incubation at 37^oC for 15 minutes. DNA extract can maintain long-term -70^oC or -20^oC for shorter periods of time.

RESULTS AND DISCUSSIONS

If this protocol extraction of DNA, the modification consisted in adding the extraction buffer of the following substances: 2% (PvP), 10 mM ascorbic acid and 4 mM dietilditiocarbamic acid (DIECA).

These substances were added before use diluted solutions of DNA. Standard protocol provided by Lodhi et al. (1994) contained in buffer extraction PvP only 2% and 0.2% beta mercaptoetanol. After DNA extraction, samples were quantified using spectofotometric the BioPhotometer Eppendorf.

Spectofotometric method is based on the fact that most organic substances have a rate of absorption feature in the UV radiation: 260 nm for nucleic acids, 280 nm for protein and 230 nm for different contaminants.

Were measured absorbants (optical density) at 260 nm and 280 nm, making the ratio between the two readings A_{260}/A_{280} . DNA is considered sufficiently pure when the ratio of the two acquiring the A_{260}/A_{280} is between 1.7 and 2.0. Values below 1.7 indicate impurification of protein, and the highest 2.0 impurification with other contaminants.(Fig.1 and 2.)

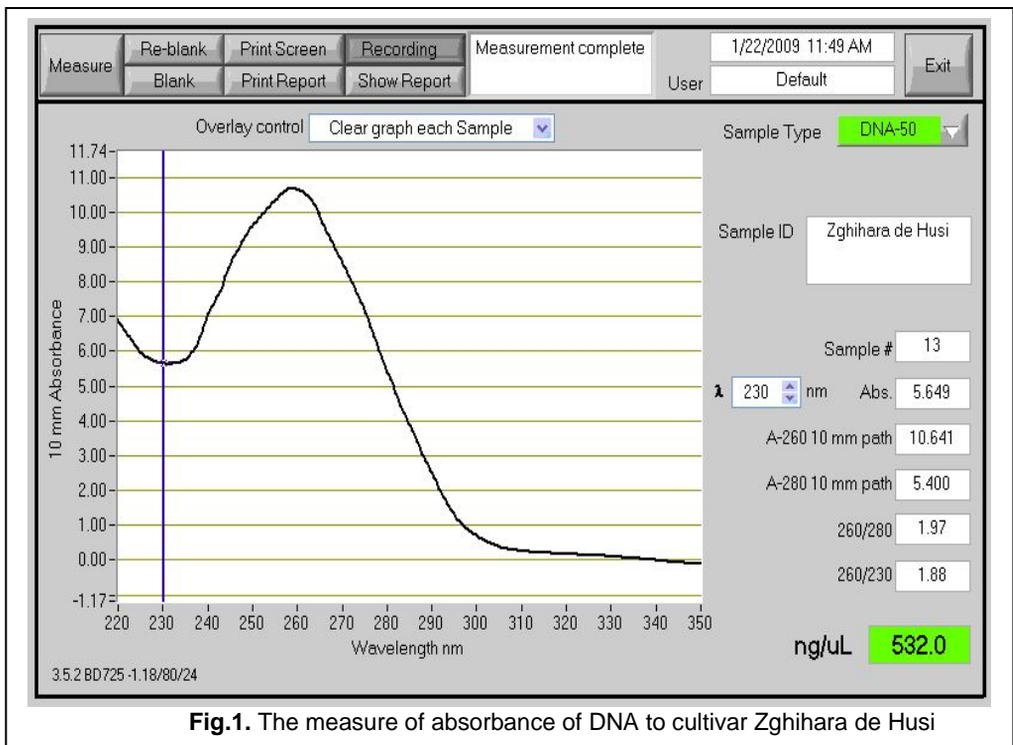
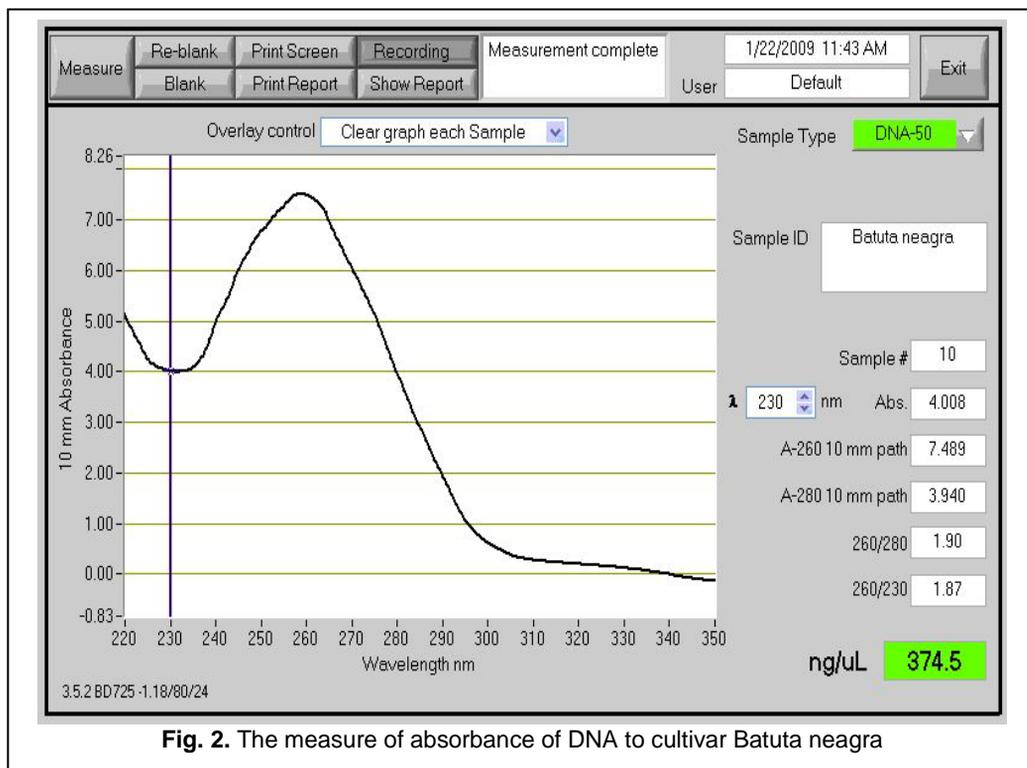


Fig.1. The measure of absorbance of DNA to cultivar Zghihara de Husi



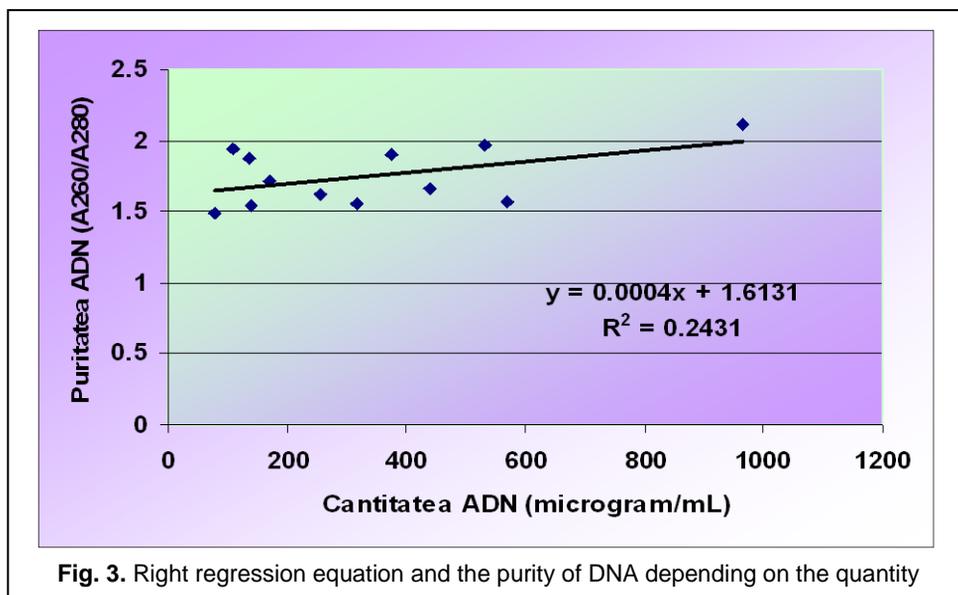
The device plays BioPhotometer Eppendorf, both the DNA and the amount of DNA expressed in ng / μ L or mg / mL. In the case of the 12 varieties investigated, DNA extracts were differences, both in terms of DNA purity and quantity (tab. 2).

Table 2

The quantity and purity of DNA obtained following extraction

Nr. crt.	Variety	quantity ng / μ L	Purity (A260/A280)
1.	Feteasca regala	138,4	1,54
2.	Feteasca alba	169,7	1,72
3.	Feteasca neagra	255,7	1,62
4.	Galbena de Odobesti	136,1	1,87
5.	Zghihara de Husi	532,0	1,97
6.	Batuta neagra	374,5	1,90
7.	Tamaioasa romaneasca	318,2	1,56
8.	Busuioaca de Bohotin	110,1	1,94
9.	Coarna alba	964,9	2,11
10.	Coarna neagra	568,2	1,57
11.	Furmint	438,7	1,66
12.	Grasa de Cotnari	78,6	1,49

A favorable effect on the purity of DNA and had to use the solution of sodium chloride and 5 M absolute alcohol, which increase the solubility polizaharidelor preventing precipitation polysaccharides and a concomitant DNA. Lodhi et al. (1994) shows that addition of sodium chloride in high concentration has been increased in the removal polysaccharides *Vitis species* (Rout et al., 2002). Adding acid and ascorbic acid dietilditiocarbamic (DIECA) proved to be beneficial, the purity of DNA having high values of 1,7-1,9, most varieties investigated. Extraction of DNA by this method led to obtain colorless solution of DNA in most samples analyzed. In figure no. 3 is presented the line and the regression equation and coefficient of correlation between the amount of DNA and its purity determined from the data x harvest time interaction extraction method. In the graph is observed that the relationship between quantity and purity is linear, the individual data group is quite closely around the right of recourse. Correlation between two variables is direct and positive, increasing the quantity of DNA, leading to an increase in its purity. $R^2 = 0.2431$ Value ** indicates a significant dependence of the purity of the extracted DNA.



CONCLUSIONS

1. Using molecular biology techniques (RAPD, AFLP, SSR) in the characterization of varieties of grapes is particularly useful.
2. To investigate the genome varieties of grapes, has a special importance when harvest plant material. As the leaves are young, quantity and purity deoxiribonucleic acid (DNA) recorded lower. In If the 12 species investigated, differences were found both the quantity and purity.

3. Right, the regression equation and coefficient of correlation between DNA quantity and purity of DNA are directly dependent on the variety of grapes and extraction method used.

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REFERENCES

1. **Bellini D., Velasco R., Grando M.S., 2001** - *Intravarietal DNA Polymorphisms in grapevine (Vitis vinifera L.)*. Acta Hort. 546, ISHS, pp. 343-349.
2. **Dordea Manuela, Coman N., Crăciunaș Cornelia, Andras C., 2000** - *Genetică generală și moleculară*. Ed. "Universitară - Clujeana", Cluj-Napoca.
3. **Fanizza G., Colonna G., Otherwise P., Ferrara G., 1999** - *The effect of the number of RAPD markers on the evaluation of genotypic distances in Vitis vinifera*. Euphytica 107:pp. 45-50.
4. **Gaboreanu John, Blackhall N.W., Andras C., Davey M.R., Pamfil D., Pamfil C., 2001** - *Genetic relationships of Mentha species evaluated by RAPD analysis*. Bull. NC-USAMV 55-56, pp. 149-153.
5. **Lodhi M.A., N.F. Weeden, B.I. Reisch, 1997** - *Characterization of RAPD markers in Vitis*. Vitis 36: pp. 133-140.
6. **Pamfil D.C., 1999** - *The use of RAPD markers for the identification of somaclonal variation of the micro propagated grapevine*. Proc Symp. Present and Prospects in Horticulture, pp. 247-254.
7. **Pop Rodica, 2008** - *Studiul variabilității somaclonale la vița de vie prin utilizarea markerilor moleculari*. Teză de doctorat, USAMV Cluj-Napoca.
8. **Pop Rodica, Ardelean M., Pamfil D., Gaboreanu John Marina, 2003** - *The Efficiency of Different DNA Isolation and Purification in ten cultivars of Vitis vinifera*. Bul. Nr. 59 USAMV Series ZB, pp.259-261.
9. **Pop Rodica, Ardelan M., John Marina Gaboreanu, Pamfil D., Corda Mirela, Raica P., Bodea Monica, Cantor Maria, 2005** - *Used in RAPD analyzes revealing molecular polymorphism of several grape varieties from vineyards of Romania*. XL croatian Symposium on Agriculture, pp. 229.
10. **Tardea C., Liliana Rotaru, 2003** - *Ampelografie*, vol II. Editura Ion Ionescu de la Brad Iasi.

STUDY REGARDING THE ANTIOXIDANT AND RADICAL SCAVENGING ACTIVITY OF ROMANIAN WINE FETEASCĂ NEAGRĂ COMPARED TO MERLOT

STUDII PRIVIND ACTIVITATEA ANTIRADICALICĂ ȘI ANTIOXIDANTĂ A VINULUI AUTOHTON FETEASCĂ NEAGRĂ COMPARATIV CU MERLOT

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Abstract. *The radical scavenging activity of wines was evaluated by their capacity of neutralising a radicals solution with a known concentration. The 2,2-diphenyl-1-picrylhydrazyl radical method (DPPH) was used to determine the total radical scavenging activity, while the Photochem method was used to determine only the antioxidant activity – superoxide scavenging activity. The material studied was represented by two red wines obtained by four wine-making methods: the Merlot wine with which we compared the values obtained for the Fetească neagră local wine. This study adjoins other studies that sustain the qualitative potential of the Romanian wine Fetească neagră and contribute to the outlining of its good image among the international ones, on the national and international wine market.*

Key words: Fetească neagră, Merlot, antioxidant, PCL, DPPH

Rezumat. *Acțiunea antiradicalică a vinurilor a fost evaluată prin capacitatea acestora de a inhiba radicalii liberi dintr-o soluție de radicali de concentrație cunoscută. Am utilizat metoda radicalului 2,2 difenil-1-picrilhidrazil (DPPH) pentru determinarea acțiunii antiradicalice totale și metoda photochemiluminescenței pentru a evidenția doar acțiunea antioxidantă - capacitatea de a bloca superoxidii. Materialul de lucru a fost reprezentat de două vinuri roșii obținute prin patru variante tehnologice: Merlot, un vin internațional, cu care am comparat potențialul antiradicalic al vinului autohton Fetească neagră. Acest studiu se alătură altor studii ce susțin potențialul calitativ ridicat al vinului autohton Fetească neagră și contribuie la imaginea favorabilă a acestuia, atât pe piața națională, cât și internațională a vinurilor, alături de cele mai cunoscute vinuri din lume.*

Cuvinte cheie: Fetească neagră, Merlot, antioxidant, PCL, DPPH

INTRODUCTION

The red wines are well-known for their benefic effects on the human organism, in a moderate consumption, due, first of all, to its specific content in phenolic compounds which scavenge the radical activity.

The free radicals have harmful effects at cellular and tissue level, being responsible of a whole series of diseases (Olinescu, 1994).

The international research laboratories tried to explain the *French paradox* (de Gaulejac Nathalie Vivas, 2001), which consists in a high consumption of fatty foods associated with a low cardiovascular diseases' risk due to red wines moderate consumption.

These wines, like other food products from the Mediterranean countries (olive oil, natural juice and vegetables), that compose the *Mediterranean diet*, contribute in the decrease of fats in the circulatory system leading to the maintaining of health state.

The wine phenols have a great structural diversity, from a small molecule to polymers. They are extracted from grapes by enzymatic processes and chemical reactions in the wine making processes (Pomohaci, 1994).

MATERIAL AND METHOD

The studied material was represented by two grape varieties that were processed into wines in four technological variants: Merlot, an international variety well known for its potential of producing high quality wines and Fetească neagră, a Romanian variety with a high potential, too. The used technological variants of maceration and fermentation are: classical maceration, ROTO-tanks maceration, thermo-maceration, microwaves maceration, ultrasounds and cryomaceration.

The classical variant was considered as a control sample to which the other variants had been compared. For the ROTO-tanks maceration method, the standard wine making process was used. The ultrasounds maceration process had destemmed grapes which were submitted to a 35 kHz frequency during 10 minutes, while for the microwave variants the grapes were submitted to 15 minutes at 650 W. The thermo-maceration was made by heating the grapes at a temperature of 60°C and the cryomaceration was obtained by freezing the berries at -30°C.

The international literature mentions technology's influence on the phenolic compounds extractions, these compounds having a direct proportional influence on the antiradical and antioxidant potential (Baiano *et al.*, 2003). The phenolic compounds content was calculated with the total polyphenolic index (TPI) and the anthocyan content was obtained by using the pH variation (*Recueil de l'OIV*, 2008).

The radical scavenging activity of food, pharmaceutical and cosmetically products can be determined by different spectrophotometrical methods. For this comparative study, the radical DPPH (2,2 difenyl-1-picryl-hidrazyl) method and the photochemiluminescence method were used. These methods quantify the wines radical scavenging activity potential from a known concentration solution.

The DPPH radical method, proposed by Brand-Williams (1995) is used for determining the total antiradical activity (ARA) of different solutions. The DPPH radical absorbs at 515 nm, but his absorbance decreases under the influence of antiradical compounds, like the phenolic compounds.

The absorbance decreases until it reaches a plateau level that represents the radical consumption from the methanol solution (the DPPH is soluble in alcohol). For the wine antiradical activity determination is necessary a dilution for reducing the initial concentration of DPPH at 50 % - the effective dilution ED50 (Brand-Williams *et al.*, 1995).

These determinations were realised using the spectrophotometer UV VIS Analytic Jena 200.

In the photochemiluninescence method the free radicals (superoxide anion radicals) are being produced by optical excitation (irradiation) of a photosensitizer

(dye) substance. These radicals are partially eliminated from the sample by reaction with the antioxidants present in sample. In the measuring cell the remaining radicals cause the detector substance luminol to emit luminescence and thereby the antioxidant capacity of the sample is determined.

The antioxidative capacity (AOA) of the sample is quantified by comparison with the standard (constructing a calibration curve with ascorbic acid) and is given in equivalent units of standard (Popov, Lewin, 1999). This method is much rapid, it takes 1-3 minutes by sample in comparison with the DPPH one, that often reach at 5 hours by sample. For these determination was used the Photochem Analytik Jena AG device.

RESULTS AND DISCUSSIONS

The tables 1 and 2 present the results obtained with the total phenolic compounds analysis (D280 index, g/L gallic acid), radical scavenging activity (EC 50) and antioxidant activity (AO, g/L ascorbic acid) of the Merlot and Fetească neagră wines. Both these wines were processed in four different maceration fermentation variants.

Table 1

The phenolic compounds and the antiradical and antioxidant indexes for the Merlot wine in the four technological variants

No.	MERLOT	Antiradical activity - ARA (EC 50)		Antioxidant activity (AOA)	TPI
	Maceration fermentation technology	concentration	dilution	g/L	g/L
				ascorbic acid	galic acid
1	Classical maceration	0,0029	1/345	1,011	49,879
2	ROTO-tanks	0,0013	1/769	1,139	52,620
3	Microwaves	0,0029	1/344	0,726	36,986
4	Ultrasounds	0,006	1/166	0,353	19,075

For both wines, Merlot and Fetească neagră, a maximum extraction of the phenolic compounds was observed for the ROTO-tanks maceration -fermentation variants (65 g/L and 53 g/L gallic acid).

The minimum values were obtained with the ultrasounds variants: 19 g/L and 31 g/L.

The maximal values of the antiradical activity, expressed by the dilutions necessary to reduce by 50 % the concentration of DPPH radical were also obtained at the ROTO-tanks variant: 1/769 for Merlot and 1/526 for Fetească neagră. The results show that these wines can be classified with a high antiradical activity, with healthy effects on the human organism, but only in a moderate consumption case.

Table 2

The phenolic compounds and the antiradical and antioxidant indexes for the Fetească neagră the four technological variants

No.	FETEASCĂ NEAGRĂ Maceration fermentation technology	Antiradical activity - ARA (EC 50)		Antioxidant activity (AOA)	TPI
		concentration	dilution	g/L	g/L
				ascorbic acid	galic acid
1	Classical maceration	0,0036	1/277	0,968	38,164
2	ROTO-tanks	0,0019	1/526	1,125	64,746
3	Microwaves	0,0038	1/263	0,849	37,422
4	Ultrasounds	0,004	1/247	0,781	30,830

The evaluation of different wines made by the authors of the method (Brand-Williams, *et al.*, 1995) gave values between 1/380 (minimum) and 1/620 (maximum).

Antioxidant activity of our wines has the same curve in as regards to the technologies variants: the maximum values for the ROTO-tanks variants are 1,139 g/L for Merlot and 1,125 g/L for Fetească neagră, the minimum values being 0,353 g/L for Merlot and 0,781 g/L for Fetească neagră.

The correlation between antiradical activity and the phenolic content shows a direct influence of the phenolic compounds on the antiradical activity (figure 1 and 2).

The influence is obvious on the antioxidant activity (figure 3 and 4).

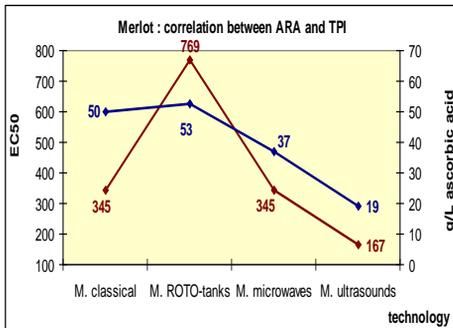


Fig. 1. Correlation between ARA and TPI for the 4 Merlot variants wines

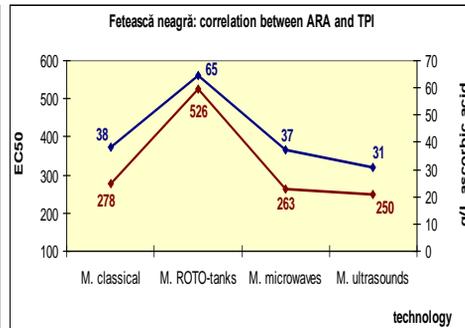


Fig. 2. Correlation between ARA and TPI for the 4 Fetească neagră variants wines

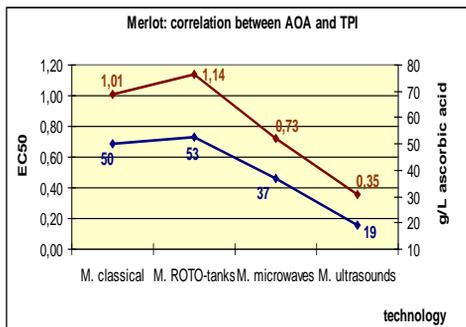


Fig. 3. Correlation between AOA and TPI for the 4 Merlot variants wines

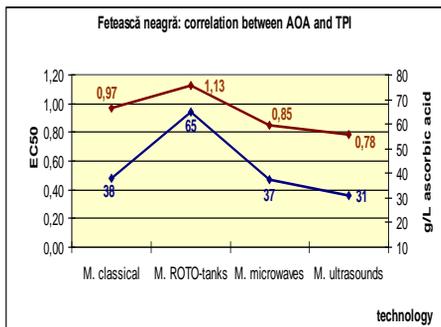


Fig. 4. Correlation between AOA and TPI for the 4 Fetească neagră variants wines

The minimal values for all indexes were obtained at the ultrasounds maceration technology, which was the least extractive variant (19,075 g/L phenolic compounds and 30,830 g/L gallic acid). So the most efficient technologies, for both wine varieties are the ROTO-tanks, followed by classical maceration.

The ultrasound and microwaves variants have intermediated values: in the case of Merlot there is a big difference between these two, while in the case of Fetească neagră wine the two variants results are very close (almost the same).

The antioxidant and radical scavenging activity values are high for the Fetească neagră ROTO-tanks obtained wine (1,125 g/L ascorbic acid; EC50 = 1/526) and very high for the Merlot (1,139 g/L ascorbic acid; EC50 = 1/781). From these results one can easily deduce the health effects that these wines can have in a moderate consumption; *in vivo* effects will be studied in a next project.

CONCLUSIONS

The results of this study on the two red wines underline a direct correlation between the content of phenolic compounds and their antioxidant and antiradical activity: the wines with the highest content in phenols also have the higher antioxidant and antiradical activity.

In both cases, Merlot and Fetească neagră, the most efficient technological variant is the ROTO-tanks one: it determines the highest content in phenolic compounds. Comparing the antiradical activity of Fetească neagră and Merlot wines, as well as with other data from international studies, the high antiradical potential of the Fetească neagră Romanian wine is demonstrated and thus recommended for a moderate consumption, for his health effects on the human body.

Alongside with others studies, this one underlines the high potential of obtaining qualitative wines from the Romanian Fetească neagră variety of grape. The quality of the local grape variety promotes it to the best wines of the world class.

REFERENCES

1. **Brand-Williams W., Cuvier M.E., Berset C., 1995** - *Use of free radical method to evaluate antioxidant activity*. *Lebensm.-Wiss. u. – Technol.*;
2. **Baiano A., Gambacorta G., Terracone C., la Gatta B., Pati S., La Notte E., 2003** - *Influence of wine-making technologies on phenolic content and antioxidant power of Primitivo musts and wines*. Dipartimento di Scienze degli Alimenti, Facoltà di Agraria, Università degli Studi di Foggia;
3. **de Gaulejac Nathalie Vivas, 2001** - *Vins et sante – Les bases scientifiques du French Paradox*. Editura Fêret, Bordeaux
4. **Olinescu R., 1994** - *Radicali liberi în fiziopatologia umană*. Seria “Medicină”, Editura Tehnică, București;
5. **Pomohaci N., Stoian V., Gheorghita M., Sirghi C., Cotea V.V., Namolosanu I., 2000** - *Oenologie. Volumul 1: Prelucrarea strugurilor și producerea vinurilor*. Editura Ceres, București;
6. **Popov I., Lewin G., 1999** - *Antioxidative Homeostasis: Characterisation by Means of Chemoluminescent Technique*. In: *Methods of Enzymology Volume 300, Oxidants and Antioxidants Part B*, Edition Lester Packer: Academic Press;
7. **** **2005** - *Recueil des méthodes internationales d'analyse des vins et de moûts*. Office International de la Vigne et du Vin. Édition Officielle, Paris.

ON THE DYNAMICS OF THE REDOX POTENTIAL DURING "IN RED" WINE MAKING

CONSIDERAȚII PRIVIND DINAMICA POTENȚIALULUI REDOX ÎN CURSUL VINIFICĂRII „ÎN ROȘU“

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Abstract. Evolution of the redox potential during “in red” wine making from grapes of two autochthonous, black sorts – Fetească neagră and Băbească neagră – has been followed. Qualitatively, the dynamics of the process does not differ from that of the “in white” wine making; more precisely, the redox potential first evidences an oxidative tendency, followed by a reductive one. Pressing causes no significant modification in the subsequent development of the redox potential. However, quantitatively, a drastic reduction of the period over which the pomace follows the oxidative tendency, alongwith the orientation towards the reductive one, should be mentioned. Even if the oxidative tendency is biochemically supported by the preponderant glycerol biosynthesis, while the reductive one – by the ethanol biosynthesis, a physiological aspect should be also involved here, namely the homeostatic tendency of the yeast of assuring to itself an optimum redox potential of the environment: rH 25 over the duration of (aerobic) multiplication and, respectively, a rH value around 20, along the duration of the (anaerobic) fermentation. In this respect, mention should be made of the fact that, in the case of both “in red” and “in white” wine making, in the end of fermentation, rH values of 19–20 are recorded in the must–wine.

Key words: rH, “in red” wine/making

Rezumat. S-a urmărit evoluția potențialului redox în cursul vinificației „în roșu” a strugurilor proveniți din două soiuri negre autohtone – Fetească neagră și Băbească neagră. Dinamica înregistrată nu diferă – calitativ – de cazul vinificației „în alb”. Anume, potențialul redox are inițial o tendință oxidativă, urmată de una reductivă. Tescuirea mustuielii nu induce nici o modificare notabilă în evoluția ulterioară a potențialului redox. Din punct de vedere cantitativ însă, se constată restrângerea drastică a perioadei în care mustuiala urmează tendința oxidativă și trecerea spre tendința reductivă. Chiar dacă tendința oxidativă are ca suport (bio)chimic biosinteza preponderentă de glicerol, iar cea reductivă de etanol, faptul reflectă și un aspect fiziologic, anume tendința homeostatică a levurii de a-și asigura un potențial redox optim al mediului: rH 25 pe durata multiplicării (aerobe), respectiv o valoare rH situată în jurul a 20 pe durata fermentației (anaerobe). În acest sens se remarcă faptul că, indiferent dacă e vorba de vinificare „în roșu” sau „în alb”, la sfârșitul fermentației se înregistrează în must–vin valori rH de 19–20.

Cuvinte cheie: rH, vinificație „în roșu”

INTRODUCTION

In a previous study [1] the evolution of the redox potential has been followed during "in white" wine making, the conclusion being reached that the quite unanimously accepted idea that alcoholic fermentation is a reductive process is not wholly valid. As a matter of fact, such process involves the oxidation of glucose to ethanol, which should implicitly cause an increase of rH value. The usually observed rH decrease should be therefore attributed to the formation of compounds with a reductive-type behaviour, yet lacking the corresponding energetic availability.

The present study, devoted to the "in red" wine making, attempts at evidencing the possible similarities or differences between the two types of wine-making processes.

MATERIAL AND METHOD

For the experiments, grapes of two autochthonous black sorts – Fetească neagră and Băbească neagră – from the Huși vineyard, harvested in 2007, have been utilized. They have been microwine-making separately, in 60 L containers. Daily, samples of must-wine were drawn, which were immediately preserved by freezing. Subsequently, samples were subjected to determination of redox potential, by a potentiometric method previously presented [2] with changes specified in [1]. Redox potential was expressed through the rH parameter, according to Clark's relation:

$$rH = \frac{E_h + 0.058 \cdot pH}{0.029}$$

where: E_h – the determined redox potential (in Volts) + the standard potential of the normal hydrogen electrode at working temperature [3]. If, in principle, the method has been applied in the reported form, from an instrumental point of view an automatic data acquiring system was added. The authors thank this way to Mr. Viorel Creangă from TVR Iași, the manufacturer of the system and of the afferent program and from whom those interested can obtain further details (+40740133658, jo_branch@yahoo.com).

RESULTS AND DISCUSSIONS

The obtained data, presented in table 1, were graphically represented in figure 1 (Fetească neagră), respectively figure 2 (Băbească neagră).

Table 1

The obtained experimental data

Time (days)	rH		Time (days)	rH	
	Fetească neagră	Băbească neagră		Fetească neagră	Băbească neagră
0	21.05	26.50	11	22.49	22.00
1	26.31	26.64	12	22.24	21.33
2	28.98	23.06	13	19.855	20.88
3	20.795	24.51	14	19.93	21.98
4	25.85	24.90	15	20.02	21.15
5	21.33	24.84	16	20.02	20.365
6	22.94	21.86	19	19.645	19.85

7	22,46	23,21	22	20,14	21,015
8	21,78	20,52	25	20,69	18,755
9	20,01	22,12	28	17,81	19,50
10	20,37	22,50			

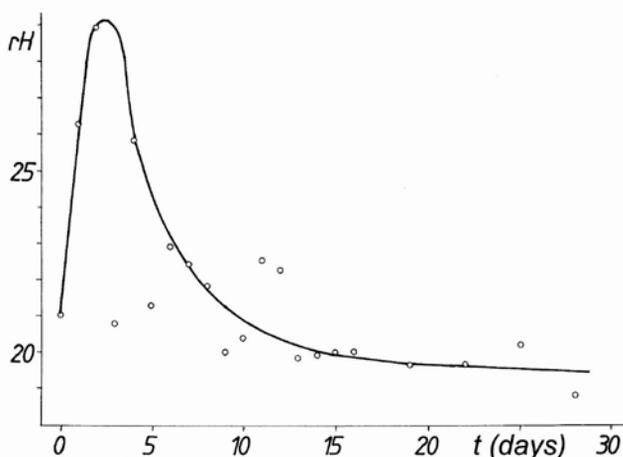


Fig. 1. Dynamics of rH' values at Fetească neagră

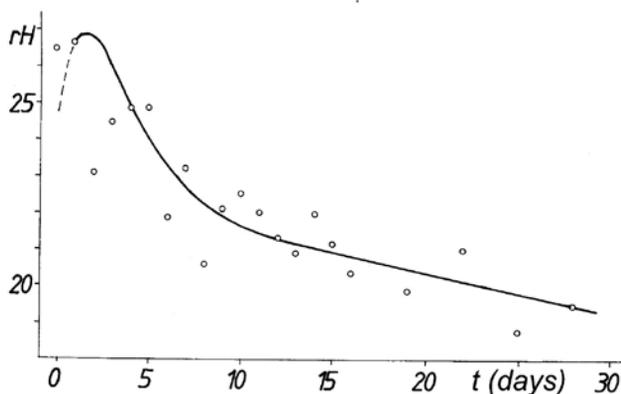


Fig. 2. Dynamics of rH' values at Băbească neagră

A first remark/observation refers to a larger spreading of the experimental data than for the “in white” wine-making, natural/explainable if taken into account the poorer homogenization of vintage compared to the must. Namely, the redox potential has at first an oxidative tendency, followed by a reductive one. Pressing the vintage ($t = 5$ days) does not induce any significant change in the subsequent evolution of the redox potential. But, quantitatively, a drastic reduction of the period in which vintage follows the oxidative tendency and the passing to the reductive tendency were noticed. We explain this by the contact between must and air, therefore by the more intense multiplication tendency of

the yeast, implicitly the fast reach of the maximum redox potential (1-2 days). This fact is better highlighted for the Fetească neagră sort (fig. 1).

Even though the oxidative tendency has as a (bio)chemical support the preponderant glycerol biosynthesis, while the reductive one by the ethanol biosynthesis, as detailed in [1], this fact also reflects a physiological aspect, namely the homeostatic tendency of yeast to ensure itself an optimum redox potential of the environment: rH 25 during the (aerobe) multiplication, respectively a rH value around 20 during (anaerobe) fermentation. In this respect, it is noticed that, no matter if we refer to “in red” or “in white” wine-making, at the end of fermentation rH values of 19–20 in must–wine are registered.

The recorded dynamics does not differ – qualitatively – from the case of “in white” wine-making. (fig. 3 [1]).

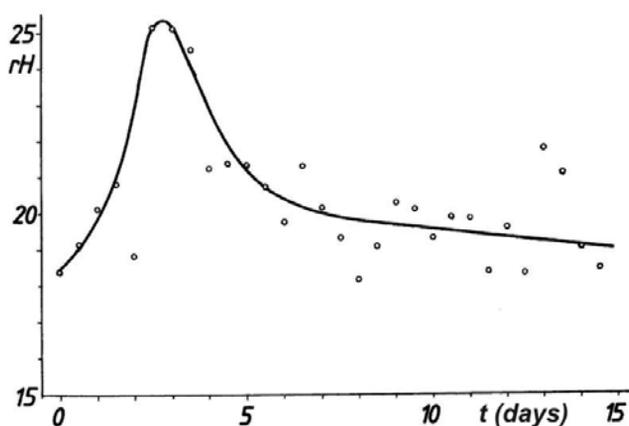


Fig. 3. Dynamics of rH' values at “in red” wine-making

CONCLUSIONS

The evolution of redox potential during “in red” and that during the “in white” wine-making do not differ qualitatively, but the oxidative period, at the end of which the redox potential reaches the maximum, is drastically shortened.

REFERENCES

1. Cotea V.V., Zănoagă C.V., Colibaba Cintia, 2007 – *Redox aspects of yeast alcoholic fermentation versus carbonic maceration*. XXXth OIV World Congress, Budapest, June 10–16.
2. Duca G., Zănoagă C.V., Duca Maria, Gladchi Viorica, 2001 – *Procese redox în mediul ambiant*. Editura Universității de Stat din Moldova, Chișinău
3. Luca C., 1973 – *pH-ul și aplicațiile lui*. Editura Tehnică, București

RESEARCH REGARDING WATER CONSUMPTION AT SOME GRAPE VARIETIES GROWN IN TRANSYLVANIA

CERCETĂRI PRIVIND CONSUMUL DE APĂ LA UNELE SOIURI DE STRUGURI CULTIVATE ÎN TRANSILVANIA

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Abstract: *The aim of this paper was to determine the variations of water consumption of vine in two different areas of Transilvania (Blaj wine-growing center and Cluj Napoca). Fetească regală, Riesling Italian and Muscat Ottonel are grape varieties taken for studies. During the growing season there are three periods represented by the lowest levels of water consumption, during the start of some phenophases: weeping, bud breaking and ripening of grapes. The research carried out confirms the existence of a maximum of water consumption in summer, in shoot growth occurs, regardless of rainfall input. Daily consumption of water by the vines has been established through monthly reporting of the number of days in month, using water balance method in soil.*

Key words: vineyard; soil water balance, water consumption.

Rezumat. *Scopul acestei lucrări a fost de a determina variații ale consumului de apă de viță de vie, în două zone diferite din Transilvania (Blaj și Cluj Napoca). Soiurile de struguri de luate în studiu sunt: Fetească regală, Riesling italian și Muscat Ottonel. În timpul perioadei de vegetație există trei perioade marcante reprezentate de cele mai scăzute niveluri ale consumului de apă, în perioadele de început a unor fenofaze: plâns, dez mugurit și părgă-maturare a strugurilor. Cercetările efectuate confirmă existența unui maxim al consumului de apă în timpul verii, la creșterea lăstarilor, indiferent de aportul de precipitații. Consumul zilnic de apă de viță de vie s-a stabilit prin raportarea consumului lunar la numărul de zile ale lunii, în cazul folosirii metodei bilanțului apei în sol.*

Cuvinte cheie: podgorie, bilanțul apei din sol, consum de apă.

INTRODUCTION

Water is one of the most important environmental factors influencing growth, yield and grape composition of grapevines and is therefore critical for the quality of wine. [2, 6] At harvest, berry size is considered a very important component of determining wine grape quality all over the world. [3, 8] The availability of water during certain periods of berry growth is known to cause changes in grape composition and berry size. These changes include an increase in berry size, and dilution of berry flavour compounds, sugars, and organic acids, and can cause a decrease in tannins and anthocyanins. Water deficit management of vineyards has therefore received much attention, the consequences of which have not been fully elucidated. [5]

MATERIAL AND METHOD

Water consumption at grape varies with variety, phenophases, composition, soil climate, geographic origin, and cultivation practices. This is why we took in study the following grape wines varieties: Fetească regală, Riesling italian and Muscat Ottonel. The grapes have been harvested at complete maturity, from two areas: Blaj and Cluj Napoca.

The term “total water consumption” is the same with “evaporation” used in scientific books and is notes like $\sum(e + t)$, **ET** or **ETR**.

To determinate, the water consumption for a culture is used direct methods, **the water balance from the soil**. To make the water balance from the soil is necessary to put the condition that all water “in”, that include all the water sources of the soil, to be equal with all water „out”, that include all the water consumption form the soil. That how it is obtains the water balance relation, then results the evapotranspiration calculus formula (water consumption):

$$R_i + P = ETR + R_f;$$

$$ETR = R_i + P - R_f$$

ETR – the real evapotranspiration or total water consumption (m³/ha);

R_i – the water reserve from the soil at the vegetation start, that is initial water reserve (m³/ha);

P – the useful precipitations sum from vegetation period (m³/ha);

R_f – the water reserve remain in the soil in the moment of the harvest, that is the final resource (m³/ha).

The gravimetric method was used to determinate humidity from the soil. To determinate the initial a finale water resource from the soil in vegetation period, was determinates using gravimetric methods.

This method assumed to dry the soil crop samples from the field and determinate the water from the soil by weighing. To dry the samples was used the drying stove. In the experience, was drawing soil samples, on different depth levels: 0-10, 10-20, 20-40, 40-60, 60-80, 80-100, 100-125 and 125-150 cm, using the values of humidity on the weighted average depth.

These samples were taken from tow control points; the wet of the soil was obtained as an arithmetic media of those repetitions. The next calculus formula was use for the soil humidity:

$$U\% = (\text{Evaporated water/Dried soil mass}) \times 100$$

RESULTS AND DISCUSSIONS

Total water consumption or evapotranspiration to a culture consists in amount productive consume from transpiration plants and in unproductive losses through evaporation at soil surface. Usually daily water consumption is expressed in mm or m³/ha/day [1, 4].

Knowledge of the water consumption phenomenon can resolve a number of problems related to positive completion of a year of economic activity, through a series of technological measures that the vine grower can take during the growing season.

Vineyards non-irrigated, which represent the largest surfaces in the country, presented not well-known issues related to the water consumption. Crucial periods of water deficit are of the utmost importance.

The dates for beginning of main phenophases at the grapes varieties, taken in study in year 2008, are presented in the table below. (Table 1)

Table 1

Main phenophases at the grapes varieties taken in study, 2008

Variety	Fetească regală		Muscat Ottonel		Riesling italian	
	Blaj	Cluj Napoca	Blaj	Cluj Napoca	Blaj	Cluj Napoca
Bud Break	20.04.08	22.04.08	21.04.08	25.04.08	24.04.08	28.04.08
Shoot growth	3.05.08	6.05.08	6.05.08	10.05.08	9.05.08	14.05.08
Blooming	10.06.08	15.06.08	11.06.08	17.06.08	13.06.08	19.06.08
Beginning of ripening	08.08.08	15.08.08	06.08.08	13.08.08	11.08.08	11.08.08
Ripening	22.09.08	28.09.08	22.09.08	26.09.08	25.09.08	1.10.08
Harvest	1.10.08	1.10.08	1.10.08	1.10.08	1.10.08	1.10.08

In 2008 the beginning of growing season was between April 20 at Fetească regală variety (Blaj) and April 28 at Riesling italian variety cultivate at Cluj.

Period of shoots growth started in the first decade to all the studied variety in Blaj wine-growing center and it is later with 3-4 days in Cluj.

Shoots growth diminished after beginning of ripening and it was made shoots pruning. Grapes ripening started with Fetească regală variety (Blaj) at September 22 and ends at October 1 to Riesling italian variety cultivate at Cluj. Harvesting has been made in October 1 to all the varieties, in both areas.

During the vegetation period, there are three specific periods to water consumption. Those periods are at the start of growing seasons, buds brake- rising sap and grapes ripening, with the lowest levels of water consumption and the growth of shoots and grapes at the middle of vegetation, phenophase with the highest water consumption. (Fig. 1)

Table 2, present the total water consumption values of vine and for the daily consumption in non-irrigated conditions, in experimental year 2008, at three grape wines varieties: Fetească regală, Riesling italian and Muscat Ottonel.

Total water consumption in the vegetation period was the smallest, 4394.42 m³/ha, at Riesling italian cultivated in Blaj wine-growing center and the bigger was at Riesling italian cultivated in Cluj Napoca, 5270.75 m³/ha.

Month with the higher water consumption of vines was July (1425.36 m³/ha at Muscat Ottonel, Cluj Napoca).

The daily consumption of vine, in non-irrigated conditions, in experimental year 2008, at three grape wines varieties: Fetească regală, Riesling italian and Muscat Ottonel is present in table 3.

Table 2

Total water consumption in the vegetation period, 2008

Variety	Nr. of day	Fetească regală		Muscat Ottonel		Riesling italian	
Area		Blaj	Cluj Napoca	Blaj	Cluj Napoca	Blaj	Cluj Napoca
Determination Months		Total water consumption, m ³ /ha					
April	30	625.00	654.49	794.89	668.99	572.67	838.46
May	31	867.22	951.51	990.54	960.17	910.69	699.5
June	30	841.49	1016.00	961.45	1287.72	964.19	985.24
July	31	936.01	1416.72	774.92	1425.36	731.77	1517.92
August	31	709.57	692.66	737.58	266.98	862.47	911.06
September	30	429.85	349.16	265.98	196.21	352.63	318.57
Total	183	4409.20	5080.54	4525.36	4805.43	4394.42	5270.75

Table 3

Daily water consumption in the vegetation period, 2008

Variety	Nr. of day	Fetească regală		Muscat Ottonel		Riesling italian	
Area		Blaj	Cluj Napoca	Blaj	Cluj Napoca	Blaj	Cluj Napoca
Determination Months		Daily water consumption, m ³ /ha/day					
April	30	20.84	21.82	26.50	22.30	19.09	27.95
May	31	27.97	30.69	31.95	30.97	29.38	22.56
June	30	28.05	33.87	32.05	42.92	32.14	32.84
July	31	30.19	45.70	25.00	45.98	23.61	48.97
August	31	22.89	22.34	23.79	8.61	27.82	29.39
September	30	14.33	11.64	8.87	6.54	11.75	10.62
Total	183	24.09	27.76	24.73	26.26	24.01	28.80

It is noted, that between the two locations where experiences were placed, there are differences in terms of total water consumption in light of variety and depending on month.

Generally, in wine-growing center Blaj water consumption is lower than in the Cluj area both due of lower rainfall during the growing season, but also because the soil easily, clay-sandy, compared to the soil from Cluj with a higher content of clay

The medium daily consumptions were swing between 6.54 mm/day in September at Muscat Ottonel, Blaj to 48.97 mm/day in July at Riesling Italian cultivated in Cluj.

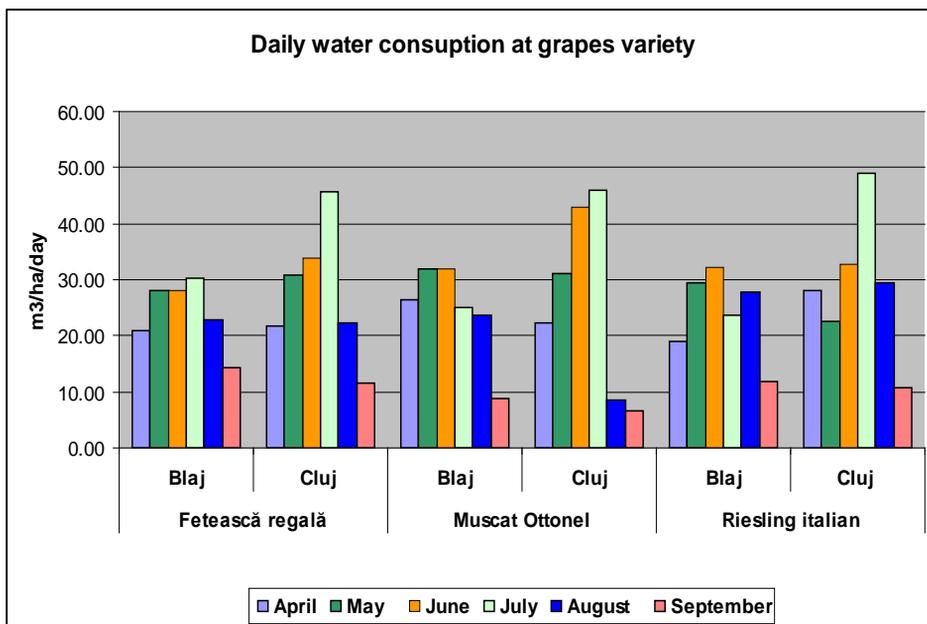


Fig. 1. The evolution of daily water consumption

The graphic also, done correlation between daily water consumption, depending on grape varieties analyzed.

The lower water consumption was recorded in September, at grapes ripening phenophase, to all the grapes varieties and in both places where have been located experiences

Water consumption has increased steadily from spring to summer in the same way with shoots increasing. The highest consumption was reached in July, in period of maximum growth at shoots and at grapes. Exceptions are at the varieties Riesling italian and Muscat Ottonel at which had recorded a slight water consumption decrease in July because of drought and soil type in Blaj wine-growing center.

CONCLUSIONS

1. By knowing the phenomenon of evapotranspiration in some areas of Transylvania, we can establish some links technology, ensuring that production is constant over time in terms of quantity and quality.

2. The total water consumption of vine, grown without irrigation, has been in direct connection with the amount of precipitation, fallen during the vegetation period.

3. It has shown that, in various conditions of the microclimate, the water consumption of vine has led to considerable changes in quantity and quality of grape yield.

REFERENCES

1. **Budiu V., 1992** - *Cercetări privind fertilizarea unor amestecuri de plante furajere și perene în condiții de irigare și neirigare*. Teză de doctorat USAMV Cluj Napoca.
2. **Dejeu L., Puiu Șt., 1985** - *Cercetări privind influența unor condiții eco-pedologice asupra creșterii și rodirii viței de vie*. Lucrări științifice I.A.N.B., seria B, vol.XXVIII;
3. **Grumeza N., 1974** - *Regimul de irigație la vița de vie pe nisipuri*, Revista de Horticultură și Viticultură, nr.5, București,
4. **Luca E., Nagy Z., 1999** - *Irigarea culturilor*. Editura Genesis Tipo, Cluj-Napoca
5. **Myburgh, P.A., 1998** - *Water consumption of South African vineyards: A modeling approach based on quantified combined effects of viticultural, soil and meteorological parameters*. D. Phil. (Agric) Dissert. University of Stellenbosch, Private Bag X1, 7602 Matieland (Stellenbosch), South Africa.
6. **Nagy Z., F.Bianu, Margareta Nagy, 1983** - *Rezultate privind regimul de irigare și consumul de apă la plantele furajere cultivate în Câmpia Transilvaniei. Probleme de Agrofitehnie teoretică și aplicată*. I.C.C.P.T Fundulea, vol V.
7. **Pop N., V. Budiu, Ana Ciotlăuș, 1999** - *Cercetări privind determinarea consumului de apă la unele specii de leguminoase perene, în zona subumedă a Transilvaniei*. Rev. Agricultură, nr.2 USAMV Cluj-Napoca,
8. **Schultz H.R., 1996** - *Water relations and photosynthetic responses of two grapevine cultivars of different geographical origin during water stress*. Acta Hortic. 427, 251-266

PEDOLOGICAL DETERMINING FACTORS OF BIOPRODUCTIVE AND QUALITATIVE POTENTIAL AS PART OF CONTROLLED DENOMINATION OF ORIGIN AREA

DETERMINANȚII PEDOLOGICI AI POTENȚIALULUI BIOPRODUCTIV ȘI CALITATIV ÎN CADRUL AREALULUI CU DENUMIRE DE ORIGINE CONTROLATĂ

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Abstract. *The purpose of this study is strict delimitation- at lot level-of high quality wines areas from a controlled denomination of origin region. In accordance with the research topic proposed, the observations and determinations were focused on influence of slope situation and soil characteristics on several biochemical and productive parameters of Cabernet Sauvignon and Sauvignon (soluble glucides content, organic acids, anthocyanins, glucoacidimetric index, berries weight and average vine production), in a well - known viticultural centre from southern part of Romanai, Segarcea. Soil, exhibition and climate characteristics are considered constant factors. Both grape varieties have been influenced by these factors, manifesting their productive potential in the same way. Differences of soil fertility and of situation on slope recovered in values variation of biochemical and productive indexes under study. The results of this study can be used for qualitative and quantitative differentiation – within the precincts of controlled denomination of origin area - of high favourable lots for obtaining grape in order to produce high quality wines.*

Key words: *anthocyanins, Cabernet Sauvignon, Sauvignon, glucoacidimetric index, quality.*

Rezumat. *Scopul acestui studiu îl reprezintă delimitarea strictă, la nivel de parcelă, a zonelor pentru obținerea vinurilor de calitate din cadrul unui areal cu denumire de origine controlată. Cercetările au urmărit influența conjugată a poziționării pe pantă și caracteristicilor solului asupra unor parametri bioproductivi (conținutul în glucide solubile, acizi organici, antociani, indice glucoacidimetric, greutatea boabelor, producția medie pe butuc) la soiurile Cabernet Sauvignon și Sauvignon, într-un binecunoscut centru viticol din sudul României și anume Segarcea. Factori constanți au fost considerați soiul, expoziția și caracteristicile climatice. Ambele soiuri au interacționat cu cei doi factori, exprimându-și potențialitatea productivă în același mod. Diferențele de fertilitate a solului și de amplasare pe panta s-au regăsit în variațiile valorii indicilor biochimici și productivi studiați. Interpretarea rezultatelor poate fi folosită în vederea delimitării pe hărți topografice a parcelelor de maximă favorabilitate pentru obținerea strugurilor destinați producerii vinurilor cu denumire de origine controlată.*

Cuvinte cheie: *antociani, Cabernet Sauvignon, Sauvignon, indice glucoacidimetric, calitate.*

INTRODUCTION

Location and development of vine cultivation particularly in determinate areas, vineyards and viticultural centres is the complex expression of practical experience, which wine-growers had attained and improved during time.

In Romania, the assignation of controlled denomination of origin areas had been accomplished since inter-war period (Legea pentru reglementarea plantațiilor de vii, 1932; Teodorescu I. C., 1942). Subsequent multiple researches averred the high quality of wines obtained from these areas.

In the context of topical competition from wines market, new researches are entailed in order to determine the most favourable lots for wine-growing as part of controlled denomination of origin areas.

MATERIAL AND METHODS

The study was carried out during two years (2006 and 2007) in a well-known viticultural centre from southern part of Romania – Segarcea - using two grape varieties for high quality wines which are cultivated in this place for more than a century: cv Cabernet Sauvignon and cv. Sauvignon. This centre has as main production aim the obtaining of quality red and aromatic wines and secondary quality white wines (Teodorescu St. și col., 1987; Popa A., 2005). The territory has a compact vine massif of about 600 hectares.

In order to reach the objectives, a map of Segarcea viticultural area was used and there were established two adequate experimental plots (fig.1). First experimental plot (Area 1) has a moderate acclive surface (gradient: 6-8%), the second one (Area 2) is a quasi-horizontal surface (gradient 1-2%) and difference in level between these two plots is approximate of 50 m. A soil profile was executed for each experimental plot. The soils were evaluated morphologically, physically and chemically.

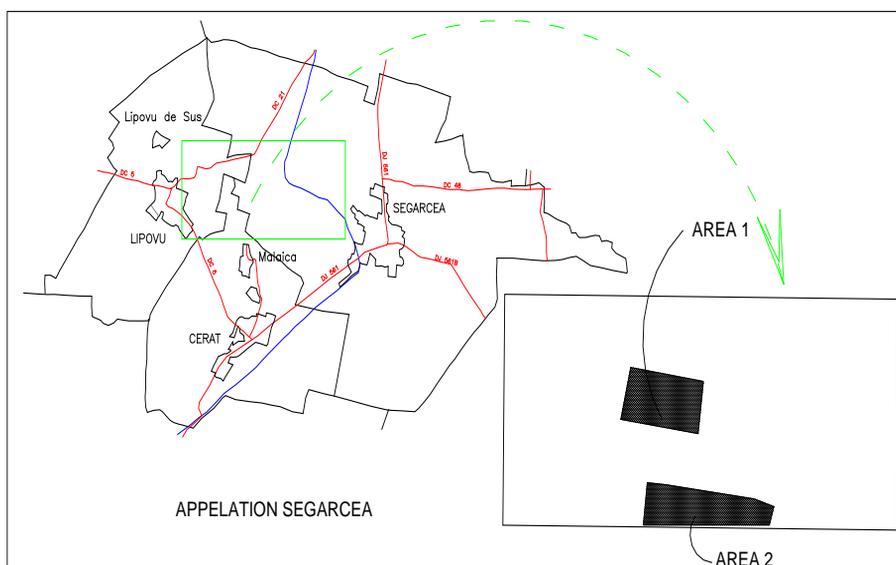


Fig. 1. Emplacement draft of experimental plots

Vineyard has a plant density about 3000 vine/ha and appellation of Segarcea limits grape productivity into 10000 kg per hectare. The grapes from each experimental plot were analysed at vintage for total soluble solids, titrable acidity and anthocyanins for red cultivar and the gluco-acidicimetric index was established. Quantitative traits (yield per vine and mass of 100 berries) were also recorded.

The variation of the climatic profile during the studied period was monitored using the data received from the Hydrological and Meteorological National Institute. Vine variety, exhibition and climate characteristics are considered constant factors.

RESULTS AND DISCUSSIONS

The morphologically, physically and chemically analysis show that the useful edaphic capacity of soil from superior part of slope is much lower than the one from inferior part of slope. For Area 1 (tab.1), the assurance of nutritional substances is moderate in first two soil horizon and very poor below 42 cm. The soil from Area 2 (tab. 2) is characterized by a better fertility, which gradually, but evenly decreases.

Table 1

CALCARIC REGOSOL										
Horizon	Depth	pH	Humus	P	K	Total CaCO ₃	Coarse sand	Fine sand	Dust	Loam
Am	0 28	7.6	1.72	19.4	130	15.4	1.6	1.9	62.3	16.4
Ac	28 42	7.5	1.36	13.2	118	14.9	24	33.7	29.4	22.6
Cca ₁	42 63	8.7	0.1	1.6	12.6	47.2	56.2	48	7.2	56.2
Cca ₂	63	8.8	0.3	1.2	16.4	41.6	18.8	16.4	1.1	4.8



The occurrence of a high amount of CaCO_3 near the surface (below 42 cm) correlative with height of feature and slope in Area 1 determined the storage of high amount of heat in soil which is released by degrees, increasing the development of vine. Because of soil texture, lower useful edaphic capacity and moderate acclive surface from this area, the retention of water, minerals and organic substances is poorer.

Table 2

Main soil characteristics from Experimental plot 2 (Area 2)

CAMBIC CHERNOZEM										
Horizon	Depth	pH	Humus	P	K	Total CaCO_3	Coarse sand	Fine sand	Dust	Loam
Am	0 38	7.3	1.92	30.3	148	14.3	9.8	50.1	17.8	22.3
Bv ₁	38 68	7.4	1.65	17.5	116	14.8	6.5	51.7	17.7	24.1
Bv ₂	68 100	7.6	1.05	16.5	106	15.2	5.9	53.5	17.8	22.6
Cca ₁	100 150	8.1	0.96	8.5	96	21.4	5.2	55.3	16	21.5



Climatically, the territory is a homogeneous area. Recorded data show that the amount of precipitation during vegetation period of the studied years was higher than the long term one (463,3 mm, respectively 509,8mm vs. 50 year media: 385 mm). Also the insolation was higher than the long term one (1672 hours, respectively 1748 hours vs. 50 year media: 1439 hours). In fact, the

oenoclimatical applicability index for both studied year has a normal value for this region.

The unusual extreme temperatures (up to 42,6 °C) from July 2007 determined about 30 days earlier harvest date. Also, the harvest time for Area 2 is delayed with about 5 days, due to soil traits and slope situation (tab.3).

Soil type controls differences on yield components and fruit ripening. For both cultivars, the level of total soluble solids is higher for Area 1 grapes than those from Area 2, but average vine production and acidity are lower.

Table 3

Main qualitative and quantitative traits at vintage

	2006				2007			
	Experimental plot 1 (Area 1)		Experimental plot 2 (Area 2)		Experimental plot 1(Area 1)		Experimental plot 2(Area 2)	
	Cabernet Sauvignon	Sauvignon	Cabernet Sauvignon	Sauvignon	Cabernet Sauvignon	Sauvignon	Cabernet Sauvignon	Sauvignon
Harvest date	01.10	15.09	05.10	22.09	29.08	20.08	04.09	25.08
Total soluble solids (g/l)	230	228	218	217	236	232	220	214
Titration acidity (g/l H ₂ SO ₄)	6,8	4,9	7,4	5.4	5,8	3,9	6,2	4,8
Anthocyanins (mg/ kg berries)	1364	-	1276	-	1378	-	1306	-
Glucosidic index	22.1	30.4	19.2	26.2	26.5	38.8	23.2	29.1
Mass of 100 berries (g)	89,4	130,6	93,6	134,5	98	136	103	139
Average vine production (kg)	1.8	2.53	2.75	3.3	1,92	2.7	2,52	3.2

CONCLUSIONS

Within the precincts of controlled denomination of origin area, where the climate, vine variety and exhibition are considered constant factors, the qualitative and quantitative differences of grape harvest are due to soils characteristics and slope situation of every lot.

On lots situated in superior part of slope, benefiting by soils with reduced fertility and high content of CaCO₃ the crop was lower but of higher quality than those from lots placed on inferior part of slope, having a more fertile soil, where the crop was higher, but less qualitative.

The results of this study can be used for qualitative and quantitative differentiation – within the precincts of controlled denomination of origin area - of high favourable lots for obtaining grape in order to produce high quality wines.

REFERENCES

1. **Popa A., 2005** - *Domeniul Coroanei- Segarcea*. Editura Universitaria, Craiova
2. **Teodorescu I.C., 1942** - *Inventarul centrelor viticole cele mai importante din România*. Tipografia „Bucovina”, București
3. **Teodorescu I.C., 1942** - *Stricta delimitare a zonelor viticole. România viticolă, VI, 2*, n:61-66.
4. **Teodorescu Șt., Popa A., Sandu Gh., 1987** – *Oenoclimatul României*. Editura Științifică și Enciclopedică, București
5. **Vandour E., 2003** - *Les terroirs viticoles*. Dunod, Paris.
6. *** - **Monitorul Oficial** nr. 96, 22.04.1932. *Legea pentru reglementarea plantatiilor de vii*.

ADJUSTMENT OF THE VITICULTURAL ASSORTMENT TO THE CLIMATIC RESTRAINTS FROM SEVERAL VITICULTURAL AREAS OF OLTENIA

ADAPTAREA SORTIMENTULUI VITICOL LA CONSTRÂNGERILE CLIMATICE DIN DIFERITE AREALE VITICOLE ALE OLTENIEI

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Abstract. *The evaluation of the impact of climatic changes on the management of viticultural resources and on viticultural areas at the level of worldwide geo-viticulture represents an objective of latest interest in the research field (Cotea V.V. și colab., 2008; Dejeu L. and coll., 2008; Jones Gregory V., 2007). In this context are also to be noted our observations presented in this paper, which have been focused on the followings: the multicriterial evaluation of the pedoclimatic opportunities of viticultural areas as compared to the ecological, bioproductive and quality requirements of grapevine; the behaviour evaluation of several both cultivated and recent new varieties, in what concerns the way they express their biological, quantitative and qualitative potential, as result of the global warming, with the purpose of identifying the most well-adjusted genotypes, of providing a durable use and management of resources available at viticultural ecosystem level, as alternative for a durable and high quality viticulture.*

Key words: climatic changes, viticultural areas, global warming, grapevine

Rezumat. *Evaluarea impactului modificărilor climatice asupra gestiunii resurselor viticole și asupra arealelor viticole la nivelul geoviticurii mondiale, constituie obiective de mare actualitate ale cercetării în domeniu (Cotea V.V. și colab., 2008; Dejeu L. și colab., 2008; Jones Gregory V., 2007). În acest context se înscriu și studiile și observațiile realizate de noi în prezenta lucrare, care au vizat: evaluarea multicriterială a disponibilităților pedoclimatice ale arealelor viticole în raport cu exigențele ecologice, bioproductive și calitative ale viței de vie; evaluarea comportării diferitelor soiuri aflate în cultură dar și a unor soiuri noi, recent introduse în cultură, sub aspectul modului în care acestea își exprimă potențialul biologic, cantitativ și calitativ, ca efect al încălzirii climatice globale, în vederea evidențierii celor mai bine adaptate genotipuri, a utilizării și gestionării durabile a resurselor disponibile la nivelul ecosistemului viticol, alternativă pentru o viticultură durabilă, de calitate.*

Cuvinte cheie: schimbări climatice, zone viticole, încălzire globală, struguri

INTRODUCTION

Present viticulture, characterized by a strong specialization of the wine-growing district production, is the result of the complex, settled relations, of the different viticultural genetic resources with pedoclimatic abilities of the different viticultural areas, of the assortments adjustment of the grafting biosystem, also of the viticulture and oenology techniques.

The climatic changes observed in the late years, more or less casual, can disturb the homogeneity of the conditions in viticultural biocenosis, with unforeseeable repercussions on the quality and quantity of the wine production.

MATERIAL AND METHOD

The evaluation of the climatic advantages has been realized as a synthesis of many climatic factors having impact on bioproductive behaviour and quality of vineyard, studying the normal conditions, the deficit or the excesses of the recorded values.

In this purpose, there had been processed and examined the climatic data on several years, from the angle of certain general climatic indicators (unicriterial), also from some synthetically climatic indicators (multicriterial) specific to viticulture.

For studying and appreciating the impact of this multicriterial values on the evolution of some phenological descriptors (full ripening) or technological (quality potential) had been taken in view either ancient grapevine varieties, that existed in the cultivation (Muscat Perla Csaba, Victoria, Chasselas doré, Hamburg Muscat, Afuz Ali), or recently inserted varieties as Auriu de Ștefănești, Augusta (grapevine varieties that are recommended to consume as fresh fruits); Fetească albă, Fetească regală, Riesling italian, Muscat Ottonel, Tămâioasă românească (grapevine varieties of white flavoured wines); Fetească neagră, Cabernet Sauvignon, Merlot, Băbească neagră, Haiduc and Pandur (varieties of grapes for red wines), cultivated in Dealurile Craiovei Vineyard and wine-growing district Tâmburești (Sadova Corabia Vineyard).

RESULTS AND DISCUSSIONS

The extension of vine culture or the introduction in a certain area of some new grapevine varieties requires the assessment of ecological advantages for the assigned space in this purpose. In this way, it points out the factors that are optimum or restrictive, it lends a certain direction of production for the investigated wine centre or those sorts that are the most adapted to the climatic environment can be choosed.

The results of the climatological study from this thesis referees to the period of time 1961-2008, period long enough to allow us, on the one side, a interannual fluctuation from the climatic point of view, and on the other, a extensive succession pointing to the qualitative potential (accumulation of sugars, phenolic ripening) of the studied grapevine varieties.

In the purpose of a broader estimation of the climatic resources from the perspective of the viticulture climate from with the studied areas, we used a series of index with synthetic character (tables 1 and 2), which integrates the combined action of two or three climatic factors. This index allows the characterization of

viticultural ecosystem under different aspects of viticultural interest as: the thermic potential for the growth and fruit-bearing of the vine, the area potential for the cultivation of the distinct precocity sorts of vine, respectively the ripening potential of the grapes.

The complex synthetic analysis of the temporal evolution of this climatic index (table1) permits us to confirm a clear tendency of growth in the heliothermic and respectively, diminution of hydric resources.

In these conditions we found that the moderate hydric deficit had positive effects on the quality of red wine grapes, because it causes the accumulation of a grater quantity of antocians; due to the strong hydric deficit, the content of antocians is diminished in the inhibition process of biosynthesis (Costea D.C. and Coll., 2008).

As for the variation of acid value due to less favourable moisture content had been noticed more raised values and a lessen amplitude of the variation of values in the case of grape sorts for red quality wines by comparison with the sorts for white quality wines (tables 4 and 5).

The criterion of the content accumulation potential in sugars at full ripening had been restrained as a basis reference for the viticultural potentialities of studied areas. In this approach had been considered the different agro meteorological determiners, among them the Huglin index, after that we passed to statistic analysis, using the multiple line regression to estimate the value of sugars content.

Table 1

The evolution in time of certain climatic index of viticultural interest in some of Oltenia vineyards

Period	T°C annual	Σ Ta°C	Σ Tu°C	Real insolation (hours)	Total Precip. 01.04 – 30.09 (mm)	Total annual Precip. (mm)	Ibcv index	laoe index
Vineyard Banu Mărăcine								
1961-1970	10,71	3403	1649	1574	-	-	10,3	-
1972-1981	10,28	3289	1588	1551	-	-	7,5	
1991-2000	10,9	3356	1635	1606	323	545	9,71	4956
2000-2008	11,39	3404	1671	1595	358	463	8,55	4883
Vineyard Tâmburești								
2000-2008	12,6	3630	1937	1610	300,9	407	8,62	4741

The dynamics of grape ripening in some sorts of vine cultivated in the two viticultural areas from Oltenia, (directed on semitall stems; 1,2 x 2,2 m spaced out when planted, loaded at 50 buds per vine) allowed to establish the heliothermic exigencies in comparison with Huglin IH heliothermic index (table 3).

Table 2

Integrating some viticultural areas from Oltenia in multicriterial classifications of the climates (CCM)

Vineyard	Wine-growing district	IS index	Huglin index (IH)	IF index
Dealurile Craiovei	Banu Mărăcine	IS ₁	IH ₄	IF ₄
	Brădești	IS ₁	IH ₄	IF ₃
	Brabova	IS ₁	IH ₄	IF ₃
Sadova-Corabia	Tâmburești	IS ₁	IH ₄	IF ₃

After the synthetic analysis of the results acquired from the Banu Mărăcine vineyard had been noticed that, to achieve an average content of sugars in the unfermented wine about 180-200 g/l Cabernet Sauvignon sort requires the recording of 1894-2070 units, value that had been taken over by IH; between accumulation potential of sugars in must (of grapes) and the Huglin index had been established significant positive correlations (Cichi Daniela and coll., 2008).

Table 3

The exigency of some grapevine varieties towards IH, in achieving sugar content in unfermented wine with a value of 160-170 g/l for consumption grapes and 180-200 g/l (Banu Mărăcine and Tâmburești vineyards)

Huglin index (IH)	Grapevine varieties
1530-1610	Augusta, Auriu de Ștefănești, Victoria, Chasselas doré
1670-1740	Muscat de Hamburg, Muscat Ottonel, Fetească albă, Fetească neagră, Merlot, Pinot noir
1752-1800	Fetească regală, Tămâioasă românească, Riesling italian, Sauvignon
2030 - 2200	Băbească neagră, Haiduc, Pandur, Cabernet Sauvignon
2040-2250	Afuz Ali

After the synthetic analysis of the values taken by the recorded night cooling indicator (IF) we noted that the studied areas integrated according to medium values registered and by the multicriterial classification of the climates (MCC) in world-wide geoviticulture for the climate type with very cold nights IF₄ and cool nights IF₃ (table 2). This demonstrates that these areas are provided with conditions of night temperature and amplitudes of temperature day-night during the ripening of grapes, fact that provides the accumulation and preservation of a large quantity of antocians into the grape grain' skin.

Comparing the qualitative levels of the production for the two branches of grapevine varieties (white and red) we notice that each varieties operates with the complex influences of the climate, expressing in a specific way the quality potential, more accentuated oscillation amplitudes are obvious with red grapevines varieties (tables 4-5).

Table 4

The main elements of qualitative potential of the grapevine varieties for white wines in harvest (1991-2008)

Grapevine varieties	Sugars (g/l)	Total acidity (g/l H₂SO₄)
Riesling italian	180,5 - 220	3,48 - 5,2
	195,3	4,4
Fetească albă	187 - 225	3,62 - 5,25
	205	4,6
Fetească regală	179 - 217	3,94 - 6,00
	197	4,75
Tămâioasă românească	187 - 229	4,08 - 5,27
	207	4,7
Muscat Ottonel	178 - 224	2,62 - 3,55
	206,3	3,16

Table 5

The main elements of qualitative potential of the grapevine varieties for red wines in harvest (1991-2008)

Vineyard	Grapevine varieties	Sugars (g/l)	Total acidity (g/l H₂SO₄)	Antocians (mg / kg)
Dealurile Craiovei – Banu Mărăcine	Cabernet Sauvignon	189 - 223	4,5 - 5,88	1132 - 1242
		209	4,8	1176
	Merlot	181 - 235	4,0 - 5,37	997 - 1104
		214	4,32	1029
	Fetească neagră	183 - 239	4,01 - 5,54	991 - 1155
		221	4,47	1051
	Pinot noir	204 - 241	3,52 - 5,12	602 - 736
		227	4,61	709
Podgoria Sadova-Corabia/Tâmburești	Merlot	154 - 189	3,5 - 4,86	896 - 925
		178	4,5	908
	Băbească neagră	169 - 185	4,93 - 5,2	597 - 650
		174	5,17	603
	Haiduc	173 - 195	4,19 - 5,0	600 - 680
		184	4,47	627
	Pandur	167 - 190	4,22 - 5,36	612 - 691
		181	4,61	634

CONCLUSIONS

According to the new directions in reorganization of the zone division in winemaking at worldwide level, in the classification system of worldwide climates, in comparison with the thermic resources, the studied areas are integrated in the climate classes IS1H4IF4 and IS1H4IF3. This provides great specialization and reorganization possibilities of the wine production, combining

the heliothermic quantum in cultivating sorts of grapes from the entire Rumanian varieties.

The climatic conditions, that characterize the studied viticultural ecosystems, may express an atypical character, respectively, excess from the heliothermic point of view and a deficit from the precipitations regime point of view.

The critical character of the hydric regime in the south of Oltenia represents the main restriction towards the extension in cultivating some sorts of vine. For this reason the investigations considering the varieties adaptation and new reorganizations in the use of strong mother plants.

The continuation and the extension of the profound studies on the knowledge of vulnerability in different grapevine varieties because of the climatic conditions, also on the adaptation possibilities of these varieties, will allow to estimate the impact which these changes can bring to the vine, on the one hand, but also on the possibility to anticipate on the viticultural potential of the different areas in certain predictable climatic conditions, on the other hand.

REFERENCES

1. **Cichi Daniela Doloris și colab., 2008** - *Monitoring and evaluation of environmental factors incidence on biodiversity variability in wine-growing*. Book of abstracts. International Society for Horticultural Science (ISHS)– First Symposium on Horticulture in Europe- Vienna, p. 97, ISSN 1996-9449.
2. **Costea D.C. și colab., 2008** - *Influence of the hydro-thermal regime over bioproductive indexes in some grapevine varieties for quality red wines*. 31st World Congress of Vine and Wine, 6th General Assembly of the O.I.V., Verona, Italy Proceedings of Congress , CD-rom.
3. **Cotea V.V., Liliana Rotaru, L.M. Irimia, Cintia Colibaba, S. Tudose Sandu-Ville, 2008** - *Effet du rechauffement global sur l'ecoclimat de la zone nord de la Moldavie Roumaine*. 31st World Congress of Vine and Wine, 6th General Assembly of the O.I.V., Verona, Italy
4. **Dejeu L. and coll., 2008** - *Impact of climate change on grapevine culture durability*. 31st World Congress of vine and wine, june 15-20, Verona, Italy. Proceedings of Congress , CD-rom.
5. **Jones Gregory V., 2007** - *Climate Change: Observations, Predictions, and Impacts for the Wine Industry*. Compte rendu du Colloque international, pluridisciplinaire « Réchauffement climatique, quels impacts probables sur les vignobles? », 28-30 mars, Dijon, France.

ASPECTS ABOUT THE INFLUENCE OF THE CLIMATIC CHANGES ON THE VITICULTURAL ECOSYSTEM IN DEALU BUJORULUI VINEYARD

ASPECTE PRIVIND INFLUENȚA SCHIMBĂRILOR CLIMATICE ASUPRA ECOSISTEMULUI VITICOL DIN PODGORIA DEALU BUJORULUI

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Abstract. *By its actions, beside t normal limits and depending on the vine bioclimate, the climate risk causes violent destructions, finally resulting in total or partial losses of biological capacity. In establishing the climate risk it should be taken into account the limit of vine climate risk. A viticultural ecosystem is that functional unit of biosphere created and controlled by humans, in order to obtain a high quality grape production in ever profitable social and economic conditions. The viticultural ecosystem is directly influenced by the global climate changes. The existence of extreme weather phenomenon problem and some major climatic changes have imposed a new approach in order to establish their impact upon vine-growing ecosystem. In order to practice a durable viticulture, climate changes must be taken into consideration, evaluated and monitored, not only to mention that at present we are facing with unknown phenomena. The global climatic changes have modified precipitation frequency with sequels in drought spreading and desertification phenomenon expansion. Researchers sustain that it is possible as high temperatures, drought and atmospheric pollution to stimulate the evolving of diseases and pest with negative results on wine-growing ecosystem health. The evolution of climatic factors during have last years have had an unfavorable impact on the vineyards from the South Moldavia, recording a frequent change of the multiannual average. In this paper, the restrictive climatic factors who influence the development and fructification of vine (minimum absolute temperatures in the winter, maximum absolute temperatures, rainfall and sunstroke) are analysed.*

Key words: Dealu Bujorului, vineyard, ecosystem, climatic changes, climat risks,

Rezumat. *Prin acțiunile sale, exceptând limitele normale și în funcție de climatul viței de vie, riscul climatic cauzează distrugerii violente, având în cele din urmă drept rezultat pierderi parțiale sau totale ale capacității biologice. În fond, riscul climatic ar trebui să aibă în vedere limita de risc pentru vița de vie. Un ecosistem viticol este ca un bloc funcțional creat și controlat de om pentru a obține o producție de struguri de înaltă calitate, în condiții sociale și economice avantajoase. Ecosistemul viticol este influențat în mod direct de schimbările globale de climat. Problema existenței unui fenomen climatic extrem și multe alte schimbări climatice majore au impus un nou mod de abordare în stabilirea impactului asupra ecosistemului culturilor de viță de vie. Pentru a practica o viticultură durabilă, schimbările climatice trebuie luate în considerare, evaluate și monitorizate, mai cu seamă că, în prezent, ne confruntăm cu*

fenomene climatice necunoscute. Schimbările climatice globale au modificat frecvența precipitațiilor, cu urmări în răspândirea secetei și expansiunea fenomenului de deșertificare. Cercetătorii susțin că este posibil ca temperaturile ridicate, seceta și poluarea aerului să stimuleze evoluția unor boli și dăunători, cu rezultate negative pentru sănătatea ecosistemului viței de vie. Evoluția factorilor climatici din ultimii ani a avut o influență nefavorabilă asupra podgoriilor din sudul Moldovei, înregistrând o schimbare frecventă a mediei anuale. În această lucrare sunt analizați factorii climatici restrictivi care influențează dezvoltarea și rodirea viței de vie (temperaturile minime absolute - iarna, temperaturile maxime absolute, ploile torențiale și insolația).

Cuvinte cheie: Dealu Bujorului, podgorie, ecosistem, schimbări climatice, riscuri climatice

INTRODUCTION

The vine plantations from the Southern Moldavia are more and more affected by climate changes noticed during the last decade. The climate evolution has a deep impact upon the environment conditions involving changes of metabolism, growing and development processes, with positive or negative influences on plant quality and viability (T. Martin, 1968). The decrease of grape yield and quality and vine affected in the vine plantations due to the early autumn frosts, extreme negative temperatures, spring late frosts and excessive drought during the vegetation period, leads to important losses for the viticultural patrimony (Calistru Gh and colab.1998). Analysing the average monthly temperatures, air seasonal temperatures, the amount of rainfalls during the period 1901-2000, the frequency of high rainfalls and meteorological phenomena during the cold season, the climatologists from the National Meteorology Administration Bucharest have noticed an average warming of 0.3 °C at country level, more evident in the Eastern part of the country, where this phenomenon is statistically put into evidence. From a pluviometric point of view it is noticed the diminishing of the annual amount of rainfalls, mainly in the central part of the country and a slight increase in the North-Eastern part and some Southern regions.

MATERIALS AND METHODS

In order to analyse the climate factors, the data recorded by the meteorological point of Bujoru Research and Development Station for Viticulture and Vinification were used. The observations and determinations have been run for Babeasca neagra, Merlot and Feteasca regala vine types during the period 2003-2008. The following aspects were studied: evolution of climate factors and indices and grape yield.

RESULTS AND DISCUSSIONS

In order to value the impact of global climatic changes upon the viticultural ecosystem of Dealu Bujorului Vineyard where Bujoru Research and Development Station for Viticulture and Vinification is situated, the data registered for a period of 6 years (2003-2008) have been analysed. In this way, the trend and frequency of climate elements have been put into evidence as well as their impact upon vine

behaviour. The climate factors in the studied period correspond to years with various conditions (table 1).

The Dealu Bujorului Vineyard is situated in a droughty area, where the average annual rainfalls are 451 mm and the multiannual air temperature is 11.5 °C. During the last years, it was noticed an increase of annual temperatures. The average annual temperature was 13.5°C in the year 2007 and 12.9 °C in the year 2008, meaning an additional temperature of 1.4 – 2.0°C compared to the average multiannual temperature.

The global temperature balance during the vegetation periods (2003-2008) have varied between 3,564.5-3,789.3, showing that, in general, at the Dealu Bujorului Vineyard, the conditions for grape maturity till the Vth and VIth stages are assured, but less for the VIIth stage.

The amount of active and useful temperatures during the vegetation period has varied between 3,521.2-3,705, respectively between 1,598.3-1,945 (table 1). A slight increase of this indicator has been noticed during the last years.

Under the temperate climate conditions of our country, the frequency of the minimum absolute temperature has a major importance for vine culture. For the Dealu Bujorului Vineyard, during the analysed period, the minimum absolute temperatures in winter season have varied between –13.0 °C and –21.0°C.

In the Dealu Bujorului Vineyard the average multiannual rainfalls in the analysed period was 421.9 mm and the average multiannual rainfalls during the vegetation period was 262.5mm. During the last years, it has been noticed a decrease of rainfalls during the vegetation period, with an ununiform distribution along the year, frequent periods of lack of rainfalls, but alternating with showers for a short period. The deficit of rainfalls has been noticed mainly in the vegetation period when air temperatures are very high with a deep impact upon the starting moment of vine vegetation phenophases. In the analysed period, the driest years have been 2003, 2006 and 2008. But is important to mention that, the lack of rainfalls during the vegetation period is compensated during winter season, so that, at annual level, theoretically, the total rainfalls cover the vine water requirements.

The average temperature during the I and II decades of July registered the maximum value of 25.9 °C in the year 2008 and 20.0 °C in the year 2005. The average temperature from the hottest month (July) was 24.8 °C (the average value for the period 2003-2008), with a slight increasing trend. The average number of days with maximum temperatures higher than 30 °C was 43.8, with a maximum of 66 days in the year 2007.

The values of the synthetical indicators (heliotermic index, hydrotermic coefficient, bioclimatic index and oenologic amplitude index) at the Dealu Bujorului Vineyard show that the area is favourable to vine growing, offering a balanced environment mainly for vine types used for producing wine and red wines.

The values of the synthetically indicators varies according to the vine type, showing a different behaviour in close relationship to the genetic background

of each type and the applied crop measures, the position of vine in the field (up, middle, down), grape yield performed in the previous years, the maturity grade of the annual vine etc.

Table 1

The main climate items at Bujoru Research and Development Station for Viticulture and Vinification during the period 2003-2008

Climate items	2003	2004	2005	2006	2007	2008
Global termic balance, ($\Sigma t^{\circ}g$)	3789,3	3564,5	3576,7	3605,5	3671,5	3694,9
Active termic balance, ($\Sigma t^{\circ}a$)	3705	3521,2	3516,6	3563,6	3618,3	3645,3
Useful termic balance, ($\Sigma t^{\circ}u$)	1945	1661,3	1716,2	1598,3	1858,3	1875,3
Σ annual rainfalls, mm	263,8	443,6	474,2	430,5	554,4	364,7
Σ rainfalls during the vegetation period, mm	153,1	320,1	292,0	330,2	254,5	224,8
Σ insolation hours during the vegetation period, hours	1367,7	1302,3	1175,3	1287,6	1477,4	1332,7
Average annual temperature, $^{\circ}C$	10,7	12,0	11,8	11,7	13,5	12,9
Average temperature in the month of – July, $^{\circ}C$	24,4	23,8	24,3	24,2	28,1	24,0
– August, $^{\circ}C$	25,2	22,8	23,3	23,5	25,5	25,9
– September, $^{\circ}C$	16,9	17,9	19,1	18,1	17,4	17,1
Air minimum absolute temperature, $^{\circ}C$	-18,5 13.1	-17,0 26.1	-13,6 8,10,11.II	-21,0 23.1	-13,0 25.II	-14,5 5.1
Average of maximum temperature in the month of August, $^{\circ}C$	30,8	28,0	28,0	29,7	30,6	32,0
Average temperature in the decades I and II of the month of June	25,2	21,2	20,0	20,2	25,2	21,9
Wind speed (km/hour)	1,9	2,1	1,9	2,1	2,3	2,0
Relative air moisture (%)	71,8	72	72	69	57	54
Nebulosity	5,7	5,5	5,9	5,5	5,6	6,2
No. Of days with maximum temperatures > 30 $^{\circ}C$	57	15	29	44	66	52
Duration of bioactive period, days	213	189	190	195	178	177
Heliotermic real Index	2,7	2,16	2,02	2,06	2,75	2,50
Hydrotermic Coefficient	0,41	0,9	0,83	0,9	0,7	0,6
Vine bioclimatic Index	18,0	7,8	7,73	7,59	11,5	11,8
Oenoclimatic amplitude Index	5169,6	4753,4	4649,3	4771	5091,2	5003,2

During the analysed period, the climate factors have allowed the studied vine types to pass through all the phenophases, counting 186 days of active vegetation in average. The evolution of climate factors has been directly reflected by grape yield which has varied from a year to another (table 2, fig. 1).

Table 2

Grape yield during the period 2003-2008

Year/Vine type	2003	2004	2005	2006	2007	2008
Băbească neagră	4900	10000	7200	5930	3677	7680
Fetească regală	9800	11571	8765	9850	7119	10640
Merlot	7200	10200	6650	9125	3040	10624

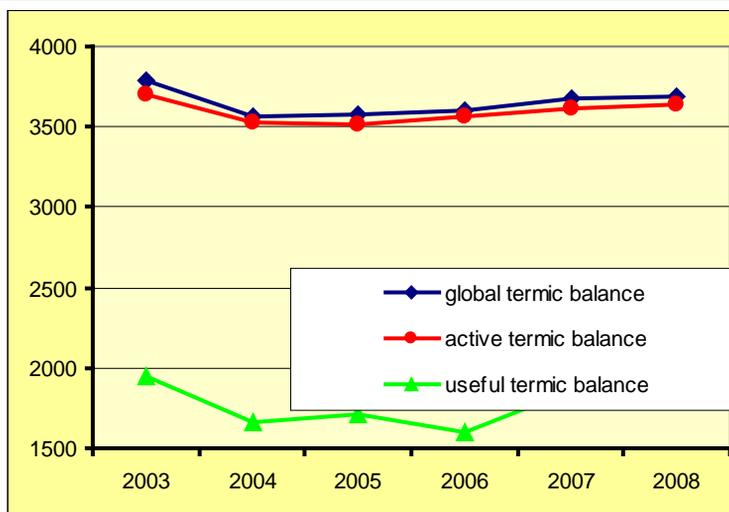


Fig.1. Global, active and useful thermic balance registered at the meteorological station of Bujoru RDSVV

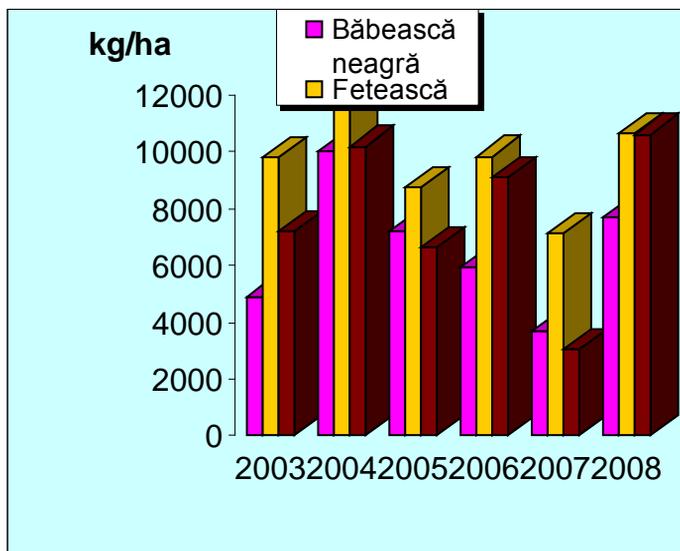


Fig. 2. Grape yield in 2003-2008 period

The studied types recorded average productions at the level of their biological potential in accordance with the evolution of the climate factors and the presence of some climate accidents (hail in the year 2007). The lowest yields were performed in the year 2007 due to the hail of the month of June and the highest productions were registered in the year 2004.

CONCLUSIONS

1. During the analysed period there were noticed some unfavourable trend in the evolution of the climate factors with a deep impact upon the production performance of the vine plantations.

2. It is recommended the permanent recover of vine affected by climate accidents – an important moment in the vine growing technology.

3. The grape productions have varied from year to another but according to the genetic potential of each vine type.

4. In the future, it is compulsory the permanent monitoring of climate factors and of their evolution, mainly of the extreme temperatures during winter and summer seasons, of atmospherical and pedological drought etc., in order to establish viable solutions able to diminish their negative effects.

REFERENCES

1. **Calistru Gh., Doina Damian, 1998** - *Comportarea unor soiuri de vita de vie la factorii climatici de stres*. Anale I.C.D.V.V. Valea Calugareasca, vol. XV, pp. 215
2. **Enache Viorica, 2007** - *Researches regarding the tendency in some climatic factors evolution from Moldavia south hilly region with reference to viticultural plantation*. Lucrari stiintifice, Anul L vol. 1(50), Seria Horticultura, Editura Ion Ionescu de la Brad, pp. 469
3. **Martin T., 1968** – *Viticultura*. Ed. Agro-Silvica, Bucuresti.

PRELIMINARY RESEARCH REGARDING THE ELABORATION OF AN ECOLOGICAL EVALUATION SYSTEM FOR THE VITICULTURAL AREAS

CERCETĂRI PRELIMINARE PRIVIND ELABORAREA UNUI SISTEM DE BONITARE ECOLOGICĂ A AREALELOR VITICOLE

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Abstract. *In the paper are presented the preliminary results of a study regarding the elaboration of an ecological classification system for viticultural areas. The methodology propose three suitability classes for the most important ecological factors and ecological indicators that reveal the oenoclimatic potential of the vineyard; rating the factors with five, eight or ten points, according to their suitability; conceiving the oenoclimatic suitability of the area by the amount of the rates given to the ecological factors and indicators. According to this classification system, the amount that can be achieved by an area is between 75 and 150 points; the minimum value reveal a low oenoclimatic potential, that allow to obtain white table wines and sparkling wines; the maximum level reveal a high oenoclimatic potential, favourable to obtain red quality wines. The amount of rates calculated for five wine-centres from Moldavia Wine Growing Region is between 90 and 125 points.*

Key words: vineyard, climatic suitability, ecological evaluation, ecological factors, terroir.

Rezumat. *În lucrare sunt prezentate rezultate preliminare ale unui studiu privind elaborarea unui sistem de bonitare ecologică a arealelor viticole. Metodologia propusă constă în stabilirea a trei clase de favorabilitate pentru factorii care condiționează potențialul arealelor viticole; notarea factorilor cu cinci, opt sau zece puncte, diferit în funcție de clasa de favorabilitate; exprimarea potențialului oenoclimatic prin suma notelor de bonitare. Conform acestei metodologii, punctajul pe care-l poate întruni un areal viticol este cuprins între 75 și 150; valoarea minimă relevă potențial oenoclimatic scăzut, suficient pentru producerea vinurilor albe de masă, vinurilor pentru distilate și pentru spumante, iar valoarea maximă potențial ridicat, favorabil pentru producerea vinurilor roșii de calitate. Suma notelor de bonitare calculată pentru cinci centre viticole din Regiunea viticolă a Dealurilor Moldovei este cuprinsă între 90 și 125 puncte.*

Cuvinte cheie: areal viticol, favorabilitate climatică, evaluare ecologică, factori ecologici, terroir.

INTRODUCTION

Ecological evaluation is the analyse of the natural conditions from an area, in order to establish its potential for agriculture. In Romania evaluation of the soils is done according to a system proposed in 1987 by the *National Institute for Pedology and Agro-chemical Research*, from the *Academy of Agricultural and Forestry Sciences*. According to this system, the agronomical potential of the TEO (*Ecological Homogenous Territory*) is assessed in report with the sum of the points conferred for 17 environmental indicators. Because the worth of one rating point is expressed in kg of

yield, the system is a quantitative one. In viticulture the evaluation of an area from a quantitative viewpoint is useful for matching the optimum areas for table grapes and other productive varieties. The zoning of varieties for qualitative wines needs another classification system based on the factors that determines the quality of the yield, respectively the sugar content, anthocyanins, aroma compounds and organic acids.

The qualitative evaluation system is needed to demarcate the “*terroirs*” from PDO (*Protected Designation of Origin*) areas, according to their ecologic features. Knowing the ecological potential of the *terroirs*, and their suitability for grapes growing, would permit an improvement of the precision in conferring the right to produce PDO wines (**CMD** - *Harvested at Full Maturity*; **CT** - *Late Harvest*; **CIB** - *Noble Harvest*). The method can't be used in the areas where at least one ecologic factor is restrictive for the grapevine culture.

MATERIAL AND THE METHOD

For evaluation of the ecological potential of the vine areas we used the climatic indicators, edaphic and topographic factors. The climatic indicators: *the annual average temperature, the average temperature of the hottest month (July), thermic sum, global radiation, solar insolation, the duration of the period with bioactive temperatures and the precipitations from the growing period*. Edaphic factors: *soil texture, soil skeleton and humus content*. Topographic factors: *the slope and the slope direction*.

In addition to these factors we used for evaluation the next synthetic climate indicators: *Branas heliothermic index (IHr), bioclimatic index Constantinescu (Ibcv) and the oenoclimatic aptitude index (IAOe)*.

For every factor and index used in this evaluation, we established three suitability classes: the third class (III) – *less suitable*; the second class (II) – *moderate suitable*; first class (I) – *very suitable*. The suitability classes were determined according to the influence of the factors on the accumulation of the sugar, anthocyanins, aroma compounds and organic acids in the grapes; for the synthetic indexes, the suitability were settled according to their correlation with the quality of the yield. The influence of the factors was quantified by ranking points accorded to the suitability classes: *five* points for the third class; *eight* points for the second class; *ten* points for the first, very suitable class.

The viability of the method was assessed and revealed through the evaluation of the vine growing centres from the north-eastern part of Moldavia: *Murgeni, Huși and Averești - Huși vineyard; Iași – Iași vineyard; Cotnari – Cotnari vineyard*. For this evaluation was considered the main ecological characteristics of the studied vinegrowing centres.

RESULTS AND DISCUSSIONS

1. Establishing the suitability classes for climatic, edaphic and topographic factors. For the thermal factor, the third class characterize the cold areas, capable to produce table wines, sparkling wines and wines for distillation. The second suitability class reveal the possibility to produce the quality wines in the majority of the years; the first class signify the abundance of thermal resources and the possibility to obtain the quality wines every year (tab. 1).

Global radiation (kcal/cm²) and *solar insolation* (hours) determines the sugar, aroma compounds and anthocyanins accumulation (Oslobeanu et al., 1991).

Table 1

Suitability classes and ranking points for the thermic factor

ENVIRONMENTAL FACTOR	Suitability classes/ranking points		
	III / 5	II / 8	I / 10
Average annual temperature (°C)	8.5 - 9.3	9.4 - 10.0	10.1 - 11.0
Hottest month temperature (°C)	18.0 - 19.0	19.1 - 20.9	> 21.0
Thermic sum (>10 °C)	1000 - 1200	1200 - 1400	1400 - 1600

The third suitability class (tab. 2) characterize the cool climates, with few thermic resources, where can be obtained white wines; the second suitability class indicate the existence of heliothermic resources necessary to produce white quality wines and red table wines; the first suitability class define the vineyards specialised in white and red wines, with *protected designation of origin (PDO)*.

Table 2

Suitability classes and ranking points for the solar radiation and insolation

ENVIRONMENTAL FACTOR	Suitability classes/ranking points		
	III/5	II/8	I/10
Global radiation (kcal/cm ² , 01.IV-30.IX)	80 - 83.9	84.0 - 86.9	87.0 - 92
Solar insolation (hours)	1280 - 1450	1451 - 1550	1551 - 1610

Synthetic climate indicators. Their values correlates with sugar, anthocianins and aroma compounds content (Tardea C. and all., 1995). The third suitability class groups the minimum values, characteristics to less favourable areas, that produce white wines; the second class values are characteristic to moderate suitable areas, that generate white quality wines and, in a few years, red wines. The highest ranking - the *first class* - were given to the areas with an abundance of heliothermic resources, where are obtained the most qualitative red wines (tab. 3).

Table 3

Suitability classes and ranking points for the synthetic climate indicators

ENVIRONMENTAL FACTOR	Suitability class/ranking points		
	III/5	II/8	I/10
Heliothermic index Branas (IHr),	1.35 - 1.70	1.71 - 2.20	2.21 - 2.70
Bioclimatic index (Ibcv)	4.0 - 6.0	10.1 - 13.5	6.1 - 10.0
Oenoclimatic aptitude index (IAOe)	3700 - 4300	4301 - 4600	4601 - 5018

The duration of the period with bioactive temperatures (daily average >10°C) indicate the possibility of over maturation and botritization of grapes at the varieties for qualitative wines. The third suitability class permit to obtain white table wines, sparkling wines and wines for distillation. The second suitability class values assure, in the most years, to over mature the grapes and to obtain qualitative wines with *Protected Designation of Origin (PDO)*. The *first class* signify that there are no climate restrictions to cultivate grape varieties for high quality wines (tab. 4).

The precipitations from the growing period influence the growing process, the cluster and berry size. The *third suitability class* includes rainy regions, that produce great yield but low quality; the *second suitability class* include droughty areas, that diminish the acidity and makes the wines fade.

Table 4

Suitability classes and ranking points for the period with bioactive temperatures

ENVIRONMENTAL FACTOR	Suitability class/ranking points		
	III/5	II/8	I/10
<i>The period with bioactive temperatures</i> (days)	160 - 175	176 – 190	> 190

The *first suitability class* include values that reveal moderate annual precipitations, that assure normal intensity in physiologic processes, qualitative yield with equilibrate acidity and large accumulation of sugar, polyphenols and aroma compounds (tab. 5).

Table 5

Suitability classes and ranking points for the precipitations in the growing period

ENVIRONMENTAL FACTOR	Suitability class/ranking points		
	III/5	II/8	I/10
Precipitations (mm, 01.IV - 30.IX)	> 400	< 270	280 - 390

2. Establishing the suitability classes for the edaphic factors. The most important for the suitability of the vineyards are the *soil texture, soil skeleton and the humus content*.

The soil texture influences significantly the size and the quality of the yield. In the *third suitability class* where included the sandy soils, that generate ordinary wines, with lack of acidity and colour. The *second class* integrates the clay soils, fertile, that produce middling wines, with moderate alcohol content and pronounced acidity. In the *first suitability class* enter the loamy soils, that chasten the grow and stimulates the accumulation of the organic compounds in the grapes (tab. 6).

Table 6

Suitability classes and ranking points for the edaphic factors

ENVIRONMENTAL FACTOR	Suitability class/ranking points		
	III/5	II/8	I/10
Soil texture (% clay)	sandy (<15)	clay (>25)	loamy (15-25)
Soil skeleton (%)	< 6	> 20	> 6 - 20
Humus content (%)	> 2.5	< 1.5	1.6 - 2.5

Soil skeleton (particles $\phi > 20$ mm) improve thermic, hydric and aeration parameters of the soil. In the *third class* were included compacted, clay soils, with no skeleton, that generate common wines, lacked of personality; in the *second class* are included the soils with an excessive quantity of skeleton; the *first class* include the soils with a moderate content of limestone skeleton, that confer fineness, minerality and personality to wines.

Humus content. The *third suitability class* comprise the fertile soils, with a large content of humus, that generate table wines; in the *second class* enter the poor soils, with lack of humus, that produce rough, lack of fineness wines. The *first class* include the soil with a moderate content of humus that sustains the quality of the grapes.

3. Establishing the suitability classes for the topographic factors. The most important for the qualitative potential of the vineyards are the slope and the exposure (tab. 7).

Table 7

ENVIRONMENTAL FACTOR	Suitability class/ranking points		
	III/5	II/8	I/10
Slope (%)	< 8	> 15	8 - 15
Exposure	V	E, SV	S, SE

The slope influence the vineyard climate through the altitudinal variation of the temperature, moisture, solar radiation and soil fertility. The *third class* groups the flat terrain, with fertile soils, that generate table wines. The *second class* groups sloping terrains with inclination bigger than 15%, terraced, that diminish wines quality because of the poverty of the poor, anthropized soils. The first suitability class include the moderate slopes; these terrains gather the most favourable conditions to produce the quality wines.

Slope direction. The highest ranking - *the first class* - was given to the south and south – east directions, that benefit the greatest values of global radiation and solar insolation, that support the accumulation of organic compounds in the berries and obtaining the quality wines.

4. Estimation of the ecological potential of the vine areas. Is based on multiannual averages of climatic factors and ecologic indexes, and the data regarding the relief and soil characteristics (Teodorescu St. et al., 1987; Tesu C., Merlescu E., 1982). Every ecological parameters of the vine areas was ranked according to its influence on the grapes and wine quality (tab. 8).

Table 8

Evaluation of the ecological potential of Murgeni vine-growing centre - Husi vineyard

ECOLOGICAL FACTORS		Average	Class	Ranking points	Σ/categ.
Climatic factors	Annual average temperature (°C)	9.8	II	8	90
	Hottest month temperature (°C)	21.7	I	10	
	Thermic sum 1.04-30.09 (>10°C)	1448.0	I	10	
	Global radiation (IV - IX)	88.0	I	10	
	Solar insolation (hours)	1526.0	II	8	
	Heliothermic index (Branas)	1.92	II	8	
	Bioclimatic index	8.8	II	8	
	<i>Oenoclimatic aptitude index</i>	4760.0	I	10	
	<i>Period with temperatures >10°C</i>	205	I	10	
Precipitations (mm)	282.6	II	8	20	
Edafic factors	Soil texture (% clay)	15 - 25	I		10
	Soil skeleton (% rubble)	< 6	III		5
	Humus content (%)	2.5-2.9	III	5	
Topographic factors	The slope (%)	8 - 15	I	10	15
	Slope direction	SV	II	8	
TOTAL				125	

Maximum synopsis that can be obtain using this evaluation system is 150. The method was used to evaluate the ecologic potential Murgeni, Huși, Averești, Iași and Cotnari vine-growing centres (tab. 9).

Data reveal important differences between vine-growing areas, the most unfavourable is Averești vine-growing centre and the most favourable Murgeni and Cotnari. According to this evaluation system, the climatic suitability of the vineyards in the Moldavia Wine Growing Region decrease from south to north, accompanying the heliothermic resources diminution; ranking sum for climatic suitability decrease from 90 points in Murgeni, at 83 points in Huși, 73 in Copou and 75 ranking points in Cotnari vine-growing centre. The scarcity of heliothermic resources from Cotnari vine-growing centre, is balanced by a greater suitability of the edafic and topographic factors.

Table 9

Evaluation of the ecological potential of Huși, Averești, Iași and Cotnari vine-growing centres

VINE-GROWING CENTRE	Ranking points for:			Total
	Climatic suitability	Edafic suitability	Topografic suitability	
HUȘI	83	20	20	123
AVEREȘTI	59	18	13	90
IAȘI	73	20	18	116
CÔTNARI	75	30	20	125

CONCLUSIONS

1. The ecological classification system is required to evaluate the *terroirs* from PDO areas, according to their suitability for grape-growing and wine production, and to improve the accuracy in conferring the right to produce qualitative wines.

2. The influence of the ecological factors is ranked through suitability classes: *the third class (III)* – less suitable; *the second class (II)* – moderate suitable; *first class (I)* – very suitable. Ranking the suitability classes: *five* points for the third class; *eight* points for the second class; *ten* points for the first, very suitable class. The maximum synopsis that can be achieved by a vine area according to this system is 150 points.

3. The vine growing areas from the north-eastern part of Moldavia achieved the next synopsis: Murgeni vine-growing centre – 125 points; Huși – 123 points; Averești – 90 points; Iași – 116 points; Cotnari – 125 points.

REFERENCES

1. Oșlobeanu M., Macici M., Magdalena Georgescu, Stoian V., 1991 – *Zonarea soiurilor de viță de vie în România*. Ed. Ceres, București.
2. Teodorescu Șt., Popa A.I., Sandu Ghe., 1987 – *Oenoclimatul României*. Ed. Științifică și Enciclopedică, București.
3. Teșu C., Merlescu E., 1982 – *Solurile României*. Ed. "Ion Ionescu de la Brad", Iași.
4. Țârdea C., Dejeu L., 1995 – *Viticultura*. Ed. Didactică și Pedagogică, București.

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A FUROSTANOL GLYCOSIDE USED IN GRAPE VINE GROWING

UTILIZAREA GLICOZIDEI FUROSTANOLICE ÎN CULTURA VIȚEI DE VIE

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Abstract - Moldstim is a furostanol glycoside and represents a natural substance belonging to the class of saponines (found in *Capsicum annuum* seeds). This compound was obtained by alcoholic extraction from pepper seeds and represents a bioactive substance of vegetal origin, having a wide range of biological activities, especially antitumoral, antimicrobial and antifungal properties. The goal of this paper was to estimate the biological activity of this bioactive compound. The influence of the natural compound with steroidal glycoside structure was studied on the grapes plantation, from the lassy vineyard. The treatments consisted in spraying the aqueous solution of Moldstim, at different doses and ways of using. The results pointed out the favorable effects of treatments on the plant growth and development, according to the phenological phase and used concentration.

Key words: bioactive compound, steroidal furostanol glycoside, natural biostimulators, grapes.

Rezumat - Moldstim - ul este o glicozidă furostanolică, reprezentând o substanță naturală ce aparține clasei saponinelor (întâlnită în semințele de *Capsicum annuum*). Acest compus a fost obținut prin extracție alcoolică din semințe de ardei iute și este o substanță bioactivă de origine vegetală, având numeroase proprietăți biologice, în special proprietăți antitumorale, antifungice etc. Scopul acestei lucrări constă în evaluarea activității biologice a acestui compus bioactiv. S-a studiat influența compusului natural cu structură glicozid - steroidică asupra plantației de viță-de-vie din podgoria Iași. Tratamentele au constat în pulverizarea cu soluție apoasă de Moldstim, în diferite doze și moduri de folosire. Rezultatele au subliniat efectele favorabile ale tratamentelor asupra creșterii și dezvoltării plantelor, în funcție de fenofază și de concentrația folosită.

Cuvinte cheie: compus bioactiv, glicozidă steroidică furostanolică, biostimulatori naturali, plantație de viță - de - vie

INTRODUCTION

The use of biological active substances (BAS) in agriculture, for quantitative and qualitative crop increase, has a tradition for over 50 years (Croitoru et al., 1988) all around the world. After a period of deconsideration (in the

'50-'70), when synthetic chemical compounds polarized all the attentions, the BAS recover in force during the last three decades because of the eco-agriculture demanded from the market.

The efficient obtaining of BAS from different natural sources, became a concern of many groups of researchers, being yet faraway in term of yields as compared to compounds obtained from synthesis (*Tschesche and Wulff, 1972; Kofler, 1972; Bobeico, Chintea, 1991; Sato, Sakamura, 1973; Tschesche, 1971*).

The emphasis of this work was to test the new obtained steroidal extract in vineyard technologies, as grow up factor for grapes.

MATERIALS AND METHODS

Investigations were carried out in the experimental field of the Faculty of Horticulture from Jassy, on grapes (*Vitis vinifera*), Fetească albă Variety, grafted on kober 5 BB rootstock. The plantation was set up in 1985, having planting distances of 2.2 x 1.2 m. The fructification pruning was done in fruit - bearing chains, made of 4-6 eye fruiting shoots and 1-2 eye renewal spurs, on each vine stock being about 50 eyes. The training technology was specific to Jassy Vineyard.

For testing the Moldstim compound, before flowering, 28 vine stocks were treated by leaf spraying, the following variants being established: V_1 - Moldstim 0.0001%; V_2 - 0.001%; V_3 - 0.005%. The experimental variants were compared to the untreated control.

During the vegetation period, the observations and determinations carried out were: content of leaf pigments, vine stock productivity, grape yield and its quality.

RESULTS AND DISCUSSIONS

The leaf application of the Moldstim has an important role as concerns the plant growth and development, having direct consequences on the metabolism of grape yield and its quality.

Tables 1-3 presents the results of the investigations concerning the influence of some steroidal glycoside biopreparations on the photosynthesis efficiency of grapes leaves in dynamics, during the vegetation period (July, August and September). In July, the lowest values of the content of assimilating pigments per 1 g fresh matter were found in the control (3.04 mg/g fresh matter).

In V_3 , the photosynthesis efficiency has increased very significantly, both on each pigment and on total pigments (16,78% against the control). V_2 has influenced positively the photosynthesis efficiency, resulting in an increase of 14,14% in the total content of pigments (distinctively significant increase against the control). In V_1 , photosynthesis was influenced positively, resulting in a significant increase of 7,89%, against the control (*Table 1*).

Table 1

Influence of the application of MOLDSTIM on the photosynthesis efficiency in vine (Fetească albă Variety) – July, 2007

Variants		Chlorophyll a mg/g fresh matter	Chlorophyll b mg/g fresh matter	Carotene mg/g fresh matter	Total pigments			
NO	BAS				mg/g fresh matter	dif. against the control	%	Signif.
V1 Moldstim 0,0001%		1.72	0.77	0.85	3.28	0.24	107.89	x
V2 Moldstim 0,001%		1.73	0.80	0.83	3.47	0.43	114.14	xx
V3 Moldstim 0,005%		1.75	0.81	0.89	3.55	0.51	116.78	xxx
V0 Control		1.63	0.66	0.75	3.04	-	100.00	-

LSD 5% = 0,23 mg/g ; LSD 1% = 0,35 mg/g LSD 0,1% = 0,52 mg/g

Table 2

Influence of the application of MOLDSTIM on the photosynthesis efficiency in vine (Fetească albă Variety) – August 2007

Variants		Chlorophyll a mg/g fresh matter	Chlorophyll b mg/g fresh matter	Carotene mg/g fresh matter	Total pigments			
No	BAS				mg/g fresh matter	dif. against the control	%	signif.
V1 Moldstim 0,0001%		1.78	0.79	0.93	3.54	0.08	102.31	xx
V2 Moldstim 0,001%		2.01	0.88	1.03	4.11	0.65	118.79	xxx
V3 Moldstim 0,005%		2.05	0.92	1,14	4,30	0,84	124,28	xxx
V0 Control		1.75	0,79	0,92	3,46	-	100	-

LSD 5% = 0,15 mg/g; LSD 1% = 0,25mg/g; LSD 0,1% = 0,39 mg/g.

Table 3

Influence of the application of MOLDSTIM on the photosynthesis efficiency in vine (Fetească albă Variety)–September, 2007

Variants		Chlorophyll a mg/g fresh matter	Chlorophyll b mg/g fresh matter	Carotene mg/g fresh matter	Total pigments			
No	BAS				mg/g fresh matter	dif. against the control	%	signif.
V1 Moldstim 0,0001%		1.71	0.65	0.75	3.11	0.12	104.01	-
V2 Moldstim 0,001%		1.78	0.73	0.79	3.30	0.31	110.37	xxx
V3 Moldstim 0,005%		1.81	0.71	0.81	3.33	0.34	111.37	xxx
V0 Control		1.62	0.63	0.74	2.99	-	100	-

LSD 5% = 0.14 mg/g; LSD 1% = 0.22 mg/g; LSD 0.1% = 0.27mg/g

In August, the highest values of the content of assimilating pigments were found in V₃, (4.30 mg/g fresh matter), with very significant positive differences against the control. In V₂, the photosynthesis efficiency has increased very significantly, both on each pigment and on the total pigments (4.11 mg/g fresh, as values close to V₃ (0,84 mg/g fresh matter). V₁ had also a positive influence on photosynthesis, but without significant increase against the control (2.31%). The lowest values of the content assimilating pigments were found in the control (3,46 mg/g fresh matter) (*Table 2*).

In September, the lowest values of the content of pigments were found at the control (2.99 mg/g fresh matter). Values close to the control, with insignificant differences, were obtained in V₁ (3.11 mg/g fresh matter). In V₃ and V₂, the photosynthesis efficiency has increased very significantly, both on each pigment and on total pigments (11.37% and 10.37%, respectively, against the control) (*Table 3*).

The productivity of vine stocks was greatly influenced by Moldstim. The number of grapes formed on the vine stock has significantly increased against the control in all the experimental variants. The highest values were found in V₃ (34.1) and V₂ (32.8). The lowest number of grapes formed on the vine stock was found at the control (29.3).

The mean grape weight has increased in variants V₃ and V₂, treated with Moldstim, against the control (80.2 g), with distinctively significant positive differences in V₃ (88.6 g). In V₁, the lowest value of the mean weight of a grape (79.2 g) was found, but with insignificant differences against the control.

Moldstim has also influenced the berry weight and diameter. The 100 - berry weight has significantly increased only in V₃ (14.8 g). In V₁ and V₂, the 100 - berry weight has registered close values to the control, with insignificant differences. The berry diameter has slightly increased in the experimental variants, by 0.8 mm in V₂ and by 1.1 mm in V₃ (*Table 4*).

Both on vine stock and per ha, the grape yields were greater against the control in V₂ and V₃. The highest grape yield, with very significantly positive differences was obtained in V₃ (3.1 kg/ vine stock and 10.8 t/ha, respectively). In V₁, the grape yield was practically equal to that obtained by the control (2.5 kg/ vine stock and 8.7 t/ ha, respectively) (*Table 4*).

The sugar content was slightly influenced by Moldstim, with insignificant differences against the control. The highest sugar concentrations were found in V₁ (216 g) and at the control (213 g). A more reduced content, correlated negatively to the grape yield was obtained in V₂ and V₃, with 210 g/l and 209 g/l, respectively.

Acidity has shown close values at all the variants and it was slightly influenced by the level of grape yield; insignificantly higher values than the control were found in V₃ (5.03 g/l H₂SO₄).

In all the experimental variants, inclusively at the control, at full ripeness, grapes had a green - yellowish colour and a juicy pulp, specific to a wine grape variety (*Table 5*).

Table 4

Productivity of Fetească albă Variety, treated with Moldstim, Jassy Vineyard, year 2007

Variant		Mean no. of grapes/vine stock				Mean weight of a grape				100 - berry weight (g)	Mean diameter of a berry (mm)
No	BAS	no.	dif.	%	signif.	g	dif.	%	signif.		
	V1 Moldstim 0,0001%	30.4	1.1	104		79.2	1.0	98.7	-	117	9.7
	V2 Moldstim 0,001%	32.8	3.5	112	xx	83.4	3.2	104.0	x	130	10.5
	V3 Moldstim 0,005%	34.1	4.8	116	xxx	88.6	8.4	110.4	xx	148	10.8
	V0 Control	29.3	-	100.0		80.2	-	100.0	-	131	9.7

LSD 5% = 2.1 grapes
 LSD 1% = 3.3grapes
 LSD 0.1% = 4.7 grapes

LSD 5% = 4.1 g
 LSD 1% = 7.8 g
 LSD 0.1% = 10.7 g

Table 5

Grape yield and its quality in Fetească albă Variety Moldstim, Jassy Vineyard, year 2007

Variant		Grape yield					Sugar content				Acidity g/l H ₂ SO ₄	Berry colour
No	BAS	kg/stock	t/ha	Dif.	%	Sign.	g/l	Dif.	%	Signif.		
	V1 Moldstim 0,0001%	2.5	8.7	0.0	100.0		216	3.0	101.4	-	4.8	green - yellowish
	V2 Moldstim 0,001%	2.6	8.9	0.2	102.0		210	-3.0	98.6	-	4.79	green - yellowish
	V3 Moldstim 0,005%	3.1	10.8	2.1	124.0	xxx	209	-4.0	98.1	-	5.03	green - yellowish
	V0 Control	2.5	8.7	-	100.0	-	213	-	100.0	-	4.78	green - yellowish

LSD 5% = 0,6 t/ha
 LSD 1% = 1,5 t/ha
 LSD 0,1% = 2,3 t/ha

LSD 5% = 7.3 g/l
 LSD 1% = 10,1 g/l
 LSD 0,1% = 14,7 g/l

CONCLUSIONS

Applied in vine, Moldstim has shown a positive influence on the photosynthesis efficiency, on grape yield and quality.

The content of leaf pigments has shown superior values at the control, both on elements (chlorophyll a, chlorophyll b and carotene) and entirely, the highest pigment content being noticed in the first decade of August at the variants treated with Moldstim 0.001% and 0.005%. The increasing of the content of leaf pigments, has also resulted in increasing the photosynthetic efficiency.

Productivity and grape yield have significantly increased in the variants treated with Moldstim 0.001% and 0.005%, with values superior to the control, as concerns number of grapes formed on the vine stock, mean weight of a grape, 100 - berry weight, berry diameter and grape yield per vine stock. At the variant treated with Moldstim 0.001%, the values of productivity and grape yield were close to the control, without significant differences.

The quality of grape yield (sugar content and acidity) was similar to the control in all the variants, the low differences being mainly determined by the dimension of the grape yield.

The influence of Moldstim was positively correlated to the concentration of the solution used for treatment, the best results being obtained in V₂ (Moldstim 0.001%) and V₃ (Moldstim 0.005%).

REFERENCES

1. **Croitoru Florica si colab., 1988** - *Biostimulatorii si influenta acestora in cultura legumelor*. Ministerul Agriculturii, Bucuresti.
2. **Kofler L., 1927** - *Die Saponine*. Julius Springer Verlag, Viena, 527 p.
3. **Bobeico V.A., Chintea P.K., 1991** - Spirosolanovii Glicotiği. Ştiinţa, Kişineev, 113 s.
4. **Sato H., Sakamura S.A., 1973** - *Bitter Principle of Tomato Seeds. Isolation and structure of a new Furostanol Saponin*. Agr. Biol. Chem., 37, 2, p.225 - 231.
5. **Tschesche R., 1971** - *Advances in the chemistry of antibiotic substances from higher plants*. Pharmacognosy and Phytochemistry, Y. Wagner and L. Horhammer eds., Springer, Berlin, p. 274 - 289.
6. **Tschesche R., Wulff, G., 1972** - *Chemie und Biologie der Saponine*. Prog. Chem. Org. Nat. Prods., 30, p. 462 - 606.

THE INFLUENCE OF SOME GLICOZID-STEROIDICS ON GRAPEVINE GROWTH AND FRUCTIFICATION

INFLUENȚA UNOR PREPARATE GLICOZID-STEROIDICE DE ORIGINE VEGETALĂ ASUPRA CREȘTERII ȘI FRUCTIFICĂRII VIȚEI DE VIE

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Abstract. *Within the Iassy „V. Adamachi” didactical farm was tested the influence of the „Ecostim” product on grapevine, Chasselas dore variety; has been settled three experimental variantes with different cocentration of „Ecostim”, comparad with an experimetal variants untreatet as control. During the vegetation period has been made determinations concerning the foliar pigments content, yield and grape quality. The grape yield was superior to control in all the experimental variantes; smaller differences than control, of 1.1 t/ha, has been registered in V₁, bigger differences than control, of 4.7 t/ha and 6.3 t/ha, has been registered in V₂ and V₃. The grape quality was not related to experimental variants, it was related to the grape yield.*

Key words: Ecostim, grapevine, Chasselas dore variety

Rezumat. *În cadrul fermei didactice V. Adamachi Iași s-a testat influența produsului „Ecostim” asupra viței de vie, soiul Chasselas dore; au fost stabilite trei variante experimentale în care produsul a fost aplicat în diferite concentrații, variante comparate cu un martor netratat. Pe parcursul perioadei de vegetație au fost efectuate observații și determinări privind conținutul în pigmenți foliari, productivitatea butucilor, producția de struguri și calitatea acesteia. Producția de struguri a fost mai mare față de martor în toate variantele experimentale; diferențe mai mici (1,1 t/ha), semnificativ pozitive față de martor s-au înregistrat la V₁; diferențe mai mari, de 4,7 t/ha și 6,3 t/ha, cu valori foarte semnificativ pozitive s-au înregistrat în V₂ și V₃. Conținutul în zaharuri nu a fost infuențat semnificativ de varianta experimentală, acesta s-a corelat cu producția de struguri.*

Cuvinte cheie: Ecostim, viță de vie, Chasselas dore

INTRODUCTION

Adjust plant growth and development through the use of biologically active substances is currently one of the most effective methods used in agriculture. Interest in this group of compounds is subject to the broad spectrum of their action on plants can adjust various stages of growth and development for resource mobilization potential of the body plant increased production of grapes and quality.

MATERIAL AND METHODS

In the period 2006-2007 has been tested on vines Ecostim product. The research was conducted in the discipline of Viticulture ampelographic Collection at White Feteasca grafted on rootstock Kober 5 BB. Plantation was established in 1985 with planting distances of 2.2 x 1.2 m; plants were led in the form of bilateral semiinalte cords (0.8 m height. Building upon cutting the vines was made in the rod rings formed by rod cordiform 4-6 eyes. Maintenance technology was the specific vineyard lasi.

Ecostim product was applied by spraying the leaves in three stages: before flowering, after flowering and grain growth fenofaza fixing the following test:

V1 - Ecostim 0.0001%

V2 - Ecostim 0.001%

V3 - Ecostim 0.005%

Experimental variants were compared with untreated control. During the growing season were made the following observations and determinations: leaf pigment content, productivity plant, grape production and quality.

RESULTS AND DISCUSSIONS

Content of leaf pigments was different depending on the experimental variant and time determination. In July (table 1) the lowest values assimilator pigment content occurred in control variant (3.04 mg/g s. pr.); V_3 in photosynthetic efficiency increased very significantly, so each pigment and the total pigments (17.76% of control); V_2 has a positive influence photosynthetic efficiency, resulting in an increase, with 15.79% of total pigment content (increase significantly distinct from positive control); in V_1 the photosynthesis was positively influenced, resulting in a significant increase compared to positive control (10.20%).

In August (table 2) the highest values of assimilator pigment content occurred in V_3 (4.42 mg / g s. pr.); with very significant differences from positive control, the photosynthetic efficiency of V_2 increased very significantly, so each pigment and the total pigment, close to the V_3 (4.30 mg / g s. pr), V_1 also positively influence photosynthesis, resulting in a distinct increase significantly compared to control positive (10,12%), the lowest values assimilator pigment content were found in March with a value of 3.46 mg / g s. pr.

In September (table 3) the lowest values assimilator pigment content occurred in control variant (2.99 mg / g s. pr.). Control close values, insignificant differences, were obtained in V_1 (3.11 mg / g s. pr.), the V_3 and V_2 photosynthetic efficiency increased very significantly, so each pigment and the total pigments (11.37% and 10.37% of control).

Productivity vine was influenced by product Ecostim (table 4). Number of grapes obtained on the plant increased significantly compared to controls at all experimental variants, the highest values were recorded at V_3 (33.5) and V_2 (35.5), but positive values with significant differences from control were were obtained in V_1 (31.7). The control was recorded the lowest number of grapes formed on plant, only 29.3.

The average weight of grapes increased in V₃ and V₂ variants Ecostim treated compared with controls (80.2 g), with significant distinct positive differences in V₃ (90.3 g) and significant V₂ (85.6 g). In V₁ showed the reduced value of the average weight of a grape (79.3 g), but with significant differences compared to controls.

Table 1

**Influence of fertilization on photosynthetic efficiency
on vines (white Feteasca) - July 2007**

Variants	Chlorophyll a mg/g fresh subs.	Chlorophyll b mg/g fresh subs.	Carotene mg/g fresh subs.	Total pigments			
				mg/g fresh subs.	diff. contr.	%	semn.
Ecostim 0,0001%	1,74	0,76	0,85	3,35	0,31	110,20	x
Ecostim 0,001%	1,78	0,85	0,89	3,52	0,48	115,79	xx
Ecostim 0,005%	1,83	0,84	0,91	3,58	0,54	117,76	xxx
Control	1,63	0,66	0,75	3,04	-	100	-

DL 5% - 0,23 mg/g s. pr.
DL 1% - 0,35 mg/g s. pr.
DL 0,1% - 0,52 mg/g s. pr.

Table 2

**Influence of fertilization on photosynthetic efficiency
on vines (white Feteasca) - August 2007**

Variants	Chlorophyll a mg/g fresh subs.	Chlorophyll b mg/g fresh subs.	Carotene mg/g fresh subs.	Total pigments			
				mg/g fresh subs.	diff. contr.	%	semn.
Ecostim 0,0001%	1,95	0,89	0,97	3,81	0,35	110,12	xx
Ecostim 0,001%	2,18	0,96	1,16	4,30	0,41	124,28	xxx
Ecostim 0,005%	2,20	0,99	1,23	4,42	0,52	127,75	xxx
Control	1,75	0,79	0,92	3,46	-	100	-

DL 5% - 0,15 mg/g s. pr.
DL 1% - 0,25mg/g s. pr.
DL 0,1% - 0,39 mg/g s. pr.

Ecostim influenced, also, the mass of 100 grains and grain diameter. Mass of 100 grains grew obviously only V₃ (160g), the V₁ and V₂ of 100 grain weight showed values around the control, with insignificant differences. Grain diameter increased slightly in the experimental variants, with 0.2 mm in V₁, V₂ and 0.8 mm to 1.2 mm in V₃.

Production of grapes (table 5), both on vine and per hectare were higher than controls in V₂ and V₃, the largest grape production, with very significant positive difference was obtained in V₃ (3, 3 kg/vine, ie 11.5 t/ha); in V₂ grape

production has lower values compared to the V₃, but with significant differences from control (2.7 kg/vine, respectively 9.4 t/ha); in V₁ grape production was equal to that obtained in the control variant (2.5 kg/vine, respectively 8.7 t/ha).

Table 3

**Influence of fertilization on photosynthetic efficiency
on vines (white Feteasca) - September 2007**

Variants	Chlorophyll a mg/g fresh subs.	Chlorophyll b mg/g fresh subs.	Carotene mg/g fresh subs.	Total pigments			
				mg/g fresh subs.	diff. contr.	%	semn.
Ecstim 0,0001%	1,71	0,65	0,75	3,11	0,12	104,01	-
Ecstim 0,001%	1,78	0,73	0,79	3,30	0,31	110,37	xxx
Ecstim 0,005%	1,81	0,71	0,81	3,33	0,34	111,37	xxx
Control	1,62	0,63	0,74	2,99	-	100	-

DL 5% - 0,14 mg/g s. pr.
DL 1% - 0,22 mg/g s. pr.
DL 0,1% - 0,27mg/g s. pr.

Sugar content (table 5) was less influenced by Ecstim product, with insignificant differences compared to control; the largest sugar contents were recorded V₁ (218 g/l) and control (213 g/l), a slightly lower content, correlated negatively with its grape production was registered in the V₂ and V₃, with 212 respectively 207 g/l.

Acidity presented values close to all variants, it was easily influenced by the production of grapes, insignificant values higher than control occurred in V₃ (5.20 g/l H₂SO₄).

In all experimental variants, including the control, at full maturity, the grapes had a green-yellow, with juicy pulp, specific for a variety of wine grape.

CONCLUSIONS

Ecstim product applied to vines presented a positive influence on photosynthetic efficiency, grape production and quality.

Leaf pigments content recorded higher values in all experimental variants, both elements (chlorophyll a, chlorophyll b, carotene) and the total highest pigment content was observed in the first part of August to variants V₂ and V₃; increased pigment content in the area and increased leaf photosynthetic efficiency.

Table 4

The productivity of white Feteasca Ecostim treated, vineyard Iasi, 2007

Variants	Average number of grapes on plant				Average weight of grapes				Mass of 100 grains (g)	Grain diameter (mm)
	No.	Diff.	%	Semn.	g	Diff.	%	Semn.		
Ecostim 0,0001%	31,7	2,4	108,2	x	79,3	-0,9	98,9	-	128	9,9
Ecostim 0,001%	33,5	4,2	114,3	xx	85,6	5,4	106,7	x	132	10,5
Ecostim 0,005%	35,5	6,2	121,2	xxx	90,3	10,1	112,6	xx	160	10,9
Control	29,3	-	100,0	-	80,2	-	100,0	-	131	9,7

DL 5% - 2,1 strug.
DL 1% -3,3 strug.
DL 0,1% -4,7 strug

DL 5% -4,1 g
DL 1% -7,8 g
DL 0,1% -10,7 g

Table 5

Grape DL production and its quality in white Feteasca treated Ecostim, vineyard Iasi, 2007

Variants	Grape production					Sugar content				Acidity g/l H ₂ SO ₄	Grain color
	Kg/plant	t/ha	Diff.	%	Semn.	g/l	Dif.	%	Semn.		
Ecostim 0,0001%	2,5	8,7	0,0	100,0	-	218	5,0	102,3	-	4,83	Green-yellow
Ecostim 0,001%	2,7	9,4	0,7	108,0	x	212	-1,0	99,5	-	4,70	Green-yellow
Ecostim 0,005%	3,3	11,5	2,8	132,0	xxx	207	-6,0	97,2	-	5,20	Green-yellow
Control	2,5	8,7	-	100,0	-	213	-	100,0	-	4,78	Green-yellow

DL 5% - 0,6 t/ha
DL 5% -1,5 t/ha.
DL 5% -2,3 t/ha

DL 5% -7,3 g
DL 5% -10,1 g
DL 5% -14,7 g

Productivity and grape production has increased significantly in the experimental variants V_2 and V_3 , with higher values compared to control concerning the number of grapes on the vine, the average weight of grapes, the mass of 100 grains, grain diameter, the production of grapes on the vine and the yield; the V_1 variant, recorded values of productivity and grape production close to the control, without significant differences. Quality grape production was similar to control in all experimental variants.

The influence of Ecostim product correlate positively with the concentration used in the treatment solution, best results were obtained in V_2 (Ecostim 0.001%) and V_3 (Ecostim 0.005%).

REFERENCES

1. **Bireescu Geanina, Bireescu L., Dorneanu Emilia, Gavriluță I., Breahănu Iuliana, Dana Daniela, 2005-** *Cercetări privind efectul unor fertilizanti foliari noi asupra productivității și calității culturilor în condițiile conservării mediului*. International symposium "Management of nutrients to improve crop quality and conservation", Editura Agris, Craiova, pag. 291-298.
2. **Burzo I., Dejeu L., Șerdinescu A., Bădulescu Liliana, 2005 –** *Fiziologia plantelor de cultură. Vol. III – Fiziologia viței de vie*. Editura Elisavaros, București.
3. **Dejeu, L., Petrescu, C., Chira, A., 1997 –** *Hortivicultura și protecția mediului*. Editura Didactica si Pedagogica, R.A. Bucuresti.
4. **Franke W., 1967-** *Mechanism of foliar penetration of solutions*. Rev. Plant Physiology, nr. 18 pag. 281-300.

THE RESHAPE OF TECHNOLOGICAL SEQUENCES IN GROW OF THE VINE THROUGH EUROPEAN SYSTEM OF QUALITY EUREPGAP

REMODELAREA SECVENȚELOR TEHNOLOGICE ÎN CULTURA VIȚEI DE VIE PRIN IMPLEMENTAREA SISTEMULUI EUROPEAN DE CALITATE EUREPGAP

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Abstract. *Food safety and the quality of agricultural products are essential conditions that a producer has to offer to consumers. Moreover, in order to have access to subsidies, quality standard conditions have to be complied with, environment protection, as well as ethical and social principles. EUREPGAP represents a normative document drafted by the European Working group of producers and traders of agro-alimentary products of Europe (EUREP - Euro-Retailer Produce Working Group). Complying with this normative document, suppliers of agricultural products and retailers can be sure that they correspond to the European legal requirements, which are very strict regarding the food safety, the health and welfare of workers and the protection of the environment.*

Key words: Eurepgap, technology, vine, grapevine varieties, quality system

Rezumat. *Siguranța alimentară și calitatea produselor agricole sunt condiții esențiale pe care un producător trebuie să le ofere consumatorilor. În plus, pentru a avea acces la subvenții, trebuie respectate condiții standard de calitate, de protecție a mediului înconjurător, precum și principiile etice și sociale. EUREPGAP reprezintă un document normativ elaborat de Grupul de lucru european al producătorilor și comercianților de produse agro-alimentare din Europa (EUREP - Euro-Retailer Produce Working Group). Respectând acest document normativ, furnizorii de produse agricole și vânzătorii cu amănuntul pot fi siguri că ei corespund cerințelor europene legale, exigente privind siguranța alimentului, sănătatea și bunăstarea lucrătorilor și protecția mediului ambiant.*

Cuvinte cheie: Eurepgap, tehnologie, viță de vie, struguri de masă, sistem de calitate

INTRODUCTION

Obtaining the EUREPGAP certification is made after having signed and enforced a specific protocol, with sections that have to be strictly respected, such as: performing registrations and the internal inspection; authentication of sorts; soil management; use of fertilizers; irrigations; protection of culture; post-crop treatment; saving residues; respect for the environment, welfare of workers.

Producers have to respect the 214 certification criteria, out of which 49 are the “Major” conformity requirements, 99 “Minor” conformity requirements and 66 “Recommendations”. For certification, these criteria have to be complied with as follows: 100% of the “Major” conformity requirements and no less than 95% of the “Minor” conformity requirements. The “Recommendations” are requirements suggested for the moment, but farmers are encouraged to respect them, as part of the management process of the agricultural exploitation, all these proving the traceability of the food chain.

In our country, the certificate entered the market last year and since then, the number of farmers who put into practice the EUREPGAP quality management system has increased, especially in the field of vegetable production.

The beneficiaries to whom the results are destined are the wine companies of Romania which will apply the innovative technology, private economic agents who will be interested in assimilating these modern technologies in order to increase their profit and enhance their position on the market and last but not least the consumer, who has in this way the certainty of a food product certifying its quality.

MATERIAL AND METHOD

The major aim of this paper is the present of stages for the of modernizing the technology of obtaining and valorizing table grapes by implementing the European quality standards (systems) (EUREPGAP), in order to ensure the traceability and the food safety for Romanian products.

By means of this certificate, the producer guarantees: the quality of agricultural production; the protection of the environment; the health and safety of agricultural workers. This certificate is not compulsory.

For reshape the technology of table grape production the main aspects to be followed are:

- the identification of the procedures and strategies for the integration and management of the production – processing – sale chain, with the purpose of improving its efficiency and its effectiveness in context oriented towards the market economy and the insurance of food safety and quality;
- the promotion of cooperation and stimulating measures for the increase of quality and long lasting management of the production – processing – sale chain, by the optimization of the relationships and information exchange among the partners;
- the identification, the stimulation and the integration of the level of consciousness on behalf of the consumer in what regards food safety.

The University of Agricultural Sciences and Veterinary Medicine of Iasi with her partner SCDVV Iasi are developed a project of traceability system in the viti-vinicol sector, correspondent to the two major stages of the table grape productions process, that is: grape production and valorification, storage, conditioning.

RESULTS AND DISCUSSIONS

The presence of a EUREPGAP certificate shows that within the entire food chain there is a diminished hygienic and production risk, that agricultural producers offer their production on the market at higher prices, that the entire work organization within the farm is subject to an independent check and to a single audit and that the farmer is ready to obtain safe and quality products. These certificates are granted in the field of fruit and vegetables, according to the European standard EN 45011/ISO 65.

The research works corresponding attaining the following specific stages:

- drafting the documentary study regarding the enforcement of traceability norms in the wine production by implementing the EUREPGAP European quality system.
- drafting the innovative technology of obtaining and valorizing table grapes by applying the conformity criteria of the EUREPGAP system.
- ensuring the primary traceability (supplier traceability) at the level of the vine producer by applying the technology specific to the EUREPGAP quality system in producing table grapes.
- ensuring the traceability at the level of the product processor (process traceability) by applying the EUREPGAP quality system in the field of harvesting and valorizing table grapes.
- certifying the traceability and increasing food safety by evaluating the fulfillment of EUREPGAP conformity criteria in producing and valorizing table grapes.

Within the SCDVV Iasi production unit, for parcels considered in the study the new technology will be applied, according to the conditions of contract.

To confirm the traceability of obtaining the product, the following specific documents will be filled in, according to the conditions of contract: the cadastral sheet and the inventory sheet, specifying: the owner, the location, the year of establishment, the direction of production, the planting distances, the management type, the density of the vineyard. These sheets are required to establish the authenticity of the vineyard soil. Then, the annual production file for each parcel is drafted, where the technological production stages are mentioned: the cutting system employed, the fruit load, the starting dates of main vegetation phenostages (debudding, blooming, ripeness of grapes and their maturity, falling of leaves), in order to establish the correlations between the respective phenostages and the necessity of applying the various interventions (fertilization, irrigation, phytosanitary treatments).

The file of applying treatments is another means in the process of certifying the traceability and it comprises: mentioning the fertilizing substances, applied herbicides or pesticides, the requirement of applying treatments (the pathogenic agent or the pest), the number of treatments, the date of applying each treatment, the surface on which it was applied, the product used (the trademark) and the

active substance, the supplier, the number of the packing batch, the concentration used and the quantity applied per hectare and the interval of days required until the harvesting of grapes. Also, the fulfillment of conformity criteria regarding the storage, the manipulation and the hygiene of fertilization and phytosanitary protection works will be monitored, by complying with the EUREPGAP conformity criteria.

The quality control of the water used in the technological process (irrigation, phytosanitary treatments, technological water) will be performed under the aspect of the origin and the chemical and microbiologic contents, eliminating the sources that may represent factors of infesting the wine production chain.

The harvest and transport of grapes will be carried out with the written consent of both parties involved (grape producer - processor). For each parcel, there will be specified the date of harvest, the sort, the quality of grapes, the means of harvesting and transport of grapes, the hygiene of the process, pointing out the quantity of grapes harvested per each transport and specifying other interventions applied during the transport of grapes. This information will be recorded twice, both by the producer and by the processor.

For drafting the harvesting file, which represents an important link of certifying traceability, determinations and analyses will be performed on the reception of grapes, inscribing on analysis bulletins the producer, the parcel, the sort, the quantity transported, the health and integrity status, the saccharine contents and the total acidity of grapes.

The file of technological operations for the valorization of grapes will comprise the specification of achieved parameters regarding: the rules of hygiene, the origin, the homogeneity of the product, its manipulation, conditioning, calibration and packaging. Monitoring the quality of adjuvants used in the valorization process will be carried out by requesting the suppliers to come up with quality certificates and by certifying only the use of products corresponding to the norms in force.

During the technological links of both production and valorization of table grapes, it will be monitored the compliance with conformity criteria regarding the welfare of workers and the safety of visitors, as well as those for environment protection.

The EUREPGAP analysis and certification is performed by an independent body and after granting the certificate, an external audit is carried out annually, in order to check if these conditions are respected. To receive an EUREPGAP certificate, a producer has to keep clear records for (at least) three months, three months before the registration to an accredited certification body, followed by relevant audits and inspections, including the inspection of the harvesting and packaging process.

In critical situations related to food products, discovering the source of contamination and the rapid reaction of withdrawing the product from the market have been, until recently, very difficult to achieve in due time.

Solving this problem, as well as the consumer's requirements to be informed about the history and the ingredients/processes used or not, in producing a food product, belong to the field of traceability.

CONCLUSIONS

In critical situations related to food products, discovering the source of contamination and the rapid reaction of withdrawing the product from the market have been, until recently, very difficult to achieve in due time. Solving this problem, as well as the consumer's requirements to be informed about the history and the ingredients/processes used or not, in producing a food product, belong to the field of traceability.

Consequently, introducing a traceability system in the production and valorization of table grapes, according to the EUREPGAP quality system in Romania represents a major activity, with beneficial effects on food safety, increasing especially the confidence of consumers in the quality of local products. At the same time, the products obtained (table grapes) within such a system can more easily find a market in the European Union, the income sources of producers thus increasing considerably.

The immediate results of this application are the following: modernizing production technologies of table grapes of Romania, according to the European quality system; promoting local and newly-created vine sorts at international level; optimized technologies of production leading to maintaining the sustainable stability of wine ecosystems and ensuring the protection of the environment; local partnership for promoting new concepts in viticulture; certifying the quality and safety of the food product (table grapes); human resources for the wine research and production.

REFERENCES

1. **Isaic-Maniu Al., Vodă V. Gh., 1997** - *Manualul calității*. Editura Economică, București.
2. **Juran J. M., 2000** - „*Planificarea calității*”, Editura „Teora”, București.
3. **Kélada J., 1990** - *La gestion intégrale de la qualité. Pour une qualité totale*. Edition Quafec, Quebec.
4. **Paraschivescu A. O., 2005** - *Ghidul Calității, Metode, Analize și Studii de Caz*. Editura Tehnopress, Iași.
5. **Scorei R., 1998** - *HACCP: Ghid practic pentru Industria Agro-Alimentara*. Editura Aius, Craiova.
6. **Trandafir Magdalena, Iosifescu M., Avram C., Văleanu M., 2005** - *Dicționar explicativ de calitate*. Ed. “Teora”, București.

7. ***, 2001 - *Codex Alimentarius Food Hygiene Basic Texts*. Food and Agricultural Organization of the United Nations, World Health Organization, Rome.
8. ***, 2001 - *Codex Alimentarius Food Hygiene Basic Texts*. Food and Agricultural Organization of the United Nations, World Health Organization, Rome.
9. www.eurep.org
10. www.eurepgap.org

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THE VALUATION OF NORTH EASTERN VINEYARDS FROM ROMANIA FOR IMPLEMENTATION OF SUSTAINABLE VITICULTURE

EVALUAREA PODGORIILOR DIN NORD ESTUL ROMÂNIEI PENTRU IMPLEMENTAREA VITICULTURII DURABILE

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Abstract. *The vine growing area in the North-East of Romania is one of the most important one, as it comprises the areas of some old vine estates with a long tradition in grape growing, such as the vine estates of Cotnari, Huși and Iași. The particularities of the area are determined by both, the restrictive effect of some weather factors (minimal temperatures under the vine resistance limit, long lasting droughts in summer), limited ecologic plasticity of some sorts (Grasa de Cotnari, Zghihara de Huși, Busuioaca de Bohotin, Fetească Neagră de Uricani), on the one hand, and the soil types that we find in that area, from excessively calcareous soils in the Cotnari vine estate, up to the forest gray soils in the Averești-Huși area, on the other hand. Therefore, the restructuring of classical technologies for vine growing practiced in the area, according to the requirements of sustainable viticulture, impose the solution of some interdisciplinary aspects (agrometeorology, ampelography, agrochemistry, viticulture, phytosanitary protection, management and agricultural marketing) and the choice of optimal variants, that may continue to ensure the well known quality of vine products in this area*

Key words: vineyard, sustainable viticulture, vine, weather factors, technologies for growing

Rezumat. *Zona viticolă de NE a țării este una din cele mai importante, cuprinzând arealul unor podgorii vechi, cu o îndelungată tradiție în cultura viței de vie, așa cum sunt podgoriile Cotnari, Huși și Iași. Particularitățile acestui areal sunt date atât de efectul restrictiv al unor factor climatici (minime ale temperaturii sub limita de rezistență a viței de vie, seceta îndelungată pe timpul verii), soiurile cultivate, multe din ele cu plasticitate ecologică limitată (Grasa de Cotnari, Zghihară de Huși, Busuioacă de Bohotin, Fetească neagră de Uricani) cât și de tipurile de sol întâlnite în această zonă, mergând de la cele cu exces de calcar în sol din podgoria Cotnari, până la cele cenușii de pădure din zona Averești-Huși. Prin urmare, restructurarea tehnologiilor clasice de cultura ale viței de vie, practicate în această zonă, la cerințele viticulturii durabile, impune rezolvarea unor aspecte interdisciplinare (agrometeorologie, ampelografie, viticultura, agrochimie, protecție fitosanitară, management și marketing agricol) și alegerea variantelor optime, care să asigure în continuare calitatea binecunoscută a produselor viticole din acest areal.*

Cuvinte cheie: podgorie, viticultură durabilă, viță de vie, factori climatici, tehnologii de cultură

In its large sense, the meaning of sustainable development as "*the capacity to meet the needs of the present generation without affecting the capacity of future generations to meet their own needs*", economic prosperity and environment conservation must support one each other. In the conditions of Romania, sustainable development means management and conservation of basic natural resources: conservation of land, water, biodiversity, environment and orientation of technological and institutional exchanges in such a way that they might meet human needs for both present and future generations.

Sustainable development retained the attention of specialists since the report of the World Commission for Environment and Development "Our Common Future" appeared in 1972. Such concept was developed and integrated in economic-social development strategies. In the Conference of Rio de Janeiro, in June 1992, it was stated the fact that environment and economic development are compatible, as they have complementary purposes. By adopting the Agenda 21 as consequence of the international agreement expressed in the Declaration of Rio de Janeiro, sustainable development became a global strategic option of action.

The accession of Romania to the European Union implies deep and important changes in the Romanian villages. Agriculture according to European standards imposes the modernization of the legislative and institutional system and of the production system, as well as the adaptation of the entire concepts of production, processing and merchandising of agricultural products according to standards applicable in the European Union. The focusing of this subject is a need imposed by the necessity to find ways for the progress in agriculture and, implicitly, for the progress of the Romanian village.

Sustainable horticulture in the conditions imposed by EU requirements can be assimilated in a high proportion in Romania as well, in case that the legislative conditions, the institutional framework and the certification and marketing procedures for agricultural alimentary products are adapted in such a way that they will allow the conversion of large surfaces to sustainable production.

MATERIAL AND METHOD

In the three main vine estates of the North-Eastern area of Romania, Iași, Cotnari and Huși, there will be collected climactic data in order to perform physic-chemical and climatic analysis. There will be calculated synthetic ecologic indexes and, on the bases of the obtained results and of the interpretation of analytical data, there will be established which are the ecoclimatic limitative factors for the vine and which are the possibilities to improve them in order to promote a sustainable viticulture.

Within the vine growing ecological stations that University of Agricultural Sciences and Veterinary Medicine of Iași has for the discipline of viticulture and

on the bases of the collaboration with prestigious vine growing institutions in the area (S.C. Vinia, S.C. Cotnari, S.C. Vincon – workplace in Huși), the proposed subject will be performed at the Iași, Cotnari and Huși vine estates. In order to fulfill this objective, the following activities will be performed:

- Evaluation of weather conditions in the reference vine estates in the North-East of Romania;
- Establishing the ecoclimatic limitative factors for the North-Eastern area of Romania and their improvement possibilities.

RESULTS AND DISCUSSIONS

The sustainable viticulture as it is defined in the resolutions OIV CST 1/2004 represents: the development of a unitary concept regarding the systems of grape production and processing in harmony with the economic and structural perennation of the wine growing terroir and of the quality and safety of the products obtained in the context of a safe viticulture, which will take into account the risks related to the environment and to consumers safety and will have to emphasize aspects related to patrimony, history, culture, ecology and landscape of the vine growing area.

For the restyling and optimization of vine growing technologies in the NE area of Romania, according to the requirements of sustainable viticulture is necessary the reevaluation and efficiency in the usage of natural resources, as well as in the production in the wine growing ecosystem, in conditions of sustainable production in the grape plantations in the NE of Romania. For this will lead to applying with success the specific technological chain in an appropriate volume, considered as the base for sustainable viticulture production and at the same time, they may contribute substantially to the protection of the soil and of other environment resources against degradation as well as to important growth in Romania.

The global heating caused a disturbance in the evolution of natural factors of the vineyard ecosystem: summers became extremely dry, autumns became either colder or wetter, either much warmer than usual, while winters are shorter and with extreme low temperatures. It became very usual to record frequent alternations of dry spells with excessive wet periods. The consequences for vineyards are as follows: because of the prolonged active period of vegetation, the vines enter unprepared and not matured enough in winter. The atypical autumn climatic conditions lead to a defective maturation of the grapes which, therefore have small quantities of natural components, responsible for wine quality. This study followed the evolution of the climatic factors in the vineyards in Moldavia, over a period of 10 years.

In the wine-growing zone of Romania, located between the geographical coordinates of 46°31' - 47°35' northern latitude and 27°28' - 27°36' longitude is one followed the evolution of the climatic factors in the vineyards located in the septentrional zone of Moldavia, namely, Iași, Cotnari and Huși,

and for the comparison, one retained the values of the climatic factors of last the ten years period, and that in order to surprise the states which limits for the sustainable viticulture in this wine ecosystems (tab.1).

Table 1

Values of the bioclimatic indices in the NE wine-growing zone of of Romania followed during one 10 years time and the limits for sustainable viticulture

Bioclimatic indices	Limits	Iasi	Cotnari	Husi
Annual average temperature (°C)	≥ 9,0	9,8	9,3	10,5
Average of the monthly minimas in the air (°C)	-24 ... -22	-23,8	-24,1	-23,9
Average of the monthly maximas in the air (°C)	≤ 42	36,2	35,9	36,8
Total heat balance (°C)	≥ 3200	3893,8	3685	3884
Active heat balance (°C)	≥ 2600	3335,9	3216	3275
Useful heat balance (°C)	≥ 1000	1446,5	1376	1455
Real insolation in the per. of vegetation (no. hours)	≥ 1200	1529,6	1489,5	1513,1
Total annual precipitations (mm)	500-700	498,6	510,2	501,9
Total precipitations in the per. of vegetation (mm)	250-500	301,9	332,1	309,5
Relative humidity of the air (%)	50-80	68	70	66
Length of the growing period (no. days)	≥ 160	187	184	186
Real solar index	≥ 1,30	2,21	2,05	2,20
Hydrothermal coefficient	0,7-1,8	0,91	1,03	0,98
Wine bioclimatic index	≥ 4,0	9,03	7,84	8,60
Index of the oenoclimatic aptitude	≥ 3600	4813,6	4623,4	4728,6
Index of Huglin	≥ 1500	1953	1891	1959

By applying the sustainable viticulture in NE area of Romania it is possible to obtain a series of results with immediate and long-term effects in the sector of vine growing. As economic effects we should mention: the obtaining of some technologies, specific for sustainable viticulture in the North-East of Romania, which will be applied in other facilities that wish to implement them; the optimizing of production technologies for table and wine grapes, as well as the quality improvement of the obtained products, the alignment of production and merchandising technologies according to standards imposed by the EU; and the modification of vine growing practices with benefic results for the incomes, which is a contribution for the regional and rural development.

The social impact of the practice sustainable viticulture is represented by: the increase of alimentary safety; the growth of possibilities of professional formation for vine producers; the increase of

performances and the competitiveness of vine producers (implicitly the improvement of the market position); the development of knowledge and skills and the increase of technical competences; the development of consulting in the field; the increase of the conscious awakening of producers regarding problems related to alimentary safety and quality control in the vine growing sector; the ensuring of welfare for vine growing workers and for the vine growing ecosystem, as requirements imposed by European life standards.

The impact on the environment is highlighted by: the contributions to protection and increase of environment quality through the responsible administrations of vine growing; the improvement of decisions regarding the rational use of manure and pesticides, in order to reduce the risk of soil pollution and phreatic water; the reduction of environment pollution by means of an appropriate management of soil, fertilizers, irrigations and wastes that result from the technological process, according to the norms of "Good Agricultural Practices (GAP)".

CONCLUSIONS

The natural setting in the North-Eastern viticultural centre of Romania has a markedly continental climate, with relative harsh winters and droughty summers, influenced by the air circulation in the open valley of the Prut river. For practise a sustainable viticulture the ecoclimatic conditions is limitative.

In the present case there will be comparatively analyzed the classical vine growing technologies with the requirements of sustainable viticulture and we shall proceed to perform, apply and monitor new vine growing technologies in the North-Eastern area of Moldavia, together with the identification of the critical points that appeared in these technologies and, especially, of the corrective actions imposed by their appearance.

During the identification of risks, evaluation, further operations, sketching and applications of the HACCP systems, we should give special attention to the impact of certain technological elements (the choice of land, the creation of cultures, maintenance and harvest works) and, especially, of those sequences that refer to: harvesting, sorting, conditioning, packing, conservation and transport of the harvest.

REFERENCES

1. **Avenard J.C., Bernos L., Grand O., Samie B., 2003-** *Manuel de Production Integree en Viticulture*. Ed. Feret, Bordeaux, France.
2. **Blake F., 1999** – *Organic Farming and Growing*. Ed. The Crowood Press, Salisbury, UK.
3. **Dejeu L., C. Petrescu, A. Chira, 1997** – *Hortivicultura si protectia mediului*. Ed. Didactica si Pedagogica, Bucuresti.
4. **Giovanneti M., Vieri M., Zoli M., 1998** – *Nuove tecnologie per la viticultura in zone di alto valore ambientale*. Simp. Internat. Territorio et Vino, Siena 19-24 Maggio.
5. **Ingels C., 1992** – *Sustainable Agriculture and Grape Production*. Am.J. Enol. Vitic., vol 43, nr. 3, pp. 296-298.
6. **Riou C., 1994** - *Le déterminisme climatique de la maturation du raisin*. Application au zonage de la teneur en sucre dans la Communauté Européenne. CECA, Bruxelles.
7. **Rochard J., 2005** – *Traite de viticulture et d'oenologie durables*. Ed. Oenoplurimedia, Maison des Vignerons du Chateau de Chaintre, France.
8. **Vandour Emanuelle, 2003** – *Les terroirs viticoles : definition, caracterisation et protection*. Ed. Dunod, Paris-France.

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COMPARATIVE STUDY ON THE BEHAVIOR OF CLONAL SELECTION OF THE MAIN VARIETIES GROWN IN THE VINEYARD PIETROASA

STUDIU COMPARATIV PRIVIND COMPORTAREA UNOR SELECȚII CLONALE ALE PRINCIPALELOR SOIURI CULTIVATE ÎN CENTRUL VITICOL PIETROASA

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Abstract *Extremely qualitative grape varieties, autochthones or global ones exist either as biotype or as ecotypes that can adjust well to crop conditions after a long selection process, but lose their value of productivity and production quality. Therefore sorting clone selections with the highest adaptability to ecopedoclimatic conditions of a vineyard center, increased resistance to environment parameters and further setting up of the polyclone vineyard are the main possibilities of development and efficiency for the Romanian wine industry. Therefore, the experiment was conducted during 2007-2008, under the SEL 51-035 project, and the main purpose was establishing the adaptability degree of some clone selections from Grasa de Cotnari, Tamaioasa romaneasca, Băbeasca neagra, Busuioacă de Bohotin, Muscat d'Adda, Muscat de Hamburg varieties and from Feteasca neagra- variety waiting to be homologated.*

Key words: selection clonals, quality, quantity

Rezumat *Soiurile de vită de vie, atât cele autohtone, cât și cele din sortimentul mondial, foarte valoroase din punct de vedere calitativ, se prezintă sub forma unor biotipuri sau ecotipuri, care supuse unui proces îndelungat de selecție prezintă o bună adaptare la condițiile de cultură în care s-au format, dar care s-au depreciat sub aspectul productivității și calității producției. Ca urmare, alegerea selecțiilor clonale, care manifestă cel mai mare grad de adaptare la condițiile ecopedoclimatice ale unui anumit centru viticol, rezistențe sporite la influența factorilor de mediu și ulterior înființarea plantațiilor policlonale, constituie importante posibilități de dezvoltare-eficientizare a industriei vitivinicole din România. În acest context, experiența a fost realizată în perioada 2007-2008, în cadrul proiectului SEL 51-035, având ca principal scop stabilirea gradului de adaptabilitate a unor selecții clonale ale soiurilor Grasă de Cotnari, Tămâioasă românească, Băbească neagră, Busuioacă de Bohotin, Muscat d'Adda, Muscat de Hamburg și a elitei în curs de omologare - Fetească neagră.*

Cuvinte cheie: clone, calitate, cantitate.

INTRODUCTION

This study is a preliminary indication of the clonal selections of varieties behavior, Grasă de Cotnari, Tămâioasă românească, Băbească neagră, Busuioacă de Bohotin, Muscat d'Adda, Muscat de Hamburg and ongoing elite approval, Fetească neagră – in ecopedoclimatic conditions recorded in the Pietroasa vineyard. The experience was achieved during 2007-2008, with the main interest

in determining the adaptability degree of these clonal selections and the elite, in an area with a moderate weather conditions, highlighting, obtaining and multiplication of autochthon biological material, justifying the need to introduce and expand them in culture.

MATERIAL AND METHOD

In order to reach the proposed goal one has taken into study Grasă de Cotnari (4 Pt, 45 Pt), Tămâioasă Românească (36 Pt, 5 Pt), Băbeasca Neagră (94 Pt), Muscat d'Adda (5 Pt), Muscat de Hamburg (4 Pt), Busuioacă de Bohotin (26 Pt) sorts and ongoing elite approval, Fetească neagră. They can be found in the Ampelographic collection of Pietroasa wine growing center. Regardless of the selection, the type of cutting was Guyot on the semi high, with 28 buds/vine. In order to determine the agro biological and technological potential of the experimental variants studied, one has analyzed the following indicators – the percentage of viable buds/vine, the absolute fertility and relative coefficients, the productivity index (absolute and relative ones), the average weight of a grape, the mass of 100 grapes, the production assessed from a quantitative (kg/vine) and qualitative point of view, the sugars concentration (g/l), the content of total acidity (g/l tartaric acid). The aspects mentioned above were analyzed during just one crop year, 2007-2008, due to the fact that the comparative analysis of these sorts has been thoroughly studied.

RESULTS AND DISCUSSIONS

From a climatic point of view, the wine-growing year of 2007-2008 was characterized by unusual high temperatures during the summer, temperature frequently passing over 36°C, accompanied by almost inexistent precipitations (6,5 mm) noting unfavorable climate conditions. These factors determined a speeding of the process of maturation, this fact influencing in a dissatisfactory way the quality of the production. In viticulture center of Pietroasa, the value of heliothermal index in 2008 decreased by 0,12 from the average multi annual value, the average value of hydrothermal coefficient in the wine growing center of Pietroasa was in accordance with the multi annual averages of 1,07 and for the viticulture year of 2007-2008 – 0,88 therefore low resources. The bioclimatic index in 2007-2008 has an average value of 7,56 in accordance with the multi annual averages registered in the vineyard, of 9,02, one noting as general aspect a very large spectrum of this index which locates the vineyard on the upper limit of favorable characteristics, in comparison with the multi annual average for the region, thus reflecting very favorable conditions for growth and ripening on one hand, and on the other hand the obtaining of a superior quality production at the most times, irrespective of the analyzed category of sorts. The average values of oenoclimatic ability registered are of 4880 in accordance with the multi annual registered media in the vineyard and 4876 for 2007-2008 which places the viticulture center in one of the classes with high favorable characteristics regarding the obtaining of superior quality wines as well as the culture of the table sorts. The agro biological assessment of studied clonal selection, analyzed by indicators as the force of growth, the percentage of viable buds, the fertility

Table 1

The synthesis of the main fertility elements of clone selections study

The viticulture Year	Experimental variants (clone selections)	% viable buds	Growth vigor	Fertile shoot	The fertility coefficients		Productivity index		
					CFA	CFR	IPA	IPR	
2008	Clones for quality white wines								
	<i>Grasă de Cotnari 4 Pt</i>	80,6	xxx	75	1,0	0,85	165	140	
	<i>Grasă de Cotnari 45 Pt</i>	81	xxx	76	1,0	0,88	160	141	
	Clones for aromatic wines								
	<i>Tămâioasă românească 36 Pt</i>	82,7	xxx	70	1,0	0,64	130	83	
	<i>Tămâioasă românească 5 Pt</i>	81,6	xxx	71	1,06	0,72	138	94	
	Clones for rose wines								
	<i>Busuioacă de Bohotin</i>	82	xxx	71	1,04	0,84	125	101	
	Clones for red wines								
	<i>Băbească neagră 94 Pt</i>	77	xxx	73	1,0	0,73	169	123	
	Clones for quality red wines								
	<i>Fetească neagră 10-4</i>	85,9	xxx	72	1,0	0,65	142	92	
	Clones for table grape sorts with medium maturity								
	<i>Muscat de Hamburg 4Pt</i>	80,1	xx	71	1,0	0,70	178	125	
<i>Muscat d'Adda 5 Pt</i>	79,8	xxx	70	1,0	0,68	197	134		

coefficients, the productivity index (Table 1) shows that the studied clone selections have a medium to normal potential production and that the genotype has a direct connection with this index and their average values are also influenced by the climate conditions. The analysis obtained from an output quantity and quality - will be presented on data listed in (Table 2), taking into account the particularities of each clonal selection skills, and the production direction.

The clone selections of *Grasă de Cotnari 4 Pt* and *45 Pt* registered values of the average weight of a grape within the normal limits specific for the sort, 165 g (4 Pt) and 160 g (45 Pt). Regarding the selections of the *Tămâioasă românească (36 Pt, 5 Pt)* sort, one notes differences among them, differences which will be felt also in the obtained production. Thus the clone *36 Pt* has the average weight of a grape of 120 g and the clone *5 Pt* that of 133 g. For the selection *Busuioacă de Bohotin 26 Pt* this parameter does not register values different from the population of the sort, the weight being practically classified within the limits of the sort (90 g). Analyzing the results obtained for the *Băbească neagră 94 Pt* selections, one notes that there are no different values compared to the population of the sort, the weight being classified within the limits of the sort (120 g). The ongoing elite approval, *Fetească neagră 10-4* registered limits of the average values of sort (140g). In the case of the clone selections of the table sorts of *Muscat de Hamburg 4 Pt* and *Muscat d'Adda 5 Pt*, the values of this parameter are also registered within the limits of the average values obtained by the populations of the two sorts, 178 g for the *Muscat de Hamburg* sort and for the *Muscat d'Adda* sort, 197 g. The mass of 100 grapes (g) - in this sector one has noted significant differences only for the sort of *Grasă de Cotnari*, being able to make the comparison due to the existence of the two selections (4 Pt and 45 Pt) - in the case of the other selections one can mention that they classify within the average normal limits of the sorts from which they have been selected.

The sugars (g/l) - The *Tămâioasă românească* sort is recognized from the point of view of its production quality, registering high accumulations of sugars accompanied by an average production, favorable for obtaining white aromatic wines of quality. For this wine growing year the clone selections of *Tămâioasă românească* sort accumulated great quantities of sugar, ranging from 246 g/l for *36 Pt* and 244 g/l for *5 Pt*, followed by *Busuioacă de Bohotin*, 245 g/l and at a very short distance the selections of the *Grasă de Cotnari* sort, 238 g/l for *4 Pt* and 240 g/l for *45 Pt*. One notices also that the selection of *Băbească neagră 94 Pt* sort has accumulated sugars at the superior limits of the sort, 219 g/l allowing the obtaining of a wine with a rather high alcoholic potential. The ongoing elite approval, *Fetească neagră 10-4* sort accumulated average values of sugar at the superior limit, 242 g/l. For the clone selections of the *Muscat de Hamburg 4 Pt* and *Muscat d'Adda 5 Pt* table sorts, values of this quality parameter were also classified within the limits of the average values obtained for the populations of the two sorts, 188 g/l for the *Muscat de Hamburg* sort and a little lower for the *Muscat d'Adda* sort, 185 g/l. However for all the selections one notes that there is a determining influence of the genotype on the accumulations of sugars in the grapes, being practically a hereditary characteristic.

Table 2

The synthesis regarding the quantitative and qualitative production obtained with the 8 homologated clone selections in Pietroasa vineyard

The viticulture year	Experimental variants (clone selections)	Average weight of grape (g)	Weight of 100 grapes (g)	Sugars (g/l)	Acidity (g/l)	Production (kg/grape vine)	Production (t/ ha)
2008	Clones for quality white wines						
	<i>Grasă de Cotnari 4 Pt</i>	165	270	238	5,5	2,400	8,9
	<i>Grasă de Cotnari 45 Pt</i>	160	266	240	5,4	2,250	8,5
	Clones for aromatic wines						
	<i>Tămâioasă românească 36 Pt</i>	130	145	246	5,5	1,700	7,2
	<i>Tămâioasă românească 5 Pt</i>	138	153	244	5,5	1,820	7,6
	Clones for rose wines						
	<i>Busuioacă de Bohotin 26 Pt</i>	120	132	245	5,1	1,800	7,5
	Clones for red wines						
	<i>Băbească neagră 94 Pt</i>	169	165	219	5,8	2,940	12
	Clones for quality red wines						
	<i>Fetească neagră 10-4</i>	142	110	242	5,4	2,400	8,9
	Clones for table grapes sorts with medium maturity						
<i>Muscat de Hamburg 4 Pt</i>	178	290	188	5,6	2,800	10,3	
<i>Muscat d'Adda 5 Pt</i>	197	325	185	5,7	2,900	10,8	

The level of acidity has been correlated with the quantity of sugar accumulated in the grapes of the experimental variants, one noting that the acidity values were lower than sugar value of the experimental variants. There were minimal differences that did not surpass 0,1 g/l.

The production (kg/grape vine, t/ha) - Comparing the average values one finds that *Grasă de Cotnari 4 Pt* selection has supplied a production of grapes (2,400 kg/grape vine- 8,9 t/ha) and *Grasă de Cotnari 45 Pt* (2,250 kg/grape vine- 8,5 t/ha). In the case of the two clone selections of *Tămâioasă românească* sort the productions were classified within the limits of the production capacities of the sort, aiming to obtain a quality production thusly: 1,700 kg/grape vine (7,2 t/ha) for *36 Pt*, respectively 1,820 kg/grape vine (7,6 t/ha) for *5 Pt*.

In the case of the *Busuioacă de Bohotin 26 Pt* clone selection the production also classifies within the limits of production for the sort, aiming at obtaining a quality production thusly: 1,800 kg/grape vine (7,5 t/ha). The production obtained at the *Băbeasca neagră 94 Pt* is higher, 2,940 kg/grape vine (12 t/ha). The ongoing elite approval, *Fetească neagră 10-4* obtained a higher production, meaning 2,400kg (8,9 t/ha). In the case of the *Muscat de Hamburg 4Pt and Muscat d'Adda 5 Pt* selections the grape production is 2,800 kg/ grape vine (10,3 t/ha) for the first selection (4Pt) and for the second selection (5Pt) 2,900 kg/grape vine (10,8 t/ha). One noticed that in the case of the experiment variants that are very close in terms of genetic values, the biological and technological parameters are close, thus posting a selection may be done only by sugar value concentration.

CONCLUSIONS

1. The obtained results from the point of view of the agro biological and technological behavior lead to the idea that the clone selections taken for the study can be multiplied with success in order to obtain an autochthon certified biological material, at the same time justifying the necessity of their introduction and extension in the culture.

2. The capacity than transmission and acquisition of different characters, such as precocity of debudding, the size of grapes, early baking grapes, increased capacity of sugar accumulation of these varieties and clonal selections, is due to their phylogenic age submitted, and their full adaptation in pedoclimatic conditions in vineyard Pietroasa.

REFERENCES

1. **Scienza A., 1993** – *Vigneti policlonali e valorizzazione della diversità dei vini*. Vignevini (12), 23-24.
2. **Stefanini M., 1996** – *Vigneto policlonale e adattabilità ambientale*. L'informatore agrario (4). 65-69.

THE INFLUENCE OF THE TECHNOLOGICAL FACTORS ON THE VEGETATIVE AND PRODUCTION POTENTIAL OF A SERIES OF HIGH QUALITY WINE GRAPE VARIETIES

INFLUENȚA FACTORILOR TEHNOLOGICI ASUPRA POTENȚIALULUI VEGETATIV ȘI DE PRODUCȚIE AL UNOR SOIURI PENTRU STRUGURI DE VIN DE ÎNALTĂ CALITATE

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Abstract: *The researches were carried out at the Station for Research and Development for Viticulture and Wine Production of Iași, during the agricultural year 2007-2008, regarding the varieties Fetească alba and Fetească regala, and the influence of technological factors such as the following was monitored: the bud load (10, 15 and 20 buds/ m²), foliar fertilization and phytosanitary (conventional and minimal) extermination. The measurements carried out focused on the amount of wood removed upon cutting, the vegetation phenological phases, the vegetation state of the vinestock (total number of vine shoots, length of the shoots, the foliar surface), the fertility potential of the soil, the relative and absolute fertility coefficient), the dynamics of the ripening of grapes, the degree of attack of diseases and pests, the production of grapes in kg/vinestock, the average weight of a grape, the content of sugars and acidity. In the circumstances of the year 2008, characterized by a lower thermal regime and a high hydric regime, the best outcomes were obtained in variants with bud loads of 10 and 15 buds/m², foliar fertilization and conventional pest control.*

Key words: Iasi, quality, technological factors, grapevine varieties, foliar fertilization

Rezumat: *Cercetările au fost efectuate la Stațiunea de Cercetare Dezvoltare pentru Viticultură și Vinificație Iași, în condițiile anului agricol 2007 – 2008, la soiurile Fetească albă și Fetească regală, urmărindu-se influența unor factori tehnologici cum ar fi: încărcătura de ochi (10, 15 și 20 ochi/m²), fertilizare foliară și combaterea fitosanitară (convențională și minimală). Determinările efectuate au avut în vedere cantitatea de lemn eliminată la tăiere, desfășurarea fenofazelor de vegetație, starea de vegetație a butucilor (număr total de lăstari, lungimea lăstarilor, suprafața foliară), potențialul de fertilitate al soiului, coeficienți de fertilitate absolut și relativ), dinamica maturării strugurilor, gradul de atac al bolilor și dăunătorilor, producția de struguri exprimată în kg/butuc, greutatea medie a unui strugure, conținutul în zaharuri și aciditate. În condițiile anului 2008 caracterizat printr-un regim termic mai scăzut și un regim hidric ridicat cele mai bune rezultate au fost obținute la variantele cu o încărcătură de 10 și 15 ochi/m², fertilizare foliară și combatere convențională.*

Cuvinte cheie: Iasi, calitate, factori tehnologici, soiuri de vita de vie, fertilizare foliara

INTRODUCTION

The use of technologies differentiated and optimized for the culture of vine is a major problem upon which the wine production depends. The purpose of the “dry” cutting of the vine is not only to maintain in time the guidance shape, but

also to achieve a balance between the growing and fructification in order to obtain optimum quantity and quality productions (Țârdea C., et. al. 1995). The optimization of the fruit load implies the establishment of the number of buds that ensure the development of a foliar surface appropriate to the agrobiological potential of the soil, with the purpose of obtaining large productions with increased accumulation of sugars and with the maintenance of the vigorous growth of vinestocks (Irimia L, 2006). An important role in ensuring a constant and high quality wine production at the level of the production potential of vinifera varieties is played by the mineral nutrition conditions which should have optimum levels during the entire vegetation period.

MATERIAL AND METHOD

The experiences were placed with two high quality varieties of wine – Feteasca alba and Feteasca regala – recommended and authorized by Copou Wine-Growing Center of Iași. Two experimental models were organized: the variety Feteasca alba engrafted on the parent stock Berlandieri x Riparia Kober 5 BB in a plantation set up in 1992, planting distance 2.2 x 1.2 m (3788 vinestocks/ha), guidance shape: bilateral cord, with 0.8 m trunks; the variety Feteasca regala engrafted on the parent stock Berlandieri x Riparia Kober 5 BB, the plantation was set up in 1990, with the planting distance of 3.0 x 1.0 m, ensuring a density of 3333 vinestocks/ha, the grapes being guided in shape of bilateral cords, the trunks being 1.0 m tall. The land is exposed to the south-east, with an 8 – 9% slope and the rows are oriented along the level curves, the soil is alternatively maintained as a farmed soil/ soil durably and naturally overcome with grass. The researches carried out pursued the elucidation of three factors: factor A – combating with the graduations: a_1 – conventional extermination and a_2 – integrated (minimal) extermination; factor B – fertilization with the graduations: b_1 biostimulators and special works related to the vinestock and b_2 foliar fertilizer with microelements responsible for the production quality; factor C – the bud load with the graduations: c_a – 10 buds/m², c_2 – 15 buds/m² and c_3 – 20 buds/m².

From the combination of these factors 12 experimental variants resulted, each variant with 3 repetitions, each repetition with three vinestocks. The measurements carried out focused on the amount of wood, the development of the vegetation phenological phases, the vegetation state of the vinestocks (total number of shoots, length of shoots, foliar surface), the fertility potential of the soil, absolute and relative fertility coefficients), the dynamics of the ripening of grapes, the degree of attack of diseases and pests, the production of grapes in kg/vinestock, the average weight of a grape, the content of sugars and acidity.

RESULTS AND DISCUSSIONS

As a consequence of the evolution of minimum temperatures from the winter of 2007-2008, the losses of buds were within normal limits. Their viability was 72% in main buds and 100% in secondary buds in the variety Feteasca alba and in the variety Feteasca regala, 78% in main buds and 100% in secondary buds. In February, the fructification cuttings were carried out differentially according to varieties and variants. Three levels of loads were used: 10 buds/m², 15 buds/m² and 20 buds/m², and different numbers of buds were obtained according to the variety and planting distance. Thus, in the variety Feteasca alba

the loads obtained were of 26 buds, 40 buds and 53 buds per vinestock, and in the variety Feteasca regala, loads of 30 buds, 45 buds and 60 buds. The cutting system used was mixed, represented by fruit chords of 5-6 buds and replacement knots of 2-3 buds. The bud load attributed upon the dry cutting and fertilization influenced the vegetative development of the vinestocks expressed in the wood amount removed upon cutting. Thus, the annual wood amount decreased as the bud load increased, hence the annual amounts of wood increased for the variety Feteasca regala (1.08 kg/vinestock) with the load of 10 buds/m² and decreased with the load of 15 and 20 buds/m².

The vegetation start, given the climatic conditions of the year 2008, was very good, with values between 88 – 94% buds sprung in both varieties. The bud load influenced differently the vegetation start, therefore, as the bud load increase, both the percentage of sprung buds and the percentage of fertile shoots. The obtained data reveal that in the loads of 10 and 15 buds/m², the total number of shoots is larger than the number of buds left on the vinestock, which means that the smaller loads stimulate the vegetation start of the secondary, tertiary and sleeping sprouts (table 1 and 2).

Table 1

Spring and fertility of the variety Fetească albă given the conditions of the year 2008

Experimental variants	Buds sprung		Total no. of shoots	Fertile shoots		Inflorescences no.	Fertility coefficient	
	nr.	%		nr.	%		absolute	relative
V1 a ₁ b ₁ c ₁	24,4	94	32	29	92	41	1,41	1,28
V2 a ₁ b ₁ c ₂	37,6	94	44	41	93	61	1,48	1,38
V3 a ₁ b ₁ c ₃	48,2	91	58	51	88	70	1,37	1,21
V4 a ₁ b ₂ c ₁	24,4	94	36	32	89	47	1,47	1,30
V5 a ₁ b ₂ c ₂	37,2	93	48	45	93	77	1,71	1,60
V6 a ₁ b ₂ c ₃	47,7	90	56	48	86	78	1,62	1,39
V7 a ₂ b ₁ c ₁	23,6	91	31	27	87	41	1,52	1,32
V8 a ₂ b ₁ c ₂	36,8	92	47	42	90	64	1,52	1,36
V9 a ₂ b ₁ c ₃	47,1	89	47	41	88	61	1,49	1,30
V10 a ₂ b ₂ c ₁	23,4	90	33	29	89	43	1,48	1,30
V11 a ₂ b ₂ c ₂	37,2	93	46	41	90	67	1,63	1,45
V12 a ₂ b ₂ c ₃	46,6	88	45	38	85	57	1,50	1,27

As regards the proportion of fertile shoots of the total of shoots on the vinestock, the largest proportion in Fetească albă was in the variants with loads of 15 buds/m² and the smaller in loads of 20 buds/m². In the variety Fetească regală, the percentage of fertile shoots decreased as the bud load increased.

The fertility of the varieties expressed by the absolute and relative fertility coefficient was influenced both by the bud load and by the agrobiological potential of the varieties. Thus, in the variety Fetească albă, given it was more vigorous, the fertility was lower, and higher values of the fertility coefficients were ensured by the variant V5 (15 buds/m²). In the variety Fetească regală, the values of the absolute and relative fertility coefficients were higher in comparison to the variety Fetească albă, between 1.70 and 1.93, and 1.52 and 1.78

respectively, with maximum values in the variants with 15 buds.m², namely 45 buds/vinestock. Moreover, the values of the relative fertility coefficients in both variants were superunitary in all variants, which shows a balance between growth and fructification.

Table2

Spring and fertility of the variety Feteasca regala given the conditions of the year 2008

Experimental variants	Buds sprung		Total no. of shoots	Fertile shoots		Inflorescences no.	Fertility coefficient	
	nr.	%		nr.	%		absolute	relative
V1 a ₁ b ₁ c ₁	27,6	92	33	30	93	57	1,90	1,72
V2 a ₁ b ₁ c ₂	41,4	92	46	42	91	81	1,92	1,76
V3 a ₁ b ₁ c ₃	54,0	90	54	48	89	86	1,79	1,59
V4 a ₁ b ₂ c ₁	27,9	93	33	31	93	57	1,83	1,72
V5 a ₁ b ₂ c ₂	41,8	93	50	47	94	83	1,76	1,66
V6 a ₁ b ₂ c ₃	55,2	92	56	50	89	85	1,70	1,52
V7 a ₂ b ₁ c ₁	27,6	92	37	35	95	63	1,80	1,70
V8 a ₂ b ₁ c ₂	42,7	94	55	51	94	95	1,86	1,72
V9 a ₂ b ₁ c ₃	53,4	89	53	49	92	85	1,73	1,60
V10 a ₂ b ₂ c ₁	27,6	92	35	33	94	62	1,87	1,77
V11 a ₂ b ₂ c ₂	41,8	93	51	47	93	91	1,93	1,78
V12 a ₂ b ₂ c ₃	52,8	88	54	48	90	86	1,79	1,59

The results of the measurements regarding the influence of the bud load on the foliar surface of the vinestocks reveal that in the variety Fetească albă, the largest foliar surface was 4.83 m²/vinestock in the variant V5 (15 buds/m²) and the smallest 3.28 m²/vinestock in V1 (10 buds/m²) and in the variety Fetească regală the foliar surface maximally developed on vinestock was 5.70 m²/vinestock in V8 (15 buds/m²) and minimum of 3.95 m²/vinestock in variant V1 (10 buds/m²). For the fertilization, the product ATONIK was used as a biostimulator, which is a growth and fructification stimulator and contains 0.2% sodium orthonitrophenolate, 0.2% sodium paranitrophenolate, 0.1% sodium nitroguaiacolate. This is a systemic product and determines the activation of the cytoplasmic flow, the faster circulation of the gross sap and assimilated substances. Its effect on the plants is of stimulating the vegetative growth, the increase in the chlorophyll content, the increase in the degree of fertility of flowers, the increase in the resistance to stress factors (drought, frost). Atonik product is compatible with most phytosanitary products and foliar fertilizers. It was applied in a dose of 0.75 L/ha, in 800 L/ha solution and two treatments were administrated, one before blooming – on June 6th – and the second at the beginning of the formation of the grapes (June 24th). The NOVA product was used as a foliar fertilizer with microelements, containing 11%, organic natrium (N), 5%phosphor (P), 8% potassium (K) and microelements (0.04% iron, 0.04% manganese, 0.32 magnesium, 0.02% borine, 0.03% zinc, 0.01% copper and 0.02% molybdenum). NOVA is an entirely organic fertilizer made of free compounds of heavy metals and toxic substances, harmful to men. This fertilizer ensures the increase in the grape production and in the content of sugars, the enhancement of the resistance to drought and frost, the correction of chlorosis and microelements, the gradual clearance of toxic

salts from the soil, the control of the heavy metals in the plants, fruits and soil. It also leads to the enhancement of the rhythm of development of the microflora and microfauna of the soil. Three treatments were administrated, the first before the blooming (June 6th), the second after the blooming (June 20th) and the last during the intense growth of the grapes (July 14th) with doses of 2 liters/ ha in 250 liters of water.

Within the phytosanitary protection factor, 9 treatments were administrated in conventional extermination and 7 treatments were administrated in (minimal) integrated extermination. The intensity, frequency and degree of attack of the main diseases (blast, mildew, must) were monitored. The data obtained revealed a higher degree of attack of blast on the leaves, of 26.36% in the variety Feteasca alba and 24.28% in Fetească regală in the minimal extermination. In the variety Feteasca regala the degree of attack of mildew on the leaves (18.07%) was higher than in the variety Feteasca alba (1.3%).

As regards the grape production, it was influenced by the bud load, the lowest production was that of the variants with 10 buds/m² and the highest in the variants with 15 buds/m². Thus, in the variety Fetească albă, the production was between 2.5 and 3.1 kg/ vinestock and in the variety Fetească regală between 3.2 – 4.2 kg/ vinestock (table 3 and 4).

Table 3

**Quantitative and qualitative grape production
in the variety Fetească albă**

Variant	Average number of grapes per vinestock	Weight of one grape, g	Kg/ vinestock	Sugars, g/L	Acidity, g/L H ₂ SO ₄	Mass 100 grape berries, g
V1 a ₁ b ₁ c ₁	33,6	83,3	2,8	191	3,3	144
V2 a ₁ b ₁ c ₂	35,4	84,8	3,0	175	3,7	142
V3 a ₁ b ₁ c ₃	38,8	80,0	3,1	170	4,0	151
V4 a ₁ b ₂ c ₁	31,2	86,5	2,7	175	3,7	143
V5 a ₁ b ₂ c ₂	39,4	76,2	3,0	172	4,0	147
V6 a ₁ b ₂ c ₃	38,9	74,5	2,9	170	4,2	150
V7 a ₂ b ₁ c ₁	28,7	87,0	2,5	193	3,7	152
V8 a ₂ b ₁ c ₂	33,7	86,1	2,9	182	3,9	151
V9 a ₂ b ₁ c ₃	31,7	85,3	2,7	175	3,6	145
V10 a ₂ b ₂ c ₁	29,7	87,5	2,6	175	4,0	153
V11 a ₂ b ₂ c ₂	39,6	78,2	3,1	170	4,1	152
V12 a ₂ b ₂ c ₃	37,5	77,4	2,9	172	3,8	150

It was asserted that the weight of grapes decreases when the load increased. In the variety Feteasca alba, the grapes had a maximum weight of 87.0 g in variant V7 (10 buds/m²) and a minimum weight of 74.5 g in variant V6 (20 buds/m²). The grapes of the variety Fetească regală weighed on an average between 72.0 and 99.3 g, with the maximum value in variant V4 (10 buds/= and the minimum value in the variant V3 (20 buds/m²). From the production quality standpoint, both varieties had the highest content of sugars in the variants with lower loads (10 buds/m²) and the lowest in the variants with higher loads (20 buds/m²). Therefore, the content of sugars in the variety Fetească albă ranged between 170 and 193 g/L and in Fetească regală between 174 and 204 g/L. The acidity content increased as the bud load increased. In the variety Fetească albă, it was between 3.3 abd 4.2 g/L H₂SO₄ and in Fetească regală between 4.8 and 5.8 g/L H₂SO₄.

Table 4

**Quantitative and qualitative grape production
in the variety Fetească regală**

Variant	Average number of grapes per vinestock	Weight of one grape, g	Kg/ vinestock	Sugars, g/L	Acidity, g/L H ₂ SO ₄	Mass 100 grape berries , g
V1 a ₁ b ₁ c ₁	40,0	85,0	3,4	204	5,4	182
V2 a ₁ b ₁ c ₂	53,6	74,6	4,0	197	5,3	204
V3 a ₁ b ₁ c ₃	58,3	72,0	4,2	182	5,6	187
V4 a ₁ b ₂ c ₁	35,2	99,3	3,5	204	4,9	203
V5 a ₁ b ₂ c ₂	46,0	82,6	3,8	200	5,3	205
V6 a ₁ b ₂ c ₃	48,4	76,4	3,7	188	5,8	187
V7 a ₂ b ₁ c ₁	37,0	86,4	3,2	195	4,8	197
V8 a ₂ b ₁ c ₂	46,0	82,6	3,8	188	5,1	182
V9 a ₂ b ₁ c ₃	46,1	78,1	3,6	178	5,3	180
V10 a ₂ b ₂ c ₁	39,6	91,0	3,6	191	5,3	204
V11 a ₂ b ₂ c ₂	46,4	90,5	4,2	188	5,4	195
V12 a ₂ b ₂ c ₃	49,5	82,8	4,1	174	5,8	187

CONCLUSIONS

1. The bud load left after the cutting influences decisively the vegetative development of the vinestocks. The data obtained reveal that in the variants with loads of 10 and 15 buds/m², the number of shoots is larger than the number of buds left on the vinestock, which means that the smaller loads stimulate the spring of the secondary and sleeping sprouts.

2. The foliar surface of the vinestocks varies depending on the variety and the bud load/m². The variety Feteasca regala had the largest foliar surface, in the variants with 15 buds/ m².

3. The fertility of the varieties expressed in absolute and relative fertility coefficients was influenced both by the grape load and by their agrobiological potential. The values of the coefficients were superunitary in both varieties, which indicates high fertility.

4. The quantitative production expressed in kg/vinestock increased as the grape load increased, the lowest production was obtained by the variants with loads of 10 buds/m² and close values by the variants with 15 and 20 buds/m². The content of sugars in the must varied depending on the variety and the grape load. In both varieties, the variants with the load of 10 buds/ m² had the highest content of sugars. The acidity content increased as the grape load increased.

REFERENCES

1. Irimia L., 2006 - *Influența tăierilor cu elemente scurte de rod asupra părții vegetativ și de producție la soiurile de viță de vie pentru struguri de vin, din centrul viticol Averești-podgoria Huși*. Teza de Doctorat
2. Țârdea C., Dejeu L., 1995 – *Viticultură*. Editura Didactică și Pedagogică, București

VARIATION OF PHYSICAL-CHEMICAL PARAMETERS IN RED WINES OBTAINED FROM ROMANIAN GRAPE VARIETIES

VARIAȚIA UNOR PARAMETRI FIZICO-CHEMICI LA VINURI ROȘII OBTINUTE DIN SOIURI ROMÂNEȘTI

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Abstract. *This present study aims at determining of physical-chemical parameters that can be used in differentiating the wines obtained from local grape sorts Băbească neagră, Fetească neagră and Codană, the latter being obtained from the sexual hybridization of the former two. The studied wines can be differentiated according to: absorption spectrums, computerized color simulation, color differences calculation and of the percentage area of the main anthocyanins.*

Key words: physical-chemical parameters, local grape sorts, absorption spectrums, color, anthocyanins

Rezumat. *În studiul de față s-a urmărit determinarea unor parametri fizico-chimici ce pot fi folosiți la diferențierea vinurilor obținute din soiurile autohtone Băbească neagră, Fetească neagră și Codană, ultimul obținut prin hibridarea sexuală a primelor două. Vinurile studiate se pot diferenția prin: spectrele de absorbție, simularea computerizată a culorii, calcularea diferențelor de culoare și a ariei procentuale a principalilor antociani.*

Cuvinte cheie: parametri fizico-chimici, soiuri autohtone, spectre de absorbție, culoare, antociani

INTRODUCTION

This study presents the main characteristics of wines obtained from local grape varieties, Băbească neagră and Fetească neagră, as well as Codană, grape sort obtained by hybridizing of Băbească neagră × Fetească neagră [5], harvested from Iași and Odobești vineyards, with different annual average temperatures (9,3, and 9,7°C).

MATERIAL AND METHOD

The grapes were harvested in 2008 and processed through classic wine-making technology [3]. The wines were analyzed after their malolactic fermentation and bottling, according to OIV regulations and specialized literature.

The alcoholic concentration, reductive sugars, volumic mass, relative density, total and volatile acidity, pH, conductivity, free and total SO₂ non-reductive extract, total dry extract, as well as anthocyanins content [4] and chromatic parameters were registered.

The chromatic parameters (L, a, b, C, H°), color intensity (I) and hue (N) were determined according to CIE Lab 76 method. Using DIGITAL COLOUR ATLAS 3

software the computerized color simulation was effectuated for underlining the color differences and for sensorial classification of the wine. Based on chromatic characteristics L, a, b, C and H^o, color differences were calculated using ΔE 1976 and ΔE 2000, for better observing if the wines obtained from the same or different grape varieties but using the same technology, can be differentiated according to these chromatic parameters.

RESULTS AND DISCUSSIONS

From the data in table 1/figure 1 and figure 2 and the wines' sensorial characteristics, the analyzed wines can be classified as follows [2]: DOC-CMD (Fn-Iași, Bn-Iași, Codană-Odobești), DOC-CT (Fn-Odobești, Bn-Odobești), IG (Codană-Iași).

Table 1

Main composition characteristics of analyzed wines

Grape variety	Fn Iași	Fn Odob	Bn Iași	Bn Odob.	Codană Iași	Codană Odob.
Alcoholic concentration (%vol.)	11,07	13,73	11,42	14,23	9,66	11,92
Relative density at 20°C	0,9949	0,9930	0,9930	0,9921	0,9940	0,9942
Total acidity (g/L C ₄ H ₆ O ₆)	7,66	7,66	7,92	7,58	6,18	6,88
Volatile density (g/L C ₂ H ₄ O ₂)	0,14	0,24	0,17	0,31	0,24	0,24
Free SO ₂ (mg/L)	11,95	8,81	10,07	15,73	7,55	23,91
Total SO ₂ (mg/L)	57,25	38,69	35,23	71,72	27,05	121,8
Reductive sugars (g/L)	3,15	2,92	1,97	2,73	1,45	2,62
Total dry extract (g/L)	25,00	27,90	22,99	27,10	18,30	25,50
Non-reductive extract(g/L)	21,85	24,98	21,02	24,37	16,85	22,88
pH	3,45	3,57	3,37	3,43	3,51	3,40
χ (mS)	2,37	2,75	2,10	2,27	2,18	2,49

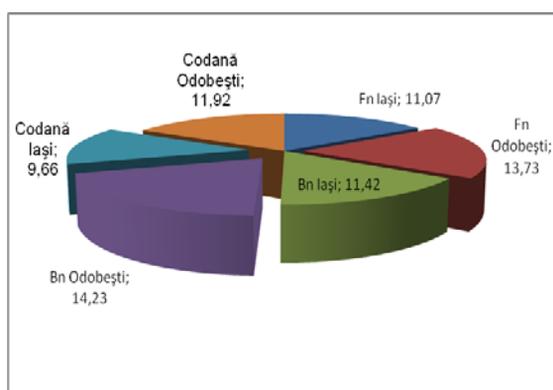


Fig. 1. Alcoholic concentration (% vol. alc.)

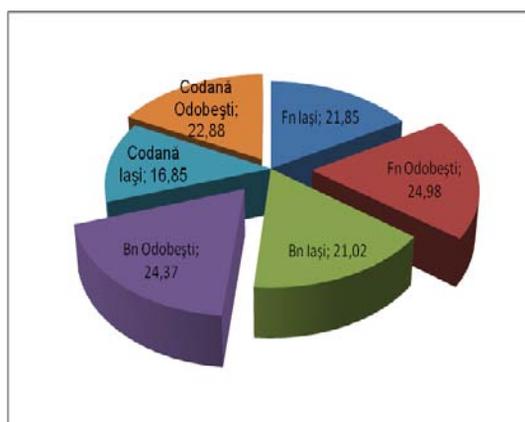


Fig. 2. Non-reductive extract (g/L)

By comparing the wines obtained from the same varieties, but harvested from different vineyards, one can say that: in the case of the wines obtained from Fetească neagră grape variety, the highest absorbance value is in the case of Fn-Iași, followed by Fn-Odobești; in the case of Băbească neagră the results are reversed; the highest value for the obtained wines from Codană grape variety is also in the case of Odobești vineyard (Tab. 2). The main fact is that the order given by the digital color's analysis for the analyzed wines is similar to the one given by the absorbance curves of the studied wines.

Table 2

Chromatic parameters' values of analyzed wine samples

Grape variety	Fn Iași	Fn Odob.	Bn Iași	Bn Odob.	Codană Odob.	Codană Iași
Computerized simulation of wine's color						
Clarity, L	25,51	45,10	51,63	51,54	59,31	70,08
Chromaticity (-a ÷ +a)	57,60	62,39	62,32	60,45	54,20	38,78
Chromaticity (-b ÷ +b)	39,16	25,29	11,98	15,76	11,32	8,69
Saturation C	69,65	67,32	63,46	62,34	55,37	39,74
Tonality H°	34,21	22,07	10,88	17,87	11,80	12,64
Intensity (A ₄₂₀ +A ₅₂₀ +A ₆₂₀)	7,63	3,27	2,45	2,55	1,22	1,18
Hue (A ₄₂₀ /A ₅₂₀)	0,46	0,57	0,58	0,57	0,67	0,96

The color intensity has decreasing values, directly proportionate with the simulated colors for the studied wines and the hue has increasing values, inversely proportional to simulated colors.

When the color differences are calculated by using the ΔE 1976 formula (Tab. 3), the less rigorous one, and also the ΔE 2000 formula (Tab. 4), the most rigorous one, major differences can be observed regarding the variety and vineyard; one can also conclude that all wines can be sensorial differentiated.

Table 3

Color difference analysis using ΔE 1976

Grape variety	Fn lași	Fn Odobești	Bn Odobești	Bn lași	Codană Odobești	Codană lași
Fn-lași	0,00	24,47	35,12	37,99	43,92	57,18
Fn-Odobești	24,47	0,00	11,67	14,83	21,54	38,17
Bn-Odobești	35,12	11,67	0,00	4,22	10,91	29,39
Bn-lași	37,99	14,83	4,22	0,00	11,19	30,09
Codană-Odobești	43,92	21,54	10,91	11,19	0,00	19,00
Codană-lași	57,18	38,17	29,39	30,09	19,00	0,00

Table 4

Color difference analysis using ΔE 2000

Grape variety	Fn lași	Fn Odob.	Bn Odob.	Bn lași	Codană Odob.	Codană lași
Fn-lași	0,00	17,98	25,49	26,60	33,64	46,18
Fn-Odobești	17,98	0,00	7,80	9,14	15,43	24,60
Bn-Odobești	25,49	7,80	0,00	2,04	7,70	17,56
Bn-lași	26,60	9,14	2,04	0,00	7,56	17,58
Codană-Odobești	33,64	15,43	7,70	7,56	0,00	10,21
Codană-lași	46,18	24,60	17,56	17,58	10,21	0,00

Also, by analyzing the results obtained regarding wine color, it can be stated that, the anthocyanins percentage from total phenolic compounds concentration registers values between 12.84 and 15.22% (tab. 5). Vineyard and phenolic maturity influences can be observed [6], the registered values being 2576.07 mg/L and 2203.01 mg/L for Fetească neagră and 1424.56 mg/L and 1798.21 mg/L for Codană.

Table 5

Total phenolic compounds content and the indexes specific to obtained wines

Grape variety	Digital wine color simulation	Phenolic compounds (mg/L)	D ₂₈₀	IFc	% anthocyanins of total phenolic compounds
Fn-lași		2576,07	31,25	19,46	15,22
Fn-Odobești		2203,73	29,10	16,65	13,23
Bn-Odobești		2033,01	25,72	15,36	13,08
Bn-lași		2025,15	15,40	15,30	13,07
Codană-Odobești		1798,21	17,78	13,58	12,84
Codană-lași		1424,56	11,92	10,76	13,66

Analyzing the total anthocyanins' content of the wines, we can underline the fact that it presents values close to Băbească neagră and very different from Fetească neagră and Codană (392.09 mg/L compared to 194.62 mg/L)(tab. 6).

Table 6

Anthocyanins' content and absorbance values at 520nm

Grape sort	Digital wine color simulation	Anthocyanins (mg/L)	A 520 Control sample	A 520 Sample
Fn-Iași		392,09	0,1664	1,1853
Fn-Odobești		291,48	0,2103	0,9687
Bn-Odobești		265,90	0,1415	0,8337
Bn-Iași		264,79	0,0883	0,7776
Codană-Odobești		230,86	0,1415	0,7429
Codană-Iași		194,62	0,0580	0,5656

The established order for the anthocyanins content of the studied wines is the same with the established hierarchy based on the total phenolic compounds concentrations, the absorption spectrums and with the digital wine color simulation.

Table 7

**Area percentage values of the main nine anthocyanins
(% anthocyanins ± standard deviation)**

Grape variety	Fn Iași	Fn Odob.	Bn Iași	Bn Odob.	Codană Iași	Codană Odob.
Del-3-gl (%)	5,87 ±0,19	3,28 ±0,15	2,13 ±0,03	1,30 ±0,02	1,55 ±0,01	0,60 ±0,01
Cya-3-gl (%)	0,35 ±0,01	0,19 ±0,01	0,00 ±0,00	0,00 ±0,00	0,11 ±0,01	0,00 ±0,00
Pt-3-gl (%)	11,96 ±1,23	7,93 ±1,04	4,74 ±1,12	4,76 ±0,87	3,77 ±0,89	2,31 ±0,34
Po-3-gl (%)	1,51 ±0,45	4,08 ±0,08	0,65 ±0,05	0,71 ±0,07	2,31 ±0,12	2,05 ±0,09
Mv-3-gl (%)	63,80 ±9,60	70,86 ±12,13	67,48 ±7,56	84,69 ±8,73	61,12 ±3,44	77,20 ±6,89
Po-3-gl-acet (%)	2,14 ±0,02	0,42 ±0,02	0,25 ±0,01	0,31 ±0,00	1,08 ±0,01	0,87 ±0,00
Mv-3-gl-acet (%)	2,99 ±0,12	3,33 ±0,17	8,54 ±0,23	7,98 ±0,12	13,17 ±0,1	9,70 ±0,12
Po-3-gl-cum (%)	1,23 ±0,21	1,89 ±0,12	0,81 ±0,04	0,00 ±0,00	2,17 ±0,02	1,01 ±0,01
Mv-3-gl-cum (%)	10,16 ±2,01	8,02 ±1,08	15,40 ±1,23	0,24 ±0,00	14,72 ±2,14	6,25 ±0,45
Σgl/(Σacet+Σcum)	5,05 ±0,00	6,32 ±0,03	3,00 ±0,04	10,71 ±0,04	2,21 ±0,01	4,61 ±0,02
Σacet/Σcum	0,45 ±0,00	0,38 ±0,01	0,54 ±0,02	33,91 ±0,02	0,84 ±0,01	1,46 ±0,01

As it can be seen in table 7, the values of area percentage, obtained by means of HPLC, for each main anthocyan, can differentiate the studied wines.

CONCLUSIONS

1. The studied wines can be differentiated according to: absorption spectrums, computerized color simulation, color differences calculation, percentual area of the main anthocyan.

2. The anthocyan content shows an influence of the vineyard and also of the maturity degree at harvest.

REFERENCES

1. **Cotea V.V., Cotea D.V., 2006** - *Tehnologii de producere a vinurilor*. Editura Academiei Române, București.
2. **Pomohaci, N., Stoian, V., Gheorghită, M., Sîrghi, C., Cotea, V.V., Namoloșanu I., 2000** - *Oenologie*, vol. I, *Prelucrarea strugurilor și producerea vinurilor*. Editura Ceres, București.
3. **Pomohaci N., Cotea V.V., Popa A., Stoian V., Sîrghi C., Nămoșanu I., Antocea Arina, 2001** - *Oenologie*, vol.2, *Îngrijirea, stabilizarea și îmbutelierea vinurilor. Construcții și echipamente vinicole*. Editura Ceres, București.
4. **Ribéreau-Gayon J., Sudraud P.P., Milhe J.C., Canbas A., 1970** - *Recherches technologiques sur les composés phenoliques des vin rouges*. *Conn. Vigne Vin.*, 4.
5. **Rotaru Liliana, 2009** - *Ampelografie*, vol. III. Ed. „Ion Ionescu de la Brad”, Iași.
6. **Țârdea C., 2007** - *Chimia și analiza vinului*. Editura „Ion Ionescu de la Brad”, Iași.

EVALUATING THE QUALITATIVE POTENTIAL OF SOME BREEDS OF BLACK GRAPES FROM SEGARCEA WIN-GROWING AREA

EVALUAREA POTENȚIALULUI CALITATIV AL UNOR SOIURI DE STRUGURI NEGRI DIN AREALUL VITICOL SEGARCEA

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Abstract. Due to its heliothermic resources, Oltenia represents the region with the highest favorability for growing black grapes in our country, they having a polyphenolic potential superior to the other wine-growing areas and a more intense cumulation in sugars, resulting red wines of a superior quality very much appreciated both in the country and abroad. The study developed within 2007-2008 aimed to be realized a comparative frame between famous breeds in the autochthonous wine-growing (Cabernet, Sauvignon and Merlot) and mediteranean breeds recently introduced in cultivation (Siraz and Marcelan) cultivated in the pedoclimatic conditions of Segarcea wine-growing area. In this way, realizing the comparative frame, encloses along the analysis of some qualitative parameters from the grapes of the analyzed breeds (acidity, sugars, poliphenols) during the aging activity and an attentive monitoring of the climatic factors (the air's temperature, relative humidity of the air, light) as well as establishing some correlations between these parameters.

Key words: black grapes, heliothermic resources, wine

Rezumat. Oltenia, datorită resurselor heliotermice ridicate, reprezintă regiunea cu cea mai mare favorabilitate pentru cultura strugurilor negrii din țara noastră, aceștia având un potențial polifenolic superior celorlalte zone viticole precum și o acumulare mai intensă în zaharuri, rezultând vinuri roșii de calitate mult apreciate atât în țară cât și în străinătate. Studiul întreprins în perioada 2007-2008 a vizat realizarea unui cadru comparativ între soiuri consacrate în viticultura autohtonă (Cabernet Sauvignon și Merlot) și soiuri de proveniență mediteraneană, recent introduse în cultură (Syrah și Marcelan) cultivate în condițiile pedoclimatice ale arealului viticol Segarcea. În acest sens, realizarea cadrului comparativ cuprinde pe lângă analiza unor parametrii calitativi din strugurii soiurilor luate în analiză (aciditate, zaharuri, polifenoli) în timpul perioadei de maturare și o atentă monitorizare a factorilor climatici (temperatura aerului, umiditatea relativă a aerului, lumina) precum și stabilirea unor relații între acești parametrii.

Cuvinte cheie: struguri negrii, resurse heliotermice, vin

INTRODUCTION

Since 1955, Florov A. and his collaborators have studied the dynamics of some biochemical substances from the grapes (sugars, acids, tanning materials,

azote, flavours, vitamins, enzymes and mineral substances), establishing their accurate proportions in different moments of the ripening process.

In order to reach a certain type of wine, with normal biochemical composition and pleasant organoleptic features, both the wine-grower and the oenologist must study first very attentively the row materia and the grapes aging phenomena (Ribereau - Gayon P., Peynaud E.-1960-1961). The grape's polyphenols proved to be the most important ones after sugars and acids: they confer color to wines, the smooth or astringent taste, the exactiveness and corpulence, physical-chemical stability (Puissant A., Huguette L.-1967, Popa A.-1996, Țârdea C. and collab.-2000, ș.a.). The climate's influence upon the grapes composition and implicitly of the obtained production quality was studied by various researchers.

Due to the changes of the climatic conditions occurred over the last years, it is imposed a rigorous monitoring of them in order to establish the hydric and thermic stress level to which the vine is submitted with consequences upon the qualitative potential. For a more accurate establishment of the best moment for harvesting the grapes, many ripeness parameters and indexes are used (Abbal and collab.- 1992, Panigai and collab.-1994).

MATERIAL AND METHOD

The supervision of the climatic data has been achieved by means of the weather station set up on the vine plantation belonging to S.C. Domeniul Coroanei S.R.L. The biological material used for analysis consisted in grapes of well-known varieties Cabernet Sauvignon and Merlot, also sorts of mediterranean sorts newly introduced in cultivation (the fourth year of plantation) Syrah and Marcelan. The organization of the experiments had been done by the method of the randomized blocks, with four versions, representing the studied varieties, cultivated in the same edaphical and orographical conditions (plateau). The qualitative analysis of the mentioned sorts was realized at a distance of five days during the ripening period and it comprised: mass determination of one hundred grains by means of automatic analytical balance for laboratory, sugars determination obtained with the refractometry method (Abbe refractometer), total acidity value with Mettler Toledo titrimetric method. The following of the ripening process of autochthonous and mediterranean varieties was achieved by determination of the glucoacidimetric index expressed according to the calculation formula: $I.G.A.=G/At$, in which G signifies sugars quantity (glucides) and At means total acidity of the respective sort. The determination of the colouring substance was obtained spectrophometric (spectrophometer UV-150pc) with the method elaborated by Puissant A. and Huguette L. The dynamics of phenolic compounds was followed at five days distance starting with the first of August until the harvesting moment.

RESULTS AND DISCUSSIONS

Climate supervision was effected with the purpose of evaluation of some restrictive climatic indicators, with effects on the bioproductive and qualitative behaviour of the analysed sorts, the obtained data were processed and analysed by means of some general climatic indicators (unicriterial).

As general climatic indicators have been processed data concerning: thermic resources evaluation (absolute maximum and minimum temperatures, medium temperatures), evaluation of the light resources, precipitation conditions, also the relative air humidity. Thermic resources represent the permanent element which through its variability determines the most important manifestations of the vine (Martin T., 1968). Also it is known the inferior level which releases the biological processes of the vine on 10°C. According to the recorded data from table 1 it is noticed that this level was achieved at Segarcea in the year 2008, late spring (March-April) when there were recorded monthly medium temperatures of 8,5°C, respectively 12,2°C, correlated with low absolute minimum temperatures (-4,9°C in March). An orientative estimation criterion of the quality conditions of the grapes is the medium temperature belonging to the warmest month (July-August), that for Romania is a minimum of 18,5°C and a maximum of 23,2°C. In the vine area of Segarcea, August, 2008 represented the month with the highest thermic parameters registering a medium temperature of 24,5°C. It is noticed the surpass of the maximum level of temperature specific to our country, the rise of this thermic indicator is bounded with the accumulation of the compounds responsible firstly for the quality of black grapes and secondly for the red wines (tables 1 and 2). The absolute maximum temperature in August represents a restrictive factor for the quality of grapes when surpasses the value of 42°C.

Table 1

Climatic parameters registered in the year 2008, in the wine-growing district Segarcea

Month	Air temperature (°C)			Precipitations (mm)	Air relative moisture (%)	Insolations (hours)		
	Max.	Med.	Min.			∑I	∑ia	∑ir
I	9,8	-3,6	-17,2	30,4	91,0	53,8	2438,7	1684,6
II	18,5	3,2	-9,7	2,4	77,0	120,7		
III	21,2	8,5	-4,9	14,8	63,0	182,6		
IV	24,7	12,2	2,1	56,4	76,0	253,2		
V	34,0	16,8	4,2	34,6	71,0	280,6		
VI	35,2	21,3	9,1	130,4	70,0	304,7		
VII	36,2	23,8	11,1	59,2	50,0	335,9		
VIII	38,0	24,5	12,6	2,4	50,0	369,0		
IX	36,2	16,7	4,0	76,0	67,0	241,2		
X	24,4	12,53	0,6	78,8	82,0	145,4		
XI	22,6	6,08	-7,1	13	85,0	74,8		
XII	15,5	2,0	-12,1	111,2	93,0	46,8		

When the air temperature touches this value the photosynthesis process is blocked bringing to a intensification of the breathing and evapoperspiration processes resulting a decreasing content of organic acids (malic acid), glucides and flavoured substances. This phenomenon was not registered in none of the

varieties studied in 2008 at Segarcea, the maximum temperature touched in August was 38°C. In the analysed period the value of this factor was of 32,6°C.

Generally, the studied year, from the hygroscopicity point of view, represents a normal year for the optimum growth of the vine (the values oscillated from the minimum level of 50% in July and August to 80-90% during the repose period). From the precipitation point of view, we can say, analysing the data registered in table 1, that it was a droughty year imposing the insurance of a hydric regime through irrigation. The light presents daily oscillations, the requests of the vine are different according to the species, variety, age and vegetation phase. This is expressed by the global annual sum of the insolation hours (potential $\sum ia$) and the sum of the effective shining hours (actual $\sum ir$). According to $\sum ir$ after calculations it is noticed a high favourability of the analysed year (1684,6 hours), and the data obtained according to $\sum ia$ indicate the high presence of light, mainly in the ripening period (2438,7 hours). These aspects are extremely important, the content of the studied grapes, in means of colouring substance, depends on the quantity of insolation (Marcelan varieties accumulates 5309 mg/kg). In the last two decades, it is found a growth in the interest for scientific research in the area of viticulture regarding those chemical elements found in grapes that establish the specificity of the different wine categories.

Meaningful in this purpose are the researches regarding the qualitative and polyphenolic potential of the grapes, decisive elements for black grapes. With this purpose the curve of ripening was followed through determination of sugar, acidity and the mass of one hundred grains, for each studied variety also for the phenolic potential to time intervals exactly established. Because of the small amount of precipitations registered during the vegetation and ripening processes it is noticed a constant growth in the grains weight, without significant variations. Among the well-known varieties we notice that Merlot has a more constant rhythm of growth as the variety Cabernet Sauvignon (133,1 g compared to 117,1 g). Among the mediterranean varieties it is noticed the Syrah with a harvesting weight of 141,0 g/100 grains (table 2). At the beginning of the ripening period the variety Cabernet Sauvignon is noticed through a high acidity (12,3 g/l), opposite to it there is the variety Merlot with 9,1 g/l acidity expressed in sulphuric acid. Because of the drought from the maturation period (2,4 mm/m) there are noticed rapid reductions of acidity to all studied varieties until the first part of September.

The variety which obtained the highest content of acidity in the process of technological maturation was Cabernet Sauvignon (5,5 g/l), the lowest acidity was registered with the variety Marcelan (4,5 g/l). Progressive quantitative accumulations, more or less spectacular, lead to the achievement of a superior level of sugars at maturation, separated on varieties, with a maximum of 277 g/l in Marcelan and a minimum of 225 g/l in the variety Cabernet Sauvignon (table 2). Following the dynamics of the maturation index it is noticed that in the year 2008, in the established climatic conditions, all the sorts met the necessary

conditions for the achievement of quality red wines, the best ripening had been obtained by Merlot, followed by Marcelan, Syrah and Cabernet Sauvignon.

Table 2

Determination of the qualitative parameters of the studied sorts in the wine-growing district Segarcea

Parameters	Sorts	Calendaristic data						
		10VIII	15VIII	20VIII	25VIII	30VIII	5IX	10IX
Mass of 100 grains (g)	Cabernet Sauvignon	60,5	69,2	78,4	84,5	98,3	114,2	117,1
	Merlot	76,4	81,4	92,4	100,4	111,2	129,5	133,1
	Syrah	85,2	98,6	107,6	119,7	128,3	137,4	141,0
	Marcelan	68,3	73,9	80,3	87,8	97,4	107,9	115,3
Acidity (g/l H ₂ SO ₄)	Cabernet Sauvignon	12,3	10,8	9,5	8,2	7,1	6,2	5,6
	Merlot	9,1	8,5	7,8	7,1	6,2	5,4	4,6
	Syrah	10,1	9,3	8,5	7,0	6,1	5,2	4,6
	Marcelan	11,0	9,5	8,7	7,3	6,6	5,3	4,5
Sugars (g/l)	Cabernet Sauvignon	164,0	170,0	181,0	200,0	212,0	223,0	225,0
	Merlot	186,0	193,0	212,0	228,0	249,0	251,0	250,0
	Syrah	170,0	187,0	191,0	203,0	214,0	246,0	248,0
	Marcelan	186,0	206,0	232,0	248,0	265,0	270,0	277,0

In terms of the colouring substances, after the effectuated investigations it was noticed that on the base of a low pluviometric regime during the period of vegetation and maturation correlated with strong sunshine length and temperature (ripening period), accumulation of total poliphenols was intense to all analysed varieties, Marcelan and Cabernet Sauvignon have been remarked through a high phenolic potential at harvesting (5309 mg/kg respectively 5187 mg/kg) closely followed by Syrah with 5111 mg/kg and Merlot with a poliphenolic content of 4946 mg/kg (figure 1).

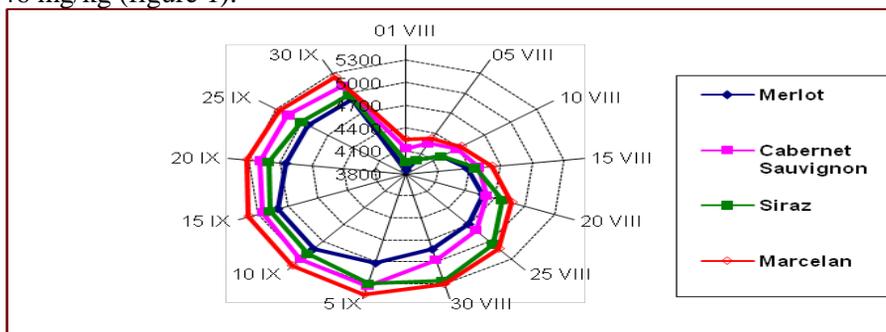


Fig. 1. The dynamics of total poliphenols to the studied varieties in the viticultural area Segarcea

Accordingly to this point of view the studied varieties fulfil the demands of high quality vinification.

CONCLUSIONS

The thermic and hydric stress installed in the year 2008 in the district of Oltenia affected a large part of the species from the cultivated area. Vine thanks to its distinct endurance to drought, succeeded by the help of viticultors (irrigation was imposed) to achieve a plurality of substances (glucides, acidity, total polyphenols), which allowed oenologists to reevaluate the harvest of the year 2008 under the aspect of high quality products.

Because of the drought installed towards the end of the vegetation period and during the ripening process, in the studied grape varieties had been noticed qualitative modifications of the glucides and acidity, in terms of dynamics modification. So, it is remarked a low dynamics of the glucides to Merlot and Syrah, and insignificant rise to Marcelan and Cabernet Sauvignon, meanwhile the acidity is maintained to a constant level to all the studied sorts.

Despite of the remembered restrictive conditions both the well-known varieties of grapes and the mediterranean varieties have been noticed through a high phenolic potential at harvesting.

All varieties of grapes destined to the achievement of red quality wines or mass consumption wines found in the south part of Romania specific conditions of temperature and light necessary for the synthesis of those compounds that give colour, corpulence and delicacy to the wine. The wines from Segarcea are famous and appreciated both at national level and at mondial level.

These aspects fulfil the observations made in the late years from the point of view of the adjustment of the mediterranean varieties newly introduced in the vine culture of the wine-growing district Segarcea.

REFERENCES

1. **Abbal P., Boulet J.C., Moutounet M., 1992** - *Utilisation de parametes physiques par la caracterisation de la veraison des baies de raisin*. J.Intern. Scint. Vigni Vin. Nr.4
2. **Florov A.M., Bagreev, Agabaliant G.G., 1995** - *Chimia vinului*. Ed. Tehnică. Moscova.
3. **Panigai L., Tribault-Sovier I., Moncomble D., 1994** - *Acidite des raisins et typicite de l'annee. Le vigneron champenois*. Nr.9.
4. **Puissant A., Huguet L., 1967** - *La matiere colorante des grains de raisins de certains cepages cultives en Anjou en 1965*. Annales de Tehnologie Agricole. No. 16, pp. 217-226
5. **Popa A., 1996** – *Vinul*. Ed. Didactică și Pedagogică, București
6. **Ribereau-Gayon P., Peynaud E., 1960-1961** - *Traite d'Enologie. Vol.I și II*. Ch. Beranger. Paris et Liege.
7. **Martin T., 1968** - *Viticultura*. Ed. Agro Silvică, București
8. **Țârdea C., Sârbu Gh., Angela Țârdea, 2001** - *Tratat de vinificație*. Ed. Ion Ionescu de la Brad. Iași

THE APPEARANCE INCIDENCE OF SOME OXIDATIVE YEAST SPECIES IN THE ECOTOPE BANU MARACINE

INCIDENȚA APARIȚIEI UNOR SPECII DE LEVURI OXIDATIVE ÎN ECOTOPUL BANU MĂRĂCINE

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Abstract. *The research has been made at the vineyard Dealurile Craiovei, S.D. Banu Maracine during 2006-2008, and focused on the appearance incidence, under the influence of the climatic factors (temperature and humidity), of the Candida spp. yeast. The temperature and the humidity of the air, also the rainfall constitute essential features of the climate in a certain viticultural area, with decisive impact on the microorganisms biological, physiological and biochemical processes, with implication on their distribution on the viticultural area. In order to obtain correct correlation between the depending factors (the number of yeasts strain isolated) and the independent factors (temperature and air humidity), all the data has been percentage expressed. For complex ecosystems, including the spontaneous flora there has been developed new methods for inventorying the yeast from a sample – without avoiding the cultural and isolation stages – and measures regarding the global evaluation of the development dynamics and of all the physiological index which reflect the metabolic and cellular activity.*

Key words: oxidative yeast, climatic factors, ecotope Banu Maracine

Rezumat. *Cercetarile au fost efectuate în plantația viticolă de la S.D. Banu Maracine 2006-2008, și s-au axat pe incidența de apariție a unor specii de levuri oxidative, sub influența factorilor climatici (temperatura și umiditatea). Temperatura și umiditatea aerului, inclusiv precipitațiile constituie caracteristici importante ale climatului în anumite zone viticole, cu un impact decisiv asupra proceselor biologice, fiziologice și biochimice ale microorganismelor, cu implicații asupra distribuției acestora în arealul viticol (Popa, A. Teodorescu Șt. 1990). Pentru a obține corelații corecte între factorii dependenți (numărul de specii izolate) și factorilor independenți (temperatura și umiditatea), toate datele au fost exprimate procentual. Pentru ecosisteme complexe, inclusiv flora spontană, sunt dezvoltate noi metode pentru a realiza inventarul tulpinilor aflate într-un eșantion – fără a ocoli etapele de cultură și izolare - și măsuri privind evaluarea globală a dinamicii de dezvoltare și a tuturor indicatorilor fiziologici care reflectă activitatea metabolică și celulară.*

Cuvinte cheie: levuri oxidative, factori climatici, ecotopul Banu Maracine

INTRODUCTION

The yeasts are eukariotic microorganisms made from a single cell. Like anyother microorganism, the yeasts are opened thermodynamic systems, changing matter and energy with the environment. These functioning conditions become clearly defined only if the environmental parameters are equally well defined. In

order to understand and forecast the microorganisms behaviour, it is necessary the characterization of the metabolic and cellular state of the microorganisms placed in their micro-climate (Bouix M., Leveau J.Y., 2001).

For complex ecosystem, including the spontaneous flora, there has been developed new methods for inventorying the strains from a sample – without avoiding the cultivation and isolation stages – and measures regarding the overall evaluation of the development dynamics and all the physiological index that reflect the metabolic and cellular activity.

During the past years there has been realized many ecological studies for knowing the dynamics, the quantification and the microflora composition responsible for the spontaneous fermentation of the must.

The largest part of the yeasts population are distributed in the soil, water and air. They form communities of species, well defined in their habitat. The yeast being chemo-organotrophic, they are encountered only in that areas where they found the sources of organic carbon needed for the growth and development. Because different species need different sources of organic carbon (selective nutrition), in the biosphere their dispersion it is very well determined on species categories (Belin J.M., 1981).

MATERIAL AND METHOD

The research has been made in the vineyard of the Didactical Station Banu Maracine, during 2006 – 2008 and focused on the appearance incidence of some oxidative yeasts, under the influence of the climatic factors (temperature and humidity).

The temperature and air humidity, including the rainfall constitute important features of the climate in certain viticultural areas, with a decisive impact on the biological, physiological and biochemical of the microorganisms, with implication on their distribution in the viticultural area.

For the data base used in the statistical analyze, we have selected only the climatic data with maximum values (table 1, 2), the use of the average and of the temperature degree summ can introduce yearly errors to the calculus and results.

In order to obtain correct correlation between the depending factors (number of yeast strain isolated) and the independents factors (the temperature and air humidity) all the data has been expressed percentage (table 5).

For the collecting of the soil samples used for isolate the yeast strains from the viticultural are Banu Maracine, there has been established 25 collecting stations.

The spreading degree of the data has been verified through the variance analyze, and the estimation of the differences between the isolated species has been verified through the calculation of the transgression probabilities, obtaining $p=0,05516\%$ for all the research years; we conclude that the results of the statistical analyze are significant for $t=3,5984$ and 21 liberty degrees.

RESULTS AND DISCUSSIONS

For the mathematical modelling of the entire experiment, there has been tested many type of curves: liniar, exponential, logarithmical, sygmoide, square and cubical. The type of curve that has represented most accurate the experiment

has been second degree function, with the interaction of the independent factors, the selection of the function being made through calculus as well the selection of the regression coefficient with the highest value (closer to the value 1).

There has been calculated the coefficient of simple correlation between the distribution frequency of the isolated yeasts strains from the vineyard soil during March – October and from the grapes during June – October (depending factors), as well the raw values monthly temperature and humidity, during the 3 years of research 2006 – 2008, these data being presented in the table 3.

In the table 4 there are presented the regression function characteristic for each isolated species, where „x” represent absolutely all the values of the air temperature during 2006 – 2008, and „y” represent absolutely all the values of the air humidity during the same period. The fifth term of the equation represent the interaction of the two independent factors and mathematically reproduce the cumulated value of their influence on the distribution frequency of the isolated yeast species from the viticultural ecotope Banu Maracine. We mention that all the results of the statistical analyze and the mathematical modelling reflect the researched period 2006 – 2008.

The results obtained after the isolation does not respect the reality in the nature (soil, grapes, must and wine), that it is why the yeast species dispersion has been presented only after a previous statistical analyze through their dispersion frequency, percentage expressed (table 4).

Thus from the data presented in table 4 it come out that the appearance incidence of the strains species *Brettanomyces claussenii* has been of 0,35% from the total of the isolated yeast population. Although the variation of the air relative humidity had a lesser influence, the percentage development of the species population in 2008 has been attributed to the higher level of the rainfall from the spring, being known the rapid development of this species in liquid media.

From the species of the *Candida* genre, *Candida stellata* had an appearance incidence of 0,4%, higher than the one of the species *Candida vini* which had presented an appearance incidence of 0,38% from the total of the isolated yeast populations. The two species have presented similar curves of the frequency during the research years: from average values in 2006, they suffer a decline in 2007 due to the lack of rainfall from spring; the rainfall from 2008 have positively acted on the increasing of the strains frequency. From the climatic factors taken in to study, the temperature had a significant positive action only on the appearance frequency of the species *Candida stellata* and the air relative humidity had a significant positive action only on the appearance frequency of the species *Candida vini*.

Table 1

**The maximum value of the temperature recorded at the Meterological
Station Banu Mărăcine(2006-2008)**

Year	Month												Yearly average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2006	0,3	3,2	10,1	12,3	21,3	23,2	31,4	29,5	23,7	18,2	11,4	4,0	10,9
2007	8,4	7,3	12,3	15,4	21,5	25,4	33,8	31,0	23,4	13,9	8,6	3,4	12,4
2008	0,1	5,7	13,8	18,5	22,2	27,0	30,3	32,4	28,5	21,2	15,2	7,6	11,9
Average 2006- 2008	2,9	5,4	12,0	15,4	21,6	25,2	31,8	30,9	25,2	26,3	17,7	5	11,7

Table 2

**The air relative humidity recorded at the Meterological
Station Banu Mărăcine(2006-2008)**

Year	The air relative humidity (%)												Average U.R./year (%)
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2006	85	83	73	70	65	72	61	70	69	75	73	90	73
2007	69	72	64	46	60	57	36	66	71	77	85	91	66
2008	91	73	57	69	65	62	55	50	66	76	71	85	68
Average 2006-2008	81,6	76	64,6	61,6	63,3	63,6	50,6	62	68,6	76	76,3	88,6	69,4

Table 3

The coefficient of the simple correlation between the strains frequency of the isolated yeasts from soil and grapes and the climatic factors

Nr. crt	Non-sporogenous yeast	Correlations with the temperature	Correlations with the humidity
1	<i>Brettanomyces claussenii</i>	0,284	0,372*
2	<i>Candida vini</i>	-0,114	0,495**
3	<i>Candida stellata</i>	0,520**	0,422*
4	<i>Torulopsis bacillaris</i>	0,783**	0,189
5	<i>Kloeckera apiculata</i>	0,254	0,441*
6	<i>Rhodotorula mucilaginosa</i>	-0,071	-0,270

*Significant correlation for $p=0,05\%$; ** Significant correlation for $p=0,001$

Table 4

The equation of the regression curves with the factor interaction

Species	Equation
<i>Brettanomyces claussenii</i>	$1,3817-0,1807x-0,5878y+0,044x^2-0,032xy+0,0981y^2$
<i>Candida vini</i>	$-1,545 +0,7809x+0,0042y-0,0576x^2-0,0738xy+0,0414y^2$
<i>Candida stellata</i>	$-1,032 +0,2408x+0,231y+0,0003x^2-0,0475xy+0,0026y^2$
<i>Torulopsis bacillaris</i>	$-0,8829-0,0277x+0,3894y+0,022x^2-0,0134xy-0,0327y^2$
<i>Kloeckera apiculata</i>	$6,0797-0,9085x-2,1282y+0,0218x^2+0,1969xy+0,1756y^2$
<i>Rhodotorula mucilaginosa</i>	$3,6399-0,9043x-0,7608y+0,0428x^2+0,1314xy+0,0229y^2$

x=air temperature și y=air relative humidity

Table 5

The strains appearance incidence of the yeasts isolated from the soil, grapes, must and wine during the three years of research (2006-2008 Banu Mărăcine)

Nr.	Species	Total strains 2006-2008	The appearance incidence %
1	<i>Brettanomyces claussenii</i>	40	3,54
2	<i>Candida vini</i>	42	3,85
3	<i>Candida stellata</i>	43	4,02
4	<i>Torulopsis bacillaris</i>	53	4,95
5	<i>Kloeckera apiculata</i>	84	5,57
6	<i>Rhodotorula mucilaginosa</i>	35	3,12
Total non-sporogenous yeasts		294	25,05

The species *Torulopsis bacillaris* had constant level of the appearance incidence (approximately 0,5%), the evolution tendency being significantly positively influenced in all the research years, by the variation of the temperature, 64,0%.

The strains distribution high level of this species in the viticultural area has encountered also in the microflora from the must,. The air relative humidity had no influence on the appearance incidence of this species strains.

Known as the most spreaded species in the yeast populations that control the fermentation process, *Kloeckera apiculata*, with 0,55% from the total of the yeast strains during 2006, has presented a drastic decrease of the appearance incidence level during the summer of 2008, 0,24%. The factor that acted significantly positive to the increase of the appearance incidence of the species (19,4%) has been the air relative humidity.

From all the yeast species isolated from the viticultural ecotope Banu Maracine, *Rhodotorula mucilaginosa* has the most affected species with an appearance incidence of 0,31% from the total of the yeast strains.

The way that the yeast responde to the climatic factors action has been different, emphasizing the different character of the species. During 2007 the amount of the rainfall was small, almost droughtness, affecting the number of the yeast species. Thus, in 2008, has increase the number of the oxidative species, especially for the species *Candida*, *Brettanomyces*. Through the positive evolution of the species *Kloeckera* and *Torulopsis*, we can forecast that in the following year these species will be majoritary during the first days of the fermentation.

CONCLUSIONS

Analyzing the appearance frequency of the non-sporogenous yeast during the three years of research, it came out that within the viticultural biocoenosis Banu Maracine, the non-sporogenous yeast population has passed through a decline period, the major reason being the climatic changes that occurred at the beginning of 2007. In generally, the appearance frequency of the non-sporogenous yeast has decrease.

In any vineyard, the spontaneous fermentation it is not conducted by the same strains year after year; there is no strain specificity and that's why it does not participate to the vineyard features.

The study of the yeast ecology can be a perpetual research theme, tack into consideration the permanent changes of the climatic factors.

REFERENCES

1. **Belin J.M., 1981** - *Biologie des levures liees a la vigne et au vin*. These Docteur en Sciences Naturelles, Universite de Dijon.
2. **Bouix M., Leveau J.Y., Cuinier C., 1981** - *Conn. Vigne Vin*. 15, p.41–52.
3. **Castelli T., 1967** - *Ecologie et systematique des levures du vin*. II^{eme} Symposium International d'Enologie, Bordeaux-Cognac, INRA Ed. Paris.
4. **Delfini C., 1995** - *Scienza e tecnica di microbiologia enologica*. Il Lievito, Asti.
5. **Heard G.M., Fleet G.H., 1987** - *Appl. Environ. Microbiol.* 51, 539–45.
6. **Popa I.A. și Teodorescu C. Șt., 1990** - *Microbiologia vinului*. Ed. Ceres, București.

STUDIES CONCERNING MORPHOLOGICAL AND BIOCHEMICAL PROPERTIES OF SOME YEAST STRAINS INVOLVED IN WINE FERMENTATION

CERCETĂRI PRIVIND CARACTERELE MORFOLOGICE ȘI BIOCHIMICE ALE UNOR TULPINI DE LEVURI IMPLICATE ÎN VINIFICAȚIE

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***Abstract:** Study of yeasts from certain wine growing region is very important for fermentative processes and for insurance of wine stability. In this paper we characterize the yeast strains from different wine types regarding cultural, colonial, morphological and biochemical properties, and regarding the behaviour response to various physical factors. The tests for yeasts fermentative properties give the possibility to exclude the strains which have unfavourable activity in growth medium and keep those strains with useful properties*

Key words: yeast, fermentation, corona discharge.

***Rezumat:** Studiul levurilor dintr-o regiune viticolă este foarte important pentru desfășurarea proceselor fermentative și pentru asigurarea stabilității vinurilor. În lucrarea de față tulpinile de levuri izolate din diferite vinuri au fost caracterizate din punct de vedere al caracterelor culturale, coloniale, morfologice și biochimice, precum și din punct de vedere al comportamentului la stresul produs de diferiți factori fizici. Testele care caracterizează levurile din punct de vedere fermentativ dau posibilitatea să fie excluse acelea care au o acțiune nefavorabilă asupra mediului pe care se dezvoltă, fiind reținute cele cu caracteristici utile pentru scopul urmărit.*

Cuvinte cheie: levuri, fermentație, descărcare corona

INTRODUCTION

Numerous studies showed important role of microorganisms in wine qualities. The species and strains of yeasts used for fermentation in wine making process contribute to developing or reduction of some properties of wine (Popa, Teodorescu, 1990).

The taxonomic study of yeasts from certain viticultural region represents the base of indispensable knowledge for rational use of these microorganisms in fermentation process and for ensuring and control of wine stability (Pomohaci et al, 2001).

MATERIAL AND METHODS

This paper contains the specifications of some particularities of certain yeast strains, isolated from two different wines, Feteasca neagra and Merlot.

We used three samples of wine at the beginning of fermentation (two samples of Feteasca neagra and one sample of Merlot). From these samples of wine we isolated seven strains of yeast with distinct cultural and colonial characteristics, by inoculating on YPG solid medium (yeast extract - peptone - glucose - agar), under the form of isolated colonies. The method for obtaining isolated colonies was the streak plate technique.

The selected yeast strains were preserved in culture tubes on the YPG solid medium slants.

The morphological study of a selected yeast strains presumed the microscopic examination of a 24 hours yeast cell suspension in YPG liquid medium. The dimensions of cells were determined with micrometer. For each sample were measured 50 cells for five repetitions.

The capacity of selected yeast for nitrate assimilation was studied, using a proper liquid medium (with glucose, potassium acid phosphate, magnesium sulphate, calcium chloride, sodium chloride, growth factors and potassium nitrate). The inoculated samples were maintain 15 days at 25°C and the level of cultures development was observed.

The capacity of yeast to ferment sugars was studied, using a liquid medium with rigorous amount of sugars (glucose, saccharose, galactose, maltose, raffinose, lactose) and Durham tubes for distinguish gas production. The capacity of yeast to ferment certain sugars depends of presence in cells of some specific enzymes. It is a firm character, which may helps to identify yeasts (Popa, Teodorescu, 1990).

In the last stage of our experiment, the behaviour of selected strains of yeast in electrical field (negative corona discharge) was observed. The exposure in electrical field is an alternative method to sterilisation of fresh grape juice in wine making process (Aubrecht et al, 1999).

We used a device with one anode and one cathode, like two wire with small radius of curvature; the exposure dose represents the product between electric intensity (17 μ A) and exposure time. The exposure time varied between 5 minutes to 15 minutes. We used a witness lot (without exposure) to compare the results. The experiences were repeated for three times.

After exposure, the number of yeast cells were estimated with Thoma chamber. It was observed the modification of viable cells number. The cells count was repeated for five times for each sample and then was calculated their arithmetic average.

RESULTS AND DISCUSSIONS

The yeast cultures were relatively uniform, with exuberant growth in liquid medium. On the YPG solid medium, the yeast colonies from wine samples had regular form and appearance, with complete bounds, white or yellow colour, gentle convex. We selected seven strains (three white colonies and four yellow colonies).

The morphological study of all seven selected yeast strains showed the spherical - ovoidal cells, with various dimension: for 1b₁ strain the values of diameters were 4,05 x (2,7 - 4,05) μ m; for 1b₂ strain the values of diameters were 2,07 - 4,05 μ m; 2b₁ strain presented cells with relatively constant dimension, (4,05 - 5,4) x (2,7 - 4,05) μ m; for 2b₂ strain the values of diameters were (2,7 - 5,4) x

(2,7 - 4,05) μm ; 2a₂ strain presented cells similar with 1b₁ strain, and 2a₃ strain with 2b₂ strain; for 3b₂ strain the values of diameters were (4,05 - 5,4) x (2,7 - 5,4) μm .

The yeast strains isolated from Feteasca neagra wine and Merlot wine were not capable to assimilate nitrate; the witness tube and test tubes had the same turbidity of the medium. These results suggest that the selected yeasts were not from *Hansenula*, *Candida* and *Pichia genus*.

În sugar fermentation experiments, the glucose, saccharose, galactose, maltose, raffinose were fermented by all selected yeast strains; lactose wasn't fermented by any of them.

These result suggest the isolated strains belong to another species than: *Saccharomyces bayanus*, *S. oviformis* and *Schizosaccharomyces pombe* (because of galactose); *S. italicus* și *S. steineri* (because of maltose); *Torulopsis stellata* (which don't have the ability to ferment galactose and maltose); *Rhodotorula mucilaginosa*, which don't have the ability to ferment any of these sugars; *Kloeckera apiculata*, which have the ability to ferment only glucose and had distinctive form of cells (Popa, Teodorescu, 1990).

For the exposure in electrical field (negative corona) we pick out three yeast strains (from seven); we had three experimental variants, depending of exposure time: 5 minutes, 10 minutes and 15 minutes.

It was remarks that the number of cells in suspensions varies inversely proportional with exposure time (decreases while the exposure time increases), comparative with cells from witness lot (Table 1). For 15 minute exposure in negative electrical discharge, the number of cells decreases with 40 % comparative with initial number of cells in suspension.

Table 1.

The effect of corona discharge for number of yeast cells

Exposed strain (cells/ml) Time (minutes)	1b ₁	2b ₁	3b ₂
0 minutes (unexposed witness)	1284 x 10 ⁴	324 x 10 ⁴	894 x 10 ⁴
5 minutes	1038 x 10 ⁴	216 x 10 ⁴	642 x 10 ⁴
10 minutes	990 x 10 ⁴	174 x 10 ⁴	564 x 10 ⁴
15 minutes	954 x 10 ⁴	126 x 10 ⁴	354 x 10 ⁴

CONCLUSIONS

1. All seven isolated yeast strains may be included in *Saccharomyces* genus, regarding for cultural and morphological properties.

2. None of investigated strains don't have the ability to assimilate nitrate and to ferment lactose; all these yeast strains fermented glucose, saccharose, galactose, maltose, raffinose, and produced various amounts of gas, at 28°C.

3. Regarding to effect of electrical discharge negative corona on yeast cells, the number of cells in suspension decreased while exposure time increased. All three yeast strains exposed in electrical field had similar behaviour.

4. In Feteasca neagra wine and Merlot wine used in these experiments were yeast which belong to *Saccharomyces* genus; their properties recommend these strains for selection and utilisation at industrial level.

REFERENCES

1. Anghel I., Toma N., Voica C., Cojocaru I., 1989 - *Biologia și tehnologia drojdiilor* (vol. I). Editura Tehnică, București
2. Aubrecht L., Koller J., Zahoranova A., 1999 - *Trichel pulses in negative corona discharge on trees*. Journal of Physics D: Applied Physics, Vol. 32, Nr. 18, 87-90
3. Florea - Dumitru I., Vamanu A., Popa O., 2002 - *Drojdiile. Biotehnologii clasice și moderne*. Editura Ars Docendo, București
4. Pomohaci N., Cotea V., Stoian V., Gheorghită M., Sîrghi C., Nămoșanu I., 2001 - *Oenologie*. Editura Ceres, București
5. Popa A., Teodorescu S., 1990 - *Microbiologia vinului*. Editura Ceres, București

STUDY REGARDING THE VALORIFICATION OF LOCAL BABEASCA NEAGRA GRAPES BY DIFFERENT TECHNOLOGICAL VARIANTS OF MACERATION FERMENTATION IN MOLDAVIA VINEYARDS

STUDIUL PRIVIND VALORIFICAREA STRUGURILOR DIN SOIUL AUTOHTON BĂBEASCĂ NEAGRĂ PRIN DIFERITE VARIANTE TEHNOLOGICE DE MACERARE-FERMENTARE ÎN PODGORIILE DIN MOLDOVA

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***Abstract.** The present paper aims at comparing the wines obtained by different maceration fermentation methods, from the local Băbească neagră grape sort. The study took place at the Oenology Laboratory of the University of Agricultural Sciences and Veterinary Medicine Iași. The study presents comparative data of wines obtained through different technologies permitting the identification of optimum wine making procedures that will improve the palette of Romanian red wine and underline at the same time the oenological potential of autochthonous grape sort Băbească neagră.*

Key words: Băbească neagră, maceration, anthocyanins, phenolic compounds

***Rezumat.** Studiul privind variantele tehnologice de producere a vinurilor roșii din soiul românesc Băbească neagră cultivat în podgoriile din Moldova s-a efectuat la Laboratorul de Oenologie al Facultății de Horticultură, din cadrul Universității de Științe Agricole și de Medicină Veterinară Iași în perioada 2008-2009. În studiul de față se prezintă date comparative privind vinurile obținute prin diferite variante de vinificație ce permit stabilirea variantelor tehnologice optime din punct de vedere calitativ în vederea îmbunătățirii sortimentului de vinuri roșii, precum și evidențierea potențialului oenologic al acestui soi autohton valoros, cu scopul promovării lui pe piața mondială a vinului.*

Cuvinte cheie: Băbească neagră, macerare, antociani, compuși fenolici

INTRODUCTION

The present paper aims at comparing the wines obtained by different maceration fermentation methods, from the local Băbească neagră grape sort. When taking into consideration that the 21st century is that of quality, different technological variants that can be used to obtain premium wines must be researched.

MATERIAL AND METHOD

Băbească neagră grapes have been used, harvest of 2008, Iași vineyard, Adamachi farm, Odobești, Panciu and Nicorești vineyards.

The grapes were manually harvested, in plastic buckets and transported to Iași Pilot Research Station where they were processed by different technologies.

Concerning the classical, thermo- and ROTO-tanks maceration, the grapes were first crushed and destemmed, the marc was homogenized. Marc processing was done differently:

In the case of classical maceration, selected yeasts of the *Saccharomyces cerevisiae* sort were added (30 g/100 kg) as well as pectolytic enzymes (1.5g/100 kg). Maceration-fermentation was performed in stainless steel tanks, for 120 hours, with pumping over twice a day. At the end of the maceration process, the marc was pressed by a pneumatic pump, the working pressure being no more than 2 atm. The obtained must has been kept in stainless steel tanks for finishing its alcoholic and malo-lactic fermentation. After finishing its malo-lactic fermentation, the wine was racked and conditioned as mentioned below at all variants obtained. Bottling was done after filtering.

When using thermo-maceration, the must was drawn separately from the rest of the marc and two thirds of it was heated up to 70°C and maintained at this temperature for 20 minutes, then mixed with the rest of the marc and after another 5 minutes, cooled back to medium temperature using the left third of the unheated must. Many studies have shown that heating the must at 70°C, for 15 – 30 minutes ends in a better anthocyanins extraction and also inactivates the oxidases (Cotea D.V., 1985).

When macerating in ROTO-tanks, the must was kept in stainless steel tanks for 72 hours, rotating them three times a day, 3 minutes/ rotation.

Carbonic maceration was applied to whole, healthy grapes, kept in a closed vessel, at its lower side with a grill that keeps them separated from must of the same grape sort with added yeasts, used for creating the necessary CO₂ atmosphere. The carbonic maceration process was considered finished when the grape skin was partially or totally discolored and the grape berries were easily crushed.

The selected yeast used was *Saccharomyces cerevisiae* BJ500, with the commercial name of Levoptime primeur, destined for young red wines that wish to enrich their expressivity and aroma.

The enzymatic treatment was done with Pectocor, while malo-lactic fermentation was obtained by adding *Oenococcus oeni* bacteria, commercial denomination Lactobacter SP 1.

RESULTS AND DISCUSSIONS

Physical-chemical analyses were done according to international standards.

It can be observed that the wines that were obtained by thermo-maceration qualify as quality wines with controlled origin denomination (in Iași, Panciu and Nicorești vineyards) with a maximum alcoholic concentration of 12.1% vol. for the Nicorești sample (tab.1).

When analyzing the wines obtained by ROTO-tanks maceration, the non-reducing extract has values of 20.5g/L - Odobești vineyard- and 22.5g/L - Nicorești vineyard- (tab.1).

The smallest values, meaning less extractive wines, were the ones obtained by carbonic maceration.

Table 1

Composition characteristics of wines obtained from Băbească neagră grape sort

No	Vineyard	Technological variant	Alc. conc. (% vol.)	T.A. (g/L C ₄ H ₆ O ₆)	Sugars g/L	N.R.E. (g/L)
1.	Iași	Classical maceration	11,3	7,6	4	21,4
2.		Thermo-maceration	11,61	8	2,2	21
3.		ROTO-tanks maceration	11,5	7,6	1,2	21,2
4.		Carbonic maceration	10,6	5,9	1,8	16
5.	Odobești	Classical maceration	10,5	7,6	3,8	20,6
6.		Thermo-maceration	10,6	7,8	2,6	21
7.		ROTO-tanks maceration	10,7	6,4	4,2	20,5
8.		Carbonic maceration	9,8	6,2	1,8	16
9.	Panciu	Classical maceration	11,63	7,6	2,6	22
10.		Thermo-maceration	11,7	7,8	1,8	22,4
11.		ROTO-tanks maceration	11,5	7,2	4,6	21,9
12.		Carbonic maceration	10,54	6,7	1,4	16,7
13.	Nicorești	Classical maceration	12	6,8	2,8	22,5
14.		Thermo-maceration	12,1	7,2	3,2	22,3
15.		ROTO-tanks maceration	11,9	6,4	1,8	22,5
16.		Carbonic maceration	10,6	5,8	1,6	16,4

Table 2

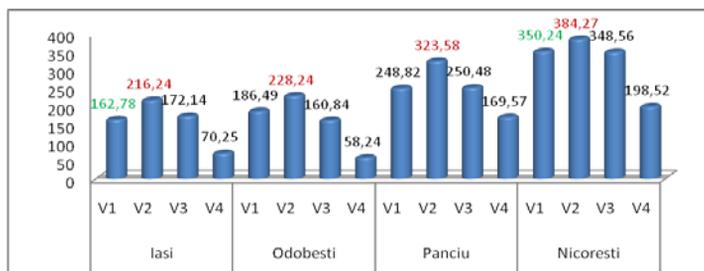
Phenolic compounds content in Băbească neagră wine

No.	Vineyard	Technological variant	Total phenolic compounds g/L	D ₂₈₀	I _{FC}
1.	Iași	Classical maceration	2,26	18,12	14,16
2.		Thermo-maceration	2,28	22,36	18,36
3.		ROTO-tanks maceration	2,24	19,84	16,26
4.		Carbonic maceration	1,14	12,21	9,26
5.	Odobești	Classical maceration	2,19	19,27	15,93
6.		Thermo-maceration	2,23	26,54	22,1
7.		ROTO-tanks maceration	2,16	23,1	18,26
8.		Carbonic maceration	1,27	12,53	9,64
9.	Panciu	Classical maceration	2,14	22,31	18,42
10.		Thermo-maceration	2,32	24,2	19,82
11.		ROTO-tanks maceration	2,19	21,96	17,43
12.		Carbonic maceration	1,18	11,34	8,93
13.	Nicorești	Classical maceration	1,92	29,85	24,72
14.		Thermo-maceration	2,31	31,25	23,96
15.		ROTO-tanks maceration	1,96	30,16	24,47
16.		Carbonic maceration	1,16	12,1	9,58

The anthocyanins content was between 162.78 mg/L (Iași) and 350.24 mg/L (Nicorești) in classical maceration wines. The maximum content of anthocyanins is 384.27 mg/L, found in wines obtained by thermo-maceration, from Nicorești vineyard (fig. 1).

Total phenolic compounds (tab. 2) are registered between 2.32 g/L in Panciu wines (thermo-maceration) and 1.14 g/L in Iași wines (carbonic maceration). The wines obtained by carbonic maceration are less astringent,

the values in table 1 reflecting the same aspect, presenting the smallest anthocyanins concentration (fig. 1).



V1 = classical maceration; V2 = thermo-maceration; V3 = ROTO-tanks maceration; V4 = carbonic maceration

Fig. 1. Anthocyanins content (mg/L) of Băbească neagră wine

CONCLUSIONS

Considering the harvesting climatic conditions of 2008, Băbească neagră produced quality wines in Nicorești and Iași vineyards, whereas in the other regions, it produced geographical indication wines.

The best quality results are given by thermomaceration, and then: roto-tanks maceration, classical maceration, carbonic maceration.

The optimal oenological potential of Băbească neagră is obvious in Iași, Panciu and Nicorești vineyards.

The wines obtained through carbonic maceration are less extractive with a lower anthocyanins content, this technique not being recommended in obtaining high quality wines from Băbească neagră grape variety.

REFERENCES

1. Cotea D.V., Barbu N., Grigorescu C., Cotea V.V., 2000 - *Podgoriile și vinurile României*. Editura Academiei Române, București.
2. Cotea D.V., 1985 - *Tratat de Oenologie*. vol. 1. Editura Ceres, București.
3. Cotea V.V., Cotea D.V., 2006 - *Tehnologii de producere a vinurilor*. Editura Academiei Române, București.
4. Macici M., 2008 - *Lumea vinurilor-Vinurile Lumii*. Editura Vreamea, București.
5. Pomohaci N., Stoian V., Gheorghită, M., Sîrghi C., Cotea, V.V., Nămoșanu I., 2000 - *Oenologie*, Vol. 1, *Prelucrarea strugurilor și producerea vinurilor*. Editura Ceres, București.
6. Pomohaci N., Cotea V.V., Popa A., Stoian V., Sîrghi C., Nămoșanu I., Antoce Arina, 2001 - *Oenologie*, Vol. 2, *Îngrijirea, stabilizarea și îmbutelierea vinurilor. Construcții și echipamente vinicole*. Editura Ceres, București.
7. Țârdea C., Sârbu G., Țârdea Angela, 2000 - *Tratat de vinificație*. Editura Ion Ionescu de la Brad, Iași.
8. Țârdea C., 2007 - *Chimia și analiza vinului*. Editura Ion Ionescu de la Brad, Iași.

STUDIES CONCERNING THE INFLUENCE OF OENOLOGICAL TANNINS ON OXIDASIC STABILITY OF FRANCUȘA WINE FROM COTNARI VINEYARD

STUDIUL PRIVIND INFLUENȚA UNOR TANINURI OENOLOGICE ASUPRA STABILITĂȚII OXIDAZICE LA VINUL FRÂNCUȘĂ DE COTNARI

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Abstract. *The importance of protecting the wine during its making and aging against unwanted micro-flora and CO₂ excess has lead winemakers to using antiseptics and antioxidants. The first one and most well-known is sulphur dioxide. Presently, a growing number of scientists raise awareness on the possible danger a high consumption of sulphur dioxide may bring. This study aims at reducing the quantity of sulphur dioxide used by utilizing instead oenological tannins. The products were: Protan pépin, Noxitan, Tanethyl, Ellagitane, Gallovin and Taniblanc. The best results were obtained when applying Noxitan which lead to a growth of antiseptic efficacy of SO₂ and a reduction in quantity of about 20%.*

Key words: wine stability, tannins, Frâncușă.

Rezumat. *Necesitatea protejării vinului în timpul elaborării și maturării sale împotriva microflorei nedorite cât și a excesului de oxigen, a condus la utilizarea primelor materiale oenologice cunoscute astăzi sub numele de antiseptici și antioxidanți. Cel mai vechi și mai utilizat este dioxidul de sulf. Un număr tot mai mare de igienişti atrag atenția asupra pericolului pe care îl poate reprezenta pentru sănătatea consumatorilor conținutul ridicat de SO₂. [1,4]. Prezentul studiu urmărește reducerea cantității de SO₂ prin folosirea unor taninuri oenologice. Produsele folosite au fost: Protan pépin, Noxitan, Tanethyl, Ellagitane, Gallovin și Taniblanc. Cele mai bune rezultate s-au obținut în urma utilizării produsului Noxitan care a dus la creșterea eficacității antiseptice a SO₂ și reducerea dozei acestuia cu cca 20%.*

Cuvinte cheie: stabilitatea vinului, taninuri, Frâncușă

INTRODUCTION

Must and wine are perishable products. For a better preservation, antiseptics must be used as authorized additives. Due to its qualities, sulphur dioxide imposed itself on the market, becoming a general and constant product in wine conservation.

Although it is widely used, scientists say that sulphur dioxide may have a harmful effect on the human body. This is why new products are developed in order to minimize the quantities of sulphur dioxide.

The present study accentuates the effect oenological tannins have on Frâncușă wine from Cotnari when using smaller SO₂ dosage.

The composition characteristics (relative density, pH, total acidity, total polyphenolic index) of the wine have been analysed as well. Oenological tannins can be found as:

- condensed catechinic tannins, extracted from grape seeds (oenotannins);
- elagotannins and hydrolysable gallotannins, mainly extracted from oak and chestnut tree bark.

MATERIAL AND METHOD

The grapes were harvested in September 2008, with 195 g/L sugars and 9,25 g/L C₄H₆O₆. Frâncușă de Cotnari wine was obtained by the classical technology for white wines.

The control sample (Frâncușă) had the following parameters (table 1):

Table 1

Main quality indexes of control sample

Control sample	Free SO ₂ mg/L	Combined SO ₂ mg/L	Total SO ₂ mg/L	pH	Total acidity g/L	TPI	Relative density
Frâncușă de Cotnari	10,63	90,32	100,9	3,5	7,43	6,6	0,9923

The following oenological tannins were added: Protan Pépin (P₁, P₂), Noxitan (N₁, N₂), Ellagitane (E₁, E₂), Gallovin (G₁, G₂, G₃), Tanethyl (T₁, T₂), and Taniblanc (T₃, T₄).

Protan Pépin is a proanthocyanidolic tannin extracted from white grape seeds, without any other additives. It is granulated and it is perfectly soluble in wine. Doses of 2g/hL and 20g/hL were used.

Noxitan is an oenological product obtained in accordance with the EU regulations, composed from potassium metabisulfite and ellagic tannins. Doses of 7 g/hL and 10 g/hL were used.

Ellagitane is an yellowish-brown powdered ellagic tannin. It was obtained according to the EU regulations and does not come from genetically modified organisms. Doses of 5 g/hL and 20 g/hL were used.

Gallovin is extracted from the galls of *Robinia pseudoacacia*. Doses of 5 g/hL, 20 g/hL, and 30 g/hL were used.

Tanethyl is extracted from white grape seeds and corresponds to the requirements of the Codex. The used doses were: 2,5 g/hL and 5 g/hL.

Taniblanc is a special tannic acid, pinkish-brown in color, extracted from South-American wood, grinded and extracted in hot water at 100 °C and then dried by atomizing. It was used in doses of 5 g/hL and 20 g/hL.

A few days after the treatment, Frâncușă wine was analysed according to the international standards and to the specialized literature: free SO₂, combined SO₂, total SO₂, pH, total acidity, TPI, relative density [5,6].

The analyses were done in the Laboratory of Oenology of the Agricultural University in Iasi and in the laboratory of Cotnari.

RESULTS AND DISCUSSIONS

The data in table 2 was obtained after the analyses were done.

Table 2

Physical-chemical parameters of analysed wine samples

Used tannin	Doses g/hL	Free SO ₂ mg/	Combined SO ₂ mg/L	Total SO ₂ mg/L	pH	Total acidity g/L	TPI	Relative density
P ₁	2	12,62	86,53	99,20	3,55	7,44	6,5	0,9923
P ₂	20	13,60	74,38	87,98	3,50	7,46	11,0	0,9924
N ₁	7	26,0	88,04	114,04	3,53	7,44	5,8	0,9924
N ₂	10	36,4	94,5	130,9	3,55	7,56	5,9	0,9924
E ₁	5	10,6	84,63	95,23	3,55	7,49	7,1	0,9924
E ₂	20	10,6	78,93	89,53	3,55	7,53	10,0	0,9924
G ₁	5	12,14	86,94	99,08	3,54	7,28	7,5	0,9923
G ₂	20	18,22	78,94	97,16	3,55	7,43	13,4	0,9924
G ₃	30	10,63	87,5	98,2	3,55	7,37	18,6	0,9925
T ₁	2,5	11,5	85,33	96,83	3,54	7,13	6,4	0,9923
T ₂	5	11,5	85,33	96,83	3,55	7,40	6,8	0,9923
T ₃	5	13,1	85,33	98,43	3,54	7,15	7,1	0,9924
T ₄	20	6,5	93,5	100,0	3,54	7,42	9,9	0,9924

The highest influence of the tannins was observed on the free, combined and total SO₂ level (figure 1). Free (active) SO₂ is the one that gives an antioxidant protection to the wine. After the tannins' treatment, changes in the SO₂ content were registered in comparison to the control sample. The noted values are between 6,5 mg/L (T₄ wine sample) and 36,4 mg/L (N₂ wine sample). Combined (bonded) SO₂ represents the fraction that combines with different substances from the wine. These values also were modified, just like the free SO₂. Total SO₂, which is obtained by summing the free and combined SO₂ registers values of 87,98 mg/L and 114,04 mg/L.

The used tannins did not have a significant influence on the pH or on the total acidity (figure 2). The lowest value of the total acidity (7,13 g/L) was found in the wine sample in which Tanethyl (2,5 g/hL) was added, while the biggest one (7,56 g/L) in the wine sample in which Noxitan (10 g/hL) was used.

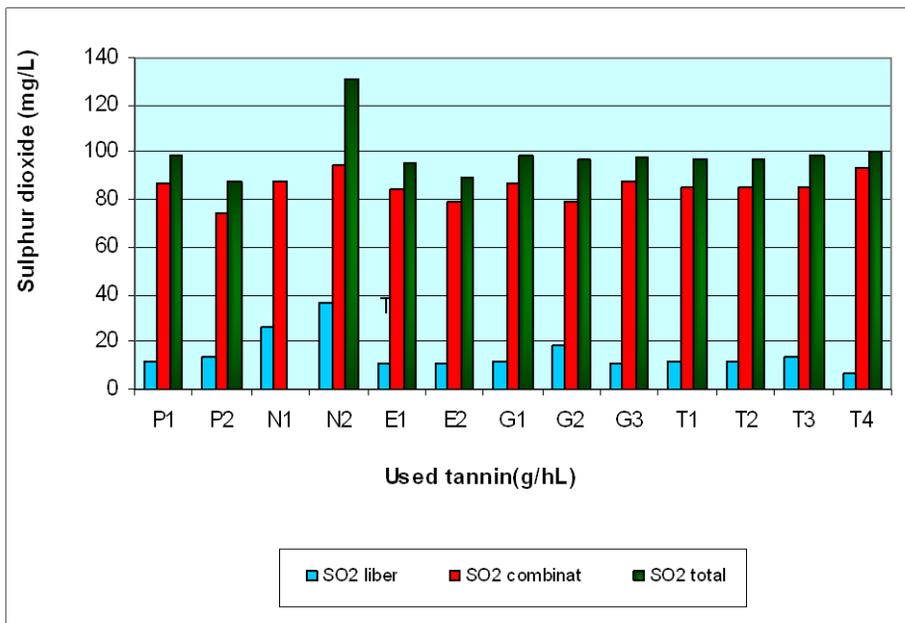


Fig.1. Tannins influence on SO₂ content in Frâncușă de Cotnari

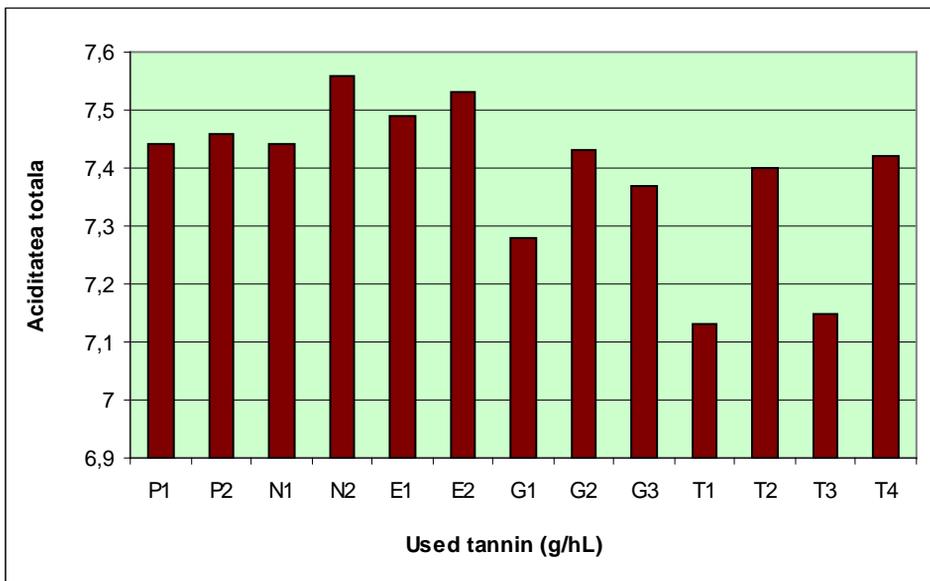


Fig. 2. Oenological tannins influence on total acidity of Frâncușă de Cotnari

Another analysed parameter was the total polyphenolic index (TPI). The polyphenols in wine are represented by tannins, flavons and anthocyanins. The TPI values were registered between 5,8 (N₁ wine sample) and 18,6 (G₃ wine sample). The best result (18,6) was obtained in the 30 g/hL Gallovin treated sample (figure 3).

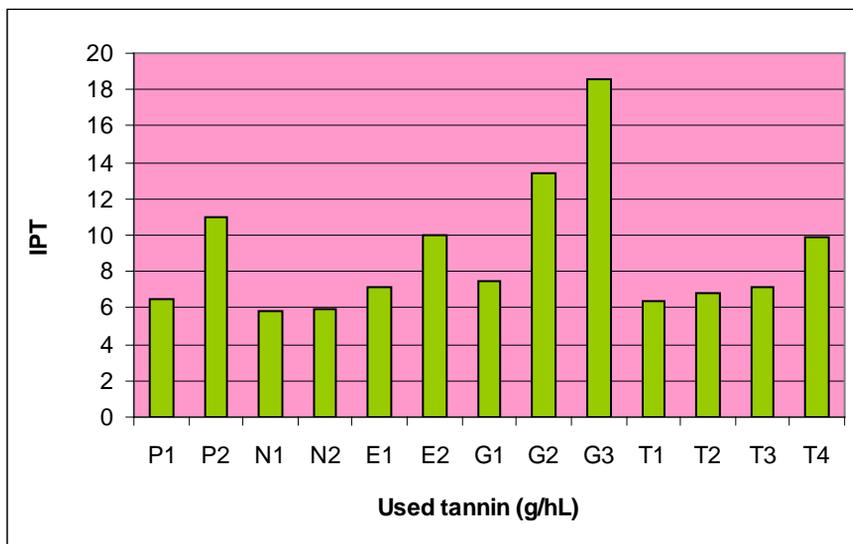


Fig.3. Oenological tannins influence on total phenolic index of Frâncușă de Cotnari

CONCLUSIONS

Oenological tannins helped to increase the antiseptic and antioxidant effect of free, combined and total SO₂ from Frâncușă de Cotnari. This is extremely important as, in this way, the quantity of added SO₂ can be lowered.

The best results were obtained when using Noxitan, which reduces oxidative phenomena and assures a better preservation of sensorial characteristics, banishing at the same time, the formation of unwanted sulphurous compounds.

The oenological products that were used in this study had a certain noticeable influence on the other wine parameters, as pH, total acidity and TPI.

Although oenological tannins have a positive influence on Frâncușă de Cotnari wine, SO₂ cannot be totally dropped in wine-making.

REFERENCES

1. **Cotea V. D., 1985** - *Tratat de Oenologie, vol.1*. Editura Ceres, București, p.367-395
2. **Grigorică L.V., 2005** - *Stabilizarea și îmbutelierea vinurilor*. Editura Ceres, București, p. 78-80, 95-97
3. **Patic M., 2006** - *Enciclopedia viei și vinului*. Editura Tehnică, București
4. **Pomohaci N., Stoian V., Cotea V. V., Gheorghică M., Nămoșanu I., 2005** - *Prelucrarea strugurilor și producerea vinurilor*. Editura Ceres, București, nu p.114-132
5. **Țârdea C., 2007** - *Chimia și analiza vinului*. Editura „Ion Ionescu de la Brad”, Iași,
6. *****, 1988** - *Colecție de standarde pentru industria vinului și băuturilor alcoolice*. Ministerul Industriei Alimentare. Centru de organizare și calcul, București.

ASPECTS REGARDING THE VARIATION OF CHROMATIC CHARACTERISTICS DURING MALOLACTIC FERMENTATION IN RED WINE

ASPECTE PRIVIND VARIAȚIA CARACTERISTICILOR CROMATICE ÎN TIMPUL FERMENTAȚIEI MALOLACTICE A UNOR VINURI ROȘII

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Abstract. *The study presents information concerning the chromatic characteristics' variation of some red wines during their malolactic fermentation. six red wines were used from Bujoru-Viile and Iași-Uricani vineyards, which were physical-chemically analysed before and after malolactic fermentation. The research proved that there appear some modifications in main composition characteristic, total acidity and volatile acidity, real acidity (pH), malic and lactic acid. At the same time; in correlation with these values, a variation in wines' colour is observed meaning a decreasing of phenolic compounds (the anthocyanins, the total polyphenolic index, D_{280} , Folin-Ciocalteau index) and a modification of chromatic characteristics (intensity and hue) and chromatic parameters (L , a , b , C , H^0). The variation of characteristic and chromatic parameters is analysed in accordance with gelatin treatments for fining red wines and with specific reactions which appear in red wines evolution.*

Key words: malolactic fermentation, phenolic compounds, organic acids, chromatic parameters.

Rezumat. *În lucrare se prezintă date referitoare la variația caracteristicilor cromatice ale unor vinuri roșii în timpul fermentației malolactice. Pentru studiu s-au folosit șase vinuri roșii, provenite din podgoriile Bujoru-Viile și Iași-Uricani, care au fost supuse analizelor fizico-chimice atât înainte cât și după fermentația malolactică. Sunt evidențiate o serie de modificări ale principalele caracteristici de compoziție: aciditate totală și volatilă, aciditate reală (pH), acizii malic și lactic. Concomitent, în corelație cu valorile acestora se constată o variație a culorii vinurilor redată prin diminuarea conținutului de compuși fenolici (antociani, indicele de polifenoli totali D_{280} , indicele Folin-Ciocalteau), precum și modificări ale caracteristicilor cromatice (intensitatea și nuanța culorii) și ale parametrilor cromatici (L , a , b , C , H^0). Variația caracteristicilor și a parametrilor cromatici este apreciată și în funcție de influența tratamentului de limpezire cu gelatină a vinurilor roșii studiate cât și de reacțiile specifice care au loc în timpul evoluției acestora.*

Cuvinte cheie: fermentație malolactică, compuși fenolici, acizi organici, parametrii cromatici.

INTRODUCTION

Malolactic fermentation or biological deacidification represent malic acid's degradation in lactic acid and carbon dioxide in wine.

As cited in literature [3, 6, 7], malolactic fermentation in red wines is a positive process because: it confers roundness to the wine by diminishing its astringency; it generally strengthens the wine's color although the anthocyanins' and tannins' content drops; it leads to a convenient deacidification, assuring biological stability towards lactic bacteria.

Analysing the chromatic characteristics' variation during malolactic fermentation had as main objective obtaining data that would contribute to explaining the aspects mentioned above regarding red wine's color. Therefore, analysing the wine's color is done in regard to phenolic compounds content (anthocyanins, total polyphenolic index, Folin-Ciocalteu index), chromatic characteristics (color intensity and hue) and chromatic parameters (L , a , b , C , H^0).

MATERIAL AND METHOD

The experiments were done during 2008 in the Oenology Laboratory of UA Iasi.

Six red wines, harvest of 2008 were studied: three (Burgund mare, Băbească neagră, Pinot noir) from Uricani-Iași vineyard and three (Cabernet Sauvignon, Merlot, Fetească neagră) from Bujoru-Viile vineyard. The wines were processed in pilot station conditions.

The research took 30 days/ wine.

At the end of the alcoholic fermentation (after 7-15 days), selected malolactic bacteria (BMS) *Oenococcus oeni*, were added to the wine (1.0 g/hL). The wine samples were stored at 18-20 °C, for 30 days. In the beginning (IFM) and at the end of malolactic fermentation (DFM), samples of each wine were taken for analysis.

At the end of the malolactic fermentation, as soon as the values of malic acid reached specific values, the bacterial activity of the wine was stopped by racking and treatment with sulphur dioxide and gelatin.

Physical-chemical analyses were recorded for each wine sample: total acidity, volatile acidity, pH, malic acid, lactic acid, tartaric acid, citric acid, free and total sulphur dioxide, non-reductive extract) as well as color analyses: (anthocyanins, total phenolic compounds, D_{280} and F_C indices), before (IFM) and after fermentation and at 10 days after the fining treatment (DFMf). The analyses were done according to known standards [15, 16] and literature [11, 12, 14].

The chromatic parameters were calculated according to CIE Lab 76 method, regarding the registered absorption spectrum of each wine sample. The used device SPECORD S200 and computer.

RESULTS AND DISCUSSIONS

Wine samples' main characteristics are presented in table 1.

The variation of the total phenolic content and specific indexes (F_C - Folin Ciocalteu, D_{280} - total polyphenolic index) and anthocyanins' content are presented in figure 1.

Over the 30 days of malolactic fermentation and another 10 days after the gelatin and sulphur dioxide treatment, the total phenolic compounds' content

(g/L) modified as follows: Burgund mare wine showed a decrease of 17.30 % at DFMf; Băbească neagră wine was down 19.52 % at DFMf; Cabernet Sauvignon wine had a decrease of 22.42 % at DFMf; Merlot wine registered a decrease of 23.36 % at DFMf; Fetească neagră wine noted a decrease of 24.66 % at DFMf; Pinot noir wine had a decrease at DFMf of 26.58 %.

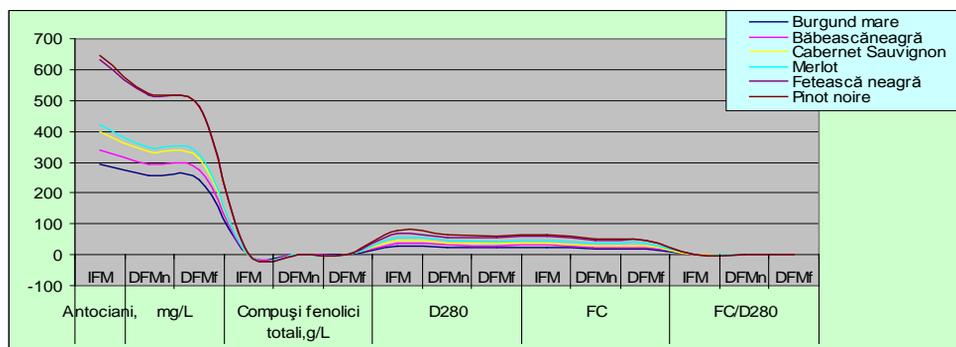


Fig. 1. Variation of phenolic compounds content in studied wines during malolactic fermentation

*) IFM – before malolactic fermentation; DFMf – after gelatin and sulphur dioxide treatment, DFMn - after malolactic fermentation

D_{280} index represents the phenolic compounds index while Folin-Ciocalteu (F_C) index is specific only to phenolic compounds with reductive properties that are directly correlated to a decrease in the total phenolic compounds that also evolved decreasingly. The anthocyanins content (mg/L) modified itself as follows: Burgund mare wine shaped a decrease of 16.44 % at DFMf; Băbească neagră wine registered a decrease of 18.28 %; Cabernet Sauvignon showed a decrease at DFMf of 21.88 %; Merlot wine had a decrease of 22.40 % at DFMf; Fetească neagră drops 23.56 % at DFMf, Pinot noir wine registered a decrease of 25.34 % at DFMf.

The variation of chromatic characteristics during malolactic fermentation is presented in table 2.

From these data, one can notice that light's intensity at a 1 cm vial had a slightly increasing values over the 30 days of malolactic fermentation and a decreasing values after the fining process.

Although through-out the experiment a diminishing of the total phenolic compounds contest takes place, it has a reverse, increasing evolution. It is believed that this increase in color intensity is due to the increase in pH value, as a result of acidity decrease in analysed wines.

Color hue is defined as rapport A_{420}/A_{520} and it has decreased over the 30 days of malolactic fermentation and it has increased during the fining treatment.

Table 1

Variation of main composition characteristics of analysed wines during malolactic fermentation

Composition characteristics	*)	Wine sample					
		Burgund mare	Băbească neagră	Cabernet Sauvignon	Merlot	Fetească neagră	Pinot noir
Total acidity, g/L C ₄ H ₆ O ₆	IFM	10,42	8,15	6,94	5,95	6,71	6,78
	DFMf	8,43	6,62	5,71	5,21	5,79	5,76
Volatile acidity, g/L C ₂ H ₄ O ₂	IFM	0,46	0,42	0,62	0,46	0,41	0,43
	DFMf	0,57	0,59	0,75	0,63	0,56	0,55
Real acidity, (pH)	IFM	3,003	3,212	3,341	3,509	3,522	3,451
	DFMf	3,266	3,342	3,485	3,631	3,674	3,613
Malic acid, g/L	IFM	3,90	3,02	2,32	1,61	2,02	2,22
	DFMf	0,64	0,50	0,42	0,37	0,44	0,42
Lactic acid, g/L	IFM	0,38	0,44	0,56	0,54	0,71	0,46
	DFMf	2,66	2,21	1,93	1,48	1,88	1,79
Non-reductive extract g/L	IFM	21,05	21,83	23,65	25,10	24,62	24,01
	DFMf	19,54	20,39	22,28	23,75	23,07	22,52

Table 2

Chromatic characteristics variation in analysed wines during malolactic fermentation (O.I.V. method)

Chromatic characteristics	*)	Wine sample					
		Burgund mare	Băbească neagră	Cabernet Sauvignon	Merlot	Fetească neagră	Pinot noir
Color intensity (1 cm)	IFM	7.12	9.59	10.53	11.21	12.22	13.59
	DFMn	7.36	10.10	11.13	12.01	13.16	14.89
	DFMf	6.99	9.35	10.18	10.70	11.77	12.74
Hue A ₄₂₀ /A ₅₂₀	IFM	0.65	0.67	0.67	0.67	0.60	0.59
	DFMn	0.59	0.62	0.64	0.61	0.56	0.55
	DFMf	0.64	0.64	0.68	0.69	0.63	0.60
Hue α	IFM	53.67	60.50	62.37	63.80	69.81	72.65
	DFMn	59.52	64.86	65.86	68.82	73.17	75.59
	DFMf	54.48	62.48	60.85	59.92	67.79	70.10

*) IFM – before malolactic fermentation; DFMf – after gelatin and sulphur dioxide treatment, DFMn - after malolactic fermentation

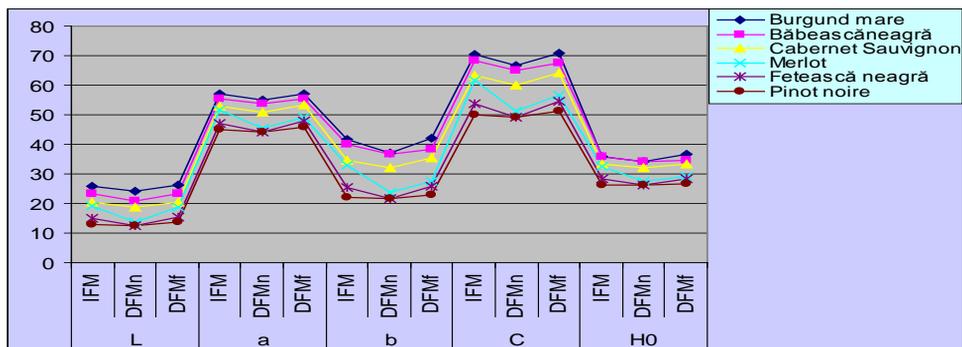


Fig. 2. Chromatic characteristics variation in analysed wines during malolactic fermentation (CIE Lab. 76 and CIE LCH⁰ methods)

*) IFM – before malolactic fermentation; DFMf – after gelatin and sulphur dioxide treatment, DFMn - after malolactic fermentation

At the end of the malolactic fermentation (DFMn), luminosity has slightly diminished its values, while after the gelatin fining treatment and the sulphur dioxide treatment (DFMf, the values increase due to pH modifications and total phenolic compounds content.

In fig.2 are presented the variation of chromatic characteristics. Chromatic parameter **a**, situated on the red-green coordinate, has relatively high positive values and it obviously reflects red hues' preponderance over green hues. It has a similar evolution to luminosity, due to color modifications throughout the experiment.

Chromatic parameter **b**, situated on the yellow-blue coordinate, has a similar evolution to parameter **a**. As all chromatic parameter **b**'s values are positive, blue hues are preponderant to yellow ones due to the diminishing of the total phenolic compounds' values but they are still sufficiently colored.

The values of chromaticity **C** had similar evolutions with the chromatic parameters **a** and **b**, specific to each wine, as it was calculated in regard to them. The values of the Hue **H°** have a similar evolution to **a** and **b**. Taking into consideration the value of the hue's angle **H°** = 90° (determined in control wine sample), corresponding to the color "pure yellow", one can observe that the wines with **H°** < 90°, they are visually determined as "bluish". Clear red is the stringer when the hue's angle is closer to zero, thus less influenced by yellow.

CONCLUSIONS

Malolactic fermentation is a positive aspect in red wines as it assures biological stability of red wines towards lactic bacteria. It also lead to a convenient deacidification, rounding the wines also by diminishing their astringency (lowering of the tannins' content) and also by improving the wine's color.

Although throughout the experiment a diminishing of the total phenolic content takes place, the color's intensity is increasing. It can be said that this happens due to the increase of pH's value as result of a decrease in acidity.

The hue, A_{420}/A_{520} , has evolved decreasingly to color intensity, over the 30 days of malolactic fermentation, while after fining, it registered an increase.

REFERENCES

1. **Bauer R., Dicks L. M. T., 2004** - *Control of Malolactic Fermentation in Wine. A Review*. S. Afr. J. Enol. Vitic., Vol. 25, No. 2. p. 74-88.
2. **Bartowsky E. J., 2005** - *Oenococcus oeni and malolactic fermentation - moving into the molecular arena*. Austral. J. grape and wine res., vol. 2, no. 11, p. 174-187.
3. **Cotea D. V., 1985** - *Tratat de Oenologie, vol. 1*. Bucuresti, Ed. Ceres, p. 533-546.
4. **Cotea V. V., Odăgeriu G., Nechita B., I., Niculaua M., Zamfir C., Coșofreț S., 2005** - *Studiul variației caracteristicilor cromatice ale vinului Fetească neagră ca urmare a tratamentelor de limpezire*. Lucrări științifice, seria Horticultură, U.Ș.A.M.V. vol. 48, Iași, 2005, format electronic (CD), p. 359 – 364.
5. **Coșofreț S., Sauciuc J., Odăgeriu G., Cotea V.V., 1997** - “VINCOLOR”- *Program pentru calcularea caracteristicilor cromatice ale vinurilor determinate prin metoda C.I.E. Lab 76*. Lucrări științifice, seria Horticultură, U.A.M.V. Iași, vol. 40, p. 117-121.
6. **Croitoru C., 2005** - *Reducerea acidității musturilor și vinurilor, Metode și procedee fizice, fizico-chimice, chimice și biologice*. Editura Agir, București, p. 241-307.
7. **Flanzy Cl., 1998** - *Oenologie, Fondements scientifiques et technologiques*. Édition Lavoisier, Techniques & Documentation, Paris, France, p. 498-525.
8. **Odăgeriu G., Cotea V. V., Țibîrnă C., Bărboiu Al. B., 1994** - *Modificarea conținutului de aminoacizi din vin ca urmare a fermentației malolactice*. Cercet. agron. în Moldova, vol. 1-2 (101), Iași, p. 209-213.
9. **Odăgeriu G., Neacșu I., Niculaua M., Zamfir C., Buzilă I., 2008** - *Aspecte privind variația unor indici fizico-chimici în timpul fermentației malolactice la unele vinuri roșii*. Simpozion INVV “Realizări inovative în domeniul viti-vinicol”, Chișinău, 18-19 septembrie, p. 186-188.
10. **Patraș Antoanela, Țibîrnă C., Cotea V.V., Odăgeriu G., 1995** - *Aspecte privind cinetica echilibrelor formelor tautomere ale antocianilor influențate de pH*. Lucrări științifice, seria Horticultură, Universitatea Agronomică Iași, vol.38, p. 254-259
11. **Ribereau-Gayon J., Peynaud E., Sudraud P., Ribereau-Gayon P., 1972** - *Traité d'oenologie. Sciences et techniques du vin, tome 1. Analyse et contrôle des vins*. Dunod-Paris, France.
12. **Sauciuc J., Țibîrnă C., Odăgeriu G., Cotea V.V., Patraș Antoanela, 1995** - *Obiectivarea observării culorii vinurilor printr-o metodă modernă*. Cercet. agron. în Moldova, vol. 3-4 (104), Iași, p. 197-208.
13. **Țârdea C., 2007** - *Chimia și analiza vinurilor*. Editura “Ion Ionescu de la Brad”, Iași.
14. **Würdig G., Woller R., 1989** - *Chemie des wines*. Ed. Ulmer, Stuttgart, Germany.
15. *****, 2005** - *Colectie de standarde pentru industria vinului si bauturilor alcoolice*. Ministerul Industriei Alimentare, Bucuresti.
16. ***** 2005** - *Recueil des méthodes internationales d'analyse des vins et de moûts*. Office International de la Vigne et du Vin, Édition Officielle, juin, Paris.

THE INFLUENCE OF OENOLOGICAL TREATMENTS ON DYNAMIC OF OXIDATIVE ENZYMES FROM WHITE GRAPES

INFLUENȚA UNOR PROCEDURI OENOLOGICE ASUPRA DINAMICII ACTIVITĂȚII ENZIMELOR OXIDATIVE DIN STRUGURI ALBI

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Abstract. Use of combined treatments like sulphite dioxide and bentonite addition is able to ensure the biological stability of white grape must. After the combined treatment the activity of oxidative enzymes (tyrosinase, laccase and peroxidase) decreased gradually and the polyphenoloxidase and browning indexes have the same trend. The favourable effect of this combined treatment is based on the presence of protein fractions involved with the first deposit collected just after must alcoholic fermentation. The aim of this study was to analyse the activity oxidase enzymes from white grapes and fresh must. In the same time the inhibition of oxidative enzymes that have been achieved by combining the experimental variates of different doses of sulphur dioxide and bentonite was quantified. In fresh musts oxidative enzyme activity is increased immediately after the grapes crushing, as a result of oxygen penetration and oxidation of phenolic compounds. Tyrosinase activity during alcoholic fermentation have a decrease of 33-42% in the case of sulphite dioxide addition and coupled sulphite dioxide and bentonite addition, while for the bentonite addition only the tyrosinase activity was total inhibited. During the alcoholic fermentation, enzymatic activity of peroxidase and laccase were reduced by 27-73% correlated with the dose of sulphur dioxide and bentonite used. After the alcoholic fermentation of grape must in the case of variants where used similar doses of sulphur dioxide and bentonite were, a reduction of oxidative enzyme activity of approximately 27-90% was observed.

Key words: enzymes, must, phenolic compounds, alcoholic fermentation, bentonite.

Rezumat. Utilizarea tratamentelor combinate de sulfitare și bentonizare, pentru tratarea mustului din struguri albi, asigură o stabilitate sporită inhibând activitatea enzimelor oxidative (tirozinaza, lacaza, peroxidaza), fapt evidențiat prin cuantificarea și evaluarea indicilor de polifenoloxidază și de brunificare. Efectul favorabil al acestui tratament combinat se bazează pe faptul că enzimele oxidative sunt reținute de burbă, deoarece enzimele sunt susceptibile la dioxidul de sulf care denaturează enzima, iar bentonita o separară din sistem. Scopul acestui studiu a fost de a analiza activitatea oxidazică inițială din struguri și mustul proaspăt după care

s-au realizat variantele experimentale prin combinarea diferitelor doze de dioxid de sulf și bentonită. În mustul proaspăt activitatea enzimelor oxidative este în creștere imediat după zdrobirea strugurilor, ca urmare a pătrunderii oxigenului și oxidarea substanțelor polifenolice. Activitatea tirozinazei în timpul fermentației alcoolice scade cu 33-42% la variantele sulfite și cele cuplate (bentonizare și sulfitare) în timp ce la variantele bentonizate activitatea enzimatică a tirozinazei este inhibată total. În timpul fermentației alcoolice, activitatea enzimatică a lacazei și a peroxidazei se reduce cu 27-73% la variantele studiate, proporțional cu doza de dioxid de sulf și cantitatea de bentonită folosită. După finalizarea fermentației alcoolice la variantele la care s-au folosit doze similare de dioxid de sulf și bentonită se observă o reducere a activității enzimelor oxidative de aproximativ 27-90%.

Cuvinte cheie: enzime, must, compusi fenolici, fermentatie alcoolica, bentonita

INTRODUCTION

Browning is an oxidative process involving sugars, lipids, amino acids or phenols in food. It is one of the main problems encountered during the vinification of wine as it on one hand, adversely affects the sensory properties of wine (loss of colour, flavour and aroma, and increase of astringency) (Escudero, Asensio, Cacho, & Ferreira, 2002) and on the other, results in the loss of nutritional value of wine (Sioumis, Kallithraka, Tsoutsouras, Makris, & Kefalas, 2005).

The enzymatic oxidation of phenols, particularly in the presence of atmospheric oxygen and oxidoreductases, takes place in the early stages of processing and is well known to be a cause of browning in foodstuffs. In the intact cells of fresh fruit or vegetable tissues, phenols located predominantly in the vacuole and oxidoreductases located in cytoplasm cannot meet due to different cell membrane systems, whereas enzymic browning will arise once the cells are bruised or wounded in air (Wang, 1990).

The main oxidoreductases responsible for browning during grape processing are PPO and peroxidase (POD) (Li et al., 2005). PPO is a copper-containing enzyme and able to oxidize substrates characteristic for tyrosinase and laccase.

Tyrosinase, also called catecholase (E.C. 1.10.3.1), is naturally produced in grape berry and can catalyze the oxidation of monophenols and o-diphenols (Singleton, 1987).

However, laccase (E.C. 1.10.3.2) is produced by moulds and able to oxidize lots of substrates, especially 1,2- and 1,4-dihydroxyphenene (Toit et al., 2006).

POD (E.C. 1.11.1.7) is a Fe-containing enzyme and its activity depends on the available hydrogen peroxide (H₂O₂) in medium. However, the browning caused by POD seems insignificant in fruits with few exceptions, such as litchi and pineapple, although some researcher found that it did enhance the degradation of phenols when coexisting with PPO (Robards et al., 1999).

In grape must, enzymatic browning is largely correlated with the content of hydroxycinnamates such as caffeoyltartaric acid (caftaric acid) and p-

coumaroyltartaric acid (coutaric acid), and is promoted by flavanols (Oszmianski, Cheynier, & Moutounet, 1996).

It is accepted that catecholase is so sensitive to SO₂ that a small amount will inactivate it, while laccase is more active, readily soluble and resistant to SO₂, and it may be present in the final wine (Ribereau-Gayon, Dubourdieu, et al., 2006). However, the concentration and activity of PPO are gradually lowered during oxidation, and with the development of fermentation and such operations as fining, SO₂ treatment and ethanol production, and sometimes no PPO exists in wine (Ribereau-Gayon, Dubourdieu, et al., 2006).

The aim of this study is to evaluate the dynamic of oxidative enzymatic activity during the winemaking of white grapes by using different combinations of SO₂ and bentonite doses.

MATERIALS AND METHODS

The research has been done at the Grape and Wine Research Institute, "Dealul Bujorului" vineyard, in the eastern part of Romania, during 2007-2008 period. The "Dealul Bujorului" vineyard has a temperate-continental climate with a lot of rains at the end of summer, drought period in July and August and sunny autumns.

The grapes (*Fetească regală* variety) were harvested at full technological maturity. After destemming and crushing, before must separation crushed grapes were treated with different combinations of SO₂ and bentonite doses: V₁ - reference sample; V₂ - addition of 50 mg/kg SO₂; V₃ - addition of 100 mg/kg SO₂; V₄ - addition of 0,5 g/kg bentonite; V₅ - addition of 0,5 g/kg bentonite; V₆ - addition of 50 mg/kg SO₂ and 0,5 g/kg bentonite.

Alcoholic fermentation was done at temperature 17-21°C. During the fermentation samples have been taken daily for physico-chemical and enzymatic activities determinations. The dynamic of oxidative enzymatic activity was quantified for grapes, must, fermented must and the new wine.

Laccase and tyrosinase activities were quantified by using the method described by Dubernet et al., 1974(2). Peroxidase activity was evaluated by using the method described by Ciopraga et al., 1978.

In the same time the browning index (BI) and polyphenoloxidase index (PPOI) were calculated as mentioned Mantis (1980) and Leglise et al., 1969 cited by Ionita et al., 1998. To analyse the musts and wines official methods (OIV) have been used.

All determinations were carried out in triplicate, and the relative standard deviations are less than ± 1%.

RESULTS AND DISCUSSIONS

The oxidative enzymatic activity of grape skin and must

Physico - chemical characteristics of the grapes at harvesting period are following: the reducing sugar content of grapes 196 g/L, total acidity 3.5 g/L H₂SO₄ and total polyphenols content 0.145 g/L.

By evaluation of laccase and tyrosinase activities in both systems grape skins and must (V₁ - reference sample), some particularities were observed. Laccase activity has higher values in grape skins than musts with 12.5%. On the contrary, the tyrosinase activity was lower in grape skins and higher in must with 51.72%.

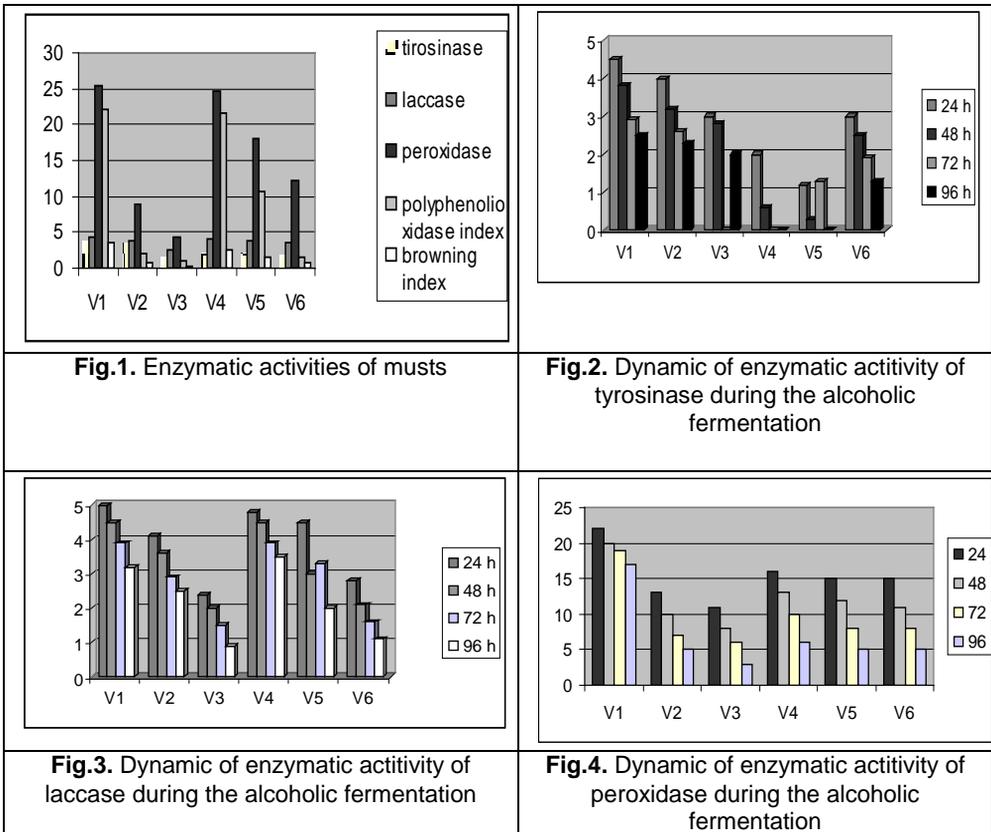
The polyphenoloxidase index in grape skins was zero and in must was 0.3.

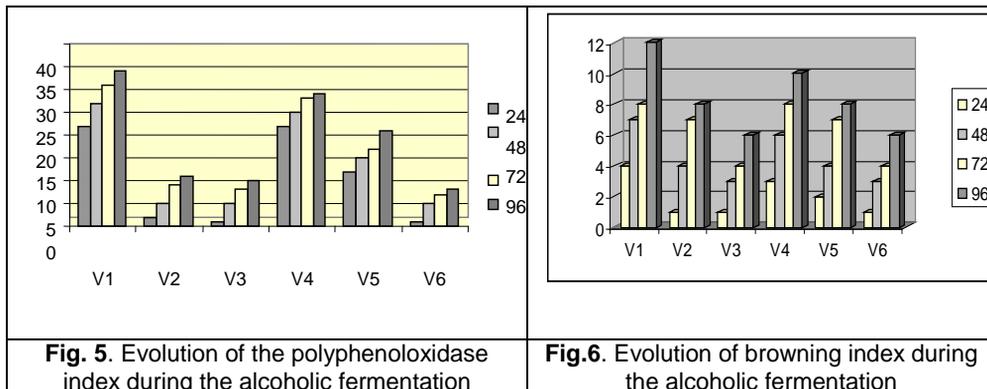
By comparing the all variants treated with different combinations of SO₂ and bentonite doses, at variant V₃ (addition of 100 mg/kg SO₂) the oxidative enzymes activity was lower (fig.1).

The oxidative enzymatic activity of grape must during the alcoholic fermentation

The oxidative enzymatic activity of grape must during alcoholic fermentation (after 24, 48 72h and 96h) was evaluated.

The enzymatic activity of laccase, tyrosinase and peroxidase decreased gradually during the alcoholic fermentation. After 96 h of fermentation about 27-73% of oxidative enzymatic activity still remains (fig. 2,3,4). The decreasing of tyrosinase activity was directly connected with the increasing of SO₂ dose utilised. At variants V₄ and V₅ no tyrosinase activity was observed after the alcoholic fermentation.





The evolution of PPO index is depicted in Fig. 5. An increasing about 30-75% of PPO index was observed for variants V₁, V₄ and V₅ in comparison with V₂, V₃ and V₆. The browning index was almost the same evolution (fig. 6).

The oxidative enzymatic activity of the new wine

Oxidative enzymatic activity was visibly lower at wines than must. Tyrosinase activity in the new wine was zero for all variants studied except the variant V₁ (reference sample).

Laccase activity was zero for variant V₃ where the higher concentration of SO₂ was used, followed by variant V₆ where a combined treatment was used.

Peroxidase activity was still present in the new wine, the lower value was observed for the high SO₂ doses used for variant V₃ (fig. 7).

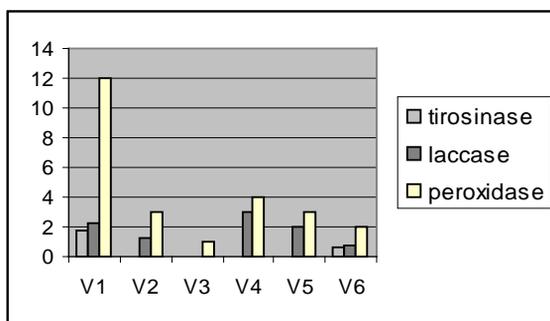


Fig.7. Total oxidative enzymatic activity of the new wine

CONCLUSIONS

The activity of PPO (tyrosinase and laccase) was gradually lowered during the alcoholic fermentation and no PPO activity was detected in the new wine, when different amounts of SO₂ and bentonite were added.

Tyrosinase activity during alcoholic fermentation has a decrease of 33-42% in the case of sulphite dioxide addition and coupled sulphite dioxide and bentonite addition, while for the bentonite addition only, the tyrosinase activity was total inhibited.

During the alcoholic fermentation, enzymatic activity of peroxidase and laccase were reduced by 27-73% correlated with the dose of sulphur dioxide and bentonite used.

After the alcoholic fermentation of grape must in the case of variants where were used similar doses of sulphur dioxide and bentonite, a reduction of oxidative enzyme activity of approximately 27-90% was observed.

REFERENCES

1. **Ciopraga J. și colab., 1978** – *New method for the determination of peroxidase activity*, Rev. Roumaine de Biochimie, 15(4), 259-283.
2. **Dubernet M., 1974** – *Thèse Doctorat 3 cycle*, Bourdeaux.
3. **Escudero A., Asensio E., Cacho J., Ferreira V., 2002** - *Sensory and chemical changes of young white wines stored under oxygen. An assessment of the role played by aldehydes and some other important odorants*. Food Chemistry, 77(3), 325–331.
4. **Ioniță Valeria, 1998** – *Studiul activității lacazei din strugurii atacați de Botrytis cinerea și aptitudinea de casare oxidazică a mustului și vinului în tehnologia de producere a vinurilor albe*. Analele ICVV Valea Călugărească, vol. XV, 407-417.
5. **Li H., Wang H., Yuan C., Wang S., 2005** - *Wine chemistry*. Beijing: Scientific Publishing Company.
6. **Oszmianski J., Cheynier V., Moutounet M., 1996** - *Iron-catalyzed oxidation of (+)-catechin in model systems*. Journal of Agricultural and Food Chemistry, 44(7), 1712–1715.
7. **Ribereau-Gayon P., Glories Y., Maujean A., Dubourdiou D., 2006** - *Handbook of enology (2nd ed.). The chemistry of wine stabilization and treatments (Vol.1, 2)*. Chichester, England: John Wiley and Sons Ltd
8. **Robards K., Prenzler P. D., Tucker G., Swatsitang P., Glover W., 1999** - *Phenolic compounds and their role in oxidative processes in fruits*. Food Chemistry, 66(4), 401–436.
9. **Singleton V. L., 1987** - *Oxygen with phenols and related reactions in musts, wines, and model systems: Observations and practical implications*. American Journal of Enology and Viticulture, 38(1), 69–77.
10. **Sioumis N., Kallithraka S., Tsoutsouras E., Makris D. P., Kefalas P., 2005**- *Browning development in white wines: Dependence on compositional parameters and impact on antioxidant characteristics*. European Food Research and Technology, 220(3–4), 326–330.
11. **Toit W. J. d., Marais J., Pretorius I. S., Toit M. d., 2006** - *Oxygen in must and wine – A review*. South African Journal of Enology and Viticulture, 27(1), 76–94.
12. **Wang Z., 1990** - *Food enzymology*. Beijing: China Light Industry Press.

INFLUENCE OF FERMENTATION TEMPERATURE ON THE VOLATILE COMPOUNDS - CONSTITUENTS OF WINES AROMA

INFLUENȚA TEMPERATURII DE FERMENTARE ASUPRA COMPUȘILOR VOLATILI CONSTITUENȚI AI AROMEI VINURILOR

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Abstract. *The white wines distinguish through compositional and sensorial characteristics. The white wines obtaining with certain typical features require the utilization some technology in elaboration process and a some conservation and stabilization techniques for flavors. From this standpoint, the fermentation temperature has a particularly important role in preserving primary flavors and secondary flavors. Fermentation of musts in different thermal regimes put in evidence considerable influence on volatile composition and the sensory characteristics of wines.*

Key words: white wines, sensorial characteristics, volatile compounds, temperature

Rezumat. *Vinurile albe se disting prin compoziție și caracteristici senzoriale specifice. Obținerea vinurilor albe cu anumite caracteristici tipice necesită utilizarea unor tehnologii în procesul de elaborare și a unei anumite tehnici de conservare și de stabilizare a aromelor. Din acest punct de vedere, temperatura de fermentare deține un rol deosebit de important în conservarea aromelor primare dar și în formarea aromelor secundare, de fermentație. Fermentarea musturilor în regimuri termice diferite a pus în evidență influența considerabilă asupra compoziției volatile și asupra însușirilor organoleptice ale vinurilor.*

Cuvinte cheie: vinuri albe, caracteristici senzoriale, compuși volatili, temperatură

INTRODUCTION

Freshness and fruitiness, naturalness and hygiene-alimentary value, characteristics more strongly demanded by consumers approved wines, at national and international, can not only get through a rational vinification, which requires, among others, a careful handling of alcoholic fermentation (Elena Heroiu, 1998).

Getting white wines of high quality, whose taste reminds of taste and flavor of fresh grapes, is conditioned by a number of factors involved in the technology to produce these wines (Popescu T. et al., 1989, Felicia Stoica, 2003).

Fermentation temperature is one of the most important factors influencing the sensory quality of wines and activity of the years used in fermentation (Felicia Stoica, 2008).

MATERIAL AND METHOD

The experience has been effectuated on a must obtained from grapes varieties Sauvignon, cultivated in the pedo-climatic condition of Dragasani vineyard.

Fermentation was headed to "dry" in the following variants:

V₁ – fermentation temperature 28°C

V₂ – fermentation temperature 24°C

V₃ – fermentation temperature 19°C

V₄ – fermentation temperature 15°C

V₅ – fermentation temperature 11°C

To put in evidence the loss of volatile compounds involved in carbon dioxide during alcoholic fermentation were captured the products by cooling at – 40°C in a hatch connected to the exit of the fermentation tank.

Of the condensed a microlitru was injected into gas-chromatograph equipped with F.I.D. detector and column filling with Reoplex 400. Compounds were identified using reference substances of high purity (standards) according to retention times.

Tests were performed using gas chromatography - method accepted by the national and international plan.

RESULTS AND DISCUSSIONS

Fermentation temperature has an important role in conservation the primary flavors and formation of fermentation flavors. Duration of fermentation was dependent on the temperature of fermentation. So, the variants V₁ and V₂ was fermented for 4 (four) days, V₃ for 7 (seven) days, V₄ for 8 (eight) days and V₅ for 10 (ten) days.

Fermentation musts in different thermal regimes put in evidence the considerable influence of these temperatures on the volatile composition and the sensorial characteristics of wines.

From Table 1 data may find that as in the volatile composition of wines and also the sensory, variant V₄ who was fermented at 15°C are included in the best followed closely by variant V₃. Wine obtained by fermentation of grape must at 28°C was the least successful in terms of organoleptic.

The data confirm those noticed in practice, according to which lower heating values during alcoholic fermentation is favorable to obtain wines with characteristics superior flavor and freshness.

It may be noted that the highest content in superior alcohols were recorded in the variant V₁ who was fermented at 28°C. Contents esters increase considerably when the fermentation temperature must decrease from 28°C to 15°C, so that the wine derived from fermented at lower temperature is the most rich in these compounds.

The wine content in volatile organic acids, decreases, overall, the fermentation temperature decreases from 28°C to 11°C (Table 2).

Table 1

**Influence of fermentation temperature on the content
in volatile compounds (mg/L)**

No. crt	Chemical composition	Fermentation temperature (°C)				
		28	24	19	15	11
1	n-propanol	0,170	0,153	0,148	0,153	0,162
2	isobutanol	5,22	4,90	4,75	4,20	4,30
3	n-butanol	0,390	0,285	0,367	0,548	0,440
4	alcohol isoamilic	108,3	95,9	83,3	67,9	70,3
5	hexanol	0,640	0,620	0,696	0,787	0,740
6	alcohol β phenyl etilic	13,9	13,1	15,6	12,9	12,3
7	Isoamil acetate	0,203	0,356	0,370	0,500	0,470
8	Ethyl caproat	0,290	0,318	0,355	0,358	0,330
9	Ethyl caprilat	0,590	0,615	0,740	0797	0,425
10	Ethyl succinat	0,188	0,251	0,197	0,74	0,190
11	Ethyl caprinat	0,045	0,090	0,138	0,160	0,142
12	β phenyl ethyl acetate	0,290	0,263	0,683	0,612	0,600
13	Ethyl laurat	0,271	0,252	0,347	0,370	0,357

Table 2

**Influence of different fermentation temperatures on volatile acids
content (mg/L) in the dry white wines – Sauvignon**

No. crt	Volatile organic acids	Fermentation temperature (°C)				
		28°C	24°C	19°C	15°C	11°C
1	Propionic acid	0,69	0,68	0,40	0,44	0,38
2	Isobutyric acid	11,50	4,76	4,16	4,53	3,75
3	n-butyric acid	3,60	3,50	1,63	0,98	0,84
4	Isovalerianic acid	1,77	1,74	1,10	0,96	0,87
5	n-valerian acid	0,98	0,55	0,73	0,28	0,25
6	Caproic acid	1,35	1,37	3,73	1,68	1,59
7	Caprilic acid	1,70	2,08	2,64	1,69	1,57
8	Pelargonic acid	0,05	0,117	0,117	0,101	0,15
9	Caprinic acid	0,98	0,76	0,84	0,76	0,30
10	Acid ethyl succinate	1,98	1,83	1,29	0,59	0,87
11	Lauric acid	0,35	0,43	0,58	1,01	0,42
12	2 hidroxicaproic acid	19,90	21,70	14,88	14,40	7,50

The lower fermentation temperature lower change the levurian metabolism, leading to the transformation of unsaturated fatty acids with long chain in fatty acid with shorter chain C_6 , C_8 , C_{10} , C_{12} .

The Variant V_3 has a higher content in caproic acid, caprylic acid and caprinic acid (Figure 1).

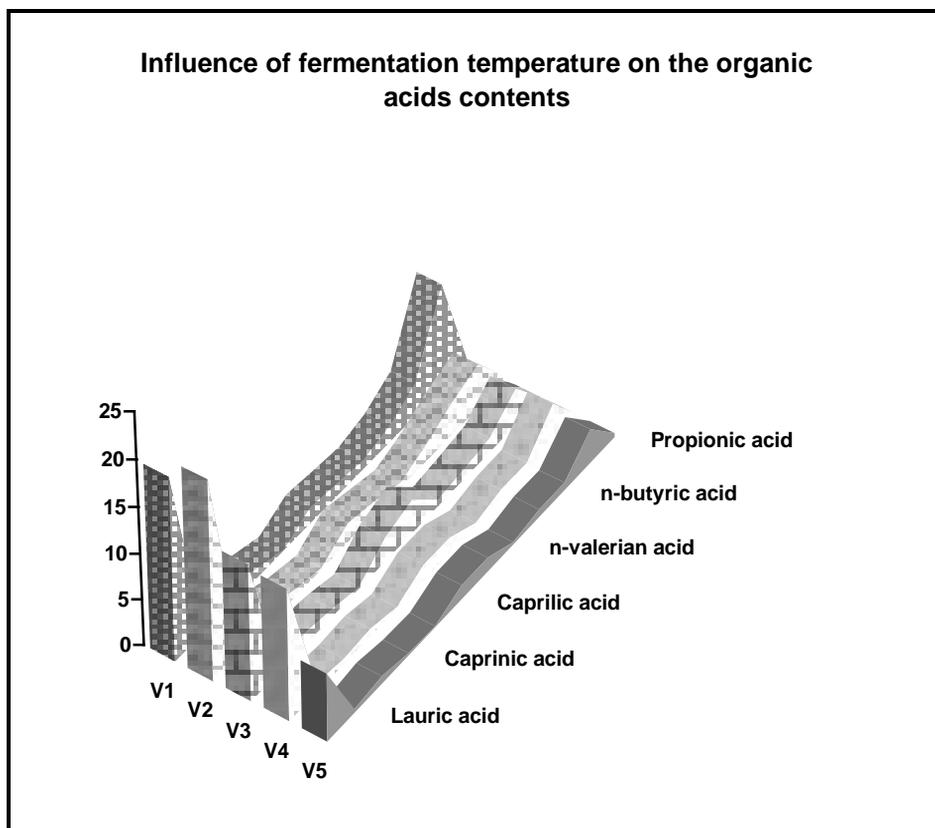


Fig. 1. Influence of fermentation temperature on the organic acids contents

According to the mechanism of esterification can be assumed that this wine will be rich in esters of the corresponding acids.

According the specialty literature ethyl caproat, ethyl caprilat and ethyl caprinat play most important role in white wine flavor being responsible for their freshness and fruitiness.

The low temperature fermentation produces a decrease of the amount of carbon dioxide that train with him and a remarkable amount of volatile products

To put in evidence the loss of volatile compounds involved in carbon dioxide during alcoholic fermentation we used the variant V_3 – must by Sauvignon grapes fermentated at 24°C .

Table 3 content the dates regarding the volatile compounds which appear in different condensate samples at the alcoholic fermentation of must at the 24°C.

Table 3

The average values of the volatile compounds involved in CO₂

NO. crt.	Volatile compounds	Average values, mg/100 ml liquid
1.	n-propanol	1,30
2.	Isobutanol	2,10
3.	Metil-2 butanol-1	0,90
4.	Metil-3 butanol-1	2,70
5.	Hexanol	0,80
6.	Ethyl acetate	0,31
7.	Ethyl capronate	0,13
8.	Acetate hexil	0,11
9.	Ethyl caprilate	0,08
10.	Ethyl caprinat	0,03

Training component of the carbon dioxide in the largest proportion was ethylic alcohol but its concentration was not quantified because alcohol isn't a compound of the wine aroma.

Compounds eliminated by the training were related to their concentration in wine. The propanol, isobutanol and methyl 3 butanol 1 are the alcohols which re found in high concentration in wine. The alcohols were quantitatively more important than the esters in the condensed sample.

A fermentation temperature of less lead to decrease the amount of carbon dioxide eliminated, and consequently a much lower volatile compounds.

CONCLUSIONS

- Fermentation temperature exerts a significant influence on the content of volatile compounds in wines and in their quality.
- The wine obtained by fermentation of grape must at high temperature has the greatest content in superior alcohols and is the least appreciated the quality of point of wieu.
- By fermentation of grape must at relatively low temperatures are obtained wines with superior characteristics in terms of flavor.
- These wines have high contents in esters that are easily volatile compounds.
- The value of low temperature fermentation leads to lower quantity of carbon dioxide formed and consequently a lower amount of volatile compounds involved.

REFERENCES

1. **Heroiu Elena, 1998** – *Cercetări asupra unor compuși organici constituenți ai aromei vinurilor din principalele soiuri cultivate în podgoria Ștefănești Argeș*. Teză de doctorat, Universitatea București
2. **Popescu T., Giosanu T, Vartolaș Eugenia, Heroiu Elena, Săvulescu Georgeta, 1989** – *Aportul principalilor factori tehnologici în procesul de elaborare a vinurilor albe seci de calitate*. *Lucrări Științifice "Contribuții la dezvoltarea științifică și tehnologică a viticulturii românești"*, pag. 303-321, București
3. **Stoica Felicia, 2003** – *Studiul posibilităților tehnologice de obținere a vinurilor aromate de tip VDOC în podgoria Drăgășani*. Teză de doctorat, Universitatea din Craiova
4. **Stoica Felicia, 2008** – *Vinuri aromate și semiaromate în podgoria Drăgășani. Tradiție, tehnologie, perspective*. Editura Universitaria, Craiova.

STUDY OF PHENOLIC COMPOUNDS IN RED WINES OBTAINED IN IAȘI VINEYARD BY DIFFERENT MACERATION-FERMENTATION METHODS

STUDIUL COMPUȘILOR FENOLICI DIN VINURILE ROȘII OBTINUTE ÎN PODGORIA IAȘI PRIN DIFERITE METODE DE MACERARE-FERMENTARE

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***Abstract.** The grape contains a high quantity of phenolic compounds responsible for color, which are transmitted into wines during the maceration-fermentation processes. The present paper's objectives are to monitor the extraction level, concentration evolution and analysis of these phenolic compounds in conjuncture with different maceration-fermentation procedures used. By approaching modern analytical methods, the correlation of studied phenolic compounds concentration variation with the maceration-fermentation technique will be facilitated. In order to underline this correlation, grapes from Fetească neagră and Merlot varieties were used, harvested at technological maturity from Iași-Copou vineyard; the grapes were processed into wine by using six maceration-fermentation techniques and the obtained products were physical and chemical analyzed for the different phenolic compounds responsible for color. The results reflect the extraction degrees for the analyzed compounds from the obtained wines.*

Key words: phenolic compounds, maceration, extraction, color

***Rezumat.** Strugurii roșii conțin o cantitate însemnată de compuși fenolici responsabili de culoare, transmiși în vinuri în timpul proceselor de macerare-fermentare. Prezenta lucrare are ca obiective urmărirea gradului de extracție, evoluția concentrației și analiza acestor compuși în conjunctura diferitelor procedee de macerare-fermentare folosite. Se urmărește, de asemenea, stabilirea unei corelații între variația concentrației compușilor fenolici studiați cu metoda de macerare-fermentare folosită. Pentru a evidenția această corelație, s-au folosit struguri aparținând soiurilor Fetească neagră și Merlot, recoltați la maturitate tehnologică din podgoria Iași-Copou; aceștia au fost vinificați prin șase modalități de macerare-fermentare, iar vinurile astfel obținute au fost analizate fizico-chimic din punct de vedere al concentrațiilor diferiților compuși fenolici responsabili de culoare. Rezultatele obținute reflectă gradele de extracție a compușilor analizați din vinurile realizate.*

Cuvinte cheie: compuși fenolici, macerație, extracție, culoare

INTRODUCTION

Red wines, as the name shows, differ from white ones, mainly because of their high content of phenolic compounds, out of which some are specific to them (anthocyanins). They are distinguishable by their aroma and taste which also are

different from those in the white wines. Compared to aromatic wines, whose odor and taste are defined by many terpenic compounds, the red ones have a varietal aroma that is given by different compounds (for example, in the case of Cabernet sauvignon, a great importance regarding aroma is represented by pyrazines)[2]. Regarding the above information, it is understood that, in red wine technology, the main objective is extraction from skins and diffusion in must of these constituents that imprint the wine with their specific characteristics. The extraction of colored compounds and aromas from grape skins, its main deposit, is done in the pre-fermentative and even in the fermentation stages, though maceration [1,5].

The present paper wants to underline the technological conditions which favor the phenolic compounds extraction from red grapes, in order to optimize the wine making methods and to obtain wines with superior chromatic characteristics.

MATERIAL AND METHOD

Research concerning the influence of different maceration-fermentation technological processes on the extraction degree for phenolic compounds from red grapes has been conducted in the Oenology Laboratory of the University of Agricultural Studies and Veterinary Medicine Iasi. Therefore, Fetească neagră and Merlot grape varieties have been harvested from Copou vineyard, which were processed by using six maceration fermentation techniques: classical maceration, ROTO-tanks maceration, thermo-maceration, micro-wave maceration, ultrasound maceration and cryo-maceration. The characteristics of each maceration-fermentation technique used are:

– Classical maceration: selected yeasts were added to the must, which was in contact with the skins for 3 days at 20 °C; when the alcoholic concentration reached 9%, the must was separated from the skins and the fermentation process continued until all sugars were depleted [2];

– ROTO-tank maceration: selected yeasts were added to approximate 40 L of marc, which was maintained in rotating tanks for three days, and the phases separation was conducted when the alcoholic separation reached 9%; the fermentation process ended in glass containers until all sugars were depleted [1,6].

– Microwave maceration: 5 kg marc underwent microwave irradiation for 10 minutes at 650 W power; the marc was then pressed; the fermentation process was conducted as stated above [4].

– Thermo-maceration: the marc was subjected to thermal treatment at 60-75 °C, for 30 minutes. A device for thermal treatment in must was used, with the following technical characteristics: tank capacity 20-40 kg, maximum temperature 80°C, maximum productivity 40 kg/hour, power 10 kW. The minimal threshold for marc thermal treatment is 50°C. After the thermal treatment, the fermentation process took place as in the above cases.

– Cryo-maceration: fresh grapes have been slowly frozen -30 °C, and then a fast destemming and crushing process took place; selected yeasts were added to the warmed must at 12°C. The fermentation process took place as in the above cases.

– Ultrasound maceration: represents the easiest way to destroy the cellular wall and obtain the extract. Ultrasound cavitation builds powerful forces which mechanically destroy the cellular wall and improve the transfer. As the compound that must be solved is surrounded by an insoluble structure, in order to extract it, the cellular wall needs to be destroyed. Therefore, the destemmed grapes were subjected to this treatment for 15

minutes. This process is not widely used in red grape processing technology but it is successful in obtaining aromatic white wines.

Many technological operations used were common to all variants: crushing and total destemming, SO₂ treatment of the marc, (doses of 0,05 g/L) in order to insure antioxidant and antiseptic protection, proteolytic enzymes addition in order to increase fluid extraction, adding the same yeast to the must, *Saccharomyces oviformis* (S.C.D.V.V. Iași collection) – characterized by a high alcoholigenous capacity, SO₂ resistance and non-foaming effect –, marc pressing using a low-capacity pneumatic press, alcoholic and malo-lactic fermentation (using endogenous lactic bacteria), oenological gelatin treatment (doses of 0,1 g/L), racking, filtration with a sterile filter and bottling [7].

The obtained wines were analysed: density, total acidity, volatile acidity, free and total SO₂ content, reducing sugar content, alcoholic concentration, and non-reducing dry extract. Also, the phenolic compounds were analysed: total anthocyanins content, total polyphenolic index, Folin-Ciocalteu index, color determination (CIELAB 76), anthocyanins' profile and phenolic acids content. An UV-VIS Analytik Jena Specord 200 spectrophotometer and a Hewlett-Packard HP-1100 HPLC with C18 column were used [8].

RESULTS AND DISCUSSIONS

The main compositional characteristics of the obtained wines (samples 1-12) are shown in table 1, while the analyses results regarding polyphenolic compounds are stated in tables 2 and 3.

Nine important anthocyanins were identified and quantified from the obtained wines (Fetească neagră and Merlot), by applying the six technological methods previously described: delphinidin (Dp-3-gl), cyanidin (Cy-3-gl), petunidin (Pt-3-gl), peonidin (Pn-3-gl) , malvidin (Mv-3-gl); peonidin acetilate (Pn-3-gl-ac), malvidin acetilate (Mv-3-gl-ac), peonidin cumaril (Pn- 3-gl-p-cum) and malvidin cumaril (Mv-3-gl-p-cum). From the registered data, we can conclude that the maceration-fermentation methods using ultrasounds and low temperature are not recommended for obtaining red wines with high phenolic compound concentration. By analyzing the other data – the Folin Ciocalteu index and chromatic parameters – the previous conclusion cannot be denied.

From all of the above, one can state that a high efficiency in extracting phenolic compounds responsible for the red color in wines can be obtained by using either classical maceration, either ROTO-tank maceration, but one must keep in mind that the marc should undergo a thermal treatment and a pectolytic enzyme addition.

Table 1

**Physical-chemical characteristics of wines obtained from Fetească neagră and Merlot grape varieties
Through different maceration-fermentation procedures**

Sample	Alcohol (%)	TA (g/L)	VA (g/L)	Free SO ₂ (mg/L)	Total SO ₂ (mg/L)	Sugars (g/L)	Density (g/L)	NRE (g/L)
FETEASCĂ NEAGRĂ								
Classical maceration	10,8	6,9	0,21	41	168	<4	0,9932	19,8
ROTO-tank maceration	11,2	7	0,18	15	53	<4	0,9953	26,3
Microwave maceration	11,2	6,6	0,2	10	71	<4	0,9922	18,3
Thermo-maceration	11,1	6,4	0,18	37	184	<4	0,9923	18,3
Cryo-maceration	11,7	4,5	0,17	25	80	<4	0,9898	13,7
Ultrasound maceration	11,3	7	0,21	29	111	<4	0,9930	20,9
MERLOT								
Classical maceration	11,6	6,34	0,46	16,45	70,77	<4	0,9930	24,2
ROTO-tank maceration	11,44	8,15	0,44	18,01	115,15	<4	0,9927	25,0
Microwave maceration	11,2	6,64	0,48	15,83	126,02	<4	0,9913	20,3
Thermo-maceration	10,94	7,55	0,44	17,07	92,81	<4	0,9925	22,9
Cryo-maceration	11,86	5,74	0,52	15,52	68,29	<4	0,9923	25,0
Ultrasound maceration	10,81	6,64	0,66	20,79	167,61	<4	0,9923	22,2

Table 2

**Phenolic indexes, total anthocyanins quantities, visual characteristics
(L, a, b) –CIE Lab 76 method values**

No.	Sample	TPI	FCI	Total anthocyanins (mg/L)	Luminosity L	a r (+) - v (-)	b g (+) - a (-)	Chromaticity	Hue
FETEASCĂ NEAGRĂ									
1	Classical maceration	28,83	52	211,13	95,47	4,57	1,63	0,16	0,91
2	ROTO-tank maceration	48,91	48,72	238,12	89,37	12,29	2,21	0,36	0,77
3	Microwave maceration	29,7	23,67	355,82	94,94	5,65	1,26	0,17	0,83
4	Thermo-maceration	28,27	22,26	228,93	92,83	8,21	1,61	0,25	0,79
5	Cryo-maceration	9,09	6,79	33,92	98,43	0,49	1,22	0,06	1,51
6	Ultrasound maceration	23,29	39,43	112,58	97,18	2,12	1,85	0,11	1,17

Table 2 continuing

MERLOT									
7	Classical maceration	37,68	37,67	301,14	86,53	19,10	0,13	0,44	0,56
8	ROTO-tank maceration	39,75	39,11	301,87	86,52	17,93	1,11	0,45	0,63
9	Microwave maceration	16,85	11,04	166,18	94,95	6,81	0,99	0,17	0,70
10	Thermo-maceration	27,94	52,22	298,40	88,91	16,78	-0,05	0,36	0,52
11	Cryo-maceration	11,31	8,91	37,24	98,06	0,98	2,19	0,08	1,64
12	Ultrasound maceration	14,41	13,7	127,83	96,65	4,42	1,16	0,12	0,74

Table 3

Percentual values of the nine anthocyanins present in wines (% of total)

No.	Sample	Dp	Cy	Pt	Po	Mv	Po-a	Mv-a	Po-cm	Mv-cm	Σ Ant.ac +Ant.cm	Σ Ant.ac/ Σ Ant.cm	Mv/ Σ Mv -COOR	Σ Ant./ Σ Ant.- COOR
FETEASCĂ NEAGRĂ														
1	Classical mac.	10,45	1,63	11,64	11,72	56,65	0,53	0,61	1,97	4,81	7,93	0,17	10,45	11,62
2	ROTO-tank mac.	10,63	3,02	11,98	14,37	46,48	1,85	6,49	1,67	3,51	13,52	1,61	4,65	6,39
3	Microwave mac.	11,57	1,14	12,99	11,12	53,34	0,59	1,95	2,08	5,23	9,84	0,35	7,44	9,16
4	Thermo-mac.	10,05	1,62	13,74	10,62	55,55	0,87	2,11	1,52	3,92	8,42	0,55	9,21	10,87
5	Cryo-mac.	1,01	0,50	1,82	5,49	80,31	2,76	5,71	0,54	1,85	10,87	3,54	10,61	8,20
6	Ultrasound mac.	4,86	1,17	9,46	12,81	66,13	0,54	1,96	0,82	2,26	5,58	0,81	15,66	16,92
MERLOT														
7	Classical mac.	11,32	2,24	10,48	12,30	40,92	4,08	10,87	2,92	4,86	22,74	1,92	2,60	3,40
8	ROTO-tank mac.	9,71	2,89	10,20	13,39	41,55	4,56	11,40	2,34	3,96	22,26	2,54	2,71	3,49
9	Microwave mac.	7,40	0,64	10,45	6,33	63,53	1,59	4,56	1,19	4,31	11,65	1,12	7,17	7,58
10	Thermo-mac.	10,95	1,57	11,58	10,41	42,99	4,76	10,25	2,67	4,82	22,50	2,01	2,85	3,44
11	Cryo-mac.	0,74	0,22	2,43	7,54	83,27	0,82	2,72	0,55	1,71	5,80	1,57	18,81	16,25
12	Ultrasound mac.	8,13	1,30	9,77	11,30	58,77	2,33	5,55	0,65	2,20	10,73	2,76	7,58	8,32

CONCLUSIONS

The obtained values for determining the total polyphenolic index and the anthocyanins' concentration from all wine samples show that the highest degree of extraction was registered at ROTO-tanks maceration variant; high values were also registered at variants obtained with thermo-maceration. The wines obtained by cryo-maceration and ultrasound maceration had a low phenolic concentrations and low anthocyanins content (except malvidin-3-monoglucoside).

The obtained results by CIELAB 76 come to strengthen the previous mentioned issues: the wines obtained through thermal treatment have superior chromatic characteristics to those obtained through cryo-maceration or ultrasound maceration.

REFERENCES

1. **Cotea V.D., 1985** – *Tratat de Oenologie*, vol.I, *Vinificația și biochimia vinului*. Ed. Ceres, București.
2. **Cotea V.V., Cotea V.D., 2006** – *Tehnologii de producere a vinurilor*. Editura Academiei Române, București.
3. **Cotea V.D., Sauciuc J.H., 1998** – *Tratat de Oenologie*, vol. II, *Limpezirea, stabilizarea și îmbutelierea vinului*. Ed. Ceres, București.
4. **Niculaua M., Cotea V.V., Nechita B., Neacșu I., Tudose-Sandu-Ville Ș., 2008** – *Microwave usage in maceration of red grape varieties*. The 31th International Vine and Wine Congress, Verona.
5. **Pomohaci N., Stoian V., Gheorghită M., Sirghi C., Cotea V.V., Nămoșanu I., 2000** – *Oenologie*, vol. I, *Prelucrarea strugurilor și producerea vinurilor*. Ed. Ceres, București.
6. **Ribéreau-Gayon P., Glories Y., Maujean A., Dubourdieu D., 2006** – *Handbook of Enology*, vol. II, *The Chemistry of Wine. Stabilization and Treatments, 2nd Edition*. Ed. John Wiley & Sons, West Sussex, England.
7. **Țârdea C., 2007** – *Chimia și analiza vinului*. Ed. „Ion Ionescu de la Brad”, Iași.
8. *****, 2008** – *Compendium of International Methods of Wine and Must Analysis*. Organisation Internationale de la Vigne et du Vin.

THE PRELIMINARY SELECTION OF ISOLATED YEAST STRAINS FROM THE INDIGENOUS FLORA OF IASI VINEYARD

SELECȚIA PRELIMINARĂ A UNOR SUȘE DE LEVURI IZOLATE DIN FLORA INDIGENĂ A PODGORIEI IAȘI

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Abstract: Knowing the importance of the yeasts with specific fermentation properties, capable to contribute to the creation of some quality wines, the isolation and selection activity is a must. It is well known that most of the wines, typically characterised, are achieved when the used yeasts are isolated and selected from the wine microbiota of the vineyard. Between 2005 and 2006 a number of 86 yeast strains was isolated in pure culture from wine-growing plantations of Fetească albă, Sauvignon blanc and Chardonnay, in the vineyard of Iasi – wine/growing centre in Copou. In order to make the selection of the biological material, from the point of view of the fermentation characteristics, the yeast strains isolated from the indigenous flora of the vineyard were preliminarily tested in laboratory in two phases, by monitoring the main parameters of the alcoholic fermentation process as well as the physical – chemical and organoleptical characteristics of wines. The data analysis shows that only the 20 % from the tested yeast strains can be considered as high-performance ones, given the stable characters when realising the fermentation processes and the quality of the achieved wines.

Key words: yeasts, isolation, Iasi, microbiota, organoleptical characteristics

Rezumat: Cunoscând importanța levurilor cu proprietăți fermentative specifice, capabile să contribuie la realizarea unor vinuri de calitate, activitatea de izolare și selecție se impune ca o necesitate. Este știut faptul că cele mai bune vinuri, caracterizate prin tipicitate se obțin atunci când levurile utilizate sunt izolate și selecționate din microbiota vinicolă a podgoriei respective. În perioada 2005 – 2006 s-au izolat în cultură pură din plantațiile viticole de Fetească albă, Sauvignon blanc și Chardonnay din Podgoria Iași - centrul viticol Copou un număr de 86 de sușe de levuri. Pentru a realiza selecția materialului biologic, din punct de vedere al caracteristicilor fermentative, sușele izolate din flora indigenă a podgoriei au fost testate preliminar la nivel de laborator în două etape, monitorizându-se principalii parametri ai procesului de fermentație alcoolică precum și caracteristicile fizico-chimice și organoleptice ale vinurilor. Din analiza datelor obținute reiese că doar 20 % din sușele testate pot fi considerate performante, datorită caracterelor stabile în realizarea proceselor de fermentație și a calității vinurilor obținute.

Cuvinte cheie: levuri, izolare, Iasi, microbiota, caracteristici organoleptice

INTRODUCTION

The wine was obtained a long time from the spontaneous fermentation of the must sugars by the yeasts present on the grapes without the deliberate inoculation at the beginning of the process (Di Maro Elena et co., 2007). The spontaneous alcoholic fermentation of the grape must is a complex process in which a great number of genders and species of yeast take part. During the first 2-4 days of the alcoholic fermentation process the apiculate yeasts are active, with a low tolerance against the ethanol concentrations, which partially contribute to the wine character (Efstratios Nikolaou et co., 2006). Once the ethanol concentration increases, the species from the gender *Saccharomyces* become dominant, affecting thus the development of the non – *Saccharomyces* species and they finish the must fermentation (Fleet G.H., 1999).

The species from the *Saccharomyces* gender selected as starter are preferable, as they have a good adaptation to the conditions of the wine-production microarea, and they can easily dominate the spontaneous flora. Moreover, these yeasts can assure the conservation of the typical sensitive properties and the characteristic profile of the wine in each area.

Therefore, the variability, the adaptation and the wide spreading of the yeasts in various biotopes allow the isolation of new yeast strains with properties which may influence the fermentation processes. From this point of view the activity of isolation and selection of the yeasts from the wine microbiota of the vineyards is a necessity in the activity of research and production.

MATERIAL AND METHOD

The isolation of the yeast strains from the Feteasca alba, Sauvignon blanc and Chardonnay varieties was made after the harvesting of the berries and rahis from five grapes, separately, which were introduced in jars with sterile serum. The wash waters were collected after shaking. Also, from the rest of the samples of aseptically harvested grapes the musts were obtained, distributed in sterile bottles. One bottle of must without sulphur was kept for each variety. The rest of the musts were distributed into sterile bottles and sulphited with doses 50, 75, 100, 150 and 200 mg/L SO₂. From the waters resulted after the washing of the berries, of the rahis and also from the unsulphited or sulphited musts with doses between 50/200 mg/L SO₂ the yeast strains isolation was performed by using the Domercq and Lindner methods (Anghel I, et co., 1991). The preliminary selection, from the point of view of the fermentation characteristics, of the isolated yeast strains was made by using glass bottles of 1000 mL where 750 mL of sterilized grape must were introduced. After the introduction of the inoculation from each yeast sources and the attachment of the boilers, the mini-fermentation containers were incubated at 20-22°C. From this moment daily observations were made monitoring the foam degree and the duration of the alcoholic fermentation phases. The yeast strains selected during the preliminary test were then verified in 10 L fermentation containers, checking the reproductibility of the fermentation characteristics.

RESULTS AND DISCUSSIONS

During the study period 2005-2006 from the vineyard of Iasi – Copou vineyard, 86 yeast strains were isolated, that is: 24 yeast strains from the

plantation of Feteasca albă, 33 yeast strains from the plantation of Sauvignon blanc and 26 yeast strains from the plantation of Chardonnay.

According to the isolation sources (the water after washing the grape berry, the water after washing the steam, the un sulphited musts and the sulphited musts), the percentual representation of the isolated sources (fig.1) shows that the lowest percentage is represented by the yeasts isolated from the washing waters, that is 16%. The percentage of isolated yeasts grew to 27% and to 56% in the case of the un sulphited and sulphited musts, respectively, incubated at 20-22°C.

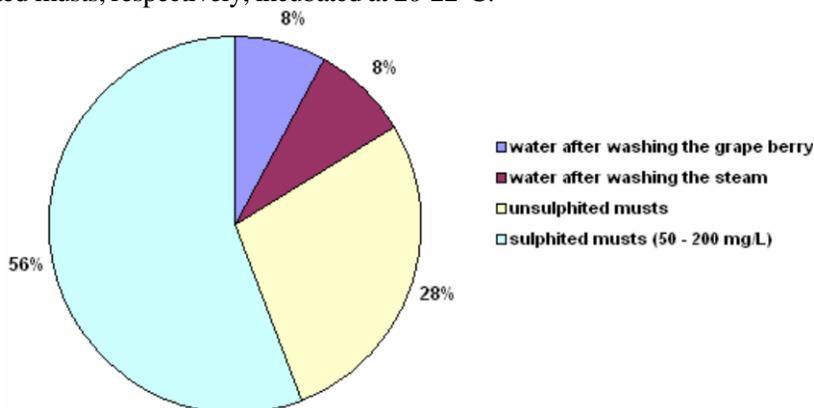


Fig. 1. Yeast strains isolated in the indigenous flora of Iasi vineyard between 2005 – 2006.

In the isolation activity the influence of the SO₂ doses was underlined, used for the treatment of the must, most of the sources being isolated during the alcoholic fermentation process in concentrations between 50-100 mg SO₂/L, the number of isolated yeasts decreases while the SO₂ doses increases.

In order to make the selection of the biologic material, from the point of view of the fermentation characteristics, the yeast strains were preliminarily tested in two phases. In the first phase, the 86 yeast strains were verified during the alcoholic fermentation process, monitoring the foaming degree, and the time intervals (hours/days) of the pre-fermentation, tumultuous fermentation and post-fermentation (calm fermentation) phases. From the analysis of the data obtained from the 86 yeast strains of isolated, 64% were eliminated. This percentage includes the yeast strains with abundant foam, with late start and finishing of the alcoholic fermentation processes or did not start the fermentation process.

Thus, in the preliminary test 31 yeast strains were selected: 11 yeast strains isolated in the plantation of Feteasca alba, 9 yeast strains isolated in the plantation of Sauvignon blanc and 11 yeast strains isolated in the plantation of Chardonnay. In continuation, the yeast strains isolated were studied in the second phase of the selection, verifying the reproducibility of the fermentation characteristics on the musts obtained from these varieties. In order to verify the fermentation capacity of the 11 yeast strains isolated from the plantation of Feteasca alba, fresh must was used with a sugar concentration of 198 g/L and the total acidity of 4,1 g/L H₂SO₄. The data obtained are presented in table I. By analysing the achieved results, they showed that foaming, also

monitored in the preliminary selection phase, remained at the same parameters for each selected yeast strains.

Table 1

Preliminary testing in the alcoholic fermentation of the yeast strains isolates on the plantation of Feteasca alba

Code of the yeast strains	Pre-fermentation phase (hours)	End of fermentation process (days)	Adherence – Non-adherence +	Alcohol Vol. %	Rest of sugar g/l	H ₂ S producers (qualitatively)
MNF1	20	14	+	11,6	-	-
MNF4	23	14	-	11,0	8	H ₂ S
MNF5	20	12	+	11,6	-	-
MNF6	18	12	+	11,6	-	-
F2(50)	23	11	-	11,5	2,5	H ₂ S
F1(75)	18	12	+	11,6	-	-
F1(100)	18	13	+	11,4	4,2	-
F2(100)	22	15	+	11,5	2	-
F3(100)	21	13	-	11,6	-	H ₂ S
F1(150)	20	12	-	10,2	24	-
F1(200)	18	13	+	11,6	-	-

From this point of view the investigations must continue for all the yeast strains selected in order to find the high-performance yeast strains. But, if we take into consideration the rapidity of growth, evaluated in hours/days at the beginning of the pre/fermentation phase and termination of the alcoholic fermentation, the sources MNF5, MNF6, F2(50), F1(75), F1(100) and F1(200) made themselves noticed. They started the alcoholic fermentation 18-21 hours after the inoculation and finished the fermentation between 11-13 days. It was also seen that they form compact, dense, stabile sedimentations, which is an important property in the case of exploitation at industrial level. The MNF1 and F2(100) yeast strains, although they finish the alcoholic fermentation process in a longer time (14 – 15 days), they will be studied together with the above mentioned at pilot level, because they are quality compatible, they have the right foaming degree, the right alcohol concentration (11.5 – 11.6%), and the correspondent organoleptical characteristics of the obtained wines. From the total of 11 yeast strains, four were excluded: MNF4, F2(50), F3 (100) and F1(150), because during processes they stick to the walls of the fermentation containers, and the obtained wine are not organoleptical right, emanating a smell of sulphured hydrogen.

The yeast strains isolates from the plantation of Sauvignon blanc, selected during the preliminary test, were submitted to the second selection phase, using fresh must from the grapes of the same variety. The sugar concentration and the total must acidity was of 230 g/L and 5.2 g/L H₂SO₄, respectively.

The analysis of the results mentioned in table 2 shows that the yeast strains selected in the preliminary test does not modify the foaming capacity and the duration of the alcoholic fermentation processes. Regarding the multiplication rapidity, 7 yeast strains started the alcoholic fermentation process 18-20 hours from the inoculation, and they finished fermentation after 11-13 days. When analyzed from the point of view of the clearing process, the yeast MNS9, S1(75), S3(75) and S4(200) did not

prove to be favourable, being evaluated as average and reduced, being also characterized by dusty, detachable sedimentations.

Table 2

Preliminary testing in the alcoholic fermentation of the yeast strains isolates on the plantation of Sauvignon blanc

Code of the yeast strains	Pre-fermentation phase (hours)	End of fermentation process (days)	Adherence – Non-adherence +	Alcohol Vol. %	Rest of sugar g/l	H ₂ S producers (qualitatively)
MNS6	19	13	+	13,5	-	-
MNS9	20	13	+	12,9	10	H ₂ S
S1(75)	20	12	+	13,5	-	H ₂ S
S3(75)	23	12	-	12,8	12	H ₂ S
S4(75)	22	12	+	11,6	32	-
S5(75)	20	14	+	13,3	8	-
S6(75)	18	13	+	13,5	-	-
S3(150)	20	11	+	13,5	-	-
S4(200)	20	14	-	12,4	19	H ₂ S

The yeast strains MNS6, S1(75), S5(75) and S3(150) made wines with an alcoholic concentration of 13.5% vol. of alcohol, and the yeast MNS9, S3(75), S4(200) made wines with the alcoholic concentration between 12.4 – 12.9% vol. alcohol. One yeast strains, S4(75), finished the fermentation with 11.6% volume of alcohol. The selection of the potentially high-performance yeast strains from this lot was possible after the organoleptical analysis. Thus, the yeast MNS9, S1(75), S3(75) and S4(200), although they presented advantageous characteristics from the point of view of the non-adherence on the walls of the fermentation containers and of the wines alcoholic concentration, were not selected because they produce sulphured hydrogen. From the 9 yeast selected in the preliminary test, the following are still of interest: MNS6, S5(75), S6(75) and S3(150). Moreover, the yeast S4(75) deserves attention when testing at pilot level, as the wine produced by it has a rest of sugar, and this aspect may be exploited at industrial level in order to obtain semi-sweet wines without interrupting the fermentation with SO₂. The verification of the fermentation capacity of the 11 yeast strains of potential high-performance, isolated from the plantation of Chardonnay and selected during the preliminary test, was also made on must from the same variety with a sugar concentration of 235 g/L and a total acidity of 4.9 g/L H₂SO₄ (table 3).

The yeast sources selected during the preliminary test and verified during the alcoholic fermentation process in 10 L fermentation containers do not modify their foaming capacity, being it a stable feature which has already evolved within the known parameters. Eight sources from this lot started the alcoholic fermentation process after 18-22 hours, and three of them after 23 hours, C3(50), C4(50) and C2(50) respectively, the finalization times of the fermentation were constant. After the organoleptical analysis, the sulphured hydrogen-producing sources were eliminated, that is MNC1, MNC7, C1(50), C3(50) and C2(100). Given the stable and reproductive properties, five sources were selected: BC1, MNC2, MNC4, C1(100) and C4(100).

Table 3

Preliminary testing in the alcoholic fermentation of the yeast strains isolates on the plantation of Chardonnay

Code of the yeast strains	Pre-fermentation phase (hours)	End of fermentation process (days)	Adherence – Non-adherence +	Alcohol Vol. %	Rest of sugar g/l	H ₂ S producers (qualitatively)
BC1	22	12	+	13,8	-	-
MNC1	20	14	-	12,2	27	H ₂ S
MNC2	18	13	+	13,8	-	-
MNC4	20	11	+	13,6	3,8	-
MNC7	22	14	-	12,8	17	H ₂ S
C1(50)	20	14	-	13,8	-	H ₂ S
C3(50)	24	14	-	11,3	42	H ₂ S
C4(50)	23	12	-	11,0	48	H ₂ S
C1(100)	21	13	+	13,8	-	-
C2(100)	23	11	+	12,9	15	H ₂ S
C4(100)	20	13	+	13,5	5	-

From the overall data analysis of the 31 yeast strains, 17 can be considered to be high-performance sources due to the stable features during the fermentation process and the achievement of quality wines.

CONCLUSIONS

1. The waters from the washing of the berries, of the steam, and the must resulted from the processing of the grapes belonging to the varieties of Feteasca alba, Sauvignon blanc and Chardonnay, were the bases from where the 86 yeast strains were isolated. The 14 yeast strains were isolated from the berries and steam washing waters, 24 from the fresh must without composition correction, and 48 yeast from the must treated with variable doses of SO₂ (50 – 200 mg/L).

2. From the analysis of the data collected in the preliminary test, 31 yeast strains were select and 64% of the 86 yeast strains isolated being eliminated.

3. After the verification of the fermentation characteristics (laboratory phase) of the 31 yeast strains isolated from the vineyard with Feteasca alba, Sauvignon blanc and Chardonnay, in the 2nd phase only 17 sources were selected, which can be considered as high-performance ones due to the stable features in the fermentation processes and the achievement of quality wines

REFERENCES

1. Anghel I., Vassu T., Segal B., Cojocaru I., 1991 – *Biotehnologia și tehnologia drojdiilor, vol II*. Editura Tehnică, București.
2. Di Maro Elena, Danilo Ercolini, Salvatore Coppola, 2007 - *Yeast dynamics during spontaneous wine fermentation of the Catalanesca grape*. International Journal of Food Microbiology 117, pp. 201 – 210.
3. Fleet G.H., 1999 – *Microorganisms in food ecosystems*. International Journal of Food Microbiology 50, pp 101 – 117.
4. Nikolaou E., E. H. Soufleros, Elizabeth Bouloumpasi, N. Tzanetakis, 2006- *Selection of indigenous Saccharomyces cerevisiae strains according to their oenological characteristics and vinification results*. Intern. J. of Food Microbiology 23, pp. 205 – 211.

THE OENOLOGICAL CHARACTERIZATION OF YEAST STRAINS POTENTIALLY PERFORMANCE IN THE ALCOHOLIC FERMENTATION PROCESS, ISOLATED FROM THE INDIGEN FLORA OF THE VINEYARD OF IAȘI

CARACTERIZAREA OENOLOGICĂ A UNOR SUȘE DE LEVURI POTENȚIAL PERFORMANTE ÎN PROCESUL DE FERMENTAȚIE ALCOOLICĂ IZOLATE DIN FLORA INDIGENĂ A PODGORIEI IAȘI

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Abstract: *With the purpose of using the new yeast strains isolated and selected from the vines of the vineyard of Iași – the Copou Wine-Growing Center in the current wine-growing biotechnological practice, the study in standardized conditions of the following oenological characters was necessary: the degree of foam production, the clearness of the wine obtained, the type of yeasty sediment formed after the fermentation, the alcoholigenic power, the capacity of leading the alcoholic fermentation to different temperatures (11 – 13°C, 22°C and 35°C), as well as the resistance to different concentrations of sulphur dioxide (60 mg/L SO₂, 100 mg/L SO₂, 150 mg/L SO₂ ad 200 mg/L SO₂). The data obtained from the application of tests for the identification of the oenological characters allowed the selection of nine yeast strains considered of high performance in the production of high quality white wines.*

Key words: Copou, vineyard, yeast, fermentation, quality

Rezumat: *În vederea utilizării în practica biotehologică vinicolă curentă a noilor sușe de levuri izolate și selecționate din plantațiile viticole ale podgoriei Iași – centrul viticol Copou s-a impus studiul în condiții standardizate a următoarelor caractere oenologice: gradul de producere a spumei, limpiditatea vinului obținut, tipul de sediment levurian format după încetarea fermentației, puterea alcooligenă, capacitatea de a conduce fermentația alcoolică la diferite temperaturi (11 – 13°C, 22°C și 35°C), precum și rezistența la concentrații diferite de dioxid de sulf (60 mg/L SO₂, 100 mg/L SO₂, 150 mg/L SO₂ și 200 mg/L SO₂). Datele obținute în urma aplicării testelor pentru determinarea caracterelor oenologice au permis selectarea unui număr de nouă sușe ce pot fi apreciate ca fiind performante în producerea vinurilor albe de calitate.*

Cuvinte cheie: Copou, podgorie, levuri, fermentare, calitate

INTRODUCTION

Specialists in the field classify the yeasts important from the oenological standpoint based on their physiological and biochemical properties or on general criteria or criteria that correspond to particular wine-production conditions (1 – 4).

Polsinelli and his collaborators consider that the selection of yeasts involved in

the wine-production involve, on the one hand, knowing the fermentative properties (the quick trigger of fermentations, high capacity of fermentation, tolerance to alcohol, osmotolerance, resistance to temperatures, aromatic properties etc.) and, on the other hand, knowing the technological particularities (genetic stability, resistance to SO₂, low formation of foam, sulphites etc.)

Thus, with the purpose of implementing in the wine-producing biotechnological practice new sources of yeasts isolated from the vineyard of Iași – Copou Wine-Growing Center, a study was necessary of the main oenological characters of the new yeast strains isolated in pure culture, in standardized conditions.

MATERIAL AND METHOD

In order to determine the degree of foaming of the yeast strains, calibrated cylinders of 1,000 cm³ were used, in which 800 cm³ of sterile must was put. The sterile must divided to calibrated cylinders was inoculated with the same quantity of active inoculum. Upon inoculation, the density of the cells/mL was approximately the same (1 x 10⁵). The cylinders were maintained at the temperature of 22°C. For 72 hours, the quantity (cm³) of foam produced by each yeast was recorded every 24 hours. The clearness and the characteristics of the yeasty sediment were established by visual examination, after the alcoholic fermentation. From the clearness standpoint, the wine was evaluated as clear, opalescent, turbid, and the appearance of the yeasty sediment was evaluated as powdery or granular. The degree of adherence to the walls of the recipients was also evaluated.

In order to determine the alcoholigenic power, grape must sterilized in the steamer was used, in different concentrations of sugars by adding concentrated must. The must was allotted to recipients and then sown with 1 mL of three-day-old suspension, with the density of 1 x 10⁵ cells/mL and thermostatically subject to 22°C. After 30 days from the sowing, the alcoholic degree (vol. %) and the non-fermented sugars (g/L) were determined. The alcoholic power was determined after the alcoholic fermentation by measuring the ebullition and recording the obtained alcohol degrees.

The fermentative capacity at different temperatures was also tested on a set of glass recipients in which must sterilized in the steamer at 0.8 atm. was put. For each yeast strains, three recipients were prepared that were inoculated and incubated at different temperatures of 13-14°C, 22°C and 35°C. After 30 days, the alcoholic degree and the residual sugar were established.

The fermentation capacity of the sugars of the must in different concentrations of sulphur dioxide was evaluated, for each yeast strains, on a set of glass recipients of 500 mL, in which sterilized grape must was introduced. After the allotment of the must, calculated amounts of SO₂ were added for the achievement of the concentrations of 60 mg/L SO₂, 100 mg/L SO₂, 150 mg/L SO₂ and 200 mg/L SO₂. Such recipients were inoculated with 1 mL of 3-day old yeasty suspension of 1 x 10⁵ cells/mL and thermostatically subject to 22°C. After 30 days from the sowing, the alcoholic degree and the non-fermented sugars for each yeast were measured.

RESULTS AND DISCUSSIONS

With a view to selecting new yeast strains of high performance in the production of high quality white wines, 17 yeast were studied. The results regarding their oenological characters are presented in tables 1-4.

The analysis of the data specified in table 1, regarding the degree of foaming,

the type of sediment and the clearness of the end product, reveal that six yeast sources are average foaming, six are minimally foaming and five are non-foaming, namely MNF6, F1(75), S6(75), MNC2 and C1(100).

Depending on the type of sediment, it was found that 70 % of them formed compact deposits and only five yeast strains formed powdery or floury deposits. According to the clearness character of the obtained wines ten yeast sources led to clear wines, namely four yeast sources isolated from the plantation of Fetească alba, three yeast strains of the plantation Sauvignon blanc and three from the plantation of Chardonnay. The rest of the yeast strains led to the achievement of turbid or opalescent wines.

Table 1

Evaluation of the degree of foaming, of the type of sediment and of the clearness of the end product

No.	Yeast code	Foam volume, (cm ³ /L)			Type of sediment	Clearness
		24 hours	48 hours	72 hours		
1	MNF1	10	5	-	compact	opalescent
2	MNF5	60	10	10	compact	turbid
3	MNF6	-	-	-	compact, non-detachable	clear
4	F1(75)	-	-	-	compact	clear
5	F1(100)	50	-	-	compact	turbid
6	F2(100)	140	5	5	floury, easily detachable	clear
7	F1(200)	10	-	-	compact, difficultly detachable	clear
8	MNS6	6	-	-	compact	clear
9	S4(75)	10	10	5	floury, easily detachable	opalescent
10	S5(75)	15	5	-	powdery, dense	turbid
11	S6(75)	-	-	-	compact	clear
12	S3(150)	9	-	-	compact	clear
13	BC1	50	50	50	powdery, detachable	turbid
14	MNC2	-	-	-	compact	clear
15	MNC4	25	-	-	Powdery, easily detachable	turbid
16	C1(100)	5	-	-	compact	clear
17	C4(100)	-	-	-	compact	clear

Note: for the yeast strains 1 – 12 the must concentration was 210 g/L;
for the yeast strains 13 – 17 the must concentration was 235 g/L;

The results regarding the capacity of the studied yeasts of fermenting the musts with different concentrations of sugars are specified in table 2. The specified data reveal that the new yeast strains isolated lead to the achievement of dry wines when using musts with concentrations of 210 and 235 g/L respectively in sugars.

The presence of musts with concentrations of 260 g/L sugars, the yeasts MNF6, S6(75), MNC2 and C1(100) led to the achievement of dry wines and the yeast strains F1(75), F2(100), MNS6 to semi-dry wines. The rest of 58.8% of the tested yeast strains produced semi-sweet wines. As regards the concentration of 305 g/L sugars in the must, all tested yeast strains achieved sweet wines with non-fermented sugars between 58 and 87 g/L.

Table 2

Capacity of accomplishing alcoholic fermentation in different concentrations of sugars

No.	Yeast code	Must with 210 g/L și /235 g/L sugars		Must cu 260 g/L zaharuri		Must cu 305 g/L zaharuri	
		Alcohol, vol %	Non-fermented sugars, g/L	Alcohol, vol %	Non-fermented sugars, g/L	Alcohol, vol %	Non-fermented sugars, g/L
1	MNF1	12,3	-	13,8	25,0	13,2	80
2	MNF5	12,3	-	15,3	-	14,2	63
3	MNF6	12,3	-	14,4	15,0	12,8	87
4	F1(75)	12,2	2,0	14,9	6,0	12,8	87
5	F1(100)	12,0	6,0	14,3	16,0	12,9	85
6	F2(100)	12,3	-	14,9	6,0	13,2	80
7	F1(200)	12,3	-	14,3	16,8	12,9	85
8	MNS6	12,3	-	14,9	6,0	14,8	53
9	S4(75)	12,3	-	15,0	5,6	11,8	104
10	S5(75)	12,3	-	14,4	15,0	12,8	87
11	S6(75)	12,3	-	14,2	18,0	11,8	104
12	S3(150)	12,3	-	15,1	3,0	14,5	58
13	BC1	13,8	-	13,0	39,0	12,8	87
14	MNC2	13,8	-	15,2	-	12,8	87
15	MNC4	13,8	-	13,2	35,0	10,7	123
16	C1(100)	13,8	-	15,0	4,8	14,5	58
17	C4(100)	13,8	-	14,7	10,0	14,5	58

Note: for the yeast strains 1 – 12 the must concentration was 210 g/L;
for the yeast strains 13 – 17 the must concentration was 235 g/L;

The experimental data regarding the checking of the fermentative capacity at different temperatures are specified in table 3.

Table 3

Capacity of accomplishing alcoholic fermentation at different temperatures

No	Yeast code	Temperature at which the alcoholic fermentation process takes place					
		13 - 14°C		22°C		35°C	
		Alcohol, vol %	Non-fermented sugars, g/L	Alcohol, vol %	Non-fermented sugars, g/L	Alcohol, vol %	Non-fermented sugars, g/L
1	MNF1	12,3	-	12,3	-	10,8	26
2	MNF5	12,2	-	12,3	-	9,9	41
3	MNF6	12,1	-	12,3	-	9,7	45
4	F1(75)	11,6	12,7	12,2	2,6	9,2	53
5	F1(100)	10,9	2,4	12,0	6,0	9,7	45
6	F2(100)	12,2	2,0	12,3	-	9,2	53
7	F1(200)	12,3	-	12,4	-	10,2	36
8	MNS6	12,2	2,6	12,3	-	12,2	2,6
9	S4(75)	12,3	-	12,3	-	9,3	51
10	S5(75)	12,3	-	12,3	-	8,6	63
11	S6(75)	12,3	-	12,3	-	12,0	6
12	S3(150)	12,3	-	12,3	-	12,3	-
13	BC1	13,0	11,0	13,2	10	9,2	141
14	MNC2	13,8	-	13,8	-	13,8	-
15	MNC4	13,0	14,0	13,5	5	10,1	63
16	C1(100)	13,7	2,0	13,8	-	13,8	-
17	C4(100)	13,8	-	13,8	-	13,7	2,0

Note: for the yeast strains 1 – 12 the must concentration was 210 g/L;
for the yeast strains 13 – 17 the must concentration was 235 g/L;

At temperatures of 13-14°C, 82 % of the yeast strains tested led to the achievement of dry wines, the rest achieved sweet wines. Nevertheless, at 22°C, all yeast tested led to obtaining dry wines, except for two of them, namely F1(100) and BC1.

Along with the increase in the temperature to 35°C, the data obtained reveal different aspects. Four yeast strains, namely S3(150), MNC2, C1(100) and C4(100) led to the achievement of dry wines, the rest of 64% of the tested yeast led to achieving sweet and semi-sweet wines, except for one yeast, BC1, which was not able to lead the alcoholic fermentation process to 35°C and thus approximately 60% of the sugars of the must remained non-fermented.

The last aspect approached was the testing of the capacity of the 17 yeast strains of accomplishing alcoholic fermentation in different SO₂ concentrations. The data obtained are specified in table 4.

Table 4

Capacity of accomplishing alcoholic fermentation in different concentrations of the sulphur dioxide

No	Yeast code	Sulphur dioxide concentration in the must							
		60 mg/L SO ₂		100 mg/L SO ₂		150 mg/L SO ₂		200 mg/L SO ₂	
		Alcohol, vol %	Non-fermented sugars, g/L	Alcohol, vol %	Non-fermented sugars, g/L	Alcohol, vol %	Non-fermented sugars, g/L	Alcohol, vol %	Non-fermented sugars, g/L
1	MNF1	12,3	-	12,3	-	12,3	-	12,3	-
2	MNF5	12,3	-	12,3	-	12,3	-	<i>Does not trigger fermentation</i>	
3	MNF6	12,2	2,6	12,3	-	12,4	-	12,3	-
4	F1(75)	12,2	2,6	12,3	-	12,3	-	12,3	-
5	F1(100)	12,2	2,0	12,2	2,0	7,3	84	7,3	84
6	F2(100)	12,2	2,1	12,3	-	12,3	-	12,3	-
7	F1(200)	12,1	-	12,3	-	12,4	-	12,3	-
8	MNS6	12,3	-	12,3	-	12,3	-	12,3	-
9	S4(75)	12,3	-	11,4	16,0	9,0	5,7	7,5	82
10	S5(75)	12,3	-	11,7	11,0	11,1	21	9,8	43
11	S6(75)	12,3	-	12,3	-	12,3	-	12,3	-
12	S3(150)	12,3	-	12,3	-	12,3	-	12,3	-
13	BC1	13,8	-	13,2	10,0	12,0	31	12,3	37
14	MNC2	13,8	-	13,7	-	13,8	-	13,7	-
15	MNC4	13,8	-	13,8	-	11,6	36	10,2	62
16	C1(100)	13,8	-	13,8	-	13,8	-	13,8	-
17	C4(100)	13,8	-	13,8	-	13,8	-	13,8	-

*Note: for the yeast strains 1 – 12 the must concentration was 210 g/L;
for the yeast strains 13 – 17 the must concentration was 235 g/L;*

The analysis of the data reveal the fact that in doses of 60 and 100 mg/L SO₂, the newly isolated yeasts achieve alcoholic fermentations, resulting in dry wines, except for the sources S4(75), S5(75) and BC1.

As for the use of the concentration of 150 mg/L SO₂, the yeasts BC1 and MNC4 resulted in alcoholic fermentation, with remaining sugar, between 21 and 36 g/L. The yeast F1(100) proved to be sensitive to this dose of SO₂, as in the

achieved wine, non-fermented sugars were found of the concentration 86 g/L.

As regards the variant with addition of 200 mg/L SO₂, the behaviour of the tested yeast strains mark out their good resistance to this dose, leading 64.7 % of the fermentations to dry wines and 29.4 % to semi-sweet and sweet wines. The yeast MNF5 did not trigger the alcoholic fermentation in 200 mg/L SO₂.

CONCLUSIONS

All in all, the data obtained as a result of the tests for the identification of the oenological characters of the potentially high performance, 17 yeast strains reveal the following aspects:

- from the point of view of the foaming degree, six yeasts are average foaming, six are minimally foaming (3 – 5 cm³/L foam) and five are non-foaming;

- according to the type of sediment, five yeasts formed powdery and floury deposits and twelve formed compact deposits;

- as for the clearness characteristic, five yeasts completed the alcoholic fermentation process and produced turbid wines, two gave opalescent wines and ten led to clear wines;

- all the yeasts strains tested are alcoholigenic and have the capacity of triggering and ending fermentation at temperatures of 13 – 14°C;

- of the 17 yeast tested, in the process of alcoholic fermentation of grape must treated with doses of SO₂ between 60 and 200 mg/L, the sources BC1, F1(100), MNC4, S4(75) and S5(75) proved to be sensitive. One yeast (MNF5) did not trigger the alcoholic fermentation process of the grape must with 200 mg/L SO₂.

After the evaluation of the oenological characters, nine yeast were selected, being considered capable of performances in the production of high quality white wines, namely three yeasts from the plantation of Fetească albă (MNF6, F1(75), F1(200)), three yeasts from the plantation of Sauvignon blanc (MNS6, S6(75), S3(150)) and three yeasts from the plantation of Chardonnay (MNC2, C1(100), C4(100)).

REFERENCES

1. **Boiteau C., 1995** – *Levures: plus de cent souches*. Ressir Vigne France. Nr. 9, pp. 20–26.
2. **Gaio P., 1992** – *I fermenti selezionati in enologia*. Vignevini. Nr.3, pp. 30 – 32.
3. **Lemasquier H., Gainors A., Charlemagne B., 1995** – *Sélection de levures oenologiques à activité clarifisnte*. *Revue Francaise d'Oenologie*. Nr. 154, pp. 23 – 29.
4. **Polsinelli M., Casalone E., 2003** – *Metodologie di miglioramento genetico di lieviti*. Vigneli, nr. 7-8, pp. 50 – 54.
5. **Villetaz J.C., 1992** - *Production industrielle des levures seches de vinification*. Les aquisitions récentes dans la Microbiologie du vin.

A STUDY ON THE USE OF THE AMINO ACID PROFILE AS A BIOCHEMICAL DESCRIPTOR FOR THE CHARACTERIZATION OF THE VINE GERMPLASM

STUDIUL PRIVIND UTILIZAREA PROFILULUI DE AMINOACIZI CA DESCRIPTOR BIOCHIMIC PENTRU CARACTERIZAREA GERMOPLASMEI VITICOLE

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Abstract. *Due to a large number of traditional cultivars, new varieties and clones, it is imperatively necessary to identify resources of vine germplasm with the purpose of further manipulation. In this respect, researches on the analysis of free amino acids in various Vitis cultivars, conducted during different stages of growth and development, have highlighted great variability in the total amino acid content and their profile. Although the amino acid content differs each year, the ratio of certain amino acids (Pro, Arg, Glu, Gln, Tre, Ser, Ala) remains constant in each cultivar and may be used as an indicator in the genetic differentiation between cultivars of the same area. This paper aims at evaluating, based on research conducted worldwide so far, the possibilities of devising new methods, techniques and working schemes which may lead to the precise genetic identification of cultivars.*

Key words: vine germplasm, amino acid profile, genetic identification

Rezumat. *Datorita existentei unui numar mare de cultivare traditionale, soiuri si clone noi este imperativ necesara identificarea in vederea manipularii resurselor de germoplasma viticola. In acest sens, cercetari privind analiza aminoacizilor liberi la diferite cultivare apartinand genului Vitis, efectuate in diferite stadii de crestere si dezvoltare, au evidentiat o variabilitate mare sub aspectul continutului total de aminoacizi si profilului acestora. Desi continutul in aminoacizi difera de la un an la altul, raportul dintre anumiti aminoacizii (Pro, Arg, Acidul glutamic, Glu, Tre, Ser, Ala) ramane constant la fiecare cultivar si poate fi utilizat ca indice de diferentiere genetica intre cultivarele din aceiasi areal. Lucrarea de fata isi propune, pe baza cercetarilor efectuate in lume pana la aceasta data, o evaluare a posibilitatilor in vederea formularii unor metode, tehnici si scheme de lucru care sa conduca la identificarea genetica de precizie a cultivarelor.*

Cuvinte cheie: germoplasma viticola, aminoacid, identificare genetica

INTRODUCTION

The evaluation of the genetic diversity in *Vitis vinifera* L. is important not only in studies about different varieties and cultivars but also in studies concerning the improvement and preservation of the germplasm fund of the species. The classic identifying methods, based on botanical and ampelographic characteristics are not entirely the most precise, with certain limitations due to the instability of morphological characteristics under the influence of environmental

factors. Where improvement is concerned, the identification of the varieties in the first stages of development is extremely difficult, since the particular characteristics appear gradually over the next few years. Also, in the case of rootstocks the ampelographic methods of identification can only be used in rootstock plantations, but not after grafting.

An important step in evaluating the genetic material has been taken with the introduction of biochemical methods at protein level through izoenzymatic analysis, which reveals differences between the accumulation of proteins or enzymes coded by various alleles (Schwennesen et al., 1982; Crespan et al., 1999), as well as molecular techniques based on DNA which have been in use for over two decades and which have the ability to identify extremely fine variations or polymorphism given by DNA sequences (Striem et al., 1990; Bourquin et al., 1991). Also researches concerning amino acid profiles in the *Vitis* genus have shown great variability (Kliwer et al. 1966, Kliwer 1969, 1970, Kluba et al., 1978, Marcy et al., 1981, Notsuka et al., 1984, Huang et Ough, 1991), pointing toward the great importance of implicating genetics in this variability. This study aims at evaluating researches in this area in order to devise a methodology for the identification of cultivars in this manner.

MATERIAL AND METHOD

Examining the amino acid profile has been an issue in various research papers for viticulture and oenology. (Peynaud et Maurie, 1953,; Peynaud et Lafon-Lafourcade, 1961; Ough et Amerine, 1966,; Ough, 1968, Poux et Ournac, 1970, Gallander, 1974, Kluba et al., 1978, Amerine et al., 1979).

Amino acids are monomeric forms of proteins, synthesized only by plants, with an important role in the growth and development process. There are more than 500 amino acids in nature, however only 24 are proteinogenic in the genetic code, present in all living organisms, 20 were identified in *Vitis Vinifera* L. as well, in various stages of growth and development. The main amino acids present in must at harvest and their quantities are shown in Table 1.

Table 1

The main amino acids present in must at harvest
(Țârdea C., 2007)

The name of the amino acid	The quantity in mg/l of must		
	Minimum	Maximum	Medium
proline	40	3800	750
arginine	55	1200	350
glutamic acid	53	270	140
threonine	9	130	85
serine	5	81	36
aspartic acid	15	100	35
tryptophane	5	31	31
alanine	7	260	30
lysine	5	63	28
glycine	2	42	22
leucine	3	58	18
tyrosine	2	75	15

fenilalanine	4	62	15
histidine	8	26	12
valine	ND	11	11
isoleucine	2	10	3
metionine	ND	15	-
hydroxyproline	ND	14	-
ornitine	ND	5	-
cysteine	ND	2	-
Total of aminoacids, mg/l	215	6255	1581

According to the data presented by the author in the paper "Wine Chemistry and Analysis" (Târdea C., 2007), the total amino acid content in must vary significantly, between 200 and 6500 mg/l. The total amino acid amount increases over the ripening process, with variations in each amino acid from one year to another. During ripening, only proline increases significantly, ten to fifty times, while other amino acids increase two or three times. (Lafon-Lafourcade et Guimberteau, 1962, Kliewer, 1968, Kluba and al., 1978, Shiraiishi and al., 1986).

RESULTS AND DISCUSSIONS

Preliminary research on free amino acids in the *Vitis* genus have been conducted in 1966 by P. W. Mark Kliewer, A. R. Nassar, and H. Olmo, through examining leaves and berries from 23 species of the *Vitis* genus during 3 development stages. 32 amino acids have been identified in different species. High contents of hydroxyproline and other unidentified amino acids have been present in leaves and unripened berries (samples taken in June and July) in 5 species: *V. aestivalis*, *V. berlandieri*, *V. cinerea*, *V. rufotomentosa*, and *V. simpsoni 'pixiala'*. There have been significant differences in quantity, in various *Vitis* species, concerning the concentration of amino acids such as arginine, proline and asparagine.

Changes in free amino acid concentrations have been noticed in three important varieties of *Vitis labrusca* Bailey (Concord, Catawba, and Delaware) during ripening (Richard M. Kluba, Leonard R. Mattick, and L. Ross Hackler, 1978). The most representative free amino acids in the three varieties have been alanine and arginine. At ripening, their concentration varied from 29,4 to 97,8 mg/100 ml must for alanine and 32,8 to 48,0 mg/100 ml must for arginine, which translates into 30,8 %, and respectively 22,2% of the total of free amino acids. Other amino acids have values ranging between 1 and 10 mg/100 ml must. The reason for the presence of alanine in high quantities in the *V. labrusca* Bailey varieties, compared to the *V. vinifera* L. has not been determined so far.

Other studies concerning establishing the free amino acid concentration in must conducted during 1986-1990 (Sara E. Spayd and Joy Andersen-Bagge, 1996) in 12 *Vitis vinifera* L. varieties cultivated in Columbia and Yakima Valley, have shown that arginine (measured in mg/l) has been the predominant amino acid in the Gewurtztraminer, Muscat Canelii, Semillion, and Pinot noir varieties, with significant variations each year, while proline has been predominant in the

Chenin blanc, Chardonnay, Cabernet Sauvignon, Grenache, Limberger, Merlot, Sauvignon blanc, and White Riesling varieties.

In the case of table grape varieties there have also been variations in the amino acid content and their profile. For example, in the Cardinal and Moldova varieties, though with relatively close total amounts of free amino acids (340 mg/l, and respectively 363 mg/l), there have been differences in their profile. Arginine was the predominant amino acid in the Moldova variety while the Cardinal variety had accumulated important quantities of glycine, tyrosine, valine, histidine, isoleucine (Abramov, S.A.; Vlasova, O.K.; Daudova, T. I., 2001).

A number of 18 amino acids has been determined from the beginning of the ripening process until harvest, over 3 years in the Tempranillo, Riesling Italian, Cabernet Sauvignon, and Moristel varieties in the Spanish region of Somontano (Puri Hernández-Orte, Ana Guitart, si Juan Cacho, 1999). Arginine, proline, histidine and glutamine have been the highlighted amino acids in all 4 varieties. The 4 predominant amino acids have amounted to 62% to 88% from the total of amino acids. During the 3 years, in the Riesling and Cabernet Sauvignon varieties, the predominant amino acid had been proline and in the Tempranillo variety, arginine was predominant. However, in the Moristel variety arginine had been predominant for a year and proline for 2 years.

Due to the ratio of the 4 amino acids (proline, arginine, glutamine and histidine), as well as the sum of all amino acids showing significant differences from one variety to the other, a conclusion has been reached: it can be used as an indicator for differentiating varieties of the same area..

Relatively recent researches on determining the profile of free amino acids in the ripened berries have been conducted in various vineyards from Australia in six *Vitis vinifera* L. varieties (Cabernet Sauvignon, Grenache, Muscat Gordon, Pinot Noir, Riesling and Sangiovese), cultivated in the same conditions and harvested in the same stage of ripening (A.P. Stines, J. Grubb, H. Gockowiak, P.A. Henschke, P.B. Høj si R. van Heeswijk, 2000). In this case there have been differences in content, however proline and arginine have been the predominant amino acids in all six varieties, represented between 65% and 82% from the total of amino acids. In the Cabernet Sauvignon varieties the berries have shown a high content of proline but a decreased content of arginine, while the other varieties had medium content of both proline and arginine.

In all cases the proline accumulation happened mostly at the end of the ripening period, approximately 4 weeks after the process had begun. The accumulation of arginine had started before ripening and continued until full ripening, except for the varieties which accumulated large quantities of proline, in which case arginine concentration reached a certain level earlier in the growth and development process. These observations concerning the metabolism of the two amino acids have led to the hypothesis of possible interrelations.

Since the amino acid profile in must is usually composed of more than 10 amino acids, there is no validity in the comparison between cultivars based on

the individual amino acid levels. In this respect, Huang si Ough (1991) have demonstrated through highlighting the genetic differences between six varieties of *Vitis vinifera* L., that the Pro/Arg ratio is characteristic to each cultivar, concluding after the statistic analysis that the Pro/Arg ratio may be used as a descriptor of various cultivars.

Studies conducted in Japan (Mikio Shiraisch, 1996) on a number of 259 vine germplasm varieties including varieties, hybrids, rootstocks, wild vines, have shown that the amino acid content of the *Vinifera* varieties and hybrids has significantly surpassed that in rootstocks and the wild species observed. Concerning amino acids, arginine (Arg), alanine (Ala) and glutamic acid (Glu) have been predominant compared to asparatic acid(Asp), threonine (Tre), serine (Ser), valine (Val), methionine (Met), isoleucine (Ile) and leucine (Leu). Based on the content of fundamental amino acids, the vine genetic material has been classified into the following types or profiles: Glu, Arg, Ala, Arg +Ala and Ala + Arg. Moreover, for an easy assessment of amino acid composition a new biochemical descriptor has been proposed, the γ ratio:

$$\gamma = \text{TRE} + \text{SER} + \text{ALA} / ([\text{ASP} + \text{GLU}] + [\text{VAL} + \text{MET} + \text{ILE} + \text{LEU} + \text{ARG}])$$

The variation of this report is significantly related to the value as well as the origin of cultivars, pointing to the fact that there are genetic differentiations in the amino acid composition in the grapevine germoplasm. In order to complete the amino acid profile as a biochemical descriptor, there have been established 3 classes (the class interval = 1.0 mmol) referring to the quantity of amino acid:

Class 3: content \leq 1.00 mmol; Class 5: 1.01 – 2.00 mmol; Class 7: \geq 2.01 mmol, and 5 classes of the γ ratio (with a class interval of 0.5):

Class 1 : \leq 0,05 ; Class 3 : 0,05 – 1,00 ; Class 5 : 1,01 – 1,50 ; Class 7 : 1,50 – 2,00 ; Class 9 : \geq 2,01

Changes in the amino acid spectrum over the growth and development process have been studied in 1999 by O. Lamikanra and A. K. Kassa on the Noble cultivar of the *Vitis rotundifolia* Michx. (muscadine). Out of the 18 identified amino acids, hystidine was the predominant amino acid, followed by alanine , since the concentration of the predominant amino acids is high at ripening. The glutamine and threonine has suddenly decreased after forming berries, while the arginine and proline concentration has started to increase gradually with ripening. It has been observed that in mature berries, the seeds have the highest amino acid content (50%), followed by the pulp (23%), must (15%) and skin (11%).

Alanine, histidine and arginine have been the main amino acids identified in must and alanine, histidine, arginine, valine, glutamine, asparatic acid, proline, serine and threonine constitute almost 90% of the free amino acids in the pulp.

CONCLUSIONS

1. Researches in this field show a continuous increase in the amino acid content over the ripening process, with a maximum accumulation close to the moment of ripening, due to the stop in the growth of berries and a reduction in protein syntetizing.

2. The total amino acid content and mostly the ratio of predominant amino acids (proline, arginine, glutamine and histidine) differs significantly from one variety of cultivar to another, and even from one year to the next in this species of *Vitis* compared to other species.

3. Observing the spectrum of free amino acids in grapes may be a means to differentiate the grapevine varieties genetically.

4. Is necessary the initiation of research in this area is aiming at verifying and confirming this hypothesis, resulting in the efficient use of the free amino acid profile as a descriptor in identifying the vine genetic material.

REFERENCES

1. **Puri Hernández-Orte, Ana Guitart, Juan Cacho, 1999** - *Changes in the Concentration of Amino Acids During the Ripening of Vitis vinifera Tempranillo Variety from the Denomination d'Origine Somontano (Spain)*, Am. J. Enol. Vitic. 50:2:pp.144-154
2. **Huang Z., C. S. Ough , 1991** - *Amino Acid Profiles of Commercial Grape Juices and Wines*, Am. J. Enol. Vitic. 42:3: pp.261-267
3. **Kluba R. M., L. R. Mattick, and L. Ross Hackler, 1978**, *Changes in the Free and Total Amino Acid Composition of Several Vitis Labruscana Grape Varieties During Maturation*, Am. J. Enol. Vitic. 29:2:pp.102-111
4. **Lamikanra O., A. K. Kassa, 1999** - *Changes in the Free Amino Acid Composition with Maturity of the Noble Cultivar of Vitis rotundifolia Michx. Grape*, J. Agric. Food Chem., 47 (12), pp 4837-4841
5. **Miele A., Carbonneau A., J. Bouard, 2000** - *Free amino acids of leaves and berries of Cabernet sauvignon grapevines*, International Journal of Vine and du Wine Sciences, vol 34/1/2000
6. **Ough S., R. M. Stashak ,1974** - *Further Studies on Proline Concentration in Grapes and Wines*, Am. J. Enol. Vitic. 25:1:pp 7-12
6. **Stines A.P., J. Grubb , H. Gockowiak, P.A. Henschke, P.B. Høj, R. van Heeswijck, 2000** - *Proline and arginine accumulation in developing berries of Vitis vinifera L. in Australian vineyards: Influence of vine cultivar, berry maturity and tissue type*, Australian Journal of grape and wine research, vol.6, no. 2, pp 150-158
7. **Sara E. Spayd and Joy Andersen-Bagge, 1996** - *Free Amino Acid Composition of Grape Juice From 12 Vitis vinifera Cultivars in Washington*, Am. J. Enol. Vitic. 47:4:pp 389-402
8. **Shiraischi M., 1996** - *Proposed Biochemical Descriptors for Amino Acids to Evaluate Grape Germoplasm*, J. Japan. Soc. Hort. Sci. 65(2): pp 283-289
9. **Shiraischi Shin-ichi, Toshiaki Sumi and Kazunori Notsu, 1986**, *Changes in the Chemical Constituents of Three Table Grape Varieties (Vitis vinifera L, x V. labrusca L.) during Maturation in Japan*, J. Japan. Soc. Hort. Sci. 55(1) : pp 15-21
10. **Țârdea C., 2007** - *Chimia si analiza vinului*. pp. 754-770, Ed. "Ion Ionescu de la Brad, Iasi.

ADVANCED TECHNOLOGIES FOR THE PUTTING TO GOOD USE OF VEGETABLES AND FRUITS BY COATING FILMS

TEHNOLOGII AVANSATE DE VALORIFICARE A LEGUMELOR ȘI FRUCTELOR PRIN PELICULE PROTECTOARE

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Abstract. *Due to the high level of perishability they have, the maintenance of products' quality in fresh state imposes the application of some adequate technologies for the entire cycle they go through from producer to consumer. The procedures to prevent degradation of horticultural products' quality during storage include treatments of coating the surface with an inert film. This method represents an actual trend which is studied in all countries with an advanced horticulture. The inert films prevent the phenomena of evaporation of the moisture from fruits and vegetables during storage by reducing the respiratory activity of fruits, they are a barrier against the UV radiations and, last but not least, they prevent the contact with diseases and pests. The maturation of the products covered with inert films lead to the better keeping of their quality as compared to the classical maturation processes. The pulverization with inert films led to the significant reduction of their biodegradation processes. The method has a special potential as an alternative for the improvement of the oxidative stability and the increase of validity for fruits and vegetables.*

Key words: advanced technologies, quality, treatments of coating films

Rezumat. *Datorită gradului ridicat de perisabilitate pe care îl au, menținerea calității produselor în stare proaspătă impune aplicarea unor tehnologii adecvate pentru întregul ciclu pe îl parcurg de la producător la consumator. Procedeele de prevenire a degradării calității produselor horticoale pe timpul depozitării includ și tratamentele de acoperire a suprafeței cu peliculă inertă. Această metodă reprezintă o tendință actuală care este studiată în toate țările cu o horticultură avansată. Peliculele inerte previn fenomenele de evaporare a umidității din fructe și legume în timpul depozitării prin reducerea activității respiratorii a fructelor, constituie de asemenea o barieră împotriva radiațiilor UV și nu în ultimul rând previn contactul cu bolile și dăunătorii. Maturarea produselor acoperite cu pelicule inerte conduc la păstrarea mai bună a calitatii lor decât în procesele de maturare clasice. Pulverizarea cu pelicule inerte a condus la reducerea semnificativă a proceselor de biodegradare a acestora. Metoda are un potențial deosebit ca alternativă pentru îmbunătățirea stabilității oxidative și a măririi valabilității legumelor și fructelor.*

Cuvinte cheie: tehnologii avansate, calitate, tratamente cu peliculă protectoare

INTRODUCTION

Consumers' increasing demand for healthier and more ecologic food products determined the researchers to develop new systems to prolong the life of products and that are non-polluting at the same time.

At present, the protection of foodstuffs is made by a mixture of synthesis chemical compounds that are not totally biodegradable. One of the most popular alternatives in recent years is the edible film acting like a barrier against moisture and air. Moreover, in this film they may also introduce other edible substances that may preserve the product's properties or merely improve its aspect.

Despite all these advantages, there is a series of obstacles in the full development of this alternative system for life prolongation of foodstuffs. The main obstacle is the cost price. Being still in the research stage, edible films are not yet produced in the macro industrial system. Companies do not have yet the technology necessary to produce these protecting films on a large scale.

MATERIAL AND METHOD

Besides the study of specialized literature in the field containing scientific articles published at the international symposia or specialized magazines and doctoral theses, we have also consulted different internet pages of some foreign non-governmental agencies that have as object of activity the research in the field of public alimentation.

The final or partial results of the researches conducted by the Department for Researches in Agriculture within prestigious universities from the United States or Spain are presented in this article.

RESULTS AND DISCUSSIONS

MB Pérez-Gago and his collaborators (2003) studied the effect of applying the edible films on the mandarins kept at low temperatures so as to maintain their qualities. They affirm that covering the fruits with a protective film may lead to the creation of a modified atmosphere inside fruits. Thus, due to this fact, the products' breathing is slowed down and consequently the quality of mandarins may be preserved longer in storage conditions.

Their study supposed the use of an edible film from bee wax and polysaccharides in different ratios and concentrations. After discovery, fruits were stored for 4 weeks at the temperature of 4⁰C. They noticed the following aspects: for all the fruits covered with an edible film they delayed the internal dehydration and they also noticed that these fruits registered a lower production of ethanol.

They demonstrated that this film acted like a barrier against moisture, due to the effective closing of pores from fruit epidermis.

In his researches, Javier Fernández Osés (2006), from the Public University of Navarre (Spain), studied diverse edible films so as to find eventual applications for different types of foodstuffs.

He analyzed films based on proteins extracted from milk and whey, different vegetal gums and different types of modified starch.

To test the effectiveness of these edible products for fruit cover, as compared to the synthetic films, Javier Fernández Osés prepared a number of samples and stored them for 6 months at different moisture levels.

He noticed that the mechanical properties of edible films change in time. The films obtained from sorbitol suffered modifications in terms of flexibility and the glycerol films suffered composition modifications.

After several tests, he obtained a mixture of vegetal gums and milk proteins. This film product is resistant and maintains its mechanical properties in time.

The researcher team from the University of Iowa (USA) is working at present to a project by which they try to replace the aluminum protective foils, used nowadays on some foodstuffs, by edible films from milk proteins or related products.

The researchers from the University of Llída, Spain, Department for Agriculture, enterprise a complex study by which they want to obtain an edible film to cover fresh vegetables and fruits that might have a destructive action over the strains of *Escherichia coli*. This film has in its structure apple puree and oregano oil and acts as a natural antibacterial agent.

They also tested for edible films other compositions that might constitute barriers for other pathogen agents, including *Salmonella*. It is estimated that these pellicular products will appear on the market in two years at the latest.

The researcher team from the Service for Agricultural Research within the University of Albany (California, USA), have also conducted a similar study anticipating that they will obtain an edible cover product from vegetables or fruit puree by which they might also increase the food quality of the protected products by the contribution of vitamins, minerals and antioxidants contained in the edible film.

The same researcher team tried 3 years ago to introduce essential oils in edible films so as to increase the food safety but, unfortunately, the obtained product proved not to have antimicrobial properties.

At present they are testing a pellicular product based on volatile oils of oregano, cinnamon, lemongrass in solutions of apple puree to follow their efficiency against *Escherichia coli*. Each compound, in diverse concentrations, was tested on *E. coli* strains. The obtained results confirmed the inhibition of *E. coli* proliferation by the volatile oils. Oregano oil was the most efficient, inhibiting the action of more than 50% of the strain samples in only 3 minutes, at a concentration of 0.034 %. The second oil in terms of efficiency was the lemongrass volatile oil followed by cinnamon one. At the opposite pole, the apple puree solution was the only one that did not have any influence on the *E. coli* strains. The only advantage of it was to contain compounds (glucides, lipids) that form a film adhering to the vegetable and fruit surface for a longer period of time.

There is also a project studying the possibility to introduce a spray containing etheric oils with an antimicrobial effect. Researchers affirm that it is

possible for the fresh fruits and vegetables to have a slight taste of oregano after its application.

Researchers from California Original Foods (California, USA) have also taken into consideration, besides the apple puree, other products that might constitute antimicrobial edible films. They are testing at present products from broccoli, tomatoes, carrot, mango, peaches and pears.

CONCLUSIONS

These edible films represent nowadays a target in the development of the fresh state preservation systems for fruits and vegetables on one hand, and the packing systems of foodstuffs, on the other hand, at least for two reasons:

- they will prolong the life span of foodstuffs in a healthy manner;
- at a global level, they will gradually reduce the use of plastic materials used nowadays in packing fruits and vegetables and, consequently, the environment pollution will also decrease.

REFERENCES

1. **Beceanu D. și colab., 2000** - *Valorificarea în stare proaspătă a fructelor, legumelor și florilor. Tehnologii specifice, de la recoltare la păstrare și livrare*, Editura "Ion Ionescu de la Brad", Iași, ISBN 973-8014-09-3
2. **Beceanu D. și colab., 2003** - *Tehnologia produselor horticole. Valorificare în stare proaspătă și industrializare*. Editura Economică, București, ISBN 973-590-744-5
3. **Javier Fernández Osés, 2006** –*Development, characterisation and applications for foodstuffs of edible coatings based on milk serum proteins, starch and mesquite gum*. Teză de doctorat, Universitatea publică din Navarro, Spania
4. **Pérez-Gago M.B., Rojas C., M.A. del Río, 2003** - *Edible coating effect on postharvest quality of mandarins CV. 'Clemenules'*. International Society for Horticultural Science, ISHS Acta Horticulturae 600, VIII International Controlled Atmosphere Research Conference
5. [www.food-info.net/Wageningen University](http://www.food-info.net/Wageningen_University), Olanda - accesat martie, aprilie 2009
6. www.fffost.org. – *European Federation of* accesat martie, aprilie 2009

NEW TRENDS IN THE TECHNOLOGY OF HORTICULTURAL PRODUCTS

TENDINȚE NOI ÎN TEHNOLOGIA PRODUSELOR HORTICOLE

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Abstract. *In the last two decades, which represent a turning period in the technologies for the putting to good use of horticultural products, one may notice an unprecedented input of the most recent scientific discoveries in the applicative direction to practically solve some problems related to the degree of pollution, productivity, cost price and quality. The direct beneficiaries of the application of these trends are likely to gain the concurrence competition in which a quality product, more secure and cheaper, has an ensured success.*

Key words: handling, preserving, transformation fruits – vegetables, trends

Rezumat. *În ultimile decenii, care marchează o perioadă de cotitură în tehnologiile de valorificare ale produselor horticole, se constată un impact fără precedent al celor mai recente descoperiri din știință, în direcție aplicativă, spre rezolvarea practică a unor probleme legate de productivitate, preț de cost, calitate și gradul de poluare. Beneficiarii direcți ai punerii în aplicare ale acestor tendințe sunt în măsură să câștige competiția concurențială, în care un produs de calitate, mai sigur și mai ieftin are un succes comercial asigurat.*

Cuvinte cheie: valorificare, păstrare, prelucrare legume-fructe, tendințe

MATERIAL AND METHOD

In the last decades more and more modern technologies have appeared and generalized contributing directly or indirectly to the effectiveness, productivity and food safety in the putting to good use of horticultural yield. Some trends have lasted for some time whereas others are recent and their concrete transposition in activity depended first on the accessibility of earmarking investments.

The horticultural raw material has diversified a lot its spectrum and especially productive technologies have emerged in correlation with the destination of the raw material. A large yield may be obtained almost every year if one uses cultivars (species, hybrids) that have this availability. Not only for the annual cultures but also for the perennial ones does density of plants per hectare determines both quantity and quality since there result uniform products behaving uniformly during the entire process of putting to good use. Uniformity is a European condition for quality.

Last but not least, a good production determines an adequate price sufficiently profitable both for beneficiaries and producers. Revenue is not obtained by promoting some high prices per unit of product but by large yields sold at profitable prices. The manual manpower is used more and more reasonably only in the sectors and segments where it cannot be yet replaced.

RESULTS AND DISCUSSIONS

The quality of the horticultural raw material ceased for a long time to be a unique and universal notion. At present, they notice an impressive diversification and differentiation, and we witness a real combination between the advanced technologies and the created breeds.

A first observation refers to the emergence of distinct assortments by destinations within the same species. Thus, the species destined to fresh consumption are more and more differentiated and individualized in terms of harvesting periods, aspect, flavour, taste or shape. Any new cultivar is promoted within a strategy involving advertising, promotion campaigns, the creation of associations and clubs of employed producers etc. They promote new products such as the grape tomatoes (in bunch) of the cherry type, cocktail or of normal size. Numerous tropical fruits, unknown in the past, have become a daily offer in the large supermarkets.

The ones destined to processing (sometimes even by types of processing) have become more and more diversified. For the tomatoes, there are species for preservation in their own juice (peeled), species for concentrates (paste, sauce) and even species for ketchup (sweeter). For apples, there is a distinct assortment for juices and cider. For plums there are special species for dehydration. Pavia peaches are peaches destined for the production of compotes. The sweet species of peas (*Pisum sativum*, var. *medullare*) allow the obtaining of thermally sterilized cans that do not produce starch. And examples could go on.

For a good preservation, they have created long-life breeds for more and more species (tomatoes, peaches, melons). We can also notice a specialization in terms of promoting cultivars with specific qualities of resistance in the storehouse conditions such as apples with a thicker wax layer, late melons like Honey Dew, pears from specific late breeds, potato tubercles with a longer rest period, cabbage hybrids with an initial higher content in vitamin C and cellulose, carrot hybrids especially created for a longer keeping.

In parallel, there have appeared breeds resistant to diseases and needing fewer treatments or which do not need treatments for certain diseases. The production technologies, beneficiary of these breeds, have possibilities to improve in the sense of some lasting variants by promoting some types of more reasonable fertilization or by using systemic pesticides from groups with more and more reduced toxicity that might not interact negatively with the environment.

The raw material meant for industrialization also promotes its distinct technologies. We notice the increased specificity level of the breeds for processing that involve completely mechanized technologies, they have the required features and yields so as to allow more accessible prices (for tomatoes, cucumbers, chilly peppers for paprika, beans, peas, onion, radiculaceae, potatoes, sour cherries, strawberries, apples for juices/cider, shrub fruits, walnuts etc.).

The framework technologies involving this level of mechanization have evolved towards more and more advanced variants from the qualitative viewpoint. We may give as an example the mechanical harvesting of sour cherries giving fruits

practically without lesions (at 5 kg just one bruised fruit, more or less). Numerous aggregates or mechanical harvesting machines also ensure the first processing stage. Thus, there are self-moving threshers that concomitantly harvest and separate the peas (the green beans), combines integrally harvesting tomatoes and separate their juice (delivered to factories in cisterns), not to mention any more the mechanical harvesting of the grapes for wine. Of course, the complete mechanization of harvesting is correlated to a certain structure of perennial plantations or certain modeling and setting up diagrams for annual cultures. Machines' performances, their adjustment, the anti-oxidizing protection and other elements related to these technologies may contribute to a more satisfactory result.

Pre-cooling is a very useful phase for the extension of the keeping period of quality, especially for the products meant for fresh consumption but which generalizes for all destinations. Air-cooling and vacuum-cooling allow even the pre-cooling of the packed products. Adequate manipulation with mechanical means, the elimination of the unjustified standing times and the most operative transport to beneficiaries are elements of a good organization.

Conditioning has become more and more complex and has turned from a big consumer of manual manpower into a fully mechanized phase comprising automation and computerization elements. The product entering the flux may be sorted electronically by using non-destructive sensors functioning in NIR (near infrared) with laser, by resonance or by other similar methods. Calibration has become more and more diversifies separating by shape and weight the most diverse fruits or vegetables in a spectrum that includes at present the most sensitive products such as cherries. The hygienic quality of products is ensured by washing that has become mechanical for several decades. The products meant for processing are sometimes also disinfected if they come from organically fertilized cultures.

Packing for marketing in fresh state is more and more diversified resorting more to ecologic solutions (biodegradable materials) and MAP (modified atmosphere package). In some cases, to diminish perspiration and maintain turgidity they use pellicular packaging techniques (chitosan coating-pellicle, natural waxes, modified biopolymers – celluloses, starches etc.).

Frigorific transport becomes the normal way to transport horticultural products whereas the supermarkets have equipped themselves with cool shop windows/shelves maintaining freshness for considerable period of time. The storage and keeping technologies resort more and more to phases and segments created by the recent technical progress.

We witness a diversification of the assortments of species and specialized breeds for keeping (for example the cabbage hybrids from Holland, the carrot hybrids, the potato species etc.). The post-harvest treatments have the tendency to become non-polluting with an as high as possible level of innocuousness. They resort to bioactive substances of natural origin and physical methods such as sinking into hot water, UV treatments etc.

The modern CA storehouses (controlled atmosphere) have evolved in more and more complex variants towards the hypobaric keeping or ULO (ultra low

oxygen) variants. Special storehouses for grapes have been re-dimensioned and designed for modern equipment such as those in Jackett system using as less as possible pieces or metal elements in direct contact with SO₂ from treatments. The mobile generators of SO₂ of different types represent more and more a cheap and multifunctional manner to ensure the protection of grapes during the process of putting to good use.

The modern storage technologies use decreasing and then increasing temperature levels for the species or breeds that do not stand the prolonged action of coolness. The naval containers arranged with storage spaces and different levels of complexity ensure the transfer of an important volume of fruits, grapes and vegetables from the southern hemisphere to the northern hemisphere markets representing more and more an alternative to the storage within the same geographic space.

The curative treatments against storehouse diseases become more and more effective for apples, onion, potatoes, radiculaceae etc, evolving towards more complex ecologic variants such as the use of antagonistic biologic agents. The putting to good use by uninterrupted refrigerating chain (chene frigorifique, refrigerating chain) is a more and more spread option ensuring the maintaining of quality for a longer period of time, in optimal hygiene conditions. The processing technologies have become more and more efficient and advanced in terms of food quality and safety. In more and more countries there are structures ensuring the collaboration between producers and suppliers with positive repercussions on the production technologies and the logistic structures afferent to a superior putting to good use.

The generalization of harvesting becomes possible at the optimal moment so necessary for peas, beans, green peppers, eggplants, cucumbers, spinach, plums, cherries etc., depending on the wanted processing. The spaced out delivery is possible following the spaced out setting up of cultures allowing the judicious use of the mechanical means for harvesting and processing in an adequate rhythm. Semi-preservation still is a necessary practice to ensure the continuity of the flow outside the season, especially during winter. They lay emphasis on the use of some storage technologies of semi-industrialized raw material that may not modify or reduce too much their nutritive value. For this reason, aseptic keeping in sterile spaces, freezing and even concentration are preferred to the old technologies where SO₂ or other chemical preservatives were used.

In the processing units, by implementation of the HACCP methodologies, they insist on the stage compliance with the strictest measures to prevent hazards. Mechanization and automation allow an efficient and advanced conditioning (washing, disinfection, cleaning, fragmenting, peeling, trimming, water or steam scalding). The enzyme inactivation treatments and antioxidizing treatments use predominantly physical methods or compounds without risks for consumers' health. The opportunity of ionization is under debate as long as there have not appeared studies affirming the need to institute major contraindications.

The use of food additives is a very controversial field nowadays. There is an obvious divergence between the official conclusions of WHO and other international organizations that control this field and the public opinion permanently troubled by frequently unconfirmed news regarding the potential or manifested hazard of these substances. A part of the interlocutors accept the idea that food additives are of several categories (some are harmless or even favorable to health whereas others may be dangerous only by not complying with the use quantity or for the allergic people). It is clear that these campaigns are started in the publicity or editorial interest.

The actual vision may not neglect these continuous discussions, though sometimes unjustified, but which have an impact on consumers. For this reason, more and more synthesis additives are replaced with diverse natural compounds with similar properties (but which are more expensive sometimes) pursuing to definitively eliminate or restrict the potentially hazardous ones and informing the respective consumers about these measures.

In all the domains industrializing vegetables and fruits, we may notice new trends. For freezing, they prefer high speed technologies for freezing ensuring more authentic products and of a better quality. For dehydration, they use more advanced variants including high technologies (lyophilization, dehydration by spraying, vacuum dehydration etc.). The economic side needs to be reevaluated in the conditions of the current energetic crisis having as consequence the larger use of solar dehydration plants and other energy-saving installations.

The concentration technologies use more and more complex plants such as the vacuum-pellicular concentrators, reverse osmosis, multi-effect vacuum plants etc. In the industry of pasteurized and thermally sterilized cans, equipment has improved and they resort to continuous plants and technological variants capable to preserve the finite product as well as possible. The sector of non-alcoholic drinks is a domain on the rise with a more and more important turnover. On the background of this ascending trend, producers strive to consolidate the increasing yield by substantial investments and continuous improvements of the fabrication networks, design and permanent promotion campaigns.

A modern feature of the food industry putting to good use vegetables and fruits is the complex turning to good account of wastes (left over after processing). There is a larger initiative to use this industrial waste in superior ways, especially where it accumulates in a sufficiently large volume. They mention the extraction of pigments and food fibers from the tomato skins left after the juice extraction. The extraction of industrial pectin and food fibers from the residues left after the separation of apple or citric juices. The products left after the grapes processing (marc, pomace) may be put to good use by extraction of edible oils (from seeds) and the skin pigments. The fruit vinegar industry (especially apple vinegar) may rely more or less on these secondary products. Examples may continue, but what remains is the desideratum of economical spirit of this activity that may start only in efficiency conditions, though its ecologic and social aspect is obvious.

Close to the agro-alimentary field emerges a technical field of processing. The sector of odorant and aromatized products, though it has connections with the food industry, which is a beneficiary, is however a distinct domain with specific raw materials, its own technologies and products with polyvalent uses. The packing technologies of the processed products pursue the use of composite materials, inert in the contact with foodstuffs and that may ensure an adequate integrity and hygiene. The packaging gases inert from the food viewpoint, such as nitrogen and carbon dioxide, become auxiliaries more and more spread in MAP.

New methods of preservation have appeared that are under study to become economical too by their application as plants and equipment and by promoting some specific products. The diversification of the industrialization sector determines permanently the appearance of some new processed products (nutraceutical, dietetic, baby food, with national specificity, catering, IV, V range), products that are received differently depending on consumers, level of civilization or material status.

CONCLUSIONS

Ecologic (biologic, organic) horticulture is a trend that appears more and more frequently among the fresh and even processed products. Though sporadic or occasional in the beginning, this offer has become stable in many states with an advanced civilization.

International marketing in the field of horticultural products has encountered permanent mutations. Numerous countries with a tradition in the horticultural commerce have registered regress following the evolution of the specific sector in the actual economic-social conditions. At the same time, we notice the more and more obvious emergence of some newly arrived (ex. China, Turkey, Chile etc.), countries where horticulture has developed with a precise direction towards exportation.

REFERENCES

1. **Banu C. (coord), 2007** – *Calitatea și analiza senzorială a produselor alimentare*. Edit. Agir, București.
2. **Banu C. (coord), 2007** – *Suveranitate, securitate și siguranță alimentară*. Edit. ASAB București.
3. **Jongen W. (edit), 2005** – *Improving the safety of fresh fruit and vegetables*. Woodhead Publishing Limited. Cambridge England.
4. **McLeod J., 2007** – *Organic gardening*. Edit. H. F. Ullmann, China.
5. **Mihele Denisa, 2007** – *Igiena alimentației. Nutriție. Dietoterapie și compoziția alimentelor*. Edit. Medicală Oradea.
6. **Munteanu N. și colab., 2008** – *Bazele tehnologice ale legumiculturii ecologice*. Edit. Ion Ionescu de la Brad Iași.
7. **Munteanu N. și colab., 2008** – *Ghid de bune practici. Modele de conversie la producția legumicolă ecologică*. Edit. Ion Ionescu de la Brad Iași.
8. **Savu C. și Georgescu Narcisa, 2004** – *Siguranța alimentelor. Riscuri și beneficii*. Edit. Semn E, București.

NATURAL QUALITY, A CONTROVERSIAL CONCEPT IN PUTTING TO GOOD USE VEGETABLES, FRUITS AND GRAPES

CALITATEA NATURALĂ, UN CONCEPT CONTROVERSAT ÎN VALORIFICAREA LEGUMELOR, FRUCTELOR ȘI STRUGURILOR

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***Abstract.** The terms of product or natural quality are often used or associated, in the conditions of the existing laws, without having a real justification. We must mention that not always a strictly natural product is healthy and hygienic, a thing that is taken into account by the sanitary legislation and expertise at national and European level. Food safety imposes certain rules, procedures and technologies that are necessary to prevent or fight against the potential inherent risks of a certain natural product. Thus, we may assert that not everything is healthy is also natural and not everything is natural is healthy, too.*

Key words: organic, ecological, contamination, food security

***Rezumat.** Termenul de produs sau de calitate naturală sunt adesea vehiculați sau asociați, în condițiile legilor existente, uneori fără a avea acoperire reală. Trebuie precizat că nu totdeauna un produs strict natural este igienic sau sănătos, lucru care este avut în vedere de legislația și expertiza sanitară la nivel național și european. Siguranța alimentară impune anumite reguli, procedee și tehnologii care sunt necesare pentru a preveni sau combate eventualele riscuri inerente unui produs natural oarecare. Putem afirma deci, că nu tot ce este sănătos este și natural și nu tot ce este natural este și sănătos.*

Cuvinte cheie: organic, ecologic, contaminare, siguranța alimentară

MATERIAL AND METHOD

After Johannesen and Torp (2005), the control of food safety in the field of ecologic products focuses mainly on the management of the bacteriologic risks and those coming from mycotoxins, respectively.

RESULTS AND DISCUSSIONS

A correct administration of organic garbage and wastes constitutes the basic requirement for an adequate fertilization. The green fertilizers and the house garbage contain frequently microorganisms dangerous for the human health. In the USA, fertilization with manure is admitted differently according to the level of composting and the ecologic destination of the crop. It is compulsory to administer the composted waste at least 120 days before harvesting or, in the case of products that have no contact with the soil, at intervals of at least 90 days. As a safety

measure, it is recommended the incorporation of manure since autumn for the early cultures.

They have noticed concretely that the vegetables cultivated on the fertilized soils with manure are contaminated with pathogen bacteria such as *Salmonella* and *Escherichia coli*. A head of lettuce may contain these microorganisms including in the tissue interior. Other studies did not notice the presence of these infection factors, though the soil was contaminated. The contaminated soil particles adhering to products by direct or indirect contact may lead to the contamination of vegetables. For these reasons, it is necessary to treat as well as possible the natural fertilizers. Composting is the most recommended measure to prevent and fight against bacterial contamination.

After Petrescu C. (1997), compost has multiple advantages not only in terms of complexity and availability in nutritive elements but also due to the melioration effect of the soil characteristics. At the same time, they notice a relatively complete elimination of pathogens, parasites and weed seeds. The necessary condition is the correct effectuation of composting by aerobic decomposition in the presence of some specific microorganisms at certain moisture and proportion between C and N. Temperatures may go up to 65°C inside the composting space (pile, silo, stack or specific recipients). The increase of temperature at more than 55 °C must last for at least 2 weeks in natural conditions, 3-5 days respectively for special spaces. There occurs the thermal destruction of the mesophile pathogen bacteria without the disappearance of the viability of sporogenous forms. Some studies have noticed even temperatures of 70°C in certain arranged composting systems that lasted up to 70 days without decreasing below 55°C. The natural systems may not achieve such temperatures due to the airing and homogenization, and values differ a lot being lower at the exterior. For this reason, special arrangements destined for composting are the most recommended. Some studies also highlighted the role of a microflora antagonistic to the pathogen bacteria and active even at more reduced thermal values. In these situations, the initial load of pathogen germs in the garbage also matters. The organic (biologic, ecologic) agriculture systems keep and preserve the microflora from soils and this becomes antagonistic towards the potential pathogen germs for the human being. They quote the case of the species *Pseudomonas* and other rhizosphere bacteria that are stimulated by the organic fertilizers, but they are hostile to the presence of some pathogen factors such as the bacteria of *Salmonella*, *Escherichia coli* and *Listeria*. It is considered that the storage of garbage for a period of time in conditions of anaerobe decomposition has the advantage of shortening the transformation period but involves a higher consumption of manpower.

After Johannesen and Torp (2005), the sowing technologies may also influence the survival of bacteria pathogen for the human being in soils, especially those of *Escherichia coli*. It is considered that there are advantages and disadvantages both in the conventional fertilization systems and in the organic fertilization ones. For the latter category, it is highly important to avoid the contamination occasions during the entire flow (pathogen agent free equipment and

endowments, the prevention of animal access to vegetable cultures, adequate sanitary arrangements for workers and especially clean water). The use of manure and organic wastes represents a risk factor if they do not comply with the existing and necessary rules and indications.

After Derache Ph. and collaborators (1986), the contamination with molds and the appearance of mycotoxins is correlated to certain environment conditions such as temperature, the moisture content and the chemical composition of products and the climatic conditions, respectively. Some species of *Fusarium* are more frequent in the periods with warm and moist climate, but they do not develop at temperatures below + 15°C. Other types of molds prefer colder climatic conditions that appear during autumns, regardless of the moisture degree.

Though most papers do not have as object the cereal infestation (molding with *Fusarium*), at present there are more and more contributions referring to the potato tubercles, apples and other fruits, respectively. If in the papers existing so far, they focused on the annual cultures, studying the effect of culture rotation and the presence or absence of pesticides to prevent and fight against, at present they publish more and more papers evaluating the risk of appearance of mycotoxins in the multi-annual and perennial cultures.

For the annual cultures, they consider that the rotation systems contribute significantly to the avoidance of microbiologic contamination. Regardless of the types of cultures, the harvesting and storage technologies are highly important. Without diminishing the importance of the harvesting years that may favor or create favorable conditions for the development of molds generating of mycotoxins, we may say that the harvesting and manipulation – transport technologies have, regardless of year, an at least equal relevance.

Fruits and vegetables are covered by the spores of numerous micromycetes that lay at the bottom of diverse moldings and putrefactions when the harvesting and storage conditions favor this phenomenon. In numerous cases, the fruits and vegetables attained by these pathogens are eliminated by sorting, but there are situations when the technology does not succeed totally to remove these sources of mycotoxins, the most often case being the processing of the raw material to obtain the apple juice.

After Segal B. and collab. (1986), patulin accumulates in numerous fruits and vegetables such as apples, pears, peaches, apricots, cherries, grapes, tomatoes etc. It may pass into the processed products such as fruit juices, mentioning concentrations up to 1 ppm/kg (in the USA, Canada, Germany, for the apple juice). They also mention the apples from storehouses (especially those kept in domestic conditions that contained patulin in more than 50% of cases).

Patulin is produced by *Aspergillus* and *Penicillium*, and the patulin content is regarded as an indicator for the apple quality. This antibiotic is not as toxic as it may be carcinogenic. The WHO recommends a limit content of 50µg/L in the apple juice. EU limits the patulin content at the same value, both in the apple juice and in cider.

Bonny Sylvie (2006) considers that the organic products may have a potential risk for health due to the pathogen bacteria coming from the insufficiently fermented composts. She also mentions mycotoxins, such as patulin, in the same risk category.

Prof. A. Trewavas (University of Edinburgh, UK) from the biochemistry department mentioned that mycotoxins from foodstuffs, coming from the contamination with micromycetes, contribute to the increase of the number of cancer cases in Europe. *Patulin* is one of these being often associated to the organic products. The impossibility to use effective fungicides in the organic farms led to the creation of genuine “archives” or collections of existing diseases. The organic farms must be protected against all contaminations’ effects because they are surrounded by conventional farms that use adequate fungicides.

CONCLUSIONS

1. Food safety related to the ecologic (organic, biologic) products has a specificity underlined by numerous authors that insist on certain aspects insufficiently solved. Only the products obtained in conditions of total and real compliance with the recommended harvesting technology might be considered safe.

2. One of the debatable aspects represents the contamination with pathogen germs coming from inadequately fermented compost (cases more or less frequent) or obtained from dejections (wastes) that should not be accepted.

3. The second controversial aspect is the existence of mycotoxins, often in dangerous concentrations, a presence that could be confirmed by the labs capable to effectuate these difficult determinations, especially in the case of organic (ecologic, biologic products) whose offer on the market is not very important.

4. Food safety of these products does not depend only on the compliance with technologies, but also on their improvement, since they have not managed so far to efficiently prevent and fight against the diseases from this sector, including from the economic viewpoint.

REFERENCES

1. **Beceanu D., 2009** - *Aspects of food safety correlated with conventional or ecological production technologies*. Rev. Cercetări agronomice în Moldova, nr. 1.
2. **Johannesen Gs și Torp M, 2005** – *Improving the safety of oranics vegetables* Woodhead Publishing Limited. Cambridge England.
3. **Lixandru Gh. 2006** – *Sisteme integrate de fertilizare în agricultură*. Edit. PIM Iași
4. **Mc Leod J., 2007** – *Organic gardening*. Edit. H. F. Ullmann, China.
5. **Mihale Denisa, 2007** – *Igiena alimentației. Nutriție. Dietoterapie și compoziția alimentelor*. Edit. Medicală Oradea.
6. **Moake M și colab. 2005** – *Comprehensive Reviw of Patulin conrol methods in food*. Comprehensive reviews in food science and food safety. Vol. 1.
7. **Munteanu N. și colab., 2008** – *Bazele tehnologice ale legumiculturii ecologice*. Edit. Ion Ionescu de la Brad, Iași.
8. **Munteanu N. și colab., 2008** – *Ghid de bune practici. Modele de conversie la producția legumicolă ecologică*. Edit. Ion Ionescu de la Brad, Iași.

ACTUAL TRENDS IN EDIBLE OILS PRODUCTION AND MARKET

TENDINȚE ACTUALE ÎN PRODUCȚIA ȘI PIAȚA ULEIURILOR VEGETALE COMESTIBILE

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Abstract. According to USDA* and WTM* there are recognized 17 commodity oils, of which 4 are of animal origin. Of the total production of oils and fats, about 80% is used for food purposes, 6% is used in animal feed and 14% is used in oleochemical industry. The trade in vegetable oils and fats is geographical divide into four categories: countries with small population that produce and exports the largest amounts of edible oil, dominating the world market (Malaysia, Canada, Australia), countries with large population, producing significant amounts of edible oil and ensure their requirements (USA, Brazil, Indonesia), countries with large of population, which despite local production are still major importers (China, India); the fourth category are the states of the EU that produce, consume, import and export these commodities.

Key words: oil market, oil production, oil consumption

Rezumat. Conform USDA* și WTM* sunt recunoscute 17 tipuri de uleiuri comestibile, dintre care 4 de origine animală. Din producția totală de uleiuri și grăsimi vegetale, aprox. 80% sunt utilizate în scopuri alimentare, 6% ca hrană pentru animale și 14% sunt utilizate în diferite industrii. Piața uleiurilor și a grăsimilor vegetale este structurată geografic, pe 4 secțiuni: țări cu populație redusă, dar care produc și exportă cele mai mari cantități de ulei comestibil, dominând piața mondială (Malaezia, Canada, Australia); țări cu populație numeroasă, care produc cantități semnificative de ulei și își asigură cerințele proprii (USA, Brazilia, Indonezia); țări cu populație foarte numeroasă, care în ciuda propriilor producții sunt și mari importatoare (China, India); ultima categorie aparține statelor din UE, care produc, consumă, importă și exportă în egală măsură uleiuri comestibile.

Cuvinte cheie: piața uleiurilor, producerea uleiurilor, consumul uleiurilor

INTRODUCTION

World production of oils and fats comes from vegetable and animal sources, currently about 119 million tones per annum, with a annual increase between 2 and 6 mil tones. In 2008, the global needs of vegetable oils has been covered mainly by the following plants: palm 40 mil tones, soybean 38 mil tones, rape/canola 18 mil tones, sunflower 10 mil tones. The soy bean oil, palm oil, canola oil and sunflower oil dominate at the moment the oil world market, while the cotton seed oil, the peanut oil and the olive oil have lost market share over the past 20 years, despite the increases in production.

MATERIAL AND METHOD

The world market of the oil seeds and oils is, in geographical terms, is divided into four categories (countries/regions). The first category belongs to countries with small populations that produce large amounts of oilseeds/oils and fats are the world's largest exporters of these commodities and dominate world trade. Examples include Malaysia, Argentina, Canada and Australia. The second category belongs to countries with large populations that produce large amounts of oilseeds/oils and fats. These countries need to feed their large populations but are still significant exporters. Examples are the US, Brazil and Indonesia. The third category belongs to countries with very large populations which, despite local production of vegetable oils, are still major importers. China and India and other highly populated countries in Asia belong to this category. Finally there are countries/regions which are essentially traders, belonging to EU, countries that play a major role in vegetable oil trade market. EU countries produce, consume, import and export these commodities.

RESULTS AND DISCUSSIONS

According to ISTA Mielke of Hamburg there are globally recognized 17 types of oils and fats. ISTA provides data on the weekly oil (Oil World) and annual (Annual World Oil). There are covered 13 varieties of vegetable oils and 4 types of animal fats. The 13 vegetable oils for which is provided information weekly and annual are subdivided into 3 categories: oils coming from by-products: cotton, germs, soy; oils coming from perennial crops: palm, palm kernel, coconuts, olive and oils coming from annual crops: *canola*, sunflower, peanuts, linnen, sesame, castor.

Trend in the production and consumption of the vegetable oils

According to World Trade Market in the last 7 years it has been record an important annual increase both for production and consumption of the vegetable oils (table 1).

Table 1

World share assortments (2001) and annual average growth between 2001-2008 (%)

Specification	Palm oil	Soy bean oil	Canola oil	Sunflower seed oil	Peanut oil	Olive oil
Share 2008	30,0	28,4	13,6	7,5	3,6	2,2
Increases 2001-2008	71,9	42,4	29	13,3	-0,3	17,9

Indonesia and Malaysia are the world biggest producers in vegetable oils (over 20 mil tones, 2008) and they are the world biggest exporters, also (tables 2 and 3). China is on the third place in the world for the production of the vegetable oils and it is also the biggest world consumer and importer, followed by the EU with an annual consumption of 22,05 mil tones and by India (tables 4 and 5). Until 2005, the soy bean oil was on the first place of the world level production for the vegetable oils. In the present time, the soy bean oil is on the second place,

after the palm oil. The soy bean oil is produced mostly produced in USA, China, Argentina, Brasil, EU-27. Argentina is the biggest exporter for the soy bean oil (5,76 mil tones) and the biggest importer is China (2,72 mil tones). The soy bean oil is consumed by the most countries of the world, China is the most important consumer (9,6 mil tones), followed by Brazil, EU-27, India, Argentina (table 5).

Table 2

**World production of vegetable oil
(mil. tones), according to WTM**

Production	2005/06	2006/07	2007/08
Indonesia	18,26	19,37	21,28
Malaysia	17,50	17,20	19,70
China	14,76	14,17	14,58
EU-27	12,80	13,67	14,28
SUA	10,39	10,41	10,51
Argentina	7,63	7,71	8,52
India	6,80	6,43	6,99

Table 3

**World exporters of vegetable oils
(mil. tones), according to WTM**

Export	2005/06	2006/07	2007/08
Indonesia	13,41	13,53	15,44
Malaysia	13,90	14,16	14,10
Argentina	6,89	7,17	7,96
Brasil	2,55	2,54	2,34
Canada	1,12	1,29	1,28

Table 4

**World importers of vegetable oils
(mil. tones), according to WTM**

Import	2005/06	2006/07	2007/08
China	6,96	8,49	9,21
EU27	8,03	8,34	8,42
India	4,89	5,58	5,82
USA	2,39	2,52	2,60
Pachistan	2,26	1,73	2,05
Bangladesh	1,23	1,22	1,27
Egypt	1,23	1,22	1,27
Iran	1,20	1,21	1,18
Turkey	1,05	0,55	1,13
Malaysia	1,24	0,78	0,90
Other	13,95	14,45	14,84
Total	44,31	46,14	48,76

Table 5

**World consumers of vegetable oils
(mil. tones), according to WTM**

State	2005/06	2006/07	2007/08
China	21,51	23,37	24,33
EU-27	19,89	21,23	22,05
India	12,02	12,65	12,70
USA	11,17	11,78	12,39
Indonesia	5,35	5,57	5,70
Malaysia	4,46	4,73	5,56
Brasil	3,66	4,06	4,21
Pachistan	2,91	2,97	3,05
Russion Federation	2,71	2,81	2,71
Japan	2,19	2,20	2,20
Mexic	1,98	1,98	2,09
Turkey	1,71	1,60	1,98
Nigeria	1,58	1,60	1,62
Bangladesh	1,24	1,44	1,55
Egjpt	1,40	1,52	1,52
Other	21,43	22,04	23,06
Total	115,21	120,93	126,66

The palm oil is for the past three years on first position in world production. Palm oil production and export market are dominated by the two South East Asian countries. Malaysia has over 50% of the palm oil production and over 60% of palm oil exports; Indonesia has levels corresponding to 30% and 26% respectively. As indicated previously, Indonesia has a much larger population than Malaysia. Other states as Thailand, Coulombia and Nigeria produce lower level of palm oil. The palm oil covers the needs of the increasing countries populations: India, China, Pakistan, which are also the world level most important consumers.

Rapeseed/canola oil now occupies the third position in rank order of production of oils. Using local seeds and/or imported seeds the oil is produced mainly in China , India, Canada, Japan and EU-27. Only 12% of the oil is then exported, mainly from Canada which accounts 48% of all rapeseed oil exports. The major importer and consumer is China (4545 mil tones consumption, 2008), followed by India (1989 mil tones consumption, 2008) (7). Sunflower seed oil is the last of the group of four major oils. It maintained its share at about 9% of the total (2000-2001), but has achieved very variable levels over the past seven years at about 10% of the total (2007-2008). Major countries involved in the production are: Russian Federation (2247 mil. tones, 2008), Argentina (1815 mil. tones, 2008) (7).

World consumption of vegetable oils record annual increases between 2-6 mil. tones, for the year 2008 the world consumption was 125,20 mil tones (table 5). The consumption of vegetable oils is increasing in Latin America (Brazil and Mexico) and in some countries in East Europe, while in Africa and in East Asia the consumption is stable.

Annual consumption of vegetable oils ranks on the first place palm oil, moving from second place in recent years.

On the second place is the soy bean oil, consumed in the major world states. The rape/canola oil (III) recorded a slightly increase and the sun flower seed oil recorded for the past years a stable increase. The peanut oil and the cotton seed oil (V, VI) are produced and consumed mainly in China and India (70%). The olive oil (VIII) is consumed mostly in the Mediterranean countries, but the demand increases in the countries of the North Europe and also in US (table 6).

Table 6

**World consumption for the mail vegetable oils
(mil. tones), according to WTM**

Oil	2005/06	2006/07	2007/08
Palm	35,35	36,61	39,53
Soy	33,46	35,58	38,05
Rape	16,83	18,05	18,59
Sunflower seed	9,69	10,39	9,89
Cotton	4,66	4,82	4,84
Olive	2,78	2,93	2,94
Coco	3,41	3,32	3,37
Palm kernel	4,04	4,34	4,56
Peanut	5,01	4,90	4,90
Total	115.21	120.93	126.66

Trade market of the vegetable oils in Romania

Romania was considered the third producer of sunflower in Europe, with an output of over 1.5 million tons, after this period as production continues to decline. Until 2004, Romania, was considered the third producer of sunflower in Europe with an output of over 1,5 mil. tones, after this period the production continues to decline (table 7). In Romania, the production of edible oils was in 2006, of 338,000 tons (tables 8), and the consumption of vegetable oils (corn, sunflower, soy) was 9 kg per capita (for NE region of approximately 10 kg).

Table 7

**Production of the oil seeds growing in Romania (thousand tons)
(The Romanian Statistical Year Book 2007)**

Plant	2001	2002	2003	2004	2005	2006
Sunflower	823,5	1002,8	1506,4	1557,8	1340	1526
Rape	101,8	35,9	8,1	98,7	147	175
Soy	72,7	145,9	224,0	298,5	229,4	344,9
Linseed for oil	2,0	1,8	1,5	2,5	-	0,3
Total	1005,5	1194,5	1760,4	1995,5	1803	2050

Table 8

**Production of the vegetable oil in Romania (thousand tons)
(The Romanian Statistical Year Book 2007)**

2001	2002	2003	2004	2005	2006
29600	228000	243000	258000	264000	338000

With an average consumption of about 11 liters of oil per capita, Romania one of the European countries with the highest consumption of vegetable oils.

Thus, a Romanian consumes annually approximately four liters more compared to Bulgarian or Hungarian neighbors, who consume only seven kilograms per capita per year. Austrians and Germans consume 6 kg of oil per capita per year. In Italy, consumption of vegetable oils is higher than in Romania, the Italians are also in the Europe top consumption, with approximately 13 kg of oil annually, but it comes almost entirely from the olive (9). At the present, in our country sunflower oil has only 80,4% of the total market. Olive oil has 8% of the total market values, the brands of the refined corn oil have a market share of 0,2%, while the soy oil is 0.1%. The rest (11,3%) is covered by other types of edible oils, such as coconut, peanuts, grape seeds, mixt oils (10). The palm oil registered an increase in trade up to 0,68% of the market in the first half of 2008, the soybean oil has reached an increase up to 0,57% of the market and the mixt sunflower an olive oil reached an increase up to 0,33% of the market (10).

CONCLUSIONS

1. The world production and consumption of vegetable oils are increasing. China remains the largest consumer of vegetable oils, followed closely by the EU-27.
2. The main oils (palm, soybean, *canola*, sunflower) are rigorously maintained in the global marketplace and increasing considerably their production every year - especially the palm oil followed by the rapeseed oil
3. Romanians are big consumers of vegetable oil, especially sunflower, but the romanian market has enriched with new sorts, there for the romanian people know and consume the olive oil, peanut oil, palm oil, grape seeds oil.

REFERENCES

1. Gunstone Frank D., 2002 - *Vegetable Oils in Food Technology*. Blackwell Publishing
2. Gunstone Frank D., 2004 - *The Chemistry of Oils and Fats*. Blackwell Publishing
3. Shahidi F., 2005 - *Bayley Industrial Oil and Fat Products*, II Ed. Willey and Sons Press
4. xxx, 2007 – *Anuarul statistic al României*
5. xxx – www.fas.usda.gov/oilseeds/circular/Current.htm
6. xxx, 2009 – *Săptămâna financiară* (on line). Martie/2009.

THE STUDY OF QUALITATIVE POTENTIAL OF VIRGINIA TOBACCO TYPE GROWN IN OLTENIA REGION

STUDIUL POTENȚIALULUI CALITATIV AL TIPULUI DE TUTUN VIRGINIA CULTIVAT ÎN REGIUNEA OLTENIA

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Abstract. *The tobacco cultures in Oltenia are some with high technological and qualitative potential, which represented a real alternative in order to diversify the horticultural culture on the soils with a sandy or sandy-clay structure and also can cover in a the necessary of raw material for the tobacco industry in our country (I. Matei și col. – 1983, Aniția N. Și col.- 1974, Giurgulescu L.- 2002, etc). In south of Roumania, the Virginia type used in this study finds favourable edafic (soil) and climatic (temperature, light and humidity) conditions, having a high yield capacity and peculiar qualities of taste and flavour. The researches developed during 2006-2008 regarded Virginia 180 and Virginia 196 breeds, cultivated in Dolj county, Amărăști and Bratovoiești areas. This study establishes the impact of edafic factor over composition and texture of chemical characteristics (total reducing substances, total reducing sugars, albumines, total azote, total volatile basis and ash) of tobacco leaves, also the relationship between temperature, light, humidity and tobacco plant*

Key words: tobacco plant, soil, chemical characteristics

Rezumat. *Culturile de tutun din Oltenia sunt cu potențial tehnologic și calitativ ridicat, reprezentând o alternativă reală pentru diversificarea culturilor horticole pe solurile cu structură nisipoasă sau nisipo-lutoasă și pot de asemenea să acopere necesarul de materie primă pentru industria de tutun din țara noastră (I. Matei și col. – 1983, Aniția N. Și col.- 1974, Giurgulescu L.- 2002, etc). Tipul Virginia folosit în acest studiu găsește în sudul României condiții edafice și climatice prielnice pentru o productivitate ridicată precum și calități deosebite de gust și aromă. Cercetările întreprinse în perioada 2006-2008 au vizat soiurile Virginia 180 și Virginia 196 cultivate în zona Amărăști și Bratovoiești din județul Dolj. Studiul stabilește impactul compozițional și structural al factorului edafic asupra caracteristicilor chimice (substanțe reducătoare totale, zaharuri reducătoare totale, zaharuri reducătoare, albumine, azot total, baze volatile totale și cenușă) ale frunzelor de tutun precum și relațiile ce există între temperatură, lumină, umiditate și planta de tutun.*

Cuvinte cheie: planta de tutun, sol, caracteristici chimice

INTRODUCTION

The significance of tobacco in the agriculture in the south of the country is increased by the fact that some varieties of tobacco (Virginia, Oriental) reevaluate economically the soil with less productive potential, as the sandy soils or other

less productive soils (reddish brown, poor leached) (I. Matei and col.-1983, Căpruciu Ramona-2008).

The cultivation of the tobacco plant is influenced to a greater degree, mainly, by the climate through temperature and precipitations (soil moisture), the quality of the leaves is also defined by other climatic elements (relative moisture of the air, wind, luminosity) aspect that have been studied since 1968 by Gisquet and Hitier.

Beside climate conditions, the character of the cultivated soil exerts a decisive influence on the tobacco quality, although this is not an exigent plant.

Other profound studies, concerning physical, chemical characteristics, the impact of the climate and the soil on them, etc., that were realised during the years in Romania, by the great scholar in the field (Aniția N.-1962, 1983) etc., together other important collaborators, showed that the type of tobacco with the greatest weight of cultivation in the pedo-climatic conditions of Oltenia's district is Virginia.

MATERIAL AND METHOD

The determinations of this study had been realized on the plants cultivated in identical orographical conditions (plateau) on reddish-brown, poor leached soil (Bratovoiești), respectively on sandy soil (Amărăști), these had been obtained from seeds with a better degree of germination at 95% (harvest of the year 2007).

The variety Virginia 180 is more precocious, having a capacity of production over 3000 kg/ ha compared to 2500 kg/ ha for the variety Virginia 196. Industrial quality of the variety Virginia 180 is good, obtaining for first two classes of quality over 80% tobacco (superior + I) compared to Virginia 196 with an industrial quality that passes over 70%. Both sorts are resistant to pest and illness, cold and have a good endurance to warmth. They present an equilibrate chemical composition of the dried leaves. The biological material used in determinations noticed in the leaves disposed in the middle layer, reached the technological maturity at the same time. These were harvested, stretched, submitted to the fermentation and drying processthrough the natural method (sun drying) and stripping. The chemical elements from the strips were determined at the Unit for Multiple Users (from the University of Craiova). Also, there have been effectuated analysis upon the two types of soil (sandy and reddish-brown, poor leached) in the purpose of determinating the suitability degree of tobacco cultivation in these areas. The drawing of the soil samples was achieved by a manual cylindrical well, for a depth comprised between 0-40 cm determined according to the present methodology: the content of humus (the method of Walkle and Black), total azote (Kjeldahl method), phosphorus and potassium (helped by the Reflectoquant machine) and the soil ph with the digital Ph-metre Schott TitroLine. After drying, the tobacco had been selected on the first and second quality grades and waste, following the colour parameters, moisture, integrity and the surface of the tobacco leaves .

The supervision of the climatic data was achieved by means of the regional weather station.

RESULTS AND DISCUSSIONS

From the climatic point of view, although tobacco plant is a tropical plant, it is also cultivated in temperate zones, because a part of the vegetation period is

passed into hotbeds, however it is a pretentious plant from the warmth point of view.

Also the relative moisture of the air holds an important part in achieving the highest quality of tobacco. It is known, from expert literature that at a low humidity the perspiration is reduced, fact that determines the achievement of slim, frail leaves, low in essential oils. Increased air moisture provides a more compact velvety follicle tissue, richer in essential oils and resins. The climate conditions in the south of Oltenia, in the context of the analysed period (the vegetation and the maturation of tobacco) are presented in table 1. In the course of March, year 2008, have been registered days with air and soil temperatures that were restrictive to seed formation, fact that contributed to a damage of 20% percentage of the growing seeds. In April, the minimum temperature over 3°C, air maxim of 24,4°C and the average soil temperatures of 14,9°C contributed to a good display of the cultivation process in 90% percent of succes. Maximum and minimum temperatures in the course of May, correlated with a great number of insolation hours (230) and a good relative air moisture took to a adequate growth of tobacco plants, defining until now, the physical characteristics typical to the cultivated sorts.

Table 1

Climatic parameters registered in the year 2008 in the south of Oltenia

Month	Air temperature (°C)			Soil temperature (°C)			Precipitations (mm)	Air relative moisture (%)	Insolations (hours)
	Max.	Med.	Min.	Max.	Med.	Min.			
March	21,40	8,30	-3,50	40,00	9,80	-2,70	16,10	57,00	212,60
April	24,40	12,40	3,10	43,00	14,90	3,40	59,60	69,00	153,00
May	34,00	17,10	5,40	52,40	21,80	8,30	31,00	65,00	230,00
June	34,90	21,70	10,00	63,20	27,90	12,20	28,40	63,00	224,70
July	35,20	22,80	10,60	60,00	27,60	12,30	97,60	54,00	265,90
August	35,90	24,30	12,50	46,90	28,30	16,10	0,60	50,00	299,00
September	35,30	16,30	3,80	44,60	18,70	5,80	55,60	66,00	181,20

Unfortunately, in June, because of the absence of rainfall, of 35°C air temperature and maximum soil temperature over 63°C, also because of so many hours of insolation, the physiological processes of the plants were enhanced, a more obvious aspect was noticed to the varieties of plants that were cultivated on sandy soil of Amărăști, soil with a higher degree of permeability because of the lack of humus registered in the An profile (table 2). The fallen precipitations registered in July (97,6 mm) contributed, on the reddish-brown poor leached soil of Bratovoiești, to a weight growth of the follicle tissue also to the forming of a higher percent of nervures than the identical varieties cultivated at Amărăști. This fact constitutes a disadvantage in the tobacco industry because the leaves will become frail after the process of drying and a great percent of nervures declines the sorts quality. The next months' variations, mostly in moisture, but also the

minimum air temperatures and the number of the insolation days brought to a two weeks surpass of the harvesting term.

Table 2

The chemical proprieties of the reddish-brown less leached soil (Bratovoiești) and sandy soil (Amărăști)

Area	Horizon	Depth (cm)	Humus (%)	Nt (%)	P (ppm)	K (ppm)	pH (H ₂ O)
Bratovoiești	Ap	0-19	2,61	0,17	78,00	225,00	6,04
	Ao	19-38	1,42	0,09	17,00	87,00	6,20
Amărăști	Aa	0-23	0,62	0,04	45,00	13,30	6,50
	An	23-40	-	-	11,00	10,70	6,30

According to the understanding of the natural frame in which the tobacco plant grows and develops, analysing table 2, we may say that the reddish-brown, less leached soil of Bratovoiești is medium to poor in terms of total azote supply, a higher value is registered at the surface level (approximately 0,17% compared to 0,04% at Amărăști), after that the percent decreases until 0,09%, as for the An sandy profile it was not detected anymore. Also the mobile content in P and K, either for the reddish-brown poor leached soil, as for the sandy one, shows variations according to the depth. In the above table it is shown the significant difference between horizons in these elements, even on the same soil profile (the horizon Ap for the reddish-brown soil poor leached presents a content in P of 78 ppm and in K of 225 ppm, in horizon Ao shows smaller values (17 ppm for P respectively 87 ppm for K). The values of this elements in the profile of the sandy soil at Amărăști, from the valuable point of view, are by far under the values shown at Bratovoiești (table 2, figure 1).

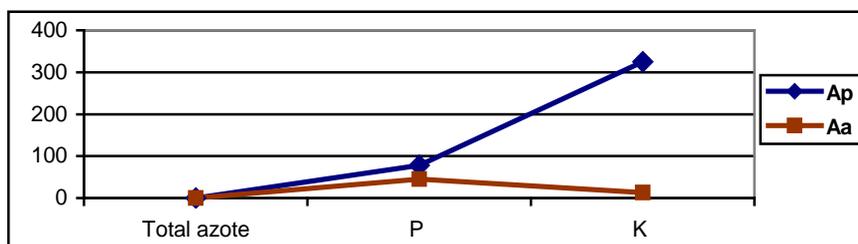


Fig. 1. The NPK content from the superior profile of the studied sorts

At Amărăști humus variation has been registered only in the surface horizon Aa on a depth of 23 cm showing values of maximum 0,62%, for the horizon An this element was not detectable (table 2). The profile analysis from the area of Bratovoiești distinguishes a reddish-brown poor leached soil that is medium to poor provisioned with humus. It is known from expert literature that the plant synthesizes the greatest part of chemical elements from the soil and if the soil is rich in azote, the tobacco plant leaves will maturate slowly, uniformly and late. We met this aspect in 2008, at Bratovoiești, the total azote found in the leaves of the variety Virginia 196, after drying

at second class, got at 3,18%, respectively at 2,78%, compared to Amărăști where the same varieties synthesized a smaller percent (2,13% total azote for Virginia 180 respectively 2,66% for Virginia 196)-table 3.

Table 3

The main chemical characteristics of the sorts Virginia 180 and Virginia 196 directly dried at sun

Variety of tobacco / Area	Class quality	S. r. t. (%)	Sugars r. t. (%)	Sugars reducing (%)	Albumines (%)	Total azote (%)	B. V.T (%)	Ash (%)
Virginia180/ Bratovoiești	I	7,80	6,61	5,40	6,74	2,45	0,67	16,32
	II	6,51	4,51	4,21	7,31	3,18	0,60	16,15
Virginia196 /Bratovoiești	I	7,16	5,33	5,08	7,90	2,50	0,51	18,03
	II	6,23	3,12	4,14	8,14	2,78	0,42	17,15
Virginia180 / Amărăști	I	7,14	6,16	5,20	6,86	2,18	0,86	16,70
	II	6,46	5,76	4,48	7,38	2,13	0,51	16,56
Virginia196/ Amărăști	I	6,25	4,87	4,88	7,02	2,33	0,98	16,96
	II	4,89	4,09	3,84	7,53	2,66	0,85	16,23

The sugars in normal quantities form by burning acid products which make the smoke soft and sweet. It is noticed a content of total diminishing sugars superior at Bratovoiești (6,61% at first class for Virginia 180), also recording significant values at Amărăști (6,16%). The variations between the classes on cultivation areas and varieties are important (5,33% for the variety Virginia 196, first class at Bratovoiești compared to 4,87% for the same variety and class at Amărăști). In the two studied areas the smallest values have been achieved at first grade, the area Amărăști (Virginia 180 with 6,86%) and higher values at second class quality for the both varieties. The leaves whose albumine content passed the admitted line for superior cigarettes belonged to the variety Virginia 196, second class cultivated at Bratovoiești (8,14%) giving to the finished product when lighted a piquant, bitter taste and an unpleasant smell similar to the smell of burnt feathers (table 3).

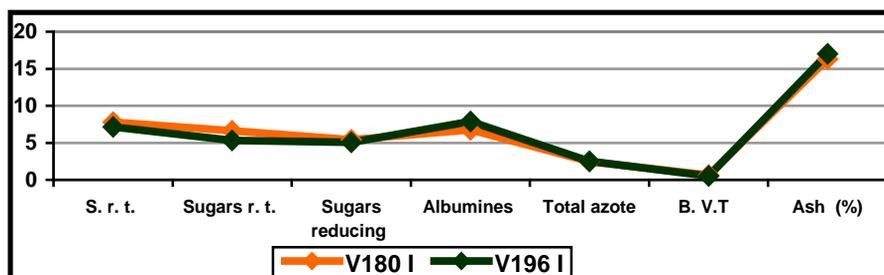


Fig. 2. Chemical analysis of the cultivated sorts in the same climatopedological conditions

The total volatile bases contributes to the forming of tobacco flavour. The tobacco leaves that were collected from the middle of the plant and dried directly to the sun registered a total of essential substances that was enough for

an equilibrated flavour both for the variety Virginia 180 and the variety Virginia 196 (figure 2).

CONCLUSIONS

Restrictive climatic conditions of tobacco cultivation registered in the year 2008, correlated with the soil low content of certain necessary elements for the growth and forming of the plant brought, according to the supervision of the physical and chemical parameters, to the loss of the Superior class (specific to Virginia type) resulting two important classes (first and second).

Both the variety Virginia 180 and the variety Virginia 196 cultivated at Bratovoiești registered superior values of total azote compared to the same sorts cultivated at Amărăști because of the higher content of this element of the reddish-brown poor leached soil contrary to the sandy one, with effects on the yellow colour and the taste of tobacco.

The same sorts cultivated on the sands of Amărăști, mainly the ones classified at second quality class, gave atypical products both organoleptical and chemical, conducting to their distribution for the achieving of couplings with the purpose of manufacturing mass consumption cigarettes.

The supervision of the climatic factors, the establishment of the realization the structural and compositional influence of the soil on the chemical composition from the leaves of the studied varieties, the realization of the comparing frame between the cultivation areas and the analysed varieties, allows an exact evaluation of their productive and qualitative potential.

REFERENCES

1. Aniția N., Ilie C., Voiculescu C., 1962 – *Variația conținutului de nicotină în foile de tutun pe etaje, sub influența azotului din sol*. Stud. Cerc. Biochimie București
2. Aniția N., Ioan E., Irimie M., 1974- *Tehnologia culturii tutunului*, Editura Ceres, București
3. Aniția N., Marinescu P., 1983 – *Tehnologia tutunului*. Editura Ceres, București
4. Căpruciu Ramona, 2008 – *The study of the technological quality of the breed of tobacco Djebel grown in Oltenia region*. Analele Universității din Craiova, Vol XIII (XLIX) pp. 431-437
5. Gisquet P., Hitier H., 1968 – *La production du tabac*. Ed. Bailliére Paris
6. Giurgiulescu L., 2002 - *Cercetări privind potențialul tehnologic al soiurilor de tutun virginia cultivate în zonele nisipoase ale Olteniei*, Analele Univ. din Craiova, Vol VII (XLIII) pp. 418-421
7. Matei I., Chichea I., Pop L., Ioan E., 1983 – *Noi contribuții la îmbunătățirea tehnologiei culturii tutunului Virginia, pe terenurile nisipoase irigate din sudul Olteniei*. Analele Universității din Craiova, Vol. XIII (XXIII)

THE FAVORABILITY FOR THE MAIN AGRICULTURAL CULTURES IN THE SÂRCA FRUIT-GROWING BASIN

FAVORABILITATEA SOLURILOR PENTRU PRINCIPALELE CULTURI AGRICOLE DIN BAZINUL POMICOL SÂRCA

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Abstract. *Acquiring thorough knowledge the conditions of plant growth and establishing the degree of favorability of these conditions for each use and culture is part of the complex work of land evaluation. With regard to this, in the first part of the paper we intend to present some aspects regarding the relief, the climate, the hydrology and the soil cover in the Sârca fruit-growing basin (The hilly plain of Jijia). In order to achieve an overall vision of soil favorability for different crops and uses (a reduced number of crops and uses were taken into account: wheat, corn, sunflower, apple tree, cherry tree, meadows, pastures) in the studied area, these were grouped in 5 favorability classes. The situations for each class were presented. Also, correlations were made between the favorability classes of soils and the current productivity classes of crops taken into account.*

Key words: favorability classes, soil resources, evaluation notes, crops, fruit-growing basin

Rezumat. *Operația de cunoaștere aprofundată a condițiilor de creștere a plantelor și de determinare a gradului de favorabilitate a acestor condiții pentru fiecare folosință și cultură face parte din lucrarea complexă de bonitare a terenurilor. În acest sens, în prima parte a lucrării ne-am propus să prezentăm câteva aspecte cu privire la relieful, clima, hidrologia și învelișul pedologic din bazinul pomicol Sârca (Câmpia colinară a Jijiei). În ideea realizării unei viziuni de ansamblu asupra favorabilității solurilor pentru diferite culturi și utilizări (s-a luat în calcul un număr redus de culturi agricole și utilizări: grâu, porumb, floarea soarelui, măr, cireș, vișin, fânețe, pășuni) din arealul studiat, s-a realizat o grupare a acestora în 5 clase de favorabilitate. S-au prezentat situațiile pentru fiecare clasă. De asemenea, s-au făcut corelații între clasele de favorabilitate a solurilor și clasele de productivitate actuală a culturilor luate în calcul.*

Cuvinte cheie: clase de favorabilitate, resurse de sol, note de bonitare, culturi agricole, bazin pomicol

INTRODUCTION

Favorability is the measure which indicates how soils satisfy the crop growth and development requirements for various plants and agricultural species within a normal climate setting and average farm practices. From this point of view, soils are divided in favorability classes, ranging from most suitable to those improper for agricultural growth.

The purpose of the Sârca fruit-growing basin terrain (soil) evaluation, from the point of view of favorability, is to establish optimum usage practices, considering both environmental and socio-economic factors.

In order to obtain a reliable result pertaining to soil favorability, a holistic approach of the soil system is required. When establishing the soil favorability for various crops, good knowledge of both the soil multiple functions and the interaction between agricultural activities and soil quality are needed.

MATERIALS AND METHODS

The soil favorability analysis for different crops within the Sârca fruit-growing basin represents the result of reading and interpreting data acquired through complex pedologic studies performed by OJSPA - Iași (1995, 1999), on a 1:10000 scale. Soil favorability in the Sârca fruit-growing basin has been studied for the following crops and agricultural usages: wheat, corn, sunflower, apple, cherry, meadows and pastures. Soil classification is done according to the Romanian System of Soil Taxonomy (SRTS) – 2003. Soil classification into favorability classes and the evaluation points calculation (OJSPA data has also been used) have been performed according to “Pedologic studies elaboration methodology”, vol II, III, I.C.P.A, Bucharest, 1987.

RESULTS AND DISCUSSIONS

The Sârca fruit-growing basin which overlaps the Bahluiet hydrographic basin, the most significant affluent of the Bahlui river, is situated in the southernmost part of the hilly plain of Jijia, at the boundary with the Iassy Coast. Within this study, the physical-geographic boundaries of the Sârca fruit-growing basin have been set to Valea Oilor to the north and east, the Bahluiet Valley to the south and the Bălțați Valley to the west.

From an administrative point of view, the basin is situated in the south-east of Bălțați commune (east of Bălțați village where the administrative center of the commune lies), 12 km from Târgu-Frumos town and 36 km from Iași city (municipality). Considering the established physical-geographic boundaries, a surface of 1210,6 ha has been calculated for the Sârca fruit-growing basin.

The relief morphology, deeply tied to the monoclinical structure of the geological deposits (bassarabian and quaternary) modeled by the water streams, is outlined by the north-west oriented coast alternation and cuesta backs, and the wide interfluves with a general south-eastern inclination. The right sides of the Bahluiet and Oilor valleys are affected by intense slope processes, predominantly landslides. Within the plateaus and interfluves crests, the relief mean declivity averages at 3 – 5°C, while on low energy sides, the slopes do not exceed 10°C. On the cuestaform sides, the values for side slopes go beyond 20°.

From a geological perspective, the studied areal is situated in the Bassarabian (ashen blue clay marls' layers) and Quaternary (loessoid deposits, eluvial clays, fluvial deposits) prevalence area.

From a climate perspective, the Sârca fruit-growing basin belongs to the temperate-continental climate. The annual average temperature value is 9,2°C

(Podu-Iloaiei) and the multi-annual precipitation average is 550,8 mm in Podu-Iloaiei and 502,3 mm in Târgu-Frumos. The hydrographic network consists of low-level water streams which regularly run dry during summer. The main water stream is the Bahluiș river, along with its left affluent stream, Valea Oilor.

From a geobotanic point of view, the Sârca fruit-growing basin is of forest steppe type. However, the natural vegetation has been mostly replaced with crop by human intervention. The available agricultural area in the Sârca fruit-growing basin is divided between orchards (most occupied area at 50,03%), followed by tillable land (26,36%), pastures and meadows (19,23%), vineyards (3,43%), forests (0,94%) (fig. 1).

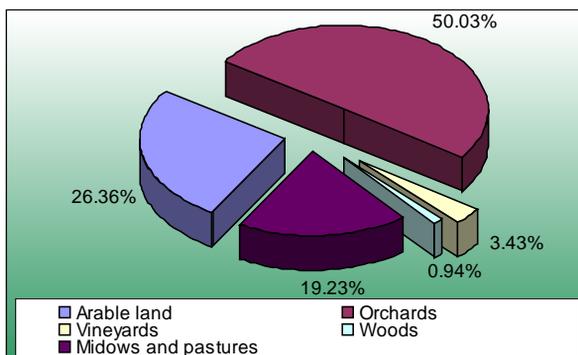


Fig. 1. Terrains distribution according to usage categories

Part of the natural setting, the soil has formed under the influence and concurrence of specific (soil genesis) factors, such as: climate, rocks, relief, ground and stagnant water, anthropic factors and the passage of time.

According to Romanian System of Soil Taxonomy (SRTS – 2003), within the Sârca fruit-growing basin four soil classes have been identified: cernisols, anthrisols, protisols and hydriols.

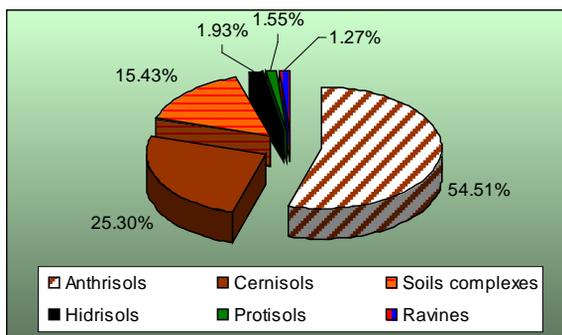


Fig. 2. Soil classes distribution in the Sârca fruit-growing basin

As can be observed in figure 2, the pedologic layer of the studied areal is dominated by the anthrisols class (54,51%), which occupies the central part of the

Sârca fruit-growing basin, the cuesta reverse side respectively. The cernisols class accounts for 25,30% of the pedologic layer, this type of soils showing up on flat or mildly sloped surfaces (plateaus, terraces, mildly sloped sides). The protisols class (1,55%) is particular to steeply-sloped sides and water stream meadows (Bahluieț and Valea Oilor fields). Hydrisols class soils (1,93%), formed during excessive humidity conditions, can be spotted on limited areas south of the fruit-growing basin, close to the Bahluieț flow. Soils complexes (15,43%) have a discontinuous spatial distribution, showing up on slope sides with clay – marl deposits within the studied area and represent soil mergers mostly of different types.

For the Sârca fruit-growing basin, according to soil favorability, a scale of 5 soil classes has been used to determine agricultural usefulness (table 1).

Table 1

The framing soil units from Sârca fruit-growing basin in the favorability classes

Soil Classes and Types	The favorability classes for the main agricultural cultures						
	WH	CN	SF	AT	CT	MD	PS
Cernisols Class							
Typical chernozem	II	II	II	II	II	III	III
Typical chernozem with surface mild erosion	II	III	II	II	II	III	III
Typical chernozem with surface moderated erosion	II	III	II	III	II	III	III
Typical cambic chernozem	II	II	II	II	II	III	III
Cumulic typical cambic chernozem	II	II	II	II	II	III	III
Typical cambic chernozem with mild surface erosion	II	III	II	II	II	III	III
Anthrisols Class							
Hortic anthrosol	III	III	III	III	II	III	III
Cambic hortic anthrosol	II	III	II	II	II	III	III
Gleied hortic anthrosol	IV	IV	III	V	V	II	III
Typical erodosoil	III	IV	IV	IV	III	IV	III
Protisols Class							
Moderately alkalized, mildly salinized, strongly gleied fluvisol	V	V	IV	V	V	III	III
Colmatated through water, moderately alkalized, mildly salinized, mollic colluviosoil	III	IV	II	V	V	III	III
Hydrisols Class							
Salinized gleyosol	V	V	V	V	V	V	V
Mildly alkalized, moderately salinized gleyosol	V	V	IV	V	V	III	III

Class I favorability, representing highly reliable soils, with no restrictions and good harvest output, has not been identified in the Sârca fruit-growing basin.

Class II favorability represents average soils, with low limitations on agricultural production and little improvement actions required. This class includes the chernozem type soils, favorable for most of the considered crops (wheat, sunflower, apple, cherry tree), the hortic anthrosol propitious to cherry

plantations, the cambic hortic anthrosol which proves favorable to wheat, sunflower, apple and cherry plantations.

Class III favorability is characterized by medium favorability soils, reducing the agricultural crop array and requiring some improvement actions. This class contains soils of the cernisols class, with a medium favorability for pastures and meadows. Also part of this class are the hortic anthrosol (wheat, corn, sunflower, meadows, pastures), the gleied hortic anthrosol (sunflower, pastures), the typical erodosoil (wheat, cherry, pastures), the strongly gleied fluvisol (meadows, pastures) and the mollic colluviosoil (wheat, meadows, pastures).

Class IV favorability refers to feeble soils, with severe limitations on crop harvest, requiring intensive improvement actions for a stable harvest. This class includes the following types: the gleied hortic anthrosol with low favorability for wheat and corn; the typical erodosoil with weak productivity for corn, sunflower, apple and meadows; the strongly gleied fluvisol (sunflower)

Class V favorability contains soils improper for agricultural or fruit-growing activity, even by improvement action; still, these can be used for meadows, pastures, forests. This category holds gleied hortic anthrosol, unfavorable to apple and cherry, strongly gleied fluvisol and mildly alkalized, moderately salinized gleyosol, unprosperous for wheat, corn, apple and cherry, and the mollic colluviosoil, improper for apple and cherry. Also part of Class V favorability is the salinized gleyosol, unsuited for all crops.

Following is the favorability per each type of soil in the Sârca fruit-growing basin for each considered crop.

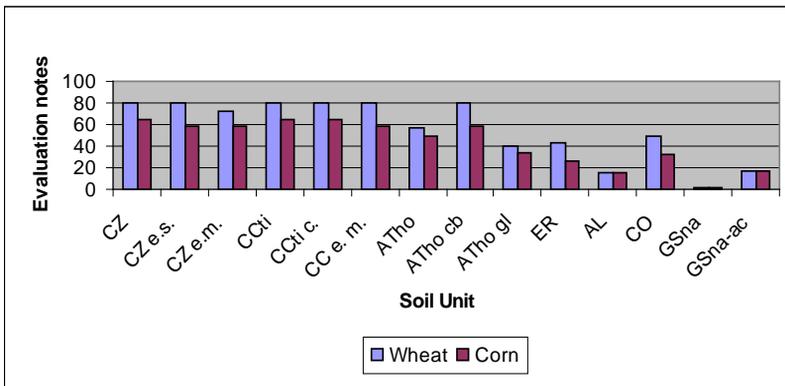


Fig. 3. Wheat and corn favorability for main soil types in the Sârca fruit-growing basin

In figure 3, it be observed that the favorable soils for wheat growth are the chernozem type soils and the cambic hortic anthrosol, with 80 evaluation points. These soils present class II favorability for this crop.

For corn, the class II favorability soils are the typical chernozem, the typical cambic chernozem, the cumulic typical cambic chernozem, each with 65 evaluation points. Soils that ensure medium favorability for wheat crops (class III

favorability) are the hortic anthrosol with 57 evaluation points, the typical erodosoil with 43 evaluation points and the salinized mollic colluviosoil with 50 evaluation points, while for corn, the medium favorability soils are the typical chernozem with mild surface erosion, the typical chernozem with moderated surface erosion, the gleied hortic anthrosol with 58 evaluation points and the hortic anthrosol with 50 evaluation points.

Class IV favorability for wheat and corn crops contains the gleied hortic anthrosol (40 evaluation points for wheat and 34 evaluation points for corn), which provides a weak development environment for these crops. Also part of class IV favorability for corn is the typical erodosoil (26 evaluation points) and the mildly salinized mollic colluviosoil with 32 evaluation points.

Improper soils for both wheat and corn crops from favorability class V are the strongly gleied fluvisol (16 and 15 evaluation points, respectively), the salinized gleyosol (1 evaluation point for both crops) and the mildly alkalized, moderately salinized gleyosol (17 evaluation points for wheat and corn).

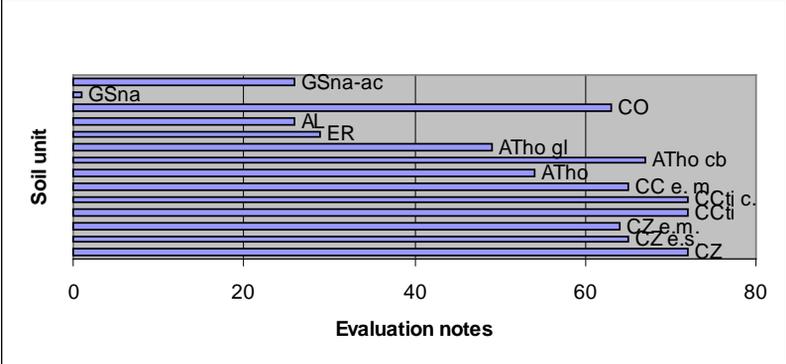


Fig. 4. Sunflower crop favorability for the main soil types in the Sârca fruit-growing basin

Soils with good favorability for sunflower crops (fig.4) from the favorability class II are the cernisols class (the typical chernozem – 72 evaluation points, the typical chernozem with mild surface erosion – 65 evaluation points, the typical chernozem with moderated surface erosion – 64 evaluation points, the typical cambic chernozem - 72 evaluation points, the cumulic typical cambic chernozem – 72 evaluation points, the typical cambic chernozem with mild surface erosion - 65 evaluation points) and also the cambic hortic anthrosol with 67 evaluation points and the mildly salinized mollic colluviosoil with 63 evaluation points. The favorability class III for this crop, represented by the hortic anthrosol and the gleied hortic anthrosol, with 54 and 49 evaluation points respectively, results in low harvest output. The typical erodosoil and mildly salinized gleyosol, each with 29 evaluation points, along with the strongly gleied fluvisol (26 evaluation points), are part of class IV favorability and of low quality to sunflower. Class V favorability for sunflower crop is represented by the salinized gleyosol with 1 evaluation point.

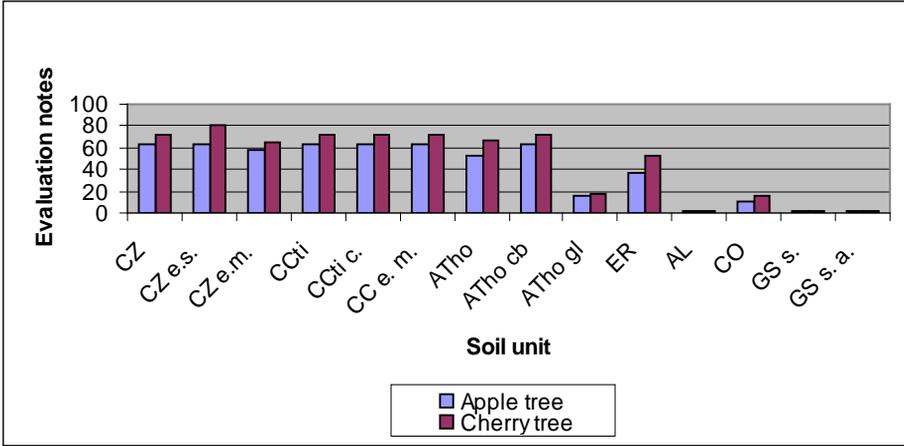


Fig. 5. Soil favorability for apple and cherry plantations in the Sârca fruit-growing basin

With the exception of the typical chernozem with moderated surface erosion, part of class III favorability (58 evaluation points), the other types soils of cernisols class are favorable for apple plantations (64 evaluation points) and are included in class II favorability (fig. 5). For the cherry plantations, all soil types in the cernisols class are highly favorable, with evaluation values ranging from 65 points (the typical chernozem with moderated surface erosion) to 80 points (the typical chernozem with mild surface erosion). Also included in the class II favorability for apple and cherry plantations is the cambic hortic anthrosol. The hortic anthrosol lies within the quality class III for apple crop (52 evaluation points) and favorability class II for cherry (67 evaluation points). The typical erodosoil is established as class III favorability for cherry plantations (52 evaluation points) and class IV for apple (37 evaluation points). Soils from class V favorability for apple and cherry are: the strongly gleied fluvisol, the mildly salinized mollic colluviosoil, the salinized gleyosol and the mildly alkalized, moderately salinized gleyosol.

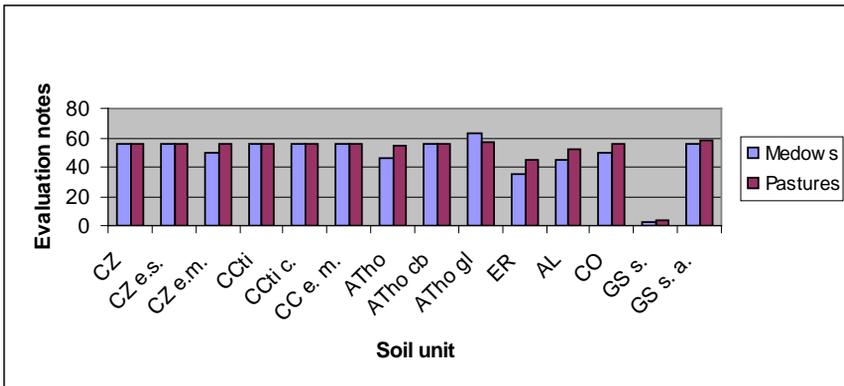


Fig. 6. Soil favorability for pastures and meadows in the Sârca fruit-growing basin

As can be observed in figure 6, for pastures and meadows, most types of soils are class III favorability. Exceptions are the gleied hortic anthrosol with 63 points, part of class II for meadows, the typical erodosoil from class IV favorability for meadows and the salinized gleyosol, unfavorable for both pastures (3 evaluation points) and meadows (4 evaluation points)

CONCLUSIONS

From the favorability point of view, the predominant soil types in the Sârca fruit-growing basin are those in favorability classes II and III.

All soil types in the cernisols class are part of favorability classes II and III.

Soils of the hydrisols class are included in class V favorability for almost all crops, with the exception of the mildly alkalized, moderately salinized gleyosol, part of class III favorability for pastures and meadows.

Comparing the two considered cereal crops, wheat and corn, it can be noticed that corn is more “sensitive” to soil types.

For tree-growth plantations (apple and cherry), soils are approximately within the same favorability classes for both species.

Most of the soils from the studied areal are have high or medium favorability for a large array of crops.

REFERENCES

1. Băcăuanu V., 1968 - *Câmpia Moldovei. Studiu geomorfologic*. Ed. Academiei, București
2. Florea N., Munteanu I., 2003 – *Sistemul Român de Taxonomie a Solurilor*. Ed. Estfalia, București
3. Horațiu F., 2004 – *Contribuții la studiul solurilor din Dealurile Someșene*. Univ. de Științe Agricole și Medicină, Cluj – Napoca, teză de doctorat
4. Patriche C. V., 2003 – *Evaluarea biofizică și tehnică a terenurilor agricole*. Ed. Terra Nostra, Iași.
5. ***, 1995 – OJSPA. *Studiu pedologic- scara 1:10.000. Teritoriul Bălțați, județul Iași*
6. ***, 1987 - *Metodologia elaborării studiilor pedologice*.,Vol. II, III, ICPA, București

THE POLYMERIC MATERIAL EFFECTS ON CHEMICAL AND BIOCHEMICAL EQUILIBRIUMS IN INTEGRATED SOIL-WATER-PLANTS SYSTEMS FROM GLASS HOUSES. I - EXPERIMENTAL SETTING AND PRELIMINARY RESULTS

EFECTELE MATERIALELOR POLIMERICE ASUPRA ECHILIBRELOR CHIMICE ȘI BIOCHIMICE ÎN SISTEMELE INTEGRATE SOL-APĂ-PLANTE DIN SERE. PARTEA I: OPTIMIZAREA EXPERIMENTELOR ȘI REZULTATE PRELIMINARE

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Abstract. *By experimental modelling have been tested the effects of four types of polymers (PEG-2000, PEG-4000, AM-VA, AM-MMA) on chemical-mineralogical equilibriums in soils from Iași and Bacău glasshouses. Have been follow the stability of polymers and mechanisms of interaction with soil components, the practicality of control and routing of these effects in. The experimental results showed that polymers affect different chemical-mineralogical and biotic equilibriums in soils. The most influenced are the acid-basis and complexation equilibriums. The effects with maximum intensity occurs locally, the global effects are mostly attenuated by other phenomena. These results are the basis for to optimize practical processes involved in conditioning and amelioration of soils from glasshouses with polymer.*

Key words: polymeric materials, soil plant, interactions

Rezumat. *Prin modelare experimentală au fost testate efectele a 4 tipuri de polimeri (PEG-2000, PEG-4000, AM-VA, AM-MMA) asupra echilibrelor chimico-mineralogice în solurile din serele Iași și Bacău. Au fost vizate stabilitatea polimerilor și mecanismele de interacțiune cu componentele solurilor, posibilitățile practice de control și dirijare a efectelor produse de acestea. Rezultatele experimentale au arătat că polimerii influențează diferențiat echilibrele chimico-mineralogice și biotice din soluri. Cele mai puternic influențate sunt echilibrele acido-bazice și de complexare. Efectele cu intensitate maximă se manifestă la nivel local, efectele globale sunt în mare parte atenuate de alte fenomene. Aceste rezultate stau la baza optimizării procedeeleor condiționării solurilor din sere cu materiale polimerice.*

Cuvinte cheie: materiale polimerice, substrat, interacțiuni

INTRODUCTION

Conditioning and improve of degraded soils with polymeric materials is one of the most approved methods with broad applications in modern agriculture. The studies from literature have indicate good results in case of polymers from poly-electrolytes class, being underlined the positive effects induced on morphological, physic-chemical and biochemical characteristics of soils (M.F. De Boodt, 1992; J.D. Hamilton & R. Sutcliffe, 1996; G.C. Chițanu et al., 2005). In case of soils from glasshouses, the conditioning with polymeric materials required the optimization of two essential aspects: (i) favourable aspects on soil quality and vegetables growing, and (ii) ecological effects on equilibriums from integrated soil – water – plants systems. The used polymeric materials must be easily biodegradable, not be assimilated by cultivated plants and not disrupt their normal development cycle, the degradation products to not be toxic and to have beneficial effects on biological systems from soil. These conditions are not integral satisfied by none of the polymeric materials used for the conditioning of soils from glasshouses (J.D. Hamilton and R. Sutcliffe, 1996; V. Voican & V. Lăcătuș, 1998; F. Filipov et al., 2008).

By experimental modelling have been tested the effects four types of polymers (PEG-2000, PEG-4000, AM-VA, AM-MMA) on chemical-mineralogical and biochemical equilibriums in soils from Iași–Copou and Bacău glasshouses. Have been follows the interaction mechanisms of polymeric materials with mineral and organic components of soils, the stability of these in exploitation conditions of soils from glasshouses and the practicality of control and routing of these effects in soils in the glasshouses. The experimental results showed that polymers affect different chemical-mineralogical and biotic equilibriums in soils.

MATERIAL AND METHOD

The experiments have been realized on soil samples, different as type, physic-chemical characteristics, exploitation technologies and degradation degree (table 1), for to underline the effects of polymeric materials as a function of pedo-geochemical characteristics of soils from glasshouses.

Table 1

Soil samples used for testing

Observations	Profile IS.1	Profile IS.2	Profile BC.1
Location	Copou – Iași Glasshouse	Copou – Iași Glasshouse	Bacău Glasshouse
Type of soil*	Hipohortic Entianthrosol Mixed-Proxicalcaric	Hortic Anthrosol Proxicalcaric	Hortic Anthrosol Proxicalcaric ⁽¹⁾
Composition ⁽²⁾	Apk1-Apk2-Ahok- Ahok(x)-(Bck)-ABk-Ck	Apk-Aho1k(x)- Aho2k(x)-(Bck)-Ck	Apk-Atpk-Ahok- Bv1k-Bv2k-Ck
Degradation**	advanced	advanced	incipient

⁽¹⁾Evolved on stream deposits. ⁽²⁾See and figure 2. *After S.R.T.S-2003. **Relative degradation degree – relative estimation (Filipov et al., 2008).

Before testing, the soils samples have been studied by physic-chemical and mineralogical analysis (F. Filipov et al., 2008). For testing were used four types of polymeric materials: polyethylene glycol with 2000 (PEG-2000) and 4000 (PEG-4000)

molecular mass, vinyl–maleate co-polymer (AM-VA) and metacrylate-maleate co-polymer (AM-MMA). The tests have been realized by experimental modelling of polymeric materials dynamic in conditions of soils from glasshouses. The experimental variants used and the general objectives are presented in figure 1. The schematic representation of experimental installation and work conditions are presented in figure 2 and table 2. In laboratory conditions were reconstituted at scale, the soil profiles from the two glasshouses, keeping unchanged sequence of horizons and pedo-geochemical characteristics of these.

Table 2

Experimental conditions				
Observations	PEG-2000	PEG-4000	AM-VA	AM-MMA
Utilization way	Aqueous solutions 0.1-1%; distribution by spraying with constant flow ⁽¹⁾			
Volume	10 mL (polymer solution / soil \approx 1 / 100)			
Flow	Descending without pressure gradient*			
pH _i	6.83	7.08	6.11	7.69
E _h , mV ⁽²⁾	0.062	0.025	0.055	0.037
Diffusion rate ⁽³⁾	$3.85 \cdot 10^{-3}$	$2.67 \cdot 10^{-3}$	$3.65 \cdot 10^{-3}$	$3.22 \cdot 10^{-3}$

⁽¹⁾Average value of flow: $3.57 \cdot 10^{-1}$ mL/hour. ⁽²⁾Initial redox potential. ⁽³⁾Average value of diffusion by column [mL / hour]. * Diffusion gradient flow under gravity.

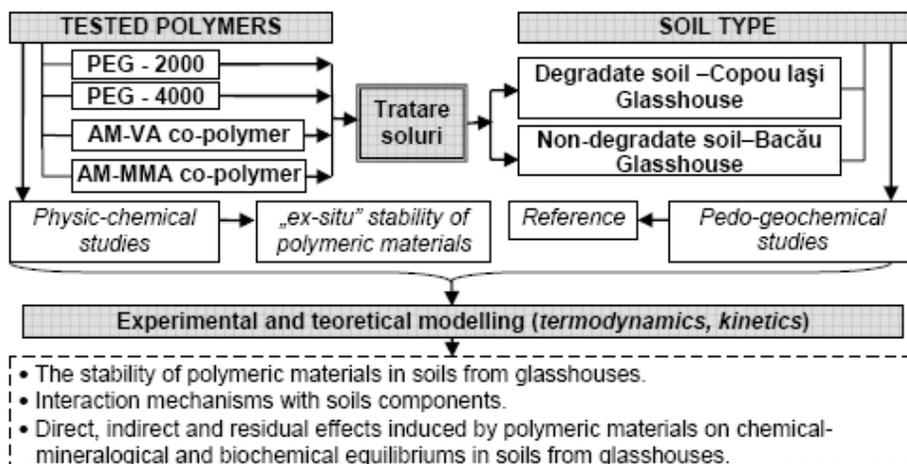


Fig. 1. Experimental variants and general objectives.

After treating with polymeric materials we follow the global dynamic of their interactions with mineral and organic components of soils and the direct, indirect and residual effects induced on different chemical-mineralogical and biotic equilibriums in soils from glasshouses, respectively. For this porpoise, by “in situ” measurements in four different points of experimental installation (figure 2), have follow the time variations of pH, redox potential, salinity and chemical composition of soil solutions. Were particularly concerned local variations of these parameters, above, within and below the horizontal of pedo-geochemical segregation (horizon Aho2k(x) – profile IS.1 and Ahok – profile BC.1) (F. Filipov et al., 2008). At the end of experiments, the samples were analyzed by microscopy, spectrometry (in IR, UV-VIS and Raman) and

X-ray diffraction, for to estimate the influence of polymeric materials on composition and structure of mineral and organic components of soils.

In parallel were done studies concerning the stability of polymeric materials under the action of aqueous solutions with variable compositions and physico-chemical properties, of temperature and of IR and UV-VIS ray. The obtained data have been used for to establish the work parameters for treating the soils from glasshouses with polymeric materials (concentration of polymer solutions, quantity and application way, etc.), and as reference for the interpretation of experimental results, respectively. For the interpretation of the interaction dynamic of polymeric materials with mineral and organic components of soils, the theoretical modelling of experimental results, towards reference samples, was done.

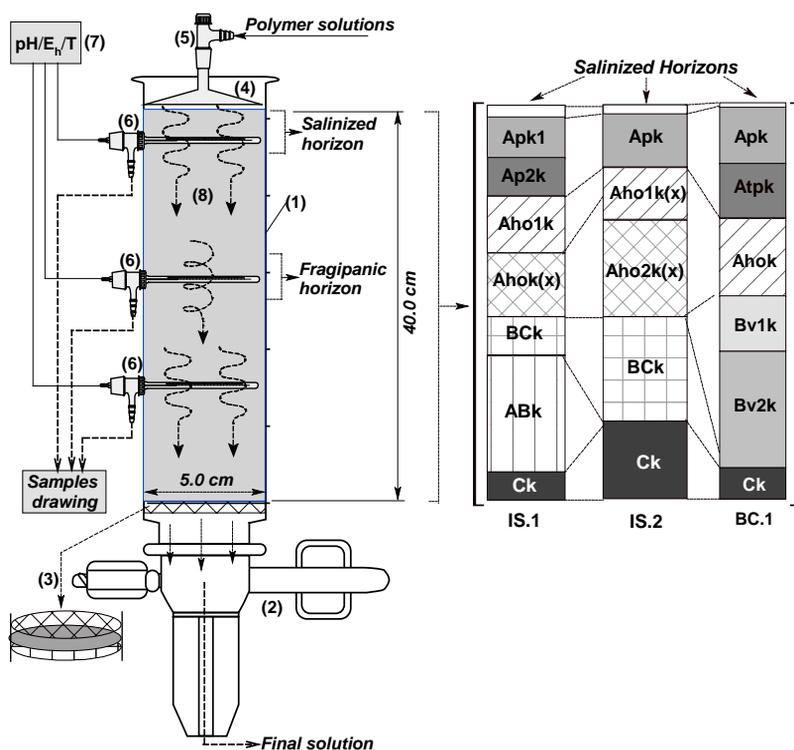


Fig. 2. Schematic representation of experimental installation: (1) Plexiglas tube, (2) tap, (3) support for soil samples (three sites of Teflon and glass fibre), (4) distribution device by spraying the polymer solution, (5) flow regulator, (6) non-perturbed system to “in situ” measurements (combination of electrochemical, pH, redox potential and ion-selective electrochemical sensors) and sample solutions for analysis, (7) multi-meter (pH, redox potential, electric conductivity), (8) soil sample (details in the right size of figure). Dotted arrows indicate the movement of polymer solution through the column.

RESULTS AND DISCUSSIONS

The effects of polymeric materials on chemical and biochemical equilibriums in soils from glasshouses are very complex and different, and depend by the type and application way of the polymeric materials, and by the chemical-mineralogical characteristics and exploitation way of soil (figure 3). The polymeric materials interact

selective and in competitive regime with all mineral and organic components of soils, and the processes by which they manifest their effects on soil characteristics are extremely sensitive to relatively small changes in soil conditions. The experimental results have shows that the variation of pH with ± 0.5 units, of redox potential with ± 100 mV, of ionic strength of soil solution with 0.1 units or of temperature with $\pm 15^\circ\text{C}$, can change radically the configuration and chemical reactivity of polymer macromolecules. These modifications conditioned directly the selectivity, the intensity and manifestation time of polymeric materials effects on different types of chemical-mineralogical and biotic equilibriums from soil.

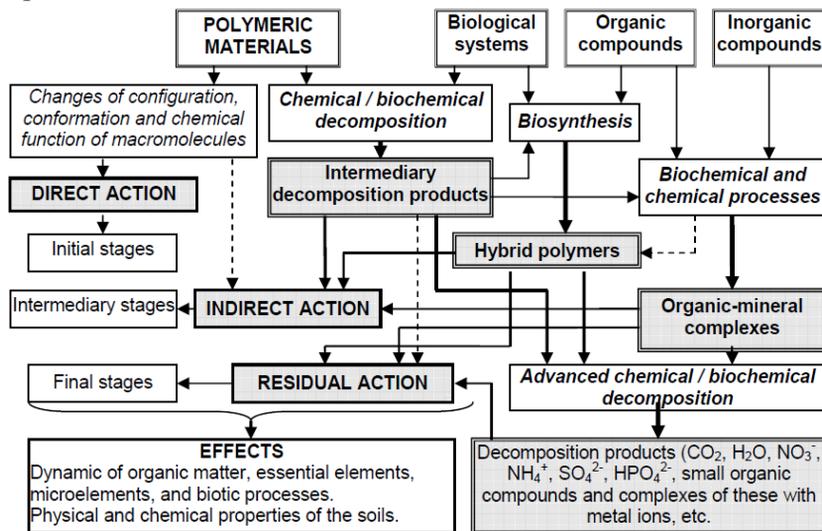


Fig. 3. General action mechanisms of polymeric materials and the effects obtained produced at the treating of soils from glasshouses. The dotted lines indicated the influences and inter-side.

The experimental results indicate that the polymeric materials practically influenced all types of chemical, mineral and biochemical equilibriums from soils, but in different way. The most influenced (as intensity and duration) are the acid-basis and complexation equilibriums, observation which can be correlated with the modification of dynamics of organic matter, essential elements and microelements from soils treated with polymeric materials (F. Filipov et al., 2008). Ours studies have been show that the effects with maximum intensity produced by polymeric materials in soils from glasshouses are manifested at local level, the global effects (towards to a horizon, or a profile) being mostly attenuated and masked by other phenomena. From this reason, the experimental studies in static conditions with average soil samples could not reveal significant variations of determined physico-chemical parameters.

The results of experimental studies have evidenced that the residual effects produced by polymeric materials have mostly, very strong influences on soils characteristics. These effects are predominant generated by the decomposition products of polymeric materials and by the complexation species formed by these in conditions of soils from glasshouses (hybrid oligomers and organic-mineral

complexes - figure 3). The residual effects are, generally beneficial for the agrochemical quality of soils (M.F. De Boodt, 1992; C.G. Chițanu et al., 2005; F. Filipov et al., 2008), but must be borne in mind that forms macromolecular complex producing these effects can have harmful effects on biological systems of treated soils, and on the ecological quality of vegetable products, respectively.

CONCLUSIONS

In soils from glasshouses the effects induced by polymeric materials are manifested differently because: (i) change conformation and reactivity of macromolecules, (ii) partial chemical and biochemical decomposition, (iii) combination with organic components from soil, and formation of hybrid oligomers, (iv) combination with mineral and organic components of soil and formation of organic-mineral complexes, (v) advanced decomposition and formation of products with low molecular mass (CO_2 , H_2O , NH_4^+ , NO_3^- , organic compounds, etc). Through these processes, polymeric materials are non-invasive connected to the chemical-mineralogical and biotic equilibriums from soils causing controlled evolutions of these, namely a wide range of direct, indirect and residual effects on physical, chemical and biological characteristics of treated soil.

These results are the basis for to optimize practical processes involved in conditioning and amelioration of soils from glasshouses with polymer.

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REFERENCES

1. Chițanu G.C., Popescu I., Gaidău C., Filipov F., 2005 – *Noi materiale multifuncționale pe bază de copolimeri maleici pentru protecția mediului și bioaplicații*. Ed. Tehnopress, Iași.
2. De Boodt M. F., 1992 – *Synthetic polymers as soil conditioners: 35 years of experimentation*. In: Verplancke, H. J. W., et al. (eds.) „Water saving techniques for plant growth”, p. 137-161. Kluwer Academic Publishers, Netherlands.
3. Filipov F., Bulgariu D., Jităreanu G., Bulgariu L., Chițanu G.C., 2008 – *The experimental modelling of interactions on some organic materials with mineral components of hortic anthrosols conditioned with polymeric materials (I). Preliminary results*. Proceedings of the Intern. Congress CODIS-2008, 27-29 February, Switzerland, Solothurn, p. 27-34.
4. Filipov F., Bulgariu D., Jităreanu G., Bulgariu L., Buzgar N., 2008 – *The mineralogy and geochemistry of some hortic anthrosols – case study: glasshouses from Iași and Bacău cities (Romania)*. Eurosoil Congress 2008, Vienna, Austria, 180 p.
5. Filipov F., Bulgariu D., Secu C., Buzgar N., Stoian M., 2008 – *Contributions to the study of mineralogy and geochemistry of hortic anthrosols from Bacău glasshouses*. U.S.A.M.V. Iași, *Lucrări Științifice* – vol. 50, seria Agronomie, Iași.
6. Hamilton J.D., Sutcliffe R., 1996 – *Ecological Assessment Polymers: Strategie for Product Stewardship and Regulatory Programs*. Wiley, New York.
7. Voican V., Lăcătuș V., 1998 – *Cultura protejată a legumelor din sere și solarii*. Ed. Ceres, București.

DISTRIBUTION, MOBILITY AND BIOAVAILABILITY OF PHOSPHORUS INTO SOILS FROM GLASSHOUSES

DISTRIBUȚIA, MOBILITATEA ȘI BIODISPONIBILITATEA FOSFORULUI ÎN SOLURILE DIN SERE

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Abstract. *The studies performed in Copou-Iași glasshouse have evidenced that in these soils the phosphorus has a particularly dynamic. The occurrence forms of phosphorus are more varied, the ratios between the mobile and fix forms and between organic and inorganic forms respectively, had large variations from one horizon to another and even within the same horizon. The total phosphorus content varied between 94.57–747.15 $\mu\text{g P}_2\text{O}_5$ / g soil, with a profile average of 357.53 $\mu\text{g P}_2\text{O}_5$ / g soil. The maximum contents of P_{total} is observed in Ap1k (2.08 times more than the profile average) and Aho2k(x) (1.84 times more than the profile average). In Ahok(x) horizons, the phosphorus has two particular occurrence forms: (i) inorganic form – most probable a polymetaphosphate associated with aluminosilicated gel; (ii) complex association forms between humic and fulvic acids, amorphous clay minerals and iron complex phosphates (or other ions) – these having an important role in the formation of fragipane horizons.*

Key words: phosphorus bioavailability, greenhouse soils

Rezumat. *Studiile realizate în sera Copou-Iași au evidențiat faptul că în solurile din sere fosforul are o dinamică particulară. Formele de ocurență ale fosforului sunt mai variate, iar raporturile dintre formele mobile și cele fixe, respectiv dintre formele organice și cele anorganice, prezintă variații largi de la un orizont la altul și chiar în cadrul aceluiași orizont. conținutul total de fosfor variază între 94,57–747,15 $\mu\text{g P}_2\text{O}_5$ / g sol, cu o medie pe profil de 357,53 $\mu\text{g P}_2\text{O}_5$ / g sol. Conținuturi maxime ale P_{total} se înregistrează la Ap1k (de 2,08 ori mai mare ca media pe profil) și Aho2k(x) (de 1,84 ori mai mare ca media pe profil). În orizonturile Ahok(x) fosforul prezintă două forme de ocurență particulare: (i) forma anorganică – cel mai probabil un polimetafosfat asociat cu gel aluminosilicatic; (ii) forme de asociere complexe între acizii fulvici sau huminici, minerale argiloase amorse și fosfați complecși de fier (sau alți ioni metalici) – acestea au un rol în formarea orizonturilor fragipanice*

Cuvinte cheie: biodisponibilitate fosfor, sol seră

INTRODUCTION

The phosphorus is a key element for the structural support of organisms and dynamic of fundamental biochemical reactions, which involve the genetic material and energy transfer. In comparison with other nutritive essential elements, phosphorus has a reduced geochemical mobility and is low assimilable by plants, in conditions of

most of soils. The phosphorus from parental material of soils is not directly accessible for plants and organisms. The conversion of inaccessible forms in soluble orthophosphate, which can be directly assimilated, is done by geochemical and biochemical processes, in different steps of pedo-geochemical cycle of phosphorus (S.K. Sanyal & D.K. De Datta, 1991; M.D. Mullen, 2003; K.C. Ruttenger, 2003; J.T. Sims & P.A. Vadas, 2005). At world level, the total content of phosphorus from soils varied between 0.01–0.15 % P. In soils from Romania, the total content of phosphorus varied between 0.026 % P – 0.093 % P. From total phosphorus content only 0.5–1.0 % is accessible by plants (Z. Borlan & Cr. Hera, 1973; R. Lăcătușu, 2006).

Due to its importance, in literature are numerous studies which present different agrochemical aspects of phosphorus: various occurrence forms (inorganic and organic) in soils, association way of these with soil components, inter-phases distribution and adsorption mechanisms by plants, etc. For the soils from glasshouses and solariums, these problems are these problems are insufficiently known and studied. Despite the research conducted by now, the current representations on the phosphorus issue in soils from glasshouses require substantially studies. The data from literature concerning the distribution and dynamic of phosphorus in soils from glasshouses are mostly contradictory. In most of cases, the studies present different particular cases, there are no clear indications and generalizations (Z. Borlan & Cr. Hera, 1973; B. Mănescu, 1984; D. Davidescu & V. Davidescu, 1992; I. Avarvarei et al., 1994; V. Voican & V. Lăcătuș, 1998).

Ours studies were performed using soil samples from Copou – Iași glasshouse, from two profiles. We follow the variations on profile of total and differential (extractable) contents of phosphorus, the distribution way of occurrence and speciation forms of phosphorus, respectively. The obtained results have show that in soils from glasshouses, the phosphorus has a particularly dynamics, different that those observed in case of unprotected plants soils. The occurrence forms of phosphorus are more varied, ratios between mobile and fix forms, and between the organic and inorganic forms respectively, present large variations from to a horizon to other, and the equilibriums between these are very sensible even at relative low variations of physic-chemical conditions.

MATERIAL AND METHOD

The studies were performed on soil samples from Copou – Iași glasshouse, from two profiles (IS.1 and IS.2 – table 2). The pedo-geochemical and chemical-minerological characteristics of studied soils have been presented in a previous study (F. Filipov et al., 2008). The determination of total phosphorus contents and of its extractable fractions was done according with work methodology described by Z. Borlan & C. Răuță (1981) and N. Florea et al. (1986), respectively. The determination of occurrence forms and the estimation of speciation forms of phosphorus the specific association ways of these with the mineral and organic components of soils respectively, was performed by sequential solid-liquid extractions, chemical analysis, microscopy, spectrometry (IR and Raman) and X-ray diffraction respectively, according with the methodology described by D. Bulgariu et al. (2008).

RESULTS AND DISCUSSIONS

For the studied soil samples, the total phosphorus (P_{total}) varied between 94.57-747.15 $\mu\text{g P}_2\text{O}_5 / \text{g}$ (0.041-0.326 % P) with an average of 357.53 $\mu\text{g P}_2\text{O}_5 / \text{g}$ (0.156 % P) on profile, and 374.78 $\mu\text{g P}_2\text{O}_5 / \text{g}$ for studied perimeter (span no. 16, Copou-Iași glasshouse) (table 2). The maximum concentrations of P_{total} were observed in Ap1k and Aho2k(x) horizons, and the minim contents in ABk and Ck horizons. From total phosphorus content point of view, the soils from Copou glasshouse fall within the normal limits (Z. Borlan & Cr. Hera, 1973; B. Mănescu, 1984; I. Avarvarei et al., 1994; V. Voican & V. Lăcătuș, 1998).

The organic phosphorus ($P_{\text{org.}}$) varied between 36.45-563.60 $\mu\text{g P}_2\text{O}_5 / \text{g}$ with an average of 211.95 $\mu\text{g P}_2\text{O}_5 / \text{g}$ on profile and 242.52 $\mu\text{g P}_2\text{O}_5 / \text{g}$ for the studied perimeter. The maximum concentration of $P_{\text{org.}}$ is obtained in Aho2k(x) and Ap1k horizons, and the minim contents in ABk and Ck horizons (figure 1.b). The inorganic phosphorus ($P_{\text{inorg.}}$) varied between 54.67-350.48 $\mu\text{g P}_2\text{O}_5 / \text{g}$ with an average of 145.57 $\mu\text{g P}_2\text{O}_5 / \text{g}$ on profile, and 132.25 $\mu\text{g P}_2\text{O}_5 / \text{g}$ for the studied perimeter. The maximum concentrations of $P_{\text{inorg.}}$ are obtained in Ap1k horizon, and the minim concentrations in ABk and Ck horizons, respectively.

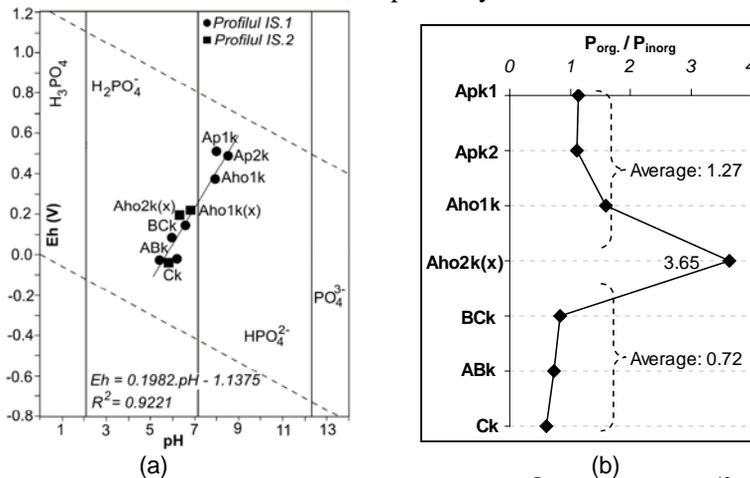


Fig. 1. (a) pH – E_h diagram of P – O – H system at 298,15 K, 10^5 Pa and $\Sigma[P] = 10^{-10}$ (E_h – redox potential). The diagram evidenced the differentiation of pH and redox potential conditions between superior and inferior horizons of IS.1 profile determined by the formation of Aho2k(x) frangipane horizon. (b) The variation of ratio between organic and inorganic phosphorus in IS.1 profile.

The mobile phosphorus, extractable in acetate-lactate P(AL), varied between 90.09-734.67 $\mu\text{g P}_2\text{O}_5 / \text{g}$ (88.61-98.71 % from P_{total}) with an average of 338.93 $\mu\text{g P}_2\text{O}_5 / \text{g}$ on profile and 348.93 $\mu\text{g P}_2\text{O}_5 / \text{g}$ for the studied perimeter. The maximum concentrations of P(AL) are obtained in Ap1k and Aho2k(x) horizons, and the minim contents in Bck and Ck horizons. The weight of extractable phosphorus forms follow the order: $P(\text{H}_2\text{SO}_4) \gg P(\text{NaOH}) > P(\text{NH}_4\text{F}) \gg P(\text{H}_2\text{O})$, the higher values being obtained in superior horizons. It was observed that in Aho2k(x) horizon, the concentrations of Ca-P and Al-P are higher than those from other horizons.

The experimental results presented in figure 1.a and in table 2 indicate that the phosphorus from Copou-Iași glasshouse is sufficiently mobile for to ensure the necessary for the cultivated plants. However, the bioavailability of phosphorus in these soils is relatively low, which limits the possibility to be assimilated by plants. In our opinion, this is determined by: (i) significant decrease of inorganic phosphates solubility, due to salinization processes, (ii) incorporate appreciable amounts of phosphorus in the composition of the organic-mineral complexes (table 1) and of organic-phosphoric esters (inosito-phosphate, in specially) – in which the phosphorus is hard assimilable, even though partially these forms of occurrence of phosphorus is extracted in acetate-lactate, (iii) the geochemical segregation phenomena induced by Aho2k(x) frangipane horizons, which determined the differential evolution of pedo-geochemical processes in superior horizons (aerobic conditions, CTS = 315.51–675.49 mg / 100 g soil; pH=7.84–8.28; E_h=365,19–521,37 mV, higher humidity and temperature), in comparison with inferior horizons (anaerobic conditions, CTS= 52,95–305.82 mg / 100 g soil; pH=5.41–6.17; E_h=(- 14,71)–96,45 mV; reduced humidity and temperature).

Table 1

Phosphorus content of organic-mineral complexes in soils from Copou-Iași glasshouse (profile IS.1)

Horizons	OMC* %, w/w	Composition OMC [%, w / w]					Phosphorus from OCM	
		CM.	OOC.	SiO ₂	FeOx	OC.	µg P ₂ O ₅ /g [#]	% din P _{total}
Apk	13.05	71.39	18.47	3.41	4.88	1.85	40.69	7.89
Aho1k	32.87	64.11	24.90	2.63	7.09	1.27	55.55	17.05
Aho2k(x)	48.36	62.08	22.05	5.69	7.36	2.82	357.95	54.37
BCK	29.05	72.53	13.91	4.56	5.83	3.17	12.06	10.72
ABk	37.19	78.86	11.53	2.73	4.15	2.73	11.73	12.41
Ck	11.36	76.45	9.76	3.39	7.61	2.79	10.02	8.05

*Organic-mineral complexes (% towards soil sample). CM. – clay minerals. OOC. – organic compounds. SiO₂ – amorphous silica. FeOx – iron oxides and oxy-hydroxides. AC – other components. [#] µg P₂O₅ / g sol.

Corroborating data on the distribution of forms of occurrence of phosphorus in the profile with results from microscopic, spectral (in UV-VIS, IR and Raman) and X-ray diffraction studies, result that in Aho2k(x) horizons, the phosphorus from glasshouses has two particular occurrence forms, with a very important role in the formation of frangipane horizons: (i) inorganic forms, represented most probable by solid solutions of polymethaphosphates and aluminosilicates gel-crystal-chemical formulas: 0.69K₂O.Al₂O₃.1.59SiO₂.0.38 P₂O₅.2.53H₂O and 0.58 Na₂O.Al₂O₃.0.99SiO₂.0.52P₂O₅.3.12H₂O in IS.1 profile, and 0.54K₂O.Al₂O₃.1.54SiO₂.0.36P₂O₅.3.82H₂O and Na₂O.Al₂O₃.1.71SiO₂.0.24 P₂O₅.4.32H₂O in IS.2 profile; (ii) complex association forms between fulvic and huminic acids, amorphous clay minerals, complex phosphates with iron (or other metal ions) and inositol-phosphates – which include cca. 54 % from P_{total} localized at the level of this horizon (table 2).

Table 2

The distribution of phosphorus in soils from Copou-lași glasshouse

Horizons	H, cm	P _{Total} ; μg P ₂ O ₅ / g	P _{org.} ; μg P ₂ O ₅ / g	P _{inorg.} ; μg P ₂ O ₅ / g	Extractable phosphorus: μg P ₂ O ₅ / g					P _{ocl.} μg P ₂ O ₅ / g	P _{non-ocl.} μg P ₂ O ₅ / g	P _{org./} P _{inorg.}
					P(H ₂ O)*	P(NH ₄ F)*	P(NaOH)	P(H ₂ SO ₄)	P(AL)			
Profile IS.1: Hipohortic Entianthrosol Mixed-Proxicalcaric												
Ap1k	0–10	747.15	396.66	350.48	32.50	24.35	58.95	630.29	734.67	734.67	12.47	1.13
Ap2k	10–18	439.72	231.51	208.20	11.65	17.80	36.54	372.13	426.74	426.74	12.97	1.11
Aho1k	18–28	325.81	200.17	125.63	5.96	21.60	37.89	259.99	308.05	308.05	17.75	1.59
Aho2k(x)	28–40	658.36	516.87	141.48	4.93	75.77	128.64	445.77	583.37	583.37	74.98	3.65
BCK	40–48	112.59	51.60	60.99	1.06	7.93	10.97*	91.99	108.94	108.94	3.64	0.84
ABk	48–70	94.57	39.89	54.67	1.10	5.43	9.67*	78.05	90.09	90.09	4.47	0.72
Ck	70–75	124.55	46.98	77.56	2.75	7.63	8.04*	105.80	120.70	120.70	3.84	0.60
	M1	357.53	211.95	145.57	8.56	22.93	41.53	283.43	338.93	338.94	18.59	1.38
	M2	504.22	276.11	228.10	16.70	21.25	44.46	420.80	489.82	489.82	14.40	1.27
	M3	110.57	46.15	64.41	1.64	7.00	9.56	91.95	106.57	106.58	3.98	0.72
Profile IS.2: Horti Anthrosol Mixed-Proxicalcaric												
Aho1k(x)	18–28	367.18	219.20	147.97	6.09	36.02*	51.80	270.79	339.05	339.05	28.12	1.48
Aho2k(x)	28–40	703.27	563.60	139.66	3.58	110.06	125.60	461.83	633.50	633.50	69.76	4.03
Ck	70–75	105.63	36.45	69.17	1.46	7.73*	11.69	84.57	104.26	104.26	1.36	0.52
	M1	392.02	273.08	118.94	3.71	51.27	63.03	272.40	358.93	358.94	33.08	2.01
	M4	374.78	242.52	132.25	6.14	37.10	52.28	277.92	348.93	348.94	25.83	1.69

H – depth. M1 – average on profile. M2 – average for superior horizons – above Aho2k(x) horizon: Ap1k, Ap2k and Aho1k. M3 – average for inferior horizons – below Aho2k(x) horizon: BCK, ABk and Ck. M.4 – average for span (no. 16, Copou – lași glasshouse) where was done the two profiles. P(H₂O) – phosphorus extractable in water (NH₄Cl solution): non-occluded phosphorus; easy soluble phosphates. P(NH₄F) – phosphorus extractable in ammonia fluoride: non-occluded aluminium phosphates. P(NaOH) – phosphorus extractable in NaOH: non-occluded iron phosphates. P(H₂SO₄) – phosphorus extractable in sulphuric acid: non-occluded Ca phosphates (partially occluded Al and Fe phosphates). P(AL) – phosphorus extractable in buffered ammonia acetate-lactate acid solution (pH=3.7): the sum of non-occluded Fe, Al and Ca phosphates (soluble phosphates). Determination in extract, after pre-concentration.

CONCLUSIONS

For studied soil samples, the total phosphorus (P_{total}) varied between 94.57-747.15 $\mu\text{g P}_2\text{O}_5 / \text{g}$ (0.041-0.326 % P), organic phosphorus ($P_{\text{org.}}$) varied between 36.45-563.60 $\mu\text{g P}_2\text{O}_5 / \text{g}$, and the inorganic phosphorus between 36.45-563.60 $\mu\text{g P}_2\text{O}_5 / \text{g}$. Even $P(\text{AL})$ has high values (90.09-734.67 $\mu\text{g P}_2\text{O}_5 / \text{g}$, 88.61-98.71 % from P_{total} , respectively), the phosphorus biodisponibility from these soils is relatively reduced. This fact is determined by: (i) significant decreasing of inorganic phosphates solubility due to the salinization processes; (ii) incorporate appreciable amounts of phosphorus in the composition of the organic-mineral complexes and of organic-phosphoric esters (inosito-phosphate, in specially) – in which the phosphorus is hard assimilable, (iii) the geochemical segregation phenomena induced by Aho2k(x) frangipane horizons, which determined the differential evolution of pedo-geochemical processes.

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REFERENCES

1. Avarvarei I., Davidescu V., Mocanu V., 1994 – *Agrochimie*. Ed. SITEH, Craiova.
2. Borlan Z., Hera Cr., 1973 – *Metode de apreciere a stării de fertilitate a solului în vederea folosirii raționale a îngrășămintelor*. Ed „CERES” București, p. 132.
3. Borlan Z., Răuță C., 1981 – *Metodologia de analiză agrochimică a solurilor în vederea stabilirii necesarului de amendamente și de îngrășăminte* (vol. I și II). Academia de Științe Agricole și Silvicultură a României, ICPA București.
4. Bulgariu D., Bulgariu L., Filipov F., 2008 – *Dinamica fosforului în antrsolurile hortice – studiu de caz: sera Copou, Iași (România)*. Simpozionul Internațional „Producția de îngrășăminte cu fosfor și intensivizarea fertilizării fosfatice – factor important în dezvoltarea producției agricole”, Constanța, 25-26 septembrie 2008.
5. Davidescu D., Davidescu V., 1992 – *Agrochimie horticolă*. Ed. Acad. Române, București.
6. Filipov F., Bulgariu D., Jităreanu G., Bulgariu L., Buzgar N., 2008 – *The mineralogy and geochemistry of some horticultural soils – case study: glasshouses from Iași and Bacău cities (Romania)*. Eurosoil Congress 2008, Vienna, Austria, p. 180.
7. Florea N., Bălăceanu V., Răuță C., Canarache A. (coord.), 1986 – *Metodologia elaborării studiilor pedologice* (vol. I-III). Academia de Științe Agricole și Silvicultură, I.C.P.A. București.
8. Lăcătușu R., 2006 – *Agrochimie* (ed. a II-a). Ed. Terra Nostra, Iași.
9. Mănescu B., 1984 – *Culturi forțate de legume*. Ed. Didactică și Pedagogică, București.
10. Mullen M.D., 2003 – *Phosphorous in Soils. Biological Interactions*. In: *Encyclopedia of Soils in the Environment*, vol. III, p. 210-216 (edited by D.Hillel, C.Rosenzweig, D. Pawloson, K. Scow, M.Singer, D.Sparks), Academic Press, New York.
11. Ruttenberg K.C., 2003 – *The Global Phosphorous Cycle*. In: *Treatise on Geochemistry*, vol. 8, pp. 585-643. Elsevier, New York.
12. Sanyal S.K., De Datta S.K., 1991 – *Chemistry of Phosphorus Transformations in Soil*, p. 1-12. In: B.A. Stewart, ed. *Advances in Soil Science*, vol. 16. Springer, New York.
13. Sims J.T., Vadas P.A., 2005 – *Phosphorous in Soils. Overview*. In: *Encyclopedia of Soils in the Environment*, vol. III, p. 202-210 (edited by D.Hillel, C.Rosenzweig, D. Pawloson, K. Scow, M.Singer, D.Sparks), Academic Press, New York.
14. Voican V., Lăcătușu V., 1998 – *Cultura protejată a legumelor din sere și solarii*. Ed. CERES, București.

THE PEDOGEOCHEMICAL SEGREGATION A FEW HORIZONS IN SOILS FROM GLASS HOUSES

SEGREGAREA PEDOGEOCHIMICĂ A UNOR ORIZONTURI ÎN SOLURILE DIN SERE

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Abstract. *Particular for soils from glasshouses are the intense changes of mineralogy and chemistry, salinization processes, formation of a compact and impenetrable horizon (Ahok horizon). In function of exploitation conditions and by the chemical-mineralogical characteristics of soils from glasshouses, the Ahok horizons can have fragipane properties, expressed more or less. These horizons determined a geochemical segregation of soils from glasshouses: (i) superior horizons, above Ahok(x) horizon evolve in weak oxidative conditions, weak alkaline pH, higher salinity, humidity and temperature; (ii) inferior horizons, below Ahok(x) horizon evolve in weak reducing conditions weak acid pH, lower salinity, humidity and temperature. Concomitant with the development of Ahok(x) horizons, the rapid degradation of the properties of soils from glasshouses is observed.*

Key words: greenhouse, soil, segregation horizon

Rezumat. *Specifice pentru solurile din sere sunt variabilitatea mineralogiei și chimismului, procesele de salinizare a orizonturilor superioare, formarea unui orizont compact și impermeabil (orizontul Ahok). În funcție de condițiile de exploatare și de caracteristicile chimico-mineralogice ale solurilor orizonturile Ahok pot prezenta însușiri fragipanice mai mult sau mai puțin exprimate. Aceste orizonturi determină o segregare pedogeochimică a solurilor din sere: (i) orizonturile superioare, situate deasupra orizontului Ahok(x), evoluează în condiții slab oxidante, pH slab alcalin, salinitate, umiditate și temperatură mai ridicate; (ii) orizonturile inferioare, situate sub orizontul Ahok(x), evoluează în condiții slab reducătoare, pH slab acid, salinitate, umiditate și temperatură mai reduse. Concomitent cu dezvoltarea orizonturilor Ahok(x) se degradează rapid proprietățile agrochimice ale solurilor din sere.*

Cuvinte cheie: seră, sol, segregare orizont

INTRODUCTION

The soils from glasshouses are characterized by a very large variability of mineralogy and chemistry, which are traduced by intense modifications of superior horizons. in many cases there are conditions for the apparition of new pedogenetic horizons through “new-pedogenesis” processes (A. Conea & T. Postolache, 1976; C.V. Secu & C.V. Patriche. 2007). Under these conditions. the definition of some general characteristics of soils from glasshouses is very difficult. Practically, each type of soil

from this category having distinct pedological and chemical-mineralogical characteristics, mostly determined by the nature of parental material and by the exploitation technologies (V. Voican & V. Lăcătuș, 1989; A. Canarache, 1995; F. Filipov et al., 2004; 2008). Concerning to the pedo-geochemistry of soils from glasshouses have not yet been written summary studies, most existing papers from literature are in fact, case studies of particular situations. The deficit of information from this field, together with the ambiguity of pedogenetical characters of diagnostic, makes difficult the unitary characterization of soils from glasshouses.

The utilization of intensive cultivation technologies of vegetables in glasshouses determined the degradation of morphological, physical and chemical characteristics of soils, by rapid evolution of salted processes (salinization and / or solidization), compaction, carbonatation, eluviation-illuviation, frangipane formation, stagnogleization, gleization etc. (A. Canarache, 1995; F. Filipov et al., 2004, 2008). Under these conditions, at depth of 30-40 cm is formed a compact and impenetrable horizon with frangipane characteristics, expresses more or less. The aspects about the formation of frangipane horizon in soils from glasshouses are not yet sufficiently know (N.E. Smeck et al., 1989; M.M. Duncan & D.P. Franzmeier, 1999; B.N. Weisenborn & R.J. Schaetzl, 2005). Whatever of the formation processes, the frangipane horizons determined a sever segregation in pedo-geochemical evolution of soils from glasshouses, with very important consequences on the agrochemical quality of these soils (V. Voican & V. Lăcătuș, 1989; F. Filipov et al., 2004, 2008).

Our studies have focused the apparition and manifestation conditions of pedo-geochemical segregation phenomena in case of soils from Copou – Iași glasshouse, and the effects of this on the pedo-geochemical and agrochemical characteristics of soils from glasshouses cultivated with vegetables. The results obtained by us have shown that together by mobile forms of Si, Al and Fe, at the formation of segregation horizons (frangipane), an important role has the phosphorus (organic. in special) and the organic-mineral complexes, respectively. The segregation effects are manifested in the differential dynamics of pedo-geochemical processes from superior horizons (situated above the segregation horizon), in comparison with the inferior horizons (situated below the segregation horizon), and in global evolution of degradation processes of soils from glasshouses.

MATERIAL AND METHOD

The experiments have been performed using soil samples from Copou-Iași glasshouse (IS.1 and IS.2 profiles – tables 1 and 2) and have follows the variations on profile of the physicochemical properties (absolute density, pH, redox potential) and of the grain-size and chemical-mineralogical compositions. The data concerning the distribution tendencies on profiles and the correlations between mineral and organic components of studied soils were combined with results of microscopic, spectral and X-ray diffraction studies, obtained for the occurrence forms of mineral and organic components in horizons of studied soil profiles. The pedological and physic-chemical analyses were done according with the methodology described by Z. Borlan and C. Răuță (1981), and N. Florea et al. (1986), respectively.

RESULTS AND DISCUSSIONS

Our studies have evidenced the presence in Copou-Iași glasshouse, at a depth of 20-40 cm of a compact horizon, with reduced permeability and high hydrophobicity, which induced a strong discontinuity in water circulation in soil profile and a sever segregation in the dynamics of pedo-geochemical processes. This fact has been evidenced by contrasting physicochemical conditions and atypical evolutions of organic matter, distribution and speciation processes of microelements in superior horizons (situated above segregation horizon), in comparison with inferior horizon (situated below segregation horizon) – figure 1. The morphological. structural. mineralogical and chemical characteristics indicate that this horizon has relatively good expresses frangipane properties.

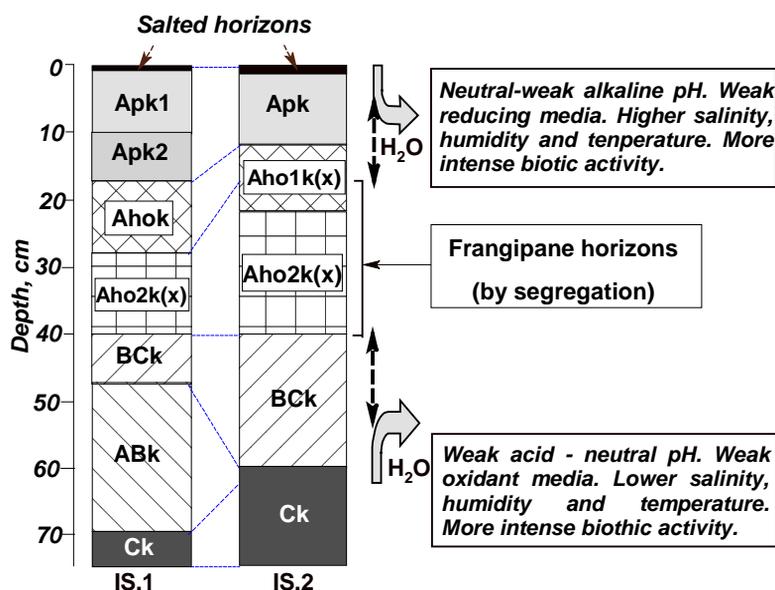


Fig. 1. Schematic representation of pedo-geochemical segregation phenomena of soils from Copou-Iași glasshouse.

The experimental results presented in tables 1 and 2. indicate a strong accumulation tendency, at the level of Aho1k and Aho2k(x) horizons, of fin grain-size fractions and of amorphous forms of mineral components. Also, was observed that in the composition of soil aggregates from frangipane horizon, and important weight have the smectites, amorphous iron oxides and oxy-hydroxides, amorphous silica and organic matter. The particularity of pedo-geochemical segregation horizon (frangipane) from Copou-Iași glasshouse is given by the relatively high contents of: (i) phosphorus – organic, in special, as inositol-phosphoric esters; (ii) fulvic acids; (iii) organic-mineral complexes – with special composition and structure (D. Bulgariu et al., 2008).

Table 1

**Grain-size composition of soils and physical properties from
Copou-lași glasshouse (IS.1 and IS.2 profiles)**

Horizons	H, cm	MG %	Sand			Dust			Clay			ρ ; g/cm ³	pH		Eh; mV
			Ng	Nf	Total	Pg	Pf	Total	Ag	Af	Total		H ₂ O	KCl	
Profile IS.1: Hipohortic Entianthrosol Mixed-Proxicalcaric															
Ap1sck	0–10	3.68	6.15	38.94	45.09	10.35	8.40	18.75	17.91	12.28	30.19	2.62	7.91	6.36	508.13
Ap2sck	10–18	2.91	4.83	37.82	42.65	8.76	11.77	20.53	15.35	16.41	31.76	2.57	8.28	7.12	465.56
Aho1sck	18–28	2.05	1.57	35.95	37.52	5.33	16.27	21.60	10.36	26.57	36.93	2.61	7.84	6.95	401.62
Aho2k(x)sck	28–40	1.48	1.91	34.56	36.47	4.28	15.79	20.07	5.35	34.51	39.86	2.56	6.59	6.31	253.97
BCksc	40–48	3.19	3.42	31.52	34.94	6.98	17.20	24.18	11.91	24.28	36.19	2.64	6.04	5.56	138.07
ABksc	48–70	4.26	5.88	30.98	36.86	8.35	10.11	18.46	18.16	20.59	38.75	2.62	5.41	5.29	53.29
Cksc	70–75	3.88	7.69	31.83	39.52	7.51	5.78	13.29	23.82	17.79	41.61	2.67	6.17	5.43	60.51
	M1	3.06	4.49	34.51	39.00	7.36	12.18	19.55	14.69	21.77	36.47	2.61	6.89	6.14	268.73
	M2	2.88	4.18	37.57	41.75	8.14	12.14	20.29	14.54	18.42	32.96	2.60	8.01	6.81	458.43
	M3	3.77	5.66	31.44	37.10	7.61	11.03	18.64	17.96	20.88	38.85	2.64	5.87	5.42	83.95
Profile IS.2: Horti Anthrosol Mixed-Proxicalcaric															
Aho1k(x)sck	18–28	2.17	2.36	35.75	38.11	5.91	17.24	23.15	9.16	25.10	34.26	2.61	7.68	6.55	380.69
Aho2k(x)sck	28–40	1.75	2.15	30.89	33.04	6.33	16.13	22.46	12.76	27.81	40.57	2.55	6.21	5.73	141.32
Cksc	70–75	4.07	8.15	36.93	45.08	5.93	5.29	11.22	17.33	20.72	38.05	2.69	5.94	5.39	-11.21
	M1	2.66	4.22	34.52	38.74	6.05	12.88	18.94	13.08	24.54	37.62	2.62	6.61	5.89	170.26
	M4	2.86	4.35	34.51	77.75	6.71	12.53	19.24	13.88	23.15	37.04	2.62	6.75	6.01	199.49

H – depth. MG – coarse material (> 2.00 mm). Sand: 2.00 – 0.02 mm; Ng – coarse sand: 2.00-0.20 mm; Nf – fin sand: 0.20 – 0.02 mm. Dust: 0.020 – 0.002 mm; Pg – coarse dust: 0.020 – 0.010 mm; Pf – fin dust: 0.010 – 0.002 mm. Clay (< 0.002 mm): Ag – coarse clay: 0.002 -0.001 mm; Af – fin clay: < 0.001 mm. ρ - absolute density (picnometric method; dispersion liquid: benzene). PH(H₂O) – determined in aqueous suspension. pH(KCl) – determined in 0.1 N KCl (electrodes: pH – calomel). Eh – redox potential (platinum – calomel electrodes). M1 – profile average. M2 – average of superior horizons (Ap1k, Ap2k, Aho1k). M3 – average of inferior horizons (BCk, ABk, Ck). M4 – average of the studied perimeter (span no. 16, Copou – lași glasshouse).

Table 2

**Chemical-mineralogical composition (% w / w – towards soil sample) of soils from
Copou – Iași glasshouse (IS.1 and IS.2 profiles)**

Horizons	Clay minerals							Cb	FeOx.	SiO ₂	Organic compounds						
	Crystalline				Amf	Total	Total				Total	Total	Humus			OOC	Total
	Kal	Smc	Illt	OCM									HA	FA	Total		
Profile IS.1: Hipohortic Entianthrosol Mixed-Proxicalcaric																	
Ap1ksc	7.36	13.28	15.34	0.61	36.59	3.43	40.02	4.21	2.61	5.63	7.83	1.29	9.17	0.08	9.26		
Ap2ksc	7.24	13.52	14.17	0.85	35.78	3.15	38.93	3.96	2.94	5.15	9.64	1.46	11.17	0.13	11.31		
Aho1ksc	6.58	17.85	13.56	0.91	38.90	4.72	43.62	2.75	3.36	4.87	6.75	2.66	9.49	0.10	9.60		
Aho2k(x)sc	3.36	21.32	12.43	2.15	39.26	7.58	46.84	2.16	3.79	7.48	5.40	4.52	10.03	0.37	10.41		
BCksc	6.56	16.47	15.26	0.68	38.97	3.83	42.80	8.65	2.82	6.05	3.98	2.81	6.83	0.12	6.96		
ABksc	8.12	15.77	16.75	0.83	41.47	4.15	45.62	4.07	1.94	2.76	3.94	2.99	6.99	0.18	7.18		
Cksc	9.45	14.85	20.37	0.75	45.42	3.35	48.77	10.28	2.53	5.63	2.04	1.52	3.57	0.03	3.61		
M1	6.95	16.15	15.41	0.96	39.48	4.31	43.80	5.15	2.85	5.36	5.65	2.46	8.18	0.14	8.33		
M2	7.06	14.88	14.35	0.79	37.09	3.76	40.85	3.64	2.97	5.21	8.07	1.80	9.94	0.11	10.05		
M3	8.04	15.69	17.46	0.75	41.95	3.77	45.73	7.66	2.43	4.81	3.32	2.44	5.80	0.11	5.91		
Profile IS.2: Horti Anthrosol Mixed-Proxicalcaric																	
Aho1k(x)sc	7.13	13.60	14.09	0.78	35.60	5.08	40.68	3.11	3.18	5.29	6.56	2.47	9.10	0.12	9.23		
Aho2k(x)sc	4.52	20.88	14.11	1.97	41.48	6.14	47.62	2.53	3.45	7.54	5.63	4.69	10.41	0.33	10.75		
Cksc	10.97	11.41	18.29	0.57	41.24	3.61	44.85	7.90	2.39	7.10	1.83	1.28	3.13	0.02	3.16		
M1	7.54	15.29	15.49	1.10	39.44	4.94	44.38	4.51	3.00	6.64	4.67	1.20	7.55	0.15	7.71		
M4	7.24	15.72	15.45	1.03	39.46	4.62	44.09	4.83	2.93	6.00	5.16	1.83	7.86	0.15	8.02		

Kal. – kaolinite. Smc. – smectites. Illt. – Illites. OCM – other clay minerals. Amf. – amorphous clay minerals. Cb. – carbonates. SiO₂ – silica. HA – huminic acids. FA – fulvici acids. OOC – other organic compounds.

CONCLUSIONS

The Ahok(x) horizons which are formed in Copou – Iași glasshouse, at the depth of 20-40 cm have good expresses fragipane properties and determined a severe segregation of the dynamics of pedo-geochemical processes.

The particularity of pedo-geochemical segregation horizon from Copou-Iași glasshouse is given by the relatively high contents of: (i) organic phosphorus as inositol-phosphoric esters. (ii) fulvic acids and (iii) organic-mineral complexes.

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REFERENCES

1. Borlan Z., Răuță C., 1981 – *Metodologia de analiză agrochimică a solurilor în vederea stabilirii necesarului de amendamente și de îngrășăminte* (vol. I și II). Academia de Științe Agricole și Silvicultură a României. ICPA București.
2. Bulgariu D., Bulgariu L., Filipov F., 2008 – *Dinamica fosforului în antrsolurile hortice – studiu de caz: sera Copou, Iași (România)*. Simpozionul Internațional „Producția de îngrășăminte cu fosfor și intensivizarea fertilizării fosfatice – factor important în dezvoltarea producției agricole”. Constanța. 25-26 septembrie 2008.
3. Bulgariu D., Buzgar N., Filipov F., 2008 – *Contributions to the study of organic-mineral complexes from hortic anthrosols*. Lucr. Șt., vol. 51, s. Agricultură, U.S.A.M.V. Iași (in press).
4. Canarache A., 1995 – *Unele probleme de fizica solurilor specifice horticulturii*. Simpozion Ecotehnologii și ecotehnici de lucrare a solului în horticultură. Ager Publishing House.
5. Conea A., Postolache T., 1976 – *Procese de pedogeneză în condiții de exces de umiditate specifice serelor*. Conf. Națională ptr. Știința Solului. Craiova. no.16 A.
6. Duncan M.M., Franzmeier D.P., 1999 – *Role of Free Silicon, Aluminum, and Iron in Fragipan Formation*. Soil Sci. Soc. Am. J., 63, 923-929.
7. Filipov F., Tomiță O., Lupașcu A., 2004 – *Procese de degradare a solurilor din sere*. Factorii și procese pedogenetice din zona temperată, vol. 3 (s. nouă), 219-224, Iași.
8. Filipov F., Bulgariu D., Jităreanu G., Bulgariu L., Buzgar N., 2008 – *The mineralogy and geochemistry of some hortic antrosols – case study: glasshouses from Iași and Bacău cities (Romania)*. Eurosoil Congress 2008, Vienna, Austria, p. 180.
9. Filipov F., Bulgariu D., Secu C., Buzgar N., Stoian M., 2008 – *Contributions to the study of mineralogy and geochemistry of hortic anthrosols from Bacău glasshouses*. U.S.A.M.V. Iași, *Lucrări Științifice* – vol. 50. seria Agronomie, Iași.
10. Florea N., Bălăceanu V., Răuță C., Canarache A. (coord.), 1986 – *Metodologia elaborării studiilor pedologice* (vol. I-III). Academia de Științe Agricole și Silvicultură, I.C.P.A. București.
11. Secu C.V., Patriche C.V., 2007 – *Solurile lumii. Clasificare, răspândire, caracteristici*. Ed. „Terra Nostra” Iași.
12. Smeck N.E., Thompson M.L., Norton L.D., Shipitalo M.J., 1989 – *Weathering discontinuities: A key to fragipan formation*. In: N.E. Smeck and E.J. Ciolkosz (ed.) “Fragipans: Their occurrence, classification, and genesis”, p. 99–112. SSSA Spec. Publ. 24. SSSA. Madison. WI.
13. Voican V., Lăcătuș V., 1989 – *Cultura protejată a legumelor din sere și solarii*. Ed. CERES, București.
14. Weisenborn B.N., Schaetzl R.J., 2005 – *Range of Fragipan Expression in Some Michigan Soils: II. A Model for Fragipan Evolution*. Soil Sci. Soc. Am. J., 1, 69(1), 178 - 187.

THE EFFECTS OF POLYMERIC MATERIALS ON THE SALINIZATION PROCESSES OF SOILS FROM GLASSHOUSES

EFFECTELE MATERIALELOR POLIMERICE ASUPRA PROCESELOR DE SALINIZARE A SOLURILOR DIN SERE

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Abstract. *In this study we follow the effects of three polymeric materials (PEG-2000; AM-VA and AM-MMA) on salinization process of soils from Iași – Copou glasshouse, during of two years. Were targeted in particular the mechanisms of inhibition and retrogradation of deposition and solubilization processes of soluble salts in soils from glasshouse, in presence of polymeric materials. The studies were done by experimental modelling in laboratory conditions, and by pedological and agrochemical investigations in exploitation conditions of soil from Copou – Iași glasshouse. In presence of polymeric materials, the rate of salinization processes is significant reduced, and in case of hydrophilic polymers (polyelectrolyte), the salinization process is practically inhibited. In saline soils, polymeric materials caused strong retrogradation of deposition processes of soluble salt the reducing of salinization degree.*

Key words: polymeric materials, soluble salts

Rezumat. *Studiul nostru a urmărit efectele a trei materiale polimerice (PEG-2000; AM-VA și AM-MMA) asupra procesului de salinizare a solurilor din sera Iași-Copou pe durata a doi ani. Au fost vizate mecanismele de inhibare și retrogradare a proceselor de depunere și solubilizare a sărurilor solubile, în prezența materialelor polimerice. Studiile au fost realizate prin modelare experimentală în condiții de laborator și investigații pedologice și agrochimice în condițiile de exploatare a solului din sera Copou - Iași. În prezența materialelor polimerice viteza proceselor de salinizare este semnificativ diminuată, iar în cazul polimerilor hidrofilii (polielectroliți) procesul de salinizare este practic inhibat. În cazul solurilor salinizate, materialele polimerice determină retrogradarea puternică a proceselor de depunere a sărurilor solubile, ceea ce are ca efect reducerea gradului de salinizare.*

Cuvinte cheie: materiale polimerice, săruri solubile

INTRODUCTION

The utilization of intensive cultivation technology of vegetables in glasshouses and solariums by high doses of organic fertilizers, supra-dimensioned irrigation and maintaining the soil moisture at high levels, causes rapid degradation of their physico-chemical characteristics, evidenced by decreasing of structural aggregates stability, accumulation of soluble salts in the upper horizons, limiting the bioavailability of

organic compounds and micro-nutrients etc. All these determined a significant reducing of productivity and of exploitation time of soils from glasshouses (J.P. Quirk, 1971; K.K. Tanji, 1990; V. Voican & V. Lăcătuș, 1998; N. Munteanu et al., 2008).

The presence of easy soluble salts in concentrations higher than those tolerated by cultivated plants negatively influenced their development by increasing of osmotic pressure and decreasing of water accessibility (increased osmotic pressure created state of physiological drought in these conditions even if the soil water content is high, can not be used by plants), the toxic action of some ions (Na^+ , Cl^- , SO_4^{2-}), the balance modification of nutritive ions from soil-plant system and modification of biochemical processes from inside of plants (Gh. Sandu, 1984; D. Davidescu & V. Davidescu, 1992; I. Avarvarei et al., 1994; R. Lăcătușu, 2000).

The degradation of soils characteristics from protected areas by salted processes (salinization and / or sodization), compaction, carbonatation, eluviation-illuviation, frangipane formation, stagnogleization, gleization, etc. The salinization process consists in step by step accumulation of some easy soluble salts in soil (more soluble in water, at low temperature than gibes: $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), represented by: chloride, sulphates, carbonates, bicarbonates, sometimes nitrates, borates, dehydrogenate-phosphates, etc., of Na^+ , Mg^{2+} , Ca^{2+} cations or sometimes of K^+ , Al^{3+} etc., from various sources (irrigation water or mineralized ground water, fertilization with organic and mineral fertilizers, etc.). The migration of salts (slat-eluviation) occurs after their dissolving in soil solution, and their precipitation and crystallization take place after reduction of water content (being consumed by plants, evaporation at soil surface) and of CO_2 concentration. By deposition of soluble salts are formed salinized ("sc") and salic ("sa") horizons (J.P. Quirk, 1971; I. Szabolcs et al., 1989; I. Avarvarei et al., 1994; R. Lăcătușu, 2000; F. Filipov et al., 2004; I. Shainberg & G.J. Levy, 2005).

One of the methods applied in recent years to prevent soil salinization in glasshouses and solariums, namely to improve the saline, is the treatment with polymeric materials. Although the results obtained in this area are generally good, however there are insufficient data for the smooth application to large scale of this conditioning and improved method from soils from glasshouses and solariums with polymeric materials (M.F. De Boodt, 1992; J.D. Hamilton & R. Sutcliffe, 1996).

Our studies have followed the effects of three polymeric materials (PEG-2000; AM-VA and AM-MMA) on the salinization process of soil from Iași-Copou glasshouse, over two years. Were targeted in particular the mechanisms of inhibition and retrogradation of deposition and solubilization processes of soluble salts in soils from glasshouse, in presence of polymeric materials.

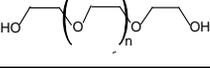
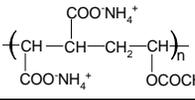
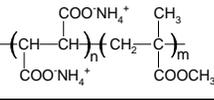
MATERIAL AND METHOD

The experiments were done on soil samples from Copou-Iași glasshouse - IS.1 profile (Hipohortic Entianthrosol Mixed-Proxicalcaric). The pedological and physico-chemical description of soils from IS. 1 profile has been presented in several previous studies (F. Filipov et al., 2004; 2008). For tests were used three types of polymeric materials (table 1): polyethylene glycol with molecular mass of 2000 (PEG-2000), vinyl-maleate copolymer (AM-VA) and metacrylate-maleate copolymer (AM-MMA). The treatment of soil

samples with polymeric materials was done in a special installation where has been reconstituted at reduced scale the soil profile from glasshouse, keeping unchanged sequence of horizons and pedo-geochemical characteristics of these. The details concerning the experimental installation and work methodology have been previously presented (D. Bulgariu et al., 2009). In table 1 are summarized the work conditions for the experimental study of influences of polymeric materials on salinization process of soils from glasshouses.

Table 1

Experimental work conditions

Observations	PEG-2000	AM-VA	AM-MMA
Chemical structure			
	Fluka product	Produced by I.C.M. „P. Poni” Iași	
Utilization way	0.5 % aqueous solutions; distribution by spraying with constant flow ⁽¹⁾		
Used volume	10 mL (polymer solution / soil ≈ 1 / 50)		
Flow	Descending without pressure gradient **		
pH _i *	6.83	6.11	7.69
E _h , mV*	0.062	0.055	0.037
Diffusion rate ⁽²⁾	3.85.10 ⁻³	3.65.10 ⁻³	3.22.10 ⁻³
Stability ⁽³⁾	390 days	319 days	293 days

*Initial values of solutions. **Diffusion gradient flow under gravity. ⁽¹⁾Average value of flow: 3,57.10⁻¹ mL/hour. ⁽²⁾Average value for the entire column [mL / hour]. ⁽³⁾Stability in conditions of soils from glasshouses (D. Bulgariu et al., 2009).

Experimentally were follow the variations of total salts content (CTS) and of cationic and anionic composition of aqueous extract obtained by treatment with polymeric materials (table 1) during of 300 months (the average soil stability in conditions of polymeric materials used in glasshouses). Have been targeted and the local variations of these parameters above, within and below the pedo-geochemical segregation horizon - Aho2k horizon (x). Were simultaneously monitored the changes of pH and redox potential. At the end of experiments have been performed microscopic and spectral (IR, UV-VIS and Raman) studies, to estimate the influence of polymeric materials on the occurrence and distribution forms of soluble salts in the treated soil horizons. The determination of total salts content (CTS) was performed with conductometric method in aqueous extract obtained from the soil saturated with water (Z. Borlan & C. Răuță, 1981). In aqueous extract the concentrations of cations were determined by atomic absorption spectrometry and anion concentrations by direct potentiometric method with ion-selective sensors and molecular absorption spectrometry and UV-VIS, respectively (Z. Borlan & C. Răuță, 1981; J.A. Dean, 1995).

RESULTS AND DISCUSSIONS

The testes polymeric materials have strong and selective effects on the dynamic of salinization process of soils from Copou-Iași glasshouse, aspects evidenced by: **(i)** significant reducing of TSC from each horizon of profile (table 2) by relative decrease of crystallized salts solubility and significant leaching of easy soluble salts; **(ii)** selective variation of cations and anions concentrations from aqueous extracts of soils treated, as a function of type of used polymeric material

and chemical-mineralogical characteristics of soils (table 3) – these are determined by the differential effects manifested on crystallization–solubilization equilibriums of soluble salts by the polymeric materials, and selective interactions between these and ionic species from soluble salts, respectively; (iii) the modification of occurrence and distribution forms of soluble salts in horizons of soil profile – indicated by the variation of cations / anions ratio and by the specific variations of paragenesis and mineral associations of soluble salts in each horizon; (iv) the selective reducing of crystallization processes rate of soluble salts (indicate a strong inhibitor effect manifested by polymeric materials on global salinization process), in case of strong salinized horizons (Ap1k and Ap2k) is manifested simultaneous, and an effect of solubilization of soluble salts (which indicate a relative strong retrogradation effect manifested by polymeric materials on global salinization process).

Table 2

Total salts content (TSC; mg / 100 g soil) in soils from IS.1 profile (Copou-lași glasshouse) at the treatment with polymeric materials

Horizon	Initial	PEG-200		AM-VA		AM-MMA	
	TSC	TSC	ΔTSC	TSC	ΔTSC	TSC	ΔTSC
Ap1k	675.49	486.08	28.04	449.26	33.49	416.50	38.34
Ap2k	315.51	227.70	27.83	190.53	39.61	176.49	44.06
Aho1k	369.73	282.65	23.55	269.60	27.08	219.87	40.53
Aho2k(x)	417.61	357.51	14.39	332.54	20.37	270.69	35.18
BCK	288.38	304.96	5.75	280.70	2.66	310.38	7.63
ABk	152.95	158.91	3.90	139.30	8.92	160.00	4.61
Ck	305.82	274.50	10.24	258.93	15.33	238.44	22.03
M1	360.78	298.90	13.48	274.41	21.06	256.05	23.98
M2	453.57	332.14	26.47	303.13	33.39	270.96	40.97
M3	249.05	246.12	6.63	226.31	8.97	236.27	11.42

ΔTSC [%] - decrease towards initial TSC (untreated soil). M1 - average on profile. M2 - average superior horizons (Ap1k, Ap2k, Aho1k). M3 - average inferior horizons (BCK, ABk, Ck).

The intensity of effects manifested by polymeric materials on salinization processes (estimated on the basis of inhibition and retardation actions) varied in order: PEG-2000 < AM-VA < AM-MMA. This estimation is yet only relative, because each polymer acts in different way on soluble salt. Thus, PEG-2000 acts most likely through a “blocking anions” mechanism (relative selectivity: $PO_4^{3-} > SO_4^{2-} > HCO_3^- > CO_3^{2-} > NO_3^- \gg Cl^-$) and leaching of cations (relative selectivity: $Na > K > Mg > Ca$), while the maleic copolymers acts predominantly by a “blocking cations” mechanism (relative selectivity: $K > Ca > Mg > Na$), but the “blocking anions” effect cannot be neglected (relative selectivity: $SO_4^{2-} > CO_3^{2-} > PO_4^{3-} > HCO_3^- \gg NO_3^- > Cl^-$). These observations are in agreement with the results of studies concerning the dynamics of crystallization (precipitation) – solubilization equilibriums of soluble salts on the action of polymeric materials and with the pedo-geochemistry of soluble salts in soils from glasshouses (J.P. Quirk, 1971; E. Bresler et al., 1982; F. Filipov et al., 2008).

Table 3

The concentrations ions in aqueous extract of soils from IS. 1 profile (Copou glasshouse) at the treatment with polymers.

Horizons	Cations (mg / 100 g sol)						Anions (mg / 100 g sol)							
	Na ⁺	K ⁺	Ca ⁺	Mg ⁺	OC	Σ1	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	CO ₃ ²⁻	HCO ₃ ⁻	PO ₄ ²⁻	OA	Σ2
Initial soil (untreated)														
Ap1ksc	111.52	49.17	24.11	65.11	7.36	257.29	114.90	45.46	152.93	23.50	17.22	49.10	12.36	415.49
Ap2ksc	62.88	19.08	10.15	33.28	4.48	129.89	60.60	16.81	54.45	22.36	5.90	17.76	6.81	184.73
Aho1ksc	68.88	17.56	14.34	44.70	6.21	151.70	70.43	9.87	72.91	24.29	5.21	26.58	6.69	215.99
Aho2k(x)	87.99	13.90	12.19	57.33	11.52	182.95	86.23	8.14	85.81	29.90	8.68	5.63	9.06	233.48
BCksc	44.38	24.82	15.37	46.68	3.57	134.84	53.92	3.20	50.06	17.15	6.89	16.95	4.58	152.78
ABksc	37.61	14.43	2.69	18.27	1.30	74.31	41.58	1.42	23.06	1.83	1.25	3.93	4.92	78.01
Cks	58.28	35.93	23.27	17.98	3.57	139.05	72.11	3.82	59.48	10.00	4.15	13.21	2.90	165.69
M1	67.36	24.99	14.59	40.48	5.43	152.86	71.40	12.67	71.24	18.43	7.04	19.02	6.76	206.60
M2	81.09	28.60	16.20	47.70	6.01	179.62	81.98	24.04	93.43	23.38	9.44	31.15	8.62	272.07
M3	46.76	25.06	13.77	27.64	2.81	116.07	55.87	2.81	44.20	9.66	4.10	11.36	4.13	132.16
Treated soil with PEG-2000 polymer														
Ap1ksc	60.03	56.96	39.03	55.85	18.03	229.91	57.40	34.75	82.34	30.42	10.25	30.57	8.36	254.12
Ap2ksc	23.38	36.56	15.00	27.46	5.30	107.72	21.38	16.73	27.96	19.94	5.98	20.88	6.64	119.54
Aho1ksc	44.43	29.36	17.75	30.30	6.19	128.04	28.66	19.36	32.87	19.22	9.86	32.05	11.61	153.65
M2	42.61	40.96	23.92	37.87	9.84	155.22	35.81	23.61	47.72	23.19	8.70	27.83	8.87	175.77
Treated soil with maleic co-polymer AM-VA														
Ap1ksc	38.00	68.37	43.62	49.23	10.15	209.40	41.24	23.54	73.36	34.23	18.33	36.66	9.65	237.03
Ap2ksc	17.45	29.85	13.96	22.95	5.67	89.91	13.20	11.26	34.44	15.96	4.85	17.54	2.89	100.18
Aho1ksc	31.35	47.42	16.41	26.63	9.89	131.73	17.38	19.76	47.47	19.27	4.74	20.84	7.41	136.90
M2	28.93	48.55	24.66	32.94	8.57	143.68	23.94	18.18	51.76	23.15	9.31	25.01	6.65	158.04
Treated soil with maleic co-polymer AM-MMA														
Ap1ksc	31.77	66.84	46.56	43.35	11.57	200.13	3.76	23.44	59.93	37.69	15.03	33.52	5.12	178.52
Ap2kscsc	11.13	34.36	16.78	20.61	5.22	88.12	4.16	9.12	27.76	14.59	3.22	12.60	3.26	74.74
Aho1k	19.98	41.18	18.97	21.61	7.76	109.52	2.80	10.57	37.62	21.08	2.83	19.23	2.99	97.15
M2	20.96	47.46	27.44	28.52	8.18	132.59	3.57	14.38	41.77	24.45	7.03	21.79	3.79	116.81

Σ1 – sum of cations. Σ2 – sum of anions. OC – other cations: Fe³⁺, Al³⁺, cations of some transitional metals (Zn, Cu, Mn, Cr, Co, Ni etc.), cationic complex ions coordinative unsaturated. OA – other anions: silicates, borates, I⁻, Br⁻, anionic complex species.

CONCLUSIONS

The tested polymeric materials have strong and selective effects on the dynamics of salinization process of soils from glasshouse, by: (i) significant reducing of CTS; (ii) selective variation of anions and cations concentrations from aqueous extract of treated soils; (iii) modification of occurrence and distribution forms of soluble salts; (iv) inhibition and / or retrogradation of global processes of salinization. PEG-2000 acts predominantly by “selective blocking anions” mechanism, while the maleic copolymers predominantly by a “selective blocking cations” mechanism.

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REFERENCES

1. Avarvare I., Davidescu V., Mocanu V., 1994 – *Agrochimie*. Ed. SITEH, Craiova.
2. Borlan Z., Răuță C., 1981 – *Metodologia de analiză agrochimică a solurilor în vederea stabilirii necesarului de amendamente și de îngrășăminte* (vol. I și II). Academia de Științe Agricole și Silvicultură a României, ICPA București.
3. Bresler E., McNeal B.L., Carter D.L., 1982 – *Saline and Sodic Soils: Principles-Dynamics Modeling*. Springer-Verlag, Berlin.
4. Bulgariu D., Bulgariu L., Filipov F., 2009 – *The polymeric material effects on chemical and biochemical equilibriums in integrated soil-water-plants systems from glass houses. I-experimental setting and preliminary results*. Simpoz științific cu participare internațională „Horticultura – știință, calitate, diversitate și armonie”, USAMV Iași, 29-30 mai 2009.
5. Davidescu D., Davidescu V., 1992 – *Agrochimie horticolă*. Ed. Acad. Române, București.
6. Dean J.A., 1995 – *Analytical Chemistry Handbook*. McGraw Hill, Inc., New York.
7. De Boodt M. F., 1992 – *Synthetic polymers as soil conditioners: 35 years of experimentation*. In: Verplancke, H. J. W., et al. (eds.) „Water saving techniques for plant growth”, p. 137-161. Kluwer Academic Publishers, Netherlands.
8. Filipov F., Tomiță O., Lupașcu A., 2004 – *Procese de degradare a solurilor din sere*. Factori și procese pedogenetice din zona temperată, vol. 3 (serie nouă), p. 219-224.
9. Filipov F., Bulgariu D., Jităreanu G., Bulgariu L., Buzgar N., 2008 – *The mineralogy and geochemistry of some hortic antrosols – case study: glasshouses from Iași and Bacău cities (Romania)*. Eurosoil Congress 2008, Vienna Book of Abstracts 180 p.
10. Hamilton J.D., Sutcliffe R., 1996 – *Ecological Assessment Polymers: Strategie for Product Stewardship and Regulatory Programs*. Wiley, New York.
11. Lăcătușu R., 2000 – *Mineralogia și chimia solului*. Ed. Universității „Al.I.Cuza” Iași.
12. Munteanu N., Stoian L., Stoleru V., Fălțiceanu M., 2008 – *Bazele tehnologice ale legumiculturii ecologice*. Ed. „Ion Ionescu de la Brad” Iași.
13. Quirk J.P., 1971 – *Chemistry of saline soil sand their physical properties*. In: Talsma T. and Philip J.R. (eds) „Salinity and Water Use”. New York: Macmillan.
14. Sandu Gh., 1984 – *Solurile saline și alcaline din R.S. România. Ameliorarea lor*. Ed. Ceres, București.
15. Shainberg I., Levy G.J., 2005 – *Salination Processes*. In: Encyclopedia of Soils in the Environment, vol III, p. 429-435. Academic Press, London.
16. Szabolcs I., 1989 – *Salt Affected Soils*. CRC Press, Boca Raton, Florida, USA.
17. Tanji K.K. (ed.), 1990 – *Agricultural Salinity Assessment and Management*. American Society of Civil Engineers, New York, USA.
18. Voican V., Lăcătuș V., 1998 – *Cultura protejată a legumelor din sere și solarii*. Ed. CERES, București.

PRACTICAL AND THEORETICAL RESULTS OF THE EXPERIMENTAL METHOD FOR THE ASSESSMENT THE EROSION RISK, USING THE IMERE INSTALLATION

REZULTATE PRACTICE ȘI TEORETICE ALE METODEI EXPERIMENTALE DE ESTIMARE A RISCULUI DE EROZIUNE FOLOSIND INSTALAȚIA IMERE

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Abstract. The paper present the software which processes the experiment data obtained with IMERE installation, [1], [2], and the main results. Also, in the paper appear some analytical formulas which represent some assays to obtain others way for assess the soil erosion risk.

Key words: soil, erosion, risk, assessment

Rezumat. Articolul prezintă programul de prelucrare a datelor și rezultatele obținute prin prelucrarea datelor numerice brute achiziționate în experiențele de estimare a riscului de eroziune efectuate cu ajutorul instalației, IMERE, [1], [2]. Se prezintă interpretarea datelor și unele încercări de obținere a unor noi estimatori ai riscului de eroziune.

Cuvinte cheie: sol, eroziune, risc, estimare

INTRODUCTION

This paper presents the method of processing the data from the experiences carried out with facility IMERE, [1], [2], in aim to determine the risk of erosion on slopes, caused by the water action. It also presents a number of top-level data, which clearly describe erosive rainfall event, was also the major source of improving theoretical models of the phenomenon.

MATERIAL AND METHOD

Method is based on algorithm testing with mobile plant for erosion risk estimation IMERE, [2], on its data and mathematical methods of classical statistical processing of experimental data. For computing and graphics, is using the MS Office software, Excel.

The experiences to estimating the risk of soil erosion situated on the slopes, caused by the water action, were made within ICDVV Valea Calugareasca, in 2008 year. To experience three locations were chosen within ICDVV experiences being carried out in April, June and September.

The software for experimental data processing - ALGIMERE

The experimental data processing program is called ALGIMERE, and is based on formulas given in Table 1. The first page of the program covers all ordinary calculations required to

the final report and related schedules. Experimental data are inserted in specially marked areas: general information, current experimental data: the capacity of containers for collection of leakages, the initial time of filling of the containers, filling the final time of collection containers, total weight of dry soil obtained by drying the contents of each container . The program supports hundreds data collection, but, practically, the number of data not exceed a few tens.

Table 1

Formulas for calculating the parameters that appear in the program ALGIMERE *

The total quantity of water given:	$A = i_f - i_0$
The amount of water administered until flow:	$A_c = i_c - i_0$
Average flow of water supplied:	$Q = A / (t_f - t_0)$
The amount of water necessary to trigger specific unit surface flow	$a_c = A_c / S$
The amount of water specified unit area, given the entire period:	$a = A / S$
Specific flow unit area:	$q = Q / S$
The total mass of dry soil collected:	$M = \sum_{i=1}^n m_i$
Mass of soil collected from the emergence of flow by the end of water supply	$M_1 = \sum_{i=1}^{n_f} m_i$
Overall loss of surface specific unit per event:	$P = M / S$
Overall loss per hectare per event:	$Pha = 10 \cdot P$
Overall loss of soil specific surface unit and flow unit pluviometric:	$\phi = P / Q$
Overall loss of soil specific surface unit and flow unit pluviometric specific unit area:	$\psi = P / q$
Coarse estimator of the annual soil loss per hectare, for a given system pluviometric, PL (in mm):	$Phaa = Pl \cdot Pha / (1000 \cdot a)$
The total duration of watering	$T = t_f - t_0$
Watering duration to flow occurrence	$T_c = t_c - t_0$
Length of slope (plot watered)	L
Rain intensity	$I = A \cdot 1000 / S$
Hourly intensity of rain	$i = A \cdot 3600 / T$

* i_0 , i_c and i_f = Flow meter index initially, when the flow and finally;
 t_0 , t_c and t_f = times at the same moments of experience

In the calculation, corrections arise because the replacement of a container filled with other goals, has duration of time and has loss of leaks. Leakage loss recorded in each time interval between the end of a container full time and during the initial filling of a new container was calculated as being equal to the amount of leakage specific unit of time multiplied by the half filled container during replacement container, plus the amount of leakage for specific unit of the container to be filled, multiplied by half the time of replacement container.

Main results of the experiment and its data processing occurs in the report of the first page of the program, as shown in the table in Fig. 1. In this table also appear in terms estimator for assessing the risk of erosion: loss of soil per m² per event of soil loss per

hectare per event, coarse estimator of annual soil loss per hectare and soil loss reported to measures of rain intensity: soil loss per hectare specific unit specific flow and soil loss rate per hectare unit, corresponding both rainfall event.

In page 2 of ALGIMERE program, is presented a chart containing the change in speed of deployment time (Fig. 2), calculated as the ratio between the amounts of material collected on each container and deployed during the collection - is therefore an average speed of deployment each collection period. It can be observed in the transitional area erosion rainfall event. The phenomenon is achieved only when both the material flows. On the same graph is presents the variation rate of leakage is corrected through the replacement of vessels breaks.

In the page 3 of the ALGIMERE program, is present the graph of the changes over time of dry material collected (Fig. 3), the uncorrected version and the corrected version. It is noted that the two curves meet the minimum requirement of monotonous growth.

From the program report, only the coarse estimator is annual soil loss per hectare. This estimator normally cannot be deduced from a single experiment with IMERE facility. The value of this estimator will be even better with how it is calculated as the average of several experiments, spread over an entire year, the key periods of development of vegetation, the conduct of agricultural operations and taking into account the natural distribution of average pluviometric regime.

The processing and interpretation of data, we tried to reach the classic estimators of the risk of erosion - the loss of soil per unit area and a coarse estimation of the annual soil loss per hectare - but we try to introduce also new possible estimators. These estimators appear in Table 1. The first proposed new estimator is *overall loss on the event specified unit area*, denoted P , which is equivalent locally (on the pluvial erosion event) of the estimator classic *annual soil loss per hectare*.

Raport experiment: A locatie: ICDVV Valea Calugareasca ALGIMERE
02 - 03.04 2008, lisimeter 2008

FINAL PRIMARY RESULTS	
total amount of water administered, A , cm	0.423
quantity of water to flow sediment, A_c , cm	0.204
average flow of water distributed, Q , mc/s	0.000418
water quant. per unit area to sediment flow, ac , sup., m	0.002429
water quantity administered per unit of surface, a , m	0.005036
Specific flow unit area, q , m/s	4.97E-06
total mass of soil collected, M , kg	1.656782
mass flow and soil collected in the final watering, $M1$, kg	0.333381
Global soil loss per unit area and per eveniment, P , kg/sm	0.019724
Global soil loss per hectar and per eveniment, Pha , tons/ha	0.197236
Global soil loss per unit of average flow, ϕ , kg s/m ⁵	47.24199
Global soil loss per unit of average flow and area, ψ , kg s/cm	3968.327
Coarse est. annual soil loss per hectar, $Phaa$, t/(ha*year)	21.54209
total duration of watering, T , s	1013.17
time before the flow appears, Tc , s:	480
rain intensity, I , mm	5.035714
intensity of rain per hour, i , mm/hour	17.89292

Fig. 1 The basic information in the report ALGIMERE program.

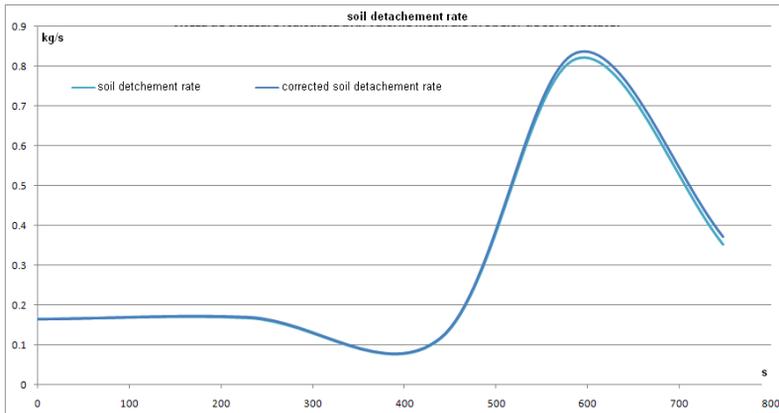


Fig. 2 Chart variation of soil detachment rate, resulting in the report ALGIMERE program.

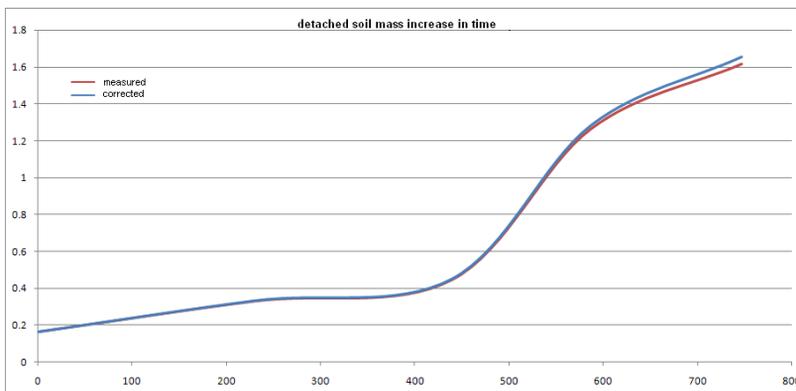


Fig. 3 Chart variation while the mass of soil detached graphics ALGIMERE program appears in the report.

Overall loss per hectare per event, noted P_{ha} , is derived from the parameter, P , so we approach the language commonly used in agriculture - the reference to the hectare as a measure of area. *Overall loss of soil specific surface unit and flow unit pluviometric*, noted Φ , is another possible measure of erosion risk. This measure introduces the link between the amount of land lost and the amount of water fell during the pluvial event. The final measure of the risk of soil erosion is *the overall loss of soil specific surface unit and flow unit pluviometric specific unit area*, noted ψ . This is a refinement of previous, as the ratio of two unit sizes specific surface.

The news soil erosion risk parameters introduced, bind the parameters of the pluviometric system with the parameters which describing soil loss. We believe that these parameters are intermediate steps to achieve a satisfactory estimator of soil erosion, possibly dimensionless interpreted as degree of erosion. One such parameter measured or estimated the likelihood or intensity of erosion, would allow comparison pluviometric erosion events, independent of the chosen geo climatic zone.

Data processing algorithm and the new estimators of the risk of erosion is the authors' original contributions.

RESULTS AND DISCUSSIONS

Main results in the paper are: program and method of processing experimental data, the new estimators of the risk of erosion introduced and results obtained for the particular locality ICDVV of Calugareasca Valley. The experiments carried out have led to estimates of annual soil loss per hectare from 0.9 - 1.9 t, for slopes of about 7%, respectively, about 5 t / ha on slopes of 15%, on a plantation hill - valley. These results are consistent with the reports and maps of erosion in Europe, [5]. This according was the main test of the method of estimation and data processing proposed by the authors. The authors of [4] give a map that characterized the area that includes soil erosion in Valea Calugareasca having negligible on most surfaces. The authors of [3] estimate for the plantations of vine in Romania, according to anti-erosion works, soil loss between 1.45 and 70.60 t / ha per year.

CONCLUSIONS

Experiences of risk assessment due to the action of water erosion on slopes produce results consistent with known data on soil erosion throughout Europe, [5]. In terms of the size of results, the estimation method (part experimental and data processing), are confident.

The experimental data are consistent with limits from 0 to 2 t / ha per year, typical of large areas of Romania, which includes territory I.C.D.V.V. Valea Călugărească, where they held their experiences.

Higher data processing, lead to results realized in the attempt to obtain some models (possibly hydraulic or mixed solid-fluid), the soil erosion under the action of water.

Experimental method of processing and interpretation of data is presented in this article, is an alternative to the methods used to estimate erosion risk: method USLE and its derivatives (RUSLE with variants), methods based on hydraulic models (WEPP, EUROS, etc.), mixed methods using GIS techniques and one of the methods above, finally, experimental methods. The alternative presented is different to the experimental methods so far by the mobility of plant IMERE by choice pluviometric arrangements according with the wishes of users, the independence of natural pluviometric regime, and also by the new erosion risk estimators have entered. The method can express the risk of erosion in classical terms also. Through the characteristics of the method for estimating the risk of erosion, this method can receive the attribute of the accelerated method for estimating the erosion because it may give a measure of erosion risk in a shorter time than the actual experiments carried out for at least a year.

REFERENCES

1. **Herea V., Cârdei P., Raluca Sfiru, 2008** - *Experimental determination of the soil erosion measures*. Bulletin of University of Agricultural Sciences and Veterinary Medicine, Agriculture, Cluj-Napoca, Vol. 65, No 2;
2. **Herea V., Cardei P., 2008** - *Installation and procedure for slope erosion assessment, caused by the water action, in control rain*. INMATEH Journal 2008 – Section II, Bucharest, 18 July 2008, pag. 116;
3. **Mihai Gh., Ionescu V., 1968** - *Ghid pentru combaterea eroziunii solului*. Editura Agro-Silvica, 1968;
4. **Motoc M., Trasculescu FI., 1959** - *Eroziunea solului pe terenurile agricole si combaterea ei*. Ministerul Agriculturii si Silviculturii, Editura Agro-Silvica de stat, 1959;
5. *****, 2003** - *Risk assessment. THE PESERA MAP*, version 1 October 2003, explanation: Special Publication Ispra 2004 No. 73, S.P.I.04.73;

THE MONITORING OF AQUATIC ECOSYSTEMS SEDIMENTS FROM THE DANUBE BASIN

MONITORIZAREA SEDIMENTELOR DIN ECOSISTEMELE ACVATICE ALE BAZINUL DUNĂRII

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Abstract. *The knowledge of the aggregation amount of a several toxic elements referred to residue metals (Al, Fe, Cd, Cr, Cu, Ni, Pb, Zn), represent a new and important direction of the investigation of water quality. This is why the study is based on the emplacement of the work and some aspects regarding the water treating. The has for result the knowledge of the water pollution load and also the capability of maintaining the water quality at high levels. In this purpose we have established the chemical properties of the residue from the river Dunarea, section Bazias-Pristol. The obtained results do not register important variation of the metals concentration, putting them between the permissible limits. The suggestions that follow the study are to keep register the chemical factors, because of the toxic metals that could be traceable, coming from the improper treatment of the discharge water, from the treating station. The studied section has a major importance for the Dunarea drainage area and requires a special attention.*

Key words: aquatic ecosystems, monitoring, sediments, chemical analysis.

Abstract. *Cunoașterea gradului de acumulare a unor compuși deosebit de toxici, respectiv a metalelor din sedimente (Al, Fe, Cd, Cr, Cu, Ni, Pb și Zn) reprezintă o direcție nouă și importantă de investigare în activitățile de protecție a apelor. De aceea studiul se referă la amplasarea lucrării hidrotehnice, organizarea acivității, aspecte privind tratarea apelor și are ca rezultat cunoașterea gradului de impurificare a ecosistemelor acvatice cât și a posibilităților de prognozare, evoluție și de menținere a calității apelor. În acest context, ne-am propus identificarea și determinarea caracteristicilor chimice ale sedimentelor pe fluviul Dunărea, respectiv sectorul Baziaș-Pristol (km 1075 – 770). În urma rezultatelor obținute, nu se înregistrează variații esențiale ale concentrației metalelor, acestea încadrându-se în STAS-urile în vigoare. Se impune o monitorizare a acestor indicatori, datorită toxicității metalelor care ar putea fi detectate și care ar putea proveni din netratarea corespunzătoare a apelor deversate din stațiile de tratare. Secțiunea monitorizată prezintă o importanță majoră pentru bazinul hidrografic al Dunării, necesitând o permanentă atenție.*

Cuvinte cheie: ecosisteme acvatice, monitorizarea sedimentelor, analize chimice.

INTRODUCTION

In collaboration with the PHARE Program were set two projects regarding the harmonization of monitoring net of inland waters, our country being a participant too. Alongside classic monitoring function was followed the investigation of environment stress factor, remediation possibilities and different scenery of development strategy. The most relevant examples regarding the development of monitoring function of water flow and mass associated for the different pollutant class, refers, among other things, to the sustainable development – the development models expands from those based on water volumes and temporary distribution to the water sources quality approach, the maintain and preservation of aquatic ecosystems. It was arise the monitoring and prediction problem of chemical species and suspension flux correlated with the possible changes of hydrologic regime.

MATERIAL AND METHOD

In order to carry out this study was monitoring the metals density from sediments of Danube Hydrologic Basin, meaning the Bazias-Pristol section. The sediments chemical characterization has like first goal the determination of real compounds density, especially the material with pronounced pollution potential. Another proposed aspect is to identify and determine the general chemical characteristics of sediments, evaluate the absorption capacity, retaining or desorption and to evaluate the contamination and pollution risks, in correlation with the major characteristics of water. This is why we used sampler devices of sediments and water assay (Shipeck drag). The metals determination methods are based on the colorimetric color reaction (STAS SR ISO method), atomic absorption using lamps for each metals (AAS) and mass spectrometry with plasma inductive joined (ICPMS).

RESULTS AND DISCUSSIONS

Ensue the analyses of metals density from sediments, on Bazias-Pristol section, km 1075-838, were determined aluminum, iron, arsen, cadmium, chrome, copper, nickel, plumb and zinc (Fig. 1,2,3).

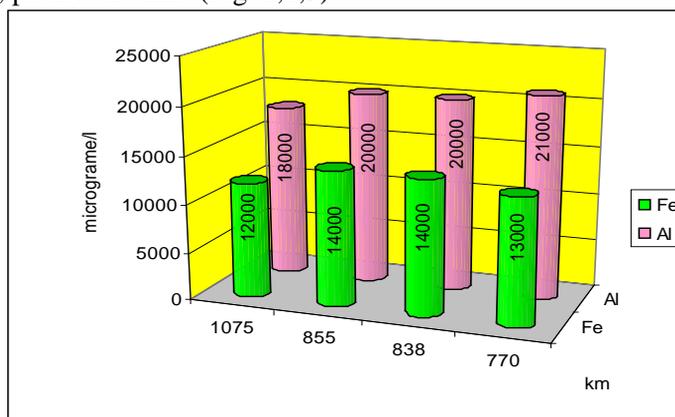


Fig. 1. Aluminum and iron density from sediments, on Bazias-Pristol section

The aluminum toxicity is due to the polluted water evacuated from the purification plant which overflows in Danube. In Baziaş-Pristol section, the aluminum density in sampled probes is under the standard value, 8 ppm. The large scale utilization of iron in industry leads to this one frequent presence in polluted waters. In our case, the iron density doesn't overcome the NTPA-001 value.

The chrome density from water depends on the oxidation stage. Thus, the hexavalent chrome compounds has a bigger cancerous activity than the trivalent chrome compounds, because at intracellular level arrives a reduction of hexavalent chrome to penta- and tetravalent species, with a small lifetime, but much reactive. There not was enlisted overcoming of standards, the hexavalent chrome being under the limit imposed. The copper values in studied section presents a relative unevenly distribution, the copper density from sediments significantly arise in Gruia Section (100 µg/g). The zinc density from sediments vary between 150-180 µg/g, fitting into the standard limits.

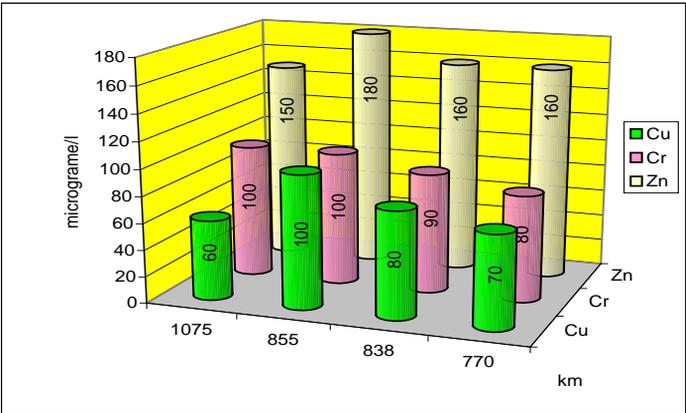


Fig. 2. Copper, chrome and zinc density from sediments, on Baziaş-Pristol section

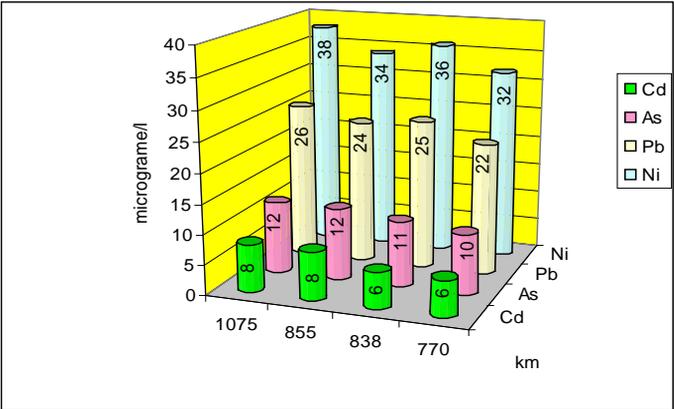


Fig. 3. Cadmium, arsen, plumb and nickel density from sediments, on Baziaş-Pristol section

The process which control the behavior and the mobility of existing arsen from sediments owe to countless oxidation states of this element, states very much influenced by the redox reaction from waters with complex composition, like Danube waters are.

In this context, in studied section, the arsen values fit in 10-12 $\mu\text{g/g}$, the maximum being enlisted to km 1075 and 855, meaning the Baziaş and Gruia village.

The cadmium is a frequent water and sediments pollutant, emanate from the industry which overflows by canalization in Danube impure waters. In our case, the value of this element fits in currently standards.

The nickel density, measured in $\mu\text{g/g}$, presents less significantly values compared to the maximum admissible value. The plumb is the most known metallic pollutant being strongly absorbed/bound by the sediments and soil particles. Frequently, many from them inorganic combination are less water soluble, being included in sediments. Anyway its solubility may arise in aquatic ecosystems depending by the pH, temperature, salinity etc. It was enlisted values varying between 24-26 $\mu\text{g/g}$.

CONCLUSIONS

The global study of the metals from the Danube water sediments on Baziaş-Pristol section don't present essential variation, the differences between the section being sometimes insignificant. The elevated values of metals density was enlisted on Gruia section, meaning the aluminum and iron.

The monitoring section presents a major importance for Danube Hydrographical Basin, being necessary a permanent surveillance, because a possible pollution could have directly negative consequence on the ecosystems.

It impose a monitoring of all affluents and overflow plant, in order to establish the way and degree in which influence the fluctuation of indicators values taking into account, because a part of detected metals derive from the inadequately treatment of overflow waters.

REFERENCES

1. **Gavrilescu Elena, Olteanu I., 2003** - *Calitatea mediului – Monitorizarea calitatii apei*. Editura Universitaria, Craiova.
2. **Gavrilescu Elena, 2006** - *Poluarea mediului acvatic*. Editura Sitech, Craiova.
3. **Haiduc Iovanca, 2005** - *Chimia mediului. Poluanti chimici*. Editura. EFES, Cluj-Napoca.

A NETWORK OF NETWORKS FOR SCIENCE OF SUSTAINABILITY: A NEW CHALLENGE FOR THE UNIVERSITIES

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***Abstract:** Sustainability is a concept that focuses on the future maintenance and longevity of human well-being and security. It considers interaction within and between global, social, and human systems, including areas such as climatology and components of agriculture, industry, forestry and fisheries, and human communities in general, as well as the various systems on which they depend. Sustainability is often viewed from the perspectives of the environment, resources and energy. Global sustainability is the term used when the concept is considered on a worldwide scale. All universities have an important role in problem-solving to leave a sustainable world to future generations. Through their research, universities are expected to provide timely solutions to these problems and to closely coordinate with policy-makers if these solutions are to be promptly and appropriately implemented. Collaboration with a range of stakeholders including civil society and the private sector is also important to ensure such solutions are practically applicable and appropriate to build a sustainable society. Universities must work together in the areas of sustainability research and policy analysis toward this end. At the same time, the academic objectivity of universities is a key strength which should not be sacrificed. To restructure scientific knowledge in this manner, a unifying framework is necessary, facilitating this integrated problem-solving approach among research disciplines. Essential to such a framework is the creation of a “network of networks” (NNs) that links the various discipline-specific research networks already in place, thereby utilizing and augmenting their respective strengths and knowledge bases. In this network of networks, interdisciplinary cooperation among universities in different regions can be effectively enhanced through initiatives such as student exchange, faculty exchange and joint research projects.*

Key words: Sustainability, environment, university, network of network - NNs

INTRODUCTION

Sustainability began as a subset of environmentalism, as concern about how to manage to flow of natural resource inputs and human-generated outputs (pollutants and waste) in a way that could go on, if not for ever, at least for a very long time. For many years the scientific and technical world was discussing of the environment in term of conservation. The conceptual base was that the human activity should be always taken into consideration the fundamental aspects related to the environment conservation, preserving the state and maintaining the original conditions. It also can be defined as a static view of the system in a world where all the parameters are in changing and interrelated equilibrium.

This view was creating a real conflict between the human needs (commodities and food) and the dynamics in the environment. With time was evident that this conflict was impossible to control and management of the environment was becoming very problematic. The last decade has witnessed the emergence of a range of increasingly lively movements to exploit science and technology (S&T) in the quest for a transition toward sustainability.

The need for sustainable development initiatives to mobilize appropriate science and technology has long been recognized. Early research on sustainable yield management of renewable resources provided the foundation for the International Union for the Conservation of Nature's seminal *World Conservation Strategy*, published in 1980. But we have to reach the 1987 with the Brundtland Commission's report *Our Common Future* to have a real breaking point and a step forward toward the "Sustainability Science". The report defines sustainable development as "*the development that meets the needs of the present without compromising the ability of future generations to meet their own needs*".

For the first time, the sustainable development of the environment was linked to human development. Man and environment are two components that have to develop together, in equilibrium, applying knowledge in support of decision making for sustainable development and allowing the maintenance of the system. In this context the concept of sustainability was preserved in the Agenda 21 action plan that emerged from the United Nations Conference on Environment and Development in 1992 (Kyoto). Over the succeeding decade, the discussion of how S&T could contribute more effectively to sustainability intensified, involving numerous researchers, practitioners, scientific academies, and development organizations from around the world. By the time of the World Summit on Sustainable Development, held in Johannesburg in 2002, a broadly based consensus had begun to take shape on the most important ways in which S&T has already contributed to sustainability, on what new R&D is most important, and on what stands in the way of getting it done (Clark and Dickson, 2003).

SUSTAINABILITY

The US Environmental Protection Agency considered the sustainable development as a real revolution comparable to the Neolithic Revolution (Agricultural Revolution) when human have been changed from pickers to farmers or to Industrial Revolution of Nineteen Century with the begin of the modern states. It is evident that the concept of environment sustainable development is a real change in the way of considering the relation between humans and the environment. Sustainability has been described as the Three E's: elements, Environment, Equity and Economics. It is clear that the three E's have as central theme the relation between man and the environment and to raise the perfect equilibrium between these elements is probably the most challenging goal that the global society has at present. It will be more important in the future because the growth of the world population and the international economy.

To leave a healthy environment to our future generations we need to consider three aspects: (1) the scientific knowledge to understand what it is occurring to our environment to become sustainable, why it is occurring, where are the limitations, weaknesses and restrictions, and how to transform a non-sustainable system in a sustainable one; (2) the economic conditions to perform the changes; (3) the political mechanisms to obtain the wanted changes.

The former General Secretary of the UN Mr. Kofi Anan, in 2001 declared that *“Only by understanding the environment and how it works, we can make the necessary decisions to protect it. Only by valuing all our precious natural and human resources, we can hope to build a sustainable future. The Millennium Ecosystem Assessment is an unprecedented contribution to our global mission for development, sustainability, and peace.”*

In other words sustainability is achieved only when there is full reconciliation between the economic development, the growing and changing human needs and aspirations on an equitable basis, and the conservation of the limited natural resources, preserving the capacity of the environment to absorb the multiple stresses that are a consequence of human activities (Hay and Mimura, 2006).

At the international level, the Johannesburg Summit (2001), building on the United Nations Millennium Declaration, has defined these priorities in terms of the so-called “WEHAB” targets for water, energy, health, agriculture, and biodiversity.

AGRICULTURE

The agriculture is one of the human economic activities that are strongly affecting the environment in much different ways. We know that agriculture needs to increase yields to feed and sustain the growing world population. But agricultural activities continuously disturb natural conditions which in turn affect agricultural productivity and menace the sustainability of agriculture (Yuya Kajikawa, 2008).

Sustainable agriculture is related to three major aspects: climate change, land use and biodiversity.

1. Climate Change. Agriculture is the major contributing to greenhouse gasses with the 23% of total emission. If we consider the major greenhouse gases we can see that 9% of global CO₂ emission and 49% of methane is coming from agricultural practices and agricultural by-products. Moreover, 90% of nitrogen oxides are produced by agriculture. It is not clear which will be the effect of climate change on agriculture but some papers has reviewed the potential impacts of climate change and air pollutants on plant growth, diseases and soil carbon pools. (Schmidhuber and Tubiello, 2007).

2. Land Use. Land use change is strongly affecting the soil C content which is reduced under the traditional agricultural practices. Emblematic is the so called “corn belt” in USA, that in 50 years of intensive agriculture with a strong use of synthetic chemicals lost 63% of total carbon.

Now days land use change is mainly in less developed countries. In South America land use provoked and emission of 1.5 billion tons of carbon, in Asia around 1.0 billion tons and in Africa 0.5 billion tons. In North America land use determined an emission of 0.2 billion tons (data from Climate Change Information, UNEP, IUC, 1997). All this carbon became CO₂!

3. Biodiversity. Biodiversity is disturbed directly by the agricultural activity. Specialised agriculture is strongly affecting the biodiversity of local areas, invading and disturbing the whole ecosystem. The lost of territories is reducing the sites for wild fauna and the entire system becomes poorer. Very often the rehabilitation of degraded areas with exotic plant species is producing an evident disturbance creating non sustainable environment. Data from UN refer that biodiversity changed slowly in the last 300 years but in the next 40 years world biodiversity will be reduced to 25% as effect of human impact.

The non sustainable characteristic of modern agriculture is evident if we consider that in developed countries the production of 1kcal of food requires 12-13 kcal of inputs while in less developed countries the ratio is only 1 to 3.

Is this a matter of development or it is a better and more rational use of the environment? Probably both reasons but we are now discovering the old systems of production, less aggressive and much more sustainable. Rotations, cover crops, organic production, zero tillage are all practices that we know are eco-compatible, respecting the environment and allowing a sustainable use of the ecosystem.

SUSTAINABILITY SCIENCE

But what is it sustainability science?

Let's consider sustainability science as a multidisciplinary research field promoting science focused in sustainability-related issues in many different fields including agriculture, fishery, forestry, water, energy, economics, sociology, and all other sciences and collecting the outcomes. In this way sustainability can work as a symbolic concept to focus attention on an issue.

Another interpretation is that sustainability science conducts interdisciplinary research that is not performed sufficiently in each discipline-based science. In this case, sustainability science has an important role in educating and promoting people who have multiple skills and perspectives.

Now days the prevalent interpretation of sustainability science is that it is a distinct discipline involved in a transdisciplinary effort over the existing disciplines. So it is something new, with a specific knowledge, specialised on sustainability issues but having a strong link with all disciplines (Yuya Kajikawa, 2008).

In this contest, the Universities have a central and very delicate role. In fact the academia collects the needs of the society and through the research produce knowledge to make more sustainable the production of commodities and food. But probably more important is the function on education that is a key instrument for bringing about changes in knowledge, values, behaviours and lifestyles of the

societies, necessary to achieve sustainability. Contributions from academia are vital to tackle challenges of the global environmental problems such as climate change, desertification, energy consumption, which are related to the continued existence of all humanity.

Sustainability science is not yet an autonomous field or discipline

Its scope of core questions, criteria for quality control and membership are consequently in substantial flux and may be expected to remain so for some time.

Nonetheless, something different is surely “*in the air*,” something that is intellectually exciting, practically compelling, and might as well be called “sustainability science.” The central point of Sustainability Science of is to understand how “the World System” works and how is responding to perturbations. The World System means living and non living components present in the atmosphere, oceans, waters and lands. Moreover, we have to include the immaterial aspects as culture, costumes, languages, and all the typical aspect of complex communities

NETWORKS

It is only very recently that networks of universities are born in different part of the word related to sustainability.

At G8 University Summit in Sapporo in July 2008, international contributions representing academia decided to achieve the sustainability of the global, social and human systems and their mutual relationship and to promote education for sustainable development and construction of an international network through cooperation among universities.

For this G8 University Summit, the presidents of research universities that play leading roles in academia were invited from the G8 nations and other major developed countries as well as major emerging economies, to discuss how we take on the challenge of the global and human issues. The aim was that the results of the discussion would be supported by the G8 and other international consensus-building processes to achieve global sustainability.

Representatives of major universities and research organizations worldwide met again at the University of Tokyo on 5th – 7th February 2009, to foster a deeper understanding of diverse academic approaches to sustainability science and to discuss how to design a framework for integrating, structuring and organizing knowledge generated on and through the practice of sustainability science.

At the conclusion of the conference, participants issued that the effective action is urgently needed to address the serious sustainability challenges the world faces today at all levels: global, regional, national, and local. In order to ensure that sustainability science results in meaningful action, networks that transcend disciplinary, cultural, geographical, and societal barriers are crucial.

Interactions between scientists across many disciplines as well as between scientists and all sectors of society are essential.

While such networks exist at regional and global levels, they tend to be centered in developed countries, to be limited in both scope and participation, and lack of communication and coordination between them.

A network of sustainability networks can help to overcome these barriers to effectiveness and speed the translation of the newly generated knowledge to appropriate action.

In the conclusion the Meeting recommend the creation of a “*Network of Networks*” (NNs) for sustainability science to facilitate effectiveness through the promotion of different aspects. Fundamental is the identification of complementarities so as to reduce duplication of effort and to enhance synergies. Sustainability Science has to guarantee the cultural and geographical diversity in network participation and assure a greater participation of developing countries. The engagement of industry and other stakeholders from both developed and developing countries in the framing and execution of research agendas is another aspect that must be considered. Since 70% of world population is living in the South the Meeting recommend increasing the participation to the network to students and economic sectors of developing countries.

Next appointment will be in June 2010 in Rome where we will evaluate the progress of the promotion of the network and the capacity of interdisciplinary, multidisciplinary, and transdisciplinary nature of sustainability science has to provide fruitful outcomes to society. Moreover we will discuss also how to achieve valuable outcomes through scientific research itself, publishing the results to disseminate them in society.

I would like to conclude my work with the inspired words of a great man, Albert Einstein, that many years ago said: “*We will never solve our problems using the same kind of thinking that caused them in the first place*”.

We should learn from him!

REFERENCES

1. **Clark William C. and Dickson Nancy M., 2003** - *Sustainability Science: the emerging research program*. PNAS vol. 100 no. 14 8059-8061.
2. **Goerner Sally J., Dyck Robert G., Lageroos Doroty, 2008** - *The new Science of sustainability*. Triangle Center for Complex Systems, Chapel Hill, North Carolina, USA.
3. **Hay J. and Mimura N., 2006** - *Supporting climate change vulnerability and adaptation assessments in the Asia-Pacific region: an example of sustainability science*. Sustain Sci. 1(1):23–35
4. **Reitan H. Paul, 2005** - *Sustainability Science-and what's needed beyond science*. Sustainability: Science, Practice and Policy. 1: 77-80
5. **Schmidhuber J., Tubiello F. N., 2007** - *Global food security under climate change*. Proc. Natl. Acad. Sci. USA. 104: 19703-19708) evaluated the potential impact of climate change on food security.
6. **Yuya Kajikawa, 2008** - *Research core and framework on sustainability science*. Sustain. Sci. 3: 215-239.

A METHOD FOR EXPERIMENTAL ASSESSMENT OF HILLSLOPE SOIL EROSION CAUSED BY WATER ACTION

O METODĂ DE ESTIMARE EXPERIMENTALĂ A EROZIUNII VERSANȚILOR DATORATĂ ACȚIUNII APEI

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Abstract. *This paper present an experimental method to assessment the hillslope soil erosion caused by the water action. We present the IMERE installation and the algorithm for the work with these installation. In this paper is shown the working parameters, the experimental data and the final estimators, and so the perspective of the using of these method.*

Key words: erosion, assessment, soil, slope

Rezumat. *Articolul prezintă o variantă experimentală de estimare a riscului de eroziune datorată acțiunii apei pe versanți. Se prezintă instalația experimentală IMERE, concepută la ICDVV Valea Calugarească, precum și algoritmul de lucru folosit pentru obținerea estimatorului final al experimentului: pierderea de sol specifică unității de suprafață, pe eveniment pluvial, precum și a altor estimatori.*

Cuvinte cheie: eroziune, estimare, sol, pantă

INTRODUCTION

Estimating the risk of soil erosion on hillsides located, because the action of water, was a constant concern in the scientific sphere from the first half of the twentieth century and was consolidated in the years 1990 - 2000, the representative theoretical models were perfected in this area. Even if the tools are very modern theoretical and applied, primarily due to their convenience, their mathematical models based on experimental facts and observations are made in tens of years of study. On the other hand, theoretical methods used in the mathematical apparatus, many constants that can not be estimated only experimentally, and the same kind of relationship between groups of parameters. Experiment remains, therefore, absolutely necessary, either for direct estimation of the unknown or the assessment of factors and relationships between process parameters, but also to verify theoretical relationships or in part theoretical. The more so, is within the current empirical method for erosion risk assessment, developed in 2008, [1], [2]. In previous articles about this method, we present installation IMERE, with which to do experiments, [1], and the main results obtained and to investigate applications of this plant in erosion processes, but also in other areas such as agriculture accuracy, [2]

MATERIAL AND METHOD

The results obtained were used using mobile plant for erosion risk assessment, designed and made to ICDVV Valea Călugărească. The installation of erosion experiments conducted using the "rain" artificial, with adjustable intensity. The main elements of installation are:

1. Water source. They used two water sources: one from Drinkable water pressure (5.5 bar) and a network of drinking water without pressure, in this case to use an electrically operated pressure pump having high pressure to 3.5 bar required to run sprinklers

2. The distribution. The distribution, is mounted on a workbench and is composed of a shift valve (which regulates the working pressure, which indirectly regulates the flow of water supplied), metal pipes, pressure gauge which monitors the working to maintain the desired water flow. Water is metered by a watermeter distribute (which helps us to know at any time how much water travels through conducte), after which water is distributed on two parts This distributor has two valves, filters and sockets for quick coupling hose that carries water to the two sprinklers.

3. Wings of spraying. Oscillating sprinklers have been used for spraying on surfaces for rectangular (square or rectangular), with continuous adjustment of working width and amplitude of oscillation as determined area sprayed. Sprayed area (between 28 sqm and 350 sqm) is adjustable in offering very low rates may, within these limits, we want to get any sprayed area, along with measuring the amount of water (by watermeter), to determine the amount of distributed water per square meter.

4. Pipe sediment collection. The pipeline, which acts as a sewer is constructed by cutting in half of a plastic pipe that is chosen by design, in accordance with the expected flow flows. Collection channel and other variations may allow design and construction. It is mounted on the slope, buried in the ground, so that the edge of the pipe to be at the soil surface making it possible to collect water with sediments drilled down.

5. Recipient of sediment core collection. Material flows in the channel collecting water and sediment, fitted with a side slope, is closely meet the boat which is fitted sob collection channel. During experiments, the time until it fills cronometreaza dish, replace with another goal, let it decanters, cut the liquid remaining after that analyzes the solid parts.

6. The link (hoses, fittings, etc..). Water is brought to the mass distribution through a polyethylene pipe diameter 1", connected with a shift valve $\frac{3}{4}$ ", which feeds the distribution system watermeter reducing section of $\frac{3}{4}$ " at two branches of $\frac{1}{2}$ " each, pressure Work is controlled by a manometer 10 bar. From the two branches leaving two hoses $\frac{1}{2}$ " up to two sprinkler installation.

Working principle. To highlight the parameters characterizing the soil (erodible soil between streams, the streams erodible soil and climatic parameters (pluviometric regime, thermal regime, during rain, its maximum intensity) was developed this system which can simulate various regimes pluviometric. It can simulate rain adjusting the main parameters: the intensity (by changing water pressure), duration and the area for distribution. Measure the time and amount of water distributed pending soil erosion.

After installing the phenomenon of detachment and sliding of soil, collected sediment transported. It can also cause soil moisture at different depths after different amounts of water distribution, resistance to penetration in soil at various depths and that moisture. To measure humidity using a device mark TDR 300. To determine the penetration resistance of soil using a device mark SC 900. System operation is based on simulation of artificial rain applied to a rectangular area in the vineyard with a particular slope, which was mounted a gutter to collect water and soil mixture drains. At the end the gutter, water and the soil transportation, running in a settling vessel where there is solid parts of the liquid separation. After separation of the water, weigh the decanted, determine moisture, and obtain the amount of dry soil.

Algorithm testing. Operations carried out in the experiments, which are measured or calculated parameters and their units appear in Table 1.

Table 1

Exp steps and parameters to be measured or calculated in algorithm testing

St.	Technical Operations	Numerical data taken or calculated	U/M
1	<p>Putting into operation: -put in working position, starts wetting the constant pressure and flow, which remain constant throughout the deployment experience, - Determination of soil moisture in the layer from 0 to 20 cm; - Determination of resistance to penetration of soil layer up to 30 cm; - Determination of soil density in the initial humidity in the layer from 0 to 5 cm; -cover crop,%</p>	<p>S - wetted surface area; p - the slope of the land; p₀ - pressure water plant; t₀ - watering during the beginning; i₀ - initial index of the water meter; u₀ - initial moisture content of soil in Zone 0 - 20 cm; r₀ - resistance to penetration by the first 30 cm depth (average and variation); ρ_{u0} - soil density in the surface layer between 0 and 5 cm; V_c - cover crop m2</p>	<p>m² degrees N/m² s m³ % N/m² kg/m³ m²</p>
2	<p>Leak early registration material posted. Allow to continue watering..</p>	<p>t_c - is observed during the early leak posted material; i_c - index of water meter at the time of observation start material flow seconded; p_c - water pressure in the plant at the time of start material flow seconded h_{max} - maximum height of fall of drops of rain; h_{med} - the average height of fall of drops of rain; m_p - mass of an average drop of water was</p>	<p>s m³ N/m² m m kg</p>
3	<p>Measurement - stage begins once the material flow is observed seconded. The leaking material collected in containers known capacity, preferably equal, denoted in order of filling containers (buckets). At this point allow to continue watering until filled 4 to 5 containers. Then stop watering. The collection will continue until the end of the flow of material posted, taking care to take over the pipeline or pipelines material collection.</p>	<p>t_f - during which water supply is stopped; i_f - index the water meter when water supply shutdown masters, t_{fi}, i=1,2,...,n times the initial filling of containers; t_{fi}, i=1,2,...,n, end times filling the containers; n_f: index last closed container filled before the water supply (nf <n)</p>	<p>s m³ s s</p>
4	<p>Weighing the evidence: The contents of each container is subject to a process of extraction of soil (dry) and then weigh the dry soil (0% humidity)</p>	<p>m_i, i=1,...,n, masses of soil contained in the containers with the same index; ρ - density kg dry soil</p>	<p>Kg kg/m³</p>

5	Calculating specific	Calculation Formulas	
5.1	The total amount of water given:	$A = i_f \cdot t_0$	m ³
5.2	The amount of water administered until the flow::	$A_c = i_c \cdot t_0$	m ³
5.3	Average flow of water supplied::	$Q = \frac{A}{t_f - t_0}$	m ³ /s
5.4	The amount of water necessary to trigger specific unit surface flow	$a_c = \frac{A_c}{S}$	m
5.5	The amount of water specified unit area, given the entire period:	$a = \frac{A}{S}$	m
5.6	Debitul specific unitații de suprafață:	$q = \frac{Q}{S}$	m/s
5.7	The total mass of dry soil collected:	$M = \sum_{i=1}^n m_i$	kg
5.8	Mass of soil collected from the emergence of flow by the end of water supply	$M_1 = \sum_{i=1}^{n_f} m_i$	kg
5.9	Overall loss of specific unit area per event:	$P = \frac{M}{S}$	kg/m ²
5.10	Global loss of hectare per event:	$Pha = 10 \cdot P$	tone/ha
5.11	Overall loss of soil specific surface unit and flow unit pluviometric:	$\phi = \frac{P}{Q}$	kg·s/m ⁵
5.12	Overall loss of soil specific surface unit and flow unit pluviometric specific unit area:	$\psi = \frac{P}{q}$	kg·s/m ³
5.13	Local variation of escape speeds posted material:	$\mu_i = \frac{m_i}{t_{rfi} - t_{rii}}$	kg/s
5.14	Chart speed variation of leakage of material posted in time: it will separate the duration of flow and appearance of water flow and supply decoupling. The coord. of the points chart are:	Coord. point of grafic are: $\left(\sum_{k=1}^i (t_{rfk} - t_{rik}) + \frac{t_{rfi} - t_{rii}}{2}, m_i \right)$	
5.15	Estimator coarse annual soil loss per hectare, for a given system pluviometric, PL, mm	$Phaa = \frac{Pl \cdot Pha}{1000 \cdot a}$	t/ha pe an
5.16	The total duration of watering	$T = t_r - t_0$	s
5.17	Flow Duration watering until the emergence	$T_c = t_c - t_0$	s
5.18	Length of slope (plot watered)	L	m
5.19	Rain intensity	$I = \frac{A \cdot 1000}{S}$	mm

5.20	Hourly rain intensity	$i = \frac{A \cdot 3600}{T}$	mm/h
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Experiments were performed in the vineyards of ICDVV Valley Calugareasca, provided that the work presented in Table 2.

Table 2

Working conditions in experiment

Nr.	Experimental conditions	Experiment					
		A	B	C	D	E	F
1	plot	Lizimetre	Lizimetre	Bazin apa	Ferma 4	Ferma 4	Lizimetre
2	Date exp.	03.04	13.05	04.06	25.06	26.06	16.10
3	Slope land,%	7.10	7.10	18.00	10.13	10.13	7.40
4	Times the rows	hill-valley	hill-valley	curve at hill	hill-valley	hill-valley	hill-valley
5	Distance between rows	3.00	3.00	2.00	2.00	2.00	3.00
6	Breadth of m wetted surface	6.00	6.00	6.00	6.00	6.00	6.00
7	Length of m wetted surface	14.00	14.00	8.40	9.00	9.00	13.00
8	Area wet, mp	84.00	84.00	50.40	54.00	54.00	78.00
9	Layer Humidity 0 to 20 cm,%	15.01	14.72	10.03	17.74	27.77	15.00
10	num plants / sqm	0	218	118	94	94	65
11	Selling pressure water	network	network	water pump	network	network	network
12	Soil type	Clay-sand	Clay-sand.	Clay-sand	Clay-sand.	Clay-sand	Clay-sand.
13	Working pressr	4.00	4.00	2.80	4.00	4.00	4.00
14	High maxim fall drops	4.66	4.66	3.70	4.66	4.66	4.66

RESULTS AND DISCUSSIONS

For use in simulation work, and capacity simulation for verification of various models and programs, is presented in Table 3 the main experimental results of experiments conducted with facility IMERE primary in 2008. Processing was done with the design software and data processing described above.

Table 3

Preliminary experimental results in 2008

	Exp. A	Ezp. B	Exp. D	Exp. E	Exp. F
Plot width, m	6.00	6.00	6.00	6.00	6.00
Length of plot, m	14.00	14.00	9.00	9.00	13.00
Length of plot, m	84.00	84.00	54.00	54.00	78.00
Initial humidity,%	15.01	14.72	17.74	27.77	15.00
water administered m3	0.627	3.3838	6.0629	1.4021	9.917

Rainfall intensity, mm	7.464	40.283	112.276	25.965	127.141
Watering duration, hours	0.41	2.30	4.00	0.98	6.63
Intensity per hour of watering, mm / hour	18.355	17.489	28.051	26.480	19.171
Loss of soil/m², per event, kg/m²	0.0197	0.0041	0.0124	0.0097	0.0027
Up until the quantity of water flow, m ³	0.204	2.9778	5.8838	1.2309	9.518
Time to onset of flow, hours	0.13	2.03	3.88	0.87	6.37

CONCLUSIONS

1. The plant can estimate the risk of erosion by implementing control measures, as can be verified effectiveness of measures taken;

2. Erosion was directly influenced by land slope, the quantity of water supplied, the degree of imburuienare, rows orientation, previous work the soil and initial soil moisture;

3. Facility to estimate the risk of erosion under controlled pluviometric serve its purpose for which it was designed: it can estimate not only the quantity of soil lost by erosion, but also other parameters such as soil erosion rate of the intensity "rain" , pre-existing soil moisture influence on the intensity of erosion, other information of practical and scientific interest;

4. The plant reaches a good quality level of watering, consistency is the main parameter for assessment in this regard. The wetting capacity of the plant also allows simulation of the slow pluviometric schemes to critical events - rainfall, so that erosion can be estimated for various events pluviometric

5. The plant, with small gauge and ease of location in this device, it has characteristics of mobile facilities, easily transported in a vehicle for small dimensions, in various locations, to estimate soil loss under controlled pluviometric.

REFERENCES

1. Herea V., Cârdei P., Raluca Sfiru, 2008 - *Experimental determination of the soil erosion measures*. 7th international symposium prospects for the 3rd millenium agriculture, october 2-4, University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca;
2. Herea V., Cardei P., 2008 - *Installation and procedure for slope erosion assessment, caused by the water action, in control rain*. Simpozionul international Engineering and management of sustainable developement in agriculture, transports and food industry, INMATEH 2008 – II, Bucuresti.
3. Farsang A., G. Kitka, K. Barta, 2001 - *Modelling of soil erosion and nutrient transport to serve watershedmanagement: case study in a subwatershed of Lake Velence in Hungary*. Hungarian Ministry of Education, FKFP research grant 0203/2001 and OTKA research grant F37552;

THE INFLUENCE OF WATER WORKS ON THE FLOW REGIME OF TAITA CATCHMENT

INFLUENȚA LUCRĂRILOR HIDROTEHNICE ASUPRA SCURGERILOR MEDII ÎN BAZINUL HIDROGRAFIC TAIȚA

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Abstract. *Taita is the most important fluvial system in Dobruja, flowing into Babadag Lake through a 22.5 km long arranged channel. The surface of the catchment of Taita is 591 km² and 0.18 km² arranged with various developments. The methodology presented in this paper and applied to Taita catchment consists of the analysis of the temporal characteristics and the identification of discontinuities in flow time series in order to determine the influence of water works on the flow regime of this river.*

Key words: statistical analysis, flow regime, impact, hydraulic works

Rezumat. *Taita este cel mai important sistem fluvial din Dobrogea, ce se varsa in lacul Babadag printr-un canal amenajat cu o lungime 22,5 km. Bazinul hidrografic Taita are o suprafata de 591km², din care 0,18km² sunt suprafete amenajate cu diverse lucrari. In acest articol se va prezenta o metodologie statistica de determinare a discontinuitatilor in seria temporală de debite medii cu scopul de a determina inflenta lucrarilor hidrotehnice asupra regimului curgerii medii a acestui rau.*

Cuvinte cheie: analiza statistica, regimul debitelor, lucrari hidrotehnice, impact

INTRODUCTION

One of the main stakes in hydrology is the characterization and the quantification of the human influence on the hydrological regime. The improvement of the available knowledge in this matter is slow, due to the huge complexity of the matter.

Over the past several years, a number of studies have been published on the analysis of instrumental records mainly to seek temporal changes in river flow regimes; examples include Lins and Slack (1999), Ouarda et al. (1999), Hisdal et al. (2001), Robson (2002), Burn and Hag Elnur (2002), Yue et al. (2003), Lindstrom and Bergstrom (2004), Kundzewics et al. (2005), Rood et al. (2005), Hannaford and Marsh (2006), among many others.

The methodology presented in this paper and applied to Taita catchment consists of the analysis of the temporal characteristics and the identification of discontinuities in flow time series in order to determine the influence of water works on the flow regime of this river.

MATERIAL AND METHODS

Dobruja or Dobrudja (Dobrogea in Romanian) is a region situated in the South – East of Romania (Fig.1). Generally, Dobrudja's climate is temperate - continental and is divided in 2 units (Fig.1): a unit (I) consisting of the Danube Delta, its south, the two lagoons (Razim Lake and Sinoe Lake) and the eastern region; and another unit (II) consisting of the rest of territory, while the climate is influenced by the moderate continental belt [17].

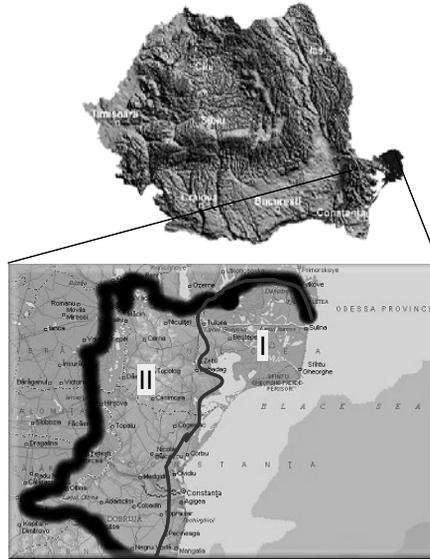


Fig. 1 – Dobrudja region

Due to the sinkhole relief, the climate, and by anthropic factors, Dobrogea has a reduced hydrographical network potential (density varies from 0.01 km/km^2 in Southern Dobrudja to 0.23 km/km^2 in Northern Dobrudja and 1.97 km/km^2 in the Danube Delta). The hydrographical network of Dobrudja is made up of two drainage basins groups: one of the Danube and the other of the seaside. In the seaside river group there are the rivers from the central-north part (NE subgroup) and those from SE group. The NE subgroup is formed of the following rivers: Tulcea (14 km), Telita (48 km), Taita (57 km), Slava (38.8 km), Hamangia (33 km), Nuntasi (10 km) and Casimcea (58 km). The SE subgroup is formed of the following important rivers: Dereaua (7 km), Dulcesti and Albesti. The hydrological data that we have used in this paper were obtained from the archives of the Company "Apele Romane – Dobrogea Litoral". Taita is the most important fluvial system in Dobrudja, flowing into Babadag Lake through an arranged channel. Taita has a catchment with a surface of 591 km^2 and is 57 km long. Taita has an asymmetrical catchment, with a 0.28 coefficient of asymmetry, well developed on the left, which is where most of the confluents come from. The quota at the river head is 240 m, and at the mouth 0 m, with a medium fall of 4%. The sweep coefficient of the catchment is 1.35 [16]. Precipitations are one of the main sources of supply of this river – 74%, compared to the subterranean supply – 24% [17]. The main affluents of the river and their characteristics are presented in the table 1. The anthropic works of the Taita catchment are presented in Table 2. From the total of 591 km^2 , the surfaces arranged with various water works sum up to 0.18 km^2 . On Taita catchment there are 2 hydrometric stations, the characteristics of which are presented in Table 3.

Table 3

Characteristics of the hydrometric stations of Taita catchment			
River	Station	Quota	Surface (mp)
Taita	Hamcearca	210	102
Taita	Satu Nou	151	565

The methodology presented in this paper and applied to Dobrudja region consists of an analysis of the temporal characteristics and the identification of the discontinuities in flow time series. In order to determine the discontinuities in flow regime in the period 1965 (1968) – 2005, some homogeneity and break test are performed. We defined break as a change of the probability law at a certain moment [5]. The break tests permit the detection of a change in a time series mean. The methods used to detect a break are: Pettitt test [11], the test “U”- Buishand [1], Lee and Heghinian test [8] and the segmentation procedure of Hubert [5].

Pettitt test is a non-parametric one. The null hypothesis that must be tested is: H_0 : There is no break in the series $(X_i)_{i \in \overline{1, N}}$.

Hubert’s segmentation procedure detects the multiple breaks in time series. The principle is to cut the series in m segments ($m > 1$) such that the calculated means of the neighbours sub-series significantly differ. To limit the segmentation, the means of two contiguous segments must be different. This constraint is satisfied by the Scheffe’s test application. This method gives the moment of the breaks.

RESULTS AND DISCUSSIONS

The variation of the annual mean flow at the two stations, Hamcearca and Satu Nou, is presented in the figures 2 and 3. At Hamcearca station we observe that the mean annual flows are higher than the multi-annual mean (0.066 mc/s) in the periods 1965-1974, 1997-2000 and 2004-2005. The values of the mean annual flows are beneath the multi-annual mean in the periods 1974-1997, with two exceptions, 1981 and 1982, when the values of the flow are 0.082 and 0.084 mc/s respectively, and 2001-2004.

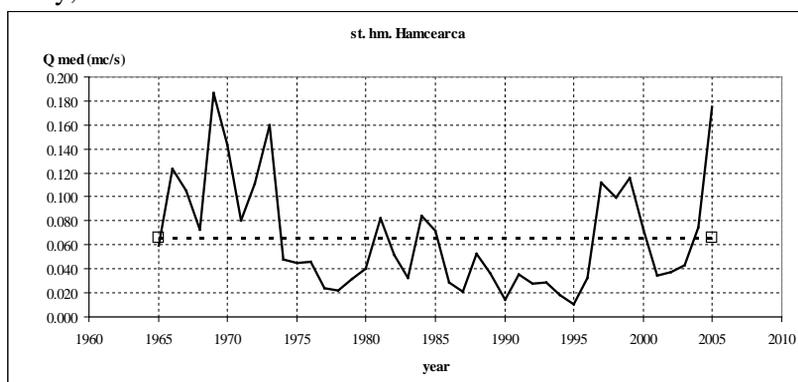


Fig. 2– The mean multi-annual flow (period 1965-2005) for the Hamcearca hydrometric station

Table 1

The Characteristics of the affluents of Taita River

Water flow	Order	Position of confl.	L (km)	I (km)	H head (m)	H mouth (m)	Medium fall (m/km)	Ks coefficient of sinuosity	F (kmp)	Network density (km/kmp)
Curaturi	1	d	7	5	186	109	11	1.23	34	0.21
Parlita	1	s	10	3	270	93	17	1.3	32	0.31
Islam	1	s	7	2	160	53	15	1.13	15	0.47
Lodzova	1	s	15	3	200	47	10	1.24	45	0.33
V. Teilor	2	s	5	3	246	137	22	1.15	16	0.31
Alba	1	s	11	3	170	35	12	1.24	34	0.32
Tilchilic	2	s	6	2	190	66	21	1.33	13	0.46
V. Carierei	1	d	11	7	152	45	10	1.14	79	0.14
Luparia	2	d	7	2	250	45	29	1.81	16	0.44
Taita	1	s	17	5	126	18	6	1.14	80	0.21

Table 2

The arrangements on Taita River

No.	Water Work	Flow	Locality	Characteristics	Owner	Year of functioning
1	Attenuation dam	Taita	Up-river from Horia (TL)	1670 ha lake	ANIF (TL)	1971
2	Regularization	Taita	Conf. lake Zebil (Razim) up to Horia	L 22.5 km		1983
3	Irrigations		Izvoarele	14 ha		Approx. 1970-1975
4			Iulia	20 ha		
5			Balcescu	30 ha		
6			Turda	14 ha		

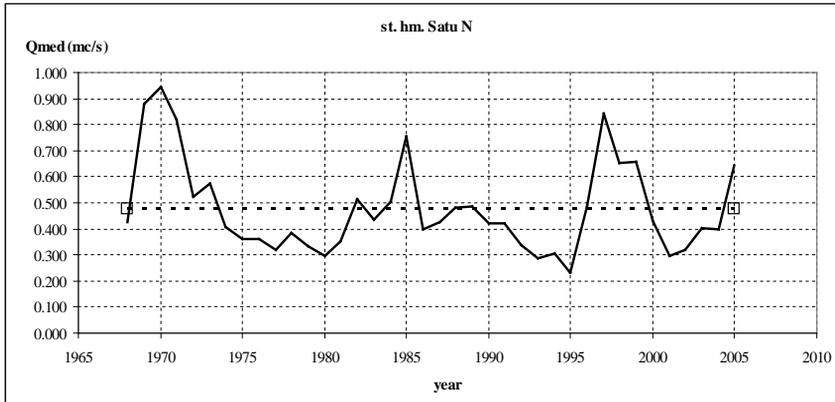


Fig. 3. The mean multi-annual flow (period 1965-2005) for the Satu Nou hydrometric station

At Satu Nou station, downstream, close to the mouth, the situation is almost identical: the periods in which the values of the mean annual flows are higher than the multi-annual mean (0.477 mc/s) are 1968-1974, 1996-2000 and 2004-2005, while the periods in which the values of the mean annual flows are lower than the multi-annual mean are 1974-1996 (with one exception – 1985 – 0.75 mc/s) and 2000-2004. The highest values of the annual mean flows were registered in 1969 (0.187 mc/s) at Hamcearca station and in 1970 (0.945 mc/s) at Satu Nou station.

Only the Pettitt and the Hubert tests were applied for the two stations, as the other tests require the normality test, or, generally, debit flow values don't follow a normal law.

At Satu Nou station, the application of the Pettitt test leads to the inexistence of any discontinuity in the series of values. The Hubert test identifies a break in 1971, thus the values at this station may be divided in two sub-series: 1968-1971 – with a mean multi-annual flow of 0.750 mc/s and 1972-2005 with a mean multi-annual flow of 0.441 mc/s, closer to mean multi-annual flow of the whole series (0.447 mc/s). If we disregarded the condition of normality the Lee and Heginian test leads to the same result, namely a break in the year 1971.

For the Hamcearca station, the results of Pettitt and Hubert tests are the following: Pettitt test identifies a break in the year 1973, the null hypothesis being rejected for the 90% probability; Hubert test also identifies a discontinuity in the year 1973, thus resulting two series of values: 1965-1973 (with a multi-annual mean of de 0.122 mc/s) and 1974-2005 with a multi-annual flow mean de 0.052 mc/s.

CONCLUSIONS

In this paper we tried to identify the influence of the water works in Taita catchment on the Taita River flows. The influence of these works was shown through statistical tests that determine break points in temporal flow series. We chose 4 categories of tests, of which 2 have been used: Pettitt and Hubert.

We observed that, at both stations, we found a break in the analyzed series. The break was in approximately the same period for both Satu Nou station and Hamcearca station (in 1971 and in 1973 respectively). This situation is certainly due to the building of the upriver dam of Horia, in 1971 and to its functioning the next years, and to the realization of the irrigation systems at that time.

For this reason, at Hamcearca station we noticed a drop to almost a half in the multi-annual mean flow and at Satu Nou station the value of the flow dropped 0.3 mc/s.

REFERENCES

1. Buishard T. A., 1984 - *Tests for detecting a shift in the mean of hydrological time series*. Journal of Hydrology vol. 58, pp. 51-69.
2. Burn D.H., Hag Elnur M.A., 2002 - *Detection of hydrologic trends and variability*. J. Hydrol. 255, 107–122.
3. Hannaford J., Marsh T., 2006 - *An assessment of trends in UK runoff and low flows using a network of undisturbed catchments*. Int. J. Climatol. 26, 1237–1253.
4. Hisdal H., Stahl K., Tallaksen L.M., Demuth S., 2001 - *Have streamflow droughts in Europe become more severe or frequent*. Int. J. Climatol. 21, 317–333.
5. Hubert P., J. P. Carbonnel, 1993 - *Segmentation des séries annuelles de débits de grands fleuves africains*. Bulletin de liaison du CIEH 92, pp. 3-10
6. Ins H.F., Slack, J.R., 1999. *Streamflow trends in the United States*. Geophys. Res. Lett. 26 (2), 227–230.
7. Kundzewics Z.W., Graczyk D., Maurer T., Pinskiwar I., Radziejewsky M., Svensson C., Szwed M., 2005 - *Trend detection in river flow series: 1. Annual maximum flow*. Hydrol. Sci. J. 50 (5), 797–810.
8. Lee A. F. S., Heghinian S. M., 1977 - *A Shift of the Mean Level in a Sequence of Independent Normal Random Variables - A Bayesian Approach*. Technometrics vol.19, n°4, pp. 503-506.
9. Lindstrom G., Bergstrom S., 2004 - *Runoff trends in Sweden, 1807–2002*. Hydrol. Sci. J 49, 69–83.
10. Ouarda T.B.M.J., Rasmussen P.F., Cantin J.F., Bobée B., Laurence R., Hoang V.D., Barabé G., 1999 - *Identification of a hydrometric data network for the study of climate change over the province of Quebec*. Rev. Sci. l'eau 12 (2), 425–448.
11. Pettitt A. N., 1979 - *A non - parametric approach to the change-point problem*. Applied Statistics vol.28, n°2, pp. 126 - 135.
12. Robson A.J., 2002 - *Evidence for trends in UK flooding*. Philos. Trans. Roy. Soc. London Ser. A 360, 1327–1343.
13. Rood S.B., Samuelson G.M., Weber J.K., Wywrot K.A., 2005 - *Twentieth-century decline in streamflows from the hydrological apex of North America*. J. Hydrol. 306, 215–233.
14. Yue S., Pilon P., Phinney B., 2003 - *Canadian streamflow trend detection: impacts of serial and cross-correlation*. Hydrol. Sci. J. 48 (1), 51–63.
15. ***, 1971 - *Raurile Romaniei – Monografie hidrologica*, Institutul de Meteorologie si Hidrologie, Bucuresti
16. ***, 1968 - *Studii de hidrologie XXIII – Monografia hidrologica a raurilor si lacurilor din Dobrogea*. Bucuresti
17. ***, 1983 - *Geografia Romaniei I Geografia Fizica*. Edit. Academiei, Bucuresti

CARTOGRAPHIC AND SPECIALIZED DATABASE FOR THE INFORMATION SYSTEM OF THE VITICULTURE CADASTRE

BAZA DE DATE CARTOGRAFICE ȘI DE SPECIALITATE PENTRU SISTEMUL INFORMAȚIONAL AL CADASTRULUI VITICOL

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Abstract. *The general cadastral survey is a unitary and mandatory information system of technical, economic and juridical evidence of all the parcels from the entire territory of Romania. By specialized cadastre, one achieves detailed technical and economic sub-systems of systematic evidence and inventory of real property, based on data extracted from the general cadastre, with regard to area size, usage category and landownership. The viticulture cadastre has the role of creating a system of technical and economic record for vineyards as well as for the buildings afferent to the national viticulture patrimony. In order to create a cartographic and specialized cadastre database for viticulture, we have studied a **vineyard** of approximate **10.00 ha** from the “**Vasile Adamachi**” horticultural farm of the Experimental Station of Iasi. The delimitation and the measurements of the vineyard were carried out by land survey with a TC 705 Leica Total Station and by employing all the technical operations typical for viticulture cadastre. The cartographic localization and the conventional graphs for the measured field was done on the sheets of the cadastral plan of the extra-urban territory from Iasi Municipality, at scale 1:2 000.*

Key words: general cadastre, viticulture cadastre, cartographic base, informational system, specialized technical data

Rezumat. *Cadastrul general reprezintă sistemul informațional unitar și obligatoriu de evidență tehnică, economică și juridică a tuturor terenurilor de pe întregul teritoriu al României. Prin cadastrarele de specialitate se realizează subsisteme de evidență și inventariere sistematică a bunurilor imobile sub aspect tehnic și economic, pe baza datelor de bază extrase din cadastrul general, cu privire la suprafață, categoria de folosință și proprietarul terenului. Cadastrul viticol are rolul să realizeze sistemul de evidență tehnică și economică a terenurilor plantate cu viță de vie, precum și a celorlalte bunuri imobile aferente patrimoniului viticol național. Pentru realizarea bazei de date cartografice și de specialitate a cadastrului viticol, s-a luat în studiu un **areal viticol** de aproximativ **10,00 ha** din ferma horticola „**Vasili Adamachi**” a Stațiunii Experimentale Iași. Delimitarea și măsurarea arealului viticol s-a efectuat pe baza ridicării topografice cu stația totală TC 705 Leica și a realizării tuturor operațiilor tehnice specifice cadastrului viticol. Încadrarea cartografică și reprezentarea grafică convențională a terenului măsurat s-a realizat pe foile planului cadastral al extravilanului municipiului Iași, la scara 1:2 000.*

Cuvinte cheie: cadastru general, cadastru viticol, baza cartografică, sistem informațional, date tehnice de specialitate.

INTRODUCTION

The introduction of the general and specialized cadastre, compatible with the one used in the European Union, implies the improvement of the measurements and of the methods employed to elaborate complex documentation concerning the technical, economic and legal aspects. The automation of the cadastral system using the GPS technology and the ortophotoplans ensures the realization of a complete database. In this context we quote the definition of the modern concept „*Cadastre 2014 is a public systematic inventory of data concerning all legal land objects within a certain country or district, based on a survey of their boundaries*”.

The viticulture cadastre is a unitary mandatory system of technical, economic and legal records for vineyards, as well as of the buildings afferent to the national viticulture patrimony (1). The unitary information system of the viticulture cadastre aims to identify, measure and register in the cadastral documents all the territorial units afferent to planted vine areas and of those in preparation for planting (3).

The graphic database of the viticulture cadastre, in digital form, reveals on the basic cadastral plans, at scale 1:1 000 and 1:2 000 for the vine farms and vine centers and on the overall plans at scale 1:5 000, 1:10 000 and 1:25 000 for the vineyards and vine regions (4). For delimitation and conventional graph representation of the measured parcels was used the existing cadastral documentation which includes: cadastral plans, ortophotoplans, establishment and organization projects of the vine regions.

MATERIAL AND METHOD

The achievement of the general cadastre and the establishment of a database proper to the viticulture cadastre, shall be carried out in accordance with Law no. 7/1996, with its amendments and further additions. Based on specialized measurements, was prepared the technical documentation, which stands out with its digital and analogical form, on surveying plan trapeziums with the official nomenclature of the territory of Romania (2, 5).

In order to create a cartographic and specialized cadastre database to be implemented in the vineyard cadastre, was carried out an experimental study on a vine area located on the “*Vasili Adamachi*” farm from the Experimental Station of the University of Agricultural Sciences from Iași. The experimental study was carried out on an area of approximate 10.00 ha and was divided into:

- **Cartographic localization** of the vineyard on the sheets of the cadastral plan, at scale 1:1000
- **The calculation of the cartographic base of the trapeziums**, at scale 1:1000, in the Local Projection System Iasi and in the Stereographic Projection System - 1970.
- **The delimitation and surveying of the vineyard** using the 3D traverse technique combined with radiation, **TC 705 Leica Total Station**, with the precision of the 5^{cc} (400 gon) angles and of 5 mm + 2 ppm distances (infrared) measurements.
- **The storage on informational support** of the technical and specialized database for the viticulture cadastre: landownership, location, land use category,

cadastral number, area, variety of vine, type of the culture, the direction of production, planting density, age and state of the plantation.

RESULTS AND DISCUSSIONS

The cadastral territory of Iasi municipality is geographically limited between $47^{\circ}06'45''$ Southern and $47^{\circ}13'30''$ Northern latitude and respectively, between $27^{\circ}28'45''$ Western and $27^{\circ}41'50''$ Eastern longitude. The establishment of the general cadastre for Iasi municipality was firstly achieved between 2005-2008, and the present stage that is between 2009-2012 is responsible for the implementation and finishing of the technical and specialized database, at the parcel level. The today area of Iasi municipality cadastral territory is represented on 103 plan sheets, at scale 1:2000 and on 347 plan sheets at the scale 1:1000.

a. Cartographic localization of the vinyard

The location of any real estate can be identified from the general plan of the administrative territory of Iasi municipality, which also includes the urban land mentioned in the General Urban Plan (GUP). The vineyard from „*Vasili Adamachi*” farm has approximately 10.00 ha and was represented on sheets of the cadastral plan at scale 1:2000, with the official trapezium nomenclature: **L-35-32-A-c-3-II-3**, and on two sheets of the plan at scale 1:1000, with the nomenclature: **L-35-32-A-c-3-II-3-b** and **L-35-32-A-c-3-II-3-d** (figure 1).

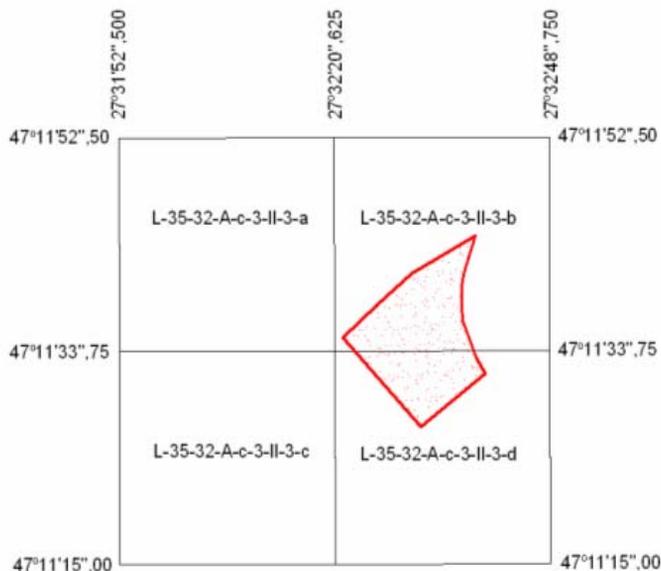


Fig. 1. Cartographic localization of the vineyard - „*Vasili Adamachi*” farm on the sheets of the cadastral plan at scale 1:1000

b. The calculation of the cartographic base of the trapeziums

For the calculation of the mathematical base of the cadastral plan at the scale 1:1000, were used the geographical coordinates (φ , λ) of the trapeziums corners of the Krasowski ellipsoid – 1940 (figure 1) and the rectangular

coordinates (X, Y) from the local Stereographic Projection Iasi and Stereographic Projection of the unique secant plan – 1970.

In the case study was established the mathematical model necessary to work out the sheets of the plan at the scales 1:2000 and 1:1000, in digital and analogical format. From the calculated elements for the identified cartographic trapeziums of the vineyard cadastral area, can be mentioned: the dimensions and the areas on the reference Krakowski ellipsoid – 1940, on the local Stereographic Projection–Iași, with Golia being the central point, and on the Stereographic Projection on the unique secant plan – 1970 and, respectively, the areolar total deformations (table 1).

Table 1

The areas and the areolar total deformations on sheets of the basic cadastral plan at scale 1:1000

The nomenclature of the trapeziums at scale 1 : 2000 and 1 : 1000	The areas of the geodetic trapeziums on the reference surfaces			Areolar total deformations on the projection plan (ΔT_s)	
	Krasowski Ellipsoid KA-40	Local STEREO Projection of Iași	STEREO 1970 Projection	Local STEREO Projection of Iași	STEREO 1970 Projection
	ha	ha	ha	m ²	m ²
L-35-32-A-c-3-II-3	137.1310	137.0340	137.1558	-970	+248
L-35-32-A-c-3-II-3-a	34.2811	34.2591	34.2873	-220	+62
L-35-32-A-c-3-II-3-b	34.2811	34.2591	34.2874	-220	+63
L-35-32-A-c-3-II-3-c	34.2844	34.2564	34.2905	-280	+61
L-35-32-A-c-3-II-3-d	34.2844	34.2594	34.2906	-250	+62

Taking into account the dimensions of the areolar total deformations (ΔT_s) of the two cartographic projections related to the undeformed areas of the trapeziums on the Krakowski ellipsoidal surface-1940, there can be noticed negative deformations for the local Stereographic Projection of Iasi municipality and positive deformations for the Stereographic Projection – 1970.

The numeric values of the areolar deformations of the sheets of the cadastral plan were also differentiated, depending on the position of the trapeziums with respect to Golia central point, for Iasi local Projection and respectively, with respect to the pole of the Stereographic Projection – 1970, situated North of Fagaras city. For the sheets of the cadastral plan at the scale 1:2000, the areolar total deformations were situated between **-970 m²** (on the local stereo plan-Iasi) and **+248 m²** (on the stereo plan-1970). For the sheets of the cadastral plan at scale 1:1000, the variation of the areolar total deformations were situated between **-220 m²** and **-280 m²** (on the local stereo plan-Iasi) and, respectively, between **61 m²** and **63 m²** (on the stereo plan–1970).

c. The delimitation and surveying of the vineyard

The following automatized operations were realized using the TC 705 Leica Total Station and suitable softwares: the transfer and storage of the data on the computer, the drawing of the plan, the printing of the plan, editing (figure 2).

The vineyard was placed in the category: „*noble vine plantation (NV), fruit-bearing, for wine consumption*”, and the vine went on the record as being exploited for over 30 years.

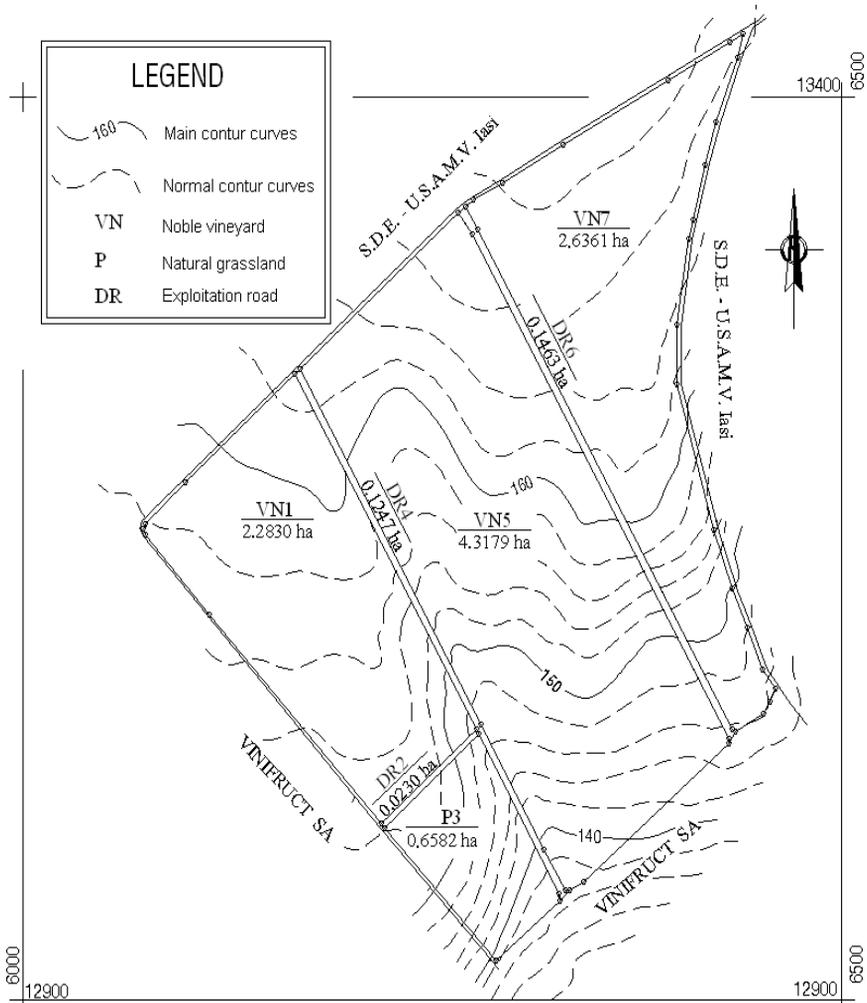


Fig. 2. The cadastral plan of the vineyard from the „Vasili Adamachi”-S.E. farm Iasi

For the calculation of the total surface of the vineyard defined by the 49 contour points and seven composing lots, were used the rectangular plan coordinates folder (X, Y) from the local Stereographic Project System-Iasi and the Stereographic Projection – 1970. The calculation was performed automatized system using the general relationship:

$$-2S = \sum_{i=n}^n X_i (Y_{i+1} - Y_{i-1}) \quad \text{and} \quad +2S = \sum_{i=n}^n Y_i (X_{i+1} - X_{i-1})$$

The centralizing record for the two systems of projections was drew up based on the calculation of the cadastral land lots (table 2).

Table 2

Cadastral lots areas and projection systems

Cadastral lot number	Local plan Iași		STEREO-1970 Plan		Area differences
	1983	2008	2004	2008	(Stereo'70 - Local Iași)
	ha	ha	ha	ha	ha
VN ₁	2.9379	2.2830	2.2800	2.2842	0.0012
DR ₂	-	0.0230	0.0200	0.0230	0.0000
P ₃	-	0.6582	0.6700	0.6585	0.0003
DR ₄	0.1381	0.1247	0.1200	0.1248	0.0001
VN ₅	4.3762	4.3179	4.3200	4.3203	0.0024
DR ₆	0.1452	0.1463	0.1500	0.1464	0.0001
VN ₇	2.5753	2.6361	2.5800	2.6375	0.0014
Total	10.1621	10.1892	10.1400	10.1947	0.0055

Depending on the areolar deformations from the vineyard, if the Stereographic Projection 1970 is used, a difference of +55 m² can be noticed with respect to the Iasi local Projection of the area measured in 2008.

In order to establish the information system of the cadastral records at the level of land lots, the typical data for the viticulture cadastre are being stocked.

CONCLUSIONS

1. The areas assessment on the sheets from the cadastral plan revealed negative values regarding the local Projection-Iasi and respectively, positive ones with respect to the Stereographic Projection – 1970, related to the undeformed areas on the ellipsoid.

2. Based on the measurements done with the total station, was drawn up the technical database for a vineyard the size of about **10.1947 ha**.

3. Adopting the Stereograph Projection - 1970 for the general cadastre of Iasi territory, means that the calculation of the land areas should be done by correlations with the control areas of the geodezic trapeziums.

REFERENCES

1. **Moca V., Radu O., Fronea Loredana, Chirilă C., 2002** – *Realizarea bazei de date tehnice și de specialitate a sistemului informațional pentru cadastrul viticol*. Lucrări Științifice, anul XXXV – vol. 1 (45), p. 439-448, ISSN 1454-7376, seria Horticultură. Editura „Ion Ionescu de la Brad”, Iași.
2. **Moca V., Popia A., Sălceanu Gh., 2006** – *Studies of the Linear and Surface Deformation of Cartographical Projections used in Introduction Works of general Survey in Iasi City*. RevCad Journal of Geodesy and Cadastre, no. 6, p. 19-28, ISSN 158 - 2279. Eternitas Publishing House Alba Iulia.
3. **Novac Gh., 2006** – *Cadastre de specialitate*. Editura Solness, Timișoara.
4. ^{xxx}, **2000** – *Norme metodologice de realizare și ținare a Cadastrului Viticol*. Monitorul Oficial, partea I-a, anul XII, nr. 212, ISBN 978-973-567-581-3, București
5. ^{xxx}, **2007** – *Cadastrel și Publicitatea Imobiliară*. Ediția a III-a, Regia Autonomă „Monitorul Oficial”, ISBN 978-973-567-581-3, București.

THE MONITORING OF THE WATER QUALITY FROM THE ARTIFICIAL ACCUMULATION BARRAGE IȘALNIȚA

MONITORIZAREA CALITĂȚII APELOR DIN ACUMULAREA ARTIFICIALĂ- BARAJ IȘALNIȚA

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Abstract. *The study is based on monitoring the water quality from the Isalnita barrage between the years 2007-2008 and consist in the emplacement of the hydro dam, aspects regarding the water treating .In this study are shown general aspects regarding the elements of forest mensuration and other aspects of the water pollution load, this being settle doing some physical and chemical tests.We have established both pshysical and chemical properties of major importance in finding the water quality class in the studied years. The obtained results range between one year to another, but, putting them in the permissible limits for the first and second class of water quality.This barrier lake has a potential and relevant impact being either positive or negative for the environment. Also, the study reveals that the barrier lake has a major roll for the industry, being one of the most important water supply, after treating, for the city of Craiova. This accumulation is not polluting during operation.*

Key words: physical and chemical indicators, water quality classes, artificial accumulation.

Rezumat. *Studiul s-a axat pe monitorizarea calității apei din Barajul Ișalnița, în perioada 2007 – 2008 și constă în amplasarea lucrării hidrotehnice, organizarea activității, aspecte privind tratarea și caracterizarea fizico-chimică și biologică a apei din acumularea artificială Ișalnița-Dolj. Această acumulare este nepoluantă în exploatare. Are impact potențial și relevant pentru mediul înconjurător, putând fi pozitiv dar și negativ pentru acesta. Are de asemenea rol important în industrie, fiind una din sursele de apă potabilă pentru Municipiul Craiova, în urma tratării. În acest studiu sunt prezentate aspecte generale legate de caracterizarea și dimensionarea tehnică a barajului și alte aspecte privind eutrofizarea și gradul de impurificare al apei lacului, acestea fiind stabilite prin efectuarea unor analize fizico-chimice. S-au determinat indicatorii fizico-chimici de importanță majoră în stabilirea categoriei de calitate a apei, în anii studiați. Valorile rezultate sunt fluctuante de la un an la altul, încadrându-se în limite maxime admisibile pentru categoria I-a și a II-a de calitate a apei.*

Cuvinte cheie: indicatori fizico-chimici, calitatea apei, acumulare artificială.

INTRODUCTION

The development of urban centers, have positive aspects like the demographical and economical aspect but also profound negative aspects on good comfort. There are numerous cases when cities thriving with prosperity enter a declining path due to low service levels. We may take for example the City of

Craiova which lacks good water providing, lack of good sewage and waste water evacuation. All the time there was at least one or even two neighborhoods which have to deal with lack of proper service. On this line can be enlisted the functions of hydrotechnical works, meaning the class and the importance category. So the Ișalnița Barrage assure the industrial water delivery of DOLJCHIM S.A. (4 mc/s), the water delivery of Water Treatment Station belong to Craiova Water Direction (1,15 mc/s), the flood attenuation effect affluented in barred section, realized by the available volume fitted between N.N.R. and N.M.R. The Ișalnița Barrage fitted in the second class and category of major importance.

MATERIAL AND METHOD

The bar plate Ișalnița was initiated in 1964 and is a hydrotechnical node composed from a locked barrage with 7 open, having a principal role in the Jiu water level elevation in order to deviate gravitational of a water debit through a unsanding machine, the decanted water being used in multiple purpose. It is placed on Jiu River, cadastral code VII, at cca. 12 km upstream of Craiova and at 99,5 km by the Danube confluence. In this paper are presented general aspects about the characterization and technical dimension of Ișalnița Barrage and other aspects about the eutrophication and impurification of lake water, using some physicochemical analysis.

RESULTS AND DISCUSSIONS

The three-dimensional representation of Ișalnița Lake is represented in Fig. 1. The bar plate Ișalnița is placed up on the river Jiu, at 12 km from the city of Craiova, near Doljchim S.A, chemical factory. The lake has a volume of 1,65 mil. m³ water and an area of 1.800.000 square metres.

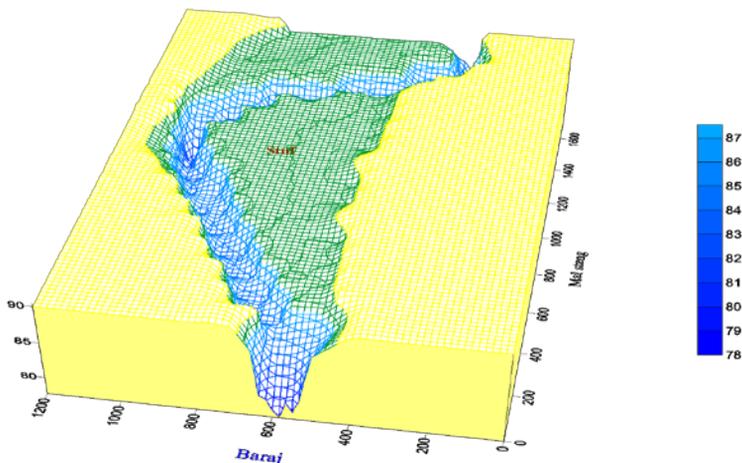


Fig. 1. The 3D representation of Ișalnița Lake

In 2007-2008, there were effectuated a series of physicochemical analyses, which are enlisted in Table no. 1 and 2.

Table 1

The water quality parameters values in 2007

Parameters	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
PH	7.8	7.7	7.8	7.7	7.7	7.8	8.0	7.9	8.1	7.9	8	8
CBO ₅	2.5	2.7	3.6	2.9	3	2.4	3.5	2.8	3.5	2.4	2.5	2.4
Fix residuum	247	208	252	254	274	268	282	233	185	278	319	241
Calcium	65.6	62.8	61	46.4	47.1	64	51.2	51.2	49.6	70.4	65.7	59.2
Mg	17	12	9.7	7.8	7	19	12	9.7	12	24	24	19.4
Na	17.3	18.8	15.1	12.8	17.6	22.3	26.8	14.7	12.8	32.6	37.1	41
NH ₄ ⁺	0.24	0.16	0.12	0.06	0.15	0.10	0.23	0.12	0.10	0.14	0.14	0.23
NO ₂ ⁻	0.02	0.01	0.01	0	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0
NO ₃ ⁻	3.9	3.2	2.6	2.7	2.5	3.3	3.4	3	2.7	2.8	3.4	2.3

Table 2

The water quality parameters values in 2008

Parameters	Jan.	Feb.	Mar.	Apr.	Mai	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
PH	7.8	7.6	7.7	7.6	7.7	7.6	7.8	7.6	7.7	7.6	7.8	7.7
CBO ₅	2.8	3.3	3.6	4.5	3.3	3.8	3.5	3.3	3.1	3.5	3.2	3.6
Fix residuum	223	235	195	124	152	154	196	189	245	206	232	175
Calcium	54	46	48	39	42	48	40	46	51	48	64	56
Mg	19	16	14	14	12	15	14	16	21	18	22	18.4
Na	28.1	24.6	14.6	14.9	22.6	13.9	22.3	14.8	17.4	24.9	25.6	16.9
NH ₄ ⁺	0.10	0.20	0.10	0.08	0.10	0.10	0.15	0.16	0.10	0.10	0.11	0.10
NO ₂ ⁻	0.01	0.01	0.01	0	0	0.01	0.03	0.02	0.01	0.01	0.01	0.01
NO ₃ ⁻	2.6	2.4	2.1	1.6	1.5	2.0	2.6	2.5	2.2	3.8	2.4	2.4

As it can be observed, both in 2007 and 2008, the pH registered values that overcome the CMA, in all the studied months, according to the Ord. no. 1146/2002, the values were oscillating between 7.6 in 2008 and 8.1 in 2007 fitting the water in second quality category (fig. 2). Regarding the CBO₅ registered values between 2.4mg/l in the year of 2007 and 4.5mg/l in the year of 2008, fitting the water in first and second category of quality (fig. 3). The fact that the organic matter is below the CMA shows that the water can be used for the population and also to grow fish. NH₄⁺ presents fluctuations, especially in the year 2007 the highest value being 0.24 mg/l, comparative to the year 2008 when the values were much lower, fitting the water in first and second quality category (fig. 4). The nitrites, measured in mg/l, present values under CMA, fitting the water in first category quality (fig. 5). The nitrates present also higher values in 2007, from this point of view the water being enframed in third category of quality (fig. 6), what means that the water has been recent polluted. The water quality in 2008 was superior on certain parameters compared to 2007 like: pH, CBO₅, NH₄, NO₃. The water qualitative parameters, determined in both years, fitted in first and second quality classes, with several exceptions for the third quality classes, regarding the nitrates.

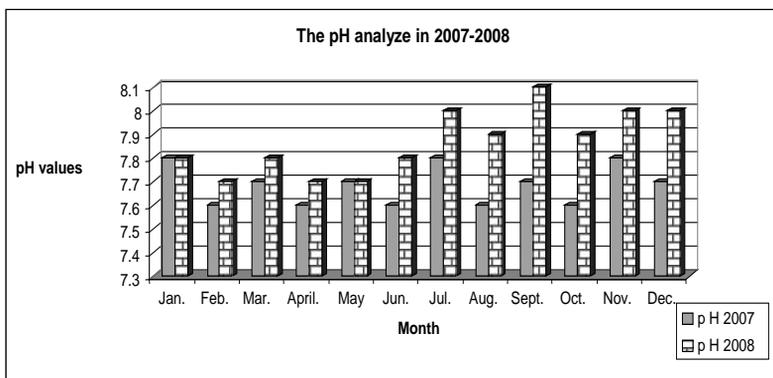


Fig. 2. The pH value (2007-2008)

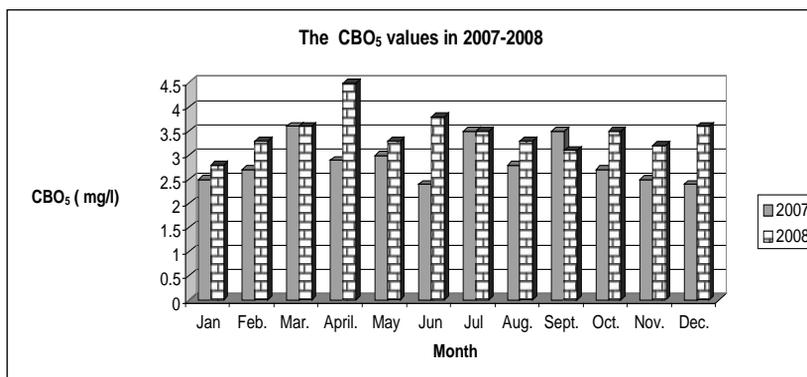


Fig. 3. The CBO₅ value (2007-2008)

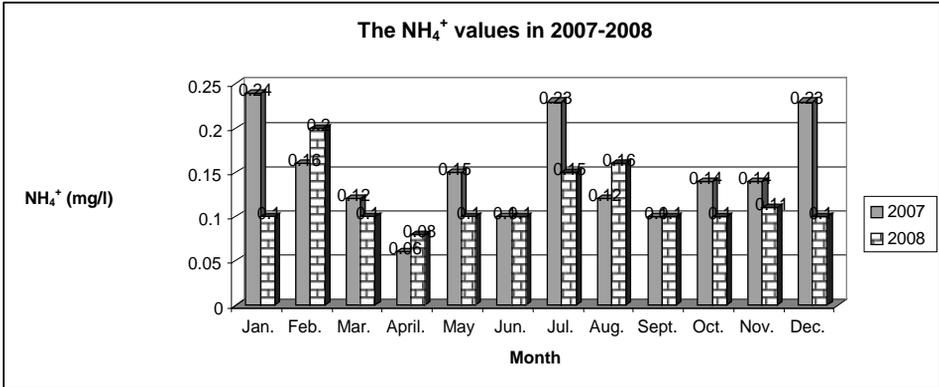


Fig. 4. The NH_4^+ value (2007-2008)

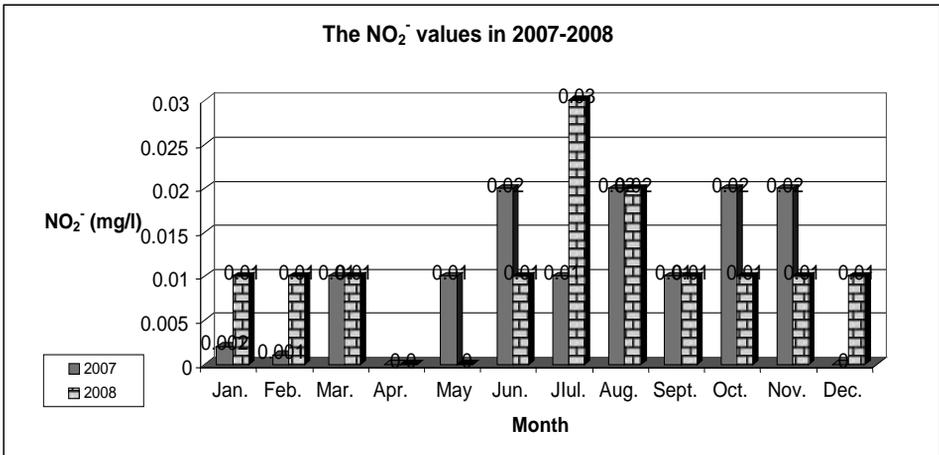


Fig. 5. The NO_2^- value (2007-2008)

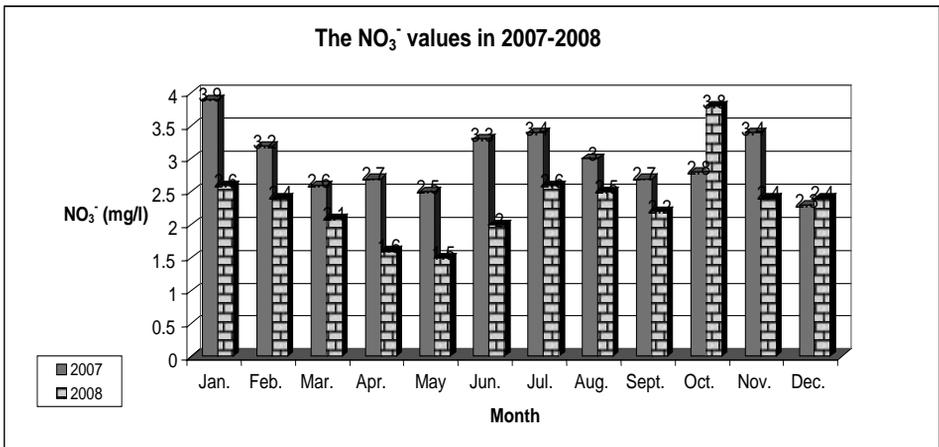


Fig. 6. The NO_3^- value (2007-2008)

CONCLUSIONS

The hydrotechnical constructions have a characteristic influence on the environment, different from those of the most creation or human activity. The fresh water is a finite resource, essential for live, agriculture and industry.

The main arguments for such a construction, like Işalniţa Barrage are the next ones:

- this accumulation is unpolluted in exploitation;
- this accumulation has a potential and relevant impact for the environment, could be positive but also negative for this.

The Işalniţa Barrage has an important role in industry assuring:

- the cooling water delivery to Işalniţa Power Plant;
- the cooling water delivery to Şimnic Power Plant;
- industrial water delivery to DOLJCHIM Chemical Factory from Craiova;
- water delivery to Potable Water Treatment Station for Craiova city;
- it has also role of accumulation, attenuation and transit of flood, it could be used to pisciculture.

It is recommended the consolidation of the barage in order to avoid the pollutants infiltration from the chemical factorz of Doljchim S.A., and also the nitrates leaching from the nearby lands.

Another source of contamination of the water can be the cinder and ash dump of the Işalniţa Power Plant, that are blown away by the wind, or because of the infiltration, they end up in the water. Therefore its recommended a better attention to this dump.

Following the physicochemical analyses, the Işalniţa Barrage water fitting into first and second quality category.

REFERENCES

1. **Gavrilescu Elena, 2006** - *Poluarea mediului acvatic*. Editura Sitech, Craiova.
2. **Constantinescu G.C., 2001** - *Chimia mediului – hidrochimia*. Editura Uni-Press, Bucureşti.
3. **Reiss Aurora, 2003** - *Poluarea și protecția mediului*. Editura Sitech, Craiova.
4. **Savin C., 2005** - *Hidrologie și protecția calității apelor*. Editura Sitech, Craiova.

INFLUENCE OF THE PARCHING-DRAINING NETWORKS, PERFORMED IN THE PĂLTINOASA-DRĂGUȘENI AREA OF SUCEAVA COUNTY, ON THE GROUND WATER

INFLUENȚA AMENAJĂRILOR DE DESECARE-DRENAJ EXECUTATE ÎN SECTORUL PĂLTINOASA-DRĂGUȘENI, JUDEȚUL SUCEAVA, ASUPRA REGIMULUI APEI FREATICE

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Abstract. *The parching-draining works were performed to remove any excessive humidity on the land surface and in the upper soil layers due to precipitations, ground water and the water coming from the more elevated neighboring areas. In the land where the ground water is not deep (0.5-2.0 m) and with a great level variation amplitude, the ground water is the main source of water that continuously or almost continuously maintains and excessive humidity of the soil. The high level of the ground water, together with water mounting to the surface due to the capillary phenomenon, cause a significant soil moistening, claying, swamping, especially in the wet climate areas. Water mounting through capillary tubes depends on soil structure and texture. The parching-draining works carried out in the Păltinoasa-Drăgușeni area influenced the ground water level by descending it, which means that large areas that used to be employed for grazing and as hayfields, were subsequently improved and became arable fields. The study of the free level ground waters emphasize the draining role of the main drains intercepting the ground water on both sides of a neighboring area of 350-1000 m, as well as the local effect of the secondary channel network.*

Key words: moisture excess, drying-drainage system, soil clogging, ground water level, hydrogeological drilling

Rezumat. *Amenajările de desecare-drenaj au fost executate pentru a elimina excesul de umiditate de la suprafața terenului și din orizonturile superioare ale solului, provenit din precipitații, apa freatică și din scurgerile de suprafață de pe zonele limitrofe mai înalte. În condițiile terenurilor cu nivelul freatic situat la mică adâncime (0,5-2,0 m) și cu amplitudine mare de variație a nivelurilor, apa freatică este principala sursă de apă care întreține permanent, sau aproape permanent, excesul de umiditate din sol. Nivelul ridicat al apei freactice, la care se adaugă și ascensiunea apei prin capilaritate, provoacă umectarea puternică a solului, gleizarea, înmlăștinirea, mai ales în zonele cu climat umed. Ascensiunea apei prin tuburile capilare depinde de structura și textura solului. Lucrările de desecare-drenaj executate în sectorul Păltinoasa-Drăgușeni au influențat nivelul apei freactice, în sensul coborârii acestuia, iar mari suprafețe care înainte erau cu folosința obligatorie pășuni și fânețe, au fost trecute la folosințe superioare și, în special, la arabil. Studiul apelor freactice cu nivel liber evidențiază rolul drenant al colectorilor principali care interceptează pânza freatică pe o zonă limitrofă de 350-1000m, de o parte și de alta a acestora, precum și efectul local al rețelei de canale secundare.*

Cuvinte cheie: exces de umiditate, sistem de desecare-drenaj, colmatare, nivel freatic, foraje hidrogeologice

INTRODUCTION

The knowledge of the nature of water that creates moisture excess is very important for choosing the efficient measures of soil improvement.

According to Mărăcineanu Fl et al. (2002), the percentage of sources, which result in water excess on the territory of Romania is the following: 31% rainfall, 26% floods, ground waters and rainfall, 16% ground waters, 15% ground waters and rainfall, 8% ground waters and rainfall on saline and alkaline soils and 4% coast springs.

Ground waters are influenced by the presence of some high levels (0.6 – 1.0 m), as well as by their low speed circulation. The low depths of ground waters favour the development of gleyfication processes that determine the appearance of a heavy permeable layer at a depth of 40-60 cm and some salinization or alkanisation processes, when the ground water is mineralized and has a slow flow and the consumption through evapotranspiration exceeds the volume of rainfall.

MATERIALS AND METHODS

In the studied area, ground waters are found in quaternary deposits, made of gravels and stones of fine and coarse sand, at which dusty sands are added in the terrace area. These are also found in meadows and on terraces, according to the field configuration. The direction of groundwater flow is NW-SE, assessing the supply from higher sides to the Moldova Valley. The value of groundwater flow slope is almost 4.0 ‰, while on the terraces from Baia area, because of the supply from high areas, the values are higher, being comprised between 2.0 ‰ ÷ 8.0 ‰. In the area of Băișești and Dumbrava localities, there is drainage of ground waters towards the Brădățelul Valley, on the other side of the water separating the Moldova Valley from the Șomuzul Mare Basin. Brădățelul, which course is situated 40-50 m down from the course of the Moldova Valley, reached with its springs the lower terraces of Moldova, from Băișești to Dumbrava. The hydrostatic levels are generally free only in the terrace area, isolated by a weakly increasing character, due to dusty-clayey formations.

According to geological, geo-morphological and hydrological conditions, four hydrological posts were set up in the Păltinoasa-Drăgușeni sector (Păltinoasa, Berchișești, Băișești and Baia posts), made of 26 drillings (fig. 1).

For pointing out the diminution and maintenance of ground waters at a low level after drying-drainage works were done, we have measured the ground water level at the Băișești Post, which is situated on both sides of the Moldova River, on the East side of the Băișești locality, in a concave-up arch profile. Drillings are perfect at depths of 10.0 ÷ 15.0 m (F₂, F₃, F₄ and F₅) and at 25.00 m (F₁, F₆, F₇ and F₈).

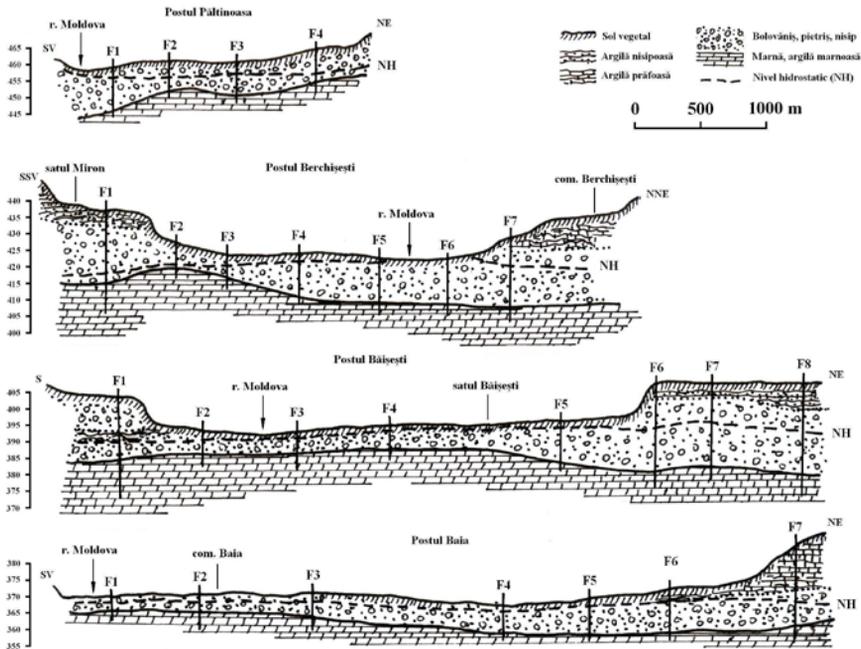


Fig. 1. Hydro-geological sections in the hydrographical basin of the Moldova River, Păltinoasa-Drăgușeni sector

RESULTS AND DISCUSSIONS

Along the valley of the Moldova River, from Păltinoasa to Baia, before the drying-drainage systems were set up, the first zone of the ground water level was found, having depths comprised between 0 and 5.0 m. Towards the terraces, both to North and South, there is the depth zone, comprised between 5 and 10 m, which develops as narrow strips along the effluents of the Moldova River. On the terraces of the Moldova River, on both banks, there is the area of the ground water level with depths from 10 to 20 m, occupying a greater and more continuous area on the left slope of the valley. In this area, NW from Baia, we found an area with the depth of the ground water level situated between 0 and 5.0 m, delimited at the outer side by a narrow uneven zone, with the depth of the ground water level situated between 5 and 10 m. Greater than 20 m depths of the ground water are found under the shape of three discontinuous patches in the region of Mălini, Valea Seacă and Dumbrava terraces.

Analyzing the levels of ground waters measured by hydro-geological drillings (Table 1), we found that the highest levels were reached during June-September, while the lowest ground water levels were recorded in the cold

months, especially during January-March, when the river was exclusively supplied with ground waters.

We also noticed a time lapse between the period of rainfall record and the increase in ground water levels in drillings. Thus, in 2006, the highest quantities of monthly rainfall of 162.3 mm/m² and 132.2 mm/m² were recorded in June and August, while the highest levels of the ground water levels were recorded after 20-30 days, according to drill setting up, in July and September.

Table 1

Levels of the ground water at the Băișești Station, in 2006

Drilling Month	F ₁	F ₄	F ₅	F ₆	F ₈
	Ground water level (cm)				
I	1467	317	259	1341	1428
II	1461	320	266	1371	1443
III	1462	320	269	1374	1450
IV	1492	310	261	1354	1451
V	1547	298	252	1335	1456
VI	1530	301	234	1338	1436
VII	1510	273	210	1295	1401
VIII	1520	286	206	1387	1406
IX	1515	282	199	1383	1398
X	1523	294	215	1388	1400
XI	1510	285	216	1383	1394
XII	1479	292	246	1362	1428
MEAN	1501	298	236	1359	1424

* F₂ and F₃ drillings – taken by water and floods

* F₇ drills – blocked

Setting up drying-drainage works, rivulet calibration and redimensioning in this area, during 1978-1980, determined the decrease and the relatively constant maintenance of ground water level, low variations of the ground water level being recorded, compared to the uneven monthly spreading of rainfall.

In 2006, a normal year from the viewpoint of annual rainfall (689.80 mm), the ground water level recorded a diminution at all studied drillings, compared to the multiannual mean on 10 years (table 2).

Table 2

Annual and multiannual mean of the ground water level at the Băișești Station

Drilling	F ₁	F ₄	F ₅	F ₆	F ₈
Mean ground water level, cm (2006)	1501	298	236	1359	1424
Mean multiannual ground water level, cm (1970-1980)	1350	243	205	1310	1380
Differences to the multiannual mean, cm	+151	+55	+31	+49	+44

The decrease of the ground water level in the Pălinoasa-Drăgușeni sector was greater in the areas where the drying-drainage network works under proper conditions and more reduced in the areas where the outlet and channel clogging was greater.

Analysing the ground water level from Băișești Post drillings, we found a depth increase by 150 cm at F₁ drilling, by 50 cm at F₄, F₆ and F₈ drillings, while at F₅ drilling, an increase of 30 cm was found, because the drying network of the area was partially out of function after 1991, by obstructing the drying channels and introducing them in the farming circuit (fig. 2).



Fig. 2. Drainage channels out of running

CONCLUSIONS

1. Setting up drying-drainage works, rivulet redimensioning and calibration in this area, during 1978-1980, determined the diminution and relatively constant maintenance of the ground water level, low variations of the ground water level being recorded, compared to the uneven monthly spreading of rainfall. The study of free level ground waters points out the draining role of main collectors that intercept the ground water on a surrounding area of 350-1000 m, on both sides, as well as the local effect of secondary channel network.

2. The diminution of ground water level in the Păltinoasa-Drăgușeni sector is higher in the areas where the drying-drainage network works under proper conditions and lower in the areas where the outlet and channel clogging is higher.

3. A time lag of 20-30 days was recorded between the period of rainfall records and the increase in ground water levels in drillings, according to the placement of drills.

4. The ground water level reaches the highest values during June-September, while the lowest values are recorded in the cold months, especially during January-March, when the river is supplied only with ground waters.

REFERENCES

1. **Amăriucăi M., 2000** - *Șesul Moldovei extracarpatice dintre Păltinoasa și Roman*. Editura Corson, Iași.
2. **Mărăcineanu FI., Constantin Elena, Nistoreanu M., Semcu A., 2002** - *Considerații privind drenajul solurilor slab permeabile*. Lucrările Sesiunii Științifice organizată cu prilejul împlinirii a 30 de ani de la înființarea Facultății de Îmbunătățiri Funciare și Ingineria Mediului, CD, U.Ș.A.M.V. București.
3. **Nitu T. și colab., 1985** – *Influența lucrărilor de desecare-drenaj asupra apelor freatice și suprafreatice din Câmpia piemontană Rădășeni-Fântâna Mare-Baia, mijloc de creștere a producției agricole la hectar*. Primul Simpozion de Îmbunătățiri Funciare, București.
4. **Radu O., 2007** - *Consecințe ale colmatării canalelor de desecare, în sistemul de desecare-drenaj Rotopânești-Rădășeni-Fântâna Mare, județul Suceava*. Lucrări Științifice, seria Agronomie, U.Ș.A.M.V. Iași, vol. 50. Editura „Ion Ionescu de la Brad” Iași.

OPERATION OF THE DRĂGOIEȘTI-BERCHIȘEȘTI DRAINAGE NETWORK IN SUCEAVA COUNTY

COMPORTAREA ÎN EXPLOATARE A REȚELEI DE DESECARÉ DIN SISTEMUL DRĂGOIEȘTI-BERCHIȘEȘTI, JUDEȚUL SUCEAVA

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Abstract. *Agricultural land and especially arable land output has been increased throughout the years by means of parching, damming-regularization, underground drainage and soil erosion prevention works, as well as by other types of works performed on them. In order to introduce in the normal agricultural circuit and to use the whole fertility potential of the land with excessive humidity in the Drăgoiești-Berchișești area, there was performed, between 1978 and 1980, a parching-draining system with an area of 1790 ha, of which 553 ha comprised underground drainage works. A proper excessive water removal from the parched land can be achieved, in principle, by a well-kept channel network, with the preservation of the channel geometric and hydraulic components, as well as with the maintenance of all the related water engineering facilities. However, after 1990, when the land became private property and an inadequate legislation on parched-drained land was passed, the changes undergone by the parching network building parameters were influenced by the way in which the land was used and by human interventions.*

Key words: moisture excess, drying system, erosion, soil clogging, geometrical and hydraulic elements of the drying network.

Rezumat. *Valorificarea capacității de producție a terenurilor agricole și, în mod special, a suprafețelor de teren arabil, s-a realizat în decursul timpului prin amenajarea acestora cu lucrări de desecare, de îndiguire-regularizare, de drenaj subteran, de combatere a eroziunii solului și altele. Pentru introducerea în circuitul normal al producției agricole și valorificarea întregului potențial de fertilitate a terenurilor cu exces de umiditate din zona Drăgoiești-Berchișești, s-a amenajat în perioada 1978-1980 un sistem de desecare-drenaj cu suprafața de 1790 ha, din care 553 ha cu lucrări de drenaj subteran. Obținerea unor rezultate corespunzătoare în evacuarea apelor excedentare de pe terenul desecat se asigură, de principiu, printr-o rețea de canale bine întreținută, prin care să se realizeze conservarea elementelor geometrice și hidraulice ale canalelor, precum și a construcțiilor hidrotehnice aferente. Începând cu anul 1990, în condițiile proprietății private asupra pământului și a unei legislații neadevrate pentru suprafețele amenajate cu lucrări de desecare-drenaj, modificarea parametrilor constructivi ai rețelei de desecare este influențată de modul de exploatare a suprafețelor deservite și de intervenția omului.*

Cuvinte cheie: exces de umiditate, sistem de desecare, eroziune, colmatare, elemente geometrice și hidraulice ale rețelei de desecare

INTRODUCTION

Among the main limitative factors of the farm production, which are found according to local soil and climatic conditions, there are moisture excess, floods, reduced soil permeability and soil compaction, erosion, slides etc.

The natural conditions of the Drăgoiești-Berchișești area favour the appearance and maintenance of the moisture excess in soil and at soil surface. The moisture excess, which resulted from rainfall or ground waters and from the floods of the hydrographical network was found under different forms and intensities, both on horizontal and slope fields.

In order to improve the air and water regime from soil, the Drăgoiești-Berchișești drying-drainage system was set up during 1978-1980. It has an area of 1790 ha, of which 553 ha have subsoil drainage works.

After setting up the hydro ameliorative projects, a special importance must be paid to the way of their exploitation and behaviour in time, having also in view the new conditions created after the passage to the private property on land.

MATERIALS AND METHODS

The Drăgoiești-Berchișești drying-drainage system belongs to the Moldova watershed and is found on its left bank, on the territory of Drăgoiești, Berchișești and Cornu Luncii communes.

Morphologically, the system is situated on the meadows of the Moldova River and meadows of the lower rivulets Ratuș, Corlata, Rău, Stejăroaia and Bahna, on the lower and upper terrace of the Moldova River, the greatest height of 510.88 m being found in the North side of the area. The sector collecting drains were placed almost parallel to level curves, having the role to intercept surface waters, with the distance between them of approximate 250 m, depth of 1.20-1.60 m, bottom length of 0.40 m and slope coefficient $m = 1.00 - 1.25$.

When setting up the network of tertiary, secondary and main channels we had in view the usage of watercourses, natural valleys and depression areas.

The main outlet canal is the channel of the Stejăroaia Rivulet, which was redimensioned on its entire length, the bottom width being of 1.40-2.00 m and the slope of 1:1.50, assuring a flow of 23.36 m³/s. The channels were made with a trapezoid section, at sizes that ensure the transportation of the highest flows at 5%.

For estimating the changes in geometrical and hydraulic parameters of the drying network, topographical measures of accurate geometrical levelling were done by the method of radiation. The level observations were done with a Zeiss Ni-030-type mean precision levelling, the level differences being determined on two horizons of the level tool. Based on the obtained data, we have drawn transversal and longitudinal profiles of different order channels of the drying network and the result interpretation was done by comparing the obtained profiles to those designed and done at setting up of the projects.

RESULTS AND DISCUSSIONS

The Stejăroaia main outlet channel of the Drăgoiești-Berchișești drying-drainage system, which resulted by redimensioning the channel of the Stejăroaia Rivulet, had the following constructive elements on the studied section: mean

depth of channel 2.50 m, bottom width 1.40 m, slope coefficient 1.5 and light of channel 8.90 m.

As a result of measurements carried out 30 year after setting up the profile of this channel, in section I (fig. 1), we noticed an increase in the channel light of 2.50 m. This change is due to the bank erosion, especially on the left side of the channel (1.70 m), because the field area crossed by the Stejăroaia channel on this side has open channels, the surface runoff caused by abundant rainfalls amplifying the bank erosion.

The augmentation of the channel light by 0.80 m on the right side of the channel, where drainage works were set up, is caused by excess grazing during the entire year and by surface runoff that caused bank erosion. Bank erosion and clogging of the channel bottom determined an increase in the slope coefficient from 1.50 to 2.48 on the left side and, respectively, to 1.70 on the right side of the channel.

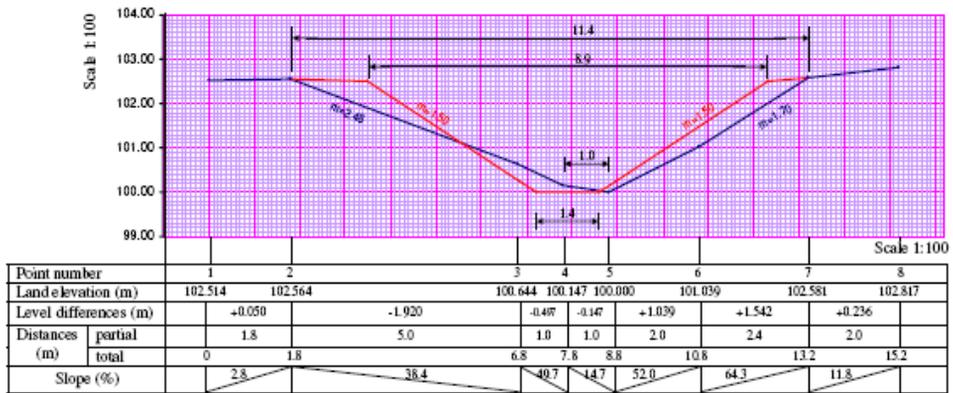


Fig. 1 Transversal section (I) through the „Stejăroaia” main outlet channel

In section II (fig. 2), situated at 600 m upstream the first section, we did not find significant changes of the constructive elements, the neighbouring areas being used as arable lands and no grazing was on channel slopes.

In both sections, the slope depth was not changed, because of the consolidation of the channel bottom with quarry-run stone at different distances (100-300 m), while the alluvial deposits on the channel bottom are trained, transported and removed during floods by the permanent flows of the Stejăroaia Rivulet, which created a small bank through alluviums on some sections (fig. 2).

After 1991, once with the passage into private property of the lands on which drying-drainage works were set up, the influence of human factor has increased on the change of the channel network parameters.

The sector collecting channel (CCst₄₈) of the Drăgoiești-Berchișești drying-drainage system was designed to be used on a dried area of about 35.00 ha.

If, when it was set up in 1980, the channel had bottom width $b = 0.40$ m, mean depth $H = 1.20$ m and slope coefficient $m = 1.00$, after 30 years of work, it

became a discharge channel, the section of channel being clogged at a rate of 90 %.

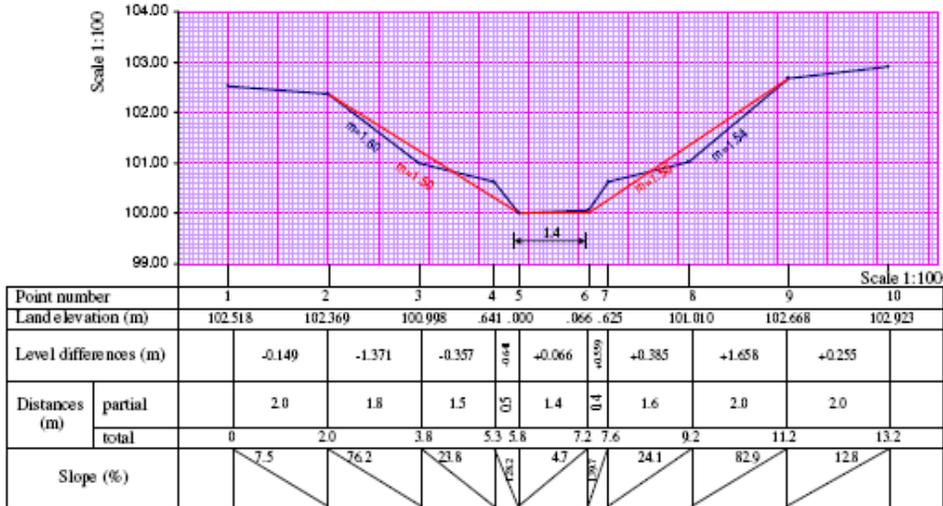


Fig. 2. Transversal section (II) through the „Stejaroia” main outlet channel

In the transversal profile I (fig. 3), done at almost 200 m from the upstream end of channel, we noticed that by channel clogging, the section shape was changed from trapezoidal to triangular, the sector collecting channel becoming a discharge channel with depth of 0.30 m. The transversal section of this channel diminished by almost 86 %, from 1.92 m² at the beginning, until 0.27 m², as it is today.

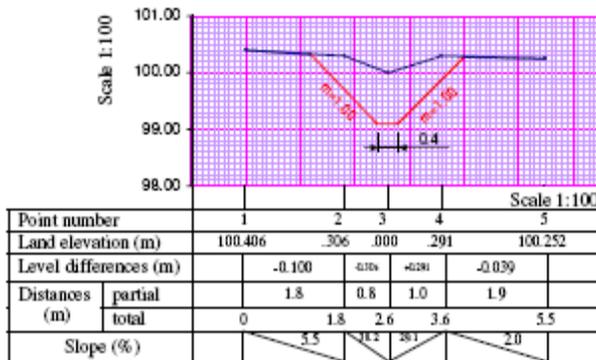


Fig. 3. Transversal section I through the CCst₄₈ sector-collecting channel

The transversal section clogging and the diminution of water transportation capacity were also noticed in the second profile (fig. 4), done at almost 400 m upstream the first one, where the ditch depth, resulted by clogging up, is of 0.10

m and the transversal section, of 0.05 m², the channel being clogged at a rate of 97 %.

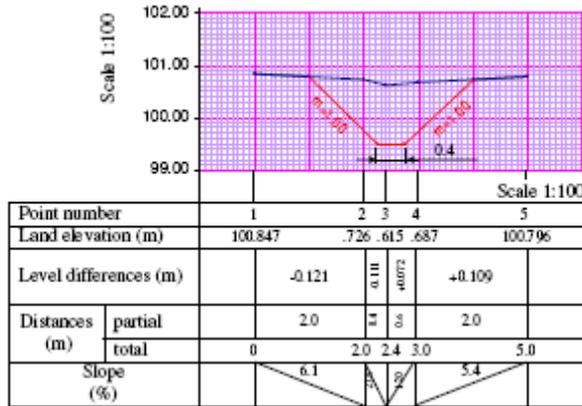


Fig. 4. Transversal section II (A-A'), through the CCst₄₈ sector-collecting channel

By applying the Law 18/1991, the land plots were placed perpendicular to this sector collecting channel and the beneficiaries of the Law considered that the property right over land allowed them to have rights on works, clogging the channel section in some portions, in order to facilitate the access to the individual land plots. These obstructions have favoured water stagnation on the channel bottom for a longer period and formation of hygrophilous and woody vegetation, accelerating the clogging process.

In the longitudinal profile of the CCst₄₈ channel (fig. 5), created upstream and downstream the second section, the determined values of the longitudinal slope were between 0.58 % and 1.62 %. This variation of the longitudinal slope is caused by the woody vegetation that stops the flow speed, favouring the alluvial sedimentation.

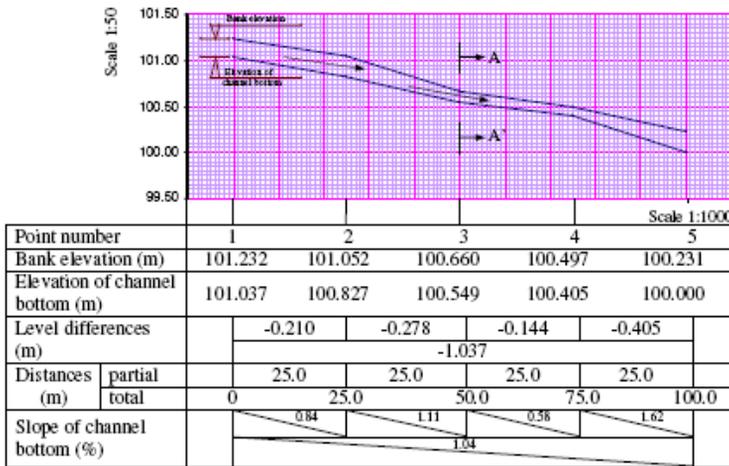


Fig. 5. Longitudinal section through the CCst₄₈ sector-collecting channel

Because of the relatively great longitudinal slope, during the abundant rainfall, a part of water reaches the Stejăroaia Channel, but the highest part stagnates in micro depressions for longer periods, favouring the formation of hygrophilous vegetation and the appearance of moisture excess on the areas crossed by the channel. Because of the lack of maintenance works, during the last 19 years, the CCst₄₈ sector collecting channel is no longer running and the entire area of 35.00 ha, which is afferent to the channel, has been used in the last years as hayfields.

CONCLUSIONS

1. The change in geometrical and hydraulic elements of the drying network was highly influenced by the usage category of the areas crossed by channels. On dried-drained areas used as grasslands, the bank erosion and clogging of drying channels is higher, being produced with almost a double mean annual rate (4-5 cm/year), compared to that of the channels crossing the areas used as arable lands and hayfields.

2. The lower channels have a higher rate clogged section, compared to the upper channels. The sector collecting channels on the areas on which drying works were set up, with a low depth (1.20-1.40 m), after 30 years of working and lack of maintenance works and, especially, in the last 19 years, became water discharge channels, and their section did not assure the transportation of collected flows.

3. The channel clogging and formation of hygrophilous vegetation resulted in changing the longitudinal slope, which had various values along the channels, sometimes making counter-slopes that favour water stagnation and sedimentation of alluviums, increasing the mean clogging rate and accelerating their out of use.

REFERENCES

1. **Mărăcineanu Fl., Constantin Elena, Semcu A., 2002** - *Considerații privind realizările și perspectivele de valorificare a terenurilor cu exces de apă din România*. Lucrările Sesiunii Științifice organizată cu prilejul împlinirii a 30 de ani de la înființarea Facultății de Îmbunătățiri Funciare și Ingineria Mediului, CD, U.Ș.A.M.V. București.
2. **Radu O., 2007** - *Evolution of the geometric and hydraulic parameters of the channels of the Rotopănești-Rădășeni-Fântâna Mare drying-draining system of Suceava county, after 27 years of operation*. Lucrări Științifice, seria Horticultură, U.Ș.A.M.V. Iași, anul L, vol 1 (50). Editura „Ion Ionescu de la Brad” Iași.
3. **Radu O., 2007** - *Consecințe ale colmatării canalelor de desecare, în sistemul de desecare-drenaj Rotopănești-Rădășeni-Fântâna Mare, județul Suceava*. Lucrări Științifice, seria Agronomie, U.Ș.A.M.V. Iași, vol. 50. Editura „Ion Ionescu de la Brad” Iași.
4. *****, 1978** - *Proiect de execuție-Desecarea zonei Drăgoiești-Berchișești, județul Suceava, nr. 22/1978*, O.I.F.P.C.A. Suceava.

MANAGEMENT ISSUES AND STRATEGIES IN THE EXPLOITATION OF IRRIGATION SYSTEMS

PROBLEME DE MANAGEMENT ȘI STRATEGII ÎN EXPLOATAREA SISTEMELOR DE IRIGAȚII

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Abstract. *The improvement of the quality of the management of water, soil and other natural resources constitutes an important direction in the specialised organisations in the field. International Water Management Institute – IWMI has developed a number of guiding marks on the means to improve it, in the sense of an increased involvement of local communities in decision-making. In this paper, we shall present a number of management issues and strategies in the exploitation of irrigations system, with a study case in the N. Balcescu irrigation system of Carasu Complex, Constanta County.*

Key words: management, strategies, irrigation system

Rezumat. *Îmbunătățirea calității managementului resurselor de apă, de sol și a altor resurse naturale constituie o direcție importantă în activitatea organizațiilor specializate din domeniu. International Water Management Institute – IWMI a dezvoltat câteva repere asupra modalităților de îmbunătățire a acestuia, în sensul unei mai mari implicări a comunităților locale în luarea deciziilor. În aceasta lucrare se vor prezenta câteva dintre problemele de management și strategii în exploatarea sistemelor de irigații, cu un studiu de caz în sistemul NicolaeBălcescu din Complexul Carasu, județul Constanța.*

Cuvinte cheie: management, strategii, sisteme de irigații

INTRODUCTION

If in developed countries, over several decades, it have created structures and institutions which enabled the implementation of gradual changes in the resources management, in the other countries where resources management was conducted centrally, it must rediscover the local institutions and to transfer the making decision to them. It is also the case of the irrigation organizational process that, in these states, was super centralized in government hands. In recent years, these governments seek to reduce the pressure exerted on the budget expenditure for the administration of irrigation systems, transferring, in part, some obligations on local organizations, specialized, such as the Users Organizations of Water for Irrigation (OUAI). In this paper has been approached issues of optimizing the economic and technical indicators of irrigation systems to implement them in Dobrogea area, on the Nicolae Balcescu irrigation system of Carasu Complex, with application in the management of irrigation systems.

MATERIAL AND METHODS

Global approach

It is known that irrigation systems have a primordial role for food production safety. A major challenge is to adapt the old systems for future food needs („irrigation systems adaptation of yesterday to the tomorrow needs”).

Financing the water infrastructure for agriculture requires institutional reforms and strong involvement of associations of water users, the investment at lower or higher level in irrigation systems.

After a peak funding at the end of the '80, it followed a reduction in irrigation financing by international financial agencies. This happened simultaneously with the decrease of the food prices (fig. 1). Lately, due the fact that the food prices increased, have become interesting investment in infrastructure and management of irrigation systems.

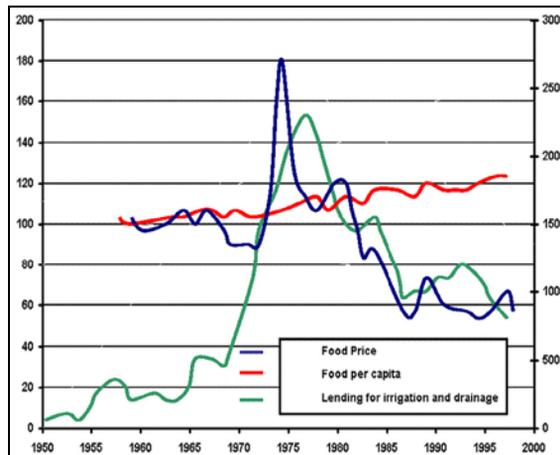


Fig. 1 – Food price developments (—), food per capita (—) and lending for irrigation and drainage (—), after Robert L. Thomson WB, ICID (Seul, 2001)

It is known that water funding for food involves complex issues that depend on a variety of sectoral political interests, operational and disturbances factors of different markets. Future investments will be considerably different from those preceding them by type, size, donors and funding models adopted. Therefore, you must know the actual situation on the need and targeting investment, on the financing mechanisms and funding category. Adopting the principle of „recovering costs” is essential: in many cases, users will realize that they will pay for services they need but that they will recover the money invested.

Hector M. Malano and Paul van Hofwegen in *Management of Irrigation and Drainage Systems* monograph presents an overview of the principles required for the management of irrigation and drainage. The dominant note of the paper is given by emphasizing the fact that the irrigation and drainage system should be considered as business services that meet varying needs and demands of consumers and that the approach of management of irrigation and drainage system is a key element of the *strategy to improve performance of many systems in the worldwide*. Hence, the requirement for clear performance in irrigation, if we need to do face to the huge change in production of increasingly large food served to growth of world population.

Approaches at national level

Performance of many irrigation systems in Romania are below potential, due to causes related to the stages of design, execution and their management:

- deficiencies in the initial project, in the work performed, improper use or design assumptions that were never fulfilled in execution;
- the distribution system is not suitable to land management system (the farms size, their location in the plan, etc.);
- poor management of irrigation systems.

In Romania, after 1989, technical condition of irrigation systems became worse due to deterioration of the basic components and due to the reduce costs of maintenance and repairs. On the other hand, demand for water has been reduced due to the division of land ownership (a farmer owning 2.5 ha on average), the irrigation existing facilities were inadequate and, assuming the irrigation rotation on large areas, have come to be insufficient or totally unusable technically. Thus, it was in a situation that in many large irrigation systems, irrigation to be applied only by a few beneficiaries, owners of large areas. This reduction of use has a negative impact on economic efficiency of irrigation, leading to increasing water costs, cost to be borne by the beneficiary.

In terms of emphasis the competition between water use, irrigation are forced to reduce water losses and increase its efficiency.

Criteria for analysis of the economic efficiency of irrigation systems

An analysis of the economic efficiency of irrigation systems, which translates into the fact of the economy of resources (water, energy, labor), particularly in reducing the current level of use of the existing irrigation systems, involving a detailed analysis of the technical and economic indicators that constitute the major criteria that influence the effective functioning of an irrigation system:

- *technical indicators*: arranged area served by pumping stations, the net volume of water needed to plant over a period of time, the volume of water pumped from the pumping station, pumping station efficiency, efficiency of water use, energy needs for pumping stations operation, the specific energy consumption at a pumping station;
- *economic Indicators*: *global economic indicators* (tariff systems for irrigation, economic profitability); *specific economic indicators* (energy cost, the value of water, work expenses, direct costs, indirect costs, subsidized expenses, non-subsidized expenses, profits and income).

Using of the decision methods and techniques induce an increase of the degree of rigor and, implicitly, the effectiveness of decisions, but differentiated, depending on the type of decision-making situations involved. Each method or management technique involves specific methodology scenarios, structured in stages and phases, which with rigorous compliance facilitates selection of the best versions of several possible.

In the paper is used *ELECTRE method* (Elimination et Choix Traduisant la Réalité), a method of ranking and choice in the presence of multiple viewpoints, allowing policy makers to adopt the most favorable solutions for the management of economic units and irrigation systems.

Services irrigation are provided by the National Administration of Land Improvements in terms of the Art. 55, 56, 57 and 64 from Law of land improvements No.138/2004 in accordance with seasonal or multi annual contracts concluded at the request of beneficiaries.

In accordance with *the multiannual-contract*, the beneficiaries pay the following rates:

- an annual rate, expressed in euro/ha, of which it is cover maintenance and repair of main irrigation infrastructure and it may be added, by case, the costs of maintenance and repair of interior irrigation system infrastructure when the irrigation water supply for irrigation is to hydrant;

- a rate of irrigation water delivery, expressed in lei/1000 cubic meters of which it is cover sampling, pumping, transmission and distribution of water through the main irrigation infrastructure, and, after case, it is added the operation cost of private infrastructure of the state where the water supply for irrigation is to hydrant.

Rates for services irrigation have in the general structure of the expenditure:

- *the direct cost* of the National Administration of Land Improvements;
- *indirect costs*, consisting of overhead from the administration units and, by case, overhead from the regional branches and headquarters of the National Administration of Land Improvements: the profit of National Administration of Land Improvements; the costs of operation works of the interior infrastructure of irrigation, and the cost of maintenance and repair contracts with third party suppliers.

RESULTS AND DISCUSSIONS

Results obtained for the rate system „Rate on a water delivery” has two components:

T_a - annual rate per unit area, which includes expenses for maintenance of irrigation planning;

T_l - rate for water delivery per unit volume, having in it the following costs and expenses: water cost, expenses for electricity, labor costs necessary for collection and distribution; indirect costs, profit (limited by law at a rate of 3%).

The amount of annual rate (thousands lei / ha) is calculated for each point of water delivery for irrigation, resulting in unit costs summation, for each point of irrigation water delivery provided in multiannual-contract:

$$T_{Aijk} = t_{Priza} + t_{SPA} + \sum_{i=0}^{i=n} t_{CAi} + \sum_{i=1}^{i=n} t_{SRPi-1} + t_{Cdj}$$

where:

T_{Aijk} (lei/ha) – annual rate for the point of the irrigation water delivery k located on the step of pumping i and distribution channel j ;

t_{Priza} (lei/ha) – share expenses related to maintenance and repair of the gripping water;

t_{SPA} (lei/ha)– share expenses related to maintenance and repair of the pumping power;

$\sum_{i=0}^{i=n} t_{CAi}$ (lei/ha) – share expenses related to maintenance and repair a section of supply channel located on the step of pumping i .

$\sum_{i=1}^{i=n} t_{SRPi-1}$ (lei/ha)–share expenses related to maintenance and repair of the repumping station which supply the channel section located on the pumping step i ;

t_{Cdj} (lei/ha)– share expenses related to maintenance and repair of the distribution channel j located on the pumping step i , where is located the delivery point of water for irrigation;

n – number of pumping steps from the irrigation planning.

The “Nicolae Balcescu” administrative irrigation system which operating the “Mircea Voda” land improvement subsystem, is one of the systems were kept in service after 1989, while areas that have concluded contracts for delivery of irrigation water were reduced significantly.

The “Mircea Voda” irrigation system, in total area of 28 125 ha, is available in four energy steps and the energy draught is represented in fig. 2.

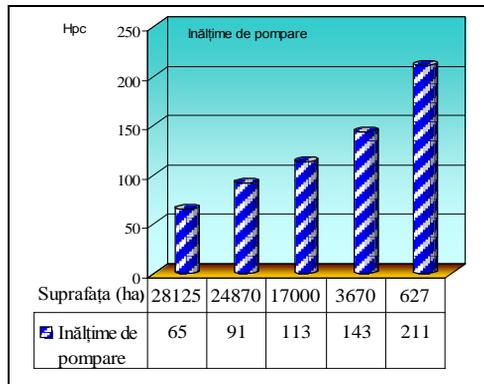


Fig. 2. The energy draught of “Mircea Vodă” irrigation system

Analysis of the main economical and technical indicators in relation to "The hydraulic chart of the operating system Mircea Voda" for different use degrees of 13%, 32%, 55%, 72%, 88% and 100% (chosen in relation with the energy steps of the system) is found that there is a maximum which corresponds to the use degree of 30% (fig. 3), the irrigated area was only willing to step IV (the most unfavorable). On these graphs (fig. 3 and fig. 4) it is a relative minimum corresponding to the full use of the system.

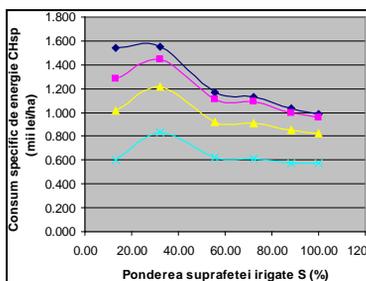


Fig. 3. Variation of the specific energy cost

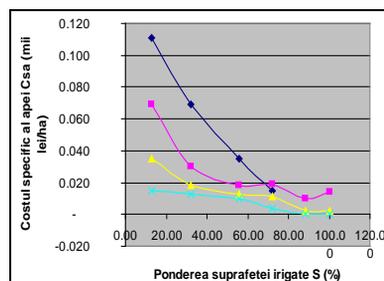


Fig. 4. Variation of the specific water cost

Legendă

- Treapta a I a
- Treapta a III a
- Treapta a II a
- Treapta a IV a

The variation curves of the economic indicators that are interested in the unit providing the service of water delivery in the irrigation system (ANIF), the profits and income (fig. 5, 6), showing a minimum for a degree of use about 30% and a maximum degree of use of 72%.

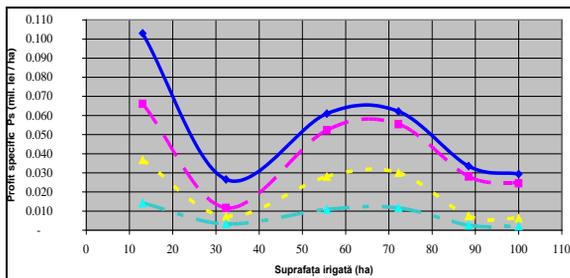


Fig. 5. Variation of the specific profit

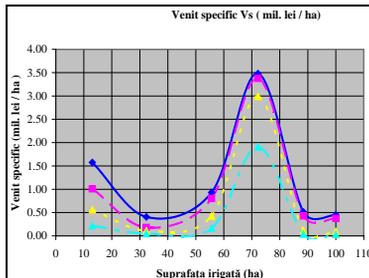


Fig. 6. Variation of the specific income

To decide on the profitability of irrigation, according to the pumping steps with the specific energy consumption over 1 kWh/m^3 are needed deep analysis of all categories of costs, both those incurred in budget allocations as well as those incurred by the beneficiaries. Choosing the best variant, using the ELECTRE method, based on relationships between upgrading variants show that the optimal variant is that which corresponds to a degree of the irrigation system use of **72%**.

CONCLUSIONS

The economic analysis based on diagnostic criteria of the irrigation system efficiency, can highlight the performance areas from the economic point of view, helping to improve the management of the operating system unit.

The study case presented shows that, from the design stage, the irrigation system was over dimensioned as area (almost 30%), fact that is common in the country and well known by experts in the field but ignored by the policy makers in that period.

Utility of such analysis will be in the rehabilitation and modernization of the irrigation systems, and the investments can be targeted to areas that are economically justify.

REFERENCES

1. **Bella A., Duckstein L., Szidarovszky F., 1996** - *A multicriterion Analysis of the Water Allocation Conflict in the Upper Rio Grande Basin*, Applied Mathem. and computation, 77.
2. **Cismaru C., Gabor V., Blidaru T.V., Scripcariu D., 2000** - *Studii privind eficiența lucrărilor de reabilitare și de modernizare a sistemelor de irigații cu mai multe trepte de pompare (cu referire la Podișul Moldovei)*, Ovidius University Annals of Constructions Vol. 1, Nr. 2, Editura Ovidius University Press, Constanța.
3. **Hector M. Malano, Paul van Hofwegen, 1999** - *Management of Irrigation and Drainage Systems*, Taylor and Francis- Balkema Publishers, ISBN 9789054104827.
4. **Nicolaescu I., Manole Emilia, 2002** - *Influența gradului de utilizare a sistemului de irigații asupra randamentului de folosire a apei*, Sesiunea Științifică Omagială "Treizeci de ani", USAMV-FIFIM, 17-18 mai 2002, Editura BREN, București.

CFD SIMULATION OF SOIL-TOOL INTERACTION

SIMULAREA CFD A INTERACȚIUNII ORGAN ACTIV-SOL

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Abstract. *The study of tillage tool interaction centers on soil failure patterns and development of force prediction models for design optimization. The force-deformation relationships used in models developed to date have been considering soil as a rigid solid or elasto-plastic medium. Most of the models are based on quasi-static soil failure patterns. In recent years, efforts have been made to improve the conventional analytical and experimental models by numerical approaches. This paper aims at reviewing the existing methods of tillage tool modeling and exploring the use of computational fluid dynamics (CFD) to deal with unresolved aspects of soil dynamics in tillage. The soil was characterized as having a rheological behavior by modeling as a visco-plastic Bingham material. The soil was characterized for its rheological behavior as a Bingham material. Three-dimensional analyses were carried out by the finite volume method with using FLUENT v.6.3, a commercial CFD code. The results indicated that due to tool movement into soil the pressure on the tool active area is highest in the edges region decreasing to central region. The drag force (draught) is shown as the sum of the pressure and the friction between the tool and soil.*

Key words: CFD, tillage tool, soil dynamic

Rezumat. *Studiul interacțiunii organ activ de prelucrare-sol se centrează pe domeniul fisurării solului și dezvoltarea modelelor de predicție a forței de tracțiune pentru o proiectare optimă. Relația forta-deformație utilizată în modelele dezvoltate până acum au considerat solul ca un solid rigid sau mediu elasto-plastic. Mai multe modele propuse au la bază conceptul de fisurare cvasistatică a solului. În ultimii ani eforturile cercetătorilor au fost făcute în dezvoltarea modelelor convenționale analitice și experimentale dar prin abordare numerică. Acest articol urmărește să revizuiască metodele existente de modelare a organelor active de prelucrare a solului și explorarea utilizării CFD pentru tratarea aspectelor nerezolvate de dinamică solului în prelucrarea lui. Solul a fost caracterizat ca având un comportament reologic prin modelarea ca un material viscoplastic Bingham. Analiza 3D a fost realizată prin metoda volumelor finite utilizând programul FLUENT v. 6.3. Rezultatele indică că datorită mișcării organului activ în sol presiunea de pe suprafața organului activ este mai ridicată în zona tăisului scăzând spre regiunea centrală. Forța de tracțiune este redată ca suma dintre componenta de presiune și cea de frecare dintre organul activ și sol.*

Cuvinte cheie: CFD, organ activ prelucrare sol, dinamică solului

INTRODUCTION

Tool interaction with agricultural soil basically deals with soil cutting, with the objective of attaining suitable conditioning for crop production. Tillage is the mechanical manipulation of the soil in the tillage layer in order to promote tilt, i.e.

desired soil physical condition in relation to plant growth. Performance efficiency of tillage is measured in terms of draft or input energy. Optimization in tillage tool design necessitates minimization of the input energy. It is estimated that tillage accounts for about one half of the energy used in crop production.

Methods of classical soil mechanics are often applied to agricultural soil mechanics with little modification for studying soil deformation. Soil mechanics dealing with agricultural soil has the distinction from those of civil and geotechnical engineering problems in the context of the soil behavior. Tillage is mostly concerned with soil loosening at shallow depths with the interaction of relatively low loads. In addition the depth of agricultural soil tillage is up to 0.5 m. During the last four decades, much research has been conducted on parametric studies for soil–tool interaction with different approaches. These parameters have primarily been studied in a quasi-static condition considering the equilibrium of the soil–tool system. The engineering soil mechanics approach is based on equilibrium state stress–strain relationships for the study of soil deformation, while deformations in agricultural soils rarely reach equilibrium [2]. In soil tillage, the soil is lifted and accelerated and thereby given potential and kinetic energies, and it is manipulated such that a change of state occurs. These processes occur under non-equilibrium conditions. Thus, tillage is a non-equilibrium process.

Recently few studies have been conducted taking the dynamic feature of soil–tool interface due to machine interaction by numerical modeling. These studies, in contrast to the conventional assumption of passive earth pressure theory (quasi-static), considered velocity and acceleration of the tool during the soil–tool interaction. However, the large scale deformation of soil is still an area in which little research has been conducted. Force prediction models for tillage tools have been relying on the classical soil failure theory for quasi-static conditions.

So far, five major methods, namely empirical and semi-empirical, dimensional analysis, finite element method (FEM) [1], discrete or distinct element method (DEM) [4] and artificial neural network (ANN) [7], have been used as approaches to solve problems in the area of soil–tool interaction and failure mechanism. A better understanding of the soil–tool interface mechanism can be obtained by correlating soil rheological behavior with its dynamic characteristics.

This article attempts to briefly review a new approach to the soil-tool dynamic interaction where occur large and irrecoverable soil deformation the use of computational fluid dynamics (CFD).

MATERIAL AND METHOD

1. FORMULATION OF THE PROBLEM

In order for a tillage tool to perform according to its desired criteria, tool geometry is an important factor. Typically, the criteria used for tillage tool design include draught to operate the tool the volume of soil loosened and total the energy requirement. The condition of the tilled soil due to the tool action depends on the soil

mechanical behavior, its initial condition and tool operating parameters. Soil is a very complex material and its behavior is not understood completely. The complexity grows further when soils of different places with different agro-climatic conditions are taken into considerations. For the purpose of developing prediction models, soil mechanical behavior has been described in different ways represented by combination of elastic spring, dashpot and slider in the perspective of elasticity, plasticity and viscosity. Many agricultural soils exhibit a highly nonlinear mechanical behavior and should thus be characterized as nonlinear plastic or visco-plastic materials. Soil deformation under steady-state stress can be described by a simple linear model of viscoplasticity, the Bingham rheological model [5]. The force requirement to pull the tool is a function of the soil pressure exerted on the tool. Soil pressure on tillage tools and its distribution with respect to tool wear is an important parameter in determining tool size and shape. In earlier studies, soil has been considered as a rigid body, elastic solid or elasto-plastic material [2]. According to these studies the force by a tillage tool is influenced by both the stiffness and the strength of the soil (figure 1 a). At the beginning of the tilling activity, most of the soil is elastic and offers significant resistance. Therefore, the force required to till soil is quite high. As the tool moves, more and more soil begins to yield and fail, resulting in the propagation of failure planes or cracks from the tip of the tillage tool to the surface (figure 1 b).

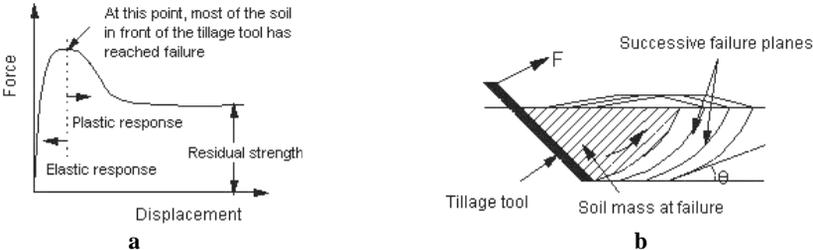


Fig. 1. (a) Force required for tillage; (b) Successive failure planes in front of the tool.

Once the soil begins to yield, the magnitude of the required force drops and reaches a residual level as the soil in front of the tool reaches a steady state in terms of crack propagation. As the tillage tool is dragged further, new failure planes are initiated in the soil in front of the tool and this cycle of peak and residual force repeats itself (figure 2).

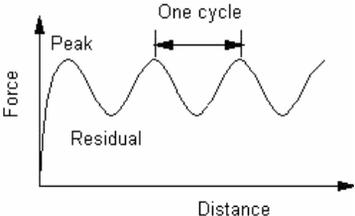


Fig. 2. Fluctuations in the tillage force due to formation of failure planes in the soil.

The frequency of the cycle and the magnitude of the peak tillage force are influenced by the speed at which tilling is carried out [6].

These quasi-static analyses generally do not take into account the dynamics of tillage. The dynamic visco-plastic nature of soil during tillage has not been given proper consideration. The soil deformation pattern around a tillage tool was studied

considering the soil as a visco-plastic material using computational fluid dynamics (CFD) simulations. The results showed that the Bingham model could successfully depict the pattern of soil plastic failure with respect to the yield stress. However, very little data are available from studies that relate soil deformation with the pressure on tool while it moving.

Using FLUENT software can do an assessment on traction forces and pressure distribution on a narrow tillage tool by considering the dynamics of soil – tool interaction using a fluid flow soil approach.

2. CFD SIMULATION

In this study, soil–tool interaction was analyzed from fluid flow perspective. A narrow, rigid and vertical blade was considered as stationary tool in the middle of the visco-plastic soil flow domain (soil bin) (figure 3). The narrow tool acted as an obstruction (the bluff body) in the flow field with 140 mm length (T), 200 mm width (W), operating at 100 mm depth (H), was considered for the study. The flow geometry consisted of an open channel of 940 mm length ($8H+T$), 1400 mm width ($7W$), and 300 mm depth ($3H$). The side and bottom walls were so placed that the effects of the boundary wall on the flow characteristics were negligible.

During the CFD simulations, it was observed that a channel width of seven times the tool width eliminated the effect of the channel wall on the flow pattern with respect to tool influence.

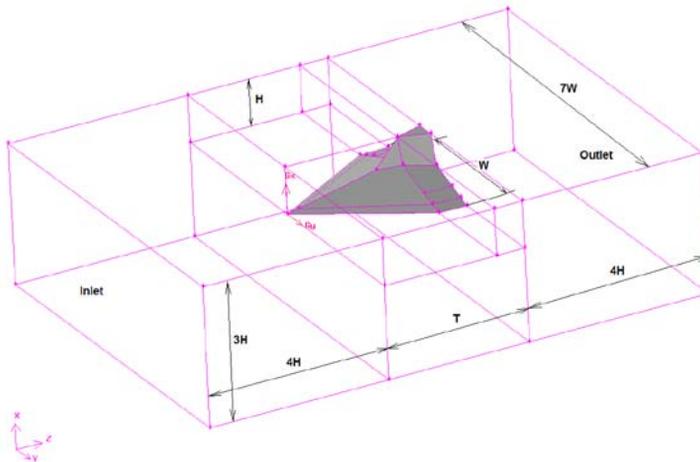


Fig. 3. Schematic of the flow field (soil bin).

The soil was assumed to be an incompressible, isotropic and homogeneous Bingham material with a single-phase laminar flow. If one assumes that soil behaves as a non-Newtonian fluid with a definite yield stress, then the motion of a tillage tool through the soil can be hypothesized as a fluid flow interaction with immersed body. This concept has been implemented in this research through the use of computational fluid dynamics. Soil yield stress in shear was considered to be the failure criterion.

2.1 General and Boundary Conditions

Three-dimensional CFD simulations were carried out in isothermal conditions for a clay loam soil (29% clay, 24% silt and 47% sand). Soil visco-plastic parameters, soil viscosity η , and yield stress τ_0 required for the simulations have been found using a constant-rate soil rheometer [3]. Input parameters for the soil considered in a simulation with 17% moisture content (dry basis) and 400 [kPa] cone index were: $\rho = 1250$ [Kg/m^3] bulk density, $\eta = 900$ [Pa s] viscosity, $\tau_0 = 12$ [kPa] yield stress. Fluid inlet velocity for soil flow domain $v = 3$ [m/s].

The system was idealized with the following assumptions: the tool is narrow, rigid, and works at a constant depth; flow is symmetrical about the vertical section of the tool; soil failure is three-dimensional; the soil is an isotropic and homogeneous continuum; the soil behaves as a Bingham visco-plastic material with definite yield stress; soil pore spaces are negligible, and the soil is an incompressible material.

Boundary conditions imposed in the simulation with respect to the flow domain are: the velocity component normal and uniform to the inlet boundary; the outlet was specified as pressure boundary; no-slip wall boundaries were specified at the bottom and the sides of the channel; the top of the flow domain was specified as free-surface.

2.2 Processing

The Navier-Stokes equation is the basis of numerical solutions of any fluid flow by assuming the conservation of mass through the control volume. In this way, the fluid flow approach addresses different aspects of dynamic soil-tool interaction, such as forces due to the velocity and acceleration of the tool, soil pressure on the tool surface considering the weight of the soil mass, and soil failure due to visco-plastic soil deformation. The following constitutive relation for the Bingham model represents the shear stress tensor in the momentum equation:

$$\tau = \tau_0 + \eta\dot{\gamma} \text{ for } \tau > \tau_0 ; \dot{\gamma} = 0 \text{ for } \tau \leq \tau_0 \quad (1)$$

where τ_0 [Pa] yield stress; $\dot{\gamma}$ [s^{-1}] shear rate; η [Pa s] viscosity.

During tillage, as the tool encounters stiff soil, there is no soil failure until the applied stress exceeds the soil yield stress. A continued applied force that exceeds the threshold yield stress results in visco-plastic soil flow due to soil shear failure. In the CFD processing a value of 10^{-4} has been employed as the convergence criterion at every step of the iteration for the sum of the normalized residuals over the whole fluid domain for all the governing fluid flow equations. A relaxation factor less than 0.3 was found to be a good value for attaining stable convergence, although it increased the computation time compared to larger relaxation factors.

RESULTS AND DISCUSSIONS

Post-Processing

Dynamic soil-tool interactions were carried out by the control volume method with fluid flow phenomena. Simulations were carried out with the soil flowing as a Bingham material in an open channel with an obstruction or bluff body in the flow domain. Results of the simulation were interpreted with the soil as stationary and the tool moving at a constant velocity. Some significant results are discussed below. The pressure distribution on the narrow surface was found to vary with the position of the blade surface and with the type of soil. Maximum pressure was observed at the tool cutting edge. The average normal pressure varied from 4.5 to 53.5 kPa at the tool edge for soil used in simulation (figure 4).

Drag on an immersed narrow tool into fluid (soil) is comprised of two components, pressure drag and viscous or friction drag. This total drag depends on the shape of that tool. Therefore, the total draught is in direct relationship with drag and therefore is divided into two components: pressure and friction or viscous (*table 1*).

Table 1

Total draught			
Zone Name	Pressure force [N]	Viscous force [N]	Total force [N]
Narrow surface	95.6	520.4	616
Vertical device	36.3	42.5	78.8
Net	131.9	562.9	694.8

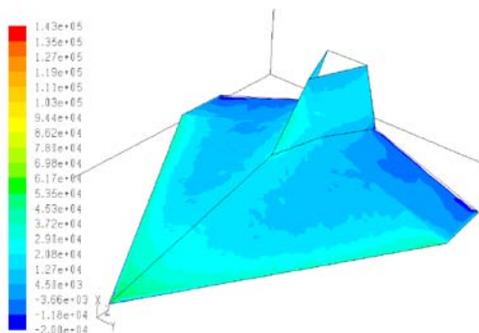


Fig. 4. Contours of Total Pressure [Pa]

CONCLUSIONS

Existing soil-tool modeling techniques have been reviewed with their relative merits and weaknesses. A wide range of such models is available to predict the force required to operate a tillage tool. Preliminary investigations using computational fluid dynamics showed promising results for modeling soil-tool interaction to determine the tillage forces (draught), distribution of pressure on the tool surface. Application of CFD in the area of tillage is anticipated to bring a new dimension to the tool design and study of soil failure behavior for different agro-climatic conditions.

REFERENCES

1. Chi L, Kushwaha RL., 1990 - *A non-linear 3-D finite element analysis of soil failure with tillage tools*. J Terramech, 27(4), 343–66.
2. Karmakar S., 2004 - *Critical state elastoplastic constitutive models for soil failure in tillage - a review*. Canadian Biosystems Engineering, 46(2),19–23.
3. Karmakar S, Kushwaha R.L., 2007 - *Development and laboratory evaluation of a rheometer for soil visco-plastic parameters*. J Terramech, 44, 197-204.
4. Tanaka H, et al., 2000 - *Simulation of soil deformation and resistance at bar penetration by the distinct element method*. J Terramech, 37(1), 41–56.
5. Vyalov SS, 1986 - *Rheological Fundamentals of Soil Mechanics*. Elsevier, Amsterdam.
6. Zhang J, Kushwaha R.L., 1998 - *Dynamic analysis of a tillage tool: Part I – Finite element method*. Canadian Agricultural Engineering, 40(4), 287-292.
7. Zhang ZX, Kushawaha RL., 1999 - *Application of neural networks to simulate soil-tool interaction and soil behaviour*. Can Agric Eng, 41(2),119–25.

EVALUATION OF THE KOMANDI TYPE SHEAR AREA EQUATION USING A TYRE TRACTION MODEL AND EXPERIMENTAL DATA

EVALUAREA RELAȚIEI DE TIP KOMANDI CU AJUTORUL MODELĂRII ȘI A DATELOR EXPERIMENTALE

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Abstract. *The paper tries to evaluate the goodness-of-fit of the shearing area equation developed by G. Komandi, using a traction model previously developed by the authors as well as experimental traction data. The traction model and the field tests referred to the driving tires of a Romanian U-650 tractor; comparison between experimental data concerning the traction force and contact area given by the traction model allowed evaluation of the shear area. As a result, a power type relationship ($A_{sh} = A_t \cdot a \cdot s^b$, where A_{sh} is the shear area, A_t is the contact area, a and b are constants and s is the wheel slip) was found to better describe the shear area instead of the power type one proposed by Komandi.*

Key words: tire traction, shear area, contact area

Rezumat. *Lucrarea încearcă să evalueze formula dezvoltată de G. Komandi, folosind un model pentru tracțiunea roții motoare dezvoltat anterior de către autori, precum și date experimentale. Modelul și datele experimentale se referă la tractorul U-650, iar aria zonei încărcate cu tensiuni tangențiale a rezultat comparând rezultatele teoretice cu cele obținute experimental. S-a constatat că o lege de variație de tip putere este mai potrivită în locul celei de tip exponențial propuse de către G. Komandi.*

Cuvinte cheie: tracțiune, pneu, suprafață de contact, forfecare

INTRODUCTION

The traction of the wheel is a complex physical process and prediction of the traction performance of a tractor wheel depends largely on the model of the tire-terrain interaction. Some models use analytical approaches (commercial CAD or FEM programs), others use semi-empirical or empirical approaches (based on the model proposed by Bekker, Wong etc.) [1].

The semi-empirical method for traction prediction developed by Bekker assumes that the vertical deformation of the soil under the wheel load is similar to the one produced by a sinkage plate and that the shear deformation of the soil due to a traction device is similar to the shear action performed by a rectangular or torsional shear device. In this paper, the semi-empirical approach is used in order to evaluate the wheel-soil pressure and shear stress in soil; as shown in other papers [6, 7], the results given by this model are confirmed by experimental data. The values of the soil constants used by the model are obtained from plate penetration tests and shear stress-shear displacement tests.

In most of the developed traction motion models the shearing surface is considered to be constant. As Komandi has shown in [5], “The shearing surface varies while the tire develops the tractive force but, for practical purposes, shear stress does not change, except for a very small decrease which may occur after sliding begins. The shearing surface can vary from zero to the entire contact surface”. Taking these facts into account we decided to combine a previously developed model for predicting the shear stress and experimental traction data in order to establish whether the Komandi equation may be applied for our soil conditions, or, otherwise, to find a valid equation for the variable shearing surface.

MATERIAL AND METHOD

1. Traction model

The traction model is based on the schematics shown in Figure 1a. The model assumes that, under the vertical load (G), the wheel sinks into the soil, reaching depth (z_c) and the load induces tire deflection (z_p). As a result, the radius of the contact patch becomes r_d ($r_d > r_0$), and the circular length of the contact patch is:

$$l_c = 2 \cdot \sin \beta \cdot r_d = 2 \cdot \sin \alpha \cdot r_0 \quad (1)$$

From Figure 1 we have:

$$z = \overline{OE} - \overline{OA} \quad (2)$$

and we finally get:

$$z = r_d \cdot [\cos(\beta - \varphi) - \cos \beta] \quad (3)$$

Using the Bekker equation $p = k \cdot z^n$ results in:

$$\begin{aligned} G &= \int_0^{2\beta} p \cdot b(\varphi) \cdot r_d \cdot \cos(\beta - \varphi) \cdot d\varphi = \\ &= k \cdot \int_0^{2\beta} r_d^{n+1} \cdot [\cos(\beta - \varphi) - \cos \beta]^n \cdot b(\varphi) \cdot \cos(\beta - \varphi) \cdot d\varphi, \end{aligned} \quad (4)$$

where, according to Figure 1b:

$$b(\varphi) = \sqrt{\frac{l_c^2 \cdot l_w^2 - 4 \cdot l_w^2 \cdot r_d^2 \cdot \sin^2(\beta - \varphi)}{l_c^2}} \quad (5)$$

Assuming the tire is perfectly elastic, we have [3]:

$$G = q_p \cdot b \cdot \frac{4}{3} \cdot (\alpha^3 \cdot r_0^2 - \beta^3 \cdot r_d^2) \quad (6)$$

where q_p is the volume deflection constant of the tire.

From (4) and (6) we get:

$$\begin{aligned} k \cdot \int_0^{2\beta} b(\varphi) \cdot r_d^{n+1} \cdot [\cos(\beta - \varphi) - \cos \beta]^n \cdot \cos(\beta - \varphi) \cdot d\varphi + \\ + \frac{4}{3} \cdot b \cdot q_p \cdot \beta^3 \cdot r_d^2 = \frac{4}{3} \cdot b \cdot q_p \cdot \alpha^3 \cdot r_0^2 \end{aligned} \quad (7)$$

From Figure 1 we also have:

$$z_c = r_0 - z_p - r_0 \cdot \cos \beta, \quad (8)$$

$$z_p = r_0 \cdot (1 - \cos \alpha) - r_d \cdot (1 - \cos \beta), \quad (9)$$

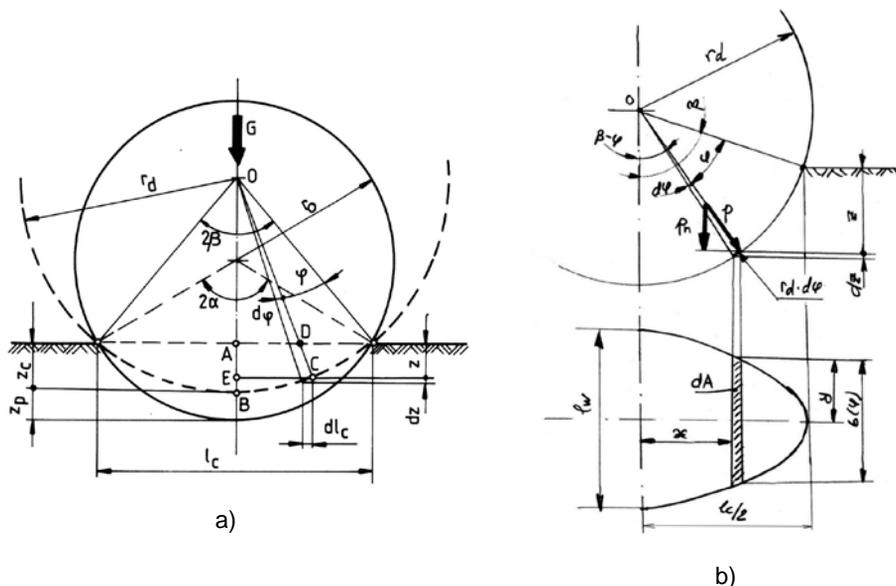


Fig. 1. Schematics of the model

The system consisting of equations (1), (7), (8) and (9) is solved with a computer program, using an iteration process, as shown in [7].

The contact patch is assumed to have an elliptical shape [12], with l_c the major axis and l_w the minor axis; the area of the contact patch is:

$$A_t = \frac{\pi}{4} \cdot l_c \cdot l_w \quad (10)$$

According to Komandi [5], the traction force is given by the sheared area and not by the overall area of the contact patch; moreover, the sheared area varies during the tractive activity exerted by the tire:

$$A_{sh} = A_t \cdot D(s), F_t = \tau \cdot A_{sh} - R_r \quad (11)$$

where A_{sh} is the sheared area, s is the wheel slip, F_t is the traction force, τ is the shear stress on the tire-terrain interface and R_r is the wheel rolling resistance. The variable parameter $D(s)$ is given by Komandi as a function of wheel slip:

$$D(s) = 1 - (1 - s) \cdot e^{-c_1 \cdot l_c^{m_1} \cdot s^{m_2}} \quad (12)$$

and the values of the constants c_1 , m_1 and m_2 depend upon the nature of the surface.

2. Experimental setup

For this work the U-650 tractor was modeled. During the experiments, drive wheel slip and net traction force $F_{t,ef,r}$ were measured directly. The experimental data were collected during field tests of the U650+P2V ploughing unit (aiming to evaluate the quality of the plough's working process); during these tests drive wheel slip was not allowed to exceed 30% because such high values must be avoided during the ploughing process.

The test conditions are shown in Table 1.

The rolling resistance and shear stress were evaluated using the procedure presented in [6, 7].

As the traction force is known and shear stress, contact patch area and rolling resistance are given by the traction model, the $D(s)$ term in equation (11) was

calculated with the formula:

$$D(s) = \frac{F_{r,ef,r} + R_r}{\tau \cdot A_t} \quad (13)$$

Table 1

Test conditions

Item		Value
Load on the drive tire [kN]		11.75
Type of drive tire		14.00 – 38
Overall diameter of tire [m]		1.58
Tire width [m]		0.367
Distance between lugs [m]		0.195
Transversal radius of the undertread [m]		0.3
Soil deformation modulus, K [m]		0.05
Coefficients for the sinkage equation	k	55
	n	1.3
Soil cohesion, c [kPa]		25
Angle of internal friction, φ [°]		32
Cone penetrometer index, CI [kPa]		970

Then the software package LABFit [9] was used in order to evaluate the goodness of fit of a mathematical expression to the calculated values of the D(s) parameter, using the “Curve fit” subroutine.

RESULTS AND DISCUSSIONS

The results concerning the D(s) parameter, starting from experimental traction data and using the relation (13) are shown in Table 2.

Fitting the Komandi type relationship to the values of the D(s) parameter led to the results shown in Figure 2. The equation for the D(s) parameter is:

$$D(s) = 1 - (1 - s) \cdot e^{-1.349 \cdot (t_c)^{-1.393} \cdot s^{0.657}}$$

Unfortunately, the coefficients involved in this equation register very high values of the standard deviation and, in the meantime, Figure 2 displays extended confidence and predict bands. As a result we concluded that, for the soil conditions taken into account, the Komandi type relationship does not fit very well to the experimental data.

Using the functions library of the LABFit software we tried to find a better fit to the experimental data. As a result we found a power type equation:

$$D(s) = a \cdot s^b,$$

where: $a = 1.4 \pm 0.07877$ and $b = 0.449 \pm 0.0335$. The correlation coefficient for this set of data was $r^2 = 0.96933$ and the results are depicted in Figure 3, which displays much narrower confidence and predict bands compared to the Komandi type equation.

In order to compare the results given by the traction model and experimental data, in terms of traction force, the power type relation was used and the results are shown in Figure 4.

Table 2
Values for the D(s) parameter

Slip	D(s)
0.06	0.4065
0.09	0.4740
0.14	0.5990
0.17	0.5779
0.18	0.6330
0.20	0.7090
0.25	0.753
0.26	0.763
0.29	0.812

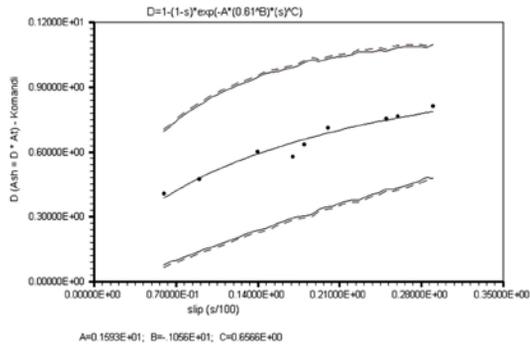


Fig. 2. Results concerning the Komandi type equation

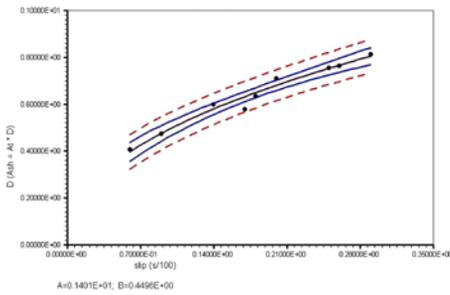


Fig. 3. Results referring to the power type equation

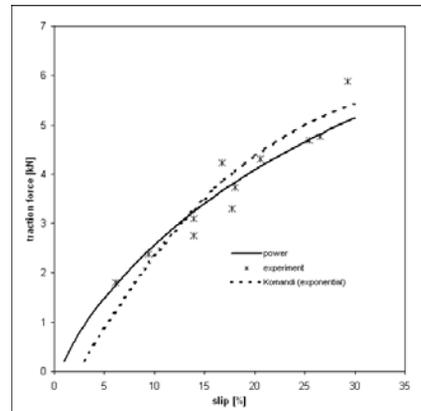


Fig. 4. Traction force

Using the percentage of points within 95% confidence interval of data (Pw95CI) as a measure of degree of fit of model to experimental data [8] we found that, for the power type equation of the D(s) parameter, 88.9% of the points fall within this interval, compared to only 44.4% when the Komandi equation is used.

The mean absolute deviation (MAD), representing the mean of the absolute value of deviation between each model prediction point and its corresponding data point, has a value of 0.2010 for the power type relation and respectively 0.3637 for the Komandi type equation.

Computation of the mean scaled absolute deviation (MSAD) [8] shows that, on average, the model is 1.193 standard errors off from the experimental data when the power type relationship is used, compared to MSAD = 2.323 for the Komandi relation.

CONCLUSIONS

A previously developed traction model and experimental data were used in order to calculate the traction force and shear area.

The shear area was supposed to be linked to the tire-ground contact area by the means of a wheel slip depending parameter $D(s)$.

Using the LABFit software in order to calculate the coefficients involved in the $D(s)$ relationship developed by G. Komandi led to conclusion that this equation did not seem to be appropriate for the evaluation of the shear area, at least not for our test conditions.

A much better goodness-of-fit between the measured traction forces and the ones predicted by our model was achieved when a power type relation was used in order to describe the $D(s)$ parameter.

REFERENCES

1. **Bekker G.M., 1969** - *Introduction to terrain-vehicle systems*. Univ. of Michigan Press, Ann Arbor.
2. **Bekker G.M., 1962** - *Theory of land locomotion*. Univ. of Michigan Press, Ann Arbor.
3. **Ghiulai C., Vasiliu Ch., 1975** - *Vehicle dynamics* (in romanian). Didactical and Pedagogical Publishing House, Bucharest.
4. **Komandi G., 1993** - *Reevaluation of the adhesive relationship between the tire and the soil*. Journal of Terramechanics, 30, 2: 77-83.
5. **Komandi G., 1998** - *A kinematic model for the determination of the peripheral force*. Journal of Terramechanics, 34, 4: 261-268.
6. **Roşca R., E. Rakoşi, Gh. Manolache, 2004** - *Wheel Traction Prediction - A Comparison Between Models and Experimental Data*. SAE Technical Paper Series 2004-01-2707.
7. **Roşca R. et al., 2008** - *Tire traction models-comparative analysis and validation*. Proceedings of the 36th International Symposium Actual Tasks on Agricultural Engineering, Opatija Croatia, p. 93-104.
8. **Schunn C.D., Wallach D., 2005** - *Evaluating goodness-of-fit in comparison of models to data*. W. Tack (Ed.), *Psychologie der Kognition: Reden and Vorträge anlässlich der Emeritierung von Werner Tack*, p. 115-154. Saarbrueken, Germany: University of Saarland Press (at <http://www.lrdc.pitt.edu/schunn/gof/index.html>).
9. **Silva Wilton P., Silva Cleide M. D. P. S.** - *LAB Fit Curve Fitting Software (Nonlinear Regression and Treatment of Data Program V 7.2.45 (1999-2009)*, online, available from world wide web: <www.labfit.net>, date of access: 2008-oct.-14.
10. **Upadhyaya S.K., Dvoralai Wulfson, Jubbal G., 1989** - *Traction prediction equations for radial ply tyres*. Journal of Terramechanics, 26, 2: 149-175.
11. **Upadhyaya S.K., Dvoralai Wulfson, Jubbal G., 1990** - *Review of traction prediction equations*. ASAE Paper 90 – 1573, St. Joseph, Michigan.
12. **Upadhyaya S.K., Dvoralai Wulfson, 1990** - *Relationship between tire deflection characteristics and 2-D tire contact area*. Transactions of the ASAE, 33,1: 25-30.

THE FERTILIZERS WITH CHELATE PROTEINIC SUBSTANCES WITH FOR USE IN THE ORGANIC AGRICULTURE

FERTILIZANȚI CU STRUCTURI PROTEICE CHELATANTE UTILIZABILI ÎN AGRICULTURA ECOLOGICĂ

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Abstract. *A less study domain from plant nutrition section is represented by leaf fertilization. For this reason, this paper work bring new results of some tests made using several new leaf fertilizers with chelate proteinic, some we can call ecological. Organic agriculture represents a sustainable alternative to the traditional agriculture system. To satisfy the new quality exigencies which are a necessity for modern agriculture, specialists must to develop new cultivation systems, depending on natural mechanisms, which must guarantee the environment protection. The researches followed to perform fertilizers and the agrochemical attempts on fertilizers that contain chelates proteinic substances applicable in organic agriculture. This paper refers to chemical characteristics for four experimental fertilizers and to agrochemical tests realized on soy and sunflower cultures.*

Key words: fertilizers, hydrolyzate, collagen, biostimulator, chelates.

Rezumat. *Cu scopul de a satisface noile exigente ale calitatii care sunt o necesitate pentru agricultura moderna, specialistii trebuie sa dezvolta un nou sistem de cultura tinand cont de mecanismele naturale ce garanteaza protectia mediului. Agricultura organica reprezinta o alternative sustenabila fata de sistemul classic. Fertilizarea foliara si fertilizantii aplicati folosind aceasta tehnologie, reprezinta un domeniu mai putin studiat. Din acest motiv, in aceasta lucrare, sunt prezentate rezultatele obtinute la teatarea unor noi fertilizanti cu structuri proteice chelatante cu posibilitatea utilizarii in agricultura ecologica. Cercetarile efectuate au urmarit realizarea si testarea agrochimica a unor fertilizanti ce contin hidrolizate proteice chelatante utilizabili si in agricultura ecologica. Sunt prezentate caracteristicile chimice pentru patru fertilizanti experimentali si testarile agrochimice efectuate pe culturile de soia si floarea soarelui.*

Cuvinte cheie: fertilizanți, hidrolizat, colagen, biostimulator, chelați

INTRODUCTION

Romania disposes of major conditions to develop ecological agriculture as well as a favorable conjunction that would motivate this system's development, of which can be mentioned:

- Rich and productive soils that cover a significant surface of plough land;

- Soils fertilization has not reached the level in UE, registering a major decrease after 1990;
- There is the possibility to locate ecological areas, unpolluted where ecological agriculture practices can be applied;
- Traditional ecological agriculture is based on clean technologies;
- The request for ecological products is increasing offering to Romania the possibility to export such sort of products;
- Prices for ecological products are accessible and allow to increase the income for farmers.

Within the Grant Agreement 141708/2008 signed with Grant Competitive Scheme in MAPDR, have been realized activities of testing and obtaining agro-chemically fertilized solutions that contain organic chelates proteic substances.

Within the Laboratory of Testing and Fertilizers Quality Control in ICPA-Bucharest (National Research & Development Institute for Soil Sciences, Agrochemistry and Environment Protection, Bucharest – I.N.C.D.P.A.P.M -ICPA) and the Laboratory of Fertilizers Testing of S.C. Chimro .S.R.L have been developed experiments that led to accomplishment of 4 technological process and fertilizers formulas that can be used in both in classical and ecological agriculture system, being agro-chemically tested.

The principles that were applied to determinate raw stock and to define technological process of obtaining these fertilizers were in addition to / specific to ecological agriculture standards, such as Council Regulation EEC 2092/91, Regulation CE 834/2007 regarding ecological production and ecological products labeling, Regulation (CE) 889/2008 - settles application standards of Regulation (CE) nr. 834/2007 of Council of ecological production and product labeling as well as Regulation (CE) 2003/2003 regarding classical fertilizers, that is mentioned in Anex 1 of Regulation (CE) 834/2007.

MATERIAL AND METHOD

To carry out the agro-chemical tests have been obtained in laboratory phase different extraradicular fertilizers having in their composition organic substances with stimulator role, obtained through neutral collagen. Substances with fito-stimulator role had the following composition: glycine 30 – 40 %, alanine 10 – 15 %, proline 10 – 15 %, glutamic acid 5 – 10%, hydroxyproline 5 – 10 %, aspartic acid 4 – 6 %, arginine 4 – 6 %, serine 3 – 5 %, threonine 1 – 3 %, and as essential amino-acids in significant proportions : lysine 2 – 4 %, valine 2 – 4 %, leucine 2 – 3 %, phenylalanine 1,5 – 2 %, isoleucine 1 – 1,5 %, histidine 0,7 – 1,5 %, methionine 0,2 – 0,5 %.

Carried out activities aimed:

- Compositional structures stabilization
- Experimental schemes realization at installation level in laboratory;
- Preliminary establishments of processing for access parameters;
- Control establishment on process phases and final;
- Sample creation to characterize physicochemical ;
- Sample creation to test agro-chemically;

Formulas of extraradicular fertilizers, experimentally tested and obtained in agro-chemically tests were:

- NPK type with chelates organic substances and microelements of trace elements in the array (one variant, coded "Fert 1");
- NK type chelates organic substances and microelements introduced in the obtaining process (2 variants with chelates organic substances in 2 compositional and structural formulas coded "Fert 2" and "Fert 3");
- N type chelates organic substances and microelements introduced in the obtaining process (one variant, coded "Fert 4").

Experimental fertilizers have been comparatively tested with one unfertilized and foliar witness (M0), 2 witnesses – certificate fertilizers as "ECO" (ECO 1R and ECO 2F) and one witness represented of one classic extraradicular fertilizer of NPK type with microelements in which have been introduced and hydrolysed proteic (MO F, experiments ruled on Soya). Agro-chemically experiments were carried out in the House of Vegetation of I.N.C.D.P.A.P.M. – ICPA Bucharest using pots of Mitscherlich type with 20 kg of sol. Agro-chemically experiments were carried out of sunflower, Justin category, on mold vermouth soil type with: 3,18 – 3.55 % humus, 0.18 – 0.26 % azote, mobile phosphor (P in AL) 37.6 – 138 ppm, with mobile potassium (K in AL) 199 – 364 ppm and an alkaline pH of 8.0 – 8.2 units of pH. There have been created 14 types / variants of 4 repetitions, with 3 plants each, of which 2 plants have been kept for agro-chemically experiments.

Experimental fertilizers were applied as concentration solution of 1%, in quantities of 30 ml/pot in number of 3 treatments at intervals of 10-15 days.

After 15 days from last application one repetition of all variants has been sacrificed and from whole plant (excepting the radicular system) chemical analyses were conducted for: N, P, K and microelements. At the end of vegetation and after the appreciation of production parameters on the medium sample of seeds from the 3 repetitions remained in vegetation, have been carried out the analysis of chemical elements and oil. The agro-chemical experiments on Soya culture, Columna category, have been carried out on mold bill, medium fertilized and with a high composition of argil (30 – 35%): humus 3.5%, total azote (N) 0,170%, mobile phosphor (P) 50 ppm, mobile potassium (K) 300 ppm, V 81(%) and pH: 6,2 – 6.4.

There have been created 10 variants of 3 repetitions each, of 3 plants / pot. The experiments have been realized on and unfertilized agro-fond, as well and on high fertilized agro-fond, realized with NPK (15.15.15) fertilizer.

Experimental fertilizers were applied as solution in concentration of 1% in quantities of 30ml/ pot, in a number of 3 treatments in periods/intervals of 10-15 days.

RESULTS AND DISCUSSIONS

The usage of some proteic substances that contain proteins, protides and free amino acids into a complex array with macro and micro chelates elements leads to the achievement of stabile fertilizers solutions, from physical and chemical point of view.

Except the role of chelates, the used proteic hydrolysate plays the role of protective colloid which helps to maintain the stability of the fertilizer; and through the components with molecular weight of aprox. 14000 Da forms at the surface of plant tissue some sort of films.

These films have the capacity to waste in time chelates micro-elements of the collagen polypeptide, acting as a hydrophilic protector at environment factors and as well as fitostimulator.

In the case of the experiments carried out on sunflower culture, Justin Category, cultivated in vegetation pots, at the end of the culture and after the

appreciation of production parameters, of average seeds sample of the 3 repetitions remained in vegetation has been carried out the analysis of chemical elements involved and oil.

Results of agro-chemical testing of fertilizers on sunflower, and also the results of the analysis carried out of plant sample, seeds after the vegetation cycle ends are presented in 1 to 3 figures.

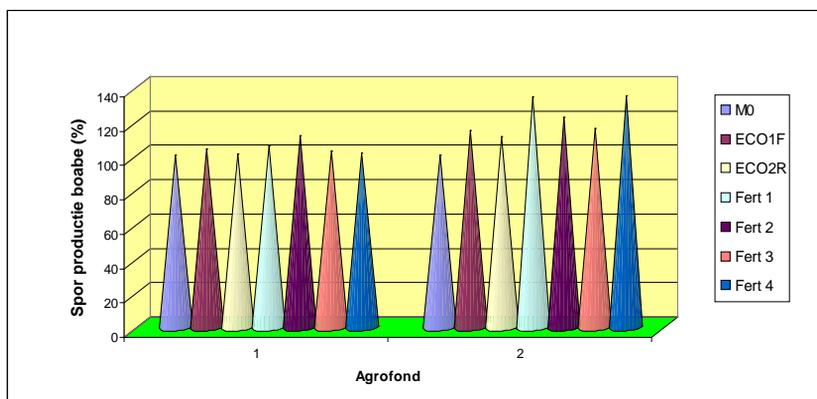


Fig.1. The evolution of production elements depending on the extraradicular fertilization applied to sunflower, Justin category (1 – without base fertilization, 2 – with base fertilization)

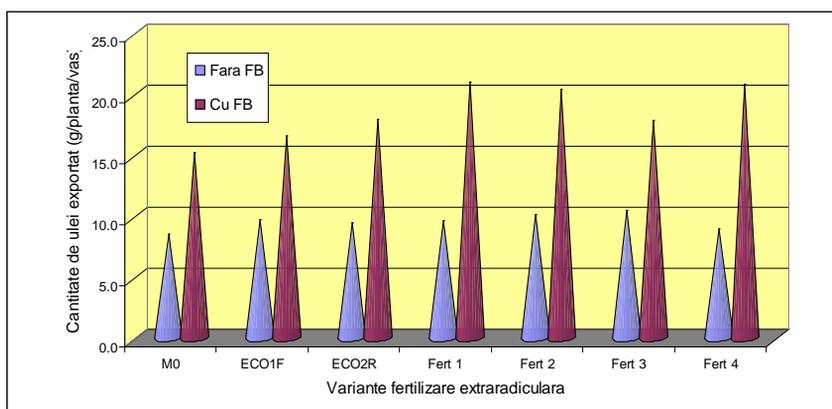


Fig. 2. The quantity of oil exported by crop depending on extraradicular fertilization applied to sunflower, variety Justin (with and without base fertilization)

Increased production level of sunflower for the experimented variants on an agro-fond without base fertilization have been with 1% (ECO 2R) up to 15,5% (Fert 2) higher than the extraradicular unfertilized witness (M0) and evolved ascending in the following order : ECO R2, Fer 4, Fert 3, ECI 1F, Fert 1, Fert 2. In the case of the experiments carried out on an agro-fond with base fertilization, increased production levels towards the M0 witness have been higher with 10.7% (ECO 2R) and up to 31,9% (Fert 4) and evolved ascending as follows: ECO 2R, ECO 1F, Fert 3, Fert 2, Fert 1 and Fert 4. The data analysis obtained in the case of oil culture export, indicated the fact that

this is with 1.7 up to 2.3 times higher that in the cases of experiments carried out on an agro-fond with base fertilization towards the unfertilized one. Oil content (g/plant/pot) situated between 8.9 (Fert 4) and 10.4 (Fert 3), for the experiment carried out on unfertilized agro-fond and 16.6 (ECO 1F) and 21.0 (Fert 4 and Fert 1). Oil content exportet through the extraradicular fertilizers application towards the foliar unfertilized witness (M0) has been higher with 4.8 $4.8 \div 22.4\%$, in case of unfertilized variants and with $9.0 \div 37.7\%$ for fertilized variants.

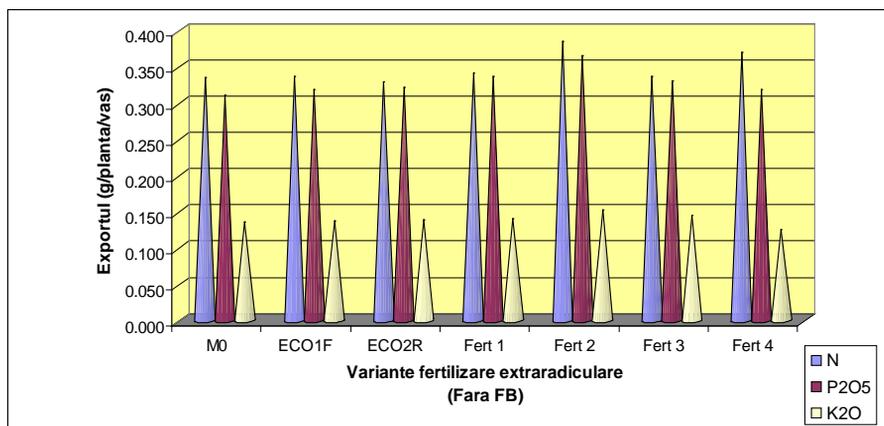


Fig. 3. Macronutrient export (N, P, K) depending on the version of radicular fertilization applied to sunflower, Justin Variety (without base fertilization)

For fertilized variants applied extraradicular to sunflower cultivated on an unfertilized agro-fond, export of macronutrients with seeds production, situated between $0.328 \div 0.383$ g N/plant (ECO 2R \div Fert 2), $0.317 \div 0.365$ g P/plant (Fert 4 \div Fert 2) and, respectively $0.125 \div 0.151$ g K/plant (Fert 4 \div Fert 2). In case of carried out experiments to sunflower cultivated on an fertilized agro-fond the export of nutrients towards the extraradicular unfertilized witness has situated between $8.4 \div 36.5\%$ N (ECO 2R \div Fert 4), $10.2 \div 35.7\%$ P (ECO 2R \div Fert 1, Fert 4) and , respectively $8.3 \div 31.4\%$ K (ECO 2R \div Fert 4). In case of experiments to sunflower cultivated on an unfertilized agro-fond, it has been observed that the experimented fertilizer Fert 2 provides the highest export of macronutrients (N, P, K).

The results of agrochemical testing of fertilizers on Soya culture, Columna category, after the vegetation cycle ends are presented in figures no. 4. For Soya culture, Columna type, the extraradicular fertilization provided high levels of production till 18.7% towards the unfertilized foliar witness M0. The evolution of all levels of production has been increasingly as follows: Fert 3 (2.2%), Fert 1 (3.3%), Fert 2 (7.2%) and M0F (18.7%). The spore production registered in case of M0F variant can be applied through the presence of substances with stimulation properties as well as for the complex matrix NPK with a high content of macro and micro element towards the fertilizers from Fert range. The export of macronutrients towards the mM0 witness for M0F variant is higher with 15.2% in case of azote, 25,4% for phosphor and 25.7 for potassium.

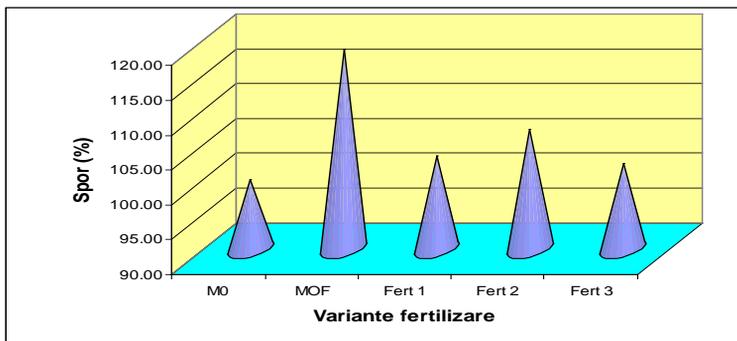


Fig. 4. The evolution of spore production (%) depending on the fertilization variant (bean Soya, Columna category)

CONCLUSIONS

1. In case of agro-chemicals experiments it has been found one evolution descendent of spore beans production in the next order: M0 F (18.7%), Fert 2 (7.2%), Fert 1 (3.3) and Fert 3 (2.2%); maximum spore obtained with extraradicular fertilizer is below 40% in comparison to the one realized with M0 F witness..

2. Macronutrients export N, P, K towards the M0 witness for the experiments realized on Soya culture has an ascending evolution as follows: Fert 3 (4 – 4.5% for potassium and phosphor), Fert 1 (7 – 9% for phosphor and potassium and 1% for azote), Fert 2 (11 – 14.6% for potassium and phosphor and 4.4 % for azote) and M0 F (26.7 – 25.4% for potassium and phosphor and 15.2% for azote).

3. In case of sunflower experiments for the unfertilized variants has been found an ascending evolution of spore beans production in the next order : ECO 2R (0.6 %), Fert 4 (1.2%), Fert 3 (2.4 %), ECO 1F (3.6 %), Fert 1 (5.5 %) and Fert 2 (11.5%), and in case of experimental variants on maximum spore fertilized agro-fond it has been found with extraradicular fertilizers Fert 1, Fert 4 with 33.8 % respectively 34.9%, followed by Fert 2, Fert 3 cu 22.1% and respectively 15.7 %.

REFERENCES

1. Dorneanu A., Dorneanu Emilia., Sirbu Carmen., Cioroianu T. M, Ilie A., 2005 - Utilizarea *ingrasamintelor lichide in contextul unei agriculturi moderne*. Simpozionul International "Managementul nutrientilor pentru imbunatatirea calitatii culturilor si conservarea mediului", 13 – 14 iulie Craiova, 2005; publicata in Ed. AGRIS, 2006, p. 373 -379.
2. Sirbu Carmen, T. Cioroianu, M. Dumitru, A. Dorneanu, Maria Negrita, Daniela Mihalache, Letitia Angelescu, 2008 - *New structures of biofertilizers with chelate proteinic substances with role of biostimulator and protection for sustainable agriculture*. Lucrari Stiintifice, Seria Agronomie, vol. 51 (2), pag. 189-194.
3. Trandafir Viorica, Cioroianu T. M., Bratulescu Victoria, Carmen Sirbu, 2003 - Use of *Collagen hydrolisate as an active component in bio-fertilisers*. Cucio Pel. Mat. 79 (6), 2003, p. 289.

THE EFFECT OF ORGANIC FERTILISATION ON YIELDS OF MAIN FIELD CROPS FROM THE LACU SARAT TRIAL PLOT, BRAILA

EFFECTUL FERTILIZĂRII ORGANICE ASUPRA PRODUCȚIEI LA PRINCIPALELE CULTURI DE CÂMP DIN CADRUL CÂMPULUI EXPERIMENTAL LACU SĂRAT, BRĂILA

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***Abstract** Agropedoameliorative works aim the improvement of some negative characteristics in order to increase the production capacity of low-productive soils. Organic fertilisation is complementary with the mineral one, and, together with other works, contributes to increase soil productivity. In this context, the trial was conducted in several years: 1998 – 1999, 1999 – 2000, 2002 – 2003, 2003 – 2004, in the surface of the Lacu Sarat trial plot, Braila county, having as main objective, to establish some technological measures on soil and crop yields at main field crops.*

Key words: trial plot, organic fertilisation, treatment of variant, crop yield

***Rezumat** Lucrările agropedoameliorative au ca scop îmbunătățirea unor însușiri intrinseci în vederea ridicării capacității de producție a solurilor slab productive. Fertilizarea organică este complementară celei minerale și, împreună cu alte lucrări contribuie la sporirea capacității de producție a solurilor. În acest context, experiența a fost realizată în perioada 1998 – 1999, 1999 – 2000, 2002 – 2003, 2003 – 2004, în cadrul câmpului experimental Lacu Sărat, Brăila, având ca principal scop stabilirea unor tehnologii asupra solului și asupra producției la principalele culturi de câmp.*

Cuvinte cheie: câmp experimental, fertilizare organică, variantă de tratament, producție

INTRODUCTION

Ameliorative fertilization is an agropedoameliorative technique which is carried out in order to recover, sustain and increase the production capacity of some soils having undergone intense, natural or human-induced processes of fertility degradation, and to rise the production potential of some weak developed soils. Ameliorative fertilization is the application, according to the specific conditions of the soils and the fields cultivated inside each perimeter, of some enhanced ratios of chemical and organic fertilizers including micronutrients able to substantially improve their production capacity (Nitu et al., 2000).

The use of organic fertilization can either supplements chemical fertilizers under some circumstances or add complexity to the measures taken to improve the fertility of soils with low production potential (acid, sandy, salty soils).

MATERIAL AND METHODS

In order to determine the influence of the different agropedoameliorative measures on the main field crop yields, the Lacu Sarat trial plot was set up in Braila county. This plot is sited in the Eastern Romanian Plain (Braila Plain), (Posea, Badea, 1984; Geografia României, 2005) in a valley area which accumulates ground waters from the neighbouring higher areas, this phenomenon also being the cause of soil degradation processes by salinization and recurrent water excess. Surface deposits are made of loess and the texture varies from loamy-sandy to loamy-clayey. On the bottom of the valley, where the trial plot is sited, ground waters reach levels of less than 2 m and in some parts less than 1 m depth. Trial plot was located on slightly-moderately salinized a chernozem (SRTS, 2003). As far as climate is concerned, the trial plot is sited in the dry steppe (Bogdan Octavia, 1999), characterized by hot and dry summers, with a mean multiannual temperature of 10.9°C, precipitations of 452 mm annually, potential evapotranspiration of 705 mm and a climatic water deficit of 345 mm (Braila Weather Facility).

The natural conditions of the trial plot were the basis for the layout for several treatments:

- horizontal drainage,
- deep loosening,
- ameliorative irrigation,
- organic fertilization,
- chemical fertilization,
- soil tillage with soil material inverting,
- without soil material inverting (paraplow) and
- mulching.

The trial plot, with a surface of 8 ha, was divided in eight technological treatments each treatment being composed of several treatments (table 1).

Table 1

Improvements applied to Lacu Sarat trial plot, Braila

Treatments of variant	Treatments										
	Drainage			Deep loosening	Ameliorative irrigation	Fertilization		Soil tillage		Mulching	Amendment
	high intense (20 m)	moderately intense (40 m)	no drainage			organic	chemical	with soil material inverting	without soil material inverting (paraplow)		
V ₁	✓			✓	✓	✓	✓		✓		✓
V ₂	✓			✓	✓		✓		✓		✓
V ₃	✓			✓	✓		✓	✓			✓
V ₄	✓				✓		✓		✓		✓
V ₅	✓			✓			✓		✓		✓
V ₆	✓			✓			✓		✓	✓	✓
V ₇		✓		✓	✓		✓		✓		✓
V ₈			✓	✓	✓		✓		✓		✓
V _{8a} (Benchmark)			✓				✓	✓			

The present paper will present the effect of organic fertilization (carried out with a dose of 120 t/ha moist manure = 60 t/ha dry manure) on the yield of the maize,

sorghum, wheat, sunflower, Sudan herb, maize green matter crops sown in the trial plot in the studied period.

The interpretation of yield data was carried out so as to highlight the influence of a sole improvement (technological link), by comparing the pairs of treatments with similar technologies, but lacking an improvement (the reference point) considered comparison treatment (Coteț Valentina, 2008), as follows:- for **the influence of organic fertilizers V₁** (*Drainage with 20 m between the drains + Deep loosening + Ameliorative irrigation + Organic fertilization + Chemical fertilization + Paraplow + Amendment*) was compared to **V₂** (*Drainage with 20 m between the drains + Deep loosening + Ameliorative irrigation + Chemical fertilization + Paraplow + Amendment*).

Even than in the whole trial plot an amelioration scheme has been applied, this paper refers only to V₁ and V₂ variants, similar from the point of view of ameliorative works, the difference being due to organic fertilizers applied to the V1 variant.

RESULTS AND DISCUSSIONS

The yield findings for the studied maize, sorghum, wheat, sunflower, Sudan herb, maize green matter crops in the trial lot for the agricultural years 1998 – 1999, 1999 – 2000, 2002 – 2003, 2003 – 2004 are presented in table 2, both as absolute and relative values compared to the benchmark treatment = 100, which in the trial context can be considered **V_{8a}** (*no drainage + chemical fertilization + soil tillage with soil material inverting + amendment*) which undergone the least improvements, an actual benchmark (with no improvement) treatment missing.

Under **organic fertilization (V₁ - Drainage with 20 m between the drains + Deep loosening + Ameliorative irrigation + Organic fertilization + Chemical fertilization + Paraplow + Amendment)** compared to the similar treatment **with no organic fertilizers (V₂ - Drainage with 20 m between the drains + Deep loosening + Ameliorative irrigation + Chemical fertilization + Paraplow + Amendment)** there one can be seen yield increases in all crops and in all years as follows: 18 – 50% in maize; 2 – 5% in sunflower; 7 – 35% in sorghum and 2 – 79% in Sudan herb (fig. 1).

For the V1 variant, the relative yields increases are very large, from 115 to 208% (relative yearly yields: 215 - 308% and average relative yields: 200 - 280%), excepting the sorghum and winter wheat, having the increases of only 60 - 65%.

The sun flower had close yields for the 4 studied years, between 215 and 253% (average relative yields being 227%).

For the second variant (V2), similar to V1 but without organic fertilization, the relative yields increases are between 43 and 157% (the average being 72-119%), excepting the sorghum and winter wheat, having the increases of only 19 - 54%. Another observation is for the sun flower, its relative yields being closely, between 205 and 241%, with a difference of 10-12% as compared with those from V1, explained by the organic fertilizers application.

Table 2

Influence of organic fertilizer application

Influence of applied improvement	Agricultural year	Yield (kg/ha)								%			
		Compared treatment				Comparison treatment							
Organic fertilization (V ₁ – V ₂)	1998/1999	Maize	Sorghum	Sun flower	Sudan grass	Maize	Sorghum	Sun flower	Sudan grass	Maize	Sorghum	Sun flower	Sudan grass
		7330	4366	2660	893	4884	3246	2535	500	150	135	105	179
	1999/2000	Maize	Sorghum	Sun flower	Sudan grass	Maize	Sorghum	Sun flower	Sudan grass	Maize	Sorghum	Sun flower	Sudan grass
		4437	4553	3440	30000	3748	4266	3285	28571	118	107	105	105
	2002/2003			Sunflower	Green matter maize			Sunflower	Green matter maize			Sunflower	Green matter maize
				1140	20500			1120	20100			102	102
	2003/2004			Sunflower	Green matter maize			Sunflower	Green matter maize			Sunflower	Green matter maize
				1160	20600			1125	20200			103	102

V₁ - Drainage with 20 m between the drains + Deep loosening + Ameliorative irrigation + **Organic fertilization** + Chemical fertilization + Paraplow + Amendment

V₂ - Drainage with 20 m between the drains + Deep loosening + Ameliorative irrigation + Chemical fertilization + Paraplow + Amendment

It can be noticed that the highest yields were obtained in the agricultural year 1998 – 1999 (table 2), an agriculturally favourable year, with precipitations of 563 mm, compared to the multiannual average of 452 mm and an annual mean temperature of 11.1⁰C compared to the multiannual average of 10.9⁰C, and the fact that before setting up the trial plot the meadow was fallowed.

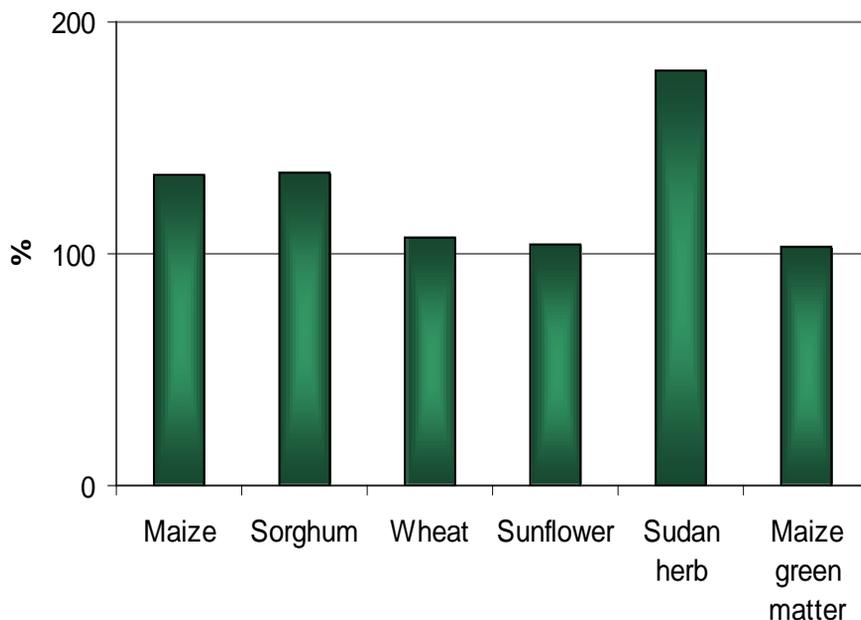


Fig. 1. Variation of mean relative crop yields (%) in crops related to organic fertilization

CONCLUSIONS

1. The application of manure together with the other improvements had favourable effects, especially in maize, sorghum and Sudan herb.

2. The most important conclusion of the research is that soils of the slightly-moderately salinized chernozem type can have yields close to those obtained from nonsalinized soils, provided drainage, ameliorative irrigation and organic fertilization are applied.

3. Besides the aspects directly related to the crop yields on salty soils, organic fertilization, together with the chemical one, essentially contributes to the intensification of soil improvement processes.

4. The organic fertilization, as amelioration works, has a high efficacy on yields for the main crops, but the amounts used are depending mainly on manure management, involving its availability as well as the distance between the plot and the manure platform.

REFERENCES

1. **Bogdan Octavia, 1999** - *Principalele caracteristici climatice ale Câmpiei Române*. Com. Geogr., III.
2. **Coteș Valentina, 2008** - *Cercetări privind influența unor măsuri agrofitehnice asupra solului și producției la principalele culturi de câmp în condițiile cernoziomului freatic umed slab salinizat și slab alcalizat din zona Brăila*. Teză de doctorat.
3. **Nițu I., Drăcea Maria, Răuță C., Mihalache M., 2000** - *Lucrările agropedoameliorative*. Editura Agris - Redacția Revistelor Agricole.
4. **Posea Gr., Badea L., 1984** - *România – unitățile de relief*. Hartă, sc. 1:750.000, Ed. Șt. Enciclop., București.
5. *****, 2005** - *Geografia României*, vol. V. Ed. Academiei Române.
6. *****, 2003** - **SRTS** - *Sistemul Român de Taxonomie a Solurilor*, autori: Florea N., Munteanu I., Ed. Estfalia, București.

THE BEHAVIOUR OF MAIZE CROP UNDER DIFFERENT TREATMENTS FROM THE LACU SARAT TRIAL PLOT, BRAILA

COMPORTAREA CULTURII DE PORUMB LA DIFERITELE VARIANTE DE TRATAMENT DIN CADRUL CÂMPULUI EXPERIMENTAL LACU SĂRAT, BRĂILA

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***Abstract** The maize is a plant with a good resistance to drought and heat, with a good adaptability to different climatic conditions, but it is affected by a number of diseases and pests. Being a weeder plant, it leaves the land clean of weeds and constitutes a good previous crop for many plants, it makes good use of mineral and organic fertilizers, and it reacts very strong to irrigation. In the natural background conditions on the trial plot, and taking into account the improvement scheme, the maize was sowing in the first two years of experimentation (1998-1999, 1999-2000), achieving high yields. The main purpose of the research was to pursue the influence of agrofitotechnical measures on soil and yields for the main field crops in the trial plot Lacu Sarat, Braila county, and, in this paper the behaviour of the maize crop has been observed.*

Key words: trial plot, maize crop, treatment of variant

***Rezumat** Porumbul este o plantă cu rezistență bună la secetă și căldură, cu o bună adaptabilitate la diferite condiții de climă și este afectat de un număr redus de boli și dăunători. Fiind o plantă prășitoare, lasă terenul curat de buruieni și constituie o bună premergătoare pentru multe plante, valorifică bine îngrășămintele organice și minerale, și reacționează foarte puternic la irigații. Pe fondul condițiilor naturale ale câmpului experimental și a schemei de ameliorare, porumbul a fost semănat în primii doi ani de experimentare (1998-1999, 1999-2000), obținându-se producții ridicate. Scopul principal al cercetărilor a fost acela de a urmări influența unor măsuri agrofitotehnice asupra solului și producției la principalele culturi de câmp în condițiile câmpului experimental Lacu Sărat, Brăila, iar în lucrarea de față s-a urmărit comportamentul culturii de porumb.*

Cuvinte cheie: câmp experimental, cultura de porumb, variantă de tratament

INTRODUCTION

Maize (*Zea mays*) is one of the most valuable crops due to its high productivity and the multiple uses of its production in human foodstuff, in husbandry and in the industry. In Romania country grain maize has, among other crops, the most important place.

Maize is a heat-loving plant and prefers fertile and deep soils. The highest yields are obtained on different types of chernozems, reddish preluvosoils and

rich alluvial soils, especially those in the Danube River Plain. Maize is not demanding special previous crops and can be cultivated, with good results, after almost all crops. The highest yields are obtained when maize follows a crop which is harvested in early summer, such as leguminous plants cultivated for their beans, then fodder plants, fall and spring strawy small grains (Muntean și colab., 2003). Strawy small grains, especially winter wheat, are the most often used as previous crops for maize, the wheat-maize rotation representing large tracts of land covered by the two crops in our country.

The present paper aims to present the experimental findings for maize crop in the Lacu Sarat trial plot which is sited in Eastern Romanian Plain, called Braila Plain or Northern Baragan (Posea, 1989; Geografia României, 2005).

MATERIAL AND METHODS

Lacu Sarat trial plot is sited in a depressionary area which accumulates ground waters from neighbouring higher areas, this phenomenon also being the cause of soil degradation processes by salinization and recurrent water excess. Surface deposits are made of loess and the texture varies from loamy-sandy to loamy-clayey. On the bottom of the valley, where the trial plot is sited, ground waters reach levels of less than 2 m and in some parts less than 1 m depth. Trial plot was located on slightly-moderately salinized a chernozem (SRTS, 2003). As far as climate is concerned, the trial plot is sited in the dry steppe (Bogdan Octavia, 1999), characterized by hot and dry summers, with a mean multiannual temperature of 10.9°C, precipitations of 452 mm annually, potential evapotranspiration of 705 mm and a climatic water deficit of 345 mm (Braila Weather Facility).

The natural conditions of the trial plot were the basis for the layout for several treatments: horizontal drainage, deep loosening, ameliorative irrigation, organic fertilization, chemical fertilization, soil tillage with soil material inverting, soil tillage without soil material inverting (paraplow) and mulching (table 1).

Table 1

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V ₂	✓			✓	✓		✓		✓		✓
V ₃	✓			✓	✓		✓	✓			✓
V ₄	✓				✓		✓		✓		✓
V ₅	✓			✓			✓		✓		✓
V ₆	✓			✓			✓		✓	✓	✓
V ₇		✓		✓	✓		✓		✓		✓
V ₈			✓	✓	✓		✓		✓		✓
V _{8a} (Benchmark)			✓				✓	✓			

- V₁ - Drainage with 20 m between the drains + Deep loosening + Ameliorative irrigation + Organic fertilization + Chemical fertilization + Paraplow + Amendment;
- V₂ - Drainage with 20 m between the drains + Deep loosening + Ameliorative irrigation + Chemical fertilization + Paraplow + Amendment;
- V₃ - Drainage with 20 m between the drains + Deep loosening + Ameliorative irrigation + Chemical fertilization + Soil tillage with soil material inverting + Amendment;
- V₄ - Drainage with 20 m between the drains + Ameliorative irrigation + Chemical fertilization + Paraplow + Amendment;
- V₅ - Drainage with 20 m between the drains + Deep loosening + Chemical fertilization + Paraplow + Amendment;
- V₆ - Drainage with 20 m between the drains + Deep loosening + Chemical fertilization + Paraplow + Mulching + Amendment;
- V₇ - Drainage with 40 m between the drains + Deep loosening + Ameliorative irrigation + Chemical fertilization + Paraplow + Amendment;
- V₈ - No drainage + Deep loosening + Ameliorative irrigation + Chemical fertilization + Paraplow + Amendment;
- V_{8a} (Benchmark) - No drainage + Chemical fertilization + Soil tillage with soil material inverting + Amendment.

After applying ameliorative technologies in 1998, the trial plot was cultivated in 1999 with next crops: maize, sunflower, sorghum and Sudan herb and in 2000 with maize, sunflower, wheat and Sudan herb.

The four crops were sown at a right angle, so that each crop goes through the eight plots with treatments.

It has to be said that all technological components (plant species, fertilization, sowing, weed control) were of ameliorative nature.

Provided that this paper only presents maize behaviour, the technological cultivation characteristics are as follows:

- seedbed preparation was carried out by plowing with U 650 + paraplow and disc harrowing with U 650 and HD 3,4 (the second time with uncoupled harrows);
- a cultivar with middle-late ripening – Opal - was used, requiring a sum of thermic units between 1400 and 1500⁰C to reach ripening;
- sowing was done at the temperature of 8⁰C in sol at the sowing depth of 10 cm, with a density of 75000 germinable seeds/ha, and the interrow distance of 70 cm;
- fertilization was done by applying 600 kg/ha ammonium sulphate, which provides 120 kg N/ha for the V₂ - V_{8a} treatments and 300 kg/ha ammonium sulphate, which provides 60 kg N/ha for the V₁ treatment, on which manure (60 t/ha manure) was applied when preparing the seedbed;
- weed control was done by applying 2,5 l Guardian/ha when preparing the field, with surface incorporation and 1 l Oltisan extra/ha in the growing season, in the 3-4 leaves stage of dicotyledonous weeds, together with a mechanical weeding;
- in order to control diseases and pests, maize seeds were treated with Furdan 28 l/ha;
- harvesting was done by hand on the treatments, at a 25 – 28% grain moisture and then the yield was weighed for each treatment.

RESULTS AND DISCUSSIONS

The production results for the studied maize crop trial plot in the 1998 – 1999, 1999 – 2000 agricultural years, are presented in figure 1.

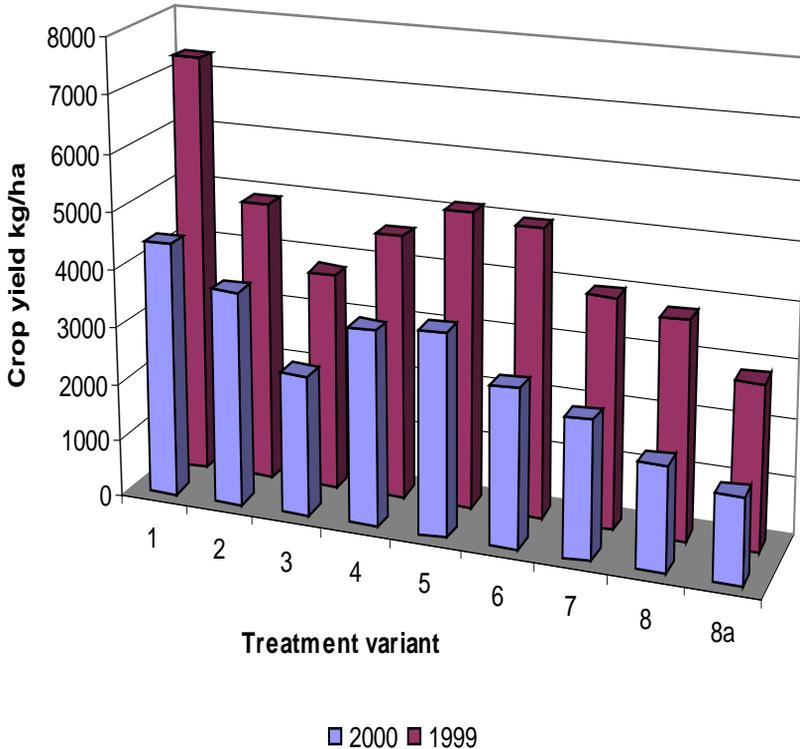


Fig. 1. Yield obtained for maize crop

In the first trial year the yield varied from 7330 kg/ha for V_1 where the manure was applied and 2866 kg/ha for V_{8a} which is considered the benchmark variant, and in the second year from 4437 kg/ha for V_1 where the manure was applied and 1460 kg/ha for V_{8a} considered the benchmark variant.

The obtained yields are presented both in absolute and in relative values (% of the benchmark treatment = 100), which in the trial context can be considered V_{8a} (no drainage + chemical fertilization + soil tillage with soil material inverting + amendment) which undergone the least ameliorative tillage, the actual benchmark (with no improvement) treatment missing. It can be seen that the best yields were obtained for the treatments with a distance of 20 m between drains and with soil tillage with soil material inverting (Cotet Valentina, 2008).

Taking into consideration how maize responded under the treatments, it can be said that the highest relative yields were obtained for V₁, V₂, V₅, V₄, V₆, with values between about 200 and 280%; under the other treatments the relative yield was between 128 and 182% (fig. 2).

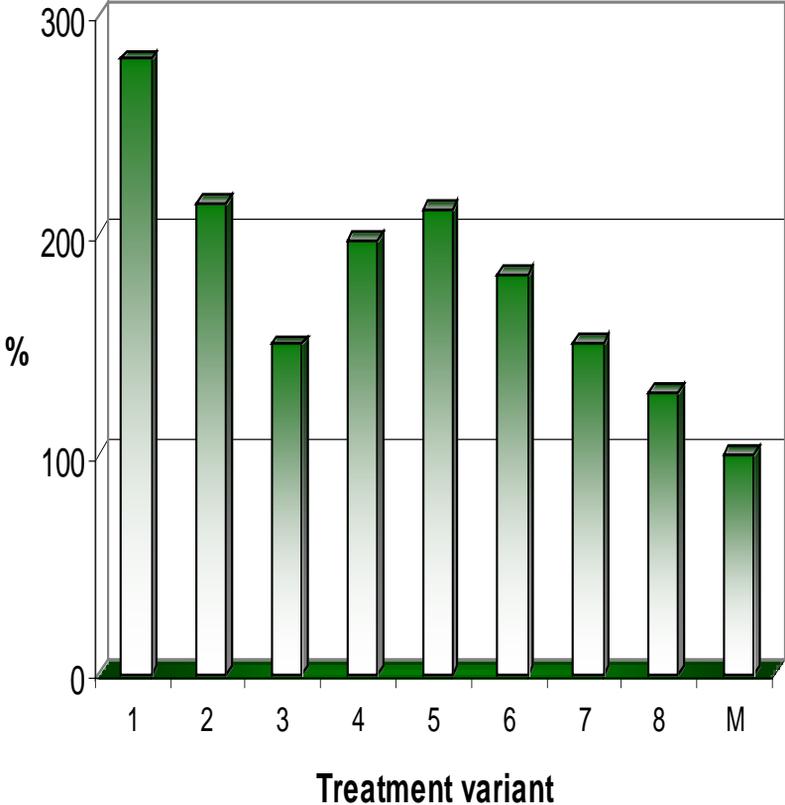


Fig. 2. Variation of mean relative maize yield (M = 100) under different treatments

CONCLUSIONS

1. Maize responded well under most treatments, the yields being similar to the ones obtained under irrigation and fertilization.
2. The highest yield was for V₁, this treatment having the following improvements: drainage with 20 m between drains + deep loosening + ameliorative irrigation + organic fertilization + chemical fertilization + paraplowing + amendment.

3. Comparing the yields obtained in the trial plot with the ones obtained Braila-county-wide, it can be noticed that, even given the conditions of Lacu Sarat trial plot, the mean maize yields under irrigation and fertilization were 134% of the county average of 3056 kg/ha. With no irrigation and drainage (the reference treatment), the maize yield reaches only 71% of the corresponding average in Braila county.

REFERENCES

1. **Bogdan Octavia, 1999** - *Principalele caracteristici climatice ale Câmpiei Române*. Com. Geogr., III.
2. **Coteș Valentina, 2008** - *Cercetări privind influența unor măsuri agrofitehnice asupra solului și producției la principalele culturi de câmp în condițiile cernoziomului freatic umed slab salinizat și slab alcalizat din zona Brăila*. Teză de doctorat.
3. **Muntean L.S., Borcea I., Roman Gh. V., Axinte M., 2003** - *Fitotehnie*. Ed. Ion Ionescu de la Brad, Iași.
4. **Posea Gr., 1989** - *Câmpia Bărăganului*. Terra, XXI (XLI), 1.
5. *****, 2005** - *Geografia României*, 2005, vol. V, Ed. Academiei Române.
6. *****, 2003** – **SRTS** - *Sistemul Român de Taxonomie a Solurilor*, autori: Florea N., Munteanu I., Ed. Estfalia, București.

AVAILABILITY OF HEAVY METALS FROM SEWAGE SLUDGE AMENDED SOIL

ACCESIBILITATEA METALELOR GRELE PREZENTE ÎN SOL AMENDAT CU NĂMOL ORĂȘENESC

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Abstract. *As a rich source of nutrients for crop production, the use of sewage sludge as fertilizer became a potential solution for both industry and governments in the modern society. However, when sewage sludge is applied to the fields, both the nutrients and the toxic chemicals (heavy metals, solvents, etc.) are released to the environment. The heavy metals would accumulate in the soil over time and pose risks to the environment and health of the people. This study presents experiments performed under Green House conditions concerning the influence of application of sewage sludge (obtained from the Sewage Treatment Station of Pitești, Romania) on heavy metals (Cd, Co, Cu, Cr, Mn, Ni, Pb, Zn) uptaken by mays. Sewage sludge was applied in amount equivalent to 100-600 kg N/ha (6 rates). The macronutrients contents significantly increased in the soil with doses of sewage sludge applied. The heavy metals contents in the soil were not statistically significant influenced by the treatment with sewage sludge. Sewage sludge application in doses expressed as N equivalent up to 600kg N /ha did not affect the quality of the plants (leaves and seeds) as concern the heavy metals accumulation.*

Key words: organic fertilizer, sewage sludge, heavy metals.

Rezumat. *Sursă bogată de elemente nutritive, folosirea nămolului orășenesc ca fertilizant a devenit o soluție posibilă în societatea modernă. Totuși, când nămolul orășenesc este aplicat pe câmp, nu numai elementele nutritive sunt eliberate în mediul înconjurător, respectiv, în sol, dar și anumite substanțe chimice toxice precum metalele grele, unele substanțe organice, etc. În felul acesta, metalele grele se pot acumula în timp în sol și devin un adevărat risc pentru sănătatea mediului și a oamenilor în mod deosebit. Acest studiu prezintă experimentele efectuate în Hala Modele Sol și se referă la influența aplicării nămolului orășenesc (obținut de la Stația de Epurare a orașului Pitești, România) asupra translocării metalelor grele (Cd, Co, Cr, Cu, Ni, Pb, Zn, Mn) în frunzele și boabele de porumb. Nămolul orășenesc a fost aplicat în cantități echivalente de 100 – 600 kg N/ha (6 tratamente). Conținutul de macronutrienți a crescut semnificativ în sol în funcție de dozele de nămol orășenesc aplicate. Concentrațiile de metale grele în sol nu au fost influențate semnificativ de tratamentul cu nămol orășenesc. Aplicarea nămolului orășenesc în doze exprimate ca N echivalent până la 600 kg N/ha nu a afectat calitatea plantelor (frunze și boabe) din punct de vedere al acumulării metalelor grele.*

Cuvinte cheie: fertilizare organică, nămol orășenesc, metale grele.

INTRODUCTION

Some amendments are generally residuals from other processes and have beneficial properties when are properly applied to soil.

When sewage sludge is added to the fields, both the nutrients and toxic chemicals (heavy metals, solvents, etc.) are released to the environment.

The heavy metals would accumulate in the soil over time and pose risks to the environment and health of the people.

Harmful substances can accumulate in plant tissue to a level that affects its growth and development. Metal toxicity can occur when a metal is present in high concentrations [1], [2].

MATERIAL AND METHODS

The aim of this study is to evaluate the influence of sewage sludge application on heavy metals (Cd, Cu, Mn, Ni, Pb, Zn) translocated into the maize plants.

There are several approaches that can be used to determine the appropriate application rate for the sewage sludge to be used. One approach is to look at healthy soil concerning metal-contaminated soil and plants.

The sewage sludge used in the Green House experiment was provided from the Sewage Treatment Station of Pitesti, Romania.

Due to the variations in sludge composition, the experiments have been conducted having into account the Maximum Allowable Limits (MAL) for heavy metals when sewage sludge is used in agriculture. These MAL are expressed in the European Council Directive on the Protection of the Environment and in particular of the soil (Table 1) and in the Technical Procedures concerning Environment Protection of Soils in Romanian Ordinance No. 344/2008 (Table 2) [3], [4].

Table 1

**Limit of heavy metals content
(Directive 86/278/EEC)**

Element	Soil mg·kg ⁻¹ d.m.	Sewage sludge mg·kg ⁻¹ d.m.	Accumulation kg/ha/year
Cd	1–3	20–40	0.15
Cu	50–140	1000–1750	12.0
Hg	1–1.5	16–25	0.1
Ni	30–75	300–400	3.0
Pb	50–30	750–1200	15.0
Zn	150–300	1500–4000	30.0

Table 2

**Maximum Allowable Limits (MAL) for heavy metals when sewage sludge
is used in agriculture**

Element	Soil MAL mg·kg ⁻¹ d.m.	Soil MAL mg·kg ⁻¹ d.m. pH>6,5	Total permissible maximum quantities added (10 years) in soils kg/ha/year
Cd	3	10	0.15
Cu	100	500	12
Ni	50	100	3
Pb	50	300	15
Zn	300	2000	30
Hg	1	5	0.1
Cr	100	500	12

The treatment with sewage sludge as a fertilizer consisted in 6 rates in amount equivalent to 100 – 600 kg N/ha.

The sewage sludge characteristics (moisture, pH, organic matter, Nt, P, K) and the heavy metals (Cd, Co, Cr, Cu, Ni, Pb, Zn, Mn) contents are presented in Table 3 and Table 4. According to Directive 86/278/EEC and the heavy metals contents in the sewage sludge applied, only Cd (72 mg·kg⁻¹) and Zn (1492 mg·kg⁻¹) concentrations can be a potential risk to contaminate soil and plants.

Table 3

Sewage sludge characteristics (n=9)

Indicator	Moisture %	pH H ₂ O	OM %	Nt %	P %	K %
\bar{x}	77.8	6.87	48.3	2.11	0.72	0.40
x _{min}	74.2	6.83	47.2	1.82	0.66	0.33
x _{max}	84.6	6.90	50.0	2.53	0.79	0.48
SD	3.3	0.02	0.9	0.22	0.05	0.05
CV (%)	4.2	0.3	1.9	10.4	6.9	12.5

\bar{x} – Mean; x_{min} – Minimum value; x_{max} – Maximum value; SD – Standard Deviation; CV – Coefficient of Variation.

Table 4

Heavy metals contents from sewage sludge used in the Green House experiment

Indicator	Cd	Co	Cr	Cu	Ni	Pb	Zn	Mn
	mg·kg ⁻¹							
\bar{x}	72	6.6	135	154	40	106	1492	400
x _{min}	54	5.5	122	137	37	88	1290	373
x _{max}	84	8.2	145	166	42	135	1932	436
SD	9	0.8	8	11	2	15	184	19
CV (%)	12.5	12.1	5.9	7.1	5.0	14.2	12.3	4.8

\bar{x} – Mean; x_{min} – Minimum value; x_{max} – Maximum value; SD – Standard Deviation; CV – Coefficient of Variation.

The pot capacity: 20 L.

The soil material support was Luvosol taken from Pitesti area.

The soil material characteristics: pH – 5.70; Corg – 1.17%; Nt – 0.144%; P_{AL} – 25 mg·kg⁻¹; K_{AL} – 36 mg·kg⁻¹; Cd_t – 0.10 mg·kg⁻¹; Co_t – 8.9 mg·kg⁻¹; Cu_t – 14.3 mg·kg⁻¹; Mn_t – 539 mg·kg⁻¹; Ni_t – 15.7 mg·kg⁻¹; Pb_t – 13.2 mg·kg⁻¹; Zn_t – 48 mg·kg⁻¹.

Maize (Fundulea 322 hybrid) has been used as a plant test.

The experimental data were statistical processed (Tukey test).

RESULTS AND DISCUSSIONS

At the end of the experiment it has been measured the height of the maize plants, the grain production, the macronutrients contents in the soil material and the heavy metals concentrations in leaves and seeds.

The height of the maize plants significantly increased under the treatment compared with Control.

The grain production increased significantly for all treatments.

The macronutrients contents significantly increased in the soil with doses of sewage sludge applied.

The significant increases of Cu, Zn, Cd, Ni and Pb contents in the leaves start from 200 kg N/ha treatment, but the level of accumulation remains in the normal limits (Figures 1, 5, 7, 8, 10).

No significant modification has been detected as concern the concentration of Cu, Mn, Cd (under the limit of detection), Ni and Pb in grain under the treatment influence. A significant increase of Zn content started with 300 kg N/ha treatment, but the values remained in the normal limits (Figures 2, 4, 6, 9, 11)

The highest level of Mn accumulation in the leaves has been detected at 300 kg N/ha (Figure 3); for the rates 400, 500 and 600 kg N/ha, the Mn contents in the leaves significantly decreased due to the amendment effect of sewage sludge.

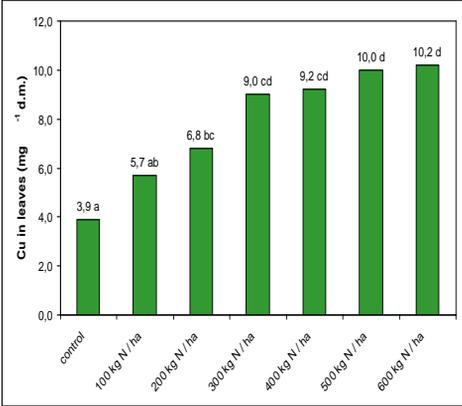


Fig. 1. Effects of fertilization with sewage sludge on **Cu** accumulation in leaves.

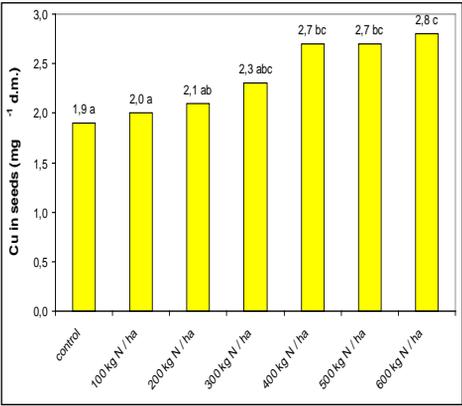


Fig. 2. Effects of fertilization with sewage sludge on **Cu** accumulation in seeds.

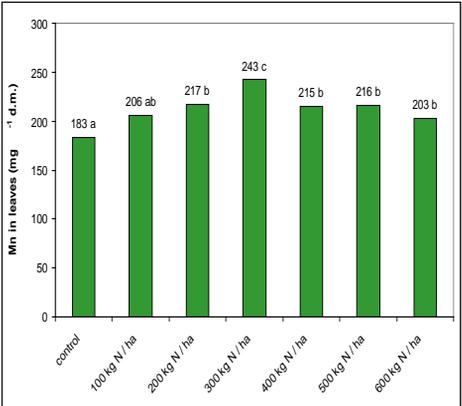


Fig. 3. Effects of fertilization with sewage sludge on **Mn** accumulation in leaves.

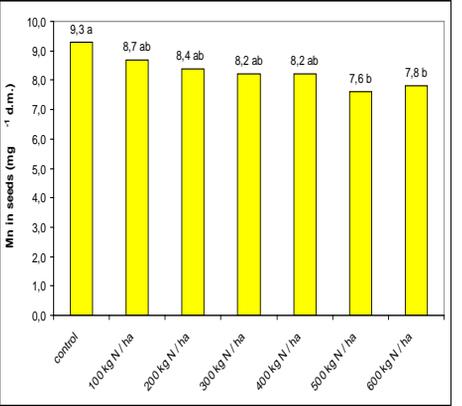


Fig. 4. Effects of fertilization with sewage sludge on **Mn** accumulation in seeds.

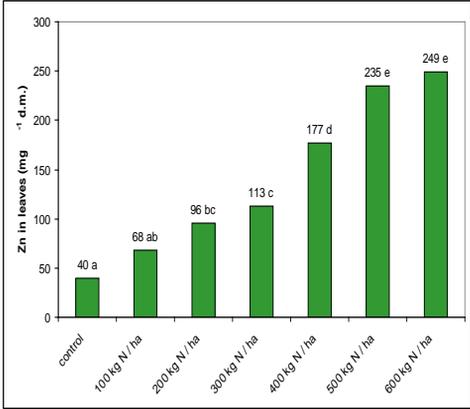


Fig. 5. Effects of fertilization with sewage sludge on **Zn** accumulation in leaves.

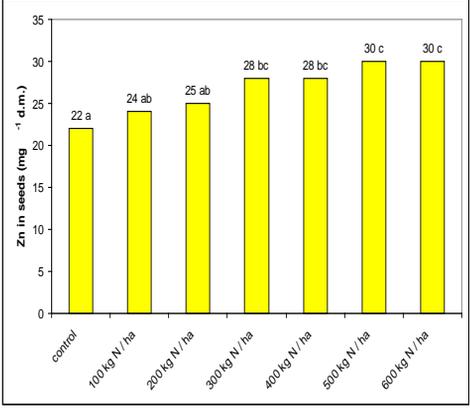


Fig. 6. Effects of fertilization with sewage sludge on **Zn** accumulation in seeds.

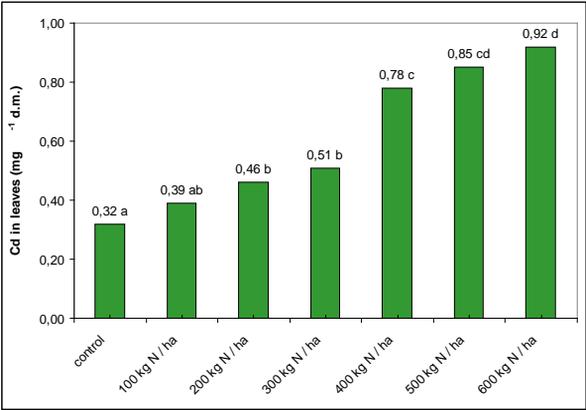


Fig. 7. Effects of fertilization with sewage sludge on **Cd** accumulation in leaves.

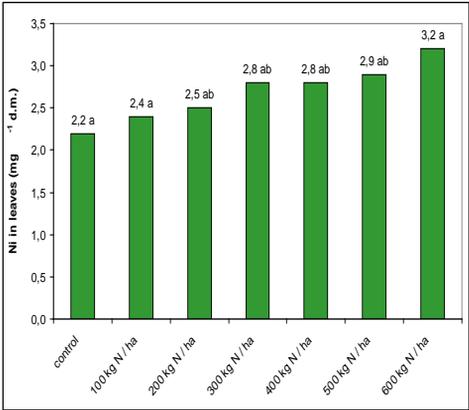


Fig. 8. Effects of fertilization with sewage sludge on **Ni** accumulation in leaves.

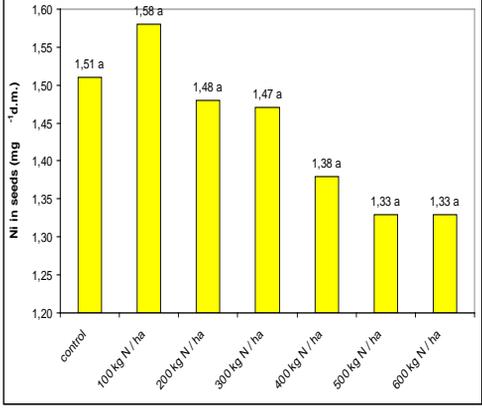


Fig. 9. Effects of fertilization with sewage sludge on **Ni** accumulation in seeds.

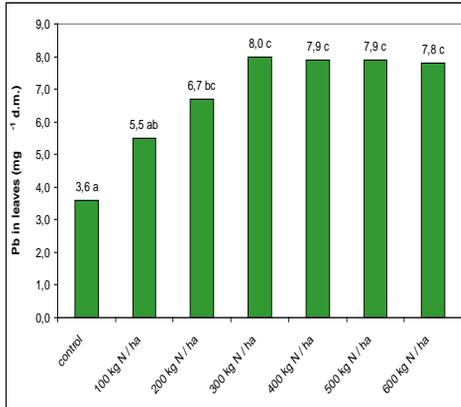


Fig. 10. Effects of fertilization with sewage sludge on **Pb** accumulation in leaves.

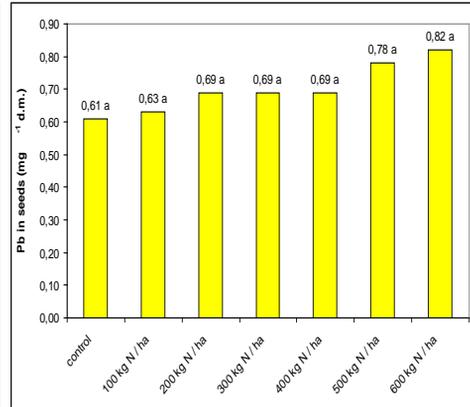


Fig. 11. Effects of fertilization with sewage sludge on **Pb** accumulation in seeds.

CONCLUSIONS

- Sewage sludge application in doses expressed as N equivalent up to 600 kg N/ha did not affect the quality of the plants (leaves and grain of maize) as concern the heavy metal accumulation.
- The sewage sludge application increased heavy metals concentrations in the maize plants compared with untreated soil, but the level were not considered to be toxic for human and animal uses.

REFERENCES

1. **Marlene A., Gobbi Ana, T. Jordão Pigozzo, Ervim Lenzi, Eduardo B. Luchese, 2000** - *Effects of the application of sewage sludge and fowl manure on soils of Paraná state in maize plants (Zea mays L.) as a macro-nutrients source.* Brazilian Archives of Biology and Technology, Vol. 43, No. 2, Curitiba.
2. **Turek M., Korolewich T., Ciba J., 2005** - *Removal of Heavy Metals from Sewage Sludge Used as Soil Fertilizer.* Soil and Sediment Contamination, Vol. 14, No. 1, pp. 143154 (12).
3. *****, 1986** - **Directive 86/278/EEC.** *Council Directive on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture.* Official Journal of the European Communities, L. 181, pp. 612.
4. *****, 2004** - **Ordin 344/2004.** *Normele tehnice privind protectia mediului si in special a solurilor, cand se utilizeaza namolurile de epurare in agricultura.* Ministerul Apelor si Protectiei Mediului din Romania.

SYNTHETIC STUDY CONCERNING THE REQUIREMENTS OF VEGETABLES TO SOIL AND AGROCHEMICAL CONDITIONS FROM ROMANIA I. SOIL REQUIREMENTS

STUDIU SINTETIC PRIVIND CERINȚELE PLANTELOR LEGUMICOLE FAȚĂ DE CONDIȚIILE PEDOLOGICE ȘI AGROCHIMICE DIN ROMÂNIA I. CERINȚE FAȚĂ DE CONDIȚIILE PEDOLOGICE

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Abstract. This scientific paper shows the main vegetable requirements to different specific features of soils. There are also shown the evaluation criteria of soil fertility according to capacity and intensity factors for different vegetable growing systems, which are more or less intensive: in field, solar or warm greenhouse (solar greenhouse).

Key words: vegetables, soil requirements, vegetable growing regions

Rezumat. Lucrarea se referă la cerințele principalelor culturi legumicole față de diferite particularități ale solurilor. De asemenea sunt prezentate criteriile de apreciere a fertilității solurilor pe baza factorilor de capacitate și de intensitate pentru diferite sisteme de cultivare a legumelor, mai mult sau mai puțin intensive: în câmp, solar sau seră caldă (seră solar).

Cuvinte cheie:

INTRODUCTION

The vegetable growing in Romania has a well-known tradition, but the highest areas and yields were achieved in the ninth decade of the last century. One of the essential conditions for vegetable growing is soil quality, determined by the great number of its characteristics. Knowing the importance of soil for vegetable growing, this scientific paper is a synthesis of the experiments carried out at the Research and Development Institute for Vegetable Growing and Horticulture of Vidra and at research and development stations of Romania.

We showed the estimate criteria of soil fertility according to capacity and intensity factors for different vegetable growing systems, which are more or less intensive: in field, solar or warm greenhouse.

MATERIALS AND METHODS

As a biological material, we have used the most liked Romanian varieties, cultivated according to the technologies elaborated by ICDLF and vegetable growing stations.

Soil sampling, conditioning and analysis were done according to the methodology elaborated by ICPA București, at which the watery extract method was added, which was introduced by the Agrochemistry Laboratory of ICDLF Vidra.

RESULTS AND DISCUSSIONS

In this scientific paper, we have shown a synthesis of the results obtained during more years, expressed directly as evaluation limits of the fertility of soils cultivated with vegetables, in open field or under protection. Our goal being that this scientific paper should be a guide for agrochemists, we have also used information from literature.

We are showing the main vegetable species requirements to soil, zoning of vegetable production according to soil and climatic conditions and to salt tolerance.

1. REQUIREMENTS OF THE MAIN VEGETABLE SPECIES TO SOIL

Sweet pepper: pH: 6.5 – 7; it requires well drained soils with a good water holding capacity; it has a mean tolerance to salinity; very susceptible to the lack of Mg;

Okra pods: pH: 6.5 – 7.5; loam-sandy, easy, warm soils;

Horse bean: less exigent; it requires soils with a good water holding capacity, heavy clay loam soils; it reacts well to potassium fertilization;

Cardoon: deep, wet, humus rich soils;

Cucumbers: pH: 5.5 – 7.5; relatively susceptible to salts; if salts are in excess, there is found a lack of P, Mg and Ca; very susceptible to the lack of Mo;

Onion: it requires dry, well drained soils; it does not like chalky soils; it is susceptible to the lack of Zn and Mo and very susceptible to the lack of Cu and Mg;

Spring onion: pH: 6.0 – 6.5; it requires soft soils, sandy-clay or clay-sandy soils;

Chicory: pH: 7.0 – 7.5; it requires a rich, deep and well drained soil; it is susceptible to the lack of Mn and Cu;

Cauliflower: pH: 6.5 – 7.5 (control of *Plasmodiophoromycetes-Plasmodiospora brassicae*); it requires well organic fertilized soils; it shows susceptibility to the lack of B, Mo, Ca and S;

Garden cress: it prefers less heavy soils with a very good water holding capacity;

Courgette: it requires soft, humic and well drained soils; it is a susceptible medium to the B excess and is susceptible to the lack of Mg and Mn and very susceptible to the lack of Fe and Mo; it has a high susceptibility to salinity;

Green bean: pH: 6.1 – 7.4; it has a great susceptibility to B and NaCl excess and to salinity; it is susceptible to the lack of Cu, Mo and Mn, very susceptible to the lack of Zn; it reacts well to the organic fertilization;

Sweet cicely: it is susceptible to the lack of Mn; it is grown on previously organic fertilized fields;

Peas: pH: 6.0 – 7.5 (sandy-clay soil); it is grown on very fertile soils; it has a mean tolerance to salinity and does not like very heavy, poorly drained and sandy soils;

Carrot: it is susceptible to salinity and to the lack of microelements; it prefers soft soils;

Kohlrabi: pH: 6.6 – 6.8; it is an *exhausting* plant, susceptible to drought (both from soil and air); it does not like limy soils; it is susceptible to the lack of Fe and very susceptible to the lack of Mn, Mg and B;

Eggplant: it prefers soils with pH of 5.5 – 8.0; it is susceptible to the lack of Mg, Fe, B and Mo;

Parsley: it is an *exhausting* and a draught tolerant plant;

Yellow melon: pH: 6.0 – 7.5; it requires well drained and aired soils; it has a mean tolerance to salinity; very susceptible to the lack of Mg, Mn, Fe and Mo;

Leek: pH: 6.0 – 6.3; it prefers well aired, loose soils; it is susceptible to lime;

Rhubarb: pH: 6.1 – 6.5; it requires well drained and loose soils;

Radish: pH: 6.0; it prefers humiferous soils; it is very susceptible to the lack of B;

Garden lettuce: it is susceptible to salinity and to the lack of B;

Vegetable Oyster and Scorzonera: these are exhausting plants; they prefer deep, loose, humus and rich soils;

Beet: pH: 5.8 – 7.0; it is exigent to the organic matter and nitrogen;

Spinach: it is susceptible to the lack of Mn, to draught and to water excess;

Asparagus: pH: 6.5 – 7.5; it requires well drained soils with ground waters found at 0.8 m; it is tolerant to salinity and susceptible to the lack of B; it is not tolerant to acid soils;

Tomato: pH: 6.0 – 7.0; it has a mean susceptibility to salinity, but a great one to Cl fertilizers and to the lack of Zn, B, Fe and Mn; it is susceptible to the lack of Mo;

Celery: pH: 6.6 – 6.8; it requires well organic fertilized soils; it is susceptible to the lack of Mg and B; it is very susceptible to the CaCO₃ excess;

Garlic: pH: 6.8 – 5.5; it requires well drained soils; it is very susceptible to the lack of Cu and Mg and susceptible to the lack of Zn, Fe, B and Mo; sulphur is very important;

Cabbage: pH: 6.5 – 7.5; it requires clay, well organic fertilized soils; it is susceptible to the lack of Mg and S; it is tolerant to salinity and Cl, but not to Cu; it prefers sulphate;

Brussels sprouts: the best pH 6.8; tolerant to salinity and susceptible to the lack of B.

Romania has very favourable soil conditions for vegetable growing. In Romania, almost 80 vegetable species are cultivated. According to soil and

climate conditions, there are three favourableness zones for vegetable growing and development:

THE FIRST ZONE is characterized by mean temperatures of 10-11°C, rainfalls between 400 and 500 mm each year and relative humidity of air of 30-60 %. *Soil types*: steppe dark-coloured soil, brown Chernozem. These soils are found in the southern Romania and in the Western Plain.

THE SECOND ZONE is characterized by mean annual temperatures of 5-11°C, rainfalls between 550 and 650 mm, relative humidity of air of 65-70 %. *Soil types*: degraded Chernozem, forest dark soil, swamp, meadow soils and solidified sands. These soil types are typical of the Subcarpathian hills from the Moldova region in the north of Romania, in the region of Satu-Mare.

THE THIRD REGION is characterized by mean annual temperatures of 6-8°C, rainfalls of 600-650 mm, relative humidity of air of 65-70 %. *Soil types* vary from Chernozem in dark forest soils, weakly or mean podzols and alluvial soils. They are found in the Transylvanian Plateau.

Early, semi-late and late tomato crops, which represent almost 25% of the vegetable grown area, are placed in the first and the second zone. Here, there are found basins used for the specialization according to different crop types. We noticed the following basins: Arad, Sânicolaul Mare, Băilești, Alexandria, Zimnicea, Vidra, Tecuci, etc.

Onion is grown especially in the south of Romania, on a part of the Western Plain, but also on great areas in Tulcea, Constanța, Brăila, Galați and Iași counties.

Sweet pepper and eggplant are grown especially in the first and the second zone, having almost the same requirements as tomato.

Cabbage has found favourable growing conditions in all the regions of Romania, being characterized by a special plasticity. However, early cabbage is grown especially in southern and western Romania.

Garden peas are grown especially around the can factories, but they found very good conditions in the second zone.

Garden beans require more from the environmental conditions viewpoint, but they are grown however in all the areas. They may be cultivated in the second crop, too, especially in southern Romania (producing two crops per year).

Cucumber, although a susceptible plant to heat, is grown both in southern Romania and in the Transylvanian Plateau and in northern Moldavia, due to an old tradition and to favourable micro-zone conditions (Dolj, Prahova and Galați).

Legumes meet favourable conditions in all the regions of Romania, but the best results were obtained in the Western Plain and in the centre of Transylvania. Because of their requirements, these crops extended around the big cities from southern Romania, showing good economic results.

2. SALT TOLERANCE

Vegetables have a different susceptibility to salts, beginning with onion, carrot, sweet pepper and lettuce that are very susceptible and finishing with beet and spinach that are the most resistant (tab. 1).

Table 1

Limits of soil salinity that result in the affection or the diminution by 50 % of the vegetable production (mineral residue, g/100g dry soil)

Crop	Limit that affects the production, according to the texture			Limit at which the production decreases by 50 %, according to the texture		
	Thin	Mean	Rough	Thin	Mean	Rough
Beans, cucumber	0.23	0.20	0.15	0.35	0.30	0.25
Carrot	0.19	0.17	0.13	0.38	0.25	0.20
Sweet pepper, lettuce	0.20	0.18	0.15	0.43	0.30	0.23
Onion	0.17	0.15	0.13	0.40	0.30	0.22
Potato	0.23	0.20	0.16	0.45	0.35	0.25
Cabbage	0.23	0.20	0.15	0.55	0.40	0.26
Courgette	0.25	0.20	0.17	0.60	0.45	0.30
Tomato	0.25	0.20	0.17	0.60	0.45	0.30
Spinach	0.30	0.25	0.20	0.60	0.45	0.30

For the soils from solariums, which content in organic matter (OM) is up to 6.5 %, according to the analysis and interpretation methods from Romania (OM – determined as calcination loss), the tolerable contents that should not be exceeded by soluble salts, sodium chloride and the electric conductivity (EC) are estimated by the following relation: (Ghidia and Lăcătuș, 1983):

$$\text{Soluble salts, \%} \leq (2 * \text{OM} + 15) * 0.01 \quad (1)$$

$$\text{NaCl, mg l at 100 g dry soil} \leq (2 * \text{OM} + 15) \quad (2)$$

$$\text{EC, mS at 25°C} \leq (2 * \text{OM} + 15) * 0.027 \quad (3)$$

The relation $(2 * \text{OM} + 15)$ is assessed as being equivalent to the water field capacity from soil, when it does not exceed a content of 6.5 % OM. Because this organic matter rate is affected by a positive error, due to the fact that at calcination, soil minerals lose water, the above-used relations reach the limit values of the respective indices, which are increased. But, the presence of mineral colloids from soil diminishes the negative effect of high salt concentration on plants, thus compensating the error when dosing the content of organic matter by calcination.

In soils from greenhouses and solariums, with a content of organic matter higher than 6.5 %, the correlation between this and water field capacity is described by the relation: $\text{cca, \%} \approx 2.7 * \text{OM} + 10,7$ (4)

In this case, relations 1,2 and 3 are modified according to the relation 4.

REFERENCES

1. **Borlan Z., Hera Cr., 1973** – *Metode de apreciere a stării de fertilitate a solului în vederea folosirii raționale a îngrășămintelor*. Ed. CERES. 190-198, 242-247, 350-357.
2. **Davidescu D., Velicica Davidescu, 1972** – *Evaluation of fertility by plant and soil analysis*. Ed. Acad., București, Romania. ABACUS PRESS, Tunbridge Wells, Kent, England. 437-484.
3. **Davidescu D., Velicica Davidescu, 1992** – *Agrochimie horticola*. Ed. Acad., București, Romania. 177-186, 347-364.
4. **Dumitrescu M., Scurtu I., Stoian L., Glăman Gh., Costache M., Dițu D., Roman T., Lăcătuș V., Rădoi V., Vlad C., Zăgrea V., 1998** – *Producerea legumelor*. Ed. GEEA. 65-101.
5. **Geissler Th., Kindt V., Lanckov J., Lekve O., Windisch B., 1976** – *Gemuseproduktion unter Glas und Platten*. VEB Deutscher Landwirtschaftsverlag, Berlin. 25, 70, 90, 123, 141, 189, 200, 232.
6. **Hera Cr., 2004** – *Solul-garanție a dezvoltării durabile și siguranței alimentare în „Lumea rurală-astăzi și mâine”*. Rev. Academica.
7. **Lăcătuș V. și colab., 2002** – *Tehnici și tehnologii în legumicultură*. Concepții moderne în cercetarea horticola Românească. 113-142.
8. **Stoian L., 1998** – *Cercetări privind testarea stării de fertilitate a solurilor destinate culturilor de legume*. Teză de doctorat.
9. **Voican V., Scurtu I., Costache M., Lăcătuș V., Stoian L., Roman T., Dumitrescu M., 2002** – *Cultura legumelor în câmp*. Ed. PHOENIX. 283-302.
10. **Voican V., Lăcătuș V., 2004** – *Cultura protejată a legumelor în sere și solarii*. Ed. CERES. 47-57, 98-100, 118-123.

SYNTHETIC STUDY CONCERNING THE REQUIREMENTS OF VEGETABLES TO SOIL AND AGROCHEMICAL CONDITIONS FROM ROMANIA

II. AGROCHEMICAL REQUIREMENTS

STUDIU SINTETIC PRIVIND CERINȚELE PLANTELOR LEGUMICOLE FAȚĂ DE CONDIȚIILE PEDOLOGICE ȘI AGROCHIMICE DIN ROMÂNIA

II. CERINȚE AGROCHIMICE

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Abstract. This scientific paper shows the main vegetable requirements to different specific features of soils. There are also shown the evaluation criteria of soil fertility according to capacity and intensity factors for different vegetable growing systems: in field, solar or warm greenhouse (solar greenhouse).

Key words: vegetables, soil requirements, vegetable growing regions

Rezumat. Lucrarea se referă la cerințele principalelor culturi legumicole față de diferite particularități ale solurilor. De asemenea, sunt prezentate criteriile de apreciere a fertilității solurilor pe baza factorilor de capacitate și de intensivizare pentru diferite sisteme de cultivare a legumelor: în câmp, solar sau seră caldă (seră solar).

Cuvinte cheie: plante legumicole, cerințe față de sol, zone legumicole.

INTRODUCTION

The vegetable growing in Romania has a well-known tradition, but the highest areas and yields were achieved in the ninth decade of the last century. One of the essential conditions for vegetable growing is soil quality, determined by the great number of its characteristics.

Knowing the importance of soil for vegetable growing, this scientific paper is a synthesis of the experiments carried out at the Research and Development Institute for Vegetable Growing and Horticulture of Vidra and at research and development stations of Romania.

MATERIALS AND METHODS

Data shown in this scientific paper were obtained in long-term trials, in stationary agrochemistry fields, set up in split-split plots or in the confounding system with 4 factors (N, P, K and manure) and 3 graduations in 4 replicates at ICDLF Vidra and SCDL Bacău, Buzău and Ișalnița. As biological material, we have used the most favoured Romanian varieties, cultivated according to the technologies elaborated by ICDLF and vegetable growing stations.

Soil sampling, conditioning and analysis were done according to the methodology elaborated by ICPA București, at which the watery extract method was added, which was introduced by the Agrochemistry Laboratory of ICDLF Vidra.

RESULTS AND DISCUSSIONS

1. Main agrochemical indicators of field soils cultivated with vegetables

Soil fertility is a multidimensional system. Its analysis should emphasize the *potential* reserve of different elements and the *present* reserve (Davidescu and Velica Davidescu, 1992). The main agrochemical indicators of soils cultivated with vegetables are humus, nitrogen index, phosphorus and mobile potassium (tab. 1, 2 and 3). At these are added the hydrosoluble forms of NPKMg, both for field crops and especially for protected crops.

Table 1

Humus content according to texture			Estimate (a)	Fertilizer need
Thin	Mean	Rough		
Below 3.0	Below 2.5	Below 1.5	Low	Very high
3.1 – 5.0	2.6 – 3.5	1.6 – 2.5	Mean	High
5.1 – 7.0	3.6 – 5.0	2.6 – 3.5	Good	Mean
Over 7.0	Over 5.0	Over 3.5	Very good	*

- a) Generally, the humus content should be almost 15 % of the clay content for field vegetables and twice higher for greenhouse crop
*) it depends on cultivated plant requirements;

Table 2

Nitrogen index according to texture			Estimate	Organic fertilizer necessary
Thin	Mean	Rough		
Below 2.5	Below 2.0	Below 1.0	Low	Very high
2.6 – 4.0	2.1 – 3.0	1.1 – 2.0	Mean	High
4.1 – 6.0	3.1 – 4.0	2.1 – 3.0	Good	Mean
Over 6.0	Over 4.0	Over 3.0	Very good	**

- *) $NI = h \cdot V \cdot 0.01 = h \cdot S_B / (S_B + Ah) \cdot 100$;
**) it depends on cultivated plant requirements;

Table 3

Content of P _{AL} , ppm	Content of K _{AL} , ppm	Estimate
Below 36	Below 66	Very poor supply
37 - 72	67 - 132	Poor supply
73 – 108	133 - 200	Mean supply
109 – 144	201 – 400	Good supply
Over 144	Over 400	Very good supply

2. Phase fertilization of vegetables in field according to present fertility soil classes

Based on long-term trials placed in a stationary agrochemistry field and giving a greater importance to the intensity factors as concerns soil fertility, we have introduced the notion of present fertility determined in watery extract (WE) and comprising six classes (tab. 4).

Table 4

Class	N-NO ₃	P _{H2O}	K _{H2O}	Estimate
0	Below 2	Below 0.2	Below 7.5	Very low
1	2 – 5.5	0.2 – 0.45	7.6 – 12.5	Low
2	5.6 – 11.5	0.46 – 1.55	12.6 – 18.0	Mean
3	11.6 – 20.5	1.56 – 4.65	18.1 – 25.0	Good
4	20.6 - 30	4.56 – 8.0	25.1 – 35.0	Very good
5	Over 30	Over 8	Over 35	High

*) ppm in EA 1: 2.5 (g/g)

The present fertility is a very useful test for over intensively exploited soils by vegetable growing. According to the plant response, we have defined the present fertility classes corresponding to the main vegetable crops (tab. 5).

Table 5

Crop	N-NO ₃	P _{H2O}	K _{H2O}
Sweet pepper and bell pepper	4	3	4
Mild heirloom	4	3 – 4	4 – 5
Onion	3 - 4	2	2
Cauliflower	3 - 4	4	2 - 3
Courgette	4	3 - 4	3
Green beans	1	3	3
Green peas	1	2	2
Carrot	2	4	3
Eggplant	4 – 5	3 – 4	4 – 5
Radish	2	2-3	2
Lettuce	2	3-4	3
Extra early tomato	3	4	2-3
Early tomato	3	4	3-4
Summer-autumn tomato	4	4	2-3
Industry tomato	3	4	4-5
Celery	3	4	3
Garlic	4	4	2
Autumn cabbage	3-4	3	2

3. Main agrochemical indicators of soils from greenhouses and solariums cultivated with vegetables

For protected crops, heated or cold, we used the watery extract analysis, with the soil: water ratio of 1:2.5 for the soils from solariums with an organic

matter content below 6.5 % and of 1:5 for the soils with greater values from greenhouses or older solariums. The analytical values are estimated according to the organic matter content (tab. 6, 7, 8, 9, 10).

Table 6

Estimate of the organic matter content * of soils from greenhouses and solariums cultivated with vegetables

Organic matter content according to texture (%)			Estimate	Organic fertilizer necessary
Thin AL-A	Mean L-LA	Rough N-NL		
Below 6.0	Below 4.0	Below 2.0	Bad	Very high
6.1 – 8.0	4.1 – 6.0	2.1 – 4.0	Mean	High
8.1 - 10.0	6.1 – 8.0	4.1 – 6.0	Good	Moderate
Over 10	Over 8	Over 6	Very good	**

*) determined as calcination loss; **) it depends on cultivated plant requirements;

Table 7

Estimate of the mineral nitrogen supply of soils from solariums

Mineral nitrogen content		Estimate
ppm in EA 1:2.5 (g/g)	ppm in K ₂ SO ₄ 0,1 %	
$\langle (2.22 \cdot MO + 16.6)$	Below 50	Low
$\geq (2.22 \cdot MO + 16.6) \leq (4.44 \cdot MO + 33.3)$	51 – 105	Mean
$\geq (4.44 \cdot MO + 33.3) \leq (6.66 \cdot MO + 50.0)$	106 – 155	Normal
$\geq (6.66 \cdot MO + 50.0) \leq (8.88 \cdot MO + 66.6)$	156 – 200	High
$\rangle (8.88 \cdot MO + 66.6)$	Over 200	Very high

*) soils with OM until 6.5 %

Table 8

Estimate of the mineral nitrogen supply of soils from greenhouses *

Mineral nitrogen content, ppm in EA 1:5 g/g	Estimate
$\langle (3 \cdot MO + 12)$	Low
$\geq (3 \cdot MO + 12) \leq (6 \cdot MO + 24)$	Mean
$\geq (6 \cdot MO + 24) \leq (9 \cdot MO + 35)$	Normal
$\geq (9 \cdot MO + 35) \leq (12 \cdot MO + 47)$	High
$\rangle (8.88 \cdot MO + 66.6)$	Very high

*) soils with over 6.5 % OM, determined as calcination loss;

Table 9

Estimate of the phosphatation degree of soils from greenhouses and solariums cultivated with vegetables

Greenhouse soils, ppm in EA 1:5			Solarium soils, ppm		Estimate
Soft texture, N-NL	Mean texture, LN-LA	Heavy texture, A-AL	În EA 1:2,5	În AL, (corrected)	
Below 17.5	Below 10.9	Below 8.7	Below 4.4	Below 100	Low
17.6 – 26.2	11.0 – 17.5	8.8 – 13.1	4.5 – 8.7	100 - 177	Mean
26.3 – 39.9	17.6 – 26.2	13.2 – 17.5	8.8 – 17.5	178 - 252	Normal
Over 39.9	Over 26.2	Over 17.5	Over 17.5	Over 252	High

Table 10

Estimate of the hydrosoluble potassium supply of soils from greenhouses and solariums cultivated with vegetables

Greenhouse soils, ppm in EA 1:5*	Solarium soils, ppm in EA 1:2,5**	Estimate
Below (5 MO+20)	Below (3.36 MO+27.4)	Low
›(5 MO+20) ‹(8.25 MO+39.6)	‹(3.36 MO+27.4) › (7.3 MO+55.0)	Mean
‹(8.25 MO+39.6) › (15 MO+57.7)	‹(7.3 MO+55.0) › (11.0 MO+82.5)	Normal
‹(15 MO+57.7) › (19.8 MO+77.5)	‹(11.0 MO+82.5) › (14.6 MO+110)	High
Over (19.8 MO+77.5)	Over (14.6 MO+110)	Very high

*) soils with over 6.5 % OM, determined by calcination; **) soils with OM until 6.5 %.

4. Total exportation of major elements by main vegetable crops

Vegetables are high consumers of mineral elements. The total quantity of elements extracted from soil together with the crop depends both on the specific consumption, necessary for making one tone of useful product and on the harvest size. If the production factors are close to optimum, both the harvest and the coefficients of utilization will be greater. Table 11 shows the total NPKMg consumption for 36 vegetable crops (Geissler *et al.* 1976; Ghidia and Lăcătuș, 1980; Zuang, 1981; Davidescu and Velicica Davidescu, 1992; Lăcătuș and Stoian, 2001, 2002; Lăcătuș *et al.* 2002; Rusu *et al.* 2005).

Table 11

Total NPKMg consumption by main vegetable crops

No	Crop	Yield t/ha	Exportation, kg/ha			
			N	P ₂ O ₅	K ₂ O	MgO
0	1	2	3	4	5	6
1	Bell pepper -c	20-30	183	28	190	23
2	Sweet pepper -c	25-30	240	40	218	37
3	Sweet pepper -s	60-80	266	73	545	69
4	Sweet pepper -p	40-50	197	60	326	33
5	Mild heirloom -c	20-25	106	21	145	16
6	Cucumber-c	15-20	43	16	78	10
7	Cucumber -s (long)	140-160	330	171	577	124
8	Cucumber -s (short)	30-50	70	59	135	29
9	Cucumber -p (short)	50-80	110	56	242	29
10	Seed onion	35-63	122	51	254	54
11	Autumn cauliflower -c	20-25	232	106	342	31
12	Early cauliflower -c	12-14	107	60	179	15
13	Green beans -c	6-9	165*	46	188	10
14	Green peas-c	5-10	108*	34	86	7
15	Carrot -c	30-50	138	58	286	22
16	Parsley-c	20-30	56	17	112	6
17	Winter radish -c	30-40	227	105	175	10
18	Early radish -p	15-20	72	35	92	4
19	Lettuce -c	30-40	80	34	150	8
20	Lettuce -s	25-35	67	27	130	9
21	Lettuce -p	15-20	47	16	84	6
22	Beet -c	40-50	247	101	445	45

0	1	2	3	4	5	6
23	Spinach-c	25-40	118	55	226	28
24	Ind. tomato -c	40-60	125	54	147	32
25	Tomato-s/cycle I	80-100	278	132	364	94
26	Tomato-s/cycle II	50-70	240	53	378	48
27	Tomato-p	50-70	300	65	414	62
28	Early tomato-c	30-40	81	28	118	24
29	Summer-autumn tomato -c	70-90	148	78	148	40
30	Celery -c	30-40	222	116	338	39
31	Autumn cabbage -c	80-100	246	98	431	48
32	Early cabbage -c	40-50	145	62	209	18
33	Summer cabbage -c	60-80	206	105	365	42
34	Eggplant -c	30-40	140	36	192	36
35	Eggplant -s	60-80	418	91	445	50
36	Eggplant -p	40-50	319	70	341	37

c-field, p-solarium, s-greenhouse;

*) for these species, the highest amount of N comes from atmosphere

We found that under conditions of normal productions, consumptions vary very much from one crop to another. For nitrogen, the total consumption varies from 43 kg/ha for field cucumber to 418 kg/ha eggplant from greenhouse, without mentioning peas and green beans, where the highest amount of nitrogen comes from atmosphere. For phosphorus, the variation field is between 16 and 171 kg/ha, corresponding to plastic protected lettuce and, respectively, to greenhouse long cucumber. As for potassium, total consumption varies between 78 kg/ha for field cucumber and 577 kg/ha for greenhouse long cucumber. The manganese variation is much higher, from 4 kg/ha for early radish to 124 for greenhouse long cucumber.

REFERENCES

1. Borlan Z., Hera Cr., 1973 – *Metode de apreciere a stării de fertilitate a solului în vederea folosirii raționale a îngrășămintelor*. Ed. CERES. 190-198, 242-247, 350-357.
2. Davidescu D., Velicica Davidescu, 1972 – *Evaluation of fertility by plant and soil analysis*. Ed. Acad., București, Romania. ABACUS PRESS, Tunbridge Wells, Kent, England.
3. Geissler Th., Kindt V., Lanckov J., Lekve O., Windisch B., 1976 – *Gemuseproduktion unter Glas und Platten*. VEB Deutscher Landwirtschaftsverlag, Berlin. 25, 70, 90, 123, 141, 189, 200, 232.
4. Lăcătuș V., Stoian L., Țuțuianu C., 2003 – *Influența fertilizării cu potasiu asupra calității legumelor*. Managementul nutrienților pentru îmbunătățirea calității culturilor și conservarea mediului. Craiova. 321-336.
5. Mengel K., Kirkby E. A., 1978 – *Principles of plant nutrition*. IPI, Berne, Switzerland. 25-96.
6. Voican V., Scurtu I., Costache M., Lăcătuș V., Stoian L., Roman T., Dumitrescu M. 2002 – *Cultura legumelor în câmp*. Ed. PHOENIX. 283-302.
7. Voican V., Lăcătuș V., 2004 – *Cultura protejată a legumelor în sere și solarii*. Ed. CERES. 47-57, 98-100, 118-123.
8. Zuang H., 1982 – *La fertilization de cultures legumieres*. CTIFL, Paris, Fr. 91-114.

THE IMPROVEMENT OF THE PASTURELANDS PLACED ON SALTY SOILS FROM N-E PART OF BRĂILA COUNTY THROUGH AMENDMENTS, FERTILIZATION AND IRRIGATION WORKS

ÎMBUNĂTĂȚIREA PAJIȘTILOR DE PE SĂRĂTURI DIN N-E JUDEȚULUI BRĂILA PRIN AMENDARE, FERTILIZARE ȘI IRIGARE

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Abstract. *The salt loving pasturelands from the N-E part of Brăila County can be improved by amendments with calcium sulphate, fertilized with organic and mineral fertilizers and irrigated, in order to increase the productive potential, to improve the floristic composition and the quality of the obtained fodder. For a pastureland of *Puccinellia distans* ssp. *limosa*, the amendments with calcium sulphate 3 t/ha and 6 t/ha, the fertilization with manure 10 – 20 t/ha and complex fertilizers (22-22-0) 100 – 200 t/ha and irrigation with 400 m³ water/ha, the production increased from 0.90 t d.m./ha for the control variant to 3.33 – 3.4 t d.m./ha. As an effect of the improvement works, the fodder's content in raw protein increased from 6.26% to 8.75 – 8.85%.*

Key words: salt loving pasturelands, improvement works, *Puccinellia distans* ssp. *limosa*, fodder's quality

Rezumat. *Pajiștile halofile din N-E județului Brăila pot fi ameliorate prin amendare cu gips, fertilizate cu îngrășăminte organice și minerale și irigate, cu scopul sporirii potențialului productiv, al îmbunătățirii compoziției floristice și a calității furajului obținut. La o pajiște de *Puccinellia distans* ssp. *limosa*, prin amendare cu gips 3 t/ha și 6 t/ha, fertilizare cu gunoi de grajd 10 – 20 t/ha, îngrășăminte complexe (22-22-0) 100 – 200 t/ha și irigare cu 400 m³ apă/ha, s-a ajuns ca producția să crească de la 0,90 t s.u./ha la mator la 3,33 – 3,4 t s.u./ha. Ca efect al lucrărilor ameliorative, conținutul furajului în proteină brută a crescut de la 6,26% la 8,75 – 8,85%.*

Cuvinte cheie: pajiști halofile, lucrări ameliorative, *Puccinellia distans* ssp. *limosa*, calitate furaj

INTRODUCTION

Grasslands placed on salty soils are wide spread in Romanian Plain, Oltenia's Plain, Western Plain, Moldavia's Plain, Prut's and Bârlad Water Meadows and on small surfaces in other geographical areas (T. Iacob and coworkers, 1996). Most of these grasslands have low fodder value, because of the improper floristic composition, give small productions and are used for a short period for pasturing. The improvement of these salt loving grasslands can be realized through amendments, fertilization and irrigation, in order to increase production and to improve the floristic composition and the fodder's quality (V. Surăianu, 1993).

The *Puccinellia distans* grasslands are the most representative salt loving grasslands and can be improved through amendments with calcium sulphate, organic and mineral fertilizers applications and irrigation (Cozma Cătălina, 2009).

MATERIAL AND METHOD

To improve a grassland of *Puccinellia distans* ssp. *limosa*, we settled an experimental area in the northeastern part of Brăila County, during 2006 – 2008, with the following factors:

Factor A – irrigation a_1 – non irrigated; a_2 – irrigated with 400 m³ water/ha, in two sessions;

Factor B – amendments b_1 – untreated control; b_2 – amended with 3 t calcium sulphate/ha; b_3 – amended with 6 t calcium sulphate/ha;

Factor C – fertilization c_1 – unfertilized control; c_2 – 10 t cattle manure/ha annually; c_3 – 20 t cattle manure/ha annually; c_4 – complex fertilizer (22-22-0) 100 kg/ha; c_5 – complex fertilizer (22-22-0) 200 kg/ha; c_6 - 10 t cattle manure/ha + complex fertilizer (22-22-0) 100 kg/ha; c_7 - 10 t cattle manure/ha + complex fertilizer (22-22-0) 200 kg/ha; c_8 - 20 t cattle manure/ha+ complex fertilizer (22-22-0) 100 kg/ha; c_9 - 20 t cattle manure/ha + complex fertilizer (22-22-0) 200 kg/ha.

The calcium sulphate amendment was applied in the fall of 2005; the manure was also applied in the fall and the complex fertilizer in the spring, in the early vegetation springing; irrigation was applied in June and July, with 200 m³ water /ha each time. The production harvesting was made in the middle of July, and for each variant we took samples to determine the dry matter content.

The production results` statistic calculus was made with the variance analysis.

RESULTS AND DISCUSSIONS

Analyzing the mean values for the productions during 2006–2008, obtained as effect of amendments, fertilization and irrigation (tab. 1), we observe that the values were positive influenced. Without irrigation, we registered production increases of 26–167% for the variants without amendments, increases of 12 – 136% for the 3 t calcium sulphate/ha amendment and increases of 18–139% for 6 t calcium sulphate/ha amendment.

For the fertilization with manure (10 and 20 t/ha), also considering the amendments, the productions were of 1.13–1.30 t d.m./ha for the variants without amendment, of 1.20–1.40 t d.m./ha for the 3 t calcium sulphate/ha amendment and of 1.30–1.43 t d.m./ha for the 6 t calcium sulphate/ha amendment.

Fertilization with complex fertilizer conducted to productions of 1.37–1.53 t d.m./ha for the variants without amendment, of 1.63–1.70 t d.m./ha for the 3 t calcium sulphate/ha amendment and of 1.54–1.70 t d.m./ha for the 6 t calcium sulphate/ha amendment. Applying the manure together with the complex fertilizers lead to bigger productions: 1.67–2.40 t d.m./ ha for the variants without amendment, of 1.80–2.53 t d.m./ha for the 3 t calcium sulphate/ha amendment and of 1.82–2.63 t d.m./ha for the 6 t calcium sulphate/ha amendment.

Table 1

The influence of amendments, fertilization and irrigation on mean production values during 2006 – 2008 for a *Puccinellia distans ssp.limosa* grassland

Fertilization	Non amended				3 t CaSO ₄ 2H ₂ O/ha				6 t CaSO ₄ 2H ₂ O/ha			
	Non irrigated		Irrigated		Non irrigated		Irrigated		Non irrigated		Irrigated	
	Prod. t/ha	% signif.	Prod. t/ha	% signif.	Prod. t/ha	% signif.	Prod. t/ha	% signif.	Prod. t/ha	% signif.	Prod. t/ha	% signif.
Unfertilized control	0.90	100	1.30	100	1.07	100	1.43	100	1.10	100	1.50	100
10 t cattle manure/ha	1.13	126	1.53	118	1.20	112	1.64	115	1.30	118	1.73	115
20 t cattle manure/ha	1.30	144***	1.77	136**	1.40	131*	1.83	128*	1.43	130*	1.90	127*
Complex fertilizer (22-22-0) 100 kg/ha	1.37	152***	1.83	141**	1.63	152***	1.92	134**	1.54	140**	2.0	133**
Complex fertilizer (22-22-0) 200 kg/ha	1.53	170***	1.94	149***	1.70	159***	2.0	140**	1.70	155**	2.07	138**
10 t manure/ha + complex fertilizer (22-22-0) 100 kg/ha	1.67	186***	2.47	190***	1.80	168***	2.47	173***	1.82	165***	2.57	171***
10 t manure/ha + complex fertilizer (22-22-0) 200 kg/ha	1.83	203***	2.77	213***	1.97	184***	2.80	196***	2.10	191***	2.90	193***
20 t manure/ha+ complex fertilizer (22-22-0) 100 kg/ha	2.23	248***	2.92	225***	2.30	215***	2.90	203***	2.40	218***	3.13	209***
20 t manure/ha + complex fertilizer (22-22-0) 200 kg/ha	2.40	267***	3.04	234***	2.53	236***	3.33	233***	2.63	239***	3.40	227***

Non irrigated: DL 5% = 0.30 t/ha; DL 1% = 0.37 t/ha; DL 0.1% = 0.50 t/ha

Irrigated: DL 5% = 0.33 t/ha; DL 1% = 0.47 t/ha; DL 0.1% = 0.63 t/ha.

The production differences between the productions obtained as result of fertilization and of amendments are small, insignificant.

For the irrigated variants, productions were bigger, for the untreated as well as for the amended variants. For the untreated variants, the biggest productions were obtained for the application of manure + complex fertilizers (2.47–3.04 t d.m./ha), bigger with 0.94 t/ha than at the non irrigated variants.

The amendment with calcium sulphate and fertilization with complex fertilizer determined productions of 2.47–3.33 t/ha, respectively 2.57–3.40 t/ha, bigger with 0.67–0.97 t/ha, respectively 0.90–1.17 t/ha compared to the non irrigated variant.

CONCLUSIONS

1. The salt loving grasslands dominated by *Puccinellia distans*, spread on salty soils are interesting from the forage production's point of view;

2. The improvement of a *Puccinellia distans* grassland can be realized through amendments, fertilization with mineral and organic compounds and irrigation;

3. Without irrigation, the biggest productions were registered for the variants without amendments and fertilized with cattle manure and complex fertilizer (1.67–2.40 t d.m./ha);

4. For the irrigated variants, the productions were bigger for the same fertilization doses for the variants without amendments (2.47–3.04 t d.m./ha) as well as for the amended ones (2.47–3.33 t d.m./ha and 2.57 – 3.40 t d.m./ha).

REFERENCES

1. **Cozma Cătălina, 2009** – *Reconstrucția ecologică a pajiștilor permanente degradate de salinitatea solului din N-E silvostepii Moldovei*. Teză de doctorat;

2. **Iacob t. and coworkers, 1996** – *Contribuții la îmbunătățirea pajiștilor halofile din Lunca Prutului*. Cercetări agronomice în Moldova, vol. 3-4;

3. **Surăianu V., 1993** – *Tehnologiile culturilor furajere pe solurile sărăturate*. SCCASS Brăila.

SALT LOVING PASTURELANDS ASSOCIATIONS FROM THE NORTHEASTERN PART OF BRĂILA COUNTY

ASOCIAȚII HALOFILE DE PAJIȘTI DIN N-E JUDEȚULUI BRĂILA

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Abstract. *The flora and the vegetation of the salt loving pasturelands from the N-E part of Brăila County are dominated by Salicornia herbacea – Puccinellia distans – Juncus gerardi formations, adapted to the high salt concentrations in the salty type soils. The vegetation coverage for the salt loving associations in the area is 55–75%, from which the graminee species occupy 20–25%, the leguminous species 1–3% and the various ones, 72–79%. There were identified and described the salt loving associations Puccinellietum distantis Knapp. ssp. limosae 1948, Juncetum gerardi Wenzel 1934, Artemisietum maritimae Soó, Camphorosmetum annuae Rapc. 1916, Soó 1933 and Obiontume verruciferae.*

Key words: salt loving pasturelands, floristic structure, Brăila County

Rezumat. *Flora și vegetația pajiștilor sărăturoase din zona de N-E a județului Brăila sunt dominate de formațiile de Salicornia herbacea – Puccinellia distans – Juncus gerardi, adaptate la concentrații mari de săruri în solurile de tip solonceac. Acoperirea cu vegetație a asociațiilor halofile din zonă este de 55–75%, din care gramineele au o pondere de 20–25%, leguminoasele 1–3% și speciile diverse 72–79%. Au fost identificate și descrise asociațiile halofile Puccinellietum distantis Knapp. 1948, Juncetum gerardi Wenzel 1934, Artemisietum maritimae Soó, Camphorosmetum annuae Rapc. 1916, Soó 1933 și Obione verrucifera.*

Cuvinte cheie: pajiști sărăturoase, structura floristică, Brăila

INTRODUCTION

The pasturelands situated on salty soils (salty and alkaline) occupy a surface of 69,000 ha in Romania, in: Romanian Eastern Plain, Oltenia's Plain, Western Plain, Moldavia's Plain and small surfaces in other areas (Florea N., 1958; Teaci D and coworkers., 1980). Most of these pasturelands are low productive, some of them without forage value and provide in a very small matter to the fodder base.

The salt loving pasturelands occupy surfaces located in the steppe and forest steppe areas, on soils with a high content of soluble salts and they are used especially for pasturing (Pușcașu Soroceanu Evdochia and coworkers., 1963). This paper intended to identify and register the species from the salt loving pasturelands' associations from the north-eastern part of Brăila County.

MATERIAL AND METHOD

The study and the description of the salt loving flora and vegetation was made after the floristic phytocenological system, in the spirit of Central European school, elaborated by J. Braun-Blanquet in 1928, where the basic unit in the description of the vegetal carpet is the vegetal association, which reunites in a biotope species with similar ecological features. In order to characterize the salt loving pasturelands' associations, we appreciated the vegetation coverage degree, the floristic structure on groups of species, the biological form

and the floristic element, registering all parameters according to the usual technical methods. For each identified salt loving association, we made at least five floristic harvestings (relevées), where we appreciated the abundance and the dominance (A + D) and the frequency (F), these contributing in establishing the vegetation coverage degree.

RESULTS AND DISCUSSIONS

In the studied area we identified and described six salt loving pasturelands' associations (Pușcașu Soroceanu Evdochia and cowork., 1963):

1. Association *Puccinellietum distantis ssp. limosa* Rapaics ex Soó R. 1936.

The association is dominated by *Puccinellia distans* which forms a herbaceous carpet with a 62–75% coverage (tab.1).

Table 1

As. *Puccinellietum distantis ssp. limosae*

Perimeter	Salcia-Tudor Măxineni		Roman Tudor Vladimirescu		Traian		Lacu Sărat		Muceha	
Coverage (%)	62		75		72		70		65	
Floristic structure (%)	Graminees	43	G.	56	G.	52	G.	56	G.	52
	Leguminous	1	L.	3	L.	3	L.	2	L.	2
	Various	18	D.	16	D.	17	D.	12	D.	11

The vegetal carpet's floristic structure is dominated by graminees (43–56%) followed by the various species (11–18%) and the leguminous species (1–3%). The dominant biological form is represented by the hemi cryptophytes and terrophytes; the dominant phytogeographic element is the Eurasian one.

The *Puccinellia distans* pasturelands are used through pasturing and can be improved through calcium sulphate amendments and organic and mineral fertilization. Their productivity is good, even if they are used especially for pasturing.

2. Association *Camphorosmetum annuae* Wenzl. 1934.

This association is widespread in small areas in the form of clusters, indicating strong salty resorts. In floristic composition falls a few species, from which the obligatory halophytes are dominant. The vegetation coverage degree is 55 - 62%, the various species being dominant (42-47%) (table 2).

Table 2

As. *Camphorosmetum annuae* Wenzl. 1934

Perimeter	Salcia-Tudor Măxineni		Roman Tudor Vladimirescu		Traian		Lacu Sărat		Muceha	
Coverage (%)	55		60		62		58		55	
Floristic structure (%)	Graminees	9	G.	12	G.	13	G.	14	G.	10
	Leguminous	2	L.	1	L.	2	L.	2	L.	1
	Various	44	D.	47	D.	46	D.	42	D.	44

From the biological forms, the terrophytes and hemi cryptophytes are dominant, and the dominant phytogeographic element is the Eurasian one. *Camphorosma annuae* has a maximum competition capacity, forming a low carpet of reddish hue. This association's productivity is small and can be used by sheep during the dry periods of the summer.

3. Association *Obionetum verruciferae* Topa E., 1939.

This association is spread on moderate to strong salted soils, in Bărăgan depressions, where it occupies under a hundred hectares. This association contains few species, *Obione verrucifera* being the dominant one, the various species having the biggest percentage (47–52%), while the graminees and the leguminous species have a smaller participation (tab. 3). The vegetation coverage degree is low (50–57%), the terrophytes and hemi cryptophytes being dominant, as biological forms, and in what regards the phytogeographic elements, the Eurasian and cosmopolite species prevail. This association has no fodder value.

Table 3

As. *Obionetum verruciferae* Topa E., 1939

Perimeter	Salcia-Tudor Măxineni		Roman Tudor Vladimirescu		Traian		Lacu Sărat		Muceha	
Coverage (%)	50		55		57		52		51	
Floristic structure (%)	Graminees	2	G.	4	G.	5	G.	3	G.	2
	Leguminous	1	L.	-	L.	-	L.	-	L.	1
	Various	47	D.	51	D.	52	D.	49	D.	48

4. Association *Juncetum gerardi* Wenzl. 1934.

Juncus gerardi, the dominant specie, covers small surfaces in flood plains, on low salty soils (salty humic gley soils). The vegetation coverage degree is 55–60%, the highest percentage being occupied by the various species (45–46%) (table 4).

Table 4

As. *Juncetum gerardi* Wenzl., 1934

Perimeter	Salcia-Tudor Măxineni		Roman Tudor Vladimirescu		Traian		Lacu Sărat		Muceha	
Coverage (%)	55		60		60		59		55	
Floristic structure (%)	Graminees	8	G.	14	G.	14	G.	13	G.	8
	Leguminous	1	L.	1	L.	1	L.	1	L.	1
	Various	46	D.	45	D.	45	D.	45	D.	46

From the biological forms, the hemi cryptophytes are dominant, followed by the terrophytes, and the Eurasian floristic elements prevail. This association's fodder value is weak and can be used by sheep only for a short period.

5. Association *Artemisetum maritimae* Topa E., 1939

This association forms pasturelands of *Artemisia maritimae* with salt loving wormwood, spread on solonetz and salty humic gley soils. The vegetation coverage degree is 50 – 65%, dominated by the various species (42 – 53%).

Table 5

As. *Artemisetum maritimae* Topa E., 1939

Perimeter	Salcia-Tudor Măxineni		Roman Tudor Vladimirescu		Traian		Lacu Sărat		Muceha	
Coverage (%)	50		60		65		55		52	
Floristic structure (%)	Graminees	7	G.	9	G.	10	G.	8	G.	7
	Leguminous	1	L.	2	L.	2	L.	2	L.	1
	Various	42	D.	49	D.	53	D.	45	D.	44

From the biological spectrum's point of view, the hemi cryptophytes and terrophytes are dominant, and in what regards the floristic elements, a high percentage is occupied by the Eurasian and continental species (tab. 5). The fodder value of the pasturelands dominated by this association is low and they can be used only for sheep pasturing.

6. Association *Salicornietum prostratae* Soó R.,1947

This association is spread on small surfaces, in the form of small clusters, on soils with a high content of salts (salty soils). Its floristic composition includes few species, all of them obligatory halophytes. The vegetation coverage degree is 55 – 75%, the various species being dominant (44 – 56%) (tab. 6). In what regards the floristic elements, the Eurasian and continental species are dominant, and as biological spectrum, the hemi cryptophytes and terrophytes have the highest percentage. The association has no fodder value, but it can evolve, on moister places, towards the *Suaedetum maritimae* association, and by draining and drying the soil, towards the *Puccinellietum distantis* association.

Table 6

As. *Salicornietum prostratae* Soó R.,1947

Perimeter	Salcia-Tudor Măxineni		Roman Tudor Vladimirescu		Traian		Lacu Sărat		Muceha	
Coverage(%)	55		70		75		68		60	
Floristic structure (%)	Graminees	10	G.	16	G.	17	G.	14	G.	11
	Leguminous	1	L.	1	L.	2	L.	2	L.	1
	Various	44	D.	53	D.	56	D.	52	D.	48

CONCLUSIONS

The salt loving pasturelands are spread in the northeastern part of the Brăila County on small surfaces, part of them being used for pasturing, but with a small fodder value;

There were identified and described 6 salt loving pastureland associations: *Puccinellietum distantis ssp. limosae*, *Camphorosmetum annuae*, *Obionetum verruciferae*, *Juncetum gerardi*, *Artemisietum maritimae* and *Salicornietum prostratae*;

Wider surfaces of salt loving pasturelands are dominated by *Puccinellietum distantis ssp. limosae* association, which can be used for pasturing and has a medium to good fodder value;

The soils occupied by salt loving pasturelands can be improved through amendements, washing, fertilization, measures which improve the floristic composition of the vegetal carpet.

REFERENCES

1. Florea N., 1958 – *Privire generală asupra sărăturilor din R.P.R.Cercetări de Pedologie*. Ed. Acad. R.P.R., București;
2. Pușcașu Soroceanu Evdochia și colab., 1963 – *Pășunile și fânețele din România – studiu botanic și agroproductiv*. Ed. Acad. R.P.R.,București;
3. Teaci D. Și colab., 1980 – *Resursele de terenuri de pășiți din R.S. România și problemele principale ale productivității actuale și de perspectivă*. Lucr. Șt. SCCp Măgurele – Brașov, vol,VI

ECOLOGICAL INTERPRETATION OF SOILS FROM NICORESTI VINEYARD ECOPEDOTOPE

INTERPRETAREA ECOLOGICĂ A SOLURILOR DIN ECOPEDOTOPUL PODGORIEI NICOREȘTI

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Abstract. *The researches shown in the present paper have been based in the Nicoresti vineyard ecosystem. Soil analysis has been performed according to „Soil Taxonomy Romanian System” (SRTS, 2003) and the Pedological Studies Elaboration Methodology (ICPA, 1987), while the ecological interpretation of soils was done after the methodology by Chirita in 1974. In the Nicoresti vineyard ecosystem, plateaus are dominated by the presence of cambic and argillic chernozems, while in the highest areas from the north and north west, at over 220- 230 m high, grey phaeozem (wood grey soils) are to be found.*

Key words: Nicoresti vineyard ecopedotope, soil analysis, soil ecological interpretation

Rezumat. *Cercetările prezentate în lucrarea de față s-au desfășurat în ecosistemul viticol al podgoriei Nicorești. Studiul solului s-a făcut în conformitate cu „Sistemul Român de Taxonomie a Solurilor”(SRTS, 2003) și cu Metodologia Elaborării studiilor pedologice(ICPA, 19987), iar interpretarea ecologică a solului după metodologia elaborată de Chiriță în 1974. În ecosistemul podgoriei Nicorești platourile sunt dominate de prezența cernoziomurilor cambice și argiloiluviale și numai în partea mai înaltă din N și NV, la peste 220-230 m, apar și faeziomuri (soluri cenușii de pădure).*

Cuvinte cheie: ecopedotopul viticol Nicorești, studiu solul, interpretare ecologică sol

INTRODUCTION

The Nicoresti Vineyard represents the connecting line between the great viticultural area of the outer piedmont Carpathian Curvature (with the Panciu, Odobesti and Cotesti vineyards) and those of Southern Moldavia (Ivesti-Hanu Conachi and Dealul Bujorului). The vineyard has a patrimony of 1,789 ha, belonging to two viticultural centres: Nicoresti (1,506 ha) and Buciumeni (283 ha).

MATERIAL AND METHODS

The researches presented here have been performed in the viticultural ecosystem from the Nicoresti vineyard, situated in the eastern part of Romania, between the Siret and the Prut Rivers, around the south western hills of Moldavia's Plateau with the Tutova Hills to the north and the Tecuci Plain, to the south.

Soil analysis has been done in accordance with The Romanian Soil Taxonomy System" (SRTS, 2003) and with the Pedological Studies Elaboration Methodology (ICPA, 1987).

Soil ecological interpretation has been achieved after the methodology elaborated by Chirita in 1974.

RESULTS AND DISCUSSIONS

1. Physico-Geographical and climatical Characterization

Geomorphologically, the territory under study belongs to the Tutova Hills, through the Nicoresti piedmont plain with variable heights of 100-200 m.

The Nicoresti area belongs to the Siret hydrographical basin, through its tributary, the Barlad, its hilly area being traversed by a rivulet, the Tecucel, a tributary on the right side of the Barlad river.

Vegetation belongs to the silvosteppe, but with a tendency towards climatic and anthropic steppization during the last centuries.

2. Soils

On the Nicoresti vineyard ecosystem, the plateaus are dominated by the presence of cambic and clayilluvial chernozems and only in the highest regions of N and NW, at about 220-230 m high, there appear forest grey soils. Both of them have well-developed profiles and they are characterized biochemically by an intense biological activity, a weak to moderate humus content (2.0-3.5%), a higher degree of saturation in bases (V=70-80 %) and in nutritional elements (N,P,K), a slightly acid to neuter reaction (pH=6.5-6.9).

Ecological Interpretation of Soils from the Nicoresti Vineyard Ecopedotope

Characteristics of Cambic Chernozem

The typical cambic chernozem can be found on 1.454 ha and it was formed on a parental material made up of loessoid deposits, showing a **Am-A/B-Bv-Cca** morphology type.

Soil samples have been taken from the soil profile on pedogenetic horizons, while the results of these analyses are shown in Table 1.

Table 1

The Main Physical , Hydro-Physical and Chemical Characteristics of the Moderately Eroded Cambic Chernozem

Specification	Diagnostic horizons			
	Am	A/B	Bv	C ca
Depth (cm)	0-32	32-49	49-63	63-150
Coarse sand	0,1	0,09	0,08	0,05
Very fine sand	43,85	45,01	52,85	53,05
Silt	43,95	45,10	52,93	53,10
Clay (%)	25,66	27,35	21,68	25,01
Soil texture class	LL	LL	LL	LL
pH	6,73	6,96	6,73	8,41
Carbonates (CaCO ₃)	0,62	0,55	0,35	13,23

Wilting coefficient (CO%)	9,57	7,35	7,56	7,79
Field capacity (CC%)	22,90	22,52	22,60	22,58
Saturation capacity (CT%)	31,47	30,16	30,37	31,41
Available moisture holding capacity (CU%)	13,33	15,17	15,04	14,80
Humus (%)	2,14	1,27	1,10	-
Total Nitrogen(%)	0,107	0,064	0,055	-
Mobile Phosphorus (ppm)	18,35	13,65	18,35	-
Mobile Potassium (%)	232	128	140	-
Total exchangeable bases (SB-me/100g sol)	22,93	24,35	23,54	-
Total exchange cation capacity (me/100 g sol)	20,67	25,06	18,60	17,70
Degree of base saturation (V%)	92,57	93,98	94,84	-
Potential trophicity (Tp=puncte)	63,48	20,29	14,60	-
Effective tophicity(Te)	45,90			

Soil samples have been taken from the soil profile on pedogenetic horizons, while the results of these analyses are shown in Table 1.

Table 2

**Evaluation of the Nicoresti Vineyard Ecopedotope
Cambic Chernozem**

Ecological factories	Ecological factor favorability class							
	0...m	I	II	III	IV	V	E ₁	E ₂
Average temperature					•			
Yearly rainfalls			•					
Winds			•					
Summer rainfalls			•					
Summer relative moisture			•					
Humus content		•						
Acidity		•						
Total Nitrogen		•						
The mobile Phosphorus				•				
The assimilable Potassium					•			
Total exchange cation capacity				•				
Degree of base saturation						•		
Alkalinity		•	•					
Summer consistency			•					
Soil aeration				•				
Volumul edafic						•		
Potential					•			

trophicity								
Bioactive period length				•				

As for the qualitative appreciation of ecological factors and determinatives the situation goes as follows: 4 ecological, climatic and pedological factors and determinatives are included in the middle range favorability category; 3 ecological factors and determinatives are included in the high favorability category; 2 ecological factors are to be found in very high favorability category; 4 ecological factors are to be found in a very low favorability class.

Soil Ecological Diagnosis. If we apply the formula of soil ecological diagnosis, we may conclude that the soil offers a higher trophic stock to biocenoses (the soil is megatrophic), but which is not totally capitalized due to the excessively dry summer season.

The formula is:

$$DE = T_{p98} \times T_{e46} \times I_{bhf} \times m_{211} / (N_{II} \times A_{II} \times O_{III} \times C_{II} \times T_{IV} \times D_{III}) \\ (H_{II} \times t_{IV} \times V_V \times V_{eV})$$

Characteristics of the Moderately Eroded Cambic Erodisol

It has been formed on parental material represented mostly by loess, under phyto-climatic conditions of northern ante-steppe and sylvo-steppe, along moderately slanted slopes, with phreatic waters at more than 10 m in depth. Such a soil has a slightly alkaline reaction, a moderate to low content of humus and nitrogen, a satisfactory quantity of phosphorous and mobile potassium, an average cationic exchange capacity, a satisfactory degree of base saturation.

The soil profile presents the following characteristics: **Amp-Am-A/Bv- Bv-Cca.**

The soil samples have been gathered from soil profiles, on pedogenetic horizons, and the results of analyses are shown in Table 3.

Table 3

The Physical, Hydrophysical and Chemical Characteristics of the Moderately Eroded Cambic Erodisol

Specification	Diagnostic horizons				
	Amp	Am	A/Bv	Bv	Cca
Depth (cm)	0-20	21-45	46-70	71-90	91-135
Coarse sand	0,2	6,5	1,3	0,2	0,5
Very fine sand	51,3	42,4	56,8	52,3	50,9
Silt	23,3	26,2	22,6	24,0	26,8
Clay (%)	35,7	38,3	31,5	34,7	35,4
Soil texture class	LL	LL	SF	LL	LL
pH	8,20	7,99	8,20	8,60	8,70
Carbonates (CaCO ₃)	0,58	0,58	0,91	5,77	5,05
Wilting coefficient (CO%)	8,84	8,72	6,95	8,33	7,60
Field capacity (CC%)	22,77	22,76	22,40	22,68	22,62
Saturation capacity (CT%)	31,61	31,48	29,35	32,01	30,22
Available moisture holding capacity	13,93	14,04	15,45	14,35	15,02

(CU%)					
Humus (%)	2,04	1,20	0,86	0,66	-
Total Nitrogen(%)	0,135	0,065	-	-	-
Mobile Phosphorus (ppm)	29,23	8,73	-	-	-
Mobile Potassium (%)	258	130	-	-	-
Total exchangeable bases (SB-me/100g sol)	23,76	24,31	24,68	22,35	-
Total exchange cation capacity (me/100 g sol)	26,21	21,23	27,26	23,61	-
Degree of base saturation (V%)	90,1	91,3	91,7	95,5	-
Potential trophicity (Tp=points)	36,76	26,29	18,92	11,97	-
Effective tophycity(Te=points)	43,21				

Table 4

**Evaluation of the Nicoresti Vineyard Ecopedotope
Cambic Erodisol, Moderately Eroded**

Ecological factories	Ecological factor favorability class							
	0....m	I	II	III	IV	V	E ₁	E ₂
Annual Average temperature					•			
Annual rainfalls			•					
Winds			•					
Summer rainfalls			•					
Summer relative moisture			•					
Humus content		•	•					
Acidity		•						
Total Nitrogen		•						
The mobile Phosphorus				•				
The assimilable Potassium					•			
Total exchange cation capacity				•				
Degree of base saturation						•		
Alkalinity					•			
Summer consistency			•					
Soil aeration				•				
Volumul edafic						•		
Potential trophicity			•		•			
Bioactive period length				•				

Analyzing all data, we may notice the following: 1 factors may be included in the 1st category; the second group includes 6 more ecological factors; in third

class of value , 4 other ecological factors and determinatives are to be found; the fourth class includes the following indicators; the 5th group includes 2 factors.

Soil Ecological Diagnosis. The soil ecological diagnosis formulates the two fundamental characteristics quantitatively, i.e. ecological specificity and the productive potential.

$$DE = T_{p_{94}} \times T_{e_{43}} \times I_{b_{h_{f_{m_{258}}}}} / (N_{II} \times A_{I} \times O_{III} \times C_{II} \times T_{IV} \times D_{III}) (H_{II} \times t_{IV} \times V_V \times VeV)$$

From the formula, we may conclude that conditions of low to average trophicity occur, being hindered by the drought conditions in summer.

CONCLUSIONS

1. The soils found in the Nicoresti vineyard ecopedotope are dominated by the presence of cambic and clayilluvial chernozems, while on the steeper slopes, regosols and erodisols are to be found.

2. All these ecological research has been done with a view to qualitatively and quantitatively characterize the two main soil characteristics: soil trophic potential and the ecological specificity of the area under discussion.

3. The majority of the ecological factors and determinatives under analysis may be included in middle and low classes for high vine growing favorability.

REFERENCES

1. **Bireescu I., Bireescu Geanina, 1999** - *Soil Ecological Interpretation and the Elaboration of Global Impact Matrices for Some Saline Pastures from the Prut Lower Sector*, USAMV Jassy, series Horticulture, No. 42, pp. 391-396;
2. **Chiriță C, 1974** - *Ecopedology with General Pedology Elements*. Ceres Publishing House.
3. **Florea N., Munteanu I., 2003** - *The Romanian System of Soil Taxonomy*. Estfalia publishing House, Bucharest.
4. **Pîrvu C, 1980** - *Romania's Ecosystems*. Ceres Publishing House, Bucharest.
5. **Pîrvu C., 1999** - *General Ecology*. Tehnical Publishing House, Bucharest.

STUDY CONCERNING THE NITROGEN VARIATION TO CERTAIN REPRESENTATIVE TYPES OF SOIL IN THE SOUTH OF THE DOLJ COUNTY

STUDIUL PRIVIND VARIATIA CONȚINUTULUI DE AZOT LA UNELE TIPURI DE SOLURI REPREZENTATIVE PENTRU SUDUL JUDEȚULUI DOLJ

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Abstract. *Under the condition of agricultural reinforcement, of the vegetable production growth but the rural development as strong links to socio-economic progress, too we can ask the proper questions: is there the possibility of realising and maintaining the vegetable production growth without bringing major prejudices to the environment and to the people health and to the other living creatures of the trophic chain. These priority but extremely difficult task is approached by the means of longlasting agricultural development as it was defined by the World Commission for Environmental Development. Within this context we have studied the nitrogen content of certain representative soil types to establish the need of these element to the long lasting agricultural. In the same time, there was established other agri-chemical indicators which are directly related to the nitrogen, as pH, humus, index of nitrogen, phosphorus and potassium. This way we obtained the whole image over the degree of fertility of soils in the south of Dolj county.*

Key words: index of nitrogen, degree of fertility, soil.

Rezumat. *În condițiile intensificării agriculturii, a creșterii producției vegetale, dar și a dezvoltării rurale ca verigi forte ale progresului socio-economic, se poate pune legitima întrebare: poate fi realizată și menținută creșterea producției vegetale fără a aduce prejudicii majore mediului înconjurător și respectiv sănătății oamenilor și celorlalte viețuitoare ale lanțului trofic? Această sarcină prioritară dar și extrem de dificilă este abordată prin prisma dezvoltării durabile a agriculturii așa cum a fost definit de către Comisia Mondială pentru Mediu Înconjurător și Dezvoltare. În acest context am studiat conținutul în azot la unele tipuri de soluri reprezentative în vederea stabilirii necesarului acestui element pentru o agricultură durabilă. Concomitent au fost determinați și alți indicatori agrochimici care sunt în relație directă cu azotul, cum ar fi pH-ul, humusul, indicele de azot, fosforul și potasiul. Am obținut astfel o imagine de ansamblu asupra gradului de fertilitate al solurilor din sudul județului Dolj.*

Cuvinte cheie: indice de azot, grad de fertilitate, sol.

INTRODUCTION

The nitrogen from soil solution is presented under the form of ions $:\text{NO}_3^-$, NO_2^- , NH_4^+ . A significant importance in the plant nutrition possessed the high concentration of NH_4^+ which are to be found in early spring, before the intense starting of the nitrification processes. The nitrates concentration in the soil

solution increases in spring , afterwards it decreases in thr periods of maximal vegetable consumption. To support this idea, Borlan determined the values depending of nitrogen supply on nitrogen index of soil NI. The nitrogen index was also calculated in this paper, beside other indicators.

MATERIAL AND METHOD

To accomplish this study there were compared seven types of soils from the Dolj county, that is: eutricambosoil, psamosoil and aluviosoil, gleiosoil, solonet, solonceac, chernozem. For each and every type of soil there were taken medium samples up to 45-50 cm, for the medium stage of development cereal plant roots which are cultivated in this area. There were determined the following analises: total nitrogen, pH in distilated water, humus, phosphorus, potasium and nitrogen index after ICPA Methodology Bucharest.

RESULTS AND DISCUSSIONS

The study was made in 2007-2008 and present the next soils index on each type of soil as follows (fig 1-6).

The greatest quantity of total nitrogen was put in relief at the eutricambosils type (0,284%) which is to be found in river meadows sand banks. The texture of the soils is muddy-muddy, the majority of soils being affected by the gleising processes. Compared to the other soils, like in gleiosils the supply of soils into this element is big.(Fig. 1).

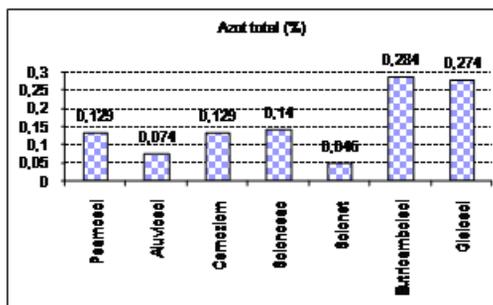


Fig .1. The content in total nitrogen in soils of the south of the Dolj county

In our agriculture system, the current situation of soil supply is make by nitrogen index. From this point of wiew, soils supply is weak and medium at psamosils, alluvisils, chernozems, solonceac, solonet, good enought at eutricambosils and very good at gleiosils (Fig. 2.).

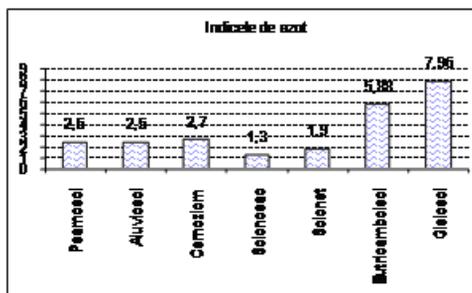


Fig. 2. The nitrogen index in soils of the south of the Dolj county

There is phosphorus in small quantities in soils, compared to the others macroelements. The analysed soils are weak supply with phosphorus, eloquent values recording only in cernozeum soil case (Fig. 3).

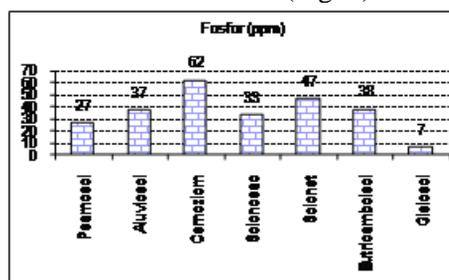


Fig 3. The content in phosphorus in soils of the south of the Dolj county

Depending on soil extraction degree, potassium has many form and values. Therefore, in fig. 4 the majority of analysed soils are medium and well supply with potassium.

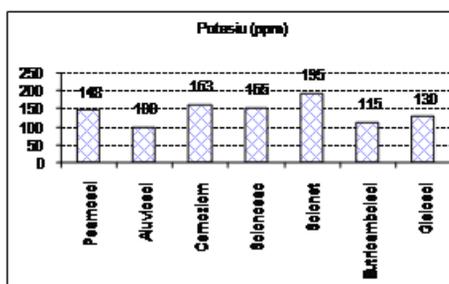


Fig.4. The content in potassium in soils of the south of the Dolj county

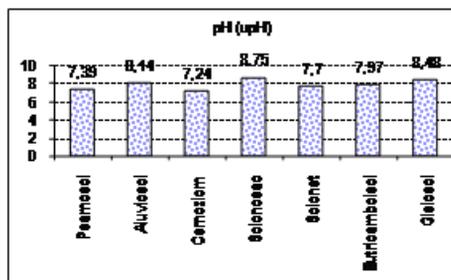


Fig. 5. Soil's pH values in south of the Dolj county

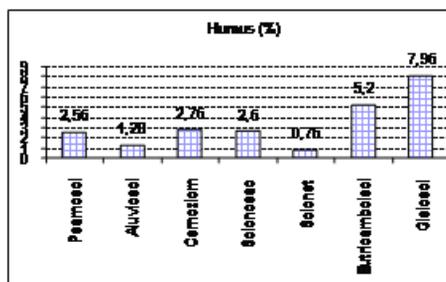


Fig 6. Humus content in soil of the south of the Dolj county

The analysed soils are weak alkaline and strong alkaline in solonosec and gleio soils case (Fig. 5). By quantity humus value is different in solonet soil and gleio soil. These values are 0,76% in solonet soil and 7,96% in gleio soil case.

CONCLUSIONS

From this paper result the direct relationship between the content of total nitrogen ,nitrogen index and humus content to the eutricambosols and gleio soils. There are phosphorus and potassium in small quantities in eutricambosols and gleio soils and in big quantities in chernozem soils.

REFERENCES

1. Avarvarei A. și colab, 1997 – *Agrochimie*. Ed. Sitech, Craiova.
2. Budoï Gh. 2004 – *Tratat de agrochimie*. vol. 1, Editura Sylvi, București.
3. Rusu M., 2005 – *Tratat de agrochimie*. Editura Ceres, București
4. ICPA,1987 – *Metodologia elaborării studiilor pedologice*, vol. 1-3, București.

RESEARCH CONCERNING FUNDAMENTAL PROCESSES INVOLVED INTO NITROGEN DYNAMICS ON SOIL PROFILES IN DOLJ DISTRICT

STUDIU PRIVIND PROCESELE FUNDAMENTALE IMPLICATE ÎN DINAMICA AZOTULUI PE PROFILELE UNOR SOLURI DIN JUDEȚUL DOLJ

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***Abstract.** Putting into practice of new agricultural techniques based on the most advanced scientific knowledges in one the field of technology, especially of the ecological one, a major requirement of promoting a long lasting agriculture. Therefore it appeared the need of new studys making concerning the content in main chemical elements of the soils nitrogen phosphorus, potassium. In the present paper I have studied the content in nitrogen on the profiles of one of the soils chernozem type, alluviosoil type and psamosoil type which are to be found in south of the Dolj county. These profiles go down to the depth of, 45-50 cm. Simultaneously there were determined other agrochemical indicators like pH, humus and the clay content. From the results obtained we can notice grate amount of nitrogen and humus on the chernozem type of soil, compared to the other type of soils.*

Key words : index of nitrogen, alluviosoil, chernozem, humus, pH.

***Rezumat.** Aplicarea unor noi practici agricole bazate pe cele mai avansate cunoștințe științifice în domeniul tehnologiilor, mai ales a celor ecologic valabile, este o cerință majoră a promovării agriculturii durabile. De aceea a apărut necesitatea elaborării unor studii privind conținutul solurilor în principalele elemente chimice, respectiv azot, fosfor, potasiu. În lucrarea de față am studiat conținutul în azot pe profilele unor soluri de tipul cernoziom, aluviosol și psamosol care se găsesc în sudul județului Dolj. Acest profile merg până la adâncimea de 45-50 cm. Concomitent au fost determinați și alți indicatori agrochimici, cum ar fi pH-ul, humusul și conținutul în argilă. Din rezultatele obținute se constată o cantitate semnificativă de azot și humus pe tipul de sol cernoziom, comparativ cu celelalte tipuri de soluri.*

Cuvinte cheie: indice azot, aluviosol, cernoziom, humus, pH.

INTRODUCTION

The long lasting development represents the capacity to the humankind to insure countinuously the requirement of the present generation, but without compromising those to the next generation. In agriculture, like in any onther economic branch no sistem can't be considerate long lasting for the farmer and the society he belongs to not benefical that is, it is not viable from the economic point of wiew.

The present paper presents one of the main elements existing in the soils, and especially the total nitrogen, from the ploughed layer and on the soil profile,

too. The total nitrogen vary between 0.07-0.38% (Vintilă, 1984), depending on the soil type and growing from the whitin luvisols to chernozems. These total nitrogen presents many forms, that is 90-95% from the total nitrogen represents organic nitrogen, mineral nitrogen representing 5-10% from the total nitrogen, this one is to be found in fixed forms of NH_4 and in changeable forms, too.

The role of this element is very important, reflecting the best the degree of participation of „nutrition humus” to supply plants with nitrogen. After the index of nitrogen, the supply with nitrogen is weak in the south of Oltenia.

MATERIAL AND METHOD

To accomplish the study there were taken three types from Gighera village, Dolj county, that is: chernozem, alluviosoil and psamosoil.

For each and every type of soil there were made three profiles at two depths, going down to 45-50 cm, i.e. the maximum stage of corn root development.

There were determined the following analyses: N_t , pH in distilled water, humus% and content in colloidal clay, after the methodology of ICPA Bucharest.

RESULTS AND DISCUSSIONS

The study was made in 2007-2008 in Gighera commune area.(table 1,2,3).

Table 1

Characteristics of Gighera chernozem

Soil area measurement	Nr. 1 CZ ka - Xvm - K ₁ - d ₅ - LL/SF - Tem/NB - Ae12		Nr. 2 CZ ka - Xvm - K ₁ - d ₅ - SF/SF - Teg/NI-A		Nr. 3 CZ cb - d ₅ - LL/LN - Tem/NI-A - c ₄₁	
	0-10 cm	30-40 cm	0-10 cm	35-45 cm	0-10 cm	40-50 cm
Sampling depth (cm)	0-10 cm	30-40 cm	0-10 cm	35-45 cm	0-10 cm	40-50 cm
Nitrogen index	2	2,2	2	0,7	2,5	2,6
pH in distilled water	8,4	8,14	6,55	6,61	6,81	6,90
Humus (%)	2,2	2,24	2	0,75	2,52	2,48
Total nitrogen (N%)	0,125	0,123	0,106	0,048	1,90	0,115

The first profile made on the depth of 0-10 cm reveals a weak alkaline soil reaction, the content of nitrogen is small, the index of nitrogen is medium and the content in humus is small. The next layer i.e.Am has an alkaline reaction, the content in total nitrogen is small, the index of nitrogen is medium and the content in humus is small.

The second profile, on the Ap layer has an acid reaction, the content in total nitrogen is small, the index of nitrogen and the content of humus has the same value. On the Am layer, the reaction of the soil is weak acid, the content in total nitrogen is very small, the index of nitrogen is very small the content in humus is very small.

The third profile, on Ap layer has an weak acid reaction, the content in total nitrogen is big, the bindex of nitrogen is middle, the content of humus is middle. On the A/B layer, the reaction of soil is neutral, the content in total nitrogen is small, the index of nitrogen is middle, the content in humus is middle.

Table 2

Caracteristics of Gighera alluviosoil

Soil area measurement	Nr. 1 ASgcsc-G ₄ -S ₂₃ -k ₁ - d ₄ -t/t-Tfm/NB-Ps		Nr. 2 ASgc-sc-G ₄ -S ₃₁ -k ₁ - d ₂ -a/a-Tfm/NB-Ps		Nr. 3 ASgcsc-G ₄ -S ₂₂ -k ₁ - d ₃ -a/a-Tfa/NB-Ps	
	Sampling depth (cm)	0-10 cm	20-30 cm	0-10 cm	27-37 cm	0-10 cm
Nitrogen index	0.1	2.2	1.1	0.4	1.9	0.8
pH in distilated water	8.60	8.68	7.99	8.15	7.71	8.08
Humus (%)	0.15	2.24	1.3	0.5	1.92	0.82
Total nitrogen (N%)	0.016	0.144	0.064	0.018	0.100	0.027

The first profil on the depth of 0-10 cm reveals a weak alkaline soil reaction, the content in total nitrogen is very small, the index of nitrogen is very small and the humus content is very small. The next layer i.e. 20-30 cm has a weak alkaline soil reaction , the content in total nitrogen is small, the index of nitrogen is small, the content in humus is small.

The second profile, on the depth of 0-10 cm has a weak alkaline reaction, the content in total nitrogen is very small, the index of nitrogen is small, the content of humus is small. On the 27-37 cm layer, the reaction of the soil is weak alkaline, the content in total nitrogen is very small, the content in humus is very small.

The third profile, on the depth 0-10 cm has a weak alkaline soil reaction , the content in total nitrogen is small, the index of nitrogen is small, the content of humus is small. On the depth 35-45 cm the reaction of soil is weak alkaline, the content in total nitrogen is very small, the index of nitrogen is small, the content in humus is small.

Table 3

Caracteristics of Gighera psamosoil

Soil area measurement	Nr. 1 PSmoka-k ₁ -d ₅ -u/u- Teg/NB-Ps		Nr. 2 PSmoka-k ₁ -d ₆ -u/u- Teg/NB-Ps		Nr. 3 PSKa-k ₁ -d ₆ -u/u- Teg/NB-Ps	
	Sampling depth (cm)	0-10 cm	40-50 cm	0-10 cm	34-45 cm	0-10 cm
Nitrogen index	2.7	2.0	2.5	2.0	2.5	2.6
pH in distilated water	7.24	7.90	7.39	7.95	6.81	6.90
Humus (%)	2.76	2.00	2.56	2.08	2.52	2.48
Total nitrogen (N%)	0.129	0.115	0.129	0.125	0.119	0.115

The first profil on the depth of 0-10 cm reveals a weak alkaline soil reaction, the content in total nitrogen is small, the index of nitrogen is medium and the humus content is medium, too. The next layer i.e. 40-50 cm has a weak alkaline soil reaction , the content in total nitrogen is small, the index of nitrogen is small, the content in humus is small.

The second profile, on the depth of 0-10 cm has a weak alkaline reaction, the content in total nitrogen is small, the index of nitrogen is medium, the content of humus is medium. On the 34-45 cm layer, the reaction of the soil is weak alkaline, the content in total nitrogen is small, the content in humus is small.

The third profile, on the depth 0-10 cm has a weak alkaline soil reaction, the content in total nitrogen is small, the index of nitrogen is medium, the content of humus is medium. On the depth 40-50 cm the reaction of soil is weak alkaline, the content in total nitrogen is medium, the index of nitrogen is medium, the content in humus is small.

CONCLUSIONS

Following the analyses made there can be noticed the direct dependence between the decrease of the total nitrogen and the humus in depth, the index of nitrogen presents the same evolution and the pH realises a increase together with the depth decrease.

As it can be noticed from the tabels 1, 2, 3 there are fluctuations in tha case of all the three types of soil, the chernozem type beeing the best supplied with nitrogen.

There can be noticed that the first layer regardless the type of soil presents the most increased values of the studied parameters except with pH.

REFERENCES

1. **Budoï Gh., 2004** – *Tratat de agrochimie*. vol. 1, Editura Sylvi, București.
2. **Rusu M., 2005** – *Tratat de agrochimie*. Editura Ceres, București.
3. **ICPA, 1981** – *Instrucțiuni privind executarea studiilor agrochimice*. Red. coord. Borlan Z.
4. **ICPA, 1987** – *Metodologia elaborării studiilor pedologice*, vol. 1-3. București.

FUNCTIONALITY VERIFICATION OF DATA OBTAINED IN THE GREEN HOUSE ON AN ARTIFICIAL POLLUTED SOIL WITH LEAD

VERIFICAREA FUNCȚIONALITĂȚII DATELOR OBTINUTE ÎN HALA MODELE SOL PE UN SOL POLUAT ARTIFICIAL CU PLUMB

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Abstract. *Phytoextraction is a technique to remove the heavy metals from soil by direct absorption in plant tissues. The implementation of a phytoextraction plans suppose one or more plants cultivation as contaminant hyperaccumulators. Specific conditions for the application of the phytoextraction plan in a polluted area reports to improvements, vegetation period, pollution degree etc. This paper presents the effects of ethylenediaminetetraacetic acid (EDTA) application as a potential improvement in an artificial polluted soil with lead (Pb) to increase the translocation capacity in vegetal part of maize in two vegetation cycles.*

Keywords: pollution, heavy metals, EDTA

Rezumat. *Fitoextracția este o tehnică de îndepărtare a metalelor grele din sol prin absorbție directă în țesuturile plantei. Implementarea unui program de fitoextracție presupune cultivarea uneia sau mai multor specii de plante care sunt hiperacumulatori de contaminanți. Condiții specifice pentru aplicarea programului de fitoextracție pentru un anumit sit poluat se referă la amendamente, perioada de vegetație, gradul de poluare, etc. Lucrarea prezintă efectele aplicării acidului etilen diamin tetraacetic (EDTA) ca potențial amendament pe un sol contaminat artificial cu Pb în scopul creșterii capacității de translocare în partea vegetală a porumbului pe doua cicluri de vegetatie.*

Cuvinte cheie: poluare, metale grele, EDTA

INTRODUCTION

Large areas of agricultural lands from Romania are contaminated with heavy metals provided, especially, by industrial emissions.

Studying the available specialty literature, it is obviously that phytoremediation could restore the balance in the stressed environment, with carefully proceeding in its application as remediation technique of heavy metal polluted soil.

In case of some pollutant metals as lead, phytoextraction could be improved by using chemical compounds with chelating properties in the presence of these metals.

Data from literature shows that ethylenediaminetetraacetic acid (EDTA) and nitrilotriacetic acid (NTA) are the most studied chelating agents.

MATERIAL AND METHODS

The present study is about the evaluation of efficiency of lead transfer from polluted soil in plant by verifying the functionality of the obtained data in laboratory experiment achieved in Green House, on two crop cycles.

The soil used in the experiment was sampled from the contaminated area Neferal – Acumulatorul.

To set up the experiment, the soil sampled from surface (0-20 cm) was homogenized and dried at air temperature.

The plant used in the experiment was maize.

The treatment with EDTA was: 0-2,7 mmol EDTA kg⁻¹ soil and was applied before seedling, in the beginning of the experiment (first cycle).

The experiment period of time was eight weeks for each cycle (first cycle, second cycle).

The values of chemical characteristics of soil were determined by analyzing three repetitions (n=3).

In table 1 and 2 are presented chemical and physical characteristics.

The experimental variants are:

- ✓ V2 – control (untreated soil);
- ✓ V3 – soil treated with 0.1 mmol EDTA·kg⁻¹;
- ✓ V4 – soil treated with 0.54 mmol EDTA·kg⁻¹;
- ✓ V5 – soil treated with mmol EDTA·kg⁻¹;
- ✓ V6 – soil treated with 1.08 mmol EDTA·kg⁻¹;
- ✓ V7 – soil treated with 1.35 mmol EDTA·kg⁻¹;
- ✓ V8 – soil treated with 2.7 mmol EDTA·kg⁻¹.

Table 2

Physical characteristics of soil (n=3)

Soil texture	Mean
Coarse sand (2,0 – 0,2 mm) (%g/g)	0,8
Fine sand (0,2 – 0,02 mm) (%g/g)	33,7
Dust (0,02 – 0,002 mm) (%g/g)	33,5
Clay (<0,002 mm) (%g/g)	32,0

Each treatment was applied in three repetitions. Experimental variant CONTROL was soil without EDTA treatment.

After each cycle of vegetation was sampled vegetal plant, weighted and chemically analyzed to determine the accumulation of lead.

Table 1

Chemical characteristics of soil (n=3)

	pH (H ₂ O)	C, %	H %	Nt, %	Pb mg kg ⁻¹	SB me/100g soil	Ah me/100g soil	T SB+Ah ml/100 g soil	V %
\bar{x}	5,70	1,24	2,13	0,158	573	18,53	5,03	23,57	78,6
SD	0,018	0,0081	0,0129	0,002	9,62	0,3935	0,0898	0,4592	0,7483
CV %	0,315	0,653	0,605	1,51	1,67	2,12	1,78	1,94	0,95
S _E	0,0104	0,0046	0,0074	0,0013	5,56	0,2274	0,0519	0,2654	0,4325

\bar{x} – Media; SD – Standard deviation; CV – Coefficient of variation; S_E –Standard error.

RESULTS AND DISCUSSIONS

From lead content point of view, the soil used in experiment was very polluted with lead – 573 mg kg^{-1} (maximum allowable limit – Kloke, 1980).

According to the Order no. 756/1997 concerning soil pollution, lead exceeds Alert threshold for all using types ($50 \text{ mg}\cdot\text{kg}^{-1}$, $250 \text{ mg}\cdot\text{kg}^{-1}$) and Intervention threshold for the sensitive using ($100 \text{ mg}\cdot\text{kg}^{-1}$).

First cycle represents the direct effect of EDTA treatment, and the second cycle represents the remanent effect of the treatment considering that in the second cycle, the seedling was effectuated after a period of time to reach a chemical equilibrium in soil.

Figure 1 shows the EDTA effect on biomass of maize leaves (first and second harvest – remanent effect). From statistical interpretation (Student test) of the obtained data resulted that the biomass had a significant decrease in both cycles dependent on treatment.

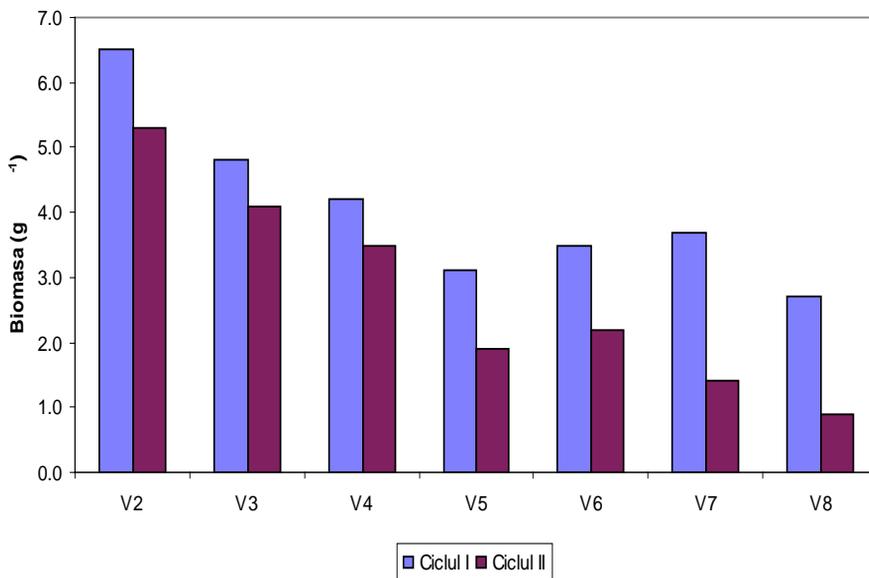


Fig. 1. The effect of EDTA application on biomass (maize) – First and Second Cycle (remanent effect)

Considering the concentration of lead in maize leaves (Fig. 2), were registered normal contents. From statistical interpretation (Student test) of the obtained data resulted that the values had a significant increase proportionally with EDTA content.

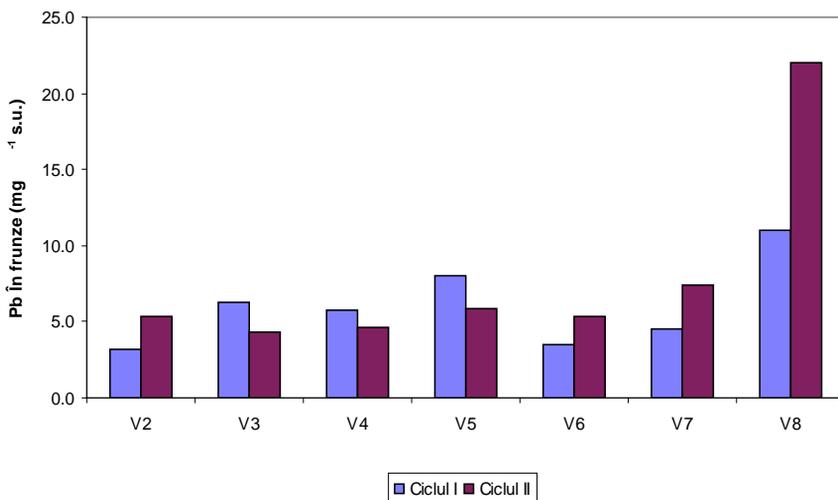


Fig. 2. The effect of EDTA application on Pb concentration in maize leaves – First and Second Cycle (remanent effect)

Regarding remanent effect (Second cycle) of lead content and EDTA treatment on soil reaction, this is presented in Table 3.

Table 3

The effect of EDTA application on soil reaction – Second cycle

Treatment	pH _{H2O}	Significance
V2 – Soil + 0 mmol EDTA:kg ⁻¹	5,47	
V3 – Soil + 0.1 mmol EDTA:kg ⁻¹	5,41	0
V4 – Soil + 0.54 mmol EDTA:kg ⁻¹	5,42	0
V5 – Soil + 0.81 mmol EDTA:kg ⁻¹	5,39	00
V6 – Soil + 1.08 mmol EDTA:kg ⁻¹	5,38	000
V7 – Soil + 1.35 mmol EDTA:kg ⁻¹	5,35	000
V8 – Soil + 2.7 mmol EDTA:kg ⁻¹	5,32	000
LD 5%		0,048
LD 1%		0,067
LD 0.1%		0,093

remanent effect
LD – Limit Difference

Comparing with control V2, the pH value had a significant decrease for the first two variants (V3 and V4), a distinct significant decrease for the experimental variant V5 with the treatment 0.81 mmol EDTA kg⁻¹ and a strong significant decrease starting with variant V6 (polluted soil (remanent effect) + 1.08 mmol EDTA kg⁻¹).

By EDTA application (remanent effect), can be observed the acidification tendency of soil explainable considering that EDTA is an acid.

Statistical data were calculated by comparison with experimental variant V2, as CONTROL (Student test).

CONCLUSIONS

– Statistical data shows significant differences between experimental variants regarding the biomass of maize and lead accumulation in vegetal part according to the applied treatment.

– High EDTA concentrations have negative effects on maize plants and determine changes in soil acidity. To accomplish the conditions of high biomass and high translocation of lead in plants, are not allowed doses higher than 0,54 mmol EDTA kg⁻¹ at different rate.

– The ratio between soil and chelating agent depends on contamination degree of soil. A higher pollution of soil with heavy metals requires a higher quantity of EDTA to mobilize the lead.

REFERENCES

1. **Canarache A., 1990** - *Fizica solurilor agricole*. Ed. Ceres, București.
2. **Greman H., Velykonya – Bolta S., Vodnik D., Kos B., Lestan D., 2001** - *EDTA enhanced heavy metals phytoextraction: Metal accumulation, leaching and toxicity*. *Plant Soil*, 235: 105-114.
3. **Lombi E., Zhao F.T., Dunham S.T., McGrath S.P., 2001** - *Phytoremediation of heavy metals hyperaccumulation versus chemicaly enhanced phytoextraction*. *Journal Environment, V.O.*, p. 1919-1926.
4. **Nascimento C.W.A., Amarasiri Wardena D., Xing B., 2006** - *Comparison of natural organic acid and synthetic chelates at enhancing phytoextraction of metals from multi-metal contaminated soil*. *Environmental Pollution*, v. 140, p. 114-123, 2006.
5. *****, 1997** - *Order no 756/1997 of MAPPAM, First Part, No 303/1997*.

SOME ASPECTS CONCERNING *VENTURIA INAEQUALIS* (Cke Wint) AND *PODOSPHAERA LEUCOTRICHA* (Ell.et Ev.Salm) CONTROL IN APPLE PLANTATION

UNELE ASPECTE PRIVIND COMBATERICA RAPĂNULUI (*VENTURIA INAEQUALIS* Cke Wint.) ȘI FĂINĂRII (*PODOSPHAERA LEUCOTRICHA* Ell.et Ev.Salm.) ÎN PLANTAȚIA DE MĂR

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Abstract. Currently the UE wants to ban pesticides used in combating fitopathogen agents considered as toxic to humans in terms of endocrinology, are carcinogenic, mutagenic and toxic for reproduction. For this purpose, knowing the action of deuterium-depleted water on different tumours in humans with good results, studied the influence of water and the evolution of fungi as apple's scab (*Venturia inaequalis*- Cke Wint.) and apple's powdery mildew (*Podosphaera leucotricha*- Ell.et Ev.Salm.) at culture apple. Deuterium-depleted water is the result of research in water isotopic separation held for years by a team of specialists from the National Institute of Research - Technology Development for Isotopic and Criogenetice Râmnicu Vâlcea . It is microbiological pure water with an isotopic concentration under natural water concentration. The study was conducted using the biological material of the variety Jonathan March, and as fungicides, comparative fungicidele classic used DDW-30ppm.

Key words: apple, *Venturia inaequalis*, *Podosphaera leucotricha*, fungicide.

Rezumat. In prezent UE vrea să interzică folosirea pesticidelor în combaterea agenților fitopatogeni, ca fiind considerate toxice pentru om din punct de vedere endocrinologic, sunt cancerigene, mutagene sau toxice pentru reproducere. În acest scop, cunoscându-se acțiunea apei sărăcite în deuteriu asupra diferitelor tumori la om cu bune rezultate, s-a studiat influența acestei ape și asupra evoluției unor ciuperci ca rapănul (*Venturia inaequalis*-Cke Wint.) și făinarea (*Podosphaera leucotricha* – Ell.et Ev.Salm) la cultura mărului. Apa sărăcită în deuteriu este rezultatul cercetărilor în domeniul separării izotopice a apei desfașurate de-a lungul anilor de către un colectiv de specialiști din cadrul Institutului National de Cercetare – Dezvoltare pentru Tehnologii Criogenetice și Izotopice Râmnicu Vâlcea. Este o apă microbiologică pură cu o concentrație izotopică aflată sub concentrația apei naturale. Studiul s-a realizat folosind ca material biologic soiul de mar Jonathan, iar ca fungicide, comparative cu fungicidele clasice, s-a folosit DDW-30ppm.

Cuvinte cheie:măr, *Venturia inaequalis*, *Podosphaera leucotricha*, fungicide

INTRODUCTION

In March of orchards with varieties susceptible to Apple's Scab - *Ventura inaequalis* and Apples's powdery mildew - *Podosphaera leucotricha*, in years with normal weather conditions these fungi attack a limiting factor in increasing the productivity of plantations is a permanent concern for fruiter and specialists in the field of plants.

Chemical treatments applied several years caused environmental pollution, lead to natural biological balance disorders, which externalize through the emergence of virulent forms of pathogens agents and some races effective at fungicides (Lefter Gh., Minoiu N., 1990).

Therefore in 70 years since the discovery of deuterium in natural water, were initiated numerous studies in order to establish the deuterium action on plant (Butnaru et ali., 1997; Butnaru 1998; Bontescu et ali.) and animal (Somlyai et ali. 1993, 1997; Haulica et ali. 1998).

MATERIAL AND METHODS

Surveys were conducted during the vegetation period of 2007-2008 in plantation variety Jonathan on apple - in the demonstration group Unity Phytosanitary Gorj.

It was observed the efficacy of DDW30 ppm, tested as a fungicide to combat apple's scab and apple's powdery mildew.

Scheme variants are presented below, each variant is composed of three trees. Between variants were left untreated two trees to avoid overlapping treatments. In experiments were performed treatments according to warnings issued by the Gorj Fitosanitary Unit.

In 2007 were conducted the following treatments in: 22.04.2007, 06.05.2007, 17.05.2007, 24.05.2007, on variants:

V1: Treatment I: *Water + Bouillie bordelaise -0,5%*; Treatment II: *Water + Carbendazim 500 SC -0,1%*; Treatment III: *Water + Systhane forte 0,02%*; Treatment IV: *Water + Carbendazim 500 SC -0,1%*;

V2: Treatment I: *DDW (30ppm) + Bouillie bordelaise -0,5%*; Treatment II: *DDW (30ppm) + Carbendazim 500 SC -0,1%*; Treatment III: *DDW (30ppm) + Systhane forte 0,02%*; Treatment IV: *DDW (30ppm) + Carbendazim 500 SC -0,1%*

V3: Treatment I: *DDW (30ppm)*; Treatment II: *DDW (30ppm)*; Treatment III: *DDW (30ppm)*; Treatment IV: *DDW (30ppm)*;

V4: Treatment I: *Water + DDW - 0,5%*; Treatment II: *Water + DDW - 0,1%*; Treatment III: *Water + DDW - 0,02%*; Treatment IV: *Water + DDW - 0,1%*;

V5: untreated sample;

In 2008 were conducted the following treatments in: 17.04.2008; 14.05.2008; 17.06.2008; 06.08.2008, on variants:

V1: Treatment I: *Water + Topsin 70 PU - 0,07%*; Treatment II: *Water + Bravo 500 SC - 0,15% + Shavit F72WP-0,2%*; Treatment III: *Water + Topsin 70 PU - 0,07%*; Treatment IV: *Water + Bravo 500 SC - 0,15% + Shavit F72WP-0,2%*;

V2: Treatment I: *DDW + Topsin 70 PU - 0,07%*; Treatment II: *DDW + Bravo 500 SC - 0,15%+Shavit F72WP-0,2%*; Treatment III: *DDW + Topsin 70 PU - 0,07%*; Treatment IV: *DDW + Bravo 500 SC - 0,15%+Shavit F72WP-0,2%*;

V3: Treatment I: *DDW*; Treatment II: *DDW*; Treatment III: *DDW*; Treatment IV: *DDW*;

V4: Treatment I: *Water + DDW – 0,07%*; Treatment II: *Water + DDW – 0,25%*;
Treatment III: *Water + DDW – 0,07%*; **Treatment IV:** *Water + DDW – 0,25%*;
V5 : Untreated sample.

Observations and numbering during the vegetation period in the years 2007 and 2008 have endorsed the attack rate, the attack rate from sample and the efficiency of biological treatment. Results were reported to sample variant. Determining the efficiency of biological treatment was done in accordance with the requirements of methodological guidelines for testing chemical and biological protection of plants.

RESULTS AND DISCUSSIONS

Experimental data on efficacy testing of biological treatment with DDW - 30ppm as a fungicide to combat some of the mushrooms of apple is presented in tables 1 and 2.

Table 1

Apple's scab attack (*Venturia inaequalis*) on apple leaves 2007 – 2008

Variant	2007					2008				
	No. leaf. observed	No. leaf. attack	F %	I %	G.A.	No. leaf. observed	Nr. leaf. attack	F %	I %	G.A.
V1	300	25	5,7	3	0,17	300	9	5,3	3	0,15
V2	300	18	4,7	3	0,11	300	2	2,7	3	0,08
V3	300	19	3,7	3	0,09	300	9	3,7	3	0,09
V4	300	19	5,7	3	0,17	300	9	5,7	3	0,17
V5	300	24	10,1	5	0,5	300	16	5,3	4	0,21

Table 2

Apple's scab attack (*Venturia inaequalis*) on apple fruits 2007 – 2008

Variant	2007					2008				
	No. leaf. observed	No. leaf. attack	F %	I %	G.A.	No. leaf. observed	No. leaf. attack	F %	I %	G.A.
V1	50	3	4,1	3	0,1	50	0	0	0	0
V2	50	0	0	0	0	50	0	0	0	0
V3	50	3	0,2	2	0,004	50	2	0,6	2	0,1
V4	50	4	0,2	3	0,1	50	2	0,2	2	0,1
V5	50	9	5,1	3	0,2	50	7	6,2	2	0,1

Note that the frequency of attack on the leaf variants V5 - witness untreated - and V1, which were used fungicides, is 10.1% and 5.7%, compared with V2 and V3 variants, which we used as a fungicide DDW - 30ppm, frequency was 4.7% and 3.7%.

The same is observed in Table 2 and where frequent attacks on fruit in V2 and V3 variants is lower.

Study of fig.1 is observed that in 2007 the attack against the witness was reduced in variants V2, V3 and V4, where the treatment was used DDW-30ppm.

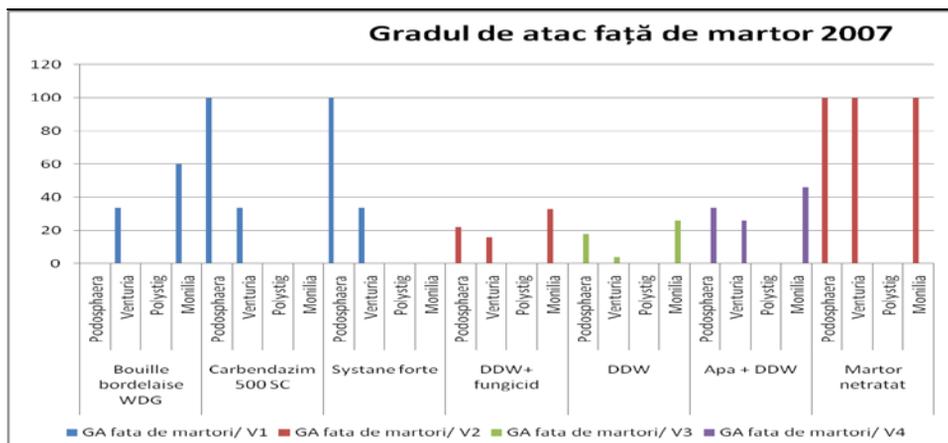


Fig.1. Apple's scab (*Venturia inaequalis*) rate attack on sample and apple's powdery mildew (*Podosphaera leucotricha*) 2007

Fig.2 analyzed, note that the efficacy of treatment was between 62% - 98% where used DDW-30ppm.

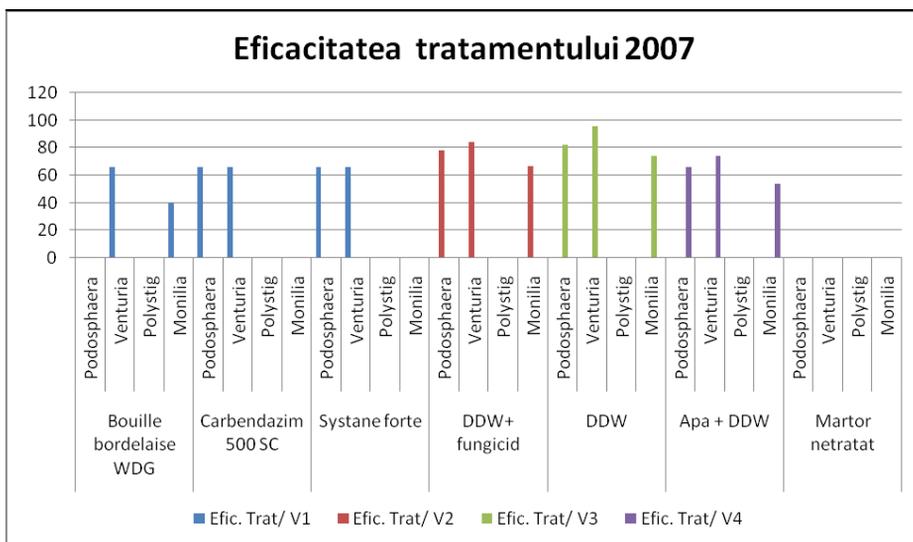


Fig.2. Efficacy of treatment apple's scab control (*Venturia inaequalis*) and apple's powdery mildew (*Podosphaera leucotricha*) 2007

Analyzing fig.3 and fig.4 note that in 2008 the results were similar.

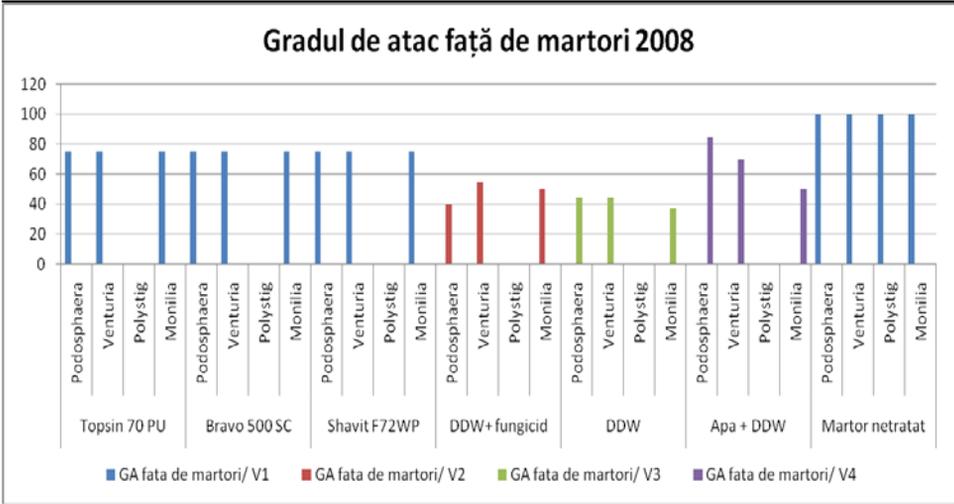


Fig.3. Apple's scab (*Venturia inaequalis*) rate attack to sample apple's powdery mildew (*Podosphaera leucotricha*) 2008

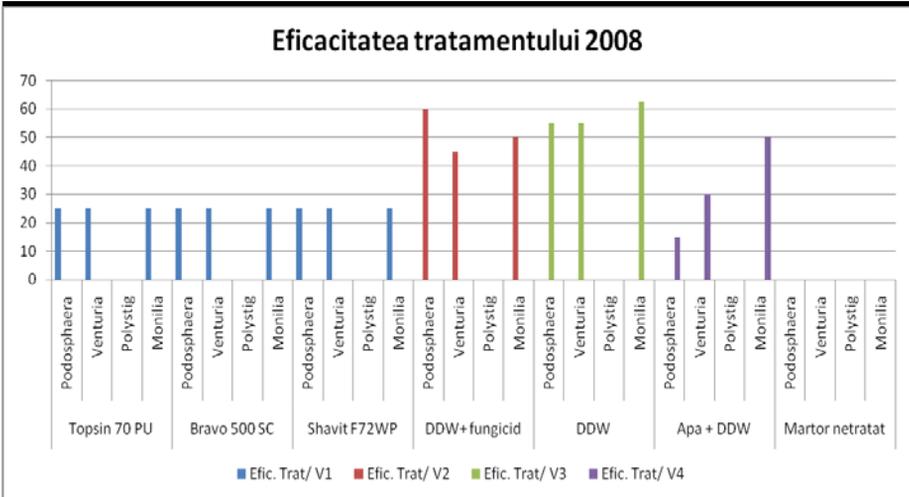


Fig.4. Efficacy of treatment apple's scab control (*Venturia inaequalis*) and apple's powdery mildew (*Podosphaera leucotricha*) 2008

CONCLUSIONS

Statistical analysis of experimental results obtained allow to conclude that simple DDW and DDW + fungicide, tested as fungicides against fungi *Venturia inaequalis* and *Podosphaera leucotricha*, showed a good biological efficiency. Therefore they can be recommended as protection against the two plants of mushrooms apple's.

As a general conclusion, we recommend further experiments on the combination of preventive treatments with the curative ones, with DDW, on larger groups of plants, which can lead to the establishment of an environmental program to combat diseases.

REFERENCES

1. Berdea P., Cuna S., Cuna C., Balas G., 2007 – *Preliminary study of deuterium depleted water effect on the live cells by isotopic ratio mass spectrometry*. Studia Universitatis Babeş-Bolyai, Geologia, Cluj Napoca.
2. Bobes I., 1983 – *Atlas de fitopatologie si protectia agroecosistemelor*. Editura Ceres, Bucuresti
3. Butnaru G., Sarac I., Titescu Gh., Chirian C., 1997 - *Deuterium - depleted water effect on Avena sativa L., growth Romania*. Journal of Biological Sciences I, 5-6.
4. Cachita C.D., Petrus C.M., Vancea A., Ardelean A., Morariu V., Stefanescu I., 2002 – *The water content decreased in the deuterium germinatiei to wheat, corn and Beets*. "Water, Environment and Health" EASA Conference Arad.
5. Corneanu M., Corneanu G.C., Cristea C., Bercu R., Rosca A., Stefanescu I., 2005 – *The effects of the deuterium – depleted water on in vitro organogenesis processes in Robinia pseudoacacia var. Oltenica*. Revue de cytologic et biologic vegetales – Le Botanist
6. Haulica I., Peculea M., Stefanescu I., Titescu GH., Todiras M., Bild W., 1998 -*Effects of heavy and deuterium – depleted water on vascular reactivity*. Rom. J. Phisiol 35, 25-32.
7. Murashige T., Skoog F., 1962 - *A revised medium for rapid growth and bioassays with tobacco tissue cultures*. Physiol. Plant. 15,473-497.
8. Parvu M., 2000 – *Ghid practic de fitopatologie*. Editura Presa Universitara, Cluj
9. Somlyai G., Jancso G., Jakli G., Vass K., Barna B., Lakics V., Gaal T., 1993 - *Naturally occurring deuterium is essential for the normal growth rate of cells*. FEBS 317, 1-4.
10. Visoiu F., Teodorescu AL., 2001 - *Biotehnologii de producere a materialului saditor viticol*. Editura Ceres, Bucuresti.

**THE ATTACK PRODUCED BY *RHIZOSPHAERA*
KALKHOFFII BUB. FUNGUS IN PUTNA FOREST DISTRICT
– SUCEAVA DEPARTMENT**

**ATACUL PRODUS DE CIUPERCA *RHIZOSPHAERA* *KALKHOFFII*
BUB. ÎN OCOLUL SILVIC PUTNA – JUDEȚUL SUCEAVA**

***GRUDNICKI* Margareta, *LUPĂȘTEAN* Daniela, *CÎRDEI* I.
"Ștefan cel Mare" University of Suceava, Romania**

Abstract. The study regarding pathogen agents in Putna forest district – Suceava departament recorded the presence of *Rhizosphaera kalkhoffii* Bub. fungus on the fir and spruce. This fungus produces the brown colour and premature fall of the leaves, growth decrease, loss of vitality trees and early draying. These pathogen agent attacks with species of *Lophodermium* genus produce the diseases and meaningful economic damages in forest ecosystems.

Key words: *Rhizosphaera kalkhoffii*, attack, disease.

Rezumat. Studiul privind agenții fitopatogeni în Ocolul Silvic Putna – Județul Suceava a semnalat și prezența ciupercii *Rhizosphaera kalkhoffii* Bub. al cărei atac se manifestă pe brad molid și brad. Ciuperca produce punctarea și căderea prematură a frunzelor, reducerea creșterilor, debilitarea și uscarea arborilor. Atacul acestui agent patogen și a speciilor din genul *Lophodermium* determină apariția unor boli concretizate prin daune economice semnificative în ecosistemele forestiere.

Cuvinte cheie: *Rhizosphaera kalkhoffii*, atac, boală.

INTRODUCTION

The fungi attack manifested in the forest ecosystem can produce significant damages concretized by the diminution of the accumulation of biomass, the physiological debilitation of the arboretum, the degradation of wood (M. Grudnicki, 2002, 2006).

Among the fungi that attack the forest species is also signalled *Rhizosphaera kalkhoffii* Bub. which produces the brown colour of the needles on fir and spruce, disease signalled in Transylvania, on *Picea abies* (L) Karst. (M., Fuss, 1867) and described by (Georgescu (1940, 1955) on *Picea abies* (L) Karst and *Pinus silvestris* L. (M., Mititiuc, V., Iacob, 1997; O., Marcu, 2005).

The late freezing, the frost, the succession of rainy vegetation seasons, the deficiencies of magnesium and potassium in the tree nutrition can constitute disease releasing factors (Th., Chifu, M., Toma, D., Dăscălescu, 1965).

In the present work we signal the presence of the disease in the studied areas concretized by the tree defoliation and drying. The study has been oriented especially on the attack of the *Rhizosphaera kalkhoffii* fungus the presence and the symptomatology of which are dominant, but we do not exclude the influence of other biotic and abiotic factors too. The data gathered on the ground have been processed through statistic methods (V., Giurgiu, 1972).

MATERIAL AND METHOD

The production unity included in the study is U.P. Putna from the Putna Forest District – Suceava Silvic Direction.

From a geographical point of view, the production unity territory is situated on the north-east side of Obcina Mare which belongs to the Oriental Carpathians occupying a part of the Putna brook basin, right affluent of the Suceava river.

The natural forest vegetation is constituted of mixtures of spruce, fir and beech in variable proportions in forests of spruces and beeches, of spruces, of firs and spruces. The most widespread natural forest type is 13.1.1 – normal mixture of conifers and beeches with mull flora on a surface of 3963, 3 ha (72%).

The most representative arboretums are the natural fundamental of superior productivity ones (87%).

The sample surfaces that were analysed have been placed in the organized unities 24 A, 24 B, 23 B and 23 C, in which a very serious attack of the *Rhizosphaera kalkhoffii* Bub fungus has been signalled, concretized by the brown colour of the needles on the fir and spruce.

Each trial surface has a circular form and a surface of 500 m². In the area submitted to the observations has been also remarked a very reduced attack produced by the fungi from the *Lophodermium* species.

The age of the trees from the organized unity 24 A is of 85 years and the age of those from the organized unities 24 B, 23 B and 23 C is of 65 years.

In order to characterize the trees on foot we considered the following characteristics: the diameter of 1,30 (cm) total height (m); the equalized height (m); the quality class (classes I-IV); the diameter of the crown (m); defoliation percent (%).

RESULTS AND DISCUSSIONS

The observations and analysis made indicate the fact that the spruce and the fir on the trial surfaces represent the species affected by the chronic and very strong attack of the *Rhizosphaera kalkhoffii* fungus the symptomatology of which is evidenced by little black spots disposed in longitudinal lines on both faces of the needles.

The fungus forms in the attacked tissues a mycelium picnidia which emerge from stomates. In picnidia differentiate elliptic or spherical pycnospores with oleaginous drops in inside.

At the level of the crown, the symptomatology is evidenced in the inferior part of this one through rarefying from the interior to the exterior and from the basis to the top (fig. 1).

On the isolated trees was signalled a weak attack of the fungi from the *Lophodermium* species (*Lophodermium macrosporum* Hart. and *Lophodermium nervisequum* (DC) Rehm), which produce the reddening and the fall of the needles at fir and spruce.

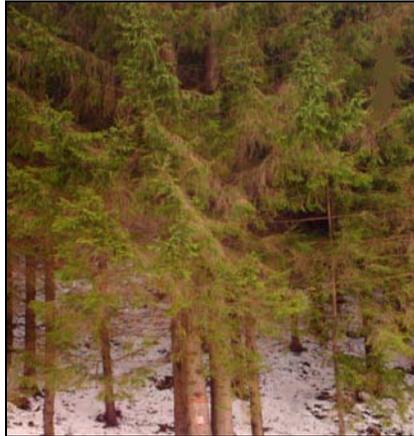


Fig. 1. Affected trees – Putna F.D.

As a result of processing the data from the ground an accentuated defoliation degree situated between 65% (u.a. 24 B, 23 B, 23 C) and 90% (u.a. 24 A) has been registered.

In the sample surface no. 1 (u.a. 24 A) of the total volume of the conifers wood ($29,81 \text{ m}^3$), $0,979 \text{ m}^3$ represents spruce wood and $0,178 \text{ m}^3$ fir wood dried on foot.

In the sample surface no. 2 (u.a. 24 B) from the total volume of the conifers wood ($11,805 \text{ m}^3$), $0,981 \text{ m}^3$ represents spruce wood dried on foot.

In the sample surface no. 3 (u.a. 23 B) from the total volume of the conifers wood ($13,087 \text{ m}^3$), $1,014 \text{ m}^3$ represents spruce wood and $0,128 \text{ m}^3$ fir wood dried on foot.

In the sample surface no. 4 (u.a. 23 C) from the total volume of the conifers wood ($18,565 \text{ m}^3$), $0,460 \text{ m}^3$ represents the spruce wood dried on foot.

From the total volume of the conifers wood $86,918 \text{ m}^3$ calculated in the sample surfaces, $0,306 \text{ m}^3$ represents the fir wood and $3,434 \text{ m}^3$ represents the spruce wood dried on foot. The proportion of the total volume of wood dried on foot is presented in the figure 2.

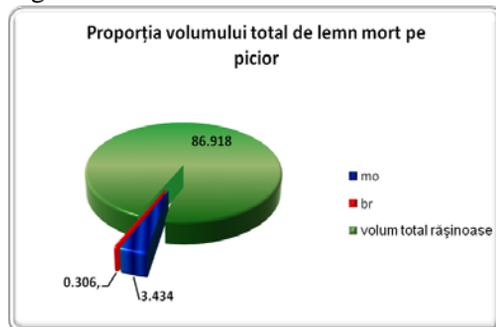


Fig. 2. The proportion of the total volume of dampened wood on foot in Putna F.D.

In this study, because the phenomenon manifests on very extended surfaces and is provoked by a complex of factors among which some of them cannot be controlled, the only measures which the silviculturists can take aim to prevent it. We recommend the right choose of the species and of the proveniences when creating the arboretums, the trees must be well adapted to the stational conditions and they must benefit of nutrition and a corresponding vegetation state.

In the case in which the phenomenon is manifested in seed-beds a series of preventive measures are presented: the fertilization of the soil with nitrogen, magnesium, potassium and phosphor for increasing the resistance to diseases of the seedlings, for gathering and burning the fallen needles, for extracting the strongly affected exemplars and as combating measure, sprinklings with specific fungicides.

CONCLUSIONS

As a result of the observations made in U.P.I Putna (the organized unities 24 A, 24 B, 23 B and 23 C) we observed the following:

From the total volume of fir and spruce wood (86,911 m³), the volume of the wood dried on foot is of 3,740 m³ of which 3,434 m³ spruce and 0,360 m³ fir.

Extrapolating these values we obtain a volume of 13,734 m³/ha spruce wood dried on foot and 1,224 m³/ha fir wood.

The economic value of the affected wood is very low in the case of the revaluation in logs for timber as well as in firewood.

In the sample surfaces the phenomenon of drying at the level of the crown and the debilitation are frequent with spruce, at which we observe a very strong and chronic attack of the *Rhizosphaera kalkhoffii* fungus.

The attacked trees become vulnerable at the attack of other pathogenic agents, at the action of the powerful winds and the abundant snowfalls.

REFERENCES

1. Chifu Th., Toma M., Dăscălescu D., 1965 - *Contribuții la cunoașterea micromicetelor din Moldova* (I). "Al. I. Cuza" Univ. Annals a Iași, sec. II, XI, 2. pp. 33-36
2. Georgescu C. C., 1940 - *Dare de seamă asupra boalelor de importanță economică semnalate în pădurile țării în anii 1934-1938*. Publ. ICEF, Second series, 32. pp. 123-126
3. Giurgiu V., 1972 - *Metode ale statisticii matematice aplicate în silvicultură*. Ceres Publishing House, Bucharest. pp. 189-201
4. Grudnicki Margareta, 2002 - *Contribuții la studiul ciupercilor de pe rășinoase din unele păduri și pepiniere ale județului Suceava cu considerație specială asupra ciupercilor din genul Fomes* (Fr.) Fr. – Doctorate Thesis, "Al. I. Cuza" Univ., Iași. pp. 56-64
5. Grudnicki Margareta, 2006 - *Fitopatologie forestieră*. Ștefan cel mare" Univ Publishing House Suceava. pp. 56-58
6. Marcu Olimpia, 2005 - *Fitopatologie forestieră*. Silvodel Publishing House, Brașov. pp. 175-178
7. Mititiuc M., Iacob Viorica, 1997 - *Ciuperci parazite pe arborii și arbuștii din pădurile noastre*. "Al. I. Cuza" Univ Publishing House, Iași. pp. 206-208

CONTRIBUTIONS REGARDING WOODS FUNGI ATTACK IN SOME FORESTS FROM SUCEAVA DEPARTAMENT

CONTRIBUȚII PRIVIND ATACUL CIUPERCILOR LIGNICOLE ÎN UNELE ARBORETE DIN JUDEȚUL SUCEAVA

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Abstract. *The paper content the impact of woods fungi of the forestry species in some forests of Suceava district. The study is to bring certain contributions regarding the fungi attack on beech species, focusing mainly on the attack produced by woods fungi, beyond the large economic damages, these fungi also affects the stability of the forest ecosystems.*

Key words: woods fungi, attack, damages.

Rezumat. *Lucrarea tratează impactul produs de ciupercile lignicole asupra speciilor forestiere din unele arborete ale Județului Suceava. Studiile aduc o serie de contribuții privind pagubele produse de acțiunea acestor ciuperci și influența lor asupra stabilității ecosistemelor forestiere.*

Cuvinte cheie: ciuperci lignicole, atac, daune.

INTRODUCTION

The xylophagous fungi, by the frequency of the attack and localization, can affect together with other biotic and abiotic factors the quality of wood.

The fungi that produce the putrefaction of wood are generally localized, at the level of the duramen (C., Delatour, 1990; M., Mititiu, V., Iacob, 1997). The process of destructing the wood structure is evidenced in function of each phase of coloration and putrefaction, from the incipient structural deregulation until the disorganization of tissues and the apparition of the destructive or corrosive dote (Marcu, 2005).

The thematic of the paper is motivated by the great spreading of the lignicolous fungi in the coniferous woods from the department of Suceava, considered the main factors that affect the quality of wood. The studies made bring a series of data regarding the amplitude and the intensity of the dote produced by the lignicolous fungi especially concerning the attack of the *Hereobasidion annosum* (Fr. Bref.) fungus, dominant species in the studied area. The paper has at its base the results of the researches made in the area (R., Ichim, 1993; I., Sima, 1982; M., Grudnicki, 2002; N., La Porta, M., Grudnicki, K., Korhonen, 2005) and the own researches, based on measurements and observations effectuated in different experimental surfaces.

MATERIAL AND METHOD

The studies were effectuated in the Pojorâta Forest District (lots 118 D, 134 M, 138), the basic criterion of the chose being determined by the proportion of trees affected by the lignicolous fungi. In these arboretums were placed trial surfaces of 500

m² in which the trees were described and then sounded with the Pressler drill with the aim to extract the growing carrots.

These ones were submitted to the direct observation for determining the proportion of trees affected by dote, at the level 1,3 m, standardized for this kind of measurements. Further, the carrots were introduced on culture areas with the aim to confirm the presence of the *Heterobasidion annosum* (Fr.Bref.) fungus.

Thus, we determined the proportion of the trees affected by this fungus and the proportion of the trees affected by other species of lignicolous fungi identified according to the specific symptomatology and the presence of the carpophores. The data from the area were processed through statistic methods (Giurgiu, 1972).

RESULTS AND DISCUSSIONS

As results from the table below the chosen arboretums present a relative homogeneity from the point of view of the structure, the type of flora and ecosystem, the variability being surprised at the level of the altitudinal conditions and of the age of the arboretums.

In the studied lots, the proportion between the healthy trees and the ones attacked by the lignicolous fungi is presented in the figure 1.

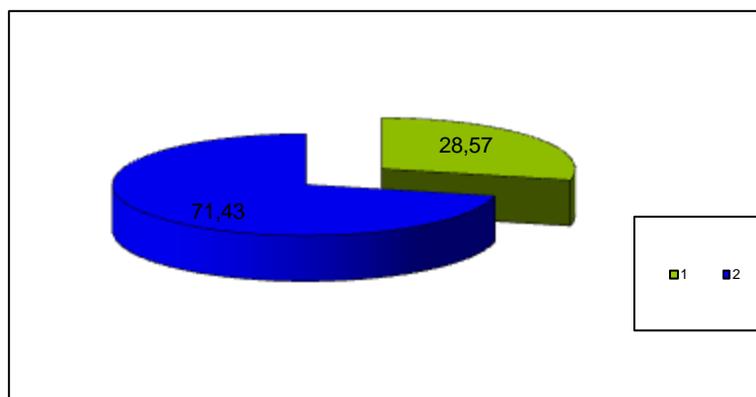


Fig.1. The proportion between the healthy trees and the affected ones
1. healthy trees; 2. attacked trees

The analysis made evidences the fact that in the arboretum with a very high level of the damaged trees (71,43%) the dote is the result of the attack produced by *Heterobasidion annosum* (Fr.) Bref. (53,85%) of the number of analysed trees. At a percent of 46,15% the discovered dote is due to the attack produced by other species of lignicolous fungi.

The graphic from the figure 2 illustrates for the lots included in the study the proportional levels of these parameters.

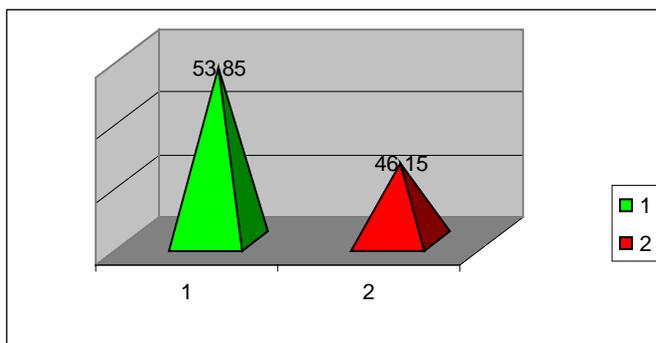


Fig. 2. The proportion of the attack of the *Heterobasidion annosum* (53,85%) fungus in comparison with other lignicolous fungi (46,15%).

The distribution of fungi on species is the following: *Heterobasidion annosum* (Fr.) Bref. (53,85%); *Phellinus pini* (Th. et. Fr.) Pil. (25,24 %); *Stereum sanguinolentum* (A.et S.) Fr. (7,69); *Fomes marginatus* (Fr.) Gill. (7,62 %); *Armillaria mellea* (Vahl.) Pat. (5,60%) (fig.3).

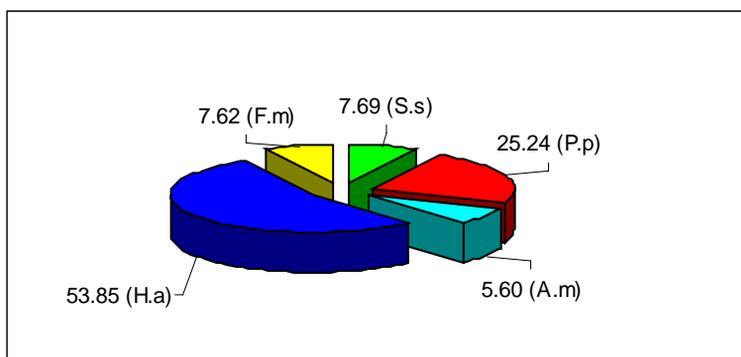


Fig. 3. The distribution of fungi on species: H.a (*Heterobasidion annosum*); P.p (*Phellinus pini*); S.s (*Stereum sanguinolentum*); F.m (*Fomes marginatus*); A.m (*Armillaria mellea*)

The programs of processing allowed the determination of some correlative relationships between the elements taken into consideration. Thus we had in view as input parameters: the medium altitude (m), the medium age of arboretums (years) and the medium distance between the trees (m) and as output elements, the percent of trees without dote (% s), the percent of trees with dote produced by the attack of other fungi (% a.c.) and the percent of trees with dote produced by the *Heterobasidion annosum* (% H.a) fungus.

The values of the correlation coefficients are presented in the table 1.

The values comprised in the table from above indicate certain tendencies of determining the relationships between the factors and the output parameters.

Table 1

The value levels of the correlation coefficients of the parameters of characterizing the attack of the lignicolous fungi

	Medium altitude	Age	Distance	% s	% a.c.	% H.a.
Medium altitude	1					
Age	0,450052	1				
Distance	0,912745	0,616832	1			
% s	-0,636633	-0,659986	-0,836874	1		
% a.c.	-0,242339	-0,48536	-0,07069	-0,226389	1	
% H.a.	0,487228	0,742788	0,38884	-0,149055	-0,929411	1

We have to remark the fact that these correlative relationships and analysis have been effectuated on trees with a high degree of damage regarding the great number of attacked trees. Consequently, the results are conclusive for this type of arboretum, the generalizations for other levels of damage could not be conclusive.

In these conditions the correlative relationship between the medium age and the proportion of healthy trees attracts our attention. The worsening of the health state, simultaneously with the age is obvious. The proportion of healthy trees becomes lower. The increased intensity of the relationship is remarked through the value of $r = -0,6599$, graphically represented in the figure 4.

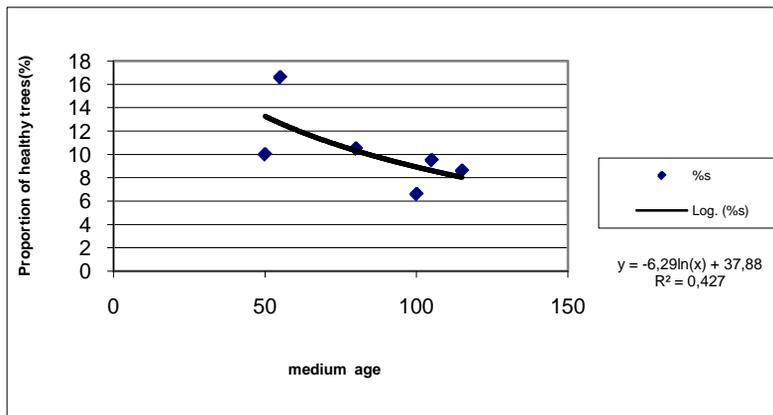


Fig. 4. The relationship between the medium age of the arboretum and the proportion of healthy trees

In this case, the compensation has been made through a curve of logarithmical type with a correlation coefficient of 0,6541, slightly under the value of the linear correlation. The evolution of the attack of lignicolous fungi in rapport with the medium age of the arboretum presents a special interest for the relationship host-parasite. By developing the tree population with the age the

proportion of attack of the trees increases too. In the figure 5 we present the relationship age – the proportion of the trees affected by *Heterobasidion annosum*. The intensity of the relationship is very high ($r = 0,7814$, $R^2 = 0,6106$), for a curve of logarithmical type, which demonstrates the vulnerability of the old trees at the attack of the fungus.

Of the information analysed separately or correlatively, it results the fact that in the woods which present a high degree of affectation, by wounds of different origins, the dote is mainly produced by *Heterobasidion annosum* fungus.

As a consequence of analyzing the relationships from above we can say that in the degradation of the health state due to the age an important role is played by the lignicolous fungi.

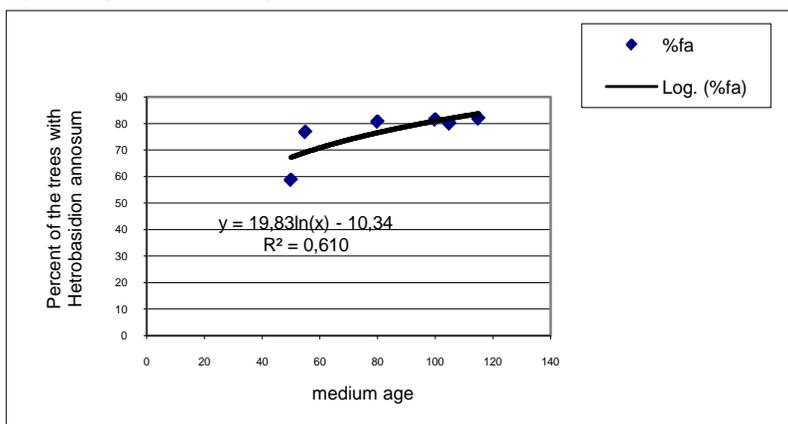


Fig. 5. The relationship between the medium age of the arboretum and the percent of the trees produced by the *Heterobasidion annosum* fungus.

The observation may lead to the hypothesis according to which during the whole life cycle of a coniferous forest with a drastic percent of damage due to the wounds produced by animals or to the wounds of exploitation, the attack of the lignicolous fungi gets an increasing expansion, that's because it is very difficult to control.

The circumscription of all the ways of piercing these fungi becomes an element of great importance in the strategy of administrating this type of arboretum.

CONCLUSIONS

From the researches that have been effectuated results the fact that the coniferous forests from the department of Suceava, which present a high degree of affectation, by wounds of different origins, the dote can be produced by different species of lignicolous fungi, the highest percent reverts to the *Heterobasidion annosum* fungus.

The dominance of the *Heterobasidion annosum* fungus in the apparition of dote could be explained by the complexity and the instability of the enzymatic

equipment of which this fungus already disposes, which allows it to occupy a healthy substratum and also a substratum already colonized by other fungi, with the condition that this one be modified in its favor.

The results of this analysis cannot be generalized for all types of arboretums, because we proceeded to choose them from the point of view of the damage degree with the aim to evidence the destructive role of the lignicolous fungi installed on the wounded and debilitated trees, from a physiological point of view.

REFERENCES

1. **Delatour C., 1990** - *Microflore interne des tissus ligneux de l'épicéa commun sur pied. III. Confrontations in vivo.* Annales des Sciences Forestière 47, 299-307.
2. **Giurgiu V., 1972** - *Metode ale statisticii matematice aplicate în silvicultură.* Ceres Publishing House, Bucharest. pp. 189-201
3. **Grudnicki Margareta, 2002** - *Contribuții la studiul ciupercilor de pe rășinoase din unele păduri și pepiniere ale județului Suceava cu considerație specială asupra ciupercilor din genul Fomes (Fr.) Fr.* – Doctorate Thesis, "Al. I. Cuza" Univ, Iași. pp. 56-64
4. **Ichim R., 1993** - *Putregaiul roșu la molid, măsuri de prevenire și combatere.* Ceres Publishing House, Bucharest.
5. **La Porta N., Grudnicki Margareta, Korhonen K., 2005** - *Distribution of Heterobasidion species in Romanian spruce-fir plantations and natural forests.* In: Malgorzata Mańka and Piotr Lakomy (eds.), *Proceedings of the 11th International Conference on Root and Butt Rots*, IUFRO Working Party 7.02.01, Poznan, Poland., pp. 73-81
6. **Marcu Olimpia, 2005**-*Fitopatologie forestieră.* Silvodel Publishing House, Brasov. pp. 175-178
7. **Mititiuc M., Iacob Viorica, 1997** - *Ciuperci parazite pe arborii și arbuștii din pădurile noastre.* "Al. I. Cuza" Univ Publishing House Iași. pp. 206-208
8. **Sima I., 1982** - *Contribuții la cunoașterea ciupercilor care produc putregaiul de rană la molidul din Bucovina. Importanța economică, măsuri de prevenire și combatere.* Summary of the doctorate thesis.

STUDY OF MICROMYCETES IN THE RHIZOSPHERE THE ORNAMENTAL TREES OF THE TREE NURSERY OF S.C.D.P. IASI

STUDIUL MICROMICETELOR DIN RIZOSFERA ARBORILOR ORNAMENTALI DIN PEPINIERA DENDROLOGICĂ A S.C.D.P. IASI

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Abstract. *The research aimed at determining the micromycetes spectrum found in the rhizosphere the ornamental trees. For Juniperus scopulorum skyrocket Sarg. 16 species of micromycetes with a total of 226 colonies were identified. For Chamaecyparis lawsoniana „Blue Piramidal” (A. Murr.) Parl 13 micromycetes with a total of 186 colonies were identified.*

Key words: micromycetes, rizosfera, ornamental trees

Rezumat. *Cercetarile de față au avut ca scop determinarea spectrului de micromicete prezente în rizosfera arborilor ornamentali. La Juniperus scopulorum skyrocket Sarg. s-au identificat 16 specii micromicete cu 226 colonii. La Chamaecyparis lawsoniana „Blue Piramidal”(A.Murr.) Parl. s-au identificat 13 micromicete cu 186 colonii.*

Cuvinte cheie: micromicetă, rizosferă, arbori ornamentali.

MATERIAL AND METHOD

The material intended for analyzing the microflora in the rhizosphere of the ornamental trees of *Juniperus scopulorum skyrocket* Sarg and *Chamaecyparis lawsoniana* “Blue Piramidal” (A. Murr.) Parl was collected from the cultures found at the tree nursery of the Research and Development Station for Fruit Tree Growing Iasi.

Experience includes four variants of fertilization with fertilizer complex: $V_1 = 0.075$ Kg/plant, $V_2 = 0.100$ Kg/plant, $V_3 = 0.125$ Kg/plant, $V_4 = 0.150$ Kg/plant,

The Petri dishes method was used for studying the *rhizosphere micro flora*. The plants were wholly collected, which allowed taking off the roots surrounded by a certain quantity of soil. In order to be transported, the samples were introduced in sterile bags. In the lab, the external and periradicular areas were removed from the plant and the internal area was separately collected on a sterile foil and served as rhizosphere material from which the analyse sample was taken. The Czapek medium allowed the development of a large number of species of fungi. The Petri dishes were sterilized in the stove at a temperature of 121°C for 3 minutes. The recipe for preparing the Czapek medium – agarized (Czapek, 1902, 1903): Na NO₃ ...3 g; K₂HPO₄...1 g; MgSO₄ .7H₂O...0,01g, KCl...0,5g; FeSO₄ . 7H₂O...0,01 g; Sucrose ...30 g; Agar...15 g; Distilled water...1000 ml. The method used to dissipate the medium in the Petri dishes was the sterilization of the necessary conditions in test tubes and then pouring the medium in Petri dishes. To avoid the condensation of water vapours on the cover of Petri dishes, the medium was poured when it had a temperature of 45°C. The medium is used in solid condition and the fungi develop at the surface. Soil dilutions were prepared according to the method of successive dilutions and inoculations were performed in Petri dishes by means of incorporation in the medium.

RESULTS AND DISCUSSIONS

Spectral micromycetes present in rhizosphere there is variable depending on the specie ornamental tree and fertilization (tab. 1, 2)

Table 1

Micromycetes identified in the rhizosphere of the ornamental trees: *Juniperus scopulorum skyrocket Sarg.* Total – 226 colonies – 12 types - 16 species.

No. crt.	Micromyceta	Number of colonies identified in the rhizosphere <i>Juniperus scopulorum skyrocket Sarg</i>					
		Witness	V1	V2	V3	V4	Overall
1.	<i>Acremoniella atra</i>	3	-	-	-	-	3
2.	<i>Aspergillus funiculosus</i>	-	1	6	-	-	7
3.	<i>Cephalosporium roseo - griseum</i>	4	2	2	1	-	9
4.	<i>Cladosporium herbarum</i>	1	6	1	-	-	8
5.	<i>Fusarium sp.</i>	2	1	-	2	6	11
6.	<i>Geotrichum sp.</i>	-	-	-	1	-	1
7.	<i>Sterile mycelia</i>	21	17	11	61	34	144
8.	<i>Mortierella sp.</i>	2	-	1	-	-	2
9.	<i>Mucor sp.</i>	-	2	1	2	7	12
10.	<i>Penicillium coryophilum</i>	6	-	-	-	-	6
11.	<i>Penicillium frequetans</i>	6	-	-	-	-	6
12.	<i>Penicillium lilacinum</i>	6	-	-	-	-	6
13.	<i>Penicillium ochraceum</i>	6	-	-	-	-	6
14.	<i>Penicillium terrestre</i>	6	-	-	-	-	6
15.	<i>Rizophus nigricans</i>	2	2	-	-	-	4
16.	<i>Sporotrichum sp</i>	1	-	-	-	-	1

Number of colonies identified rizosphera *Juniperus scopulorum skyrocket Sarg*

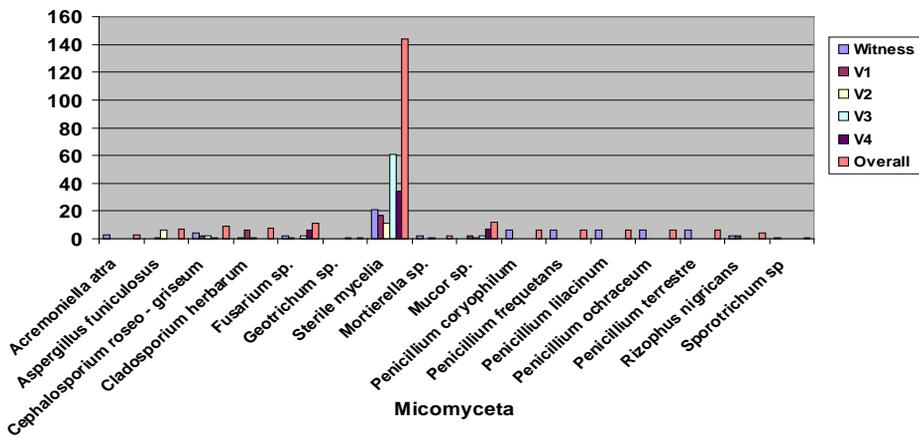


Fig.1. Micromycetes identified in the rhizosphere of the ornamental trees - *Juniperus scopulorum skyrocket Sarg.*

Table 2

Micromycetes identified in the rhizosphere of the ornamental trees: *Chamaecyparis lawsoniana* Blue Piramidal" (A.Murr.) Parl", Total – 188 colonies – 9 types -13 species

No crt.	Micromyceta	Number of colonies identified in the rhizosphere <i>Chamaecyparis lawsoniana</i> Blue Piramidal" (A.Murr.) Parl",					
		Witness	V1	V2	V3	V4	Overall
1.	<i>Aspergillus funiculosus</i>	3	2	2	-	-	7
2.	<i>Cladosporium herbarum</i>	-	4		2	-	6
3.	<i>Fusarium</i> sp.	-	-	2	1	-	3
4.	<i>Micelii sterile</i>	4	13	4	15		36
5.	<i>Mucor</i> sp.	-		6	3	10	19
6.	<i>Penicillium brevi-compactum</i>	20	1	-	-	-	21
7.	<i>Penicillium frequetans</i>	2	-	-	-	-	2
8.	<i>Penicillium lilacinum</i>	2	2	-	-	36	40
9.	<i>Penicillium ochraceum</i>	-	2	-	-	-	2
10.	<i>Penicillium pallidum</i>	7	8	3	13	15	46
11.	<i>Rizophus nigricans</i>	-	-	1	-	-	1
12.	<i>Trichoderma glaucum</i>	1	-	-	-	2	3
13.	<i>Verticillium lateritium</i>	-	2	-	-	-	2

Number of colonies identified in the rizosphaera *Chamaecyparis lawsoniana* Blue Piramidal A. Murr Parl.

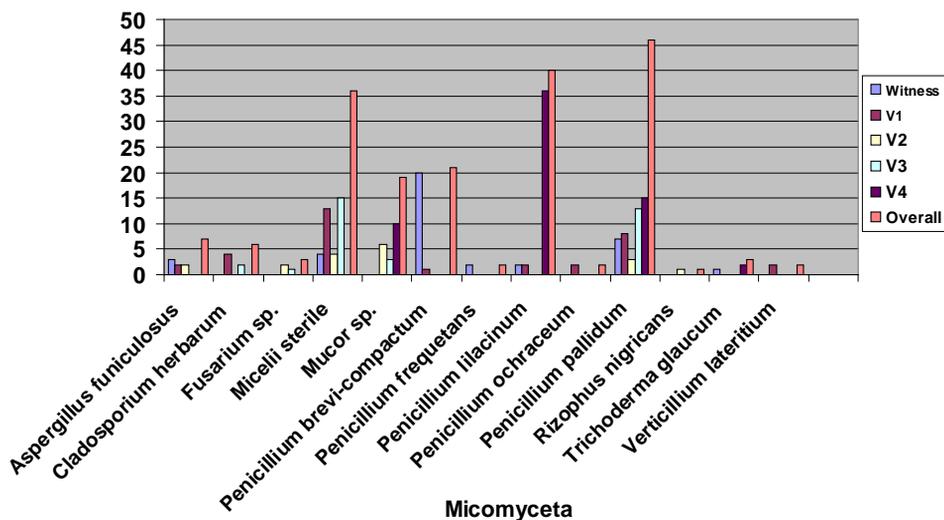


Fig.2. Micromycetes identified in the rhizosphere of the ornamental trees - *Chamaecyparis lawsoniana* Blue Piramidal" (A.Murr.) Parl"

1. *Acremoniella atra* Sacc. Syll. Sacc. Syll. Fung., IV, p.302 (1886); Ellis, Dematiaceous Hyphomycetes, page 79, fig. 44 (1971). The colony developed in Czapek medium is effuse, slightly coloured in brown when reaching maturity. The 2-7 μm width filamentous thallus is both superficial and immersed.

2. *Aspergillus funiculosus* G. Smith, Brit. Mycol. Soc. Trans., XXXIX, page 111-114, fig. 1 (1956); J. Gilman, *A Manual of Soil Fungi*, page 220 (1957); K.B. Raper and D. Fennel, *The Genus Aspergillus*, page 440, fig. 91 F, H (1965);

The colonies of this fungus are green - yellowish, granule-like with white edge and funiculous surface. The reverse side of the colony has olive colour with some reddish spots.

3. *Cephalosporium roseo - griseum* Saksena, *A new genus of Moniliaceae*, Mycologia 46, page 660 (1954); Gilman, *A Manual of Soil Fungi*, page 211(1957).

The colony that occurs on the agarized Czapek medium has 4 cm diameter after 10 days of culture with flocculent surface, white then pink and, at the end, grey. The reverse of the colony is pink.

4. *Cladosporium lignicolum* Corda, Icon. I, fig. 2067, page 14 (1837); Massee, Brit. Fung. Fl. III, page 394 (1885); Sacc., Syll. Fung. IV, page 356(1886); De Wilde Dur.,Prod. Fl. Belgie, II,page 338(1898); Lindau, Rabenh. Kr. Fl. Deutschl. Oester und Schw., VIII page 809 (1907); Gilman, *A Manual of Soil Fungi*, p. 334 (1959).

The micromycetes develop on the agarized Czapek medium a black, circular colony with 1 – 1,5 cm diameter and a central cambered area.

5. *Fusarium sp.* The micromycetes develop on the medium a flossy mycelium of white colour first and then pink which colour the medium under the colony in reddish shades. The determination of the species was not performed since passing on standard media is necessary for *Fusarium* type.

6. *Geotrichum sp.* - J. Gilman *A manual of Soil Fungi*, p. 206 (1957) – Mushroom forming on it medium colonies from hife septal how conidiophores erections to completes by conidium short cylindrical, abrupt hyalin.

7. *Mortierella sp.* - J. Gilman *A manual of Soil Fungi*, p. 49(1957). Mycelium mushroom there is by half fine au present sporangiophores erections how to complete by spherical sporange, no columele

8. *Penicillium brevi - compactum* Dierckx, in Soc. Scien. Brux. XXV, page 88 (1901); Thom, *The Penicillia*, page 295-296 (1930); J. Gilman, *A Manual of Soil Fungi*, p. 255 (1957); Raper and Thom, page 407-409, fig. 106, 107 (1968); *Domsch end Gams, Pilze aus Agrarböden*, page 98 (1970). The colonies that occur on the medium are pretty limited, silky green – grey with under-colony medium coloured in yellow – grey.

9. *Penicillium coryophilum* Dierckx, in Soc. Sci. Brux. XXV, page 86 (1901); Thom, *The Penicillia*, page 254-255 (1930); J. Gilman, *A Manual of Soil Fungi*, page 250 (1957); Raper and Thom, page 341-343, fig. 91 (1968).

The colonies developed on the agarized Czapek medium are 2,5 – 3 cm in diameter after 10 days from their occurrence. The surface of the colonies is silky, folded, turquoise green coloured with small spots and the reverse of the colony is slightly coloured in brown.

10. *Penicillium frequentans* Westling, Arkiv för Botanik, XI, 58, page 133-134, fig., 39, 78 (1911); Thom, *The Penicillia*, page 216-217 (1930); J. Gilman, A

Manual of Soil Fungi, page 241 (1957); Raper and Thom, page 171-173, figure 48, 49 (1968); *Domsch and Gams, Pilze aus Agrarböden*, page 103, 105, 112, abb. 92 (1970).

The colonies that occur on the agarized Czapek medium have radii and are silky and turquoise green coloured.

11. *Penicillium lilacinum* Thom, in U.S. Dept. Agr., Bur. Anim. Ind., Bul. 118, page 73-75, figure 30 (1910); Thom, *The Penicillia*, page 331-334, figure 49, 50 (1930); J. Gilman, *A Manual of Soil Fungi*, page 263 (1957); Raper and Thom, page 285-288, figure 76, 77 - A, B (1968).

The colonies that occur on the agarized Czapek medium have a white flocculent surface first, and then when the fructification begins they get a mauve colour without colouring the medium under the colony. The micromycetes was also collected from soils cultivated with wheat, corn, freesia and salad.

12. *Penicillium ochraceum* (Bainier) Thom, *The Penicillia*, page 309-310 (1930); Gilman, *A manual of Soil Fungi*, page 272 (1959); Raper and Thom, *A Manual of the Penicillia*, page 477, figure 123 A, B (1968). The colonies developed on the agarized Czapek medium reach 3 cm in diameter after 10 days of culture. They have a more or less flocculent surface and are 2-3 mm high. At first, the colonies are silky and then they become flocculent, with white edges and folded. Drops occur on the upper surface and the reverse is coloured in yellow to olive.

13. *Penicillium pallidum* Smith, in Bot. Mycol. Soc. Trans. XVIII, 88-89, Pl. IV, figure 1, 2 (1933); J. Gilman, *A Manual of Soil Fungi*, p. 271 (1957); Raper and Thom, p. 459, 460, fig. 120 A, B (1968). The colonies developing on the agarized Czapek medium grow fast (6 – 7 cm in 10 – 14 days), have funiculous surface because of the groups of butter yellow conidiophores without exudates.

14. *Penicillium terrestre* Jensen, in Cornell University Exp. Sta. Bul. 315, p. 486-487, fig. 122 (1912); Thom, *The Penicillia*, p. 371-372 (1930); J. Gilman, *A Manual of Soil Fungi*, p. 270 (1957); Raper and Thom, p. 450-452, fig. 116 - A, B, fig. 117 (1968).

The micromycetes colonies develop on the circular shape agarized Czapek medium with dark-green colour and have characteristic conidiophores with harsh walls. The micromycetes was also collected only from mountain soils.

15. *Rizopus nigricans* Ehrenb. Nova Acta Acad. Leop. X, p. 198 (1820); Sacc., Syll. Fung. VII, p. 212 (1888); Lendner, *Les Mucorinées de la Suisse*, p. 115 (1908); Gilman J.C., *A Manual of Soil Fungi*, p. 21 (1957). The mycetes develops very quickly a colony comprising very fine hyaline hyphae from which hyaline sporangiophores appear and support the black coloured sporophere heads. The fungus is cosmopolite and it is very frequently met on various substrates or soil.

16. *Sporotrichum sp.* - J. Gilman. *A manual of Soil Fungi*, p. 206(1957). Mushroom forming on it hife irregular branched and conidia appear side or terminal, many sessi, ovate or globular hyaline and smooth.

17. *Trichoderma glaucum* Abbott, Taxonomic studies of soil fungi (1926); J. Gilman, A Manual of Soil Fungi, p. 213 (1957). On the agarized Czapek medium, the micromycetes form a diffuse yellow colony with green shades around the sporipheric area, which rapidly extends.

18. *Verticillium lateritium* Berkeley, Cooke, Brit. Fgi., p. 635 (1871); Sacc., Michelia II, p. 637 (1882); Sacc., Syll. Fung. IV, page 156 (1886); Gilman, A Manual of Soil Fungi, p. 304 (1959). On the agarized Czapek medium, the micromycetes produces hemispheric, circular colonies which are tile-coloured and bounded by a white area when reaching maturity. The fungus was found by Negru Al. on various vegetables (1966, 1972), by C. Sandu -Ville and his colleagues on dahlias and by the researchers from Cluj, Lörinczi (1970) and Lucia Turcu (1974,1975) who determined the soil fungi.

CONCLUSIONS

1. After performing the counting of the colonies on 30th of September 2008 for *Juniperus scopulorum skyrocket Sarg.* on average on 5 repetitions - 324 mycotic embryos/g soil, la *Chamaecyparis lawsoniana Blue Piramidal*"(A.Murr.) Parl", on average on 5 repetitions - 204 mycotic embryos /g soil.

2. The species determined la *Juniperus scopulorum skyrocket Sarg.* were: 7 species of *Penicillium* and one species of *Acremoniella*, *Aspergillus*, *Cephalosporium*, *Cladosporium*, *Fusarium*, *Geotrichum*, *Mortierella*, *Rizopus*, *Sporotrichum*, *Trichoderma*, *Verticillium*, *Mucor* and *Sterile micelles*.

3. The species determined la *Chamaecyparis lawsoniana Blue Piramidal*" (A.Murr.) Parl", were: 5 species of *Penicillium* and one species of *Aspergillus*, *Cladosporium*, *Fusarium*, *Rizopus*, *Trichoderma*, *Verticillium*, *Mucor* and *Sterile micelles*.

4. All variants fertilized were reported more micomycete only to witness unfertilized.

REFERENCES

1. Ahmet Asan, 1940 – *Check List of Aspergillus and Penicillium Species Reported From Turkey*. Trakya Universitesi, Fen Edebiyat, Fak.ltesi Biyoloji B.l.m.,22030 Edirne-Turkey.
2. Allescher A., 1903 - *Rabenhorst Kryptogamen Flora von deutsch. Oesterr.Und Schweiz, Die pilze, VII.Abt. Fungi imperfecti* -Leipzig;
3. Bontea Vera, 1985-*Ciuperci parazite și saprofite din România*. Ed Acad.R.S.R.București..
4. Ellis M.B., 1971 - *Dematiaceous Hyphomycetes*. Surrey, England.
5. Iacob Viorica., 2003 – *Bolile plantelor cultivate – Prevenire și control*. Ed. „Ion Ionescu de la Brad”, Iași,
6. Iliescu Ana-Felicia, 1998– *Arboricultura ornamentală*. Editura Ceres, București.

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STUDIUL MICROMICETELOR DIN RIZOSFERA PUIETILOR DE ARBORI ORNAMENTALI DIN PEPINIERA DENDROLOGICA A S.C.D.P. IASI

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Abstract. *The research aimed at determining the micromycetes spectrum found in the rhizosphere soil of the ornamental trees. For Chamaecyparis lawsoniana „Blue Piramidal” (A.Murr.) Parl. 11 species of micromycetes with a total of 132 colonies were identified. For Thuja occidentalis fastigiata Jaeg, 9 species of micromycetes with a total of 116 colonies were identified.*

Key words: micromycetes, rizosfera, seedling of ornamental trees

Rezumat. *Cercetările de față au avut ca scop determinarea spectrului de micromicete prezente în rizosfera puietilor de arbori ornamentali. La Chamaecyparis lawsoniana „Blue Piramidal” (A.Murr.) Parl. s-au identificat 11 specii micromicete cu 132 colonii total. La Thuja occidentalis fastigiata Jaeg s-au identificat 9 specii de micromicete cu 116 colonii total.*

Cuvinte cheie: micromicete, rizosfera, puiți de arbori ornamentali.

MATERIAL AND METHOD

The material intended for analyzing the rhizosphere micro flora consists of the seedlings of perennial ornamental plants - *Chamaecyparis lawsoniana* *Blue Piramidal” (A.Murr.) Parl*, *Thuja occidentalis fastigiata Jaeg* – which are cultures placed in the dendrologic nursery of the Research and Development Station for Fruit Tree Growing Iasi. Experience includes three variants of fertilization with fertilizer complex: $V_1 = 0.010$ Kg/plant, $V_2 = 0.010$ Kg/plant, $V_3 = 0.015$ Kg/plant, $V_4 = 0.020$ Kg/plant. The Petri dishes method was used for studying the *rhizosphere micro flora*. The plants were wholly collected, which allowed taking off the roots surrounded by a certain quantity of soil. In order to be transported, the samples were introduced in sterile bags. In the lab, the external and periradicular areas were removed from the plant and the internal area was separately collected on a sterile foil and served as rhizosphere material from which the analyse sample was taken. The Czapek medium allowed the development of a large number of species of fungi. The Petri dishes were sterilized in the stove at a temperature of 121°C for 3 minutes. The recipe for preparing the Czapek medium – agarized (Czapek, 1902, 1903): Na NO₃ ...3 g; K₂HPO₄...1 g; MgSO₄ .7H₂O...0,01g, KCl...0,5g; FeSO₄ .7H₂O...0,01 g; Sucrose ...30 g; Agar...15 g; Distilled water...1000 ml. The method used to dissipate the medium in the Petri dishes was the sterilization of the necessary conditions in test tubes and then pouring the medium in Petri dishes. The medium is used in solid condition and the fungi develop at the surface. Soil dilutions were prepared according to the method of successive dilutions and inoculations were performed in Petri dishes by means of incorporation in the medium.

RESULTS AND DISCUSSIONS

Spectral micromycetes present in rhizosphere is amended after fertilization (tab.1,2). The number of germs per gram of soil is approximately in all variants (tab.3).

Table 1

Micromycetes identified in the rhizosphere of seedling of ornamental trees *Chamaecyparis lawsoniana* Blue Piramidal” (A.Murr.) Parl, Total – 132 colonies – 8 types - 11 species.

No crt.	Micromyceta	Number of colonies identified in the rhizosphere with seedlings of ornamental trees <i>Chamaecyparis lawsoniana</i> Blue Piramidal”(A.Murr.) Parl,				
		Witness	V1	V2	V3	TOTAL
1.	<i>Aspergillus funiculosus</i>	2	1	1	3	7
2.	<i>Cladosporium herbarum</i>	6	-	1	3	10
3.	<i>Fusarium sp.</i>	3	2	4	1	10
4.	<i>Humicola grisea</i>	1	-	-	-	1
5.	<i>Sterile mycelia</i>	5	6	16	10	27
6.	<i>Mucor sp.</i>	1	1	-	-	2
7.	<i>Penicillium lilacinum</i>	5	-	-	-	5
8.	<i>Penicillium ochraceum</i>	-	-	7	-	7
9.	<i>Penicillium pallidum</i>	12	17	9	17	55
10.	<i>Penicillium terrestre</i>	1	-	1	-	2
11.	<i>Stachibotris sp</i>	1	3	-	2	6

Number of colonies identified in the rhyosfera seedlings by *Chamaecyparis lawsoniana* Blue Piramidal A. Murr. Parl.

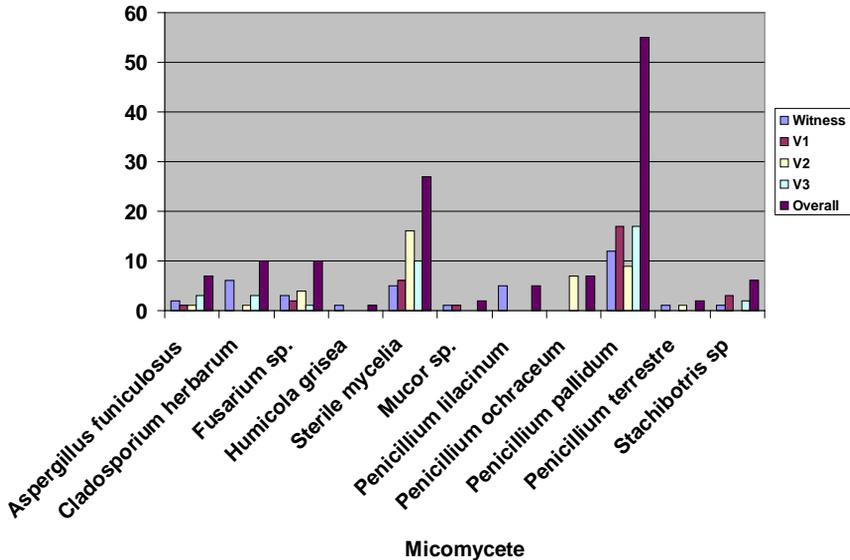


Fig.1. Micromycetes identified in the rhizosphere of seedlings: *Chamaecyparis lawsoniana* Blue Piramidal”(A.Murr.) Parl

Table 2

Micromycetes identified in the rhizosphere of seedling: *Thuja occidentalis fastigiata* Jaeg. Total – 116 colonies – 8 types - 9 species.

No. crt.	Micromycetes	Number of colonies identified in the rhizosphere with <i>Thuja occidentalis fastigiata</i> Jaeg				
		Witness	V1	V2	V3	TOTAL
1.	<i>Acremoniella atra</i>	-	1	-	-	1
2.	<i>Alternaria alternata</i>	-	1	-	1	2
3.	<i>Aspergillus funiculosus</i>	1	4	-	3	8
4.	<i>Cladosporium herbarum</i>	-	1	-	-	1
5.	<i>Humicola grisea</i>	1	1	-	-	2
6.	<i>Sterile mycelia</i>	6	6	5	3	20
7.	<i>Mucor sp.</i>	1	-	-	-	1
8.	<i>Penicillium pallidum</i>	16	25	17	21	79
9.	<i>Penicillium terrestre</i>	-	1	-	1	2

Number of colonies identified in the rizosphere of seedlings *Thuja occidentalis fastigiata* Jaeg.

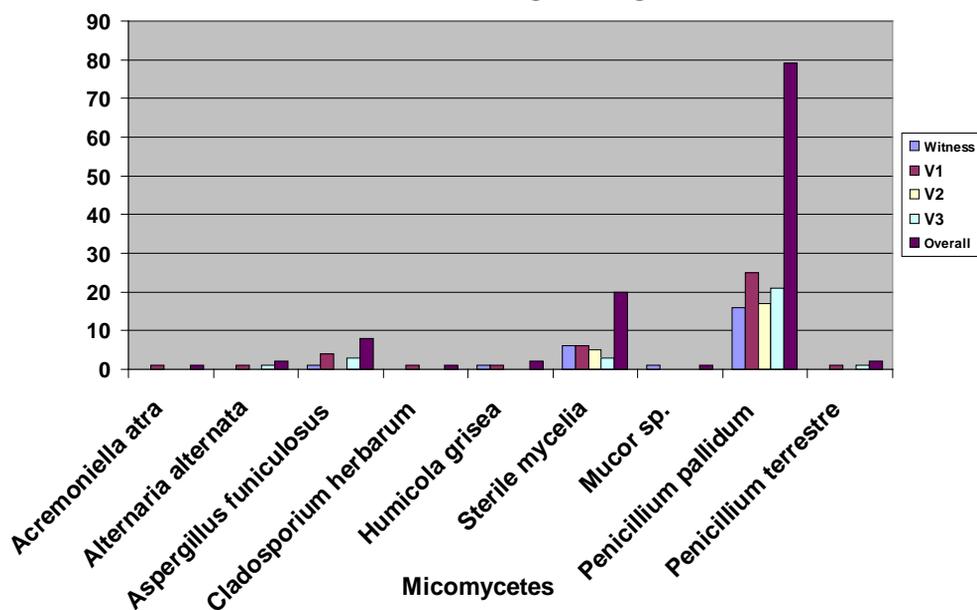


Fig. 2. Micromycetes identified in the rhizosphere of seedlings: *Thuja occidentalis fastigiata* Jaeg,

1. *Acremoniella atra* Sacc. Syll. Sacc. Syll. Fung. IV, p.302 (1886); Ellis, Dematiaceous Hyphomycetes, p.79, fig. 44 (1971). The colony developed in Czapek medium is effuse, slightly coloured in brown when reaching maturity.

2. *Alternaria alternata* (Fr.) Keissler, Beih. Bot. Zbl., 29, p. 434 (1912); Ellis, Dematiaceous Hyphomycetes, p. 465, fig. 330(1971). Sin:*Torula alternata* Fr. *Alternaria tenuis* C. G. Nees. The micromycetes develops brown-blackish colonies which are covered by short brown conidiophores. In the speciality literature it is mentioned on many substrates.

3. *Aspergillus funiculosus* G. Smith, Brit. Mycol. Soc. Trans., XXXIX, p. 111-114, fig.1 (1956); J. Gilman, A Manual of Soil Fungi, p. 220 (1957); K.B. Raper and D. Fennel, The Genus *Aspergillus*, p. 440, fig. 91 F, H (1965);

The colonies of this fungus are green-yellowish, granule-like with white edge and funiculous surface. The reverse side of the colony has olive colour with some reddish spots.

4. *Cladosporium lignicolum* Corda, Icon. I, fig.2067,p. 14 (1837); Masee, Brit. Fung. Fl. III, p. 394 (1885); Sacc., Syll. Fung. IV, p.356(1886); De Wilde Dur. Prod. Fl.Belgie, II, p.338(1898); Lindau, Rabenh. Kr. Fl. Deutschl. Oester und Schw, VIII.p.809 (1907); Gilman, A Manual of Soil Fungi,p. 334 (1959). The micromycetes develop on the agarized Czapek medium a black, circular colony with 1 – 1,5 cm diameter and a central cambered area. The conidia are brown-black of 8-10 x 5 µm.

5. *Fusarium sp.* The micromycetes develop on the medium a flossy mycelium of white colour first and then pink which colour the medium under the colony in reddish shades.

6. *Humicola grisea* Traaen, Nyt. Mag. Naturvid.,52, p. 31 (1914); Gilman, A Manual of Soil Fungi, p.60, fig.29 B (1971). Syn. *Monotospora daleae* Mason

At the surface, the fungus forms separated hyaline hyphae with 4 µm in diameter. The mycelial colony is covered with yellow brownish conidia. The micromycetes was identified by Viorica Iacob in the soil from Podu Iloaiei - Iași in 1973 and by Ioachimescu - Dinulescu Mariana from the rotten wood in mines, in 1978.

7. *Penicillium lilacinum* Thom, in U.S. Dept. Agr., Bur. Anim. Ind., Bul. 118, p. 73-75, fig. 30 (1910); Thom, The Penicillia, p. 331-334, fig. 49, 50 (1930); J.Gilman, A Manual of Soil Fungi, p. 263 (1957); Raper and Thom, p. 285-288, fig. 76, 77 - A, B (1968).

The colonies that occur on the medium have a white flocculent surface first, and then when the fructification begins they get a mauve colour without colouring the medium under the colony.

The micromycetes was also collected from soils cultivated with wheat, corn, freesia and salad.

8. *Penicillium ochraceum* (Bainier) Thom, The *Penicillia*, p. 309-310 (1930); Gilman, A manual of Soil Fungi, p. 272 (1959); Raper and Thom, A Manual of the Penicillia, p. 477, fig. 123 A, B (1968). The colonies developed on the agarized Czapek medium reach 3 cm in diameter after 10 days of culture.

They have a more or less flocculent surface and are 2-3 mm high. Drops occur on the upper surface and the reverse is coloured in yellow to olive.

9. *Penicillium pallidum* Smith, in Bot. Mycol. Soc. Trans. XVIII, 88-89, Pl. IV, fig. 1, 2 (1933); J. Gilman, A Manual of Soil Fungi, p. 271 (1957); Raper and Thom, p. 459, 460, fig. 120 A, B (1968). The colonies developing on the agarized Czapek medium grow fast (6 – 7 cm in 10 – 14 days), have funiculosus surface because of the groups of butter yellow conidiophores without exudates.

10. *Penicillium terrestre* Jensen, in Cornell University Exp. Sta. Bul. 315, p. 486-487, fig. 122 (1912); Thom, The *Penicillia*, p. 371-372 (1930); J. Gilman, A Manual of Soil Fungi, p. 270 (1957); Raper and Thom, p. 450-452, fig. 116 - A, B, fig. 117 (1968). The micromycetes colonies develop on the circular shape agarized Czapek medium with dark-green colour and have characteristic conidiophores with harsh walls.

The micromycetes was also collected only from mountain soils.

11. *Stachybotris sp.* J. Gilman, a Manual of Soil Fungi, p. 321 (1957).

The mycelial colony present hife septal, branched, hialin. Conidiophores erection septal ends with elliptical sterigme hialin forming single conidia, elongate, smooth.

Table 3

Germes fungal of rizosfera ornamental saplings

Species	Variant	No of repetitions	Average number of mycotic germs (tens of thousands) g/soil
1. <i>Chamaecyparis lawsoniana</i> „Blue Piramidal” (A.Murr.) Parl”,	Witness	5	7,6
	V ₁		6,2
	V ₂		8
	V ₃		8,8
2. <i>Thuja occidentalis fastigiata</i> Jaeg.	Witness	5	7,4
	V ₁		9
	V ₂		5
	V ₃		7,4

CONCLUSIONS

1. After performing the counting of the colonies on 30th of September 2008 for *Chamaecyparis lawsoniana* „Blue Piramidal” (A.Murr.) Parl”, on average on 5 repetitions - 122 mycotic embryos /g soil.

2. For *Thuja occdientalis fastigiata* Jaeg, on average on 5 repetitions - 116 mycotic embryos /g soil.

3. The species determined *Chamaecyparis lawsoniana* „Blue Piramidal” (A.Murr.) Parl: four species of *Penicillium* and one species of: *Aspergillus*, *Cladosporium*, *Fusarium*, *Humicola*, *Stachybotrys*, *Mucor* and *Sterile mycelia*.

4. The species determined *Thuja occdientalis fastigiata* Jaeg, were: two species of *Penicillium* and one species of: *Acremoniella*, *Alternaria*, *Aspergillus*, *Cladosporium*, *Humicola*, *Mucor* and *Sterile mycelia*.

REFERENCES

1. **Bontea Vera, 1985** – *Ciuperci parasite și saprofite din România*. Ed. Academiei R.S.R. București.
2. **Constantinescu O., 1974** – *Metode și tehnici în micologie*. Ed. Ceres București.
3. **Eliade E., Toma M., 1977** - *Fungi*. Ed. Didactică și pedagogică, București, p. 5-7, 19-20, 72-129.
4. **Iacob Viorica., 2003** – *Bolile plantelor cultivate – Prevenire și control*. Ed. „Ion Ionescu de la Brad”, Iași.
5. **Iliescu Ana-Felicia, 1998** – *Arboricultura ornamentală*, Ed.Ceres București.

IMPACT OF INVASIVE SPECIES ON FOREST ECOSYSTEMS

IMPACTUL SPECIILOR INVAZIVE ASUPRA ECOSISTEMELOR FORESTIERE

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Abstract. *The introduction of species beyond their natural range is rising sharply lately, due to increased trade between different regions on Earth, transport, travel and tourism and the unprecedented accessibility of goods resulting from globalization. Climate changes recorded during the last years resulted in changes of some species spread area. Invasive species may cause extinction of a native species, change the structure or functions of biocenoses, or alter the genetic structure of a local population. Because invasive species are a serious threat on biodiversity and stability of the receiving ecosystem, in Europe and in USA as well, organizations were established to deal with development and implementation of strategies meant to minimize the negative effects.*

Key words: Alien invasive species, natural biodiversity, globalization.

Rezumat. *Extinderea arealului unor specii în afara limitelor naturale este un fenomen care se manifestă tot mai puternic în ultima perioadă, datorită intensificării schimburilor comerciale între diferite regiuni ale Globului, a transporturilor, a turismului, a accesibilizării fără precedent a bunurilor ca urmare a globalizării. Schimbările climatice globale, tot mai pregnante în ultimii ani, au determinat, de asemenea, modificări ale arealului unor specii. Speciile invazive pot conduce la dispariția unor specii autohtone, modificarea structurii și funcțiilor biocenozelor receptoare sau a structurii genetice a populațiilor locale. Întrucât speciile invazive constituie un factor perturbator al biodiversității și stabilității ecosistemelor colonizate, atât în Europa cât și în SUA, au fost înființate organizații menite să elaboreze și implementeze strategii de minimizare a efectelor negative.*

Cuvinte cheie: Specii invazive, biodiversitate naturală, globalizare.

INTRODUCTION

Tourism development, increased trade between different regions on Earth, transport resulted in accidental or intentional transfer of many species which became able to overpass the natural barriers and enlarge the spreading area in new territories. Alien invasive species were recorded in every taxonomic group: viruses, fungi, algae, bryophytes, ferns, superior plants, invertebrates, fishes, amphibians, reptiles, birds, and mammals. Reaching new territories, some of the alien species don't adapt to the new conditions and disappear and others, on the contrary, manage to develop very well and, not in few cases, in disadvantage of the local species, influencing the ecosystems' biological diversity.

MATERIAL AND METHODS

The aim of the present paper is systematization and evaluation of the existent data regarding the occurrence of the invasive species in forest ecosystems, the spreading ways,

the impact on forest ecosystems. The study is focused mainly on the phytophagous insects and phytopathogenic fungus species in forests, but other examples will not be avoided.

RESULTS AND DISCUSSIONS

Invasive species are considered the second important cause of decreasing biodiversity, following after direct destruction of habitats, with subsequent environmental, economical and social impacts (CBD, 2006). The impact of non-indigenous species on biodiversity acts at different levels of organization: ecosystem, community, population, individual, genetic (Kenis & Péré, 2008). This includes reducing biodiversity or even extinction of some indigenous species as a result of competition, predation or diseases, which resulted in disturbances of local ecosystems' functions. Exotic species dispersal beyond the natural range affected the biodiversity of the majority of ecosystems on Earth. Almost 40% of the extinctions recorded starting the 17th century, when the causes are known, are attributed to invasive species (CBD, 2006). Negative effects of non-native species introduction are emphasized by climate changes, pollution, habitat destruction and human disturbances.

Not any newly introduced species become invasive. If only the new territory provides conditions resembling to natural distribution area, the new species can survive and reproduce. Climate conditions are considered a major influence in species distribution, especially for poikilotherm species. Seasonal climate variation, mainly temperature and humidity, can be determinant for the newly introduced pathogens. In order to infect the host plant, develop the disease and spread, the pathogens, especially fungi, reclaim special temperature and humidity conditions during particular time period of the year, determinant for the pathogen installation. To become invasive, a phytophagous species has to successfully compete for food supplies and habitat, to increase the population density so that negative effects to be recorded on spread area. Phytophagous species may alter the level of food resources by intense consuming of leaves or other plant parts, change the relation predator – parasite – phytophagous species, change the competition among species, become drivers for new pathogens, hybridize with related species, disturb or even destroy habitats. All these effects can be recorded from ecosystem to genetic level.

Invasive species may cause extinction of a native species, change the structure or functions of biocenoses, or alter the genetic structure of a local population. The pathogenic fungus *Cryphonectria parasitica* Murril, causing chestnut blight, was accidentally introduced from Asia to North America, than spread and caused die of an important rate of chestnut trees in North America, where this species was predominant before the introduction of the mentioned pathogen. This resulted in almost full extinction of chestnut trees in North America with repercussion in biocenoses structure, chestnut being replaced by oak trees (*Quercus* spp.). Changes caused by *C. parasitica* in forests were beneficial to other non – indigenous species, a defoliating insect, *Lymantria dispar* L., which prefers as host oak trees (*Quercus* spp.). The changes induced by these two invasive species may have been led to changes of the community and individuals' genetic structure by

modifying the selection direction, but this repercussion is difficult to detect and highlight.

Data on invasive species, including forest species, in Europe are provided by the program Delivering Alien Invasive Species Inventories in Europe (DAISIE). It's estimated that today, in Europe, there are about 1200 exotic insect species, of which 313 live in forests, parks, shelterbelts, road sides. Most of exotic insect species belong to Homoptera and Coleoptera orders. The number of newly introduced species increased during the second half of the twentieth century, and 42,2% is estimated to be introduced since 1950. The most important source of invasive species is Asia, which provided more than 20% of the introduced species in Europe. Less than 2% of the forest species come from deliberate releases (e.g. species of Saturnidae, biocontrol agents). The majority of the introduced insect species is phytophagous (77%).

Among the main drivers of the new forest insect species were identified: bonsai import from Asian countries (about 35,3% of invasive species), wood package from Asia (37,7%), timber trade from Russia (24,1%). The diversity of the species introduced with bonsai imports was assessed to be higher than of the species introduced with wood packages or timber (Roques, 2007).

There are only 109 exotic insect species feeding on plants introduced in Europe and successfully installed in wooden plant ecosystems. These belong to North America and Asia as well and most of them feed on broadleaves. Statistics (Vanhanen, 2008) show that there are three times more phytophagous invasive insect species coming from Europe in USA than vice versa, although the number of invasive species increased in Europe by 40% and in USA by only 13% comparing with the mid of the last decade. Many phytophagous species in North America succeeded in establishing permanent populations in Europe, either because the host plant preceded their arrival in Europe or joined them, or because they reproduce asexual.

In 1985 – 2000, APHIS (United States Animal and Plant Health Inspection Service) intercepted during the quarantine inspections about 500 000 transports containing exotic insects (Haack, 2006). Yearly are recorded about 53 000 interceptions of exotic species in USA (Pimentel *et al.*, 2004) and the records for one species may vary from 1 to several hundreds in one year. But only 2% of the goods introduced in USA are properly inspected because of the limited resources of the agencies in charge considering the burgeoning volume of the imported goods (McMannus, 2006), consequently the major importance is given to detection of the species harmful to living plants (Vanhanen, 2008).

Many countries deal with complex and expansive issues caused by invasive species. For example, the economic losses caused yearly by exotic species in USA, Great Britain, Australia, South Africa, India and Brazil were estimated at over 100 billion US \$ (CBD, 2006).

Because invasive species are a serious threat on biodiversity and stability of the receiving ecosystem, in Europe and in USA as well, organizations were established to deal with development and implementation of strategies meant to minimize the negative effects. EPPO (European and Mediterranean Plant Protection

Organization) is an intergovernmental organization which coordinates actions for providing a proper phytosanitary state on the European continent. Its role is to elaborate international strategies for preventing the introduction of new bark and wood insect pest species. EPPO promoted in 2000 a project oriented to potential risk assessment associated to regional timber trade and to development of detection protocols for common pests in EPPO region. The risk associated to timber importation from Russia and former USSR countries is highlighted. A list of forest pest species QPF (Quarantine Pest for Forestry) was produced, encompassing 1365 species.

APHIS is a governmental agency, established in USA. The goal of this agency is to protect natural and agricultural resources in USA. APHIS works to prevent the introduction of non-native invasive species, animals, plants and pathogens, and surveys and coordinates the control of already installed invasive species. In the same time, it's responsible with developing and application of preventing strategies against introduction of new species.

CONCLUSIONS

The major part of exotic invasive species in European forests belongs to Homoptera and Coleoptera orders.

The main sources of new insect species in forest ecosystems in Europe are: bonsai import from Asian countries, wood packages from Asia, timber trade from Russia.

There are three times more phytophagous invasive insect species coming from Europe in USA than vice versa.

Yearly are recorded about 53 000 interceptions of exotic species in USA during phytosanitary quarantine inspections.

Although difficult to assess, environmental damages caused every year by exotic species in USA, Great Britain, South Africa, India and Brazil were estimated at over 100 billion US \$.

REFERENCES

1. Haack R.A., 2006—*Exotic bark- and wood-boring Coleoptera in the United States: recent establishments and interceptions*. Canadian Journal of Forest Research 36:269–288
2. Kenis M., Péré C., 2008 – Ecological impact of invasive forest insects. Proceedings of the IUFRO Working Party 7.03.10, Gmunden, Austria, 2006, pp: 158 – 162.
3. McMannus M.L., 2006 – *Impact of invasive species in North American Forests*. In: Csóka, G., Hirka, A., and Koltay, A. (eds.) 2006: Biotic damage in forests. Proceedings of the IUFRO Symposium held in Mátrafüred, Hungary, September 12-16, 2004, pp: 136 – 143.
4. Pimentel D., Lach L., Zuniga R., Morrison D., 2004 – *Update on the environmental and economic costs associated with alien invasive species in the United States*. Bioscience 50(1): 53–67.
5. Roques A., 2007 - *Invasive insect species in Europe: first results of the DAISIE program*.
6. Vanhanen H.M., 2008 – *Invasive insects in Europe - the role of climate change and global trade*. Dissertationes Forestales 57, 33 p.
7. ***, 2006 – *Convention on Biological Diversity*.

L'APPARITION ET L'EVOLUTION DE L'ATTAQUE DE (*PSEUDOPERONOSPORA CUBENSIS* ROST.) ET LES AUTRES PATHOGENES AU MELON, DANS LES CONDITIONS DE LA PLAINE BĂRĂGAN (LA ZONE BRĂILA)

APARIȚIA ȘI EVOLUȚIA ATACULUI DE *PSEUDOPERONOSPORA* *CUBENSIS* ROST. ȘI A ALTOR PATOGENI LA PEPENELE GALBEN, ÎN CONDIȚIILE CÂMPIEI BĂRĂGANULUI (ZONA BRĂILA)

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Résumé. *Le mildiou des cucurbitacées, produit par le champignon Pseudoperonospora cubensis Rost., c'est un agent pathogène, qui apparaît fréquemment dans les cultures de légumes cucurbitacées, avec les intensités d'attaque différentes, en fonction de l'espèce, des conditions climatiques et de la technologie appliquée. Pendant les années avec temps pleuvieux, les pertes provoquées par cette maladie, peuvent être quelquefois plus grandes. Toutefois, en commençant avec 2006, la maladie a eu une évolution descendante, grâce aux températures plus hautes et des quantités petites de précipitations enregistrées. Mais, on a été observer une croissance de la poids de l'attaque des autres agents pathogènes par exemple les viroses et le jaunissements mycosiques (Verticillium, Fusarium).*

Mots-clés: melon, *Pseudoperonospora cubensis*, *Verticillium*, *Fusarium*

Rezumat. *Mana cucurbitaceelor, produsă de ciuperca Pseudoperonospora cubensis (Berk. et Curt.) Rostov, este un agent patogen care apare frecvent în culturile de legume cucurbitacee, cu intensități de atac diferite, în funcție de specie, condiții climatice și tehnologia aplicată. În anii ploioși, pierderile provocate de această boală pot fi uneori foarte mari. Totuși, începând cu anul 2006, boala a avut o evoluție descendentă, datorită temperaturilor foarte ridicate și cantității mici de precipitații înregistrate. În schimb, a fost observată o creștere a ponderii atacului unor alți agenți patogeni, cum ar fi de exemplu virozele și ofilirile micotice (Verticillium, Fusarium).*

Cuvinte cheie: pepene galben, *Pseudoperonospora cubensis*, *Verticillium*, *Fusarium*

INTRODUCTION

Les melons sont attaqués par des viroses, surtout celles qu'on transmet facile par les vecteurs. Par ici on mentionne surtout le virus du mosaïque des concombres. Pendant le temps derniers, on constate une croissance de la fréquence de l'attaque des champignons qui produisent des jaunissements

vasculaires stridents, dans les cas de *Fusarium*, plus lents dans le cas de du *Verticillium*.

MATÉRIEL ET METHODE

Les expériences ont été faites dans le département Braila. On a utilisé la sorte du melon Ananas F1.

Ces expériences ont été créées avec l'engagement strict de la technologie de culture, spécifiques au melon.

L'apparition et l'évolution de l'attaque du champignon *Pseudoperonospora cubensis*, des viroses et des sortes *Verticillium* et *Fusarium*, ont été observées à la variété témoin sans traitement. Pour l'évaluation de l'attaque des pathogènes mentionnés, on a utilisé le système de notation qui exige le calcul des suivantes valeurs: F% (fréquence de l'attaque), I % (l'intensité de l'attaque) et D.A. (le degré de l'attaque). Le degré de l'attaque est donné par la formule $F \times I / 100$.

Pour le calcul des valeurs signales, dans le cas du champignon *P. cubensis*, et des viroses, on a analysé 21 de feuilles à la chaque parcelle expérimentée.

Dans le cas des champignons de la sorte *Verticillium* et *Fusarium* on a considéré la fréquence (F %) des plantes attaquées vis – à – vis de celles – ci non attaquées.

RÉSULTAT ET DISCUSSIONS

Observations en 2006.

L'apparition du mildiou (*P. cubensis*)

L'attaque du mildiou a été signalée en 2006 à la variété étudiée Ananas F1 au mois d'août 10 G.A. – 0,8 %. On a eu une apparition plus tardive en comparaison 2005, quand le premier symptôme du mildiou a été observé au mois de juillet 8. Cette apparition – ci, on peut s'expliquer par le niveau très bas des précipitations enregistrées dans la troisième décennie au mois de mai ($3,4 \text{ l/m}^2$) ainsi la première décennie au mois de juin ($0,8 \text{ l/m}^2$), et la troisième décennie au mois de juin ($0,6 \text{ l/m}^2$). Effectivement, le mois de juin en 2006, a été très pauvre en précipitations, en totalité dans le mois – ci en étant seulement $17,4 \text{ l/m}^2$, en commençant avec la première décennie au mois de juillet ($14,2 \text{ l/m}^2$) le régime des précipitations s'est amélioré et pendant ce mois – ci on a totalisé $78,2 \text{ l/m}^2$. Il semble que toutes ces – ci précipitations abondantes conduisent à l'apparition d'attaque du mildiou dans la première décennie au mois d'août. Il faut souligner que le nombre d'heures avec l'humidité sur feuilles a été particulièrement élevé (114), dans la première décennie au mois d'août. Après l'apparition, l'évolution de l'attaque du mildiou au mois d'août a été relativement lente G.A – 3,6 %, dans la deuxième décennie et 5,3 % dans la troisième décennie. Cette évolution assez lente de l'attaque du mildiou on peut devoir aux valeurs très élevées enregistrées de température dans la deuxième moitié au mois d'août. C'est important à mentionner que dans la deuxième décennie au mois d'août la température moyenne a été particulièrement élevée – 28 C° , aussi comme dans la troisième décennie $25,3 \text{ C}^\circ$. Aussi, le niveau de précipitations enregistré au mois d'août ($57,8 \text{ l/m}^2$), a été plus réduit qu'au mois de juillet ($78,2 \text{ l/m}^2$). Dans la première décennie du mois septembre, le degré de l'attaque du mildiou est monté à 27,7 % (fig. 1).

On peut expliquer le fait que les températures moyennes, descendent aux valeurs moindres, qu'au mois d'août et certain de 22,5 C° dans la première décade. Celles valeurs – ci s'integrent entre les limites optimales très faivorables au champignon (18 – 22 C°). Aussi, le niveau de précipitations enregistré au mois de septembre a été assez élevé (68 l/m²).

L'apparition du jaunissement verticille (*Verticillium dahliae*).

Le premier symptôme de l'attaque du jaunissement verticille a été observé dans la deuxième décade au mois de juillet (17). Le degré de l'attaque de la maladie à l'apparition des premiers symptômes a été petit – 1,04 %.

D'après approximativement un mois du début de l'attaque, jusqu'au milieu du mois d'août, on avaient paru des troubles de croissance, et les nouveaux sorments formes sont resses petits et avec les feuilles serées. Au début du mois du septembre ont été observées les premières plantes jaunissements irréveribles et certain, celles – ci qui ont été les premières attaques. D'après l'observatiion des premières symptômes (le 13 juillet), la maladie a eu une évolution assez lente ensuite la deuxième moitié du mois de juillet. Ainsi, le degré de l'attaque de la maladie a été 3,12 % à la fin du mois de juillet et 15,6 à la fin de la deuxième du mois de septembre. En commençant avec la troisième décade du mois de septembre, les symptômes de la maladie ont débuté être dominés par les symptômes de mildiou et n'était pas plus possible la distinction des celles-ci (fig.1).

Pendant l'année 2006, au milieu des expériences effectuées, les symptômes produits par les viroses ont été manqués d'importance pratique. Ont été paru des taches sensibles de décoloration sans la forme du mosaïque, mais qu'ils n'ont pas influencé la croissance et le développement des plantes. Également, le jaunissement produit par *Fusarium* a été présente en totalité isolement.

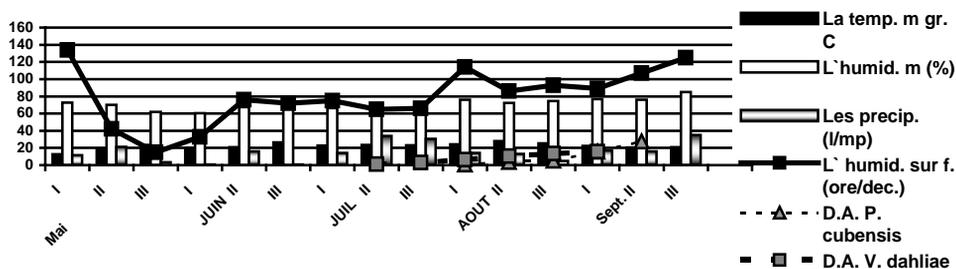


Fig. 1. L'apparition et l'évolution de l'attaque de *P. cubensis* et *Verticillium dahliae* au melon, à la variété Anans F1, en fonction de conditions climatiques en 2006.

Observations en 2007

L'apparition et du mildiou (*P. cubensis*).

L'attaque du mildiou des cucurbitacées a été signalée en 2007 à la variété étudiée – Ananas F1 à la date du 6 au mois de septembre D.A. – 1,9 %. C'était la plus tardive apparition du mildiou aux melons, en commençant avec 2002. Cette apparition aussi tardive de l'attaque du mildiou on peut s'expliquer par le

niveau très baissé des précipitations, enregistré dans la deuxième décade au mois de mai – 0 l/m².

Aussi, dans la deuxième et la troisième décade au mois de juillet, les précipitations ont manqué en totalité 0 l/m². À cette apparition très tardive du mildiou a contribué encore le nombre moindre d'heures de rosée enregistré dans les dernières deux décades du mois de juillet 11 heures dans la deuxième décade et seulement 5 heures dans la troisième décade.

La température très élevée, enregistrée dans l'entier mois de juillet a été un facteur important dans le retard de l'apparition de l'attaque du mildiou. Ainsi, dans la première décade la température moyenne a été 27,5 C°, dans la deuxième décade 27,8 C° et même 30 C° dans la troisième décade. Les valeurs – ci ont été plus encore sur la valeur optimale nécessaire du champignon pour former des spores (18 – 22 C°).

L'humidité relative d'air a enregistré des valeurs très basses au mois de juillet et certain 54,3 % dans la première décade , 64,2 % dans la deuxième décade et 58,4 % dans la troisième décade.

En commençant avec le mois d'août, le régime de précipitations s'est amélioré davantage (72 l/m² dans le mois entier). De même, au mois d'août on intensifié le nombre d'heures d'humidité sur les feuilles – 173 heures. Ces facteurs – ci ont contribué à l'apparition de l'attaque du mildiou au mois de 6 septembre. Après l'apparition (D.A. – 1,9 %), l'attaque du mildiou a évolué relativement rapidement, le degré de l'attaque en arrivant à 9,7 % dans la deuxième décade au mois de septembre et 30,5 % dans la troisième décade.

À côté de cette évolution au cours de mois de septembre une série de facteurs on contribué c'est – à – dire: le niveau de précipitations (45,6 –le mois entier), le nombre d'heures de rosée (164 – le mois entier), ainsi que le niveau des températures moyennes. Les températures moyennes (sur les décades) ont eu des valeurs optimales pour le développement et par l'augmentation du champignon *P. cubensis* et tel: 21,2 C° dans la première décade, 20,4 C° dans la deuxième décade et 20,0 C° dans la troisième décade (fig.2).

L'apparition du jaunissement verticille (*Verticillium dahliae*).

Pendant 2007, le premier symptôme de l'attaque du jaunissement verticille a été observé dans la deuxième décade au mois de juillet (le 20 juillet). Le degré de l'attaque de la maladie dès le début a été plus grand, que l'année dernière, et tel 2,1 %.

On a manifesté par jaunissement et nécroses marginaux des feuilles, en forme de lettre „V”, sur les portions plus grands de sarments que l'année 2006. Après l'apparition, la maladie a évolué relativement rapidement dans la troisième décade au mois de juillet quand le degré de l'attaque est arrivé à 7,3 %. En commençant avec la première décade au mois d'août, l'attaque du jaunissement verticille s'est diminuée. Ce fait – ci s'explique par l'apparition des précipitations (72 l/m² pour le mois entier). Le degré de l'attaque de cette valeur a atteint pendant le mois d'août 8,4 % dans la deuxième décade.

Au cours de la première décade au mois de septembre, le degré de l'attaque de la maladie a été approximativement au niveau enregistré à la fin du mois d'août. Jadis l'apparition et l'évolution du mildiou, dès la deuxième décade du mois de septembre, les symptômes de cette maladie ci ont commencé être dominés du mildiou (fig.2).

L'apparition des viroses.

En 2007, la présence des aphides vecteurs a été enregistrée dans la troisième décade au mois de mai. Les premiers symptômes produits par les viroses ont été observés dans la deuxième décade au mois de juillet. Dès le moment d'apparition les premiers symptômes, l'évolution de l'attaque des viroses a été lente et a enregistré les suivants degrés de l'attaque: 1,5 % à l'apparition la deuxième décade au mois de juillet, 3,7 % dans la première décade, 4,6 % dans la deuxième décade et 4,9 %, dans la troisième décade au mois d'août.

L'apparition du jaunissement produites par *Fusarium*.

Au milieu du mois d'août ont été observés des cas isolés, des jaunissements rapides, avec le maintien de la couleur verte du feuillage. La fréquence de l'attaque de cette maladie a été réduite de 2 % (0,5 plantes attaquées), par parcelle expérimentale. L'intensité de l'attaque dans les cas de ces plantes – ci a été notée avec 6, c'est – à – dire 100 %, parce que le jaunissement les ont affecté en totalité, même de l'apparition des premiers symptômes.

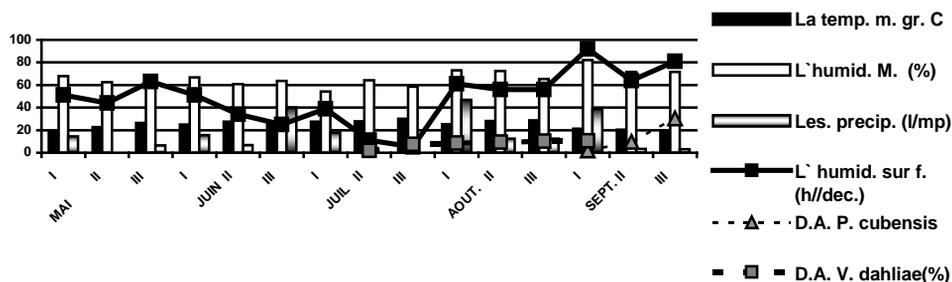


Fig. 2. L'apparition et l'évolution de l'attaque de *P. cubensis* et *Verticillium dahliae* au melon, à la variété Anans F1, en fonction de conditions climatiques en 2007.

CONCLUSIONS

Les pertes provoquées de mildiou ont été petites pendant 2006 et très petites pendant 2007. Dans les conditions climatiques d'année 2006, au moment de l'apparition du premier symptôme (le 10 mois d'août), 55 – 60% de la production était déjà arrivée à la maturité de consommation. La différence de 45 – 40 % de la production, qui s'est maturée après l'apparition du mildiou a été un peu affectée (seulement qualitative) pendant le mois d'août, par l'apparition de la maladie. Ce fait – ci est donné à l'évolution lente de la maladie, sur le mois de la maladie, sur le mois d'août entier. L'évolution de la maladie a été plus rapide

au cours de mois de septembre, mais les fruits affectés, ne préstaient pas plus de la valeur économique élevée.

Dans les conditions climatiques d'année 2007, les pertes provoquée, par le mildiou ont été insignifiantes. C'est important à remarquer que'au mois de 21 juin, l'expérience de melons a été affectée par des par des précipitations torrentielles, accompagnées par grêle puissante. Les températures très élevés et la secheresse qui ont suivi après la grêle, n'ont pas permis l'apparition et l'évolution du mildiou, pendant l'été 2008.

Pendant 2007, le mildiou a apparu plus tard (le 6 mois de septembre). Après l'apparition, grâce aux précipitations, la maladie a évolué rapidement au mois de septembre mais l'influence en concernant la production a été moindre. Si quelques pertes apparaissent, celles – ci sont petites et elles se produisent à la fin d'été et au début d'automne, quand les prix aux melons soint moindre. Le traitements contre le mildiou se justifient pendant les années qand les précipitations tombent en commençant dès la deuxième moitié du mois de mai, du mois de juin et le début du mois de juillet. Celles – ci sont nécessaires pour protéger surtout la première partie de la production qu'elle est la plus cherchée (la fin du mois de juillet et la première moitié du mois d'août).

Pendant 2006 le degré de l'attaque du verticilliose est arrivé à la fin du mois d'août à 13,6 %. Pareil, pendant 2007, ont apparu isolément des plantes affectées par le jaunissement rapide, apoplectique avec des symtômes spécifiques de *Fusarium*. Dans l'expérience exécutée pendant 2007, ont apparu des symptôme tipiques de viroses mais les plantes affectées ont fructifié normalement.

BIBLIOGRAPHIE

1. **Marinescu Gh., Costache M., Stoenescu A., 1986** - *Bolile plantelor legumicole*. Editura Ceres, Bucuresti.
2. **Săulescu N. A., Săulescu N. N., 1967** - *Câmpul de experiență*. Editura Agro-Silvică București
3. **Velichi E., 2006** – *Contribuții la îmbunătățirea tehnologiei de prevenire și combatere integrată a agenților patogeni ai pepenilor verzi și pepenilor galbeni în cadrul Câmpiei Bărăganului (zona Brăilei)*. Teză de doctorat, U.S.A.M.V Iași.

EFFICACITE DE QUELQUES INSECTICIDES DANS LA LUTTE CONTRE LE VER DES POMMES (*CYDIA POMONELLA* L.) DANS LES PLANTATIONS DE POMMIER Á S.R.D.A.F. IAȘI

EFICACITATEA UNOR INSECTICIDE ÎN COMBATEREA VIERMELUI MERELOR (*CYDIA POMONELLA* L.) ÎN PLANTAȚIILE DE MĂR DE LA S.C.D.P. IAȘI

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Abstract. *Ces dernières années on a constaté un accroissement significatif de l'attaque du ver des pommes – Cydia pomonella L. Dans la période 2005-2007, à SCDP Iași on a fait des recherches concernant la lutte chimique contre le ver des pommes (Cydia pomonella L.). L'expérience s'est effectuée dans une plantation de pommiers avec les produits de dernière génération ci-après: Decis 2,5 EC, Decis 25 WG, Karate Zeon, Victenon 50 WP, Mospilan 20 SP, Calypso 480SC, Novadim 40EC, Fyfanon 50EC. On a obtenu les meilleurs résultats avec le produit Calypso 480 SC à la concentration de 0,02%. De bons résultats ont donné aussi les autres produits: Victenon 50WP à la concentration de 0,05%, Karate Zeon à la concentration de 0,02% etc.*

Mots clés: *Cydia pomonella L., pommiers, lutte chimique*

Rezumat. *În ultimii ani s-a constatat o creștere semnificativă a atacului viermelui merelor – Cydia pomonella L. În perioada 2005-2007, la SCDP Iași s-au efectuat cercetări cu privire la combaterea chimică a viermelui merelor (Cydia pomonella L.). Experiența s-a efectuat pe o plantație de măr la soiul Jonathan unde au fost experimentate următoarele produse de ultimă generație: Decis 2,5 EC, Decis 25 WG, Karate Zeon, Victenon 50 WP, Mospilan 20 SP, Calypso 480SC, Novadim 40EC, Fyfanon 50EC. Cele mai bune rezultate s-au obținut la produsul Calypso 480 SC în concentrație de 0,02%. Rezultate bune au dat și celelalte produse: Victenon 50WP în concentrație de 0,05%, Karate Zeon în concentrație de 0,02% etc.*

Cuvinte cheie: *Cydia pomonella L., măr, combatere chimică*

INTRODUCTION

Le ver des pommes – *Cydia pomonella* L., on le rencontre dans notre pays dans toutes les régions à plantations d'arbres fruitiers et on l'estime un ravageur principal des plantations de pommiers.

Les larves de la première génération attaquent les jeunes fruits, et celles de la deuxième génération les fruits arrivés à la pleine maturité. Les fruits atteints présentent des galeries pleines de restes de nourriture et d'excréments.

Pour lutter contre le ver des pommes on conseille d'appliquer un système complexe de méthodes: mécaniques, biologiques et chimiques.(1,2,3,4)

Ainsi, dans la période 2005-2007, à la SCDP Iași on a suivi l'efficacité de la méthode chimique dans la lutte contre l'espèce *Cydia pomonella* L.

MATERIAU ET METHODE DE RECHERCHE

Les recherches concernant la lutte chimique contre le ver des pommes ont consisté dans l'utilisation de produits de protection des plantes, de dernière génération. On a testé des insecticides du groupe des pyréthroides de synthèse organophosphorés et carbamates. Ces pesticides ont été: Decis 25 WG (s.a deltaméthrine) – 0,003%, Decis 2,5 EC (s.a deltaméthrine) – 0,025%, Karate Zeon (s.a lambda-cyhalotrine) – 0,02%, VICTENON 50 WP (s.a bensultap) – 0,015%, Mospilan 20 SP (s.a acétamipride) – 0,015%, Calypso 480 SC (s.a thiaclopride) – 0,02%, Novadim 40 EC (s.a diméthoate) – 0,075%, Fyfanon 50 EC (s.a malation) – 0,175%.

On a corrélié la mise en pratique des expérimentations avec le nombre de mâles capturés dans les pièges à phéromone sexuel synthétique de type AtraPOM. Poursuivre la dynamique du vol des adultes de *Cydia pomonella* L. au moyen des pièges à phéromones sexuels synthétiques a de l'importance pour déterminer la période d'application des traitements. Ainsi, en 2005-2007, la période avertie pour exécuter les traitements est présentée dans la table 1.

Table 1

Période avertie pour lutter contre le ver des pommes dans les 2005-2007

Année	I-e génération	II-e génération
	Période avertie	Période avertie
2005	24-28 mai	4-8 juillet
2006	24-28 mai	5-9 juillet
2007	18-22 mai	25-29 juin

Pour lutter contre l'espèce *Cydia pomonella* L., on a appliqué à chaque génération deux traitements chimiques:

- le premier dans les délais mentionnés dans la table
- le second traitement 8-14 jours après le premier;

RÉSULTAT ET DISCUSSIONS

Dans la période 2005-2007, à la SCDP Iași on a mis en évidence une grande densité du ravageur et un grand danger potentiel pour la production de pommes, considérant que le seuil économique d'endommagement de 2-5 papillons/ piège/ semaine (Minoiu N., 2003).

De même, les conditions de climat ont été très favorables au développement des deux générations de *Cydia pomonella* L.

Les résultats concernant l'efficacité des pesticides utilisés dans la lutte contre le ver des pommes sont présentés dans la table 2.

En 2005, on a obtenu les meilleurs résultats avec le produit Calypso 480 SC avec une efficacité de 98,6% (GI) et 99,1% (GII). Des résultats proches ont été obtenus aussi avec le produit Mospilan 20 SP qui a eu une efficacité de 97,8 (GI), respectivement 98,7% (GII) et le produit Decis 25 WG qui a enregistré une efficacité de 96,9% (GI) et 97,7%(GII).

Table 2

Efficacité de quelques insecticides utilisés dans la lutte contre l'espèce *Cydia pomonella* L. dans la période 2005-2007 à la SCDP Iasi

Variante	Dose kg, l/ha	2005		2006		2007	
		Efficacité %		Efficacité %		Efficacité %	
		G I	G II	G I	G II	G I	G II
V1 – Decis 2,5 EC	0,5	92,6	93,8	93,0	93,9	93,2	93,9
V2 – Decis 25 WG	0,003	96,9	97,7	97,1	98,2	97,3	98,3
V3 – Karate Zeon	0,4	97,1	97,6	97,3	98,2	97,3	98,2
V4 – Victenon 50 WP	1,0	97,3	98,0	97,6	98,5	97,8	98,8
V5 – Mospilan 20 SP	0,3	97,8	98,7	98,3	99,0	98,3	99,0
V6 – Calypso 480 SC	0,4	98,1	99,0	98,6	99,1	98,6	99,1
V7 – Novadim 40 EC	1,5	93,5	93,3	93,9	93,5	94,2	93,7
V8 - Fyfanon 50 EC	3,5	94,8	95,7	94,8	95,6	95,1	95,6
VM – témoin non traité		37,7	18,5	39,8	20,3	38,7	20,5

On a enregistré les plus faibles résultats dans le cas du pyréthroïde Decis 2,5 EC pour lequel l'efficacité a été de 92,6% (G I – 2005) et 93,9% (G II – 2006-2007) et le produit Novadim avec 93,3% (G II – 2005) et 94,2% (G I – 2007).

De l'analyse des résultats obtenus, on constate que tous les produits ont eu une efficacité élevée. On a obtenu les meilleurs résultats avec le produit Calypso 480 SC à la concentration de 0,02%, pour laquelle le taux de fruits atteints a été le plus faible de 1,9% à la I-ère génération et de 1,0% à la seconde. Les autres produits ont aussi donné de bons résultats: Victenon 50 WP avec une efficacité de 97,8 % (G I), 98,8% (G II) en l'an 2007; Mospilan 20 SP 99% (G II) en 2006 et 2007; Decis 25 WG 98,2% (G II), Fyfanon 50 EC 95,7 % (G II) en 2005, Novadim 40 EC avec une efficacité de 94,2% (G I) en 2007 et Decis 2,5 EC avec une efficacité de 93%.

Comme on l'observe, les produits expérimentés les trois années d'investigation ont été les plus efficaces en 2007 (figure 1).

En conclusion, pour la lutte chimique contre l'insecte *Cydia pomonella* L., avec les produits pyréthroïdes, organophosphorés, carbamiques et mélanges, ils montrent une très bonne efficacité garantissant une protection des plantations de pommiers, si l'on respecte les moments optimums de leur application, le groupe de toxicité des produits, la dose d'application et qu'on les choisit avec la plus grande exigence quant à leur impact nocif sur l'homme, sur les animaux, les plantes et l'environnement.

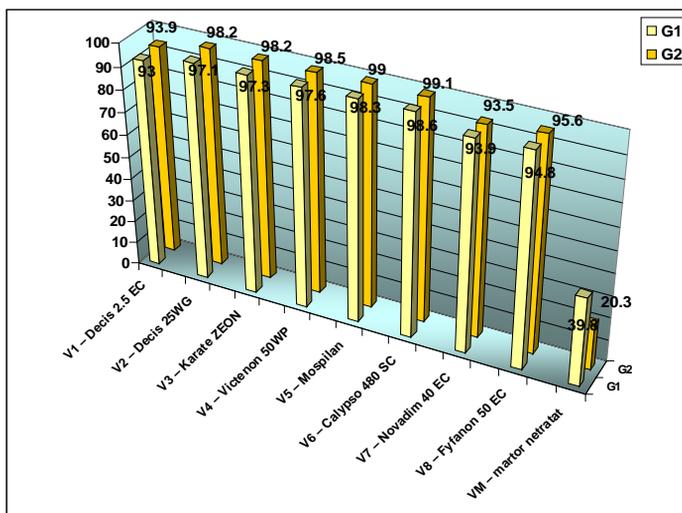


Fig. 1. Efficacitate de quelques insecticides utilisés dans la lutte contre l'espèce *Cydia pomonella* L. dans l'année 2007 à la SCDP Iași

CONCLUSIONS

- les produits utilisés ont eu une bonne efficacité vers très bonne dans la lutte contre le ver de la pomme – *Cydia pomonella* L.;
- de la gamme d'insecticides testés, l'efficacité maximum est constatée dans le cas de l'utilisation des produits Calypso 480 SC à la concentration de 0,02%;
- l'avertissement des traitements s'est fait conformément au critère écologique, quand s'est réalisée la somme des degrés de température.

BIBLIOGRAPHIE

1. **Beșleagă Ramona, 2008** – *Cercetări privind biologia, ecologia și combaterea principalilor dăunători din plantațiile de măr, în condițiile ecosistemului pomicol Iași*. Rezumatul tezei de doctorat, U.S.A.M.V. Iași
2. **Cârdei E., 1992** – *Contribuții privind fitoprotecția speciilor semințoase*. Revista Cercetări Agronomice în Moldova, vol II
3. **Georgescu T., Tâlmăciu M., Bernardis R., Rădescu C., Martin Doina, 2004** – *Dinamica zborului adulților de *Cydia pomonella* L., cu ajutorul capcanelor cu feromoni sexuali sintetici de tip AtraPOM*. Lucr. Șt. Vol 47, seria Horticultură, USAMV Iași.
4. **Minoiu N., 2003** – *Invazie de viermele pielței fructelor în livezile din Transilvania*. Revista Sănătatea plantelor, nr. 68.

RESEARCHES ON BARK BEETLE PREDATOR AND PARASITOID SPECIES OF SPRUCE BARK BEETLES

CERCETĂRI PRIVIND SPECIILE DE PRĂDĂTORI ȘI PARAZITOIZI AI GÂNDACILOR DE SCOARȚĂ AI MOLIDULUI

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Abstract. *There is a long tradition in forest entomology regarding the study of different aspects on bark beetle ecology, including the natural enemies, in order to evolve control methods. During the last period of time, the interest in natural mortality agents of bark beetles increased because of the necessity to create efficient control methods, considering the entire ecosystem. Researches on entomophagous species were developed in bark beetle outbreak spots in spruce forests. The entomophagous bark beetle entomofauna in the studied area was represented by coleopteran (Cleridae) and dipteran (Medetera) predators, as well as hymenopteran parasitoids (Pteromalidae, Braconidae). The population density of *Thanasimus formicarius* clerid decreased during the third season of vegetation after the windfalls, due to larval stages destroying, during the debarking and/or removal from the forests of the bark beetle infested trees.*

Key words: entomophagous entomofauna, bark beetles, windfalls, debarking.

Rezumat. *Există o lungă tradiție în entomologia forestieră pentru studierea diferitelor aspecte de ecologie a gândacilor de scoarță, inclusiv a complexelor de dușmani naturali, în scopul elaborării metodelor de combatere. În ultima perioadă, din necesitatea de a elabora metode durabile de combatere a dăunătorilor forestieri, luând în considerare întregul ecosistem forestier, a crescut interesul pentru cunoașterea factorilor naturali de producere a mortalității la gândacii de scoarță. Au fost desfășurate cercetări privind complexul de prădători și parazitoizi în focarele de înmulțire în masă a populațiilor de gândaci de scoarță ai molidului. Cel mai frecvent prezente în entomofauna scolitofilă sunt insectele prădătoare, coleoptere (Cleridae) și diptere (Medetera), precum și himenopterele parazitoide (Pteromalidae, Braconidae). Densitatea mai redusă a cleridului *Thanasimus formicarius* în al treilea sezon de vegetație după doborâturi se explică și prin distrugerea stadiului larvar prin acțiunea de cojire a materialului lemnos infestat și de transport în afara pădurii a acestuia.*

Cuvinte cheie: entomofauna entomofagă, gândaci de scoarță, doborâturi produse de vânt, cojire.

INTRODUCTION

There is a long tradition in forest entomology regarding the study of different aspects on bark beetle ecology, including the natural enemies, in order to evolve control methods. During the last period of time, the interest in natural mortality agents of bark beetles increased because of the necessity to create efficient control methods, considering the entire ecosystem.

The parasitoid complex of a certain species of bark beetles is hard to determine because of the hidden living place of larvae and because bark beetles usually share food resources with other insect species. Most of the studies worked on parasitoids reared on infested logs and attributed to the most abundant species or the most common host, resulting in inaccurate conclusions. The errors are hard to detect when samples containing two or more associated scolytid species are analyzed (Kenis *et al.*, 2004). Same as parasitoids, many predators localize the prey using the pheromones released by bark beetles or the volatiles released by host trees. Usually predators find the trees even before these have been infested, and often in the same time with the host insect, as the majority of parasitoids reach later the infested trees. Predator species seem not to prefer particular parts of the trees, but they localize only occasionally on the basal part of the trunk, comparing with parasitoids, which prefer parts from the top of the trees with thin bark (Wermelinger, 2004).

MATERIAL AND METHODS

The studies of parasitoid and predator species developed during the growing season and after cease of the flight. During the growing season, parasitoids and predators were collected from infested trees partially debarked, as well as from pheromonal traps and the biological material was analyzed in lab conditions for species determination. For a clear image on the parasitoid and predator complex, rearing boxes in lab conditions were executed. Two directions were adopted:

- Bark samples with hibernating adults were collected from infested trees, and were monitored the parasitoid and predator emerging adults. The emerged individuals were analyzed, selected and identified with the help of experts.
- In order to avoid the errors in associating some parasitoid species with bark beetle species, because they were obtained from the same piece of log, parasitoid cocoons were collected from galleries and separately reared (fig. 1).



Fig. 1. Parasitoid cocoons (original)

RESULTS AND DISCUSSIONS

Bark beetle population outbreaks are followed by the increase of the density level of entomophagous insect populations.

Field trials consisted in observations on parasitoid and predator species, during the growing season and after flight ceasing as well. The partial debarking

of infested trees revealed the occurrence of *Thanasimus formicarius* L. (Coleoptera: Cleridae)(fig. 2) and *Medetera* sp. Fischer (Diptera: Dolichopodidae) larvae, as well as *Nemosoma elongatum* L. (Coleoptera: Trogossitidae) adults.



Fig. 2. *Thanasimus formicarius* larva (original)

In pheromonal trap catches, it was frequently recorded the occurrence of *T. formicarius* adults, at traps baited for *I. typographus* and *N. elongatum* adults, at traps baited for *P. chalcographus*. The lower density of *T. formicarius* populations in the third season after windfalls may be the consequence of larvae extinguish during the debarking operation and transportation of the infested timber far from forests.

In lab trials, besides bark beetles, from infested logs emerged predator, parasitoid and saproxylophagous insects (insects living in bark beetles galleries and feeding on bark and wood altered by fungi and insects). The infested logs were collected in Tomnatic, Pojorâta, and Moldovița Forest Districts, from stands placed between 900 and 1000 m a.s.l. elevation. At sampling, the beetles were found inside the bark, ready to hibernate. About 30% of the adults have been already left the initial place. Bark samples of 30 x 30 cm were introduced in rearing boxes and were kept at room temperature and proper humidity conditions. The emerging insects were daily collected during one month.

Table 1

Reared associated scolytid fauna

Scolytids' associated entomofauna	Insects/m ² bark			Food regime
	F.D. Pojorâta	F.D. Moldovița	F.D. Tomnatic	
<i>Thanasimus formicarius</i> L.-larvae	9,1	7,2	8,1	predator
<i>Medetera</i> sp. - larvae	3,1	4,5	2	predator
<i>Rhopalicus tutella</i> (Walk.)	3,2	1,7	4,7	parasitoid
<i>Coeloides bostrichorum</i> Giraud.	1	-	1	parasitoid
Sciaridae	38,1	31,2	15,9	sapromycetophagous
Staphilinidae	5,3	2,7	-	necrophagous
Acarina	6,3	-	3,3	Saprophagous?

The samples from Pojorâta, Moldovița and Tomnatic Forest Districts belonged from trees infested merely with *I. typographus*. In table 1 are integrated data on entomophagous and necrosaprophagous species resulted from infested trees.

Among the main mortality agents, were recorded subcortical predators (*Medetera* sp., *Thanasimus* sp.) and larval ectoparasitoids (*Coeloides bostrichorum* and *Rhopalicus tutela*). Staphylinids (Coleoptera) and sciarids (Diptera) are acting as saprophagous or their status is not clear.

In order to avoid the erroneous association of some parasitoid species with bark beetle species merely because they emerge from the same logs, in the field were collected parasitoid cocoons from the galleries, were reared and *Rhopalicus tutella* adults emerged. Among the entomophagous insects, the most frequent are predator beetle species (Cleridae) and flies (*Medetera*), as well as hymenopteran parasitoids (Pteromalidae, Braconidae).

The amount of parasitoids in the analyzed samples confirms that the density of entomophagous population is high in the infested logs even after it was left by bark beetles. So that, it's authorized the recommendation not to debark the trees left by bark beetles before May next year (Ceianu, 1971, Ceianu *et al.*, 1990), providing this way the possibility for associated fauna to leave the host tree. The entomophagous population efficiency in controlling bark beetle populations' density depends on the existence in forests of trees infested and left by bark beetles.

CONCLUSIONS

Among entomophagous species of *Ips typographus*, predators have the higher frequency: coleopterans (Cleridae) and (*Medetera*) dipterans, as well as parasitoid hymenopterans (Pteromalidae, Braconidae).

The lower density of clerid *Thanasimus formicarius* in the third season after the windfalls can be explained by the extinction of larval stage during debarking or transportation of the infested timber out of forests.

The efficiency of entomophagous species in controlling bark beetle populations strongly depends on the existence in forests of infested trees, left by bark beetles.

REFERENCES

1. Ceianu I., 1971 – *Limitarea înmulțirii în masă a gândacilor de scoarță prin insecte entomofage*, manuscris ICAS, 137 p.
2. Ceianu I., Ghizdavu Luminița, Mihalciuc V., Ichim I., 1990 – *Contribuții la cunoașterea ecologiei unor coleoptere scolițofage din pădurile de molid*. Lucrările Simpozionului „Entomofagii și rolul lor în păstrarea echilibrului natural”, Iași, pp. 123 – 136.
3. Kenis M., Wermelinger B., Gregoire J.-C., 2004 – *Research on parasitoids and predators of Scolytidae, a review*. In: F. Lieutier et al. (eds.), *Bark and Wood Boring Insects in Living Trees in Europe, A Synthesis*, 237 – 290, Kluwer Academic Publisher.
4. Wermelinger B., 2004 – *Ecology and management of the spruce bark beetle Ips typographus - a review of recent research*. *Forest Ecology and Management* 202, pp. 67 – 82.

THE CHEMICAL CONTROL OF THE CODLING MOTH (*CYDIA POMONELLA* L.) IN THE FRUIT GROWING AREA BANU MARACINE

COMBATEREA CHIMICĂ A VIERMELUI MERELOR (*CYDIA POMONELLA* L.) ÎN ZONA POMICOLĂ BANU MĂRĂCINE

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Abstract. *The chemical method consist in chemical treatments applying, only if the other methods (agrotechnical, mechanical, physical, biological, aso) has not limitedated the pests populations under the economical treshold (P.E.D.) The treatments are apply only when it is necessary using products framed in the III-rd and IV-th toxicity groups, in order to protect the beneficial fauna from the orchards, playing an important role in maintining the biocenotic ballance. In order to increase the treatments efficiency, the insceticides are mixed with fungicides, for controlling at the same time the pests and the phytopathogens agents.*

Key words: *Cydia pomonella*, chemical control, pyreteroid products

Rezumat. *Metoda chimică constă în aplicarea de tratamente chimice în cazul în care celelalte măsuri (agrotehnice, fizico-mecanice, biologice, etc.) nu au limitat populațiile de dăunători sub pragul economic de dăunare (P.E.D.). Tratamentele se efectuează numai la avertizare și se urmărește folosirea de produse mai ales din grupa a III-a și a IV-a de toxicitate, în scopul protejării faunei utile din cadrul plantațiilor pomicole, cu rol important în menținerea echilibrului biocenotic. Pentru mărirea eficacității tratamentelor, acestea se complexează cu fungicide, pentru a combate agenții fitopatogeni.*

Cuvinte cheie: *Cydia pomonella*, combatere chimică, produse piretroide

INTRODUCTION

The species *Cydia pomonella* L. belong to the *Tortricidae* family and it is one of the most dangerous pest of the apple in Romania.

Due to the climatic conditions from our country, this species present two generation/year, hibernate into a chrysalis cocoon named hibernaculum.

In the absence of the control methods the losses produced by the species *Cydia pomonella* L. can reach 70-80% from the yield.

The chemical method consist in chemical treatments applying, only if the other methods (agrotechnical, mechanical, physical, biological, aso) has not limitedated the pests populations under the economical treshold (P.E.D.)

The treatments are apply only when it is necessary using products framed in the III-rd and IV-th toxicity groups, in order to protect the beneficial fauna from the orchards, playing an important role in maintining the biocenotic ballance.

In order to increase the treatments efficiency, the insceticides are mixed with

fungicides, for controlling at the same time the pests and the phytopathogens agents.

MATERIAL AND METHOD

The research has been made during 2006 – 2008, in an intensive apple orchard, within the Didactical Station Banu Maracine.

The chemical control tests has been set under the experimental technique standards, according to the randomized blocks with four repetitions.

There has been made observation regarding the attack frequency (F%), the attack intensity (I%) and the attack degree (AD%) on repetitions and variants, and the treatments efficiency (E%) has been determined using the Abbot formula:

$$E = \left(1 - \frac{a_2}{N - M_2} \right)$$

where:

a_2 = the number of attacked fruits at the treated variant;

N = the total number of the analyzed fruits;

M_2 = the total number of the unattacked fruits at the control variant. numărul total de fructe neatacate la mator (gradul de atac la mator).

The data has been processed and interpreted through statistic calculus, using programms for the variance analyze.

The pheromones traps has been set early in the spring, the clay plates has been changed every 3-4 weeks function the clogging and the pheromones capsule at every 5 weeks.

RESULTS AND DISCUSSIONS

The chemical method consist in chemical treatments applying, only if the other methods (agrotechnical, mechanical, physical, biological, a.s.o.) has not limited the pests populations under the economical treshold (P.E.D.)

For the species *Cydia pomonella* L. the most simple criteria for the determination of the right moment for treatments applying it is the adults flight dynamics, established with the pheromones traps.

The adults (male) surveillance has been made with pheromones traps (ATRAPOM), the chemical treatments has been applied applied after 5 – 8 days after the recording of the peak adults flight curve (I. Ghizdavu and L. Oprean).

During 2006 – 2008, at the Didactical Station Banu Maracine, on the observation regarding the biology and ecology of the species *Cydia pomonella* L. (codling moth) we have follwed the efficiency of some products used for control this species.

There has been tested a series of insecticides from the group of synthesis pyrethroids and methamorphosys inhibitor.

The experiments has been set in an apple orchard Starkrimson variety after the randomized block method.

The products efficiency has been established through the frequency of the attked fruits on each variant, analyzing 500 fruits percentage expressed.

Starting with 2006, we have organized an experiment regarding the

pyrethroid products used for controlling the apple codling moth (table 1).

Table 1

The efficiency of some pyrethroid products used for controlling the apple codling moth, in 2006

The Product	Dose (%)	% attacked fruits	Efficiency (E %)
Decis 2,5 EC (Mt)	0,03	9,6	94,5
Fastac 10 EC	0,02	6,2	96,8
Cipertrin 10 EC	0,02	4,2	98,6
Cypermethrin 10 EC	0,03	3,6	99,2
Supersect 10 EC	0,03	4,0	98,8

During the first year of research we have tested five products with an efficiency ranged between 95,5% j at the product Decis 2,5 EC, dose 0,03% considered to be the control variant and 99,2% at the product Cypermethrin 10 EC, dose 0,03%.

The other three products have presented a superior efficiency to the control variant: 96,8% for the product Fastac 10 EC, dose 0,02%, 98,6% for the product Cipermetrin 10EC, dose 0,02% and 98,8% for the product Supersect 10 EC, dose 0,03%.

The percentage of attacked fruits has been ranged between 3,6% for the product Cypermethrin 10 EC and 7,2% for the product Fastac 10 EC, comparative with the product Decis 2,5 EC, considered to be the control variant with 9,6% attacked fruits.

During 2007 there has been tested 6 products from the pyrethroid group, with an efficiency ranged between 96,9% for the product Fastac 10 EC (table 2), 99,4% for the product Cypermethrin 10 EC and 99,6% for the product Supersect 10 EC, comparative with the control variant (Decis 2,5 EC) with an efficiency of 95,2%. The other products have presented a percentage of the attacked fruits ranged between 3,8% and 6,2%. The highest percentage of attacked fruits (9,8%) has been recorded at the variant treated with 37 CE.

Table 2

The efficiency of some pyrethroid products used for controlling the apple codling moth, in 2007

The Product	Dose (%)	% attacked fruits	Efficiency (E %)
Decis 2,5 EC (Mt)	0,03	9,8	95,2
Fastac 10 EC	0,02	7,5	96,9
Cipertrin 10 EC	0,02	4,2	98,7
Cypermethrin 10 EC	0,03	3,6	99,4
Supersect 10 EC	0,03	3,2	99,6
Fastac 2,5 EC	0,01	4,0	98,6

During the third year of research (2008) it came out that the highest efficiency it was recorded at the same variants like in the previous years, 99,8% for Cypermethrin 10 EC, dose 0,03%, 99,4% for Supersect 10 EC, dose 0,03, and 99,3% for Cipermetrin 10 EC, dose 0,02 (table 3).

The lowest efficiency has been recorded at the control variant treated with Decis 2,5 EC. The evolution of the attacked fruits percentage during 2008, has been ranged between 3,2% recorded at the variant treated with Cypermetrin and 6,2% at the variant treated with Fastac, comparatively with the control variant, where has been recorded 6,7% attacked fruits.

Table 3

The efficiency of some pyrethroid products used for controlling the apple codling moth, in 2008

The Product	Dose (%)	% attacked fruits	Efficiency (E %)
Decis 2,5 EC (Mt)	0,03	6,7	95,5
Fastac 10 EC	0,02	6,2	97,9
Cipertrin 10 EC	0,02	4,0	99,3
Cypermetrin 10 EC	0,03	3,2	99,8
Supersect 10 EC	0,03	3,5	99,4
Fastac 2,5 EC	0,01	4,5	98,4

In conclusions, we can ascertain that from all the six pyrethroids we noticed the products Cypermetrin 10 EC, dose 0,03%, Supersect 10 EC, dose 0,03% and Cipermetrin 10 EC, dose 0,02%, which ensured a very good protection, these products can be recommended to be apply in any orchard.

During the research period we have followed the effect of some inhibitor for the arthropods metamorphosis used for control this species.

Thus, we have initiated a series of research regarding the tests of these products, three in the first year and five in the next two years.

The biological efficiency of the inhibitor for the arthropods metamorphosis in 2006 had presented values ranged between 96,8% for the product Dimilin 25 WP, dose 0,03% and 98,7% for the product Calypso 480 SC, dose 0,02% (table 4). At the variant treated with Cascade has been recorded an biological efficiency of 96,8%.

The attacked fruits percentage has been of 3,5% at the variant treated with Calypso 480 SC and 3,8% at the variant treated with Cascade 5 EC, comparative with the control variant treated with Dimilin 25 WP, which has been recorded with a percentage of 5,2%.

Table 4

The biological efficiency of some inhibitors for arthropods metamorphosis used for control the apple codling moth, in 2006

The Product	Dose (%)	% attacked fruits	Efficiency (E %)
Calypso 480 SC	0,02	3,5	98,7
Cascade 5 EC	0,05	3,8	98,2
Dimilin 25 WP (Mt)	0,03	5,2	96,8

During 2007 we have increased to five the number of products.

From the analyze of the results regarding the percentage of attacked fruits, we notice that this percentage has been ranged between 2,7% at the variant treated with the product Calypso 480 SC and 8,2% at the variant treated with the product Rimon 10 EC.

Other variants have presented intermediary values ranged between 3,2% and 5,6% (table 5).

Table 5

The biological efficiency of some inhibitors for arthropods metamorphosis used for control the apple codling moth, in 2007

The Product	Dose (%)	% attacked fruits	Efficiency (E %)
Calypso 480 SC	0,02	2,7	99,6
Cascade 5 EC	0,05	3,2	98,7
Dimilin 25 WP (Mt)	0,03	4,1	97,2
Nomolt 15 SC	0,05	5,6	96,3
Rimon 10 EC	0,06	8,2	93,2

The treatments efficiency has been ranged between 93,2% at the variant treated with Rimon 10 EC and 99,6% at the variant treated with Calypso 480 SC. The other products has been recorded with values of the efficiency over 96%.

In 2008 (table 6), the efficiency of the treatments has been good, with values over 99,8% at the variant treated with Calypso 480 SC, followed by the variant treated with Cascade 5 EC (98,9%) and Dimilin 25 WP considered to be control variant (97,5%).

Table 6

The biological efficiency of some inhibitors for arthropods metamorphosis used for control the apple codling moth, in 2008

The Product	Dose (%)	% attacked fruits	Efficiency (E %)
Calypso 480 SC	0,02	2,6	99,8
Cascade 5 EC	0,05	3,1	98,9
Dimilin 25 WP (Mt)	0,03	4,2	97,5
Nomolt 15 SC	0,05	5,1	95,9
Rimon 10 EC	0,06	4,7	94,8

The other two products has been recorded with values lower than the one recorded at the control variant 95,9% at the variant treated with the Nomolt 15 SC, doza 0,05% și 94,8% la produsul Rimon 10 EC.

CONCLUSIONS

Following the obtained results we can draw the conclusion that for the control of the apple codling moth it can be used without any reserve the products Calypso 480 SC and Cascade 5 EC, which have presented an efficiency over 98,0%.

We have to mention that though the biological products have presented a lower efficiency comparative with the chemical products, we recommend the promotion and use of these products having in mind that these products do not pollute the fruits, ecosystem and the environment.

Also we recommend to choose the product function the vegetation

phenophase of the plants, as well the alternation of the products during the vegetation period, in order to avoid the appearance of resistant forms of the pest due to the exaggerate use of a single product.

REFERENCES

1. **Alfaro Moreno A., 1954** – *Investigaciones sobre la biologie de Cydia pomonella L. en les condiciones de la vegas aragone say y ensvoy de trataments en ella bassados.* Monogr. Minist. Agric. Dir. Gen. Coord.,
2. **Baicu T., Săvescu A., 1978** – *Combaterea intregată în protecția plantelor.* Editura Ceres, București. vol. 17, nr. 4.
3. **Cutin R., 1954** – *Les difficultés de la lutte contre le Carposapse.* – C.R. Journées fruit et maratch Avignon, 131-137.
4. **Georgescu T., Tălmăciu M., 1991** – *Dinamica zborului unor lepidoptere dăunătoare mărului, cu ajutorul capcanelor cu feromoni sexuali sintetici.* Lucrări științifice, vol. 33, seria Horticultură, I. A. Iași.
5. **Ghizdavu L., Oprean L., 1987** - *Feromonii în combaterea insectelor dăunătoare.* Editura Ceres, București.
6. **Szekely I., 1985**– *Reducerea de tratamente chimice în combaterea viermelui merelor (Laspeyresia pomonella L.) element de bază al combaterii intregate.* Lucr. șt. a IX-a Conf. Prot. Plant., București (5-6 sept., 1985)
7. **Șuta Victoria ș.a., 1976** – *Difuzarea rezultatelor științifice în ceea ce privește biologia, ecologia și lupta contra bolilor și dăunătorilor mărului.* Probl. Prot. Plant., 4, 2, 265-257.
8. *****, 2004** – *Codexul produselor de uz fitosanitar omologate pentru a fi utilizate în România.* Ministerul Agriculturii, Pădurilor și Dezvoltării Rurale, București.

HABITAT PREFERENCES, DIVERSITY, MOBILITY, POPULATION ESTIMATES AND CONSERVATION IMPLICATIONS OF SCORPION FAUNA OF SASWAD- JEJURI IN WESTERN INDIA

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Abstract. *Quantitative documentation of biodiversity is an important aspect of ecology. Though, scorpions feature in the diet of predators like owls, biodiversity studies of invertebrate groups like arachnids are limited in our country. Since no quantitative estimates on natural occurrence of scorpion fauna of India are reported earlier, we undertook the present baseline study for evaluation of ecological implications such as prey-predator relation between owls and scorpions in future studies. Our paper deals with habitat preferences, diversity, mobility and population estimates of scorpion fauna of Saswad-Jejuri region in Western India, and highlights the conservation implications of such studies. 8 species of scorpions in 5 genera and 3 families are recorded in 10 habitat types. The interdependence of some habitats categorized as 'wastelands' and hence vulnerable for land use modifications such as plantation, beautification and urbanization, which are inhabited by neglected species groups like scorpions and their predators like owls, is highlighted. This information provides a baseline biological data for further demographic and broader ecological studies and stresses the need for impact assessment prior to undertaking developmental projects, especially since the interdependent taxa like arachnids exhibit restricted movements and are vulnerable to habitat modification.*

Keywords: Arachnids, Scorpion, Biodiversity, Ecological implications, Habitat destruction.

INTRODUCTION

Quantitative documentation of biodiversity is an important aspect of ecology and a hot topic in recent times. Biodiversity of taxa like birds (Pande *et al*, 2003), butterflies (Nayak *et al*, 2004; Padhye, *et al*, 2006) amphibians (Dahanukar and Padhye, 2005), etc. has been recently studied in India. However, biodiversity studies of invertebrate groups like arachnids are limited in our country. Although scorpion fauna of India as a whole has been worked out (Tikader and Bastawade, 1983), previous studies were restricted to qualitative data collection and analysis and publication of checklists of various regions (More & Khatavkar, 1990; Shivshankar, 1992). Further, the habitats occupied by scorpion fauna are often considered as 'wastelands' and are subjected to land use modifications such as plantations for social forestry to meet demands of fuel and fodder, plantations by State Forest Department, introduction of new irrigation facilities leading to

development of orchards, croplands, and other horticultural and beautification activities, industrialization and urbanization. Since minor taxa like scorpions occupy specific microhabitat and exhibit restricted movements as shown in this paper, such habitat modifications can have a negative impact on scorpion populations. Such data can be a baseline for further prey-predator relationships since the scorpions have been recorded in the diet of higher predators in the food chain such as gecko, shrike, owl, civet, mongoose, fox and jackal, all of which are recorded from the study area.

This paper deals with habitat preferences, diversity, mobility and population estimates of scorpion fauna with a systematic and quantitative approach and highlights the conservation implications of such studies. Saswad-Jejuri region in Western India was selected as study area on the basis of report of various species of scorpions in the diet of Spotted Owlet *Athene brama* and Indian Eagle-Owl *Bubo bengalensis* (Pande, et al, 2004; Kumar, 1985; Ramanujam, 2006), which are representative predators in the study area. Since no quantitative studies on natural occurrence of scorpion fauna of India are reported earlier, we undertook the present baseline study for evaluation of ecological implications of prey-predator relation between owls and scorpions in the future. Our study provides a baseline biological data for further demographic and broader ecological studies and emphasizes the need for impact assessment prior to undertaking developmental projects, especially since the taxa like arachnids exhibit restricted movements and are vulnerable to habitat modification (Stepnisky, 1997; Pande et al, 2004).

MATERIAL AND METHODS

Ten different 100 x 100 m quadrates were sampled bi-monthly for the estimation of diversity and populations of scorpion species in Saswad (18^o, 20' N; 73^o, 58 E) and Jejuri (18^o, 15' N; 74^o, 09' E), Tal. Purandar, Dist. Pune, Maharashtra, from March 2004 till March 2005. Nests of Spotted Owlets and Indian Eagle-Owl were previously recorded in the region. In all ten different habitats were noted in various quadrates. These were 1. Loam and stones on hilltop. 2. Scrubland with stones. 3. Veld with stones. 4. Red and black soil in cropland. 5. Grassy hilltop and stones. 6. Black soil in mango orchard. 7. Beneath the tree bark. 8. Hill slope with stones. 9. *Eucalyptus* plantation. 10. Heaped debris and stones.

Heterometrus xanthopus (Pocock, 1897) is a psammophilous fossorial scorpion. The shape of the opening of its burrow is typically semi-circular (More and Khatavkar, 1990). Usually one member occupies one burrow except during parturition when young ones may be present with mother (Pande, et al, 2006. *In Press*). We have taken the number of burrows as a corresponding estimate of their population. We did not excavate each and every burrow of *Heterometerus xanthopus* in the study area. *Hottentotta tamulus tamulus* (Fabr., 1798), *Orthochirus bicolor* (Pocock, 1897) and *Heterometrus phipsoni* (Pocock, 1893) are peleoophilous scorpions found under stones, the latter usually under boulders, hence are readily visible. *Isometrus rigidulus*, Pocock, 1897 and *Hottentotta pachyurus* (Pocock, 1897) were seen to be habitat specific but were also visible. Thus, except *Heterometerus xanthopus*, all other scorpion species in the study area could be directly counted.

All the stones in the quadrates were turned by four experienced and trained observers and scorpion species were identified, counted and recorded in the serial order of encounter in the field (Sutherland, 2000). Various scorpion species were spot identified using published key (Tikader and Bastawade, 1983) and one of the authors of the key (DBB) is also co-author in this communication. A repeat study was done in four adjacent separate quadrates by mark-release-recapture method to estimate the population and movement of the scorpion species *Hottentotta tamulus tamulus* (Sutherland, 2000). All scorpions encountered in the four quadrates were separately colour coded with a touch of oil paint of four different colours, white, yellow, blue and red at the time of sampling, one colour code for each plot. Our pilot studies had revealed that the colour does not disappear up to 3 weeks of marking. So also, every stone under which a scorpion was found was marked by the same colour that was used for the scorpion. One week later all four quadrates were re-sampled and marked scorpions were noted quadrate wise, if they were in the same quadrate or adjacent quadrates; if they were under marked stone or had moved away from it or if any unmarked scorpions or other colour coded scorpions were found in the quadrate. All the observations were recorded.

In order to estimate total number of species that could be present in the study area we constructed species individual curves using data gathered through quadrates. Cumulative number of species recorded was plotted against the number of individuals seen. We fitted Michelis-Menton equation, given by $S = S_{\max} N / (K_m + N)$, where S is the cumulative number of species, N is the cumulative number of individuals, S_{\max} is the maximum number of species that could be present and K_m is the Michelis-Menton constant (Paranjape and Gore, 1997).

Margalef's species richness index was used to compare species richness across habitats (Magurran, 1988). The α -diversity of scorpion species across habitats was calculated using Shannon index of diversity (Magurran, 1988). To calculate whether species are distributed evenly across habitats, evenness index was used (Magurran, 1988). The β -diversity, which represents unshared species, was measured by finding similarity or overlap between scorpion species composition across habitats, using Bray Curtis similarity index (McAleece, 1998). Population estimates were done for three commonly encountered species, *Hottentotta tamulus tamulus*, *Heterometrus xanthopus* and *Orthochirus bicolor*, irrespective of habitat, from direct counts and their mobility was corroborated by applying Peterson's mark-release-recapture method (Sutherland, 2000).

RESULTS AND DISCUSSIONS

Population density: In the quadrate analysis we encountered 6 species of scorpions (table 1) while two more species *Heterometrus granulomanus*, Couzijn, 1981 and *Neoscorpions deccanensis*, Tikader and Bastawade, 1978 were encountered later in the study area but not during quadrate sampling. Therefore the total number species occurring in the study area is 8. However for the estimation of various indices the scorpion species encountered during quadrate sampling are considered (n=6).

The average population density of scorpions irrespective of habitats as well as species was 0.063 / sq m. While species wise population was: 0.042 / sq m for *Hottentotta tamulus tamulus*, 0.017 / sq m for *Heterometrus xanthopus* and 0.005 / sq m for *Orthochirus bicolor*. The population density as corroborated by mark-release-recapture was 0.098 / sq m for all scorpions; and 0.066 / sq m for

Hottentotta tamulus tamulus, 0.054 / sq m for *Heterometrus xanthopus* and 0.006 / sq m for *Orthochirus bicolor*. Population of the remaining species *Hottentotta pachyurus*, *Isometrus rigidulus* and *Heterometrus phipsoni* in the study area is very low (table 1).

Table 1

Habitat wise population indices and % abundance of scorpions

Specification	Habitat										
	Loam and stones on hilltop (1)	Scrubland with stones (2)	Veld with stones (3)	Red & black soil in cropland (4)	Grassy hilltop & stones (5)	Black soil in mango orchard (6)	Under tree bark (7)	Hill slope with stones (8)	<i>Eucalyptus</i> plantation (9)	Heaped debris & stones (10)	Entire study area - all quadrates surveyed (ALL)
RI	0.48	0.62	0.17	0.34	0.35	-	0.26	0.46	0.24	-	0.75
H'	0.93	0.86	0.66	0.59	0.46	-	0.29	0.90	0.57	-	1.1
E'	0.84	0.61	0.95	0.85	0.67	-	0.43	0.82	0.83	-	0.61
% ABUNDANCE OF VARIOUS SCORPION SPECIES IN STUDY AREA											
T%	51.5	69.7	37.3	72.2	82.3	100	8.9	51.9	73.7	0	48.43
H%	39.1	15.6	62.7	0	0	0	0	40.3	0	0	38.87
B%	9.4	13.9	0	27.8	17.7	0	0	7.8	26.3	0	6.54
HP%	0	0.8	0	0	0	0	0	0	0	0	0.13
IR%	0	0	0	0	0	0	0	0	0	100	0.88
P%	0	0	0	0	0	0	91.1	0	0	0	5.16

Key to abbreviations: **RI:** Margalef's species richness index. **H':** Shanon species diversity index. **E:** Evenness index. **T%:** % abundance of *Hottentotta tamulus tamulus*. **H%:** % abundance of *Heterometrus xanthopus*. **B%:** % abundance of *Orthochirus bicolor*. **HP%:** % abundance of *Heterometrus phippsoni*. **IR%:** % abundance of *Isometrus rigidulus*. **P%:** % abundance of *Hottentotta pachyurus*.

The table shows habitat wise values obtained with respect to various parameters in the scorpion survey.

Documentation of mobility: Mark - release - recapture studies were done to evaluate the mobility of *Hottentotta tamulus tamulus*, the most abundant species in the study area. After 1 week of marking and releasing 6.3 % marked scorpions of this species were recaptured under marked stones. 33.3 % scorpions had moved within 50 m of the marked stone. 6.3 % scorpions with one colour code were found in plot with different colour code. 53.9 % unmarked scorpions were found in the four quadrates.

α Diversity indices and Relative abundance studies: Table 1

Species Accumulation Curve (fig. 1) predicts presence of 8 species of scorpions in the study area, of which 6 species in 5 genera of 3 families have been recorded by us within quadrates. We could observe the remaining 2 species outside the quadrates but within the study area, particularly *Heterometrus granulomanus* Couzijn and *Neoscorpiops deccanensis* Tikadar & Bastawade. Overall species richness index is 0.75, whereas evenness index is 0.6 and Shanon diversity index is 1.1. Habitat wise indices are as in table-1. Percent abundance as

shown in table-1 indicates that *Hottentotta tamulus tamulus* (48.43 %) is most dominant and commonly occurring species while *Heterometrus phipsoni* (0.13 %) is the rare species. Habitat wise percent abundance reveals that habitat 6 (Black soil in mango orchard) and habitat 10 (Heaped debris and stones) are inhabited by a single species each, *Hottentotta tamulus tamulus* and *Isometrus rigidulus* respectively. Habitat 2 (Scrubland with stones) shows highest Richness index (RI = 0.62).

β Diversity study by Cladistic (Bray-Curtis) analysis:

Comparison of species composition with various habitats reveals that habitat 10 (Heaped debris and stones) and habitat 7 (Beneath the tree bark) are unique, as they don't show any similarity with any other habitats. All other habitats show 50% or more similarity with each other indicating more species overlap (fig. 1).

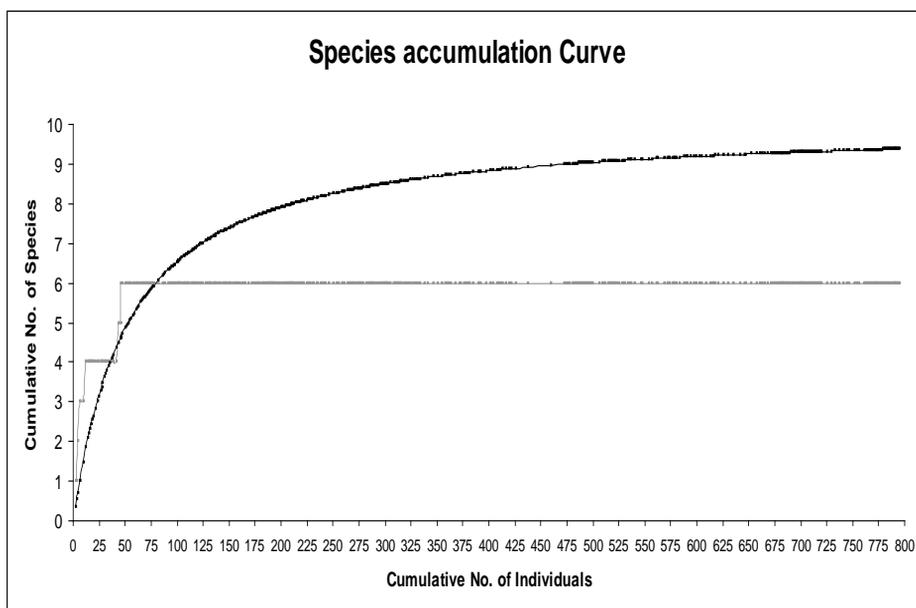


Fig. 1. Species Accumulation Curve of Scorpions of study area. Least square curve had the parameters $S_{max} = 10$, $Km = 53$, predicting the maximum number of species inhabiting the study area to be 10, though we could record only 6 in Quadrates and in all 8 including two found out of Quadrates but in the study area. Black solid line indicates theoretical curve (using Michelis-Menton equation) and Grey line represents the actual quadrat data.

India has about 107 species of scorpion fauna of which 38 species are recorded from Maharashtra in western India (Tikader and Bastawade, 1983). We recorded a total of 8 species (8.4 % of the total scorpion fauna of India and 23.8 % of scorpion fauna of Maharashtra), of which 6 species were found during the quadrat analysis in the study area located in western Maharashtra. Further, though only 6 species of scorpions were recorded in the quadrates, more species are predicted by Species Accumulation Curve (fig. 1), and their presence is

confirmed by us outside the quadrates. Hence even though the apparent loss from quadrate analysis alone predicts lesser damage due to habitat modification, in terms of number of species, the actual loss is higher, a point well brought out in the present study. It therefore stresses the need for holistic approach in Environmental Impact assessment Surveys.

The overall Shannon index is very low indicating low species diversity. The average population density of scorpions irrespective of habitats and species was 0.063 / sq m. The population of *Hottentotta tamulus tamulus* was 0.042 / sq m followed by 0.017 / sq m for *Heterometrus xanthopus* and 0.005 / sq m for *Orthochirus bicolor*. The populations of other species in the quadrate analysis were negligible. While comparing the Shannon Indices of various habitats, it is revealed that the habitats 1, 8 and 2 (1. Loam and stones on hilltop. 2. Scrubland with stones. 8. Hill slope with stones), show higher Shannon Index indicating the higher diversity among the habitats under the current study.

Among these three habitats, Habitat 2 shows highest Richness index (RI = 0.62) as it inhabits 4 species. However, the max Shannon Index is shown by habitat 1 ($H' = 0.93$) as the distribution of individuals within three species is more even than habitat 2 and 8. Maximum Evenness index is shown by habitat 3 ($E = 0.93$) as it inhabits only 2 species but the individuals are distributed more evenly amongst these two species. When we compare the overall percent abundance, *Hottentotta tamulus tamulus* (48.43 %) appears to be the most dominant species whereas *Heterometrus phippsoni* (0.13 %) is the most rare one. However, *Heterometrus xanthopus* is co-dominant with 38.8 % abundance.

Bray-Curtis analysis showed that two habitats, Heaped debris (Habitat 10) and habitat under tree bark (Habitat 7) are preferred only by one species each (*Isometrus rigidulus* and *Hottentotta pachyurus*, respectively). Other two habitats, Loam and stones on hilltop (Habitat 1) and Hill slope with stones (Habitat 8) are preferred by maximum number of scorpions. Scrubland with stone (Habitat 2) inhabits 4 species out of 6 found in quadrate sampling. Currently, these very habitats are considered as 'wasteland' by the State administration and are earmarked for development projects such as plantation, beautification, and urbanization, that will lead to habitat loss through land use modification.

Mark – release – recapture studies have revealed that 39.6 % scorpions of *Hottentotta tamulus tamulus* species had *definitely moved* after one week of initial marking of which 6.3 % had moved from one plot to another, while 33.3 % scorpions had moved within a radius of 50 m. 53.9 % unmarked scorpions were found in the colour coded quadrates. It can be inferred that most of these 53.9 % scorpions must have arrived from plots further away from the marked plots and can be grouped as scorpions that *probably moved*. However, it is possible that some of these unmarked scorpions may have been missed in the first survey when the scorpions were colour marked. 6.3 % scorpions had not moved or had not changed the initial place where it was first marked. We found two *Hottentotta tamulus tamulus* molts under marked stones with freshly molted scorpions under the same stone and these were counted in the category of absent movement. It

may be concluded that at least 90 % scorpions of *Hottentotta tamulus tamulus* species show mobility from less than 50 m to more than 100 m in a period of one week. Since scorpions are not sedentary but nocturnally mobile, they are vulnerable to predation by nocturnal species like owls (Pande et al 2006 *In Press*). Their occurrence in the diet of owls is thus explained. However, the mobility of scorpions is restricted and the habitat of each of the species is specific, hence habitat modifications can have adverse effects on scorpion populations. This can also have repercussions on their predators like owls. Such ecological relationships need further studies, but the interdependence of habitats categorized as wastelands, neglected species like arachnids inhabiting such habitats and predators like elusive owls cannot be underestimated.

Low α diversity indices are obvious while studying taxon like scorpions. The scorpions are well known for their restricted movement, cannibalism, habitat specificity, food size specificity and show extreme climate adaptability, habitat specificity and adaptive radiation (Polis, 1990; Newlands, 1972, 1978). These factors act as the limiting factors as far as the species diversity is concerned.

CONCLUSIONS

Our study is important as it documents the habitat preferences, diversity indices, mobility and population estimates of less known scorpion species from western India, and also focuses on conservation and ecological implications. 8 species of scorpions in 5 genera are recorded in 10 habitat types. The interdependence of some habitats categorized as 'wastelands' and hence vulnerable for land use modifications such as plantation, beautification and urbanization, which are inhabited by neglected species groups like scorpions and their predators like owls, is highlighted. This information provides a baseline biological data for further demographic and broader ecological studies and stresses the need for impact assessment prior to undertaking developmental projects, especially since the taxa like arachnids exhibit restricted movements and are vulnerable to habitat modification (Stepnisky, 1997; Pande et al, 2004).

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REFERENCES

1. Dahanukar N., Padhye A. D., 2005 - *Amphibian diversity and distribution in Tamhini, northern Western Ghats, India*. Current Science, Vol. 88 (9), pp 1496 – 1501.
2. Kumar T. Suresh, 1985 - *The life history of the Spotted Owlet (Athene brama brama, Temminck) in Andhra Pradesh*. Hyderabad: Raptor Research Centre.
3. Magurran A. E., 1988 - *Ecological diversity and its measurement*. Chapman and Hall, London.

4. **McAleer N., 1998** - *BioDiversity Professional Beta*. The Natural History Museum and The Scottish Association for Marine Sciences.
5. **More N. K., R. S. Khatavkar, 1990** - *Burrowing habits of Heterometrus xanthopus*. J. Soil Biol. Ecol. Vol 2, 79-81.
6. **Nayak G., Subramanian K. A., Dadgil M., Achar K. P., Acharya, Padhye A. D., Deviprasad, Bhatta G. K., Ghate H. V., Murugan, Pandit P., Thomas S., Thomas W., 2004** - *Patterns of Diversity and Distribution of Butterflies in Heterogeneous Landscapes of the Western Ghats, India*. ENVIS Technical Report, Center for Ecological Sciences, Indian Institute of Science, Bangalore. No. 18, pp 1 – 38.
7. **Newlands G., 1972** - *Ecological Adaptations of Kruger National Park Scorpionids (Arachnida : Scorpionides)* Koedoe 15:37-48.
8. **Newlands G., 1978** - *Biogeography and Ecology of Southern Africa-Arachnida*. Edts. M.J.A.Werger and A.C.Van Bruggen. Publ.The Hague. Pp. 685-702.
9. **Padhye A. D., Dahanukar N., Paingankar M., Deshpande M., Deshpande D., 2006** - *Season and landscape wise distribution of butterflies in Tamhini, northern Western Ghats, India*. Zoos' Print Journal, Vol. 21(3), pp 2175 – 2181.
10. **Pande Satish, Amit Pawashe, Niranjana Sant, Anil Mahabal, 2004** - *Status, habitat preference and population estimates of non-breeding shrikes Lanius spp. in Maharashtra and Karnataka states, India*. Biological Letters 41(2):65-69.
11. **Pande Satish., Pawashe A., Bastawade D. B., Kulkarni P., 2004** - *Scorpions and molluscs as new dietary record of Spotted Owlet Athene brama brama*. Newsletter for Ornithologists.
12. **Pande Satish; Amit Pawashe, Murlidhar Mahajan, Anil Mahabal, Charu Joglekar, 2007** - *Differential effect of habitat and food on breeding success in rural and urban populations of Spotted Owlet (Athene brama)*. Journal of Raptor Research 41 (1): 26-36.
13. **Pande Satish, A. Pawashe, D. B. Bastawade, A. Padhye, 2006** - *Population, adaptations and risks in burrowing and factors that affect the length of burrow of Heterometrus xanthopus (Pocock) in Maharashtra*. In Press.
14. **Paranjape S. A., Gore A. P., 1997** - *Effort needed to measure Biodiversity*. Int. J. Ecol. Environ. Sci., 23: 173-183.
15. **Polis Gary. A., 1990** - *The Biology of Scorpions*. Stanford University Press. Ca. Pp. 1-585.
16. **Ramanujam M. E., 2006** - *On the prey of the Indian Eagle Owl Bubo bengalensis (Franklin, 1831) in and around Pondicherry, Southern India*. Zoos' Print Journal 21(5): 2231-2240.
17. **Shivashankar T., 1992** - *The Importance of Burrowing for the Scorpion H. fluvipes Koch (Arachnida)*. J. Soil Biol. Ecol.12(2):134-138, Sept.1992.
18. **Stepinsky D. P., 1997** - *Landscape Features and Characteristics of Great Gray Owl (Strix nebulosa) Nests in Fragmented Landscapes of Central Alberta* in Biology and Conservation of Owls of the Northern Hemisphere. Eds. James. R. Duncan, D. H. Johnson and T. H. Nicholls. 185-189 pp.
19. **Sutherland W., 2000** - *The Conservation Handbook*. Research, Management and Policy. Blackwell Science.
20. **Tikadar B.K., Bastawade D.B., 1983** - *Fauna of India: Scorpions: Scorpionida: Arachnida* 3:1-762. Zoological Survey of India, Calcutta.

THE ATTACK QUANTIFICATION OF SOME HARMFUL ORGANISMS ON THE GROWTH AND DEVELOPMENT OF THE EVÉLIN VARIETY ROSE

CUANTIFICAREA ATACULUI UNOR ORGANISME DĂUNĂTOARE ASUPRA CREȘTERII ȘI DEZVOLTĂRII SOIULUI DE TRANDAFIR EVÉLINE

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***Abstract.** The attack of the harmful organisms on the supratherapeutic organs of the rose produce high disturbance in the plant metabolism with influence on the growth and development. The results of the attack effect quantification of the pathogens *Sphaerotheca pannosa* var. *Rosae*, *Diplocarpon rosae*, *Phragmidium mucronatum* and of the aphid *Macrosiphon rosae* on the Evelin variety have shown a negative influence of these ones with repercussion on the quality and commercial feature of the flower. The modification of the biological features of the attacked organs comparative with the healthy organs have oscillated function the harmful organism, the attacked organ proportionally with the attack degree.*

Key words: pathogen, pest, rose, quantification

***Rezumat.** Atacul organismelor dăunătoare asupra organelor supratherane ale trandafirului produce puternice dereglări în metabolismul acestora cu influențe asupra creșterii și dezvoltării. Rezultatele cuantificării efectului atacurilor patogenilor *Sphaerotheca pannosa* var. *rosae*, *Diplocarpon rosae*, *Phragmidium mucronatum* și a afidului *Macrosiphon rosae* asupra soiului de trandafir Eveline au ilustrat influența negativă a acestora cu repercusiuni asupra calității și aspectului comercial al florii. Modificarea însușirilor biologice ale organelor atacate comparativ cu cele neatacate au oscilat în funcție de agentul de dăunare, organul atacat proporțional cu valoarea gradului de atac.*

Cuvinte cheie: patogen, dăunător, trandafir, cuantificare

INTRODUCTION

In the rose crop, as in the case of other ornamental species crops, during the vegetation period, can be signalized the attack of manz harmful organisms, with a negative influence on the growth and development of the plants.

In order to emphasize the fact that the control measures for plant protection are essential for the rose crop, in this paper we present data related to the diminishing of some features at the Eveline rose variety as a consequence of the attack produce by some harmful organisms considered to be „key organisms” for this species.

MATERIAL AND METHOD

There observation regarding the attack produced by the pathogens: *Sphaerotheca pannosa* var. *rosae*, *Diplocarpon rosae*, *Phragmidium mucronatum* and the pest *Macrosiphon rosae* has been made in the „Green Spot” section of the „Nicolae Romanescu” Park, Craiova on the Eveline rose variety cultivated in open field.

The attack frequency and intensity has been calculated for each harmful organism, analyzing 30 attacked plants.

The attack degree has been percentage expressed function the (F) frequency and intensity (I) reported to 100. The data has been interpreted with the results regarding the attack quantification on the growth and developemnt of the rose plants, which has been made through measurements at 30 attack plants comparative with healthy unattacked plants.

The measurements has been made at the end of August and focused on the stem height, leaf dimensions (length, width) and flower diameter.

The results has been statistically calculated using the variation row.

The features diminishing has been calculated using the formula:

$$P\% = \left(1 - \frac{b}{a}\right) \times 100$$

where: b= values at the unattacked organ;

a= values at the attacked organ.

RESULTS AND DISCUSSIONS

The attack of the fungus *Sphaerotheca pannosa* (Wallr.) Lev. var. *rosae* Woron which produce the rose powdery mildew has a negative influence on the growth and development of the organs (stems, leaves, buds), the quantification of the negative effect on the Eveline variety are presented in the table 1.

As it can be observed, the average made of tenattack degree has been of 23,52% which has been materialized on the decrease of the stem height with 16,34 cm, of the leaves length with 4,90 cm and of the leaves width with 2,44 cm comparatively with the unattacked plant. Also, it came aut that the effect of the attack on the leaves and flowery buds produce a decrease of the flower diameter at the attacked plants from 11,06 cm at the unattcked plants to 8,63 cm at the attacked plants.

The black spots produced by the fungus *Diplocarpon rosae* Wolf. it is another frequent disease in the rose crops from the Nicolae Romanescu Park, which in the case of the Eveline variety has been recorded with an average attack degree of 15,42%.

The results regarding the quantification of the negative effect on the Eveline rose variety are presented in table 2. Thus, the stem height decrease to 74,22cm at the attacked plants comparative with 87,54 cm at the healthy unattacked plants; the leaves dimensions at the attacked plants are considerably reduced: length/width 11,41 cm respectively 8,10 cm comparatively with dimensions of the unattacked plants 13,01cm/11,41 cm. As a results the physiological processes in the leaves are affected materialized in to an reduce

growth rhythm with implication in the flower features, with a diameter of 9,25 cm at the attacked plants comparatively with 11,00 cm at the healthy unattacked plants.

Another pathogen in the crop rose has been *Phragmidium mucronatum* (Pers.) Schlecht. Which produce the rose rust, that has been recorded with an average attack of 11,21%, with the most powerful attack recorded at the end of the summer (August).

From the results presented in the table 3, it come out that the diminishing of the attacked leaves dimensions to 12,01 cm/9,00 cm (length/width) comparatively with the unattacked leaves 13,02 cm/10,01 cm, in relative values the decrease of the leaves dimensions being of 16% respectively 12%.

Due to the diminishing of the leaves dimensions (length/width), there has been recorded the decreasing of the stem height and finally as a consequence of the rust attack on the leaves and stems the flower diameter at the attacked plants has decreased to 9,97 cm comparatively with 11,03 cm recorded at the healthy unattacked plants, losing their commercial and esthetic value.

The attack of the aphid *Macrosiphon rosae* L. produce powerful disturbance of the metabolism in the attacked organs, especially through the phytotoxic effect of the proteolytic enzymes introduced by the insect together with their saliva.

In field conditions, the average attack degree of the aphids on the Eveline variety has been of 7,34%. In such infestation conditions there has been quantified the attack effect on the growth and blossom of the plants (table 4). The attack on the leaves has affected the growth rhythm, thus the leaves dimensions (length/width) has been smaller with 13% respectively 11% at the attacked leaves comparative with the healthy unattacked.

The height of the stem has been negatively affected by the attack of the aphids on the cosses and leaves, the healthy unattacked plants presented an average stem height of 87,59 cm, with 11% more than the attacked plants with an average stem height of 79,02 cm.

The most important diminishing has been recorded for the diameter of the flowers, 8,98 cm at the attacked plants with 18% smaller than the diameter of the healthy unattacked plants of 11,04 cm.

Analyzing the data regarding the decreasing of some biological features at the Eveline rose variety following the natural attacks of the harmful organisms (table 5) we can ascertain that the attack of the pathogen *Spaerotheca pannosa* var. *rosae* has produced the most accented diminishing of all the analyzed biological features. The attack of the *Diplocarpon rosae* fungus has affected the development rhythm of the leaves while the attack of the aphid *Macrosiphon rosae* had repercussions that affected the flowers diameter.

Table 1

The attack effect quantification produced by the fungus *Sphaerotheca pannosa* (Wallr.) Lev. var. *rosae* Woron on the growth and development of the Eveline rose variety

Variable	Stem		Leaf				Flower		DA%
	Height cm		Length cm		Width cm		Diametru cm		
	$\bar{X} \pm S \bar{X}$	S%	$\bar{X} \pm S \bar{X}$	S%	$\bar{X} \pm S \bar{X}$	S%	$\bar{X} \pm S \bar{X}$	S%	
Unattacked	89,4±1,23		13,06±0,2	0,87	10,30±0,19	1,05	11,06±0,12	0,62	23,52
Attacked	73,06±1,41		8,86±0,19	1017	7,86±0,19	1,32	8,63±0,13	0,88	
P%	19%		33%		24%		22%		

Table 2

The attack effect quantification produced by the fungus *Diplocarpon rosae* Wolf. on the growth and development of the Eveline rose variety

Variable	Stem		Leaf				Flower		DA%
	Height cm		Length cm		Width cm		Diametru cm		
	$\bar{X} \pm S \bar{X}$	S%							
Neatacat	87,54±1,3	0,6	13,01±0,4	1,01	9,94±0,22	0,80	11,0±0,23	0,69	15,42
Atacat	74,22±1,09	0,78	11,41±0,12	1,02	8,10±0,34	1,76	9,52±0,25	1,66	
P%	16%		20%		21%		17%		

Table 3

The attack effect quantification produced by the fungus *Phragmidium mucronatum* (Pers.) Schlecht. on the growth and development of the Eveline rose variety

Variable	Stem		Leaf				Flower		DA%
	Height cm		Length cm		Width cm		Diametru cm		
	$\bar{X} \pm S \bar{X}$	S%							
Neatacat	87,34±1,05	0,67	13,02±0,31	1,26	10,01±0,20	0,72	11,03±0,24	1,25	10,02
Atacat	78,03±0,87	0,71	12,01±0,30	1,42	9,00±0,24	1,25	9,97±0,20	1,24	
P%	12%		16%		12%		16%		

Table 4

**The attack effect quantification produced by the aphid *Macrosiphon rosae* L.
on the growth and development of the Eveline rose variety**

Variable	Stem		Leaf				Flower		DA%
	Height cm		Length cm		Width cm		Diametru cm		
	$\bar{X} \pm S \bar{X}$	S%							
Neatacat	87,59±0,28	0,18	12,95±0,20	0,85	9,44±0,34	1,02	11,04±0,18	1,04	7,34
Atacat	79,02±1,32	0,94	11,78±0,31	1,23	8,52±0,27	1,34	8,98±1,44	1,32	
P%	11%		13%		11%		%		

Table 5

**The diminishing of some biological features at the Eveline rose variety
following the natural attacks of the harmful organisms**

Harmful organism	Diminuarea însușirilor (P%)				DA%
	Stem	Leaf		Flower	
	Height cm	Length cm	Width cm	Diametru cm	
<i>Sphaerotheca pannosa</i> var. <i>rosae</i>	19	33	24	22	23,52
<i>Diplocarpon rosae</i>	16	20	21	17	15,42
<i>Phragmidium mucronatum</i>	12	16	12	16	10,02
<i>Macrosiphon rosae</i> L.	11	13	11	18	6,84

CONCLUSIONS

1. The natural attacks of the harmful organisms identified in the field rose crop, Eveline variety have determined growth and development changes comparative with the unattacked control variant.

2. The average degree of the attack of the pathogen *Sphaerotheca pannosa* (Wallr.) Lev. var. *rosae* Woron, has been of 23,5% and led to the diminishing of some biological features, 19% for the stem height, 33%/ 24% for the leaf length/width and 22% for the flower diameter.

3. The Eveline rose variety attacked by the fungus *Diplocarpon rosae* Wolf., had recorded the highest diminishing of the leaf area of 20%/ 21%, while the attack of the pathogen *Phragmidium mucronatum* (Pers.) Schlecht. had affected the flower diameter and the leaf length with a decrease of 16%.

4. The yield features losses quantification of the rose plants following the aphids attack has emphasize the diminishing of the stem height with 11%; of the leaves dimensions – length/ width (cm) with 13% respectively 11%; the flowers diameter (cm) with 18%.

REFERENCES

1. **Bordeau Corinne, Gilbert C., 2002** - *Etat sanitaire des plantes florales, rosiers, bulbes ornementaux et gazon en 2000 – 2001*. PHM – Revue Horticole, n. 435, p. 33-35.
2. **Carlson – Nilsson B.U., 2001** - *Evolution of rose species and cultivars for resistance to Marsonine rosae (Diplocarpon rosae)*. Acta Hort. (ISHS) n. 547, p. 413-417.
3. **Marinescu Maria, 2002** - *Trandafirul: cum îi recunoaştem bolile?* Sănătatea pl. N. 49, p. 26.
4. **Montagneux G., Tracol A., 1985** - *Les maladies des Plantes Ornamentales*. Paris, 273p.

RESEARCHES REGARDING THE EPIDEMIOLOGY AND THE DIAGNOSE OF PLUM POX VIRUS AT PLUM

CERCETĂRI PRIVIND EPIDEMIOLOGIA ȘI DIAGNOZA VIRUSULUI PLUM-POX (PPV) LA PRUN

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Abstract. *The researches carried out pursue the identification and the diagnose of Plum pox virus (PPV) in the plum orchards. Over 30 plum cultivars and hybrids were studied. The biological material was analysed from the point of view of the plum behaviour to the contamination to PPV in natural conditions and of his reaction to the imuno enzymatic test ELISA and to the imuno cromatografic test AgriStrip. Depending of the plum cultivar symtomps of the PPV appeared distinct on leaves and fruits. He is considered the most devastating and the most spread virus of plum trees and he has a negative influence in plant production. The serological tests through DAS ELISA and AgriStrip indicated variable viral concentration from 0,333- 0,465 (HNCI/995, Andreea, Vâlcean, Miroval, Corval, Diana, Stanley) to 1,027-2,566 (Silvia, Centenar, Pescăruș, H 57-2-85). The measures against the disease are mostly preventive and consist in using healthy biological material established through control from selected mother plantations witch are periodically verified.*

Key words: ELISA, *Prunus domestica*, AgriStrip, Plum pox.

Rezumat. *Cercetările întreprinse au urmărit identificarea și diagnosticarea virusului Plum-pox (PPV) la prun. Au fost luate în studiu peste 28 de soiuri și hibridi de prun. Materialul biologic a fost analizat din punct de vedere al comportării lui la infecțiile cu PPV în condiții naturale și a reacției acestuia la testul imunoenzimatic ELISA și testul imunocromatografic AgriStrip. În funcție de genotip, atacul de Plum pox s-a manifestat diferențiat pe frunze. Este considerat cel mai grav și răspândit virus la prun, influențând negativ producția de fructe. Analizele serologice prin tehnica DAS-ELISA și AgriStrip, au indicat valori ale absorbanței variabile de la 0,333-0,465 (HNCI 995, Andreea, Vâlcean, Miroval, Corval, Diana, Stanley) la 1,027-2,566 (Silvia, Centenar, Pescăruș, H 57-2-85). Lupta preventivă a infecțiilor cu virusul PPV este aceea de a utiliza material săditor pomicol stabilit prin control ca fiind sănătos, provenit din plante selecționate și verificate periodic din punct de vedere fitosanitar.*

Cuvinte cheie: ELISA, *Prunus domestica*, AgriStrip, Plum pox.

INTRODUCTION

The main hosts for Plum pox virus are all cultivated stone fruit species of the genus *Prunus* including apricot (*Prunus armeniaca*), peach (*Prunus persica*), plum (*Prunus domestica*) and the japanese plum (*Prunus salicina*). Susceptible to

the virus infection are also the wild and the ornamental species of the genus *Prunus* like *P. besseyi*, *P. cerasifera*, *P. insititia*, *P. tomentosa* and *P. spinosa*.

The application of chemical treatments in orchards is absolutely necessary for the control of the Plum pox virus specific vectors. Unlike fungal or bacterial plant pathogens that can be controlled chemically, antiviral treatments to control PPV in the field are not available. However, in the countries where the virus is wide spread, between the cultivated varieties exist differences regarding the susceptibility to the virus infection (Hamdorf, 1986). More, the presence of the virus rises problems to the export of biological plant material.

This paper presents the behaviour of the existent plum genotypes in collections in both natural and isolated conditions and the diagnosis of Plum pox virus for the negative fitovirotic selection and also to obtain resistant or tolerant forms to this virus.

MATERIAL AND METHODS

The study and the tests were made in the national collection of plum at the Fruit Growing Research&Extension Vâlcea. The plants were analyzed visual regarding the presence or absence of the PPV symptoms on leaves and fruits in both natural and isolated conditions.

As biological material were used leaves sampled from the inside of the crown from 30 plum varieties, rootstocks and hybrids, samples that didn't manifested any characteristic symptoms of Plum pox virus. The samples collected represented the antigen for the immunoenzymatic test DAS-ELISA (Double Antibody Sandwich-Enzyme Linked Immunosorbent Assay). The reagents used for the tests came from the firm Bioreba (figure 1). Also was performed the test for the fast diagnosis of the PPV for 25 from the 30 samples that were studied. The AgriStrip test (figure 2) consists in the detection and confirmation in several minutes of the Plum pox virus for the species of the genus *Prunus* without the specification of the amount of the viral protein present in the sample analyzed.



Fig. 1. The ELISA test



Fig.2. The AgriStrip test

RESULTS AND DISCUSSIONS

From the evaluations made on the plum biological material studied regarding his behaviour to the PPV infections resulted that only a part of the plants presented symptoms characteristic to the virus.

The samples analyzed through the two methods and their reactions showed that the virus is present also in latent form.

The spread of the Plum pox virus was rapid and sure from the infected plant to the health plant thanks to the vectors of the virus from the orchards and to the presence of the hosts infected

The datas from the table 1 show that from the 30 sample analyzed through DAS-ELISA using polyclonal antibodies only 9 proved to be infected: the hybrids H 70-25-83, H 74-17-83, H 12-48-85, H 57-2 -85 and the varieties Silvia, Centenar, Tuleu gras, Pescăruș and Tegera. The values of the ELISA absorbance at 404 nm point out variable viral concentration from 1,027/1,091 at the variety Silvia to 2,565/2,566 at the variety Pescăruș comparative with the values of the positive witness (3,000) from the firm producing kits for the diagnose of the PPV Bioreba.

The genotypes HNC/1995, Andreea, Rival, Oltval, Miroval, Carpatin, Stanley, Vânăț românesc, Tita, etc. proved to be healthy, state demonstrated through ELISA values very low from 0,327/0,331 to 0,459/0,581.

The values of the ELISA absorbance regarding the negative witness were 0,423/0,427, values very close to the value of the 21 samples analyzed and proved to be healthy.

A number of 25 samples represented by plum varieties, rootstocks and hybrids were tested for the presence of Plum pox virus through the imunocromatografic method AgriStrip (table 2). Through this method only the variety Tegera proved to be infected. Thus, the positive results obtained through DAS-ELISA weren't confirmed through the AgriStrip method regarding the

hybrids H 70-25-83, H 74-17-83, H 12-48-85, H 57-2-85 and the varieties Centenar, Tuleu gras and Pescăruș.

Probably through AgriStrip the detection of the virus exist only in case the amount of the viral protein is proper to be made evident (values of approximately 2,566).

The tests made through both DAS-ELISA and AgriStrip assured the negative fitovirotic selection regarding PPV. Thus, the plum biological material virus free can be used in the breeding and multiplication programs.

Table 1

The reaction to PPV of the plum biological material through DAS-ELISA

No. crt.	Variety/Hybrid/Rootstock	Place of sampling	ELISA values (at 1 h)	Sample reaction
1	H 70-25-83	G culture R11/P2	1,435 / 2,137	+
2	HNC/1995	Greenhouse	0,333 / 0,344	-
3	H 74-17-83	G culture R30/P3	1,891 / 2,071	+
4	H 12-48-85	G culture R31/P1	0,993 / 1,015	+
5	Andreea	G culture R1/P2	0,331 / 0,727	-
6	Dobrovika	Greenhouse	0,333 / 0,335	-
7	Andreea	G culture R1/P4	0,327 / 0,338	-
8	H 57- 2 - 85	G culture R35/P1	1,034 / 1,061	+
9	Vâlcean	G culture R14/P3	0,449 / 0,465	-
10	Silvia	G culture R16/P2	1,027 / 1,091	+
11	Centenar	G culture R18/P2	1,485 / 1,540	+
12	Tuleu gras	G culture R19/P1	2,565 / 2,566	+
13	Pescăruș	G culture R20/P2	2,401 / 2, 554	+
14	Rival	Pl.mother cuttings R1/ P21	0,562 / 0,581	-
15	Oltval	Pl.mother cuttings R2/ P3	0,334	-
16	HNC/1995	Pl.mother cuttings P4	0,338 / 0,343	-
17	Miroval	Pl.mother cuttings P2	0,344 / 0,345	-
18	Pinval	Pl.mother cuttings	0,419 / 0,438	-
19	Oțeșani 11	Pl.mother cuttings R1 / P2	0,334 / 0,345	-
20	Oțeșani 8	Pl.mother cuttings R 4 / P2	0,372 / 0 ,374	-
21	Corval	Pl.mother cuttings R9 / P2	0,335 / 0,453	-
22	Mirobolan 2 V	Pl.mother cuttings R1 / P18	0,455 / 0,459	-
23	Carpatin / răd.proprii	Bio-depositary 2	0,336 / 0,342	-
24	Tuleu gras /răd. proprii	Bio-depositary 2	0,334 / 0,335	-
25	Stanley / răd. proprii	Bio-depositary 2	0,345 / 0, 354	-
26	Diana	Bio-depositary 2	0,342 / 0,345	-
27	Vânăt românesc / răd. proprii	Bio-depositary 2	0,355 / 0,359	-

28	Tita CI 1/ răd. proprii	Bio-depositary 2	0,361 / 0,363	-
29	Centenar CI 15 / mirob.	Bio-depositary 2	0,354 / 0,373	-
30	Tegera	R4/ P7	2,565 / 2,566	+
Negative witness			0,423 / 0,427	-
Positive witness			3,00	+

Note: + = infected sample
 - = healthy sample

Table 2

The reaction to PPV of the plum biological material through the imunocromatografic method AgriStrip

No. crt	No. sample	Variety/Hybrid/Rootstock	Sample reaction (After 15 min)
1	1	H 70-25-83	*
2	2	HNC/1995	-
3	3	H 74-17-83	*
4	4	H 12-48-85	*
5	5	Andreea	-
6	6	Dobrovika	-
7	7	Andreea	-
8	8	H 57- 2 - 85	*
9	9	Vâlcean	-
10	10	Dobrovika	-
11	11	Centenar	*
12	12	Tuleu gras	*
13	13	Pescăruş	*
14	14	Rival	-
15	15	Oltval	-
16	16	HNC/1995	-
17	17	Miroval	-
18	18	Pinval	-
19	19	Oteşani 11	-
20	20	Oteşani 8	-
21	21	Corval	-
22	22	Mirobolan 2 V	-
23	23	Carpatin/own roots	-
24	24	Tuleu gras/own roots	-
25	30	Tegera	+

Note: + = infected sample
 - = healthy sample
 * = doubtful result

CONCLUSIONS

1. The Plum pox virus (PPV) is the most spread and devastating virus that affects plum trees with repercussions on the quality of the fruit-growing biological material and of the fruits. The symptoms induced by the virus on the leaves manifested differently, from low evident to very evident or in certain cases the leaves were without symptoms (latent infection).

2. The immunoenzymatic method DAS-ELISA and the immunochromatographic method AgriStrip showed that the hybrids H 70-25-83, H 74-17-83, H 12-48-85, H 57-2-85 and the varieties Silvia, Centenar, Tuleu gras, Pescăruș și Tegera were infected with PPV.

3. The negative values showed at the plum analyzed samples HNC/1995, Andreea, Dobrovika, Vâlcean, Rival, Oltval, Miroval, Pinval, Oteșani 11, Oteșani 8, Corval, Mirobolan 2V, Carpatin/own roots, Tuleu gras/own roots, Stanley/own roots, Vânăț românesc/own roots, Tita Cl.1/own roots, Diana, Centenar Cl.15/mirobolan revealed that the analyzed biological material was not infected with the Plum pox virus (PPV).

4. The plum genotypes virus free resulted from the lab tests can be used as healthy biological material in the multiplication process and in the breeding programs.

REFERENCES

1. **Botu I., Botu M., Presa S., Achim Gh.** - *A new concept regarding the improvement of plum tree breedings with tolerance to PPV (Plum pox)*. Annales of the University of Craiova, Vol. XI (XLVII), 2006
2. **Hamdorf G., 1986** - *The susceptibility of some plum cultivars to plum pox virus*. Acta Horticulturae, nr.193
3. **Isac M., Șarpe C., Călinescu M.** - *Utilizarea metodei Das-Elisa și a culturii „in vitro” în diagnosticarea și devirozarea materialului biologic pomicol*. Lucrări Științifice, seria Horticultură, anul XLVIII (48), 2005, vol. 1 și 2. Editura “ Ion Ionescu de la Brad”, Iași
4. **Minoiu N., 1994** - *Epidemiologia și combaterea Plum pox-ului la prun*. Protecția Plantelor SNPP IV, 13, București
5. **Preda S., Isac M., 1994** - *Cercetări privind diagnosticul virusurilor la S.C.D.P. Vâlcea*. Protecția Plantelor SNPPN, 13, București

VINE'S PHYTOSANITARY CONTROL IN 2008

CONTROLUL FITOSANITAR AL VIȚEI DE VIE ÎN 2008

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Abstract. *Vine's pathogenic and deleterious agents represent the main cause of yield loss, the attack severity, in certain climatic conditions, being able to compromise the entire yearly crop. As a result, the phytosanitary vine protection research are directed today towards finding means to proficiently control the pathogenic agents, in order to obtain a maximum yield, but by preserving the natural background. Experiments conducted by S.C.D.V.V. Iasi consisted in building up an incorporated program to control the main pests and pathogenic agents, by using high-end pesticides, during 2008, which proved to be efficient, with a positive influence on crop yield.*

Key words: pathogen, pest, protection, vine.

Rezumat. *Agenții patogeni și dăunătorii viței de vie reprezintă principala cauză a pierderilor de recoltă, severitatea atacului, în anumite condiții climatice, putând compromite întreaga producție a anului. Ca urmare, cercetările de protecție fitosanitară a viței de vie sunt direcționate în prezent spre găsirea mijloacelor de combatere cât mai eficiente a patogenilor, în condițiile obținerii unui maxim de recoltă, pe fondul conservării sistemului natural exploatat. Experimentarea în cadrul S.C.D.V.V. Iași a unui program de combatere integrată a principalilor agenți patogeni și dăunători, cu pesticide de ultimă generație, pe parcursul anului 2008, a asigurat o eficacitate deosebită, cu o influență pozitivă asupra producției.*

Cuvinte cheie: patogen, pesticid, protecție, viță de vie.

INTRODUCTION

In the last decades, the issue of limiting the use of pesticides has become more and more common, as a result of the fact that, besides the positive effects, the excessive use of these products can have undesired outcomes; thus, their partial replacement with other methods and means of yields protection has become compulsory.

Moreover, on the background of global climatic and implicitly local changes, at the level of biocenosis occur modifications that can determine the increase of the virulence level of certain pathogen agents.

Therefore, the researches have been focused on finding the means for obtaining the maximum of yield, in the conditions of conserving the natural exploited system.

Through the integrated control of the pathogen agents and vine pests, we aimed, within the Polygon of Plant Protection of S.C.D.V.V. Iași, at rationalizing the chemical methods, by increasing the biological and biotechnical phytoprotection share.

MATERIAL AND METHOD

The experiment was organized in the Polygon of Plant Protection of the Station of Research and Development for Viticulture and Vinification on the Aligoté variety, grafted on Kober 5BB, planted at the distance of 2.2 m between the lines and 1.2 m per line, on a surface of 3 ha, on a land with south-west exposure and slant of 5-7 %.

The crop system practiced in our area is the semi-protected one, and the soil maintenance on the intervals between the lines is alternative, black field- long duration grass overgrowing. For establishing the best moment to apply the treatment, we monitored the main climatic elements from the own meteorological platform (maximum, minimum air, soil temperature, precipitations, hygroscopicity and solarization) we monitored the growing dynamics of the sprouts and the soil phenology. Through the phytosanitary control from the polygon, we registered and evaluated the numerical density of the main pathogen agents (manna, mildew, grey rot of grapes), respectively pests (moths, acarians).

We placed pheromone traps and we established the acarians reserve from the parcel. We carried out nine treatments, on warning, using the MPSP-300 splashing pump, equipped with MVL 10.01 type nipples, at the pressure of 2,5 Bars.

In addition, we carried out all the technological works specific to the viticultural plantations (cutting, encircling and tying the chords, reviewing the support system, works for soil maintenance, clearing of weeds and management of sprouts, top removal and leaf removal, harvesting).

RESULTS AND DISCUSSIONS

During the vegetation period, the atypical evolution of the climatic factors (table 1), of the agricultural year 2007-2008, and the soil phenology (table 2) had a determinant role in appreciating the moment for applying the treatments.

The ecoclimatic conditions from the vegetation period were characterized through a heliothermal reduced regime on the background of rich hydric resources. April started with a gradual heating, and the frequent precipitations registered during 14 days have determined the triggering of non-uniform vegetation on April 18th 2008.

The month also presented under the thermal aspect a constant heating without great variations, however the precipitations from the end of the month, respectively the hailstone from May 25th 2008 imposed the necessity of a phytosanitary intervention. For the cicatrization of wounds, we used a bordolese juice, and for combating the mildew, we used Kumulus.

The average temperature from June of 20.2^oC and the frequent precipitations registered in 10 days with rains that were not rich quantitatively, were favorable factors for the development of *Plasmopara viticola* fungus. The manna was aggressive both on the leaves and on the young inflorescences.

On the background of a great pressure of attack and of some very favorable conditions, from July, with the daily average temperatures comprised between 15.9^o C-25.4^o C and 15 days with rains, which summed up 155.2 mm, of almost 2.5 times the normal monthly value, the manna continued to be aggressive both on the young tops, on the leaves (fig. 1,2) and on the grapes and shoots).



Fig. 1 and 2. The vine manna (*Plasmopara viticola*) – attack on the leaves

Table 1

**Climatic data from Copou Iași viticultural centre
in the agricultural year 2007-2008**

Month	Monthly average (t°C)		Absolute max (t° C)	Absolute min (t° C)	Precipitations (l/m ²)		Hygroscopicity (%)		Insolation (hours)	
	Norm	2008			Norm	2008	Norm	2008	Norm	2008
IV	10.1	10,9	23,1	1,6	40.3	99,7	62	73	171.3	136,6
V	16.1	15,4	28,2	5,8	52.5	64,6	62	66	220.9	243,5
VI	19.4	20,2	30,6	8,4	75.1	74,7	63	64	264.6	263,2
VII	21.3	20,9	34,5	10,8	69.2	155,2	62	64	294.4	257,6
VIII	20.6	21,6	38,0	8,9	57.6	70,9	63	65	272.2	309,6

Table 2

The phenology of Aligoté variety in the agricultural year 2007-2008

Variety	Debudding	Flowering	Dough	Ageing	Fall of leaves
Aligoté	16 IV	10 VI	5 VIII	15 IX	16 X

For comparison, we disposed of the program of splashes in a near-by parcel, cultivated with the same variety and with an untreated control variant. We have to mention the fact that, during the year 2008, the program of phytosanitary interventions for the two parcels was different (table 3, 4).

Table 3

Program of phytosanitary interventions in the demonstrative lot

No.	Phenophase	Pathogenic agents	Recommended product
1.	Debudding - Vine shoot 5-10 cm	Acarians Midlew	Calcium sulphate juice 2 %
2.	Vine shoot 10 -25 cm, 6/27.05.2008	Manna Midlew, Moths	Verita 2,5 Falcon 0,3 Calypso 0,100 Bordolese juice 5,0 Kumulus 3,0
3.	Before the blooming 05.06.2008	Manna Midlew	Profler 2,5 Folicur solo 0,4
4.	End of blooming 13/16.06.2008	Manna Midlew Rot	Verita 2,5 Flint max 0,180 Teldor 1,0
5.	Growth of grapes 25.06.2008	Manna Midlew	Eclair 0,5 Flint max 0,180
6.	Compacting of grapes 07.07.2008	Manna Midlew	Antracol 3,0 Flint max 0,180

		Rot, Moths	Rovral 1,0, Decis 0,200
7.	At 10-14 days after the last treatment 8.07.2008	Manna Midlew	Melody Compact 1,5 Flint max 0,180
8.	Before the beginning of dough 07.08.2008	Manna Midlew	Bordolese juice 5,0 Kumulus 3,0
9.	Beginning of dough 25.08.2008	Rot	Mythos 3,0

Table 4

Program of phytosanitary interventions in the comparative parcel- Production farm – S.C.D.V.V. Iași

No.	Phenophase	Pathogenic agents	Recommended product
1.	Debudding - Vine shoot 5-10 cm - 24.04.2008	Acarians Midlew	Calcium sulphate juice
2.	Vine shoot 10 -25 cm 26/27 .05.2008	Manna Midlew	Bordolese juice Kumulus
3.	Before the blooming 06.06.2008	Manna Midlew	Ridomil Topas
4.	End of blooming 19.06.2008	Manna Midlew	Mikal, Ridomil Topas
5.	Growth of grapes 08.07.2008	Manna, Midlew, Rot	Manzate, Ridomil, Bordolese juice, Topas, Mythos
6.	Compacting of grapes 28.07.2008	Manna, Midlew, Rot	Folpan, Bordolese juice Topas, Kumulus, Mythos

Thus, after the analyses regarding the attack of the main pathogen agents, manna, mildew (fig. 3) and the grey rot of grapes (fig. 4) we calculated the intensity, frequency and degree of attack of the pathogens, both within the demonstrative lot of the comparative parcel and of the untreated control (table 5).



Fig. 3. Mildew of *Uncinula necator* grape vine – attack on the leaves



Fig. 4. The grey rot of grapes *Botryotinia fuckeliana* – attack on the grapes

We notice the obvious difference between the values obtained in the degree of attack of the three pathogens compared to the values registered in the untreated control. Also, we notice a slight difference between the values of the attack degree registered on the comparative parcel compared to the demonstrative lot.

Table 5

Comparative results regarding the attack of the main pathogen agents

Agents monitored	Demonstrative lot			Comparative parcel			Untreated control		
	I %	F %	G.A.	I %	F %	G.A.	I %	F %	G.A.
Manna on the leaves	21,7	46,55	10,11	35,65	74,14	26,36	64,3	100	64,35
Manna on the grapes	7,89	52,42	4,13	16,02	68,08	11,04	48,6	84,13	40,89
Mildew on the leaves	4,42	16,87	0,75	8,78	14,86	1,30	5,9	56,81	3,35
Mildew on the grapes	5,06	6,66	0,34	6,79	13,65	0,92	5,26	32,75	1,72
Grey Rot on the leaves	5,27	11,49	0,61	7,88	28,49	2,32	8,04	37,5	3,02
Productions obtained (kg)	10 000			4 500			-		

This thing attests the fact that the fungicides used within the combating program have protected very well both the leaves and the grapes, the production obtained in 2008 in the demonstrative lot parcel being of 10 t/ha.

Table 6

The physical-chemical characteristics of the wines obtained from the Aligoté variety

Variety	Production t/ha	Must		Wine	
		Sugars g/l	Acidity g/l H ₂ SO ₄	Alcohol % vol	Acidity g/l H ₂ SO ₄
Aligoté- demonstrative lot	10	195	5,2	11,5	4,8
Aligoté- comparative parcel	4,5	168	4,8	9,9	4,2

The production growth was of 5.5 t/ha in the variant of the demonstrative lot, as we notice from table 6 as well, the ageing of grapes occurred in an appropriate manner. Because of the healthy vegetal apparatus, a normal but superior accumulation of reducer sugars was also registered. The reduction of acidity during the period of ageing registered a decreasing, smooth evolution, ensuring a balance in conformity with the technological requirements.

On the background of a small biological reserve, the populations of tetranychidae and eriophyse Acarians (fig. 5, 6) were maintained under control and as a result of the treatment carried out at the phonological moment of sprouts of 5-7 cm, with the product calcium polysulphide.



(5)



(6)

Fig. 5 and 6. The grape vine erinosis -*Eriophyes vitis* – attack on the leaf

The flight of grape vine moths (fig. 9,10) was monitored with the help of pheromone traps (fig. 7,8), the efficacy of insecticides Calypso and Decis 25 WG being ensured by maintaining the pests under the economic threshold of deterioration.



(7)



(8)

Fig. 7 and 8. Aspects regarding the placement of pheromone traps



Fig. 9. The green moth of *Lobesia botrana* grape vine



Fig. 10. The brown moth of *Clysia ambiguella* grape vine

CONCLUSIONS

1. Among the fungicides applied for combating the manna, the Verita fungicide in dose of 2.5 k/ha has ensured the best protection in the Aligoté variety, taken in the study.

2. The efficacy of the insecticides Calypso and Decis 25 WG have ensures the maintenance under the economic deterioration threshold of the vine grape moths.

3. The production of 10 t/ha obtained in the demonstrative lot and the production increase of 5.5 t/ha compared to the comparative parcel, to which we add the production quality, confirm the good efficacy of the products used and the importance of complying with the phytosanitary combating programs.

REFERENCES

1. Iacob Viorica, Ulea E., Hatman M., Puiu I., 2000 - *Fitopatologie horticolă*. Editura "Ion Ionescu de la Brad", Iasi;
2. Sandru D. I., 1996 - *Protejarea culturilor agricole cu ajutorul pesticidelor*. Editura "Helicon", Timisoara;
3. Săvulescu T., 1941 - *Mana viței de vie, Studiu monographic*. Academia Română, Bucuresti.
4. Săvescu A., Rafailă C., 1978 - *Prognoza în protecția plantelor*. Editura Ceres, Bucuresti.
5. Tomoiaga Liliana, 2006 - *Bolile și dăunătorii viței de vie – prevenire și combatere*. Editura "Mediamira", Cluj-Napoca.

OBSERVATIONS REGARDING THE CARABIDS' FAUNA (COLEOPTERA - CARABIDAE) FROM THE APPLE ORCHARDS

OBSERVAȚII CU PRIVIRE LA FAUNA DE CARABIDE (COLEOPTERA - CARABIDAE) DIN PLANTAȚIILE POMICOLE DE MĂR

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Abstract: *The observations were made in period 2005 - 2007, in the apple orchards belonging to Stăniliești – Vaslui area. The material was collected by means of Barber soil traps. In order to kill the captured insects, a formol solution 3 – 4% concentration has been used. The traps' collectings were made from 10 to 20 days in between, during the vegetative season. From the collected material, the carabids were separated and identified. The most common species, with the highest number of collected exemplars were: Pseudophonus rufipes De Geer, Harpalus distinguendus Duft., Pseudophonus griseus Panz., Amara aenea Dejean, Amara familiaris Duft.*

Keywords: carabids fauna, apple orchards

Rezumat: *Observațiile au fost făcute în perioada 2005 - 2007, în plantațiile pomicole de măr din zona Stăniliești – Vaslui. Colectarea materialului a fost făcută cu ajutorul capcanelor de sol de tip Barber. Pentru omorârea insectelor capturate, s-a folosit o soluție de formol 3 - 4% concentrație. Recoltarea materialului colectat s-a făcut la intervale de 10 – 15 zile, pe durata perioadei de vegetație. Din materialul colectat au fost selectate speciile de carabide care au fost apoi determinate. Speciile cu cel mai mare număr de samples și cel mai frecvent colectate au fost: Pseudophonus rufipes De Geer, Harpalus distinguendus Duft., Pseudophonus griseus Panz., Amara aenea Dejean, Amara familiaris Duft.*

Cuvinte cheie: lepidoptere miniere, plantatii pomicole

INTRODUCTION

The study of Coleopterans (the beetles) seems a scientific and practice necessity, taking in consideration their frequency on Terra meridians, the big number of species contained (across 250. 000), the biggest from class Insecta, which group more than one million species, and the numerous species that damage the world agriculture.

MATERIALS AND METHODS

The observations were made in period 2005 - 2007, in the apple orchards belonging to Stăniliești – Vaslui area. The material was collected by means of Barber soil traps. In order to kill the captured insects, a formol solution 3 – 4% concentration has been used.

The traps' collectings were made from 10 to 20 days in between, during the vegetative season. From the collected material, the carabids were separated and identified.

RESULTS AND DISCUSSIONS

In 2005 the species with the highest number of samples were: *Pseudophonus rufipes* Dej. with 853 samples, presenting 66,69% from total, *Harpalus distinguendus* Dej. with 195 samples, presenting 15,24% from total, *Pseudophonus griseus* Panz. with 85 samples, presenting 6,64% from total, *Amara aenea* Degeer. with 48 samples, presenting 3,75% from total, *Amara familiaris* L. with 37 samples, presenting 2,89% from total, *Calathus fuscipes* Panz. with 19 samples, presenting 1,48% from total.

The other species had a much smaller number of samples and there is one species (*Broscus cephalotes*) that had a single copy (Table 1).

In 2005 the species with the highest number of samples were: *Pseudophonus rufipes* Dej. with 520 samples, presenting 68,43% from total, species *Harpalus distinguendus* Dej. with 112 samples, presenting 14,74% from total, *Pseudophonus griseus* Panz. with 43 samples, presenting 5,65% from total, *Amara aenea* Degeer. with 24 samples, presenting 3,15% from total, *Amara familiaris* L. with 22 samples, presenting 2,89% from total, *Calathus fuscipes* Panz. with 15 samples, presenting 1,97% from total.

The other species had a much smaller number of copies, with a total of 6 species (*Carabus besseri* Fischer., *Zabrus tenebrioides* Goeze, *Carabus glabratus* Paykull, *Amara crenata* Dejean., *Idiochroma dorsalis* Pontopp. and *Amara apricaria* Payk.) who had only one copy (Table 1).

In 2007 the most frequent collected species were: *Pseudophonus rufipes* Dej. with 625 samples, presenting 65,30% from total, species *Harpalus distinguendus* Dej. with 127 samples, presenting 13,27% from total, *Pseudophonus griseus* Panz. with 59 samples, presenting 6,17% from total, *Amara familiaris* L. with 43 samples, presenting 4,49% from total, *Amara aenea* Degeer. with 29 samples, presenting 3,03% from total, *Calathus fuscipes* Panz. with 21 samples, presenting 2,19% from total.

The other species had a much smaller number of copies, with a total of 6 species (*Brachynus explodens* Dftsch., *Carabus glabratus* Paykull, *Harpalus aeneus* F., *Amara apricaria* Payk., *Abax carinatus* Duft. and *Cicindela germanica* L.) who had only one copy (Table.2)

It is noted that during 2005 - 2007, the species with the highest number of samples collected were: *Pseudophonus rufipes* Dej. with 1998 samples, urmată de speciile *Harpalus distinguendus* Dej. with 434 samples, *Pseudophonus griseus* Panz. with 187 samples, *Amara aenea* Degeer. with 101 samples, *Amara familiaris* L. with 102 samples, *Calathus fuscipes* Panz. with 55 samples, etc. Other species have a smaller number of samples collected.

Table 1

**The abundance of carabids species collected between 2005 and 2007
from the apple orchard**

No.	Name of species	YEAR			Total
		2005	2006	2007	
1	<i>Pseudophonus rufipes</i> Dej.	853	520	625	1998
2	<i>Harpalus distinguendus</i> Dej.	195	112	127	434
3	<i>Pseudophonus griseus</i> Panz.	85	43	59	187
4	<i>Amara aenea</i> Degeer	48	24	29	101
5	<i>Amara familiaris</i> L.	37	22	43	102
6	<i>Calathus fuscipes</i> Panz.	19	15	21	55
7	<i>Anisodactylus signatus</i> Panz.	6	4	11	21
8	<i>Brachynus explodens</i> Dftsch.	5	3	1	9
9	<i>Brachynus crepitans</i> L.	5	3	9	17
10	<i>Amara similata</i> Degeer.	5	2	11	18
11	<i>Harpalus calceatus</i> Duft.	4	2	7	13
12	<i>Carabus violaceus</i> L.	4	2	4	10
13	<i>Carabus besseri</i> Fischer.	3	1	2	6
14	<i>Zabrus tenebrioides</i> Goeze	3	1	-	4
15	<i>Panagaeus crux-major</i> Linneus	2	-	-	2
16	<i>Carabus glabratus</i> Paykull	2	1	1	4
17	<i>Dolichus halensis</i> Schall.	2	-	3	5
18	<i>Broscus cephalotes</i> L.	1	-	-	1
19	<i>Harpalus aeneus</i> F.	-	2	1	3
20	<i>Amara crenata</i> Dejean.	-	1	-	1
21	<i>Idiochroma dorsalis</i> Pontopp.	-	1	-	1
22	<i>Amara apricaria</i> Payk.	-	1	1	2
23	<i>Abax carinatus</i> Duft.	-	-	1	1
24	<i>Cicindela germanica</i> L.	-	-	1	1
TOTAL		1279	760	957	2996

The values of ecological parameters (A, C, D, W) is as follows (table 2):

The abundance (A) represents the number of the samples collected. This have the values between 1998 samples (*Pseudophonus rufipes* Dej.) and 1 samples (*Broscus cephalotes* L., *Amara crenata* Dejean., *Idiochroma dorsalis* Pontopp., *Abax carinatus* Duft., *Cicindela germanica* L.).

This have the most value at the species: *Harpalus distinguendus* Dej. (144,66 samples), *Pseudophonus griseus* Panz. (62,33 samples), *Amara aenea* Degeer (33,66 samples) and *Amara familiaris* L. (34,00 samples).

The dominance (D), depending on the values of this indicator, the species collected is classified thus:

- 18 subrecedent species, with the domination indices < 1,1%;
- on specie – recedent specie, with the domination indices between 1,1-2,0% (*Calathus fuscipes* Panz.);

- 2 species - subordinate species, with indices between 2,1-5% (*Amara aenea* Degeer and *Amara familiaris* L.);
- on species - dominate, with indices between 5,1-10,0% (*Pseudophonus griseus* Panz.);
- 2 species – eudominate, with the domination indices > 10% (*Pseudophonus rufipes* Dej. and *Harpalus distinguendus* Dej.).

The constancy (C) have the values between 6,25% et 75%. Depending on the values of this indicator, the species collected is classified thus:

- 8 accidental species with indices between 1-25%: *Dolichus halensis* Schall., *Broscus cephalotes* L., *Harpalus aeneus* F., *Amara crenata* Dejean., *Idiochroma dorsalis* Pontopp., *Amara apricaria* Payk., *Abax carinatus* Duft. and *Cicindela germanica* L.
- 10 accessory species with indices between 25,1-50%: *Pseudophonus rufipes* Dej., *Pseudophonus griseus* Panz., *Anisodactylus signatus* Panz., *Amara similata* Degeer., *Harpalus calceatus* Duft., *Carabus violaceus* L., *Carabus besseri* Fischer., *Zabrus tenebrioides* Goeze, *Panagaeus crux-major* Linnaeus and *Carabus glabratus* Paykull;
- 6 constante species with indices between 50,1-75%: *Harpalus distinguendus* Dej., *Amara aenea* Degeer, *Amara familiaris* L., *Calathus fuscipes* Panz., *Brachynus explodens* Dftsch. and *Brachynus crepitans* L.;
- euconstante species with indices between 75,1-100%, was not a species.

Parameter of ecological semnification (W) represents the relationship between structural indicators (C) and productive (D).

Percentage calculated on the amount of the species are distributed in the following classes:

- accidental species, values index below 0.1%, are 12 species: *Carabus besseri* Fischer., *Zabrus tenebrioides* Goeze, *Panagaeus crux-major* Linnaeus, *Carabus glabratus* Paykull, *Dolichus halensis* Schall., *Broscus cephalotes* L., *Harpalus aeneus* F., *Amara crenata* Dejean., *Idiochroma dorsalis* Pontopp., *Amara apricaria* Payk., *Abax carinatus* Duft. and *Cicindela germanica* L.
- accessories species with index values between 0,1-5,0% are 10 species: *Pseudophonus griseus* Panz., *Amara aenea* Degeer, *Amara familiaris* L., *Calathus fuscipes* Panz., *Anisodactylus signatus* Panz., *Brachynus explodens* Dftsch., *Brachynus crepitans* L., *Amara similata* Degeer., *Harpalus calceatus* Duft. and *Carabus violaceus* L.
- characteristic species of apple plantations, which have index values between 5,1-10,0% and above 10.0% are 2 species: *Pseudophonus rufipes* Dej. (33,345%) and *Harpalus distinguendus* Dej. (9,955%)

Table 2

The average size of the ecological parameters (A,C,D,W) of the carabids species collected between 2005 and 2007 in the apples orchards

No.	Species	A	D	C	W
1	<i>Pseudophonus rufipes</i> Dej.	666,00	66,69	50,00	33,345
2	<i>Harpalus distinguendus</i> Dej.	144,66	14,48	68,75	9,955
3	<i>Pseudophonus griseus</i> Panz.	62,33	6,24	37,50	2,340
4	<i>Amara aenea</i> Degeer	33,66	3,37	68,75	2,317
5	<i>Amara familiaris</i> L.	34,00	3,40	68,75	2,337
6	<i>Calathus fuscipes</i> Panz.	18,33	1,84	75,00	1,380
7	<i>Anisodactylus signatus</i> Panz.	7,00	0,70	50,00	0,350
8	<i>Brachynus explodens</i> Dftsch.	3,00	0,30	56,25	0,168
9	<i>Brachynus crepitans</i> L.	5,66	0,57	56,25	0,320
10	<i>Amara similata</i> Degeer.	6,00	0,60	31,25	0,187
11	<i>Harpalus calceatus</i> Duft.	4,33	0,43	31,25	0,134
12	<i>Carabus violaceus</i> L.	3,33	0,33	37,50	0,124
13	<i>Carabus besseri</i> Fischer.	2,00	0,20	43,75	0,087
14	<i>Zabrus tenebrioides</i> Goeze	2,00	0,13	50,00	0,065
15	<i>Panagaeus crux-major</i> Linnaeus	2,00	0,06	31,25	0,018
16	<i>Carabus glabratus</i> Paykull	1,33	0,13	50,00	0,065
17	<i>Dolichus halensis</i> Schall.	2,50	0,16	12,50	0,020
18	<i>Broscus cephalotes</i> L.	1,00	0,03	6,25	0,002
19	<i>Harpalus aeneus</i> F.	1,50	0,10	12,50	0,013
20	<i>Amara crenata</i> Dejean.	1,00	0,03	6,25	0,002
21	<i>Idiochroma dorsalis</i> Pontopp.	1,00	0,03	6,25	0,002
22	<i>Amara apricaria</i> Payk.	2,00	0,06	6,25	0,004
23	<i>Abax carinatus</i> Duft.	1,00	0,03	6,25	0,002
24	<i>Cicindela germanica</i> L.	1,00	0,03	6,25	0,002

CONCLUSIONS

In 2005 they were collected 18 carabide species belonging to 11 genera and 8 Subfamilies, family Carabidae, with a total of 1279 samples collected in 2006 were 760 samples of carabide belonging to 19 species, 9 genera and 6 Subfamilies,

In 2007 the family Carabidae were collected 732 samples of carabide (Coleoptera - Carabidae) belonging to 19 species

The most frequent collected species were: *Pseudophonus rufipes* Dej. with 1998 samples, urmată de speciile *Harpalus distinguendus* Dej. with 434 samples, *Pseudophonus griseus* Panz. with 187 samples, *Amara aenea* Degeer. with 101 samples, *Amara familiaris* L. with 102 samples, *Calathus fuscipes* Panz. with 55 samples etc.

REFERENCES

1. **Chatened du Gaetan, 1990** - *Guide des Coleopteres d'Europe*. Délaçrois et Niestlé, Paris.
2. **Panin I., 1951** - *Determinatorul Coleoptereilor daunatoare si folositoare din R.P.R.* Editura de Stat, Bucuresti.
3. **Reitter E., 1908** - *Fauna Germanica*. Die Käfer des Deutschen Reiches Band I, Stuttgart.
4. **Rogojanu V., Perju T., 1979** - *Determinator pentru recunoasterea daunatorilor plantelor cultivate*. Editura Ceres, Bucuresti.
5. **Talmaciu M., Georgescu T., Mitrea I., Filipescu C., Badeanu Marinela, Radu C., 1996** – *Contributions to the knowing of the carabid fauna of the vine plantation in Husi vineyard, Vaslui District*. 1996 - *Lucrari stiintifice*, vol. 39, Seria Horticultura, U.S.A.M.V. IASI, pp.267 - 271.
6. **Talmaciu M., Talmaciu Nela, Diaconu A, 2007** - *The efficacious fauna of carabids (Coleoptera: Carabidae) from apple plantations in north-eastern Romania*. Symposium Intern. „Plant Protection and plant Health in Europe” Germania-Berlin, vol.no. 82, p.114-115. ISSN 0306-3941, ISBN 13:978-1-901396-82-9.
7. **Tălmaciu M.,Tălmaciu Nela, Diaconu A., Artene I., 2006** - *Contribution in relation to cognition structure, dynamics and abundances of species from coleopteres (Coleoptera) in plantation of apple*. *Rev. Cercetări agr. în Moldova*, vol 4 (128), p.33-41, ISSN 0379-5837
8. **Varvara M. et all., 1981** – *Aspectes of the fauna of Carabidae in sugar beet crop, Dobridor, Doly county*. *An St.Univ.” Alex.I.Cuza” Iași*, T.XXVII, II, Biol., 75-80.

INVASIVE SPECIES – POWERFUL COMPETITORS TO THE NATIVE SPECIES

SPECIILE INVAZIVE – CONCURENTE PUTERNICE ALE SPECIILOR AUTOHTONE

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Abstract. *In Romania, as well as in Europe, there are many vegetal and animal species that have acclimated here and rapidly spread aggressively occupying even larger areas, and their activity often influences negatively the ecosystems in which they grow. The number of invasive species registered in Romania is very large; it comprises plants such as Galisoga parviflora, mammals such as Canis aureus, birds such as Streptoptelia decaocto, fishes such as Ictalurus nebulosus, gasteropods such as Rapana tomasina, aranea such as Latrodectus spp. The largest number of invasive species is represented by the insects, some of them being veterans of the invasion, such as Leptinotarsa decemlineata, Hyphantria cunea, Phylloxera vastatrix, Quadraspidiotus perniciosus and other new guests such as Phyllonorychter robiniella and Parecopta robiniella, Cameraria ohridella, Diabrotica virgifera virgifera, Anoplophora chinensis și Anoplophora malasiaca, Linepithema humile, Losius neglectus. All these species have a powerful negative impact on the cultivated plants or on the spontaneous flora and they don't present specific entomofag, which makes them difficult to control with biological methods.*

Key words: invasive species, impact, fauna.

Rezumat. *În Romania, ca de altfel și în Europa, există numeroase specii vegetale și animale care s-au aclimatizat aici, iar activitatea lor influențează adesea negativ mediul înconjurător. Diseminarea acestor specii departe de arealul lor de origine a fost favorizată de accelerarea procesului de globalizare, sub toate formele sale. Intensificarea schimburilor comerciale, acvatice sau terestre, intensificarea turismului, schimbările climatice globale, constituie tot atâtea categorii de factori majori, favorizanți ai speciilor invazive. În lucrarea de față ne propunem centralizarea datelor existente pe plan național până la această dată, legate de prezența și activitatea speciilor de animale invazive, (nevertebrate și vertebrate) și evidențierea efectelor negative pe care le atrage instalarea lor în noile ecosisteme.*

Cuvinte cheie: specii invazive, impact, fauna

MATERIAL AND METHOD

In this paper there was made a study on the fauna, correlated to all the information existing already and after that we have tried to bring together and interpret the results and the effects they have on nature. An invasive species is a species whose population has the ability to massively cover new and wide areas and which lead to an exaggerated increase in the number of organisms. These species produce ecological disequilibrium in the invaded ecosystem, being also helped by the absence of any natural enemies (parasites or predators) which would be able to limit the reproduction rate.

RESULTS AND DISCUSSIONS

The following table presents the most popular species of invertebrates noticed on the territory of Romania (table 1).

Table 1

Invasive invertebrates signalled on the territory of Romania

No.	Scientific name	Common name	Order	Family	Year
Branch Mollusca-Class Gastropoda					
1	<i>Rapana venosa</i> Vall.	-	<i>Monotocordia</i>		1947
Branch Mollusca-Class Bivalvia					
2	<i>Mya arenaria</i> L.	-	Myoidae	<i>Myidae</i>	1967
Branch Arthropoda- Class					
3	<i>Latrodectum</i> spp.	Black widow	Aranea	Tiredida	-
Branch Arthropoda- Class Insecta					
4	<i>Dicerca furcata</i> Thun.	-	<i>Coleoptera</i>	<i>Buprestidae</i>	2002
5	<i>Leptinotarsa decemlineata</i> Say.	Colorado beetle	<i>Coleoptera</i>	<i>Chrysomelidae</i>	Europa 1922, România-Săpânța 1952
6	<i>Diabrotica virgifera virgifera</i>	-	<i>Coleoptera</i>	<i>Chrysomelidae</i>	Europa 1992, România-Nădlac 1996.
7	<i>Pedicia apusenica</i>	-	<i>Diptera</i>	<i>Pediciidae</i>	1986
8	<i>Ula mixta</i>	-	<i>Diptera</i>	<i>Pediciidae</i>	1983
9	<i>Dicranota brevicornis</i> Niels.	-	<i>Diptera</i>	<i>Pediciidae</i>	1981
10	<i>Lossius neglectus</i>	Ant garden	<i>Hymenoptera</i>	<i>Formicidae</i>	-
11	<i>Linepithema humile</i> Mayr.	Australian ant	<i>Hymenoptera</i>	<i>Formicidae</i>	-
12	<i>Formica rufa</i>	Ant forest	<i>Hymenoptera</i>	<i>Fromicidae</i>	-
13	<i>Phylloxera vastatrix</i> Plank.	-	<i>Homoptera</i>	<i>Phylloxeridae</i>	Europa 1863, România-Dealul Mare 1884
14	<i>Quadraspidiotus perniciosus</i> Comst.	Testos scale	<i>Homoptera</i>	<i>Diaspididae</i>	1933 Bihor
15	<i>Eriosoma lanigerum</i> Hansm.	Linus scale	<i>Homoptera</i>	<i>Eriosomatidae</i>	Europa 1787
16	<i>Hyphantria cunea</i> Drury	American withe butterfly	<i>Lepidoptera</i>	<i>Arctiidae</i>	1949 Bihor
17	<i>Cameraria ohridella</i> Desch.	-	<i>Lepidoptera</i>	<i>Gracilariidae</i>	1986
18	<i>Parectopa robiniella</i> Clem.	-	<i>Lepidoptera</i>	<i>Gracilariidae</i>	1989
19	<i>Phyllonorichter robiniella</i> Clem.	-	<i>Lepidoptera</i>	<i>Gracilariidae</i>	1989

In the table 1 there are presented 19 out of more 100 species of invertebrates, respectively the most dangerous ones and newest on the territory of our country. It can be easily noticed that more than 90% are insects. Some of them entered this habitat at the beginning of the last century, others very recently.

From the species entered a long time ago we distinguish *Phylloxera vastatrix* which practically destroyed European vineyards immediately after it had reached Europe, the vineyard did not have any resistance mechanism against this pest and the main measure which had to be taken in order to revive viticulture was to import and then use American engrafts. Another pest coming from the same area is the Colorado potato beetle -*Leptinotarsa decemlineata*, which gradually and relatively quickly conquered the potato crops in Europe, remaining until this day the most dangerous pest for Solanaceae. In the fight against this pest there were used various chemical methods to which the organisms gradually developed resistance.

From the species recently appeared in Romania we can individualize coleoptera *Diabrotica virgifera virgifera*- a corn rootworm from the West which reached Europe and our country at the time of the war in Yugoslavia and it is advancing to the East at great speed being possible to reach Lunca Prutului corn crop in a few years. This pest is helped by the fact that it does not have any natural enemies, it spends the winter in eggs under the ground. Another species – horse chestnut leaf-miner - *Cameraria ohridella* was signalled in Europe in 1986 and in our country in 1996, thus, in a decade, it succeeded in covering a surface larger than 2000 km, a rather strange fact, as this is known as a strictly monophagous species with a reduced potential of dissemination. This species is also distinguished by the lack of natural enemies. Leaf mines and leaf miners - *Phyllonorycter robiniella* and *Parectopa robiniella* are also new inhabitants in Europe and our country, starting from 1989, both species are monophagous and lack natural enemies in the ecosystems of our country.

But as we mentioned earlier, not only the invertebrate species could have an invasive character, vertebrates as well. The table below shows the most popular species of invasive vertebrates noticed on the territory of our country during this century (table 2).

Out of these, many species of fish have invaded Romanian freshwaters to the detriment of many aboriginal species (topmouth gudgeon- *Pseudorasbora parva*), and also many species of birds and mammals, for example the golden jackal - *Canis aureus*, was present only scarcely in the south of the country, whereas now it lives in packs, conquering the areas left free by the decrease in number of wolf packs; the Florida turtle or *Trachemys scripta elegans* conquers the areas inhabited by the aboriginal species; the Euroasian collared-dove - *Streptopelia decaocta* has invaded the territory occupied by the aboriginal species *Streptopelia turtur* (the feeding but also the nesting territory), to their detriment.

Table 2

Invasive vertebrates signalled on the territory of Romania

No.	Scientific name	Common name	Order	Family	Year
Branch Vertebrata-Class Pisces					
1	<i>Lepomis eupomotis gibosus</i>	Sun perch	<i>Teleosteeni</i>	<i>Centrarchidae</i>	19th century
2	<i>Ctenopharyngodon idella</i>	Withe amur	<i>Teleosteeni</i>	<i>Ciprinidae</i>	1960
3	<i>Mylopharyngodon piceus</i>	Brack amur	<i>Teleosteeni</i>	<i>Ciprinidae</i>	1965
4	<i>Hypophthalmichthys nobilis</i>	-	<i>Teleosteeni</i>	<i>Ciprinidae</i>	1960
5	<i>Hypophthalmichthys molitrix</i>	-	<i>Teleosteeni</i>	<i>Ciprinidae</i>	1960
6	<i>Ictalurus nebulosus</i> L.	-	<i>Siluriformes</i>	<i>Ictaluridae</i>	1908 in Sf. Ana Lake
7	<i>Pseudorasbora parva</i>	-	<i>Teleosteeni</i>	<i>Ciprinidae</i>	1960
8	Class Reptilia				
9	<i>Chrysemys (Trachemys) scripta elegans</i>	Florida turtle	<i>Chelonia</i>	<i>Emididae</i>	After 1990
Class Aves					
10	<i>Streptopelia decaocta Friv.</i>	-	<i>Columbiformes</i>	<i>Columbidae</i>	1872- Calafat, 1950 in the carpathian area
11	<i>Phasianus colchicus</i> L.	pheasant	<i>Galliformes</i>	<i>Phasianidae</i>	Introduced in Europe and in our country in the 17th century
12	<i>Coturnix coturnix</i> L.	quail	<i>Galliformes</i>	<i>Phasianidae</i>	-
13	<i>Passer hispaniolensis</i>	Spanish sparrow	<i>Passeriformis</i>	<i>Passeridae</i>	1964
14	<i>Turdus pilaris</i> L.	-	<i>Passeriformis</i>	<i>Turdidae</i>	1972
15	<i>Strutio camelus</i>	ostrich	<i>Struthioniformes</i>	<i>Struthionidae</i>	20th century
Clasa Mammalia					
16	<i>Alces alces</i> L.	Elan	<i>Artyodactyla</i>	<i>Bovidae</i>	1960
17	<i>Ovis amon musimon</i> Pall.	mouflon	<i>Artyodactyla</i>	<i>Bovidae</i>	Disappeared from our habitat and reintroduced in the 20th century
18	<i>Canis aureus moreticus</i> Geoff.	Sacal	<i>Carnivora (Fissipeda)</i>	<i>Canidae</i>	-
	<i>Marmota marmota</i> L.	Marmot	<i>Rodentia</i>	<i>Sciuridae</i>	Disappeared from our habitat and reintroduced in 1973

19	<i>Nyctereus procynoides</i>	Enot	<i>Carnivora (Fissipeda)</i>	<i>Canidae</i>	1951
20	<i>Mustela vision</i>	mink	<i>Carnivora (Fissipeda)</i>	<i>Mustelidae</i>	Its number is 5 times or more than that of the European species.
21	<i>Rhinolophus euryale euryale Blas</i>	-	<i>Chiroptera</i>	<i>Rhinolophidae</i>	-
22	<i>Myotis bechsteinii</i> Leis.	-	<i>Chiroptera</i>	<i>Vespertilionidae</i>	1965
23	<i>Myotis ikonnikovii</i> Ag.	-	<i>Chiroptera</i>	<i>Vespertilionidae</i>	1962
24	<i>Neomys anomalus milleri</i> Mott.	-	<i>Insectivora</i>	<i>Soricidae</i>	1958
25	<i>Ondatra zibetica</i> L.	Bizam	<i>Rodentia</i>	<i>Cricetidae</i>	1905
26	<i>Cricetus migratorius migratorius</i> Pall.	-	<i>Rodentia</i>	<i>Cricetidae</i>	1963
27	<i>Myocastor coypus</i>	coypu	<i>Rodentia</i>	<i>Myocastoridae</i>	1960
28	<i>Rattus alexandrinus</i>	-	<i>Rodentia</i>	<i>Muridae</i>	-

CONCLUSIONS

During the last 100 years, on the territory of our country have entered more than 200 species of vertebrate and invertebrate animals, some of them having the ability to rapidly disseminate, others conquering the habitat of other, aboriginal species.

The insects are amongst the most numerous, in 2005 the statistics made at national level registered more than 98 species in the category of invasive species.

The invasive species of insects with the widest presence amongst cultivated plants but also with the greatest ability to disseminate *Diabrotica virgifera virgifera*, *Cameraria ohridella*, *Parectopa robinella*, *Phyllonorycter robinella*. Another extremely invasive species is *Rapana venosa*, which destroyed the whole population of oysters in the Black Sea and it is now affecting the population of blue mussels.

We mention as a destructive vertebrate the golden jackal - *Canis aureus*, which 10 years ago could be hardly met in the south of the country, but today it wanders in large packs, occupying the habitat of the aboriginal wolf; the Euroasian collared-dove - *Streptopelia decaocta* which occupies the habitat of the turtle dove - *Streptopelia turtur*; as well as numerous species of fish, native from Asia, which entered the Romanian waters and feed on the roe and larvae of the aboriginal species.

REFERENCES

1. **Bădeanu Marinela, Sandu Tatiana, Slabu Cristina, 2007** - *Recherches sur les maladies et les ravageurs de quelques especes des arbres ornamentales utilisee dans les jardins particulieres*. Lucr. Șt. Vol. 50, Seria Horticultură Iași, ISSN 1454-7376.
2. **Botnariuc N., 1987** - *Monitoringul ecologic*. Ocrotirea naturii și Mediului înconjurător, (Ecological Monitoring, Nature and Environment Preservation), 31,2; 109-115.
3. **Perju T., Olteanu I., 2001** - *La dynamique des populations de la mineuse du feuillage (Cameraria ohridella DESCHKA & DIMIC), insecte niosible du chataignier ornamental (Aesculus hippocastanum L.)*. Bul. Inf. Soc. Lepidopter. Soc., **12** (1-4): 121-126
4. **Rakosy L. 1999** - *Molia castanului sălbatic Cameraria ohridella DESCHKA & DIMIC, 1986 (Lepidoptera: Gracillariidae) în România*. II. Bul. Inf. Soc. Lepidopter. Rom., **10** (1-2): 67-70.
5. **Sandu Tatiana, Trofin Alina-Elena, Bădeanu Marinela, Păduraru E.I., Bernardis R., Dascălu M.C., 2007** - *Aspecte privind activitatea de monitoring forestier în Ocolul Silvic Vaduri-Neamț.* („Observations regarding the forestry monitoring activity in Vaduri-Neamț Forest Ward”). Lucr. Șt. Vol. 50, Seria Horticultură Iași, ISSN 1454-7376

RESULTATS CONCERNANT LA BIOLOGIE, L'ÉCOLOGIE ET LA LUTTE INTEGREE CONTRE LE MINIER PLAQUE (*PHYLLONORYCTER CORYLIFOLIELLA* HBN.) DANS LES PLANTATIONS DE POMMIER

REZULTATE PRIVIND BIOLOGIA, ECOLOGIA ȘI LUPTA INTEGRATĂ A MINIERULUI (*PHYLLONORYCTER CORYLIFOLIELLA* HBN.) DIN PLANTAȚIILE DE MĂR

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Rezumat. On a fait l'expérience dans la période 2007-2008, dans les plantations de pommier de la SCDP Iași. Dans l'ouvrage on présente les résultats des recherches sur la propagation, la morphologie, la biologie, l'écologie et la lutte intégrée contre l'espèce *Phyllonorycter corylifoliella* Hbn., ravageur important dans les plantations de pommier de la zone de Iași. A la suite des recherches on a constaté que l'espèce *Phyllonorycter corylifoliella* Hbn a trois générations par an et hiverne dans le stade de larve. Sur la base des observations concernant la biologie et la dynamique de l'attaque de minier on a poursuivi aussi l'efficacité de certains produits insecticides, à savoir: Decis 25 WG –0,003%, Calypso 480SC – 0,02%, Vichtenon 50 WP – 0,05%, Mospilan 20 SP –0,02% et Fyfanon 50 EC –0,175%.

Mots - clés: *Phyllonorycter corylifoliella*, plantation de pommier, lutte intégrée

Rezumat. Experiența s-a efectuat în perioada 2007-2008, în plantațiile de măr de la SCDP Iași. În lucrare se prezintă rezultatele cercetărilor asupra răspândirii, morfologiei, biologiei, ecologiei și combaterii integrate a speciei *Phyllonorycter corylifoliella* Hbn., dăunător important în plantațiile de măr din zona Iași. În urma cercetărilor efectuate, s-a constatat că specia *Phyllonorycter corylifoliella* Hbn are trei generații pe an și ierneză în stadiul de larvă. Pe baza observațiilor privind biologia și dinamica atacului acestei molii miniere s-a urmărit și eficacitatea unor produse insecticide și anume: Decis 25 WG – 0,003%, Calypso 480SC – 0,02%, Vichtenon 50 WP – 0,05%, Mospilan 20 SP – 0,02% și Fyfanon 50 EC –0,175%.

Cuvinte cheie: *Phyllonorycter corylifoliella*, plantație de măr, luptă integrată

INTRODUCTION

Phyllonorycter corylifoliella Hbn. este răspândue dans toute l'Europe, l'Amérique du Nord et dans l'Asie. En Roumanie on la rencontre presque dans tout le pays, les zones à plus grandes densités, et dans lesquelles les dégâts sont plus considérables, se concentrant surtout au centre du pays.

Des recherches sur le minier plaqué ont été effectuées tant à l'étranger (Baggiolini 1961, Alvarez 1966, Veresceaghina et col. 1968, cités par Beșleagă Ramona-

2008) que dans notre pays (Popa 2000, Artenie I., et collab. 2007, Frăsin Loredana, 2005 etc.).

MATERIAU ET METHODE

On a entrepris les recherches concernant la biologie, l'écologie et la lutte intégrée contre le minier plaqué – *Phyllonorycter corylifoliella* Hbn dans la période 2007 – 2008 dans les plantations de pommier de la SCDP Iași.

On a identifié l'espèce par des observations directes au verger et on en a fait la détermination au laboratoire après avoir collecté un riche matériel consistant en feuilles atteintes avec des insectes se trouvant en différents stades de développement.

Sur la base des observations concernant la biologie et la dynamique de l'attaque de cette espèce on a suivi aussi l'efficacité de quelques produits insecticides, à savoir: Decis 25 WG – 0,003%, Calypso 480SC – 0,02%, VICTENON 50 WP – 0,05%, Mospilan 20 SP – 0,02%, Fyfanon 50EC – 0,175%.

RÉSULTATS ET DISCUSSIONS

A la suite des observations effectuées à la S.C.D.P. Iași, dans la période 2007-2008, il a résulté que l'espèce *Phyllonorycter corylifoliella* Hbn. a trois générations par an et hiverne au stade de larve mature (tab.1).

Ainsi en 2007: G I – 12 mai-12 juin

G II – 13 juin– 22 juillet

G III – 23 juillet– 11 mai

En 2008: G I – 5 mai – 5 juin

G II – 3 juin – 25 juillet

G III – 20 juillet– 6 mai

Comme on peut l'observer de la table, à cause des conditions de climat, l'espèce *Phyllonorycter corylifoliella* Hbn. est apparue approximativement une semaine plus tôt en 2008, par rapport à 2007.

Par exemple, en 2007, dans les conditions de Iași, la transformation des larves en chrysalide à la I-e génération a eu lieu au mois de mai (12.V – 31.V) et les adultes ont apparu dans la dernière décade de mai (27.V) et en 2008, la transformation des larves en chrysalide a eu lieu toujours au mois de mai (5.V-17.V), les adultes apparaissant à la fin du mois de mai (23.V – 31.V).

Quant à la lutte intégrée contre cette espèce, on présente les résultats concernant l'efficacité des produits chimiques utilisés dans la tab.2

La meilleure efficacité des produits chimiques utilisés pour lutter contre l'espèce *Phyllonorycter corylifoliella* Hbn. a été enregistrée avec Calypso 480 SC (0,02%) en 2007, l'efficacité étant de 99,95%, et en 2008, on a enregistré la meilleure efficacité avec le produit Mospilan 20 SP (0,15%) de 99,99%, quand on a obtenu une production de 34,20 t/ha.

Table 1

Fiche centralisatrice pour l'espèce *Phyllonorycter corylifoliella* Hbn
dans les années 2007-2008 à la SCDP Iași

Stade	Génération					
	GI		GII		GIII	
	2007	2008	2007	2008	2007	2008
Larve	12.V-25.V	5.V-17.V	13.VI-25.VI	3.VI-15.VI	23.VII-14.III	20.VII-9.III
Chrysalide	19.V-31.V	12.V-26.V	23.VI-5.VII	13.VI-23.VI	15.III-28.III	12.III-20.III
Adulte	27.V-7.VI	23.V-31.V	5.VII-12.VII	19.VI-7.VII	26.III-7.IV	18.III-28.IV
Oeuf	5.VI-12.VI	28.V-5.VI	10.VII-22.VII	7.VII-25.VII	27.IV-11V	15IV-6.V

Table 2

Efficacité de quelques insecticides utilisés dans la lutte contre l'espèce *Phyllonorycter corylifoliella* Hbn.
dans la période 2007-2008 à la SCDP Iași

Variante	2007			Prod. de fruits t/ha	2008			Prod. de fruits t/ha
	Efficacité				Efficacité			
	G I	G II	G III		G I	G II	G III	
V1-Mospilan 20 SP	99,93	99,92	99,94	29,65	99,95	99,97	99,99	34,20
V2 - Decis 25 WG	99,81	99,86	99,94	24,25	99,88	99,91	99,95	30,55
V3- Calypso 480 SC	99,94	99,92	99,95	30,25	99,97	99,92	99,98	31,15
V4- VICTENON 50 WP	99,97	99,85	99,87	23,85	99,81	99,85	99,88	29,73
V5-Fyfanon 50 EC	99,71	99,00	99,85	23,20	99,75	99,80	99,85	29,84
Témoin	4,30	2,60	3,25		3,32	3,45	3,12	

On a eu de bons résultats avec les autres produits aussi: Decis 25 WG (0,003%), une production de 24,25 t/ha pour l'année 2007 et de 30,55 t/ha pour l'année 2008, VICTENON 50 WP et Fyfanon 50 EC, dont l'efficacité a mené à la réalisation d'une production de 23 t/ha, en l'an 2007 et de 29 t/ha, en l'an 2008.

CONCLUSIONS

- dans les conditions de la zone de Iași, *Phyllonorycter corylifoliella* Hbn., a 3 générations/an (G I: mai-juin; G II: juin-juillet; G III: juillet-mai) et hiverne au stade de larve mature, dans les feuilles tombées;

- en ce qui concerne la lutte chimique, pendant les deux années d'étude, on a obtenu les meilleurs résultats avec les produits: Calypso 480 SC et Mospilan 20 SP et Decis 25 WG.

BIBLIOGRAPHIE

1. **Artenie I., Filipescu C., Georgescu T., Tălmăciu Nela, Bernardis R., 2007** – *Biology, ecology and integrated control of the species Leucoptera scitella Zell pest in the apple plantations from Husi-Vaslui area*. Lucr. șt.vol 1(50), seria Horticultură. Editura „Ion Ionescu de la Brad”, Iași.
2. **Baggiolini M., Naury G., 1961** – *Essais de lutte contre la mineuse sinueuse du feuillage des arbres fruitiers (Lyonetia clerckella L.)*. Revista Rom. Agric. Arbor., 17 Lausanne
3. **Beșleagă Ramona, 2008** – *Cercetări privind biologia, ecologia și combaterea principalilor dăunători din plantațiile de măr, în condițiile ecosistemului pomicol Iași*. Rezumatul tezei de doctorat, U.S.A.M.V. Iași
4. **Frăsin Loredana, 2005** – *Cercetări biologice și de combatere a minierului placat – Phyllonorycter corylifoliella Hbn., în condițiile zonei pomicole Mărăcineni-Argeș*. Teză de doctorat, U.S.A.M.V. București
5. **Popa P., 2000** – *Contribuții la studiul sistematic, morfologic, biologic și ecologic asupra lepidopterelor miniere dăunătoare în plantațiile de măr din Moldova*. Rezumatul tezei de doctorat, USAMV Iași.

THE STUDY OF SEXUAL PHEROMONE TRAPS FOR PEST MONITORING, CABBAGE MOTH – *MAMESTRA BRASSICAE L*

STUDIUL UNOR VARIANTE DE FEROMONI SEXUALI PENTRU MONITORIZAREA DĂUNĂTORULUI BUHA VERZEI – *MAMESTRA BRASSICAE L*.

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Abstract. *For experiments we have used the sexual pheromone traps: V1 – Mb 2008 and V2 – Atrabras (The control). The first generation of adults of Cabbage moth was observed in May and early June. They were caught 1,5 males/traps in V1 – Mb 2008 and 0,5 males/traps in V2 - Atrabras (The control). The second generation of Cabbage moth flew in August. The sexual pheromone traps were caught 11,9 ex/trap in V1 – Mb 2008 and 4,6 ex/trap in V2-Atrabras (The control). The results have been used for flying diagrams from first and second generations and for established the efficiency of MB 2008 – new pheromone variant.*

Key words: sexual, pheromone, traps, cabbage moth.

Rezumat. *În cadrul prezentelor experimente, au fost utilizate mai multe capcane cu feromoni sexuali: V1 – Mb 2008 and V2 – Atrabras (martor). Prima generație cu adulți de buha verzei a fost observată în mai și la începutul lunii iunie. Au fost capturați un număr de 1,5 masculi/capcană la varianta V1 – Mb – 2008 și 0,5 masculi/capcană la varianta V2 – Atrabras (varianta martor). Cea de-a doua generație de buha verzei a zburat în August. Capcanele cu feromoni sexuali au capturat un număr de 11,9 ex/capcană pentru varianta V1 – Mb – 2008 și 4,6 ex/capcană la varianta V2 – Atrabras (martor). Rezultatele au fost utilizate pentru stabilirea diagramelor de zbor pentru prima și a doua generație și pentru stabilirea eficacității noi variante feromonale Mb – 2008.*

Cuvinte cheie: feromoni sexuali, capcane, buha verzei

INTRODUCTION

The cabbage moth is one of the main pests in cabbage cultures, producing significant damages in the cabbage crops both in summer (Călin, 1998).

Stan et al. (1991) monitoring the populations of noctuide with the pheromonal found two generations of cabbage moth per year. Steene et al. (1990) experimenting the light and pheromonal traps, with the purpose of establishing the biologic cycle of a pest, didn't observe a strict demarcation between the generations. The captures obtained with the pheromonal variants experimented by Steene and al. (1990) demonstrated a maximum of flight curve in August.

An important place in the biology and ecology of cabbage moth population is occupied by the pedo-climatic conditions (Leather, 1995). The warning and prognosis of noctuid apparition, as well as the estimation of larva attack have a great importance in the maintaining of cabbage moth population under the economic damage threat attack (EDTA).

Stan et al. (1991) experimenting numerous variants of pheromonal traps didn't found a positive correlation between the number of captures and the attack developed by the larva in cabbage crops. The authors explain this situation through: photogene, preferential habitat, level of food, polygamies and reproductive isolation between the sympatric species of noctuide.

For the warning and the reduction of number of treatment applied for the control of cabbage moth, SCDL Bacau and I.C.C. Cluj-Napoca has accomplished synthesis of variants with synthetic pheromones as well as experiments in the field during 2007 – 2009. In the present paper we present the generations with the highest number of captures.

MATERIAL AND METHODS

The monitoring of cabbage moth pest in adult stage was accomplished with the pheromonal traps with adhesive.

The sexual pheromones were assured by the Institute for Chemistry Cluj-Napoca. The following variants were experimented: V1 – Mb 2008, V2 - Atrabras.

The pheromonal traps were placed in the cabbage cultures from establishing until harvest, almost 3 traps/ha, at plant level. The pheromonal capsules were changed at each 3 weeks, and the surfaces with adhesive at the clogging with fauna.

The captures were collected from the pheromonal traps twice a week. The dates regarding the development of stages and generations were obtained after different boring, observation in the field and the captures registered in the pheromonal traps. With the results obtained curves of male cabbage moth flight were marked out.

RESULTS AND DISCUSSIONS

In the first generation of cabbage moth, the number of pheromonal captures was very low (table 1, fig. 1).

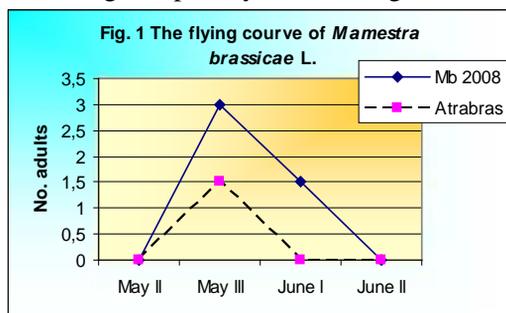
Table 1

The species of Lepidoptera captured on the pheromonal variant Mb 2008, comparatively with Atrabras, in the first generation of noctuides

Specie	Mb 2008 - no. ex./trap		Total ex./trap	Atrabras - no. ex./trap		Total ex./trap
	May III	June I		May III	June I	
<i>Mamestra brassicae</i> L.	1	0,5	1,5	0.5	0	0,5
<i>Discestra trifolii</i> H.	0.3	0	0,3	0.5	0.3	0,8
<i>Autographa gamma</i> L.	0.3	0	0,3	0	0	0
<i>Agrotis</i> spp.	0.3	0	0,3	0	0	0

The dates presented shows that many of the Lepidoptera traps were obtained at variant MB 2008, specie *Mamestra brassicae* L., in May third decade and June first decade. Also, the variant MB 2008 captured a number of 4 sympatric species,

comparing with the variant Atrabras that allowed the capture of only two species. Most of the captures belonged to cabbage moth specie, in variant V1 - Mb – 2008 – 1.5 males/trap and in variant V2 Atrabras (control) - 0,5 males/trap. The pest flight curve for the first generation is presented in figure 1. We can observe that the flight started in the second part of May, the curve maximum being registered in the third decade of this month. At the beginning of June the male flight finished, the cabbage moth being present in cabbage crops only in larva stage.



In the second generation the population was more numerous (table 2). Analyzing the dates presented, on observe that the variant Mb 2008 captured butterflies that belongs to *Mamestra brassicae* L and *Discestra trifolii* H. The population of cabbage moth was higher, being captured 3.3 ex./trap in the first decade of August, 6,1 ex./trap in the second decade of August and 2,5 ex./trap in the third decade of August.

Table 2

The species of Lepidoptera captured in the pheromonal variant Mb 2008, comparatively with Atrabras in the second generation of noctuide

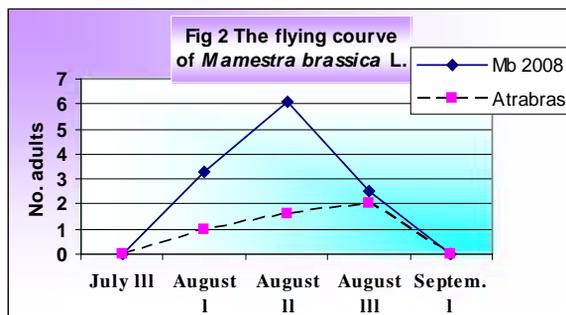
Specification	Medium no. of butterflies /trap in variant Mb 2008				Total	Medium no. of butterflies /trap in variant Atrabras				Total
	August decade			Sept. decade I		August decade			Sept. decade I	
	I	II	III			I	II	III		
<i>Mamestra brassicae</i> L	3,3	6,1	2,5	0	11,9	1	1,6	2	0	4,6
<i>Discestra trifolii</i> H.	0,6	1	2	0,6	4,2	0,6	1	1	0,6	3,2

The number of butterflies belonging to the specie *D. trifolii* was lower, but the period of flight was higher – inclusive for the first decade of September. The control Atrabras captured a lower number of butterflies, respectively: one ex. /trap in the first decade of August, two ex./trap in the second decade of August and two ex./trap in the last decade of August.

The flight curve corresponding to the total number of captures (fig. 2) had a maimum of flight in the following decades of August: second (Mb 2008) and third (Atrabras). The results obtained underline the efficacy of the new synthesized pheromonal variants - Mb 2008, comparatively with Atrabras, (homologated variant).

The researches and experimentations were accomplished at I.C.C. Cluj Napoca and S.C.D.L. Bacau.

Two pheromonal variants Mb 2008 and Atrabras (control) were experimented.



CONCLUSIONS

The highest number of Lepidoptera captures was obtained at variant MB 2008, specie *Mamestra brassicae* L., in the third decade of May and first decade of June. Also, the variant MB 2008 captured a number of four sympatric species, comparing with the variant Atrabras that captured only two species of Lepidoptera. The highest number of captures belonged to cabbage moth specie, in variant Mb 2008 - 1,5 males /trap and in V2 Atrabras (control) - 0,5 males/trap. In the second generation the population was higher. The variant Mb 2008 captured butterflies belonging to the species *Mamestra brassicae* L and *Discestra trifolii* H. The population of cabbage moth was higher, being captured 3,3 ex./trap in the first decade of August, 6,1 ex./trap in the second decade of August and 2,5 ex./trap in the third decade of August.

The variant Atrabras (V2) captured a lower number of butterflies, respectively: one ex./trap in the first decade of August, two ex./trap in the second decade of August and two ex./trap in the last decade of August.

The results obtained showed the efficiency of new synthesized pheromonal variant - Mb 2008, comparatively with Atrabras, (homologated variant).

REFERENCES

1. Călin Maria, Gh. Popa, G. Mihu, Tr. Roman, Georgeta Negru, Al Szobo, Maria Tudose, Lorelai Glavan, Lidia Pop, I. Oprean, 1998 - *Cercetări privind ecologia și avertizarea tratamentelor de combatere a dăunătorului buha verzei (Mamestra brassicae L.)*. Analele I.C.D.L.F Vidra, vpl. XV, 1998.
2. Leather, S. R. 1995 - *Factors affecting fecundity, fertility, oviposition, and larviposition in insects*. Insect Reproduction. S. R. Leather and J. Hardie. New York, CRC.
3. Stan Gh., Viorica Chiș, Coroiu I., Crișan Al., Tomescu N., Lidia Pop, Oprean I., 1991 - *Utilizarea feromonilor sexuali sintetici în cercetări de biologia comportamentului și controlul populațiilor unor specii ale genului Mamestra (Lepidoptera Noctuidae)*. Simpozionul Național de Protecția Plantelor Târgu Mureș, Revista de protecția plantelor, Cluj Napoca, 52-53, 1991.
4. Steene F., Vanparis L, Benoit E., Ceustermans N., Rooster L., 1990 - *Phenological observation on Mamestra brassicae L., Mamestra oleracea L. and Plutella xylostella L during 1990*. Parasitica, 46 (2-3), 93-97, (R.AE, 81, 7) , 1990.

THE STUDY OF AGGREGATION EFFECT AT COLORADO BEETLE WITH SYNTHETIC PHEROMONE

STUDIUL EFECTULUI DE AGREGARE AL ADULȚILOR GÂNDACULUI DIN COLORADO CU AJUTORUL FEROMONILOR SINTETICI

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Abstract. *The adult of Colorado beetles in second generation have appeared in 3rd decade of June. The adult fly has been observed till the early August. The most clusters of eggs lay around of synthetic aggregation pheromone traps, the nearest of pheromone trap, in normal climatic conditions for third decade of July and second decade of August. In the first decade of August the weather was characterized by low temperature, rain and winds. So, the density of egg clusters was decreased from 3,1 to 1,6. The distance from pheromone traps didn't influence the number of clusters eggs/square meter.*

Key words: aggregation, Colorado beetle, synthetic, pheromone.

Rezumat. *Adulții gândacului din Colorado, generația a doua au apărut în a treia decadă a lunii iunie. Zborul adulților a fost eșalonat până la începutul lunii august. În condițiile climatice normale pentru a treia decadă a lunii iulie și a doua decadă a lunii august, cele mai multe ponte au fost depuse în jurul primei capcane, cât mai aproape de momeala feromonală. În decada întâi a lunii august, temperaturile au scăzut și au fost semnalate ploi în averse și vânturi. Ca urmare densitatea pontelor a scăzut de la 3,1 la 1,6 și distanța față de capcana feromonală nu a mai influențat nr. de ponte/mp.*

Cuvinte cheie: feromoni, agregare, gândacul din Colorado

INTRODUCTION

Visser et al. (1979) had identified and isolated compounds from potato plants, with attracting effect for the Colorado beetles. Then, Panasiuk (1984) underline the answer of Colorado beetles to different volatile compounds isolated from *Tanacetum vulgare*. The researches continue and new information regarding the biological activity of the pest is gathered. New organic, volatile substances issued by potato plants and Colorado beetles are isolated and identified (Khalilova et al., 1998). In 2002 Dickens et al. identify the synthetic aggregation pheromone produced by the males of Colorado beetles. Martel et al. (2005), accomplish different laboratory and greenhouse experiences for the evaluation of aggregation pheromone of Colorado beetles efficiency. Kuhar et al. (2006) studied the potential of synthetic aggregation pheromone for the integrated control of Colorado beetles.

Our researches targeted the evaluation of aggregation effect of the synthetic aggregation pheromone synthesized by I.C.C. Raluca Ripan – Cluj Napoca, over

the Colorado beetles and the study of its efficiency for the integrated control of Colorado beetles.

MATERIAL AND METHODS

The study of synthetic aggregation baits for *Leptinotarsa demilineata* L. specie was accomplished at S.C.D.L. Bacău, during 2007 – 2008. Due to the conditions that were unfavorable for the development of the pest in 2007, in the present paper we present only the results obtained in 2008.

The installation of synthetic aggregation pheromone for the pest Colorado beetle was done in the cultures of eggplants, variety Contesa in the second generation of Colorado beetle pest (the first generation developed on potato). At the limit of eggplant crop 9 pheromonal traps were placed linearly. The following parameters were determined: - in variants V1 (with pheromones) and V2 - control (without pheromones, located in the opposite part of the parcel), the number of egg booklets laid by the pests, at 1 – 8 m toward the pheromonal trap (V1) and 1 – 8 m toward the crop limit (V2); - intensity (I%), frequency (F%) and degree of attack (GA%) developed by the adults and larva on the eggplant plants in the two tested variants.

RESULTS AND DISCUSSIONS

The adults of Colorado beetles, second generation, appeared in the third decade of June. The apparition of adults was faded until the end of August.

In the case of the first pheromonal trap (located at the edge of the crop) the distribution of the egg booklets was the following one (table 1, fig. 1).

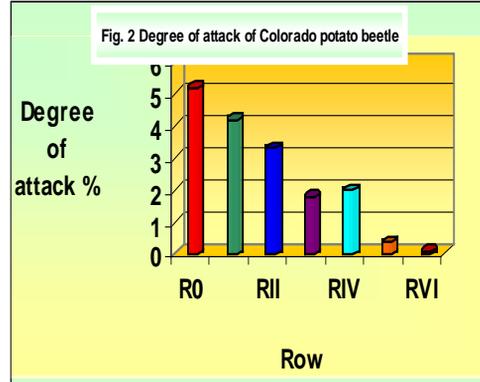
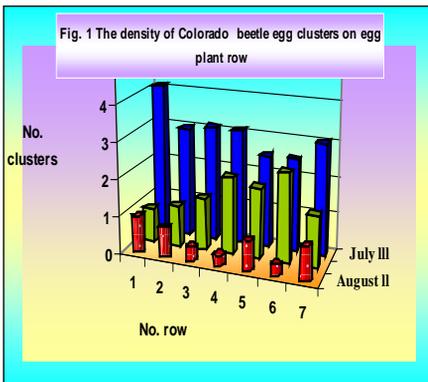
Table 1

The distribution of egg booklets on the eggplant rows at the edge of the crop, in the area of first pheromonal trap

The distances of clusters toward the pheromone (m)	No. of clusters on row							Total
	1	2	3	4	5	6	7	
July third decade								
1	14	6	3	5	5	5	2	40
2	6	4	7	1	2	2	1	23
3	2	2	4	1	1	1	2	13
4	3	3	3	3	3	3	5	23
5	2	2	2	9	2	2	5	24
6	1	2	1	1	1	1	1	8
7	3	3	3	3	4	4	6	26
8	2	2	2	2	2	2	2	14
Total clusters on row	33	24	25	25	20	20	24	171
No. clusters/mp	4,1	3,0	3,1	3,1	2,5	2,5	3,0	3,1
No. clusters/mp at control	0.4	0.2	0.1	0	0.5	1.2	0.7	0.4
August first decade								
1	3	3	3	6	4	6	3	28
2	2	2	2	2	2	2	2	14
3	1	1	1	5	4	6	4	22
4	0	1	1	1	2	2	1	8
5	0	0	2	1	2	2	0	7
6	0	0	0	0	0	0	0	0

7	0	0	0	0	0	0	0	0
8	1	2	2	2	1	1	1	10
Total clusters on row	7	9	11	17	15	19	11	89
No. clusters/mp	0,9	1,1	1,4	2,1	1,9	2,4	1,4	1,6
No. clusters/mp at control	0.2	0.2	0.2	0.1	0.1	0.3	0.2	0.3
August second decade								
1	1	1	1	1	1	1	1	7
2	1	1	1	0	0	0	0	3
3	1	0	1	0	1	0	0	3
4	1	1	0	0	1	0	2	5
5	0	0	0	0	0	0	1	1
6	4	3	3	0	3	0	0	13
7	0	0	0	0	0	0	1	1
8	0	0	0	1	0	1	2	4
Total clusters on row	8	6	6	2	6	2	7	37
No. clusters/mp	1,0	0,8	0,4	0,3	0,8	0,3	0,9	0,7
No. clusters/mp at control	0.4	0.3	0.5	1.0	0.2	0.2	0.6	0.3

In normal climatic condition for the third decade of July and second decade of August, the highest numbers of clusters were laid down around the first trap, very close to the pheromonal bait. In the first decade of August, when the temperatures decreased and there were a series of rain and winds, the density of clusters decreased also from 3.1 to 1.6. The distance toward the bait didn't influence positively the number of clusters/mp. (fig. 1).



The adults of Colorado beetle, second generation appeared in the third decade of June. The adult apparition was fazed until the beginning of August. As a result of synthetic aggregation pheromone, the attack developed by the population of Colorado beetle, at the end of the vegetation period (September) (table 2, figure 2).

In the climatic conditions of 2008 year, the second generation of Colorado beetle induced a low attack that stopped in the area of first pheromonal trap. We consider that this situation is due to the aggregation effect of the pheromone and to the climatic conditions, specific for 2008 year.

Table 2

**The attack of Colorado beetle in the second decade of
September at S.C.D.L. Bacau**

No. of row	Frequency of attack %	Intensity of attack %	Degree of attack %	Comments
Trap 1 from the end of crop				
0	41,5	12,6	5,2	Row with trap
1	40,1	10,4	4,2	The first row from the trap
2	24,3	13,5	3,3	The second row from the trap
3	15,7	11,2	1,8	The third row from the trap
4	15,8	12,5	2,0	The fourth row from the trap
5	5,2	8,2	0,4	The fifth row from the trap
6	1,1	6,1	0,1	The sixth row from the trap
Trap 2 from the end of crop				
0	1,5	0,1	0,1	Row with trap
1	2,1	0,1	0,1	The first row from the trap
2	1,6	0,1	0,1	The second row from the trap
3	0	0	0	The third row from the trap
4	0	0	0	The fourth row from the trap
5	0,1	0,1	0,1	The fifth row from the trap
6	1,1	0,1	0,1	The sixth row from the trap
Trap 2 from the end of crop				
0	1,2	0,1	0,1	Row with trap
1	0,1	0,1	0,1	The first row from the trap
2	0	0	0	The second row from the trap
3	1,4	0,1	0,1	The third row from the trap
4	1,8	0,1	0,1	The fourth row from the trap
5	0	0	0	The fifth row from the trap
6	0	0	0	The sixth row from the trap

CONCLUSIONS

In the climatic conditions, normal for the third decade of July and second decade of August, the highest numbers of clusters were laid down around the first trap, very close to the pheromonal bait. In the first decade of August the weather was characterized by low temperature, rain and winds. So, the density of egg clusters was decreased from 3,1 to 1,6. The distance from pheromone traps didn't influence the number of clusters eggs/square meter.

REFERENCES

1. **Kuhar T.P., Mori K., Dickens J.C., 2006** - *Potential of a synthetic aggregation pheromone for integrated pest management of Colorado potato beetle*. Agric. Forest Entomol. 8:77-81.
2. **Martel J.W., Alford A.R., Dickens J.C., 2005** - *Laboratory and greenhouse evaluation of a synthetic host volatile attractant for Colorado potato beetle, Leptinotarsa decemlineata (Say)*. Agric. Forest Entomol. 7:71-78.
3. **Dickens J.C., Oliver J.E., Hollister B., Davis J.C., Klun J.A., 2002** - *Breaking a paradigm: male-produced aggregation pheromone for the Colorado potato beetle*. J. Exp. Biol. 205:1925-1933.

THE PEST CONTROL IN SYSTEMS WITH ONE PREY AND TWO PREDATORS

CONTROLUL DĂUNĂTORILOR ÎN SISTEME CU O PRADĂ ȘI DOI PRĂDĂTORI

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Abstract. *Organic agriculture imposed biological control, which uses the living organisms to suppress pest populations. Organisms in a cropping system interact in many ways — through competition. There are different approaches in regard the possibility of the modeling of these complex systems. Over the last decade, there has been considerable progress in generalizing the concept of synchronization to include the case of coupled chaotic oscillators especially for biological systems. Many examples of biological synchronization have been documented in the literature, but currently theoretical understanding of the phenomena lags behind experimental studies. In order to formulate the pest control in this work the synchronization of two Lotka–Volterra systems with three species, one prey and two predators is presented. The transient time until synchronization depends on initial conditions of two systems and on the control number.*

Key words: biological control, chaos, synchronization, prey, predator

Rezumat. *Agricultura organica impune controlul biologic care utilizeaza organismele vii pentru a micșora populația dăunătorilor. Un ecosistem agricol constă dintr-un ansamblu de relații între plante de cultură sau pomi, erbivore, pradatori, buruieni etc. Organismele dintr-un astfel de sistem interacționează pe diferite căi fiind în competiție. Există diferite moduri de abordare privind posibilitatea de modelare a acestor sisteme complexe. În ultimele decade există un interes considerabil în generalizarea conceptului de sincronizare pentru a include oscilatoriile haotice cuplate, în special pentru sisteme biologice. În literatură au fost documentate multe astfel de exemple dar cunoașterea teoretică duce la lipsa de studii experimentale. Pentru a analiza controlul dăunătorilor, în această lucrare se studiază sincronizarea a două sisteme Lotka–Volterra cu o pradă și doi pradatori. Timpul de tranziție până la sincronizare depinde de condițiile inițiale și de numărul populațiilor de control.*

Cuvinte cheie: control biologic, haos, sincronizare, pradă, prădător

INTRODUCTION

The pest control is of great interest in agriculture domain because the pests have been the major factor that reduces the agricultural production in the world. Different methods have been used in the process of pest management, for instance, chemical pesticides, biological pesticides, computers, atomic energy etc. Of all methods, chemical pesticides seem to be a convenient and efficient one, because they can quickly kill a significant portion of a pest population. But synthetic chemical pesticides introduced and used widely on agricultural crops in

order to control the agricultural pests represent a significant food safety risk. Organic agriculture imposed biological control, which uses the living organisms to suppress pest populations.

Generally, from mathematical viewpoint, biological control has been modeled as a two-species interaction. In this case, the prey-predator or host parasitoid models ignore many important factors such as interactions between another species of same ecosystem, interactions with environment, etc. Arneodo et al. [1], have demonstrated that one can obtain chaotic behaviour for three species. In a 1988 paper Samardzija and Greller [9] propose a two-predator, one prey generalization of the Lotka-Volterra problem into three dimensions. The synchronization of trajectories of two attractors of this modified, three-dimensional Lotka-Volterra equation, was performed by John Costello [2] using the Kapitaniak method.

THEORY

Samardzija and Greller [9] proposed equations for a two-predator, one prey generalization of the Lotka-Volterra system as follows:

$$\begin{aligned} \dot{x} &= x - xy + Cx^2 - Azx^2 \\ \dot{y} &= -y + xy \\ \dot{z} &= -Bz + Azx^2 \end{aligned} \tag{1}$$

Here x is the prey population, y and z are predator populations and A, B, C are positive constants.

For $A=2.9851$, $B=3$ and $C=2$ the systems has chaotic behaviour. For initial conditions $x_0=1$, $y_0=1.4$ și $z_0=1$ the strange attractor is given in figure 1.

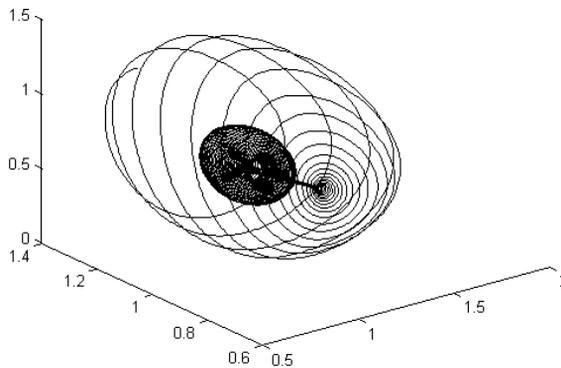


Fig. 1. Phase portrait of (x, y, z) for Samardzija and Greller system with one prey and two predators

Over the last decade, there has been considerable progress in generalizing the concept of synchronization to include the case of coupled chaotic oscillators especially

for biological systems [3], [7-8]. To synchronize two Lotka –Volterra systems with three species we used a simple method for chaos synchronization proposed in [4-6].

If the chaotic system (master) is:

$$\dot{x} = f(x) \text{ where } x = (x_1, x_2, \dots, x_n) \in R^n$$

$$f(x) = (f_1(x), f_2(x), \dots, f_n(x)) : R^n \rightarrow R^n$$

The slave system is:

$$\dot{y} = f(y) + \varepsilon(y - x)$$

where the functions $\dot{\varepsilon}_i = -\lambda_i (y_i - x_i)^2$ and λ_i are positive constants

RESULTS AND DISCUSSIONS

The slave system for the system (1) is:

$$\dot{x}_1 = x_1 - x_1 y_1 + 2x_1^2 - 2.9851z_1 x_1^2 + \varepsilon_1(x_1 - x)$$

$$\dot{y}_1 = -y_1 + x_1 y_1 + \varepsilon_2(y_1 - y) \tag{2}$$

$$\dot{z}_1 = -3z_1 + 2.9851z_1 x_1^2 + \varepsilon_3(z_1 - z)$$

The control strength is of the form:

$$\dot{\varepsilon}_1 = -10(x_1 - x)^2$$

$$\dot{\varepsilon}_2 = -10(y_1 - y)^2 \tag{3}$$

$$\dot{\varepsilon}_3 = -10(z_1 - z)^2$$

Fig.2, 3, 4 and 5 show the synchronization of the two Lotka –Volterra generalized systems (for one prey and two predators).

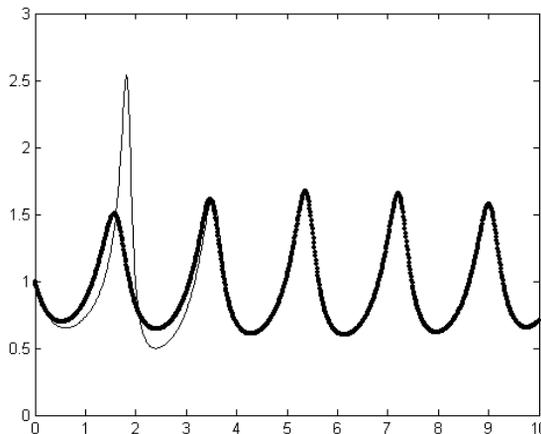


Fig.2 – $x(t)$ -black, $x_1(t)$ - gray [$x(0) = 1; y(0) = 1.4 z(0) = 1; x_1(0) = 1; y_1(0) = 1.5; z_1(0) = 1; \varepsilon_1(0) = \varepsilon_2(0) = \varepsilon_3(0) = 1$]

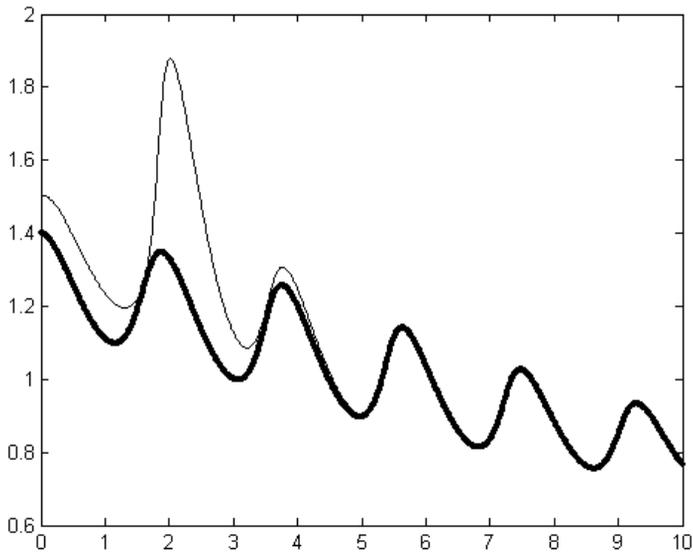


Fig. 3. $y(t)$ -black, $y_1(t)$ - gray [$x(0) = 1$; $y(0) = 1.4$ $z(0) = 1$; $x_1(0) = 1$; $y_1(0) = 1.5$; $z_1(0) = 1$; $\varepsilon_1(0) = \varepsilon_2(0) = \varepsilon_3(0) = 1$]

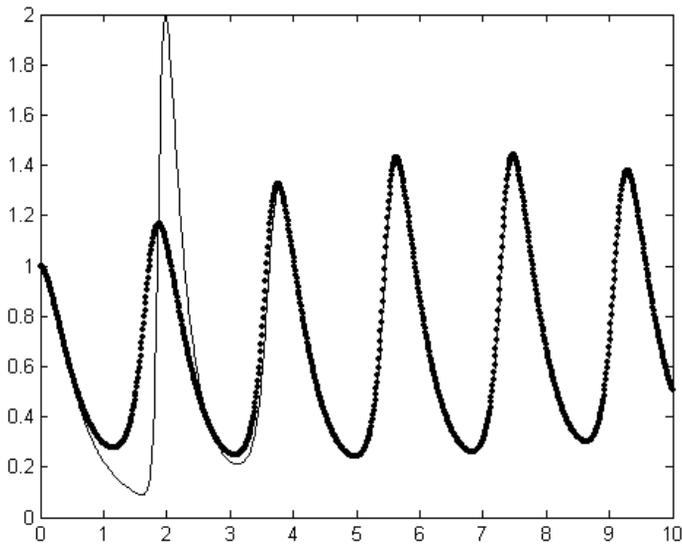


Fig. 4. $z(t)$ -black, $z_1(t)$ - gray [$x(0) = 1$; $y(0) = 1.4$ $z(0) = 1$; $x_1(0) = 1$; $y_1(0) = 1.5$; $z_1(0) = 1$; $\varepsilon_1(0) = \varepsilon_2(0) = \varepsilon_3(0) = 1$]

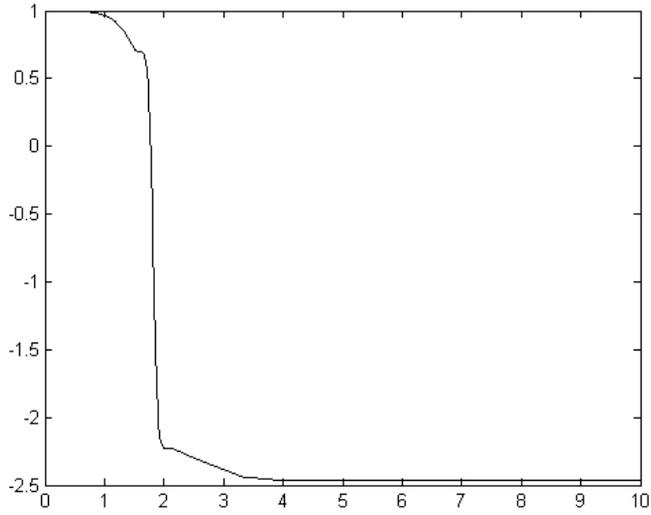


Fig. 5 – The control strength $\varepsilon_1(t)$ [$x(0) = 1$; $y(0) = 1.4$ $z(0) = 1$; $x_1(0) = 1$; $y_1(0) = 1.5$; $z_1(0) = 1$; $\varepsilon_1(0) = \varepsilon_2(0) = \varepsilon_3(0) = 1$]

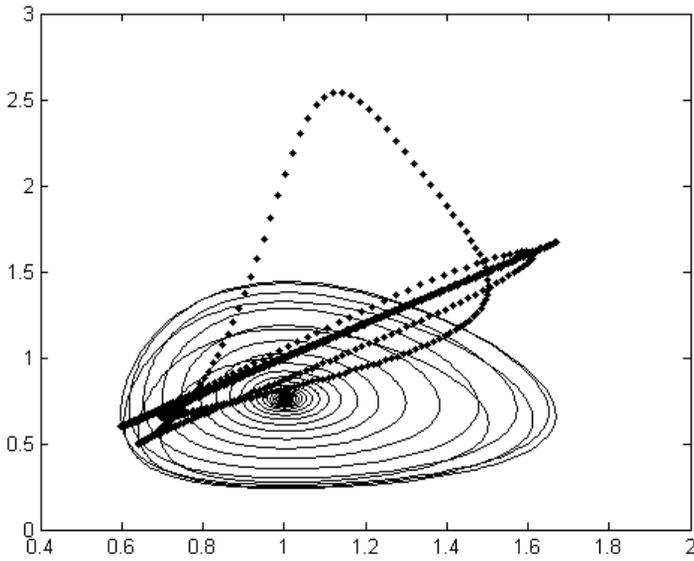


Fig. 6. Phase portrait of (x, z) , and (x, x_1) for Samardzija and Greller system with one prey and two predators [$x(0) = 1$; $y(0) = 1.4$ $z(0) = 1$; $x_1(0) = 1$; $y_1(0) = 1.5$; $z_1(0) = 1$; $\varepsilon_1(0) = \varepsilon_2(0) = \varepsilon_3(0) = 1$]

CONCLUSIONS

In order to formulate the biological control, the synchronization of two Lotka–Volterra systems with one prey and two predator is presented in this work. The transient time until synchronization depends on initial conditions of two systems and on the control strength. Therefore, we suggest that we can control the three species obtaining the synchronization of prey and predator population as a function of the control strength.

REFERENCES

1. **Arneodo A., Couillet P., Tresser C., 1980** - *Occurrence of Strange Attractors in Three-dimensional Volterra Equation*. Phys. Lett. 79A, 259-263
2. **Costello J.S., 1999** - *Synchronization of Chaos in a Generalized Lotka-Volterra Attractor*. The Nonlinear Journal, 1 11-17
3. **Grosu I., 1997** - *Robust Synchronization*. Phys. Rev. 56, 3709-3712
4. **Guo R., Li G., 2007** - *Modification for collection of master–slave synchronized chaotic systems*. Chaos, Solitons and Fractals. In press, http://www.sciencedirect.com/science?_ob=ArticleListURL&_method=list&_ArticleListID=890244681&_sort=d&view=c&_acct=C000068109&_version=1&_urlVersion=0&_userid=6260515&md5=393929003d6252f59a9fda86b905f3ac
5. **Guo W., Chen S., Zhou H., 2009** - *A simple adaptive-feedback controller for chaos Synchronization*. Chaos, Solitons and Fractals 39, 316–321
6. **Huang D., 2005** - *Simple adaptive-feedback controller for identical chaos synchronization*. Phys. Rev. E, 71, 037203.
7. **Lerescu A.I., Constandache N., Oancea S., Grosu I., 2004** - *Collection of master-slave synchronized chaotic systems*. Chaos Soliton Fract., 22(3), 599-604
8. **Lerescu A.I., Oancea S., Grosu I., 2006** - *Collection of Mutually Synchronized Chaotic Systems*. Physics Letters A, 352, 222-228.
9. **Samardzija N., Greller L.D., 1988** - *Explosive route to chaos through a fractal torus in a generalized Lotka-Volterra model*. Bulletin of Mathematical Biology, 50(5), 465-491

A STUDY ON USEFUL OR HARMFUL FAUNA IN THE GRAPEVINE PLANTATIONS AT S.C.D.V.V. ODOBESTI

STUDIUL FAUNEI UTILE ȘI DĂUNĂTOARE DIN PLANTAȚIILE VITICOLE DE LA S.C.D.V.V. ODOBEȘTI

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Abstract. *One of the characteristics of our planet, ensuring the optimal functioning of ecosystems, is biological diversity. Generally, the existence and development of the biosphere, due to the human impact lately, cause the problem of preserving biodiversity at the level of ecosystem, species, populations and genes to become increasingly acute. Grapevine plantations may be considered stable ecosystems, but showing clear interdependencies among various food chains where natural factors play an important part. Thus, an obvious imbalance between various populations occurred, some considered harmful by humans, others useful. Research covers the study of the useful and harmful fauna in the grapevine plantations of S.C.D.V.V. Odobesti, Vrancea Country. The data resulted from comparing figures from the main pests as well as useful species allow us to approximate, as accurately as possible, the future dangerous attacks against the grapevine cultures.*

Key words: ecosystem, useful and harmful fauna, taxons

Rezumat. *O particularitate specifica planetei noastre, care asigura functionalitatea optima a ecosistemelor, o reprezinta diversitatea biologica. Plantațiile viticole pot fi considerate ecosisteme stabile dar cu interdependente precise între diferitele lanțuri trofice în care factorii naturali joacă un rol foarte important. Astfel, a apărut un dezechilibru între efectivele diferitelor populații, unele considerate de om daunatoare, altele utile. Cercetările se referă la studiul faunei utile și daunatoare din plantațiile viticole ale SCDVV Odobesti, județul Vrancea. Datele obținute prin compararea procentelor de la principalii daunatori cât și a speciilor utile ne permit să apreciem, cât mai aproape de realitate, situația viitoarelor atacuri periculoase culturii vitei de vie.*

Cuvinte cheie: ecosistem, fauna utila, fauna daunatoare, taxoni

MATERIAL AND METHOD

The experience we have acquired over more than two decades in the study of the HF/UF report allows us to proceed.

From the methods we have used so far we have chosen the method of soil sampling (25-25-30 cm) which has offered the most pertinent data of the presence of invertebrate fauna of the soil.

Researches have been conducted between the 21st-22nd of August and 20th-22nd of October in two biocenoses.

1. in the Odobesti vineyard- the ampelographic collection, the age of the plantation is 31, cultivated with royal Feteasca and the Sarba region is 37 years old;

2. in the Catesti vineyard, the Carligele viticultural centre, cultivated with the White Feteasca variety, over 35 years old;

The collected biological material has been processed and analyzed with a SM XX binocular magnifying glass and fixed in ethylic alcohol 70%.

RESULTS AND DISCUSSIONS

In table 1 we present biological material collected on the 22nd of August 2008 from the the biocenosis of the S.C.D.V.V. Odobesti Sarba area.

The biological material is represented by 22 taxons, of which 15 of the harmful fauna and 7 of useful fauna.

Of the harmful fauna we highlight the *Brachycera* group with 28 specimens, followed by *Javesella Pellucida* F. with 19 and *Empoasca solani* Curtis with 18 specimens.

Of the useful fauna we have *Formicidae* with 352 specimens, *Araneae* with 132 specimens and *Chalcididae Hymenoptera* with 38 specimens.

Also the first group has 162 specimens and the second 562 specimens, a total of 724 specimens. In percentages, we have 22.37% and 77.63% HF/UF, the useful fauna 3.47 times more numerous than the harmful fauna.

Table 1

**The fauna of the Sarba viticultural ecosystem - SCDVV Odobesti
22. 08. 2008**

Nr. crt	Group and species	Sample				Relative abundanc e (%)
		1	2	3	Total	
1	<i>Tettigonia viridissima</i> L.	2	4	-	6	0.38
2	<i>Ceresa bubalus</i> F.	2	-	-	2	0.27
3	Cicade. <i>Dictyophara europea</i> L.					
4	<i>Cicadella viridis</i> L.	3	5	-	8	1.11
5	<i>Javesela pellucida</i> F.	8	9	2	19	2,62
6	Sciaride Dipt.Nemat.	11	5	7	23	3.18
7	<i>Ligus campestris</i> L. Heteropter	3	6	-	9	1.24
8	<i>Lygeus</i> sp.	2	-	-	2	0,27
9	<i>Macrosteles laevis</i> Ribaut.	3	1	-	4	0.55
10	<i>Empoasca solani</i> Curtis	4	2	12	18	2.49
11	Winged Aphide	6	3	1	10	1.38
12	Coleopters	2	7	5	14	1.93
13	Brachycera Dipt.	16	10	2	28	3.94
14	<i>Trombidium holosericeum</i> Acari.	10	5	-	15	2.07
15	Lepidoptera - Noctuids	-	3	-	3	0.42
TOTAL HARMFUL FAUNA					162	22.37
16	<i>Coccinela</i> 7 PCT.	1	6	4	11	1.52
17	<i>Chrysopa perla</i> L.	4	1	-	5	0,69
18	<i>Nabis rugosus</i>	3	5	2	10	1.38
19	<i>Araneae lycosidae</i>	51	32	49	132	18.31

20	Formicidae Hymenopterae	239	21	92	352	48.72
21	Braconidae Hymenop.	7	4	3	14	1.93
22	Chalcididae Hymenop.	9	14	15	38	5.31
TOTAL USEFUL FAUNA					562	77.63
GENERAL TOTAL		387	143	194	724	100%

HF = 22.37%; UF = 77.63%

In Table 2 we have the invertebrate fauna from the soil of vine culture, collected on the 21st-22nd of October 2008.

Of the useful fauna we highlight 10 taxons collected out of 4 samples with a total of 44 specimens, calculated for a square metre resulted in a number of 176 specimens in the Royal Feteasca biocenosis of the ampelographic collection.

In the White Feteasca biocenosis of the Carligele viticultural centre –the Cotesti vineyard, of the 10 resulted taxons and 4 samples with 33 specimens, calculated for a square meter there resulted 132 specimens.

Out of the harmful fauna we have 11 taxons with 22 specimens about of 88 specimens per square meter in White Feteasca. For the White Feteasca we have observed 18 specimens in 4 samples and 72 specimens per square meter. The total of invertebrate fauna of the Royal Feteasca biocenosis was of 66 specimens, and in the White Feteasca biocenosis 51 specimens, with a total of 117 specimens in both biocenoses.

The ratio of the two working points was of 56.41% in Royal Feteasca to 43.6% in White Feteasca. Out of the useful fauna category we highlight the species: *Fridericia bulbosa* with 32 specimens/square meter, *Harpalus Pubescens* with 52 specimens /square meter and *Araneae* with 16 specimens /square meter.

Of the harmful fauna we have the Julidae– Dipterae group with 28 specimens /square meter, *Harpalus Pubescens* with 16 specimens/square meter and *Agriotes Ustulatus* with 4 specimens /square meter.

Table 2

**The invertebrate fauna from the soil of the grapevine culture
from S.C.D.V.V. Odobesti
20.10.2008-21.10.2008**

Nr. crt	GROUP AND SPECIES	20.10.2008	Feteasca regala-Odobesti	21.10.2008	Feteasca alba-Carligele
		Numbers from 4 samples (25/25/30 cm)	Numbers /m	Numbers from 4 samples (25/25/30cm)	Numbers /m
1	<i>Lumbricus terrestris</i> Mich.	2	8	1	4
2	<i>Lumbricus rumbelus</i> L.	1	4	2	8
3	<i>Allobophora caliginosa</i> L.	4	16	3	12
4	<i>Allobophora roseae</i> L.	5	20	7	28
5	<i>Fridericia bulbosa</i> L.	8	32	4	16
6	Geophilidae	3	12	4	16
7	Gordidae	2	12	4	16
8	<i>Lyctobius forficatus</i> L.	2	8	2	8

9	Formicidae	13	52	5	20
10	Aranae	4	16	3	12
TOTAL USEFUL FAUNA		44	176	35	132
11	Julidae – Diplopoda	7	28	5	20
12	<i>Melolontha melolontha</i> L.	2	8	-	-
13	<i>Planorbis marginatus</i> L.	3	12	-	-
14	<i>Porcellio scaber</i> L.	1	6	4	11
15	<i>Polydesmus</i> sp. Miriapodae	-	-	8	32
16	<i>Harpalus pubescens</i> Mull.	4	16	-	-
17	<i>Harpalus distinguendus</i> Duft.	1	4	-	-
18	<i>Bembidion properans</i> Steph.	239	21	92	352
19	<i>Agriotes ustulatus</i> Schol.	1	4	-	-
20	<i>Opatrum sabulosum</i> L.	-	-	1	4
21	<i>Zabrus tenebrioides</i> Geoeze.	-	-	1	4
TOTAL HARMFUL FAUNA		22	38	18	72
GENERAL TOTAL		66	264	51	72

56,41%

43,6%

CONCLUSIONS

1. In S.C.D.V.V. Odobesti in the year 2008 in August and October samples of invertebrate have been collected from two biocenoses in which the usual adequate treatments for the control of grapevine diseases and pests have been applied.

The species which have exceeded the PED have been: *Empoasca solani* with 18 specimens, *Harpalus pubescens* with 16 specimens/square meter and the *Jullidae* group with 28 specimens/ square meter.

2. By using the soil sampling method we are able to find out beforehand the optimal periods for the control of key pests of the grapevine, with minimal investment.

REFERENCES

1. Manole T. si colab., 1996 - Cercetari privind entomofauna daunatoare si utila din cultura de gramineae perene de pajisti, din zona pedoclimatica Brasov (II). Anale ICPP, Vol.XXVII, pg.147-165.
2. Podosu Aurelia, Iuliana Antonie, Gh. Anghelache, V. Oancea, Gr. Mărgărit, 2004 - Raportul faunei utile si daunatoare de nevertebrate din ecosistemul viticol Odobesti–Sarba. Analele ICDVV Valea calugareasca. Vol. XVII, pg. 229-235.

RESEARCHES ON TESTING CERTAIN BIO PREPARATES IN ORDER TO PREVENT BACTERIAN CANCER OF THE GRAPEVINE IN THE ODOBESTI VINEYARD

CERCETĂRI PRIVIND TESTAREA UNOR BIOPREPARATE ÎN VEDEREA PREVENIRII CANCERULUI BACTERIAN LA VIȚĂ DE VIE ÎN PODGORIA ODOBESȚI

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Abstract. Under the pedological and climatical conditons of the Odobesti vineyard, the attack of the pathogenic bacterium *Agrobacterium tumefaciens* is manifested on the wooden parts of the vine (cords, stems) through the apparition on the surface of the organs of tumors of various sizes, covered in a characteristic spongiuous tissue. Generally, tumors form on the grafting point, in the areas where cords have been damaged (twisting, hail, breaking, etc). Using biological means in the prevention and control of diseases in cultivated plants is one of the issues in the attempt of finding ways to reduce both damage done by pathogens and pollution of the environment. In the attempts to limit and prevent tumorigenesis caused by *Agrobacterium tumefaciens* in grapevine, the efficacy of certain biological products based on *Bacillus subtilis* strains has been tested. The B4 biological product has inhibited the development of colonies in the highest percentage, respectively 95% in the table variety Muscat d'Adda, protecting the wounds of the vine from the attack of the *Agrobacterium tumefaciens* pathogen. The BSO biological product has manifested a moderate action in protecting the wounds against the action of the pathogen, with an inhibitory percent of up to 80%.

Key words: *Agrobacterium tumefaciens*, tumors, biological products.

Rezumat. În condițiile pedo-climatice ale podgoriei Odobesți, atacul produs de bacteria patogenă *Agrobacterium tumefaciens* se manifesta pe elementele lemnoase ale butucului (coarde, cordoane, tulpini, etc.) prin apariția la suprafața organelor a unor tumori de dimensiuni variabile, acoperite cu un țesut buretos specific. În general, tumorile se formează la punctul de altoire, în zonele în care coardele au fost ranite (prin rasucire, grindina, rupere, etc). Utilizarea mijloacelor biologice în prevenirea și combaterea bolilor la plantele de cultură se înscrie în preocupările găsirii căilor de reducere a pagubelor produse de patogeni, precum și a poluării mediului înconjurător. În încercările de limitare și prevenire a tumorogenezei produsă de *Agrobacterium tumefaciens* la vița de vie, s-a testat eficacitatea unor produse biologice pe baza unor tulpini de *Bacillus subtilis*, rezultate la INCD CF București. Produsul biologic B4 a inhibat dezvoltarea coloniilor în procentul cel mai mare, respectiv 95%, la soiul de masă Muscat de Adda, protejând ranile plantelor de via de vie de atacul produs de patogenul *Agrobacterium tumefaciens*. Produsul biologic BSO a manifestat o acțiune mijlocie în protejarea rănilor de ațuneza patogenului,

procentul de inhibiție fiind de până la 80%.

Cuvinte cheie : *Agrobacterium tumefaciens*, tumori, produse biologice;

INTRODUCTION

Using biological means of disease prevention and control in cultivated plants is among the main concerns in the attempt to find ways to reduce damage done by pathogens and pollution of the environment. Putting into practice these biological means led to an increase in the study of microbe antagonism; helping to disperse antagonists leads to a limitation of their host's pathogens, diminishing loss (Josifović., 1967; Solovei, I.1974; Garrett, C.M.E, 1979; Grindrat D., 1983; Ponchet, J., 1983; Severin V., Iliescu C.H., 2006; Zang W., Saks E.J., Lewis Ivey M.I., Miller S.A., Franus D.M., 2005).

Concerns in this fields are linked to the inhibitory action of microorganisms such as fungi (*Penicillium*, *Aspergillus*, *Chaetonium*) and bacteria (*Bacillus sp.*, *Pseudomonas sp.*, *Xanthomonas sp.*, *Erwinia amylovora*), on the pathogenous bacterium *Agrobacterium tumefaciens*. Thus, a good rate of prevention in tumor appearance has been observed after using avirulent *Agrobacterium* strains, which have prevented the infection of the cultivated plants in the field, by excluding virulent strains from the penetration spot (the HLB-2 strain, of the biovar 1, isolated by Xiaoyng în China(8). The treatment of the grafted cuttings, before planting in the nursery, using a biological product derived from HLB-2, of the biovar 1, isolated by Xiaoyng în China, has inhibited cancer in high percentages (Pu et Goodman, 1993). Good results have been obtained with a product obtained from a strain of *Agrobacterium*, patented as a preparation with the name Biozin, by Zinca, 1971.

MATERIAL AND METHOD

1.1. Isolating and identifying the bacterium

In the bleeding phenological phase of the grapevine crude sap was collected by attaching sterile test tubes to the cords of plants from the Black Feteasca variety which had shown symptoms of bacterial cancer. The collected liquid has been included in a colony environment (peptone, meat juice, glucose-agar) and distributed in Petri dishes. Six days later, the surfaces developed colonies characteristic for *Agrobacterium tumefaciens*.

1.2. Testing the protective capacity

During the experiment the response reaction has been tested on a number of five varieties, as follows: Chasselas doré, Muscat d'Adda, Muscat Hamburg, Royal Feteasca si Black Feteasca.

Cords taken from healthy plants had been cut at 3 buds and placed in water containers at constant temperature in order to start the vegetation process. The inoculation has been done with the *Agrobacterium tumefaciens* we have isolated.

The biological products used for testing the protective capacity have been produced by the National Institute for Chemical Pharmaceutical Research and Development in Bucharest (INCDCF), and are strains of *Bacillus subtilis*, as follows:

- BSP + BSU – isolated from twitch and dried cereals
- BSP + BSV – isolated from twitch and medicinal plants
- B4-isolated from leaves in deciduous forests (immediately after cutting when the wounds were fresh)

Testing has been conducted under laboratory conditions, thus, on cords taken from

different varieties of the Odobesti vineyard, cotton balls soaked in a suspension of bacterial cells (active substance 10^7 ufc/ml) have been applied. The virulent cells suspension has been administered simultaneously with the biological product from INCDCF Bucharest.

In order to establish whether the wound had been protected by the action of the pathogen, after 25 days of treatment, one cm samples have been taken from the place of the infection up to the first bud, and the fragments distributed on the culture environment characteristic for the growth of *Agrobacterium tumefaciens*, and observations have been made after 6 days.

RESULTS AND DISCUSSIONS

Following the investigations conducted in the grapevine plantations of SCDVV Odobesti, Vrancea, concerning the varieties' reaction to the attack of *Agrobacterium tumefaciens*, it has been observed that the table grapes varieties are more sensitive than the wine grapes, and of these, the Feteasca regala variety has considerable resistance.



Fig.1. Colonies of the *Agrobacterium tumefaciens* bacterium

Under laboratory conditions colonies of the pathogen bacteria *Agrobacterium tumefaciens* have been obtained, isolated in the liquid leaked by the plant in the bleeding phenological phase. On a colony environment, (peptone, meat juice, glucose-agar), *Agrobacterium tumefaciens* has formed white-yellow colonies with a creamy aspect and brownish-yellow reverse (fig.1).

Table 1

The frequency of grapevine plants affected by cancer (*Agrobacterium tumefaciens*) in a grapevine plantation of the Odobesti vineyard, 2008

Variety	Analyzed plants	Diseased plants	Attack frequency (%)
Muscat Hamburg	58	49	84,48
Muscat d' Adda	55	44	80,00
Chasselas dore	50	38	76,00
Feteasca regala	61	36	59,02

Following the administration of biological products of fresh wounds, simultaneously with the inoculation of *Agrobacterium tumefaciens*, compared to control plants which had not been infected nor treated, the fresh wounds on the cords have been protected by the pathogenic action of the *Agrobacterium tumefaciens*, in a percentage between 70-95%, depending on the strain used for

the preparation of the biological product (table2).

The B4 biological product has noticeably protected the freshly cut wounds from infections with *Agrobacterium tumefaciens*, with an inhibition percentage of 80-95% in all observed varieties.

The BSV product has protected the wounds of the cords from the pathogenic action of the bacterium in a percentage of 75-84%.

The BSO biological product has had a weaker effect of protecting wounds from cutting, the percentage being of 60-70%. (fig. 2)



Fig. 2. The efficiency of biological products in protecting wounds against the pathogenic action of *Agrobacterium tumefaciens*

The table varieties (table 2) Chasselas dore, Muscat d' Adda and Muscat Hamburg have manifested an increased sensibility for the pathogenic bacterium. Among the wine varieties, the Royal Feteasca may be considered resistant to the action of the pathogen.

Table 2

The growth of colonies and the inhibition percentage of the bioproducts tested on grapevine varieties for table grapes

Nr. crt.	Variety	Product	Conc. (%)	Colonies grown in Petri dishes (no.)	Inhibition %
1	Muscat d' Adda	BSO	5	30	70
		BSV	5	25	75
		B4	5	5	95
		Control plant	-	100	0
2	Chasselas doré	BSO	5	40	60
		BSV	5	16	84
		B4	5	10	90
		Control plant	-	100	0
3	Muscat Hamburg	BSO	5	20	80
		BSV	5	16	84
		B4	5	10	90
		Control plant	-	100	0
4	Fetească neagra	BSO	5	23	77
		BSV	5	19	81
		B4	5	10	90
		Control plant	-	100	0
5	Fetească regala	BSO	5	20	80
		BSV	5	30	70
		B4	5	10	90
		Control plant	-	85	15

CONCLUSIONS

1. The B4 biological product has inhibited the growth of colonies in a percentage of 90 - 95%, in the Muscat de Adda table variety, significantly protecting the wounds of the grapevine plants against the attack of the *Agrobacterium tumefaciens* pathogen.
2. The biological product BSO has had moderate effects in protecting the wounds against the action of the pathogen, with an inhibition percentage of up to 80%.

REFERENCES

1. **Garett C.M.E, 1979** - *Biological control of crown gall in cherry rootstock proportion*. Annals of Applied Biology 91
2. **Grindrat D., 1983** - *Posibilités et limites de l'utilisation des antagonistes dans la lutte biologique in Les antagonisms microbiens*. 24-eme colloque SFP; Bordeaux, 26-28 mai 1983, Ed. INRA nr.18, p.333-3415.
3. **Ponchet J., 1983** - *Reconnaissance et domestication de l'antagonisme microbien in Les antagonisms micobiens*, 24-eme colloque SFP; Bordeaux, 26-28 mai 1983, Ed. INRA nr.18,1-5

4. Severin V., Iliescu C.H., 2006 - *Bolile bacteriene ale plantelor*. Ed. Geeă, p.328
5. Solovei E.F. 1974. *Effect of antibiotics on Agrobacterium tumefaciens Smith and grapevine tumors*. Biologich.Nauki, 17 (8) 101-106.
6. Zang W., Saks E.J., Lewis Ilev M.I., Miller S.A., Franus D.M., 2005 - *Resistance in Lycopersicon esculentum intraspecific crosses race T1, strains of Xanthomonas campestris pv. vesicatoria causing bacterial spot of tomato*. Phytopath.,95,5,519-527.
7. Zinca N.,1971. *Cercetări asupra cancerului la vita de vie produs de Agrobacterium tumefaciens* Con Teză de doctorat.
8. Xiaoyng J.F., Xie M., Chen P.M., Guo J.M., 1990 - *Control of grape crown gall disease with HLB-2 strain of Agrobacterium radiobacter*. Chinese J.Contr.6,1,35-37

PRELIMINARY RESULTS CONCERNING THE CONTROL OF VINE PERST AND DISEASES UNDER THE CONDITION AGROCLIMATIC OF DEALU BUJORULUI VINEYARD

REZULTATE PRELIMINARE PRIVIND COMBATEREA PRINCIPALELOR BOLI ȘI DĂUNATORI AI VIȚEI DE VIE ÎN CONDIȚIILE AGROCLIMATICE DIN PODGORIA DEALU BUJORULUI

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***Abstract.** At the Research Station for the vine growing and Bujoru, in to 2008 does experimentation have a program of combat integrate has principals pests and diseases of vine in the plantation Dealu Bujorului or has introduction of the pesticide has last generation as are: Equation, Coragen, Talendo, Curzate F, Kocide. This products plant health to apply in a number to low of treatments has to ensure effectiveness exceptional in the combater's principal of agent's pathogen and pests and diseases one in the wine plantation.*

Key words: grapevine, pathogens, vineyard

***Rezumat.** În anul 2008 la S.C.D.V.V. Bujoru a fost experimentat un program de combatere integrată a principalelor boli și dăunători ai viței de vie din podgoria Dealu Bujoru în care au fost introduse pesticide de ultima generație cum ar fi: Equation, Coragen, Talendo, Curzate F, Kocide etc. Aceste produse fitosanitare aplicate într-un număr redus de tratamente au asigurat o eficacitate deosebită în combaterea principalilor agenți patogeni și dăunători din plantațiile viticole.*

Cuvinte cheie: vița de vie, agenți patogeni, podgorie

INTRODUCTION

The pest control of vineyard represents a technological measure important for the production's quality maintenance as well as for the maintenance of the productive potential of the vineyard plantations. Because now days the pesticides are found in a large variety, to establish the specific kind of pest-killers to be used it is necessary to consider their biological and economical efficiency as well as the extent in which they are able to reduce the grapes' pollution as well as the entire ecosystem's pollution. The purpose of using new pesticides was to combat the main pathogens in Dealu Bujorului vineyard in a context in which the climate factors' deviation from the usual annual average affects their biology, their occurrence, as well as their evolution.

MATERIALS AND METHOD

The experimental lots were located within a plantation started in 1980 including three grape vine sorts: Merlot, Feteasca Neagra, and Cabernet Sauvignon which have as a partner the mother plant Berlandieri X Riparia S04-4 with a semi-tall bilateral cordon leading form and a plantation distance of 2/1, 20 m. The experimental design included the following lots:

1. V1 - The Witness/ The Untreated Lot
2. V2 - The Conventional Chemical Treatment Lot
3. V3 - The Du Pont Product Experimental Lot

To establish how badly the diseases such as vine manna, vine mildew, and grape moth attacked the grape wine, observation have been made on the intensity and frequency at which these diseases damaged the grape leaves and grape clusters.

a) The attack intensity (I %) is a relative value that gives the degree in which the attack spreads on the plant by comparing the attacked surface to the whole observed surface. To report the attack intensity a six category intensity scale is used; each category represents a grade of the attack intensity.

The results of the observation that has been made on the lots regarding the attack intensity have been interpreted using the following calculus formula: $I\% = \frac{\sum (i \times f)}{n}$. The symbols in this formula represent:

n - the number of plants or plants organs being attacked

I - the grade or the percent of attack on the plant

f - the number of plants attacked for each grade/percent

b) The attack frequency (F %) is the relative value representing the number of attacked plants (grape vines) compared to the number of the observed plants, determined by using the following formula: $F\% = \frac{n \times 100}{N}$. The symbols of this formula stand for the following variables:

n - the number of plants or plant organs being attacked

N - the number of plants being observed

c) The Attack Degree (AD/GA %) represents the extent of the attack spreading on the whole plantation or the total number of plants under observation, and it is given by the following formula: $GA\% = \frac{F\% + I\%}{100}$.

RESULTS AND DISCUSSIONS

Under the climatic conditions of the vegetative period of 2008 there have been advertised seven phyto therapeutic treatments to combat grape vine pathogens and diseases.

During the vegetative period there have been observations made on the intensity, the frequency and the degree of the attack of the vine manna, the vine mildew, and the grape moth on the grape leaves, as well as on the grape clusters. The data have been calculated and interpreted in the laboratory for the following grape vine sorts: Feteasca neagra, Merlot and Cabernet Sauvignon.

To maintain the health of the grape vine from the experimental lots, treatments with systemic and contact phyto therapeutic products have been applied. These products are as follows: Sulfavit 80 PU, Sulfavit 95 PP, copper sulfate, Ridomil Gold Plus 42,5 WP, Equation, Coragen, Talendo, Curzate F, Kocide etc.

The treatments have been applied when advertised using the MPSP 3 machine; the chemical products being combined depending on the pathogens that

needed to be eliminated. The amount of solution used was 400 l/ha for the two first treatments, and 900- 1000 l/ha for the next treatments.

In order to characterize the climatic conditions of 2008 from the Dealu Bujorului vineyard, the data recorded at the meteorological station S.C.V.V. Bujoru have been used. Thus, analyzing the recorded climatic data, it has been noticed that during the vegetative repose period the absolute minimum temperatures did not drop under the cold resistance limit of grape vine (-18, 0°C).

On 05.01.2008 there have been recorder -14, 5°C; temperature which did not affect the viability of the grape vine's buds from the experimental lots.

The vegetative period has started with abundant precipitations, but irregularly scattered through it. Also during this period the recorded precipitations have been higher than the monthly regular average and so, during March, April, and May, a precipitation surplus of 11, 4 mm has been recorded.

With regard to the precipitations' evolution, there has been noticed an irregular distribution of them throughout this period of time, with an excess during May (60, 6 mm compared to a multiannual average of 31, 2 mm), a value close to the normal average during June and July, and a deficit during August, September, and October.

In the context of scarce biological reserves and swinging climatic conditions during the vegetative period (high temperatures, abundant precipitations, high atmospheric humidity, dew etc.) the following results have been recorded:

- **The Vine Manna** (*Plasmopara viticola* - Bert et Curt)

In 2008 the vine manna's occurrence and evolution have been favoured by the climatic conditions during May, June, and July. The primary infections occurred in the first decade of May, while the symptoms (brown spots and the fructifications of the vine manna) occurred during the second decade of May.

The pathogen had a strong evolution during the blooming period; the attack could be seen on the blossoms as well as on the young grape clusters (favoured by the abundant and frequent precipitations); this stage called the "rot - gris" has produced important damage in the vineyards where the phytotherapeutic treatments have not been applied at the right time using the adequate products.

Under the climatic conditions during the research period it has been noticed that the manifestation of the pathogen's attack on the grape leaves and clusters has been weaker for the grape vine sorts that have been studied. Therefore the vine manna's attack on the grape leaves has varied from 0, 05 % for Cabernet Sauvignon (V2) and 0, 13 % for Merlot; while the attack on the grape clusters has varied from 0, 18 % for Feteasca Negra and 0, 47 % for Cabernet Sauvignon (table 1). For the Merlot sort a G.A (Attack Degree) of 8, 49 % on the leaves and 14, 07 % on the grape clusters has been registered.

The evolution of the pathogen has been kept under control by applying six phytotherapeutic treatments. During the vegetative period of 2008, 43 secondary infections have been recorded among which 33 occurred during May, and June, and 10 during July.

Table 1

**Vine Manna's and Vine Mildew's Attack Degree on the Grape Vine
on 18. 07. 2008 in the Dealu Bujorului Vineyard**

Lot	Grape Vine Sort	Vine Manna's Attack (<i>Plasmopara viticola</i> - Bert et Curt)		Vine Mildew's Attack (<i>Uncinula necator</i> - Schw- Burr)	
		Leaves (G.A %)	Grape Clusters (G.A %)	Leaves (G.A %)	Grape Clusters (G.A %)
V 1	Untreated - Merlot	8,49	14,07	7,65	4,85
V 2	Merlot	0,09	0,75	0,06	0,01
	Fetească neagră	0,09	0,18	0,27	0,66
	Cabernet Sauvignon	0,05	0,19	0,03	0,13
V 3	Merlot	0,13	0,67	0,03	0,0
	Fetească neagră	0,12	0,68	0,34	0,04
	Cabernet Sauvignon	0,10	0,47	0,28	0,03

- **The Vine Mildew** (*Uncinula necator* - Schw-Burr)

The vine mildew has good conditions of evolution during the vegetative period, the attack being noticed after budding and the coppices' growth. Later on 15 generations of vine mildew have been recorded and they have been controlled using seven phytotherapeutic treatments. The vine mildew attack degree on the leaves varied from 0, 27 % for Feteasca neagra (V2) and 0, 34 % for Feteasca neagra (V3), while on the grape clusters varied from 0, 66 % for Feteasca neagra (V2) and 0, 04 % for Feteasca neagra (V3). For Merlot a G.A. of 7, 65 % on the leaves and 4, 85 % on the grape clusters has been recorded.

- **The Grapes' Gray Rotten** (*Botrytis cinerea* Pers.)

In 2008 the disease had a weak evolution because it has not been favored by the climatic conditions during the grapes maturation's period (low atmospheric humidity, low level of precipitations, etc.) as well as because of the weak attack of the grape moth. Therefore, the attack degree on the grapes was 0, 31 % for Cabernet Sauvignon (V2), 0, 07 % for Cabernet Saugvinon (V3), and 1, 54 % for untreated Merlot (table 2).

- **The Grape Moth** (*Lobesia botrana* Den et Schiff)

The grape moth remains the main pathogen met in the Dealul Bujorului vineyards, producing significant damage, especially for 2nd and 3rd generation favouring the occurrence of the grapes' gray rotten.

In 2008, even though the biological reserve of the grape moth from the previous years has been very large, the medium number of moths captured surpassed the economical damage edge (100 captured moths/ trap/ week) on for generation (GI) and generation (GIII) only. The maximum of the flight curve for 1st Generation (GI) reached 07.V.2008 la $\sum (tm - t_0) = 60,5^{\circ}C$ with 215 captured

moths which involved the advertising and the application of a combating treatment using Reldan 40 EC for V1 (lot1) and Coragen for V2.

For the 2nd generation, the flight peak was reached on 25.06.2008 at $\sum (tm-t_0) = 484,4$ °C with 72, 12 captured moths. The 3rd generation (G3) reached the flight peak on 13. 08.2008 at $\sum (tm-t_0) = 1101,7$ °C with 179 captured moths/ trap/ week. A significant growth of the number of the male captured moths of 3rd generation has been observed compared to the previous generation which did not surpass the economic damage edge. Regarding the larvae's frequency, the following data can be read from table 2:

- the larvae's frequency of the 1st generation (G1) had close values for all grape vine sorts; a minimum of 2, 0 % being recorded for Merlot (V2), and a maximum of 6, 0% for Feteasca neagra (V3).

- for the 2nd generation (G2) low and close values have also been recorded for the majority of the grape vine sorts observed, except for Merlot (V2) that showed a larvae's frequency on the grape clusters of 10%.

- for the 3rd generation (G3) the attack had medium and close values for all grape vine sorts that have been studied.

Table 2

The Grape Gray Rotten's (*Botrytis cinerea Pers*) and the Grape Moth's Attack (*Lobesia botrana Den et Schiff*) at S.C.D.V.V. Bujoru during 2008

Lot	Grape Vine Sort	Grape Gray Rotten's Attack			Grape Moth's Attack (the attack on grapes frequency %)		
		F	I	G.A %	G al a	G all a	G all a
V 1	Untreated - Merlot	13,66	11,33	1,54	11,66	13,66	22,66
V 2	Merlot	4,66	6,03	0,28	2,00	10,00	6,00
	Fetească neagră	3,33	4,94	0,16	5,00	0,66	4,66
	Cabernet Sauvignon	6,66	4,77	0,31	3,50	0,00	7,00
V 3	Merlot	2,66	5,33	0,14	6,00	0,00	5,00
	Fetească neagră	3,00	6,11	0,18	6,00	0,66	6,00
	Cabernet Sauvignon	2,00	3,77	0,07	3,33	0,00	7,00

CONCLUSIONS

1. The climate conditions during the research period favored the attack of the criptogamic diseases (grape manna and grape mildew) requiring the application of six treatments for grape manna and seven treatments for grape mildew which kept the grape vines in a good phytotherapeutic condition.

2. Even though the biological reserve of grape manna from the previous year has been small, the climatic conditions favorable to the occurrence and the evolution of the pathogen determined the occurrence of the symptoms in the vineyard during the second decade of May, the attack being observed on the blossoms and on the new grape clusters as "rot-gris".

3. The grape mildew had favorable conditions of evolution during the vegetative period; the attack has manifested with a greater intensity on the grapes.

4. The monitoring of the grape moth has shown that even though the biological reserve from the previous year has been significant, the pathogen's occurrence evolution in 2008 has been modest, surpassing the economic damage edge (PED) (100 captured moths/ trap/ week) for 1st and 3rd generation only. For this reason, it was necessary to advertise and apply one treatment for the larvae's combat for GI (1st generation) of V1, and two treatments for V2 (1st and 3rd generation).

5. The experiments involving the use of the phytotherapeutic products ensured a good protection of the grape vine against the pathogens and diseases under changing global climatic conditions.

REFERENCES

1. **Mirică I., Mirică Afrodita, 1976** – *Combaterea bolilor și dăunătorilor la vița de vie*. Editura Ceres.
2. **Tabaranu G., Simion Cristina, 2005** - *Întrebări și răspunsuri privind recunoașterea și combaterea dăunătorilor precum și a celor mai frecvente boli în plantațiile viticole din S-E Moldovei*, Editura Pax Aura Mundi, Galați.
3. **Teodorescu Georgeta, Roman T., Mirică Sumedrea Mihaela, 2003** - *Entomologie Horticolă*. Editura Ceres, București.
4. **Ulea E., 2003** – *Fitopatologie*. Editura "Ion Ionescu de la Brad", Iași.
5. *****, 1980** - *Metodici de prognoză și avertizare a tratamentelor împotriva bolilor și dăunătorilor plantelor de cultură*. Ministerul Agriculturii și Industriei Alimentare, București.

CRUDE OIL DEGRADATION IN AN ARTIFICIAL POLLUTED SOIL

DEGRADAREA ȚIȚEIULUI ÎNTR-UN SOL POLUAT ARTIFICIAL

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Abstract. *Crude oil is both the principle source of energy for man and an important environmental pollutant. Bioremediation is becoming the technology of choice for the remediation of many contaminated/polluted soils, particularly with petroleum hydrocarbons. This paper presents the results obtained in the second year of bioremediation in the soil polluted with 5% and 10% crude oil, treated with a natural biodegradable product and bacterial inoculum. The plant use in the experiment is maize. The aim of this study was to examine the effects of the natural biodegradable product and bacterial inoculum on the degradation of crude oil hydrocarbons and on plant growth.*

Key word: degradation, crude oil, polluted soil

Rezumat. *Țițeiul este principala sursă de energie, dar în același timp un important poluator al mediului înconjurător. Bioremedierea a devenit cea mai bună tehnologie de remediere a solurilor contaminate/poluate, mai ales cu hidrocarburi din petrol. Lucrarea prezintă rezultatele obținute în cadrul celui de-al doilea an experimental de bioremediere a solului poluat cu 5% și 10% țiței, tratat cu un produs biodegradabil natural și inocul bacterian. Planta utilizată în cadrul experimentului este porumbul. Scopul studiului este acela de a urmări efectele produsului natural biodegradabil și al inoculului bacterian asupra degradării hidrocarburilor din țiței și a dezvoltării plantei.*

Cuvinte cheie: degradare, țiței, sol poluat

INTRODUCTION

Accidental spills of crude oil and its refined products occur on a frequent basis during routine operations of extraction, transportation, storage, refining and distribution.

Bioremediation was tested for the first time in 1989, when 40,9 millions litres crude oil (Exxon Valdez incident) polluted 2200 km costal area in the Prince William Sound, Alaska. It is considered one of the most devastating human-caused environmental disasters ever to occur at sea. As significant as the Exxon Valdez spill was, it ranks well down on the list of the world's largest crude oil spills in terms of volume released. Exxon had to pay 900 millions \$ and contact Environmental Protection Agency (EPA) to find an immediately and efficient solution. The researchers found a large taxonomic variety in microorganisms and a good aeration of soil and decided to use the bioremediation method by nutrients addition (azote, phosphorous) to increase biodegradability rate. The decontamination was a real success and was achieved in short time.

Bioremediation of crude oil polluted soils (decontamination by using microorganisms) is an efficient solution from economically point of view compared to the physical and chemical methods.

Bioremediation strategies are based on the application of various methodologies to increase the rate or extent of the biodegradation process. Biodegradation as a natural process may proceed slowly, depending on the type of oil. The success of oil spill bioremediation depends on our ability to optimize various physical, chemical, and biological conditions in the contaminated environment. The most important requirement is the presence of microorganisms with the appropriate metabolic capabilities.

MATERIAL AND METHODS

It has been achieved an experiment in Green House. The soil used in the experiment was cambic chernozem with a pH value by 8,09, organic matter content value by 5,155%, organic carbon content by 2,99%, azote content by 0,279% and a ratio carbon/azote (C/N) by 12,5.

The experiment has 11 experimental variants with soil polluted 5% and 10% crude oil, treated with 50g, 100g and 200g ECOSOL/20 kg polluted soil, inoculated and uninoculated with bacteria selected according to the following experimental scheme:

- ✓ V₁, control (unpolluted soil);
- ✓ V₂, polluted soil with 5% crude oil;
- ✓ V₃, polluted soil with 10% crude oil;
- ✓ V₄, polluted soil with 5% crude oil + 50 g ECOSOL;
- ✓ V₅, polluted soil with 5% crude oil + 50 g ECOSOL + bacterial inoculum;
- ✓ V₆, polluted soil with 5% crude oil + 100 g ECOSOL;
- ✓ V₇, polluted soil with 5% crude oil + 100 g ECOSOL + bacterial inoculum;
- ✓ V₈, polluted soil with 10% crude oil + 100 g ECOSOL;
- ✓ V₉, polluted soil with 10% crude oil + 100 g ECOSOL + bacterial inoculum;
- ✓ V₁₀, polluted soil with 10% crude oil + 200 g ECOSOL;
- ✓ V₁₁, polluted soil with 10% crude oil + 200 g ECOSOL + bacterial inoculum.

In the first experimental year was observed an increase of biodegradability rate in accordance with the applied treatment, so the experiment continued.

For determining the total petroleum hydrocarbons concentration from soil samples was used gravimetric method. The samples was submit to a solide-liquid extraction in organic solvent by using Soxhlet device. The minimum time for extraction is 4 hours in function with sample content in petroleum hydrocarbons.

RESULTS AND DISCUSSIONS

The soil polluted with 5% and 10% crude oil, treated with different quantities of natural product, inoculated and uninoculated with bacteria inoculum determined a decrease of total petroleum hydrocarbons concentration in accordance with the applied treatment.

The results obtained in the second experimental year shows that the biodegradation processes take time according to the existing literature data. A decrease was recorded in time and this agrees with the observation existing in scientific literature.

Each value for total petroleum hydrocarbons concentration represents the mean of 3 replicates.

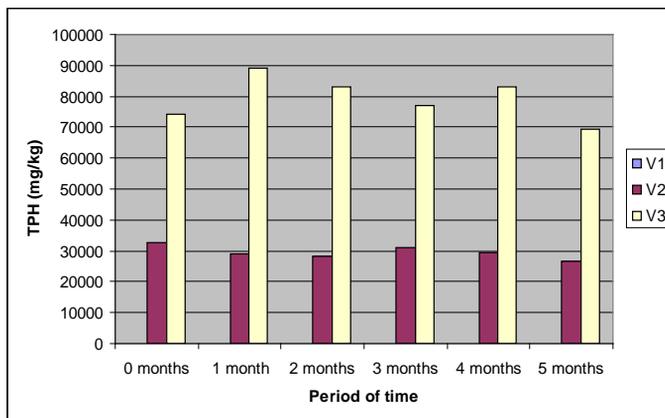


Fig.1. The evolution of total petroleum hydrocarbons (TPH) concentration in unpolluted soil, polluted soil with 5% crude oil and polluted soil with 10% crude oil (V_1, V_2, V_3)

The evolution of total petroleum hydrocarbons concentration with time in experimental variant V_1 - unpolluted soil, V_2 - polluted soil with 5% crude oil and V_3 - polluted soil with 10% crude oil is presented in figure 1. The figure shows that total petroleum hydrocarbons values were higher on experimental variants with polluted soils compared to the control suggesting the presence of crude oil.

The total petroleum hydrocarbons concentration decreases in time with 19%, respectively 6% in the polluted soil with 5%, respectively 10% crude oil.

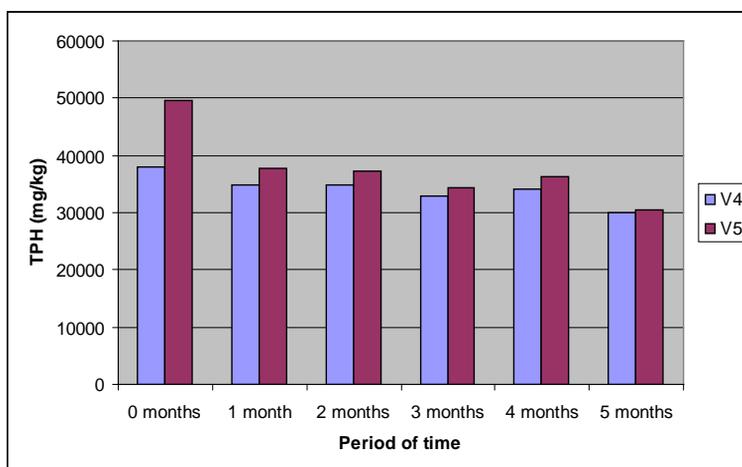


Fig. 2. The evolution of total petroleum hydrocarbons (TPH) concentration in the polluted soil with 5% crude oil conditioned with 50 g ECOSOL/20 kg polluted soil (V_4 and V_5)

The evolution of total petroleum hydrocarbons concentration in the polluted soil with 5% crude oil conditioned with 50 g ECOSOL/20 kg polluted soil is presented in figure 2. The polluted soil with 5% crude oil conditioned with 50 g ECOSOL/20 kg polluted soil presented a total petroleum hydrocarbons decrease in time with 20% in the case of V₄ experimental variant and with 38% in case of inoculated variant V₅ comparatively with the untreated polluted soil where the decrease was by 19%.

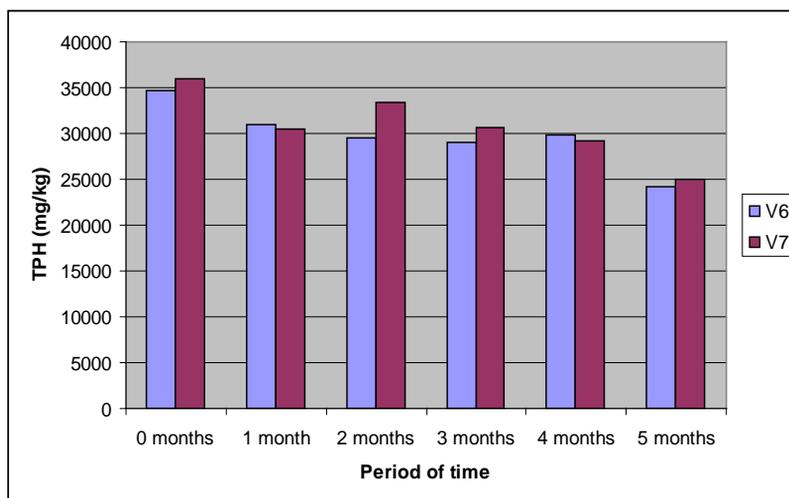


Fig. 3. The evolution of total petroleum hydrocarbons (TPH) concentration in the polluted soil with 5% crude oil conditioned with 100 g ECOSOL/20 kg polluted soil (V₆ and V₇)

The evolution of total petroleum hydrocarbons concentration in the polluted soil with 5% crude oil conditioned with 100 g ECOSOL/20 kg polluted soil is presented in figure 3. The total petroleum hydrocarbons concentration decreases with 30% in V₆ experimental variant and with 31% in the inoculated variant V₇.

If there are analysed the experimental variants polluted with 5% crude oil, conditioned with 50 g ECOSOL/20 kg polluted soil, respectively 100 g ECOSOL/20 kg polluted soil, the decrease were by 20%, respectively 30%. In the experimental variants polluted with 5% crude oil, inoculated with bacteria, conditioned with 50 g ECOSOL/20 kg polluted soil, respectively 100 g ECOSOL/20 kg polluted soil, the decrease were by 38%, respectively 31%.

As a preliminary conclusion, the experimental variant recommended to remediate a polluted soil with 5% crude oil could be the one treated with 100 g ECOSOL/20 kg polluted soil and bacterial inoculum.

The evolution of total petroleum hydrocarbons concentration in the polluted soil with 10% crude oil conditioned with 100 g ECOSOL/20 kg polluted soil is presented in figure 4.

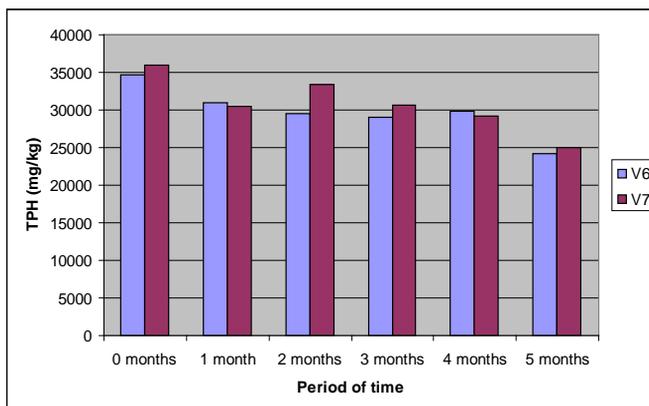


Fig. 4. The evolution of total petroleum hydrocarbons (TPH) concentration in the polluted soil with 10% crude oil conditioned with 100 g ECOSOL/20 kg polluted soil (V₈ and V₉)

As it can be observed, the polluted soil with 10% crude oil conditioned with 100 g ECOSOL/20 kg polluted soil presented a total petroleum hydrocarbons decrease in time with 12% in the case of V₈ experimental variant and with 20% in case of inoculated variant V₉, comparatively with the untreated polluted soil where the decrease was by 6%.

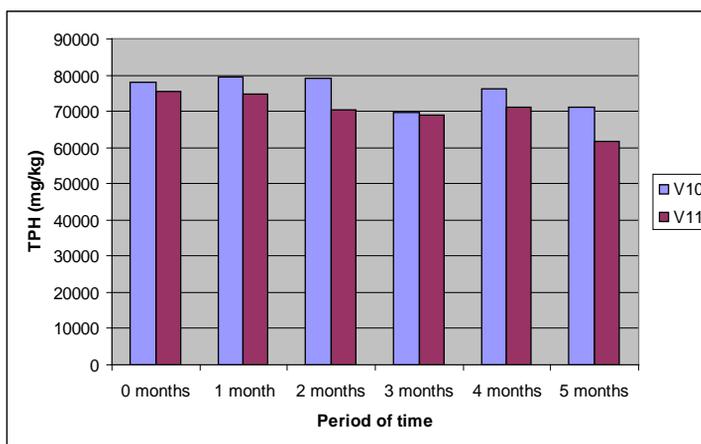


Fig. 5. The evolution of total petroleum hydrocarbons (TPH) concentration in the polluted soil with 10% crude oil conditioned with 200 g ECOSOL/20 kg polluted soil (V₁₀ and V₁₁)

The evolution of total petroleum hydrocarbons concentration in the polluted soil with 10% crude oil conditioned with 200 g ECOSOL/20 kg polluted soil is presented in figure 5. The total petroleum hydrocarbons concentration decreases with 10% in V₁₀ experimental variant and with 18% in the inoculated variant V₁₁.

In the experimental variants polluted with 10% crude oil, conditioned with 100 g ECOSOL, respectively 200 g ECOSOL/20 kg polluted soil, the decrease were by 12%, respectively 10%. In the experimental variants polluted with 10%

crude oil, inoculated with bacteria, conditioned with 100 g ECOSOL/20 kg polluted soil, respectively 200 g ECOSOL/20 kg polluted soil, the decrease were by 20%, respectively 18%.

As a preliminary conclusion, the experimental variant recommended to remediate a polluted soil with 10% crude oil could be the one treated with 200 g ECOSOL/20 kg polluted soil and bacterial inoculum to increase the biodegradability rate.

CONCLUSIONS

The experimental study leads to the following preliminary conclusions:

- ✓ To remediate a soil polluted with 10% crude oil is recommended the treatment with 100 g ECOSOL/20 kg polluted soil and bacterial inoculum to increase the biodegradability rate.
- ✓ To remediate a soil polluted with 10% crude oil is recommended the treatment with 200 g ECOSOL/20 kg polluted soil and bacterial inoculum to increase the biodegradability rate.
- ✓ The results obtained in the second experimental year leads to the conclusion that the treatment of the crude oil polluted soil with natural product and bacterial inoculum determined a decrease of total petroleum concentration in time.
- ✓ The reduction of pollution degree in experimental variants is due to the intensification of biodegradation processes and the establishment of a favorable equilibrium from microbiological point of view.

REFERENCES

1. Atlas R.M., Bartha R., 1992 - *Hydrocarbon biodegradation and oil spill bioremediation*. In K.C. Marshall, ed. *Advances in Microbial Ecology*, Vol. 12, Plenum Press, NY, pp. 287–338.
2. .Nikolopoulou M., Pasadakis N., Kalogerakis N., 2007 - *Enhanced bioremediation of crude oil utilizing lipophilic fertilizers*. *ScienceDirect, Desalination* 211 (2007) 286–295.
3. Okoh A.I., Trejo-Hernandez M. R., 2006 - *Remediation of petroleum hydrocarbon polluted systems: Exploiting the bioremediation strategies*. *African Journal of Biotechnology* Vol. 5 (25), pp. 2520-2525.
4. Pepper Ian L., Gerba Charles P., Brusseau Mark L., 1996 - *Pollution Science*. Academic Press.
5. Snape I., Riddle M.J., Stark J.S., Cole C.M., King C.K., Duquesne S., Gore D.B., 2001 - *Management and remediation of contaminated sites at Casey Station*. *Antarctica, Polar record*, 37:199-214.

EFFECT OF CARBETOX ON METAMORPHOSIS OF *RANA RIDIBUNDA* TADPOLES

INFLUENȚA CARBETOX ASUPRA METAMORFOZEI LA MORMOLOCII DE *RANA RIDIBUNDA*

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Abstract. *In our experiments we investigated the histological modifications induced by the action of the insecticide Carbetox in the Rana ridibunda tadpoles during metamorphosis. Carbetox is known to cause nonreversible acetylcholine inhibition and diminishes activity, growth and development in amphibian tadpoles. The tadpoles used in the experiment were divided in three experimental lots: one lot of control individuals and two experimental lots in which the tadpoles were kept in aquaterrarios with a 0.02 ml/l water and respectively 0.002 ml/l water Carbetox. The water and toxic was changed daily and the tadpoles were fed for the duration of the experiment. After 28 days of exposure to Carbetox rved significant effects on morphogenetic tissue.*

Key words: Carbetox, insecticide, tadpoles, *Rana ridibunda*

Rezumat. *Exeprimentele au urmărit modificările histologice induse de acțiunea insecticidului Carbetox la mormolocii de Rana ridibunda în timpul dezvoltării embrionare. Carbetox-ul determină inhibiția ireversibilă a acetilcolinei, diminuează activitatea, creșterea și dezvoltarea mormolocilor. Mormolocii utilizați în experimente au fost împărțiți în trei loturi: un lot martor și două loturi de experiență în care mormolocii erau ținuti în acvaterarii cu 0.02ml/l, respective 0.002ml/l Carbetox. Apa și toxicul erau schimbate zilnic, iar mormolocii au fost hrăniți pe toată durata experienței. După 28 de zile de expunere la Carbetox au fost evidențiate modificări asupra unor teritorii morfogenetice.*

Cuvinte cheie: Carbetox, insecticid, mormoloci, *Rana ridibunda*

INTRODUCTION

The action of chemical pollutants on various species of amphibians is the main objective of the numerous researches carried out in recent years (Ch.Bridges 2000, Ferah Saym 2008, A. Relyea 2004, 2005, 2006, Ponepal et al. 2008, Păunescu et al. 2008). The interest for such a topic is partly explained, by the widespread use of insecticides to combat pests and secondly by the fact that this group of organisms is probably, the most exposed to toxic pesticides (Fulton and Chambers, 1985, Berril et al. 1994, Sparling et al.2001). Larva of amphibians is usually exposed to low levels of pesticides during their development. The studies generally examine, the short-term effects of exposure, but often ignore the importance of individual development cycle during which tadpoles are exposed.

The study has in view the effects of Carbetox insecticide on embryonic development of frog tadpoles.

MATERIAL AND METHODS

In our experiments we have used larvae of *Rana ridibunda*, hatched in the laboratory, the laying of eggs being taken from lakes bordering Pitesti. The larvae were divided into three lots: the first lot includes control individuals of *Rana ridibunda* kept in aquaterrariums with clean water; the second lot consists of larvae of *Rana ridibunda* kept in aquaterrariums with Carbetox in a concentration of 0.02ml/l and the third lot consists of larvae of *Rana ridibunda* kept in aquaterrariums with Carbetox in a concentration of 0.002ml/l. The experiences have been conducted at a temperature of 20-22°C. Water and toxic have been changed daily, and larvae were fed ad libitum. The treatment began on the first day of larval life and lasted four weeks, during which no mortality was recorded for specimens of the third lot; the dose used for the second lot was lethal since the first week. Sampling was done weekly. They were fixed in 8% formalin for poikilotherms, histologically processed, colored with hemalaun-eozine and observed under a microscope.

The toxic used is an organophosphorous insecticide containing melathion as the active substance, which is part of the third group of toxicity. It is used to combat pests in vegetables, field crops, fruit trees, grape moth, defoliating caterpillar, black louse and peas weevil.

RESULTS AND DISCUSSIONS

The results of the lot treated with a solution of Carbetox 0,002ml/l for seven days are shown in figure 1. It has been noticed that, the toxic causes a delay in the development of the neural tube, since its upper edges have not been detached from ectoblast although its typical contour is evident. At this stage it was natural that ectoblast should be restored above the neurectoblast, which has not happened, due to the slow process of differentiation under the action of the toxic. The same phenomenon affects the neural crests, which were not individualized to detach from the neural tube.

Similar researches have been carried out by Mary Jordan, K. Rzehak and Anna Maryanska (1977), studying the effects of Miedzian 50 and Gesagard 50 pesticides on the development of tadpole *Rana temporaria*. The water slurries matter of the two pesticides induced changes in the digestive tract, brain and muscles; Miedzian 50 caused a partial cytolysis of intestinal epithelium cells an liver parenchyma. Gesagard 50 pesticide caused significant degenerative changes of the alimentary canal and the brain, which consisted in a partial inhibition of growth and delay in the adjustment process of the opercula.

Our experiments also recorded a late development of the nothocord which, under normal circumstances, it should have been outlined. The related research made by M. Pilar Honrubia et al. (1993) have demonstrated that CarbamatZZ- Apfax ® insecticide induce structural changes of gills, liver, gall-bladder, heart and notochord to *Rana perezi* tadpoles in a dose of 0.02‰ and 0.14‰ for nineteen weeks.

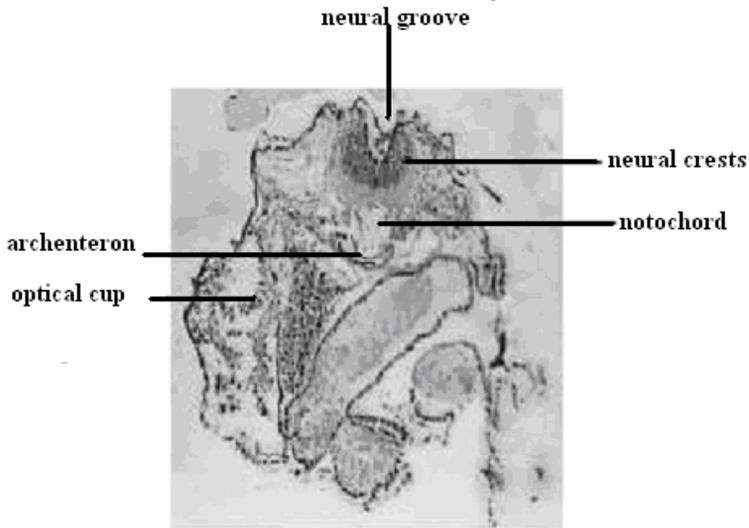


Fig. 1. Cross section through the frog tadpole treated with Carbetox in a concentration of 0,002ml/l, HE coloration, (4X)

The research also shows that after fourteen days of treatment, the same dose of Carbetox of 0,002ml/l, induces changes similar to those observed after seven days of treatment.

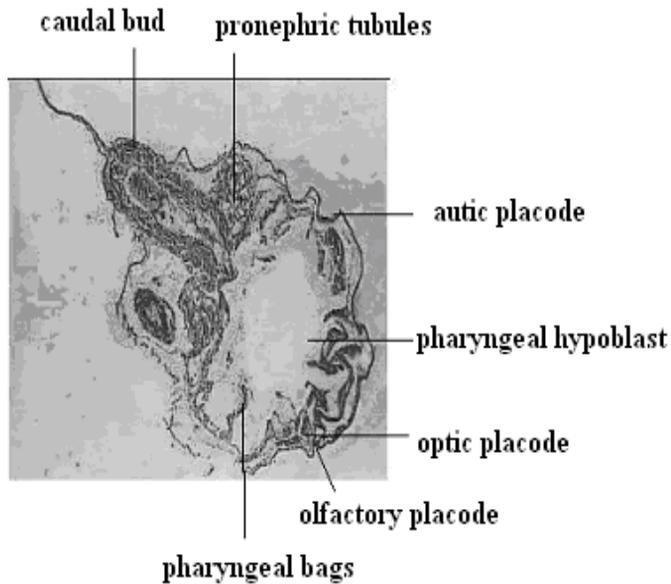


Fig. 2. Cross section through the frog tadpole treated with Carbetox in a concentration of 0,002ml/l, HE coloration, (4X)

Therefore, as seen in figure 2, the primary sense organs which begin to appear are least apparent while the development of the excretion organs causes deficiencies manifested through the incomplete structure organisation of the mesonephros.

It should be emphasized that after 21 days of treatment, degenerative changes induced by the harmful effect of Carbetox are illustrated by delays in the development of the mesoblast that have not developed somites, the intermediate parts and intestines (fig.3).

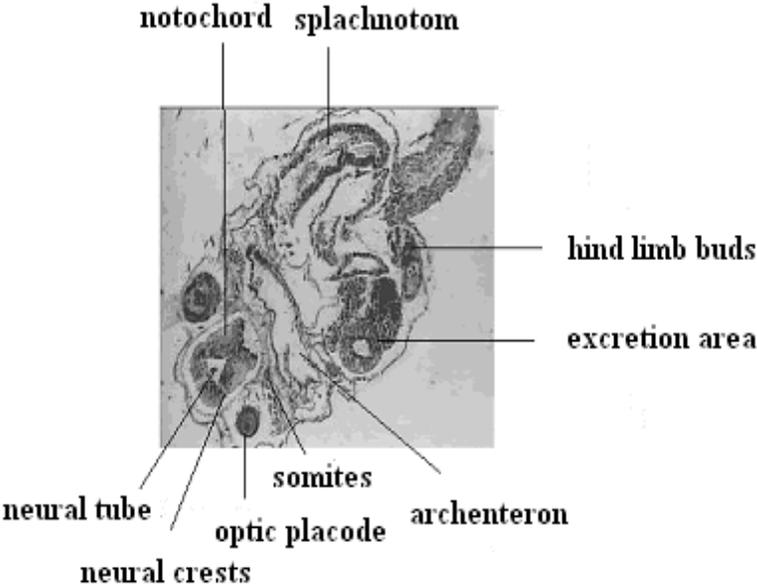


Fig. 3. Cross section through the frog tadpole treated with Carbetox in a concentration of 0,002ml/l, HE coloration, (4X)

Similar effects were observed in the research conducted by H.P.Gurushankara et al. (2007) who followed the effects of malathion on survival, growth and feeding of *Limnonectes limnocharis tadpoles*. They found out that the number of tadpoles that survived the increasing doses of malathion (from 500µg to 3000µg/g) decreased, their food consumption also decreased and slowed the tadpoles growth and development. Similarly, in his studies on the larvae of *Rana ridibunda* treated with malathion, Ferah Sayim (2008) has observed some signs of toxicity such as: loss of balance, delay of growth, deformation of the tail, abnormally coiled intestine and generalized edema.

We point out that the deformation of the tail and edema were observed in our research as well, for larvae treated with Carbetox in a dose of 0,002ml/l which had no lethal effect, and a dose of 0.02ml/l, respectively. This latter dose appears

to have completely blocked all the processes of differentiation and development of morphogenetic territories (fig.4). This concentration of Carbetox is likely to have inhibited the development of the hypoblast which formed pharyngeal bags in the pharyngeal regions. The toxic effect was lethal.

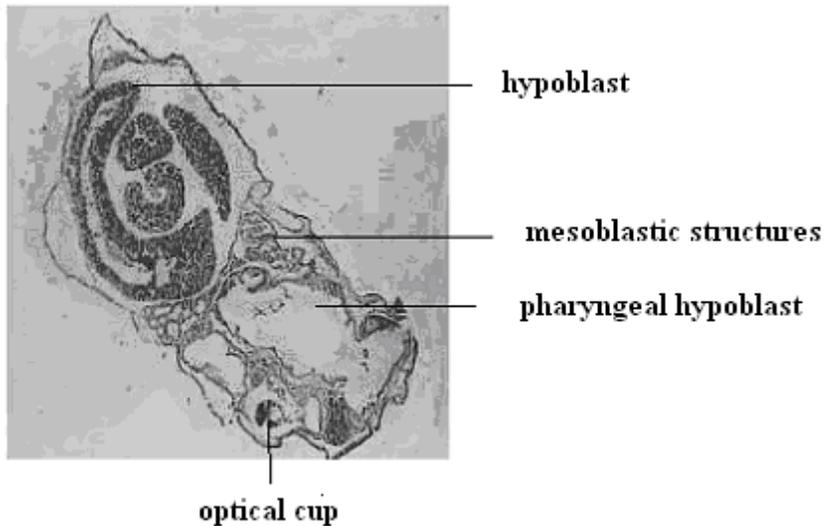


Fig. 4. Cross section through the frog tadpole treated with Carbetox in a concentration of 0.02ml/l, HE coloration, (4X)

It can be concluded that the harmful effect of Carbetox, in which malathion is the active substance, is manifested by deformation of the tail and the entire larval body.

CONCLUSIONS

A dose of 0.02 ml/l Carbetox causes a noticeable slowing larval development in *Rana ridibunda*, its effect being lethal after seven days of treatment. A dose of 0,002ml/l Carbetox causes disorders of histogenesis and organogenesis, which are clear in the neural stage throughout the treatment. This dose is not lethal, but causes delays in the development and evolution of the neurectoblast, chordoblast, mesoblast and hypoblast. After 28 days of treatment there appear some malformations with deformities of the tail and the whole larval body, delays of histogenesis and organogenesis.

REFERENCES

1. **Berrill M.S., Bertram S., McGillivray L., Kolohon M. and Paull B., 1994** - *Effects of low concentrations of forest-use pesticides on frog embryos and tadpoles.* Environmental Toxicology and Chemistry. 13, p. 657-664.
2. **Bridges Ch.M., 2000** – *Long-term effects of pesticides exposures at various life stages of the Southern Leopard Frog (Rana sphenocephala).* Journals Archives of Environmental Contamination and Toxicology, vol. 39, nr.1/ June, p. 91-96.
3. **Ferah Sayim, 2008** – *Acute Toxic Effects of Malathion on the 21st Stage Larvae of the Marsh Frog,* Türk J. Zool. 32, p. 99-109.
4. **Fulton M.H., Chambers J.E., 1985** - *The toxic and teratogenic effects of selected organophosphorus compounds on the embryos of three species of amphibians.* Toxicology Letters 26, p. 175-180.
5. **Gurushankara H.P, Krishnamurthy S.V., Vasudev V., 2007** – *Effect of Malathion on Survival, Growth, and Food Consumption of Indian Cricket Frog (Limnonectes limnocharis) Tadpoles.* Journal Archives of Environmental Contamination and Toxicology, vol. 52, nr. 2 / February, Collection Earth and Environmental Science, p. 251-256.
6. **Honrubia M.P., Herraes M.P., Alvarez R., 1993** – *The carbamate insecticide ZZ-Aphox[®] induced structural changes of gills, liver, gall-bladder, heart and notocordof Rana perezi tadpoles.* Journal Archives of Environmental Contamination and Toxicology, vol. 25, nr.2 / August, p. 184-191.
7. **Jordan M., Rzehak K., Maryanska A., 1977** – *The effect of two pesticides, Miedzian 50 and Gesagard 50 on the development of tadpoles of Rana temporaria.* Journal Bulletin of Environmental Contamination and Toxicology, vol.17, nr. 3 / May, p. 349-354.
8. **Păunescu Alina, Ponepal Cristina Maria, Drăghici O., Marinescu Al.G., 2008** – *Histologic Modification Induced by the Action of the Insecticide Samurai on the Skin and Liver of Rana ridibunda.* „A 60-a aniversare a Facultății de Horticultură” și „A 10-a aniversare a specializării de peisagistică”, Seria B LI, p. 666-670.
9. **Ponepal Cristina Maria, Marinescu Al.G., Drăghici O., Păunescu Alina, 2008** – *The changes of some physiological parameters in Prussian carp under the action of the Propiconazole fungicide.* 37th IAD Conference „The Danube River Basin in a changing World”, Chișinău, Moldova.
10. **Relyea R. A., 2004** – *Synergistic impacts of malathion and predatory stress on six species of North American tadpoles.* Environmental Toxicology and Chemistry 23, p. 1080-1084.
11. **Sparling D.W., Fellers G.M., McConnell L.L., 2001** - *Pesticides and amphibian population declines in California. USA,* Environmental Toxicology and Chemistry 20, p. 1591-1595.

EFFECT OF THE FUNGICIDE CHLOROTHALONIL (BRAVO) ON SOME PHYSIOLOGICAL PARAMETERS IN PRUSSIAN CARP

EFFECTUL FUNGICIDULUI CLOROTALONIL (BRAVO) ASUPRA UNOR PARAMETRI FIZIOLOGICI LA CARAS

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Abstract. *In this paper we study the action of the Bravo 500 SC fungicide (the active substance is the chlorothalonil), under different concentration (0.78125×10^{-3} , 1.5625×10^{-3} , 3.125×10^{-3} , 6.25×10^{-3} and 12.5×10^{-3} ml / l water) on some physiological parameters on prussian carp (*Carassius auratus gibelio* Bloch). The fungicide Bravo had an inhibitory effect on oxygen consumption for the prussian carp. In all studied concentration the Bravo fungicide modified the values of breathing frequency (the fungicide effect is stimulating at first and then inhibiting of the breathing frequency).*

Key words: chlorothalonil, prussian carp, oxygen consumption, breathing frequency, number of erythrocytes.

Rezumat. *În această lucrare am studiat acțiunea fungicidului Bravo 500 SC (substanță activă clorotalonil) în diferite concentrații (0.78125×10^{-3} , 1.5625×10^{-3} , 3.125×10^{-3} , 6.25×10^{-3} și 12.5×10^{-3} ml / l apă) asupra unor parametri fiziologici la caras (*Carassius auratus gibelio* Bloch). Fungicidul Bravo a avut un efect inhibitor asupra consumului de oxigen al carasului. În toate concentrațiile studiate fungicidul Bravo a modificat valorile ritmului respirator (efectul fungicidului este stimulator la început, după care frecvența mișcărilor respiratorii scade).*

Cuvinte cheie: clorotalonil, caras, consum de oxigen, frecvența mișcărilor respiratorii, număr de eritrocite

INTRODUCTION

The commercial product Bravo 500 SC is a concentrated suspension of chlorothalonil (500g / l) produced by Syngenta Crop Protection AG, Basel, Switzerland. Chlorothalonil (2,4,5,6 tetrachlor isophthal-nitrile) is a contact fungicide with curative and preventive action (works by stopping germination and the development of spores) for combating a large number of pathogens (leaf spots, downy mildews, alternarioses, fruit rots, brown rot of fruit, scab) that threaten the main crops (12). Chlorothalonil has been marketed since 1969 under different trade names: Bravo, Anathalonil, Anadra, Anadac, Retador, Bravonil, Cheyene, Helmonil, Clorimex, Daconil etc. The fungicide is part of group IV of toxicity; it is not toxic to bees, warm-blooded animals and moderately toxic to insects (Kidd and James, 1991). Chlorothalonil and its metabolites are very toxic to fish, aquatic invertebrates and marine organisms: LC50 (96 h) is of 0.25

mg/l for rainbow trout (*Salmo gairdneri*), 0.3 mg/l for sun perch (*Lepomis macrochirus*), 0.43 mg/l for sea devil (*Ictalurus punctatus*), etc. (Kidd and James, 1991). Using an open breathing chamber and highly purified chlorothalonil, Davies and White (1985) report values of LC 50 (96 h) for aquatic organisms between 10.5 and 29.2 mg/l (Davies and White, 1985). Present in the animal organism, chlorothalonil reacts with glutathione in the intestine, giving mono- or diconjugates or triglutathione which can be excreted or further metabolized to thiol or mercapturic acid derivatives (Ernst et al., 1991). One also notices increases in levels of GSH in the liver from exposure to 10 mg / l after 96 hours, and significant decreases in the liver thiols (Davies and White, 1985). Chlorothalonil is not stored in the adipose tissue and is rapidly excreted outside the body, its rate of bioaccumulation being low.

This study was carried out to analyze the impact of lethal and sub-lethal concentrations of chlorothalonil on some physiological parameters of Prussian carp (*Carassius auratus gibelio Bloch*).

MATERIAL AND METHOD

Determinations were carried out during February-April 2008 on samples of Prussian carp (*Carassius auratus gibelio Bloch*) caught in the lakes bordering Pitesti. Fish were acclimatized for two weeks before the completion of experiments in aquariums with a capacity of 100 l, under natural photoperiodic conditions in which they were fed once a day (*ad libitum*), at around 10. After acclimatization in the laboratory, fish were separated into groups and placed in the experiments.

Six experimental variants were completed, of two-three lots of 10 fish belonging to two generations (C_0 and C_1): variant I - fish subjected to the fungicide concentration of 0.78125×10^{-3} ml Bravo 500 SC/l (0.39 mg/l chlorothalonil) (I.1 - fish with average weight of 14.16 g, I.2 - fish with average weight of 35.42 g and I.3 - fish with average weight of 32.15 g), variant II - fish subjected to the fungicide concentration of 1.5625×10^{-3} ml Bravo 500 SC/l (0.78 mg/l chlorothalonil) (II.1 - fish with average weight of 13.24 g, II.2 - fish with average weight of 28.57 g and II.3 - fish with average weight of 34.85 g), variant III - fish subjected to the fungicide concentration of 3.125×10^{-3} ml / Bravo 500 SC/l (1.5625 mg/l chlorothalonil) (III.1 - fish with average weight of 15.24 g and III.2 - fish with average weight of 27.45 g), variant IV - fish subjected to the fungicide concentration of 6.25×10^{-3} ml Bravo 500 SC/l (3,125 mg/l chlorothalonil) (IV.1 fish with average weight of 12.58 g and IV.2- fish with average weight of 33.12 g), variant V - fish subjected to the fungicide concentration of 12.5×10^{-3} ml Bravo 500 SC ml/l (6.25 mg/l chlorothalonil) and variant VI (control) - comprises three lots of 10 fish with no treatment, kept in dechlorinate tap water (VI.1 - fish with average weight of 15.24 g, VI.2 - fish with average weight of 36.84g and VI.3 - fish with average weight of 31.35 g).

In mentioned variants (lots I.1-VI.1, I.2-VI.2) determinations were made at intervals of 24, 48, 72, 96 hours and 7 days of oxygen consumption and the frequency of respiratory movements (fish mortality was observed during 14 days of treatment). Lots I.3, II.3 and VI.3 (the control lot) includes hematological determinations (number of erythrocytes) done on the lots of fish after 7 days of exposure to the toxic (after 7 days of immersion in the toxic solution, blood samples were collected to establish the number of erythrocytes and fish were killed).

Concentrations of Bravo 500 SC were established by preliminary tests of survival. Introducing fish into the solution was done after their good mixing and aeration for 5 minutes. Water temperature was of 16-18° C, the "immersion" solution was changed every 24 hours and water aeration was continuous; the fish were not fed during experiments to avoid interference of this additional factor. The testing method was semi-static with refreshing solution in 24 hours after the calculations of the day, in aquariums of 100 l for each experimental lot. Oxygen consumption was established by means of Winkler method and oximeter, glycemia was determined using o-toluidine method and the glucometer and erythrocytes were counted in a Thoma chamber, using a small amount of blood from the caudal artery on the optic microscope (Picos and Nastasescu, 1988). The statistical interpretation of the results was performed with the Anova test.

RESULTS AND DISCUSSIONS

For a good comparison between the toxic effects of chlorothalonil in the concentrations investigated, the average frequency of respiratory movements was represented graphically in Figure 1.

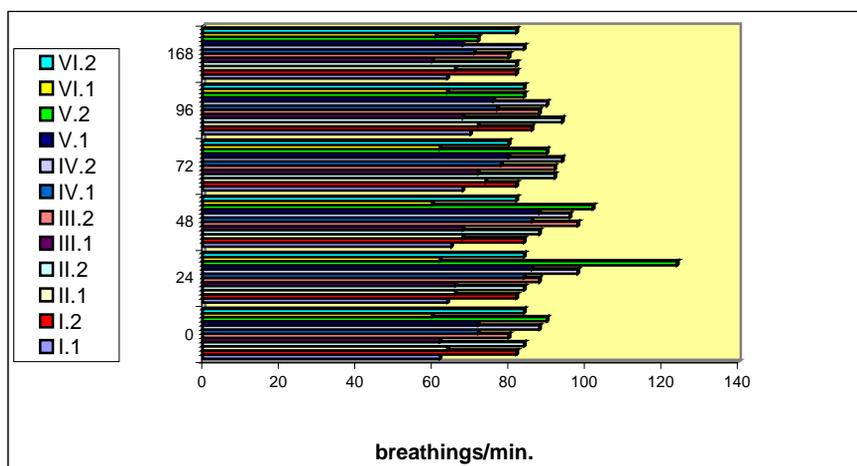


Fig. 1. The influence of Bravo fungicide upon breathing frequency on prussian carp

Chlorothalonil has changed the respiratory rhythm of prussian carps in all investigated concentrations. For all concentrations tested the effect of the fungicide is initially stimulating and inhibitory as regards the frequency of respiratory movements. Similar effects on prussian carps were also noticed at another fungicide - propiconazole (Ponepal et al., 2008). Variations of the respiratory rhythm in both generations of fish exposed to chlorothalonil concentration of 0.39 mg / l are insensitive to the threshold of significance $p < 0.05$. The stimulating effect of respiration is maintained for 72 hours after exposure to three concentrations, the strongest stimulation being recorded after 24 hours of exposure to the concentration of 12.5×10^{-3} ml / l Bravo 500 SC (37.77%

more than the value recorded at the beginning of the experiment, a significant increase for $p < 0.05$).

Analysis of Figure 1 shows that chlorothalonil effect is stronger on smaller fish. This physiological parameter values recorded after 7 days of exposure to toxic action, return to normal for the four concentrations tested, both for fish of larger sizes, and for those of smaller size. Figure 2 shows the average oxygen consumption at prussian carps exposed to the fungicide Bravo in different concentration for 7 days.

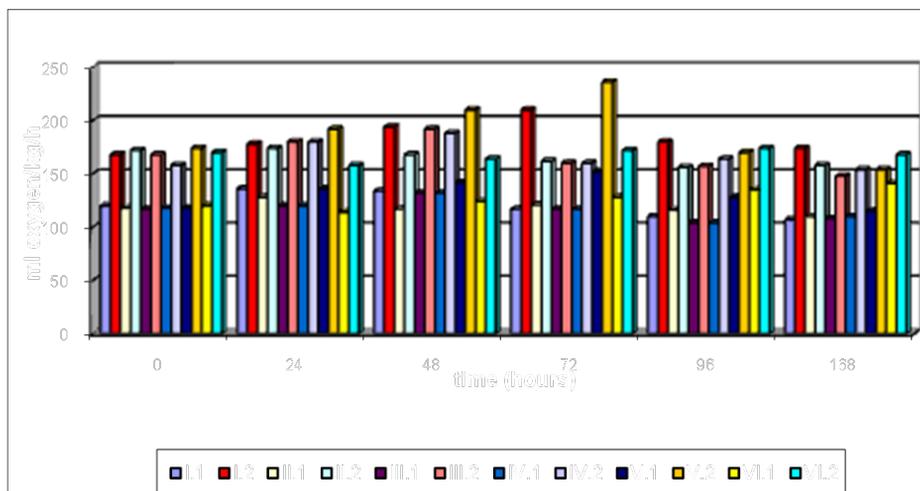


Fig. 2. The influence of Bravo fungicide upon oxygen consumption on prussian carp

After 7 days of exposure, for all lots of fish tested, oxygen consumption values fall below the value recorded before the introduction of fish in experiments, significant reductions of between 88.09 and 97.45 of the control lots. Similar changes (for specific concentrations) were reported by Marinescu, under the action of another fungicide - Dithane M-45 (Marinescu et al., 2004).

Figure 3 represents graphically the average values of erythrocytes at prussian carps exposed to the toxic chlorothalonil concentrations of 0.39 and 0.78mg / l, compared to the average control. The values obtained for the control variant are higher than those presented in the specialized literature (Schliecher, 1927, Mc Cay, 1931, cited from Motelica et al., 1965), probably due to the period in which experiments were carried out. For both experiments carried out – I.3 and II.3, the average values of erythrocytes after 7 days of immersion in the toxic solution have decreased by 4.81% and 12.83% compared to control, significant decreases for the threshold of significance $p < 0.05$, which can be correlated with decreased consumption of oxygen after 7 days of exposure to toxic.

Decreases in the number of erythrocytes after 7 days of exposure to the action of a pesticide have also been reported by other authors (Dhembare and Pondha, 2000, Hughes et al., 1995, Ponopal et al., 2006). Table 1 shows the data on Prussian carps mortality during the experiments.

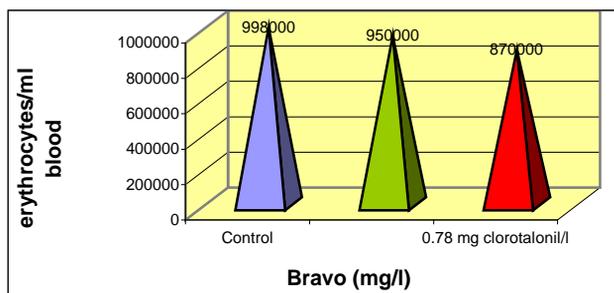


Fig. 3. Changes in the number of erythrocytes in prussian carp after 7 days of exposure to the fungicide Bravo

Table 1

Lethal effect of the fungicide Bravo on Prussian carp

Experimental variants	The number of living specimens					
	Immersion time (hours)					
	24	48	72	96	168	336
VI.1	10	10	10	10	10	10
VI.2	10	10	10	10	10	10
I.1	10	10	10	10	10	10
I.2	10	10	10	10	10	10
II.1	10	10	10	10	9	9
II.2	10	10	10	10	9	8
III.1	10	10	9	9	8	7
III.2	10	10	9	9	8	8
IV.1	10	10	9	9	8	6
IV.2	10	9	7	7	6	4
V.1	10	10	9	8	7	2
V.2	9	8	7	6	4	0

The acute test (96 hours) records mortality from the concentration level of $3,125 \times 10^{-3}$ ml / Bravo 500 SC, but none of the variants record absolute mortality. Chlorothalonil toxicity is lower than that indicated in the literature (Kidd and James, 1991, Davies and White, 1985), which is due both to the testing method (semi-static) and the fact that no pure chemical product has been used.

CONCLUSIONS

Chlorothalonil (commercial product from Bravo 500 SC) in concentrations of 0.78125×10^{-3} , 1.5625×10^{-3} , 3.125×10^{-3} , 6.25×10^{-3} and $12,5 \times 10^{-3}$ ml / l Bravo, had an overall stimulating effect on oxygen consumption of Prussian carps in the first phase (with variable duration: 24-96 hours after exposure) followed by restoration of energy metabolism after 7 days of exposure to toxic.

In all concentrations studied, chlorothalonil (0.39, 0.78, 1.5625, 3125, and 6.25 mg/l water) has significant changed (for $p < 0.05$) the values of the respiratory rhythm at Prussian carps during the acute test (96 hours), the toxic effects being initially stimulating, followed by reducing the physiological parameter. The

values recorded after 7 days of exposure to the fungicide were in all cases very close to the control.

The fungicide Bravo 500 SC, in a concentration of 0.78125×10^{-3} , 1.5625×10^{-3} ml/l water, has produced a significant decrease in the number of erythrocytes (by 4.81% and 12.83% as compared to the control, a significant decrease of the threshold of significance $p < 0.05$).

During the acute test (96 hours) the fungicides Bravo 500 SC has caused mortality only in concentrations of 0.3125×10^{-3} , 6.25×10^{-3} and 12.5×10^{-3} ml / l the smaller species being more sensitive to the toxic than the larger ones.

REFERENCES

1. **Davies P.E. and White R.W.G., 1985** - *The toxicology and metabolism of chlorothalonil in fish. 1. Lethal levels for Salmo gairdneri, Galaxias maculatus, G. truttaceus and G. auratus and the fate of super(14)C-TCIN in S. Gairdneri.* Aquatic Toxicology, 7 (1-2). pp. 93-105.
2. **Davies P.E., 1985** - *The toxicology and metabolism of chlorothalonil in fish. Metabolism, enzymatics and detoxication in Salmo spp. and Galaxias spp.* Aquatic Toxicology, 714, pp. 277-299
3. **Dhembare A. J., Pondha G. M., 2000** – *Haematological changes in fish. Punctius sophoreexposed to some insecticides.* J. Expt. Zoo India, 3 (1), 41-44
4. **Ernst W., Doe K., Jonah P., Young J., Julien G. and P. Hennigar, 1991** - *The toxicity of chlorothalonil to aquatic fauna and the impact of its operational use on a pond ecosystem.* Archives of Environmental Contamination and Toxicology, Springer New York, Volume 21, Number 1/July 1991, pag. 1-9
5. **Hughes G.M., Szegetes T., Nemcsok K.J., 1995** - *Haematological and biological changes in the blood of carp (Cyprinus carpio) following brief exposure to an organophosphoric insecticide (Methidathion).* Abs.Int.Bioid.Symp.Cesze Budejovice
6. **Kidd H., James D. R., 1991** - *Eds. The Agrochemicals Handbook.* Third Edition. Royal Society of Chemistry Information Services, Cambridge, UK, (as updated). 6-10
7. **Marinescu Al. G., Drăghici O., Cristina Ponepal, Alina Păunescu, 2004** – *The influence of fungicide (Dithane M-45) on some physiological indices in the prussian carp (Carassius auratus gibelio Bloch).* Intern. Assoc. Danube Res, 35, Novi Sad, pp. 209-214
8. **Moteliță I., Picoș C.A., Matei C., Vlădescu C., 1965** – *Observații asupra numărului de eritrocite și cantității de hemoglobină la unele vertebrate poikiloterme.* Stud.Cerc.Biol., Ser. Zool, București, 17 (4)
9. **Picoș C.A., Năstăsescu Gh., 1988**– *Lucrări practice de fiziologie animală.* Tipografia Universității din București, București, 107, 122-123, 192-195
10. **Ponepal M.C., Marinescu A.G., Draghici O., Paunescu Alina, 2008** - *The changes of some physiological parameters In Prussian carp under the action of the propiconazole fungicide.* 37th IAD Conference „The DanubeRiver Basin in a changing World”, Chisinau, Moldova
11. **Ponepal M.C., Paunescu A., Draghici O., Marinescu Al.G., 2006** - *Research on the changes of some physiological parameters in several fish species under the action of the thiametoxame insecticide.* Proceedings 36th International Conference of IAD, Austrian Committee Danube Research / IAD, Vienna, 4-8 septembrie, pp. 163-167
12. <http://extoxnet.orst.edu/pips/chloroth.htm>

WASTE TREATMENT IN MECHANICAL BIOLOGICAL TREATMENT (MBT) UNITS

TRATAREA DEȘEURILOR MUNICIPALE ÎN INSTALAȚII MECANO-BIOLOGICE (MTB)

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Abstract. *The paper presents a study related to municipal waste treatment in a Mechanical Biological Treatment (MBT) unit. The installation was elaborated by the company „Global Renewables”. The process is working in Sydney – Australia. All recyclable materials are separated and recycled, including biodegradable products. Following this process a large amount of carbon contained in the waste is converted in bio-available product by composting. Electrical energy is also produced.*

Key words: waste, composting, recycling, environment.

Rezumat. *Lucrarea prezintă un studiu legat de stațiile de Tratare Mecanică și Biologică (MTB) a deșeurilor. Metoda a fost elaborată de firma „Global Renewables”. Procesul se aplică în Sydney – Australia. Toate materialele reciclabile sunt separate și reciclate, inclusiv produșii biodegradabili. Prin acest proces o cantitate mare de carbon conținut în deșeu este transformată în materiale bio-asimilabile prin compostare. Se produce, de asemenea, energie.*

Cuvinte cheie: deșeu, compostare, reciclare, mediu

INTRODUCTION

As the standard of living of people increases, there is a significant increase in the amount of waste that accumulates, resulting the need to address the problem of recycling in a new way that takes into account the evolution of mankind, in terms of raw materials and resource conservation energy

Addressing the issue of waste is a vital component of the principles of sustainable development. Worldwide there are concerns related to the optimization of the methods of waste treatment, in order to ensure the best possible recovery of materials and energy contained therein. The process developed by “Global Renewables” is a progress compared with other treatment processes because it involves integrated municipal waste treatment methods, ensuring a high recovery of waste in terms of economic efficiency.

MATERIAL AND METHOD

Modern waste processing units apply complex technologies involving mechanical and biological processes (Mechanical Biological Treatment - MBT) for separation and waste treatment.

In a first stage separation occurs in the main stream of waste recyclable materials. It is considering separating paper, plastics, glass and metals, which are then recycled by specific procedures.

Organic fraction of waste is subjected to a process of composting, obtaining a nutrient-rich compost. Typically, in the process of composting the temperatures are increasing enough in order to destroy pathogens. Biodegradable materials that can't be composted are subject to anaerobic degradation processes, in order to obtain biofuels. The obtained biofuels are used in order to provide thermal energy for the processes involved, and some of the biogas is used to produce electricity. Sand is also separated. In order to ensure economically and technologically efficient processes it is essential to assure the control of the process, so as to minimize the potential environmental contamination.

A modern treatment plant of municipal waste by mechanical-biological methods work in Australia where the process "The Urban Resource - Reduction, Recovery and Recycling Process® - UR-3R" is applied by Australian company Global Renewables' in association with the City of Sydney [1-4].

The 'UR-3R' is an integrated MSW plan for reduction, recovery, recycling (3R), accepting the full waste stream including green and food waste. Essentially is a mechanical-biological (MBT) separation and conversion process. The process utilizes advanced material sorting, the ISKA Percolation process, energy recovery (from biogas only), and composting [5].

RESULTS AND DISCUSSIONS

The application of the process proposed by the company Global Renewables' reduced by 210,000 tons per year the amount of carbon dioxide eliminated in the atmosphere and obtains an income of 11.6 M per year [1-11]. In parallel, a quantity of 30,000 tons of organic fertilizer for use in farms is produced. This compost improves soil quality assuring accelerated growth of crops, reintroducing a significant quantity of nutrients to agriculture.

Compacted or loose waste are handled and stored in a storage room which which is held at a negative pressure to prevent odours from escaping, and then manually sorted into three categories: paper, glass, plastic (sort itself in polyethylene terephthalate (PET), high density polyethylene (HDPE) and mixtures of plastics). Metal separation is made by means of electro-magnetic methods, plastic films and sheets of paper, by stripping drafts using cyclones. Recyclable materials are then sent to companies specialized in recycling.

After the separation of recyclable materials in mainstream material remained other organic materials and small pieces of materials. They are subject to a percolation process (extraction with water followed by filtration). Following this process the reduction of odor and of the quantity of organic waste takes places. The extract is subjected to anaerobic biological treatment process (digestion), separation of sand, denitrification, cleaning for removal of contaminants (broken glass, sand, and ceramics). Following anaerobic digestion process a fraction of biogas rich in methane (70% methane and 30% carbon dioxide, with small amounts of other gases such as hydrogen sulphide) are produced. After water separation, which is recirculated in the process, a stage of aerobic biological treatment of separated solid material at temperatures between

45-75°C takes places. Then follows a stage of maturation of compost that lasts up to eight weeks, separation the remaining contaminants, filtration, separation and packing oversized materials for distribution. Water should always be recirculated in the process so that installation does not require installation of additional drains or water treatment plants. The required energy is produced using the biogas produced in anaerobic biological treatment stage. Excess energy is sold to consumers.

The process stages with the mass balance are shown in Figure 1 [1]. One can noticed that from 100 tonnes of unsorted municipal waste 3,2 tons of metal, 7.2 tons of paper, 2.6 tons of glass and 6.8 tonnes of plastic are recovered. In parallel a quantity of 4.9 tonnes of biogas and 20.7 tons of compost are produced.

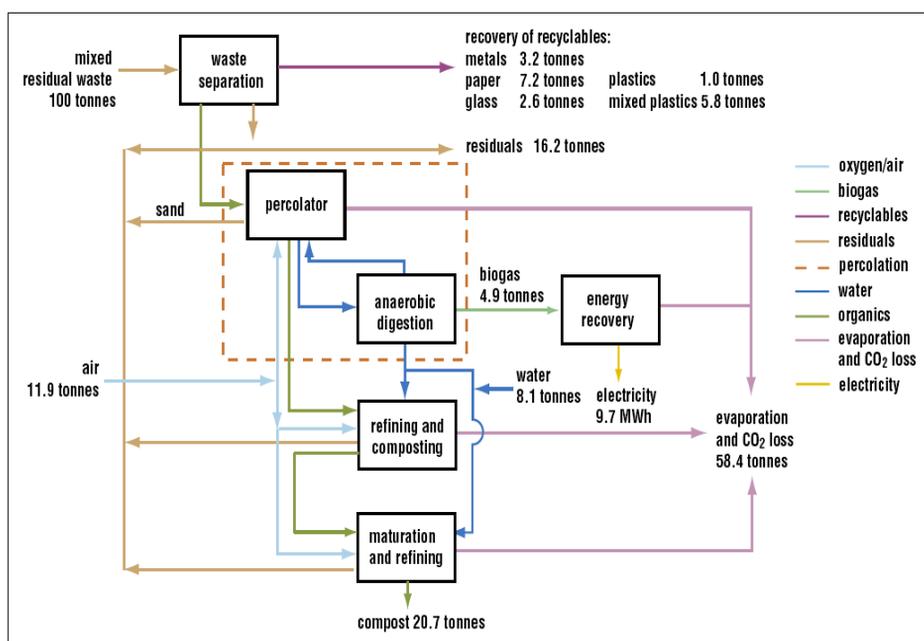


Fig. 1. The UR-3R Process®, showing mass balance of waste input and output. SOURCE: GLOBAL RENEWABLES GROUP [1]

The method presented in this paper can be a good example of municipal waste treatment, for the treatment plants that had to be elaborated. Starting from this example research programs has to be developed in order to establish the best solutions for waste treatments plants adapted to the specific composition of the waste from Romanian cities.

The process Ur 3R is also a very good example of integrated waste treatment method for teaching materials, in order to teach the state-of-the-art processes.

CONCLUSIONS

Application of mechanical-biological treatment methods of municipal waste is an effective method of recovery of materials and energy contained in municipal wastes.

The method proposed by the company Global Renewables' differs essentially from other methods that have become "classics" in economically advanced countries, by the way of approaching of the problem of organic waste.

In other methods, these wastes are either biologically degraded through anaerobic processes in order to obtain biofuels or are incinerated together with other waste with high calorific value.

The method proposed by the company Global Renewables' apply two types of biological treatment: anaerobic in order to obtain biofuels and aerobic, in order to obtain compost with high nutritional value. In parallel the recovery of other recyclable materials is assured. For this reason, municipal wastes are considered true "deposits" of which one can extract valuable materials.

REFERENCES

1. **Drynan L., 2008** - *Proposed alternative waste technology facility at chullora waste and recycling centre. Part 3 - a application for consent. Preliminary environmental assessment., Cardno Lawson Treloar Pty Ltd., LJ2675/R2417,* http://www.planning.nsw.gov.au/asp/pdf/08_0089_chullora_waste_prelimasst.pdf
2. **Milford E., 2005** - *Refining urban ore. The UR-3R plant opens in Sydney,* Waste Management World, March–April, p. 29.
3. **Partl H., Philpott L., Salem J., 2005** - *Full cost pricing – one approach to internalising environmental costs.* http://lca-conf.rmit.edu.au/2005/Papers/Partl_Philpott_Salem.pdf
4. **Singh D., La Brooy S., Lawson J., 2003** - *Hybrid resource recovery and the demise of AWT, Sustainable outcomes: Making it happen.* Waste & Recycle, 9-13 September.
5. **Williams R. B., Jenkins B.M., Nguyen D., 2003** - *Solid Waste Conversion: A review and database of current and emerging technologies, Final report, University of California Davis, Department of Biological and Agricultural Engineering:* http://biomass.ucdavis.edu/materials/reports%20and%20publications/2003/2003_Solid_Waste_Conversion.pdf
6. **White J., 2005** - *Garbage miners mean business.* ECOS Magazine, Issue 125.
7. **Yenken D., Wilkinson D., 2000** - *Resetting the Compass: Australia's Journey Towards Sustainability.* CSIRO Publishing, Melbourne.
8. <http://emergentcapital.com.au/globalrenewables>
9. http://www.c40cities.org/bestpractices/waste/sydney_recycling.jsp
10. http://www.sustainability.vic.gov.au/resources/documents/GRL_UR3R_Facility.pdf
11. <http://www.globalrenewables.com.au/>

THE IMPACT OF SOLID WASTES AGAINST THE PRINCIPAL ENVIRONMENT COMPONENTS

IMPACTUL DEȘEURILOR SOLIDE ASUPRA PRINCIPALELOR COMPONENTE DE MEDIU

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Abstract. *Together with the introduction of sustainable development concept, the problems of wastes are clearly emphasized, because it can not be applied a sustainable development, in economic, social and environment protection terms, without implementation of a sustainable wastes management. When is speaking of sustainable wastes management it must be considered the following: reduction of wastes quantity, waste use as secondary raw matter, non-recovering wastes deposition into controlled landfills, wastes use as alternative fuels.*

Key words: solid wastes, environment impact, waste management

Rezumat. *Odata cu introducerea conceptului de dezvoltare durabilă, problematica deșeurilor iese și mai mult în evidență, deoarece nu se poate realiza o dezvoltare durabilă, în termeni economici, sociali și ai protecției mediului, fără a implementa și gestionarea durabilă a deșeurilor. Vorbind despre gestionarea durabilă a deșeurilor ne referim la: reducerea cantităților de deșeuri, utilizarea deșeurilor ca materie primă secundară, îngroparea deșeurilor nerecuperabile în depozite controlate fără a influența mediul, utilizarea deșeurilor ca și combustibil alternativ.*

Cuvinte cheie: deseuri solide, impactul asupra mediului, managementul deseurilor

INTRODUCTION

The 21st century society is a super industrialized one, the lifestyle and civilization level being highly superior to the one in the last century, with an urban explosion difficult to control, and with a consumption rate increasing every year. But, as a paradox, the same society faces a serious crisis of raw materials, the resources exhaustion and the acceleration of the environmental contamination (Zaharia C. and all, 2008). Presently proof is given about the fact that the industrial civilization generated disequilibrium which is difficult to control, as a consequence of the irrational exploitation of natural resources, and facing at the same time an enormous amount of industrial and urban waste. The waste problem, irrespective of the category, but mainly the biohazard and toxic one, is of an increasing interest both in the intensely industrialized countries and in the countries on the way of development. as a proof of it we have numberless norms and juridical deeds elaborated both at the European Union level and internationally; all of them aim at regulating the present tendencies of environmental contamination as a result of the uncontrolled waste storage places, irrational exploitation of several categories of resources, deforesting, emissions and spillage with negative impact on the atmosphere, on the soil and on the hydrographic basins.

Analyzed under all the aspects, we can say that waste represent a substantial loss of resources, both material and energetic. It is the consequence of the fact that the excessive waste generation is the result of inefficient production processes, low durability of the goods and a certain consumption profile. The waste volume is the indicator of the way a society uses the raw material efficiently or inefficiently (Oros V. and all, 2002; Ungureanu C. and all, 2006). Once the concept of durable development was introduced, the waste problem is much more visible, because we cannot talk about a durable development in economic, social and environmental protection terms without the durable waste management implementation. When we speak about durable waste management we refer to: reducing the waste quantity, using waste as secondary raw material, burying the unrecoverable waste in controlled storage places without harming the environment, using waste as alternative fuel.

MATERIAL AND METHOD

This paper proposed a preliminary study by synthesing the scientific literature data in order to initiate the experimental researches on the integrated management of solid wastes, and biodegradable wastes respectively.

In this context, we used the informations from scientific literature, environmental reports and case studies from Romania and from abroad.

RESULTS AND DISCUSSIONS

1. LEGAL FRAMEWORK REGARDING THE WASTE MANAGEMENT

The achievement of the targets established in the European Union regarding the waste management is supported by a solid institutional and legislative framework, and by regulation. In this context we may mention the following UE Directives regarding the waste management (Zaharia C., 2008): Directive referring to batteries and accumulators containing dangerous substances (66/2006/EEC); Directive regarding the waste regime; Directive 293/2005/EC referring to the rules of monitoring the reuse/exploitation and reuse/recycle targets for the disabled cars; Directive 12/2004/EC referring to packing and packing waste; Regulation 2150/2002/CE regarding the statistics in the waste field; Directive regarding hazard waste (95/2002/EEC); Directive 96/2002/CE and Directive 95/2002/EC regarding electric equipment and electronic waste; Directive 76/2000/EC and 67/1994/EC regarding waste incineration; Directive 31/1999/EC regarding the controlled waste storage; Directive regarding the disposal of the petroleum waste (75/430/EEC), (87/101/EEC) and (91/692/EEC), etc. These directives are the result of the debates in the International Conventions (Basel Convention regarding the international transport of hazard waste and its disposal; Stockholm Convention regarding the persistent organic pollutants - 2004), and the organisms habilitated by the European Union are in charge with the compliance and accomplishment of the provisions of these norms. The European Directives were transposed in the national legislation as laws (i.e. Law no.27/2007 on the waste regime; Law 265/2002 on the international transport of the hazard waste; Law 139/2002 on the public services for city sanicity; Law 465/2001 on the management of the industrial recyclable waste), government resolutions and ordinances (i.e. HG 788/2007 on

measures regarding the waste transfer; HG 358/2007 referring to the approval of the national Strategy of waste management and of the national plan for waste management; HG 236/2007 on the management of the used oil; HG 61/2006 on waste management; HG 1872/2006 on packing waste management; HG 1313/2006 on the management of the disabled cars; HG 621/2005 on packing and packing waste management; HG 448/2005 on the management of electric and electronic waste; HG 349/2005 regarding the waste storage; HG 268/2005 regarding the waste incineration; etc.) (Zaharia C., 2008). The Directives of the Communitary Strategy referring to Waste Management COM (96) 399 several principles were established which are defining and relevant for what is desired, a planning process for waste management. These principles refer to:

- Minimization of waste generation for the conservation of the environment and of the natural resources;
- Reducing the impact generated by waste on the human health and on the quality of the environment, especially by reducing the dangerous substances in waste, and implementing the principle of precaution;
- Make sure the waste generators pay for polluting the environment, by activating the principle “the Polluter pays”;
- Assure the necessary infrastructure by establishing an efficient facilities’ network for the waste disposal, based on the principle of proximity.

2. TYPES OF SOLID WASTE

Starting from several definitions of the “waste”, their classification tried to be done, using criteria which allow the subsequent achievement of statistics, comparable and compatible in the UE countries. Therefore the UE Council elaborates the Directive 75/442/CEE subsequently amended by Directive 91/156/CEE which classifies the waste according to the source. A waste classification can be done according to the following criteria (Oros C. and all, 2002; Ungureanu C. and all, 2006; Atudorei A., 2002):

1. According to **major sources**, in the order of the contribution, we have:
 - a. agricultural waste
 - b. mine and quarry waste
 - c. manufacture (industrial waste)
 - d. city waste
 - e. waste from energy generation.
2. According to the **chemical composition**, waste divides into:
 - a. organic waste (vegetal and animal waste, paper, cardboard, textile, plastic, wood, balsa, pieces remained from skin and fur cleaning, organic mud);
 - b. inorganic waste (metal and non-metal, glass, ceramic, clinker, ashes, inorganic mud, construction material – cement, plastering) ;
3. According to the **characteristics of the main elements**, we have:
 - a. combustible waste (paper, rubber, textile, plastic, wood)
 - b. fermentable waste (rests of food, fruit and vegetables)
 - c. inert waste (glass, metal, ceramics)
 - d. fine waste (soil, clinker, ashes)
4. According to the **aggressiveness towards the environment**:

- a. hazard waste (explosives, oxidant, inflammable, irritant, toxic, cancer, corrosive, infective, etc.)
- b. inert waste

The organic (biodegradable) represent an important part of the city waste, approximately 40-70%. There are then important quantities of waste from the agriculture and zootechnics, from agro-industrial processes, as well as the mud from the water treatment stations. Starting from their capacity of fermentation, in the view of the implementation of efficient techniques in order to treat this type of waste, several biotechnologies were developed and improved; in many cases they operate simultaneously with or they replace the incineration and controlled storage techniques. Their big advantage is that they reduce the waste volume, creating instead two highly useful products: compost and biogas. Among the biotechnologies used for the waste exploitation and treatment, the digestion technologies (aerobic – composting and anaerobic). These ones, through their main generated products, meets the new UE tendencies regarding the obtainment of energy from new sources and the replacement of the chemical products for the enhancing of the soil fertilization with ecological product, without a negative impact on flora and fauna.

3. THE IMPACT OF SOLID WASTE ON THE ENVIRONMENTAL FACTORS

Along with the concept of durable development, the issues of the waste stands out more, as a durable development cannot be achieved in economic, social and environmental protection terms, without also implementing the durable management of waste (Zaharia and all, 2008). When speaking about the durable management of waste, we refer to: the reduction of the waste quantities, the use of waste as a secondary raw material, the burial of unrecoverable waste in controlled warehouses without influencing the environment, the use of waste as an alternative fuel. On this background, the efficient management of waste calls for the existence and observance of special measures, appropriate to each phase of exploitation and disposal of waste. In addition, the responsibility of the manufacturers related to their own products when they become waste and the involvement of the population in the selective collection of waste should also be stressed. In the European Union, the waste management policy is based on the waste hierarchy principle, which implies mainly the prevention of the waste generation, followed by its recovery (reuse, recycling, recovery of energy or materials) and eventually its elimination (incineration without recovery of energy and storage) (fig.1).

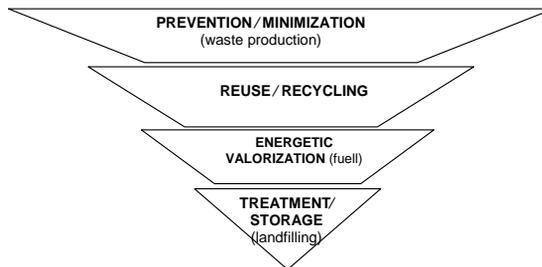


Fig. 1. Priorities in the approach of the waste management

Due to the lack of appropriate set up and inadequate exploitation, uncontrolled waste warehouses – the most common practice nowadays in numerous countries for the waste management – are among the sources recognized as generating negative impact for the environment and public health. Among the impact and risk forms determined by these warehouses, either industrial or municipal, we mention the following: landscape changes and visual discomfort, air, surface and underground pollution, changes of the soil fertility and of the biocenoses on the neighboring lands.

4. WASTE TREATMENT AND EXPLOITATION ORIENTATIONS

The basic principles of the environmental policy in Romania are established according to the European and international provisions, with a view to ensuring nature protection and preservation, biological diversity and durable use of its components (NPWM). The main **principles** based on which the waste management activities are emphasized in the National Plan for Waste Management (NPWM) are the following:

1. The principle of **protection of the primary resources** is formulated in the wider context of the “durable development” concept and establishes the need to minimize and optimize the use of primary resources, especially the renewable ones, emphasizing the use of secondary raw materials.
2. The principle of **preliminary measures**, correlated to the principle of the **BATNEEC use** (“The best techniques available that do not involve excessive costs”) establishes that, for any activity (including for the waste management), the following main aspects must be taken into consideration: the current stage of the technology development, the requirements for environmental protection, the selection and application of those measures feasible from the economic standpoint.
3. The principle of **prevention** establishes the hierarchy of the waste management activities, in decreasing order of the importance they should have: avoiding the appearance, minimalization of amounts, treatment with the purpose of recovery, environment-friendly treatment and disposal.
4. The principle stating that the **pollutant pays**, correlated with the principle of the **manufacturer’s responsibilities** and that of the **user’s responsibilities**, establishes the need for the creation of an appropriate legal and economic background, so that costs for the waste management be covered by the waste generator.
5. The principle of the **substitution** establishes the need to replace hazardous raw materials with non-hazardous raw materials, thus avoiding hazardous waste.
6. The principle of **proximity**, correlated to the principle of **autonomy** establishes that waste must be treated and eliminated on the national territory, as much as possible, and as close as possible to the generation source; in addition, the export of hazardous waste is accepted only by those countries that have appropriate elimination technologies and only in compliance with the requirements regarding the international waste trade.
7. The principle of **subsidiarity** (correlated to the principle of proximity and to the one of autonomy) establishes the granting of competences so that decisions in the field of waste management may be taken at the lowest administrative level related to the generation source, but based on uniform criteria at a regional and national level.

8. The principle of **integration** establishes that the waste management activities are a part of the social-economic activities that generate them.

In compliance with the above mentioned principles, a hierarchy of the waste management options may be made, depending on the priorities (Fig.1) (SNGD).

CONCLUSIONS

The waste treatment and exploitation become imperative in the new century, in the context of the exhaustion of the raw material resources and the enhancement of pollution of all the environmental factors.

Moreover, the practical application of waste treatment technologies that may lead to products useful to the society, considered raw materials for a series of industrial sectors or alternative sources of energy and amendment for the soil tends to replace the controlled permanent storage and incineration.

REFERENCES

1. **Atudorei A., 2002** - *Gestiunea deșeurilor urbane*. Ed. Matrix Rom, Bucuresti
2. **Oros V., Drăghici C., 2002** - *Managementul deșeurilor*. Ed. Universității Transilvania, Brasov
3. **Ungureanu C., Ionel I., Oprisa-Stanescu P.D., Gruescu V., 2006** - *Gestionarea integrată a deșeurilor municipale*. Ed. Politehnica, Timisoara
4. **Zaharia C., Surpățeanu M., 2006** - *The environmental impact of municipal waste deposition on water quality*. Environmental Engineering and Management Journal, 5(1), p. 69-78
5. **Zaharia, Surpățeanu M., Macoveanu M., 2007** – *Assessment of environmental impact generated by municipal waste deposition into a Romanian landfill*. Journal of Environmental Protection and Ecology, 8(2), p. 332-345

VALORISATION OF BIODEGRADABLE WASTES USING WORMS' CROPPING

VALORIFICAREA DEȘEURILOR BIODEGRADABILE PRIN INTERMEDIUL VIERMICULTURII

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Abstract. *Worms' cropping or worms' composting are included into the category of biological treatment applied on biodegradable wastes, being an aerobic composting process of organic wastes, relatively cold, using worms. The procedure is based on their capacity to use as food different types of organic wastes coming from agriculture, wood industry and food industry, from slaughter houses or zootechny, together with domestic or housekeeping wastes. Finally, the wastes are transformed into stabilized products that can be used as organic manure named bio humus or bio compost.*

Key words: biodegradable waste, worms, worm composting

Rezumat. *Viermicultura sau viermicompostarea face parte din categoria metodelor biologice de tratare a deșeurilor biodegradabile, fiind un proces aerob de compostare relativ rece a deșeurilor organice cu ajutorul viermilor. Procedeeul se bazează pe capacitatea acestora de a folosi în calitate de hrană diverse tipuri de deșeuri organice provenite din agricultură, industria lemnului și cea alimentară, de la abatoare sau din zootehnie, precum și deșeuri menajere. În final, deșeurile sunt transformate în îngrășămint organice numit biohumus sau biocompost.*

Cuvinte cheie: deșeuri biodegradabile, rame, viermicompostare

INTRODUCTION

The management of the solid waste has always been a problem especially in the rural areas, where there are no special places for the controlled waste storage or disposal techniques; most of the times the waste is left in the outskirts of the localities, on the shore of a river. There are 3 categories of environments affected by the wrong storage of the waste: *exogenous* (on the ground surface), *endogenous* (inside the ground) and *hypogenous* (from the deep layer, under the soil horizon). The faster affected are the endogenous environments, which include the biotopes of the soil and its annexes: the humus layer, the litter, the moss layer, and the micro-caves.

The organic (biodegradable) wastes represent an important part of the city waste, approximately 40-70%. There are then important quantities of waste from the agriculture and zootechnics, from agro-industrial processes, as well as the mud from the water treatment stations.

Seeing their capacity of fermentation, and in order to implement some efficient techniques for the treatment of these types of waste, several biotechnologies were developed and improved, which are used in parallel in some cases or which

replace the techniques of incineration and controlled storage. They have the big advantage that the waste volume is reduced, producing instead two very useful products: **compost** and **biogas** (Istrati L. and all, 2006).

Among the biotechnologies applied for the waste exploitation and treatment, the digestion technology are highly considered lately (aerobic – compost and anaerobic – anaerobic fermentation). Due to the main products generated by them, they meet the new tendencies of the European Union regarding the obtainment of energy out of new resources and the replacement of the chemical products for the soil conditioning with ecological products, with a reduced negative impact on flora and fauna.

MATERIAL AND METHOD

Materiales: biodegradable home wastes (food wastes) and four-six worms from *Lumbricus rubellus* and *Eisenia foetida* species (fig. 1).



Fig. 1. *Lumbricus rubellus*

Working method: An amount of chopped paper waste is put into a drilled plastic box as a support and part of the grinding food waste was added. The worms are added over this and then a new amount of waste. Everything was covered with paper waste, that serves as cellulose material for worms and as covering material, with the role of maintaining the moisture and providing the escape of the worms. The entire box is kept at 20-25°C, making sure that the moisture is maintained around 50-70% by means of swilling. After two weeks, the composting degree of the waste is checked, by sampling an amount of the formed biohumus and chemical testing it. The sample is replaced with an approximately equal amount of new food waste.



Fig. 2. Selected food wastes



Fig. 3. The worms added in the plastic box prepared for composting process

RESULTS AND DISCUSSIONS

1. Before introducing the solid wastes into the process of worm composting, these must be firstly physically and chemically characterized in order to determine the inhibitors or other toxic compounds having negative actions into *Lumbricidae* growth (e.g. heavy metals or pesticides). The analysis methods are adapted after the actual standards for soil quality:

- determination of organo-chlorate pesticides using extractions liquid-liquid and gas chromatography;
- spectrophotometric determination of Fe ions content;
- determination of other heavy metals using the demineralization with concentrated nitric acid and AAS analysis.

2. *Worms' composting* is a relatively cold composting process of the organic waste with the help of the worms, based on their capacity of using various types of organic waste as food. The worms crumble mechanically the compostable organic material, and they partially decompose them after swallowing. Then biochemical decomposition is realized through bacteria and different chemical substances present in the worm's digestive tract (Duca Gh. and all, 2006). Eventually, the waste is transformed into organic fertilizer called **biohumus** or **biocompost**. This method of treatment of the organic waste is practiced at a small scale, mostly in individual farms or in pilot projects (Germany, Japan, Sweden, Republic of Moldavia). This technique stands at the base of educational projects, being practiced in schools (in 40% of the German schools) where simultaneously with the ecological education; it can be an attractive material for the Chemistry and Biology classes (Duca Gh. and all, 2006). The main advantages of this method lie in the fact that it does not require high-costs, it can be practiced in any type of farm, and under favourable weather conditions the vermicomposting can be practiced even in the open air. Moreover, the use of the biological material represented by the earthworm species is cheap and easy to get for everybody, as our country has a considerable fauna of *Lumbricidae*.

3. There are over 35 animal species which live from the vegetal and animal waste, directly or indirectly participating to the recycling. From all these, nine species belong to *Annelida*, Class of *Oligochaeta*, and they are the humifying species, and 26 species are part of the *Arthropoda*, Class *Insecta*, belonging to 4 families: *Histerinae*, *Sacarbaeidae*, *Silphidae* and *Staphylinidae*, coprophagus, necrophagus, detritivorous species or with mixed food (Pop V., 1949). Earthworms intervene in the transformation of the organic waste into biohumus (*Annelida*, Class *Oligochaeta*), in whose nutrition process several types of organic waste, which passed the fermentation process, are used. They may or may not have purple pigment. The species with purple pigment (porphyrin) get into the soil only accidentally; they live on the surface, under the rocks, under the fallen timbers, under the foliage on the soil, under the moss or under the manure. The most

frequent are *Eisenia foetida*, *Lumbricus rubellus*, *Lumbricus castaneus*, *Dendrobaena octaedra*, *Dendrobaena rubida*.

In this experiment we used the worms from *Eisenia foetida* species. The pigmented lumbricids on the surface eat plant pieces, leaves, which they transform in the digestive tract into humic matter, eventually eliminated as excrements. The non-pigmented lumbricids or those with other pigment than prophyrin get into the soil and eat the humus produced by the first ones and the edaphon's components (Pop V., 1949). Instead, these lumbricids compensate the negative activity on the soil quality with a very efficient mechanical action, by deeply aerating the soil. The most globally used species (in Moldova Republic for example) is *Eisenia foetida*, also known as "California's Red Hybrid".

4. The wastes with a biodegradable fraction are used in vermiculture:

- the domestic waste, selectively collected from the population or from bars, restaurants, canteens, which is not contaminated with dangerous substances or pathogenic agents;
- vegetal waste: mown lawn; leaves and springs from the vine (if it was not recently treated with pesticides); the leaves of the orchard trees fallen in the autumn; all the leaves and stems of the vegetables, etc. Among the trees for leaves, in the first weeks after death the cherry and pear leaves are preferred; the red shamrock from the fodder species; and onion leaves from the vegetables. Only the beech leaves are consumed undegraded, immediately after their falling.
- animal debris;
- domestic waste: skins from vegetables and fruit, cereal products. The egg shells, crashed or finely ground, are very useful as they have an important quantity of calcium.

In view to obtain a qualitative biohumus, the raw material used to produce the wormcompost must comply with the following requirements (Duca Gh. and all, 2006; 6): the humidity of the organic waste must be of 73-80%; the absence of uncompostable materials (rocks, metal, timber, glass etc.); the avoidance of the contamination with chemical polluting agents (traces of heavy metals or pesticides), the assuring of a pH appropriate for the development of the frames and the wormcasting process (6.8 – 7.5). An essential condition is an optimum C:N ration, which may ensure the energy necessary for the development of the microorganisms involved in the degradation of waste, preparing them for the wormcasting process.

5. As a consequence of the studied wormcomposting process, we obtained an intense black biohumus with high content of moisture (70%) which was subject to the physical-chemical characterization: humidity determination, active acidity, total carbon and nitrogen, Ca, Mg, K and P, microbiological contamination.

Table 1

Quality indexes of the vermicompost (biohumus)

Nr.	Indicators	Admissible values	
		minime	maxime
1.	Humidity, %	30	40
2.	Organic substances, %	20	30
3.	Active acidity (pH)	6,5	7,5
4.	Total Nitrogen, %	0,9	1,0
5.	Fosphour (P ₂ O ₅), %	0,8	1,5
6.	Photassium (K ₂ O), %	0,8	1,0
7.	Calcium, %	-	4,0
8.	Magnezium, %	-	1,0
9.	Lead, %	-	-
10.	Non-patogen bacterium flora, colonies	-	2x10 ¹²

Following the bioconversion process of the organic waste, the result is the compost called *biohumus*, used as fertilizer for the soil, in agriculture or floriculture. It can be used one year after fermentation. The biohumus obtained like this with certain quality indexes, standardized (table 1) is dried, screened and packed in polyethylene bags or send directly to the fields (7).

CONCLUSIONS

1. The vermiculture is constituted into an ecological and future alternative for the present ways of treating biodegradable waste. A number of 33 species are involved in the organic waste degradation process, 9 of which are earthworms (*Oligochaeta-Lumbricidae*) and 24 are insects (*Coleoptera*). Among the most efficient lumbricids for the biohumus production we mention *Eisenia foetida*, *Lumbricus terrestris*, *Lumbricus castaneus* și *Dendrobaena rubida*, which are species with porphyric pigmentation, excellent humifiers.

2. The ecological agriculture will be put into practice thanks to these products. The main advantages of this method are the facts that the technology is not expensive, it can be applied in any type of farm, and in good weather conditions the worm culture may be practiced even in the open air. Moreover, the use of the biologic material represented by earthworm's species is cheap and easy to be found by anyone, as our country has a significant lumbricid fauna.

3. If we take into consideration the economic aspect of the process (low achievement costs), the favourable climate from Romania, as well as the fact that the use of the biological material made of worms species is cheap and handy, as the lumbricide fauna of our country is considerable, we may conclude that the treatment of biodegradable waste by wormcomposting can become a promising technique.

4. Due to these aspects, wormcomposting is a technique easy to apply in any type of household (urban or rural), with perspectives of extending it to a macro scale.

REFERENCES

1. **Duca Gh., Tugui T., 2006** - *Managementul Deseurilor*. Academia de Stiinte a Moldovei, Centrul Regional de Mediu Moldova, Chisinau
2. **Istrati L., Harja M., 2006** - *Biotehnologii in protectia mediului*. Ed. Tehnica-Info, Chisinau
3. **Popescu Gh., Meglei V., Bucur D., 2002** - *Protectia mediului si valorificarea in agricultura a unor deseuri, reziduuri si ape uzate*. Ed. Tehnopress, Iasi
4. **Pop V., 1949** - *Lumbricidele din România*. Analele Academiei RPR, Seria A, Tomul I, Memoriul 9, Editura Academiei RSR, București
5. **Ungureanu C., Ionel I., Oprisa-Stanescu P.D., Gruescu V., 2006** - *Gestionarea integrata a deseurilor municipale*. Ed. Politehnica, Timisoara
6. <http://www.recolta.eu/idei-de-afaceri-ferma-de-rame/>
7. *******, Government Resolutions of the Ministry of Agriculture and Food Industry from Moldova Republic: Technical Settlement, „Worm compost (Biohumus)”

RELATIONAL ART AND INFORMATION SOCIETY

ARTA RELAȚIONALĂ ȘI SOCIETATEA INFORMAȚIONALĂ

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Abstract. *Nowadays, Relational Art seems to be an interesting candidate for a new artistic trend or a new “-ism”. Starting from the characteristics emphasized by Nicolas Bourriaud, we can say that Relational Art corresponds to a specific need of contemporary people of putting in common intimate experiences with other members of the community. Present paper starts with the remark that such a characteristic can also define the so-called “information society” and makes us wonder if we can trace a possible link between the two concepts.*

Key words: Relational Art, new artistic trend, information society.

Rezumat. *Arta relațională pare să fie un candidat destul de interesant la statutul de nou curent artistic în zilele noastre. Plecând de la caracteristicile pe care i le scoate în evidență criticul de artă Nicolas Bourriaud, putem afirma că ea corespunde nevoii omului contemporan de punere în comun cu ceilalți membri ai comunității a unor experiențe din ce în ce mai intime. Lucrarea de față pleacă de la observația că o astfel de caracteristică este proprie și societății informaționale, ceea ce ne duce cu gândul la o posibilă conexiune între cele două concepte.*

Cuvinte cheie: Arta relațională, nou curent artistic, societate informațională.

INTRODUCTION

Relational Art is a concept introduced by the art critique Nicolas Bourriaud through which he intended to characterize a wide range of artistic activities emerged in the 90's. Starting from certain features characteristic for the art work of personalities like Gabriel Orzoco and Jens Haaning and taking into consideration the remarks of Jean François Lyotard according to which the artists of this category use art for learning how to make present world a better place instead of creating a new world starting from the preconceived idea of an historical evolution of the world, Bourriaud tried to synthesize specificity of a new kind of artistic discourse. For him, ” the role of artworks is no longer to form imaginary and utopian realities, but to actually be ways of living and models of action within the existing real, whatever the scale chosen by the artist.” (Nicolas Bourriaud, 2002)

His conceptual effort was expressed in the book entitled „Relational Art” and can be justified by the need of understanding the new coordinates of the interaction between the public and some of the recent contemporary art works. From a historical perspective, one can observe important changes in the evolution of the relation between the artist and his public. This relation is very often

mediated by the artistic discourse and its impact upon the receivers it is addressed to and the historical transformations of this relation can be quite well characterized using communication theory. The gradual increasing of the target public determined enlargement of the variety of addressing means and formulas used by the artist. In the same time, the artist became aware of the increasing interpretation possibilities of his discourse and took into consideration this element in the process of assembling his artistic discourse.

MATERIAL AND METHOD

Starting from some distinct features of Relational Art and from some characteristics of the communication process in information society, we will try to link the two concepts and to acknowledge the idea that Relational Art, also seen as specific type of Garden Art, responds to a deep need for sharing at the communitary level, the experience of real time and real space in such a way that the difficulties of computing mediated communication could be surmounted.

RESULTS AND DISCUSSIONS

One of the most important problems arised in the context of information technology development refers to the connection among the evolution of the communication system, the structure of society and a possible change of the relation between individuals and groups determined by this evolution. A considerable number of specialists regarded with deep interest these transformations and tried to characterize as precisely as possible the features of contemporary society in this regard.

Some of them talk about „information society” with new hierarchies and new communication rules, others try to identify specific ethics for this type of society and to understand the impact of the new mentalities on social interactions. They talk about a new kind of tribalism favored by a new relation of communities with time and space, which has been shaped by the birth of cyberspace. Therefore, we can talk about a new morphology of communication, characterized by specific codes, new semantics and pragmatics that are influenced by computer as a privileged communication tool. We have to remark also that, in this new context, not only the message and its significance are re-created by the communicational environment, but also the communication identities of the partners. The cyberspace is characterized by a particular morphology of communication. More and more of what was considered before as being part of private space becomes part of public space. Moreover, public space becomes more and more one characterized by radical diversity and radical freedom.

On one hand, *the other*, the one we communicate with, could be *different* in geographical and cultural sense. On the other hand, his feedback, as a reaction to our messages, could be *only* a written or a verbal message, which is quite different from direct communication, as regards the authority aspect. And a low authority favours a high level of freedom. As to violence it does not disappears, rather it takes a written or verbal form.

Moreover, a high degree of freedom and the clash between different value systems do not determine the lack of hierarchies on cyberspace. Because the information is the only indispensable resource on the internet, the structure of the elites and hierarchies depends directly on the access to information. But the access to valuable information cannot be controlled and limited by the state. The only condition one has to meet in order to gain a high freedom of moving in the net refers to being capable of putting to practice his knowledge in informatics. The one who is enough smart and patient to go thoroughly into the computer science mysteries, paying enough attention, both in software and hardware fields has this privilege of network freedom beyond any institution control. In this regard, the hackers communities benefit by a freedom of information access which cannot be limited and efficiently controlled by the state and as a consequence they gain a specific power in cyberspace (Pekka Himanen, 2001).

Thus, the new hierarchies of cultural values are not configured anymore exclusively in local geographical areas. A well person today is accustomed to get in contact with a diversity of opinions regarding a certain issues which are delivered by different sources on the internet. Despite of the influence of local cultural identities which did not lose completely their importance, the attachment to them is dropping down occasionally because of arising cultural pluralism on cyberspace.

Information society is a network type one, a multilevel one, in which we are given different identities and profiles like in a world of mirrors which do not reflect their images towards us, but also towards the others. Our image which is delivered to the others does not belong exclusively to us, but it is sometimes built or rebuilt by the others independently from our direct intentions. We are the text which is written on our behalf by the others, but without wanting it and knowing it. Sometimes this image distorts us comparing with what we believe ourselves. Sometimes, this image anticipates our evolutions and when we succeed to know this image about us, we have the feeling that we are not only recreated by the others, but even antecreated as identities in comparison with what we allow ourselves to be. The creation of an own identity in information society depends on us, but in a less and less intentional and personal way.

Pekka Himanen emphasized this aspect in his book when he talked about the shaping of a certain profile of the consumer in the virtual world by use of specialised software dedicated to the surveillance of the consumers behaviour. This software is dedicated to the accounting of the connection to certain sites in a certain period. (Pekka Himanen, 2001)

The communication space is considered, traditionally, as a partial superposition of the characteristic anticipations of the participants to the communication process. Actually, human communication takes place between two limits, which are represented by *total difference* and by *total identity* of communicators. Both of these two limits make the communication impossible.

If the partner seems completely and definitely different from us, then we have no possibility to address to him. We have no common code and we can build

no one. We do not have an open channel for communication, or a channel to help us surmounting the background noise. (Claude E. Shannon, 1948) We cannot have a common syntax, nor a semantics at least partially shared, or a set of plausible anticipations of the partners, concerning their pragmatic reactions. Without any sort of shaped identity for the partner, we do not have *to whom* to address the message because there is *nobody* for whom to formulate it.

On the contrary, in the case of *total identity* with the partner, we do not have anything to transmit towards him, just because the value of any message, which is directly proportional with the degree of novelty or improbability of the message for the partner, becomes practically zero. (J. Van Cuilenburg, O. Scholten, G.W. Noomen, 2004)

Therefore, in order to be able to communicate with the partner, we need to share with him a common awareness of the partial identity, which unifies us, which makes in the same time the communication possible and interesting between us. Any difference between us can be identified and defined only in comparison to this partial identity that links the partners. For communicating with the partner, we need that at least *a part* of what we consider as representing us in front of him to be already known and accessible for him. Thus, the problem of identity in communication becomes extremely important in this context. The very shaping of this identity in information society is a very specific one.

Because the communicative interaction takes place somehow independently of spatial borders, in information society context the responsibility regarding the message we transmit to the others is defined in comparison to very specific guide marks. One cannot be *immediately* punished for what he communicates to the others, but in the same time, one cannot be sure that the meaning of his words was decoded in a manner somehow closed to what he was expecting. Cyberspace, as communication space, is an independent one with respect to communicators. It is a place of deep awareness of radical differences. The availability for communication becomes actually the only element that unifies the communicators. However, given this element, one cannot be sure for the last time about the fact that the others become aware in the same manner as he does of the differences among communicators that are present throughout the entire process. This type of awareness, as a preemptory condition for communication, varies in the case of information society from person to person in a very prominent way, comparing with other types of society, especially because space matters less than time in this kind of society.

In network communication, the lack of nonverbal and preverbal means for optimizing the communication makes the adaptation process more difficult. While our communicational identity continues to evolve, what we actually deliver to the others represents a *succession of hypostasis* of us throughout the dialogue with them, which we become aware of and we manage to put in order for creating our own mark. This problem deepens in information society case also because we are not the only source for building a fragmentary identity of us, which is put into relation with our communication conscription. As P.H. remarks, on cyberspace our actions are continuously monitored through specialized software and the rate

of accessing certain sites becomes an important indicator in our profile as internet communicators. According to this web profile, some institutions elaborate special advertising strategies and sometimes even political messages. These profiles of us created by the others are overlapping the fragmentary image we create about ourselves and deliver to the others.

Consequently, inside of the network society, as Manuel Castells calls it, not only the message is recreated, but also the participants in the communication process are recreated as far as their external identity and their internal identity, their way of seeing themselves, are concerned. The portrait shaped by the others and assigned to us in the social space anticipates many of our actions and gives us the impression that other people are capable of knowing who we are and what will we do in different circumstances just before we know it. This is an aspect, which could induce us a supplementary state of alienation. Among others intimate elements that became public in contemporary period, including the naked human body, identity becomes also more and more a public issue, in continuous reconstruction. In network society, the others are different from us in various ways; each participant to the communication process is building and rebuilding his own image for himself and for the others as an expression of the interactions with the others. The groups on the internet have sometimes a tribal character, which could be due to the need of tracing again a clear line for separating “me” from “the others”.

In this context, we pose naturally the question if the need for an extensive interaction with the works of art, in other words the need for building and shaping in a *communitarian* manner the artistic discourse space used by the artist in relational art case, represents a characteristic symptom of information society. The need for direct communication as major component in the effort of affiliation to the group, a very deep need of many people nowadays, could be caused by the intense technological mediation of any communication in information society. Therefore, the need of sharing real space and real time with other members of the community could be satisfied by relational art, including a garden relational art. Participating in common projects capable to redefine not only the relations among participants, but also the participants identities could be for the benefit of various geographical communities and could be occasioned by relational garden art. However, for meeting the conditions of relational art, garden art projects, including any sort of green space in the town, should be characterized by a dynamic morphology; each member of the community should have the possibility of participating in the shaping process of the general communicational context. Although a rained artist initiates a relational art project, no one knows for sure what would be the final shape of the project, provided the fact that the artist could be also the one who decides when to stop the successive transformation of the work of art—in our case, of the garden - as a result of the contributors activity.

In contrast to its traditional function as space dedicated to the inter-communitarian dialogue, as important element of the cultural identity of a town, the new function of the garden is oriented mainly to the communication process

inside the community. Thus, the relational garden becomes a place where every member of the community can express his feelings through a precise action, which enables him to change something in the final form of a communitarian project. This fact has a good psychological influence on the equilibrium and transparency of the community. There is, of course, the risk of chaos in this continuous process of artistic interaction among participants. The artistic object, the garden itself becomes in the same time the result and the environment of this interaction, but this way, the degree of sincerity in communication increases very much. Consequently, the cultural message embodied in the final shape of the garden becomes more representative for the communicational particularities of the community. Each participant to the project expresses himself in front of the others, witnesses the expression of the others in front of him, but more important, feels *as being expressed* by the others, as part of a semantically live project regarding the relation between the part and the hole.

CONCLUSIONS

A garden relational art can be seen as a modality of recreating the others inside of the community. The identity of the viewer is recreated by the artist, who invites him to participate in shaping the final form of the work of relational art. This kind of artistic production is the expression of the relation between two identities and can be analyzed as process using the message-feedback model. It is possible in this way to emphasize the way the participants recreate each other inside the *relation* that the art object *became*. The very artist exposes himself to the process of identity transformation by the others and this style of conceiving the artistic discourse could be the result of a specific need, characteristic for information society.

REFERENCES

1. **Bourriaud N., 2002** - *Relational Esthetic*. Les Presses du Réel, Paris.
2. **Himanen P., 2001** - *The Hacker Ethic and the Spirit of the Information Age*. Random House Trade Publishers, New York.
3. **Shannon E. C., 1948** - *A mathematical Theory of Communication*. The Bell System Technical Journal, Vol. 27, pp. 379-423, 623-646, July, October.
4. **Van Cuilenburg J., Scholten O., Noomen G. W., 2004** - *Știința comunicării*. Ed. Humanitas, București.

REVAMPING A PARK FROM ANOTHER CENTURY

REAMENAJAREA UNUI PARC DIN ALT VEAC

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Abstract. *Dumbraveni village, located on about 20 kilometers from Suceava, on the road to Botosani, benefits by the existence of historical park, belonging to the manor house of Leon Ghica. Here, lived and worked the tax collector Gh. Eminovici, the father of the national poet, at this manor house, most of the family life was spent here, not far away there are the graves of two of his sisters. After the World War 2, here, it was organized the activity of a hospital that owes a large part of the land and public park of a surface of about 38.000 m². In spite of that fact that there is a rich arboreal plantation, with many secular species, the passing of the time, the lack of funds, the lack of some absolutely necessary maintaining works, all of these create an unfavorable image to the park. We focused on reorganization from a compositional-landscaping point of view of the entire park, redefinition of areas of concern, creating of a lake, creating various land areas for leisure games, differentiated on age groups, alleyways redrawing, rehabilitation of external lighting system, endowment with specific urban furniture and, not in the least, improving the vegetal structure, by completing and marking of some concern landmarks, with trees and plants of various species, complementary regarding the size, texture and color. The expected effects by this intervention focus on the increasing of life quality and population health, as well as increasing of environment factors quality, providing at the same time a visual identity definition specific to the Dumbraveni village.*

Key words: revamping, historical park, secular species.

Rezumat: *Satul Dumbrăveni, aflat la cca 20 de kilometri de Suceava, pe drumul către Botoșani, beneficiază de prezența unui parc istoric, aparținând conacului boieresc al lui Leon Ghica. Aici a activat căminarul Gh. Eminovici, tatăl poetului național, o bună parte din viața familiei desfășurându-se la conac, în apropiere fiind înmormântate două dintre surorile sale. După cel de al doilea război mondial aici s-a organizat activitatea Spitalului, care deține o bună parte din teren și un parc public în suprafață de aproximativ 38.000 m². În ciuda existenței unei plantații arboricole bogate, cu multe exemplare seculare, trecerea timpului, lipsa fondurilor, a unor lucrări de întreținere absolut necesare, fac ca imaginea generală să nu fie favorabilă. S-a avut în vedere reorganizarea sub aspect compozițional-peisagistic a întregului parc, redefinirea zonelor de interes, crearea unui luciu de apă, alocarea unor suprafețe de teren pentru jocuri, diferențiate pe grupe de vârstă, retrasarea aleilor, reabilitarea sistemului de iluminat exterior, dotarea cu mobilier urban specific și nu în ultimul rând îmbunătățirea structurii vegetale, prin completarea și marcarea unor puncte de interes, cu arbori și arbuști din specii diverse, complementare sub aspectul taliei, texturii și culorii. Efectele scontate prin această intervenție au în vedere creșterea calității vieții și sănătății populației, precum și creșterea calității factorilor de mediu, asigurând în același timp definirea unei identități vizuale, proprii Dumbrăvenilor.*

Cuvinte cheie: reamenajare, parc istoric, specii seculare.

INTRODUCTION

Dumbraveni village, located at about 20 kilometers from Suceava, on the way to Botosani, benefits of the presence of a historical park, belonging to the boyar's manor house of Leon Ghica. Over here, worked the tax collector Gh. Eminovici, the father of the national poet, a great deal of his family life was at this manor house. Near by, two of his sisters are buried here.

After the Second World War, the activity of a hospital was organized here, to which a part of the land belongs to, as well as a public park with a land surface of about 38.000 m².

Despite the existence of a rich arboreal plantation, with many centuries old species, the passing of the time, lack of funds, and lack of absolutely necessary up keeping works resulted in an unfavorable present general image.

MATERIAL AND METHOD

We focused on reorganization from a compositional-landscaping point of view of the entire park, redefinition of areas of concern, creating of a lake, creating various land areas for leisure games, differentiated on age groups, alleyways redrawing, rehabilitation of external lighting system, endowment with specific urban furniture and, not in the least, improving the vegetal structure, by completing and marking of some concern landmarks, with trees and plants of various species, complementary regarding the size, texture and color. The expected effects by this intervention focus on the increasing of life quality and population health, as well as increasing of environment factors quality.

RESULTS AND DISCUSSIONS

Geologically and structurally, the emplacement belongs to the Moldavian Platform having a foundation made of crystalline rocks. The sedimentary covering is transgressively and discordantly displayed over this foundation and can reach a thickness of 7000 m, including the time span between Vendian and Quaternary. The latter closes the geosynclinal evolution of Moldavian Platform and is made of loessoid deposits, of sands and gravels, fossil soils etc.

From the point of view of tectonics, the foundation and the sedimentary covering is going deeper towards west and south-west under the Carpathian orogen, under an angle of about 15 degrees. At the same time, it was revealed a slight inclining to south, south-east with about 5-8 m/km, e.g. to the regression direction of the Sarmatian Sea.

Concluding, the present relief genesis of the Moldavian Platform is tributary to the nature of accumulated rocks, to the emergence of Carpathian orogen, to the diastrophic and epirogenetical movements, all these in direct connection with the external erosion factors that in time formed and brought the platform areal to the present morphology.

Seismically, the region is affected by the "Moldavian earthquakes" which hearth is located in the Vrancea area, but the propagation and intensity of seismic

movements depend by the position of the emplacement in regard to the hearth, magnitude, system energy, geological constitution etc.

In close compliance with the presented geological elements, by orientation, altitude, vertical and horizontal fragmentation degree, exposition and slope, the relief represents an important factor in formation and evolution in time of the water flow and deposits of Siret River. This river and its tributaries cross distinct geomorphological units and represented by the mountain and plateau areas.

The geographical area where the Dumbraveni Park is located can be framed in the temperate-continental climatic type, with moderate touches due to direct influence of the continental air masses, of Asiatic origin, in winter with dry and cold air masses and in summer with warm and dry air masses.

Because of its framing in the climatic level of low hills with altitudes between 200-500 m, Siret corridor is individualized as a physical geographical structure with a complex microclimate where the following specific microclimates are obvious: of meadow, of steps and terraces, of forest and versants, with exposition towards the four cardinal points.

Monitoring the multi-annual temperature values, we may notice warm years and cold years, observing the continental degree of the climate:

- Multi-annual thermal amplitude = 22.7°C
- Record low temperature = -31.8 C
- Record high temperature = 38.6 C
- Record high amplitude = 70.4 C
- Average monthly number of frost days = 128.7, the first frost comes in the first decade of October and the last in the third decade of April
- Number of frosty days = 96
- Relative humidity = 84%
- Absolute humidity = 10.1 g/mc
- Saturation deficiency = 2.9 mb
- Nebulosity = 6.0
- Rainfall conditions (basic element in climate definition) are characterized by monthly and multi-annual average rainfall

Rainfall conditions are due to the thermal and frontal convection, determined by the movement of cyclonic areas, including Baltic masses, recording high values in the warm season and low values in cold season.

The wind conditions, determined by morpho-hydrologic aspect and the position of barometric centers are characterized by the fact that the north-west and south-east winds have high frequencies and speeds. These conditions record variations depending on the general circulation conditions of the atmosphere and both indicators present negative and positive aspects regarding the natural framework and human activity.

Climatic and topoclimatic regional distribution of Siret Valley imposes the differentiation of meadow topoclimate, characterized by thermal inversions, reduced amplitude of temperature, high air humidity, increased intensity of wind and frequent hydrometeorological phenomena.

The emplacement area presents the following hydrogeological structures:

- The hydrogeological structure belongs to the alluvium of the major and minor river bed (terraces and meadow steps), supplied from the hydrographical network as well as from rainfall, having free level
- The hydrogeological hydrostructure of platform geological formations, located in sandy-clayish strata and presenting a discontinuous aspect, discharging only by strata ends (low rate spring)

The flow rates from the alluvionary hydrostructure are dynamic in time as a hydric potential because they are influenced by the porosity coefficients of the constituent rocks.

According to the hydric balance values, the hydrographic basin is located in the area of variable humidity in which the rainfall contributes with values of 604.5 mm.

The supplying conditions in the area is of pluvo-nival type, moderately underground, the Siret River rendering in the group of eastern rivers of Romania.

The flood emergence in the hydrographic basin of Siret River is due to some natural and antropical factors.

Among the natural factors we mention the rainfall with torrential character, the previous humidity of soil, slope and lithographical nature, not favoring the infiltration.

Among the antropical factors we observe the high degree of deforestation, non-calibrated hydrotechnical constructions at increased solid transport, poor maintenance of minor and major river beds, overloading of major river beds by afferent constructions of some neighboring placements.

Following the beneficiary order, we assume the reinvigorating of this concern point, located in the central area of the site, so that to allow the display of some social-cultural manifestations (folklore festivals, poetry festivals, village day, artistic tours). Its mission is to complete and to increase the activity run in the two existing endowments, the Library and the Cultural Center, proposed to be the object of some distinct revamping work. This place should be the daily relaxation location of various age groups, starting from children, youth and till the elderly, offering distinct ways to relax for everyone.

At the same time, we focused on organizing, from a composition-landscape point of view, the entire park by retracing the alleys, redistribution of concern areas, provision of specific urban furniture, revamping the amphitheatre and stage area as a central point of the composition, as well as suggestion in two variants of recovering the east side of the park.

In the first variant, it was suggested to vamp an artificial lake on a heavy clay stratum with a maximum depth of 1.8 m, having as natural water source the springs in the area and additionally the input of the existing street supplying water network.

In the second variant, in the same area, instead of the lake, it was suggested to vamp three sporting grounds, accompanied by specific provisions (cloakrooms and sanitary facilities).

Another important target is the improving of vegetation structure by completing and outlining some concern points with trees and bushes of various species, complementary as size, texture and color.

Sustaining the area distribution of the assembly by suitable furniture, the following areas were defined:

- Parallel to the national road DN 29, it was suggested a vamped area with geometrical style, linearly, with finished pathways cu prefabricated footway slab and rest benches
- Intersecting this longitudinal axis, it was suggested a transversal axis, perpendicular to the street and the outdoor amphitheatre, aiming at an easy access to the central area of the park, outlining the major function of representative manifestation place for the community life. At the same time, the concern was to intensify the activities run in the Cultural Center by opening the ground floor to the west and south sides, to the access alley and amphitheatre area.
- It was suggested a system of sinuous pathways, suitable for walks to the other areas: children playgrounds, chess players club, lake area or to the sport grounds and to the botanical mini-gardens in the area of children playgrounds.

By chaining these areas, it is offered various types of activity and increasing the addressability of various age groups.

The vamping of the playing place was dictated by the following principles:

- Provision of playing conditions on age groups (specific endowments depending on the physical and psychic development stage of the child)
- Provision of users' security (materials reducing the ecological injury hazard)
- Provision of supervising the children by the accompanying adults and offering them a proper psychic relation environment

Vamping of the green areas was our major concern for functional rehabilitation and started from a still existing heritage, with arboreal century old plantation mainly made of species like poplars, maples, lime trees, birches. By suggested corrections and by new tree and bush plantations, our concern was to obtain some interesting perspectives, framing of the worthy constructions, outlining and pointing out some esthetical quality areas, hiding some not worthy places, spatial separation of functional areas, setting of some fair relations between light and shadow, forming contrasts, harmonizing the colors and textures, spreading of aromas. Along main axes, it was suggested rebates, platbands and floral massifs for perennial plants of large size by also for the annual and bi-annual ones. Their selection is carried out depending on the blooming season, the colors of the flowers, leaves and fruits, aromas. The park lawn plays the role of a green carpet, making up the main background for arranging the other elements. It was suggested works for rehabilitating some surfaces in order to improve the constituent species composition.

The proposed urban furniture pieces, slabbed footways, grass footways in the amphitheatre area, the stage and the protection covering, the benches, dustbins, drinking fountains and lighting posts have the mission to functionally improve the park ambience with modern elements carried out of high quality materials, esthetically compatible.

CONCLUSIONS

In the initial stage of setting the solution, some consulting activities were carried out with the local decision makers in order to emphasize the participation of local people, to take over their claims and to find out the functional, technological and economical optimal solution.

The anticipated effects of this intervention aim at increasing the life quality and health of the population as well as the increasing of environment quality factors, providing at the same time the definition of a visual identity specific to Dumbraveni village.

REFERENCES

1. **Bilikowski Krystyna, 1983** - *Historic Parks and Gardens*. Hampshire County Council,
2. **Ciobanasu C., 2008** - *Reamenajare parc in com. Dumbraveni, jud. Suceava*. Proiect nr. 522/2008 – S.C. WARESO PROD S.R.L., Suceava
3. **Watkins J., Wright T., 2007** - *The management and maintenance of historic parks, gardens and landscapes*. English Heritage.

ALARMING SITUATION: THE GRADUAL EXTINCTION AND DEGENERATION OF URBAN LANDSCAPE SETTLEMENTS

O SITUAȚIE ALARMANTĂ: DISTRUGEREA ȘI DEGENERAREA TREPTATĂ A AMENAJĂRILOR PEISAGERE URBANE

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Abstract. *The accelerated destruction of many urban spaces, mainly those with plantation and landscape arrangements, became nowadays an alarming situation in many Romanians towns, representing a chronic and common process. Using a menacing corruption, avoiding and defying the lows and the human rights to a better urban life, many city fathers operate by spreading fear, creating a pessimistic atmosphere. Many urban spaces was destructed, as streets, plazas, transition urban spaces and green spaces, by using subtle ways like avoidances of the existent urban and landscape lows, or exposing an aggressive defiance of it. Usually the action start generating an urban dereliction or degradation of the marked area, then a gradual amputation, finishing with total demolition of these spaces. What effect can have this destruction, the gradual degeneration of green spaces, the presence of dirtiness and kitsch at the urban scale? There are well-known the main results: the emphasis of urban pollution, an urbanistic layout full of visual shocks, and a particular human spoilage on physical, psychic and aesthetical level.*

Keywords: landscape arrangements, destruction, urban pollution.

Rezumat. *Distrugerea accelerată a spațiilor urbane, în special a multora amenajate peisagistic sau doar plantate, a devenit în prezent o situație alarmantă în multe orașe ale României, reprezentând un proces cronic obișnuit. Folosind corupția agresivă, evitând și sfidând drepturile umane la o calitate mai bună a vieții și a confortului urban, mulți edili ai orașelor încearcă să răspândească teamă, generând o atmosferă de pesimism. Multe spații urbane, precum străzi, piețe, spații de tranziție și spații verzi, au fost distruse oficial sau neoficial, evitând subtil sau sfidând agresiv legile urbanistice și peisagistice existente. De cele mai multe ori acțiunea poate începe printr-o abandonare urmată de o degradare a zonei vizate, apoi o amputare gradată, sfârșind cu demolarea totală a acestor spații. Ce efect poate avea această distrugere și degenerarea gradată a spațiilor verzi, prezența mizeriei și a prostului gust la scară urbană? Este binecunoscut principalul rezultat al acestei anihilări: creșterea poluării și încălzirea microclimatului urban, un aspect urbanistic plin de șocuri vizuale și o alterare umană specială, pe plan fizic, psihic și estetic.*

Cuvinte cheie: amenajări peisagistice, distrugere, poluare urbană.

INTRODUCTION

The destruction of many green urban spaces, in order to build different constructions, represents a chronic and common Romanian process. Using a menacing corruption, avoiding and defying the existing lows and the human

rights to a better urban life, many city fathers operate by spreading fear, creating a pessimistic atmosphere. They inhibit the citizen's protests and defence. Usually the corrupted urban "developers" start generating an urban dereliction or degradation of the marked area, then a gradual amputation, finishing with total demolition of those spaces. Many urban spaces, which need an urgent rehabilitation, receive a subtle and gradual degradation, instead of a new life. Streets, plazas or transition urban spaces start to be suffocated by cars, dirtiness and bad taste advertising. Green spaces and landscape architectural arrangements disappear over night in many ways, like subtle avoidances of the laws protecting the urban green landscape, or an aggressive violation of it.

MATERIAL AND METHOD

We started from an existing example of urban landscape destruction in Iasi town, identifying two manners and some administrative characteristics of this process. Selecting and analyzing other proper examples, we will try to link all these facts to the main results: the emphasis of urban pollution, an urbanistic layout full of visual shocks and a particular human spoilage on physical, psychic and aesthetical level.

RESULTS AND DISCUSSIONS

1. Destroying the existent green spaces and children's games

The urban rehabilitation in Romania focuses mainly on the buildings. Many towns' spaces are waiting to be rehabilitated, designed and transformed, replacing the destructed ones. The buildings and the traffic expansion generate a high level of constructed areas saturation and a huge urban pollution, but also a huge waste of public space, waste of spatial qualities, of urban comfort and of urban life quality.

During the communist regime many areas were demolished, but after the 1989 revolution the urban destruction followed on, destroying the cities personality and identity. Either historical urban spaces, but also new ones were destroyed. As a result, the lack of public spaces for recreation creates a stressing zones atmosphere for the inhabitants.

In this context, in Iasi town, the destruction of one central green square, from the 60's époque, constitutes an alarming example. This green square hardly satisfied the needs of a big dwellings complex around. 60% of the inhabitants of this area are elders: they cannot easily walk far away to rest and have fresh air in other green places. 10% are little children-they don't have any place for games: the destruction of children's games was the starting point of the demolition works.

Despite the public protests of the inhabitants, the municipality assigns this green square to a hotel of neighbourhood, in order to build their parking area, underground. From the very beginning of this project the corruption was obvious: in the urbanism certificate they didn't specify the existing function of the place, that the place is an urban green square with landscape arrangements and furniture for relaxation of the elders and also with children games. They "forgot" to specify

because of the existing laws protecting the green spaces: an Urgent Government Decree (OUG) 195/2005 (ratified through the Law 265/2006 and improved by OUG 114/2007) forbids the destruction of urban green spaces or the changing of this function. The destruction of the square and the works for the new parking started despite this decree (fig. 1 and 2).



Fig. 1. They started by cutting the trees and destroying children's games (original)



Fig. 2. The works started despite the public protest of the inhabitants (original)

The parking project proposes some new green spaces, but only over the concrete floor of the subterrain area; this situation creates a big problem: the earth for the vegetation roots can be only 1,00 m high, meaning that big trees cannot be planted and the other green species will not resist without regular irrigation and maintenance works in order to avoid drying. Without the shadow of big trees this area will be totally dry and the repose areas for elders and children will be exposed to the heat of the sun without protection.

It is known the attachment of elders to their old residential and public places, which can give them an important territorial feeling, urban identity and self respect. After the destruction of this green area, all the old people inhabitants suffered an important psychological shock and a part of them became very ill.

2. Alarming signs in landscape rehabilitation works

The importance and role of the urban spaces with landscape arrangements as stimulating and coagulating element of urban life, with its multitude of aspects, was understood long ago, but the transformation of the public consciousness has a very slow pace, especially the consciousness of authorities to take saving and rehabilitating measures.

The modern city with geometrized spaces, with arid technical details and dry decorations, having a polluting psychic effect, tends to be deeply disqualified by its values of content and form. In fact, the majority of our cities public spaces were degraded, not only the very old historical spaces, but also the modern spaces created several decades ago, becoming mostly utilitarian, contaminated by strange and parasitical ornamental objects or kitsch arrangements and advertising.

Even when there are some rehabilitation efforts of authorities, injudicious design solutions were performed as a result of municipality's designer's disinterest, or because the correct details of landscape design were not known. In this way, not only the destructed spaces, but also some new rehabilitated ones, offer nowadays many visual, physical and psychological shocks.



Fig. 3. Sideslip urban floor (original)



Fig. 4. Dangerous polished surface (original)



Fig. 5. Excessive floor declivity (original)



Fig. 6. Benchstairs with declivity (original)



Fig. 7. Dry space, lack of trees (original)



Fig. 8. Cars traffic and parking in the plaza (original)

The following examples of dysfunctional details from these rehabilitated public spaces prove how the flagrant landscape design mistakes have already critical consequences for the citizen's safety domain: side-slip urban floor dangerous for rainy and snowy days circulation (fig. 3 and 4); excessive declivity of urban floor leading dangerously from plaza directly/open to the roadway (fig.5); bench-stairs, which are sitting places, having absurd sidelong declivity, instead of being horizontal (fig. 6); the lack of trees exposing the space to the heat of the sun and a big percent of impermeable floor (fig. 7); the dangerous presence

of cars traffic and parking crossing the plaza, carrying away and subordinating to the needs of traffic an important surface of plaza (fig. 8).

Beside the urban discomfort and insecurity, the daily presence of these dysfunctional design details inside two central plazas constitute also a dangerous inoculation to the citizens of wrong ideas about urban landscape design, instead of giving them good lessons about harmony and aesthetical composition: stylistic, texture type and colour dissonances (fig. 9 and 10); furniture redundancy, like benches in front of bench-stairs sitting places (fig. 11); benches around a monument spoil the perspective and the magnetic effect of the monument-the statue should be a spatial focus point, but the benches destroy its image (fig. 12).



Fig. 9. Stylistic and texture dissonance of furniture (original)



Fig. 10. Stylistic and colour dissonance (original)



Fig. 11. Furniture redundancy (original)



Fig. 12. Spoilage of the statue magnetism (original)

Missing the proper information and education in the domain of judicious urban design and landscape arrangements, the inhabitants of our cities don't know about their daily visual pollution, they are not aware of these negatives aspects and details which spoil their safety and sanity. They also don't know that they can and should protest, protecting their rights to urban security, comfort and a high quality of urban life.

Solutions? In the context of finding sustainable method to minimize urban spaces loss, the universal design constitute an ideal instrument, contributing to the improvement of urban comfort degree, offering very efficient tools for the urban regeneration. Multifunctional landscape design can follow the highlight of landscape morphological elements, offering solutions that can be adapted to any specific environment problems, giving multiple efficiency to many urban design details.

CONCLUSIONS

The nowadays urban situation is one of alarming dejection: architectural erections are furiously built, monuments are demolished, parks and green spaces are destroyed, the density of constructions is increasing and the atmosphere became dry and dirty. We hardly find the presence of water, green vegetation or harmonious landscape design compositions. The public spaces were suffocated by cars, commercial shop-windows, strange signboards and advertisings, all aiming to visually and psychically stimulate the attention of inhabitants in an egotist goal to sell their products. Finally, these stimuli degenerated in aggression and kitsch.

In the historical central areas, the green spaces became the object of financial speculations. Only in the neighboring dwellings, plantations hardly still exist and have a beneficial contribution, either to create a more pleasant atmosphere or hiding out some negative aspects.

What effect can have this destruction, the gradual degeneration of green spaces, the presence of dirtiness and kitsch at the urban scale?

It is well-known the main result of this annihilation: the emphasis of urban pollution and microclimate warming. Beside this, there are the aspects of wasting through degradation many urban spaces, their architectural and urbanistic layout being generally full of visual shocks, creating a particular human spoilage on physical, psychic and esthetical level.

The conclusion is obvious: we should learn more from all these mistakes trying to repair it as quickly as possible.

REFERENCES

1. **Broadbent G., Bunt R., Llorens Th., 1980** - *Meaning and behaviour in the built environment*. John Wiley & Sons, Chichester-New York-Toronto.
2. **Dascalu Doina Mira, 2006** - *Peisagistica: o posibilă terapie pentru problemele mileniului al III-lea (Landscape Architecture: possible therapy for the III Millennium problems)*. Editura Societății Academice "Matei - Teiu Botez", Iași.
3. **Shri Mataji Nirmala Devi, 1995** - *Meta Modern Era*. Computex Graphics, Bombay, India.

ABSTRACT AND VIRTUAL CREATIONS IN LANDSCAPE ARCHITECTURE

CREAȚIILE ABSTRACTE ȘI VIRTUALE ÎN PEISAGISTICĂ

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Abstract. *It is well-known the fact that nowadays refuge of human being into the abstract world or in virtual reality is an alarming signal of alienation, of psychic tensions which press us to retire into an univers aparently without stress. Some of the futuristic ideas from the abstract or virtual domain, those not publicly accepted, are not in harmony with Mother Nature, but some seems to be assimilated because of some particular qualities. Many nowadays experiments of creating an artificial landscape was taken from the repertory of the minimalist, hiper-realistic or pop-art of the years '70, but without public succes. The virtual reality try to conquer terrain projecting natural landscapes on huge screens, rivalling with the real natural landscape. Virtual refuge satisfactions are not sufficient because this retirement don't heal our energy, but spoil it. The refuge in the middle of real nature is the most tranquilizing and refreshing. Nowadays, the humanity need of aesthetically arranged green spaces became stringent.*

Keywords: abstract and virtual creations, artificial landscape, nature.

Rezumat. *Este binecunoscut faptul că refugiul actual al umanității în lumea abstractului sau a realității virtuale este un semnal de alarmă al alienării, al tensiunilor psihice care ne presează să ne retragem într-un univers aparent mai puțin stresant. Nu toate ideile futuriste manifestate abstract sau virtual sunt în armonie cu Mama Natură - unele au fost respinse de public, dar altele au fost acceptate pentru calitățile lor. Multe experimente actuale, de confecționare a unui peisaj artificial, au fost preluate din repertoriul artei minimaliste, hiper-realiste sau pop-artei anilor 70, dar nu s-au bucurat de succes. Realitatea virtuală încearcă să câștige teren propunând ample proiecții de peisaje naturale pe ecrane, făcând concurență cadrului natural. Satisfacțiile acestui refugiul virtual nu sunt mulțumitoare, deoarece această retragere nu ne reface energiile, ci ni le consumă. Refugiul în natura reală rămâne cel mai liniștitor și mai reconfortant, de aceea, în prezent, nevoia umanității de spații verzi amenajate estetic a devenit extrem de stringentă.*

Cuvinte cheie: creații abstracte și virtuale, peisaj artificial, natură.

INTRODUCTION

In 1990, the American magazine "Landscape Architecture" initiated an international contest "Visionary Landscape", expecting valuable landscaping proposals. In 2000, a deadlock was reached at this contest: no one of the 122 works was awarded. Most of the works were experimental or imaginary projects, in the field of artificial and virtuality abstract, away of reality and, mostly, away of stringent daily needs of an urban space more and more suffocated by concrete, plastic and NOx gases. The jury members formulated some opinions among

which the idea that “**the future of landscaping is not in artifices**” was obvious. The language of the presented compositions determined the jury to respond, outlining the ecological and sustainable role of landscape architecture at the level of entire city: “landscaping architecture should introduce a new language in metropolis planning”. The jury tried to remind the urbanists and landscape architects a long forgotten truth in the context of an urbanizing rage: “landscape architecture could be a way by which the city would become a homogenous whole, by unifying its fragments”.

What all these jury opinions are referring to? The acceleration of the urbanizing process, from the second half of the 20th century, with its excessively pollutant effects on multiple levels, already became a commonly know fact. As an obvious consequence, a huge process was intensified, a conscious annihilations of the nature presence within the urban frame.

MATERIAL AND METHOD

Some of „futuristic” ideas from the abstract domain, are not publicly accepted because are not in harmony with Mother Nature. However, some of them seems to be assimilated because of particular qualities. The virtual reality try to conquer terrain projecting natural landscapes on huge screens, rivalling with the real natural landscape. Selecting and analyzing some examples, we linked all these creations to an essential problem of the contemporary age: the mankind need of real nature became very stringent and the landscape creations should face and solve this situation.

RESULTS AND DISCUSSIONS

At the end of the 20th century, the city inhabitants need to escape in a “patch” of nature largely increased. The possibilities to cover this stringent human need were and still are extremely limited, in the conditions in which the constructions are rapidly erected on any surface, destroying with a furious greed the existing nature. It is well known the fact that the present refuge of humanity in the world of abstract or virtual reality is an alarm signal of alienation, of psychic strain pressing us to retreat in an apparent less stressing universe.

Related to this refuge in an artificial universe and its causes, the art critic Rene Huyghe visionary stated since 1965: “Our contemporaries have to cope with a new, terrifying reality, yet outcoming from their brain and minds. It seems to gain an increasing authority, imposing to the society restrictions and unexpected perils. It goes even further: *by its laws and operation becomes a sort of bare parody of life*”. The rapid way of degradation, degeneration and wasting of the urban land imposed the necessity to find new solutions for its rehabilitation and regeneration, as well as new way of its usage and endowment. Unfortunately, not all the ideas of the creators are in harmony with nature. Here, also, we face the temptation of artificiality, to which the above mentioned contest jury referred. Of course, these settlements are influenced by the personality of the urbanists, landscape architects or fine art creators, involved in these projects. On the other hand, the various manners and trends in art and architecture influence many of these creations. The

creations tried to change the dull and tired aspect of these spaces, the result being obviously positive from this point of view, the spaces regained their personality and dignity lost in time. But, at a second glance, the landscape critic reproaches the aridity of many of these too dry, too abstract creations, full of concrete and stone.

Let us take the example of public squares, of streets and passages, historical or modern that long ago lost their magnetism because of agglomeration, traffic, and mainly because of advertising kitsch that visually and psychologically pollutes the urban spaces. A present tendency in urbanism, for which there are many for and against pleadings, aims at their rehabilitation by landscape arrangements, by introducing the natural elements – earth, water and green spaces, their value being sometimes powered, other times annihilated by the presence of urban furniture. However, there are positive examples in which the arid abstract seems to be diminished by natural elements.

In the Sankt Hans Torv Square of Copenhagen, the sculptor Sven Ingvar Andersson created a monumental composition called “Rain House” by spectacularly using the water. Andersson did not create a certain edging for the areas where the water falls, but he slightly curved the slabbed land, letting the bypassers to approach as close as possible to the water (fig. 1). The massiveness of the central sculpture is slackened by water gushes that flush out of the slab work, so that everything seems to be very spontaneous and close to the residents soul (fig. 1). The composition is set free, defying the enclosures.



Fig. 1. “Rain House” in Sankt Hans Torv Square of Copenhagen

The Marugame Station Plaza created in Japan by Peter Walker is another example of square where the abstract seems to be assimilated and appreciated by the inhabitants (fig. 2 and 3).

Among the attempts of urban rehabilitation using abstract language, we may mention also *the creation of symbolic axes of the cities*, conferring their personality by ample and spectacular landscape development. An eloquent exemplification could be the project of Dani Karavan “Major Axis” of Cergy-Pontoise neighboring Paris. Karavan set a large axis, of three kilometers, having alongside 12 points and areas of concern. Karavan stated that he tried to work alongside the axis with archetypal forms, by their symbolism and subtle significances, to create a peculiar spiritual atmosphere (fig. 4 and 5). His axis visually unifies Paris, but not

pedestrian: from the platform of the 12 columns, at the horizon, at a very long distance, we can see the perspective head The Arch of the Defense, the long urbanistic axis going further till the Louvre Palace, ending in the Bastille Square.



Fig. 2. Marugame Station Plaza



Fig. 3. Children appreciating the rocks

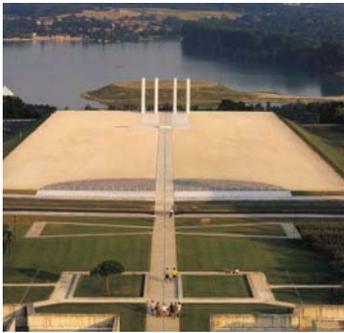


Fig. 4 and 5. Dani Karavan “Major Axis” of Cergy-Pontoise

The ambiantal arrangements of this kind try to resuscitate the lost magnetism of some public spaces, offering to the inhabitants a necessary daily refuge. *The way in which the proposals were compositionally solved has raised and still raising divergent opinions.* Many of these creations can not be billeted in a certain creative category: they belong both to landscaping and architecture, art in nature, as well as to the urban composition. It would be a natural approach, considering the unifying role of the nature. “La Villette” Parisian contest was trying in the 1980’s to find out how the creators foreshadow “the future garden”. On the site of an ex-cattle market of about 55 ha, it was suggested the development of a park dedicated generally to the Sciences and Technique, Music and Arts (fig. 6). Bernard Tschumi would win the contest with his visionary proposals, under the mark Urbanism-Leisure-Experiment, pleading for an opened program offering the escape in to a multi-functional paradise-city. Some critics consider that he failed to offer “unity in diversity” to his ample compositions. For them, La Villette constitutes a row of spaces without connection between them, a kind of urban exhibition.



Fig.6 and 7. La Villette is or is not “The Park of the 21st century”?

The opinions are divided whether La Villette is or is not “The Park of the 21st century”. Using a very modern language, appealing especially to materials, shapes and colors reminding of abstract constructivism, Tschumi considers that he carried out an integrating cultural act. By functional pluralism, by the multitude of the pass ways scattered with expressive objects, by surfaces charged with significances, he states that he succeeded to accomplish the vision of “park-cultural object”, suitable for a “refined cultural city” like Paris (fig. 6 and 7). By this example, we come back to the old dispute on city-nature-culture relationships.

Some “futuristic” ideas, of making up an artificial landscape, are taking over from the portfolio of minimalist art, hyper-realist art or pop art of the 1970’s, without having success.



Fig.7. Plastic volumes



Fig.8. Plastic flowers design



Fig.9. Artificially colored plants



Fig.10. Artificial landscape

In these creations, the synthetic materials try to impose their own language by totally inadequate compositions or urban furniture, by an ostentative kitsch visibly placed in public spaces. We can find in parks alarming signs: natural plants are poisoned with acrylic colors (fig. 9), replaced with plastic flowers or plastic landscape (fig. 8 and 10), the trees are suffocated under plastic only to create “images” (fig. 7), Mother Earth skin is covered with large lengths of colored plastic foils. Despite the

fact that industrial aesthetics (plastics, Astroturf) were explored in landscaping creations along with high-tech ideas (artificial fog and fiber-optics), the designers still see in these artificial gardens their potential wildness. There are some abstract proposals trying ecological landscapes with natural materials (metal, shells or stones) some of them placed in damaged areas trying to save them, others inadequately placed in valuable natural landscapes competing with them, visually polluting and destroying their charm. On the other hand, *the virtual reality* is also trying to catch up suggesting ample screen projections, imitating the natural frame. In this respect, a famous example is the Miyazaki Ocean Dome-Japan where, just near the ocean, it was erected a huge dome, accommodating a large beach and an ocean, artificially created, with a sky and a horizon virtually realized, using projections on a gigantic background screen. However, when the climatic conditions allow it, the dome covering is mechanically slid letting the natural sun and sky to penetrate inside.

CONCLUSIONS

At concluding these surveys, some words uttered long time ago should be mentioned. In 1948, the urbanist Ch. Tunnard mentioned, in his book "Gardens in the modern landscape", a strange human attitude toward landscape: "For centuries, the western man imagined himself in antithesis with nature. But the truth is that his identity is not separated from nature, but together with it." A few years later, in 1965, the art critic R. Huyghe stated in "The Image Power": "The 20th century man is placed in front of a terrific universe through the new perspectives that scientific explorations offer. There are signs of a profound disorder in front of a remodeled world by the discoveries of the human industry." Nowadays, in the context of proliferation of artificial landscapes, we were tempted to find out its psychological causes: an alarm signal of alienation, of daily stressing tensions. The accelerated degradation of human health made the mankind need of nature to become very stringent nowadays. Artificiality does not renew our energies but consumes them in a vortex of illusions. The harmonious blending of natural elements in the landscaping compositions will always create a really calming, comforting and healing refuge.

REFERENCES

1. **Dascalu Doina Mira, 2006** - *Peisagistica, o posibila terapie pentru problemele mileniului al III-lea (Landscape Architecture: possible therapy for the III Millennium problems)*. Ed. Societatii Academice Matei - Teiu Botez, Iasi.
2. **Taylor G., Cooper G., 2000** - *Garden for the Future-Gestures against the Wild*. Monacelli Press, NY.

NEW TRENDS IN PUBLIC URBAN PARKS - INDUSTRIAL AREAS REHABILITATION

NOI CURENTE ÎN PARCURILE PUBLICE URBANE – REABILITAREA ZONELOR INDUSTRIALE

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Abstract. *The rehabilitation of industrial areas and the development of parks that incorporate the industrial ruins represents a trend born in the USA in the early 1970s, when, for the first time, the abandoned industrial areas were accepted as a valid part of history, with a major contribution to the memory of the society and that of the land. The first such development is the Gas Works Park, in Seattle, designed by landscape architect Richard Haag in 1971, which was followed 20 years later by Landschaftspark, the concept of German landscape architect Peter Latz, located in Duisburg Nord.*

Key words: public urban park, abandoned industrial area, rehabilitation

Rezumat: *Reabilitarea zonelor industriale și crearea de parcuri în care se înglobează ruinele industriale este un curent care s-a născut în SUA la începutul anilor 70, când pentru prima dată au fost acceptate zonele industriale dezafectate ca parte validă a istoriei, cu o contribuție importantă la memoria societății și a locului. Prima realizare în acest sens este Parcul Gas Works, la Seattle, proiectat de peisagistul Richard Haag în 1971, urmând abia după 20 de ani Landschaftspark, conceput de peisagistul german Peter Latz la Duisburg Nord.*

Cuvinte cheie: parc public urban, arie industrială abandonată, reabilitare

INTRODUCTION

In this paper I will briefly present a new trend in the design of urban public parks, namely, the recovery of industrial areas, the rehabilitation of unused industrial lands through their conversion into parks. The urban public park typology was developed over time. The need for more spaces in order to create new parks coupled with the concentration of the urban area, which is growing exponentially, are premises for a park that rehabilitates the industrial areas, as well as for the respect regarding the history of the place, the spirit of the place (*genius loci*) and for the architectural value of the buildings.

MATERIAL AND METHOD

The methods I used in studying/analyzing parks with industrial zone rehabilitation are:

- study and analyse of documents: books, reviews, internet sites, images;
- visits and analyses of sites as possible;
- systemisation of analyses.

RESULTS AND DISCUSSIONS

The industrial ruins were ignored and demolished until the early 70s. The first industrial area rehabilitation, the Gas Works Park, located on the site of a former gasification plant, was designed in 1971 by one of the most influential American landscape architects, Richard Haag, in Seattle, Washington. The concept was a very controversial one, and it took all of twenty years for another specialist to employ it for another project. Peter Latz, a German landscape architect with important works worldwide, created Lanfdschftpark at Duisburg Nord, in Germany, based on an abandoned steel production plant. Following this project, the industrial rehabilitation trend spread quickly around the world: in Holand, at Utrecht, Griftpark is also realized on a former gasworks site, as Westergasfabriek in Amsterdam, a cultural park opened in 2003; in London, Barnes Wetland Centre is designed on a former water supply reservoir; in Portugal, at Barcarena, a former gunpowder factory was converted into a cultural park; at Caen, in Normandy, Dominique Perrault designs a park on an abandoned iron works site. Here, the industrial traces of the past are transformed in visual landmarks, reference points of the landscape.

Gas Works Park

The American landscape architect Richard Haag initiated the abandoned industrial areas rehabilitation trend through the Gas Works Park project, which was developed between 1971 and 1988 in Seattle, Washington. The park is located on the northern bank of Union Lake, on the site of an abandoned gasification plant.



Fig. 1. Gas Works Park, aerial view

At the end of the 1960s few individuals in this field were interested in industrial archeology, leaving the unused industrial lands in a state of decay. Haag convinced the conservatory government and citizens, that expected the oil plant to be removed and for a common park to take its place, to preserve a significant part of the industrial structures and machines, instead of destroying them. Some of these he included as simple industrial ruins, the others he creatively transformed

into different functionalities (fig. 1, 2). The play barn includes part of the former compressor (where one can also find a maze of lively colored machinery), and the boiler room was turned into a covered picnic area.



Fig. 2. Gas Works Park, special event

Because this was an industrial site, the soil was contaminated. The methods Haag chose in order to remedy this problem were those of phytoremediation, the use of certain plants and natural biological processes. At the time, these methods were highly original and controversial and rendered very good results. Only after two decades they were used again in Europe at Duisburg.

Landschaftspark

20 years later, in 1991, the German landscape architect Peter Latz won the competition for the development of a park in Duisburg Nord, on an abandoned industrial site, with a project that enhanced the history and character of the landscape. The park stretches over 200 ha of land out of which 20 ha are covered by an abandoned steel production plant whose main structure Latz preserved and incorporated in a postmodern landscape (fig. 3). The landscape architect's approach towards the site's industrial background is one of healing and understanding, instead of one of rejection.



Fig. 3. Landschaftspark, aerial view

Like Haag, Latz doesn't change the polluted soil, but he improves it through bioremediation, using certain plants. The contaminated soil was buried deep inside the buildings, under layers of clay that form hanging gardens, home for a spontaneous vegetation, well adapted to the characteristics of the terrain. Thus, the German landscape architect's approach immediately references Gas Works Park, both through the value lent to the site's industrial heritage and through the project's defining environmental trait. The use of existing materials and vegetation are the main features that illustrate this environmental characteristic: the technological structures become symbols reminiscent of Land Art; a sequence of rooms (bunkers) of the old plant are converted to a series of symbolic gardens (fig. 4); the industrial materials and articles from around the site are recycled, the most eloquent example being the 49 steel plates with different high temperature wears from the foundry, that Latz used as pavement for the park's central square, located in the heart of the old plant, Piazza Metallica (fig. 5), a place for ad hoc gatherings, events, shows; the iron stairs were originally part of the demolished merchandise handling path, the metallic blades of the mill become a landmark of the new park (fig. 6).



Fig. 4. Landschaftspark, secret gardens

Like Haag at Gas Works Park, Latz preserves the industrial vestiges of the site. Some he incorporates as ruins, for others he finds new functionalities: the bunkers become spaces for symbolic and reclusive gardens, the old gas reservoirs are transformed into diving pools, the concrete walls become climbing walls, and the heart of the plant becomes the main square, Piazza Metallica (fig. 5).

The vegetation is made mostly of pioneer species, capable of colonizing the difficult and polluted sublayers of soil, most of which are of a recent nature, due to the transportation processes in the iron and steel industry. The exotic vegetation from the park was classified and studied, turning Landschaftspark into a true botanical garden. The presence of vegetation between the rails, the great empty and abandoned plants, the contaminated soil that receives unknown species, the drained channel, everything contributes to the illusion that past wounds inflicted

by men on the landscape can finally be healed by nature, and this strengthens the environmental character of Latz's project. This is a highlight for the metaphor of ruin and that of memory.



Fig. 5. Landschaftspark, Piazza Metallica

The idea of the park is for a grandfather, former worker of the plant, to be able to walk his grandchildren here and tell them the story of what he used to do and that of the site using the authentic objects and articles scattered around. In Landschaftspark memory represents the main theme. Many critics write about the ways in which keepsakes can give visitor information about the site, a concept that prevails in postmodernism. Memory is not about conservation in this project, but about the flow of time. Instead of destroying the plant because of its lack of production, the architects created a design that includes it; they allowed the vegetation to grow spontaneously in order to mend the soil, thus offering visitors the opportunity to understand the process of change. Each individual can have his own experience of the park and create his own personal story.



Fig. 6. Landschaftspark, the propeller

The project focuses mainly on the concept aspect, and less on the design-composition one; it tries to give people a place for recreation, despite the fact that

the main component that this project was based on, is the steel production plant, which, in any other circumstances, would not constitute a very pleasant site. This cleverly planned space attracts more visitors than other German parks because it offers people a wide range of recreational activities. And, most importantly, it is a curiosity and a challenge both for the locals, who continue the story of their lives in a permanent state of change, and for the tourists that are now creating their own memory of the place.

CONCLUSIONS

Accepting the industrial ruins represents a very important step in landscape architecture's recent history. This ensures the preservation of an important architectural heritage, but also of the memory of the place, the *genius loci*, and the memory of the society. Gas Works Park and Landschaftspark are examples to be followed all over the world, even in Romania, where the industrial architectural heritage is an extremely valuable one.

REFERENCES

1. **Amidon Jane, 2003** - *Le Jardin radical. Nouvelles définitions du paysage*. Ed. Thames & Hudson, Paris
2. **Ashton M., 2002** - *Landscape Architects*. Ed. Atrium, Chester NJ
3. **Cortesi Isota, 2000** - *Parcs publics. Paysages 1985-2000*. Ed. Actes Sud / Motta, Arles
4. **Leccese M., 2000** - *Le nouveau paysage américain. La cote Ouest*. Ed. Telleri, Paris
5. **Nicolin P., Repishti F., 2003** - *Dictionnaire des paysagistes d'aujourd'hui* Ed. Skira, Milano
6. **Norberg-Schulz Ch., 1981** - *Genius loci. Paysage, ambiance, architecture*. Ed. Mardaga, Sprimont, Belgia
7. **Prigann H., 2004** - *Ecological aesthetics. art in environmental design: theory and practice*. Ed. Birkhauser, Boston
8. **Spens M., 2003** - *Modern Landscape*. Ed. Phaidon, London
9. **Weilacher Udo, 2008**– *Syntax of Landscape. The Landscape Architecture of Petre Latz and Partners* – Ed. Birkhauser, Boston

AESTHETIC MEANING IN LANDSCAPE DESIGN

SEMNIIFICAȚII ESTETICE ÎN ARHITECTURA PEISAGERĂ

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Abstract. *The psychological, visual and emotional comfort given by the environment design, such as parks and gardens, is actually created by harmony and expressivity. Landscape architecture, the art of designing outdoor spaces, cannot be imagined without its aesthetic and artistic side. Landscape design operates with elements of vocabulary in the realm of other visual arts – geometry, color, texture, light - and finds its specific way of expression in the molding of the natural elements and outdoor spaces. Both, basic geometrical shapes – circle, square, triangle, pyramid, spiral – and the natural elements – water, vegetation, light, materials – have their own intrinsic meanings, out of which some bear a universal character, and others are specific to some communities or individuals. Once the symbolism of these elements is transferred to the designed environment, it helps shaping some aesthetic meanings that bear cultural and psychological connotations.*

Key words: meanings of the landscape composition elements, aesthetic symbolism, cultural and psychological connotations

Rezumat. *Confortul vizual, psihologic și afectiv față de mediul exterior amenajat, al parcurilor și grădinilor, este creat de frumos, de armonie și de expresivitate. Arhitectura peisageră, arta amenajării spațiilor exterioare, nu poate fi concepută fără dimensiunea estetică și artistică. Creația peisageră operează cu elemente de vocabular plastic comune cu cele ale altor arte vizuale – geometrie, culoare, textură, lumină -, și își găsește în modelarea elementelor naturale și amenajarea spațiului exterior forma specifică de exprimare. Atât figurile geometrice primare – cercul, pătratul, triunghiul, piramida, spirala -, cât și elementele naturale – apa, vegetația, lumina, materialele -, au semnificații intrinseci, din care unele au caracter universal, altele sunt specifice unor comunități sau indivizi. Transferată asupra mediului amenajat, simbolistica acestor elemente contribuie la conturarea unor semnificații estetice ce au conotații culturale și psihologice.*

Cuvinte cheie: semnificații ale elementelor de compoziție peisageră, simbolism estetic, conotații culturale și psihologice

INTRODUCTION

Landscape architecture, the art of outdoor spaces, cannot be conceived without its aesthetic and artistic side. The psychological, visual, and emotional comfort towards the designed environment of the parks and gardens is actually derived from beauty, harmony, and expressivity. The aesthetic information as part of the landscape art is often transmitted by symbolical, superior meanings. The receiving of the aesthetic messages depends on their value, but is also marked out by subjectivity, fashion, and tastes, by the preferences for different styles or by the psychological predisposition to certain shapes, colors, materials, or textures.

MATERIAL AND METHOD

Landscape design operates with elements of vocabulary in the realm of other visual arts – geometry, color, texture, light - and finds its specific way of expression in the molding of nature and outdoor spaces. These elements have their own inner meanings, out of which some bear a universal character, “symbolic images of the man in the world” (Mircea Eliade), others are specific to some communities or individuals, during certain historical periods.

The geometric composition leads to order and harmony in the spaces of gardens and parks. It confers them grandeur and magnificence, or creates them an intimate, warm climate. Concurrently, the language of geometric shapes contributes to the outlining of the meanings and concepts in landscape creations, due to their intrinsic symbolism, which is being transferred to the designed environment.

RESULTS AND DISCUSSIONS

The archetypal shapes - *circle*, *square*, and *triangle* – are powerful figures, the first, original sample of the objects [fig.1]. They are symbols of perfection and simplicity, ancestral universal modules of the intuition and intellect, which appear in dreams and myths. The human mind tends to simplify the environment, to reduce it to these basic shapes. The more simple and regular the figures that embody the landscape compositions are, the easier they are perceived and understood, and become a better communication vehicle.



Fig.1. Salk Institute by Louis Kahn

The circle or sphere means homogeneity, represents the sky and the planets cycles, and symbolizes the Universe, the sun, the fire. It is the sign of the spiritual, invisible and transcendental world (fig.3,5). Its circular movement is perfect, without an end or a beginning, with no variations. That is the reason the circle is used to immerse and to measure time.

The square and the cube represent the Earth and the Created Universe. Equal, balanced, and standing, it is a no dynamic figure suggesting stability and solidification (fig.2,4). Being a neutral and static shape with no preferential directions, the square was associated with rationalism and purity in the modern art and architecture. According to Jung, the circle is the archetypal image of the entire psychic, while the square is the symbol of the earth matter, of the body and reality.

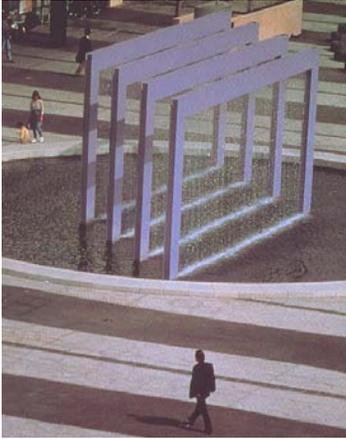


Fig. 2. Marugame Station Plaza by P.Walker

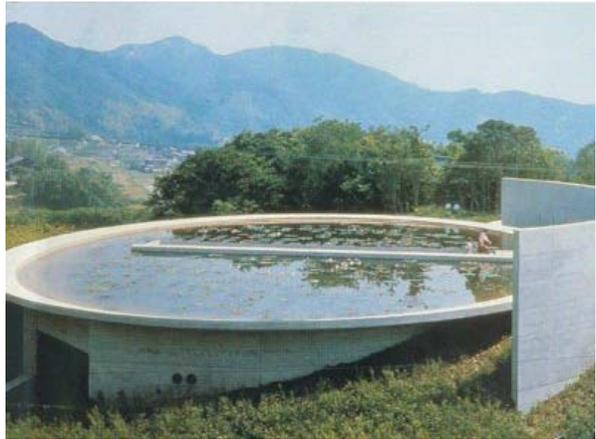


Fig. 3. Water Temple by Tadao Ando

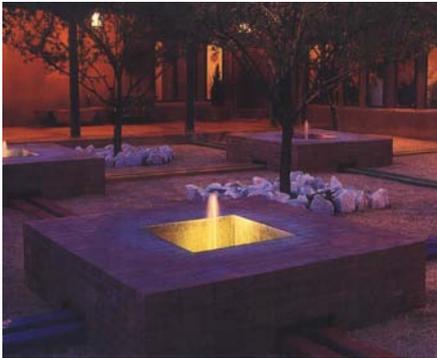


Fig. 4. Dickenson Garden by M. Schwartz

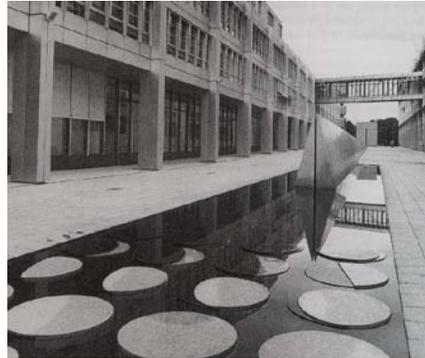


Fig.5. Court of Moon by W.Hannsjorg

The cross is the symbol of the Christian religion, of the divine sacrifice and of the human beings' salvation. Alike the square, the intersection of the arms of the cross symbolizes the earth, but in a dynamic way. The cross is the sign of orientation with functions of synthesis and measure. Indicating the four points of the compass, the cross is the base of all the orientation symbols. The cross is whereon the sky meets the earth (fig.5). It has the power of synthesis, it recapitulates the Creation and has a cosmic meaning. The intersection of its arms coincides with the Center and fixes an axis mundi.

The triangle is the symbol of the spiritual elevation and divinity. The triangle shape has stability from the interior and imparts dynamic movement directions from the exterior (fig.5). *The pyramid*, formally and semantically associated with the triangle, stands as a symbol of eternity and enlightenment, of purity and intelligence (fig.6). With a steady base and a peak towards the sky, the pyramid transposes geometrically the dialectic between horizontality and verticality.

The spatial or plane spiral evokes the cyclical progressive development, the evolution, extension, emanation. The symbol of the eternal return and of the connection between sky and earth, the spiral used in landscape architecture has

dynamism, spatiality and bears a great suggestive power (fig.7).



Fig. 6. The court of Louvre Museum by I.M.Pei



Fig. 7. Japanese garden

The labyrinth, a crossing of roads wherefrom most have no exit way, is associated with the dangerous world hunting after a center, after a savior escape from disorder and obscurity. Characterized by a complicated plan and by the difficulty of its getting over, the labyrinth represents the endlessness and the complexity of the Universe.

The labyrinth is a mysterious place, made on purpose to be unknown, conceived for keeping safely some precious things. It may also be perceived as a try-out whose overtaking would uplift our spirit. It is a place of self-revelation, an exterior complicated reality that once defeated, would enlighten us inside.

Andrei Plesu thinks of labyrinth as a symbol of errancy, as an experience of failure. It depends on us to transform it from itinerancy and misleading into a way of redemption. The fallen labyrinth, the broken fetter, and the deciphered problem, always know how to gratify our efforts. In the center of every labyrinth, there is the bower of a precious thing. This reward worths the risk of getting ourselves lost in its thicket.

The numbers do not express just quantities, but also ideas, qualities and forces. They are “the best way of reaching the divine truths” (Nicolas Cusanus). This refers not only to simple numbers, but also to eternal fundamentals that equal Truth. Platon used to consider the interpretation of numbers as the highest step of the knowledge and the essence of the cosmic and interior harmony. The landscape creation uses the symbolism and rules of numbers in order to recreate the harmony of the Universe and the cosmic rationality on Earth.

The golden section, the symbol of life and harmony, the key of the living creatures’ proportions, constitutes for the landscape architecture a controlling instrument used to create perfect rapports. The relations between simple numbers correspondent to the harmonic codes are used as abstract proportion canons in the compositions of parks and gardens.



Fig. 8. San Cristobal Stables and Folk Egerstrom House by Luis Barragan

The colors (fig.8) are one of the means of knowledge and symbolic representation of the world. According to Jung, the colors express the main functions of the human psychic: ideas, feelings, intuition, and sensation. The colors' meanings vary in different cultural areas and historical periods; they have a cosmic, ethical, biological, social, and even political symbolism, and the parks and gardens' environment may function as a vehicle for their transmitting.

In landscape architecture, the color is three-dimensional; it gives character and deepness to the entertainment exterior spaces. The color sets emotional contacts with the viewers and creates specific ambiances. The clear light colors have positive effects on human psychic; the warm and cold colors have different stimulating effects and influence processes of adaptation and communication.

The water is the symbol of purity, of wisdom, grace, and virtue. It is a source of bodily and spiritual regeneration. Water is one of the four primordial elements of the Creation, the origin of life and the primary substance from which the forms come into life and then return in regression.

An ambivalent symbol, the water means richness and protection, but it may also be an imminent danger. It is a blessing making life possible, and a purifying force, a source of creation and regeneration, yet a cause of death and destruction. The innate power of water represents the Yin and Yang essence, wherein good cannot exist without mischief. As a compositional design element, it lends energy, space, and vitality by its reflexion property and its audio-visual effects. The artesian wells and water basins bring psychological benefits and they represent attraction sights, places of communion, sources of power and regeneration. (fig.8,9,10).

The light is the symbol of divinity, of love and good. It is the life, the redemption, the sign of holiness and eternity. Light is an essential morphologic element for the molding of spaces and shapes. It generates dynamism and a feeling of depth; it amplifies the perspective and enlivens expressivity through the dialogue with the shadow.

Water, light, and vegetation used as esthetic elements in parks and gardens bring vitality and beauty; they harmonize the relation between the natural environment and the human set environment. They are a homage brought to

Creation and Nature, “the only body of God we could ever know” (Frank Lloyd Wright).



Fig.10. Water garden by Kathryn Gustavson



Fig. 9. Salk Institute by Louis Kahn

CONCLUSIONS

Once the symbolism of the geometrical shapes, of numbers, colors, water, and light is transferred to the designed environment of parks and gardens, it contributes to the shaping of some aesthetic meanings with cultural and psychological connotations. The purpose of landscape compositions is not only to create full of vitality, harmonious ambiances, but also to mold the environment in a suggestive and symbolic way in order to give it a human identity.

REFERENCES

1. **Chevalier Jean G. Alain, 2007** - *Dicționar de simboluri*. Editura Artemis, București.
2. **Ching Francis D.K., 1979** - *ARCHITECTURE, Form, Space, & Order*, (second edition). Van Nostrand Reinhold Company, Florence.
3. **Dascălu Doina Mira, 2006** - *Peisagistica. O posibilă terapie pentru mileniul al III-lea*. Editura Societății Academice Matei-Teiu Botez, Iași.
4. **Evseev I., 2001** - *Dictionar de simboluri si arhetipuri culturale*. Editura Amarcord, Timișoara.
5. **Iliescu O. A., 2002** - *Simbol în arhitectură*. Editura Universitară Ion Mincu, București.
6. *****, 1997** - *Architectural Design*, 3-4/1997, “Light in architecture”, vol. 67.
7. *****, 1997** - *Architectural Design*, 5/1997, “Architecture and water”, vol. 66.

STEEL AND CHLOROPHYLL

OȚEL ȘI CLOROFILĂ

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Abstract: *The modernism of contemporary American architecture - the combination of cold steel and glass - is considered to be opposite to nature - most buildings in down town sites seems free of life with an unfavourable impact on the environment. City of Seattle was the one who gave the tone for an eco-revolution, by two approaches: 1. The favourable visual impact which had this combination - sometimes surprising - between austerity and the rigor of the urban landscape and the „heat” of the natural „alive” elements - represented by ornamental plants; 2. Applying a plan that involves among others the adoption of other “green” technologies, for the electricity energy production.*

Key words: American architecture, steel, glass, urban landscape

Rezumat: *Modernismul arhitecturii contemporane americane – asocierea rece dintre oțel și sticlă - e considerat antitetic naturii - majoritatea clădirilor din down town-uri părănd lipsite de viață și cu un impact nefavorabil asupra mediului. Orașul Seattle a fost cel care a dat tonul pentru o revoluție ecologică, prin două abordări: 1. impactul vizual favorabil pe care îl are asocierea - uneori surprinzătoare – dintre austeritatea și rigoarea peisajului urban și “căldura” elementelor naturale - “vii”, reprezentate de plantele ornamentale; 2. aplicarea unui plan ce presupune printre altele adoptarea unor tehnologii “verzi” pentru producerea energiei electrice.*

Cuvinte cheie: arhitectură americană, oțel, sticlă, peisaj urban

INTRODUCTION

The paradox of the modern times regarding the attitude towards inclusion of the *green element* into the urban space is that of theoretical orientation towards nature as a perfect model. We evolve more and more into a setting which supposes an alternation between *cold* and *warm*, but everything is put under the sign of refinement.

The dimensions and values of the public space have completely different connotations on the American continent. They are used ‘wisely’ as we say. That is why perhaps one cannot feel the crowdedness of the urban zones. A characteristic of the architectural landscape is the big enough difference between levels. All the constructions develop vertically while the private buildings and primary schools develop in length (Althen Gary, 1988). The functionalistic modernist style had made urban constructions as well as human habitat an even surface, making them obey to a strict logic. After the Second World War, in the United States, besides the innovation of some saving solutions; the need of architectural evenness has expanded rapidly. At the same time, the American architecture has been the host to so called ‘renaissances’ which meant the reproduction of some style from different times of worldwide architecture, among which the

multiculturalism of the American society had an important point to make (Stevenson Deborah, 2003). The glass, the nickel, the clear atmosphere, light, cleanliness, represent the privilege of the contemporary American architecture.



Fig. 1. Down Town, Seattle



Fig. 2. Nordstrom Commercial Centre, Seattle

The transparency of the building, the possibility to look inside it and the light symbolize its open power and structure. The metal and glass signify suppleness, clarity of structure, transparency and are usually used as a sign. Architecture has become a space of life. It is the justification through rendering things aesthetic in conquering the world, because a beautiful construction is not a simple element anymore, through which the man contributes to the disappearance of a piece from the natural environment, but a cultural component.

MATERIAL AND METHOD

The American townplanner who propose the green colour, take into consideration the building of a new landscape and its 'real' possibility to bring nature into town. At the same time it is desired to prevent the town from becoming ill, by making vegetation interventions. The *green* element are not an architectural prolongation, not even a space in which this floats but an enclosing, an additional space, an urban function (<http://www.urbanecology.washington.edu/>). The urban landscape is not reduced to the simple presence of the glass and steel anymore. It appears to be combined in the *pith* of life, a possible compensation to the urban pollution. However, in order to obtain results that are as *real* as possible, the authorities have intervned choosing other ways as well. Two years ago, the mayor of Seattle town Greg Nickels has started an ecological revolution. Following his proposal, hundreds of mayors have started a campaign to reduce carbon emissions by replacing the vehicles used by authorities with hybrid vehicles. The results were immediate and carbon emissions have been reduced to 60% comparing to year 1990. Moreover, he proposed to the vehicles owners to use the public means of transport and he took the responsibility of creating bicycle lanes. He also enlarged the pavements to facilitate the pedestrian flux (<http://www.green-report.ro/revista->

presei/adevarul-revolutie-ecologica-primarilor-american). These project proposals are found more or less in all geographical spaces. But putting them into practice sees difficult as they remain at the project stage, in our country as well.

Some people are happy with a cleaner atmosphere, being aware at the same time that a 'saved' fir tree in the construction area in the middle of the town is not seen as a separate nature element, but as a concept of each place's becoming. The care for nature is not that big in other parts of the world as this fact would at least lead to discontent.



Fig. 3. Down Town, Seattle



Fig. 4. Public Library, Seattle

But more than that, the wish to feel *the green* everywhere, has led to innovative solutions. One of the public library halls in Seattle is 'warmed' by a huge carpet which gives you the sensation that the bookshelves are in the garden of a house (Fig. 5).



Fig. 5. Seattle, The public library, study hall

RESULTS AND DISCUSSIONS

The West Coast of the United States is more different from the East Coast. The population is smaller and the urban zones do not make themselves known by sky scrapers. Seattle, the capital of state Washington has a single higher building,

Columbia Tower, which is also the highest building on the West Coast side. (fig. 3, fig. 4). Seattle has such a spectacular natural positioning, so that a radical architectural concept appears to be too much in rapport with the natural ambient. The geometrical skyscrapers are perfectly combined with nature. You could even say that they have been built in order to complete the richness of the landscape and not the other way. But vegetation is part of the ambient, as much as an art object. Where there is no place for the nature's elements, the mirroring help to multiply them (fig. 6, fig. 7).



Fig. 6. Public Library, Seattle



Fig. 7. Macy's Commercial Centre, Seattle

A remarkable element is offered by the footbridges built between the buildings and on different floors and which also connect the streets (fig. 8).



Fig. 8. Footbridge, Seattle

One the other hand, American architecture has nothing cold or impersonal, even if the materials used could deny this thing. Glass and steel, alternations between brown, grey and blue colours, natural light which exploited to the maximum, everything is combined with the warm green colour of the ornamental plants. These are strategically placed and emphasize the value of spaces. The mirroring is searched even if the appearances can be hazardous (fig. 9). What can be seen in a mirror is not accidental, it has first of all the role of leading the sight, of informing and last but not least of creating aesthetic pleasure (fig. 10, fig. 11).



Fig. 9. Mirroring, Public library, Seattle



Fig. 10. Cafe, Bellevue



Fig. 11. Business centre, Seattle

We find innovative solutions for capturing the light in the public space as well as in the private one. The light spots replace the artificial light where it is possible, being welcome from an economic point of view too. The climate also allows this artificial zone, the roofs having to stand large quantities of snow.

The building from downtown of an American town develop- as we said before- more lengthwise, while the inhabiting spaces, whether they are private houses, or buildings centres, having at least a few storeys. You could say that after eight or ten hours of work without touching the ground, even more than that, being quite far from it, you could only wish for the lawn in your garden or even your balcony (fig. 12). Reading a book or relaxing in the middle of nature start being preferred by people, matching the technology available anytime and almost anywhere.

There are a lot of inhabiting spaces in the United States where the owners have given up on TV or computer just because they want a space which is truly private. But only 5 % of the population is part of this phenomenon. The media culture consumerism is on the top place, being favoured by the advanced technology and being mistaken for the cultural activities, for the reason that it offers information. More than that, the impression left is that the choice of information depends on the will of the consumer (Spellman Catherine, 2003).



Fig. 12. Private house, Seattle

CONCLUSIONS

The America culture is too little obsessed with the imagination's transcendental, metaphysic or anthropological basics and is more interested in the practical results of it. All projects that have been done in the United States, which have as a main target the protection of man an nature are not a novelty.

It is quite a long time since these preoccupations with practical results have existed. An example can be the big programme of interdisciplinary education in the field of urban ecology, initiated by the University of Washington, in year 2002. Its mission is clear: *Improving the Earth's situation by putting into action political factors of decision, researchers, students and citizens from the present generation, learning and using their knowledge about interactions between people and ecological processes in urbanizing the environment.*

The strictness this issue is dealt with proves that the space in which we work and interact with our peers can have a tremendous importance on our evolution in time.

REFERENCES

1. **Althen Gary, 1988** - *American Ways*. Business International, Bucharest, Romania.
2. **Spellman Catherine, 2003** - *Re-envisioning Landscape / Architecture*. Barcelona, Actar
3. **Stevenson Deborah, 2003** - *Cities and urban cultures*. Philadelphia, Open Univ. Press
4. <http://www.green-report.ro/revista-presei/adevarul-revolutie-ecologica-primarilor-americiani>
5. <http://www.urbanecology.washington.edu/>

THE LATEST TECHNOLOGIES IN ECO-DESIGN: COMPUTER AIDED ECOLOGICAL DESIGN

TEHNOLOGII DE ULTIMĂ ORĂ ÎN ECO-DESIGN: PROIECTAREA ECOLOGICĂ ASISTATĂ DE PC

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Abstract. *Without trying to be exhaustive, this presentation focuses on new technologies in design that are also environment friendly. In brief it will present technologies for technical solutions like the product optimization in Solid Works in order to achieve a minimum usage of material and a simplified production/assembly process. Also the virtual simulation of stress resistance and durability using Solid Works as an alternative to simulations on prototype will be explained. The second part will detail some technologies for aesthetic solutions. Included here are the rendition of photo-realistic graphics and motion pictures using Bunkspeed Hypershot and Hyperdrive and also a rapid prototyping technique using the powder modeling machine.*

Key words: new technologies, design, ecological, virtual reality, photorealism

Rezumat. *Fara a-si propune sa epuizeze subiectul, aceasta prezentare pune accentul pe tehnologiile de proiectare noi, prietenoase cu mediul si economice ca timp. Prima parte face referire la doua tehnologii pentru determinarea solutiilor tehnice. Inclusa aici este optimizarea produsului in Solid Works in vederea utilizarii unui minimum de material in procesul de fabricatie si urmarind simplificarea procesului de productie/asamblare. A doua tehnologie din aceasta categorie vizeaza realizarea de simulari de rezistenta si durabilitate pe computer in Solid Works ca alternativa la simularile in real. Cea de-a doua parte vizeaza tehnologii pentru determinarea solutiilor estetice. Include aici sunt realizarea de imagini si animatii foto-realiste ale produsului folosind Bunkspeed Hybershot si Hyperdrive, precum si prototipizarea rapida folosind modelatorul cu pulbere.*

Cuvinte cheie: noi tehnologii, design, ecologic, realitate virtuala, fotorealism

INTRODUCTION

Design used to be a lot about trial and error in the past. The design process relied mostly on prior experience. Testing design products in a real environment was extremely costly, involving extensive use of materials, logistics and safety measures. The introduction of CAD (Computer Aided Design) more than 30 years ago represented the dawn of a new era in design. However, it is only nowadays, with the latest generation of CAD software that we can see how the design process can happen almost entirely in a virtual environment that is safe, cost effective and very important, environment friendly. There are numerous design software solutions available, but we we'll focus here on the ones considered

revolutionary, most advanced, eco-friendly and also suited for landscape architecture.

MATERIAL AND METHOD

The technologies presented below cover all stages of the design process and show how the future of design is closely connected to information technologies. Crucial for environment awareness, the latest developments in computer aided design will ensure an ecological approach in all future product developments. The movement of the design process from real life to a virtual environment is controversial and seen with reservation by some, but the advantages in term of safety and cost reduction cannot be denied. The inertia and the resistance to change that is common to people will make the transition to this new “virtual design” slow, but the switch will be made eventually, that is for sure. For this study were used Solid Works 2008 and Bunkspeed Hypershot 1.7.1 software packages and a Z Printer 310 Plus 3D modeller.

RESULTS AND DISCUSSIONS

It is a known fact that any problem has numerous solutions and solving methods. The duty of design these days is to identify the best solution for every need and issue. That “best” involves seeking for minimal environment effect, but maximum user satisfaction, for low production cost, but an extended product life. Finding this best way means ultimately trying out all of the possible ways and deciding which is the superlative. If up until now this search process was nearly impossible due to the expensive nature of a real try-out of every design variant, today we can reduce costs and experiment freely in a virtual environment.

The design methods we are presenting here today are under study and in use by the teachers and students at the Design College (part of the “G. Enescu” University of Arts) from Iasi. These methods complement both visual and technical sides being also of great help in landscape architecture.

The first part of this material refers to product eco-optimization using the latest SolidWorks CAD software. Depending on their role in the community, people will cite different factors as being those to contribute to what makes a product “better”.

(http://www.solidworks.com/sw/docs/SWPrem_DesigningBetterProducts_WP_ENG.pdf).

The words of the day are “ecological” and “environment friendly”. People finally begun to realize that the world as we know it cannot last if we continue to abuse it. The effort of environment preservation can be implemented at all stages in the design process. And CAD software such as SolidWorks is a powerful tool to support this effort.

A serious demand for all new design products is that of increased efficiency and environment responsibility. Consumers are demanding these days greater participation in “green” initiatives, including saving energy, reducing waste, and eliminating the use of environment hazardous materials. For lots of people, better products result from manufacturing in more efficient and environmentally

responsible ways, such as reducing the number of prototypes and employing more energy-friendly processes.



Fig. 1. Design validation in SolidWorks

SolidWorks offers via a component called DFMxpress a potent design validation tool that enables users to identify geometry that would be difficult, expensive, or impossible to manufacture by conventional machining operations, such as milling, drilling, and turning [See Figure 1]. Other features like Thickness Check, Undercut Check, Geometry Check, and Part Difference Check are also available. They can help designers easily identify potential problems and reduce the number of costly prototypes.

Considering that a single industrial product can consist of thousands of complex parts, being able to determine machine performance digitally can significantly reduce prototype development time. With CAD software like SolidWorks you can analyze the effects of motion on a product and establish how fast it will accelerate or you can subject a device to varying real-like environmental forces and study its reactions.

Among the most important simulation tools in SolidWorks are those that enable stress and damage analysis, pointing the areas that are prone to weakness and failure. This can be of particular help in landscape architecture. Urban furniture, as an example, can be tested in (VR) simulating the conditions of open environment (temperature changes, sun-light, rain, frost etc.). SolidWorks Motion allows you to study the physics of moving assemblies, determining how component will interact and function as a whole. A different component called FloXpress can simulate fluid flow and cooling and display the results as section planes or flow trajectories. This tool can be used to simulate wind and its effects in a virtual environment (fig. 2).

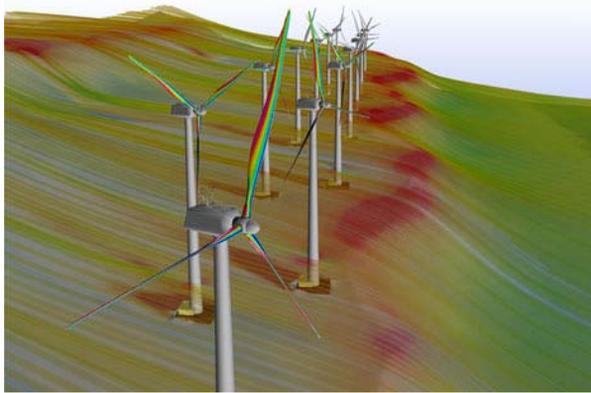


Fig. 2. Wind test in SolidWorks

Another very interesting feature of SolidWorks is the addition of a drop test. This very important test show what would happen if a design product is accidentally dropped onto the ground and, in consequence, how it can be improved in order to better withstand such a fall. Until now the results for this tests was attained by physically dropping the object and, in most of the cases, by destroying the prototype. In SolidWorks this virtual test is as safe as it can be and offers a dramatic reduction in costs (fig. 3). The user has to define the materials for the product subjected to the test, then the hardness of the floor, the height of the drop and the floor orientation.

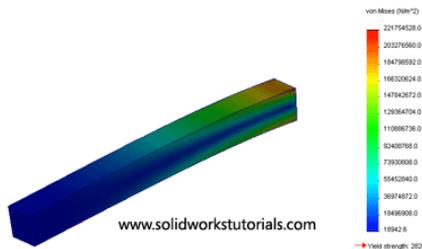


Fig. 3. Drop test in SolidWorks

The second part of this material covers the revolutionary visualization software offered by Bunkspeed. Hypershot and Hypermove offer real time rendering capabilities based on actual physics that are able to produce photo-realistic imagery and motion pictures. The results are so close to actual photographs, that rendering images in this software has become a cheaper alternative to actually taking photos of an object. Manufacturers all over the world began using the software both for the design process and for marketing purposes (<http://www.bunkspeed.com/hypershot/>).

In the design stage the role of the software from Bunkspeed is even more significant. The results are so close to reality that they almost eliminate the need for prototyping (fig. 4).



Fig. 4. Computer generated landscape in Hypershot

These incredible results are even more laudable considering the speed and ease that they are achieved with. Real materials with realistic properties are rendered in minutes in life-like environments. Because Hypershot uses HDRI (high definition 360° images) of real environments it is ideal to produce renderings of objects that will be displayed in an existing environment (plaza, garden, parc etc.). This makes it very valuable for landscape architecture also.

However the 2D representation (on a screen) has its limitations. Now matter how the screens will evolve, nothing will match the possibility of seeing an actual three dimensional objects, hence the need for prototyping and scale modeling. A new technology that allows fast modeling is using a powder atmosphere 3D printer. Produced by Z Corporation, these printers use laser beams to solidify a powder and are able to raise any shape from the ground up by laying layer after layer of material (fig. 5).



Fig. 5. Powder model on a 3D Printer

A real advantage of this printer is that virtually any shape can be produced. Even if it includes negative angles, or if it contains a part completely enclosed into another part. This liberty of shape makes the technology useful in any area of design and architecture.

CONCLUSIONS

With hope that these latest development in ecological design have convinced you that our future is set on a right path the finish lines are that product development is now more responsible and environment oriented than ever.

Due to the help of informatics we can save energy, time and materials by making resistance, stress and usage tests in virtual reality. We can see, analyze and correct design products before they are actually built. This eliminates to some level the need for prototyping and, finally when a prototype is still needed we can create it fast with a powder 3D printer. The flexibility of this technologies, makes them useful in most creative areas, including landscape architecture.

Where evolution will take us we can only wait and see, but it is nice to have the feel of a real control in the design process, that we can have today using these latest developments.

REFERENCES

1. **Musca G., 2008** - *Cresterea competitivitatii companiilor folosind proiectarea asistata de calculator si managementul datelor pe intreaga durata de dezvoltare a produsului*. Editura Pim, Iasi.
2. **Musca G., 2008** – *Solid Edge, solutia completa pentru proiectarea mecanica*. Editura Pim, Iasi.
3. **Pralea Jeni, 2009** - *Designul in contextul proiectarii produsului industrial*. Editura Artes, Iasi.
4. <http://www.solidworks.com/sw/mechanical-design-3d-whitepapers.htm>
5. <http://www.solidworks.com/sw/design-validation-whitepapers.htm>
6. <http://www.bunkspeed.com/hypershot/>
7. <http://www.bunkspeed.com/hypermoves/>
8. <http://www.zcorp.com/en/Products/3D-Printers/ZPrinter-450/spage.aspx>
9. <http://en.wikipedia.org/wiki/CAD>

USING THE COMPUTER CREATIVELY IN THE DESIGN PROCESS

UTILIZAREA CREATIVĂ A COMPUTERULUI ÎN PROCESUL DE DESIGN

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Abstract. *Computers are an indispensable part of our lives. And design makes no exception. Smart use of computers can drastically improve the quality of the design process. Are being brought to your attention here some smart ways of acquiring reference material from the web, some quick rendering techniques using the scanner, the graphic tablet and Adobe Photoshop. Also on the part of technical drawing we will demonstrate how to produce fast blueprints using Solid Works (isometric views, side views, section views, etc.). The rendition of photo realistic presentation graphics in 3d environments (Solid Works, Alias) and their advantages and the production of presentation collages using Adobe Photoshop and Adobe Illustrator will conclude this material.*

Key words: computer, creativity, illustration, blueprints

Rezumat. *Computerele au devenit parte integranta din viata de zi cu zi. Domeniul designului nu face exceptie. Folosirea ingenioasa a calculatorului poate imbunatati sensibil calitatea procesului de design. Sunt prezentate cateva modalitati rapide de documentare in mediul web si cateva tehnici de randare accelerata folosind scannerul, tableta grafica si Adobe Photoshop. Pe partea de proiect tehnic sunt demonstrate realizarea desenelor tehnice de executie in Solid Works (vederi ortogonale, axonometrii, sectiuni, rupturi, etc.). Producerea de imagini de prezentare fotorealiste in medii tridimensionale (Solid Works, Alias), cu avantajele acestora, precum si colarea imaginilor in planse de prezentare folosind Adobe Photoshop si Adobe Illustrator vor incheia acest material.*

Cuvinte cheie: computer, creativitate, ilustratie, desen tehnic

INTRODUCTION

Modern life is almost unimaginable without the use of information technologies (IT). Computers have taken over the repetitive tasks in our activities, as their abilities to manipulate numbers exceed greatly what a normal human can do. This takes a lot off our shoulders and allows humans to focus on what they do best. That is the very thing that differentiates them from beasts, their ability to create and innovate. This material will show you how the two sides mentioned above, the human with his creative power and the PC with its computing strength can work side by side and produce, as a team, far better results. The idea of “team” and “co-operation” has new values nowadays when the internet infrastructure makes communication and interaction so much easier and accessible worldwide.

MATERIAL AND METHOD

This material is intended as a showcase for the latest information technologies in the design process. This activity that was since its birth entirely analogical, is nowadays strongly influenced by the development of computer aided design. Whether design going digital is a good or bad thing is still a matter of debate. Pro digital design is the ease of the process, the cost reduction or the ability to improve safety and ergonomics of the final product. Those that enjoy analogical design consider the digital artificial and connected more to the machines than it is to humans. For this study were used Adobe Photoshop CS4 software mated with a Wacom Cintiq graphic tablet, Solid Works 2008, Alias Studio 2008 and Adobe Illustrator CS4.

RESULTS AND DISCUSSIONS

Key to any important operation is being well informed. Luckily IT and the internet have eased the access to most of the information that we need. The network is already huge and rapidly increasing. Although that means the chances of it containing what you need are increasing, on the downside, it also means that finding anything in that enormous pile is a lot more difficult. Therefore the first part of this material will describe a few fast and effective searching techniques, to be used on the web.

Most of us are familiar with search engines and use them on a regular basis. Also, without doubt, the most popular SE, Google is home page for many people. Finding something on the web using Google is already pretty easy, but there are a few tricks and tips that can help you save lots of time and also help you find the information that is most relevant.

First is important to know that Google ignores capital letters and punctuation, therefore using them is a waste of time. Also connection words like “and”, “or”, “to” are ignored by the search engine. The best way to make a search is to use only a few, but descriptive words. As an example, if you need to know how that weather will be in Iasi there is no need to type something like “How will the weather be in Iasi?”, instead of that “weather Iasi” will suffice.

A few operators are very useful and will help refine and improve the search (<http://www.google.com/support/websearch/bin/answer.py?answer=136861>). By inserting double quotes around a set of words (“ ”), you are telling Google to consider the exact words in that exact order without any change. Google already uses the order and the fact that the words are together as a very strong signal and will stray from it only for a good reason, so quotes are usually unnecessary. But this helps if you need to reduce your search to an exact order of words.

The operator (site:) helps you search only within a specific website. For example, the query [Iasi site:romania.ro] will return pages about Iasi but only from romania.ro. You can also specify a whole class of sites, for example [Iasi site:.ro] will return results only from a .ro domain and [Iasi site:.com] will return results only from .com sites.

Attaching a minus sign (-) immediately before a word indicates that you do not want pages that contain this word to appear in your results. The minus sign should appear immediately before the word and should be preceded with a space.

You can exclude as many words as you want by using the - sign in front of all of them, for example [Iasi - newspaper - restaurant].

The *, or wildcard, is a little-known attribute that can be very strong. If you include * inside a query, it will tell Google to try to and place any unknown term(s) instead of it and then find the best results. For example, the search [Copou*] will give you results about the boulevard, the park, the cinema, etc. Note that the * operator works only with whole words, not parts of words.

Tilde (~) is another very interesting feature of Google. Placed before any words in a query, it will search not only that word, but also all of its known synonyms. As an example, the search [~car] will also search for “automobile”, “vehicle”, etc.

Now that we have the necessary information for the design process, it is the time to get started with some ideation sketches. Sketching is largely still connected with analogical instruments: pen, paper, pastels, etc. However the latest developments in digital imaging blend the advantages of both traditional and modern drawing techniques.



Fig. 1. Landscape sketch rendered in Photoshop

One such method is to make a free hand quick sketch on a piece of paper, have it scanned, import it into Photoshop and then have it enhanced or even fully-colored with ease and precision. Even the most fanatic supporters of analog sketching can't deny the flexibility and the speed offered by digital painting software (fig. 1).

The possibility to undo any action in a digital drawing when needed is a great advantage. That and the ability to copy/paste image sections and to blend them seamlessly shows just how much faster this can be. If you add to that the fact that anything you have created can be changed in terms of color, contrast, size, position in any given moment the advantages become clear.

Another method, biased even more towards the digital side, is the use of a graphic tablet. The most advanced of these devices, like the Wacom Cintiq,

combine the advantages of an LCD monitor with the performance of a tablet with 1024 levels of pressure sensitivity. By using a digital pen directly on a screen that mimics the properties of canvas computer use is as natural as possible (<http://www.wacom.com/cintiq/>) (fig. 2). These fast ideation techniques are of great use in any visual creative area. Their applicability in landscape architecture is obvious.

Another point of interest in design is the interface with the engineering team. That was known to be problematic in the past, due mostly to the different training of the sides. Designers are basically artists and are less interested in a technical approach, while engineers are trained and used to see mostly the practical issues. Modern software can also help with this particular matter. SolidWorks CAD software, for instance can successfully be used by both designers and engineers. It was intended as a design developing platform that covers all the necessary requirements in this process.



Fig. 2. A Wacom Cintiq graphic tablet

As an example, a designer can sketch a new wheel on a piece of paper, scan the paper and have it modeled into 3D using SolidWorks and afterwards, within minutes, have the model represented into detailed technical drawings that the engineering team can easily use.

More than that, an artist with no technical or computer knowledge can sculpt an object that afterwards can be scanned in a 3D scanner, the result being a fast and accurate 3D SolidWorks model. Model that can be after declined into technical drawings in the same manner as the one mentioned before. This eases a lot communication between engineers, designers, landscape architects, etc.

But what if a complex object exists only in the imagination of a designer. Bringing it to reality is a costly process that can be from case to case even risky. Or what if there are several ideas that should be evaluated before deciding which the best and the one to be turned into reality. For these problems are of help the

new software packages for computer generated images and motion pictures. Programs like Autodesk Alias and Bunkspeed Hypershoot can produce results that are so close to reality that they almost eliminate the need for a prototype (fig. 3).



Fig. 3. Rendering of a bench in Alias

Finally, after we have gathered all of the necessary materials for a successful design presentation we need to collate them into coherent media. While motion pictures are a great way to show ideas, design presentations have remained focused on still images. These can capture “more than a thousands words” as we know and also give the viewer the necessary time to digest the concept without having to rewind. Great means for producing such presentations are Photoshop and Illustrator from Adobe that handle all there is to handle when it comes to imagery. The first one is focused on raster, while the second is dedicated to vector images. They come handy in any creative field, including landscape architecture.

CONCLUSIONS

Progress is, if not desirable by everyone, hard to avoid. Not even resistance to change can stop it. Things are the same in design. No matter how fond will some be to the traditional methods, the safer, more viable ways will take over. However we need to make sure that this automation is only limited to the repetitive tasks. Creativity remains a quality that only humans have, and they have to be those leading the machines in the design process, not vice-versa.

REFERENCES

1. **Musca G., 2008** - *Cresterea competitivitatii companiilor folosind proiectarea asistata de calculator si managementul datelor pe intreaga durata de dezvoltare a produsului*. Editura Pim, Iasi.
2. **Musca G., 2008** – *Solid Edge, solutia completa pentru proiectarea mecanica*. Editura Pim, Iasi.
3. **Pralea Jeni, 2009** - *Designul in contextul proiectarii produsului industrial*. Editura Artes, Iasi.
4. <http://www.google.com/support/websearch/bin/answer.py?answer=136861>

5. <http://www.wacom.com/cintiq/>
6. <http://www.adobe.com/products/photoshop/photoshop/faq/>
7. <http://www.adobe.com/products/illustrator/faq/?promoid=DRHWY>
8. <http://usa.autodesk.com/adsk/servlet/item?siteID=123112&id=8810677>
9. <http://avarvarii.carbonmade.com/projects/21240#30>

SOFTWARE COMPATIBILITY FOR REALTIME LANDSCAPING ARCHITECT, GOOGLE SKETCHUP 7 AND COREL GRAPHICS SUITE IN THE GENERAL TERM INTITLED CAD (COMPUTER ASISTED DESIGN)

COMPATIBILIZAREA PROGRAMELOR REALTIME LANDSCAPING ARCHITECT, GOOGLE SKETCHUP 7 ȘI SUITA COREL 11 SUB CONCEPTUL GENERAL DE AMENAJARE PEISAGERĂ ASISTATĂ DE CALCULATOR

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Abstract. *The concept of cad (computer assisted design) must be looked from a global point of view where the entire programs used in landscape design are compatible. Generally speaking this fact is possible, but most of the software producers tend to make unique software with fewer possibilities for software compatibility with other programs. In order to fulfill a software compatibility landscape designers who are using computer accuracy in their designs must be capable to use different software's and known their strong and week points to make a perfect landscape design generated through cad techniques. The present paper wants to illustrate multiple compatibilities between three landscape design software Realtime Landscaping Architect, Goggle Sketch Up 7 and Corel Graphics Suite.*

Key words: library creation, symbol, model, CAD

Rezumat. *Conceptul general de proiectare asistată de calculator trebuie privit dintr-o perspectivă globală, unde programele de amenajare peisageră asistată de calculator sunt compatibile între ele. Cu referiri generale acest lucru ar fi posibil, însă majoritatea producătorilor de programe tind să facă din programele lor „unicaturi” lăsând puține posibilități pentru eventuale compatibilități cu alte programe. Pentru a face posibilă compatibilitatea dintre diferite programe de amenajare peisageră utilizatorii de programe trebuie să cunoască cel puțin utilizarea a trei programe, insistând pe punctele forte sau slabe ale acestor programe, rezultatul final concluzionându-se într-o amenajare peisageră asistată de calculator cât mai corectă și funcțională. Lucrarea dorește prezentarea posibilităților de compatibilizare a trei programe de amenajare peisageră Realtime Landscaping Architect, Goggle Sketch Up 7 și Corel Graphics Suite.*

Cuvinte cheie: creare bibliotecă, simbol, model, CAD

MATERIAL AND METHODS

The present paper reveals the importance of using the compatibility between CAD software's. In most of the cases landscape software programs are meant to be looked as singular CAD solutions. With the interrelated usage of *Realtime*

Landscaping Architect, *Google SketchUP 7* and *Corel Graphics Suite I* propose a different approach in CAD techniques by creating a custom library of 3D or 2D symbols with the help of the mentioned above programs. The tests were carried on a medium equipped computer: CPU AMD Duron 950 MHz, Memory 640 MB RAM, Video Board - NVIDIA FX 5500 - 256 MB

RESULTS AND DISCUSSIONS

For creating 2D objects or 3D *Realtime Picture Editor* represents the perfect solution for this problem. With a simple crop function the designers can make exact replicates of existing plant cultivars or exterior furniture from a picture. Through this method the plant library or the accessory library of the program is constantly improved by adding new objects by the software user.

The following figures are explaining the main steps for creating and importing a new object in the plant library.

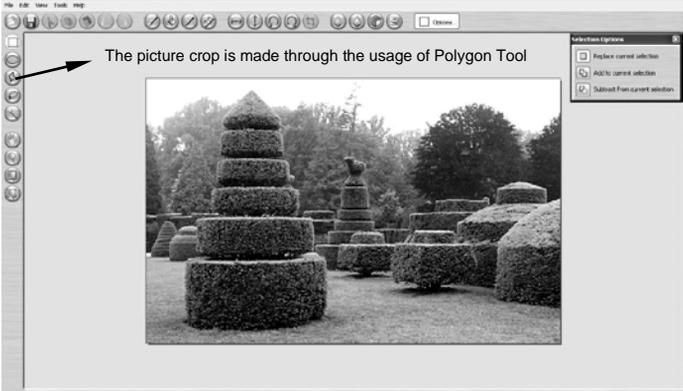


Fig. 1. The importing method of a picture in *Realtime Picture Editor*

Once imported the picture it must be cropped by using the Polygon Tool. At the end of the cropping method the result would look like the figure 2.



Fig. 2. The cropped vegetative form

As we can see in the figure 2, all the background of the picture disappears once with the cropping of the picture. At this point I saved the new topiary art with the extension tga (recommended for the best quality of the picture). Also through this extension the picture will maintain the transparency effect.

The final example of the imported topiary art model is showed in figure 3.



Fig. 3. The imported new object in *Realtime Landscaping Photo*

A forward approach for improving the plant and object library of *Realtime Landscaping Architect* software I made it by importing 3D models from *Goggle Sketch Up 7* program.

Here is a simple example how I accessed the library of *Goggle Sketch Up 7* through *Realtime Landscaping Architect* software.

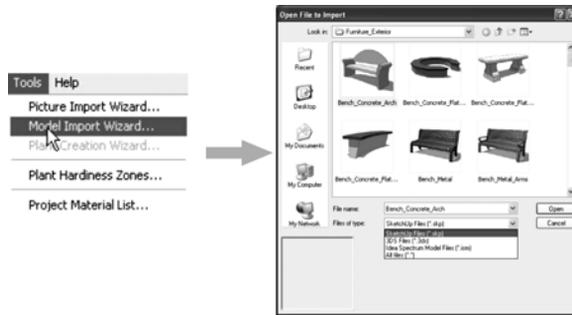


Fig. 4. Importing 3D Sketch UP models through *Realtime Landscaping* software

The advantage of the 3D imported object is that it can be moved and looked from any kind of perspective. This is a major strong point of an imported 3D object against an imported picture that can be looked only by the perspective when the picture was taken.

Corel Draw Suite witch is a powerful vectorial design software can benefit from the importing of 2D symbols.

This issue can be resolved by importing through the tga extension all the 2D symbols of the *Realtime Landscaping Architect* software.

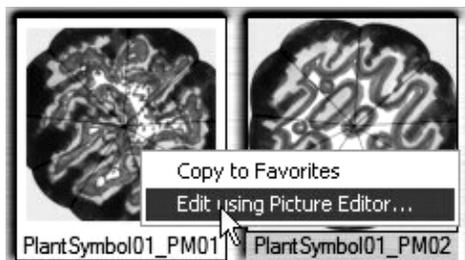


Fig. 5. Exporting method of 2D models from *Realtime Landscaping* software

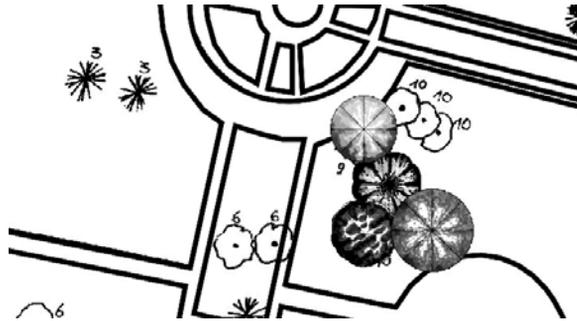


Fig. 6. Imported 2D symbols in Corel Draw software

When I exported the 2D symbols from the *Realtime Landscaping* program I selected the extension of the file tga. This extension is recommended for best quality and its transparency effect.

CONCLUSIONS

Following the mentioned above steps a landscape designers who is using CAD software's can improve the plant library or the object library. The presented solution tends to improve and facilitate the work in different types of software's.

All the presented programs can be looked as 100% compatible through CAD perspective. When the user finished importing all the 2D symbols from the *Realtime Landscaping* library, Corel Draw becomes a powerful landscape design program.

Goggle Sketch Up 7 is another free of charge software that can be used for its 3D libraries or 3D modeling of a landscape project.

REFERENCES

1. **Iliescu Ana-Felicia, 2003** - *Arhitectură peisageră*. Ed. Ceres, București
2. **Zaharia D., Dumitraș Adelina, 2003** - *Arboricultură ornamentală*. Ed. Risoprint, Cluj-Napoca
3. **Lance Hattatt, 1999** - *Gardening with colour*. Ed. Parragon, Anglia
4. **Robin W., 2003** - *Inițiere în design*. Ed. Corint, București
5. **Etiene Blouin, 2006** - *ABC-ul grădinăritului*. Ed. Polirom, Iași
6. **www.ideaspectrum.com**
7. **<http://sketchup.google.com>**
8. **www.corel.com**

DESIGNING THE FUTURE BOTANICAL GARDEN OF "ȘTEFAN CEL MARE" UNIVERSITY OF SUCEAVA

PROIECTAREA VIITOAREI GRĂDINI BOTANICE A UNIVERSITĂȚII „ȘTEFAN CEL MARE” DIN SUCEAVA

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Abstract: *In the present context of the development of "Ștefan cel Mare" University - Suceava, in close accordance with the structure and its future needs, it was necessary to create a new campus. Campus II Moara will be built on a surface of 30 hectares and, in addition to the areas of education and research, polyvalent room, sports field, swimming pools, a culture house, a museum, it will also include a generous botanical garden with numerous sectors on about 17 hectares. The Botanical Garden of "Ștefan cel Mare" University - Suceava will be structured and arranged on the following sectors: the greenhouse sector, the dendrological area and Romania's vegetation, the ornamental plants, rosarium, taxonomic sector, world's flora, rocks vegetation, vegetation of lakes and marshes, useful plants, a nursery. The Urban Area Plan and the Prefeasibility study for this campus have been developed by the University of Architecture and Urbanism "Ion Mincu" Bucharest (fig. 1). By its judicious future systematization the botanical garden will meet scientific and teaching duties, as well as educational, health, recreation and decorative functions.*

Key words: botanical garden, campus, greenhouse, Urban Area Plan

Rezumat: *În contextul actual al dezvoltării Universității „Ștefan cel Mare” din Suceava, în strânsă concordanță cu structura și nevoile viitoare ale acesteia, a apărut necesitatea creării unui nou campus universitar. Campusul II Moara se va ridica pe o suprafața de 30 hectare și care, pe lângă obiectivele cu spații de învățământ și cercetare, sală polivalentă, terenuri sportive, bazine de înot, casă de cultură, muzeu, va cuprinde pe cca. 17 hectare și o generoasă grădină botanică cu numeroase sectoare. Grădina Botanică a Universității „Ștefan cel Mare” din Suceava, va fi structurată și amenajată pe următoarele sectoare: sectorul serelor, sectorul dendrologic și vegetația României, sectorul plantelor ornamentale, rozariul, sectorul taxonomic, sectorul florei Globului, sectorul vegetației de stâncărie, sectorul vegetației de baltă, sectorul plantelor utilitare, pepinieră. Planul Urbanistic Zonal și Studiul de Prefeabilitate pentru acest campus a fost realizat de Universitatea de Arhitectura și Urbanism "Ion Mincu" din București (fig. 1). Viitoarea grădină botanică prin sistematizarea judicioasă a acesteia va fi în măsură să îndeplinească atât funcțiile științifică și didactică cât și funcțiile educativă, sanitară, de recreare și decorativă.*

Cuvinte cheie: grădină botanică, campus universitar, seră, Plan Urbanistic Zona

INTRODUCTION

The progress of both the Faculty of Forestry and the "Stefan cel Mare" University of Suceava in terms of number of students, specializations or study programs, implies the achievement of a multipurpose botanical garden.

The objective of the current investment put forward is creating a proper space to shelter a collection of woody and grassy plants, and to serve as an *in situ* laboratory for students, teachers and specialists, thus enabling them to make simple observations as well as complex studies on the organization and evolution of the living matter, on plant taxonomy, on chorology, on species ecology, on the conservation of rare or endangered species, on the acclimatization of valuable exotic species, on utilitarian purposes, on the value of the landscape etc.

This botanical garden will be an extremely useful training in cultural education and will help people's environmental consciousness to come into shape, by the abundance of information provided by the collections in this unit. At the same time, the establishment of the botanical gardens in the city of Suceava is more than convenient, given that in Bukowina and the north-eastern part of Transylvania there is no such objective, thereby increasing the character of "center of gravity" of the city and the region.

In terms of the flora and vegetation of this region, it is definitely necessary to create such a garden, given the existence of many plant species that are either rare or endangered, which would benefit from an *ex situ* protection as required in this area. For Suceava city, the new unit will compensate for this, becoming a place of recreation and rest for both the local population and those passing through town (Negruțiu Filofteia, 1980).

MATERIAL AND METHOD

Botanical gardens are created for scientific purposes (research, conservation of plant species), teacher-training, cultural education, recreation, aesthetic and health (Diaconescu V., 1985; Negruțiu Filofteia, 1980). Many examples, from the country and especially from abroad, can serve as models for this garden, even if they might differ in their structure and species, due to the climate or relief of the area, or to the institution's orientation which governs this unit. By studying specialised literature, by visiting similar units and following the specific character of the Faculty of Forestry from Suceava, we designed a project which underlies the systematization of the future botanical garden. Campus Il Moara will be built on a surface of 30 hectares, inside of the administrative area of Moara village, and it will include a generous botanical garden of about 17 hectares.

RESULTS AND DISCUSSIONS

The Botanical Garden will have the following specific sectors (fig. 1):

- **The administrative sector** will include the building with offices, the Exicata collection room, seed laboratory, cultures "*in vitro*" laboratory, workshops, warehouses (Leucov M. et al., 1985). It is recommended that this building should be located near the building of the Faculty of Forestry or maybe even be part of the same building, but with separate entrance, and also, that a "green roof" should be arranged on the last terrace of the building, which will help completing the environment and provide a model for future similar arrangements.

- **The greenhouse**, or the complex of greenhouses for exhibition, collection

and research-production greenhouses, will include air-conditioned constructions of metal and glass, with vegetal species from the subtropical, tropical and equatorial areas of the Globe (Diaconescu V. et al., 1982). They will offer the general public, as well as students, teachers and researchers, plant exhibits ranging from the remotest ecosystems of the world, in them selves a rich topic of study and observation (Pop E., 1966).

The Greenhouse Complex will consist of 11 greenhouses, the plant species being distributed by biogeographical and taxonomic criteria (palm-house, Mediterranean and sub-tropical plants, succulent plants, cactuses, covered tanks, epiphytes, tropical and equatorial trees, acidophilic plants, ornamental plants, the research and breeding/propagation and the greenhouse for exhibition). The total useful surface recommended for the complex of greenhouses is 5000 sqm.

The route followed by visitors must be continuous, picturesque, often without intersections, possibly a circular one (with a point of departure and arrival point). The transition should be performed successively from the cold greenhouses (Mediterranean greenhouses and subtropical plants, acidophilic plants) to the warm and humid ones (epiphytes, covered pools, palm-house etc.).

As an element of absolute novelty, in the greenhouses in Romanian botanical gardens there is a system of visiting which includes three pedestrian traffic manners: alleys placed at ground level for most of the greenhouse, a corridor (tunnel) on the glass bottom of the basin or basins for the aquatic ecosystems of Amazon river basin, Asian rivers, rivers of Africa (a first-time construction in Romania, ideal for observation of aquatic vegetation, and why not, the fauna of Amazon), stairs or gangways at different levels for observation from different angles of large plant specimens or plant associations found here (palm-house, equatorial and tropical trees greenhouse) .

- **The ornamental sector** will be placed next to the main entrance area, having the most important impact on the public and will include floral collections (perennial, biennial and annual), which will assure a continuous chromatic harmony. This sector will be arranged geometrically and the species' positioning will be done like in the classic French gardens. The surface we suggested for this sector in 20000 sqm.

- **The rosarium** will be placed after the ornamental sector and will be established geometrically, for an adequate systematic presentation. The suggested surface is 5000 sqm.

- **The taxonomic sector** will be placed on both sides of the main axis. The suggested surface is 40000 sqm.

- **The dendrological sector and aspects from the Romania's vegetation** will be placed on the periphery of the area and will include forest vegetal systems specific to our country (juniper, spruce, fir, larch, pine woods, mixtures, beech stands, durmast stands, oak wood, xerophile boscage, water meadows, marine forest steppe) but also aspects from the herbal vegetation - mezophites, xerophile, eutrophic, oligotrophic meadows, sand lands, saline areas (Mihalache Ana, 1988; Mihalache Ana, 1989; Radu St. et Hulea A., 1964). The surface will have 90000 sqm.

- **The Worldwide Flora Sector** will be placed within the inferior third (from altitudinal point of view) of the central axis, and will include a small Japanese garden. The suggested surface is 15000 sqm.

- **The rocky vegetation sector** will be placed in the sunniest area. The suggested surface is 3000 sqm.

- **The marsh vegetation sector** will include a hydrological establishment with a surface covered by water of minimum 3000-4000 sqm and it will be placed within the microdepression area partially resulted from the excavations. This sector's vegetation will be represented by thicket, cat tail, sedges, water lilies etc. The recommended surface is 5500 sqm.

- **The useful plants sector** will be placed laterally (towards the hostel complex) and will include species of a utilitarian importance (medicinal, nutritious, nectarious, technical, toxic plants, green crops, etc). The suggested surface is 5000 sqm.

- **The didactic-experimental sector and the nursery** will be located laterally too, towards the hostel complex) following the sector of useful plants and will include fields in rotation with various sown fields, experiments, etc. This sector will serve for the laboratories, research, as well as for the production of the material to be engrained and it will not be opened to the public, being delimited by an enclosure (Radu St. et Hulea A., 1964). A platform for the compost will also be available here. The suggested surface is 10000 sqm.

The avenues will allow mainly the pedestrian visitors access into the sectors open to the public but also the access of the cars used for the maintenance or for other specific activities. These are differentiated into two categories: main, secondary alleys and paths for the public and roads for high tonnage equipments.

The access to the public garden will be available through the main entrance from the north – eastern side (for public and equipments) but also through the two secondary entrances (one on the south–west and one in the north–eastern side), for equipments.

The avenues for the pedestrians will be planned according to the mixed style principles, namely: the ornamental sector and the rosarium will be placed on the main perspective axis and will be characterized by the presence of large alleys, mapped out geometrically, ground floors with sod and species of flowers, shrubs, ornamental lakes/tanks, arranged according to a strict symmetry against the main axis, the other sectors opened to the public being arranged according to the English landscape architecture style, with naturally-traced alleys, with sinuous directions, and no strict geometrical shapes.

The road crosses the garden from one end to the other, being located (on the whole) at the limit between the dendrologic and Romania's flora sector and the other adjoining sectors, reaching the limit with the didactic–experimental sector and the nursery. This road follows an optimum direction, which can serve all the sectors of the garden, whenever work is done in the area.

The main entrance building will be placed at the main entrance in the botanic garden and will include a room for the security staff, box–office, a mini-

market and a toilet.

The lightening system and the urban furniture will be distributed on the whole surface of the sectors with public access. The lightening system will include various types of illuminators (pillars, small lamps, floodlights, etc) distributed according to these sectors arrangement. The urban furniture will include benches, kiosks, pavilions, trash cans, explicative panels, informative signs.

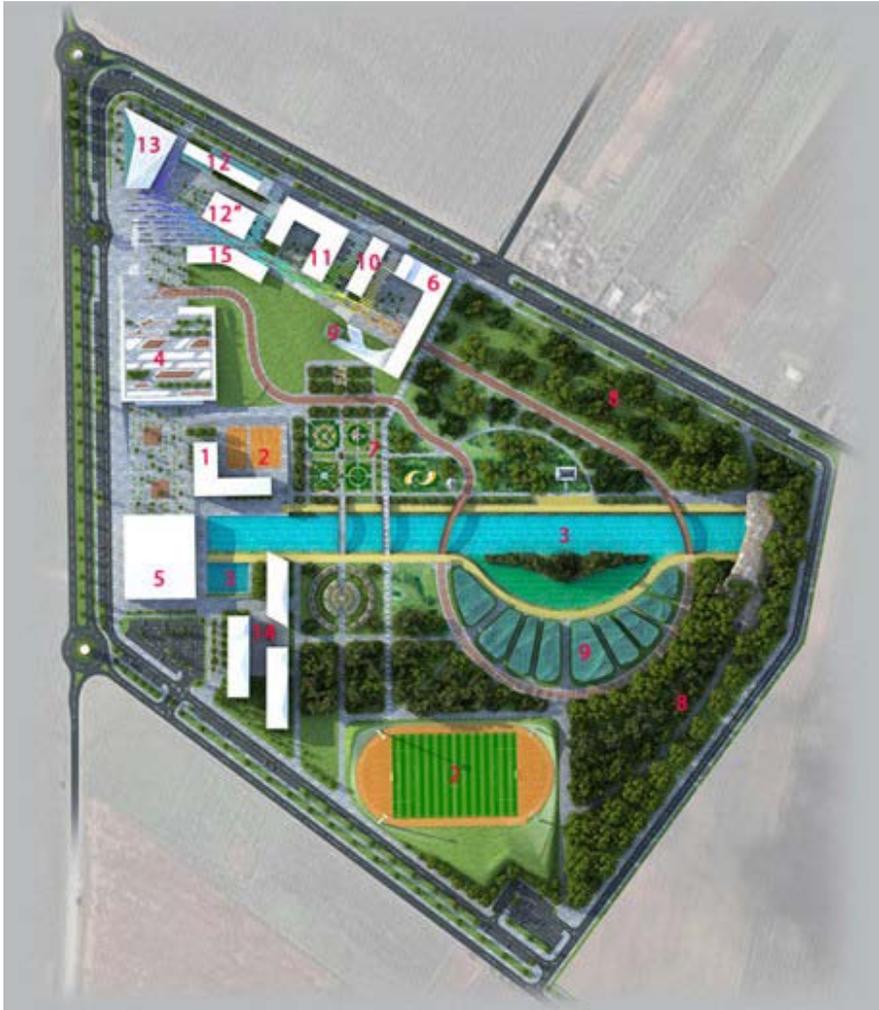


Fig. 1. The situation plan – Campus II Moara, designed by the University of Architecture and Urbanism “Ion Mincu” Bucharest (1 - teaching spaces for Faculty of Physical Education and Sport, 2 – sports, 3 - lake for water sports, 4 - Polyvalent Hall, 5- Olympic swimming, 6 - teaching spaces for Faculty of Forestry, 7 - the ornamental sector and the rosarium, 8 - the dendrological sector and aspects from the Romania’s vegetation, 9 - the complex of greenhouses, 10 - Biotechnology center of excellence, 11 - Nanotechnologies research center, 12 - Rehabilitation center and museum, 12* – Library, 13 – House culture, 14 - student hostels, 15 - student restaurant)

The enclosure of the botanic garden will be done by an aesthetic and strong fence, which will limit the uncontrolled access within the arranged area.

Other installations: electrical energy supply, thermal energy supply, water supply, drainage, toilets.

The parking lot will be located next to the main entrance, outside the enclosed area and will ensure the parking of the cars and buses. The suggested surface is 1500 sqm.

CONCLUSIONS

Campus II of the University "Ștefan cel Mare", located on the administrative area of Moara village, has a generous surface area (30 ha), and will include an area specifically designed for a botanical garden with a rich Dendrological collection.

The future Botanical Garden of "Ștefan cel Mare" University - Suceava comes to meet the natural needs that a university that is developing dynamically has.

The Urban Area Plan and Prefeasibility Study for this campus, conducted by the University of Architecture and Urbanism "Ion Mincu" of Bucharest, were resolved in an appropriate basis for the design requirements for future botanical garden (Fig. 1), following in the future, to cover all stages to achieve this objective.

By its judicious future systematization the botanical garden will meet scientific and teaching duties, as well as educational, health, recreation and decorative functions.

We hope that in the near future, this botanical garden will find their place among botanical gardens in Romania and abroad.

REFERENCES

1. Diaconescu V., 1985 – *Grădini botanice din România*. Ed. Științifică și Enciclopedică, București.
2. Diaconescu V., Mohan Gh., Țipa L., Nedelcu G., Firea-Mihăilescu Silvia, Lungeanu I., Constantinescu Maria, Dănescu-Culeanu Andreea, 1982 – *Grădina botanică din București*. Institutul Poligrafic Sibiu.
3. Leucov M., Țopa E., Lazăr Maria, Rugină Rodica, Sârbu I., Tăbăcaru C., 1985 – *Grădina botanică din Iași*. Universitatea „Al. I. Cuza” Iași.
4. Mihalache Ana, 1988 – *Monografia arboretumului Doftena*. Întreprinderea Poligrafică „Oltenia”, Craiova.
5. Mihalache Ana, 1989 – *Monografia arboretumului Hemeiuș*. Întreprinderea Poligrafică „Oltenia”, Craiova.
6. Negruțiu Filofteia, 1980 – *Spații verzi*. Ad. Didactică și Pedagogică, București.
7. Pop E., 1966 – *Grădina botanică din Cluj*. Ed. Meridiane, București.
8. Radu St., Hulea A., 1964 – *Arboretumul Simeria*. ghid – album, Ed. Agro-Silvică, București.

PROPOSED PROJECT FOR THE BIOLOGICAL PURIFICATION OF WASTEWATER USING PLANT SPECIES

PROIECT PROPUȘ PENTRU PURIFICAREA BIOLOGICĂ A APELOR UZATE PRIN INTERMEDIUL PLANTELOR

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Abstract. *The establishment of artificial wetlands is an ecological alternative to the conventional water treatment systems and reduces the anthropogenic impact on the environment. In this context a project consisting in a succession of cells filled with gravel and planted with different vegetal species having a purifying role is proposed for the Suceava’s University campus. Beside water cleaning, the artificial wetland has many other functions: increasing biodiversity, recreational, esthetical, and educational.*

Key words: wastewaters, biological purification, biodiversity

Rezumat. *Una dintre soluțiile care se pot adopta pentru diminuarea impactului antropogenic asupra mediului este aceea de epurare a apelor uzate prin crearea de zone umede artificiale. În acest context se propune un proiect de amenajare a unor celule (bazine) plantate cu diferite specii vegetale cu rolul de a epura apele uzate provenite din viitorul campus Moara al Universității „Ștefan cel Mare”, Suceava; se evidențiază multifuncționalitatea proiectului care are și valențe estetice, recreative, de ameliorare a biodiversității și educative.*

Cuvinte cheie: ape uzate, purificare biologică, biodiversitate

INTRODUCTION

Nowadays, the anthropogenic pressure is more and more powerful and one of the fundamental demands of sustainable development is to diminish this pressure. The creation of artificial wetlands is one of the ways to succeed in this attempt, solution that is already used in certain countries around the world [1, 3, 7].

There are two types of artificial wetlands: with open flow using water ponds and canals, very similar to the natural wetlands, or artificial cells with subsurface flow. In both cases hydrophilic or aquatic plants are planted; these plants are enhancing the removal of pollutants from the wastewater by consuming a part of them as nutrients (especially the nitrogen and the phosphorus), but metals also, which are adsorbed and deposited in their biomass [2, 4]. In the same time, the plants pump air into their root system and so creating conditions for maintaining populations of aerobic bacteria which are decomposing organic substances from the wastewater.

Starting with this idea, the creation of a multifunctional green zone is proposed for the purification of the wastewaters resulting from the Moara campus of the „Ștefan cel Mare” University of Suceava.

MATERIAL AND METHODS

The solution adopted for the proposed project is the one comprising artificial cells with subsurface flow which are planted with a variety of carefully chosen plants for cleaning the wastewaters from the university campus. In the same time the plants must be able of living in these water-saturated conditions.

The project realisation **consists in** the succession of following phases:

- the execution of the three different cells by mechanical soil excavation to the maximum depth of 2,5 meters
- the water insulation of the cells with geomembranes or clay to prevent the contamination of soil or phreatic layer by the polluted water
- the implantation of porous pipes system which ensure the adduction and circulation of sewage water from a cell to another
- filling the cells with different sorts of gravel, placing the roughest elements on the base
- planting the different chosen species with their own soil or in perforated pots; right after planting the plants must be provided with the necessary water flow. The water reaches the three types purifying cells after passing through a usual septic tank.
- the last phase consist in the disposal of a control box in order to allow the monitoring of the water level

The criteria for the selection of the species planted in the cells were their ecological demands; consequently, due to their purifying qualities, for the type 1 cells, hygrophytes, hydrophytes and mesohygrophytes species were chosen. In the same time, for the type 2 cells, mesophytes, mesohygrophytes and hygrophytes species were chosen for their purifying capacity but also for their aesthetic values. In the 3 type cells, trees and bushes are planted to accomplish the purification process by evapotranspiration.

RESULTS AND DISCUSSIONS

The Moara university campus capacity will be of about 2500 resident equivalent units (meaning persons living in the campus 24 hours per day). It have been taken into account that for every resident equivalent unit results 150 l wastewater a day which requires for purification an artificial wet zone of 2,5 square meters; thus, for purifying the full amount of wastewater, a total area of 6000 m² artificial wetland was projected, considering some periods like holidays or exam sessions while the campus attendance is diminished. The depurative surface is formed of the three types of cells already mentioned placed as follows: in centre the type 1 cell, surrounded by the type 2 cell and peripheral the type 3 cell (figure 1). The wastewater is conducted in summer from the septic tank towards the type 1 cell then goes over the type 2 and 3 cells (figure 1); beyond the growing season when the plants can't carry on their filtrating capacity, the wastewaters are oriented along an alternative way, through a green house (one of the several green houses belonging to the university botanical garden) placed near

the purifying wet zone (figure 1). Among other species in this green house the Nil salad (*Pistia stratiotes* L) and water hyacinth (*Eichornia crassipes* Mart. Solms.) are grown for their extraordinary capacity to filtrate polluted waters [2].

The hygrophytes, hydrophytes and mesohygrophytes species which can be planted in type 1 cell are: *Alchemilla vulgaris* L., *Calamagrostis pseudophragmites* (Haller fil.), *Caltha palustris* L., *Comarum palustre* L., *Epilobium hirsutum* L., *Epilobium parviflorum* Schreber, *Equisetum fluviatile* L., *Equisetum palustre* L., *Equisetum telmateia* Ehrh., *Filipendula ulmaria* (L.) Maxim, *Hippuris vulgaris* L., *Lathyrus pratensis* L., *Lychnis flos-cuculi* L., *Lycopus europaeus* L., *Lysimachia nummularia* L., *Lysimachia vulgaris* L., *Lythrum salicaria* L., *Mentha aquatica* L., *Mentha longifolia* (L.) Hudson, *Pedicularis palustris* L., *Phragmites australis* (Cav.) Steudel, *Polygonum bistorta* L., *Polygonum hydropiper* L., *Polygonum lapathifolium* L., *Potentilla anserina* L., *Ranunculus repens* L., *Ranunculus sardous* Crantz, *Ranunculus sceleratus* L., *Saponaria officinalis* L., *Stellaria palustris* Retz., *Thelypteris palustris* Schott, *Typha angustifolia* L., *Typha latifolia* L., *Typha minima* Funck in Hoppe, *Veronica anagallis-aquatica* L., *Veronica beccabunga* L.

These species will be placed in the compartments of the purifying cell (figure 1) according to the taxonomic classification, for educational purposes, every species being provided with an informative panel. The access to the compartments of this cell is ensured through 2 meters width wood walking alleys (figure 1). The total area of this cell will be 20% of the 6000 m² - the extent of the entire aggregate. The depth of the type 1 cell will be 1,20 m.

The type 2 cell can be planted with the following mesophytes, mesohygrophytes and hygrophytes species: *Acorus calamus* L., *Agrostis stolonifera* L., *Arundo donax* L., *Bolboschoenus maritimus* (L.) Palla, *Briza media* L., *Calla palustris* L., *Calystegia sepium* (L.) R.Br., *Carex acutiformis* Ehrh., *Carex hirta* L., *Carex riparia* Curtis, *Carex tomentosa* L., *Carex vulpina* L., *Cirsium oleraceum* (L.) Scop., *Deschampsia cespitosa* (L.) Beauv., *Eleocharis palustris* (L.) Roemer et Schultes, *Eriophorum latifolium* Hoppe, *Geranium palustre* L., *Geranium pratense* L., *Glyceria maxima* (Hartmen) Holmberg., *Glyceria notata* Chevall.; *Hemerocallis lilioasphodelus* L., *Heracleum sphondylium* L., *Inula helenium* L., *Iris pseudacorus* L., *Iris sibirica* L., *Juncus effusus* L., *Juncus inflexus* L., *Menyanthes trifoliata* L., *Myosotis scorpioides* L., *Petasites hybridus* (L.) P. Gaertner, B. Meyer et Scherb., *Poa palustris* L., *Scirpus sylvaticus* L., *Solanum dulcamara* L., *Stachys palustris* L., *Telekia speciosa* (Schreber) Baumg., *Trollius europaeus* L., *Valeriana officinalis* Kreyer. These vegetal species will be disposed according to the romantic landscape style. The type 2 cells area will represent about 50% of the total area and their depth will be 1,70 m.

The type 3 cells will be set with trees and bushes for accomplishing the purifying process by returning in the air the water vapours; there are chosen species with very intense evapotranspiration process like: *Salix alba* L., *Salix fragilis* L., *Salix purpurea* L., *Salix viminalis* L., *Alnus glutinosa* (L.) Gaertner.,

Alnus incana (L.) Moench., *Tamarix ramosissima* Ledeb., *Corylus avellana* L., *Frangula alnus* Miller, *Myricaria germanica* (L.) Desv., *Padus avium* Miller, *Ribes nigrum* L. The total area of this type cell will reach about 30% and the depth of 2-2,5m.

If the wastewater volume exceeds the filtrating capacity of the three cell types and is not entirely consumed by them, the water excess will be conducted to a fourth type cell represented by an artificial pond where hydrophilic species will be planted to fulfil the same purifying role as the other plant species of the complex. The following species can be used: *Alisma plantago-aquatica* L., *Butomus umbelatus* L., *Ceratophyllum submersum* L., *Elodea canadensis* Michx., *Hydrocharis morsus-ranae* L., *Nuphar lutea* (L.) Sm., *Nymphaea alba* L., *Nymphoides peltata* (S.G.Gmelin), *Polygonum amphibium* L., *Potamogeton natans* L., *Ranunculus aquatilis* Schrank; *Ranunculus trichophyllus* Chaix; *Sagittaria sagittifolia* L.; *Stratiotes aloides* L., *Utricularia vulgaris* L.

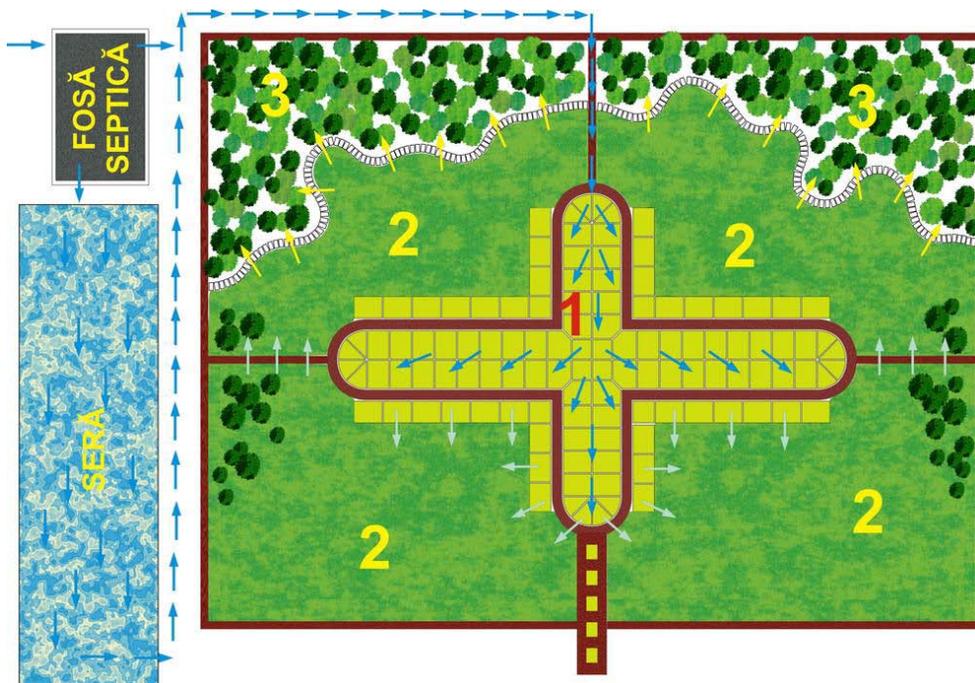
The water lies in the septic tank for 2 - 2,5 days and then for about 4-4,5 days in each purifying cell type [5]. The alternative adopted with subsurface flow avoids the bad odour and the mosquitoes.

In time, numerous animal species (insects, amphibians, reptiles, micromammals) will naturally colonise the artificially created cells, finding appropriate food and shelter conditions. Gradually, humid ecosystems will form, characterised by a high biodiversity, useful in the same time for the educational process.

This kind of artificial wetlands using natural processes and phenomenon for water purification have a lot of advantages comparing with the conventional sewage treatment facilities: efficiency, important economical advantages, not need sophisticated technology and use no machine or chemicals, no electricity consumption, easy maintenance, odourless and beautiful to look and be around, last longer (3-4 time longer than normal wastewater treatment systems), the trees and bushes biomass can be used (compost, osier etc.), increase biodiversity, useful in educational process.

Regarding the filtration efficiency, this vegetal complex reduces with 90-95% the CBO_5 , with 90-95% the solid suspensions, with 40-80% the total nitrogen, with 30-60% phosphorous and with more than 98% harmful bacteria [6].

An important amount of money is saved because the investment's initial cost is up to 50% lower [6], and the operational and maintenance costs are only 5-10% comparing with a normal wastewater treatment system. The maintenance stuff is formed only by the gardeners, the same ones in charge with the botanical garden and the other green areas of the university campus.



Legend:

- 1 – Cell with purifying vegetation
- 2 – Cell with purifying and ornamental vegetation
- 3 – Cell with trees and shrubs with a role in completing the cleaning process

Fig. 1. The filtrating cells location and the wastewater circuit routing

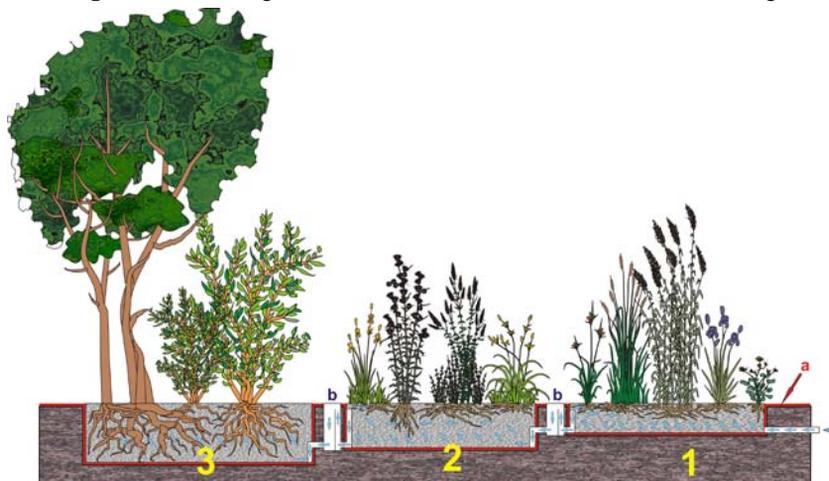


Fig. 2. Cross section through the three type cells for wastewater purification (a – hydro isolation, b – control box for the cell's water level)

The maintenance consist in the periodical checking of water level in the control boxes, the gravel changing or cleansing (after 15-20 years if it porosity

diminishes) and comprises too the biannual analysis of the water in different points of the water circuit (exit of septic tank, exit type 1 cell, exit type 2 cell).

This built ecosystem with high biodiversity will be a part of the botanical garden open to the public and useful for the university students in the same time. With a minimum of effort and investment, educational routes can be designed with visual signs along, each of them illustrating various aspects of the newly created ecosystems.

CONCLUSIONS

The proposed project represents an ecological alternative to the conventional wastewater treatment systems and it is a new solution never used in this form until now in our country. So, the sewage waters from the University “Stefan cel Mare” campus reach first the septic tank, after which it is fed into several filtrating cells (ground holes) filled with a diverse range of plants with a gravel base. The plants maintain a population of aerobic bacteria and take up and transform the wastewater.

The design work consisted in planning the proper elements for the specific local conditions: the purifying cell location, the wastewater circuit routing, the filling material, the location and species selection, the alleys design, the insurance of water purification beyond growing season, for assigning the optimum performance and minimum cost functions to this artificially multipurpose created wetlands.

The multiples advantages of the project speak for it self and recommend the multiplication of this ecological solution in other locations too, for public institutions, residential districts, singular habitations, towns or villages.

REFERENCES

1. **Hassle M., 2004** - *Phytorestore: des jardins filtrants pour deppoluer*, <http://www.gazettelabo.fr/2002archives/prives/2004/92phyto.htm>
2. **Mohan Gh., Avram A., 1989** - *Valorificarea resurselor vegetale în gospodărie și industrie*. Editura tehnică, București
3. **Vrhovsek D., V. Kujanka, Bulc T., 1995** - *Constructed wetland for industrial waste treatment*, Water Science and Technology, vol. 32, issue 3, pp. 305-315
4. **Zimmels Y., Kirzhner F., Roitman S., 2004** - *Use of naturally aquatic plants for wastewater purification*. Water Environment Research, vol. 76, no. 3, pp. 220-230
5. *****, 2006** - *Recirculating Wastewater Garden*. Ecological Engineers end Design, <http://www.ecological-engineering.com>
6. *****, 2007** - *Wastewater gardens*. Institute of Ecotechnics – Planetary Coral Reef Foundation, <http://www.wastewatergardens.com>
7. *****, 2008** - *La restauration ecologique et paysagere des ressources par les plantes*. <http://www.phytorestore.com>

SOIL AND PLANT BIODIVERSITY CONSERVATION AT TATA POWER WESTERN INDIA

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Abstract. *The Western Ghats, also known as the Sahyadri mountain ranges, are well known for their rich and unique assemblage of flora and fauna currently under the threat due to human intervention (Myers, 1990; Alfred et al, 2001). Further, Myers et al. (2000) included the Western Ghats amongst the 25-biodiversity hot spots identified in the world. Around 4000 species of flowering plants are known from the Western Ghats (Daniels & Venkatesan, 2008). Of all organisms, birds are the best studied in the Western Ghats and subsequent studies have suggested that there are 508 species of birds (Ali & Ripley, 1968-74; Pande et al., 2003; Padhye et al., 2007). Six Hydropower lakes of The Tata Power Company in Maharashtra India fall in the Northern parts of Western Ghats. The companies' strong environmental policy backed up by correct technical support and availability of financial resources has helped towards the conservation of the flora and fauna in its catchment areas. This paper highlights the challenges faced by the company in designing, implementing and improving on its conservation policy. The gradual transition from fast growing species to indigenous species of trees for afforestation programs can be a model for similar corporate initiatives. Identification of the appropriate plant species for preserving biodiversity, reducing soil erosion, attracting faunal life, and providing a secondary source of income to the villagers is the aim of our conservation programme.*

Key words: Afforestation, Biodiversity, Conservation, Ecology, Forest-Fire, Trees survival, Western Ghats

INTRODUCTION

In Western Ghats there are several hydropower projects located in hilly regions where forest cover is comparatively better than that over the adjacent plain areas. In the study area, in Northern Western Ghats, the Tata Power Company has three hydropower projects. Diversion of forestland for Hydro Power projects is often unavoidable. Submergence of this land under water leads to loss of flora and fauna. However, the Company makes systematic and conscious efforts to minimize the diversion and submergence of forest lands and implement restoration programmes for biodiversity conservation.

Compensatory afforestation is also mandatory in accordance with Forest (Conservation) Act, India, 1980. Clearance from Ministry of Environment & Forest is also mandatory for such projects. Six Hydropower lakes of the Company in Maharashtra, Western India, fall in the study area covering an area of 400 sq km. The catchments of Hydro lakes receive an annual rainfall of 3500 to 4000 mm spread over three months from mid June to mid September. Heavy rains result in soil erosion and siltation of the lakes. Large scale deforestation by

the villagers to cater their needs for fuel wood requirements has denuded the catchments making them barren. Deforestation has also resulted in decreasing the population of indigenous plants finally affecting the flora and fauna. Another most common hazard is the forest fires. They pose additional threat to the biodiversity and ecology of the region.

The survival of the trees during afforestation programs is under the influence of such forest fires. Afforestation and conservation of the flora and fauna in the catchment areas becomes a challenging task in this scenario. In the current study, we have tried to overcome this major hurdle in the afforestation programs by correlating root length at the time of plantation with post fire survival to decide the time of shift of saplings from nursery to the fields and comparing alternative ways of plantation methods.

MATERIAL AND METHODS

Study Area. The study area is Tata Power company's Walwhan dam catchment in Lonavla, Western Maharashtra, India (18° 45' 0 N: 73° 25' 0 E). It is a part of the Western Ghats, a global Hotspot, located at 622 MSL. The area receives heavy South West Monsoon rainfall from mid June to mid September with a break of few days in between. The annual precipitation is about 3000 mm to 3500 mm. (Pande et al., 2008). The hottest months are March and April [37.8° – 40° C] and the coldest months are December to January [up to 5° C]. Soil is lateritic, red porous and water holding capacity of the soil is poor. Patches of evergreen, semi evergreen, grasslands and wetlands are observed in the area. The terrain is hilly and unprotected with interference of human activities.

Nursery Management. The seeds of 14 species of plants (Table 1) were collected locally from the forest or purchased from reliable resources. The seeds were tested for germination and the lot germinating more than 80% was selected and sown. The seeds of all the species were sown at the same time and the saplings were raised in the nursery. Raised seedbeds were prepared in the nursery. Red garden soil mixed with Farm Yard Manure in the ratio of 3:1 was used in the nursery. The seeds were broadcasted on the beds and then covered with a thin layer of the same mixture. The seeds of *Acacia auriculiformis* and *Bauhinia* were treated by soaking the seed in hot water for 24 hrs before sowing. The sowing was done in last week of March and was nurtured till July. Periodic watering and weeding was carried out as and when required to ensure proper and healthy growth.

Planting Methods, Root Measurements and Plant Survival. As per forest dept guidelines two methods were used for plantation, trenching and pits. Trenches measuring 2 m in length X 0.60 m width and 0.30 m depth were dug in the last week of April in open spaces along the hilly contours. Similarly pits of size 0.3 m X 0.3 m X 0.3 m were dug in open spaces on hill slopes (Blatter and Millard, 1993). The trenches and pits were then exposed to sun for 15 days. In the second week of May the trenches and pits were refilled and kept ready for planting at the onset of SW Monsoon. After the monsoon was set in perfectly the saplings grown in the nursery were transplanted naked on trenches and pits. The saplings were planted randomly. During plantation in July 2006, the saplings of all the species were 4 months old. The plantation was completed in two days. The sample size selected was 50 saplings of each of the 14 species (total n=700). Light to heavy showers continued through out till September. The recording of observations for

survival started in September 2006, followed by December 2006, March 2007, June 2007 and September 2007. All saplings of each species were measured for their root length in July prior to plantation [n=50 for each species] and again in March [n=5 for each species, randomly]. Forest fires occurred in the 2nd week of April and burnt the entire hill causing damage to the plantation area. The fire lasted for one night. Subsequently, from June 2007, after forest fires, plants were said to have survived only if they exhibited new growth sprouts.

OBSERVATIONS AND RESULTS

Out of 14 species that were selected for plantation, 13 were indigenous except *Acacia auriculiformis*, which was exotic (table 1).

Table 1

Comparison of plant species with respect to their root length at the time of Plantation in July (n=50 for each species) and in March before forest fire (n=5 for each species).

Sr.No.	Species	Root length in July in m.	Root length in March in m.
1	<i>Pongamia glabra</i>	0.19	0.23
2	<i>Bauhinia racemosa</i>	0.28	0.33
3	<i>Dendrocalamus strictus</i>	0.16	0.20
4	<i>Acacia auriculiformis</i>	0.20	0.24
5	<i>Butea monosperma</i>	0.21	0.25
6	<i>Acacia catechu</i>	0.17	0.20
7	<i>Syzigium cumini</i>	0.17	0.20
8	<i>Dalbergia sissoo</i>	0.14	0.18
9	<i>Madhuca latifolia</i>	0.14	0.17
10	<i>Terminalia tomentosa</i>	0.15	0.19
11	<i>Terminalia chebula</i>	0.16	0.19
12	<i>Thespesia populnea</i>	0.13	0.17
13	<i>Erythrina indica</i>	0.16	0.18
14	<i>Embilica officinalis</i>	0.16	0.16

Species wise final percent survival (survival in September 2007, after forest fire) is shown in fig.1. No plant was observed infected with any of the diseases at any time during the observation period and it was confirmed that grazing was not permitted in the study area. It can be seen that the highest survival is shown by *Pongamia glabra* and the lowest survival is shown by *Embilica officinalis*.

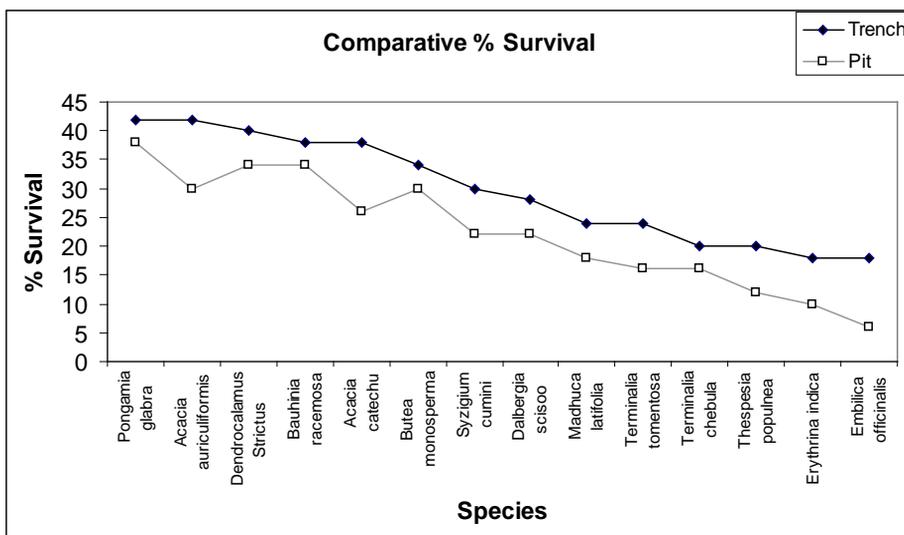


Fig. 1. Species wise comparative percent survival of plants in trench and pit method of plantation

Average percent survival of all species by trench method of plantation was 29.71 % and that by pit method of plantation was 22.42 %. We have defined hardiness of a species when average percent survival of a species was more than average percent survival for all species for that method of plantation. *Pongamia glabra*, *Acacia auriculiformis*, *Dendrocalamus strictus*, *Bauhinia racemosa*, *Acacia catechu*, *Butea monosperma*, *Syzigium cumini* were found to be hardy in trench method (Av. Survival of these hardy species - 37.7 %) while *Pongamia glabra*, *Bauhinia racemosa*, *Dendrocalamus strictus*, *Acacia auriculiformis*, *Butea monosperma*, *Acacia catechu* were hardy in pit method of plantation (Av. survival of these hardy species - 32 %). *Syzigium cumini* was hardy in trench but was not hardy in pits. For the remaining non-hardy species in trenches the average survival was 21.7 % and in pits was 15.3 % respectively (fig. 3).

The χ^2 values and P values of percent survival of individual tree species in September 2007, for comparison of trench and pit methods of plantation is shown in table 4. It can be seen that except for *Erythrina indica* ($p=0.08$) and *Embilica officinalis* ($p=0.15$), where the percent survival in both trench and pit method of plantation is very poor, there is significantly higher percent survival of all other species in trench plantation as compared to in pit plantation.

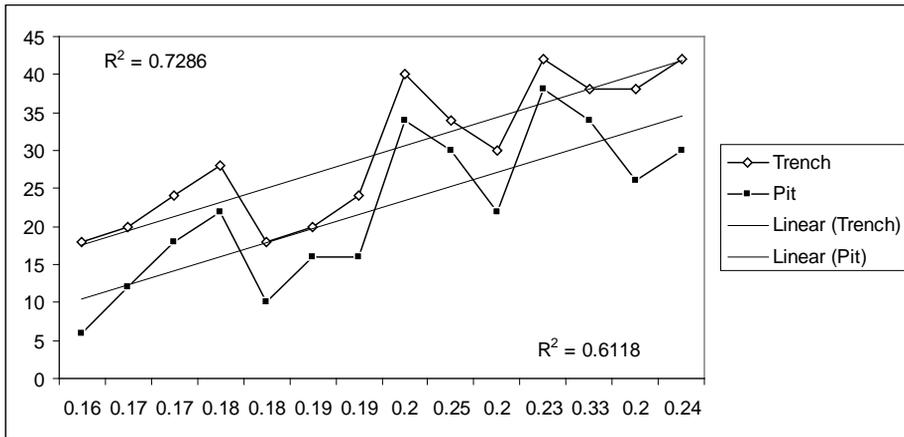


Fig. 2. Correlation between root length in m. of each species with percent survival of the species in trench and pit method of plantation

The percent survival of all plant species in trench plantation is shown in fig. 4. It can be observed that there is a steep decline in percent survival of species after forest fire in April 2007 as recorded during observation in June 2007.

The average root length of 14 species at the time of plantation in July 2006 (n=50 for each species) and just prior to forest fire in March 2007 (n=5 for each species) is given in Table 1.

Percent survival of plant species before and after forest fire when planted in trenches and in pits (n=50 for each species) is given in Table 2 and Table 3. It is observed that the root length at the time of plantation in July 2006 has significant correlation with percentage survival of plant species both in trench method and pit method of plantation (p =0.002; p=0.001 respectively); (n= 50 for all species, total 700 saplings). So also root length in March 2007 just before forest fires has significant correlation with percentage survival of species in both in trench method as well as in pit method of plantation (p =0.001; p= 0.004 respectively; (n= 5 for all species; Total 70 saplings) (fig. 2).

Apart from better plant survival the trench method of plantation is also found to reduce soil erosion by preventing the washing away of soil due to SW Monsoon rainfall and filling the hydro-reservoirs. The trenches are seen to gradually become shallower each year and the trenches are seen to completely fill by three to four years and the observations on this aspect are currently under study.

Table 2

Percent Survival of Plant Species before and after Forest Fires When Planted In Trenches (n=50 for each species).

Sr. No.	Plant species	July	Sept	Dec	Mar	June	Sept
1	<i>Pongamia glabra</i>	100	94	84	72	10	56
2	<i>Bauhinia racemosa</i>	100	82	76	68	14	56
3	<i>Dendrocalamus strictus</i>	100	90	86	68	8	52
4	<i>Acacia auriculiformis</i>	100	86	80	70	24	50
5	<i>Butea monosperma</i>	100	90	88	72	12	44
6	<i>Acacia catechu</i>	100	82	76	58	10	44
7	<i>Syzigium cumini</i>	100	78	62	52	6	30
8	<i>Dalbergia sissoo</i>	100	68	54	50	6	28
9	<i>Madhuca latifolia</i>	100	52	50	44	6	22
10	<i>Terminalia tomentosa</i>	100	50	48	40	6	22
11	<i>Terminalia chebula</i>	100	46	42	36	4	16
12	<i>Thespesia populnea</i>	100	42	34	28	4	12
13	<i>Erythrina indica</i>	100	40	32	18	2	6
14	<i>Embilica officinalis</i>	100	40	30	26	2	4

Table 3

Percent Survival of Plant Species before and after Forest Fires When Planted in Pits (n=50 for each species).

Sr. No.	Plant species	July	Sept	Dec	Mar	June	Sept
1	<i>Pongamia glabra</i>	100	88	74	58	4	22
2	<i>Bauhinia racemosa</i>	100	82	70	58	6	20
3	<i>Dendrocalamus strictus</i>	100	78	70	54	10	16
4	<i>Acacia auriculiformis</i>	100	78	56	44	4	14
5	<i>Butea monosperma</i>	100	76	62	58	14	14
6	<i>Acacia catechu</i>	100	82	64	60	6	12
7	<i>Syzigium cumini</i>	100	64	44	38	2	2
8	<i>Dalbergia sissoo</i>	100	62	40	38	6	8
9	<i>Madhuca latifolia</i>	100	48	40	32	2	6
10	<i>Terminalia tomentosa</i>	100	42	36	30	0	0
11	<i>Terminalia chebula</i>	100	36	30	24	0	0
12	<i>Thespesia populnea</i>	100	30	24	24	0	0
13	<i>Erythrina indica</i>	100	26	24	20	0	0
14	<i>Embilica officinalis</i>	100	26	18	18	0	0

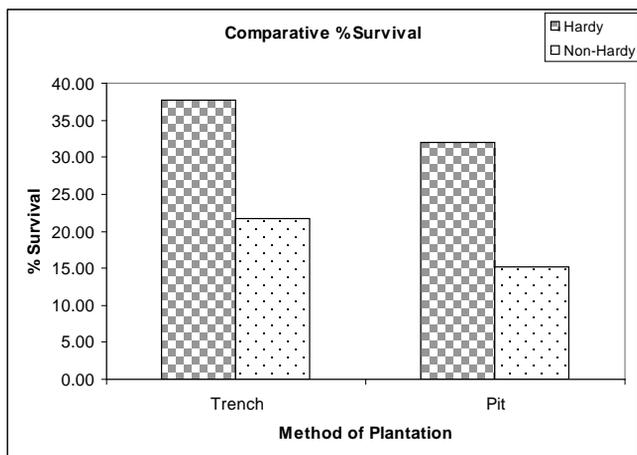


Fig. 3. Comparative survival of hard species and non-hardy species in trench and pit method of plantation

Table 4

χ^2 values and P values of survival of various tree species by trench and pit methods of plantation

Sr. No	Plant species	Chi Square Value	P VALUE
1	<i>Pongamia glabra</i>	12.15	0.0005
2	<i>Bauhinia racemosa</i>	13.66	0.0002
3	<i>Dendrocalamus strictus</i>	14.67	0.0001
4	<i>Butea monosperma</i>	15.3	0.0072
5	<i>Acacia auriculiformis</i>	15.68	0.0001
6	<i>Acacia catechu</i>	15.85	0.0004
7	<i>Dalbergia sissoo</i>	22.74	0.0092
8	<i>Madhuca latifolia</i>	28.98	0.0211
9	<i>Syzigium cumini</i>	30.47	0.0001
10	<i>Terminalia tomentosa</i>	38.04	0.0004
11	<i>Terminalia chebula</i>	43.09	0.0032
12	<i>Thespesia populnea</i>	47.29	0.0115
13	<i>Erythrina indica</i>	54.85	0.0786
14	<i>Embilica officinalis</i>	57.71	0.1530

DISCUSSIONS

Total 14 species of plants were selected for plantation in trenches and pits, out of which 13 species exist in the forest locally while *Acacia*

auriculiformis though exotic was selected to cater to the pressure of fire wood requirements of local people. Plants were selected for various reasons cited in parenthesis after each species given below: *Pongamia glabra* (biodiesel) *Dendrocalamus strictus* (furniture), *Bambusa bambos* (structure), *Acacia auriculiformis* (fuel wood), *Acacia catechu* (coloring agent), *Syzgium cumini* (fruits), *Butea monosperma* (medicinal), *Madhuca latifolia* (medicinal), *Terminalia tomentosa* (medicinal), *Terminalia chebula* (medicinal), *Bauhinia racemosa* (medicinal), *Embilica officinalis* (medicinal), *Thespesia populnea* (timber), *Dalbergia sissoo* (timber), *Erythrina indica* (orthinophilous) (Apte, 1972; Randhawa, 1983; Joshi, 2000; Sahani, 2000; Almeida et al, 2006; Kothari, 2007). The study area is a part of the global hotspot, the Western Ghats, which are host to at least 4000 species of flowering plants, some of which are endemic, others threatened and many need highly specialized conditions for their survival (Daniels & Venkatesan, 2008). Due to increasing human pressure and interference the forest cover is lost, and many of these species suffer due to loss of habitat. Thus it is necessary to protect the forests and initiate efforts to revive them where they are severely degraded. Regeneration is a long term process and its benefits may not be apparent immediately. In the mean time, plantation meets the urgent requirements of fuel, timber and other forest produce and offers refuge to wild fauna many of the species of which are endemic to the region.

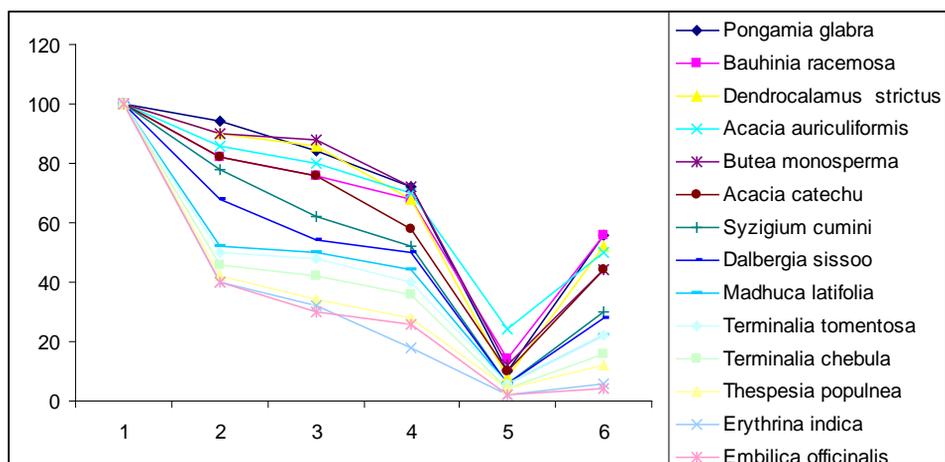


Fig. 4. The percent survival of all 14 plant species in trench plantation. Forest fire occurred in April.

Even for plantations, forest fire is a major contingency in the study area and cause significant drop in plant survival (fig. 4). (Shah, 1988). The commonest reasons of fires are natural causes such as lightning and brushing of trees since high atmospheric temperatures and dryness offer favorable circumstance for a fire to start in the study area and man made causes like naked flame, cigarette buts, local cigarettes called bidis, electric spark or any

other source of ignition. In the study area, surface fires involve leaf litter, dry grasses and twigs on the forest floor and the saplings in plantations are ravaged in such fires. We have compared the percent survival of plants in trenches and pits in September 2007 after they were exposed to forest fires in April 2007. We observed higher survival of plants in trenches as compared to pits. The possible reasoning is that after monsoon the height and thickness of the grass was taller and closer to the saplings planted in pits as compared to saplings planted in trenches. It was also observed that after forest fires the saplings in pits were charred and burnt completely while those planted in trenches only burnt their leaves and branches. There was significant correlation between the length of roots and survival of plants in trenches and pits but it was higher in the former, which could be due to better recharging of water levels in the soil beneath the trenches. In view of biodiversity, both the hardy and non-hardy species are important. All hardy species except *Dendrocalamus* and *Bambusa* species have tap roots, while these two species have rhizomes that are well developed. Thus, more care and attention should be given for assuring the survival of non-hardy species like *Butea monosperma*, *Madhuca latifolia*, *Terminalia tomentosa*, *Terminalia chebula*, *Bauhinia racemosa*, *Embilica officinalis*, *Thespesia populnea*, *Dalbergia sissoo* and *Erythrina indica* which apart from their indigenous importance also have medicinal, timber and orthinophilous importance. Especially for the two species *Erythrina indica* and *Embilica officinalis* which we plant at the age of four months of nursery care and have very low survival in both methods of plantation, we recommend that plantation at the end of one year of nursery care may increase the survival rates, a practice which we are currently adopting. Unless due attention is focused on the survival of non-hardy species, eventually the forest flora can decrease in diversity due to the dominance of few fire hardy species. Such 'fire climax vegetation' may dominate the area with fire hardy species taking over, negatively affecting the diversity and floral composition as seen in some parts of Bandipur Tiger Reserve in Karnataka (Karanth, 2000). So also weeds like *Eupatorium* and *Lantana* with the capacity to regenerate using the burnt plant material as fertilizing compost can prosper.

CONCLUSION

Though regeneration is the best long term method to meet the negative effects on flora and fauna due to human interference, the immediate solution is plantation. We recommend trench method of plantation for better survival of plant species in the study area and also elsewhere. The non-hardy species need more attention to assure the existence of overall biodiversity of the region and prevent dominance by fire hardy species. Root length of plants bear a significant correlation to their survival both in trench and pit method of plantation, but it is higher in trenches.

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REFERENCES

1. **Alfred J. R. B., A. K. Das, A. K. Sanyal, 2001** - *Ecosystems of India*. Envis-Zool. Surv. India, Kolkata. Pp 1 - 410.
2. **Ali S., S. Dillon Ripley, 1968-74** - *Handbook of The Birds of India and Pakistan Together With Those of Bangladesh, Nepal, Bhutan and Sri Lanka*. New Delhi: Oxford University Press (In 10 Vols).
3. **Almeida Marselin, Naresh Chaturvedi, 2006** - *The Trees of Mumbai*. Bombay Natural History Society 1st Edition Pp 1 – 149.
4. **Anonymous, 1983** - *Forest Fires in India*. National Institute of disaster Management. Ministry of Disaster management GOI.
5. **Apte M. V., 1972** - *Vanashree Shrushti* Volume 1 & 2.
6. **Blatter E., Walter S. Millard, 1993** - *Some Beautiful Indian Trees* Second edition Pp 1 – 165.
7. **Daniels R., J. Ranjit, J. Vencatesan, 2008** - *Western Ghats Biodiversity. People. Conservation*. Rupa & Co.
8. **Joshi S. G., 2000** - *Medicinal Plants*. Oxford & IBH Publishing Co. Pvt. Ltd. Pp 1 – 491.
9. **Karanth, 2000** - *In Malve, Neeraj. Fire, Fire Burning Bright!* Bangalore, India <http://www.bmcindia.org/forestfire.htm>.
10. **Kothari Ashok S., 2007** - *A Celebration of Indian Trees*. National Society of the Friends of the Trees. Pp 1 - 196.
11. **Myers N., 1990** - *The Biodiversity challenge: expanded Hot Spots Analysis*. Environmentalist 10:433-456.
12. **Myers N., R. A. Mittermeier, G. A. Mittermeier, G. A. B. da Fonesca, J. Kent, 2000** - *Biodiversity hotspots of conservation priorities*. Nature 403:853-858.
13. **Padhye A.D., M. Paingankar, Nelesh Dahanukar, Satish Pande, 2007** - *Season and Landscape Element wise Changes in the Community Structure of Avifauna of Tamhini, Northern Western Ghats, India*. Zoos' Print Journal 22(9): 2807 – 2815.
14. **Pande Satish, Vivek Vishwasrao, Niranjan Sant, Pramod Deshpande, 2008** - *Birds of Lonavla and Khandala including some Butterflies, Reptiles, Amphibians and Mammals*. Ela Foundation, Pune. Pp 1 – 210.
15. **Pande Satish, Saleel Tambe, Clement Francis M, Niranjan Sant, 2003** - *Birds of Western Ghats Konkan and Malabar [Including Birds of Goa]*. Bombay Natural History Society and Oxford University Press, Mumbai. Pp 1 – 377.
16. **Randhawa M. S., 1983** - *Flowering trees*. National Book Trust India 8th edition. Pp 1 - 208.
17. **Sahani K. C., 2000** - *The Book of Indian Trees*. Bombay Natural History Society 2nd edition. Pp 1 – 230.
18. **Shah, S. A., 1988** - *Forestry for People*. Indian Council of Agriculture Research Krishi Anusandhan Bhavan Pusa New Delhi Pp 1 – 147.

THE ANALYSIS OF VEGETATION STATUS, RATIOS AND REPRESENTATIVE VEGETAL STRUCTURES FOR THE GREEN SPACES INSIDE IASI

ANALIZA STĂRII DE VEGETAȚIE, A PONDERILOR ȘI STRUCTURILOR VEGETALE REPREZENTATIVE PENTRU SPAȚIILE VERZI DIN MUNICIPIUL IASI

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Abstract. *The study analyzes the surfaces cultivated with wooden plants (trees, shrubs, lianas) and herbaceous plants (floral species, grass species), which are characterized by a certain vegetation status, expressed by the plants' health level, the vegetative growth rhythm (in height, in thickness etc.) and by development (flowering, fruit formation etc), as well as by the ratio or the effective surface occupied by the different types of wooden plants, presented in surface units or percentages. Briefing, we can conclude that the green spaces inside Iasi present the following situation regarding the vegetation status: 54% with a very good vegetation status, 28% with a good vegetation status, 13% with an acceptable vegetation status and 5% with an unsatisfying vegetation status.*

Key words: vegetation, green spaces, analysis, ratios.

Rezumat. *Studiul analizează suprafețele amenajate cu plante lemnoase (arbori, arbuști, liane) și ierboase (specii floricole, specii gazonante), care se caracterizează printr-o anumită stare de vegetație, exprimată prin nivelul de sănătate al plantelor, ritmul de creștere vegetativă (în înălțime, în grosime ș.a.) și de dezvoltare (înflorire, fructificare etc), precum și prin ponderea sau suprafața efectiv ocupată de către diferitele tipuri de plante lemnoase, reprezentată în unități de suprafață sau procentual. Rezumând, se poate concluziona că spațiile verzi din municipiul Iasi prezintă următoarea situație privind starea de vegetație: 54% cu o stare de vegetație foarte bună, 28% cu o stare de vegetație bună, 13% cu o stare de vegetație satisfăcătoare și 5% cu o stare de vegetație necorespunzătoare.*

Cuvinte cheie: vegetație, spații verzi, analiză, pondere

INTRODUCTION

By green spaces vegetation status, generally speaking, we understand plants' health level, the vegetative growing rhythm (in height, thickness, density and healthy colour of the leafage etc.) and developing rhythm (flowering, fruit formation etc.). By green spaces component elements' ratio we understand the actual surface occupied by different wood plant types (trees, shrubs, underwood, lianas) and by the two main subdivisions (resinous and leafy trees), expressed in surface units or percentages. The dominant vegetation type is represented by one or more dominant species as volume, abundance and actual occupied surface inside that particular green space.

MATERIAL AND METHOD

The green spaces territorial analysis from Iasi city was conducted during May 2007 - May 2009, by visual monitoring activity of the vegetation status, the ratios and the vegetal structures which are representative for the green spaces inside Iasi. The observations were made every three month, in what regards the vegetation status, and annually for the ratios and dominant vegetal structures list inside the target area. The registered and processed data served for structuring the results and for their representation in percentage units.

RESULTS AND DISCUSSIONS

The observations regarding the vegetation's health status for all the green spaces inside Iasi lead to the following results:

- 54% have a very good vegetation status;
- 28% have a good vegetation status;
- 13% have a satisfying vegetation status;
- 5% have a poor vegetation status.

The improper vegetation status of some green spaces or only parts of them is related to the following items:

- **location conditions** are improper, some green spaces being placed on slippery lots, entirely eroded soils, debris deposits, salty soil lots etc. The natural improvement of the vegetation conditions lasts many years and an artificial improvement is expensive (for example, a part of the Botanical Garden's surface is represented by eroded soils; some green spaces between blocks of flats are placed on debris deposits resulted after demolitions and reconstructions etc.)

- **lack of protection and care** of some green spaces (for example, the green spaces of some schools and some sport fields where their area mingles with the planted spaces).

The dominant tree species, in all green spaces inside Iasi, proved to be:

▪ **Limetrees** (*Tilia tomentosa*, *T. platyphyllos*, *T. cordata*) – autochthonous species adapted to local climate, with vigorous growing and abundant flowering, with a great ornamental and health generating value; we observed even the existence of some varieties and natural forms. We can consider that limetree is the representative specie for Iasi.

▪ **Maple and sycamore maple trees** (*Acer platanoides*, *A. pseudoplatanus*, *A. negundo*, *A. campestre*) – are species perfectly adapted to Iasi's local climate, with vigorous growing, thick interesting leafage, with a great ornamental and health generating value.

▪ **Oak trees** (*Quercus robur*, *Q. pedunculiflora*, *Q. cerris*, *Q. rubra*) – are most of them autochthonous species, perfectly adapted to Moldavia's climate, with a long life and impressive stature.

▪ **Poplar trees** (*Populus x canadensis* – Canadian poplar), exist as many cultivars, from which some are only female type and produce the reprehended „cotton”, bad for people with allergies. They fit into the lower areas of the city

and in the future they will be replaced with ornamental forms of white poplar (*Populus alba* var. *pyramidalis*, *P. alba* var. *nivea* etc.).

From the most spread resinous species inside Iasi we can name:

- **Pine tree** (*Pinus sylvestris*) – autochthonous, extremely rustic tree, which grows on very different types of soils and is used in Iasi especially to sustain some slopes;

- **Black Austrian pine tree** (*Pinus nigra* ssp. *nigra*) – central European specie introduced in our country in culture less than the previous specie but it has a great ornamental value;

- **Oriental arbor vitae** (*Thuja orientalis*) – is frequently enough seen in Iasi's green spaces, used especially for hedges, but we suggest its limitation for the future purposes because it loses a lot as ornamental value by trimming;

- **White cedar** (*Thuja occidentalis* var. *fastigiata*) – is one of the frequently observed western presences in Iasi, proving a good adjustment to the city climate and a great ornamental value.

In the next part we will present in detail the health status of the vegetation for each zone, in order to understand better which of the ornamental vegetation zones from inside Iasi has bigger deficiencies in this field. The agreement area, which occupy 405.4 ha, present the following situation in what regards the vegetation status: 3% - have a very good vegetation status; 27% - have a good vegetation status; 59% - have a satisfying vegetation status and 11% - have a poor vegetation status.

In what regards the ratio of the component elements, the agreement zones from inside Iasi present the following situation: 2% - resinous trees; 77% leafy trees and 21% leafy shrubs.

The agreement areas in Iasi have the following tree species considered as dominant: maple tree (*Acer negundo*), oak tree (*Quercus robur*), common ash tree (*Fraxinus excelsior*), locust tree (*Robinia pseudacacia*), evergreen oak tree (*Q. petraea*), lime tree (*Tilia tomentosa*, *T. cordata*) etc.

Gardens, squares, inside gardens, inner city planted intervals, protective forest lines etc. from the territory of Iasi sum a surface of 1,113.20 ha. These area were declared „protected natural zones” by Iasi County Council's Decision no. 8/1994.

Considering the vegetation status, all of these protected natural zones show the following ratios: 31% - with a very good vegetation status (especially oak trees and sycamore maple trees), 31% - with a good vegetation status, 35% - with a satisfying vegetation status and 3% with a poor vegetation status.

The vegetal component elements' ratio for the protected natural zones in Iasi are presented like this: 8% resinous trees, 67% leafy trees and 25% leafy shrubs.

The dominant shrub species inside green spaces are: lime trees (*Tilia cordata*, *T. tomentosa* ș.a.), oak trees (*Q. robur*), maple and sycamore maple trees

(*Acer pseudo-platanus*, *A. platanoides*, *A. negundo* ș.a.), pine trees (*Pinus sylvestris*, *P. nigra*), locust trees (*Robinia pseudacacia*) etc.

We observed that the average ratio between trees and shrubs is 2.33 / 1.00, but its maximal value must be 2.00 / 1.00, fact that shows a small deficit in shrubs' number.

CONCLUSIONS

1. The vegetation's health status for all the green spaces inside Iasi lead to the following results: 54% have a very good vegetation status; 28% have a good vegetation status; 13% have a satisfying vegetation status; 5% have a poor vegetation status.
2. The dominant tree species, for all the green spaces inside Iasi proved to be: lime trees, maple and sycamore maple, oak trees, poplars, forest pine, black pine, oriental arbor vitae and white cedar.
3. The agreement area, which occupy 405.4 ha, present the following situation in what regards the vegetation status: 3% - have a very good vegetation status; 27% - have a good vegetation status; 59% - have a satisfying vegetation status and 11% - have a poor vegetation status. Dominant tree species registered here are: American maple tree, oak tree, common ash tree, locust tree, evergreen oak tree, lime tree etc.
4. Gardens, squares, inside gardens, inner city planted intervals, protective forest lines etc. from the territory of Iasi present the following health status: 31% - with a very good vegetation status (especially oak trees and sycamore maple trees), 31% - with a good vegetation status, 35% - with a satisfying vegetation status and 3% with a poor vegetation status.
5. The vegetal component elements' ratio for the protected natural zones in Iasi are presented like this: 8% resinous trees, 67% leafy trees and 25% leafy shrubs.
6. The dominant vegetation is represented by: lime trees, oak trees, maple and sycamore maple trees, pine trees, locust trees etc.

REFERENCES

1. **Constantinescu, A.C. și colab., 1993** - *Starea factorilor de mediu în județul Iasi. Rev. „Omul și mediul înconjurător”, Iasi.*
2. **Luca P., 1980** - *Culturi forestiere de protecție din județul Iasi. Teza de doctorat, Iasi*
3. **Sandu Tatiana, Bernardis R. - 2003.** „*Studiu privind situația spațiilor verzi în municipiul Iasi și posibilitățile de îmbunătățire a stării acestora*” în *Lucr. Șt. Vol. 46, Seria Horticultură, Iasi*
4. **Sandu Tatiana, Chelariu Elena-Liliana, 2006** - *Zone și obiective cu valoare peisagistică deosebită de pe teritoriul municipiului Iasi și gradul lor valorificare. Buletinul U.Ș.A.M.V. Cluj-Napoca, 63/2006, pag. 418.*

RESEARCH REGARDING THE SUITABILITY OF SOME WINTER RIPENING APPLE CULTIVARS FOR THE OBTAINING OF NATURAL JUICE

STUDII PRIVIND COMPORTAREA UNOR SOIURI DE MERE CU COACERE DE IARNĂ PENTRU OBTINEREA SUCURILOR NATURALE

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Abstract. *The study has been carried out during 2005-2007 years within the laboratory of the technology of horticultural products (T.H.P) of USAMV Cluj-Napoca and it analyzed the main physical and chemical parameters as well as the processing rate capacity of 27 apple cultivars coming from S.C.D.P. Cluj-Napoca. The results obtained show a very good suitability for the natural juice processing of following cultivars: Roșu de Cluj, Wagener premiat, Red Ionagold, Feleac, Crețesc and Granny Smith, alone or in mixture.*

Key words: apple, soluble dry substance, malic acid, C vitamin, processing rated capacity.

Rezumat: *Studiul s-a desfășurat pe parcursul anilor 2005-2007 în cadrul laboratorului de T.p.h. al USAMV Cluj-N și a urmărit principalii parametri fizico-chimici și randamentul la prelucrare la 27 soiuri de mere provenite de la S.P.D.P. Cluj-N. Rezultatele obținute evidențiază o pretabilitate foarte bună la prelucrare sub formă de suc a următoarelor soiuri: Roșu de Cluj, Wagener premiat, Red Jonagold, Feleac, Crețesc, Granny Smith singure sau în amestec.*

Cuvinte cheie: măr, substanța uscată solubilă, acid malic, vitamina C, capacitate de prelucrare

INTRODUCTION

Apples are mainly consumed fresh, but they provide as well a valuable raw matter for processing (Radu, 1985): juices and natural syrups, jam, marmalade, dried fruit and other products. The apple natural juices, along with fresh apples constitute one of the most rich and diverse source of nutritional and medical substances necessary for the human body (Segal et al., 1977; Neamțu et al., 1996).

The high demand for juices, including cloudy apple juices, increases every year and it is not at all satisfied.

MATERIAL AND METHOD

The research done between 2005-2007 years, in the T.H.P. laboratory of the USAMV Cluj-Napoca, had analyzed the suitability of some apple cultivars for natural juice processing. The biological material which was studied consisted of 27 cultivars of winter ripening apples coming from S.C.D.P. Cluj-Napoca, which for harvesting maturity doesn't coincide with consuming maturity and technical maturity. The fruit of these cultivars perfect their ripening process during storage period (November-February) depending on cultivar,

when the characteristic features correspond to certain usage directions (fresh consumption or processing). Among the characteristics, which are important for the juice processing, the following were studied: dry soluble substance, organic acids, vitamin C and the processing rate capacity. For the completion of the physical and chemical analyses, average samples collected according to specific methodologies have been used. Each analysis was carried out in three replicates and the results were processed and statistically interpreted as well as compared with the experience's average.

RESULTS AND DISCUSSIONS

The results of determinations concerning the suitability of studied cultivars for the obtaining of natural juice are presented in table 1 and table 2.

Table 1

Variation of soluble solid and organic acid content

Var. No.	Cultivar	Soluble solid content			Organic acid content		
		%	% beside the average value of experiment	Signif. of diff.	% of malic acid	% beside the average value of experiment	Signif. of diff.
1.	Crețesc	14.40	101.6	-	0.66	126.90	*
2.	Empire	14.73	103.9	-	0.48	92.30	-
3.	Feleac	14.40	101.6	-	0.72	138.50	**
4.	Florina	16.76	118.3	-	0.26	50.00	ooo
5.	Gloria	14.60	103.0	-	0.49	94.23	-
6.	Gloster	15.10	106.6	-	0.65	125.00	(*)
7.	Jonne spur	14.73	103.9	-	0.55	105.80	-
8.	Kaltherer Bohmer	12.00	84.7	-	0.59	113.50	-
9.	Kidd's Orange	14.16	100.0	-	0.41	78.8	-
10.	Golden spur	13.53	95.5	-	0.68	130.80	*
11.	Granny Smith	12.63	89.1	-	0.82	157.70	***
12.	Jonathan	15.46	109.1	-	0.61	117.30	-
13.	Jonathan Smith	14.56	102.7	-	0.56	107.70	-
14.	Jonathan Watson	13.53	95.5	-	0.47	90.40	-
15.	London Pepping	13.86	97.8	-	0.49	94.20	-
16.	Red Delicios	16.80	118.6	-	0.29	55.80	ooo
17.	Red Jonagold	15.10	106.6	-	0.67	128.80	*
18.	Reinette de Canada	13.50	95.3	-	0.49	94.2	-
19.	Starkrimson	13.46	95.0	-	0.44	84.60	-
20.	Sobotsugam	15.96	112.6	-	0.23	44.20	ooo
21.	Wellspur	14.56	102.7	-	0.19	36.5	ooo
22.	Jonagold	16.30	115.0	-	0.43	85.70	-
23.	Idared	14.80	104.4	-	0.81	155.80	***
24.	Generos	12.70	89.6	-	0.42	80.80	-
25.	Roșu de Cluj	15.90	112.2	-	0.74	142.30	**
26.	Wagener premiat	13.10	92.4	-	0.70	134.60	*
27.	Mutsu	16.03	113.1	-	0.36	69.20	o
Average value of experiment		14.17	100.0	-	0.52	100.00	-

LSD 5%

0.14

LSD 1%

0.19

LSD 0.1%

0.23

From the analyses done for those 27 apple cultivars regarding the dry soluble content determined at harvesting moment it can be observed that the recorded values doesn't present statistical proved differences in comparison with the average value of experiment. If these results are considered as percentage in comparison with average value of experiment it can be observed that this was surpass with 1-10% by 11 cultivars, with 10.1-18.6 % by 6 cultivars, 1 cultivar presents an equal value and 9 cultivars present lower values, comprised between 3.2-15.3%.

The content in organic acids, as an average for three experimental years, presents different values in accordance with cultivar but the differences among cultivars are very high. In comparison with average value of experiment (0.52% malic acid) Granny Smith and Idared cultivars were remarked, which for the differences were very significant. Regarding the organic acid content higher values than average value of experiment, which were statistical proved, were recorded at following cultivars: Feleac (0.72%), Roșu de Cluj (0.74%), Crețesc (0.66%), Golden spur (0.68%), Red Ionagold (0.67%) and Wagener premiat (0.70%). A difference very closed by 5% limit of significant difference (LSD) but statistical not assured was recorded for Goldster cultivar (0.65%). For 13 cultivars more, which represent 41.1% from the analyzed cultivars, the organic acid content presents very close positive or negative deviations from average value of experiment, the differences being not statistical proved. Opposite were situated Subotsugam, Red Delicious, Florina and Mutsu cultivars with negative deviations which were statistical proved.

Analyzing the data presented in table 2 regarding the vitamin C content it can be observed that in comparison with the average value of experiment (12.56 mg/100g D.M.) 6 cultivars present positive deviation which are statistical proved and for over 50% of variants the vitamin C content is situated around the average value of experiment. The highest vitamin C content is recorded at Roșu de Cluj cultivar (17.01 mg/100g D.M.) the recorded difference of 4.45 mg/100g D.M. being very significant. For other cultivars as Jonathan, Wagener premiat, Feleac, Grany Smith and Ionagold the differences are also positive and statistical proved. Fruit of Jonne spur cultivar accumulate the lowest quantity of vitamin C (8.38 mg/100g D.M.), the difference of 4.18 mg/100g D.M. in comparison with the average value of experiment being very significant negative.

Inferior deviation from the average value of experiment and statistical proved were recorded for 6 cultivars (Empire, Florina, London Pepping, Red Delicious and Subotsugam) while 14 cultivars are placed close to the average value of experiment, the differences in their case being not statistical proved.

Juice rated capacity oscillates between 59.8% at Starkrimson cultivar and 75.2% at Red Delicious cultivar. Regarding the juice rated capacity the analyzed apple cultivars belong to following groups:

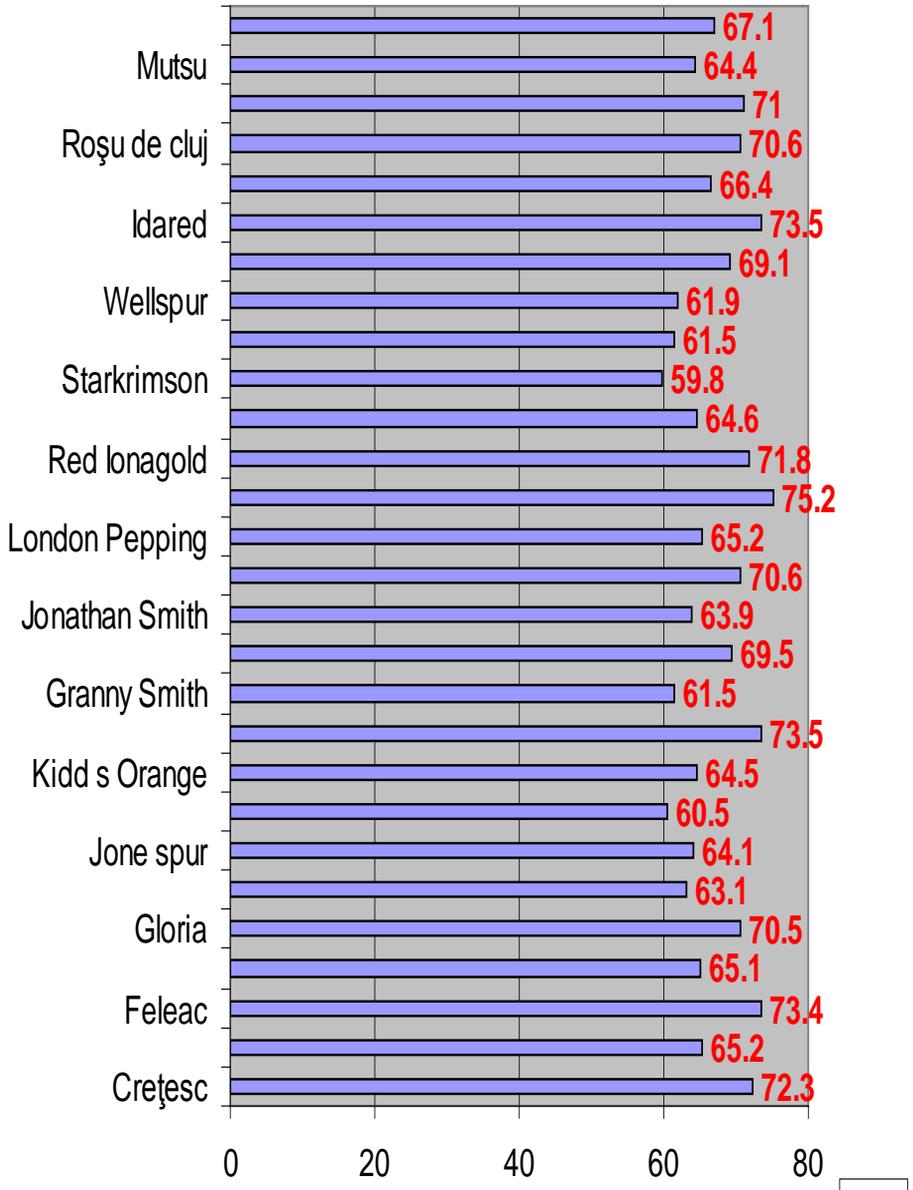
- group A, with very good juice rated capacity (over 70%), group which contain 11 cultivars (Crețesc, Feleac, Gloria, Golden spur, Jonathan Watson, Red Delicious, Red Ionagold, Idared, Roșu de Cluj, Wagener premiat);
- group B, with juice rated capacity comprised between 65-70%, which contains the cultivars: Empire, Florina, London Pepping, Ionagold and Generos;
- group C, with juice rated capacity comprised between 60-65% which included 10 cultivars which for the differences in comparison with the average value of experiment are inferior and statistical proved.

Table 2

Vitamin C content variation and processing rate capacity

Var. No.	Cultivar	Ascorbic acid content		Processing rate capacity	
		%	Significance of difference	%	Significance of difference
1.	Crețesc	14.40	-	72.3	***
2.	Empire	9.81	o	65.2	-
3.	Feleac	15.98	**	73.4	***
4.	Florina	10.26	o	65.1	(o)
5.	Gloria	9.49	oo	70.5	**
6.	Gloster	10.75	-	63.1	ooo
7.	Jonne spur	8.38	ooo	64.1	oo
8.	Kaltherer Bohmer	11.02	-	60.5	ooo
9.	Kidd's Orange	11.95	-	64.5	o
10.	Golden spur	13.06	-	73.5	***
11.	Granny Smith	15.46	*	61.5	ooo
12.	Jonathan	16.31	**	69.5	*
13.	Jonathan Smith	13.49	-	63.9	oo
14.	Jonathan Watson	10.89	-	70.6	**
15.	London Pepping	9.13	oo	65.2	(o)
16.	Red Delicios	9.98	o	75.2	***
17.	Red Ionagold	13.00	-	71.8	***
18.	Reinette de Canada	11.50	-	64.6	o
19.	Starkrimson	11.01	-	59.8	ooo
20.	Sobotsugam	9.88	o	61.5	ooo
21.	Wellspur	12.85	-	61.9	ooo
22.	Ionagold	15.29	*	69.1	-
23.	Idared	14.02	-	73.5	***
24.	Generos	13.44	-	66.4	-
25.	Roșu de Cluj	17.01	***	70.6	**
26.	Wagener premiat	16.25	**	71.0	**
27.	Mutsu	14.56	-	64.4	o
Average value of experiment		12.56	-	67,1	-
LSD 5%			2.18		22.48
LSD 1%			2.91		30.09
LSD 0.1%			3.83		39.51

Cultivar



Gr. 1. Processing rate capacity

■ %

CONCLUSIONS

The results obtained between 2005-2007 years, concerning the suitability of some winter ripening apple cultivars at processing as natural juice, allow us to draw the following conclusions:

- the analyzed varieties behave differently to this kind of processing;
- from the standpoint of their content in dry soluble substance, 9 cultivars (Florina, Goldster, Jonathan, Red Delicious, Red Ionagold, Subotsugam, Ionagold, Roșu de Cluj and Mutsu) outrun the average value of experiment (14.17%) with over 5%;
- concerning fruit acidity, though the limits of variation of this characteristic are relative big (0.19% malic acid at Wellspur cultivar and 0.82% malic acid at Granny Smith cultivar), statistical proved values were recorded at Crețesc, Florina, Golden spur, Granny Smith, Red Ionagold, Idared, Roșu de Cluj and Wagener premiat cultivars;
- vitamin C content for 22.2% of analyzed cultivars (Feleac, Granny Smith, Jonathan, Ionagold, Roșu de Cluj and Wagener premiat) presents positive and statistical proved differences in comparison with the average value of experiment;
- the biological material used in the experiment is suitable for processing as juice, the processing rate capacity being comprised between 59,8-75,2%. The next cultivars can be remarked from this point of view: Crețesc, Feleac, Gloria, Golden spur, Jonathan Watson, Red Delicious, Red Ionagold, Idared, Roșu de Cluj and Wagener premiat with a processing rate capacity over 70%;
- among the analyzed cultivars Roșu de Cluj, Wagener premiat, Red Ionagold, Feleac, Crețesc and Granny Smith are recommended for processing as juice, alone or in a mixture.

REFERENCES

1. Neamțu G. and colab., 1996 - *Substanțe biologice active*. Ed. Ceres, București.
2. Radu I.F. and colab., 1985 - *Tehnologia păstrării și industrializării produselor horticole*. EDP București.
3. Segal B. and colab., 1977 - *Tehnologia sucurilor cu pulpă. Îndrumări tehnice, nr. 32*, București.
4. Segal B. and colab., 1991 - *Tehnologia produselor alimentare de protecție*. Ed. Ceres, Bucureș

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