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ANATOMICAL AND ECOLOGICAL OBSERVATIONS IN SUCCULENT (ARTICULATED) HALOPHYTES FROM *CHENOPODIACEAE*

OBSERVAȚII ANATOMO-ECOLOGICE LA SPECII DE HALOFITE SUCULENTE (ARTICULATE) DIN FAMILIA *CHENOPODIACEAE*

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Abstract. *Several succulent halophytes, with articulated segments have been anatomically investigated: Sarcocornia fruticosa (L.) A. J. Scott, Arthrocnemum macrostachyum (Moric.) Moris in Moris & Delponte, Salicornia ramosissima Woods (Chenopodiaceae). These species have been collected from Spain, in 2010. The nature of articulated segments is still disputed from anatomical point of view, a caulinar or foliar origin being suggested during time. We also evidenced several special structures, such as stereids ('spicular cells') and tracheoidioblasts, whose functions played within these segments, are still incompletely elucidated. These structures, as well the succulence are discussed as adaptations of halophytes to environmental conditions.*
Key words: *halophytes, anatomy, ecology.*

Rezumat. *În lucrarea de față, am supus investigației anatomice următoarele specii de halofite suculente, cu segmente articulate, din familia Chenopodiaceae: Sarcocornia fruticosa (L.) A. J. Scott, Arthrocnemum macrostachyum (Moric.) Moris in Moris & Delponte, Salicornia ramosissima Woods, colectate din Spania, în 2010. Natura segmentelor articulate este încă disputată din punct de vedere anatomic, ridicându-se problema dacă acestea au origine caulinară sau foliară. Am evidențiat şi alte structuri speciale, cum ar fi stereidele (celule „spiculiforme") şi traheoidioblastele, ale căror funcții în cadrul acestor segmente suculente sunt încă incomplet elucidate. Aceste structuri, precum şi prezența suculenței, au fost interpretate în sensul adaptărilor halofitelor la condițiile complexe de mediu.*
Cuvinte cheie: *halofite, anatomie, ecologie.*

INTRODUCTION

Halophytes are plants that naturally vegetate in saline habitats (Grigore, 2008). They are included in a very heterogeneous ecological group; for this reason, plants present very different and complex adaptive features, formed most likely during evolution, as a result of continuous influence of environmental factors (Grigore and Toma, 2010).

In the present paper, we continue the anatomical and ecological research

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regarding halophytes from Mediterranean climate, a work included in a large series (Grigore, Toma, Boşcaiu, 2011; Grigore, Toma, Ivănescu, 2011).

In the Mediterranean region, the halophytic communities represent two categories – those that belong to the maritime salt marshes and those that belong to the salt deserts (Chapman, 1974). Moreover, as already stated, Mediterranean salt marshes provide special ecological conditions, controlling the spatial distribution of vegetation; this is related to the predominance of several environmental factors and to adaptive set of halophytes (Grigore, Toma, Boşcaiu, 2011).

MATERIAL AND METHOD

In this study, three species of halophytes from *Chenopodiaceae* (sometimes included in *Amaranthaceae*) have been anatomically investigated: *Sarcocornia fruticosa* (L.) A. J. Scott, *Arthrocnemum macrostachyum* (Moric.) Moris in Moris & Delponte, and *Salicornia ramosissima* Woods. These have been collected in July of 2010, from a coastal salt marsh from Alicante (Spania).

Anatomical investigations were conducted following the method standardized by our group from Faculty of Biology, Iasi (for an extended description of this method, see: Grigore, Toma and Boşcaiu, 2010).

RESULTS AND DISCUSSIONS

Following the anatomical investigations, several observations can be delineated. In *Arthrocnemum macrostachyum*, in the external cortex of unarticulated stem long or very long brachysclereids are dispersed; these are perpendicular on the epidermis, simple or branched (especially at the ends), with a thick and lignified wall. At the limit between the external cortex and the middle one there are located very small vascular bundles, with spiral xylem vessels disposed on a circle.

There follows a special type of cork area (Fig. 1): 2-3 layers of rectangular cells, slightly tall with relatively thick and suberified walls. The phelloderm forms a thick area with cells disposed in radial rows having the tangential walls moderately thickened.

The stele comprises 3-4 rings of vascular bundles (Figs. 1, 2) embedded into the fundamental sclerenchyma mass, all resulting from the activity of the supernumerary cambia. The phloem appears like cellulosic isles surrounded by sclerenchyma and the xylem of the conducting vessels.

On the internal face of the first ring, that is, close to the medulla, there are six vascular bundles (Fig. 2) larger than the ones resulting from the activity of the supernumerary cambia, having the xylem with little libriform fibers and being separated by wide medullary rays, made of parenchyma cells with moderately thickened and lignified wall.

In the cortex of articulated (succulent) segment, there are many stereides (Fig. 3), perpendicular on the epidermis, partially embedded in the water-storage parenchyma. These stereides have been also evidenced by De Fraine, (1912), who called them “spicular cells”. This author considers the stereides and

tracheoidioblasts (see below) as homologous structures. Mangin (1882), Monteil (1906) and Mateu Andrés (1989) also evidenced them in *A. macrostachyum*. It is interesting that Chermezon (1910) did not explicitly mentioned stereides in *A. macrostachyum*, but these can be easily observed in a drawing made by Chermezon (fig. 45, p. 245, in the quoted work).

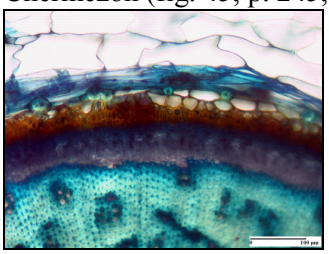


Fig. 1 - Cross section through the unarticulated stem of *Arthrocnemum macrostachyum*

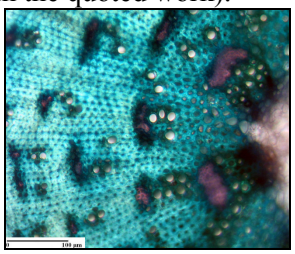


Fig. 2 - Cross section through the unarticulated stem of *Arthrocnemum macrostachyum*

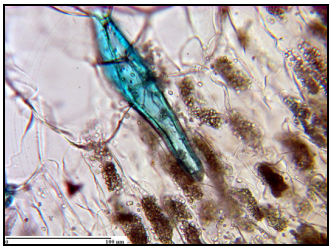


Fig. 3 - Cross section through the articulated segment of *Arthrocnemum macrostachyum*

In *Sarcocornia fruticosa*, the central cylinder of the root is affected by successive cambia phenomenon (Fig. 4). The stele consists of five lignified rings, with phloem isles; in the lignified part of each ring, vessels towards outside and sclerenchyma fibres towards inside are noticed (Fig. 4). When analysing more thoroughly, they seem to be vascular bundles surrounded by sclerenchymatic fibres with extremely thick and intensely lignified wall. In the central part, four xylem and phloem bundles can be found (Fig. 4).

The stele of unarticulated stem is very thick, resulting mainly from the activity of the supernumerary cambia. In the central area, 5-6 internal vascular bundles, with little phloem (sieved tubes and companion cells) and a little more xylem (lignified parenchyma cells and vessels) can be observed; on the internal face of each bundle there is a cellulosic parenchyma arch, in whose thickness are visible several vessels or remains of primary xylem which have a little thickened and poorly lignified wall (Fig. 5).

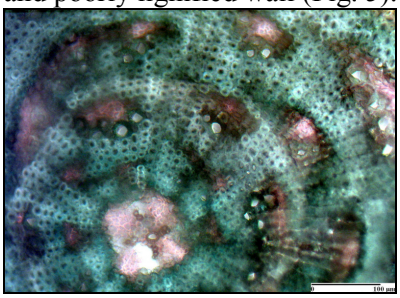


Fig. 4 - Cross section through the root of *Sarcocornia fruticosa*

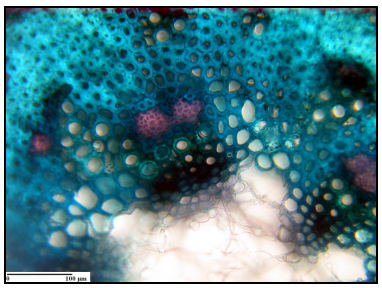


Fig. 5 - Cross section through the unarticulated stem of *Sarcocornia fruticosa*

The cortex of succulent (articulated segment) is very thick and consists of an assimilating external area, formed by 2-3 layers of long palisade cells (Fig. 6); among them, very long, poorly branched brachysclereids (Fig. 7) are present,

perpendicular in relation with the epidermis and partially embedded in water storage parenchyma. The central, internal area is thicker, forming an aqueous parenchyma (Fig. 6), consisting of large cells, many of them radially prolonged; the internal layer has small cells, where sclereides, of different shape and size can be noticed.

According to some botanists (Chermezon, 1910) this internal cortical layer would represent the upper epidermis of leaf fused with the stem.

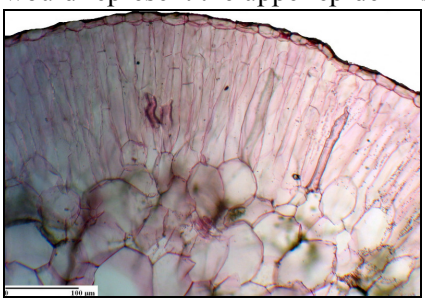


Fig. 6 - Cross section through the articulated segment of *Sarcocornia fruticosa*

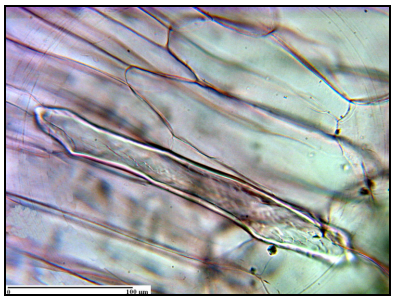


Fig. 7 - Cross section through the articulated segment of *Sarcocornia fruticosa*

In the root of *Salicornia ramosissima,* the stele comprises a very thin ring of secondary phloem (sieved tubes, companion cells and phloem parenchyma cells, some with druses of calcium oxalate) and a central compact body of secondary xylem, completely lignified, and crossed by numerous medullary rays.

In the thickness of the xylem body, one can distinguish 4-5 rings of different thickness, with larger vessels in their internal side, all with very much libriform made of fibres with an extremely thick and heavily lignified wall. The root axis has narrower vessels, scattered irregularly in the libriform mass.

From the analysis of this material, one can estimate the number of supernumerary cambia (Fig. 8) that have generated the ring-shaped conductive tissues, without noticing the different vascular bundles or the complete rings of xylem and phloem.

The stele of unarticulated stem is thick, with a structure more similar to the one of the root, predominant being the sclerified and lignified part. In fundamental mass represented by a significant quantity of libriform (fibres with an extremely thick and lignified wall) numerous and very small islands of phloem, and very few vessels (which differentiate by the fibrous elements only that they are slightly wider) can be observed (Fig. 9).

The stele also comprises an internal ring of small vascular bundles, with a "V"-shaped xylem, in the arms of which is localized the phloem), separated by parenchymatous-cellulosic medullary rays.

The centre of the stem is occupied by an air-storing cavity of irregular outline.

As in the root, the presence of the phloem islands embedded in the compact

mass of xylem (in which clearly predominates the libriform) shows the same activity as of several supernumerary cambia, although initially the structure was a primary one, with vascular bundles around the medulla.

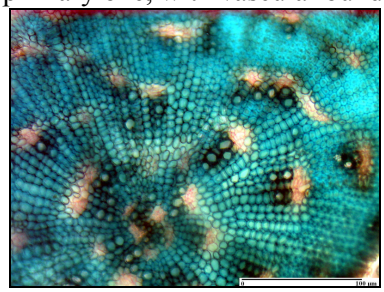


Fig. 8 - Cross section through the root of *Salicornia ramosissima*

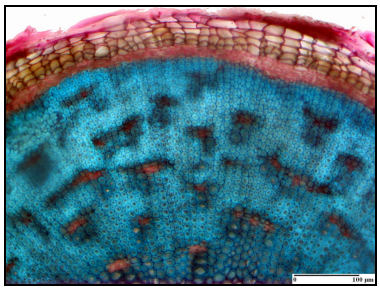


Fig. 9 - Cross section through the unarticulated stem of *Salicornia ramosissima*

The cortex of articulated segment is very thick, with cells of different size and consists of an external zone, thinner, with 2 layers of palisade layers (Fig. 10), rich in chloroplasts. Internal zone is thicker, of water-storage parenchyma (Fig. 11) with approximately 7 layers of colourless cells, out of which 2-3 layers of very large cells (large and long), followed by 3-4 layers of smaller and smaller polygonal cells. In the thickness of palisade tissue, tracheoidioblasts can be observed (Fig. 11); their roles have been largely discussed (Grigore şi Toma, 2010).

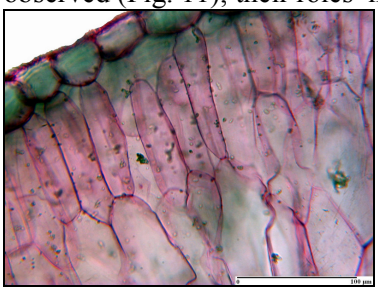


Fig. 10 - Cross section through the articulated segment of *Salicornia ramosissima*

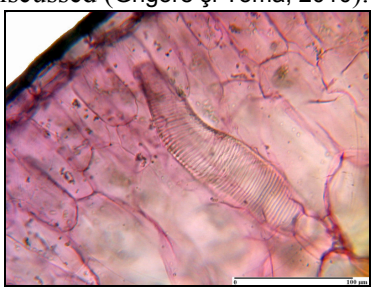


Fig. 11 - Cross section through the articulated segment of *Salicornia ramosissima*

Ecologically, *Arthrocnemum* and *Sarcocornia* develop dominant plant communities in several Mediterranean salt marshes; these species are confined to lower, humid and even flooded (in rainy season) areas of salt marshes (Grigore, Toma, Boşcaiu, 2011). Scattered among these shrubs *Salicornia* can be found; it is an annual plant, with similar ecological preferences as the other two species.

All the species are succulent, at the level of articulated segments; succulence is a typical adaptation in halophytes, with role in dilution of concentrated salts and water storage, since these habitats are affected by physiological drought (Grigore and Toma, 2010).

The presence of streides and tracheoidioblasts may be correlated with supporting function, since the mechanical tissues are less developed in the succulent segments.

CONCLUSIONS

The adaptations of these three halophytes with articulated stems (succulent segments) can be included in the general structural frame characteristic for *Chenopodiaceae*. In addition, these adaptations reveal the close affinity for environmental factors, an interrelation built during co-evolution process plant-saline environment.

Acknowledgements. *Activity conducted by M. - N. Grigore in Spain has been supported by COST Action FA0901: "Putting Halophytes to work – From Genes to Ecosystems". Iulia Daraban acknowledges the Structural Funds POSDRU/CPP107/DMI 1.5/S/77082 "Burse doctorale de pregătire ecoeconomică şi bioeconomică complexă pentru siguranţa şi securitatea alimentelor şi furajelor din ecosisteme antropice".*

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THE PHENOTYPIC EVALUATION OF SOME OILSEED RAPE (*BRASSICA NAPUS*) CULTIVARS USING THE MAIN MORPHOLOGICAL TRAITS

EVALUAREA FENOTIPICA A UNOR UNOR CULTIVARE DE RAPITA (*BRASSICA NAPUS*) CU AJUTORUL PRINCIPALELOR CARACTERELOR MORFOLOGICE

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Abstract. *Oilseed rape is considered to be nowadays one of the most important oilseed plant due to its large utilizations in human nutrition, animal feed and biofuels production (Rygulla şi colab., 2007). The aim of this study was to analyze the main morphological traits at 65 oilseed rape cultivars in order to make their morphological characterization. For this purpose, the studied material was sown in the field in the year 2011-2012 at SCDA Secuieni. During the vegetation period, some observations had been made in order to determine: the plant height, the number of branches, number of pods per plant and weight of a thousand grains. The obtained results showed that the studied material has a large phenotypic diversity.*
Key words: *oilseed rape, morphological traits, phenotypic evaluation*

Rezumat. *Rapița (Brassica napus L.) este considerată în prezent una dintre cele mai importante plante oleaginoase datorită multiplelor sale întrebuințări în alimentația umană, furajarea animalelor sau la obținerea de biocombustibil (Rygulla şi colab., 2007). Scopul acestui studiu a fost evaluarea principalelor caractere morfologice a 65 de cultivare de rapiță de toamnă în vederea caracterizării fenotipice. Pentru realizarea acestui lucru, cele 65 de cultivare de rapiță au fost semănate in câmp, în anul agricol 2011-2012 la SCDA Secuieni. In timpul perioadei de vegetație s-au facut observații pentru a determina următoarele caractere morfologice: înălțimea plantelor, numărul de ramificații, numărul mediu de silicve pe planta si masa a o mie de boabe. In urma observațiilor efectuate s-a constatat o diversitate fenotipica ridicata a cultivarelor studiate*
Cuvinte cheie: *rapiță, caractere morfologice, evaluare fenotipică*

INTRODUCTION

Brassica napus is a young species that originating through a spontaneous hybridization between turnip rape and cabbage (Kimber and McGregor 1995).

Due to its many uses oilseed rape started to be one of the most cultivated crop worldwide. The information about the phenological traits, yield components and seed yield of *Brassica* are very important in the breeding program to develop

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oilseed rape varieties that are better adapted to target production areas (Rameeh, 2010; Ali et al.,1995; Malik et al., 2004).

The aim of this study was to analyze the main morphological traits at 65 oilseed rape cultivars which will provide valuable information for the future studies to obtain some oilseed rape cultivars which are better adapted to the climatic conditions from our country.

MATERIAL AND METHOD

The biological material used for the researches which were conducted in the present study was represented from 65 oilseed rape cultivars originating from Centre for Genetic Resources Netherlands – CGN. The details about this are presented in table1.

The oilseed rape cultivars were sown in the field in the year 2010-2011 in order to make the necessary observation regarding the morphological traits. The experience was sown in randomized blocs in three repetitions.

During the vegetation period, we made some observations to determine the plant height, the number of branches, number of pods per plant and weight of a thousand grains.

Table 1

Details aboul the studied oilseed rape cultivars

Nr. Crt.	*Name of accession*	*Country of origin*
1.	Libritta	Germany
2.	Skriverskii	Lithuania
3.	B. napus group 1	Ukraine
4.	Kievskii 216	Ukraine
5.	Kievskii 18	Ukraine
6.	Kombi	Ukraine
7.	SKR. II Kormovoi	Lithuania
8.	Uspekh	Ukraine
9.	Blagodatnyi	Ukraine
10.	Fedorovskii	Ukraine
11.	Snityskii	Ukraine
12.	Diana	Germany
13.	Ksaverovskii	Ukraine
14.	Kodakskii	Ukraine
15.	Lictor	Germany
16.	Liglandor	Germany
17.	Ligora	Germany
18.	Lindora	Germany
19.	Lingot	France
20.	Link	-
21.	Liquanta	Germany
22.	Lirabon	Germany
23.	Lirajet	Germany
24.	Lirakotta	Germany
25.	Lirama	Germany
26.	Lirastern	Germany
27.	Lirektor	Germany
28.	Liropa	Germany
29.	Madora	Germany
30.	Maras	Poland
31.	Marens	France
32.	Marex	Germany
33.	Matador	Sweden
34.	Mirander	Germany
35.	Niederarnbacher	Germany
36.	Norli	Germany
37.	Octavia	-

38.	Olimpiade	Italy
39.	Olymp	Germany
40.	Panter	Sweden
41.	Perle	Germany
42.	Andol	France
43.	Arabella	Germany
44.	Bienvenu	France
45.	Brilland	Poland
46.	Bristol	France
47.	Buko	-
48.	Capricorn	Great Britain
49.	Cobra	Germany
50.	Collo	Germany
51.	Planet	Germany
52.	Prominj	Russia

53.	Ridana	Germany
54.	Samourai	France
55.	Score	Great Britain
56.	Silesia	Czechoslovakia
57.	Silvia	Germany
58.	Sollux	Germany
59.	Susana	Germany
60.	Tamara	Germany
61.	Tapidor	France
62.	Tor	Sweden
63.	Veronika	Germany
64.	B. napus group 2	Ukraine
65.	B. napus group 3	Moldavian Republic

The plant height was determined in the field in July, when all the oilseed rape plants were at the flowering stage, by measuring the plant height at 10 plants for each cultivar and each repetition. The number of branch for each cultivar was determining also in the field, by counting it at 10 plants for each cultivar and repetition.

The number of pods and MMB were determined in laboratory, by collecting the pods from 10 plants from each cultivar and repetition. The number of pods was determined by counting and the MMB was determined by weighting the seeds.

For each trait the observations were determined in three repetitions and the results were statistically calculated using the analyze of variance method (Săulescu et al., 1967; Leonte, 1997). The significance of the differences between the variants were interpreted using the limit difference method (Dl 5%, Dl 1% şi Dl 0,1%).

RESULTS AND DISCUSSIONS

After the observations that were made during the year 2010-2011 in the condition from SCDA Secuieni, the plant height varied between the analyzed cultivars. The plant height varied between 144.97 cm recoded at genotype "Maras" and 59.99 cm at "Manshlots Hambourger" with an average of 113.82 cm (figure 1). The average of the experience was used as control.

The value was generally higher than the mean value of the experience and 29 cultivars had positive significant differences compared to the control (such as Collo", "Prominj", "Helena") and also 29 had significant negative differences than the control, for example "Doral", "Herkules", "Lecor".

The number of branches per plant ranged from 13.67 at "Liglandor" cultivar and 4 "Olympiad" with an average of 8.49 (figure 2). In this case, 4 cultivars had positive significant differences than the control („Lesira”, „Ridana”,

„Brassica napus group 4”) and just one cultivar significant negative differences („Marex”).

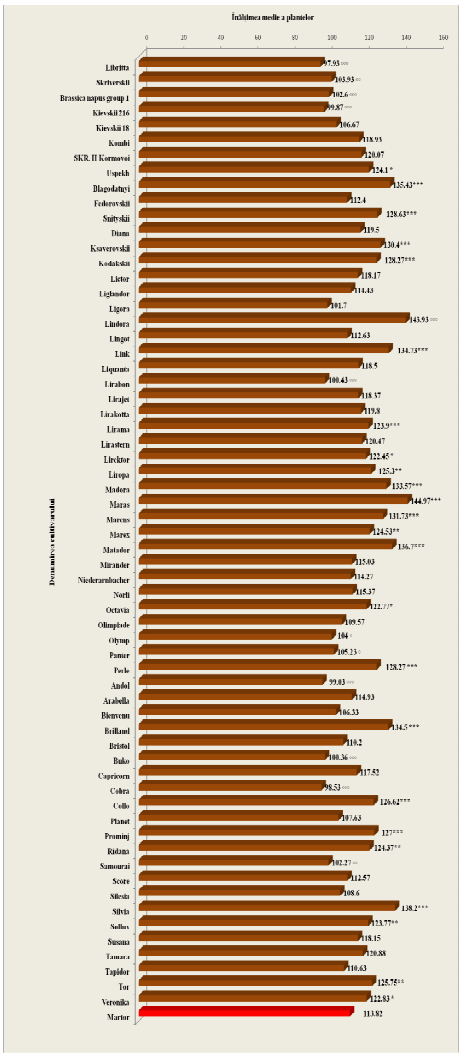


Fig. 1 - Plant height values of the studied oilseed rape cultivars

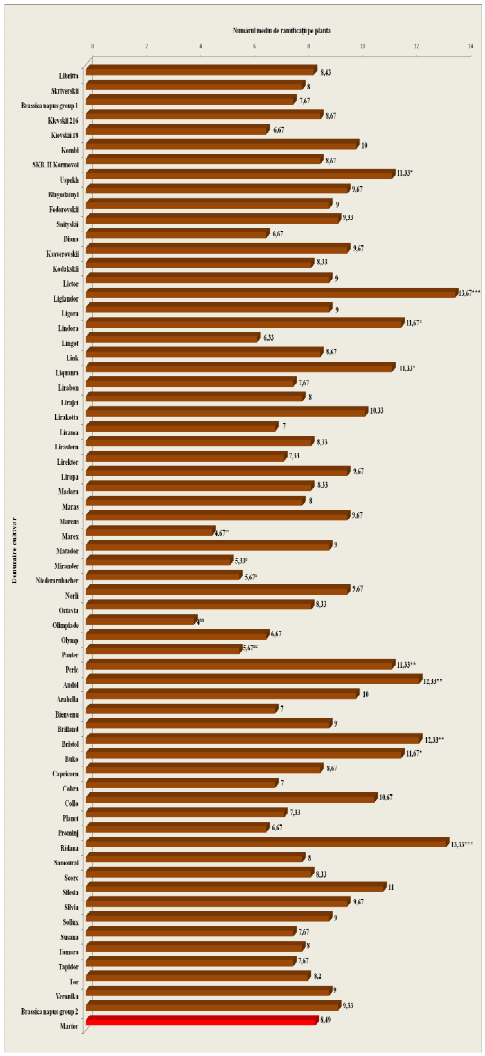


Fig. 2 - The number of branches of the studied oilseed rape cultivars

The number of pods per plant for each cultivar ranged between 1283 to "Libraska" and 115 to "*Brassica napus* group 9" with an average of 115 silicve per plant (figure 3).

For this character, 33 genotypes had positive significant differences than the control („Collo”, „Prominj”, „Fiona) and 63 were with significant negative differences than the control („Diamant”, „Janetzkis” , „Kurander”, etc.)

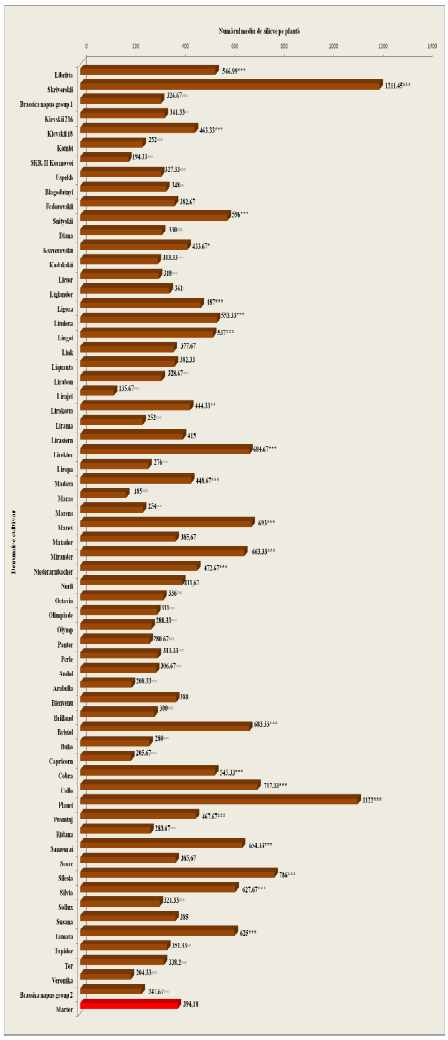


Fig. 3 - The number of pods of the studied boilseed rape cultivars

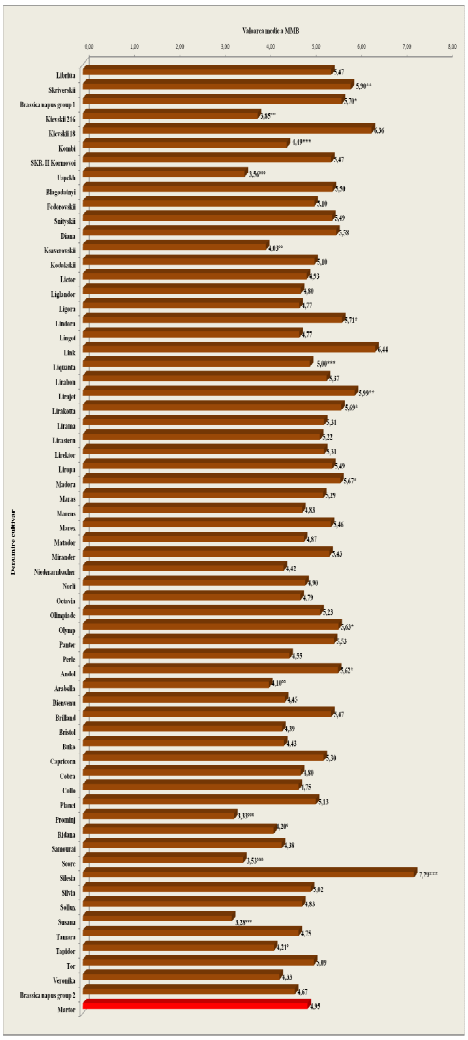


Fig. 4 - MMB at the studied oilseed rape cultivars

The thousand grain weight ranged from 7.89g to "Silesia" and 3.24 grams "Janetkis" with an average of 4.94 grams (figure 4).

Nine cultivars („Silesia", „Jupiter", „Mansholts Hamburger", etc) had positive significant differences than the control and 8 had negative significant differences („Mestnji", „Lesira", „Janetzkis", etc.).

CONCLUSIONS

Analyzing the morphological traits of the studied oilseed rape material it was observed a great phenotypic variation among the cultivars.

The character "plant height" recoded an amplitude variation of 84,98 cm and the number of branches had an amplitude variation of 9,67 compared with the control.

The number of pods registered an amplitude variation of 1198 pods/ plant and the MMB had an amplitude variation of 4,05 grams.

The obtained results regarding the phenotypic evaluation of the studied *Brassica napus* material gave valuable information to the breeders that can be used in the future studies in the selection process.

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THE SYNCHRONIZATION FOR TWO FIVE-DIMENSIONAL CHAOTIC SYSTEMS

SINCRONIZAREA A DOUA SISTEME HAOTICE CINCI-DIMENSIONALE

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Abstract. *Chaos control in chaotic systems has attracted much interest in recent years and there has been considerable progress in generalizing the concept of synchronization to include the case of coupled chaotic systems, especially from technicaland economical reasons. Different types of synchronization have been documented in the literature. In order to formulate the chaos control of the chaotic systems, in this work the synchronization of two chaotic five-dimensional systems using an adaptive feedback method of synchronization is presented. The transient time until synchronization depends on initial conditions of the two systems and the control strength.*
Key words: *five-dimensional nonlinear system, chaos control*

Rezumat. *Controlul haosului in sistemele haotice a atras mare interes in ultimii ani si a existat un considerabil progres in generalizarea conceptului de sincronizare pentru a include sistemele haotice cuplate, in speciat din motive tehnice si economice. In literatura au fost documentate diferite metode de sincronizare. Pentru a realiza controlul haosului în sistemele haotice, în această lucrare sincronizăm două sisteme cinci-dimensionale, folosind o metodă de feedback.Timpul după care se obține sincronizarea depinde de condițiile initiale ale celor doua sisteme si de intensitatea controler-ului.*
Cuvinte cheie: *sistem haotic cinci-dimesional, controlul haosului*

INTRODUCTION

Over the last decade, there has been considerable progress in generalizing the concept of synchronization to include the case of coupled chaotic systems, especially from technical and economical reasons. A chaotic system has complex dynamical behaviors that possess some special features, such as excessive sensitivity to initial conditions, fractal properties of the motion in the phase space, and so on. When the complete synchronization is achieved, the states of both systems become practically identical, while their dynamics in time remains chaotic. Different types of synchronization phenomena have been found in a variety of chaotic systems, such as complete synchronization, lag synchronization, phase synchronization and generalized synchronization. Many examples of synchronization have been documented in the literature, but currently theoretical understanding of the phenomena lags behind experimental studies (Grosu, 1997),

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(Grosu et al, 2008), (Hu et al, 2008), (Lerescu et al, 2004), (Lerescu et al, 2006), (Oancea, 2009). In order to formulate the chaos control of two chaotic systems, in this work the synchronization of two five-dimensional chaotic systems using an adptive feedback method of synchronization is presented.

THEORY

The five-dimensional chaotic system found by Mahmoud and coworkers is (Mahmoud et al, 2007), (Hu et al, 2008):

$$\begin{aligned}
\dot{x}_1 &= ax_1 - x_5x_3 \\
\dot{x}_2 &= ax_2 - x_5x_4 \\
\dot{x}_3 &= -bx_3 + x_5x_1 \\
\dot{x}_4 &= -bx_4 + x_5x_2 \\
\dot{x}_5 &= -cx_5 + x_1x_3 + x_2x_4
\end{aligned} \tag{1}$$

This system has a chaotic behavior for:

a=9.5, b=19 and c=3 (2)

Figure 1 shows that the attractor projected onto ,x_1x_2 space for the chaotic system (1) with values from (2)

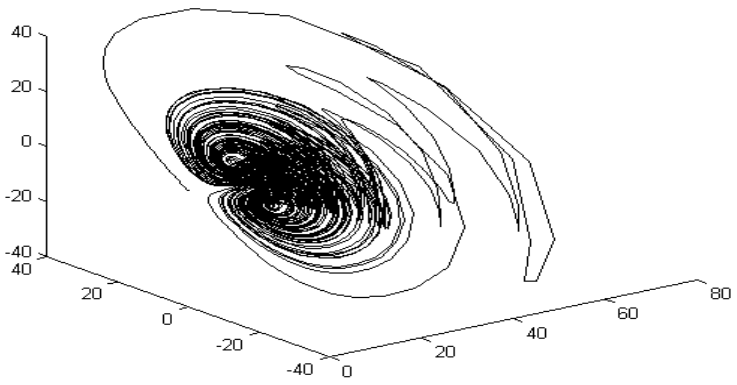


Fig. 1– Phase portrait of (x_5, x_1, x_2,) for system (1)

To synchronize two chaotic systems we used a simple method for chaos synchronization proposed by Guo and coworkers (Guo W., et al, 2009) and used by Oancea (Oancea S., 2009).

If the chaotic system (master) is:

$\dot{x} = f(x)$ where $x = (x_1, x_2, ...x_n) \in R_n$;

$f(x) = (f_1(x), f_2(x).....f_n(x)) : R^n \to R^n$

then the slave system is: $\dot{y} = f(y) + z(y - x)$

where the functions $\dot{z}_i = -\lambda_i (y_i - x_i)^2$ and λ_i are positive constants

RESULTS AND DISCUSSION

The slave system for the system (1) is:

$$\begin{aligned}
\dot{y}_1 &= 9.5y_1 - y_5y_3 + z_1(y_1 - x_1) \\
\dot{y}_2 &= 9.5y_2 - y_5y_4 + z_2(y_2 - x_2) \\
\dot{y}_3 &= -19y_3 + y_5y_1 + z_3(y_3 - x_3) \\
\dot{y}_4 &= -19y_4 + y_5y_2 + z_3(y_4 - x_4) \\
\dot{y}_5 &= -3y_5 + y_1y_3 + y_2y_4 + z_5(y_5 - x_5)
\end{aligned} \tag{3}$$

The control strength is of the form:

$$\begin{aligned}
\dot{z}_1 &= -(y_1 - x_1)^2 \\
\dot{z}_2 &= -(y_2 - x_2)^2 \\
\dot{z}_3 &= -(y_3 - x_3)^2 \\
\dot{z}_4 &= -(y_4 - x_4)^2 \\
\dot{z}_5 &= -(y_5 - x_5)^2
\end{aligned} \tag{4}$$

Fig.2 shows the syncronization of the two chaotic five-dimensional systems.

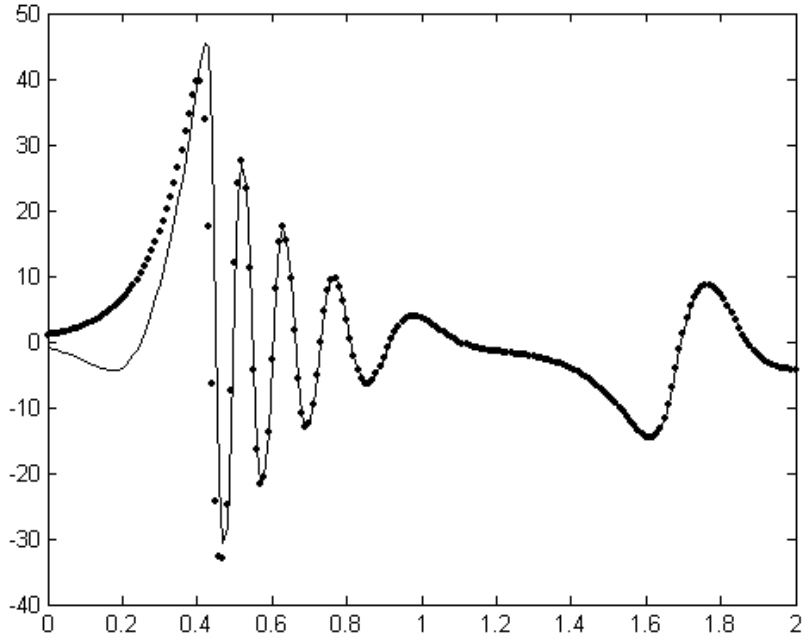


Fig. 2 – The synchronization of the two chaotic systems

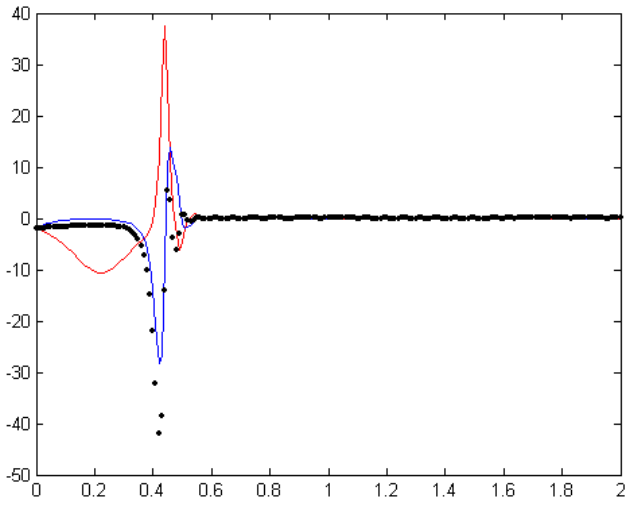


Fig. 3 – Synchronization errors between master and slave

CONCLUSIONS

In order to formulate the chaos control, the synchronization of two five-dimensional systems is presented in this work. The transient time until synchronization depends on initial conditions of two systems and the control strength.

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THE INFLUENCE OF APITHERAPY TREATMENT ON COAGULATION PARAMETERS IN EXPERIMENTALLY CARBON TETRACHLORIDE INDUCED HEPATOPATHY

INFLUENŢA APLICĂRII TRATAMENTULUI PRIN APIDIETĂ ASUPRA PARAMETRILOR DE COAGULARE ÎN HEPATOPATIA INDUSĂ EXPERIMENTAL CU TETRACLORURA DE CARBON

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Abstract. *The present experiment evaluates the influence of apitherapy diet on carbon tetrachloride (CCl_4) induced hepatopathy in Wistar rats by the means of coagulation parameters (Quick's time, thrombin time and fibrinogen). The experimental model included 60 Wistar rats divided into 6 groups: control group standard food, control group apitherapy diet, control group apitherapy diet + royal jelly, CCl_4 group, CCl_4 group + apitherapy diet, CCl_4 group + apitherapy diet + royal jelly. The hepatopathy was experimentally induced by intraperitoneal injection of CCl_4 (dissolved in paraffin oil, 10% solution) in a dose of 2ml/100 g, once at two days, for 2 weeks. In order to reduce the factors that accelerate the progression of liver damage apitherapy products purchased from "Stupina" LLC have been administrated (Apiregya, ApiImunomod, ApiImunostim, ApiImunostim Forte). Administration of apitherapy diet led to the decrease of the investigated parameters when compared to the CCl_4 group: Quick's time (19.51±1.8 vs. 18.18±1.28), thrombin time (31.12±4.49 vs. 24.42.41±2.7), fibrinogen (395±48.95 vs. 267.1±56.83). Administration of apitherapy diet and royal jelly resulted in the decrease of the following parameters when compared to the CCl_4 group: Quick's time (19.51±1.8 vs. 17.68±0.87), thrombin time (31.12±4.49 vs. 24.16±1.31), fibrinogen (385.6±48.95 vs. 241.2±47.92).*
Keywords: *apitherapy, coagulation tests, liver disease.*

Rezumat. *Prezentul experiment evaluează influenţa apidietei asupra hepatopatiei induse experimental cu tetraclorură de carbon (CCl_4) la şobolani Wistar, urmărind parametrii de coagulare (timp Quick, timp de trombină şi fibrinogen). Modelul experimental s-a desfăşurat pe 6 loturi de şobolani Wistar: lot martor hrană standard, lot martor apidietă, lot martor apidietă şi lăptişor de matcă, lot CCl_4, lot CCl_4 + apidietă, lot CCl_4 + apidietă + lăptişor de matcă. Afectarea hepatică a fost indusă prin injectarea i.p. a CCl_4 dizolvată în ulei de parafină, soluţie 10%, în doză de 2 ml per 100 g, o dată la 2 zile, timp de 2 săptamâni. În scopul reducerii factorilor care accelerează progresia leziunilor hepatice s-au administrat produse apiterapice (Apiregya, ApiImunomod, ApiImunostim, ApiImunostim Forte), procurate de la firma S.C. Stupina S.R.L. Administrarea apidietei a condus la scăderea următorilor*

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parametri, comparativ cu lotul CCl_4: timp Quick (19.51±1.8 vs. 18.18±1.28), timp de trombină (31.12±4.49 vs. 24.42.41±2.7), fibrinogen (395±48.95 vs. 267.1±56.83). Administrarea apidietei cu lăptişor de matcă a condus la scăderea următorilor parametri, comparativ cu lotul CCl_4: timp Quick (19.51±1.8 vs. 17.68±0.87), timp de trombină (31.12±4.49 vs. 24.16±1.31), fibrinogen (385.6±48.95 vs. 241.2±47.92).
Cuvinte cheie: *apidietă, parametri de coagulare, hepatopatie.*

INTRODUCTION

The liver plays a central role in the clotting process and acute and chronic liver diseases are invariably associated with coagulation disorders due to multiple causes: decreased synthesis of clotting and inhibitor factors, decreased clearance of activated factors, platelet defects, hyperfibrinolysis and accelerated intravascular coagulation (Amitrano et al., 2002). Liver damage is commonly associated with variable impairment of haemostasis. Many factors are responsible for maintaining the haemostatic balance, and, among them, hormones directly influence both primary and secondary haemostasis (Orwoll and Orwoll, 1987).

Fibrinogen is a protein produced by the liver. The increase of the fibrinogen synthesis after the acute period may be a sign of collagen affection (Dati and Wagner, 1998).

The prolongation of the thrombin time is met in severe liver damage (Fischbach, 2004).

MATERIAL AND METHOD

All the experimental proceedings achieved on laboratory animals (Wistar rats) in this study were in agreement with the international ethics regulations. Hepatic lesion was induced by i.p. injection of carbon tetrachloride (CCl_4 dissolved in paraffin oil, 10% solution). Two ml per 100 g were administered, once at 2 days, for 2 weeks. The experiment was unfolded on six groups of Wistar rats. The first group served as control, the second one was fed with apitherapy diet, the third group was given apitherapy diet and royal jelly (RJ). The next three groups of animals were intoxicated with CCl_4 and fed with normal food (group IV), apitherapy diet (group V) and apitherapy diet with royal jelly (group VI).

The laboratory animals were given apitherapy products produced by *STUPINA LLC*, Bălăneşti, Gorj, Romania (*Apiregya, ApiImunomod, ApiImunostim, ApiImunostim Forte*). The daily administered doses were 2g *Apiregya*, 1g *ApiImunomod*, 1g *ApiImunostim*, 1g *ApiImunomod Forte*. These products included in their composition honey, royal jelly, propolis, and pollen and were registered to OSIM with number AO 1242. After three weeks of apitherapy treatment, the laboratory animals were anesthesiated with thiopental (dose of 1 ml/100 g from a 0.01% thiopental solution), and blood samples were collected by the punction of the cord with a Vacuette® system and submitted to biochemical analysis. The investigated parameters were: Quick's time (QT), thrombin time (TT) and fibrinogen.

The statistical interpretation of the results was performed with One-Way ANOVA test and Tukey's post-hoc test. The results were given as mean ± standard deviation. The value of $p<0.05$ was considered significant.

RESULTS AND DISCUSSION

Quick's time (QT)

In animals with CCl_4 induced hepatopathy (group IV) a significant increase of QT can be noticed when compared to all the experimental groups: i) control group apitherapy diet (group II) (16.5±0.36 versus 19.51±1.8, $p<0.0001$); ii) control group apitherapy diet + RJ (group III) (15.65±0.39 versus 19.51±1.8, $p<0.0001$) (fig. 1).

Administration of apitherapy diet to laboratory animals with CCl_4 induced hepatopathy (group V) determines the statistically significant increase of QT when compared to: i) control group apitherapy diet (group II) (16.5±0.36 vs. 18.18±1.28, $p<0.0495$); ii) control group apitherapy diet + RJ (group III) (15.65±0.39 vs. 18.18±1.28, $p<0.0007$) (fig. 1).

Administration of apitherapy diet and RJ to laboratory animals with CCl_4 induced hepatopathy (group VI) produces the statistically significant decrease of QT in comparison with CCl_4 group (group IV) (19.51±1.8 vs. 17.68±0.87, $p<0.0103$) (fig. 1).

No statistically significant differences regarding QT could be noticed between groups V (group CCl_4 + apitherapy diet) and VI (group CCl_4 + apitherapy diet + RJ) (fig. 1).

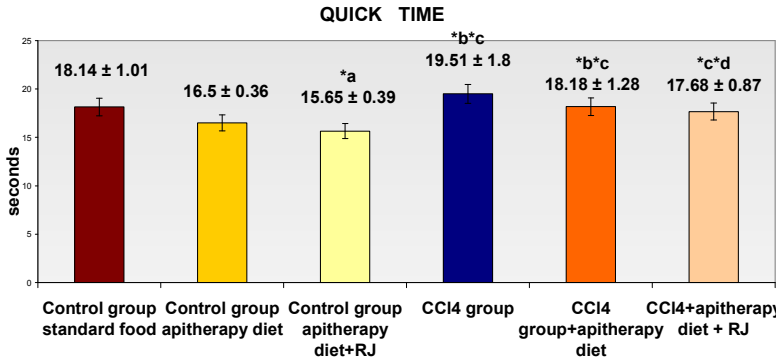


Fig. 1 - Mean values of the QT and standard deviation (* a p=0.0025 vs. control group standard food; * b p<0.05 vs. control group apitherapy diet; * c p<0.05 vs. control group apitherapy diet + RJ; * d p=0.0103 vs. CCl_4 group)

Thrombin time (TT)

In animals with CCl_4 induced hepatopathy (group IV) a significant increase of TT can be noticed when compared to all the other experimental groups: i) control group standard food (group I) (21.65±0.89 vs. 31.12±4.49, $p<0.0001$); ii) control group apitherapy diet (group II) (18.64±1.38 vs. 31.12±4.49, $p<0.0001$); iii) control group apitherapy diet + RJ (group III) (19.04±1,18 vs. 31.12±4.49, $p<0.0001$) (fig. 2).

Administration of apitherapy diet to laboratory animals with CCl_4 induced hepatopathy (group V) determines the statistically significant increase of TT when compared to: i) control group apitherapy diet (group II) (18.64±1.38 vs. 24.42±2.7, p<0.0004); ii) control group apitherapy diet + RJ (group III) (19.04±1.18 vs. 24.42±2.7, p<0.0012) (fig. 2).

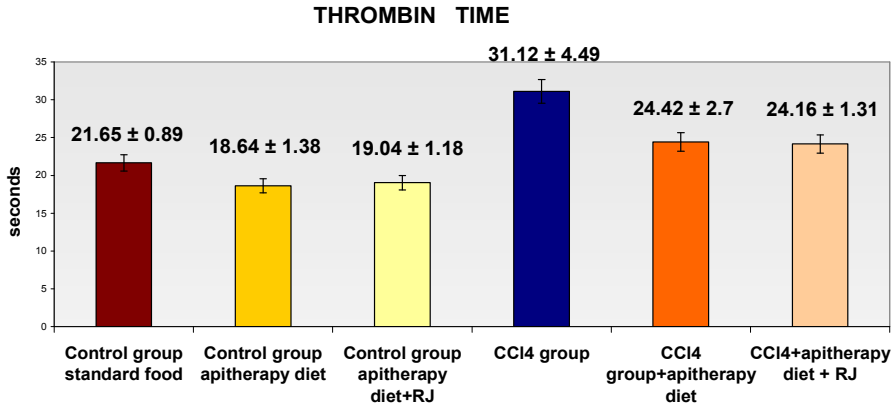


Fig. 2 - Mean values of TT and standard deviation (* a p<0.0001 vs. control group standard food; * b p<0.05 vs. control group apitherapy diet; * c p<0.05 vs. control group apitherapy diet+RJ; * d p<0.0001 vs. CCl_4 group)

Fibrinogen

In animals with CCl_4 induced hepatopathy (group IV) a significant increase of fibrinogen can be noticed when compared to all the other experimental groups: i) control group standard food (group I) (322±8.64 vs. 385±48.95, p<0.0295); ii) control group apitherapy diet (group II) (214.28±9.01 vs. 385±48.95, p<0.0001); iii) control group apitherapy diet + royal jelly (RJ) (group III) (208.4±5.79 vs. 385±48.95, p<0.0001) (fig. 3).

Administration of apitherapy diet to laboratory animals with CCl_4 induced hepatopathy (group V) determines the statistically significant decrease of fibrinogen when compared to CCl_4 group (group IV) (385±48.95 vs. 267.1±56.83, p<0.0001) (fig. 3).

Administration of apitherapy diet and RJ to laboratory animals with CCl_4 induced hepatopathy (group VI) leads to the significant decrease of fibrinogen values in comparison with: i) control group standard food (group I) (322±8.64 vs. 241.2±47.92, p<0.0023); ii) CCl_4 group (group IV) (385±48.95 vs. 241.2±47.92, p<0.0001) (fig. 3).

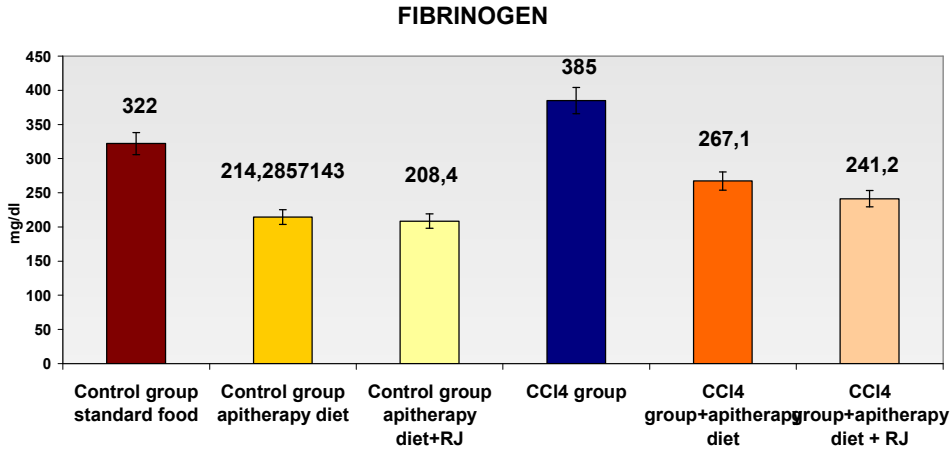


Fig. 3 - Mean values of fibrinogen and standard deviation (* a $p<0.05$ vs. control group standard food; * b $p<0.0001$ vs. control group apitherapy diet; * c $p<0.0001$ vs. control group apitherapy diet + RJ; * d $p<0.0001$ vs. CCl_4 group)

There can be noticed in the present study that administration of standard food produces an increase of the fibrinogen levels, modification also seen after the administration of CCl_4.

Administration of apitherapy diet and, respectively, of apitherapy diet + royal jelly to laboratory animals with CCl_4 induced hepatopathy led to values of fibrinogen comparable to the values obtained for the control healthy groups.

Regarding the results for QT, administration of standard food leads to a value that can be compared to the quick time level for the group with CCl_4 induced hepatopathy. Administration of apitherapy diet and, respectively, of apitherapy diet and RJ improves the QT levels towards the normal limits.

Administration of CCl_4 leads to an increase of TT, while administration of the apitherapy treatment lowers the values of TT towards the normal limits.

Vitamin K is necessary for gamma-carboxylation of factors II, VII, IX and X. The intestinal absorption of vitamin K, soluble fat, is conditioned by the presence of bile salts (Szántó P., 2004). The hepatic synthesis of these clotting factors requires the presence of vitamin K for the sake of adding the molecule of carboxylic acid in the position of gama glutamic acid residues (Ansell J. *et al.*, 2008). The gamma-carboxylation is a post-translational process that enables those of coagulation factors to bind calcium ions (Buligescu L., Lupescu I., 1999). Vitamin K is found in bee products and preparations. It is absorbed in the small intestine and partially, at the level of the colon. After absorption, vitamin K incorporated into chylomicrons shall pass into the lymph and reach the liver, where it is incorporated into lipoproteins VLDL and LDL, the form under which it is transported to tissues (Andriţoiu V., 2006).

CONCLUSIONS

1. Administration of the toxic carbon tetrachloride to the laboratory produces a significant increase of Quick's time, Thrombin time and fibrinogen.

2. Administration of standard food leads to an increase of the fibrinogen levels, modification also seen after the administration of CCl_4.

3. The treatment with apitherapy products *Apiregya, ApiImunomod, ApiImunostim, ApiImunostim Forte* improve the values for Quick's time, Thrombin tine and fibrinogen.

Acknowledgement. *This paper was supported by the project PERFORM-ERA "Postdoctoral Performance for Integration in the European Research Area" (ID-57649), financed by the European Social Fund and the Romanian Government.*

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CONTRIBUTIONS ON THE BIOCHEMICAL COMPOSITION IN FRUITS OF TWO *ROSA* L. TAXA FROM THE SPONTANEOUS FLORA

CONTRIBUȚII PRIVIND STUDIUL COMPOZIȚIEI BIOCHIMICE A FRUCTELOR A DOI TAXONI AI GENULUI *ROSA* L. DIN FLORA SPONTANĂ

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Abstract. *The aim of this study was to assess comparatively some biochemical parameters in ripen rose fruits of two spontaneous taxa. The wild fruits of Rosa corymbifera and R. nitidula were collected during the autumn of 2012 from Suceava district. The variations in moisture level, dry matter, total polyphenol compounds and flavonoids contents have been analyzed in achenes and hypanthium of both taxa. The results show that in hypanthium and achenes of both species, the water and dry matter contents were relatively constant. The amount of total polyphenol and flavonoids was slightly increased in R. nitidula than in R. corymbifera, both in hypanthium and achenes. The total anthocyanins content (in hypanthium) ranged from 12,04 mg/100 FW in R. nitidula and 19 mg/100 FW in R. corymbifera.*
Key words: *rose hips, polyphenol compounds, flavonoids, anthocyanins*

Rezumat.. *Scopul acestui studiu a fost de a analiza comparativ o serie de parametri biochimici în fructe mature provenite de la 2 taxoni spontani. Astfel, fructele sălbatice de Rosa corymbifera și R. nitidula au fost recoltate în toamna anului 2012, din județul Suceava. Au fost analizate variațiile în conținutul de apă și substanță uscată, conținutul total de compuși polifenolici și flavonoide atât în hipanțiu cât și în achene, pentru ambii taxoni. Rezultatele evidențiază faptul că, în hipanțiul și achenele ambelor specii, conținuturile de apă și substanță uscată au fost relativ constante. Cantitatea totală de compuși polifenolici și flavonoide a fost ușor mai ridicată la R. nitidula comparativ cu R. corymbifera, atât în hipanțiu cât și în achene. Conținutul total în antociani (în hipanțiu) variază între 12,04 mg/100g material proaspăt la R. nitidula și 19 mg/100g material proaspăt la R. corymbifera.*
Cuvinte cheie: *măceșe, compuși polifenolici, flavonoide, antociani*

INTRODUCTION

Genus *Rosa* L. is well represented in Romanian spontaneous flora (23 species described). The false fruit of *Rosa* species has been known since ancient times as having important medicinal properties. Rose hip extracts have antibacterial, antifungal and anti-inflammatory properties and antioxidant activity has also been shown. They contain large amounts of pharmacologically active

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compounds such as ascorbic acid, flavonoids, carotenoids and tannins. (Nădășan, 2011, Adamczak et al., 2012).

The real fruits (achenes) are enclosed in hypanthium, forming the rose hip. Hypanthium and achenes both contain pharmacologically active compounds, such as ascorbic acid, carotenoids and a number of phenolic compounds (flavonoids and anthocyanins) (Drocan, 1973, Adamczak et al., 2012, Arsenescu-Popa et al., 2008, Novruzov și Shamsizade, 2011, Szentmihályi et al., 2002). These compounds can be found in variable amounts in fruits of the spontaneous *Rosa* species; the content varies with genetic differences between species, but also with the altitude, soil type, climate and harvesting time (Adamczak et al., 2012, Drocan, 1973). The content in pharmacologically active compounds varies in fruits from different species of the *Rosa* L. genus, but also varies between individuals from the same species, grown in different altitudes and climatic conditions and even in different fruits of the same plant (Drocan, 1973).

The achenes contain a toxic glycoside (Nădășan, 2011) and are generally considered a waste material when rose hips are processed (Szentmihályi et al., 2002).

The main useful compounds of rose hips are ascorbic acid and carotenoids, but total polyphenols, flavonoids and anthocyanins contents are also very important. These compounds are secondary metabolites wich play multiple roles in plants; the protective role against pathogens and other destructive environmental factors is especially important (Daglia, 2012). It is generally considered that the hypanthium represents the useful part of rose hips and for a long time, achenes were thought to be only a waste material (Szentmihályi et al., 2002). But studies (Perédi et al., 1995, Szentmihályi et al., 2002) showed that achenes display a valuable content of useful substances (carotenoids, tocopherol, fatty acids, proteins, microelements) and they could be valorised in cosmetic industry and also for medicinal use.

Among the most intensely used *Rosa* species in phytotheraphy, *Rosa canina* (dog rose, wild rose) owned the top position (Bârcă, 1981; Dihoru, 1984; Popescu, 1984; Grigorescu *et al.,* 1986; Nădășan, 2011), as one of the most common species in Romania and most intensely investigated. *Rosa corymbifera*, also a wide distributed species in Romania, was only mentioned by few authors as showing medicinal properties (Dihoru, 1984).

Both *R. corymbifera* and *R. nitidula* are closely related taxa to *R. canina*; all three taxa are parts of the same subdivision of *Rosa* L. genus, section *Caninae* (Zanoschi et al., 2000).

The aim of this study was to assess comparatively some biochemical parameters in ripen rose hips of two spontaneous taxa, *Rosa corymbifera* Borkh. and *Rosa nitidula* Besser, collected from the montainous area of Suceava district.

MATERIAL AND METHOD

The material, consisting in ripen fruits of *R. corymbifera* and *R. nitidula,* was collected in october 2012, from the montainous area of Suceava district (Suhardului Mountains). Analysed individuals from each species were identified since the

flowering phenophase and were marked in the field. Biological material was stored at 4º C until processing. Fresh material was used for assessing the anthocyanins content and dry material, for the determination of polyphenolic compounds and flavonoids contents.

Dry matter and water contents were determined by gravimetric method (drying fresh material at 105ºC to constant weight) (Boldor, 1983); samples of hypanthium and achenes were analysed separately. Total polyphenols content was assesed with modified Folin-Ciocalteu method (Singleton et al., 1999). Spectrophotometric method was used to determine flavonoids content (Dewanto et al., 2002). Anthocyanins contents in hypanthium were determined by the spectrophotometric method.

RESULTS AND DISCUSSIONS

So far, relatively few studies have investigated dry matter and active substances contents in fruits of *R. corymbifera* and *R. nitidula* taxa from Romania.

Both investigated taxa show an average value of dry matter content in hypanthium around 43% (43.77% in *R. corymbifera* and 43,52% in *R. nitidula*, respectively) (fig. 1). Dry matter contents in achenes range from an average value of 74.50% in *R. nitidula* to a relatively higher average - 76.54% in *R. corymbifera*.

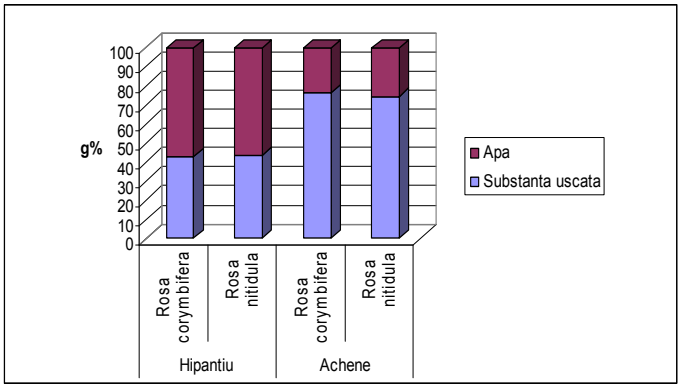


Fig. 1 - Variation of water and dry matter contents in *R. corymbifera* and *R. nitidula*

Our results for *Rosa nitidula* confirm the values previously reported in literature (42.12-44.8% dry matter in hypanthium of fruits collected from N-E Romania (Roșu et al., 2011)). The amount of dry matter in hypanthium of *R. corymbifera* fruits is slightly higher (43.77%) than the values provided by literature for *R. corymbifera* fruits harvested from N-E Romania, 31.9-38.7% dry matter in hypanthium (Roșu et al., 2011).

In *R. canina* and *R. corymbifera* fruits harvested in Portugal, Barros et al. reported an average value for dry matter content of 51.32% (Barros et al. 2010). Drocan (1973) reported, for *R. rugosa* fruits collected from Romania, maximum 29.55% dry matter and also maximum 38.75% for *R. canina* fruits, while Arsenescu (2009) reported 37.55% dry matter content in *R. canina* collected from Romania. The higher value of dry matter contents in our *R. corymbifera* samples

could be explained both by interspecific differences and the fact that the vegetation season of the year 2012, in our study area, was affected by periods of drought, amplified by the S-W exposition of the slope.

Polyphenolic compounds are secondary metabolites produced by higher plants, wich play an important role in plant's defense against pathogens and herbivores. These compounds are also produced as a plant response to abiotic stress, like UV exposure (Daglia, 2012).

Table 1

Variation of polyphenolic compounds and flavonoids contents in hypanthium and achenes in *R. corymbifera* and *R. nitidula* (DW= dry weight)

Taxa	Material (DW)	Polyphenols (mg GAE/g DW)	Flavonoids (g catechin/g DW)
R. corymbifera	hypanthium	82.66	57.35
	achenes	30.85	14.51
R. nitidula	hypanthium	87.63	50.25
	achenes	33.11	19.22

Our researches show, both in hypanthium and achenes, a slightly higher content of polyphenolic compounds in *R. nitidula* (87.63 mg GAE/g DW in hypanthium and 33.11 mg GAE/DW in achenes) than in *R. corymbifera* (82.66 mg GAE/g DW and 30.85 mg GAE/g DW, respectively) (table 1).

Polyphenolic compounds content in fruits of investigated taxa is similar to that obtained for the fruits of *Rosa* species collected in Turkey, ranging between 73-96 mg GAE/g DW (Ercisli, 2007). Barros et al. (2011) reports 149.35 mg GAE/g extract as total polyphenols content in hypanthium of ripen fruits of *R. canina* and 23.54 mg GAE/g extract in achenes.

Flavonoids are a class of phenolic compounds giving specific colors to flowers and fruits of a large number of plant species. In oxidoreduction processes, the flavonoids act as vitamin P (Gherghi et al., 2001); they also play a role in regulating plant growth and in plant reactions to biotic stress (bacteria, viruses) (Havsteen, 2002). Flavonoids (flavonols, isoflavones, flavones, catechins and flavanones) are considered some of the most important antioxidants (Gherghi et al., 2001), displaying useful properties for human health, such as the ability to inhibate the activity of certain enzymes, to simulate the activity of a number of hormones and neurotransmitters and also the ability to scavenge free radicals (Havsteen, 2002).

Our researches show that the flavonoids content, in hypanthium, is higher in *R. corymbifera* (57.53 mg catechin/g DW) than in *R. nitidula* (50.25 mg catechin/g DW). In *R. nitidula*, our results showed a flavonoids content of 19.22 mg catechin/g DW, slightly higher than the value in achenes of *R. corymbifera* (14.51 mg catechin/g DW, respectively) (Table 1).

Anthocyanins, located in cell vacuoles from vegetal tissues, according to local pH values, can produce red-colored (pH=3), violet (pH=8.5) or blue (pH=11) salts. Anthocyanins accumulation in plants is influenced by factors like temperature, light intensity, nitrogen content of the soil etc. Similar to flavonols,

anthocyanins are important compounds for human health, possibly contributing in the reduction of coronary diseases (Gherghi et al., 2001). In *R. corymbifera* fruits, the average value of the anthocyanins content was 19.00 mg/ g FW, higher than in *R. nitidula* (12.04 mg/g FW) (fig. 2).

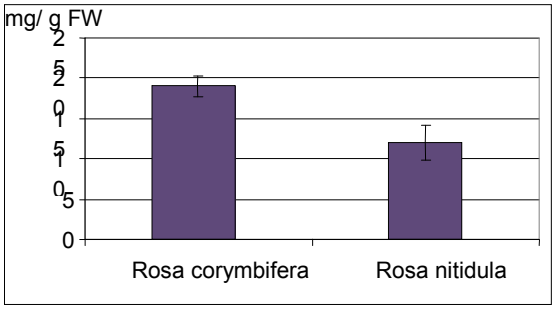


Fig. 2 - Variation of anthocyanins content in hypanthium of *R. corymbifera* and *R. nitidula* (FW = fresh weight)

CONCLUSIONS

1.Our results on the study of some biochemical parameters in *R. corymbifera* and *R. nitidula* show a variation in polyphenolic compounds, flavonoids, anthocyanins, dry matter and water contents, both in hypanthium and achenes.

2. Water and dry matter contents in both analysed taxa show relatively equal values, both in hypanthium and achenes.

3. *R. nitidula* showed a higher content of total polyphenolic compounds and flavonoids than *R. corymbifera*.

4. The amount of anthocyanins found in *R. corymbifera* was higher than in *R. nitidula*.

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ASPECTS CONCERNING THE OBTAINING OF NANOPARTICLES WITH BIOCIDES PROPERTIES BASED ON LIGNIN MODIFIED BY HYDROXYMETYLATION

ASPECTE PRIVIND OBȚINEREA DE NANOPARTICULE CU PROPRIETĂȚI BIOCIDE PE BAZĂ DE LIGNINĂ MODIFICATĂ PRIN HIDROXIMETILARE

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Abstract. *In this paper are presented the results of a study concerning the obtaining and characterization of nanoparticles based on lignin modified by hydroxymetylation reaction and interaction between them and birch veneer. The lignin derivatives were synthesized using lignin from grass (grass Sarkanda) offered by the company Granit (Switzerland), in specific conditions to ensure the obtaining of nanoparticles. The birch veneer samples were successively immersed in copper (II) solutions and unmodified and modified lignin (5% concentration in 0.1 N ammonia solutions) in order to realize in situ complexes between the two partners. The biostability of veneer samples thus treated was assessed by their burial in soil for six months and was characterized by mass loss and contact angle values variations. The obtained results show that treatment of birch veneer with complexes of nanoparticles with copper provides high stability of the woody substrate.*
Key words: *lignin, nanoparticles, veneer, biocides, biostability.*

Rezumat. *În această lucrare sunt prezentate rezultatele unui studiu privind obținerea şi caracterizarea nanoparticulelor pe bază de lignină modificată prin reacția de hidroximetilare şi interacțiunea acesteia cu furnirul de mesteacăn. Derivații de lignină au fost sintetizați din lignina din iarbă oferită de firma Granit (Elveția), în condiții specifice, pentru a asigura obținerea de nanoparticule. Probele de furnir de mesteacăn au fost imersate succesiv în soluții cuprice (II) şi soluții de lignină nemodificată şi modificată (concentrație de 5 % în soluție de amoniac 0,1 N), în scopul de a realiza un complex in situ între cei doi parteneri. Biostabilitatea probelor de furnir astfel tratate a fost evaluată prin îngroparea acestora în sol timp de şase luni şi caracterizate prin variațiile pierderilor de masă şi a valorilor unghiului de contact. Rezultatele obținute arată că tratamentul aplicat furnirului de mesteacăn cu complecşi de cupru şi nanoparticule de lignină oferă o stabilitate ridicată a substratului lemnos.*
Cuvinte cheie: *lignină, nanoparticule, furnir, biocizi, biostabilitate.*

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INTRODUCTION

Lignin is a macromolecular compound more chemically active than cellulose or other natural polymers due to the functional groups contained in its macromolecule; being the main aromatic component of plant tissues, representing 20-40% of higher plants' mass it is located in the cellular wall and in intercellular spaces. Globally, lignin is regarded as a raw material with high recovery potential, accessible from renewable sources, with low costs and a negligible degree of pollution (Căpraru et al., 2008). The nanoparticles applicative impact is mainly important considering the wide range of fields identified so far: in medicine to provide drugs, new smart nano-sized coatings beginning to be used on an industrial scale, and also IT, auto, cosmetics, chemicals and packaging industries (Popa et al., 2011).

The researches in the lignin area, in the last decades, were focused not only on the extraction process but also on structures elucidation of products separated from different vegetal raw material, on chemical and reactivity characterization, functional properties and new application directions (Ungureanu et al., 2008). Lignin accessibility from renewable resources and its environment compatibility, lately enlarge the researches area in lignin modification reactions. The previous studies evidenced that the antimicrobial properties of aromatic polymers can be amplified through chemical modification and complexation with cooper ions (Măluțan et al., 2007, 2008, Popa 1983, Căpraru et al., 2008, 2009). The favorable results previously obtained permitted the synthesis of nanoparticles from modified lignins through hydroxymethylation, in special reaction conditions (Schilling, 1993). The aim of this work was to test the capacity of nanoparticles obtained from different lignins and copper ions in ensuring birch veneer biostability (Yamaguchi et al., 2001, Matsushita et al., 2006). The results evidenced that in these conditions it was possible to assure a better interaction between lignin and wood by copper ions supplementations, which promoted the increasing of wood stability. Wood stability was quantified through mass loss and contact angle.

MATERIAL AND METHOD

Materials: In this study we used the following materials: birch veneer samples sizes (1x10) cm, Sarkanda grass lignin, dissolved in 0.1 N ammonia solution, in 5% concentration (unmodified products - from Granite Company- Switzerland in the European research program-Ecobinders) and laboratory modified lignin by hydroxymethylation reaction under appropriate conditions to obtain nanoparticles, cupric chloride and cuproxam. To evaluate the biostability degree the birch veneer specimens treated with lignin derivatives and solutions containing copper ions were buried in soil for six months. The influence of tratments applied was monitored by mass loss and contact angle (measured of Kruss Goniometry).

Methods

1. The synthesis of nanoparticles by hydroxymetylation of lignins: 10 g lignin were suspended in 47 mL of distilled water under stirring for two hours at room temperature. After obtaining the lignin suspension 1.29 g of 50 % NaOH solution were added and 3.14 g of 25 % NH_4OH solution as a catalyst, and the mixture was shaken

for two hours. Afterwards, 6.7 g of 37 % formaldehyde were introduced in the system and the reaction was performed at 85 ^{0}C for 4h in a water bath. The resulted product was recovered by precipitation at pH 2 with 1N HCl solution and then it was separated by centrifugation. The solid phase was washed twice with distilled water and then dried and weighed (Schilling et al., 1993). The resulting product was subjected to nanoparticles dimensional distribution analysis using Multi Seiser.

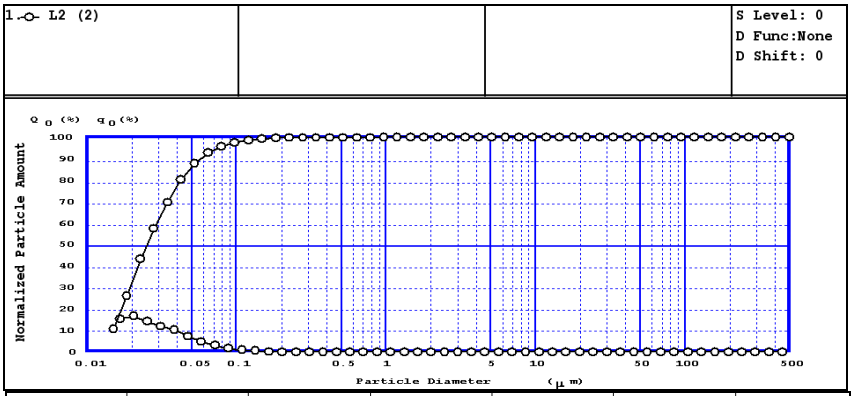
2. Treatment of birch veneer samples with unmodified lignin, lignin-based nanoparticles and cupric solutions

We used birch veneer samples (size 1x10 cm) for the treatment with lignin-based nanoparticles dissolved in 0.1 N ammonia solution at a concentration of 5 %, as following:

- Birch veneer samples were immersed in solutions containing copper ions (copper chloride or copper ammonia solutions) for 5 minutes, followed by drying at room temperature (laboratory conditions);
- Samples were immersed in unmodified and modified lignin solutions for five minutes and dried under mild conditions. The treated birch veneer samples were weighed before to determine the quantity of material retained on the surface of the samples and then they were buried in soil under laboratory conditions for a period of six months, with regular watering to maintain specific soil moisture. The degree of biodegradation was evaluated by determining the mass loss and the contact angle measured on the surface the birch veneer treated with lignin derivatives and copper solutions.

RESULTS AND DISCUSSIONS

The possibilities of obtaining of nanoparticles based on ligins or its derivatives could, properly represent a new direction to study both applicative and fundamental character. In figure 1 it is presented the nanoparticle size distribution curve obtained in dimensional analysis of Sarkanda grass lignin submitted to modification.



Median D	Modal D	Mean V	Std Dev	25.0%D	50.0%D	75.0%D
0.025	0.018	0.027	0.237	0.018	0.025	0.038

Fig. 1 - Dimensional distribution curve for nanoparticles synthesized from hydroxymethylated grass lignin (L2)

Thus, it appears that the structural characteristic of lignin's used in the modified reaction induced different characteristics in nanoparticles size and distribution. In the case of grass lignin (L2) particles presented a lower average size and a more uniform distribution.

Mass loss determination recorded for birch veneer samples treated with nanopartciles based on hydroxymetylated lignin

The veneer samples were treated with nanoparticles based on hydroxymethylated lignin, with their copper complexes and with copper solutions ($CuCl_2$ and Cuam). The biodegradation degree of samples thus obtained was determined by mass loss after burial in soil for six months.

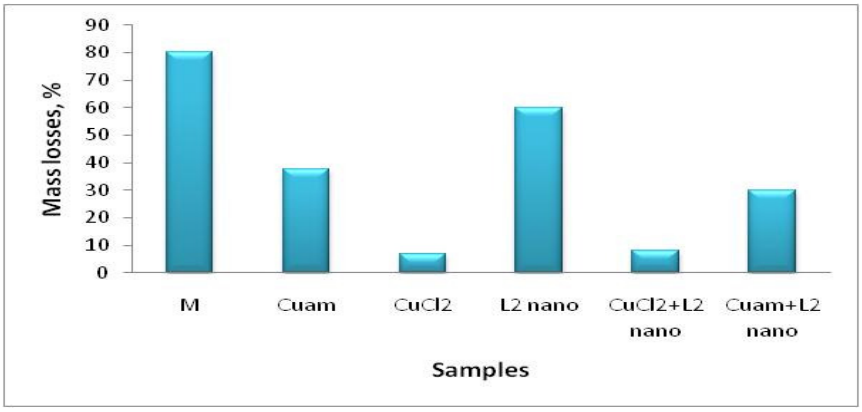


Fig. 2 - Variation of mass loss for the birch veneer samples non-treated (M) and treated with $CuCl_2$, Cuam, L2nano, $CuCl_2$L2nano, CuamL2nano

The data obtained for samples treated with lignin based nanoparticles and copper compounds show that the mass loss is lower compared to untreated samples. The lower mass loss was due to copper's toxic effects, to lignin's derivatives and to the two components' complexes, which limit and inhibit the microorganisms' attack.

The treatment of wood surface with copper containing solutions, especially when provided by the chloride derivative and the lignin nanaoparticles, proved to be more efficient. This situation may be correlated with their various functionalities induced thru hydroxymetylation, consequently resulting in different degrees of copper complex forming and wood surface interaction.

Determination of contact angle of the veneer samples treated with nanoparticles based on hydroxynmethylated lignin

The contact angle values for veneer specimens, buried into the soil for six months, were done to monitories the efficiency of surface treatment and to establish the correlation between this parameter and weight loss recorded (fig. 3).

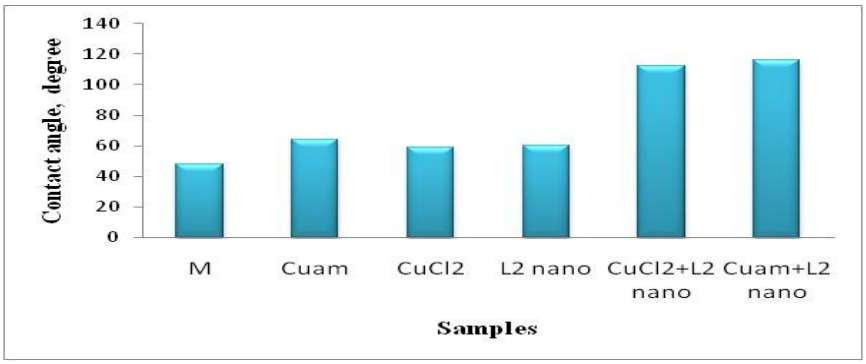


Fig. 3 - Variation of contact angle for the veneer samples non-treated (M) and treated with Cuam, $CuCl_2$, L2nano, $CuCl_2$L2nano, CuamL2nano

The data showed that the contact angle reaches higher values (94 -116 ^{o}) in the case of samples treated with copper complexes lignin derivatives, compared with the control or with those samples for which it was used copper ions solutions or unmodified lignin.

Therefore, those treatments provide biological stability and hydrofobycity of wood surfaces due to the more efficient action of lignin nanoparticles in the presence of copper ions which were better fixed on wood support. That is how it was assured a better protection against microbiological attack. During the contact angle measurement, it was observed that the hydrophilic surface has a very low level, the drop of water in some cases penetrated the wood surface and its evolution showed insignificant variations in time (fig. 4 and 5).

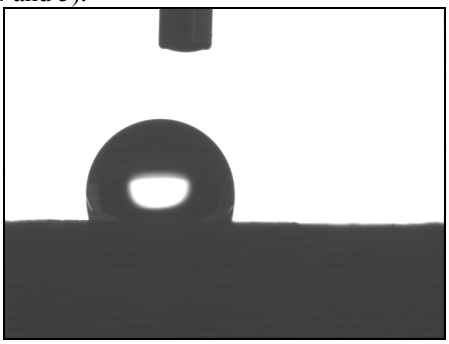


Fig. 4 - The image of drop of water on the surface of birch veneer based nanoparticles treated lignin and copper solutions (Cuam+L2nano) measured of Kruss Goniometry

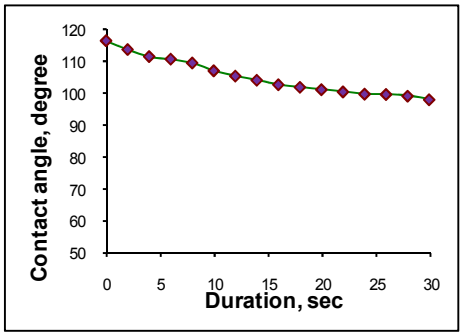


Fig. 5 - Variation in time of contact angle of specimen surface of birch veneer treated with Cuam+ L2nano

The image of drop of water on the surface of birch veneer treated with nanoparticles based hydroxymethyl lignin and copper solution (Cuam+L2) is presented in figure 10. Water droplet stability was found at over 100 degrees for angle values registered. In figure 5 it could be observed the slow decrease of contact angle during the measurement for 30 seconds.

CONCLUSIONS

1. A modified method of hydroxymethylation made possible the synthesis of nanoparticle from five types of lignin products from different sources with different reactivity capacity.

2. The nanoparticles obtained in hydroxymethylation were characterized by different dimensional size and distribution depending on studied lignin type.

3. Synthesized derivatives have been used to treated birch veneer in order to ensure its protection against microbiological attack followed by burial in soil samples for a period of six months.

4. The biological stability was assessed by determining mass loss and contact angle reported to the distilled water.

5. The data showed that the use of hydroxymethyl lignin-based nanoparticles and their complexes with copper provides good protection reducing mass losses and high values of contact angle. It was also observed certain hydrophobicity effects and a decreasing in the penetration level of water into the substrate timber.

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INFLUENCE OF SALINITY STRESS ON SEVERAL BIOCHEMICALS ATTRIBUTES OF *BRASSICA NAPUS* cv. EXGOLD SEEDLING

INFLUENȚA STRESULUI SALIN ASUPRA UNOR PARAMETRI BIOCHIMICI LA PLANTULE DE *BRASSICA NAPUS* cv. EXGOLD

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Abstract: *The present work has been performed to study the NaCl treatment effect on growth and some biochemical indices in Brassica napus seedling. For this, the rapeseed seeds were treated four hour with NaCl concentrations (50, 100, 150mM) comparatively with a control free of salt exposure. The early response of seedling under salinity levels was different at 4-day-old and 7-day-old. Amylase and phosphatase activities were influenced by NaCl concentrations. Thus, at both studied intervals, a decreasing trend of amylase activity was observed, while the phosphatase activity showed an increasing trend. The antioxidant catalase and peroxidase activities were found to be influenced by NaCl concentration especially after 7 day of treatment application.*
Keyords: *saline stress, catalase, peroxidase, hydrolase*

Rezumat: *Prezenta lucrare a fost efectuată pentru a studia efectul tratamentului cu NaCl asupra creşterii şi a unor indici biochimici în plantule de rapiță. Astfel, semințele de rapiță au fost tratate timp de patru ore, cu concentrații de NaCl (50, 100, 150 mM). În paralel a fost realizat şi un control care nu a fost expus tratamentului salin. Răspunsul timpuriu la salinitate al plantulelor a fost diferit la cele două intervale de studiu (4 şi 7 zile). Activitățile α-amilazei și fosfatazei au fost influențate de concentrațiile de NaCl. Astfel, la ambele intervale studiate, există o tendință de diminuare a activității amilazei, în timp ce activitatea fosfatazei a indicat o tendință de creştere. Activitatea enzimelor antioxidante, catalaza și peroxidaza, a fost influențată, în special, la sapte zile, de la aplicarea tratamentului.*
Cuvinte cheie: *stres salin, catalază, peroxidază, hidrolaze*

INTRODUCTION

Brassica napus L. belonging to *Brassicaceae* family is one of the most cultivated plants in Middle Asia, North Africa and West Europe (Saeidnia and Gohari, 2012). Rapeseed is now the third most important source of edible oil in the world after soybean and palm oil (El-Beltagi and Mohamed, 2010). Beside that it is an important source of edible oil, the by-product provide from production of rapeseed oil is a high-protein animal feed. As one kind of the most important oilseed crops all over the world, *B. napus* L. are very sensitive to salt stress throughout the growth and development cycle. Thus, salinity stress affects plant growth, as well as, seed germination, seedling growth and vigor, flowering and fruit set (Sairam and Tyagi, 2004). Plants have evolved efficient antioxidant systems

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that can protect them from the damaging effects of biotic and abiotic stress. These protection mechanisms, enzymatic and non-enzymatic, remove reactive oxygen species (ROS) formed after stress because they are highly toxic. The most important enzymes to remove ROS are superoxide dismutase, peroxidase and catalase (Asada, 1999).

The aim of this study was to determine the early morphological and biochemical responses of *Brassica napus* seedling at NaCl treatment, to improve knowledge of rapeseed crop growth under conditions of salinity.

MATERIAL AND METHOD

Brassica napus cv Exgold seeds were provided by Territorial Institute for Quality Seeds and Planting Material, Iasi. The seeds were sterilized in 3% H_2O_2 solution for ten minutes followed by three rinses with distilled water and then treated with 50 mM, 100mM and 150mM NaCl for four hours. Control seeds were stored for four hours in distilled water. After sterilization, 100 seeds were transferred into Petri dishes on filter paper and then were wetted with 7 ml distilled water (control) or saline solutions. The Petri plates were transferred in a growth chamber and watered with saline solution (at variants) and water (at control) every two days.

Plant roots growth was evaluated as the elongation of root length young seedling at four and seven days old. Catalase activity was determined according to Sinha method based on reduction of dichromate, acetic acid mixture to chromic acetate when heated in the presence of hydrogen peroxide (Artenie et sal. 2008). Determination of peroxidase activity is based on the measurement of color intensity of o-dianisidine oxidation product with hydrogen peroxide in enzymes presence (Artenie et al., 2008). Protein content was determined according to Bradford method and all enzymes activities were reported as U/mg protein (Bradford, 1976). Acid phosphatase activity determination is based on ability of β-glycerophosphate disodium hydrolysis and dosing then phosphorus resulted (Artenie et al. 2008). The α-amylase activity was determined using the Noelting-Bernfeld method (Artenie at al., 2008).

RESULTS AND DISCUSSIONS

Plant growth and development are adversely affected by salinity - a major environmental stress that limits agricultural production. As different response of plant to salinity, Munns developed the concept “two-phase growth response to salinity”. Thus, the first phase of growth reduction happens quickly (within minutes) after exposure to salinity and is due to the osmotic changes outside the root. Several minutes after the initial decrease in leaf growth, there is a gradual recovery of the growth rate until a new steady state is reached, dependent upon the salt concentration outside the root. The second much slower effect, taking days, weeks or months is the result of salt accumulation in leaves, leading to salt toxicity in the plant, primarily in the older leaves (Munns, 2002).

In our experiment salinity affected the germination rate of rapeseed seedling at both interval studied. Thus, after four days of saline stress, the root length of seedling ranged between 1,97 cm (at 150 mM) and 4,77 cm in control (Table 1). At seven days it was observed the same effect of root inhibition with one exception, concentration 100 mM where the root length was greater then

control (12,12 cm comparatively with 11,62cm). In general, salt stress affected negatively the plant root length, but the different effect depending on the concentration of NaCl, the age of seedling and the duration of treatment.

Table 1.

Effect of salt stress on growth root in rapeseed seedling. Means of ten replicates ± S.x. are shown

mM NaCl	Root length (cm)			
	4 days		7 days	
	x±Sx	STDEV	x±Sx	STDEV
0	4,77±0,13	0,26	11,62±1,79	3,58
50	3,47±0,33	0,67	8,1±0,05	0,11
100	4,05±0,36	0,71	12,12±0,71	1,43
150	1,97±0,24	0,49	9,9±0,9	1,80

Alpha amylase has an active role in the hydrolysis of starch just before a seed germinates (Ashraf et al., 2002). Salinity reduced the percentage of seed germination, seedling vigor index, α-amylase activity of canola seedling (Farhoudi, 2012). Another study indicated that salinity induced changes in α-amylase activity in three cotton cultivar during germination and early seedling growth. Thus, it was observed that the increase in NaCl concentration leads to decrease in α-amylase activity (Ashraf et al., 2002).

In our experiment, after treatment with NaCl the α-amylase activity at rapeseed seedling decrease comparatively with control at both intervals studied, more pronounced in 4-day-old seedling (Fig. 1). The same result was founded by Sangeetha, 2013, who studied the effect of salinity on α-amylase activity in corn germinating seeds.

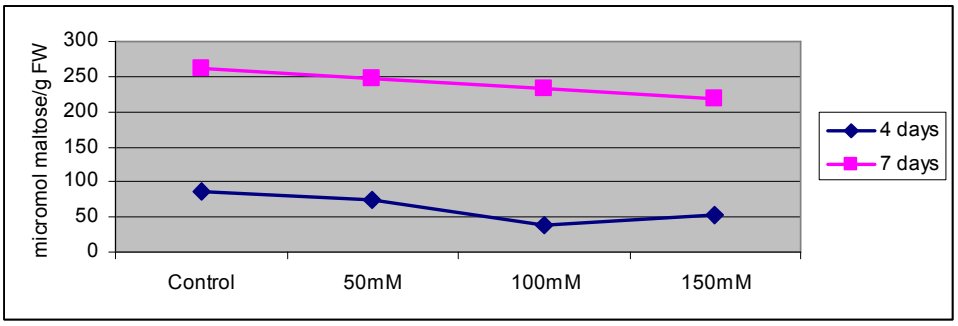


Fig. 1 - Variation of α–amylase activity at rapeseed seedling under NaCl stress

Activities of acid and alkaline phosphatases enzymes show significant alteration in plants exposed to abiotic stressful conditions such as soil salinity (Ehsanpour and Amini, 2003). Salt stress found to have profound effects on various hydrolases. Thus, Singh and Ramasare, (2009) reported a decreasing of several hydrolases activities, gradually with increasing salt stress in groundnut. Under salinity stress the decrease in acid phosphatase activity may imply fewer amounts of free PO_4^{-3} ions in cell wall. On the other hand, effect of salinity stress on canola caused an increase in both acid and alkaline phosphatase activities (Bybordi and Ebrahimian, 2011). Acid phosphatase hydrolyzes phosphatidyl groups into free

fatty acids and soluble phosphorus in plant cells. In *B. napus* cv. Exgold seedling the early phase of saline stress (four days) the acid phosphatase activity decrease with the augmentation of NaCl stress (Fig. 2). The stimulant effect of salinity was in accordance with other results using *B. napus* cv. Exagone, where at seven days, the acid phosphatase activity increase with arise of NaCl stress (Oprica et al., 2011).

Plants exposed to various abiotic stresses, like salinity, initiate the cascade of changes starting with imbalanced water and nutrient uptake, stomatal closure, altered gaseous exchange, improper functioning of photosynthetic systems due to over-reduction of electron transport chains in chloroplast and mitocondria finishing with generation of ROS. The first line of cells defense who converting $O_2^{\bullet -}$ to H_2O_2 is superoxide dismutase. Therefore, it is important that H_2O_2 be scavenged rapidly by the antioxidative defence system to water and oxygen, this can be performed by catalase (CAT) and peroxidase (POD) enzymes (Guo et al., 2006). CAT is important in removal of H_2O_2 generated in peroxisomes by oxidases involved in β-oxidation of fatty acids, photorespiration and purine catabolism. CAT is known to have low affinity to H_2O_2 than POD, wich suggest that it is involved in mass scavenging H_2O_2, whereas POD is suggest to be involved in fine regulation of H_2O_2 (Sharma et al., 2012).

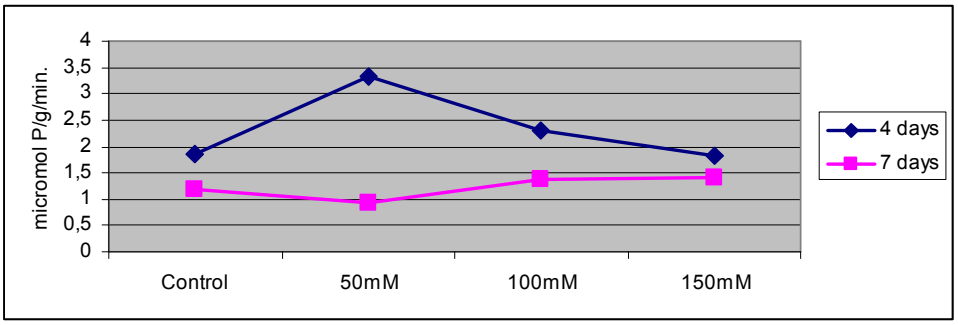


Fig. 2 - Acide phosphatase activity at rapeseed seedling under NaCl stress

The increase of catalase activity under abiotic stress has been observed in *Calendula officinalis* and *Lycopersicon esculentum* seedlings (Chaparzadeh et al., 2004) as soon as, *Cicer arietinum* leaves (Eyidogan and Oz, 2007) and roots of *C. arietinum* (Kukreja et al., 2005).

Our results indicated that in *Brassica napus* cv. Exgold seedling, catalase activity decreased in all NaCl concentrations at four days after saline treatment. At seven days old seedling, as salt stress was maintained, this enzyme activity increased and a significant increase was observed at 150 mM (Fig. 3). The decrease in catalase activity by salt stress is a phenomenon that occurs in many plant species, not only in the gramineous like rice and wheat (Erdal et al., 2011) but in pea plants (Sandalio et al., 2001) and in some rapeseeds seedling cultivar leaves (Zare and Pakniyat, 2012).

The effect of salinity on POD activity of *Brassica napus* cv. Exgold seedling was different after four and seven days exposure of salinity. The

increased levels of POD and CAT activities in 7-days-old seedling were observed at 150 mM, which may result from the protective function of this enzyme (Fig. 4).

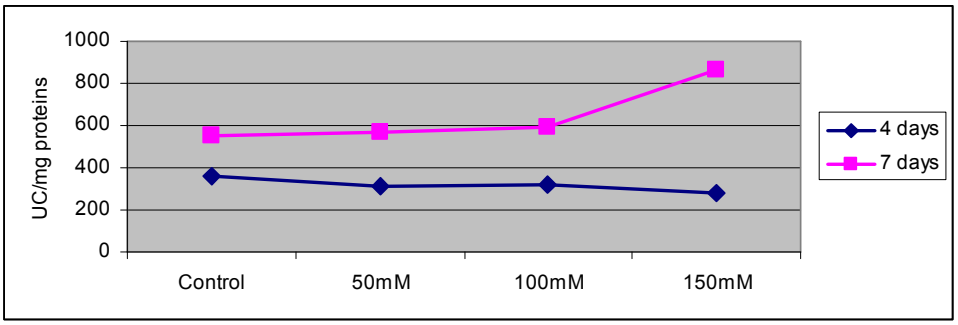


Fig. 3 - Catalase activity at rapeseed seedling under NaCl stress

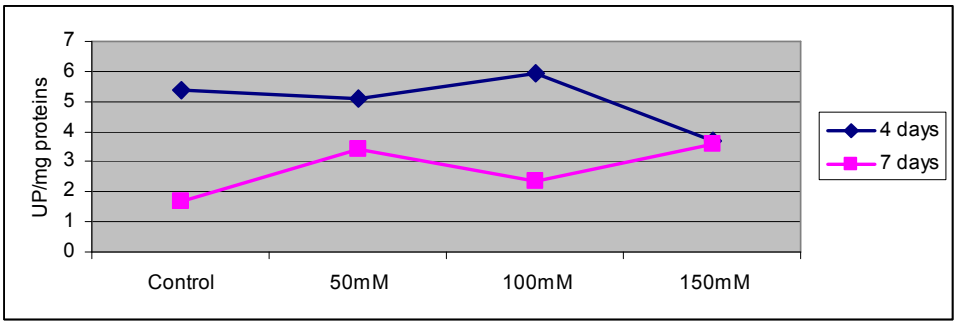


Fig. 4 - Peroxidase activity at rapeseed seedling under NaCl stress

CONCLUSIONS

1. The impact of salinity stress on physiological and biochemical indices of *Brassica napus* cv. Exgold seedling varied depending on the concentration of NaCl, the age of seedling and the treatment duration.

2. Salt stress was found to affect negatively the root length at both intervals studied. Hydrolytic enzymes have differently responded at saline stress at both ages of rapeseed seedling, being a reduced tendency of α-amylase activity but an increasing trend of acid phosphatase activity.

3. In four day after saline treatment the enzymes catalase and peroxidase activity, have registered a decline. As the abiotic factor was maintained the enzymes activities was intensified at seven day comparatively with the control.

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THE WOUND HEALING EFFECT OF A DERMAL PREPARATION WITH *HYPERICUM PERFORATUM* IN SKIN INCISIONS

EFECTUL CICATRIZANT AL UNUI PREPARAT DERMIC PE BAZĂ DE *HYPERICUM PERFORATUM* ÎN LEZIUNILE DE TIP INCIZIE

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Abstract. *St. John's wort (Hypericum perforatum) is a plant used in traditional and modern medicine for treating skin disorders, peptic ulcer disease, infections, inflammatory affections and depresive disorders. The present experiment aims to prepare a new ointment formulation, based on the total extract of Hypericum perforatum included into a natural and biocompatible ointment base, determination of the total flavone content, and the evaluation of the wound healing potential using an in vivo experimental model of skin incision. The spectrophotometric results emphasize the presence of a high concentration of polyphenols that act sinergically with the ointment base in healing the lesions with lack of continuity. The histopathological results demonstrate the rehabilitation of the normal dermal tissue after only 6 days of treatment, showing the formation of a mature granulation tissue and the reconstruction of the epithelial matrix.*

Key words: *Hypericum perforatum, dermal formulation, wound-healing*

Rezumat. *Sunătoarea (Hypericum perforatum) este o plantă utilizată în medicina tradițională şi modernă în tratamentul afecțiunilor dermice, a ulcerului gastric, a infecțiilor, bolilor inflamatorii şi tulburărilor depresive. Prezentul experiment îşi propune ca obiective prepararea unei noi formule de unguent, având la bază extractul total de sunătoare înglobat într-o bază de unguent naturală şi biocompatibilă, determinarea conținutului în flavone şi evaluarea efectului cicatrizant la nivel dermic, utilizând un model experimental in vivo de tip incizie. Rezultatele analizei spectrofotometrice evidențiază un conținut ridicat în flavone, ce acționează sinergic cu baza de unguent în cicatrizarea leziunilor cu pierderea soluției de continuitate. Rezultatele histopatologice demonstrează reabilitarea țesutului dermic normal după 6 zile de tratament, cu formarea țesutului de granulație matur şi refacerea matricei epiteliale.*

Cuvinte cheie: *Hypericum perforatum, formulare dermică, cicatrizare*

INTRODUCTION

Natural biocompatible products are gaining more attention in medical research and industry to the detriment of synthetic compounds that lack

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biocompatibility and their production is polluting the environment (Pavlenkov J., 2010). *Hypericum perforatum* L. (St. John's Wort) is a member of the genus *Hypericum* that includes about 400 species worldwide (Saddiqe et al., 2010). It is native to Europe, West Asia, North Africa, Madeira and the Azores and is naturalized in many parts of the world. The plant spreads rapidly by means of runners or from the prodigious seed production and can invade pastures, disturbed sites, dirt roads, the sides of roads and highways, and sparse woods. The plant has a long history of more than 2400 years and has enjoyed a reputation as a wound healer since the fifth century B.C. (Gerard, 1597; Withering., 1796).

The present study aims to develop a new wound-healing ointment based on the total extract of the aerial parts of *Hypericum perforatum*, advantaged by the simple, low-cost and environmentally friendly preparation.

MATERIAL AND METHOD

II.1. Chemical and materials

Ethyl alcohol, petrolatum, lanolin, methanol (R), aluminium chloride, sodium acetate and olive oil *(Olivae oleum virginale)* were purchased from Sigma-Aldrich. The aerial parts of *Hypericum perforatum* (St. John's wort) were collected from the Botanic Garden, Iaşi, Romania and a voucher specimen was identified by the staff of the same institution.

II.2. Hypericum perforatum histological analysis

The plant material has been fixed and preserved in 70% ethylic alcohol. The sections were cut by microtome, coloured with iodine green and rutheniu red, then analyzed in a Optika light microscope. The light micrographs were performed by means of the same light microscope, using Canon A540 camera.

II.3. Preparation of the Hyperici herba ointment

After collection, the plant material was dried in a dark room with controlled temperature and relative humidity. Samples with 10% moisture content were mechanically ground to obtain a homogenous drug powder. The extracts were prepared by macerating 50 g powder in 500 mL virgin olive oil/500 mL 70% ethanol, at room temperature, for 2 weeks. In the end, the extracts were filtered and placed in dark brown jars with stoppers. The ointment base was prepared by mixing white petrolatum and lanolin in equal amounts on water bath (40ºC) until a homogenization. Fifteen mL of each extract were gradually included into the ointment base.

II.4. Determination of total flavonoids

The hydroalcoholic extracts prepared from three different samples of *Hypericum perforatum* as described above were analyzed for the total flavonoid content, by the spectrophotometric method (FRX). The extracts were diluted in the proportion of 1:10, mixed with 5 mL of sodium acetate 100 g/l (R), 3 mL of aluminum chloride 25 g/l (R), and completed with methanol (R) to 25 mL. The samples were kept at room temperature for 40 min and the absorbance read at 430 nm. Rutine was used as the standard to produce the calibration curve. The mean of three readings was used and the total flavonoid content was expressed in rutoside (g%).

II.5. Experimental model of dermal injury

All the experimental proceedings achieved on laboratory animals (Wistar rats) in this study were in agreement with the European Council Directive of 24 November 1986 (86/609/EEC). The experiment included 3 groups of Wistar rats (7 animals per group): negative control group (incision, not treated), *Hyperici herba* ointment group (treated with

Hyperici herba ointment), and ointment base group (treated with the ointment base). The incision wound model was based on a previously described model (Süntar et al., 2010), with some modifications. Two linear paravertebral incisions (1 cm long) were made with a sterile surgical blade through the full thickness of the skin at 1.5 cm distance from the midline of each side of the vertebral column. The *Hyperici herba* ointment and the ointment base were applied topically once a day for 6 days.

RESULTS AND DISCUSSIONS

III.1. Hypericum perforatum histological analysis

In cross-section, the stem has a circular contour, modified by two opposing ridges. The epidermis contains large cells, slightly tangentially elongated, with a very thick external wall and covered by a thin striated cuticle. Conductive tissues are largely of secondary origin, cambium making a thin ring of phloem towards the outside and a very thick ring of xylem towards the inside. The phloem consists of sieve-tube cells, companion cells and few parenchymatous cells. The xylem has vessels irregularly disspersed in the libriform bulk. The pith is parenchymatous-cellulose, meatic, the size of the cells increasing towards the inside. The center section is occupied by a large lacuna (fig. 1). The front view of the leaf epidermis (fig. 2) shows cells of irregular shape, with wavy side walls. The lower epidermis shows anisocytic stomata, sometimes in large numbers, even intertwined, other times very rare or absent, so the lamina is hypostomatic. In cross section (fig. 3) the midvein protrudes from the underside of the lamina. The two epidermis contain isodiametric or slightly tangentially elongated cells, bigger on the upper side and with some stomata amongst them on the underside. The midvein has several layers of hypodermic collenchyma and a vascular bundle with primary structure.

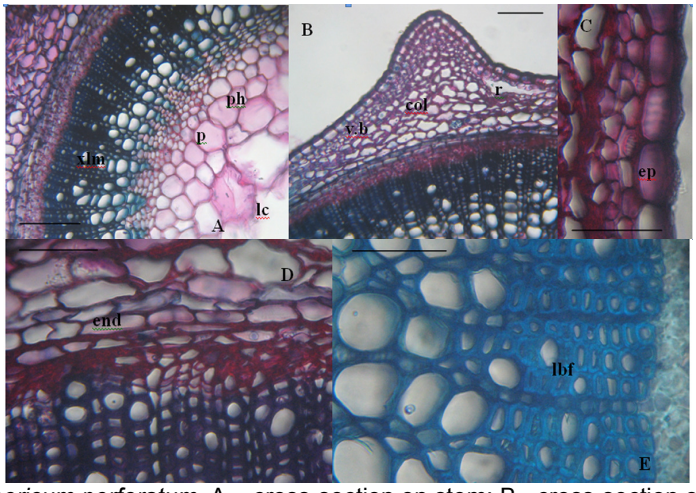


Fig. 1 - *Hypericum perforatum*. A – cross-section on stem; B - cross-section on stem with detail of ridge; C – cross-section on stem with detail of epidermis; D – cross-section on stem with detail of cork and central cilinder; E – cross-section on stem with detail of libriform

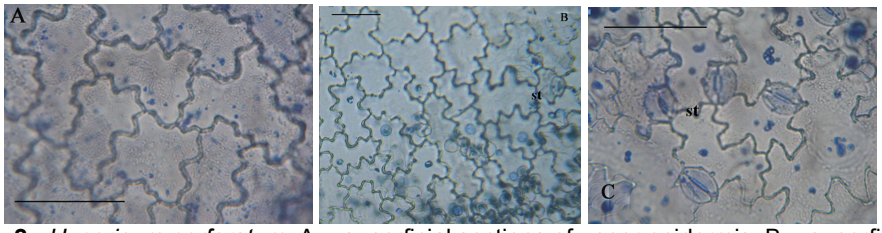


Fig. 2 - *Hypericum perforatum*. A. - superficial sections of upper epidermis. B. - superficial sections of lower epidermis; C. – superficial sections of lower epidermis

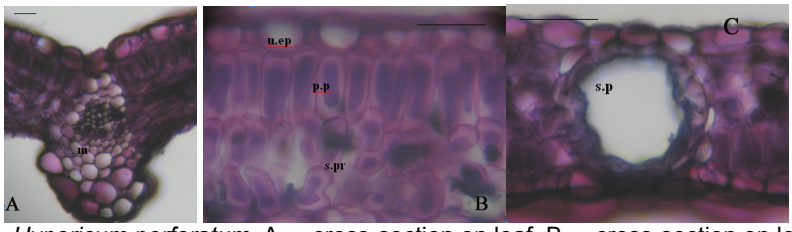


Fig. 3 - *Hypericum perforatum*. A. – cross-section on leaf. B. – cross-section on leaf with detail of mesophyll; C. – cross-section on leaf with detail of secretory pocket; Abbreviations: c – cork; col – colenchyma; end – endodermis; ep – epidermis (u – upper, l – lower); lbf – libriform; lc – lacuna; m – midvein; mes – mesophyll; mxlm – metaxylem; p – pith; ph – phloem; p.p – palisade parenchyma; r – ridge; rz – rhizodermis; s.p – secretory pocket; s.pr – spongy parenchyma; st – stomata; v.b – vascular bundle; xlm – xylem.

III.2. Determination of the total flavonoids

The content of flavonoids in 3 different samples of *Hypericum perforatum* is presented in Table 1. The results are expressed as g% rutoside.

Table 1

Concentrations of total flavonoids in *Hypericum perforatum* samples

***Hypericum perforatum* samples**	**Total flavonoids (g% rutoside)**
Sample 1	3.900
Sample 2	3.825
Sample 3	3.705

III.3. Histopathological results

The histopathological results after 6 days of topical treatment with Hypericum perforatum ointment are presented in Fig.4. If in the first day the edema is severe, the epidermis is atrophic and focal fibrosis is present, the third day of treatment reveals an improvement in the clinical and histopathological signs (mild inflammation in the hypodermis, normal aspect of the muscle tissue, small intracellular abcess). In the 6th day of treatment, the ulceration is replaced by granulation tissue, that spreads from the epidermis towards the hypodermis, where a mild inflammatory infiltrate with nodular perivascular disposition can be found. The muscle fibers have normal appearance, with interstitial edema.

Normal wound healing follows a predictable pattern that can be divided into overlapping phases: (a) hemostasis and inflammation, (b) proliferation, and (c) maturation and remodeling (Barbul , 2010). The total extract of the aerial parts of St. John's wort interferes in all the stages of the wound-repair process, improving

the healing of the skin injuries due its antibacterial, antioxidant, and anti-inflammatory effects.

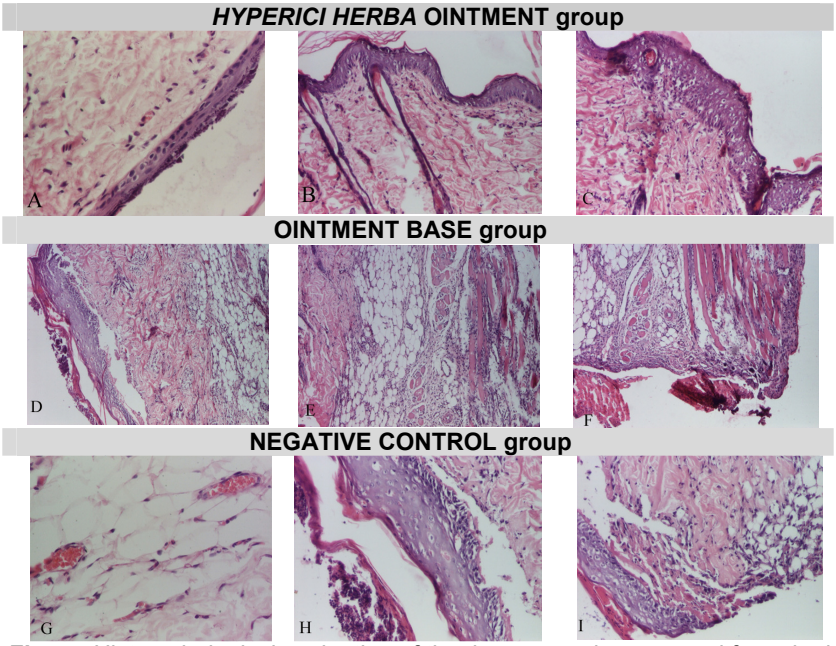


Fig. 4 - Histopathological evaluation of the tissue samples removed from the healed skin of the Wistar rats at the end of the treatment

***HYPERICI HERBA* OINTMENT group**: **A** - Epidermis with regenerated aspect (HEx100); **B** - Epidermis with ortokeratosis and rare perivascular lymphocytes (HEx100); **C** - Epidermis with mild spongiosis and vacuolar degeneration of keratinocytes. Transversal section of the hair follicle (HEx100); **OINTMENT BASE group**: **D** - Vascular congestion at the level of hypodermis (HEx40); **E** - Abscess in the keratin crust, parakeratosis and the absence of the granular tissue (HEx40); **F** - Microabscess in the keratin crust, spongiosis and vacuolar degeneration in the epidermis. (HEx40); **NEGATIVE CONTROL group G** - Abscess in the keratine crust, vacuolar degeneration of the keratinocytes; mild inflammatory infiltrate with perivascular disposure (HEx200); **H** - Inflammatory infiltrate in hypodermis and muscle tissue with aspects of necrosis and muscle regeneration (HE x100); **I** - Inflammatory infiltrate at the level of hypodermis and muscle tissue (HEx100)

Wounds represent an environment that facilitates the development of micro-organisms that hinder the wound healing process. Hyperforin from the *Hyperici herba* extracts shows antibacterial properties against Gram-positive bacteria, along with tannins, hypericin and volatile oil. Although the anti-inflammatory effect of the *Hypericum* extracts was attributed mainly to the inhibitory action of quercetin upon the signal transduction pathway, recent experiments reveal the inhibitory effect of hyperforin upon the lymphocyte reaction at the level of the epidermal cells and upon the T-lymphocyte proliferation. On the other hand, hyperforin is one of the natural compounds with a strong inhibitory effect upon cyclooxygenase-1 and lipoxygenase-5 (Albert et al., 2002). Recent studies demonstrate that hyperforin may interfere with other inflammatory responses of the leukocytes, including the marked inhibition of the reactive oxygen species and release of elastase (Feißt and Werz, 2004).

The ointment base itself contributes to wound healing, the ingredients being biocompatible and efficient in the re-epithelialization process. The oils found in lanolin are similar to those oils we secrete from within our own skin, which is why lanolin is so effective. Lanolin is a natural moisturizer with powerful emollient and protective properties. Vaseline (white petroleum) is a mixture of saturated petroleum hydrocarbons that was used in World War I to treat cuts and bruises and prevent sunburn, while during World War II, it was used to prepare sterile antiseptic wound dressing (Wiles et al., 2010).

CONCLUSIONS

1. The dermal formulation based on the total extract of *Hypericum perforatum* is efficient in wound-healing.

2. The ingredients used in the preparation of the ointment are natural and biocompatible.

3. The method of preparation is friendly to the environment, leaving no toxic or polluting compounds.

Acknowledgements. *This paper was supported by the project PERFORM-ERA "Postdoctoral Performance for Integration in the European Research Area" (ID-57649), financed by the European Social Fund and the Romanian Government.*
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FTIR SPECTRAL DATA IN CORRELATION WITH MAIN ORGANOLEPTIC AND BIOCHEMICAL FEATURES OF JONATHAN POSTHARVEST APPLES

DATE PRIVIND SPECTRELE FT-IR ÎN CORELAȚIE CU PRINCIPALELE CARACTERISTICI ORGANOLEPTICE ŞI BIOCHIMICE ALE MERELOR JONATHAN DUPĂ RECOLTARE

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Abstract. *Apple fruit quality is a multi-component concept, defined by organoleptic, biochemical and physiological attributes such as firmness, skin and flesh color, sugars, organic acids, pigments, phenolic compounds and volatiles, ethylene production, respiration rate. Most instrumental techniques currently required for measuring these parameters are long, expensive and involve a considerable amount of manual work. Therefore, there is a demand for new and rapid analytical methods for assessing quality attributes. Recently, Fourier transform mid-infrared (FT-IR) spectroscopy has become a well-accepted method for the determination of food constituents since it achieves high analysis speed and requires little or no sample preparation. In our study Jonathan apples were evaluated by FT-IR spectral data in order to establish main characteristics / modification after postharvest and to correlate it with apple fruit quality main parameters.*
Key words: *FT-IR spectral data, biochemical features, Jonathan apples.*

Rezumat. *Caracteristicile organoleptice, biochimice şi fiziologice ale merelor (fermitatea, culoarea, conținutul de glucide, acizi organici, substanțe solubile, producția de etilenă, rata respirației) pot fi monitorizate în prezent prin tehnici instrumentale clasice dificile, costisitoare şi greoaie astfel încât s-a impus necesitatea unor metode analitice rapide şi precise. Astfel, spectroscopia în infraroşu cu transformată Fourier (FT-IR) este o metodă recent adoptată pentru analiza substraturilor alimentare datorită rapidității şi mai ales datorită faptului că implică o minimă pregătire a probelor. Lucrarea prezintă caracteristicile spectrelor FT-IR pentru merele Jonathan după recoltare în corelație cu principalele modificări ale parametrilor organoleptici şi biochimici.*
Cuvinte cheie: *spectre FT-IR, parametri biochimici, mere Jonathan.*

INTRODUCTION

Apple fruit quality is a multi-component concept, defined by organoleptic, biochemical and physiological attributes such as firmness, skin

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and flesh color, sugars, organic acids, pigments, phenolic compounds and volatiles, ethylene production, respiration rate (Beceanu, 2010).

Most instrumental techniques currently required for measuring these parameters are expensive and involve a considerable amount of manual work. Therefore, there is a demand for new and rapid analytical methods for assessing quality attributes.

Recently, Fourier transform mid-infrared (FT-IR) spectroscopy has become a well-accepted method for the determination of food constituents since it achieves high analysis speed and requires little or no sample preparation (Trincă et al., 2012, 2013).

In our study Jonathan apples were evaluated by FT-IR spectral data in order to establish main characteristics / modification after postharvest and to correlate it with apple fruit quality main parameters.

MATERIAL AND METHOD

Jonathan apples were purchased from the city market with weight ranging between 81-103 g and normal, healthy appearance. Periodic measurements for various types of biochemical features were carried out for 60 apples (by considering the lot of ten apples stored under the same conditions of temperature and humidity).

Drying of the samples was performed by oven drying (Trincă et al., 2012). For oven drying. 5 g sample of Jonathan apple (chunks or grinded) have been subjected to drying at 90^0 C temperature until constant mass ($\Delta<10^{-2}$ g).

Water content was determined according to eq.(1):

$$H_2O\ \% = \frac{m - m_1}{m_2} \times 100 \qquad \textbf{(1)}$$

Spectral analysis by FTIR spectroscopy highlights functional changes of the structure sample substrate in relation to the standard.

FTIR spectra were recorded in KBr pill using DIGILAB-EXCALIBUR SDS 2000 spectrometer fitted with a heating device.

Working parameters were: spectral range between 4000-400 cm^{-1}, resolution 4 cm^{-1} and the number of scans 24.

RESULTS AND DISCUSSION

In figures 1- 4 are presented FTIR spectra for apples (chunks and grinded) in day five and day twenty.

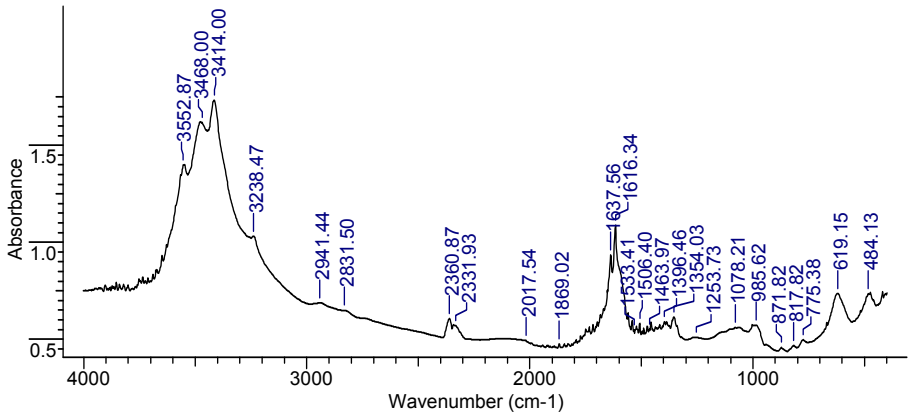


Fig. 1 - FT-IR spectral data for chunks apple day 0

The vibrational spectrum of a molecule is considered to be a unique physical property, characteristic of the molecule. As such, the infrared spectrum can be used as a fingerprint for identification by the comparison of the spectrum from an ‘‘unknown’’ with previously recorded reference spectra. This is the basis of computer-based spectral searching. In the absence of a suitable reference database it is possible to do a basic interpretation from first principle leading to characterization and possibly even identification of an unknown sample (Coates, 2000).

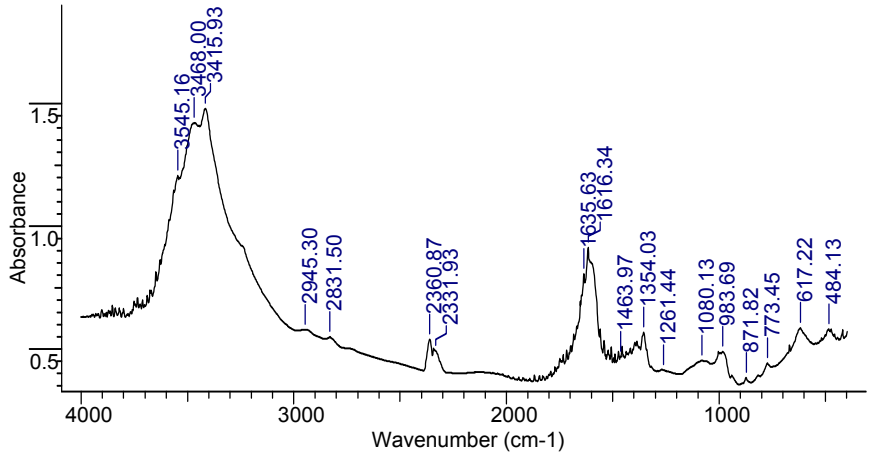


Fig. 2 - FT-IR spectral data for chunks apple day 20

This first principles approach consider that structural features of a molecule- whether they are the backbone of the molecule or the functional groups attached to the molecule- produce characteristic and reproducible signals in spectrum. First step monitoring if whether the backbone consists of linear / branched chains or unsaturation and aromatic rings in the structure. Finally, it is possible to deduce whether specific functional groups are present.

Absorptions in the region 3560–3420 cm^{-1}

The corresponding signals of water in the food substrate are given by symmetric and asymmetric bands of excitation of phenolic groups -OH present in the area 3552-3540 cm^{-1}. These signals are specific to chemical bound water from the substrate structure.

Thus, from these registered spectra can be notice that intense signals appears in the area just in the case of the samples analysed in day five. Spectra recorded for samples of day twenty day presented low intensity signals in this area maybe because of the existence of a smaller percentage of chemical bound water in raw samples. In this case the signals appear only in the aria of 3480-3420 cm^{-1} both for apple pieces and minced samples (Chiş et al., 2010, Esbensen et. al., 2002).

Absorptions in the region 3200–2700 cm^{-1}

Well-defined and characteristic absorptions in this region are normally characteristic of carbon- and hydrogen containing species, and are assigned to various forms of C-H stretching.

Ther are there slightly signals of absorptions above 3000 cm^{-1}, which correspond to unsaturated (contains C=C) or aromatic compounds.

The signals presented in the 2935-2860 cm^{-1} and 1470- 720 cm^{-1} absorption area , correspond to long linear aliphatic chain compounds.

Absorption in the region 1850–1620 cm^{-1}

A major band in this region usually indicates the presence of a C=O group (carbonyl compound). The signals at the high end of the range, e.g. 1775 cm^{-1} or above, correspond to a simple carbonyl compound, such as a ketone, an aldehyde, an ester, or a carboxylic acid.

The conjugation with another carbonyl group, or a double bond or aromatic ring, will lower the carbonyl absorption by 30–50 cm^{-1}. Therefore, conjugated aldehydes, ketones, esters, and carboxylic acids may fall into this lower end category. If conjugation with a double bond is present, then a second strong absorption should be observed nearby, between 1650 and 1600 cm^{-1}. In the case of the involvement of an aromatic ring, it is important to look for evidence of the characteristic aromatic absorptions (Max et al, 2007, Rudnitskaya et. al., 2006).

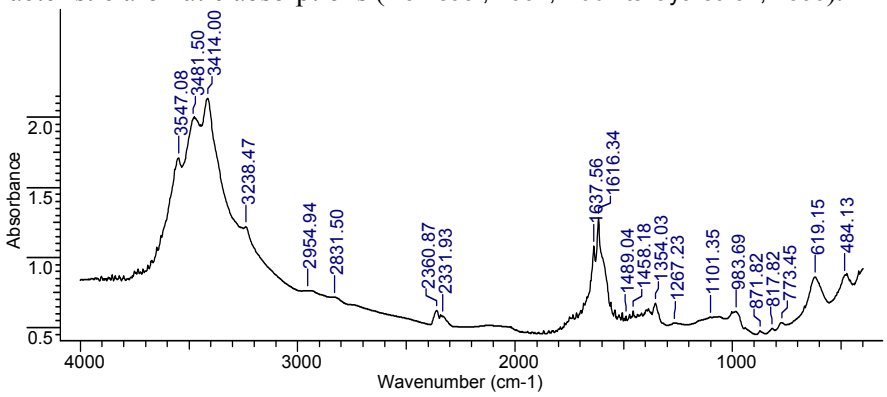


Fig. 3 - FT-IR spectral data for grinded apples, day 0

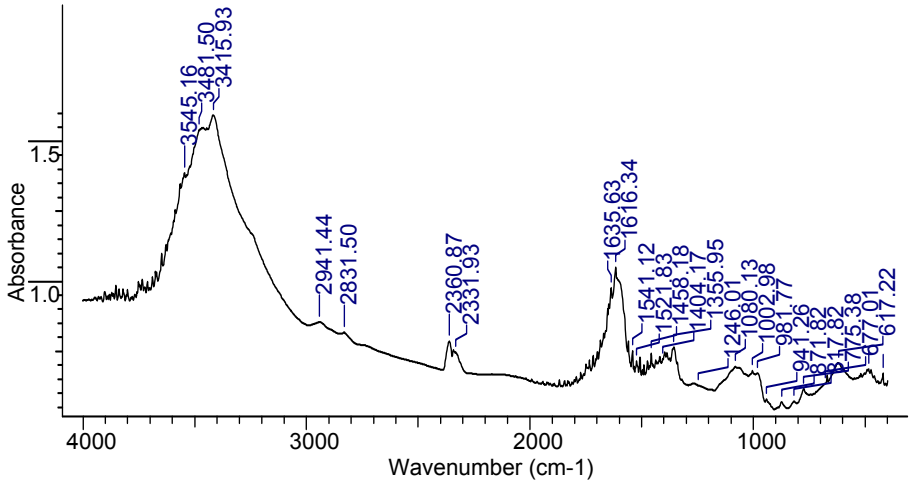


Fig. 4 - FT-IR spectral data for grinded apples, day 20

Absorption in the region1640–480 cm^{-1}

FTIR spectra present a strong bandwidth due to water absorption bandwidth, centered around 1637 cm^{-1}.

The bands of the 885-1500 cm^{-1} are assigned to the stretching vibration of the C - O and C - C, while the bands from 1474-cm^{-1} are due to vibrations of groups O = C - H and C - O - H of carbohydrate components.

Characteristic bands of glucose were identified (specific maximum at 983, 1062, 1283, 1261, 1366, 1386, 1458, 1367 şi 1460 cm^{-1}), fructose (specific maximum at 966, 1063, 1155, 1254, 1346, 1416 şi 1456 cm^{-1}) and sucrose (specific maximum at 995, 1055, 1113, 1138, 1338 şi 1464 cm^{-1}).

CONCLUSIONS

1. In our study Jonathan apples were evaluated by FT-IR spectral data in order to establish main characteristics / modification after postharvest and to correlate it with apple fruit quality main parameters.

2. FTIR analysis confirmed the presence of bound water in apple samples (bound water specific signals were more intense in day 0 while in day 20 can be noticed their absence in certain areas of absorption).

3. The results highlight the potential of FTIR spectroscopy to realise quick and efficient analyses for routine monitoring of carbohydrates in apples, as indicators of quality and authenticity

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GRAVITATIONAL SEDOMENTOMETRICAL ANALYSES APPLIED TO THE WHEAT STRAW LIGNIN

ANALIZE SEDIMENTOMETRICE GRAVITAȚIONALE APLICATE LIGNINEI DIN PAIE DE GRÂU

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Abstract. *The lignin stands out by a very large range of applications in extremely various domains. The adsorption-desorption capacity, ion exchange capacity and its catalytic properties are just a few specific characteristics which are emphasizing the importance of harnessing the lignins. In this paper is shown by sedimentometrical analyses that lignin can be used inagriculture and zootech.*
Key words: *sedomentometrical analyses, wheat straw lignin, density, pycnometer, sedomentometrical curves.*

Rezumat. *Lignina se remarcă printr-o gamă foarte largă de aplicații în domenii extrem de diverse. Capacitatea de absorbție-desorbție, capacitatea de schimb ionic, proprietățile catalitice sunt doar câteva repere specifice care recomandă şi evidențiază importanța valorificării ligninelor. În această lucrare, se arată prin sedimentarea gravitațională, că lignina se poate utiliza în agricultură şi zootehnie, industria celulozei şi hârtiei, construcții, metalurgie sau cataliză. sedimentometrical analyses that lignin can be used inagriculture and zootech.*
Cuvinte cheie: *analize sedimentometrice, lignină din paie de grâu, densitate, picnometru, curbe sedimentometrice.*

INTRODUCTION

At a global level, lignin resulted from cellulose fabrication or technologies of hydrolysis of vegetal mass can be considered as raw material with high capitalization potential, because of its provenience from regenerating sources and due to reduced price. Lignin is a macromolecular compound, much more active than cellulose or other natural polymers, due to functional groups contained in its macromolecule, constituting the main aromatic component of vegetal tissues, standing for 20%-30% of the mass at superior plants, where it is present within the cellular membrane and in intercellular spaces (Ungureanu E., 2011; Hiementz et al., 1997). The structure of wheat straw lignin is naturally variable: macro-porous, porous or micro-porous. (Ungureanu et al, 2012; Odochian,1989).

Up to now, the attempts made at creating an industry which can capitalize lignin have registered only partial success.

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Fig. 1 - Wheat straw lignin (dust)

One of the pursued directions refers to ameliorating the properties of lignin resulted from processes of chemical wood and annual plants processing through reactions that may lead to increased functionality and diversification of the fields of use for lignin. Due to its regeneration, capacity through photosynthesis, vegetal biomass and its components (including lignin) will become in the future sources of raw material with a high degree of capitalization.

In this paper is shown by sedimentometrical analyses that lignin can be used in agriculture and zootechnics, cellulose and paper industry, constructions, metallurgy or as catalysts.

MATERIAL AND METHOD

The following materials have been used:

- Wheat straw lignin (L_1), offered by Granit Recherché Dévelopement, having the characteristics described in table 1

Table 1

Characteristics of wheat straw lignin L_1

Characteristics	L_1
Relative humidity, %	5.00
Ash, %	2.30
pH in suspension	2.70
Manganese, %	0.7
Nitrogen, %	1
Uronic acid, %	0
Solubility in acids, %	1
Insolubility in acids, %	90

- RS-71 Tensio-tixometer gravimetric sedimentation balance;
- Steel ball crusher;
- Toluene;
- Distilled water.

Methods:

- picnometer method;
- gravitational sedimentometrical method.

Work procedure*:* 45 g of wheat straw lignin were weighed, crushed for 30 min. and dissolved in 1L of distilled water. The electrostatic forces of attraction between the

hydroxylic groups of the lignin and the dipoles of the dissociated water are so powerful that a colloidal-hydric aggregate is formed and its volume is smaller that the sum of volumes that interact (water-lignin). Experimental data were statistically processed with the aid of the *Unscrambler* application.

RESULTS AND DISCUSSIONS

Based on the standard curve (fig.2) 10 sedimentation curves were plotted according to the dependence q(g) = f(t, s), and the experimental data are also listed in tables.

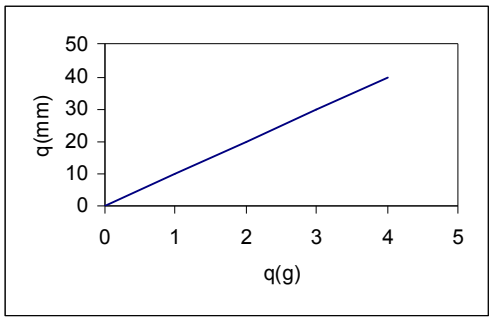


Fig. 2 - The standard curve

10 sedimentation curves in q(mm) = f(t, s) coordinates were obtained using RS-71 Tensio-tixometer under constant conditions (mass lignin = 45 g/L water).

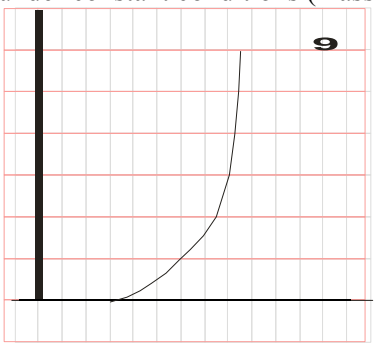


Fig. 3 - Exemple of sedimentation curve

These sedimentation curves were also listed in table 2.

Table 2

Parameter values of the sedimentation curves

No. det.	t (mm)	t (sec)	q (mm)	q (g)
1	3	7,85	3,50	0,25
2	6	15,7	5,0	0,40
3	9	23,49	7,0	0,59
4	12	31,40	8,0	0,60
5	15	39,25	9,0	0,73
6	18	47,10	10,5	0,80
7	21	54,95	11,0	0,86
8	24	62,80	11,5	0,89

9	27	70,65	12,0	0,90
10	30	78,50	12,5	0,99
11	33	86,35	12,5	0,99
12	36	94,20	13,0	1,01
13	39	102,05	13,5	1,04
14	42	109,90	13,5	1,04
15	45	117,75	14,0	1,11
16	48	125,60	14,0	1,11
17	51	133,45	14,5	1,17
18	54	141,30	14,5	1,17
19	57	149,15	14,5	1,17
20	60	157,00	14,5	1,17

Further on it was obtained the most expected sedimentation curve plotting the values of sediment quantity, q(g) and time t(s), for the reproductible measurements (2, 3, 4, 5, 9) (fig. 4).

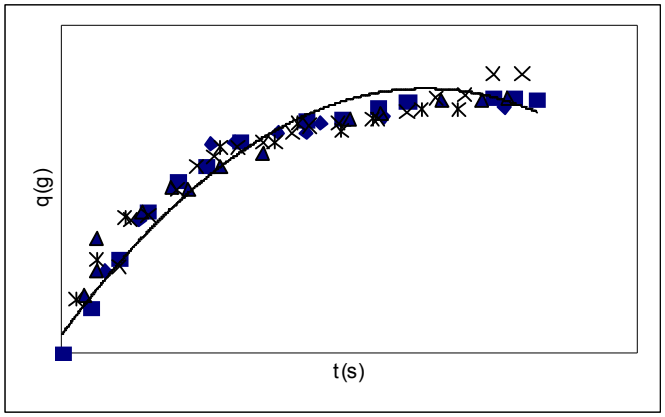
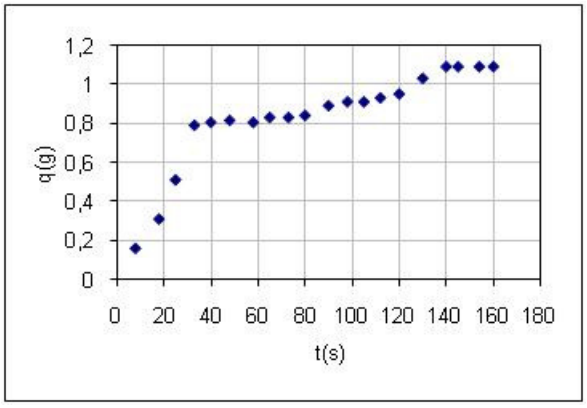


Fig. 4- General sedimentation curve

Measurements 1, 6, 7 and 10 are not reproductible due to a non-uniform distribution of the scattered particles obtained before the recordings (fig. 5a and b).



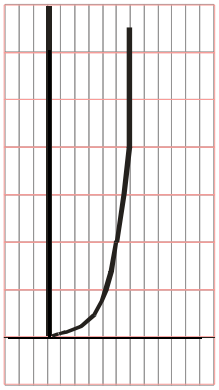


Fig. 5 - Sedimentation curves using:
a) q(g) = f(t, s) dependence b) tensio-tixometer q(mm) = f(t, min.)

dependence

Based on the general theory of sedimentation in gravimetric field of micro-heterogeneous systems, the radius boundaries of the scattered particles in ground lignin were evaluated. According to the determinations performed the amount of deposited lignin was Q = 1.18 g. In order to determine the density of lignin, the picnometer method was employed. In table 3 are presented the values obtained experimentally by weighing or theoretically determined.

Table 3

Density of lignin measured by picnometer method

m_1 (g)	m_2 (g)	m_3 (g)	m_4 (g)	ρ_s (g/cm^3)
13,6512	14,6515	23,0630	22,4048	2,5307
13,6512	14,6508	23,0622	22,4048	2,5282
13,6512	14,6486	23,0642	22,4048	2,5539

m_1 – empty pycnometer mass; m_2 – pycnometer mass + solid; m_3 – pycnometer mass + solid + liquid; m_4 – pycnometer mass + liquid (toluene); ρ_s - solid density

By graphical derivation of the sedimentation curve (Fig.3), the sedimentation rates were obtained at certain periods of time, t = 0, 14, 30, 70, 80, 90, 100, 105 s. These rates were used to determine various fractions radii of the disperse system (table 4).

Table 4

Sedimentation rates corresponding to the most expected sedimentation curve for the reproductible results

Time (s)	Sediment quantity (g)	Sedimentation rates (mm/s)
0	0	0,042
14	0,2	0,0164
30	0,6	0,0140
70	0,94	0,0035
80	0,97	0,0026
90	1,00	0,0017
100	1,03	0,0015
105	1,04	0,0150

Based on the resulted sedimentation rates, the particle radii of lignin were obtained (table 5).

Table 5

Values of disperse particle radii of lignin obtained by sedimentation in gravitational field.

Fractions number	Dimension of superior and inferior sieve mesh (mm)	Diameter a_i (mm)	Beam r_i (mm)	
			By rieving	By sedimentation gravitational feils
1	1,25 – 1,10	1,125	0,562	-
2	1,0 – 0,05	0,815	0,407	0,30 (0)
3	0,63 – 0,25	0,440	0,220	0,1570 (14)
4	0,25 – 0,20	0,225	0,1125	0,140 (30)
5	0,20 – 0,125	0,1625	0,0812	0,0740 (70)
6	0,16 – 0,10	0,130	0,0650	0,0630 (80)
7	0,10 – 0,09	0,095	0,0470	0,0520 (90)
8	0,09 – 0,08	0,085	0,0425	0,048 (100)
9	0,08 – 0,07	0,075	0,0370	0,040 (105)

CONCLUSIONS

1.The sedimentometrical method applied in gravitational field confirms that the reproducibility of the experimental data depends on the uniform distribution degree of the analyzed disperse particle.

2.In order to determine the lignin density, the picnometer method was success fully employed.

3.The variation range of the disperse particle radius in ground lignin can be determined either by sieving or by sedimentation in gravitational field.

4.The analysis of the values obtained for particle dimensions of wheat straw lignin using both methods leads to a general conclusion that the obtained data are reproducible.

5.Using the gravitational sedimentation, it can be determined in a shorter period of time the particle dimensions comparing with the sieving method, which is a much more complex one.

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THE STUDY OF SOME QUANTITATIVE CHARACTERS TO CORIANDER (*CORIANDRUM SATIVUM* L.) IN THE M_2 MUTAGEN GENERATION

STUDIUL UNOR CARACTERE CANTITATIVE LA CORIANDRU (*CORIANDRUM SATIVUM* L.) ÎN GENERAȚIA MUTAGENĂ M_2

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Abstract. *The coriander belongs to the Apiaceae family, crop species is Coriandrum sativum L., local varieties are Omagiu and Sandra (Imbrea F., 2006). The seeds from the two varieties of coriander were treated with three types of chemical mutagen agents, like: colchicine, ethidium bromide and dimethyl sulphate, with respective concentrations of 0,02%, 0,04%, 0,06%, 0,08%; each concentration having four and six hours for action time. The control variant was represented by each variety, which did not apply mutagenic treatments. The harvested plants were M_1 generation each plant seeds being sown in the following year, resulting the M_2 generation. For all the lines, we made biometric measurements regarding the characters: the number of fruits/plant, number of umbels and weight of fruit/plant. In M_2 generation, there can be identified and selected those useful mutants and plants with valuable traits, mutation being found in homozygous state.*
Key words**:** *Coriandrum sativum L., number of fruits/plant, number of umbels and fruit/plant weight.*

Rezumat. *Coriandrul face parte din familia Apiaceae, specia cultivată este Coriandrum sativum L. Soiurile zonate sunt Omagiu şi Sandra (Imbrea F., 2006). Semințele de la cele două soiuri de coriandru, s-au tratat cu trei substanțe mutagene: colchicină, bromură de etidium şi DMS, în 4 concentrații, respectiv: 0,02%, 0,04%, 0,06%, 0,08% fiecare concentrație având ca timp de acțiune patru şi şase ore. Varianta martor a fost reprezentată de fiecare soi în parte, la care nu s-a aplicat tratamente mutagene. Plantele recoltate au constituit generația mutagenă M_1, semințele fiecărei plante fiind semănate în anul următor, rezultând generația mutagenă M_2. Pentru toate descendențele, s-au efectuat determinări biometrice asupra următoarelor caractere cantitative: numărul de fructe/plantă, numărul de umbele şi greutatea fructelor / plantă. Din generația M_2 se pot identifica şi reține, prin selecție, acele mutante utile şi plantele cu însuşiri valoroase la care mutațiile se pot afla în stare homozigotă.*
Cuvinte cheie**:** *Coriandrum sativum L., numărul de fructe/plantă, numărul de umbele şi greutatea fructelor/plantă*

INTRODUCTION

The coriander is an annual species, of Mediterranean origin (Verzea Maria, 2002). Is grown on all continents. Occasionally appears wildly.

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In Romania is cultivated more in the south and east (Oroian Silvia, 2004). The varieties grown in our country are Sandra (since 1987) and Omagiu (since 2000) (Muntean et. al., 2003).

The coriander (*Coriandrum sativum* L.) is an aromatic plant, from which, either fresh leaves or fruits (seeds) are used; which have a bitter-sweet taste with a slight tinge of celerity.

MATERIAL AND METHOD

The biological material was represented by plants of *Coriandrum sativum* L. from generation M_2. The M_2 generation plants were obtained through the sowing of the M_1 generation seeds. The M_1 generation plants were obtained from seeds treated with 3 types of chemical mutagen agents, like: ethidium bromide, colchicine and dimethyl sulphate, in concentration of 0.02%, 0.04%, 0.06%, 0.08%, each concentration having an action time of four and six hours.

Observations on the three quantitative characters (number of fruits/plants, number of umbels and fruit weight) were made in the experimental field of the farm Ezăreni belonging to Science Teaching Station of Iasi city, in 2012. The results were processed using mathematical and statistical methods: analysis of variance and differences limit.

RESULTS AND DISCUSSIONS

The majority of chemically induced mutations, for cross-pollinated species, are recessive; they can be phenotypically identified starting with M_2 generation, after the respective traits have been previously conditioned by homoalele genes. (Leonte, 2003).

In M_2 generation was made a selection based on the results of the biometric determination of all variants of it.

The number of umbels

Sandra variety

For number of umbels per plant, the Sandra variety control sample had recorded an average of 211.66 (fig. 1).

At the treatment time of 4 and 6 hours, the colchicine had a marked effect of reducing the number of umbels per plant at concentrations 0.02% (119.32 - 4 hours respectively 129.32 - 6 hours) and 0.04% (134.66 - 4 hours respectively 134.32 - 6 hours), the differences being very significant compared with the control sample (fig. 1).

The 4 hours treatment with ethidium bromide in a concentration of 0.04% (62.32) and 0.08% (87.32) and the 6 hours treatment with the ethidium bromide in a concentration of 0.04% (87.99) and 0.06% (88.99) caused a reduction of umbels number, the differences from the control sample being significant. Significant differences were achieved as well for the concentration of 0.08% (102.99) at 6 hours treatment time (fig. 1).

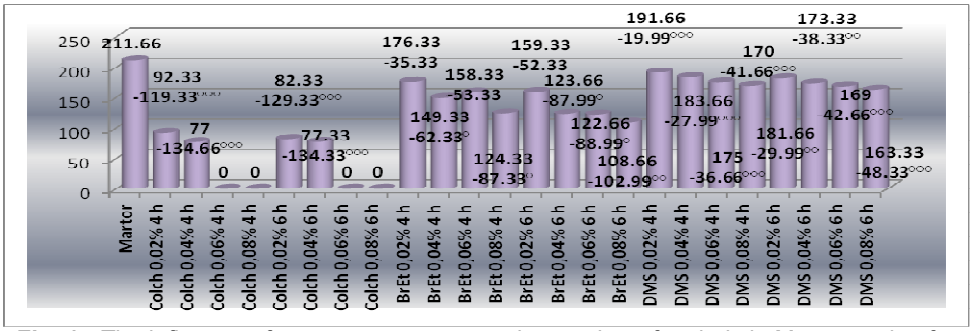


Fig. 1 - The influence of mutagen agents over the number of umbels in M_2 generation for Sandra variety

The dimethyl sulphate treatment to all four concentrations – 0.02% (19.99), 0.04% (27.99), 0.06% (36.66) and 0.08% (41.66) for a 4 hours treatment time, determined significant decreases in the number of umbels per plant, recording significant differences compared to the untreated control sample (fig.1). Substantial differences were also recorded for 6 hours treatment time at concentrations of 0.06% (42.66) and 0.08% (48.32).

Omagiu variety

For the Omagiu variety, like the Sandra variety, the negative differences compared to the control sample (control average 205.66) (fig. 2) were very significant for the 4 and 6 hours treatment time with colchicine in concentrations of 0.02% (113.66 - 4 hours respectively 121.99-6 hours) and 0.04% (127.66 - 4 hours respectively 26.66 - 6 hours) (fig. 2).

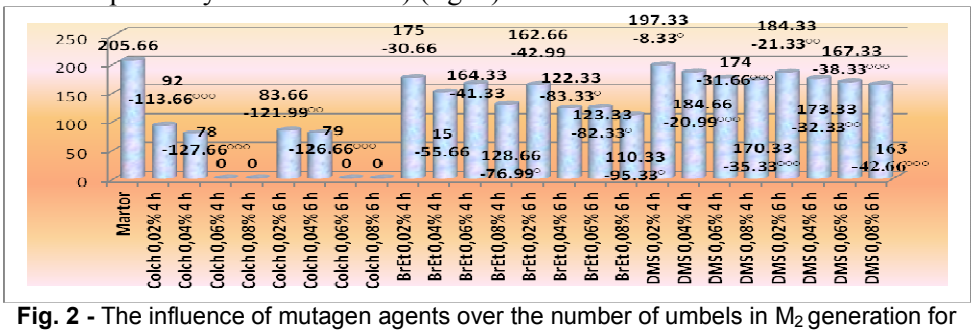


Fig. 2 - The influence of mutagen agents over the number of umbels in M_2 generation for Omagiu variety

The ethidium bromide had a negative effect over the number of umbels, leading to significant differences compared to control sample, to treatments with an exposure time of 6 hours at concentrations of 0.04% (83.32), 0.06% (82.32) and 0.08% (95.32) (fig. 2).

The DMS led to a pronounced decrease in the number of umbels: for the 0.04% (20.99), 0.06% (31.66) and 0.08% (35.32) concentrations, with a 4 hours treatment time and respectively the 0.06% (38.32) and 0.08% (42.66) concentrations, with the time of exposure of 6 hours (fig. 2).

The number of fruit per plant

Sandra variety

Control sample for the Sandra variety recorded an average number of fruits per plant of 1658.66 (fig. 3).

The colchicines treatments for this variety, for concentration of 0.04% (984.99 - 4 hours respectively 1337.99 - 6 hours) and for concentration of 0.02% (1246.99 – 6 hours) had a strong effect by reducing the number of fruits per plant, the differences being very significant compared to the control sample (fig. 3).

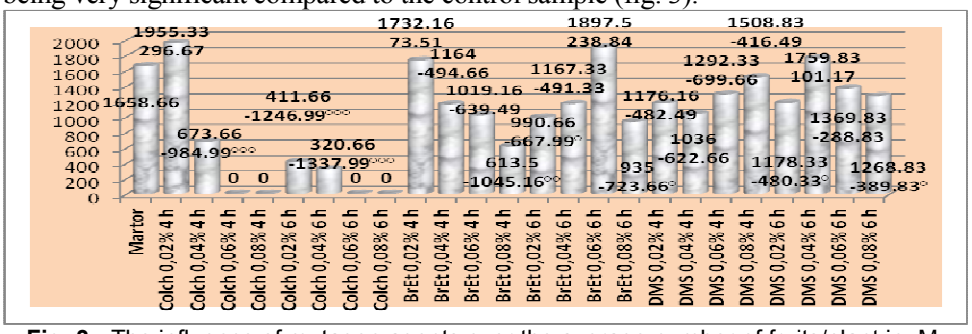


Fig. 3 - The influence of mutagen agents over the average number of fruits/plant in M_2 generation for Sandra variety

Ethidium bromide and dimethyl sulphyte at concentrations of 0.02% (667.99 respectively 480.32) and 0.08% (723.66 respectively 389.82), with a 6 hours exposure time, had a reducing effect with significant differences from the control sample (fig. 3).

Omagiu variety

The number of fruits per plant for the Omagiu variety registered both negative and positive differences compared to the control sample (average control 1121.83) (fig. 4).

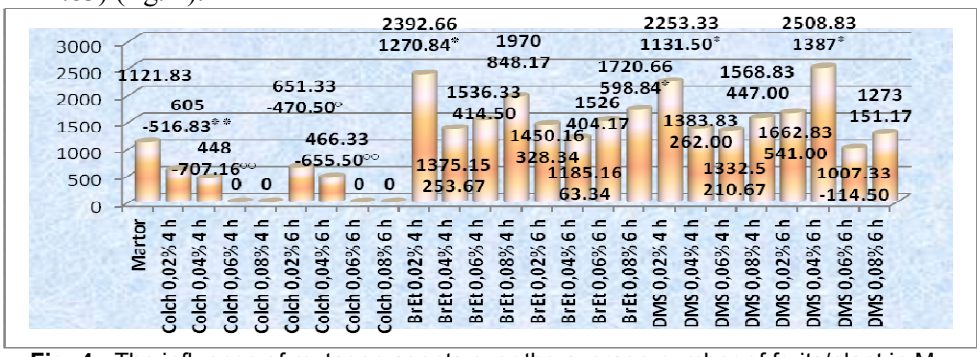


Fig. 4 - The influence of mutagen agents over the average number of fruits/plant in M_2 generation for Omagiu variety

The treatment with colchicine at concentration of 0.04% with a 4 and 6 hours treatment caused decreases in the number of fruits per plant with distinct significant differences from control sample (707.16 - 4 hours respectively 655.49 - 6 hours) (fig.4).

The colchicine in concentration of 0.02% with a 4 hours treatment time produced positive differences, distinct significant (516.83) compared to the control sample.

Ethidium bromide and dimethyl sulphate had the effect of increasing the number of fruits per plant at a concentration of 0.02% for the 4 hours treatment time, leading to significant differences compared to the control sample (1270.83 or 1131.50) (fig. 4). With a duration of 6 hours, the treatment with etidium bromide with a concentration of 0.08% (598.83) and dimethyl sulphate with a concentration of 0.04% (1387.00) showed significant differences compared to the control sample (fig. 4).

Fruit / plant weight

Sandra variety

Regarding the fruit weight yielded per plant, Sandra variety recorded an average of 8.33 (fig. 5). For this variety, ethidium bromide in concentration of 0.06% (2.99) with a 6 hours treatment time, had the effect of increasing the weight of fruits per plant, showing a significant difference from the control (fig. 5).

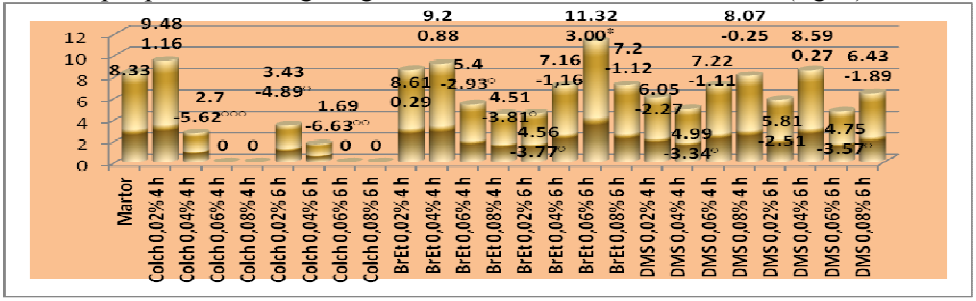


Fig. 5 - The influence of mutagen agents over the average weight of fruits/plant (gr) in M_2 generation for Sandra variety

The 4 hours treatment with colchicine in concentration of 0.04% (5.62) showed an effect of reducing the weight of fruits per plant, which led to very significant differences compared to the control sample (fig. 5).

Dimethyl sulphate resulted in a significant difference compared to the control sample at a treatment of 4 hours exposure time with the concentration of 0.04% (3.33) and handling time of 6 hours at the concentration of 0.06% (3.57) (fig. 5).

Omagiu variety

Regarding the fruit weight yielded per plant, Omagiu variety recorded an average of 6.16 (fig. 6).

At a treatment time of 6 hours, the colchicine in concentrations of 0.02% (3.77) and 0.04% (3.46) had negative effects, very significant compared to the control sample (fig. 6).

At a concentration of 0.02% (3.87) and with a 4 hours treatment time, the colchicine determined significant positive difference compared to the control sample (fig. 6).

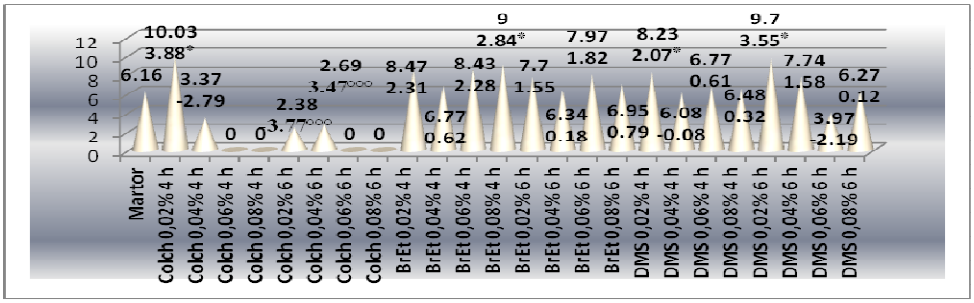


Fig. 6 - The influence of mutagen agents over the average weight of fruits/plant (gr) in M_2 generation for Omagiu variety

The dimethyl sulphate treatments with duration of 4 and respectively 6 hours at concentration of 0.02% (1.07-4 hours respectively 3.57- 6 hours) resulted in a significant positive difference, compared with the control (fig. 6).

The ethidium bromide had an effect of increasing fruit weight per plant at the concentration of 0.08% (2.84) at the 4 hour treatment, the difference being significant compared with control sample (fig. 6).

CONCLUSIONS

1. In M_2 generation, to both Sandra variety and Omagiu variety, the number of umbels per plant was reduced following the treatment with colchicine for an 4 hours exposure, the differences being very significant compared to the control sample (0.02%: 119.33 respectively 113.66, 0.04%: 134.66 respectively 127.66).

2. The 4 hours treatments with ethidium bromide and dimethyl sulphate in the concentration of 0.02% for Omagiu variety, the average number of fruits per plant increases compared to control sample, differences being significant (1270.84 respectively 1131.50).

3. The 6 hours treatments with colchicine led to a decrease in the average fruit weight yielded per plant at the Sandra variety (0.04%: 6.63) and Omagiu variety (0.02%: 3.77; 0.04%: 3.46), the differences being very significant compared to the control sample.

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THE EFFECT OF CHEMICAL MUTAGEN AGENTS ON SOME MORPHOLOGICAL CHARACTERS TO *ARACHIS HYPOGAEA* L.

EFECTUL AGENȚILOR MUTAGENI CHIMICI ASUPRA CARACTERELOR MORFOLOGICE LA ARAHIDE (*ARACHIS HYPOGAEA* L.)

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Abstract. *Arachis hypogaea L. is an annual herb belongs to the Fabaceae family, native to South America origine and has 2n = 40 chromosomes genom (Marin, 2011). In this paper we present some biometrical data obtained during vegetation period of peanuts, for seeing the effect of some mutagen agents on the plants in M_1 generation.. The M_1 generation of plants was obtained from treated seeds with three types of chemical mutagen agents, like : ethyl methane sulfonate, dimethyl sulfate and sodium azide. Ethyl methane sulfonate and dimethyl sulfate concentration were 0.2%, 0.4%, 0.6% and 0.8% and sodium azide concentration was 0.02%, 0.04% , 0.06% and 0.08%, each concentration having six hours for action time. Thus, it was determined: plant height, number of branches and number of umbels. Thus, the wealth of new biological material can be isolated useful forms for use in the process of creating new varieties.*
Key words: *ethyl methanesulfonate, dimethyl sulfate, sodium azide, Arachis hypogaea L.*

Rezumat. *Arachis hypogaea L. este o plantă anuală, din familia Fabaceae, originară din America de Sud (2n=40) (Marin, 2011). În lucrare sunt prezentate câteva observații biometrice realizate în timpul perioadei de vegetație a arahidelor în scopul determinării acțiunii agenților mutageni asupra plantelor în generația M_1. Această generație a fost obținută din semințe tratate cu trei tipuri de agenți mutageni chimici şi anume etilmetansulfonat, sulfat de dimetil şi azidă de sodiu. Etilmetansulfonatul şi sulfatul de dimetil au fost în doze de 0,2%, 0,4%, 0,6% şi 0,8%, iar azida de sodiu a fost în doze de 0,02%, 0,04%, 0,06% şi 0,08%, fiecare concentrație având ca timp de acțiune de şase ore. În felul acesta, din bogăția de material biologic nou se pot izola formele utile în vederea folosirii acestora în procesul de creare a noi soiuri.*
Cuvinte cheie: *etil metansulfonat, sulfat de dimetil, azidă de sodiu, Arachis hypogaea L.*

INTRODUCTION

Arachis hypogaea L. is an annual herb belongs to the Fabaceae family, having 2n=40 chromosomes genom. The plant are native to South America origine. In Europe peanuts were brought by portuguese sailors in the sixteenth century (Pop et al., 1986).

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Peanuts are particularly important because of high seed protein content (25-34%) and fat (45-60%) (Marin, 2011). The world production of oil, peanuts ranked third (over 3 million tons annually), being as soybean, sunflower and before cotton (Marin, 2011).

Savage and Keenan (1994) shows that seeds of peanuts contain between 44-56% fat and 20-30% protein, which are also a rich source of minerals (phosphorus, calcium, magnesium and potassium) and vitamins (group E, K, and B).

MATERIAL AND METHOD

Biological material was represented by plants of *Arachis hypogaea* L. in generation M1, varieties: Tâmbureşti, Jelud, black Brazilian and L 1984 line. The M1 generation of plants was obtained from treated seeds with three types of chemical mutagen agents, like: ethyl methanesulfonate (EMS), dimethyl sulfate (DMS) and sodium azide (SA). EMS and DMS solutions were made in concentration of 0.2%, 0.4%, 0.6% and 0.8%, and the SA solution was in concentration of 0.02%, 0.04%, 0.06% to 0.08%, each concentration having six hours for action time.

Observations on the plant height, number of mature pods and thousand-grain mass were made in the experimental field of the farm Ezăreni in Science Teaching Station in Iasi,in 2012.

The results obtained were processed using mathematical and statistical methods: analysis of variance and differences limit.

RESULTS AND DISCUSSIONS

After treatment with mutagenic agents are obtained numerous mutations that show changes in morphological characters. Under the influence of chemical mutagens, mitotic cell division changes, induces the morphological changes of plants.

The plant height was influenced very significant by applying mutagens and their concentration in M1 generation.

As the plant height, the control had an average value of 24.33 cm to Tâmbureşti variety, 35.66 cm to Jelud variety , 36 cm to L 9184 line and 41 cm to Brazilian black variety (fig. 1).

The Tâmbureşti variety, stimulation effects on plant height were evident after treatment with ethyl methanesulfonate in concentration of 0.2% (4.03) and 0.4% (4.7), the difference was significant and distinct significant compared to the control (fig. 1).

Dimethyl sulfate also produced a growth enhancing of plant height in concentration of 0.2% (7.36) and 0.4% (10.03), the difference from the control were very significant. With increasing concentration of dimethyl sulfate a gap has been found in plant height concentration of 0.6% (2.63) and 0.8% (3.63), the difference was distinct significant compared to the control (fig. 1).

The plant height at the Tâmbureşti variety treated with sodium azide was negative, distinct significant, compared the control in concentration of 0.02% (1.63) and negative, very significant in concentration of 0.04% (2.3) and 0.06% (3.96) (fig. 1).

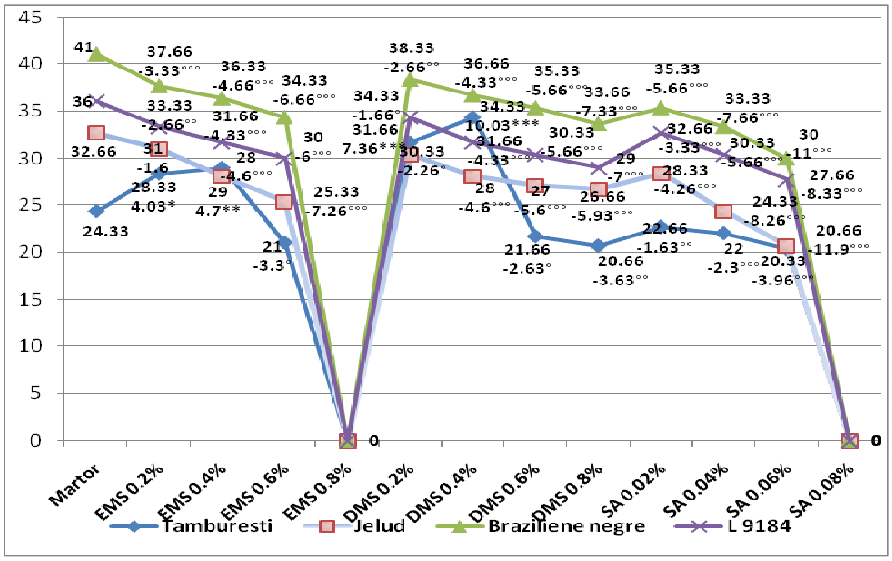


Fig. 1 – Influences of mutagen agents on plant height and its significance in M1 generation

Treatments with three mutagenic at the Jelud variety produced significant decreases and very significant in plant height compared to the untreated control (fig. 1).

Treatments with ethyl methanesulphonate had a reduction effects on the plant height, in the treatment with the solution concentration of 0.4% (4.6) and 0.6% (7.26), the difference was very significant compared to the control (fig. 1).

Treatments with dimethyl sulphate caused a pronounced deficit on the plant height in particular at concentrations of 0.4% (4.6) 0.6% (5.6) and 0.8% (5.96), the difference was very significant compared to the untreated control (fig. 1).

Effect of sodium azide reduction was the most pronounced on the Jelud variety in the plant height, even at concentration of 0.02% (4.26). At concentrations of 0.04% (8.26) and 0.06% (11.9) was a deficit of plant height, the differences was very significant compared to the control (fig. 1).

After treatment with sodium azide, at black Brazilian variety was observed a pronounced decrease in plant height at concentrations of 0.04% (7.66) and 0.06% (11), the difference was very significant compared to the control (fig. 1).

Treatments with EMS at the line L 9184 in concentrations of 0.4% (4.33) and 0.6% (6) had an inhibitory effect on plant height, the difference was very significant compared to the control. A decrease in plant height was recorded at the treatment with sodium azide in concentrations of 0.04% (5.66) and 0.06% (8.33), the difference was very significant compared to the control (fig. 1).

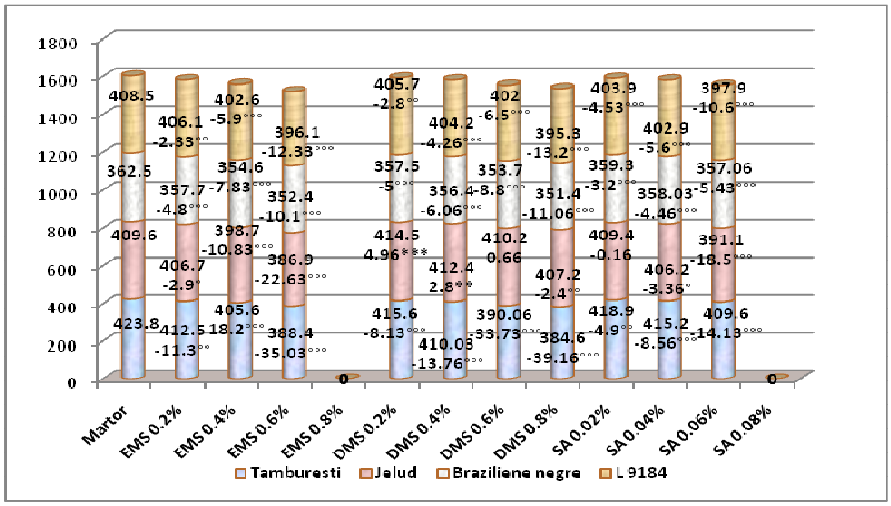


Fig. 2 - Influences of mutagen agents for thousand-grain mass and its significance in M1 generation

The thousand-grain mass at control variants recorded an average value of 362 g to black Brazilian variety, 408.5 g to line L 9184, 409.6 g to Jelud variety and 423.8 g to Tâmbureşti variety (Fig. 2).

The thousand-grain mass, at Tâmbureşti variety, differences from control was negative, very significant for the EMS treatments in concentrations of 0.4% (18.2) and 0.6% (35, 03) (fig. 2).

Treatments with sodium azide recorded a deficit for thousand-grain mass, for the concentration of 0.04% (8.56) and 0.06% (14.13), the difference was very significant compared to the control (fig. 2).

In the case of the Jelud variety it has been found a very significant decrease of the thousand-grain mass after treatment with EMS in concentrations of 0.4% (10.83) and 0.6% (22.63) (fig. 2).

Dimethyl sulfate at Jelud variety had an increasing effect of the thousand-grain mass at variants with concentrations of 0.2% (4.96) and 0.4% (2.8) ,differences was distinct and very significant from the control. The most pronounced effect of sodium azide was observed at the concentration of 0.06% (18.5), the difference from the control was negative, very significant (fig. 2).

The line L 9184 with EMS treatments at concentrations of 0.4 (5.9) and 0.6% (12.33) had an decreasing effect of the thousand-grain mass, the differences was very significant compared to the control. Dimethyl sulfate resulted a decrease in the thousand-grain-mass at a concentration of 0.8% (13.2), the difference compared to the control was considered to be very significant (fig. 2).

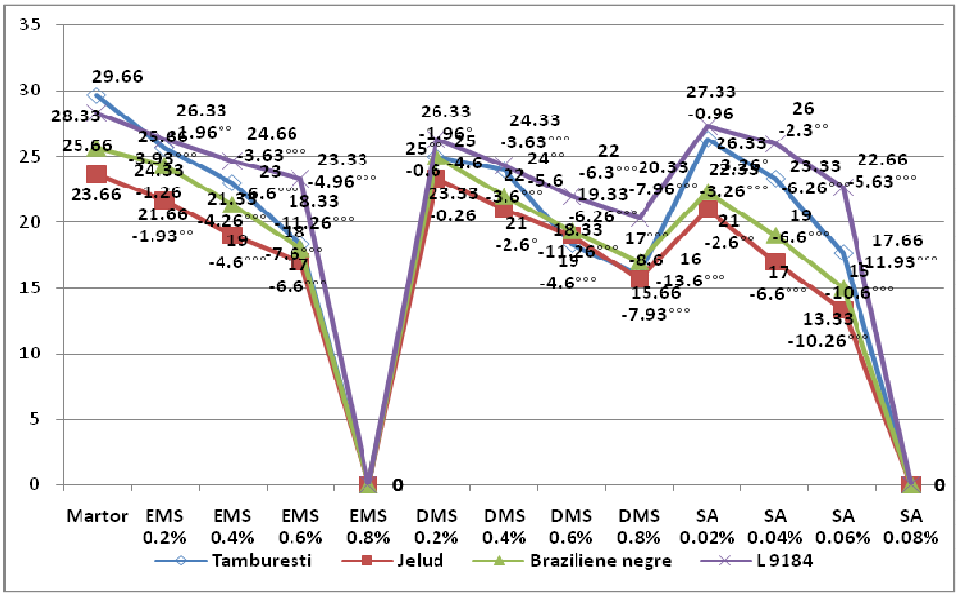


Fig. 3 - Influences of mutagen agents on the number of mature pods and its significance in M1 generation

Regarding the number of mature pods per plant, the control had an average value of 23.66 in Jelud variety, 25,66 to Brazilian black variety, 28,33 to line L 9184 and 29,66 to Tâmbureşti variety (fig. 3).

The variety Tâmbureşti recorded lower values from the control in terms of the number of mature pods per plant at treatment with EMS concentration of 0.4% (6.6) and 0.6% (11.26) (differences very significant) (fig. 3).

A decrease in the number of mature pods per plant was recorded at dimethyl sulfate treatments, the difference from the control was distinct significant at concentrations of 0.2% (4.6) and 0.4% (5.6) and very significant at concentrations of 0.6% (11.26) and 0.8% (13.6). At treatments with sodium azide it has been found a deficit very significant in the number of mature pods per plant in concentration of 0.04% (6.26) and 0.06% (11,93) (fig. 3).

After treatment with EMS the Jelud variety was observed a distinct decrease significant in the number of mature pods per plant in concentration of 0.2% (1.93), followed by decreases very significant in the concentration of 0.4% (4, 6) and 0.6% (6.6) compared with the untreated control. In the case of treatment with dimethyl sulfate, the number of mature pods per plant was a very significant decrease in concentration of 0.6% (4.6) and 0.8% (7.93) from untreated control (fig. 3).

Compared with untreated control, the concentration of 0.04% (6.6) resulted in treatment with sodium azide a reduction in the number of mature pods per plant (significant differences), and with concentration of 0.06% (10.26) and 0.08% (10.26) were recorded only differences very significant from the control (fig. 3).

The black Brazilian variety at treatment with ethyl methanesulfonate, concentration of 0.4% (4.26) and 0.6% (7.6) resulted a very significant reduction in the number of mature pods per plant compared to untreated control. Regarding the number of mature pods per plant treatment with dimethyl sulfate, in concentration of 0.6% (6.26) and 0.8% (8.6) had recorded differences negative , very significant compared to the control. In the case of treatment with sodium azide, the difference from the control was negative, distinct significant , in concentration of 0.02% (3.26) and very significant in concentrations of 0.04% (6.6) and 0.06 % (10.6) (fig. 3).

Treatment with EMS to line L 9184 resulted a decrease distinct significant the number of mature pods per plant in concentration of 0.2% (1.96) and very significant in concentration of 0.4% (3.63) and 0.6% (4.96) compared with the untreated control (fig. 3).

Treatment with dimethyl sulfate had a significant decrease in the number of mature pods per plant at concentration of 0.4% (3.63) 0.6% (6.3) and 0.8% (7.96) the difference were very significant compared to the control. After treatment with sodium azide it has been found a distinct significant decrease in concentration of 0.04% (2.3) and very significant in concentration of 0.06% (5.63) (fig. 3).

CONCLUSIONS

1. After treatment it was found a reducing plant height, thousand-grain mass and the number of mature pods per plant with increasing mutagen concentration used, recording differences distinct significant and very significant compared with untreated control.

2. At treatment with ethyl methanesulphonate the black Brazilian variety, concentrations of 0.4% and 0.6% resulted a reduction very significant in the number of mature pods per plant compared to untreated control.

3. Dimethyl sulfate to Jelud variety has an increase effect of the thousand-grain mass on variants with concentrations of 0.2% and 0.4% the difference was very significant compared to the control.

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BIOCHEMICAL AND FUNCTIONAL ALTERATIONS IN THE PHOTOSYNTHETIC APPARATUS OF *RUBUS IDEAUS* L. IN RESPONSE TO WATER AND LIGHT ENVIRONMENT

ALTERĂRI BIOCHIMICE ŞI FUNCŢIONALE ÎN APARATUL FOTOSINTETIC DE *RUBUS IDEAUS* L. CA RĂSPUNS LA LUMINĂ ŞI CANTITATEA DE APĂ DIN SOL

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Abstract. *In higher plants, the CO_2 availability and light intensity are liable to be limiting under conditions of water stress, due to the closure of stomata and photoinhibition. Under such conditions, cells are likely to experience oxidative stress, due to the formation of reactive oxygen species associated with the absorption of light by chlorophylls. The aim of this work was to investigate the effects of water and light on the functional and biochemical parameters of photosynthetic apparatus in two red raspberry cultivars (Opal and Ruvi) cultured in field conditions. Plants have been divided into two categories; one category was used as control and maintained in optimal water conditions by irrigation; a second category was not irrigated, thus exposed to water deficit. In each category, 50% plants were exposed to 100% sunlit (HL) and 50% plants were shaded and exposed to 25% sunlit (LL). The functionality of photosynthetic apparatus after dark and light adaptation was assessed through chlorophyll fluorescence measurements using Handy Pea. Chlorophylls and carotenoids were also quantified. The results showed that some parameters had a higher degree of sensitivity to the experimental conditions than others. From all photosynthetic parameters, the performance index (Pi) showed the largest variations among plants from different experimental categories.*
Key words: *raspberry, water deficit, JIP test, chlorophylls*

Rezumat. *În plantele superioare, disponibilitatea CO_2 şi intensitatea luminii pot deveni factori limitativi ai fotosintezei în condiţii de stres hidric, ca urmare a închiderii stomatelor şi fotoinhibitiei. În aceste condiţii, celulele sunt susceptibile de a experimenta stresul oxidativ, datorită formării speciilor reactive de oxigen asociate cu absorbţia luminii de către clorofile. Scopul acestei lucrări a fost acela de a investiga efectele apei şi intensitatii luminii asupra parametrilor funcţionali şi biochimici ai aparatului fotosintetic în doua cultivare de zmeur (Opal si Ruvi) cultivate în condiţii de camp. Plantele au fost împărţite în două categorii: o categorie a fost folosita ca si control fiind mentinuta în condiţii optime de apă prin irigare; a doua categorie a fost neirigata si deci expusa stresului hidric. În fiecare categorie, 50% plante au fost expuse la 100% radiatie solara (HL) şi 50% plante au fost umbrite şi*

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expuse la 25% radiatie solara (LL). Funcţionalitatea aparatului fotosintetic, după adaptarea la intuneric si lumina a fost evaluată prin măsurarea fluorescenţei clorofilei folosind HandyPea. Clorofilele si carotenoizii au fost, de asemenea, cuantificate. Rezultatele au aratat ca unii parametri au avut un grad mai mare de sensibilitate la condiţiile experimentale decât altii. Dintre toţi parametrii fotosintetci investigati, indicele de performanta (Pi) a aratat cele mai mari variaţii între plantele din diferite categorii experimentale.
Cuvinte cheie: *zmeur, deficit hidric, JIP test, clorofile*

INTRODUCTION

Raspberries (*Rubus ideaus* L.) need an abundant supply of water at all times and, therefore, water deficit may drastically affect plant growth and development. One of the first physiological responses to water limitation in plants is stomatal closure which results in the decrease in photosynthetic carbon assimilation and may imbalance the photosynthetic electron transfer. If photosynthesis is inefficient, excess light energy must be dissipated to avoid damaging the photosynthetic apparatus. Energy can be dissipated as heat (non-photochemical quenching) or emitted as chlorophyll fluorescence.

A number of studies showed that chlorophyll fluorescence measurements could be used to estimate, rapidly and non-invasively, the responses of plants to abiotic stress including drought. Moreover, using this method, the effect of stress in plants can be detected before any symptoms can be observed visually (Živčák et al., 2008). Recently, chlorophyll fluorescence was used to measure heat tolerance for a segregating population of field-grown raspberries (Molina-Bravo et al., 2011) or for evaluation of drought stress in strawberry (Razavi et al., 2008). The aim of this work was to investigate the effects of water and light intensity on the functional and biochemical parameters of photosynthetic apparatus in two red raspberry cultivars (Opal and Ruvi) cultured in field conditions.

MATERIAL AND METHOD

Two raspberry (*Rubus idaeus* L.) cultivars, Ruvi and Opal were cultured in June 2011 at the experimental station "V. Adamachi" from Iasi, Romania. After a month of acclimation to field conditions 50% of plants were covered with a net retaining 75% of the solar radiation (LL). The other half of plants were not covered, thus exposed to full sunlight (HL). All plants were irrigated until the field capacity reached 90%. At this time (T0) we measured photosynthesis and collected leaf samples for pigment analysis. After that time half of plants of each light treatment were maintained well watered by irrigation (90% FC) and used as controls, and the other half plants were subjected to water deficit treatment by withholding irrigation until the end of experiments. Leaf samples and photosynthesis measurements were taken after 2 (T1), 5 (T2), and 10 (T3) weeks from T0.

To measure the photosynthetic pigments, the leaves were thoroughly homogenized in chilled 80% acetone in the dark at 4^0C. The homogenate was centrifuged at 4500 rpm for 10 min. The supernatants were collected and the absorbances were read at 663, 646 and 470 nm using a T70 UV/VIS

spectrophotometer (PG Instruments Ltd., London, UK). The photosynthetic pigments were calculated following the equations of Lichtenthaler (1987).

Chlorophyll a fluorescence was measured using HandyPea (Hansatech Ltd., Norfolk, UK). The transients were induced by a red light (peak at 650 nm) of 3000 μmols $m^{-2}s^{-1}$ provided by an array of six light-emitting diodes (for details, see Strasser et al., 1995). The leaves were dark-adapted for 30 min before the fluorescence measurements. Excitation of leaves with red actinic light resulted in the rise of Chl fluorescence from the initial O-level (F0) to the maximum P-level (Fm) with two intermediate steps J and I. The fluorescence signal at 50 μsec after the onset of illumination was considered as F0 (Strasser and Strasser, 1995). The J step was the fluorescence measured at 2 ms while the I step was the fluorescence value recorded at 30 ms. The variable fluorescence, Fv (the difference between the initial fluorescence, F0, and the maximal fluorescence, Fm in dark adapted leaves) was used to calculate the Fv/Fm ratio. Data from fluorescence measurements were analyzed using the JIP-test. Several parameters such as absorbance per reaction centers (ABS/RC), energy dissipation per reaction center (DIo/RC) and the performance index (Pi) were calculated according to Strasser and Strasser (1995). All data were subjected to t-test analysis at the $P<0.05$ probability level using SPSS 20.0 software package. The results are given as the difference (Δ) between the values obtained for irrigated and non-irrigated plants.

RESULTS AND DISCUSSIONS

Alterations induced by water deficit in the fluorescence parameters. The Fv/Fm ratio is a measure of the photosynthetic efficiency of a dark-adapted sample. An Fv/Fm value in the range of 0.79 to 0.84 is the approximate optimal value for many plant species, with lower values indicating plant stress (Maxwell and Johnson, 2000). During experiments, the Fv/Fm values maintained at 0.78±0.05 irrespective of measurement time, treatment or cultivar which means that PSII functionality was not affected (Fig. 1).

The ABS/RC describes the absorption flux per RC and gives information on antenna size. During T0-T2 there were no differences in the ABS/RC between control and non-irrigated plants in Ruvi+HL. In contrast the ΔABS/RC had negative values in T3 fact that suggests an increase in antenna size in non-irrigated plants probably due to the cumulative effects of water deficit and a reduction in light intensity. A similar situation was found in Opal+HL. An enlargement in antenna size was also found in non-irrigated plants grown under LL conditions but at different times (T1 in Opal and T2 in Ruvi) (Fig. 1).

The heat dissipation capacity (DI0/RC) indicates the rate of the total dissipation of untrapped excitation energy from all RCs with respect to the number of active RCs. Dissipation in this context refers to the loss of absorbed energy through heat, fluorescence and energy transfer to other systems (Strasser et al., 2004). In our study DI0/RC was higher in non-irrigated plants, mainly at T2 with Ruvi showing the lowest ΔDI0/RC values. The loss of fluorescence at T2 might be due to the cumulative effects of water and temperature. However, it was not accompanied by changes in the Fv/Fm ratio and thus it can be seen as a protective mechanism of PSII functionality (Fig. 1).

The performance index Pi may be used to estimate the degree of plant vitality because it includes three independent parameters: the density of fully active reaction centers (RCs); the efficiency of electron movement by trapped exciton into the electron transport chain beyond the QA; and the probability that an absorbed photon will be trapped by RCs (Strasser et al. 2004). Figure 1 depicts that soil water and light conditions highly influenced the performance index. The ΔPi had positive values that continusly increased from T0 to T3 in both cultivars maintained under HL conditions (Fig. 1).

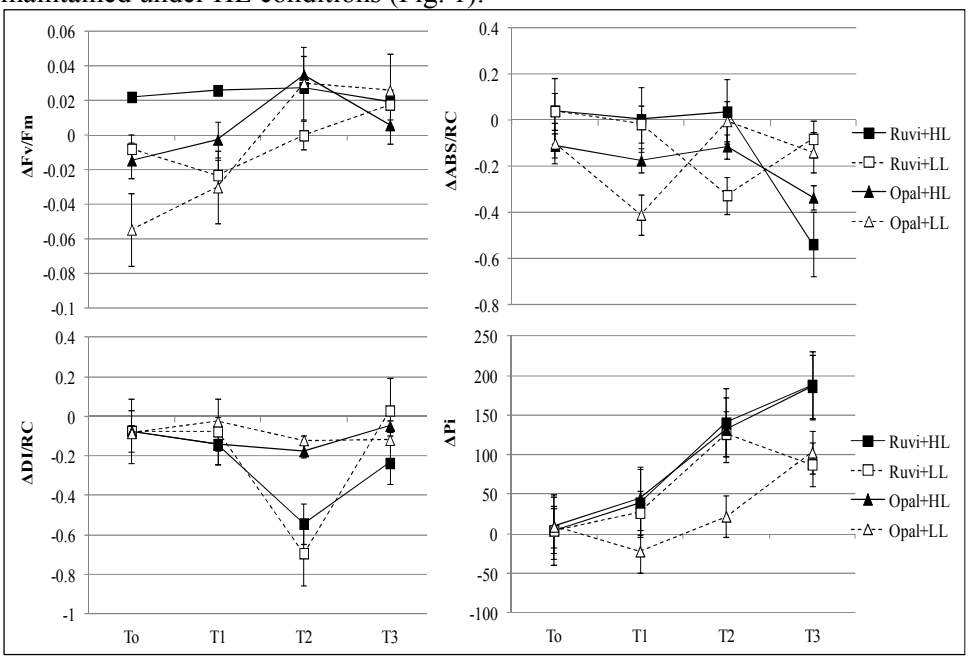


Fig. 1 - Differences (Δ) in the maximum quantum yield of PSII photochemistry (Fv/Fm), absorbance per reaction centers (ABS/RC), dissipation of excess energy (DI/RC) and performance index (Pi) between irrigated and non-irrigated plants during exposure of two raspberry cultivars to water deficit under full sunlight (HL) and reduced sunlight (LL) conditions

However, in Opal control plants grown under LL had lower Pi values than those grown under HL. Moreover, water stressed plants grown had the same photosynthetic performance with control plants. These results suggest that Opal is more sensitive to LL than HL but in conditions of water deficit it also became sensitive to HL (Fig. 2), due to a reduction in the density of active reaction centers and electron transport rate (data not shown). A different situation was found in Ruvi where from T0 to T2 control plants had the same Pi irrespective of the light treatment. These data suggest that the Pi response to water deficit in Ruvi was not influenced by light intensity. However in T3 the photosynthetic performance of LL grown plants was higher than in HL-grown plants due to changes in the proportion of active reaction centers (data not shown) (Fig. 2).

It is well known that chlorophyll content is one of the major factors affecting photosynthetic capacity. Alterations in chlorophyll content of plant under drought stress have been observed in different plant species and they depended on stress intensity and duration (Kyparissis et al., 1995). In our study we found that the amount of total chlorophylls was higher in non-irrigated plants because ΔChls had negative values among treatments. Prolonged water deficit increased even more the amount of total chlorophylls in plants maintained under HL conditions and therefore the corresponding ΔChls had lower values in T2 than in T1 (Fig. 3). Increases in chlorophyll content under drought stress were also reported by Mensah et al. (2006) for sesame or Beeflink et al. (1985) for onion. A similar pattern was found for carotenoids which increased in plants exposed to water deficit (data not shown).

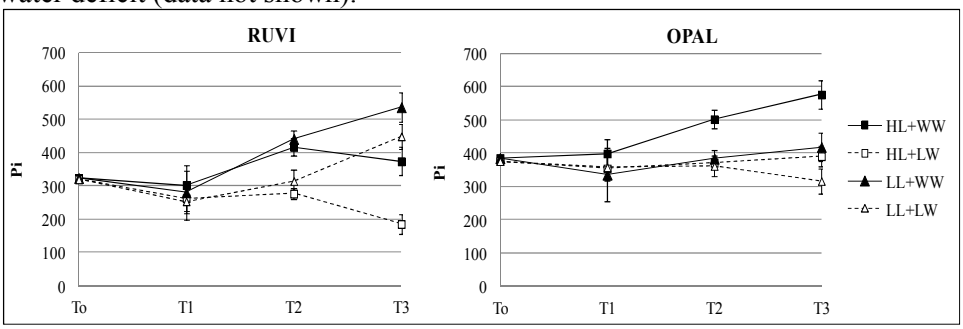


Fig. 2 - Alterations in the performance index (Pi) during exposure of two raspberry cultivars to well-watered (WW) and water deficit (LW) conditions in full (HL) and reduced (LL) sunlight

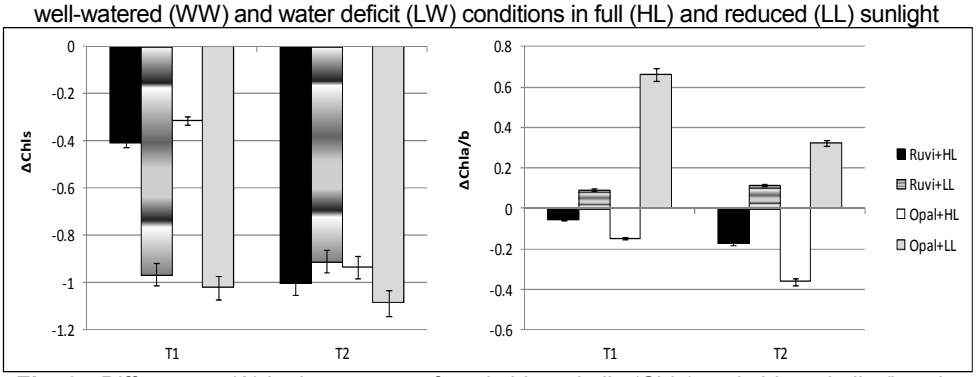


Fig. 3 - Differences (Δ) in the amount of total chlorophylls (Chls) and chlorophyll a/b ratio (Chl a/b) between irrigated and non-irrigated plants during exposure of two raspberry cultivars to water deficit under full sunlight (HL) and reduced sunlight (LL) conditions

The Chl a/b ratio showed large variations among treatments. In T1 as well as T2 the ΔChl a/b had negative values in plants grown under HL conditions and positive in those grown under LL which means that water deficit decreased the Chl a/b ratio in LL plants but increased it in HL plants (Fig. 3). Since Chl a/b ratio is an indicator of light harvesting size (Givnish, 1988) one may assume that antenna increased under a combination of LL and water deficit. Further

investigations are needed to understand the role of light during acclimation of raspberry plants to water deficit.

CONCLUSIONS

1. Soil water deficit induced changes in the functionality of photosynthetic apparatus that culminated with the decrease of photosynthetic performance.

2. The response of cultivars to water deficit was modulated by light intensity. In general, Opal was more sensitive to shade conditions than Ruvi.

3. Water deficit did not alter the chlorophyll content but it induced changes in the chlorophyll pattern.

4. Pi can be used as screening tool for drought tolerance in raspberry.

***Acknowledgment**: The present work was supported by the EU-funding grant POSCCE-A2-O2.1.2-2009-2 ID.524, cod SMIS-CSNR 11986.*

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THE INFLUENCE OF WATER DEFICIT AND LIGHT INTENSITY ON BLACKBERRY FRUIT YIELD AND QUALITY

INFLUENȚA STRESULUI HIDRIC ȘI A LUMINII ASUPRA PRODUCȚIEI ȘI CALITĂȚII FRUCTELOR DE MUR

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Abstract. *An overwhelming body of research has now firmly established that the dietary intake of berry fruits has a positive and profound impact on human health, performance, and disease. This work aimed to investigate the effects of light intensity and water deficit on fruit quality and productivity in two blackberry cultivars, Thornfree and Lochness. Plants were grown for two consecutive years during summer under 100% (HL) and 25% (LL) sunlight conditions with (WW) and without (LW) irrigation. Both cultivars produced large amounts of fruits under HL+WW conditions. Under water deficit the fruit yield and weight decreased in Thornfree while it increased in Lochness plants grown under LL conditions. Soluble solids content did not change in plants exposed to HL but it decreased slightly in both cultivars under LL conditions. Soluble sugars decreased only in Thornfree under LL.In both cultivars fruits harvested from non-irrigated plants showed lower titrable acidity values than irrigated plants. Light and water treatment did not affect the amount of total phenolics, but water deficit decreased anthocyanins in both cultivars when plants were grown under LL conditions. The potential use of both cultivars in future breeding programs is discussed.*
Key words: *blackberry, soluble sugars, SSC, acidity, phenolics, anthocyanins.*

Rezumat. *Numeroase cercetări au dovedit faptul că includerea fructelor de pădure în alimentație are un impact pozitiv și profund asupra sănătății umane, performanței şi stării de boală. Accentuarea gustului, îmbunătățirea aspectului, creşterea fermității și termenului de valabilitate al fructelor contribuie la stimularea consumului fructelor de pădure. Prezenta lucrare a avut ca scop investigarea efectelor intensitatii luminii și deficitului de apă asupra calitatii fructelor și productivității la două soiuri de mur, Thornfree și Lochness. Plantele au fost cultivate timp de doi ani consecutivi în timpul verii în condiții de 100% (HL) și 25% (LL) lumină solară cu (WW) și fără (LW) irigare. Ambele soiuri au produs cantități mai mari mari de fructe în condiții de HL+WW. Deficitul de apă a dus la scăderea producției si greutății fructelor la Thornfree şi la creşterea lor la Lochness în condiții de LL. Conținutul de substanță solidă nu s-a schimbat în plantele expuse la HL, dar a scăzut uşor în ambele soiuri în condiții LL. Zaharurile solubile au scăzut doar în Thornfree expus la LL. La ambele soiuri fructele recoltate de la plante neirigate au înregistrat valori de aciditate titrabilă mai mici decât cele colectate de la plantele irigate. Regimul de lumină și apa nu a afectat conținutul de fenoli totali, dar deficitul de apă a scăzut antocianii în*

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ambele soiuri atunci când plantele au fost cultivate în LL. Utilizarea potențială a soiurilor respective în viitoare programe de ameliorare este discutabilă.
Cuvinte cheie: *mur, zaharuri, SUS, aciditate, compuși fenolici, antociani.*

INTRODUCTION

Blackberries are a good source of natural antioxidants (Wang et al., 1996). In addition to vitamins and minerals, extracts of blackberries are also rich in anthocyanins, flavonoids, and phenolic acids which demonstrated considerable scavenging properties of reactive oxygen species (Heinonen et al., 1998). They are effective in inhibiting oxidation of human low-density lipoproteins and thus have potential effects in preventing various human diseases (Steinberg, 1991).

The composition of nutraceuticals in blackberries is dependent on the cultivars and growth conditions. Therefore, blackberry adaptation to the environment is a fundamental process in plant breeding (Finn and Hancock, 2008). For instance, breeding plants with better drought resistance could improve the economic yield of blackberry production.

This work aimed to investigate the effects of water deficit and light microenvironment on fruit quality and yield in two blackberry cultivars in order to evaluate their potential for future breeding programs.

MATERIAL AND METHOD

Blackberry (*Rubus fruticosus* L.) fruits of two cultivars (Thornfree and Lochness) were harvested in July 2012. The experimental orchard was established in 2011 in Iasi, Romania; it was divided in two categories: HL, plants grown in full sunlight and LL, plants grown in shade conditions by covering them with a net which retained 75% sunlight (LL). Each experimental category was divided in two lots, irrigated (WW) and non-irrigated (LW). All variants (HL+WW; HL+LW; LL+WW; LL+LW) were grown under natural conditions of precipitations but the WW plants were irrigated when the field capacity dropped under 90%. Mature berries assessed by full color development were harvested from 5 plants/variant. The berries were transported to the laboratory in the same day for weighting, sample preparation and analysis. Fruit size was analyzed using ImageJ. Sugar accumulation and SSC (soluble solids content) were determined by refractometric method. Titrable acidity (TA) was estimated by potentiometric method. The content of total phenolics was determined by Folin-Ciocalteu method using gallic acid as a standard compound (Singleton et al., 1999). The total anthocyanin content was measured using the pH-differential method (Giusti and Wrolstad, 2001). At least three analyses were run for each experimental category for SSC, soluble sugars, TA, total phenolics and anthocyanins. Each analysis consisted of triplicate measurements of each sample and data were averaged over the three measurements.

RESULTS AND DISSCUSIONS

In both cultivars, the fruit yield was higher in HL+WW than in LL+WW conditions. However, Thornfree gave a higher fruit yield than Lochness, irrespective of the treatment. Under water deficit the fruit yield decreased in Thornfree (86% in HL+LW and 59% in LL+LW conditions) while it increased

about 200% in Lochness plants grown under LL+LW conditions (Fig. 1). In Thornfree, the fruit size did not significantly differ among treatments. In Lochness, non-irrigated plants produced larger fruits (about 15%) than irrigated plants (Fig. 2, Picture 1 and 2).

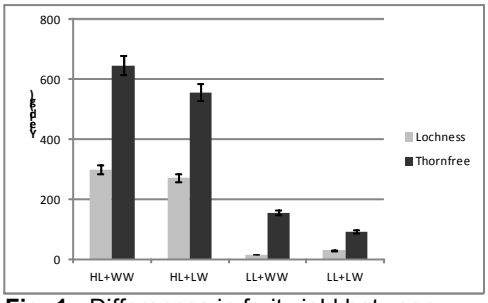


Fig. 1 - Differences in fruit yield between irrigated and non-irrigated blackberry plants grown under two different light conditions.

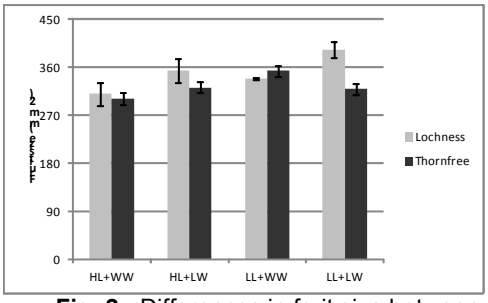
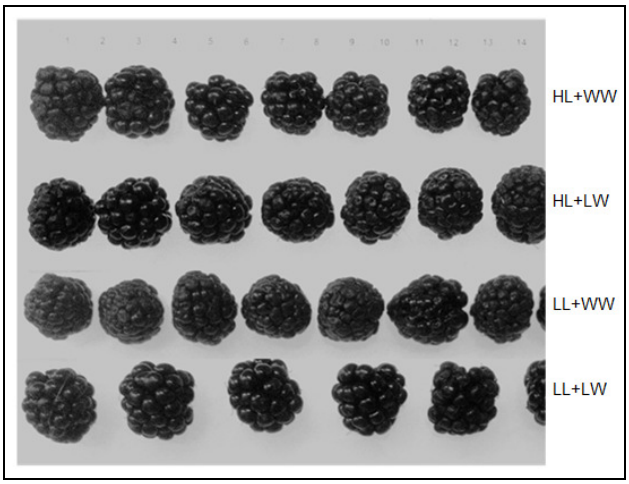
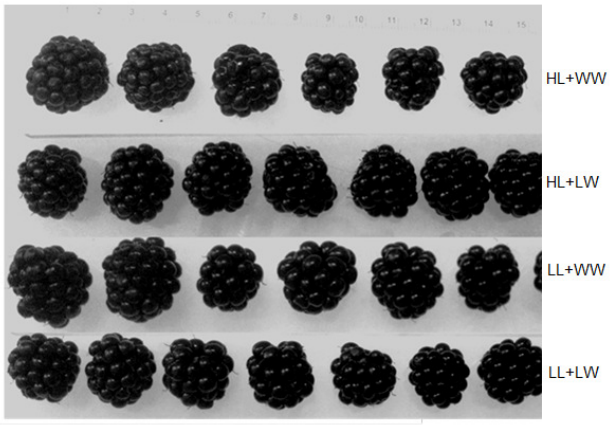


Fig. 2 - Differences in fruit size between irrigated and non-irrigated blackberry plants grown under two different light conditions.



Picture 1 - Differences in fruit size and shape between irrigated and non-irrigated blackberry Lochness cultivar grown under two different light conditions.

Under LL+LW conditions the fruit weight decreased in Thornfree (about 20%) while it increased in Lochness (about 35%). Under irrigation, Thornfree showed higher values than Lochness, mainly in LL conditions (Fig. 3). Soluble solids content (SSC) contribute to fruit flavour. A high content in sugars and acids characterizes a good berry flavour. Under irrigation, SSC values were higher in Lochness than in Thornfree, mainly in HL conditions. Under water stress SSC did not change in plants exposed to HL but it decreased slightly in both cultivars when plants were grown under LL conditions (Fig. 4).



Picture 2 - Differences in fruit size and shape between irrigated and non-irrigated blackberry Thornfree cultivar grown under two different light conditions.

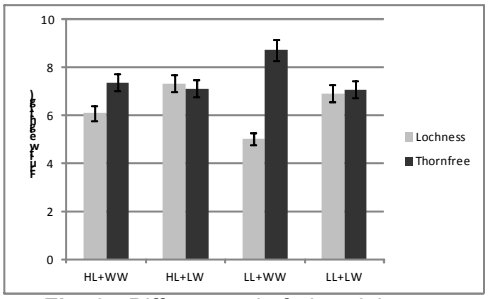


Fig. 3 - Differences in fruit weight between irrigated and non-irrigated blackberry plants grown under two different light conditions.

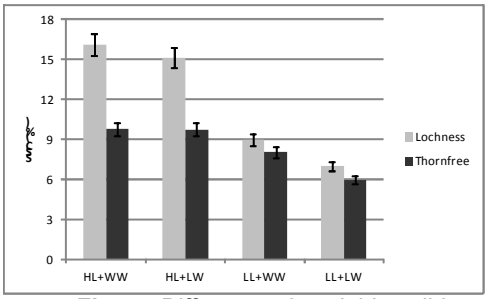


Fig. 4 - Differences in soluble solids content of fruits between irrigated and non-irrigated blackberry plants grown under two different light conditions.

Soluble sugars content was significantly influenced by light conditions. Well watered plants showed high values under HL conditions. As compared with Thornfree, Lochness had a larger amount of soluble sugars. This might be due to the conversion of starch to soluble sugars which caused also an increase in SSC. Water deficit decreased the amount of sugars in LL conditions only in Thornfree (Fig. 5).

The titrable acidity (TA) is an important determinant of fruit taste. High concentrations of organic acids help to stabilize ascorbic acid and anthocyanins. High light intensity decreased TA in both cultivars. The highest values were found in Lochness plants maintained under irrigation in LL conditions. In both cultivars non-irrigated plants showed lower values than well-watered plants (Fig. 6).

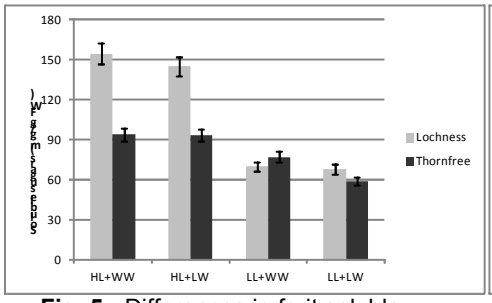


Fig. 5 - Differences in fruit soluble sugars content between irrigated and non-irrigated blackberry plants grown under two different light conditions.

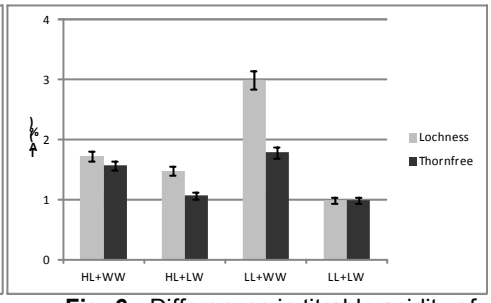


Fig. 6 - Differences in titrable acidity of fruits between irrigated and non-irrigated blackberry plants grown under two different light conditions.

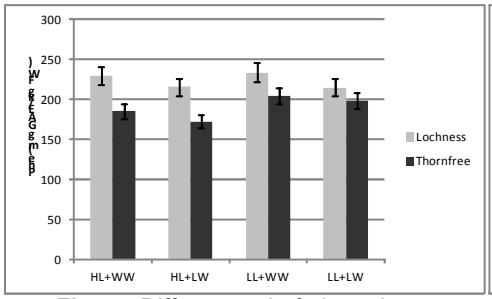


Fig. 7 - Differences in fruit total phenolics content (Phe) between irrigated and non-irrigated blackberry plants grown under two different light conditions.

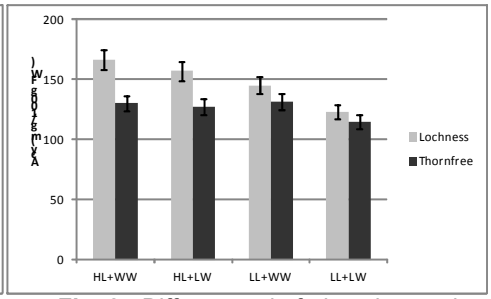


Fig. 8 - Differences in fruit anthocyanins content (Acy) between irrigated and non-irrigated blackberry plants grown under two different light conditions.

Light and water treatment did not affect the amount of total phenolics (Phe), but in Lochness the Phe contents were higher than in Thornfree mainly in plants grown under HL+WW conditions (Fig.7). Similarly, anthocyanins (Acy) were higher in Lochness than in Thornfree but water deficit decreased Acy in both cultivars when plants were grown under LL conditions (Fig. 8).

CONCLUSIONS

Based on the results of our study, a combination of high light intensity and irrigation increases the fruit yield and soluble sugars content but decreases the accumulation of organic acids. Fruit yield is higher in Thornfree than Lochness while fruit quality attributes (SSC, soluble sugars, Acy) are better in Lochness than in Thornfree. Lochness cultivar has higher adaptation capability to insufficient water and/or lower light intensities and can be recommended to growers as a commercial crop in similar conditions.

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PHOSPHORUS DISTRIBUTION IN TWO SOYBEAN CULTIVARS AND CONTENTS OF PHOSPHATES IN SOIL IN RELATION TO PHOSPHORUS AND RHIZOBACTERIA APPLICATION UNDER TEMPORARY DROUGHT

DISTRIBUȚIA FOSFORULUI ÎN PLANTELE A DOUĂ CULTIVARE DE SOIA (*GLYCINE MAX*. L.,) ŞI A CONȚINUTULUI FOSFAȚILOR MOBILI ÎN SOL LA FERTILIZAREA CU FOSFOR ŞI BACTERII RIZOSFERICE ÎN CONDIȚII DE SECETĂ TEMPORARĂ

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Abstract. *The effect of phosphorus (P) deficiency on phosphorus uptake and distribution in legumes has been widely studied under normal water conditions. However, the response of P content in roots stems and leaves of Glycine max., to low P supply is not yet fully understood in relation to water regime of soil. In this study, two cultivars of soybean were grown in low and sufficient (100 mg P* kg^{-1}*) P supply with or without of rhizobacteria application. Results show that low P decreased growth, P contents in both cultivars Zodiac and Horboveanca as well as contents of available of phosphates in soil. Under low P supply the P concentration in soybean leaves increased more pronounced in Horboveanca, than in Zodiac. Fertilization with P alone or in combination with microorganisms significantly improved the contents of available phosphates in soil irrespective of water soil regime. Thus, application of P in particular with suspension of* pseudomonas fluorescence *and* azotobacter chroococcum *improved mineral nutrition of plants in both soil moisture regimes due to increase the availability of phosphates in soil.*
Key words: *phosphorus, rhizobacteria, drought, phosphates, soybean*

Rezumat. *Influența deficitului de fosfor (P) asupra absorbției şi distribuirii fosforului la leguminoase s-a studiat în condiții optimale de umiditate. Paternul distribuției conținutului de P în rădăcini, tulpini, frunze la Glycine max. L. în cazul insuficienței de P cu aplicarea microorganismelor rizosferice nu este elucidată pe deplin în dependență de regimul hidric al solului. Două soiuri de soia au fost crescute la nivel scăzut şi suficient de P pe solul de tip cernoziom carbonatic. Rezultatele cercetării au arătat că deficitul de fosfor a micşorat creşterea, concentrația P în rădăcini şi frunze la ambele cultivare ceea ce s-a asociat cu diminuarea conținutului fosfaților mobili în sol. S-a demonstrat că Horboveanca posedă o capacitate mai bună de alocare a fosforului în frunze mai ales în condiții deficitare de fosfor. Aplicarea fosforului separat sau în combinare cu bacteriile Pseudomonus fluorescence şi Azotobacter chroococcum a îmbunătățit nutriția cu fosfor a plantelor pe ambele fonduri de umiditate ale solului prin sporirea accesibilității fosfaților din sol.*
Cuvinte cheie: *fosfor, rizobacterii, secetă, fosfați mobili, soia*

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INTRODUCTION

Phosphorus plays a key role in plant growth and metabolism, participating in photosynthesis, respiration, biosynthesis of carbohydrates, lipids, phospholipids, enzyme activation/inactivation (Raghothama, 1999). The low solubility and higher sorption capacity of phosphates in soils make it relatively unavailable to plant roots. Therefore, in such conditions phosphorus deficiency is one of the major growth-limiting factors for plants in many natural and agricultural ecosystems. Hence, it is a key constraint to accomplish the potential crops productivity (Vance et al., 2003). Legumes, in comparison to cereals, have a higher phosphorus requirement for growth, nodulation and nitrogen fixation and that's why they are more susceptible to poor phosphorus nutrition. These species contribute not only to solving the problem of protein deficiency but also have an important ecological role, improving soil fertility and reducing the dose of chemical fertilizers. The positive effect of phosphorus due to mineral fertilization or due to application of rhizosthere microorganisms (Bethenfalway et al., 1988, Gyaneshwar et al., 2002) on plant growth and phosphorus uptake has been demonstrated in a number of researches as a rule under optimal humidity (Vadez et al., 1999). The application of rhizosthere bacteria could serve as reliable alternatives to properly replace the incessant application of chemical fertilizers in order to increase crop productivity (Adesemoye et al., 2009). It was established that rhizosthere microorganisms stimulate the absorption of nutrients, particularly of low mobility such as phosphorus (Glick, 1995, Dey et al., 2004). It is known that pattern of uptake, distribution and remobilization of phosphorus within plants is affected by environmental factors (Bieleski, 1973). The mobility of phosphorus in the soil, as well as its distribution in the plant parts depends to some extent on the environmental abiotic factors, particularly the soil moisture regime. Nowadays, the phenomenon of drought is commonly spread in many agricultural regions as well as in the Republic of Moldova and Romania. Droughts negatively affect the physiological processes including mineral nutrition of plants by reducing the availability of nutrients in the soil. Phosphorus deficiency and drought are therefore a major factors contributing to poor nutrition and yield of legumes. Although these abiotic factors exist simultaneously under field conditions however their impact on agricultural crops has been mostly studied independently.

The objectives of this study were to investigate the effect of inorganic P and rhizosthere bacteria *Pseudomonas fluorescence* and *Azotobacter chroococcum* applied to two soybean cultivars on P distribution and phosphates contents in soil under temporary drought conditions.

MATERIAL AND METHOD

To accomplish the objectives of this study it was conducted out a pot experiment in a green house under controlled humidity conditions. The research included two soybean (*Glycine max*., L.) cultivars Zodiac and Horboveanca that differ

by potential productivity and responsiveness to phosphorus fertilization. The soil was cernoziom carbonated with low level of phosphorus, basic pH (7,7), which was mixed with sand in a 2:1 ratio (by volume). Seed inoculation with bacterial preparation was carried out on the basis of rhizobium japonicum. Phosphorus dose of 100 mg kg-1 was administered to the soil (P100) being regarded as sufficiently supplied with phosphorus and control treatment (P0) - deficient in phosphorus. The suspension of azotobacter chroococcum and pseudomonas fluorescens was applied to the soil before sowing. Soil moisture regime was achieved by watering to 70% of the water holding capacity of the soil (WHC) in the control as optimal value and 35% in WHC treatment option, being considered as water stress for soybean. Temporary drought regime began in the flowering stage and lasted 12 days. The plants were harvested at the end of water stress and separated into roots, leaves, stems, nodules. The total phosphorus content in plant tissues was determined by the method of Murthy and Riley (1962). The content of mobile phosphates in the soil was carried out according to Machigin (Mineev, 1989). Data in tables and figures represent the average value of the results of chemical analyze of plant and soil of three replications. The experimental results were analyzed statistically, determining significant differences at the level of P = 0.05.

RESULTS AND DISCUSSION

The conditions of nutrition and soil moisture had obvious repercussions on the pattern of total phosphorus content in leaves, stems and roots in both cultivars. The data of phosphorus concentration in cultivars Horboveanca and Zodiac are shown in Table 1 and 2. It was found that leaf phosphorus concentration showed lower values in particular for Horboveanca under phosphorus deficiency (control variant). The same trend was also observed in the roots. Phosphorus concentration in plant tissues increased in treatment with fertilization in both water regimes. Compared to the unfertilized control, total phosphorus content in leaves and roots of Zodiac increases by 18% and 34% in the variant by applying a sufficient dose of phosphorus (P100), under optimal conditions of humidity (70% WHC).

Table 1

Concentration of phosphorus (mg P/g) in leaves and roots of Zodiac and changes of ration between their concentration (Pl/Pr) in relation to phosphorus supply and rhizobacteria application (RH)

Variant	Leaves	Roots	Pl/Pr	Leaves	Roots	Pl/Pr
	70% WHC			35% WHC		
P0	1,85±0,07	3,52±0,07	0,52	2,12±0,02	3,22±0,16	0,66
P20	2,18±0,06	4,80±0,02	0,60	2,58±0,01	4,16±0,04	0,62
P100	2,50±0,03	4,81±0,04	0,52	3,22±0,09	4,96±0,18	0,65
P0 +RH	1,91±0,02	3,46±0,11	0,55	2,06±0,05	3,14±0,09	0,66
P100 +RH	2,22±0,07	4,83±0,01	0,46	3,30±0,05	5,10±0,08	0,65

These increases in leaves and roots of Horboveanca were 11% and 35,3% respectively. The analysis of experimental results revealed that the differences between cultivars were higher in the case of leaves. The same trend was observed in plants subjected to water deficit but the difference was more pronounced. Under water stress conditions the roots of Zodiac showed a greater potential for accumulation of phosphorus than Horboveanca. Reductions in uptake of nutrient were more evident in treatment with both abiotic factors: moisture deficiency and insufficiency of phosphorus. Under suboptimal moisture regime there was a better allocation of phosphorus in the leaves of Horboveanca, significantly exceeding the concentration recorded in Zodiac (*table 1 and 2*).

Table 2

Concentration of phosphorus (mg P/g) in leaves and roots of Horboveanca and changes of ration between their concentration (Pl/Pr) in relation to phosphorus supply and rhizobacteria application (RH)

Variant	Leaves	Roots	Pl/Pr	Leaves	Roots	Pl/Pr
	70% WHC			35% WHC		
P0	2,35±0,06	3,71±0,07	0,63	3,41±0,15	3,58±0,02	0,95
P20	2,63±0,17	4,05±0,03	0,65	3,14±0,22	4,22±0,19	0,74
P100	2,70±0,14	5,01±0,02	0,54	3,75±0,05	5,16±0,13	0,73
P0+RH	2,31±0,05	2,93±0,05	0,79	3,41±0,08	3,19±0,05	1,07
P100+RH	3,23±0,14	5,53±0,08	0,58	4,12±0,23	4,89±0,08	0,84

The application of bacterial suspension in the soil with low phosphorus fertility did not contribute to significant changes in the pattern of distribution of phosphorus within the plant's vegetative parts. However, the utilization of biofertilizers together with phosphorus increased significantly the total phosphorus concentration in leaves and roots of Horboveanca but their effects in Zodiac were less pronounced regardless soil moisture regimes. The phosphorus concentration in the stems of Zodiac cultivar had higher values after the administration of microorganisms (data not shown).

According to the data of the plants subjected to drought we could conclude that the leaves of Horboveanca had a better ability to accumulate phosphorus in treatment of combined application of phosphorus and microorganisms. The assessment of changing the ratio of the concentration of phosphorus in leaves and roots suggest about the ability of plants to transport phosphorus from roots to shoots. This index showed higher values in Horboveanca, especially in adverse humidity conditions. Managing rhizosthere bacteria scored poorly this report for Zodiac and the Horboveanca tended to increase the ratio to the reference variant (tab. 2). Improving phosphorus status in leaves leads to increase or at least to maintain the physiological activity at a higher level, with beneficial impacts on the whole plant productivity (Rao and Terry, 1989).

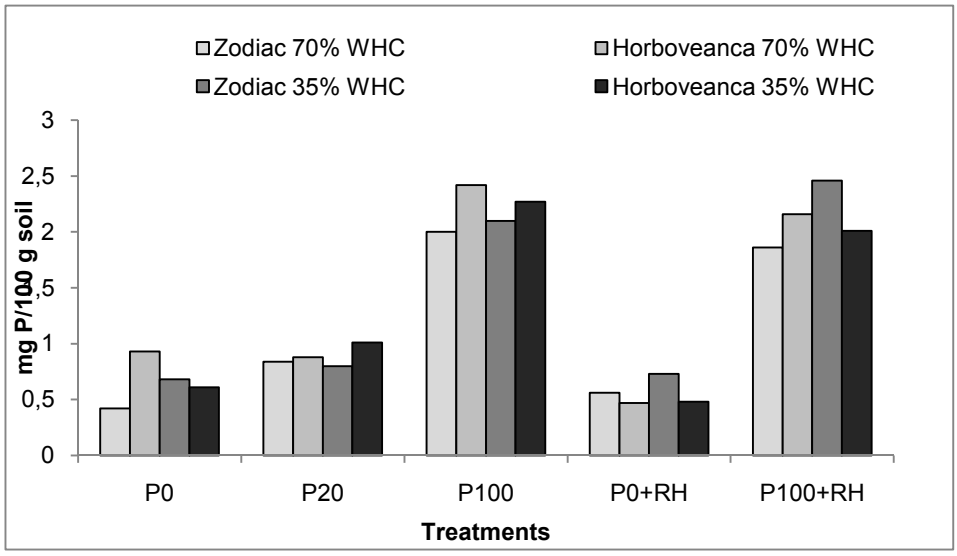


Fig. 1 - Influence of phosphorus and rhizobacteria (RH) on contents of phosphates in soil

Changes of the phosphorus contents in organs vary in relation to the availability of the nutrient phosphate in soil. It is important to know the changes that occur in the plant-soil system and that is useful primarily for resource efficiency strategies for soil and fertilizer in agriculture productivity. Considering that between the phosphorus content in plants and its availability in the soil is a strong correlation we examined the impact of the fertilization and application of microorganisms on the changes of phosphates in the soil (*fig. 1*). Supplementary nutrition increased phosphorus content in both varieties of mobile phosphates in comparison to the control. Thus, due to fertilization, the phosphorus content increased from 0,4 to 4,8 mg/100g soil in variant - P100. The lowest values of available phosphates were recorded for the control, regardless of the soil moisture level. Under the normal water regime the administration of biofertilizers to the soil vulnerable in phosphorus, in available forms, contributed to the increase of phosphate content only in pots cultivated with Zodiac. The same trend was observed in the case of rhizosthere bacteria application under water stress conditions. The administration of rhizosthere microorganisms without industrial fertilizer had no effect on the soil for available phosphate contents in pots where Horboveanca was cultivated irrespective of the soil moisture. The difference between cultivars in regards to the content of the phosphates in the soil probably could be explained through the chemical processes induced by the root system. Similar changes in rhizosthere have been mention by Hinsinger (2001). Soybean, unlike other species does not have the ability to form cluster roots, therefore it has other adaptation mechanisms to low phosphorus.

Hence, a clear improvement of soil fertility with phosphorus was established in variants with the use of mineral fertilizers alone or in combination

with rhizosthere bacteria. The results obtained in the current study evidenced the improvement of P nutrition promoted the adaptation of plants to water deficits.

CONCLUSIONS

1. The application of phosphorus and suspension of rhizosthere microorganism's pseudomonas fluorescence and azotobacter chroococcum improved the phosphorus nutrition of plants irrespective of soil moisture.

2. Under phosphorus deficient conditions, cultivar Horboveanca has a better capacity for translocation of phosphorus in leaves and stems than Zodiac, particularly under temporary drought.

3. Fertilization alone or in combination with rhizobacteria increased the fertility of the soil through increasing the availability of phosphates in soil.

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NANODISPERSION BASED ON LIGNIN AS A GROWTH REGULATORS

NANODISPERSII PE BAZĂ DE LIGNINĂ FOLOSITE CA BIOREGULATORI DE CREŞTERE

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Abstract. *The paper present the results concerning obtaining nanodispersions based on lignin and their use as maize seedlings bioregulators. Thus, two commercial lignins, wheat straw (L1) and Sarkanda grass (L2) from Granite Company, Switzerland were used. Nanodispersions based on lignin, were obtained by physical methods (cavitation) and were characterized in terms of average dimensional distribution. Using germination tests, the maize seedling bioregulators effect was evaluated. Compared with the control sample, a reduction in biomass accumulation in all vegetative organs has been found. These results are correlated with a elongation reduction for vegetative organs and photoassimilating pigments decreasing, in leaves.*
Key words*: nanodispersions, bioregulators, lignin, maize.*

Rezumat. *In lucrare sunt prezentate rezultatele cu privire la obtinerea de nanodispersii pe baza de lignina si utilizarea lor ca bioregulatori ai metabolismului din plantulele de porumb. Astfel, s-au folosit lignine comerciale din paie de grau (L1) si iarba Sarkanda (L2), provenite de la firma Granit, Elvetia. Nanodispersiile pe baza de lignina au fost obtinute prin metode fizice (cavitatie) si au fost caracterizate din punct de vedere al distributiei medii dimensionale. Prin teste de germinare s-a evaluat efectul bioregulator asupra plantulelor de porumb. Comparativ cu martorul, s-a constatat o reducere a acumularii de biomasa in toate organele vegetative. Aceste rezultate se coreleaza si cu o reducere in alungirea organelor vegetative si scaderea cantitatii de pigmenti fotoasimilatori.*
Cuvinte cheie*: nanodispersii, bioregulatori, lignina, porumb.*

INTRODUCTION

Lignin is a biopolymer with aromatic structure, which play an important role in fixing of polysaccharides in the cell walls of higher plants. That confers mechanical resistance and at the action of microorganisms and enzymes, stability (Popa et al., 2001). Also, lignin structure is unknown, its contain combination of macromolecular amorphous systems (Rozmarin, 1984). Lignin abundance in nature and importance from economic point of view is the reason why its biosynthesis and structure intensely studied has been (Popa, 1983). The big part of lignin resulted from chemical pulping is converted to energy by concentration of black liquor followed by combustion. Environmental compatibility, accessibility and abundance of this biopolymer, motivates the development of superior

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technologies. In recent years, using chemical biochemical and physical modify was possible enlarge the range of potential applications in different field for lignin products. Constitutive units of lignocellulosic biomass at fundamental level have nano dimensions, its confers unique properties for wood and wood derivatives. Water insoluble nanodispersions based on organic substances can substitute inorganic nanodispersions which have a negative impact on the environment. Some researchers have been used these nanodispersions in the treatment of textile fibers and in the production of water based-ink (Zimniewska et al, 2008, Peter Schilling and Charleston, 1993). Nanoparticles were synthesized using cavitations phenomena from Sarkanda grass and wheat straw lignin.

The paper present studies concerning possibility to use nanoparticles based on lignin, wich were obtained by psihical modification, as plant grouth regulators.

Biovegetal regulatory are natural or synthetic organic, who exercise on plant growth and development, an similar action like that phytohormones.

Polyphenols, applied to the plants in very small amounts in some phases of development, may modify growth, nutrition or body or organs resistance at different stress conditions by inducing changes in vital processes. So that crops quality and quantity can increase and also at a more convenient and rapid mechanical harvesting (Gergen, 1988). In the same time are also known lignin applications in agriculture which work as a soil former and in the bioremediation processes.

MATERIAL AND METHOD

For nanodispersion obtaining wheat straw (L1) and Sarkanda grass L2) lignin, from Granit Recherche Developement Company, was used. A suspension was prepared (0.7%) in distilled water, then it was ultrasonated with ultrasonic horn. (600 W power, 20 kHz frequency). Dimensional analysis was performed with SALD 7001 (Gîlcă et al., 2011).

The germination tests were carried out according to a standard method. It was used 10 Petri dishes for each experimental variant (distilled water – control, nanodispersion based on lignins obtained from wheat - L1 and grass Sarkand - L2). On a filter paper it sat to 5 corn seeds, carefully chosen order not present a major deterioration. The plant material was subjected to a presterilization proces. This consisted in seed submersion in absolute ethanol for 10 seconds, followed by sterilization itself in the presence of Na-hypochlorite 10% for 20 to 30 minutes (Cachita et al., 2004). The volume of solution added was 10 mL / plate. Petri dishes were incubated in the dark in a thermostat set at 27 ° C. After a 7 day period, the Petri dishes was kept in day light for 3 days to allow the seedlings to synthesize the photoassmilating pigments. Biometric measurements, quantitative components of seedling (roots, stems, leaves) and spectrophotometry to determine the concentration of photoassmilating pigments were performed at finaly.

Quantification of assimilating pigments - 0.05 g fresh vegetal material was extracted in 80% acetone by grinding with a spatula tip of quartz sand. Chlorophyll extract was analyzed spectrophotometrically by reading absorbance at various specific wavelengths: 470, 646, and 663 nm. In order to determine the concentration of chlorophyll pigments (chlorophyll a and b) and carotenoid pigments were used formula proposed by Lichtenthaler and Welburn (1983):

Clorophyll a (µg/mL) = 12, 21 (A_{663}) – 2, 81 (A_{646})
Clorophyll b (µg/mL) = 20, 31 (A_{646}) 5, 03 (A_{663})
Carotenoids (µg/mL) = (100· A 470 – 3,27 [chl a] – 104 [chl b])/22

Our results are expressed as mean ± standard error where n = 3. Comparison of the means was performed by the Fisher least significant difference (LSD) test (PB ≤ 0.05) after ANOVA analysis using program PAST 2.14. Sampling and chemical analyses were examined in triplicate in order to decrease the experimental errors and to increase the experimental reproductibility.

RESULTS AND DISCUSSIONS

Analysis of distribution particle size is presented in Figure 1, the mean values recorded were between 20-130 nm.

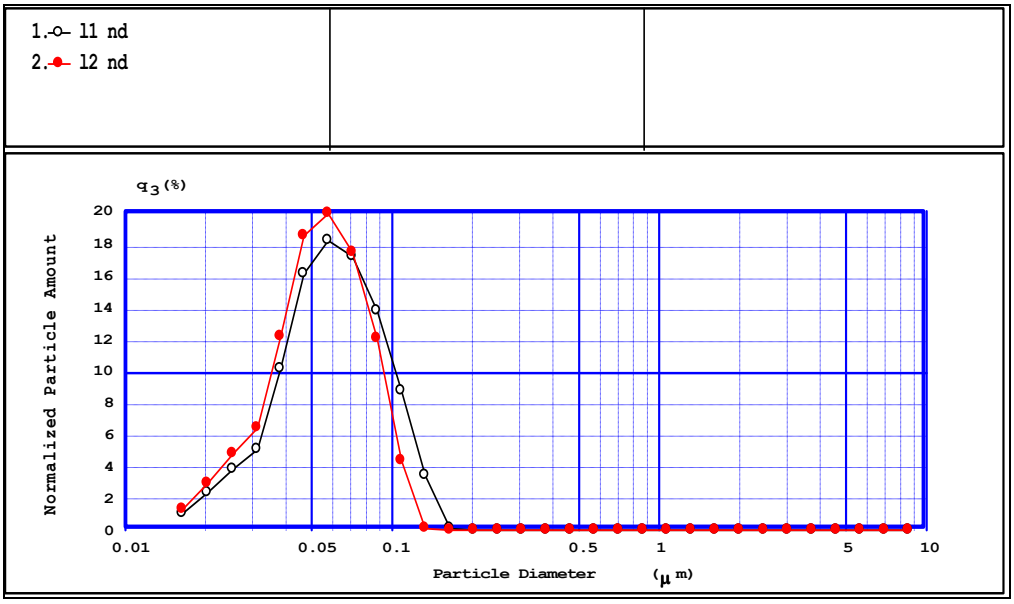


Fig. 1 - Dimensional average distribution of synthesized nanodispersions (L1 nd -wheat straw, L2 nd - Sarkanda grass)

After germination tests, it can be seen that the presence of nanodispersions based on lignin to wheat and Sarkanda grass has inhibitory effects on energy (4.5% - L1, 31.8% - L2) and capacity germination (20, 8% - L1, 34.4% - L2) (Fig. 2). Nanodispersions present in the growth medium leads to inhibition growth of all vegetative organs (Fig. 3). For the roots, the percentage inhibition of growth was 16.2% - L1, and 28.95% for the solution L2. Increasing in length of the stem is negatively influenced with a percentage of 24.1% for L1 version, and 40.03% for L2 version. The leaves growth was also negatively influenced by the nanodispersions presence in the growth medium (24.3% - L1 and 43.3% - L2).

In terms of biomass accumulation in vegetative organs, there is an inhibitory effect (Fig. 4). The percentage of biomass accumulation inhibition at

the root, compared to the control, is 11, 11% for L1solution and 26.14% for L2 solution. Biomass accumulated in stem of corn seedlings that have been developed in the presence of L1 and L2 was with 13% (L1) and 20% (L2) lower comapring with control. For biomass accumulated in leavs results are similar. Thus the percentage of inhibition of wet biomass accumulation in leaves is 13.04% to L1 variant and 16.34% for L2 variant.

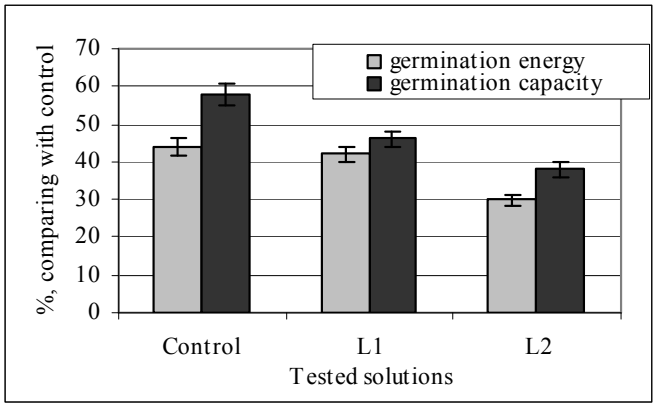


Fig. 2 - Influence of nanodispersions used on maize seed germination

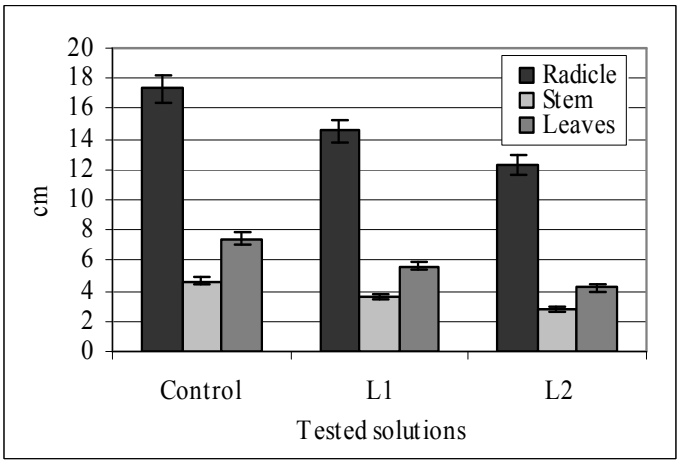


Fig. 3 - Influence of nanodispersions used on maize seedling elongation

Concerning of synthesis of photoassimilating pigments it is found that nanodispersions bazed on lignin inhibit this process with a percentage of 24% (L1) respectively 50.1% (L2) for chlorophyll a, 63% (L2) and chlorophyll b 36.62% (L1) or 48.2% (L2) for carotenoid pigments.

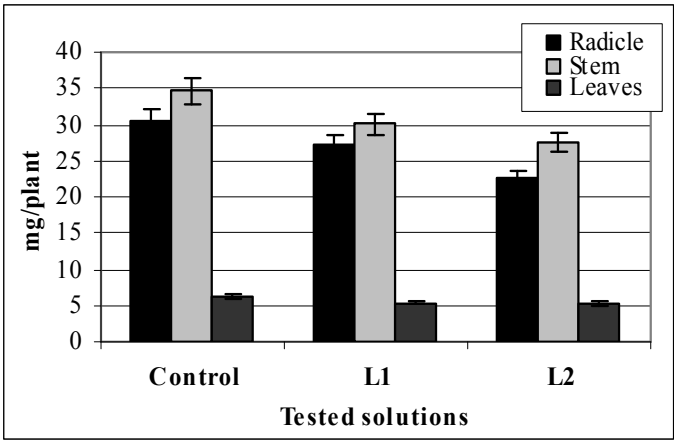


Fig. 4 - Influence of nanodispersions on biomass accumulation of maize plants

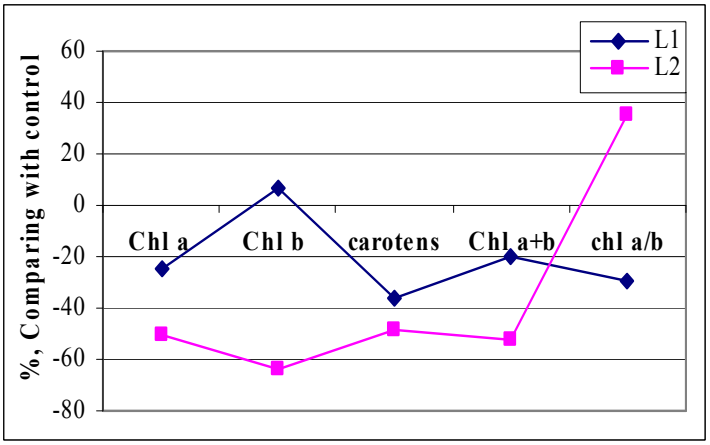


Fig. 5 - Influence of nanodispersions on photoassimilating pigment in maize leaves

The percentage of inhibition of the synthesis of the photoassimilating pigments will be greatly reduced or even positive if we refer to the percentage for chlorophyll b, when applied nanodispersion based on lignin obtained from L1 (Fig. 5).

CONCLUSIONS

1. Following experiments were synthesized nanodispersions based on lignin which were dimensional characterized and used in vegetal systems.

Nanodispersions studied have shown an inhibitory effect of the germination process, both the the germination energy and germination capacity.

2. Growth and development of maize seedling, in the presence of two types of nanodispersion, was significantly reduced. Also the same for plant biomass accumulation in all vegetative organs. Concerning to the photoassimilating pigments synthesis it is found that nanodispersions used inhibit this process.

3.Thus for first time was highlighted the fact that nanodispersions bazed on lignin from wheat straw an Sarkanda grass manifest inhibitory effects on growth and development maize seedling, properties who can be studied for the herbicides creation.

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RESEARCHES REGARDING THE IDENTIFICATION OF SSR MARKERS ASSOCIATED WITH THE RESISTANCE OF RAPESEED TO THE ATTACK OF *SCLEROTINIA SCLEROTIORUM* (LIB.) DE BARY

CERCETĂRI PRIVIND IDENTIFICAREA DE MARKERI PENTRU SSR ASOCIATI CU REZISTENȚA RAPIȚEI LA ATACUL DE *SCLEROTINIA SCLEROTIORUM* (LIB.) DE BARY

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Abstract. *White rot, caused by Sclerotinia sclerotiorum (Lib.) de Bary is an important pathogen of the Brassica napus crop. The most efficient way of protecting the rapeseed plants from this patthogen is through genetic resistance. The aim of this study was to identify SSR markers for white rot resistance in a collection of 130 rapeseed cultivars from the Centre of Genetic Resources of Nerherlands. The correlations made between the genotypic and the phenotypic data previously obtained for the artificial infection with the pathogen, revealed 10 SSRs significantly associated with rapeseed resistance to Sclerotinia sclerotiorum (Lib.) de Bary. The identification of these SSRs will enhance the breeding for white mold resistance in Brassica napus L.*
Key words: *rapeseed, SSRs, resistance*

Rezumat. *Putregaiul alb, provocat de Sclerotinia sclerotiorum (Lib.) de Bary este un pathogen important pentru specia Brassica napus. Cea mai oficientă metodă de protecție a plantelor de rapiță împotriva acestui patogen este prin intermediul rezistenței genetice. Scopul acestui studiu a fost identificarea de markeri pentru SSR asociați cu rezistența la putregai alb, în cadrul unei colecții de 130 de cultivare de rapiță provenită de la Centrul pentru Resurse Genetice al olandei. Corelațiile realizate între datele genotipice și cele fenotipice obținute anterior în urma realizării infecției artificiale au evidențiat 10 markeri pentru SSR semnificativ asociați cu rezistența rapiței la Sclerotinia sclertiorum (Lib.) de Bary. Identificarea acestor markeri va sprijini ameliorarea speciei Brassica napus L., în ceea ce privește rezistența la putregai alb*
Cuvinte cheie: *rapiță,markeri pentru SSR, rezistență*

INTRODUCTION

There is a concerted effort among rapeseed breeders to reduce the losses caused by the fungus *Sclerotinia sclerotiorum* (Lib.) de Bary.

Depending of the environmental conditions, the yield losses can get up to 100% (Sarahan et al., 2008). Until now, no oilseed rape cultivars are marked as

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having resistance to this pathogen. Strategies for selecting resistant host are considered the most economic and sustainable control means (Garg et al., 2008).

In order to identify the SSRs associated to white rot resistance in rapeseed, we correlated the data previously obtained for the artificial infection with the pathogen (Calistru, 2012), with the genotypic data obtained at the SSR analysis. There were found 10 SSRs significantly associated with the resistance to *Sclerotinia sclerotiorum* (Lib.) de Bary.

MATERIAL AND METHOD

The plant material. The 130 rapeseed genotypes that were tested were provided by the Centre of Genetic Resources of Netherlands.

DNA extraction. The DNA for each cultivar was isolated using the CTAB protocol, modified by Doyle & Doyle (1987). The quantity and quality of the DNA were determined using agarose gel electrophoresis and spectrophotometer.

DNA amplification. The amplification was made on a LICOR 4200 system.

There were used 51 SSR markers, that amplified 139 polymorphic fragments. The fragments ranged between 80 and 340 bp (Table 1).

Table 1

The results of the SSR analysis

Crt. No.	Primer	No of bands	Allelle size	Crt. No.	Primer	No of bands	Allelle size
1	CB-10065	2	210-230	**27**	Na12-A01	3	155-165
2	Na10-G08	3	310-340	**28**	Ol10-D03	3	155-235
3	Ol10-B02	2	80-170	**29**	Ol10-F02	1	155
4	Na12-C01	3	40-110	**30**	Na14-G06	2	240-245
5	BRMS-30	2	210-220	**31**	Ol11-B05	3	140-160
6	Na10-D11	2	218-220	**32**	Ni2-C12	1	80
7	CB 10536	2	145-150	**33**	Na12-B11	1	130
8	Ol10-E12	1	280	**34**	Ol13-E08	2	170-190
9	MD 60	2	180-190	**35**	Ol10-G06	3	130-165
10	CB 10028	5	170-255	**36**	OL10-E05	6	130-170
11	CB10206	2	240-245	**37**	OL13-F08	2	140-145
12	CB 10437	1	190	**38**	Na12-B07	7	130-147
13	Cb 10097	2	210-220	**39**	Ra12-E12	5	150-240
14	CB 104347	2	220-230	**40**	Na12-A02	5	150-226
15	Na12-H06	3	210-265	**41**	Na12-B05	2	220-230
16	CB 10611	2	170-190	**42**	HMR416	4	240-265
17	BRMS 20	1	200	**43**	Ra2-F11	5	210-245
18	Ol10-D08	2	180-185	**44**	Ol11-H02	2	200-210

19	BRMS 309	4	200-230	**45**	Na10-C01	1	100
20	Na10-B11	4	200-240	**46**	HMR354	6	260-315
21	Na12-D08	4	90-145	**47**	Na14-G10	2	170-180
22	OL10-C10	6	190-280	**48**	HMR562	2	210-215
23	Ra2-F04	2	110-150	**49**	HMR585	5	170-195
24	Na14-H12	1	257	**50**	Na12-G05	3	120-230
25	Ol10-D01	2	270-275	**51**	CB10536	2	145-150
26	CB10600	1	310				

Data analysis. For the data analysis, it was used the ANOVA method, with the SPSS v.13 software, with a probability P< 0.05%.

RESULTS AND DISCUSSIONS

From the data analysis, there were identified 10 SSRs significantly associated with rapeseed resistance to the pathogen (Table 2).

Table 2

The SSRs significantly associated with the resistance to white rot

Crt. No.	Primer	R	R^2	Adjusted R^2	p	Significance
1.	Na10B11_204	0.209	0.044	0.036	0.017	***
2.	Ol10C10_200	0.217	0.047	0.04	0.013	***
3.	Ol10C10_204	0.422	0.178	0.172	0	***
4.	Ol10D01_270	0.183	0.034	0.026	0.037	***
5.	Ol10E12_280	0.238	0.057	0.049	0.006	***
6.	Ol11B05_140	0.21	0.044	0.037	0.016	***
7.	Ol10G06_165	0.177	0.032	0.024	0.043	***
8.	Na12B07_137	0.237	0.056	0.049	0.007	***
9.	Na12A02_150	0.186	0.035	0.027	0.034	***
10.	Ol11H02_210	0.243	0.059	0.052	0.005	***

The R^2 indicates the rate of the phenotypic variation given by the considered marker.

The value of $p < 0,05$ indicates that the marker is significant for the resistance to the pathogen. The *Ol11H02* marker has been perviously used by Hasan et al. (2006), in researches regarding the genetic diversity in rapeseed. Also, Tommasini et al., (2003) used the *Na12A02* marker in experiments in order to evaluate some qualitative traits in the *Brassica napus* species.

CONCLUSIONS

The results obtained indicate that these markers can be successfully used in researches, in order to identify QTLs for the rapeseed resistance to *Sclerotinia sclerotiorum* (Lib.) de Bary.

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GRAMMAR AND STYLISTICAL ASPECTS OF ROMANIAN LANGUAGE IN TERMS OF THE CONTRIBUTION OF THE LINGUIST D. IRIMIA

ASPECTE GRAMATICALE ŞI STILISTICE ALE LIMBII ROMÂNE PRIN PRISMA CONTRIBUȚIEI LINGVISTULUI DUMITRU IRIMIA

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Abstract. *Our contribution comments upon the linguist D. Irimia's original, synthetic modality to present aspects of Romanian morphology and syntax. He was a disciple of Eugen Coserio and he continued Iorgu Iordan's tradition devoting great attention to the oral aspect of our language. We mainly underline the semantic and stylistic, even prosodic, commentaries done by professor D. Irimia in his major studies: „Eminescu's Poetic Language" (1979), „The Stylistic Structure of Contemporary Romanian Language" (1986), and „The Grammar of the Romanian Language" (2008). The contribution highlights his modality of presenting the counteraction of grammatical categories, the semantic aspects of relative and absolute tenses, moods and other grammar categories with stylistic functions.*
Key words: *linguistics, stylistics, relation, oposition, function.*

Rezumat. *Contribuția noastră comentează modalitatea originală şi sintetică a lingvistului ieşean D. Irimia de a prezenta aspecte ale morfologiei şi sintaxei limbii române. Profesorul Irimia a fost un discipol al lui Eugen Coşerio şi a continuat tradiția instaurată de Iorgu Iordan, manifestand mare atenție pentru aspectul oral al limbii noastre. Noi evidențiem comentariile semantice, stilistice, chiar prozodice, ale profesorului D. Irimia, comentarii existente in principalele sale opere: „Limbajul poetic eminescian" (1979), „Structura stilistica a limbii române contemporane" (1986) şi „Gramatica limbii române" (2008). Contributia reliefează modalitatea sa de prezentare a interacțiunii dintre diversele categorii gramaticale, a aspectelor semantice ale timpurilor relative şi absolute, ale modurilor gramaticale, precum şi ale altor categorii gramaticale care au şi functii stilistice.*
Cuvinte cheie*: lingvistică**,** stilistică, relație, opoziție, funcție.*

INTRODUCTION

Professor D. Irimia (1939-2009) was a well-known and respected academic and scientific personality who spent his entire career as a professor at "Al. I. Cuza" University, Iasi. He contributed to the development of Romanian stylistics due to his PhD thesis, "Eminescu's Poetic Language" (1979), and "The Stylistic Structure of Contemporary Romanian Language" (1986), both of them being

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considered valuable benchmarks in any reference list. He was a disciple of Eugenio Coseriu and he continued Iorgu Iordan's tradition devoting great attention and interest to the oral aspect of our language and to the richness of its oral expression which he illustrated and commented upon. His remarkable attention for Eminescu's contribution to modern Romanian literary language could be noticed in many other studies, analyses and, also, due to the annual Mihai Eminescu Symposium for students (Arhip O, 2013). He coordinated an electronic studying process of Eminescu's texts and of the program for lyric equivalences – "Dictionary of Eminescu's Poetic Language; Signs and Meanings" (two volumes in 2002 and in 2005)**.** The stylistic diversity of the Romanian language can be discovered in another Irimia's major work: "The Grammar of the Romanian Language" – last edition in 2008. This handbook has brought "many new elements to the old academic rules" and its new-built perspective has influenced the Grammar of the Romanian Academy, published in 2008.

MATERIAL AND METHOD

We present and comment on the original elements of D. Irimia's descriptive grammar. His points of view have been validated by other authors and have appeared as such in the Academic Grammar. Having this scientific approval, we do not address controversial subjects. Due to the fact that almost all the examples are very subtle and have complete linguistic and stylistic relevance in Romanian, we have decided to leave them un-translated and to explain the phenomena in as much details as possible. We often emphasize the stylistic and semantic interpretation of the author.

RESULTS AND DISCUSSIONS

Underlining the fact that the semantic criterion is appropriate for the lexical system, not for the grammatical one, Irimia disputes the morphologic description for the quatification pronouns as "doi/ambii/câte doi", etc. The traditional grammar calls them numerals. The morphologic class of numerals has given rise to many questions for lots of researchers who tried to classify them as nouns, adjectives or adverbs (Rosetti and Byck, 1945). Some of them argued for adjectives (Iordan, I., 1954) as the numeral does not express proper qualities such as colors, shapes, dimensions, but only quantitative qualities. Iordan submitted the class of quantitative adjectives and his proposal was later adopted by B. B. Berceanu (Berceanu, 1971). Another researcher also proposed to abolish the class completely. Irimia had a more inspirited solution. He took as a starting point for his argument the fact the all these words are expressing extrinsic features, not intrinsic ones, like demonstrative pronouns (doi studenți/al doilea student/aceşti studenți) and all of them are substitutes, even with an anaphoric connection: *Doi studenți au repetat examenul/Aceşti studenți au repetat examenul/Doi au repetat examenul/Aceştia au repetat examenul* or *Au dat două examene, primul, pe 5 septembrie, al doilea, pe 7 septembrie*. He, in fact, followed Otto Jespersen's hypothesis. Irimia made another relevant observation; he pointed out that quantitative pronouns could be used to cancel the ambiguity of the opposition

singular/plural in the same manner as the adverbs cancel the poly-semantic characteristic of tenses: *Plec azi/Plec mâine/Un pui/Doi pui* etc. As an independent class which must express the category of number as well, quantitative pronouns attract elements previously considered to be undefined adjectives to their paradigm: *mulți, puțini, toți, atâția* etc. Taking into account the deictic aspect, this class only seems to be closer to that of nouns, because it includes the objects of the communication process, but some of them frequently include the protagonists in the same way an inclusive pronoun does this: *„Căci amândoi vom fi cumințI,/Vom fi voioşi şi teferi."* The new Grammar, edited by the Academy, agreed with Irimia's point of view and offer more patterns: *Am analizat situația elevilor. Trei dintre ei au luat premiu*. In this example, the quantitative pronoun is involved in an anaphoric relationship as well. In mathematical sentences, the autor considers that they are absolutely abstract and there are no syntactic relationships (*Doi şi cu doi fac patru*).

Building on G. Gougenheim's theory, which was incorporated by Vl. Robu and Iorgu Iordan into their own work, Dumitru Irimia included the grammatical intensity in his grammar, underlining the fact that it implies open phrases instead of close phrases required by the classic category of comparison. This distinction has been taken into account sometimes and only for the superlative. Irimia stated that this is the only authentic grammatical category for adjectives and adverbs having the required double nature: semantic and deictic features. In this context, all types of intensity categories are presented in his grammar, according to a semantic criterion, but the presence of a second correlative term is not necessary: "*Din ce în ce mai singur mă-ntunec şi îngheț, / Când tu te pierzi în zarea eternei dimineți."* (Mihai Eminescu); *„Când ura cea mai crudă mi s-a părea amor..."* (Mihai Eminescu); *„Atunci puse să îi facă altul mai greu – îl aruncă în sus"* (Mihai Eminescu). Of courses, there are contexts in which the second term is explict: *„Mai verosimil decât adevărul / e câteodată un vis."* (Lucian Balga); *„Aşa că închipuindu-ți lăcrimoasele ei gene, / Ți-ar părea mai mândră decât Venus Anadyomene"* (Mihai Eminescu). This personal view regarding the intensity category is more reliable and it renders the deictic nature expressed by infrequent stylistic means mainly met in spoken language or popular record: *„...l-a făcut bucăți, bucățele"*; *„Ce frumoasă, ce nebună / E albastra-mi, dulce flore"* (Mihai Eminescu); *„S-au cum s-ar mai zice la noi în țărăneşte, era frumoasă de mama focului: la soare te puteai uita, iar la dânsa ba"* (Ion Creangă). This category is applied for adverbs as well: *„O, umbră dulce, vino mai aproape/ Să simt plutind deasupră-mi geniul morții"* (Mihai Eminescu); *„Dar şi mai bine-i când afară-i sloată,/ Să stai visând la foc, de somn să picuri"* (Mihai Eminescu). Irimia suggested a more complete representation of a category having its own content and specific means of expression; the very same category is present in the new grammar edited by the Academy, but without detailed explanations of the difference between intensity and comparison – reading that chapter, the general opinion might be that it is only a kind of synonymy or a modern way to name a grammatical category, which is far removed from the linguistic implications.

Dumitru Irimia studies a linguistic issue quite neglected by previous Romanian authors of grammar handbooks – grammatical aspect. It is the expression of the temporal development of an action, from the point of view of the speaker, inside the relevant relationship *statement - enunciation*. This grammatical category is very common in English and German, but not in Romanian. It reveals the oppositions: finished/unfinished, perfective/imperfective, known/unknown. For Romanian, this category is strongly related to the one of tense and can be discussed only for the Indicative Mood. The imperfective aspect is usually associated with Imperfect Tense (*„Când am cunoscut-o, cânta într-un restaurant”*), and the perfective aspect is specific for past tenses such as: Simple Perfect Tense (*Traversaşi în fugă bulevardul*), Compound Perfect Tense (*Am traversat în fugă bulevardul*), Past Perfect Tense (*Traversasem în fugă bulevardul*). The Present Tense cancels the opposition perfective – imperfective. Other connotations expressed by this category are: frequentative, ingressive, continuity, or the opposition momentary – continued action. Sometimes, all these may be conveyed with the help of semi-auxiliary verbs or adverbs: *Începe/Prinde/Continuă să plouă; Ioana stă să plângă; Şi tot vorbeşte; A venit din nou; Iar spune*, etc. This kind of verbs expresses the following meanings: *a începe, a prinde, a continua, a termina etc.* (*Începe/prinde/continuă să plouă*). This boundary enriches narrative and stylistic distinction between narrative and descriptive predicate.

Dumitru Irimia added two new types of coordination. He considered that conjunction “ci” has not the same meaning as “dar/but” or “însă, iar”. It was called antagonist coordination. “Dar/iar/însă” has an adversative value, whilst “ci” connotes a very clear and strong opposition, the first part element of the coordination having a negative significance: *„Eminescu nu cântă incidenţele unei iubiri,* ci iubirea, *nu cântă farmecele unei femei, ci femeia.”* (Garabet Ibrăileanu). Irimia makes a clean-cut distinction between the coordinating conjunctions “dar” and “ci”. The elements coordinated by “but” do not express parts of reality objectively mutual opposed, but the opposition between them is reflective a subjective point of view: *„Nu a citit romanul, dar vorbeşte cu dezinvoltură despre valoarea lui”; „A ştiut totul de la început, dar a tăcut.”* The conjunction “ci” binds elements objectively related and which cannot exist simultaneously: *„Copilul a fost determinat să apere nu adevărul, ci minciuna.”* The antagonist coordination exists between elements belonging to the same lexical field: *„Nu-i frumos, ci urât”; „Nu pleacă, ci vine”; „Nu e luni, ci vineri.”* The elements involved in an adversative coordination are not consistent: *„E bun pentru mine, dar rău pentru tine.”* A more obvious example is the following one – in Romanian, it is possible to say *„În casă nu e frig,* ***ci*** *e foarte frig”*, but using „dar” renders the sentence incorrect: *În casă nu e frig, dar e foarte frig”*. Irimia also specified that adversative coordination is very close, from a semantic point of view, to a concessive subordinated sentence as has already been noted by Gh. Ivănescu: *„Citeşte mult, dar nu reţine nimic*” meaning in fact *„Deşi nu reţine nimic, citeşte mult”*. He has also pointed out an alternative coordination realized

by parataxis: *„Domnul se plimbă de colo pînă colo pe peron, aci către partea pe unde vin pasagerii, aci către geamul în care stă în picioare omul cu sacul..."*(I. L. Caragiale). The adverb „aci" laks semantic value.

D. Irimia did not include articles, prepositions and conjunctions into the large category of parts of speech. They are grammatical instruments. They have no lexical content, lack semantic autonomy and they belong only to the grammatical system of a language, allowing lexical units to form syntactic units. Prepositions have grammatical functions in sentences: „*Oricine are dreptul la adevăr"*. Conjunctions become effective at an upper level, that of phrases: „*El a uitat că a trimis scrisoarea"*. Irimia presents pronominal adverbs (*aici, acolo, atunci, niciodată*) as part of this class playing the role of semantic markers: *„Trecut-au anii ca nori lungi pe şesuri/Şi niciodată n-or să vie iară."* – temporal meaning (Mihai Eminescu). The same opinion can be found in the Academy Grammar several years after his contribution (Gramatica limbii române, II; 2005). Always interested in stylistic aspects, Irimia commented upon certain lexical units which may appear with a syntactic function or without a syntactic function: *„Crezi tu că râul curge, că unda/Care ne scaldă-i pururea nouă?"* – attributive function (St. Aug. Doinaş); *„O, moartea-i un secol cu flori înflorit,/Când viața-i un basm pustiu şi urât"* – no syntactic function (Mihai Eminescu).

He has also introduced two new syntactic functions: circumstantial attribute („Curta, obosit de orele de plimbare, se aşază într-un luminiş proaspăt defrişat de trunchiuri falnice de brad" – P. Sălcudeanu) and predicative complement („*De umblat umblu ca fiecare / Cînd vinovat pe coperişele iadului / Cînd fără păcat pe muntele cu crini.*" – L. Blaga). These functions develop a double relation of subordination depending both on nominal and verbal elements.

CONCLUSIONS

1. Dumitru Irimia was the first author to promote a modern approach to of a modern approach to Romanian grammar and his opinions were largely shared with the Academy Grammar several years after he first discussed them. His contribution deserves appreciation and great proliferation.

2. Although the text is eclectic, the author introduces several new and fertile categories in Romanian grammar.

3. D. Irimia offered the richest and most systematic comparative description of the scientific, judicial, journalistic and literary functional styles associating a great wealth of concrete language examples.

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USING MOODLE AT THE UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE OF IASI

PLATFORMA MOODLE DE E-LEARNING A U.S.A.M.V. IASI

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Abstract*: In the beginning of the 2012-2013 academic year, a Moodle e-learning platform was installed and put into use at The University of Agricultural Sciences and Veterinary Medicine of Iasi. Its end users are the university students who benefit from the courses developed by their teachers. The first results of using the e-learning technology are starting to be seen. The paper presents some aspects of how the platform is being utilized from an administrator's perspective. An emphasis is given to user registration, to student course enrollment and to managing rights and permissions for teachers who develop their own courses on the platform.*
Key words*: e-learning, Moodle*

Rezumat*: Începând cu anul universitar 2012-2013, la USAMV Iaşi a fost instalat şi este în funcțiune o platformă Moodle de e-learning ai cărei beneficiari finali sunt studenții Universității. Primele efecte ale utilizării tehnologiei e-learning în procesul didactic au inceput să fie observabile. Lucrarea prezintă câteva aspecte ale exploatării acestei platforme din perspectiva administratorilor acesteia. Sunt evidențiate elemente legate de gestionarea eficientă a înregistrării utilizatorilor, de înrolarea studenților la cursuri şi de alocarea de drepturi şi obligații cadrelor didactice care solicită crearea de spații de clasă virtuală pentru dezvoltarea cursurilor proprii.*
Cuvinte cheie*: e-learning, Moodle*

INTRODUCTION

In the beginning of the 2012-2013 academic year, a Moodle e-learning platform was installed and put into use at The University of Agricultural Sciences and Veterinary Medicine of Iasi. Its end users are the university students who benefit from the courses developed by their teachers.

The Moodle software environment was installed on an IBM server that was purchased during a research program (CEEX 1801 No. 74/31.06.2006) that was carried out between 2006 and 2008. One of the themes was studying and assessing the benefits of developing an e-learning system at the University. One conclusion was that from various points of view Moodle would be the most appropriate choice.

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After one academic year the first results of using the e-learning technology are starting to be seen. The paper presents some aspects of how the platform is being utilized from an administrator's perspective.

PREMISES FOR USING MOODLE AS SOFTWARE SOLUTION

As mentioned above, the decision of using Moodle came after assessing different potential options. One the one hand, Moodle is now continuously and systematically developed by Moodle Pty Ltd (www.moodle.com). Moodle is now used by numerous organizations, including universities, to develop and manage e-learning courses. On the other hand Moodle is free, being developed as an open-source project.

Before putting into current use the Moodle platform, in two preceding annual sessions about 50 teachers in the University were trained in creating e-learning courses using Moodle. action In the years that preceded. Those training sessions were held in cooperation with AUF – l'Agence Universitaire de la Francophonie who provided the teaching staff.

The main element of the infrastructure (the server) being available, and having an initial number of teachers trained in developing e-learning courses under Moodle, the next thing that had to be accomplished was the platform administration. This activity was assumed by the academic staff of the IT group of disciplines which is part of the Department of Sciences of the University.

THE MOODLE PLATFORM AFTER ONE ACADEMIC YEAR OF UTILIZATION

A Moodle platform is accessed by a few categories of users which are placed on four levels, as shown in Figure 1. The significance of these levels in the following:

- a user on some level benefits of the services provided by the users on the levels below;
- a user on some level grants access rights to users on the levels above.

The server on which Moodle was set up is installed in the ITC Center where the continuous and proper functioning of all the similar machines held by the University is supervised.

The Moodle site can be found at https://193.231.26.58.

As mentioned, the site administration is made by the academic staff from the IT group of disciplines.

The administrator performs the users registration into the system. The main method used for this is the so-called *bulk uploading* (Buchner, 2011) that allows importing in one step the attributes of multiple users from a text file. The respective file is carefully prepared using a multiple step procedure through a Microsoft Excel workbook that finally generates a CSV format. The goal is to generate a absolutely valid text file that will subsequently be used in the bulk

uploading procedure as Moodle doesn't prove to be very explicit when it comes to signal errors that may possibly occur in the input data.

Automatically generated usernames have a standardized format that would permit future users filtering and searching.

Student	Benefits of resources and activities within the courses he is enrolled to
Teacher	Creates, develops and manages courses and grants student access to the respective resources and activities
Moodle administrator	Performs the overall administration of the site and of its users. Grants access rights to different categories of users.
Server administrator	Ensures the proper and safe functioning of the server machine

Fig. 1 – Categories of users of a Moodle platform

Each member of the teaching staff receives two usernames:

- One username will be used to enroll him with *teacher* rights to the courses that he develops and maintains. The general structure of this username is

  xy-name.surname

  where *xy* is an internal coding of the department the teacher belongs to. Example:

  `h2-calin.marius`

- A second username will be used to enroll him to its own courses with *student* rights, in order to see them "with student eyes". The general structure of this username is

  xy-stud.*name.ss*

  where *ss* are the first two letters of the surname. Example:

  `h2-stud.calin.ma`

All of the students being in their first academic year were assigned a username that they will use throughout their studentship. The students usernames are also standardized, having the general form

aaaa999-name.surname

where *aaaa* is the acronym of the programme of studies, and *999* is the group the student belongs to in the students directory. Example:

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tppa426-ionescu.radu
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The administrator also creates and sets up the framework of each new course following the request that came from a teacher. He also makes the first two enrollments to the course: the two usernames of the teacher that were described above. The teacher will then make all further development of the course using the *teacher* username that he owns.

At present the students enrollment to courses is also made by the administrator. To manage more efficiently their enrollment to different courses, students were grouped in *cohorts*. This concept was introduced in Moodle 2.0 and it permits a more efficient grouping. Cohorts are particularly useful (Rice, 2011) when one group of students must be enrolled to more than one course (the courses of one semester) and when the movement of students from one course to another must be done (between semesters).

After one academic year, approximately 1350 user are registered, that is all of the students from the first year, all the members of the teaching staff and a few more users registered separately.

There are already about 30 courses under development and current use. The administrator maintains an introductory course aimed to the teaching staff that makes the first steps in creating Moodle course material. These lecture notes were made using existing literature (Rice, 2011) and elements from the official Moodle site (www.moodle.org).

Future development include:

- registration and course enrolment of new students at the beginning of each academic year;
- registration of the site as a standalone domain;
- automation of cohorts enrolment and movement from one course to another;
- designing of a personalized look of the site;
- increasing the number of courses.

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GOING PLACES METHODOLOGY IN RELATION TO THE USE OF ICT IN VOCATIONAL LANGUAGE EDUCATION

METODOLOGIA PROIECTULUI GOING PLACES PRIVIND UTILIZAREA COMPETENȚELOR TIC ÎN ÎNVĂȚAREA LIMBILOR STRĂINE

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Abstract. *Young people involved in education and training struggle to understand how language skills can improve their effectiveness in becoming competitive EU citizens with a full understanding of languages and cultural context to fulfill their potential in the labour market. The Going Places project could be an example on how to combine ICT with teaching vocational languages, aiming to provide some innovative tools to tackle issues of engagement and motivation in language learning in upper secondary and pre-vocational and vocational education and training. The concept aims to making learning a language an enjoyable experience and immersing the learners in a story (with the adventure of the first days of work theme) that would enable them to make decisions based on their knowledge of a situation together with their learned understanding of a language and culture.*
Key words: *languages, ICT, vocational, VET, game, innovation*

Rezumat. *Tinerii implicați în procesul de educație și formare se luptă pentru a înțelege modul în care competențele lingvistice pot îmbunătăți eficiența acestora în a deveni cetățenii UE competitivi, cu o înțelegere completă de limbi și contextului cultural pentru atingerea potențialului maxim pe piața muncii. Proiectul Going Places ar putea fi un exemplu asupra eficienței combinării compenețelor TIC în predarea limbilor pentru domeniul profesional. Oferind o serie de instrumente inovatoare care abordeayă problemele de angajare și motivare în învățarea limbilor străine în învățământul secundar, vocațional și al formării profesionale. Conceptul are drept scop transformarea învățării unei limbi într-o experiență plăcută prin cufundarea cursanților într-o poveste (aventura unui tănâr în primele sale zile ca angajat), care le permite să ia decizii pe baza cunoștințelor dobândite legate de limbă și cultură.*
Cuvinte cheie: *limbi, TIC, vocational, VET, joc, inovație*

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INTRODUCTION

New technologies have become the dominant feature which influences living and working at the beginning of our millennium. The resulting challenge to education has been discussed and the explanation is "that with knowledge doubling every five years – every 73 days by the year 2020 – we can no longer attempt to anticipate future information requirements. If students are to keep pace with the rapid increase of knowledge, we cannot continue to organise curriculum in discrete compartments … the disciplines as we have known them, no longer exist. They are being replaced by human inquiry that draws upon generalised trans-disciplinary bodies of knowledge and relationship." (Costa and Liebmann, 1995).

"As a result, the traditional skills of information gathering and storming as well as the more learning of facts will no longer be sufficient in order to live, work and learn in the coming centuries. Consequently, the ultimate aim of teaching and learning will be to assist learners in their need to develop strategies of knowledge processing. Therefore, the traditional transmission model of learning must be replaced by models which emphasise information processing and knowledge construction as acts of learning most suited for the acquisition of the king skills needed for the knowledge society. Education a detaching in the knowledge society can no longer be reduced to "the act, process, or art of imparting knowledge and skill" as Roget's Thesaurus proposed, but learning must be recognised as an act in which a learner plays the role of an active constructor of knowledge. Criteria based on such principles need to be considered when evaluating the effectiveness and value of technology enhanced materials for language learning." (Rüschoff and Lund, 2003)

There is a general and specific need to familiarize language teachers and trainers with the use of ICT and to show them how to use these to their best advantage in different vocational training situations. There is an urgent need to develop the new types of literacies (scientific, digital, practical, linguistic and cultural) if vocational language teachers and trainers are to take full advantage of the possibilities offered by virtual learning environments.

The Going Places project could be an example on how to combine ICT with teaching vocational languages, aiming to provide some innovative tools to tackle issues of engagement and motivation in language learning in upper secondary and pre-vocational and vocational education and training. The concept aims to making learning a language an enjoyable experience and immersing the learners in a story (with the adventure of the first days of work theme) that would enable them to make decisions based on their knowledge of a situation together with their learned understanding of a language and culture.

The project aims to support the promotion of language learning and to empower both learners/trainees and teachers/trainers to engage in more effective ways of developing language and cultural competencies. It also aims to give opportunities to teachers/trainers to develop tasks at a higher level,

hence becoming a progressive learning and teaching tool, where learners/trainees and teachers/trainees can generate new learning situations. This would be achieved by the development of guidance tools for creating new content using the existing animated scenarios.

There will be a set of materials giving suggestions for other activities focusing on specific vocabulary to a certain area corresponding to the stage in the animation as well as suggestions for the teachers themselves on how to organize situational activities with their students that will allow for more freedom in the choice of vocabulary and type of interaction.

MATERIAL AND METHOD

The main educational resource promoted by the project is the Going Places with Languages DVD, a new and exciting language learning tool. This interactive DVD will support the teacher to increase the attractiveness of the teaching techniques, making the lessons more enjoyable and motivating for students. It will also give students the opportunity to discover that learning a language can be fun and can help them access different information sources and interact easily in a foreign country.

The topic of the learning animations focuses on the development of transferable basic business language skills which are useful for vocational learners involved in areas such as business, retail, travel and tourism and customer service.

The animation of the DVD is based on a young man's first work experience and the adventure he embarks on. The story of the main character starts with his first day of work in a company. As he knows a foreign language, he ends up navigating his way around Europe with his boss and lands the company its largest ever contract, and also a well-paid job for himself. The learners will follow the main character on his European adventures, and assist him with information gathering, booking travel arrangements, problem solving, communicating with other business professionals and many other activities. The topic are everyday business language topics, and the resource is particularly suitable for youngsters in year 9/10 who are interested in using computer games and ICT based resources.

The animation is available for developing vocational language skills in German, French and Spanish, and it also provides various teaching/learning supporting materials for CLIL for vocational learners.

The planned activities are:

1. Research and contextualization in each partner country in relation to VET

- An analysis of the present state of languages education and national policies supporting VOLL and CLIL in vocational language education, current implementation models in the countries of the partners.
- Identifying current training and professional ways of development for teachers and trainers in the context of vocational language teaching.
- Identifying current accreditation models for Vocational Education in languages.
- Identification of potential issues in the analyzed areas as follows: VET education; Policy for supporting training of teachers in the field of vocational language education; Models for teaching with an emphasis on identifying the use

of ICT in teaching languages in vocational education; Current accreditation models in use.

The information will be collected via desk research, questionnaires and focus groups with teachers, policy makers and staff involved in training of teachers/trainers in vocational education

2. Adaptation of the resource

The aim of this activity is to modify and adapt the original resource to meet the needs on the new target groups. With the help of this package, the interactive resource content will be adapted in the languages of the partner countries. The language of instruction (EN) will also be modified for use as a CLIL resource. Adaptation of the resource will also take into account sociocultural aspects of the target countries to maximize the European dimension.

3. Implementation 'Train the Trainer'

The aim is to develop training materials to conduct training of teachers/trainers in using the new adapted resource. The training materials will include guidance for possible accreditation of non-formal techniques used in language learning, according to the European Framework (EF). This will form the basis for the Implementation concept which will take into account the results of the WP 2 and ensure suitability for the target groups in each of the countries.

Another aim will be to conduct training of teachers and trainers and obtain feedback for the train the trainers' events - evaluation of training.

4. Piloting and testing of the resource

The piloting and testing of the resources will be conducted by the trained teachers in class with their students; by liaising with lead partners they will get feedback on usage issues, limitations and suggestions for further improvement. This is part of the evaluation process and will impact on the adaptation plan of the resource to ensure that it takes into account end users' feedback. Once feedback has been received, the resource will be adapted accordingly and as soon as all partners are agreed on the content, it will be launched.

5. Evaluation, Impact and Quality Assurance

The aims are to analyze the transfer, to identify possible impact indicators for further improvement (which will feed back in the production stage) and implement a quality assurance process to ensure the projects aims and objectives are met to high standards. In this stage the partnership cooperation will also be evaluated alongside the evaluation of the resource produced and the training materials. The evaluation and quality assurance aims will be an on-going support for the partners to maximize cooperation, expertise and collaboration. Quality assurance is a key element of the project and will be closely monitored throughout its lifetime, via the project quality plan. This plan outlines the key aims and objectives and is clearly linked to specific deliverables and milestones from the initial stage of the project to its final evaluation.

6. Production Stage

The aim is to produce the final product, which is the adapted and modified version of the original resource in three other languages - German, Polish and Romanian. A guidance booklet for trainers/teachers will be available in DE, PL, RO, EN, including guidance on accreditation. Mapping of the resource to the European Framework will be included. This package aims to ensure that the final version of the resource is produced, which takes into account results from the piloting, testing and validation.

RESULTS AND DISCUSSIONS

Results of the project:

- 4 reports on the analysis of the current state of languages education and national policies supporting VOLL and CLIL in vocational language education in RO, DE, PL and UK;
- 160 (40 per country) target people involved in the questionnaire researches;
- 48 (6 per country) target people involved in the focus group researches;
- 1 teacher guide on how to use the resources developed within the Going Places project
- 1 guidance on how the resources are mapped according to the European Framework and steps for accreditation;
- Interactive materials to be used as guidance in the teaching process;
- 18 (6 per country) teachers involved in the trainings for teachers;
- 150 (30-60 per country) students involved in piloting activities;
- 9 adapted DVD's (available in Romanian for learning German, French and Spanish; available in Polish for learning German, French and Spanish; available in German for learning French and Spanish; and available in English for CLIL);
- Evaluation and feedback forms;
- 200 (50 per country) booklets (guidance for teachers);
- Project website http://www.going-places.eu;
- Dissemination and exploitation materials and events.

CONCLUSIONS

The short term impact of the project will be aimed at VET teachers/ trainers in upper secondary education and in formal VET. The learners and trainees will also benefit during the piloting, testing and validation of the resource. Teachers/Trainers, and learners, should witness a greater interest in language learning, through increased accessibility to innovative teaching/learning tools enabling them to become better prepared language teachers/trainers and learners.

The long-term impact of the project will be spread wider than the project consortium and will be carried out by the dissemination and exploitation plan by making interested parties aware of the project, the products produced, the methods explored and the experiences of project participants. This impact will be felt through the inclusion of project products into mainstream language teaching programmes and accredited tools (in the partner countries and beyond). Higher quality of language teachers/trainers formation – using modern and "fun" tools for learning. The impact will be felt also by VET pupils, students, and their language teachers, educators and decision makers in the field of education and labour with the overall level of quality of vocational education and training in languages in the target

countries being raised. There will be innovative added value for new target groups and new vocational sectors.

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A FUNCTIONAL APPROACH OF THE TOURISM SATELLITE ACCOUNTS (TSA)

ABORDAREA FUNCȚIONALĂ A CONTURILOR SATELIT DIN DOMENIUL TURISMULUI (CST)

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Abstract. *There are several types of satellite accounts recommended to be developed and compiled at European level, such as Tourism Satellite Account (TSA). Demand generated by tourism covers a wide range of goods and services in which the transport, accommodation and food play an important role. A functional satellite account for tourism might combine a functional method along with an analysis on activities and products. For Romania, Tourism Satellite Account (TSA) is not structured, although there are compiled and reported to Eurostat (European Commission) 19 variables in this field since 2010.*
Key words: *satellite accounts, tourism satellite account (TSA), European Union, Romania.*

Rezumat. *Există o serie de tipuri de conturi satelit recomandate a fi dezvoltate şi compilate la nivel European, precum cel din domeniul turismului (CST). Cererea generată de turism acoperă o gamă variată de bunuri şi servicii, în care transportul, serviciile de cazare şi alimentaţie joacă un rol important. Un cont satelit funcțional precum cel din domeniul turismului poate combina o metodă funcțională cu o analiză pe activități și pe produse. Pentru România, contul satelit pentru turism (CST) nu este structurat, deşi se compilează şi se raportează la Eurostat (Comisia Europeană) 19 variabile din domeniul turismului încă din 2010.*
Cuvinte cheie: *conturi satelit, contul satelit din domeniul turismului (CST), Uniunea Europeană, România.*

INTRODUCTION

There are several types of satellite accounts recommended to be developed and compiled at European level (European Parliament, 2010): a) agricultural accounts; b) environmental accounts; c) health accounts; d) household production accounts; e) labor accounts and social accounting matrices; f) productivity and growth accounts; g) R&D accounts; h) social protection accounts; i) tourism accounts.

Functional satellite accounts focus on describing and analyzing the economy for a function, such as environment, health, and research and development. For each function they provide a systematic accounting framework. They do not provide an overview of the national economy, but focus on what is relevant for the function. To that end, they show detail not

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visible in the aggregated central framework, rearrange information, add information on non-monetary flows and stocks, ignore what is irrelevant for the chosen function and define functional aggregates as the key concepts (European Parliament, 2010).

MATERIAL AND METHOD

The fundamental aim of the personal research was represented by the current state and prospects of international implementation of satellite accounts of the national accounts system (SNA) in EU and Romania, to meet the specific needs of certain data in the tourism sector in line with EU requirements (SEC 95; SEC 2010) (European Commission et al., 2008; European Parliament, 2010).

The concepts are generalizations. In economics, a concept is a "logical, mental construction of one or more connections". The concepts are inherently abstract and based on logic and reasoning. In economics, the concepts are typically focused on the relationships between variables. The main purpose of the fundamental conceptual framework is the development of hypotheses to be tested (Evensen, 2012).

Personal research on tourism satellite accounts (TSA) of national accounts system (SNA) is a fundamental, conceptual and, partly, a development one, i.e. the empirical application of the concept of functional satellite accounts for agriculture in Romania (Costuleanu, 2013).

RESULTS AND DISCUSSIONS

The document entitled „Proposal for a Regulation of the European Parliament and of the Council on the European System of national and regional accounts in the European Union" offers a general introduction for satellite accounts. Although in proposal phase, it describes and discusses how the central framework can be used as a building-block-system to serve many important specific data needs. Satellite accounts elaborate or modify the tables and accounts in the central framework to serve specific data needs. (European Parliament, 2010).

Satellite accounts can meet specific data needs by providing more detail, by rearranging concepts from the central framework or by providing supplementary information, such as non-monetary flows and stocks. They may deviate from the central concepts. Changing the concepts can improve the link with economic theoretic concepts such as welfare or transactions costs, administrative concepts such as taxable income or profits in the business accounts, and policy concepts such as strategic industries, the knowledge economy and business investments used in national or European economic policy. In such cases, the satellite system will contain a table showing the link between its major aggregates and those in the central framework (European Parliament, 2010).

The most important characteristics of satellite accounts are presented in Table 1, adapted after European Commission and European Parliament (2010).

Table 1

The most important characteristics of satellite accounts (adapted after European Commission and European Parliament, 2010)

	Functional accounts	Links to industries or products	Links to institutional sectors	Inclusion of non-monetary data	Extra detail	Supplementary concepts	Different basic concepts	Experimental results and more use of modeling	Part of EU transmission program
Agricultural		X			X	X			X
Environmental	X	X		X	X	X	X	X	X
Health	X	X		X	X		X		X
Household production			X	X	X		X	X	
Labor and SAM		X	X	X	X				
Productivity and growth		X		X	X	X	X	X	X
R & D	X	X		X	X		X	X	
Social protection	X			X	X				X
Tourism	X	X		X	X	X			
Balance of payments			X		X				X
Government finance			X		X	X			X
Monetary and financial statistics, and flow of funds			X		X	X			X
Supplementary pension table			X		X	X	X	X	X
Corporate activity			X		X				
Informal sector					X			X	
Non-profit institutions			X		X			X	
Public sector			X		X				
Tax revenue tables			X		X				X

Major advantages of satellite accounts include the following: a) based on a set of clear definitions; b) application of a systematic accounting approach; c)

linkage to the basic national accounting concepts; d) linkage to national accounts statistics (European Parliament, 2010).

The tourism satellite account (TSA) provides an overview of the supply and use of goods and services for the various types of tourism and their importance for domestic employment, balance of payments, government finance and personal and business income.

"Tourism" comprises the activities of persons travelling to and staying in places outside their usual environment for less than a year and for a main purpose other than to be employed by a resident entity in the place visited. These activities encompass all that visitors do for a trip or while on a trip. It is not restricted to typical tourism activities such as sightseeing, sunbathing and visiting sites. Travelling for the purpose of conducting business and for education and training can also be part of tourism (European Parliament, 2010).

The demand generated by tourism covers a variety of goods and services, in which transportation, accommodation and food services figure prominently. In order to obtain international comparability, tourism characteristic products are defined as products which, in the absence of visitors, in most countries would probably not exist in meaningful quantities or for which the level of consumption would be significantly reduced, and for which it seems possible to obtain statistical information.

Tourism-connected products are a residual category, including those that have been identified as tourism-specific in a given country but for which this attribute has not been acknowledged on a worldwide basis. Some of the services for tourism purposes, such as accommodation in second homes or transportation in individual motor vehicles, can be produced in significant amounts on own account. However, in the central framework, unlike own account housing services, transportation services produced within households for their own benefit are not regarded as production. It is recommended to follow that convention in the tourism satellite account. But for countries in which own account transportation services are significant, they can show them separately in the tourism satellite account (European Parliament, 2010). The supply and use of goods and services for tourism purposes, as well as value added and employment generated by tourism, can be shown in a supply and use table distinguishing its characteristic products and industries and the tourism-connected products.

Definitions of trade in health goods and services under the SHA framework and the concepts adopted for tourism satellite accounting show many similarities that may be useful in identifying relevant data sources.

First and foremost, tourism is primarily a demand-side phenomenon that refers to the activities of visitors and their role in the acquisition of goods and services across many different industries, including health goods and services. Tourism, as defined under tourism statistics, goes beyond what may be traditionally perceived to include persons travelling (under certain conditions

explained below) for holiday, leisure and recreation purposes and also includes, among others, business, education, and importantly, health.

However, if the purpose of a trip is for employment or to earn an income, then the trip is not considered as a tourist trip, and the individual cannot be considered as a visitor. Therefore, in the case of seasonal and border workers, any expenditure on health would be excluded from the Tourist Satellite Account (European Commission et al., 2008).

The wider measure of tourism consumption is a TSA concept that is more inclusive because it also includes "services associated with vacation accommodation on own account, tourism social transfers in kind and other imputed consumption". For the purposes of health, this distinction can be useful, since it includes, in theory, government consumption expenditure on individual non-market services or products including social services and health that can be considered as benefiting visitors (social transfers in kind) (European Commission et al., 2008).

The Tourism Satellite Account is organized according to products (using the internationally approved classifications of products CPC Ver. 2) – that is, the goods and services consumed by visitors. However, since the product breakdown of tourist expenditure is based primarily on information provided by visitors, the classification for collection of this expenditure is usually based on purpose, in this case the COICOP. Consequently, there is a need to adapt data based on the COICOP – a functional classification – to the CPC – a product classification – which can be linked to products (CPC) and activities (ISIC).

It should be noted that a specific category "health and medical care" corresponds closely to the main purpose of the trip, and as such the incidental purchase of health care products and occasional health services may be allocated into non-tourism-related consumption products in the first instance. Additional tables of the TSA show both how this tourist demand is met by domestic supply and imports as well as the link with non-monetary information.

For example, Switzerland specifically includes "Health care" as a tourism-connected product in their Tourism Satellite Account (European Commission et al., 2008).

In 2009, the European Union was considering that "Romania is in an early stage of development of TSA with a feasibility study partly conducted (2005 and 2008) and also a pilot, non-official, TSA informally developed in 2004. The current objective is to improve the statistical basis in order to have a series of detailed data necessary for the compilation of TSA ". Thus, Romania was included, along with Italy and Belgium, among EU countries at the "Start Compilation" level, providing the first empirical results on the TSA (Eurostat-European Commission, 2009).

In the EU version of the 2010 document, published in 2011, Romania is referred to as an originator of the steps to achieve TSA, having previously reported a number of 19 variables in tourism to Eurostat (Eurostat-European Commission, 2011).

CONCLUSIONS

1. EU legislation related to tourism satellite accounts (TSA) is strictly regulated.

2. A functional satellite account as that for tourism might combine a functional method with an analysis on activities and products.

3. For Romania, the Tourism Satellite Account (TSA) is not structured, although there are compiled and reported to Eurostat (European Commission) 19 variables in tourism field since 2010.

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THE INFLUENCE OF PLANTING DENSITY ON THE EFFICIENCY OF PHOTOSYNTHESIS AT AN ASSORTMENT OF TOMATOES GROWN IN POLLYTUNNELS, IN ECOLOGICAL CONDITIONS

INFLUENȚA DENSITĂȚILOR DE PLANTARE ASUPRA EFICIENȚEI PROCESULUI DE FOTOSINTEZĂ LA UN SORTIMENT DE TOMATE CULTIVATE ÎN SOLAR, ÎN CONDIȚII ECOLOGICE

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Abstract. *The paper aims to assess the ecological plasticity of tomato cultivars to specific cultural conditions, expressed by the efficiency of photosynthesis process. The increase of the photosynthesis rate, along with the transpiration rate in optimal hydratation and temperature conditions occurs due to stimulation of the stomatal opening degree. The stomatal reaction is a response to water availability to adjacent tissues and results in an increasing of perspiration. Having direct influence on the growth and yield, the total content of chlorophyll pigments was determined in vivo, revealing the predominant influence of the genotype.*
Keywords*: ecological tomatoes, photosynthesis process, stomatal conductivity, total content of chlorophyll pigments*

Rezumat. *Lucrarea își propune să evalueze plasticitatea ecologică a cultivarelor de tomate la anumite condiții de cultură, exprimată prin eficiența procesului de fotosinteză. Creșterea ratei fotosintezei, însoțită de creșterea ratei transpirației, în condiții de hidratare și temperatură optime are loc datorită stimulării gradului de deschidere al stomatelor. În cazul tomatelor, reacția stomatelor este un răspuns la disponibilitatea apei pentru țesuturile adiacente și are ca efect o creștere a ratei transpirației. Conținutul total în pigmenți clorofilieni, influențând în mod direct creșterea și productivitatea, a fost determinat in vivo, relevând preeminența influenței genotipului.*
Cuvinte cheie*: tomate ecologice, fotosinteza, conductivitate stomatală, conținutul total de pigmenți clorofilieni.*

INTRODUCTION

The evaluation of the cultivars ecological plasticity to specific cultural conditions is an important step in researches regarding the study of the photosynthesis process due to its high sensitivity to a number of environmental factors.

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Researches conducted by various authors indicate that the intensity of the photosynthesis process is higher on plants grown in open field to those grown under controlled conditions (greenhouses or pollytunnels). Mainly, these variations are caused by the differences in the quantity and quality of light (synthesis by Schwarz, 2002).

The paper aims to evaluate the ecological plasticity of tomato cultivars to specific cultural conditions, expressed in the efficiency of the photosynthesis process.

MATERIAL AND METHOD

The researches were conducted during the 2012 year in the vegetable growing experimental field from "V. Adamachi" farm belonging to UASVM Iași, in two pollytunnels, on a tomato culture with seedling produced at alveolar pallets (without subculturing procedure).

The bifactorial experience (table 1) was organized in a subdivided plots device with three repetitions, each plot containing ten plants.

Table 1

Tehnological factors graduation

A factor (Cultivar)	B factor (Distance between plants / row)
a1 = Margarita F1	**b1** = 33 cm (33.670 plants/ha)
a2 = Primadona F1	
a3 = Winona F1	**b2** = 40 cm (27.778 plants/ha)
a4 = Belladona F1	
a5 = Siriana F1	**b3** = 50 cm (22.223 plants/ha)
a6 = Buzău 1600	

Photosynthesis rate (A), stomatal conductivity (gS), transpiration rate (E) and water use efficiency (A / E) were measured in pollytunnel cultivation conditions (t = 15 °C - 16°C, humidity = 78% - 84%, photosynthetic active light intensity PAR 500-600 micromol mol^{-1}) with gas analyzer device (600 LCi, ADC BioScientific Ltd., England). Measurements were performed on three leaves / plant and three repetitions meaning nine measurements / variant.

The total content of chlorophyll pigments was determined in vivo using the CCM-200 Chlorophyll Content Meter plus device. The results are shown in table 2.

Table 2

The description of physiological indicators determined in the experiment

Physiological indicator	Symbol	Measurement unit
Photosynthesis rate	A	μmol CO_2 $m^{-2}s^{-1}$
Transpiration rate	E	mmol H2O $m^{-2}s^{-1}$
Water use efficiency	WAE	A/E
Stomatal conductivity	gs	mol CO_2 $m^{-2}s^{-1}$
Total content of chlorophyll pigments	CCI	relative units

RESULTS AND DISCUSSIONS

Pollytunnel environmental conditions differ widley from those acting at an open field culture.

The data that we have obtained (figure 1) showed that the photosynthesis rate at tomato hybrids grown in pollytunnels is between 3,6 µmol $CO_2/m^{-2}\cdot s^{-1}$ at Siriana F1 x 33 cm variant and 5,92 µmol $CO_2/m^{-2}\cdot s^{-1}$ at Buzau 1600 x 50 cm variant. These data are in accordance with those obtained by other authors (Kosobryukhov, 2000).

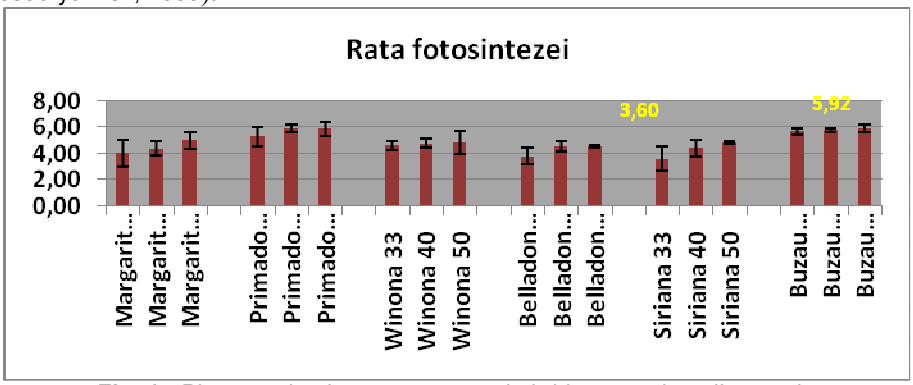


Fig. 1 - Photosynthesis rate at tomato hybrids grown in pollytunnels

The compensation of photosynthesis losses by increasing the fixation of carbon dioxide to the amount of photons absorbed is determined by the adaptation to low light intensity (Logan, 1998). Particularly, in this process, stomatal conductivity occurs associated with the rate of photosynthesis and light intensity and less with soil's water availability and transpiration rate (Wayne and Van Auken, 2009). This can be influenced by plant's phenological phase, temperature or other environmental factors (Ogle and Reynolds, 2002).

Regarding the transpiration rate, it varied within a fairly wide spectrum, with a minimum at Siriana F1 x 33 cm variant (2,48 mmol H_2O / $m^{-2}*s^{-1}$) and a maximum at Buzau 1600 x 40 cm variant (4,79 mmol H_2O / $m^{-2}*s^{-1}$) (fig. 2).

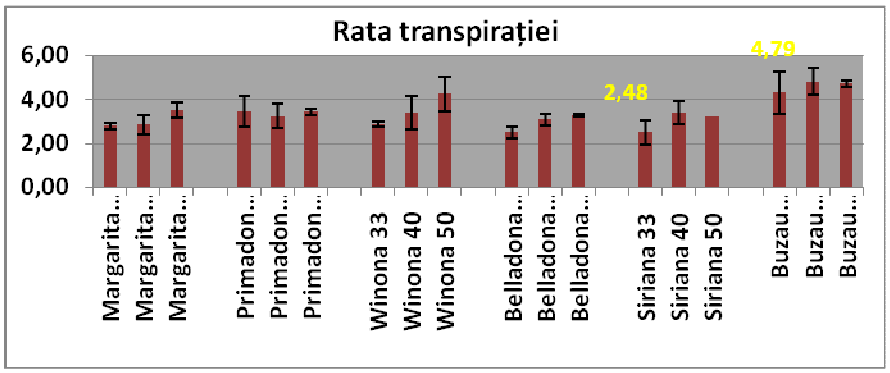


Fig. 2 - Transpiration rate at tomato hybrids grown in pollytunnels

Water use efficiency (figure 3), expressed as the ratio between the photosynthesis rate and transpiration rate, highlights the Winona F1 x 50 cm (1.13) and Primadonna F1 x 40 cm (1.83) as limit variants.

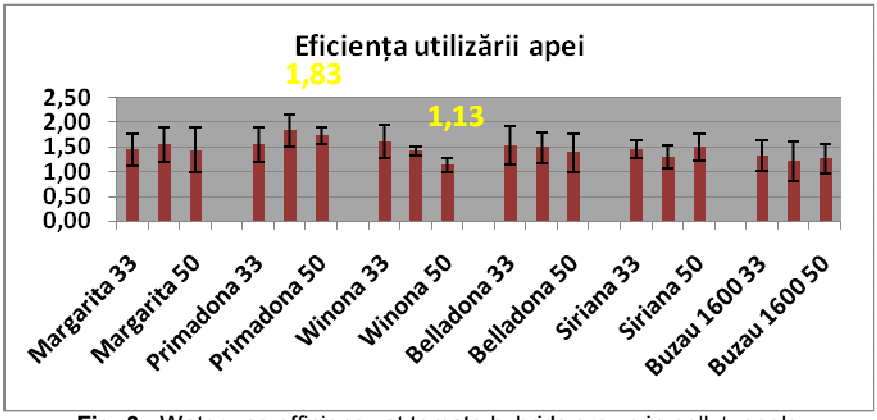


Fig. 3 - Water use efficiency at tomato hybrids grown in pollytunnels

The main internal factor that influences stomatal conductivity is the turgor of epidermal and stomatal cells (Wu, Sharpe and Spence 1985; Mencuccini, Mambelli and Comstock, 2000; Franks et al., 2001), the regulation of this turgor taking place by energy consumption (Farquhar and Wong, 1984; Assman, 1999; Blatt, 2000; Netting, 2000). Turgor is the result of a balance between the amount of water lost by perspiration process and the one absorbed from soil at the roots level. (Cowan, 1977; Mott and Parkhurst, 1991; Maier-Maercker, 1999; Mott and Franks, 2001).

Siriana x 33 cm variant registered the lowest stomatal conductivity (0,10 mol H_2O/m^{-2} s^{-1}) and Margarita x 50 cm variant – the highest (0,32 mol H_2O/m^{-2} s^{-1}) (figure 4).

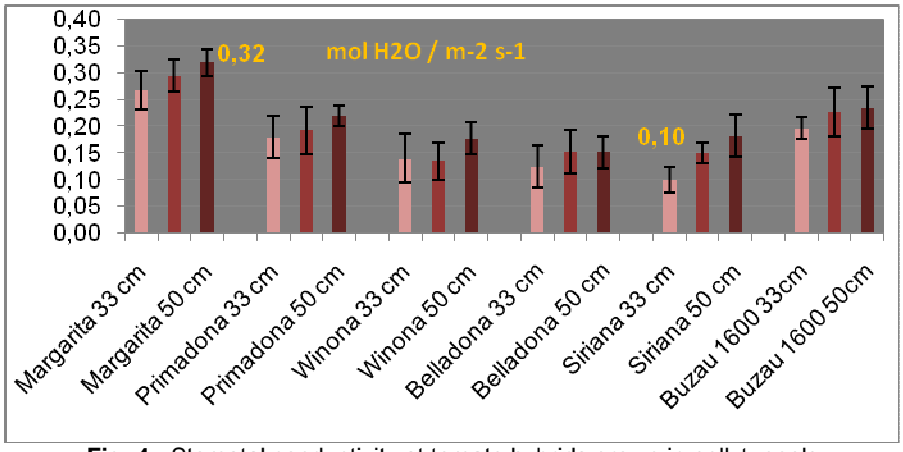


Fig. 4 - Stomatal conductivity at tomato hybrids grown in pollytunnels

There is a positively corelation between total chlorophyll content and growth and yield (Ramadasan et al., 1993, cited by Vijitha and Mahendran, 2010).

Adaptability of plants to low light intensities is closely related to a number of internal factors, of which the most important are fotosistems efficiency (particularly PSII) and relative chlorophyll content (Griffin et al., 2004).

All variants showed the minimum content of total chlorophyll at 33 cm between plants/row and the maximum content at 50 cm between plants/row, the distance between plants/row having a direct influence on the total chlorophyll content.

Interaction of the two factors show two distinct limit variants: Buzau 1600 x 40 cm variant (38,93 relative units) and Siriana F1 x 50 cm variant (67,08 relative units) (figure 5).

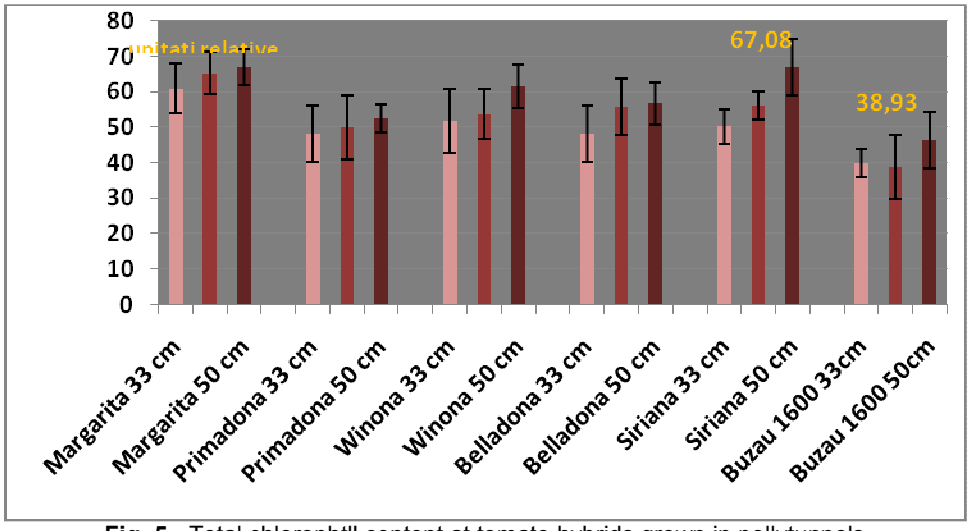


Fig. 5 - Total chlorophtll content at tomato hybrids grown in pollytunnels

CONCLUSIONS

1. In almost all cases, decreasing the distance between plants/row results in the decrease of the photosynthesis rate, due to increasing the shading of plants or to plant competition for water and soil.

2. Stomatal conductivity and total content of chlorophyll pigments increased proportionally to the distance between plants/row, while the influence of planting densities on the transpiration rate and water use efficiency was found to be stochastic.

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STUDIES ON THE MAIN FEATURES VARIABILITY AT 'PREMIER', (*SPINACEA OLERACEA*) VARIETY

STUDII PRIVIND VARIABILITATEA PRINCIPALELOR CARACTERE LA SOIUL DE SPANAC 'PREMIER' (*SPINACEA OLERACEA*)

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Abstract *Extinction of species, varieties and cultivars impose conservation actions by scientific methods. Studies on uniformity, stability (DOS) and production performance are undertaken annually by breeders in order to maintain the variety within the normal variability that has been created. This paper presents the limits of variability depending on studied feature. The phenological observations and biometric measurements performed highlight that the variety of spinach "Premier" has medium variability (s% range 10-20) for characters: height and diameter of leaves rosette, plant height, seed weight / plant and large variability (% ≥ 20) for characters: weight of leaves rosette, number of branches / plant.*
Key words: *population, gene, genotype, coefficient of variability*

Abstract *Pericolul disparitiei unor specii, varietati si soiuri a determinat actiuni de conservare a acestora dupa metode stiintifice. Studii privind verificarea conditiilor de distinctibilitate, omogenitate si stabilitate (DOS) si a performantelor de producţie se fac anual de către ameliorator, în vederea menţinerii soiului în limitele de variabilitate normale prin care a fost creat. În lucrare sunt prezentate limitele de variabilitate funcţie de caracterul studiat. Din observaţiile fenologice şi măsuratorile biometrice efectuate se relevă faptul că pentru soiul de spanac "Premier" variabilitatea a fost mijlocie (s% cuprins între 10-20) pentru caracterele: înălţimea şi diametrul rozetei de frunze; înălţimea plantei semincere; greutatea seminţelor/plantă si mare (s% ≥ 20) pentru caracterele: greutatea rozetei de frunze, numărul de ramificaţii/plantă.*
Cuvinte cheie: *populatie, gene, genotip, coeficient de variabilitate*

INTRODUCTION

Extinction of species, varieties and cultivars determined their conservation actions by scientific methods. Investigations of distinctibility, uniformity and stability (DOS) and studies on production performance are made annually by the breeder to maintain variety within the normal variability that has been created (Ambarus, 2010).

Spinach is considered quite rustic, meaning that germinate at relatively low temperatures from 3-5 ° C and resists quite well to the slight negative temperature (minus 8-10 º C). The plant is sensitive to photoperiod and thermoperiod. Day long and / or low temperatures (6-10°C) causes early vernalization and flowering. In terms of sexuality, spinach is a dioecious species (with unisexual flowers on

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different plants of the opposite sex). The ratio of female and male plants usually is 1:1, but some environmental conditions can alter this ratio. Pollination is made by wind, male plants produce large amounts of 'easy' and dry pollen. Dioicious can be explored to obtain hybrids, knowing that this species has a significant somatic heterosis. Getting inbred lines can be solved by causing hermaphrodism or monoecious, or by self-pollinated full-sib (full sib) in the two plants brother + sister (Muresan 1986). The fruit is a round shaped pseudoachen (var. inermis) or round-corners (var. spinosa). Each fruit contains a single seed. A plant produces 200-300 seeds / fruit. Cultures of 'PREMIER' variety set up in early spring cover the following stages: the juvenile stage (about 30-40 days), postjuvenile phase (10-20 days), followed by prefloriferous phase (10-15 days), flowering stage (15-20 days), and finally, the seed stage (Brezeanu, 2010).

MATERIAL AND METHOD

Selection method used was individual selection as positive characters (choice of elites). Following characters were studied: height rosette of leaves – cm, diameter of the rosette of leaves – cm, weight of the rosette of leaves – g, number of branches / plant, seed plant height – cm, weight of seeds / plant – g.

Biometric measurements were performed on a sample of 100 individuals (random sample) taken at random on the diagonal field.

The experiments were conducted in condition of an alluvial soil, medium evaluated and sandy loam developed texture, pH value between 6.2 and 6.7 and humus content 2.5-2.7 %.

RESULTS AND DISCUSSIONS

Research methods in genetic, breeding and seed production find its real use when working is done with a suitable biological material. Choosing of material need to respect some general conditions: (1) to present distinct, clear and easy to follow features, from parents to descendants; (2) have a short life cycle; (3) to produce more descendants; (4) easy to produce mutagenic changes under the influence of muthagens factors; (5) maintain the valuable characters at the descendants.

In cultivation of spinach variety 'Premier' phenological observations and biometric measurements were made for each phenological phase as follows: (i) date of sowing - 22.09, (ii) the date of emergence - 10.10, (iii) date training rosette of leaves - 14.04, (iv) date of issue floriferous stems - 30.04, (v) flowering time - 20.05,(vi) reaching physiological maturity of seeds - 15.07.

By analyzing the proportion of female plants, male and hermaphrodite, 100 individuals included in the study, resulted: 71% of plants were female, 27% of plants were male and 2% of plants were hermaphrodite.

In the conservative selection of "Premier" spinach variety a sufficiently large number of elites (typically plants) have chosen in purpose to avoid the genetic drift. Statistical and mathematical processing of data drawn from the measurements, showed the following ranges of variation at spinach variety "PREMIER" (table 1).

Table 1

Variability study of some traits at "Premier" spinach variety

No	Features	X	s	s%	Limits of variation	Signification %
1.	Height of rosette leaves - cm	15.19	1.93	12.71	13.26-17.12	10-20
2.	Diameter of rosette leaves - cm	38.70	4.02	10.39	34.68-42.72	10-20
3.	Weight of rosette leaves - g	198.40	44.26	22.31	154.14-228.66	>20
4.	Number of branches / plant	11.42	2.36	20.67	9.06-13.78	>20
5.	Height of plant seed - cm	108.94	19.69	18.07	89.25-128.63	10-20
6.	Weight of seeds / plant - g	9.07	1.35	14.88	7.72-10.42	10-20

- 10-20 - medium level of variability
- >20 - high level of variability

From the data presented in Table 1, it appears that the variability differ depending on studied character. It's middle at height and diameter of rosette leaf, plant height seed and seed weight / plant and high at leaf rosette weight and number of branches / plant. Histograms of variation (Gaus's curve) for each studied traits present variation of : height rosette of leaves – cm, diameter rosette of leaves – cm, weight rosette of leaves - g, weight of seeds / plant - g. (Fig.1-4).

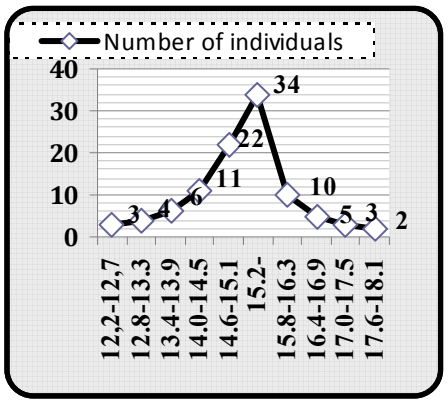


Fig. 1 - Histogram of leaf rosette's height variation (cm)

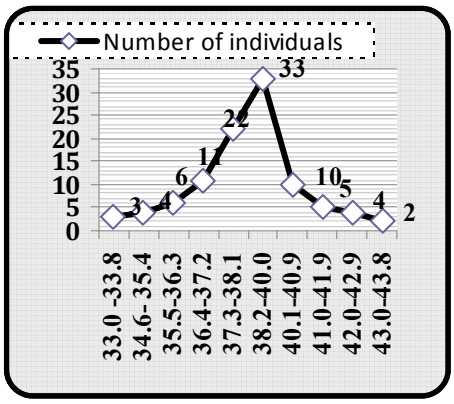


Fig. 2 - Histogram of leaf rosette's diameter variation (cm)

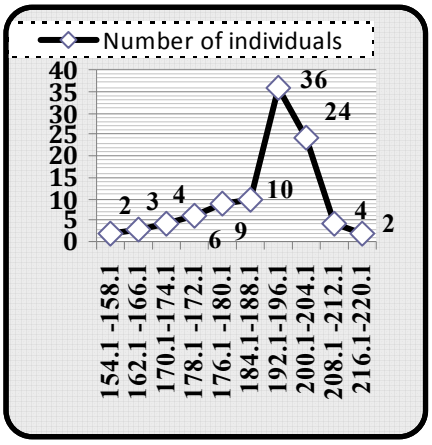


Fig. 3 - Histogram of leaf rosette's weight variation (cm)

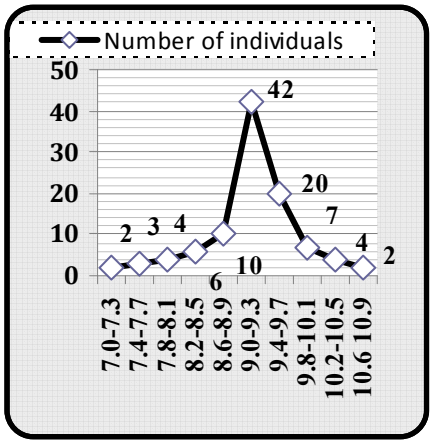


Fig. 4 - Histogram of seed's weight/ plant variation (g)

CONCLUSIONS

"PREMIER" variety was within the normal range of variation behaving in culture as a kind distinct, uniform and stable.

The variability of features like height and diameter of rosette leaf, plant height seed and seed weight / plant was middle and high at leaf rosette weight and number of branches / plant.

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SUITABILITY STUDY OF VEGETABLE CULTIVARS IN ORGANIC FARMING

STUDIUL PRETABILITĂȚII UNOR CULTIVARE DE LEGUME LA CULTURA ÎN AGRICULTURĂ ECOLOGICĂ

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***Abstract**: Tomato lines: L3, L4, L5, L6, L6 -7, LL1, LL2, LL3, LL4, LL5, LL7, LL8, LL9, LL10, LL11, LL12, LL13, LL14, LL15, LL16, LL17, LL19, LL20, LL21, LL22, LL23, LL24, LL25, LL27 and Benatar F1 hybrid had the highest suitability in organic farming system. Lines: L1, L2, LL6 and hybrids: F1 Abelus, Bersola F1, Amanet F1 were tolerant of soil pathogens attack. The proportion of healthy plants was 96%. Lines: LL18 and LL26 were susceptible to attack by soil diseases the % of healthy plants was under 78%. Degree of attack at varieties of lettuce: were less than 3% for Marilena and 0% at Silvia and Serata. The % of healthy plants at long pepper - Siret, sweet pepper - Dariana Bac and round pepper - Creola was higher than 95%.*
***Key words:** study, soil pathogens attack, tomato, pepper, organic agriculture*

***Rezumat:** Liniile de tomate: L3, L4, L5, L6, L6 -7, LL1, LL2, LL3, LL4, LL5, LL7, LL8, LL9, LL10, LL11, LL12, LL13, LL14, LL15, LL16, LL17, LL19, LL20, LL21, LL22, LL23, LL24, LL25, LL27 şi hibridul Benatar F1 au avut cea mai bună pretabilitate la sistemul de agricultură ecologică. Liniile: L1, L2, LL6 şi hibrizii: Abelus F1, Bersola F1, Amanet F1 au fost tolerante la atacul patogenilor de sol, procentul de plante sănătoase fiind de peste 96%. Liniile: LL18 şi LL26 au fost sensibile la atacul bolilor de sol, procentul de plante sănătoase fiind sub 78%. La soiurile de salată gradul de atac a fost sub 3% în cazul soiului Marilena şi 0% la soiurile Silvia şi Serata. La soiurile de ardei lung - Siret, ardei gras - Dariana Bac şi ardei gogoşar - Creola procentul de plante sănătoase a fost mai mare de 95%.*
***Cuvinte cheie:** studiul, atacul patogenilor de sol, tomate, ardei, agricultură ecologică*

INTRODUCTION

The major diseases of seedlings are: *Pythium debaryanum* (Hesse), *Rhizoctonia solani (*Kühn), *Fusarium* spp*., Peronospora destructor* (Berk.), (Goldberg, 1995).

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The best practice for minimizing the incidence of disease in organic vegetable crops is planting high quality disease-resistant cultivars (Hamilton, 2004).

All species of plants grown from seed are susceptible to one or more of the soil-borne fungi attack, capable to kill the seedlings (Ravishankar Rai and Mamatha 2004; Ravishankar Rai and Mamatha 2005).

The plants wilt and die suddenly, sometimes before emerging from the soil (preemergence damping-off) and sometimes after emerging from the soil (postemergence damping-off). Symptoms can include root rot, stem lesions, and general seedling wilt. This is even more important, because the tolerant species at pathogen attack have ability to grow in organic agriculture. The sensible species are not indicated for cultivation in organic agriculture.

MATERIAL AND METHOD

During 2010– 2012 years, greenhouse experiments were performed in Vegetable Research-Development Station Bacau - Romania, in order to evaluate the behaviour of vegetable species in the seedling stage, to the soil-borne diseases attack. We refer at the following species: tomato, pepper, lettuce, eggplant.

The seeds of species were sown in the greenhouse on March.

After to 6 – 15 days the young plants were transplanted in cell plastic trays. The soil was treated two times with a fermentation extract of *Urtica dioica*. No preventive chemicals treatments were applied in order to encourage the development of the natural diseases.

Ratings were based on Pathogenically Rating Scale 0-5 (0 is no disease, 5 is terminally infected). The plants were visually evaluated. The following scale was used:

1 - No spots and lesions,
2 - 1 - 3 spots or lesions present on stem or leaves,
3 - 4 - 8 spots present on stem, leaves and bracts,
4 - Lesions and spots present on stem, bracts, leaves, flowers and stems,
5 - Collapse of plant.

The observations were made every 10 days during a 30 days period after plantation of young vegetable plants in cell plastic trays.

The attack estimation was accomplished according with following indicators:

- Frequency of attack (F%),
- Intensity of attack (I%),
- Degree of attack (DA%).

The obtained results will be used in plant breeding activity in order to decrease the number of diseases treatments in the organic agriculture practices of plants with multiple uses.

RESULTS AND DISCUSSIONS

The results obtained in the study accomplished for the determination of the frequency and intensity of the attack of soil borne pathogens is shown in table 1. You can see that the data varied in high limits. The data obtained show that the tomato lines: L3, L4, L5, L6, L6 -7, LL1, LL2, LL3, LL4, LL5, LL7, LL8, LL9, LL10, LL11, LL12, LL13, LL14, LL15, LL16, LL17, LL19, LL20, LL21, LL22, LL23, LL24, LL25, LL27 and Benatar F1 hybrid had the best suitability to organic farming system.

Table 1

Vegetable species used for monitoring of pathogens attack

No.	Cultivar	Attack			H%	Comment
		F%	I%	DA%		
1	2	3	4	5	6	7
Tomatoes with indeterminate port						
V1	L1	1.8	100	1.8^{PPP}	98.2**	Normal emergence
V2	L2	1.8	100	1.8^{PPP}	98.2**	Normal emergence
V3	L3	0	0	0^{PPP}	100***	Normal emergence
V4	L4	0	0	0^{PPP}	100***	Normal emergence
V5	L5	0	0	0^{PPP}	100***	Normal emergence
V6	L6	0	0	0^{PPP}	100***	Normal emergence
V7	L6 -7	0	0	0^{PPP}	100***	Normal emergence
V8	LL1	0	0	0^{PPP}	100***	Normal emergence
V9	LL2	0	0	0^{PPP}	100***	Normal emergence
V10	LL3	0	0	0^{PPP}	100***	Normal emergence
V11	LL4	0	0	0^{PPP}	100***	Normal emergence
V12	LL5	0	0	0^{PPP}	100***	Normal emergence
V13	LL6 Mt	10.0	100	10.0^{PP}	90.0	Normal emergence
V14	LL7	0	0	0^{PPP}	100***	Normal emergence
V15	LL8	0	0	0^{PPP}	100***	Normal emergence
V16	LL9	0	0	0^{PPP}	100***	Normal emergence
V17	LL10	0	0	0^{PPP}	100***	Normal emergence
V18	LL11	0	0	0^{PPP}	100***	Normal emergence
V19	LL12	0	0	0^{PPP}	100***	Normal emergence
V20	LL13	0	0	0^{PPP}	100***	Normal emergence
V21	LL14	0	0	0^{PPP}	100***	Normal emergence
V22	LL15	0	0	0^{PPP}	100***	Normal emergence
V23	LL16	0	0	0^{PPP}	100***	Normal emergence
V24	LL17	0	0	0^{PPP}	100***	Normal emergence
V25	LL18	28.6	100	28.6^{P}	71.4^{000}	Normal emergence
V26	LL19	0	0	0^{PPP}	100***	Normal emergence
V27	LL20	0	0	0^{PPP}	100***	Normal emergence
V28	LL21	0	0	0^{PPP}	100***	Normal emergence
V29	LL22	0	0	0^{PPP}	100***	Normal emergence
V30	LL23	0	0	0^{PPP}	100***	Normal emergence
V31	LL24	0	0	0^{PPP}	100***	Normal emergence
V32	LL25	0	0	0^{PPP}	100***	Normal emergence
V33	LL26	22.2	100	22.2^{P}	77.8^{000}	Normal emergence
V34	LL27	0	0	0^{PPP}	100***	Normal emergence
V35	Abelus F1	3.2	100	3.2^{PPP}	96.8**	Normal emergence
V36	Bersola F1	1.4	100	1.4^{PPP}	98.6**	Normal emergence
V37	Benatar F1	0	0	0^{PPP}	100***	Normal emergence
V38	Amanet F1	2.7	100	2.7^{PPP}	97.3**	Normal emergence
Lettuce						
V39	Marilena	2.1	100	2.1^{PPP}	97.9**	Normal emergence
V40	Serata	0	0	0^{PPP}	100***	Normal emergence
V41	Silvia	0	0	0^{PPP}	100***	Normal emergence
Pepper						
V42	Long - Siret	4.2	100	4.2^{PPP}	95.8**	Normal emergence

1	2	3	4	5	6	7
V43	Round pepper – Creola	1.0	100	1.0 ^{PPP}	99.0**	Normal emergence
V44	Sweet pepper – Dariana Bac	3.2	100	3.2 ^{PPP}	96.8**	Normal emergence
V45	Eggplants Contesa	2.3	100	2.3 ^{PPP}	97.7**	Normal emergence

F% - frequency, I% - intensity, DA% - degree of attack (%),
H% - health plants (%).
*** very good ability for organic agriculture
** good ability for organic agriculture
* low ability to organic agriculture
Very good suitability for organic agriculture ^{PPP}
Good suitability for organic agriculture ^{PP}
Suitability reduced for organic agriculture ^{P}
DL 5% - 4,9
DL 1% - 6,8
DL 0,1% - 9,2

The soil pathogens attack after transfer in seedling container was absent. Lines L1, L2, LL6 and hybrids: Abelus F1, Bersola F1, Amanet F1 were tolerant to soil pathogen attack. The percentage of healthy plants is over 96%. Lines: LL18 and LL26 were susceptible to disease soil borne attack (Fig. 1). The percentage of healthy plants was under 78%. Plants do not have suitability for organic farming.

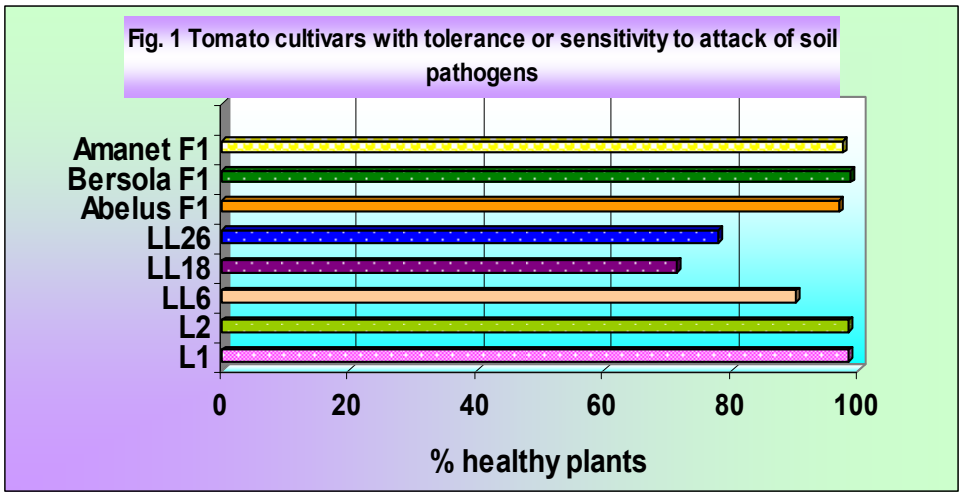
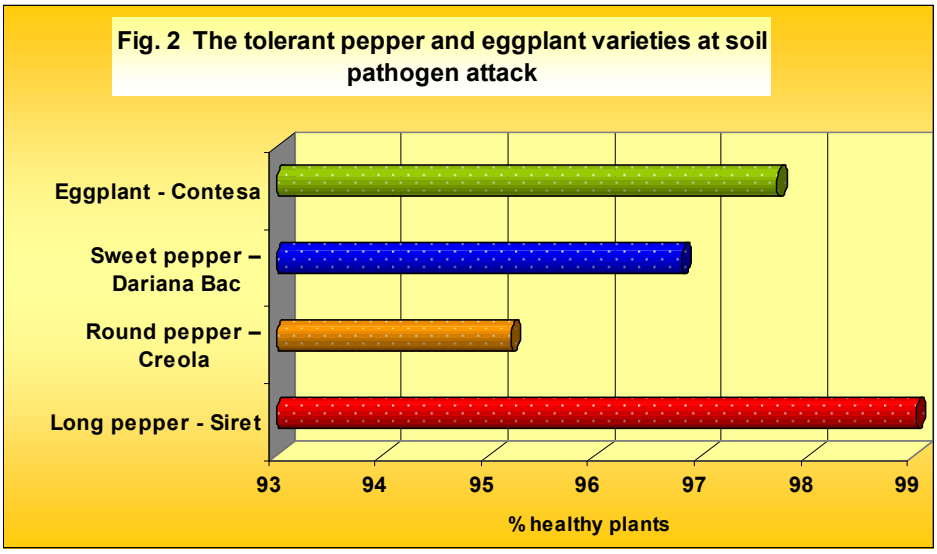


Fig. 1 Tomato cultivars with tolerance or sensitivity to attack of soil pathogens

Varieties of lettuce: Marilena, Serata and Silvia had very good suitability in seedling stage at the attack of soil borne diseases. The attack level was below 3% for Marilena and was absent at Serata and Silvia varieties.

Siret, long pepper variety, Dariana Bac, sweet pepper, Creola, round pepper and Contesa, eggplant were tolerant at soil pathogens attack fig. 2. The percent of healthy plants were higher than 95%.



CONCLUSIONS

The trials were performed during 2010 – 2012 at Vegetable Research and Development Station Bacau. The tomato lines: L3, L4, L5, L6, L6 -7, LL1, LL2, LL3, LL4, LL5, LL7, LL8, LL9, LL10, LL11, LL12, LL13, LL14, LL15, LL16, LL17, LL19, LL20, LL21, LL22, LL23, LL24, LL25, LL27 and Benatar F1 hybrid had the best suitability to organic farming system. The soil pathogens attack after transfer in seedling container was absent.

Lines L1, L2, LL6 and hybrids: Abelus F1, Bersola F1, Amanet F1 were tolerant of soil pathogen attack. The percentage of healthy plants is over 96%. Lines: LL18 and LL26 were susceptible to disease soil borne attack. The percentage of healthy plants was under 78%. Plants do not have suitability for organic farming. Varieties of lettuce: Marilena, Serata and Silvia had very good suitability in seedling stage at the attack of soil borne diseases. The attack level was below 3% for Marilena and was absent at Serata and Silvia varieties.

Siret - long pepper variety, Dariana Bac - sweet pepper, Creola - round pepper and Contesa - eggplant were tolerant at soil pathogens attack. The percent of healthy plants was higher than 95%.

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ANALYSIS OF CULTURE MEDIUM INFLUENCE OVER THE MICROSPORE EMBRYOGENESIS AT *BRASSICA OLERACEA* L.

ANALIZA INFLUENȚEI MEDIULUI DE CULTURĂ ASUPRA EMBRIOGENEZEI MICROSPORILOR DE *BRASSICA OLERACEA* L.

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Abstract: *The culture of isolated micropores offers the opportunity to generate double haploid embryos starting from single haploid cells, thus assuring the genetic purity of haploid plants obtained. For Brassica species double haploid plants are strongly required for use as isogene lines in F1 hybrids production. By this innovative technique the time required is dramatically shortened from 8-9 years to one year generation. The advantages brought by its utilization tagger the interest of specialists to improve the culture conditions in order to assure the efficiency of the culture, as the species from Brassica genus are recalcitrant to cultivation, displaying a strong genotype dependency. In this study three main type of culture medium formulation were tested and the viability of micropores as well as embryo development were recorded in order to achieve an efficient protocol in Brassica oleracea Romanian genotypes.*
Keywords*: haploids, embryo, somatic, cabbage, viability*

Rezumat: *Cultura de microspori izolati ofera oportunitatea generarii de embrioni dublu haploizi pornind de la o singura celula haploida, astfel asigurand puritatea genetica a plantelor obtinute. Pentru genul Brassica plantele dublu haploide sunt extrem de importante din perspectiva utilizarii lor ca linii izogene in procesul de generare a hibrizilor F1. Prin intermediul acestei tehnici inovative timpul necesar producerii acestor linii se scurteaza considerabil de la 8 - 9 ani, cat e necesar in conditii de ameliorare clasica la un an. Avantajele aduse de utilizarea acestei tehnici a determinat cresterea interesului specialistilor in imbunatatirea conditiilor de cultura pentru a asigura eficienta acesteia, stiut fiind faptul ca o parte din speciile genului Brassica sunt reclacitrante fata de acest tip de tehnica de cultura, sustenabilitatea ei fiind in stransa dependenta de genotip.*
Cuvinte cheie: *haploizi, embrion, somatic, varza, viabilitatea*

INTRODUCTION

Doubled haploid (DH) plants have been used in breeding programs for many years to develop improved crop varieties (Thomas et al., 2003, Ferrie and Mollers, 2011). The production of haploid plant *in vitro* is more efficient than

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conventional plant breeding for the generation of diploid homozygous pure lines, because such lines are obtained in a single generation *in vitro*, while several generations of inbreeding are required using traditional means. One of the most common method for producing haploid plants has been the cultivation of whole anther *in vitro*. The use of isolated microspores, however, rather than the entire anther, is now considered the most efficient approach for haploid plant production, because the isolated microspore culture avoids the formation of calli and embryos from the somatic tissues of the anther. All embryos yielded from isolated microspore cultures can only be microspore-derived, thus assuring the certainty of being either haploids or doubled haploids. Another advantage offered by this innovative technique is the fact that it allows the direct access to the microspores, which speeds up the optimization of culture conditions, as all modifications are directly subjected to single cells. Third, isolated microspore culture produces a higher number of embryos than does anther culture.

In order for doubled haploidy to be effective in a breeding program, an efficient microspore culture protocol is required. The conditions leading to the induction and development of microspore-derived embryos vary depending on the species, and therefore doubled haploidy methods have to be determined for each species. A number of factors influence microspore embryogenesis including genotype, stage of microspore development, donor plant growing conditions, media composition, and culture conditions.

Regarding the culture media, species-specific differences in the efficiencies of embryogenesis and embryonic development from microspores are seen with various culture media. For example, the embryogenesis in wheat is more effectively induced using A2 (Touraev et al., 1996) or AMC media (Kunz et al., 2000), while in Brassica species the embryogenesis is efficiently induced with NLN or modified NLN media (Swanson, 1989), B5 medium (Gamborg et al., 1968) or MS (Murashige Skoog, 1962). Lichter (1982) first reported the successful application of microspore culture techniques to Brassica napus, thereby establishing the basis of isolated microspore cultures for the Brassica genus. Subsequently, successful microspore culture in different cauliflower (*Brassica oleracea* var. *botrytis*), broccoli (*Brassica oleracea* var. *italica*), tronchuda cabbages (*Brassica oleracea* var. *costata*), kohlrabi (*Brassica oleracea* var. *gongylodes*), ornamental kale (*Brassica oleracea* var. *acephala*). However, there are relatively few reports on microspore cultures of white cabbage (Yuan et al., 2012).

MATERIAL AND METHOD

Plant material

The open-pollinated variety DM 56 provided by Vegetable Research and Development Station Bacau was used in our study as donor plants. The mother plants are grown in 20 cm plastic pots, in greenhouses until the stage of 10 leaves. Afterwards the plants are vernalised for 90 days in growth chambers at 4^0C, in 16 h photoperiod conditions with active photosynthetic active radiation of almost 60 µmol m^{-2} s^{-1}, and than passed into the same 16 h photoperiod but with a temperature

regime of 15^0C during light and 10^0C during dark. The plant fertigation was accomplished weekly with liquid fertiliser (N:P:K – 20:10:20).

The biologic material, collected from 12-14 week old plants is represented through healthy floral buds of 3,2-3,5 mm, containing microspores at uninucleat stage, as determined in our previous studies (data unpublished) to be the most effective dimension for the obtaining of a homogenous microspores population with high embriogenic competence. The excised buds were surface sterilized in 0.1% mercuric chloride (w/v) for 15 min, followed by rinsing in sterile distilled water for 3 to 4 times.

Microspore culture

Under sterile condition the buds are squeezed gently with a piston taken from a 10 ml disposable syringe into a small glass vial, releasing the microspores in 10 ml medium containing 13 g of sucrose. The suspension is filtered through a sterile 40 µm nylon mesh and the filtrate was centrifuged 3 minutes at 200 g. The supernatant is discarded and pellet is resuspended in 10 ml medium and centrifuged again. The procedure is repeated three times. Finally, the microspores are suspended in 1-2 ml of medium and plated in Petri dishes with a density adjusted to $1x10^4$ microspores/ml.

The cultures are subjected to a heat stress by incubating the cultures in darkness at 33^0C for three days. Following the same procedure, the renewal of the medium is accomplished after the heat shock and the culture plates are incubated to 25^0C in dark for three weeks. After that the embryo yield is determined and the cotyledonary embryos are transferred to B5 (Gamborg et al., 1968) solid medium for regeneration.

The variants tested in the present study are represented by basic medium formulas established by: variant V1 - NLN (Lichter, 1982), variant V2 - B5 (Gamborg, 1968), variant V3 – MS (Murashige Skoog, 1962).

Cytological studies

For the determination of the medium influence over the orientation of developmental processes of Brassica oleracea microspores cultivated in vitro we utilised the FDA (fluorescein diacetate) staining squash method for the screening of their viability during the early period after incoulation. 150-300 µl suspension with micropores is transferred in an Eppendorf tube. The volume is completed with culture medium until 1 ml and 1 ml stock solution of FDA medium is added. After 2 minutes the suspension is centrifugated and the pellet is removed. 10 µl of suspension is used for squash sampling and observed under UV filter microscope HUND 600. The bright green cells are recorded and utilised for statistical analysis. The number of viable microspores in different stages was counted in randomly selected visual areas of the microscope in four replications per sample.

Statistical analysis

The experiments were accomplished in three replications, each one containing five plates per variant. The viability of microspores and the mean number of embryo per variant was recorded. The data were analyzed by ANOVA (analysis of variance). The means were compared using the Duncan multiple comparison test at $P < 0.05$.

RESULTS AND DISCUSSIONS

Isolated microspores of flowering plants can undergo embryogenesis when cultured *in vitro* under appropriate conditions. To investigate the effect of culture medium over the orientation of morphogenesis of *Brassica* microspores we tested

three variants of the medium formulation: variant V1 - NLN (Lichter, 1982), variant V2 - B5 (Gamborg, 1968), variant V3 – MS (Murashige Skoog, 1962).

After the initiation of cultures the microscopic analysis revealed that more than 85% of microspores were viable – fig. 1.

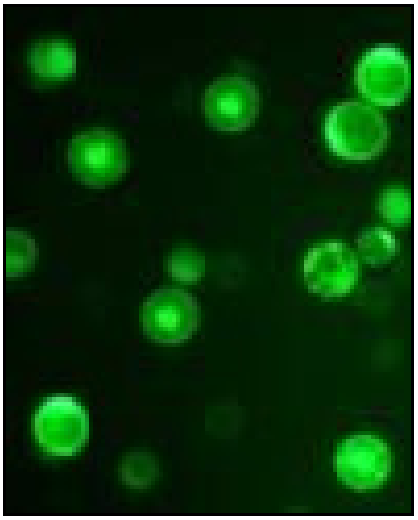


Fig. 1 – Viable microspores, variant V1- under fluorescence micropore 40x

The percentage decreased with culture time, as part of the microspores started to divide and became pro-embryos while a part of them were viable but showing no sign of embryogenesis, resembling more to gametophytic-like cells. The results registered in day 7 and 14 are synthetised in table 1.

Table 1

The evolution of microspore viability after 7 and 14 days of cultivation

Genotype	Variant	After 7 days	After 14 days
DL 20	V1	+++	+++
	V2	+++	+++
	V3	++	-

+++ - more than 10% embryogenic microspores
++ - embryogenic cells and viable microspores
+ - embryogenic cells and non-viable microspores
- - without embryogenic cells, dead microspores

As illustrated in the previous table, the optimum medium for sustainability of microspores viability, as well as for the switch of developmental processes toward embryogenesis is medium NLN – variant V1. After their transfer in new fresh medium, the evolution of the microspores was oriented toward the apparition of star-like microspores – fig. 2 and symmetric divisions.

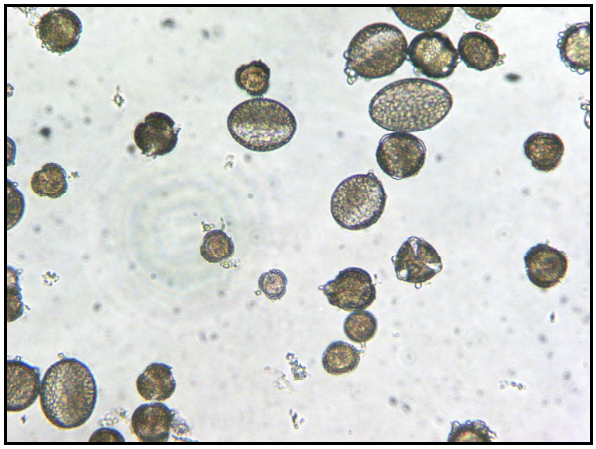


Fig. 2 – Heterogenous population of microspores with star-like microspores and gametophytic-like microspores

Thus the embryogenic microspores passed through a series of transformations of cellular organization, from two cells surrounded by microspore cell, exine to proembryos and globular, torpedo and cotyledonary embryos. During experimentation the embryo yeld was recorded, the results being presented as the average of the three replication for each variant – fig. 3.

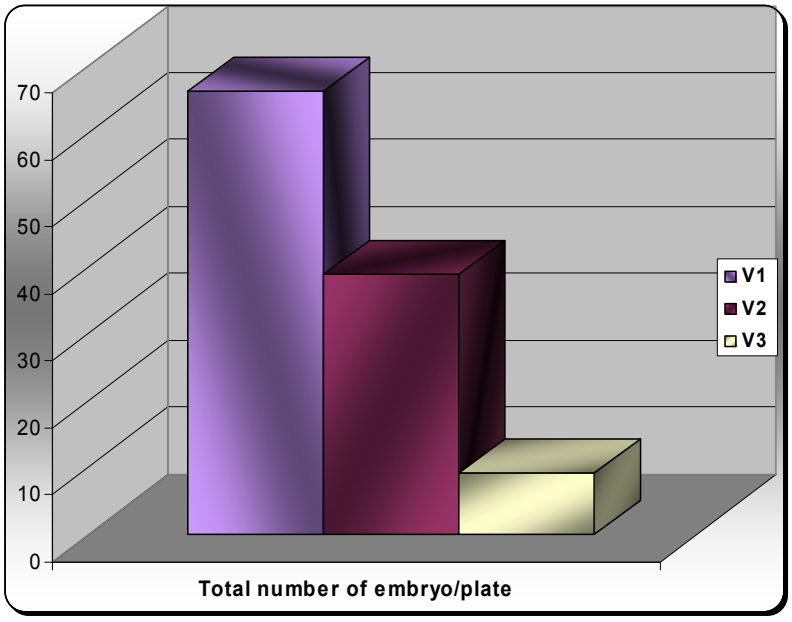


Fig. 3 – Graphical representation of frequency of embryo formation on different variants of basal culture medium

The highest frequency in embryo formation was recorded on NLN medium. From the total number of 114 embryo yielded from all variants 34 of them displayed different degree of abnormality: lack of cotyledons, albinism and slow

growth and died. The transfer of the normal embryos on B5 solid medium allowed their development in green plants and only 17 died during acclimatization. The acclimatized plants were potted individually and transferred to greenhouse and allowed to grow to maturity.

CONCLUSIONS

In this study three main type of culture medium formulation were tested and the viability of microspores as well as embryo development were recorded in order to achieve an efficient protocol in *Brassica oleracea* Romanian genotypes. The highest frequency in embryo formation was recorded on NLN medium, while the lowest results were obtained on MS medium. The transfer of the normal embryos on B5 solid medium allowed their development in green plants and only 17 died during acclimatization. The acclimatized plants were potted individually and transferred to greenhouse and allowed to grow to maturity.

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TECHNOLOGICAL ASPECTS CONCERNING ESTABLISHMENT THE PHENOTYPIC COMPATIBILITY ROOTSTOCK/SCION TO WATERMELONS

ASPECTE TEHNOLOGICE PRIVIND STABILIREA COMPATIBILITĂȚII FENOTIPICE PORTALTOI/ALTOI LA PEPENI VERZI

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Abstract. *The research was realized in the Laboratory of Protected Cultures of the ICDIMPH-Horting Bucharest, in 2012 year. Were watched technological aspects concerning the phenotypic compatibility from rootstocks and scions at watermelons. The biological material used was composed from scions – Santa Vittoria F_1 – watermelons and rootstocks – Shintoza F-90 and TZ 148. The TZ 148 rootstock obtained a better result concerning forming the callus at plants. Were established the stages of the technological flow for obtaining grafted seedlings at the cultivars researched. By the quality of the seedlings the depends the success of the cultures realized with grafted plants in terms of quality and quantity.*
Key words: *grafting, cucurbits, technology*

Rezumat. *Cercetarea s-a realizat în Laboratorul de Culturi Protejate al ICDIMPH-Horting Bucureşti, în anul 2012. Au fost urmărite aspect tehnologice privind compatibilitatea fenotipică dintre portaltoi şi altoi la pepeni verzi. Materialul biologic folosit a fost alcătuit din altoi – Santa Vittoria F_1 – pepeni verzi şi portaltoi – Shintoza F-90 şi TZ148. Portaltoiul TZ148 a obţinut un rezultat superior privind calusarea plantelor. Au fost stabilite etapele fluxului tehnologic pentru obținerea răsadurilor altoite la cultivarurile cercetate. De calitatea materialului săditor depinde reuşita culturilor realizate cu plante altoite din punct de vedere calitativ şi cantitativ.*
Cuvinte cheie: *altoire, cucurbitacee, tehnologie*

INTRODUCTION

Grafting vegetables is an agronomic activity used worldwide. The grafted seedlings induce to crops: quality, productivity and resistance to diseases (*Fusarium* spp., *Verticillium* spp.) and pests (nematodes) transmitted through the ground (Bogoescu et. al., 2008).

The method is based on the fusion of scion and rootstock - wild variety (Edelstein, 2004). Scion and rootstock plants must be phenotypically compatible, to have the same diameter in the area where it makes cutting and joining.

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In Romania, the watermelons culture is very popular; sensitivity to diseases and pests has imposed introduction grafting cultivars on resistant rootstocks (Bogoescu et al., 2010).

MATERIAL AND METHOD

The rootstocks used for the grafting of watermelons were TZ 148 and Sinthoza.

TZ 148 F_1 - fig. 1 - is resistant to *Fusarium oxysporum radicis-cucumerinum* 0,1, 2, *F.o.f.*sp. *melonis* 0,1, 2, *Verticillium dahlie*, *Meloidogyne* spp.

The plants obtained on this rootstock have high vigor, stronger root and produce higher crops.

Shintoza F-90 (*C.maxima* x *C.moschata*) - Fig. 2 - give resistance of the cultures to *F.o. radicis-cucumerinum* 0,1,2 *F.o.f.*sp. *melonis* 0,1,2, *V. dahlie*, *M. incognita*, *M. javanica*. The fruits obtained from these plants are tasty and early.



Fig. 1 - Rootstock TZ 148, plants in seedling stage



Fig. 2 - Rootstock Shintoza F-90, plants in seedling stage

The scion used in grafting was a F_1 hybrid of watermelon, **Santa Vittoria** – fig.3. It is a hybrid of semi-early watermelon, vigorous, with big number of fruits/plant and high production. The fruit have a particular color, light green with dark green stripes. The average weight is 12-14 kg. The pulp is intense red color, crispy and sweet. Presents an excellent adaptability to conditions in Romania. It is resistant/tolerant to certain diseases, such as fusariosis and some antracnosis.



Fig. 3. Scion plants from Santa Vittoria cultivar

Experience has included two variants of work (300 scion plants x 300 rootstock plants) / variant:

V_1 - Santa Vittoria x Shintoza;

V_2 - Santa Vittoria x TZ 148.

The grafting technique has supposed a technological process: sowing (scion and rootstock), preparation of grafting, grafting itself, the introduction of grafted plants in tunnel covered with polyethylene to callusing, transferring seedlings in greenhouse for growing and maintenance in accordance with the standard technology (Bogoescu et al., 2008).

Sowing scion and rootstock

The rootstock was sowing after the emergence of the scions because the rootstock has a high germination energy, vigor and a strong growth from emergence. The dates of sowing must be strictly respected, because to graft with successfully is required that the stems (scion and rootstock) to have the same thickness.

The sowing was done classically, in a substrate free of pests and diseases, in alveolar trays (3/3 cm/alveoli). During germination, the temperature was 28^0C, day and night and the relative humidity (RH) was 98-100%.

Both the scion of melon, but and the rootstock used germinate easily, in about 3 days after sowing. The scion and rootstock plants were maintained until grafting according to standard technology presented by Popescu and Atanasiu, 2011.

Preparing of grafting

The preceding operations of the grafting have consisted in the supply with necessary materials (clamps for grafted, from silicone, different sizes, as the rootstock

and scion diameter, razor blades, disinfectants for hands, sorting and watering of seedlings.

Grafting

The grafting process was performed in indirect light, with an optimum shading when the weather was sunny. The temperature was 21-22^{0}C. The grafting method was by joining of the plants. The grafting was done mechanized, using robot for grafting (fig. 4).

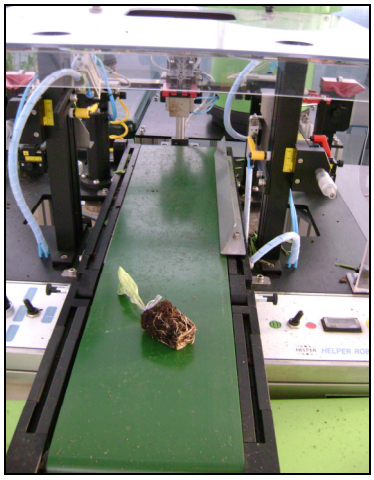


Fig. 4. Semi-mechanized robot for grafting

To grafting, the cutting and the joining of plants were made mechanized, with robot for grafting. The manual works were sorting of seedlings and placing in the places of cutting of the machine, collection of grafted plants in alveolar trays, the feeding of the robot for grafting with clamps.

RESULTS AND DISCUSSIONS

The researches have established the technological dates for the production phases of the watermelons grafted seedlings for combinations studied (scion x rootstock) - table 1.

Table 1

Results concerning established the technological dates for the production of the watermelons grafted seedlings

S C I O N **ROOTSTOCK**	**SOWING data**	**EMERGENCE data**	**GRAFTING data**	**CALUSSING %**
Santa Vittoria Shintoza	4.03. 16.03.	8.03. 18.03.	24.03.	93
Santa Vittoria TZ 148	10.03. 23.03.	14.03. 27.03.	1.04.	94

Is observed the germination energy quality of the rootstock and scion cultivars; the plants have emergence in four days from sowing. Due the high vigor of the plants, the rootstock seeds were sown at 12-day (Shintoza) and 13 days (TZ 148) difference by the scion plants (Santa Vittoria).

The grafting operation was realized after five days (TZ 148) and six days (Shintoza) from the emergence of the rootstocks; the phase of emergence of the first true leaf was recorded at 16 days - the scion (Santa Vittoria), grafted on Shintoza and at 15 days - the scion (Santa Vittoria), grafted on TZ 148 (fig. 5).

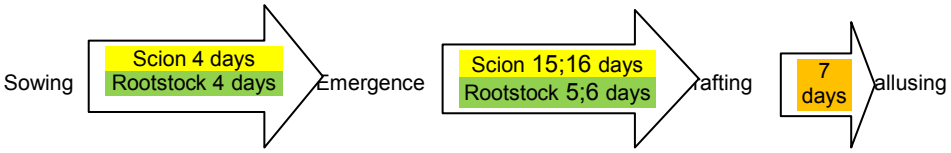


Fig. 5 - Technological stages of grafting

The callusing percentage of the plants grafted mechanized, using the robot for grafting, was 93-94%.

Difference by 1% between the two variants was due to a phenotypically mismatch between scion and rootstock, leading to the absence of tissue fusion of the two partners. The capacity of forming of the callus at the plants, depending on variant, is shown in figure 6.

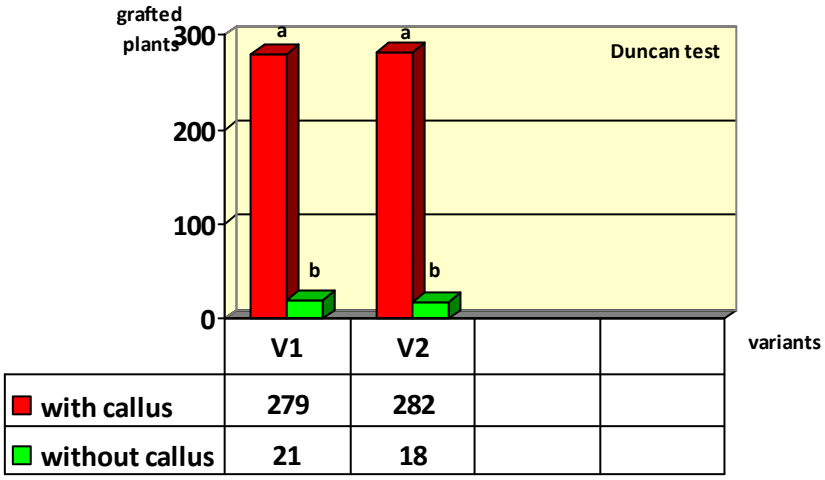


Fig. 6 - The callusing of the plants at variants researched

- V_1 variant - from 300 grafted plants, 279 plants have formed callus;
- V_2 variant - from 300 grafted plants, 282 plants have formed callus;
- the difference is insignificant between variants, but very significant in variant, between the number of plants with callus and the number of plants without callus.

CONCLUSIONS

1. Were correlated dates of the technological stages, depending on the cultivars researched, ensuring thus the phenotypic compatibility rootstock-scion.

2. Were obtained percentages of callusing 93% (Santa Vittoria x Shintoza) and 94% (Santa Vittoria x TZ148).

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PRELIMINARY STUDIES FOR NEW CULTIVATION SYSTEMS OF RUNNER BEAN (*PHASEOLUS COCCINEUS* L.)

STUDII PRELIMINARE PENTRU NOI SISTEME DE CULTIVARE LA FASOLEA MARE (*PHASEOLUS COCCINEUS* L.)

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Abstract. *Paper presents a literature synthesis on the new cultivation systems of runner bean (Phaseolus coccineus L.), based on a large Romanian and international bibliography. There were pointed different cultivation systems in monoculture and succesive crops or intercropping crops. Assessment of these systems is done according to quantity and quality of the yields.*
Key words: *continuous cropping, successive cropping, intercropping*

Rezumat. *Lucrarea prezintă o sinteză asupra cunoştinţelor referitoare la noi sisteme de cultivare a fasolei mari (Phaseolus coccineus L.), pe baza unei ample bibliografii din ţară şi străinătate. Au fost puse în evidenţă sisteme de cultivare în ogor şi monocultura, sisteme de culturi succesive şi duble şi sisteme de culturi asociate şi intercalate (intercropping). Evaluarea sistemelor se face în funcţie de cantitatea şi calitatea recoltei.*
Cuvinte cheie: *monocultură, cultură succesivă, cultură intercalată*

INTRODUCTION

The runner bean (*Phaseolus coccineus* L.*)* is not very studied in our country, because it is cultivated mainly in the gardens of local farmers (Munteanu, 2005). Very often, the crop of this species was confused with that of the climbing garden bean (*P.vulgaris* L. *var. communis*), to which it is actually quite similar.

The agricultural crop is an agronomical category representing an artificial biotope where the growth and development conditions are ensured for a certain species that is useful to humans. Assuring the conditions for the plants' growth and development is conducted through the cropping system, in which technology is the integrating factor of the system. The cropping technology defines a process of agricultural production following specific rules in a certain chronological order. Basically, this contains specific stages: choosing the land, preparing the land, setting up the crop, taking care of the crop, harvesting, and so on (Stan and Stan, 2010). The cropping system is a complex of technical elements, integrating through specific relations and thus creating a unified whole conducting a mutual exchange of energy and substance and creates an output (biomass) which integrates in the environment or is collected by humans as harvest.

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The runner bean is known as a species growing in a cool and humid climate. Under these circumstances the runner bean crop in the forest steppe from the North-East part of the country is subject to excessively high temperatures and especially atmospheric draught as well as soil draught (Munteanu, 2005).

A sure method to obtain high and stable yields of superior quality and favorable economic results is to find a cropping system in which technology, as an integrating factor, will correct the unfavorable environmental conditions. Taking this into consideration, the purpose of this paper is to present existing information from the specialized literature, domestic and foreign, covering new systems of cultivating runner bean that may suggest solutions or hypotheses of work in developing certain cropping system methods.

MATERIAL AND METHOD

In this paper are presented certain cropping systems of the runner bean, based on the information available in the specialized literature. The biological material considered is the runner bean species, represented by the local population in our country (Munteanu, 1985). The runner bean is an annual, herbaceous species, reproducing by seeds in the conditions from our country.

As work methods were used the comparative analysis and the case study of the existing information, according to the nature and volume of this information, as well as the possibilities for their application in the domestic ecological conditions.

RESULTS AND DISCUSSIONS

The runner bean is cultivated in various systems, according to area, technical facilities and traditions etc. These systems are different, depending on some criteria: cultivation technology, place of cultivation, vegetation or life duration, plants habitus, the place in crop rotation, establishment of the crop, plants design in the crop, intercropping etc.

The cropping systems of vegetable plants may be grouped, according to **the applied technology**, into two large categories: *intensive agricultural systems* (conventional ones) and *non-conventional agricultural systems*. The conventional agricultural systems have as an objective the intensive use of the land and of the capital goods, while the non-conventional ones have as a purpose stopping the pollution and erosion of the agricultural ecosystems, even their regeneration and obtaining agricultural products free of pesticides residues or heavy metals thus preserving and improving the consumers' health (Stoleru, 2013). The runner bean lends itself to both cropping systems allowing for an intensive valorization of the land, considering that the space between the rows of supported, plants can be used for growing other vegetables (carrot, salad, cabbage, cauliflower etc.) (Munteanu et al., 2007). The climbing bean varieties are considered to be very appropriate for intensive cropping, considering the costs, the work volume, the quantity and the value of the harvest, because it responds well to fertilizing, including the organic one and to abundant irrigation (Stan et al., 2003).

Depending on **the place of cultivation** one can distinguish between the vegetable systems *in the laylands* and *the vegetable systems from specially designed or built spaces*. Globally, the runner bean is cultivated almost exclusively in the field. In protected areas the crop aims at obtaining garden peas, in such countries as Belgium and the Netherlands (Popa, 2010). In our country its cultivation began in protected areas began after 1973.

During **its lifetime**, the runner bean is cultivated as an *annual* or *perennial plant*. In Mexico, for example, it is cultivated as an annual plant on a field, in a monoculture system, in intercropping with maize but also as a perennial plant (associated with maize, at least in the first year) in a monoculture system every two years, cultivated after maize in the second year, in-between orchard trees and cultivated on fences, balks and side lands (Salinas, 1988).

Depending on **habitus**, one uses *the bushes cropping system* and *the supported cropping system.* In Great Britain the system with climbing plants are very well known as well as those using types of bushes. The bushes system is preferred in the areas with strong wind. In the Netherlands, Belgium, France, Spain the cropping system with climbing varieties in layland are used.

Depending on **the crop rotation system scheme** one uses *monoculture* or *the crop rotation.* Cultivating the runner bean for several years on the same field (monoculture) or other related species contributes to the multiplying and spreading of specific diseases and pests. Monoculture also determines a substantial decrease in the yield, after five years having a fall of 35-36% comparing to the first year (http://scribd.com/doc/98586506/La-Legumicultura). The crop rotation ensures a better use of the land, capitalizing the beneficial effect of self-fertilizing with bean plants – produced nitrogen thus avoiding or reducing the attack of diseases and pests (Stan and Stan, 2010).

Depending on **the set up manner** of the runner bean one uses the cropping system of *direct sowing* in the fields (seeds) as well as the system of seeding *material planting* (tuberized roots, seedling) (Kay, 1979).

Depending on **the time of establishment**, the runner bean crop can be done in *one stage* (after reaching a soil temperature higher than 10-12 °C), on a layland, owing to the long period of vegetation. Therefore, it is not appropriate for successive cropping, unlike the bushes. The purpose of the crop is to ensure a higher yield compared to the bushes, 5-10 times more, on a longer period of time, from July until the autumn when the hoar frost falls (Popa & Co., 2008).

According to **the manner of plant design on the land**, the climbing bean crop is conditioned by the type of the plants' support system. The crop is arranged in rows of individual plants or in nests of 3-5 seeds. In Bulgaria it is quoted the example of a crop in groups of four, six or eight nests (fig 1.), with the plants supported in a pyramid. In the Netherlands and Belgium the crop is set up in nests of 2-3 seeds or pod by pod , the supporting being done on espaliers, 1-2 rows of plant nests to a an espalier, with an average distance between rows of 1,5 m, and on the row, between plants, of 40 cm. In Great Britain the sowing is done in nests

of 2 seeds, in double rows at 30 cm and on the row, in-between nests, at 30 cm, the distance between two double rows being of 1.5 m-2 m. The support is done on the espalier in two close rows. The support can also be an individual one on a stake (Rusti and Munteanu, 2008).

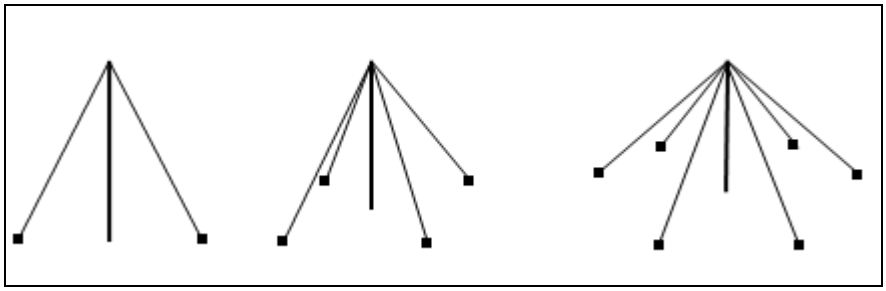


Fig. 1 - Support system of the runner bean plants

In countries from Latin America research has indicated the importance of schemes and densities in setting up the crops as well as the cropping system, recommending distances of 50, 60, 70 and 80 cm in-between the rows and on the rows in-between the plants as well as individual support on the espaliers of 1-2 rows in pyramid shape, with a varying distance between the espaliers from 50 to 220 cm, depending on the support system (Rusti and Munteanu, 2008).

As far as **the use of the land** is concerned, runner bean lends itself very well to *associated cropping* and *intercropping*. Intercropping involves the cultivation of two or more crops at the same time on the same land surface (http://www.oisat. org/control_methods/cultural_practices/intercropping.html). This is a ancient practice of great interest even today owing to its numerous advantages, such as:

- reduces the populations of pest insects owing to the diversity of the crops; when there is an agricultural crop diversity on the field, the pest insects need a longer period of time to identify the plants they want to attack;
- reduces the diseases of the crops; the distance between the plants from the same species is bigger because other plants (belonging to difference botanical families) are sown in-between them;
- reduces the erosion of slopes and protects the soils (eg. Intercropping in strips);
- attracts a larger number of beneficial insects especially when plants with flowers are included in the cropping system;
- uses the farm land more efficiently;
- determines a potential increase in the total yield and the farm profit in comparison to separate cultivation of crops;
- offers a diversity of crops for the farmer families in just one growth season.

The cultivation of runner bean among or in-between the rows of other vegetable varieties (associated crops) or of phyto-technical crops (intercropping) are important for the environment and the producers alike. The simultaneous cropping of vegetables for pods and cereals allows for mixed harvesting and its direct use as forage (vegetable plants make up for the protein and the cereals supply the carbohydrates) and can be separated for individual use.

The runner bean can be very well cultivated with maize, this cropping system being used for hundreds of years. At the same time, the setting up of the runner bean crop is associated with that of Jerusalem artichoke and sunflower, using as a support their stems. The leaves are ripped off so as not to shadow the bean crop, leaving just a few leaves at the top. These cropping systems are extremely efficient especially considering that the support system is very expensive.

The farmers in Central America traditionally use intercropping for maize, beans and Turkish pumpkins. Cultivated together, these three crops optimize the available resources. Maize grows taller than the other crops and the bean climbs up on the maize stems. The pumpkin flowers spread on the ground attracting and reflecting the light, thus shading the earth. The shadow discourages the growth of weeds (http://portal.organicedunet.eu/index.php?option=com_content&view=article&id=11810&catid=1&Itemid=103).

In Romania for the runner bean are used the associated cropping systems or the intercropping with maize supported on stakes, but also monoculture (Popa, 2010).

CONCLUSIONS

1. The runner bean can grow in different systems depending on certain criteria, such as:

- the applied technology;
- the place of cultivation;
- the period of vegetation;
- habitus;
- the crop rotation system scheme;
- the set up;
- the time of establishment;
- the manner of plant design;
- association or succession mode and so on.

2. High perspective, for the conditions in our country, is intercropping system (association with other plants (vegetables or belonging to other groups cultivated)). In this system, the best known is the association with corn, sunflowers and Jerusalem artichokes, which are support plants what replace the support system.

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INFLUENCE OF MOLDSTIM ON THE GROWTH AND DEVELOPMENT OF ORGANIC TOMATO CROP FROM POLYTUNNELS

INFLUENȚA MOLDSTIMULUI ASUPRA CREȘTERII ŞI DEZVOLTĂRII TOMATELOR ECOLOGICE ÎN SOLAR

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Abstract. *The Moldstim is a natural bioregulator with glycosidic structure extracted from pepper (Capsicum annum). The paper aims to assess the influence of this bioactive substances used in two concentrations (0.001% and 0.0015%) on two cultivars of tomato in polytunnel, under organic farming conditions. The biological material was represented by two hybrids obtained Hazera company (Israel), Winona F1 and Primadona F1. The results obtained were compared with the average experience. Experience distinctly revealed significant differences Moldstim version 0.0015% (58.35 t/ha) compared to the control, in which the production obtained was 44.65 t/ha.*
Keywords*:Moldstim, tomato, organic crop*

Rezumat. *Moldstimul este un bioregulator natural cu structură glicozidică extras din ardei (Capsicum annum). Lucrarea îşi propune sa evalueze influența acestei substanțe bioactive, utilizată în două concentrații (0,001% si 0,0015%), asupra a două cultivaruri de tomate, în solar, în condiții de agricultură ecologică.Materialul biologic a fost reprezentat de doi hibrizi obtinuți de firma Hazera (Israel), Winona F_1 si Primadona F_1. Rezultatele obținute au fost comparate cu media experienței.Experiența a scos în evidentă diferențe distinct semnificative ale variantei Moldstim 0,0015% (58,35 t/ha) comparativ cu varianta martor, la care producția obținută a fost de 44,65 t/ha.*
Cuvinte cheie*:Moldstim, tomate, cultură ecologică*

INTRODUCTION

During the last decades of vegetable practice, stimulating by bioactive substances have acquired a key role due to the positive contribution they have on physiological processes and therefore the final product by increasing precocity, the quantity and quality while ensuring high economic efficiency (Stan et al., ; 1995; 1996).

The Moldstim is such a bioactive substance, with steroidal glycoside structure extracted from sweet pepper (*Capsicum annum*), an annual herbaceous plant belonging to the botanical *Solanaceae* family.

The favorable effect of Moldstim on vegetable crops is presented by Chintea P et al., 1998: tratated tomato and cucumber seeds, although they have

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been sown in an infested soil with different pathogenic fungus, generated healthy plants, the accumulation of biomass and increasing the rate of development of the vegetative organs of plants produced from the seeds from untreated (control) (Matevosyan et al., 2001).

Also, from the biochemical point of view, the treated plants showed high levels of total carbohydrates.

The Moldstim of 0,001% increases the production by 15-20%, extend the fruiting season and reduce nitrate content from fruit (Kintia et al., 1993).

MATERIAL AND METHOD

Research have been carried out in 2012 in the experimental vegetable field in "V. Adamachi" farm, belong U.A.S.V.M. Iaşi. Tomato crop was established in a polytunnel of 270 m^2, on 26/04/2012, using an assortment consisting of two hybrids from Israel origin: Primadonna F1 and Winona F1. The crop was cultivated in extended cycle through product alveolar seedling trays (without transplant).

The experience has included six variants, determined by differentiated applying in two strengths of Moldstim (0,001% and 0,0015%) on two hybrids, with untreated variants.

$V_1 = a_1b_1$ untreated x Primadona F_1;
$V_2 = a_1b_2$ Moldstim 0.001% x Primadona F_1;
$V_3 = a_1b_3$ Moldstim 0.0015% x Primadona F_1;
$V_4 = a_2b_1$ untreated x Winona F_1;
$V_5 = a_2b_2$ Moldstim 0.001% x Winona F_1;
$V_6 = a_2b_3$ Moldstim 0.0015% x Winona F_1;

The treatments were carried out with a spraying machine of 16 L (Vermorel) it through fine, uniform spray solution on the entire surface of the plants, weekly, the first treatment being carried out two weeks after planting.

The organization experiment was done in a randomized blocks device with three repetitions, each repetition parcel including 10 plants.

The effectiveness of treatments was emphasized by the observation and biometric measurements on height plants, number of flowering, flowers number and linked fruits, the average of fruit weight, as well as the production of fruit for each variant.

The results for each variant have been analyzed compared to untreated control for each hybrid.

Measurements on growth and development indices of tomato were carried out in dynamics from July until the first decade of September.

RESULTS AND DISCUSSIONS

Following the observations and performed determinations, it was noted the positive influence of treatment with Moldstim 0.0015%, so on growth and on production of the two tomato cultivars.

From the dates related in Table 1, about the effect of treatment with Moldstim the growth in height can be observed for both hybrids the difference compared to the control (Mt) ranged from 22.27 cm (Primadonna) to 32.80 cm

(Winona). The greatest increase in plant height was achieved on Winona hybrid when treated with Moldstim 0.0015%.

Table 1

The treatment effect on growth and development plants with stimulating substances

Variants	Indices for growth and development				
	Height (cm)	No. of inflorescen-ces/plant	No. of flowers /plant	No.of fruits/plant	Average fruit weight (g)
Primadona F_1 (untreated)	162,53	5,67	22,21	16,20	83,13
Primadona F_1 x Moldstim 0,001	179,87	7,27	24,31	18,01	95,22
Primadona F_1 x Moldstim 0,0015	184,80	7,89	25,40	19,26	104,56
Winona F_1 (untreated)	166,80	6,01	22,26	16,40	79,60
F_1 x Moldstim 0,001	187,30	7,37	24,86	18,13	82,70
Winona F_1 x Moldstim 0,0015	199,60	8,01	25,06	20,16	91,60

In terms of development indices obtained by applying the Moldstim substance (Table 1), we can see that in the case of both product concentrations achieved a positive effect on binding of flowers and fruit difference. At the same time, by spraying Moldstim, to produce a growth inhibition in the internode length (Table 1), calculated as the ratio of the height of plants and average number of inflorescences per plant.

Regarding on influence of glycosidic substances number of flowers per plant, it is observed that in all 4 treatment variants have been made and very significant differences compared to control.

The best results have been obtained in variants which applied Moldstim 0.0015%, respectively 7.89 inflorescences per plant on Primadonna hybrid and 8.01 inflorescences per plant at Winona.

Regarding the influence of Moldstim on number of fruits per plant is seen the best results were obtained by the application on Winona hybrid in concentration of 0.0015% respectively 20.16 fruit per plant.

Regarding the ratio of fruit number and formed flowers, the best percentage was obtained from the hybrid Winona data in which the Molstim was applied in concentration of 0.0015%, respectively 80.45%. Also, Primadona tratated with Molstim in conc. of 0.0015% was achieved the highest percentage of binding of fruit, 75.83%.

The Moldstim treatment effect can be observed where the average weight of tomato fruits. Thus, most of the weight of the obtained fruit from the Primadona hybrid, 104.56 g respectively compared with the control in which the weight was 83.13 g.

In the case of Winona F1 cultivar, by applying Moldstimulului 0.0015% fruit weight was 91.60 g (Table 1).

Table 2

Dynamics of production

Variants	Date of production evaluation					Total yield \ (kg/ha)
	June	July	August	September	October	
Primadona F_1 (untreated)	1,34	8,93	12,50	14,28	7,60	44,65
Primadona F_1 x Moldstim 0,001	1,98	9,92	13,89	15,88	7,96	49,63
Primadona F_1 x Moldstim 0,0015	2,33	11,67	16,33	18,67	9,35	58,35
Winona F_1 (untreated)	1,81	9,06	11,60	10,15	3,64	36,26
Winona F_1 x Moldstim 0,001	2,49	10,41	13,32	11,66	3,77	41,65
Winona F_1 x Moldstim 0,0015	3,59	12,83	16,41	14,36	4,11	51,30

From measurements carried out in 2012 about the influence of Moldstim treatments on two hybrids on its earliness, can be seen from Table 2, that on 31 July 2012, the best results were obtained by applying Moldstim in conc. of 0.0015%. Significant results compared to the control have been obtained by applying the product in conc. of 0.001%.

The biggest early production was achieved by Winona cultivar respectively 16.42 t / ha, about 32% of total production compared to the control in which the percentage of early production was 29.9%.

Regarding the total production and significance of differences of production, from Table 2 shows that untreated variants showed lower total production compared to treated variants.

In the case of the production of Primadona varied from 44.65 t / ha in the control to 58.35 t / ha treated with Moldstim 0.0015%, differences of production is provided statistically 99%, compared to the control, the differences was 13.70 t / ha.

In the case of Winona cultivar, total production ranged from 36.26 t / ha to 51.30 t / ha, the difference between the two variants are statistically ensured that production 99.9% relative to the control, the best results were variant was obtained Winona F1 x Moldstim 0.0015% respectively 141.5%.

Table 3

Analysis of total production

Variants	Total yield (t/ha)	Differences than control (t/ha)	Relatively yield (%)	Significant of difference	LSD (t/ha)
Primadona F_1 (untreated)	44,65	0	100	-	DL 5%= 4,26
Primadona F_1 x Moldstim 0,001	49,63	4,98	111,2	*	DL 1%= 9,17
Primadona F_1 x Moldstim 0,0015	58,35	13,70	130,7	**	DL 0,1%= 15,39
Winona F_1 (untreated)	36,26	0	100	-	DL 5%= 4,17
Winona F_1 x Moldstim 0,001	41,65	5,39	114,9	*	DL 1%= 8,64
Winona F_1 x Moldstim 0,0015	51,30	15,04	141,5	***	DL 0,1%= 13,85

CONCLUSIONS

1) The dynamics of height plant growth highlights the fact that it is directly proportional to the increase in the concentration of moldstim, variants of which have been applied to the highest concentration showing vigorous growth compared to untreated variants.

2) The variants treated with Moldstim showed a number of inflorescences, flowers and fruits linked higher than untreated variants denoting positive treatment effect.

3) The main measure of effectiveness of treatments proved average fruit weight, all treated variants, giving an average weight of about 8-10 g higher than untreated variants.

4) The main measure of treatment effectiveness proved to be average weight and relative to total production was higher in the Moldstim treated variants, they are superior to the untreated control. Differences from the control are statistically assured 95%, 99% and 99.9%.

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UNCONVENTIONAL HEAT GENERATING SYSTEMS FOR THE ADJUSTMENT OF THE MICROCLIMATE FROM THE PROTECTED CULTURE SPACES

SISTEME NECONVENȚIONALE GENERATOARE DE CĂLDURA PENTRU REGLAREA MICROCLIMATULUI DIN SPAȚIILE DE CULTURI PROTEJATE

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Abstract. *This paper presents new materials used in the extension of the vegetable crops growth season. To ensure the microclimate conditions regarding humidity, temperature and solar radiation, there are presented the indicators of ventilation capacity of materials and the electrical properties of these necessary in the establishment of the generated heat flux.*
Key words: *unconventional systems, protected cultures;*

Rezumat. *Lucrarea prezintă noi materiale utilizate în extinderea sezonului de creştere a culturilor de legume. În vederea asigurării condiţiile de microclimat privind umiditatea, temperatura şi radiaţia solară, sunt prezentaţi indicatorii capacităţii de ventilare a materialelor şi proprietăţile electrice ale acestora necesare în stabilirea fluxului de caldură generat.*
Cuvinte cheie: *sisteme neconventionale, culturi protejate*

INTRODUCTION

The assignation of the correlations between the microclimate factors and the biological requirements of plants is necessary for the design of textile materials with controlled heat potential.

The heat exchange on the surface of the textile material can be realized both by convection and by radiation. The natural convection is determined by the variable consistencies field of the air related to temperature(Munteanu, 2008; Korner,2007). When appear forces that generate a difference of baric pressure (wind) we can talk about forced convection that altogether supposes the intensifying of the thermal losses on the textile material surface. In the heat exchange on the surface of the textile material, we will also take into account the presence of a contiguous air layer whose characteristics determined by its position of partitionary wall between the microclimate and the outside environment, offers it a certain role of thermal protection according to the vegetable culture. The radiation represents a particular form of heat exchange where the energy carrier is featured according to the theory of electromagnetic waves. According to this theory we can say that the thermal radiation has a dual character, with the

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properties of the continuous field of electromagnetic waves and the discreet properties of photons. In green houses take place complex thermal phenomena of the warm and cold air exchange. In their inside, the solar radiation contributes to the general exchange of heat, to the steadfastness of caloric and radiation balance (complex phenomena where participate also temperature and humidity, evaporation and condensation) (Munteanu, 2008; Stan, 2003; Rodríguez, 2002).The temperature control is essential in green houses because too low temperatures prolong the vegetation and fructification duration.

MATERIAL AND METHOD

Structure of proposed materials

The studied knits have been made on flat knitting machines having as knit structure rib 1x1, with inlaid yarn, every structure being crafted in three stitch densities (NP=9.0; NP=9.5; NP=10). The inlaid yarn from the knit structure is copper and manganin type necessary for the heat production. Towards that, for the tested knit variants have been determined the following properties: permeability to air of knitted materials and the necessary electrical properties in the establishment of the generated heat flux.

RESULTS AND DISCUSSIONS

1. The assessment of air permeability for the studied knit variants

The gas exchanges between the proposed microclimate and the environment take place both ways, regarding the quantity of carbon dioxide and oxygen, so the studied materials must optimise the continuous or almost continuous air exchange.

By definition, the permeability to air represents the quantity of air that passes through material, at a certain pressure difference in the time unit and through the surface unit.

The general formula of air permeability adaptable to any type of apparatus is:

$$P_{ap} = \frac{V}{t \cdot A} \ (m^3/min \cdot m^2) \qquad (1)$$

where:

V – represents the air volume that passes the textile surface, between whose faces a pressure difference is created $p = p_1 - p_2$ (m^3)

t – represents the time needed for the passing of the air through the material (min, s)

A – the analysed sample surface (m^2)

If we take into account the definition relation of the air flow, q=V/t, then the air permeability formula becomes:

$$P_{ap} = \frac{q}{A} \ (m^3/min \cdot m^2)$$

For the establishment of all parameters that characterize the air passing through the knitted material we need the apparatus type ATL 2 for the determination of the air flow that passes through the textile material.
For the determination of the air permeability the apparatus type ATL-2 has been used, using the following calculus relation:

$$P_{ap} = \frac{q \cdot 10^3}{60 \cdot A \cdot 10^{-4}} = \frac{q}{6 \cdot A} \text{ (m}^3\text{/min} \cdot \text{m}^2\text{)} \qquad (2)$$

where:

q – represents the air flow that passes the analyzed textile material.

A – the surface of absorption hatch (cm^2)

The values of the air permeability for the studied knit variants are presented in Table 1.

Table 1

The calculus of air permeability for the studied knit variants

NP	DP = 5 mm col. water q(l/h)	Pa (m^3/min·m^2)
9.0	5733	49
9.5	6225	53,2
10	6500	55.55

The overflow of optimal level of temperature and humidity of the air from microclimate can determine an unbalance of the plants metabolism and the reduction of the photosynthesis. The choosing of the value limits for the ventilation capacity indicators of the textile materials must be realized according to the requirements of the cultivated biological potential. According to table 1, the studied textile materials come under the value limits for the April-May period.

2. Electrical measurement system setup

In order to test the heating properties of the materials a measurement system was developed. The setup of the system is depicted in Figure 1. A personal computer is controlling the system using two USB ports (*USB0* and *USB1*). First USB port is used to command a programmable power supply. This device is a EA-PSI 6032 device and can generate up to 32 Volts and 3 Amps. The electrical heating wire is connected to the output of the power supply. This is the "power circuit" of the system. Two temperature transducers (*TS1* and *TS2*) are fixed within the heating conductor in order to measure the real wire-temperature. These sensors are AD590 type and they are integrated circuit temperature transducer that produces an output current proportional to absolute temperature. The temperature range is large (-55 °C to 150 °C) and the output current is linear (1μA/°C). A data acquisition board is used to measure the temperature sensors signals. This board is a National Instruments bus-powered M series multifunction

board for USB and has up to 400 kS/s and up to 32 Analog Inputs. Secondary USB port of the computer is connected with the DAQ board.

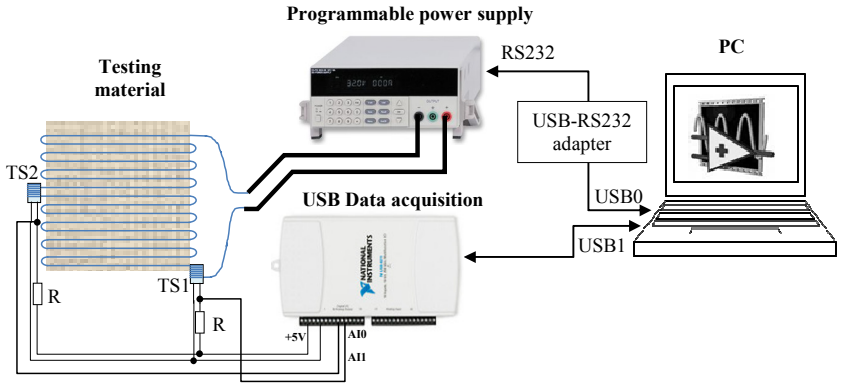


Fig. 1 - The measuring system setup

The system uses two temperature sensors because we needed the confirmation that the electrical wire is heated uniformly and the material texture has no influences in this. In the measurement results only one temperature is presented because these tow sensors indicated very closed values of temperature.

A virtual instrument designed in LabVIEW software platform is used to control the system and to collect the data from sensors. A screenshot of this instrument is presented in fig 2. As can be seen the instruments has two different tasks to do: to program the power supply and to collect the sensor's data. In order to control the supply voltage the operator must set the starting voltage, the stop voltage, the step voltage and the number of seconds to hold that voltage. The instrument displays the actual voltage and can be stopped anytime by pressing the "*STOP*" control button. The instrument read the sensors values every second and displays the data on the graphical indicator. All the data are also saved into a data file for further analyzing and processing.

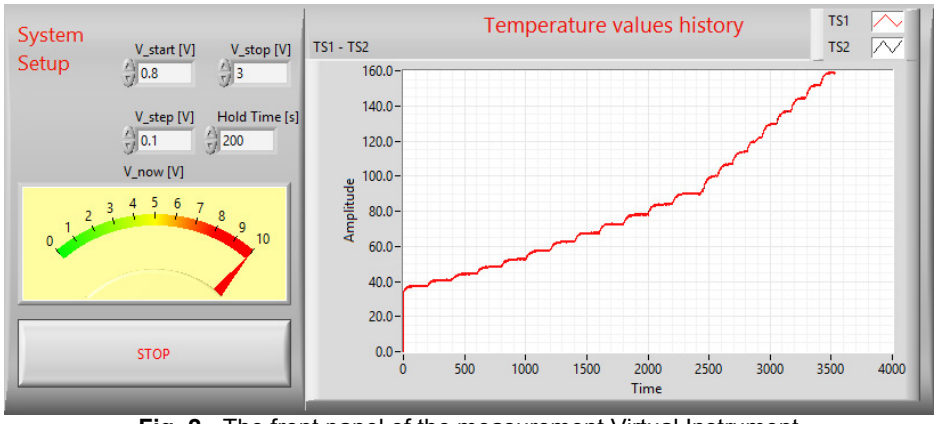


Fig. 2 - The front panel of the measurement Virtual Instrument

Two types of electrical heating conductor were tested: copper and manganin. The choice was made for these materials because of their electrical resistivity coefficient (16.78 nΩ*m for copper and 43-48 nΩ*m for manganin), small variation with temperature and because of their higher tensile strength (200-250 N/mm^2 for copper and 300-600 N/mm^2 for manganin). These tests are performed just to observe how the heating textile materials acts, for further tests and implementation other dedicated heating material (as Kanthal, Nichrome or Cupronickel alloys) will be used.

Figure 3 presents the measurement results for two conductors. In both cases the textile materials maintain their physical properties (dimension, elasticity and shape) even the higher temperature was around 160 °C.

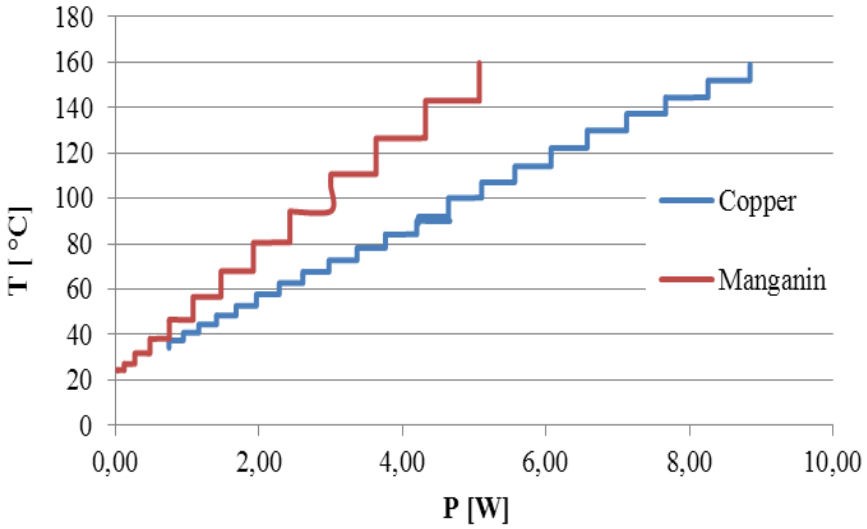


Fig. 3 - Temperature vs. absorbed power of heating materials

The above results show that both conductors can be heated up to 160 °C. The difference in supplying power values are because of the electrical resistance of conductors (0.86 Ω for copper and 33.33 Ω for manganin). The low resistance of copper impose greater supply power but at lower voltage values. The high temperature (160 °C) was achieved with a voltage of 3 V and 3.16 A current. In case of manganin because of a greater value of resistance, the same temperature was achieved with 13 V and 0.39 A. These values can be seen in next tables, where one can see that the heating material can be selected regarding the electrical parameters of the power supply. In case of a power supply that can provide more voltage with low current then manganin is appropriate material. In case of a power supply with low voltage but more current heating conductor based on copper are suitable.

CONCLUSIONS

In the design of heat generator textile materials, used in prolonging the growth season of plants, an important role is being taken by the absorption capacity and humidity transfer indicators, indicators of the ventilation capacity. The correlations between the air flow that passes through the textile material q(m^3/min) – the coefficient of permeability to vapors μ – the specific heat generated by the material through the heating elements contribute to the development of an optimal microclimate according to the biological needs of plants.

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SOIL MOISTURE STUDY AND ITS INFLUENCES ON BLACKBERRY CULTURE FOR NORTH EAST MOLDOVA COUNTY

STUDIU PRIVIND UMIDITATEA SOLULUI ŞI INFLUENŢA ACESTEIA PENTRU CULTURA MURULUI ÎN ZONA DE NE A MOLDOVEI

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Abstract: *Blackberry (Rubus caesius) has a large commercial potential but in the Northeastern Romania is currently in a status of low economic importance. The development of this crop depends on a range of factors including the cultivation limitations due to soil and water conditions. For this reason , the Department of Fruit Trees culture conducted a study to determine the most suitable growing conditions that would allow the expansion of blackberry production in the North-eastern Romania.*
Key words: *Blackberry, agro-technologies*

Rezumat: *Murul (Rubus caesius.) este o specie cu un potenţial comercial crescut dar în nord-estul României are importanţă economică scăzută.Dezvoltarea acestei culturi depinde de o serie de factori care include si limitarea cultivarii datorită condiţiilor de sol şi apă. Din acest motiv, Departamentul de Cultura a pomilor fructiferi a efectuat un studiu pentru a determina condiţiile de creştere cele mai potrivite, care ar permite extinderea culturii murului în nord-estul România.*
Cuvinte cheie*: mur, tehnologii agricole.*

INTRODUCTION

Small fruits including blackberries and raspberries are a good source of natural antioxidant substances and act effectively as free radical inhibitors (Purgar et al., 2012). Blackberry (*Rubus caesius*.) is a soil moisture–sensitive species with commercial potential that in the North-eastern Romania is currently in a status of low economic importance. The development of this crop depends on a range of factors including the cultivation limitations due to soil and water conditions. Because the root system explores a small volume of soil, especially in the profile depth, this species is affected by drought during the summer, and therefore it needs irrigation (Marvin et al., 1999, McGhie et al., 2002).

In the „V.Adamache" horticol farm it was established an experimental plot with two varieties of blackberries (Thornfree and Lochness) in order to study the behavior of this species under water stress conditions. Plants were grown in soil and a mixture of soil : peat (1:1), under irrigation and without irrigation.

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Biometric measurements were made in order to establish the impact of water deficit on plant growth and development as well as the influence of growth substrate on plant response to soil moisture conditions.

MATERIAL AND METHOD

The experimental plot was established in the V Adamache field (Iasi, Romania) in 2011 as previously described (Dascalu et al., 2012). The blackberry cultivars used in this study were Thornfree and Lochness (3,5 x 0,5 m, 5714 plants/ha), cultured in both soil and soil:peat mixture (1:1). Half of the plants were supplementary irrigated and maintained in well watered conditions while the other half was not irrigated and exposed to water deficit. The field capacity was monitored at regular interval of time.

Biometric measurements such as the plant height, average number of leaves per plant, stem diameter, the average number of inflorescences per plant and fruit yield were made on both categories of plants in two consecutive years. Statistical analysis was also performed.

RESULTS AND DISCUSSIONS

Under irrigation conditions, the length of stem in both cultivars was smaller in plants cultured in soil than in those cultured in soil:peat.. In the second year of culture the stem length reached 308 cm in Lochness and 357 cm in Thornfree Water deficit decreased the stem length in both cultivars and this effect was stronger in soil:peat conditions than in soil (table 1).

Table 1

The average height of the blackberry plants (cm)

Variant		2011		2012	
		Soil	Soil - peat	Soil	Soil - peat
Lochness	V1 – non-irrigated	173.5**	181.3***	278.3	282.3***
	V2 - irrigated	180.3***	191.7***	284.6	308.0***
Thornfree	V1 – non-irrigated	128.4	133.7	260.5	262.3
	V2 - irrigated	178.5**	199.0	324.3	357.7***
DL 5%		6.10	7.07	9.03	8.84
DL 1%		9.83	10.71	15.76	13.39
DL 0,1%		15.2	17.19	27.15	21.50

From 2011 to 2012 the average number of leaves per plant in Lochness maintained under irrigation conditions increased about 50% in soil:peat while in soil the increase was smaller. In Thornfree there were slight differences between plants grown in soil:peat and those grown in soil, However, Lochness showed higher values than Thornfree in the second experimental year. Water deficit

strongly reduced the average number of leaves per plantand this effect was more pronounced in Lochness than in Thornfree, mainly in soil:peat (table 2).

Table 2

The average number of leaves per plant

Variant		2011		2012	
		Soil	Soil - peat	Soil	Soil - peat
Lochness	V1 - non-irrigated	63.2	66.0	87.2	104.7*
	V2 - irrigated	82.1*	94.7*	125.4*	146.0**
Thornfree	V1 – non-irrigated	45.3	50.3	69.5	78.0
	V2 - irrigated	87,3*	91.5*	89.2	91.3
DL 5%		6.02	7.39	7.21	7.06
DL 1%		9.98	11.20	10.64	10.55
DL 0,1%		14.65	17.95	17.86	17.02

The average diameter of stems was higher in Lochness than in Thornfree mainly in plants grown in soil:peat. Water deficit decreased this parameter in both varieties irrespective of substrat (table 3).

Table 3

The average diameter of stems (cm)

Variant		2011		2012	
		Soil	Soil - peat	Soil	Soil - peat
Lochness	V1 - non-irrigated	0.90*	0.93*	0.92*	0.94
	V2 - irrigated	0.98**	1.02**	1.49	1.54*
Thornfree	V1 – non-irrigated	0.47	0.52	0.63	0.74
	V2 - irrigated	0.91*	0.98*	1.03*	1.17*
DL 5%		0.42	0.51	0.55	0.62
DL 1%		0.59	0.72	0.87	0.82
DL 0,1%		1.01	1.10	1.79	1.52

In the second year the average number of inflorescences/plant was measured in both cultivars. Irrigated plants cultured in soil:peat showed higher values than those grown in soil. Water deficit decreased the number of inflorescences/plant. In Thornfree this effect was stronger in soil:peat conditions than in soil ones. However, Lochness showed slightly higher values than Thornfree, mainly in soil:peat (table 4).

The fruit yield was over 10 t/ha in Thornfree plants maintained under well watered conditions. In Lochness the yield was lower than in Thornfree in both irrigated and non-irrigated conditions Water deficit decreased the fruit yield but this effect was stronger in Thornfree where plants cultured in soil:peat showed a half of the fruit yield of irrigated plants (table 4).

Table 4

The average number of inflorescences per plant and fruit yield (kg/plant, t/ha)

Variant		Number of inflorescences		Fruit yield	
		Soil	Soil - peat	Soil	Soil - peat
Lochness	V1 - non-irrigated	13.1	14.0	0.9 kg/plant (5.14 t/ha)	0.88 kg/plant (5.13 t/ha)
	V2 - irrigated	19.5	24.7	1.32 kg/ plant (7.54 t/ha)	1. 44 kg/plant (8.23 t/ha)
Thornfree	V1 – non-irrigated	11.1	16.3	1..04 kg/plant (5.94 t/ha)	1.20 kg/plant (6.89 t/ha)
	V2 - irrigated	20.6	28.7	1.82 kg/plant (10.40 t/ha)	2.10 kg/plant (11.99 t/ha)

CONCLUSIONS

1. The cultivation of blackberry plants under irrigation gives results when the soil is more acid which can be done by the addition of peat.

2. The Lochness cultivar showed superior values than Thornfree for most biometric parameters taken under investigation

3. In terms of fruit yield Thornfree is more productive than Lochness.

4. Both cultivars are recommended for culturing in the northeastern region of Romania because they have the potential to adapt to the environmental conditions that characterize this region.

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STUDIES ON BIOLOGICAL PECULIARITIES OF GROWTH AND DEVELOPMENT ROOTSTOCK AT DIFFERENT GRAFTING METHODS

STUDII PRIVIND PARTICULARITĂȚILE BIOLOGICE ALE CREŞTERII ŞI DEZVOLTĂRII PORTALTOIULUI LA DIFERITE METODE DE ALTOIRE

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Abstract. *Modernization (improvement) propagation technologies by grafting fruit trees species at the table constitute and is an ongoing concern in the research field, both nationally and internationally. Thus, it requires further research and experiments and after approval of new varieties / rootstocks high value in terms agrobiological to establish the most efficientmethods to increase efficiency work. In this study we proposed modernization of technological sequences on the table and containerization grafting, fruit tree seedlings grafted on different rootstocks and follow the behavior combinations variety / rootstock in the nursery.*
Key words*: table grafting, grafting in "Ω", grafting in "V".*

Rezumat. *Modernizarea (perfecționarea) tehnologiilor de înmulțire a speciilor pomicole prin altoire la masă a constituit şi constituie o preocupare permanentă în domeniul cercetărilor, atât pe plan național, cât şi internațional. Astfel, se impune continuarea cercetărilor şi experimentărilor şi după omologarea unor noi soiuri/portaltoi cu valoare ridicată din punct de vedere agrobiologic pentru a stabili cele mai eficiente metode de lucru pentru creaşterea randamentului la înmulțire. În prezentul studiu ne-am propus modernizarea unor secvențe tehnologice privind altoirea la masă şi containerizare, a materialului săditor pomicol altoit pe diferiți portaltoi şi urmărirea comportării combinațiilor soi/portaltoi în pepinieră.*
Cuvinte cheie: *altoirea la masă, altoirea în "Ω", altoirea în "V".*

INTRODUCTION

Grafting at the table has the advantage that shortens with one year the dates of grafted trees production, allows mechanization for the grafting process reducing the consumption of labor and eliminates the need for specialization for long time (Baciu, 2005). In the production units of grafted trees can be achieved using a continuous flow sheet in which rootstocks and scion branches occur during the growing season, harvested in autumn, is

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maintained and is grafted to the table throughout the rest period (Teodorescu and Neculae, 1998).

A few years ago, worldwide grafting at the table in protected areas are used mainly in walnut, but in recent years, this method was extended to other tree species, considering that it can run in dormant period, ensuring continuous flow of work a limited number of permanent workers (Elfving and Schecter, 1993).

MATERIAL AND METHOD

Like study material were used the varieties: Romus 3, Monica, Stanley and Stella, each one grafted on two rootstocks by three different methods(grafting in "T", "Ω" and "V").

The studies focused the influence of grafting methods on fruit tree seedlings obtained at different tree species.

The experiment was placed in a plot from Raducaneni nursery where was planted rootstocks from apple, pear, plum and cherry at a distance of 0,2 × 0,9 m for grafting method ("T"grafting) and the material grafted at table by two types of joint, first they were perforced (contained, callused and rooted). For each one of species was used two rootstocks which was grafted in August (for"T"grafting) and in March (for table grafting in"Ω"and "V"). In all cases was applied specific technology for nursery, specific agronomic works, phytosanitary treatments, irrigation and in June, fertilization.

The experiment, organized in randomized blocks, with three repetitions, ten tres for each repetition is polyfactorial with three experimental factors studied(4×2×3) resulting 24 variants.

The experimental factors were:

Factor A – species	**Factor B– roothstock**	**Factor C – Grating method**
a1: apple – varietyRomus 3	b1 – high vigor roothstock	c1 – grafting in „T"
a2: pearr – variety Monica	b2 – low vigor roothstock	c2 – grafting in „Ω"
a3: plum – variety Stanley		c3 –grafting in „V"
a4: cherry – varietyStella		

RESULTS AND DISCUSSIONS

1.1 Aspects about tree diameter in different methods of grafting

The mutual interaction between the two symbionts causes changes in the anatomy of hipobiontului but especially the epibiont. For this reason to have a complex image in which the clamping force of the tree grafted and the graft were determined diameter of the tree measured above and below the graft (graft or rootstock diameter) and determining the relationship between the two (Santos, 2004).

At higher values of apple species tree diameter (measured both the scion and the rootstock) were grafted on MM 106 variations recorded in the two methods of grafting at the table to grafting in occultation ("T") (table 1).

Comparing the trees diameter bellow the grafting is found that in use of rootstock with higher vigor (MM 106) as well as small vigor (M 9) together with combination change of both symbionts was an increase in thet hickness

of the rootstock and the scion higher percentagec ompared to the situation in which was grafted inoccultation with latente bud. Regarding the tree above the graft diameter, differences recorded between the two rootstocks grafted variants were statistically significant only at the table grafting variants in"Ω".

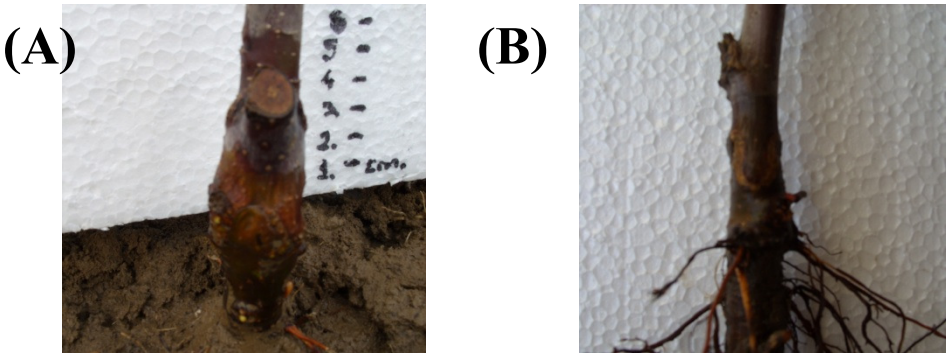


Fig.1 -Apple variety “Romus 3” on roothstock MM106, grafting in “Ω”-(A); grafting in “V” (original)

On pear as in apple species was observed the same trend of increasing diameter trees with using grafting in the table.

Also, there was a clear difference between variants grafted on different rootstocks, values recorded in the case of grafting on rootstocks franc Harbuzesti surpassing ones due to variants grafted on quince (table 1).

Grafting on quince resulted in a decrease of up to 11%, of the diameter of the rootstock grafted version "V" from the control in the case of a reduction of 10.5% graft of this indicator values.Positive differences were reported for grafting in the "Ω" to control and to the grafting of the "V" both above and below the graft (table 1).

In plum, higher values of trunk diameter variations were recorded in grafted on *Prunus cerasifera,* which may be due to the higher vigor of this rootstocks (table 1).

The variants grafted on *Prunus domestica* rootstock grafting methods on the table did not affect significantly the diameter trees under or above the graft, causing a significant decrease of this indicator most of all above the grafting, respectively 1.07 mm (grafting in”Ω”) and 1.62 mm (grafting in "V"). In contrast, the variants grafted on *Prunus cerasifera* values of these indicators were significantly decreased both scion and rootstock diameter just grafting in "V" that was performed grafting (tab.1.1).

It was also observed that grafted on *Prunus domestica* variants have a higher degree of uniformity in respect of the diameter trees (both the scion and the rootstock) to variants grafted on *Prunus cerasifera*.

Table 1

The average diameter of the trunk at speciesa pple, pear, plum and cherry

Variety/ Roothstock	Roothstockdiameter (mm)						Graftdiameter (mm)					
	V1 = „T”	V2 = „Ω”	V3 = „V”	DL 5% (mm)	DL 1% (mm)	DL 0,1% (mm)	V1 = „T”	V2 = „Ω”	V3 = „V”	DL 5% (mm)	DL 1% (mm)	DL 0,1% (mm)
Romus 3/ MM 106	25,72$^{(Mt)}$	28,99 ^{xxx}	26,32	0,82	1,33	2,55	17,21$^{(Mt)}$	24,64^{xxx}	18,36	1,52	2,44	4,51
Romus 3/ M9	22,44$^{(Mt)}$	27,43 ^{xxx}	25,62 ^{xxx}	0,83	1,44	2,64	16,36$^{(Mt)}$	22,15^{xxx}	17,53	1,11	1,81	3,42
Monica/ Harbuzesti	17,36$^{(Mt)}$	18,44	17,67	1,12	1,94	3,53	14,57$^{(M)}$	16,36 ^{xx}	15,40 ^{x}	0,64	1,03	1,95
Monica/ Quincetype A	15,34$^{(Mt)}$	16,45	14,75	1,07	1,87	3,48	12,89$^{(Mt)}$	13,10	12,27	1,79	3,12	5,73
Stanley/ P. Franc	14,28$^{(Mt)}$	13,37	13,12	1,33	2,12	3,87	12,40$^{(Mt)}$	11,33 ^{0}	10,78 ^{00}	0,88	1,46	2,84
Stanley/ P.cerasifera	18,55$^{(Mt)}$	19,23 ^{x}	17,51 ^{00}	0,39	0,67	1,29	16,55$^{(Mt)}$	17,54 ^{x}	15,23 ^{00}	0,85	1,25	2,50
Stella/ IPC1	16,49$^{(Mt)}$	18,31^{xxx}	19,17 ^{xxx}	0,54	0,94	1,65	14,21$^{(Mt)}$	15,81	15,24	1,40	2,38	4,42
Stella/ Mahaleb	19,47$^{(Mt)}$	20,63 ^{xx}	19,70	0,74	1,08	2,04	17,37$^{(Mt)}$	16,53 ^{0}	14,87 ^{00}	0,77	1,17	2,33

In contrast to other species, the species cherry trees values larger diameter (measured at the level of the scion and rootstock) were determined at the variants grafted on the *Prunus mahaleb*, while trees grafted on the IPC1were recorded lowest values of this indicator (table 1).

Analyzing the variation of this indicator in this species was a trend for reduction of its values to the values scion on rootstock grafting rootstock from *Prunus mahaleb*. Although the variants grafted on IPC1, diameter below the graft showed lower values compared to those determined for the variants grafted on *Prunus mahaleb*, it is found that if vegetative rootstock grafted to mass variations recorded significant differences compared to control.

Regarding graft diameter, where grafting was performed on generative rootstock was a decrease in this indicator values were used when grafting on the table instead the trees grafted on rootstocks vegetative state was diametrically opposed, values of this indicator reduced by 10.5% (from grafted variant Ω) and 11.68% (the variant grafted in "V") (table 1).

1.2 Ratio between the diameter graft and the rootstock

The ratio of the diameter of the scion and rootstock is used in literature as an important indicator in evaluating the success of grafting.A report diameter graft / rootstock diameter with values as close to one, indicates a welding and optimal vascularization of the two partners, ensuring normal growth and development subsequently grafted tree.

Regarding the ratio of the diameter of the scion and the rootstock (both measured at 2 cm from the area of grafting) can say that it varied according to species and grafting methods applied (Figure 1).

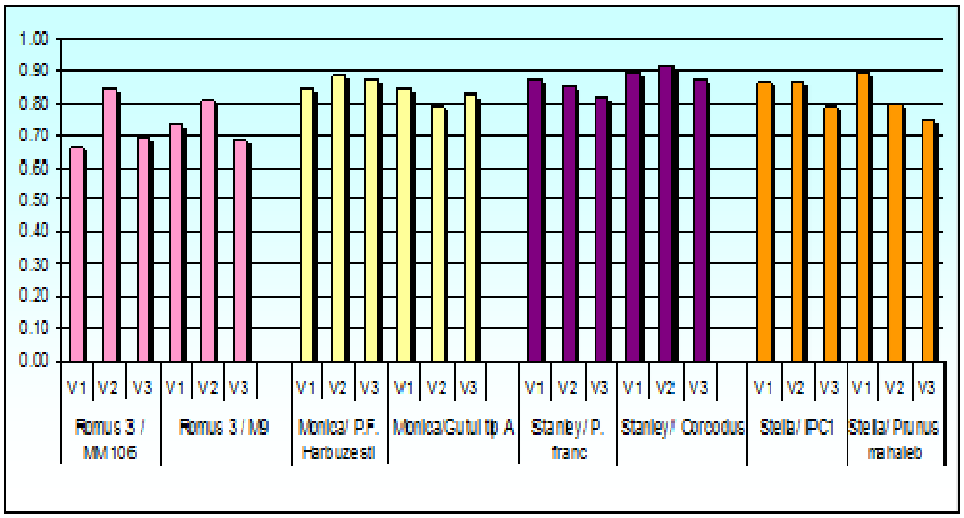


Fig.1- Ratio between diameter graft/diameter rootstock at some tree species using different grafting methods(V1=”T”; V2=”Ω”; V3=”V”)

Increasing the thickness of the rootstock at a rate faster than the scion subunit caused a report to all variants. Pear species (Monica / Quince), plum (Stanley / PF) and cherry grafted on the table, caused a slight decrease in the ratio from field grafted variants (control). It is also possible that in the area of the graft to be some malfunction that prevents assimilate transport to graft thereby limiting growth.

The values of the ratio between the graft and the rootstock diameter increased with the use of "Ω" grafting method, which is up to version Stanley / *Prunus cerasifera*, Monica / PF Harbuzesti, Romus 3 / MM106 and Romus 3 / M9 (Figure 1).

A comparative analysis of the four species can be seen that the influence of grafting methods on the value ratio diameter graft / rootstock diameter is proportional to the vigor rootstock.

CONCLUSIONS

Tree diameter varies with the use of different methods of grafting.This is considered normal, because combining the two symbionts in various forms, causes callus grafting better or less good.

Grafting at the table welding and lead to a better vascularization in variants grafted on rootstocks higher than those at which grafting was performed on smaller rootstocks.

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FLOWERING PERIOD AND MANIFESTATION OF MONILIOSIS OF SOME APRICOT AMERICAN GENOTYPES IN THE CONDITION OF REP. MOLDOVA

PERIOADA DE ÎNFLORIRE ŞI MANIFESTAREA MONILIOZEI LA UNELE GENOTIPURI AMERICANE DE CAIS ÎN CONDIŢIILE REPUBLICII MOLDOVA

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Abstract. *Flowering period and susceptibility to Monillinia laxa of 40 american apricot varieties and selections in the conditions of central part of Moldova were studied between the years 1996 to 2012. No significant differences have been observed between American and Moldavian genotypes according to the time of initiation and characteristics of the differentiation of flower buds. American varieties Rival, Robada, Lorna, Katy, does not have an acceptable resistance of flower buds to the winter low (-15 - -20 °C during 7-10 days) temperatures. Only some studied American genotypes have the earliest beginning of blooming (1-2 days) in comparison to the Moldavian ones. There have not been found varieties with late blooming period. Period of flowering of CR-263, NJA-42, Paterson, Tilton coincide with the principal Moldavian varieties (Bucuria, Krasnoshciokii, Nadejda, Detskii), being good pollinators for its. The most of American varieties are more susceptible to the attack of Monillinia laxa than Moldavian ones. On the basis of the complex of good manifestation of biological and agronomical properties variety CR-2-63 has been registered for the Rep. of Moldova after State Testing. NJA-42 is considered interesting variety regarding very early fruit maturation and high resistance to winter colds.*
Key words: *apricot, varieties, breeding, flowering, Monilinia laxa*

Rezumat. *În perioada a.a 1996-2012 în condiţiile părţii centrale a Rep. Moldova au fost studiate perioada de înflorire şi susceptibilitatea la Monillinia laxa a 40 soiuri şi selecţii americane de cais. Nu s-au depistat diferenţe semnificative privind iniţierea şi caracterul diferenţierii mugurilor florali între soiurile americane şi moldoveneşti. Soiurile americane Rival, Robada, Lorna, Katy, nu posedă rezistenţă acceptabilă a mugurilor floriferi la temperature relative joase din timpul iernii (-15 - -20 °C timp de 7-10 zile). Numai unele genotipuri americane studiate posedă perioadă mai timpurie de înflorire (cu 1-2 zile) comparative cu soiurile moldoveneşti. Nu s-au depistat genotipuri cu înflorire tardivă. Perioada de înflorire a soiurilor CR-2-63, NJA-42, Paterson, Tilton coincide cu perioada respectivă a soiurilor moldoveneşti (Bucuria, Krasnoshciokii, Nadejda, Detskii), ei fiind buni polenizatori pentru soiurile moldoveneşti. Majoritatea soiurilor americane sunt mai sensibile la atacurile de Monillinia laxa decât cele moldoveneşti. În baza manifestării bune a complexului de caractere biologice şi agronomice la Testarea de Stat, soiul CR-2-63 a fost înregistrat pentru înmulţire în Rep Moldova. Soiul*

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NJA-42 este considerat interesant conform caracterelor: maturare extratimpurie a fructelor şi rezistenţă mare la gerurile de iarnă.
Cuvinte cheie: *caisul, soiuri, ameliorare, înflorire, Monilinia laxa*

INTRODUCTION

Apricot fruits are distinguished by valuable qualities, being considered as an important and primordial source of nutritional and therapeutic primordial substances for maintenance and fortification the human health. In the Republic of Moldova cultivation of apricot have secular traditions. Actually there are sophisticate apricot varieties which are characterized compact crown, small and medium but strong fruiting shoots, form of crown appropriate for high density of orchard, root system of rootstock which is adaptable to different kind of soils, especially for "heavy" soil, which is specific for majority of terrains, attributed to apricot in the case of Republic of Moldova; genetic resistance to frost, fluctuations of winter ant spring unfavorable temperatures; physiologic potential of equilibration of growth and fructification, especially high excitability of vegetative buds with the possibility of rehabilitation of crown after drastic manifestation of moniliosis (Cociu, 1993, Pîntea, 2003).

For fresh consumption apricot fruits should be big, very attractive colored, with firm but juicy but succulent flesh, fine texture, equilibrate taste and pretty apricot aroma, with relatively small stone, detachable from flesh. In the same time fruits destinated for industrial processing should have constant form and largeness, uniformly colored flesh after boiling or dehydration, with high content of dry substances, sugar, pectins, macro and microelements, etc. Therefore in the programs of varieties amelioration regarding enlargement of fruit varietal conveyer there are indispensable multilateral experimental researches for evaluation of important genitors, including comparative studies of introduced perspectives varieties from international assortment (Hough According received data of researcher from domain (Nicotra et al., 2006) control of manifestation of propriety „resistance" to *Monilinia laxa* there are polygenic, and varieties which have this property of resistance could transmit this propriety to theirs progenitors. Thus, finding the respective donators for apricot amelioration for the conditions or Moldova represent a major assignment.

MATERIAL AND METHOD

Experimental researches where effectuated in the national collections of apricot (Experimental Station „Codrul", Research and Practical Institute for Horticulture and Alimentary Technologies). In the quality of biologic material in our researches where utilized more than 40 American introduced varieties and selections being compared with main created in Rep. Moldova (Bucuria, Kişinevskii rannii, Moldavskii olimpieț, Detskii, Kostiujenskii). As a rootstock served apricot biotype MVA, schema of plantation: 5 x 4 m, in the absence of irrigation. During the investigations there are employed methodical and methodological principles which are approved for breeding and genetics of fruit trees species (Cociu, 1993, Cociu and Oprea, 1989). Frequency and level of attack to *Monilinia laxa* where appreciated in percents.

RESULTS AND DISCUSSIONS

Table 1

Comportment of some American and Moldavian apricot varieties against the attack of *Monilinia laxa* in the conditions of the Rep. Moldova

Genotype	Attack frequency (%)		Class of resistance
	Flowers	Juvenile shoots	
Varieties of American origin			
Cream ridge	50	24	MA-LA
CR 24-17	65	21	HA-LA
Early orange	45	18	MA-LA
Early blush	70	20	HA-MA
Goldrich	72	70	HA
Katy	85	45	VHA -MA
Kettleman	90	72	VHA -HA
K-106-2	92	70	VHA -HA
K-604-19	96	58	VHA -HA
K-611-150	95	65	VHA -HA
Lorna	65	70	HA-AFÎ
NJA-19	67	58	HA
NJA-21	35	65	MA-HA
NJA-38	40	24	MA
NJA-42	70	70	HA
NJA-44	68	42	HA-MA
Patterson	30	20	MA-LA
P72-155	49	65	MA-HA
P74-74	41	48	MA
P301-105	30	80	LA- VHA
Robada	77	25	VHA -LA
Stark Early Orange	50	24	MA-LA
Tomcot	41	70	MA-HA
Y103-253	70	76	HA- VHA
Y604-75	81	45	VHA -MA
Wesley	77	47	VHA -MA
Created in Rep. Moldova			
Bucuria	25	20	LA
Kishinevskii rannii	38	24	MA-LA
3-2-17	60	52	HA
Raduga	27	26	MA

Legend: Attack degree: 0%-resistanse (R); 0-25%-low attack (LA); 26-50%-atac medium attack VHA (MA); 51-75 %-high attack HA)-100% - very high attack (VHA).

As a result of microscopic investigations of floral buds initiation and embryonic development of floral parts of experimented genotypes in the in summer-autumn period there are no distinguished principled differences between

American varieties and Moldavian ones. Practically within all varieties there are noticed the same morphogenetical dynamic of initiation and development of whole perianth, commencement of the development of stamens, ovarian loge (tab. 1).

Detailed observations concerning outgoing of floral buds from deep biological rest demonstrate the following results. American varieties and selections Lorna, Katy, Kettleman, Modesto, Helena, Nicole, Robada, P301-105, Y 103-253, Y604-75, K-106-2, K-604-19, Wesley, K-611-150, Y103-253, Y604-75, Rival (mains – from California) finished the profound biological rest already at December 20-25. In the same time another part of American varieties (for example: Stark Early Orange, Creame ridge, CR 24-17, Early orange, Henderson, Goldrich, Early blush, Tomcot, NJA-19, NJA-21, NJA-38, NJA-42, NJA-44 and others) continued to be in profound rest yet 4-5 weeks, that is coming to second decade of January.

During the same period get out of rest period the flower buds of local varieties (Bucuria, Kishinevskii rannii, Detskii, Moldavskii olimpieț, Nadejda, Raduga, Kosrtiujenskii). Effectuated researches demonstrate that at group of American varieties, which get out from the rest period more earlier, there is continued development of reproductive organs and structures during the "windows" of 1-2 weeks which have relatively high temperatures (higher of 10^0C). Thereby during these periods at genotypes with relatively short rest period is running rapid processes of microspogenesis.

After there main part of flower (being in buds yet) there are affected by frost of about 17^0C just in 4-6 days. We notice that dynamic of floral development in buds of the majority of registered apricot varieties in the Republic of Moldova. there is comparatively slowly.

Beginning of flowering of American genotypes, with earliest outgoing from biological rest of flower buds (during December) was earliest comparatively with others Moldavian and American varieties (average terms –the third decade of Mars –second decade of April) maximum with 1- 2 days. Thereupon terms of flowering-pollination of the majority of Moldavian varieties overlaps the same of main studied American varieties at least for 2 days.

In the conditions of Rep.Moldova American variety Cream ridge there is distinguished from the majority of studied varieties by more long periods of flowering (with 1-2 days) and by delayed maturation of fruits (more than one weak). This variety were registered in Rep. Moldova for cultivation in the frame of domestic production.

Manifestation of attack of *Monilinia laxa* (flowers and juvenile shoots) of both American and moldavian varieties there are done in tab. 1. Received data shows that the both open flower and juvenile shoots of the American genotypes there are more susceptible to this pathogen. The most susceptible varieties are Helena, Katy, Nicole, Wenatchee, Kettleman, Lorna, K-106-2, K 604-19, K 611-150, P 72-155, Y 103-255, Y 604-75 Wesley, Robada.

Table 2

General characteristics of some American apricot varieties.

Genotype	Vigor	Productivity	Fruit quality	Primary fruits purpose	Recovery capacity of trees	Important features
Varieties of American origin						
Cream ridge	+++	+++	+++	FC, PR	++	Productivity, fruit quality. Good resistance to unfavorable abiotic local factors
Early orange	+++	+++	+++	FC, PR	+++	Productivity, good fruit quality, especially for processing
Goldrich	+++	+++	++	FC, PR	++	Productivity, fruit quality.
Tom cot	++	++	+++	PR	++	Early fruit maturation, fruit quality.
NJA 42	++	++	+++	FC, PR	++	Extra early fruit maturation
Orange red	+++	+++	+++	PR, FC	++	Early fruit maturation, fruit quality.
Paterson	+++	+++	++	PR	++	Stable productivity, fruit quality. Good resistance to unfavorable abiotic local factors
Varieties created in Rep. Moldova						
Kostiujenskii	++	+++	+++	PR, FC	++	Productivity, fruit quality. Good resistance to unfavorable abiotic local factors
Nadejda	++	++	++	FC	+	Productivity, fruit quality. Good resistance to unfavorable abiotic local factors

Legend: +++ -high, ++ - medium, + - low, FC -=fresh consumption, PR - processing

The varieties Early orange, Cream ridge, Stark Early Orange, CR 24-17, Henderson, Goldrich, Early blush, Tomcot, NJA-21, NJA-38 also there are relatively highly attacked, but usually in epiphytotic years conserve a weak yield. Moldavian varieties (Bucuria, Kişinevskii rannii, Costiujenskii, Raduga, 3-2-17) there are smaller attacked. In our opinion this phenomenon could be explained by presence of various fruiting shoots, which have a different dynamic of flower structures differentiation in buds. In such cases one part of flowers and vegetal buds there are developed later, when the opportune microclimatic conditions for intensive development of patogen already pasted.

General analysis of manifestation of the most important agronomical and biological features during period of studies in relation with the frequency and intensity of the development of moniliozis lat the american varieties, introduced

in the the specific conditions of the rep. Moldova permit to ascertain the following.. The varieties Patterson, Cream ridge, Goldrich, Tomcot and Early orange there are characterized in rep Moldova by high productivity of qualitative fruits for processing, having good resistance to unfavorable local factors. Extra early ripening of fruits of NJA-42, medium vigor and high capacity of regeneration or trees represent the features for its promotion as of perspective varieties. Within the conveyer of early varieties with high quality of fruits there are tested variety Orangered. A stable fruit production of evaluated American varieties depends of appropriate management of moniliosis during flowering ad initial development of juvenile shoots.

CONCLUSIONS

1. No significant differences have been observed between American and Moldavian genotypes according to the time of initiation and characteristics of the differentiation of flower buds. American varieties Rival, Robada, Lorna, Katy, does not have an acceptable resistance of flower buds to the winter low (-15 - -20 ^{o}C during 7-10 days) temperatures. Only some American genotypes have the earliest beginning of blooming (1-2 days) in comparison to the Moldavian ones.

2. The most of American varieties are more susceptible to the attack of *Monillinia laxa* than Moldavian ones.non depending of duration of rest period of flower buds and flowering period. The varieties Cream ridge, Stark Early Orange, Goldrich, NJA-42, Patterson there are interesting for utilization in intraspecific hybridizations because the presence of the complex of valuable features which are favorable manifested in the conditions of the republic of Moldova

4. On the basis of the complex of good manifestation of complex of biological and agronomical properties variety CR-263 has been registered for the Rep. of Moldova after State Testing. NJA-42 is considered interesting variety regarding extra early fruit maturation and high resistance to winter colds.

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RESEARCH CONCERNING THE INFLUENCE OF CURRENT CLIMATE CHANGES OVER THE PHENOLOGICAL STAGES AT SWEET CHERRY TREE (*PRUNUS AVIUM* L.)

CERCETĂRI PRIVIND INFLUENȚA SCHIMBĂRILOR CLIMATICE ACTUALE ASUPRA STADIILOR FENOLOGICE LA CIREŞ (*PRUNUS AVIUM* L.)

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Abstract. *Carrying out the phenological stages of vegetation and fructification in sweet cherry is determined by the cumulative action of daily average temperatures exceeding 5°C, value considered as biological limit of sweet cherry cultivars. In climate conditions from last few years, was observed some changes about value of the sum degree of active temperature necessary onset the phenological stages of sweet cherry tree compared with the same period in '50. The research was conducted during 2009-2012 by 20 sweet cherry cultivars with different fruit maturation period, existing in the sweet cherry germplasm fund from Fruit Growing Research Station Iaşi, Romania. This paper aims to determine the active thermal balance needed to carry out the fruiting phenophases and comparing the results with data cited in the literature.*
Key words*: temperature, phenology, cultivars, flowering, fruiting, sweet cherry tree*

Rezumat. *Desfăşurarea fenofazelor de vegetaţie şi fructificare la cireş este determinată de acţiunea cumulată a temperaturilor medii zilnice ce depăşesc valoarea de 5°C, considerată prag biologic la specia cireş. În condiţiile climatice din ultimii ani, s-a observat o schimbare a sumei gradelor de temperatură activă necesară declanşării stadiilor fenologice la cireş, comparativ cu aceleaşi date din perioada anilor '50. Cercetările au fost efectuate pe perioada 2009-2012, la 20 soiuri de cireş cu perioada de maturare a fructului diferită, existente în colecţia naţională de cireş din cadrul Staţiunii de Cercetare-Dezvoltare pentru Pomicultură, Iaşi. Lucrarea are ca obiectiv determinarea bilanţului termic activ necesar desfăşurării fenofazelor de fructificare şi compararea rezultatelor cu datele citate în literatură.*
Cuvinte cheie: *temperatură, fenologie, soiuri, înflorire, fructificare, cireş.*

INTRODUCTION

The sweet cherry tree is a species with economic importance due to nutritional, technological and commercial aspects of the fruits (Budan and Grădinariu, 2000). The period between the beginning of the growing and maturing fruit phenophases is very short at sweet cherry tree compared to other fruit tree species, being surpassed only by the strawberry. Previous research have shown that the start of vegetation and fruiting phenophases in sweet cherry tree are

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determined by the action of daily average temperatures that exceed the value of 5°C (Istrate, 2007) and have a direct influence on plant flowering (Roversi and Ughini, 2008; Radicevic et al., 2011).

The importance of air temperature is low during the flowering sweet cherry tree until the stengthening of the stone and it increases during the fruit ripening (Budan and Grădinariu, 2000). Kolesnikov (1959) cited by Budan and Grădinariu, 2000 noted that the heat during the blooming and ripening of the fruits is different and it depends on the cultivar. Zacharias and Zacharias (1986) shows that different cultivars of sweet cherry recorded a period of 43 and 65 days from the start of flowering until the harvest maturity, requiring between 660.1°C and 1105.3°C active temperature. Drăgoi and Chitu (1995) studied the influence of meteorological parameters on phenological dynamics using statistical methods to 163 plum genotypes. Global climate change affects indications used by plants to start flowering (Sparks et al., 2000) bringing the phenophases to advance with 4-7 days per degree Celsius of high temperature (Darbyshire et al., 2012).

This paper aims to determining the active thermal balance necessary to fruiting phenophases of sweet cherry cultivars in terms of climate change and comparing the results with data from literature.

MATERIAL AND METHOD

For experimentation, 20 sweet cherry cultivars were studied in period 2009-2012, which were in existence at the national collection of the experimental polygon, which can be found at the Fruit Growing Research Station, Iaşi - Romania. The studied sweet cherry cultivars were different periods of the fruit ripening: early (*Rivan, Muncheberge Frühe, Cetățuia, Catalina, Bigarreau Burlat, Scorospelka* and *Bigarreau Moreau*), medium (*Van, Maria Golia, Bucium, Ludovic, Bing* and *Cociu*) and late period (*Bigarreau Drogan, Germersdorf, Margo* and *George*). Phenological data were determined through the Fleckinger system (Fleckinger, 1960): B_1 - the bud swelling: the bud rounds delicate and gains a green light at the top; F_1 - the beginning of the flowering: the flowers are open for 5%. The date of the fruit ripening was established in the time of marketing quality traits (color, the content of dry matter) specific to each cultivar. The climatic data were recorded with the AgroExpert system by the station located on the perimeter of the experimental polygon of the Fruit Growing Research Station, Iaşi - Romania.

The active thermal balance (Σt°a) is provided by the sum of average daily temperature grades, which exceeds the biological limit characteristic to the sweet cherry tree, considered to be 5°C (Istrate, 2007).

Σt°a = ΣT atd – BL, in which:

ΣT atd = sum of average temperature of days between two subsequent phenological stages;

BL = the biological limit of fruit tree species.

The statistical interpretation of experimental data. The statistical analysis was performed with the Microsoft Excel programme. The difference between cultivars was determined by the Duncan test ($p \leq 0.05$) and the Pearson correlation coefficient has been calculated between the variables measured ($p \leq 0.05$).

RESULTS AND DISCUSSIONS

During 2009-2012 it has been observed a great variability of the number of days and the sum of active degrees of temperature between the vegetation stages according to the sweet cherry tree cultivar and climatic year. Therefore, the period from the swelling of the buds until the beginning blossoming, the studied cultivars showed large variations in vegetation period and the active thermal balance (table 1).

Table 1

Active thermal balance necessary during the vegetation period between the swelling bud to beginning blossom of the sweet cherry cultivars (2009-2012)

Cultivar	Duration of the vegetation between the swelling of the buds to the beginning of blossom (B_1-F_1)								Average	
	2009		2010		2011		2012			
	Nr. days	∑ t°a	Nr. days	∑ t°a	Nr. days	∑ t°a	Nr. days	∑ t°a	Nr. days	∑ t°a
Rivan	29	166,7	14	133,6	32	236,7	13	114,6	22^{cde}	$170,4^{cdef}$
Muncheberge fruhe	28	171,3	15	149,8	27	179	12	98,9	21^{e}	$149,8^{f}$
Cetățuia	25	126,3	14	137,8	29	219,0	14	124,9	21^{e}	$152,0^{f}$
Cătălina	28	171,3	14	144,4	28	227,3	15	133,5	21^{de}	$169,1^{def}$
Bigarreau Burlat	28	171,3	17	169,1	31	251,7	15	129,1	23^{bcde}	$180,3^{cdef}$
Scorospelka	27	180,3	13	124,3	28	203,2	16	140,1	21^{e}	$162,0^{ef}$
Bigarreau Moreau	32	218,7	15	145	33	260,1	17	148,7	24^{abcd}	$193,1^{bcde}$
Van	31	207,8	13	126,4	29	213,8	17	151,4	23^{bcde}	$174,9^{cdef}$
Maria	29	180,3	15	144,4	30	247,7	17	161,7	23^{bcde}	$183,5^{bcdef}$
Golia	30	207,8	15	145	25	194,8	18	176,5	22^{cde}	$181,0^{bcdef}$
Bucium	33	218,7	14	137,4	29	237,8	16	156,5	23^{bcde}	$187,6^{bcde}$
Ludovic	33	218,7	13	126,4	30	250,2	21	197,8	24^{abcd}	$198,3^{bcd}$
Bing	31	189,3	12	119,7	31	242,1	15	134,9	22^{cde}	$171,5^{cdef}$
Cociu	33	218,7	14	135,7	30	246,3	18	185,1	24^{abcde}	$196,5^{bcde}$
Bigarreau Drogan	33	229,4	12	166,1	32	260,1	20	188,2	24^{abcd}	$211,0^{ab}$
Germersdorf	34	218,7	18	178,4	30	242,1	20	183,3	26^{ab}	$205,6^{abc}$
Margo	35	242,2	18	178,4	32	272,9	24	243,5	27^{a}	$234,3^{a}$
George	30	198,8	18	177,4	28	227,1	18	181,4	24^{bcde}	$196,2^{bcde}$
Marina	31	198,8	15	145	26	217,7	17	171,3	22^{cde}	$183,2^{bcdef}$
Anda	32	162,8	16	157,3	30	245,6	23	225,2	25^{abc}	$197,7^{bcd}$
LSD 5%									3	29,3

The average values during the study ranged between 21 days (*Muncheberger Frühe, Catalina* and *Scorospelka*) and 27 days (*Margo*) and the active thermal balance of values were registered between 149.8°C (*Müncheberger Frühe*) and 234.3°C (*Margo*) (table 1).

For the period from the beginning of the blossoming (F_1) to the ripening of the fruit (mf) was required an average over the studying period which ranges from 40 days to 87 days for different sweet cherry cultivars.

Table 2

Active thermal balance necessary during the vegetation between the beginning blossom to ripening period of sweet cherry cultivars (2009-2012)

Cultivar	Duration of the vegetation between the beginning blossom to ripening period (F_1 – mf)								Average	
	2009		2010		2011		2012			
	Nr. days	∑ t°a	Nr. days	∑ t°a	Nr. days	∑ t°a	Nr. days	∑ t°a	Nr. days	∑ t°a
Rivan	54	779,0	49	685,9	30	429,5	40	655,4	43de	637,5^{e}
Muncheberge fruhe	45	635,9	43	577,0	34	458,3	38	608,8	40^{e}	570,0^{f}
Cetățuia	48	691,9	44	591,6	43	663,9	41	665,9	44de	653,3^{e}
Cătălina	54	785,5	56	816,3	46	724,8	41	665,9	49^{d}	748,1^{e}
Bigarreau Burlat	50	769,1	53	796,8	29	418,8	37	600,6	42de	646,3^{e}
Scorospelka	52	760,1	48	666,7	34	484,5	34	559,7	42de	617,8^{f}
Bigarreau Moreau	50	752,8	50	711,1	36	554,5	44	732,2	45de	687,7^{e}
Van	64	1025,8	61	921,9	56	925,8	61	1083,1	61^{c}	989,2^{cd}
Maria	65	1013,7	61	909,7	61	1037,3	64	1131,9	63^{c}	1020,9^{cd}
Golia	62	986,2	61	921,9	60	1005,3	55	946,9	60^{c}	965,1^{cd}
Bucium	61	975,3	61	935,8	57	971,8	56	958,2	59^{c}	960,3^{d}
Ludovic	56	1190,0	61	946,8	62	1065,1	58	1015,6	59^{c}	1054,4^{cd}
Bing	68	1085,5	70	1128,0	54	1155,5	63	1113,2	64^{c}	1120,6^{c}
Cociu	65	1056,1	60	1034,0	59	1003,7	56	970,5	60^{c}	1016,1^{cd}
Bigarreau Drogan	64	1045,4	72	1196,3	61	1069,7	61	1137,1	65^{c}	1112,1^{c}
Germersdorf	66	1080,1	64	1049,0	56	962,1	58	1051,2	61^{c}	1035,6^{cd}
Margo	68	1009,5	63	1031,2	55	949,4	56	1080,9	61^{c}	1017,8^{cd}
George	93	1636,4	97	1681,8	80	1398,3	76	1450,6	87^{a}	1541,8^{a}
Marina	85	1473,9	92	1539,3	71	1221,7	62	1148,6	78^{b}	1345,9^{b}
Anda	66	1067	68	1106,4	60	1108,4	60	1106,6	49^{c}	1097,1^{cd}
LSD 5%									6	121,5

The active thermal balance, during this period, ranged between 570.0°C (*Müncheberger Frühe*) and 1541.8°C (*George*) (table 2). Statistically speaking, there were significant differences in the thermal balance activity necessary during the period from the beginning of the blossom (F_1) and fruits maturation (mf) for *Marina* and *George*, in comparison with cultivars with ripening period in early or

medium season (table 2). *Bigarreau Drogan, Germersdorf, Margo* and *Anda* had late fruit maturation but not showed significant statistically differences in comparison with the sweet cherry cultivars with medium season maturation.

Cultivars with early fruit maturation (*Rivan, Muncheberger Frühe, Cătălina, Bigarreau Burlat, Scorospelka* and *Bigarreau Moreau*) registered significant statistically differences in comparison with sweet cherry cultivars with medium or late maturation season, both in number of days and the active thermal balance required for the period from the start of the blossoming (F_1) and fruit maturation (mf) (table 2).

From the data cited by Kolesnikov, 1959 cited by Budan & Grădinariu, 2000 it's considered necessary active temperature range of 460-670°C for the period from the beginning of blossom (F_1) to the fruit ripening (mf) for early sweet cherry cultivars. From research performed by us during 2009-2012 it was found that these limits have increased to 515-748°C, the difference being greater than 55-78°C. Also, the need for active temperature during the start of blossom (F_1) and the fruit maturation (mf) for the medium season cultivars was higher compared to the cited data from Kolesnikov, 1959, respectively 955-1085°C, with 135-145°C higher. Speaking about late maturing cultivars, registered limits were higher (1095-1281°C) with 45-131°C, compared with studies from the '50s. However, Zaharia & Zaharia, 1986, shows that *Van* requires an average of 65 days with 1068.3°C active thermal balance and *Bing* requires 63 days with 1002.1°C active thermal balance into Mehedinți County conditions, during the 1984-1985 years, but in failing to specify the biological limit considered for sweet cherry species. From the data recorded by us *Van* required an average of 61 days with a 989.2°C as active thermal balance, which were lower values, compared with the data cited. *Bing* took 64 days with 1120.6°C active thermal balance, higher values compared to the data cited by Zaharia & Zaharia, 1986.

By correlating the number of days from the period of the phenological phases from the swelling of the bud (B_1) to the beginning of the blossoming (F_1) and the period between the beginning of the blossoming (F_1) to fruit maturation (mf), it was observed that these variables are positively correlated (table 3), but there is some exceptions. Thereby, it was observed that in the years with low temperatures during February-March, when the starting of the phenological phases is long overdue, these variables were negatively correlated, but statistically insignificant.

Table 3

Correlations between the number of days and the sum of degrees of temperature over different phenological periods in sweet cherry tree

Year	Correlations between variables:	
	Number of days between: B_1-F_1 ÷ F_1 – mf	**Sum of degrees of temperature between: B_1-F_1 ÷ F_1 – mf**
2009	$0,41^{ns}$	$0,41^{ns}$
2010	$0,24^{ns}$	$0,25^{ns}$
2011	$-0,28^{ns}$	$0,21^{ns}$
2012	$0,54^{**}$	$0,64^{***}$
$P_{5\%}$= 0,44		

This means that, in the years with low temperature of the beginning of the springs, the period between the swelling of the buds (B_1) and the start of the blossoming (F_1) is greater and the period between the start of the blossoming (F_1) and the fruit maturation (mf) is reduced, compared to the normal years according to the climate conditions. Correlating the sum of degrees of active temperature degrees for these phenological intervals, it can be observed that it is positively correlated, which means that the large thermal balance from the swelling of the bud (B_1) until the beginning of the blossoming (F_1) implies an increase of the active thermal balance during the period from the beginning of the blossoming (F_1) to the fruit ripening (mf).

CONCLUSIONS

1. The climate change from recent years have influenced the duration of the phenological phases of different cultivars of sweet cherry tree.

2. Sweet cherry cultivars which have been studied, showed an increasing need for active temperature for the duration of phenophases, in comparison with the data cited in the 50's.

3. Phenological period of the same sweet cherry cultivars are variable, depending on the climate year conditions and the cultivation area.

4. In the years with cold springs, the beginning of the phenological phases is delayed and the phenophases between blossoming and fruit ripening succeed in a short time.

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GENETIC VARIABILITY OF INDIGENOUS BIOTYPES HAZELNUT (*C. AVELLANA* AND *C. COLURNA* L.) FROM OLTENIA AND SOUTHERN TRANSILVANIA

VARIABILITATEA GENETICA A BIOTIPURILOR AUTOHTONE DE ALUN (*C. AVELLANA* SI *C. COLURNA* L.) DIN OLTENIA SI SUDUL TRANSILVANIEI

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Abstract. *The hazelnut (C.avellana and C. colurna) is a plant present in Romania, so that the crop and in the spontaneous flora, represented by populations, biotypes and cultivars. Hazelnut spread wide areas in Romania, but also their knowledge in certain micro-areas and taking into account the specific biological aspects (dichogamy emphasized, the need for pollination alogam) led to the formation of natural hybrids and finally biotypes with high genetic variability. This variability requires protection of "in situ" and "ex situ" to the phenomenon accentuated by erosion and genetic vulnerability, with negative effects on genetic resources.*
Key words*: hazelnut, biotype, genetic variability*

Rezumat. *Alunul (C.avellana si C. colurna) este o planta prezenta in Romania, atat ca planta de cultura cat si in flora spontana, reprezentata prin populatii, biotipuri si soiuri. Raspandirea alunului pe largi areale din Romania, dar si cunoasterea acestora in anumite microzone si tinand seama de unele aspecte biologice specifice (dichogamia accentuata, nevoia de polenizare alogama) au determinat formarea de hibrizi naturali si in final de biotipuri cu o mare variabilitate genetica. Aceasta variabilitate necesita protejarea "in situ" si "ex situ" fata de fenomenele accentuate de eroziune si vulnerabilitate genetica, cu efecte negative asupra resurselor genetice.*
Cuvinte cheie: *alun, biotip, varianilitate genetica*

INTRODUCTION

The hazelnut (*C.avellana* and *C. colurna*) is a plant present in Romania, so that the crop and in the spontaneous flora, represented by populations, biotypes and varieties.

The hazelnut plants existing in the spontaneous flora is stuck, especially in the hills, at an altitude of 90-100 m and shows interest in the identification of genotypes and to protect and preserve them for future generations, according to the International Union action for Conservation of Nature (IUCN), the FAO and Bioversity International (Bioversity, FAO and CIHEAM, 2008, Botu and Botu, 2000; Rovira, 1996; Vicol, 2010).

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Collecting hazelnut genetic resources (populations, biotypes, older varieties) is a high-action scientific and economic importance and of interest to develop this culture based on new varieties possessing some valuable genes adapted to the specific conditions of our country.

The identification, collection and evaluation are related to the storage and subsequent use.

Hazelnut spread wide areas in Romania, but also their knowledge in certain micro-areas and taking into account the specific biological aspects (the dichogamy emphasized, need for alogam pollination) led to the formation of natural hybrids and finally biotypes with high genetic variability. This variability requires protection of "in situ" and "ex situ" to the phenomenon accentuated by erosion and genetic vulnerability, with negative effects on genetic resources.

Consequently, we intend to identify, collect, evaluate and the conservation of some biotypes of hazelnut in southern Transylvania and Oltenia.

MATERIAL AND METHOD

In southern Transylvania and Oltenia formed hazelnut numerous biotypes belonging to *C. avellana* and *C. colurna* even on the edge of deciduous forests and along rivers and streams.

In these areas, between 2008-2011, was identified a total of 37 biotypes. Among these are three biotypes of *C. avellana* x *C. colurna* origin.Biotypes were evaluated "in situ". All plants studied are aged over 20 years.

Observations and measurements were related to the behavior in the growth process (force the type of growth suckering capacity, etc.) and in the process of fructification (index size and average fruit weight, index round exocarp thickness, strength fruit breaking, shape and color of the fruit etc). At each biotype were measured 25 fruits.

Remark and measurements were within the descriptors Bioversity International and local positioning identification was performed using GPS.

RESULTS AND DISCUSSIONS

Identification of biotypes of hazel (37) was made in southern Transylvania and Oltenia with GPS, specifically in an area located between parallels $44^0$47 'N and $45^0$81' N and meridians $23^0$38'E and $24^0$81 'E. The area covered several localities in the counties of Dolj, Valcea, Gorj, Hunedoara and Brasov (Table 1).

Biotypes from *C.avellana* (34) *C.colurna* natural interspecific hybrids (*C.avellana* x *C.colurna*).

Between Mehedinti and Gorj is a natural forest formed from natural hybrids, the dominant character of *C. colurna*.

Biotypes identified wide variability shows character growth and fructification.

Plant growth vigor of mature (over 20 years) is generally average, except biotypes from *C.colurna* which shows a large effect (plants and tree heights over 8.0 m).

Table 1

Place identification of *C. avellana* and *C. colurna* hazelnut biotypes

No.	Accession	Species	Place identification	Latitude	Longitude
1	A1-1-2008	C.avellana	Rou-Valcea	$44^0$85’	$24^0$23’
2	A1-2-2008	C.avellana	Rou-Valcea	$44^0$85’	$24^0$23’
3	A1-3-2008	C.avellana	Rou-Valcea	$44^0$85’	$24^0$23’
4	A1-4-2008	C.avell xcol	Rou-Valcea	$44^0$85’	$24^0$23’
5	A1-5-2008	C.avell xcol	Rou-Valcea	$44^0$85’	$24^0$23’
6	AM -13-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
7	AM-14-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
8	AM-15-2008	C.avelana	Rou-Valcea	$45^0$35’	$24^0$33’
9	AM-16-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
10	AM-17-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
11	AM-18-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
12	AM-19-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
13	AM-20-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
14	AM-21-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
15	AM-22-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
16	AM-23-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
17	AG-1-2008	C.avellana	Rou-Gorj	$44^0$72’	$24^0$33’
18	AG-2-2008	C.avellana	Rou-Gorj	$44^0$72’	$23^0$08’
19	AM-1-2008	C.avellana	Rou-Valcea	$45^0$35’	$23^0$08’
20	AM-2-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
21	AM-3-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
22	AM-4-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
23	AM-5-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
24	AM-6-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
25	AM-7-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
26	AM-8-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
27	AM-9-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
28	AM-10-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
29	AM-11-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
30	AM-12-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
31	AM-24-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
32	AM-25-2008	C.avellana	Rou-Valcea	$45^0$35’	$24^0$33’
33	ANB-2008	C.avellana	Rou-Valcea	$45^0$12’	$24^0$45’
34	AF-2008	C.avellana	Rou-Brasov	$45^0$81’	$24^0$81’
35	AV1-2008	C.avellana	Rou-Dolj	$44^0$47’	$23^0$92’
36	AV2-2008	C.avellana	Rou-Dolj	$44^0$47’	$23^0$92’
37	AP-2009	C.colurna	Rou-Hunedoara	$45^0$41’	$23^0$38’

Type of plant growth is in the form of bush (*C. avellana*) from the displayed semierect. Biotypes of *C. colurna* oscillates between semietalat (A1-4-2008) and erect (AP-2009). Most biotypes shows a large number of suckers / plant (13-36 pieces), except biotypes *C.avellana* x *C.colurna* not suckers.

Biotypes identified in the spontaneous flora shows a very low capacity fruition (0,2-2,5 kg / plant), which according to both the plant genotype and the position within the biotype. Fruit characteristics are defining elements of differentiation between biotypes (Table 2 and 3).

Table 2

The main characteristics of the fruit of hazelnut biotypes

No.	Accession	Fruit size index (mm)	Average weight (g)	Round index	Fruit shape	Exocarp thickness	Exocarp break
1	A1-1-2008	18,9	2,4	1,1	Globular	1,9	Hard
2	A1-2-2008	18,2	2,2	1,2	Flat globular	1,7	Hard
3	A1-3-2008	18,8	2,3	1,1	Flat globular	1,8	Hard
4	A1-4-2008	15,5	1,5	0,8	Short subcylindrical	1,7	Hard
5	A1-5-2008	15,1	1,4	0,8	Short subcylindrical	1,6	Hard
6	AM-13-2008	16,3	1,9	0,7	Short subcylindrical	1,8	Hard
7	AM-14-2008	14,6	1,4	0,7	Short subcylindrical	1,7	Hard
8	AM-15-2008	14,9	1,6	0,8	Globular	1,8	Hard
9	AM-16-2008	14,0	1,2	0,7	Globular	1,7	Hard
10	AM-17-2008	15,6	1,6	0,7	Globular	1,9	Hard
11	AM-18-2008	15,8	1,7	0,7	Globular	1,7	Hard
12	AM-19-2008	14,0	1,3	0,8	Globular	1,8	Hard
13	AM-20-2008	16,3	1,9	0,8	Short subcylindrical	2,0	Hard
14	AM-21-2008	15,2	1,5	0,8	Short subcylindrical	1,9	Hard
15	AM-22-2008	13,3	1,0	0,7	Short subcylindrical	1,7	Hard
16	AM-23-2008	15,3	1,5	0,7	Short subcylindrical	1,8	Hard
17	AG-1-2008	13,7	1,3	0,8	Short subcylindrical	1,8	Hard
18	AG-2-2008	13,8	1,3	0,8	Short subcylindrical	1,6	Hard
19	AM-1-2008	16,1	2,7	0,7	Ovoid	1,9	Hard
20	AM-2-2008	15,2	1,6	0,7	Ovoid	1,7	Hard
21	AM-3-2008	14,9	1,5	0,9	Globular	1,6	Hard
22	AM-4-2008	14,8	1,5	0,8	Globular	1,9	Hard
23	AM-5-2008	13,7	1,2	0,7	Long subcylindrical	1,6	Hard
24	AM-6-2008	18,1	1,4	1,2	Globular	1,8	Hard
25	AM-7-2008	13,4	1,0	0,6	Long subcylindrical	1,9	Hard
26	AM-8-2008	15,9	1,7	0,8	Short subcylindrical	1,5	Hard
27	AM-9-2008	15,3	1,7	0,8	Short subcylindrical	1,6	Hard
28	AM-10-	13,8	1,2	0,7	Long	1,7	Hard

	2008				subcylindrical		
29	AM-11-2008	16,2	1,7	0,6	Long subcylindrical	1,9	Hard
30	AM-12-2008	14,3	1,8	0,8	Short subcylindrical	1,8	Hard
31	AM-24-2008	15,7	1,6	0,8	Short subcylindrical	1,8	Hard
32	AM-25-2008	13,9	1,2	0,7	Short subcylindrical	1,6	Hard
33	ANB-2008	13,5	1,1	0,9	Globular	1,6	Hard
34	AF-2008	14,7	1,0	0,8	Ovoid	1,5	Hard
35	AV1-2008	14,5	1,4	0,7	Ovoid	1,6	Hard
36	AV2-2008	14,5	1,4	0,9	Globular	1,5	Hard
37	AP-2009	15,8	1,7	0,7	Globular	1,7	Hard

Fruit size index is between 13.3 and 18.9 mm, with an overall average of 15.2 mm. fruits fall in small and medium class. Standard deviation (3.80 mm) and coefficient of variation (25.0%) have high values, indicating that differences between the size biotypes are high. Measured by the same statistical indicators each biotype (s and s%) showed that they are much smaller (s = 1.0-1.8% and s = 8-12), the fruit is smooth. Average weight of fruit to hazelnut biotypes is 1.55 g (lightweight class) and oscillation between biotypes ranged between 1.0 and 2.4 g. standard deviation (0.39 g) and coefficient of variation (25.2%) were large differences between fruit weight biotypes are appreciated. In the same biotype these indicators are much lower (s = 0.18-0.21% and S = 9.4 to 13.5%).

Some biotypes (A1-1-2008, A1-A1 2-2008 and 3-2008) shows the indices of average fruit size and weight that fits in middle class (18.2 to 18.9 mm and from 2.2 to 2,4g). Hazelnut round fruit are rated for industrial processing industry (peeling may be mechanized). Biotypes identified shows generally elongated fruit (Ir = Ir = 0.6-0.8 and 1.0-1.2), only 3 of them have fruit globular or spherical (Ir = 0.9 to 1.0). Mean round index is 0.8, with s = 0.24 and s = 30.0%, indicators that show a high degree of variability.

For each biotype, round index shows s% lower (below 10%) with a low variability.Average thickness of 1.75 mm exocarp with amplitude between 1.5 and 2.0 mm, which looks like peanuts to biotypes studied shows a very thick skin and tough enough. Differences between the fruit exocarp thickness is reduced (s = 0.28 mm and s = 16%). S% compared to values within each biotype it is huge (s% = 6-8%).Differences between biotypes register and fruit color, cross-sectional shape of the fruit, the fruit tip shape, fruit shape, etc. The hazelnut biotypes were found to be resistant to *Botrytis cinerea*, with a variation of 1.2% in the frequency of attacks (MA-19-2008, I-14-2008, I-15-2008) and 7.3% (AM-20-2008), the *Phytoptus avellanae* (not present attack) and *Balaninus nucum* (frequency of 1.2 to 5.1%). Their strength is far superior cultivated varieties.

Table3

Variability of fruit charactaristics of some biotypes of wild hazelnut

Specifications	U/M	Val. min.	Val. max.	Amplitude	Val. medium	s	s%
Size index	mm	13,3	18,9	6,6	15,2	3,80	25,0
Fruit weight	g	1,0	2,4	1,4	1,55	0,39	25,2
Round index	-	0,6	1,2	0,6	0,8	0,24	30,0
Exocarp thickness	mm	1,5	2,0	0,5	1,75	0,28	16,0
Fruit colour	-	Yellowish	Brown	-	-	-	-
Fruit transversal section shape	-	Elliptic	Round	-	-	-	-
Apex fruit shape	-	Sharpening	Flat	-	-	-	-
Curvature basal scar fruit	-	Convex	Smooth	-	-	-	-
Fruit shape	-	Long subcylindrical	Globular	-	-	-	-
Exocarp break	-	-	Hard	Hard	-	-	-

CONCLUSIONS

In spontaneous flora of southern Transylvania and Oltenia 37 biotypes were identified by *C. avellana* and *C.avellana* x *C.colurna* which shows great variability in growth and fruiting characteristics. Plant growth form of tufa, of medium size and shape to semispred et al. Interspecific biotypes exception of *C. colurna* with a big increase with one trunk.

Biotypes of *C.avellana* shows many suckers in the bush (13-36 units/plant). Fruits of hazelnut biotypes shows a large variability on fruit size index (13.3 to 18.9 mm), average fruit weight (1.0 to 2.4 g), round index (0.6-1.2), exocarp thickness (1.5-2.0 mm), etc. High variability in fruit descriptors from hazelnut biotypes results from determinations indicators dispersion (standard deviation and coefficient of variation), which shows high values.

All hazel identified biotypes resistant to some diseases (*Botritis cinerea*) and pests (*Phytoptus avellanae* and *Balaninus nucum*) variable, but superior varieties of culture. Hazelnut biotypes are possessors of genes of interest for breeding programs and conservation needs for the future.

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THE HEMEIUȘI ARBORETUM - „A LIVING LABORATORY”

ARBORETUMUL HEMEIUȘI – „UN LABORATOR VIU”

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Abstract. *Dendrological Park ,,Hemeiuşi" Bacău, created in 1880, with an area of 49,5ha, is situated on the right bank of the river Bistrița. The multifunctionality of conservation, environmental protectin, recreation, education and scientific research, derived from many indigenous and exotic species, represented by solitary species, biogrups, orchands and compararive cultures, assigned to park a real character of,, living laboratory". The encounter with the arboretum communicates to the visitor, in an live manor data and knowledge concerning the species in the patrimony collection, brought here from all the corners of the world, an impressive explosion of shapes, sizes and colours.*
Key words: *arboretum, dendrological, park, Hemeiusi, collection*

Rezumat. *Parcul Dendrologic ,,Hemeiuşi" Bacău , creat în anul 1880, cu o suprafață de 49,5ha este așezat pe malul drept al râului Bistrița. Prin multi-funcționalitatea de conservare, protecția mediului, recreație, educativă și a cercetărilor științifice, derivate din multitudinea speciilor indigene și exotice, reprezentate prin exemplare solitare, biogrupe, plantaje și culturi comparative, atribuie parcului dendrologic un adevărat caracter de ,, laborator viu". Întâlnirea cu arboretumul comunică vizitatorului, într-o manieră vie date şi cunoştințe în legătură cu speciile aflate în patrimoniul colecției, aduse aici din mai toate colțurile lumii, o explozie impresionantă de forme, dimensiuni, culori.*
Cuvinte cheie: *arboretum, dendrologic, parc, Hemeiuși specii, colecți.*

INTRODUCTION

Arboretums are collections of wood plants represented by solitary species, biogroups or small experimental stands, located in the teritory by echological, systematical or fitogeographical criteria. They show themselves under the form of original vegetal structure, created by man in strong collaboration with nature, in different landscape architectural styles (Mihalache, 1982).

Romania was a country poor in tree species and shrubs, things observed from the first Romanian forestry. This time, there were concerns of bringing wood species from different parts of the world, to try them acclimated on this occasion giving birth dendrolgice parks and gardens.

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Such a vegetal collection includes the Hemeiusi Arboretum also known as the "Dendrological park of Hemeiusi" located at the periphery of the UP Lilieci village, at a 10 km distance from Bacău.

MATERIAL AND METHOD

The Hemeiusi Arboretum is covered in the ecological subregion B3-Bistrita Tarcau, being located at the west limit of the Moldavian Plateau, at the interface with Moldavia lower Carpathians, on the straight shore terasse of the Bistrita river.

Arboretum was created by arranging a meadow openly structured in terms amenajistic in 12 plots.

The climate is continental, hilly plateau characteristic attire with large hollows summer registering periods of drought and winter cold currents localized on Bistrita valley, which creates a specific microclimate, drier. The fog is a common climatic phenomenon that associated with low winter temperatures negatively influence Lemon exotic vegetation species, causing partial or total plant frostbite.

The landscape is very diversified, featuring 2 - 4m bumps characteristic meadows, including a mosaic of soils belonging to several classes and types, most of the area occupying a class undeveloped land. Of the other soils meet the cambisoil class and the hydromorphic.

Most of the exotic species in its area are received from Europe and America, and very little from Japan and China. The timber group represents 18% of the total of existing species, and the deciduous group that dominates the collection represents 82%. Observations, measurings, studies and specialised complex work realised this whole time on the arboretum are the sources used in this short presentation.

RESULTS AND DISCUSSIONS

The Hemeiusi Arboretum was founded at the end of the XIXth century, in 1880. Incorporation Basics Arboretum Hemeiusi were made by German specialist Cristian Adolf of Essen Forest Academy graduate, who entered the park in a rich and varied range of exotic and indigenous species by planting saplings from seeds brought from home seeds of Darmstadt, Germany (Mihalache, 1988).

Its initial functionality was limited only to satisfy the need to create around the private residence an original, spectaculous and as exotic as possible by planting some trees with unique ornamental qualities brought from far lands that contrasted with the local vegetation.

After 50 years in the administration arboretum Forest Research and Management Institute Hemeiusi under the guidance engineer A. Mihalache, who had a great contribution in enriching dendrologic collection, all over the park, with exotic species, placed in isolation, in biogroups, orchards and comparative cultures that formed over the years to source genuine scientific research.

In this period a great importance had it set up in the park arboretum nursery in order to obtain seedlings and ornamental belonging to various indigenous and exotic species that were used in creating or enriching dendrologic parks or recreational, collection for gardens botanical (Iasi, Bucuresti) to green areas in cities etc.

Its multifunctionality amplified considerably through time obtaining scientifical, botanical (360 sistematic units from the herbaceous flora and over 1060 sistematic units from the wood flora), forestry (old climatisation centre and forestry experiments), ornamental purposes and also recreational sanogene and learning purposes.

Experiments and research studies had as theme the Hemeiusi Arboretum since 1956, and played an important role in the development of the dendrological collection and also in implementing the results in the silvic production. Thus, with the passing of time, there were orchards *(Larix decidua, Pinus silvestris si Pinus strobus, Picea abies)*, comparative cultures and many biogroups with exotic species of forestry interest realised in the arboretum with foreign and local sources and also indigenous species and this proved to be an important experimental base for selection and improvement works of the exotic species, being a precious source for seeds, an important production and distribution centre for the exotic and decorative seedlings.

Numerous studies and research over the last 5 decades were recovered through scientifical work (books, essays, parts of thesis or articles in specialised publications), but this rich experiment field leaves place for approaching new scientifical aspects.

A supported activities took place in the international trade conducted over 60 similar units or botanical gardens especially in the northern hemisphere of the globe (Mihalache, 1976).

Arboretum was a research base for various topics such as:

- acclimatization of exotic wood species forestry interest by introducing new exotic species, obtained by culture of different samples or batches of seeds received, special orders, collecting their own seeds;
- about genetic improvement spruce orchards by installing a number of 28 clones of spruce (Picea abies) of different origins in our country and in Europe and 13 clones of various exotic and indigenous origin spruce in North America ;
- comparative culture with various exotic forestry interest
- the production of vegetative material by grafting for creating comparative cultures with various exotic pines;
- improvement of forest species of economic interest and production forestry genetically improved seeds;
- determination of the vegetation of major forest species based on phenological phases;
- biology of flowering and fructification, methods of providing a quantitative assessment of fruiting species of oak.

Originality Hemeiuşi Arboretum is on landscape style. The style in which it is done is the English with walkways curves and surfaces alternating with meadows surrounded stand in an irregular shape of the stand. Network paths plots the boundaries marked by hedges, collections of woody and shrub species and valuable collection Roza, comprising around 280 species of roses.

The large diversity that is the arboretum made possible the development throughout time of a rich ecosystem in fauna elements (vertebrate and invertebrate), who these were subjects over time in the development of valuable works scientifically, the specialists in forestry and biology.

CONCLUSIONS

1.The large number of systematic units contained dendrological Arboretum is a valuable collection for the east of the country – Moldavia.- a living testimony to the next generation, for which it is necessary to continue to give special attention and care to maintain them.

2.The Hemeiusi Arboretum, besides its wealth in systemtical units it is also a form of "ex situ" preservation and protection of the genetic forest resources of Terra, highlighting their multiplication methods with special reference to the endangered species being at the same a living laboratory that indicates us the their value as superior forestry essences and also as ornamental species.

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AQUASCAPING: CONCEPT AND DEVELOPMENT OF UNDERWATER ECOSYSTEMS

AQUASCAPING: CONCEPT ŞI DEZVOLTARE A ECOSISTEMELOR ACVATICE

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***Abstract**. Aquascaping is a creation which is derived from Anglo-American landscape. It is an ancient art and in the same time a new trend, which refers to the creation of aquatic ecosystems. Since the Victorian era, passionate people decorated aquarium with plants and fishes. Aquatic landscape is three-dimensional sculptures immersed in water in an artificial biological system, which are constantly changing, both through growth and deterioration. The components of these creations are: rocks, different accessories, wood, gravel, sand, plants and fishes. These are built taking account the aesthetic principles as: golden section, chromatic harmonies and contrasts similar stage scenery or paintings. This paper presents the appearance and development of these aquatic ecosystems. It also debates some aspects of styles, plants and materials used in this kind of landscapes.*
***Key words:** miniature gardens, fishes, plants, gravel, sand.*

***Rezumat.** Aquascapingul este o creație anglo-americană ce derivă din peisagistică. Este o artă străveche şi în acelaşi timp un curent nou, care face referire la crearea unor ecosisteme acvatice. Încă din epoca victoriană, pasionații de acvaristică decorau acvariile cu plante şi peşti. Peisajele acvatice sunt sculpturi tridimensionale scufundate în apă, într-un sistem biologic artificial, care se află într-o continuă schimbare, atât prin creştere, cât şi deteriorare. Elementele componente ale acestor amenajări sunt: roci, diferite decoruri, lemn, pietriş, nisip, plante şi peşti. Acestea sunt construite ținând cont şi de principiile estetice ca: secțiunea de aur, armonii cromatice sau contraste, similare decorurilor de scenă sau picturilor. Lucrarea de față prezintă apariția şi dezvoltarea acestor ecosisteme acvatice. De asemenea, tratează câteva aspecte privind stilurile de amenajare, plantele şi materialele folosite în astfel de amenajări.*
***Cuvinte cheie:** grădini miniatură, peşti, plante, pietriş, nisip.*

INTRODUCTION

Concerning the history of aquascaping, some evidence proves that in Victorian era (around 1856) aquarists have design their tanks with plants and fishes. Later, Dutch hobbyist began the practice of aquascaping and today this art is well developed. Every year some competition is held under the guidance of National Aquarium Society. Aquascaping is the mastery of finding location for aquatic plants and rocks, gravel and wood, in an aesthetic and harmonious way

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inside an aquarium - in essence, it is about gardening under water. However, the main aim of aquascaping site is to create an artistic underwater landscape, the technical aspects must be considered for maintenance and plant development. The aquarium is a closed system, and keeping the water balance is essential for maintaining the landscape (Toma, 2009).

The underwater world is strange and charming. Plants are waving under the influence of the water, fishes are swimming isolated, and colors have a special overtone. The underwater seascape called "aquascape" can captivate and divert attention from the daily stress. Due to the restful of water features, aquariums can be a wonderful addition to any home or office (Park, 2009).

Aquascaping is an art and a science that creates sustainable and amazing underwater environments. It is being essentially underwater gardening and landscaping. It is a new concept which involves plants, fishes, woods and gravel in aquatic ecosystems (Dumitraş, 2008; Toma, 2009).

For creation of underwater ecosystems there are no strict rules. The most common and important styles of aquascaping are the Dutch and Japanese. Dutch style is based on creating a similar design with a picturesque garden using color, texture and size. Japanese style is using rocks, wood and moss to create natural aquatic ecosystems. Many of the principles used in traditional landscape can be applied in aquascaping. The major difference between the two is the level of difficulty in preserving and maintaining the terms of aesthetic value.

Takashi Amano (1992) was the first man who introduced the natural underwater gardens that looked like dreamscapes. He is working to reproduce nature biotopes of special regions.

Asquascaping has derived from a functional practice to a contemporary art form. This art has been most heavily influenced by Takashi Amano, a Japanese nature photographer and the world's most famous aquascaper. He invented and developed the nature aquarium style which emphasizes longevity and harmony among everything present in the tank.

The nature aquarium style is in contrast to the Dutch style aquarium, which emphasizes order and contrast to create a visually striking image (http://fish-etc.com/aquascaping-main/aquascaping-a-planted-aquarium).

In this work are presented the concept and developing of aquascaping and some maintenance work of this and also some styles and special aquatic plants.

MATERIAL AND METHOD

Aquarium is an ecosystem, an underwater world. This is very popular in homes and offices can provide the possibilities of incursion to restful and natural world. The increased popularity of underwater design is due to the fact that this can be changed easy over time.

Most of aquarium plants come from tropical and subtropical areas, with a few of warmer parts of the temperate parts. Aquatic plants are able to receive nutrients through whole surface of plant body, especially the epidermis of the leaves. Such typically submerged plants as *Ceratophyllum* and *Utricularia* do not form roots at all, while *Elodea* forms only very short ones. For this reason the composition of substrates

and water are very important; the water must contain mineral substances absorbed directly by the plants (Rataj and Horeman, 1990).

The most important styles are: Dutch and Natural. Over the time have developed other styles: German and Zen.

The Dutch style is using multiple types of plants having different leaves as colors, sizes, and textures are displayed much as terrestrial plants are shown in a flower garden. This style was developed in the Netherlands beginning in the 1930s, as freshwater aquarium equipment became commercially available (Henning, 2003). It emphasizes plants located on terraces of different heights, and frequently omits rocks and driftwood (Fig. 1). Linear rows of plants running left-to-right are referred to as "Dutch streets" (Hudson, 2008).



Fig. 1 - Aquascaping in Dutch style
(http://www.aquascapingworld.com/gallery/images/1/1_Fluo01.jpg)

Plant assortment which is used in this style, are the following: *Limnophila aquatica*, some *Hygrophila* species, *Alternanthera reineckii*, *Ammania gracilis* and *Rotala* species (Hudson, 2008). More than 80% of the aquarium base is covered with plants, and little or no substrate is left visible. Tall growing plants that cover the back glass originally served the purpose of hiding bulky equipment behind the tank (Hudson, 2008).

Natural style or Japanese style was introduced in the 1990s by Takashi Amano. Amano's compositions try to reproduce typical Japanese gardens with natural landscapes aspect using asymmetrical arrangement of few species of plants, and carefully selected stones or driftwood.

The utilized plants assortment in this style is with small leaves, such as *Eleocharis acicularis*, *Glossostigma elatinoides*, *Hemianthus callitrichoides*, *Riccia fluitans*, *Versicularia dubyana* or *Taxiphyllum barbieri* are usually emphasized, with more limited colors than in the Dutch style. Because the reason of this style is minimalism the number of species is often limited.

German style is known as a combination of submerged and emerged landscape. A German-style aquatic landscape is also known as the biotope or paludarium (is a combination between aquatic and terrestrial elements). This aquatic landscaping includes a dry area in the aquarium, which basically simulate a river side or pond. The designers of these landscapes start with plants that grow submerged (underwater), then letting them to grow emerged (above water) or out of tank (Fig. 3).



Fig. 2 - Aquascaping in Japanese style
(http://www.blueaquarium.org/wp-content/uploads/2009/09/Top_10_International_Aquascaping_Contest_2009_91.jpg)

Zen style simulates an ancient Japanese garden which gives a feeling of tranquility and balance. Zen style is based on creating sophisticated and graceful arrangements, with aquatic plants and "hardscape" elements (gravel, sand, rocks, roots, wood etc.). The Zen style landscaping rules are exemplified through Bonsai Gardens.



Fig. 3 - Aquascaping in German style
(http://www.aquascapingworld.com/gallery/images/1/1_18.jpg)

Zen style shows the relationship between objects, while Natural style simulates a perfect scene from nature. There are old Japanese aesthetic rules that dictate how to design a Zen garden, whether it's a landscape or an aquarium. For example, the place of stones has to be arranged in a specific order to qualify as a Zen garden (Fig. 4).



Fig. 4 - Aquascaping in Zen style
(http://www.swelluk.com/img/blog_images/natureaquascape.jpg)

RESULTS AND DISCUSSIONS

Most aquarium designers organize the aquatic landscape to keep about 6 months to reaches its true aesthetic and aquatic landscape vision, but a correctly realized aquascape can beautify for a much longer period of time (Takashi, 1992).

All items for use in the aquascape design should be disinfected before they are placed in the tank. Also, the tank should be completely "cycled" before adding new items. The most frequent elements used in underwater gardens are the following: substrates, rocks, stones, cavework, or driftwood and plants.

The aquariums substrate consists in two components: decorative substrate and nutrient substrate. Its choice is the most important, is the first essential step and the designer must consider when planning an aquarium setting. Decorative substrate is represented by river sand, any kind of construction sand or any form of commercially available. The main criteria for choosing sand is purely aesthetic, it is used mostly for decoration, for fixing the plant, and can be used as clamping surface of denitrifying bacteria. The nutritive substrate is also available in a variety of shapes; it contains nutrients for the plants in aquarium (Hiscock, 2003).

The recommended rocks in aquascaping are purchased from the water. Rivers, streams and lakes are the best sources. These rocks are often more rounded edges and will fit more naturally in the aquarium. Since they come from aquatic medium algae problem will be reduced significant. It is recommended for aquariums design, the following types of rocks: basalt, granite, marble, quartzite, slate, gravel, sand, ballast, gritstone, travertine, limestone, shell limestone, chalk, diatomite (Paulette and Buta, 2009).

In many underwater landscapes the wood is very important. It is used in Dutch and German styles. Wood is a natural floating element, regardless of weight. Wood choice is important, it is recommended a hardwood, and alder tree (even if is soft), but is necessary to be with a good resistance to moisture.

Regarding the plants, it is useful to select plants with different leaves size and colors to create depth and naturalness. Plants with red leaves can create more contrast in the aquarium. At the setting of aquarium the first step is to establish the focal point. Then it is important to place the small and middle plants and in the end the high plants. For background planting it is recommended the following assortment: *Bacopa caroliniana, Cabomba caroliniana, Crinum thaianum, Echinodorus major, Egeria densa, Limnophila aquatica, Ludwigia palustris, Myriophyllum hippuroides, Rotala macrandra* and *Vallisneria americana*. The following plants are recommended for midground planting: *Althernanthera reineckii, Anubias barteri, Bacopa monnieri, Cardamine lyrata, Didiplis diandra, Heteranthera zosterifolia, Hydrocotyle verticillata, Lysimachia nummularia, Microsorium pteropus*. For foreground planting, the following assortment is recommended: *Anubias barteri* var. *nana, Cryptocoryne willisi, Echinodorus tenellus, Eleocharis parvula, Marsilea hirsuta, Sagittaria pusilla, Vesicularia dubyana* (Hiscock, 2003).

CONCLUSIONS

Aquascaping is to create an aesthetically pleasing environment, which needs to select correctly the plants and materials to keep a balance and harmony of the planted aquarium.

This kind of landscapes is suitable for small indoor places with low light.

It can be used not only in private areas but also in hotels, markets and restaurants.

It is important the selection of plants, accessories and substrates to give an easy maintenance. All the materials used for decoration, should not produce changes in the aquarium (change water pH, disturbing water). Before using, the materials must to be disinfected. The selected plants must contribute to the oxygenation of the water and reduce algae.

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RESEARCHES CONCERNING THE NEW POT VARIETIES OF *ANTHURIUM ANDREANUM* USED FOR INDOOR DESIGN

CERCETĂRI PRIVIND COMPORTAREA UNOR VARIETĂȚI NOI DE *ANTHURIUM ANDREANUM* CULTIVATE LA GHIVECE FOLOSITE ÎN DESIGNUL INTERIOR

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Abstract. *The diversity in varieties has been greatly increased in recent years through breeding and selection work. Anthurium andreanum is a plant that formerly was known particularly as a cut flower, but in recent years is more and more appreciated as a pot plant thanks to its elegance, but also for the contrast between the color of the leaves and the brightly flowers. Diversification of the assortment with new varieties of floricultural plants is a permanent work of specialists in our country for the promotion and commercialization of novelties in order to obtain substantial incomes. This paper shows the behavior of six new pot varieties of Anthurium (Alpine, Absolut, Baleno, Alabama, Cherry champion and Otazu), imported from Netherlands and which have been studied at the Flower shop „Briza" Cluj-Napoca and in didactical greenhouses at U.S.A.M.V. Cluj-Napoca. Observations and measurements were made on the leaves and flowers (number, length, width, diameter, number of flower/plant). All the data obtained were interpreted statistically by calculating the average and has tested the significance of differences between variants using LSD test. There were also analyzed the coefficients of variability.*
Key words: *varieties, floral assortment, morphological characteristics*

Rezumat. *Diversitatea soiurilor a crescut mult în ultimii ani datorită muncii de ameliorare şi selecţie. Anthurium andreanum este o plantă care în trecut era cunoscută în mod deosebit ca floare tăiată, dar în ultimii ani este tot mai mult apreciată şi ca plantă la ghiveci datorită eleganţei deosebite, a contrastului între culoarea frunzelor şi cea viu colorată a florilor. Îmbogăţirea sortimentului cu noi soiuri de plante floricole este o permanentă preocupare a specialiştilor din ţara noastră pentru promovarea şi comercializarea noutăţilor în scopul obţinerii de venituri substanţiale. Lucrarea de faţă prezintă comportarea a 6 soiuri noi de Anthurium la ghivece (Alpine, Absolut, Baleno, Alabama, Cherry champion şi Otazu), importate din Olanda şi care au fost studiate la Florăria „Briza" Cluj-Napoca şi în serele didactice de la U.S.A.M.V. Cluj-Napoca. Asupra acestor soiuri s-au efectuat observaţii şi măsurători asupra frunzelor şi florilor (număr, lungime, lăţime, diametru, numărul de flori obţinute pe plantă). Toate datele obţinute au fost interpretate statistic, calculându-se media şi s-a testat semnificaţia diferenţelor dintre variante cu ajutorul testului DL. Au fost analizaţi şi coeficienţii de variabilitate.*
Cuvinte cheie*: varietăţi, sortiment floral, caracteristici morfologice*

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INTRODUCTION

Anthurium, also called "flamingo flower" is a tropical plant, which belongs to the complex family Araceae. *Anthurium* varieties are common throughout South and Middle America. The genus includes about 300 species, including well-known cultivated species *Anthuriurn andrenum* and *Anthurium scherzerianurn* (Toma, 2009*)*. Anthurium is one of the most popular of the tropical cut flowers which are being grown commercially for export as well as for the local market. In the last decades with a wide range of ornamental plants and cultural knowledge technologies, indoor plants are becoming the most popular passions. Though at first only the rich could afford, today is accessible to anyone. In any home, family atmosphere is warmer, more agreeable, and more restful with plants (Draghia and Chelariu, 2011). In recent years *Anthurium* gained an important place in the collections of passionate in our country, due to the large number of hybrids appeared worldwide, hybrids which present many shapes and colors and are well adapted to our apartments (Cantor, 2008). *Anthurium* genus includes species which are distinguished by great beauty of inflorescence (*A. andreanum, A. scherzerianum*) or the richness and elegance of leaves (*A. cristalinum*, A. *coriaceum*). The number of cultivars is very high and is distinguished by their color and beauty. Commercial crops have been established in recent years worldwide, but the largest producers are the United States (Florida) and the Netherlands.

It is well to remember that *Anthurium* is a toxic plant, with all parts poisonous. Ingestion of this plant hardly occurs because chewing causes quickly painful irritation of the mouth and throat. For this plant poisoning symptoms are usually burning, dysphasia (difficulty in swallowing food), and hoarseness, with a degree of toxicity: 3, 4, and 5 (http://condo.kudika.ro/articol/Anthurium-andraeanum-Flamingo.html). Culture in pots is practiced at *Anthurium scherzerianum, Anthurium crystallinum, Anthurium coriaceum*, and expanding to the *A. andreanum*. It is a culture that is practiced in our country only in protected areas, greenhouses and apartments.

MATERIAL AND METHOD

Continuous improvement of the range of indoor ornamental plants is a very important objective for researchers and farmers in our country and around the world.

The experiments were conducted during the years 2011-2012, at the "S.C. BRIZA SRL" Cluj-Napoca and in didactical greenhouses at U.S.A.M.V. Cluj-Napoca. Biological material for study consisted of six varieties of *Anthurium andreanum* grown in pots from Holland and imported by Briza Company: 'Alpine', 'Absolute', 'Baleno', 'Alabama', 'Cherry champion' and 'Otazu'. *Anthurium* varieties studied were arranged in randomized blocks, of three repetitions. Each variety was a variant and for each variety was taken 5 plants per repetition, so 15 plants per variety, resulting in a total of 90 potted plants/experience. Observations and measurements were made to all the cultivars on the leaves and flowers (number, length, width, diameter, number of flower/plant). All the data obtained was interpreted statistically by calculating the

average and has tested the significance of differences between variants using LSD test. Also there were analyzed the coefficients of variability (Ardelean and Sestraş, 1996).

RESULTS AND DISCUSSIONS

Elements of plant growth and decor were analyzed and presented in the next tables.

Table 1

The average length of the floral stem of *Anthurium* varieties

Variety (Variant)	The average length of flower stem (cm)	Relative value (%)	± Difference (cm)	Significant difference	CV %
Alpine	35.67	189.4	16.83	xxx	3.2
Absolute	12.67	67.3	-6.17	ooo	4.6
Otazu	18.33	97.3	-0.50	-	3.1
Baleno	13.33	70.8	-5.50	ooo	4.3
Alabama	14.67	77.9	-4.17	ooo	3.9
Cherry Champion	18.33	97.3	-0.50	-	3.1
Average (Control)	18.83	100.0			3.7

LSD 5% 1.13, LSD 1% 1.57, LSD 0.1% 2.27

Depending on the average length of flower stem was noted 'Alpine' variety with very significant positive differences. At the opposite pole were following varieties 'Absolute', 'Baleno' and 'Alabama' which recorded the lowest average length of flower stem with very significant negative deviations from the average experience. The coefficients of variation of floral stems length at analysed varieties are relatively small; all cases analyzed are below 10%. Average value s% of experience was 3.7%, and s% variation limits for the average length of flower stem ranged from 3.1% (Cherry champion) to 4.6% (Absolute).

Table 2

Average number of leaves per plant of *Anthurium* varieties

No.	Variety (Variant)	Average number of leaves	Relative value (%)	± Difference	Significant difference	CV %
1	Alpine	28.33	125.6	5.78	xxx	14.3
2	Absolute	19.67	87.2	-2.89	o	22.9
3	Otazu	18,.7	82.8	-3.89	oo	22.3
4	Baleno	28.33	125.6	5.78	xxx	12.4
5	Alabama	18.67	82.8	-3.89	oo	22.3
6	Cherry champion	21.67	96.1	-0.89	-	16.2
Average (Control)		22.56	100.0			18.4

LSD 5% 2.25, LSD 1% 3.19, LSD 0.1% 4.62

Compared with the average experience, provided values statistically were recorded at five varieties studied. The highest number of leaves was recorded at 'Alpine' and 'Baleno' varieties very significant positive differences. At the

opposite pole the varieties 'Otazu' and 'Alabama' showed differences distinct significantly negative and the variety 'Absolute' shows differences significantly negative. The coefficients of variation calculated for number of leaves in varieties tested was relatively medium in three of the cases analyzed, reaching more then 20%. The s% value mean of the experience was 18.4%, and s% variation limits for the number of leaves ranged from 12.4% (Baleno) to 22.9% (Absolute).

Table 3

The average length of leaves of Anthurium varieties

No.	Variety (Variant)	Length of leaves (cm)	Relative value (%)	± Difference (cm)	Significant difference	CV %
1	Alpine	18.33	108.2	1.39	-	35.5
2	Absolute	13.67	80.7	-3.28	-	11.2
3	Otazu	17.33	102.3	0.39	-	40.5
4	Baleno	15.33	90.5	-1.61	-	19.9
5	Alabama	19.67	116.1	2.72	-	12.8
6	Cherry champion	17.33	102.3	0.39	-	3.3
Average (Control)		16.94	100.0			20.5

LSD 5% 5.42, LSD 1% 7.70, LSD 0.1% 11.15

The average length of the leaves had values close to the varieties studied (table 3), resulting in an amplitude variation between 13.67 cm and 19.67 cm. The average of experience for this character at varieties studied was 16.94 cm. Compared with the average experience, the control variant provided the values statistically not occurred in any of the varieties studied. The coefficients of variation calculated for the average length of leaf to the tested varieties presented medium to large values at two of the cases analyzed were above 20%. S% mean on experience is 20.5%, and s% variation limits to leaf length ranged from 3.3% (Cherry Champion) to 40.5% (Otazu).

Table 4

Average width of spathe of *Anthurium* varieties studied

No.	Variety (Variant)	Average width of spathe (cm)	Relative value (%)	± Difference (cm)	Significant difference	CV %
1	Alpine	6.33	87.7	-0.89	-	9.1
2	Absolute	7.33	101.5	0.11	-	7.9
3	Otazu	10.67	147.7	3.44	xxx	10.8
4	Baleno	4.33	60.0	-2.89	ooo	13.3
5	Alabama	8.33	115.4	1.11	-	6.9
6	Cherry Champion	6.33	87.7	-0.89	-	9.1
Average (Control)		7.22	100.0			9.5

LSD 5% 1.18, LSD 1% 1.68, LSD 0.1% 2.44

Data from table 4 show that only two varieties present statistical difference comparing to the control variant of this character (7.22 cm). Variety which had

the highest average width of spathe of experience was: 'Otazu', with very significant positive differences while 'Baleno' had very significant negative. The coefficients of variation calculated for the average width of spathe were relatively small, most being less than 10% on the cases analyzed. S% mean on experience is 9.5%, and the limits of variation s% for the average spathe width ranged from 6.9% (Alabama) to 13.3% (Baleno).

Table 5

Average length spathe of *Anthurium* varieties

No.	Variety (Variant)	Average length of spathe (cm)	Relative value (%)	± Difference (cm)	Significant difference	CV %
1	Alpine	11.67	120.0	1.94	x	30.1
2	Absolute	10.00	102.9	0.28	-	20.0
3	Otazu	11.33	116.6	1.61	-	27.0
4	Baleno	4.00	41.1	-5.72	ooo	50.0
5	Alabama	12.33	126.9	2.61	xxx	20.4
6	Cherry champion	9.00	92.6	-0.72	-	11.1
Average (Control)		9.72	100.0			26.4

LSD 5% 1.68, LSD1% 2.39, LSD 0.1% 2.51

The floral length of spathe had different values in the studied varieties, yielding amplitude of variation ranged between 4.00 cm and 12.33 cm. 'Alpine' and 'Alabama' varieties were noted significant positive differences, the opposite pole 'Baleno' variety recorded very significant negative differences. The coefficients were relatively high, in all varieties over 10%. The variation limits s% has ranged from 11.1% (Cherry Champion) to 50% (Baleno). It follows the variety 'Cherry champion', with minimal variability, while 'Baleno', presented the largest non-uniformity of the flowers on their length.

Table 6

The average number of flowers per plant of *Anthurium* varieties

No.	Variety (Variant)	Number flowers/ plant	Relative value (%)	± Difference	Significant difference	CV %
1	Alpine	12.33	124,7	2,44	x	20.4
2	Absolute	8.33	84,3	-1,56	-	6.9
3	Otazu	6.33	64,0	-3,56	oo	9.1
4	Baleno	17.67	178,7	7,78	xxx	14.2
5	Alabama	7.33	74,2	-2,56	o	7.9
6	Cherry champion	7.33	74,2	-2,56	o	7.9
Average (Control)		9.89	100,0			11.0

LSD 5% 2.44, LSD 1% 3.46, LSD 0.1% 4.59

The average number of flowers had values close to the varieties studied, yielding an amplitude variation between 7.33 and 17.67. Average of the experience for analyzed character among the six studied varieties was 9.89.

Compared with the average of experience (the control variant), five varieties studied provided statistically values. Thus, 'Baleno' variety had the highest number of flowers with very significant deviations above the average for the entire experience and 'Alpine' variety showed significant positive difference. 'Otazu', 'Alabama' and 'Cherry champion' varieties registered significant negative differences. The coefficients of variation calculated for the number of flowers were relatively small, four of the cases analyzed were below 10% and only two varieties have been recorded medium values. Mean on experience s% was 11.0%, and the variation limits s% for the number of flowers ranged from 6.9% (Absolute) to 20.4% (Alpine).

CONCLUSIONS

Flower stem length data reveals that there was a great variability of this character inside varieties studied. 'Alpine' variety noted very significant positive differences and the opposite ranged 'Absolute', 'Baleno' and 'Alabama' varieties, with very significant negative deviations from the average of experience.

The average length of the leaves had similar values in the varieties studied, there were no values provided in statistical terms.

'Otazu' variety recorded the highest spathe width, showing significant positive differences, while 'Baleno' presented the smaller width of spathe.

Floral spathe length had amplitude of variation between 4.00 to 12.3 cm, remarking 'Alpine' and 'Alabama' varieties with significant positive differences.

The average number of flowers per plant had an amplitude variation from 7.33 to 17.67, 'Baleno' and 'Alpine' varieties, showed positive deviations.

The coefficients of variation calculated for the floral stem length, spathe width and number of flowers/plant had values below 10% for most of the varieties analyzed which indicates good stability of character to descents.

Coefficients of variation for the number of leaves were relatively medium; only three varieties analyzed were above 20%. The coefficients of variation calculated for the leaf length presented medium to large values.The limits of variation (s%) for length of floral spathe ranging from 11.1% (Cherry champion) to 50% (Baleno).

Based on these results it is recommended to extend the culture in our country pot varieties which are distinguished by morphological top characters. Coefficients of variation values obtained in the experiment will be used for improvement of this species in breeding work.

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RESEARCH REGARDING THE CULTIVATION IN PROTECTED SYSTEMS OF SOME *LILIUM* ASIAN HYBRIDS

CERCETĂRI PRIVIND CULTURA ÎN SISTEM PROTEJAT A UNOR HIBRIZI ASIATICI DE *LILIUM*

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Abstract*. In this paper are presented three Asian hybrids of Lilium. Gironde, Lolly Pop and Crimson Pixie that wore grown in a protected system: in the green house and solarium, both cultured in the direct soil of the green house and in pots. The plants wore observed during the time necessary to develop from bulbs till flowering period and then till the end of the circle, the height of the stem, the number of the flowers of each plant, and their diameter. The results show that for all three hybrids, planting in the solarium is the most efficient.*
Key words: *Lilium, Asian hybrids, protected crops*

Rezumat. *Lucrarea de faţă prezintă trei hibrizi asiatici de Lilium: Gironde, Lolly Pop şi Crimson Pixie cultivaţi în cultură protejată: în seră şi în solar, la fiecare din cele două sisteme practicându-se cultura la ghivece şi direct la sol. Asupra plantelor s-au efectuat observaţii cu privire la: durata de timp necesară de la plantare până la apariţia bobocilor floriferi şi încheierea înfloririi, înălţimea tijelor florifere, numărul de flori pe plantă, diametrul florilor. Rezultatele demonstrează că la toţi cei trei hibrizi, cultura în solar este cea mai eficientă.*
Cuvinte cheie: *Lilium, hibrizi asiatici, culturi protejate*

INTRODUCTION

The *Lilium* genus is part of the *Liliaceae* family and has more than 110 species also known by their popular name of lilies, with a diversity of shapes and cultures that is very uncommon for most flowers. All species are perennial and their bulbs assure their vegetative multiplication (Cantor and Pop, 2008). Native species of *Lilium* are outspread in the northern hemisphere (10° to 60° latitude) and found mostly in Asia, North America and Europe. The Lilly is a well known plant that it s job in pleasing the eye is an old knowledge. At the moment lilies has a major importance in horticulture as a cut flower, potted flower and also as a garden flower. On a global scale, every year over 2000 bulbs are produced, Holland is the first on bulb production and forth on cut flowers. Also a large number are produced annually in Japan, United States of America and more recently in the southern hemisphere Australia, Chile and South Africa.

The conventional reproductive system is made using the bulbs, it is the most used method of multiplication and it is used in the commercial cultures but also to satisfy the increasing demand of planting material; the modern techniques

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of in vitro culture of tissue and cells are used as an alternative and are used a variety of explants and types of concentrations for the growth, or crioconservation using vitrification of the meristems (Kapoor, 2008; Kumar, 2009; Roh, 1999). Also, applying the fertilizers and the growth regulators substances and also the possibility of using herbicides for the regulation of herbs growth in the bulb culture are of a big importance in the study made on lilies (Wilfret, 1999).

This paper wants to establish the possibility of culturing some Asian Hybrids of the genus *Lilium*, in different systems of culture: in the greenhouse, in pots in the greenhouse, in the solarium, in pots in the solarium with the purpose of assuring which method is best for exploitation also as cut flowers and potted ones.

MATERIAL AND METHOD

The experiments wore made in the greenhouse and the solarium of the Floriculture, field of study part of the Univeristy of Agriculture Science and Veterinary Medicine Iaşi, Romania.

The biological material used to start the experiment field was represented by hybrid bulbs of Asian *Lilium*:

- *Gironde*, with yellow flowers, high stems between 70-80 cm, glossy green lance like leaves (fig. 1 a);
- *Lolly Pop*, has pink flowers, stems from 40 to 50 cm, narrow lance like leaves that remain green throughout season (fig. 1 b);
- *Crimson Pixie,* with purple red flowers, 25-30cm stems, deep green lance like leaves (fig. 1 c)



a) b) c)

Fig. 1 - Asian hybrids used in the experiments variants :a) *Gironde*; b) *Lolly Pop*; c) *Crimson pixie*

Experiments wore made in randomized blocks, in a three repetitions process, of planting 33 bulbs for each repetition.

Planting of the bulbs in the greenhouse,and also in the solarium was made at 25 cm distance between bulbs and 15 cm deep in the soil. In the case of planting in pots, it was used 10 cm diameter potts and a soil made of a mixture of garden soil and coal (3:1). Before planting, regarding the place of culture, the bulbs wore keept for 30 min in a solution of Topsin 0,3%.

The starting day of the cultivations was 22 March 2012. No suplimentary heating was applied in the solarium and the potted cultures wore placed in the heated greenhouse, at temperatures between 18-24^{0}C. The experiment scheeme is described in table 1.

Table 1

Experimental scheme

Hybrid	Variant	Specifications
Gironde	V_1	Culture in greenhouse soil
	V_2	Culture in pots, in greenhouse
	V_3	Culture in the solarium soil
	V_4	Culture in the solarium, in pots
Lolly pop	V_1	Culture in greenhouse soil
	V_2	Culture in pots, in greenhouse
	V_3	Culture in the solarium soil
	V_4	Culture in the solarium, in pots
Crimson Pixie	V_1	Culture in greenhouse soil
	V_2	Culture in pots, in greenhouse
	V_3	Culture in the solarium soil
	V_4	Culture in the solarium, in pots

The establishment and maintenance of the greenhouse culture and pots culture were specific for every variant, keeping the techology recomended in the speciality range for each culture system. During the period of the experiment determinations wore made regarding the begining of vegetation, high of the stems, number and diameter of the flowers and also the period of the flowering.

RESULTS AND DISCUSSIONS

After the setup of greenhouse and pot cultures determinations have been made regarding the height growing of flower shanks.

The height of flower shanks varied depending on type and culture system (fig. 2). The type character has influenced the registered values. Thus, with an average of variants of 39cm, the *Gironde* hybrid has registered the highest value of shanks, followed by *Lolly Pop* with 33,2cm. *Crimson Pixie* has had the shortest shanks, the average of the four variants being 18,9 cm.

Depending on the culture variant, the differences within the type have underlined the tendency of the greenhouse plants to grow higher, not only in the ground–V_3, but also in pots – V_4 (with approx. 37% for *Gironde,* 33,2% for *Lolly Pop* and 17,9% for *Crimson Pixie*). At the same time, the highest growth was that of the plants cultivated directly in the ground (V_1, V_3) as compared to the ones cultivated in pots (V_2, V_4), larger differences being in the case of the green house culture for the *Gironde* variety (16,8%) and the greenhouse cultures for varieties *Lolly Pop* and *Crimson Pixie* (with 13,7%, namely 10,8% to the advantage of variants V_3 to V_4). For the greenhouse cultures from the *Gironde* variety, differences have been insignificant (0,9%), through they have been in favour of the plants cultivated in the ground (V_3), and for the greenhouse culture for varieties *Lolly Pop* and *Crimson Pixie*, the plants from variants V_1 have exceeded the height of the plants in V_2 by 6,9%, namely by 6,5%.

From the analysis of the obtained results we can ascertain that for each variety, the differences between variants are higher if the height of the shanks is bigger, the *Crimson Pixie* variety registering the closest values of the four variants.

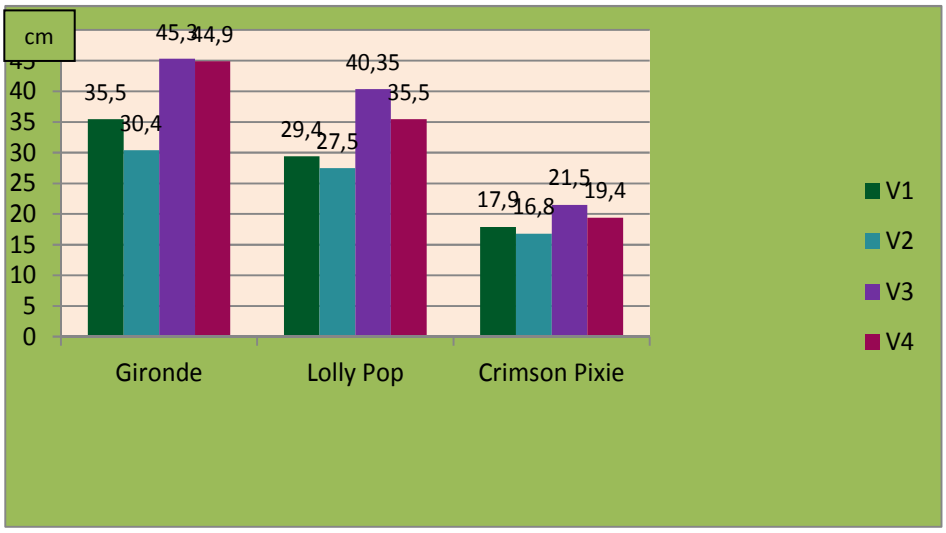


Fig. 2 - Height of flower shanks

For each of the three hybrids studied in the two culture systems, we have also followed the decorative aspect of flowers by determining the number and size of the flowers and their flowering period. Regarding the average number of flowers/plant (table 2) we ascertain that at the *Gironde* hybrid the differences to the average of the variants are significantly positive for variant V_3 and significantly negative for variants V_1 and V_2. At the other two hybrids, *Lolly Pop* and *Crimson Pixie,* the differences significantly positive statistically insure the results obtained for the plants cultivated in greenhouse, in the ground.

Tabel 2

Number of flowers/plant

Hybrid	Variant	Number of flowers	% regarding average	Diferences	Significance of difference
Gironde LSD 5%=1.0 unit. LSD 1%=1.5 unit. LSD 0.1%=2.4 unit.	V_1	3.0	75,0	-1	0
	V_2	3.0	75,0	-1	0
	V_3	5.7	142.5	1.7	XX
	V_4	4.4	110,0	0.4	-
	Average	4.0	100,00	-	-
Lolly Pop LSD 5%=0.9 unit. LSD 1%=1.4 unit. LSD 0.1%=2.2 unit.	V_1	2.6	74.29	-0.9	0
	V_2	2.8	80.00	-0.7	-
	V_3	4.5	128.57	1.0	X
	V_4	4.1	117.14	0.6	-
	Average	3.5	100,00	-	-
Crimson Pixie LSD 5%=0.8 unit. LSD 1%=1.2 unit. LSD 0.1%=1.9 unit.	V_1	3.2	91.43	-0.3	-
	V_2	2.5	71.43	-1.0	0
	V_3	4.3	122.86	0.8	X
	V_4	3.9	114.43	0.4	-
	Average	3.5	100,00	-	-

The results of the flower chalice varied between 8,2 and 12,6cm at *Gironde*, between 7,0 and 11,4cm for *Lolly Pop* and between 8,2 and 11,5cm at *Crimson Pixie.* Analysing this characteristics, we ascertain that the positive differences statistically insured in comparison to the average of the variants, are registered at the plants cultivated in the greenhouse on the ground (V_3) and in pots (V_4). In the case of *Gironde* hybrid, the differences are distinctively significant, and for *Crimson Pixie* the differences are significant. At the hybrid *Lolly Pop* we have registered very significant differences at variant V_4 and distinctively significant at V_3. To the same proportion, but with negative differences in comparison to the average, we have the variants cultivated in greenhouses (V_1 and V_2) from all types (table 3).

Table 3

Flower diameter

Hybrid	Var.	Diameter (cm)	% regarding average	Diferences	Significance of difference
Gironde LSD 5%=1.0 cm LSD 1%=1.5 cm LSD 0.1%=2.4cm	V_1	8.6	82.69	-1.8	00
	V_2	8.2	78.85	-2.2	00
	V_3	12.1	116.35	1.7	XX
	V_4	12.6	121.15	2.2	XX
	Average	10.4	100	witness	-
Lolly Pop LSD 5%=0.6 cm LSD 1%=0.9 cm LSD 0.1%=1.5cm	V_1	7.7	84.62	-1.4	00
	V_2	7.0	76.92	-2.1	000
	V_3	10.4	114.29	1.3	XX
	V_4	11.4	125.27	2.3	XXX
	Average	9.1	100	witness	-
Crimson Pixie LSD 5%=1.4 cm LSD 1%=2.1 cm LSD 0.1%=3.4cm	V_1	8.4	84.00	-1.6	0
	V_2	8.2	82.00	-1.8	0
	V_3	11.8	118.00	1.8	X
	V_4	11.5	115.00	1.5	X
	Average	10.0	100	witness	-

Table 4

Calendar data regarding flowering

Hybrid	Variant	Opening of the flowers	Closing of flowers	The flowering duration (days)
Gironde	V_1	12.06.2012	4.07.2012	22
	V_2	10.06.2012	6.07.2012	26
	V_3	22.06.2012	5.07.2012	13
	V_4	24.06.2012	4.07.2012	10
Lolly Pop	V_1	14.05.2012	3.06.2012	20
	V_2	12.05.2012	30.05.2012	19
	V_3	23.05.2012	17.06.2012	26
	V_4	22.05.2012	15.06.2012	20
Crimson Pixie	V_1	11.05.2012	4.06.2012	23
	V_2	16.05.2012	10.06.2012	23
	V_3	24.05.2012	29.06.2012	36
	V_4	22.05.2012	1.06.2012	10

In table 4 we have presented the calendar data regarding the opening of the flowers, conclusion of the flowering, data from which the flowering period for the three varieties can be deducted.

We ascertain that the earliest varieties are *Lolly Pop* and *Crimson Pixie,* the opening of the flowers starting in the second decade of May, with variations depending on the culture location. At a difference of about 30 days (second decade of June) the opening flower of *Gironde* start coming out.

CONCLUSIONS

1. The protective culture of those tree Asian hybrids of *Lilium* (*Gironde, Lolly Pop* and *Crimson Pixie*) asures the differencial utilization (as cut flowers or planted in pots ones), regarding the specific caracteristics of the flowering stem and flowers

2. The hight differences of the stems in our studyed plants are direct proportional with every genus (obvoius differences at the taller genus and lower at the shorter ones). The culture in the solarium, either in the soil or in the pot, determins the aquire of plants with taller stems than the ones planted in the greenhouse. In pots they tend to reduce their hight.

3. In the solarium, the number of the flowers on the stems and also the diameter of the flowers had reached the maximum parameters..

4. Cultures in the greenhouse made an early flowering period of 10-14 days regarding the ones in the solarium.

5. The reduced high of the stems, that will not be over 20-22cm , dissmisive of the culture system, recomands using the hybrid *Crimson Pixie* only for efficiency in planted pots; hybrids *Gironde* and *Lolly Pop,* from all the studied variants they are very efficient as cut flowers and also potted ones.

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POSSIBILITIES OF USING *GLADIOLUS* VARIETIES IN GREEN SPACES DESIGN

POSIBILITAȚI DE UTILIZARE A GLADIOLELOR ÎN DECORUL SPAȚIILOR VERZI

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Abstract*. The landscaping design evolved very much from antiques gardens to modern ones, having variables dimensions and the vegetal material is currently more diversified, thanks to breeding programs. This paper work aims to make Gladiolus varieties more popular so that it can be used more often in parks or in small gardens and so, to increase the economical value as decorative horticultural plant on the garden plant market, not just as cut flowers. At the UASVM Cluj-Napoca was initiated a case study in a small area that showed no functionality and a proposal for redevelopment of the same area was made, using different Gladiolus varieties, combining a great diversity of colours, with different flower shapes and various heights, such as: 'Medina', 'Pink Lady', 'Perceus', 'Red zone', 'Nova Lux', 'Excelsa', 'Early Riser' etc. To create bi-dimensional and three-dimensional plans for new proposal were used landscaping design programs like: Realtime Landscaping (3D), Google SketchUp and Corel Draw.*
Key words: *garden, landscaping, decoration period, perennial plant.*

Rezumat. *Design-ul spațiilor verzi a evoluat mult de la grădinile antichității până la cele moderne, având dimensiuni variabile, iar datorită programelor de ameliorare, materialul vegetal folosit astăzi este mult mai diversificat. Aceasta lucrare are scopul de a promova speciile genului Gladiolus astfel încât, acestea să fie amplasate în parcuri sau grădini mai mici, crescând astfel valoarea economică a speciilor pe piață ca plante horticole decorative, nu doar ca flori tăiate. În cadrul USAMV Cluj-Napoca a fost inițiat un studiu de caz asupra unei zone care nu prezenta nici o funcționalitate, realizându-se o propunere de reamenajare a acestei zone, folosind specii ale genului Gladiolus care îmbină varietatea culorilor cu cea a formei florilor şi a înălțimilor: 'Medina', 'Pink Lady', 'Perceus', 'Red zone', 'Nova Lux', 'Excelsa', 'Early Riser'etc. Pentru crearea planurilor de propunere bidimensionale şi tridimensionale au fost folosite programe de amenajare spații verzi ca: Realtime Landscaping (3D), Google SketchUp and Corel Draw.*
Cuvinte cheie: *grădină, peisaj, perioadă de decor, plante perene.*

INTRODUCTION

Living in areas with walkable green spaces positively influenced the longevity of urban senior citizens independent of their age, sex, marital status, baseline functional status, and socioeconomic status (Takano, 2002).

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The interest for green spaces design was manifested since antiquity being an important activity especially near villas, castles or palaces. In the small spaces, the arrangement of colour in the garden has to be one of the most satisfying and pleasurable of all the aspects of gardening (Hattatt, 1998). Colors are central to a successful garden, and how they are used sets the tone of the planting (McHoy, 1997).

The landscaping design evolved very much from antiques gardens to modern ones, having variables dimensions and the vegetal material is nowadays more diversified, thanks to breeding programs.

Because of the great species variety and cultivars of the genus, *Gladiolus* gives a lot of possibilities to create interesting arrangements using only gladioli or in associations with other flowers or shrubs. Being a flower with a long decoration period (from June to September) with normal ecological requirements (Cantor et al., 2007), it is easy to be included in many garden designs. Unfortunately, in Romania it is used more as cut flower and less in green spaces decoration.

Tall gladioli are recommended for groups, at the back of the border and shorter species can be placed in rock gardens or mixed in borders with spring bulbs (***, 1996).

The paper work aims to make *Gladiolus* species more popular so that it can be used more often in parks or in small gardens and so, to increase the economical value as decorative horticultural plant on the garden plant market, not just as cut flower.

The main objective of the research was to diversify the assortment used in green spaces designs by introducing new species or varieties in order to enhance the esthetic value of the environment.

MATERIAL AND METHOD

In the present work, was presented a case study of existing arrangements of gladioli in landscaping design and a proposal for decorating a private garden using cultivars of *Gladiolus* with a great variety of colours, different flower shapes and various heights, such as: 'Medina', 'Pink Lady', 'Perceus', 'Red zone', 'Nova Lux', 'Excelsa', 'Early Riser', 'Plum Tart', 'White Prosperity', 'Mon Amour' (http://en.wikipedia.org/) etc.

There were made analyses of different green areas designs observing plants that were used, associations of colors, heights and blooming periods. New proposals were made using landscaping design programs like Realtime Landscaping (3D), Google SketchUp and Corel Draw. These programs were used to create bi-dimensional and three-dimensional plans for new proposal.

The space was recreated in 3D and the plants were picked-up from the program's library. Google sketchup was used to recreate the unevennesses of the land and then, the image was imported to Realtime Landscape to add the vegetation and to create the design. After the design was finalized, the plan was exported and then, the image was imported to Corel Draw where the image was processed so that the final image looks good.

RESULTS AND DISCUSSIONS

Most *Gladiolus* flowers can be planted almost everywhere but it is

important to be aware of the ecological necessities of those plants, therefore should be avoided shady places and clayey substrates.

Also it is necessary to respect the heights of the plants when flowers are associated in groups. Tall gladioli, like 'Plum Tart', 'Mon Amour', 'White Prosperity', can be placed in the middle of the group only if it has a circular form or it is symmetrical for at least two points of view, like in the image below (Fig.1).

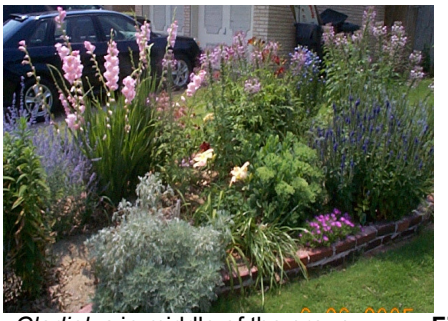


Fig. 1 - *Gladiolus* in middle of the group (www.mastergardener.okstate.edu)



Fig. 2 - Miniature *Gladiolus* in rock garden (www.davesgarden.com)



Fig. 3 - Group of *Gladiolus* (www.botanicgardensblog.com)



Fig. 4 - Association of *Gladiolus* (www.gapphotos.com)

Miniature gladioli are easier to include in the design of the landscape because their heights are lower and so they can be associated even with rock plants, in rock gardens. Some examples are: *G. 'Golden Gem'* (50 cm), G. 'Lemonade' (70 cm), G. 'Madonna' (65cm) (http://www.rareplants.de) (Fig. 2) etc.

Having such a variability of colors, from shades of pure white, pink, and cream to strange combinations of tan and brown, flower shapes and heights, can be proposed designs using only *Gladiolus* flowers grouped in clusters (Fig. 3) for a beautiful blooming and a wonderful effect, with at least three different cultivars. For a better support to avoid the breaking of the flower stems, twine can be placed near flowers to sustain it (Fig 4). This kind of arrangement can be placed in a flower garden between the rows of other flowers if they are having smaller sizes or near an alee where they can be admired by everyone who's passing by, or in front of a rock garden.

Gladioli may be used as background plants in the garden to cover a fence, or combined with other summer annuals and perennials, or can be left alone to grow in rows even to serve as cut flowers for the inside design, by creating arrangements for vases. For the background designs are recommended glads that are reaching more than 100 cm, because a larger area can be covered by their leaves and inflorescences. Moreover, the beauty of the flower reduces the unaesthetic aspect of the fence.

CONCLUSIONS

In landscaping design it is very important to fallow all the design principals to avoid unfortunate plant associations of colors, textures (for the leaves) or heights and so, the plants will be perfectly emphasized.

Gladiolus flowers are very beautiful and being so colorful can be easily included in almost any garden design for summer season. In Europe and mostly in USA, gladioli are widely used in green spaces designs but in Romania, they can be seen in very few private gardens. However, with the help of landscaping designers, the genus can be promoted and so more people could enjoy the beauty of these flowers in public spaces also.

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TYPE AND ASSORTMENT OF ORNAMENTAL SPECIES FROM THE TRADITIONAL ROMANIAN GARDENS

TIPOLOGIE ŞI SORTIMENT DE SPECII ORNAMENTALE ÎN GRĂDINILE TRADIŢIONALE ROMÂNEŞTI

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Abstract*. The assortment of ornamental plants specific for traditional gardens have registered, over time, a remarkable evolution. If in the past the traditional garden was occupied mainly with vegetables and aromatic herbs, ornamental character of the species being often complementary, over time, plants were introduced in culture for decorative purposes only. Brought from the spontaneous flora by villagers or introduced in various ways from other parts of the world, traditional plants have enriched the assortment of present days and reached an impressive number of species and cultivars. This paperwork presents the assortment of ornamental species specific to the traditional Romanian gardens, the arrangement of these plants in the garden area and the purpose for which they were used. At the same time, the ornamental plants commonly used and which have a defining role in shaping the character of these gardens are highlighted.*
Key words*: peasant homestead, traditional garden, ornamental plants*

Rezumat*. Sortimentul de plante ornamentale specifice grădinilor tradiţionale a cunoscut, de-a lungul timpului, o evoluţie remarcabilă. Dacă în trecut grădina tradiţională era ocupată în special cu plante legumicole şi aromatice, caracterul ornamental al speciilor fiind, de cele mai multe ori, complementar, în decursul timpului au fost introduse plante cultivate în scop exclusiv decorativ. Aduse din flora spontană de către locuitorii satelor ori introduse prin diverse căi din alte zone ale lumii, acestea au îmbogăţit sortimentul, ajungând astăzi la un număr impresionant de specii şi cultivaruri. Lucrarea de faţă prezintă evoluţia sortimentului de specii ornamentale specifice grădinilor tradiţionale româneşti, modul de dispunere al acestora în perimetrul grădinii, precum şi scopul pentru care acestea au fost utilizate. Totodată, sunt evidenţiate plantele cu caracter ornamental frecvent folosite şi care au un rol definitoriu la conturarea caracterului acestor grădini.*
Cuvinte cheie*: gospodăria ţărănească, grădina tradiţională, plante ornamentale*

INTRODUCTION

The traditional Romanian garden has raised, over time, the interest of researchers and specialists in the field, mainly from the point of view of the plant assortment of utilitarian and ornamental plants that are found in it, but also

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regarding the elements connected to the typology and organization manner of the traditional garden.

The gardens on Romanian territory initially occupied small surfaces and were mainly utilitarian in nature (Iliescu, 2008), the spontaneous flora and natural landscape being predominant in peasant gardens up to the end of the 11th century (Glăman and Mircea, 2003). From the earliest times, a series of flower plants were appreciated in villages, such as the spotted tulip, lily, basil, mint, sage, sweet William, colchicum, wood lily, anemone, bluet etc. these being introduced in the utilitarian garden, some from the spontaneous flora, often with multiple usages (Glăman and Mircea, 2003). During the years, the plant assortment has greatly increased (Iliescu, 2008) so that the garden has become a mixture of plants, in which, from spring to late autumn, flowers such as hyacinths, daffodils, tulips, peonies, lilies, poppies, daisies, dahlia, chrysanthemums and many other showcase their beauty and flagrance one after the other, true colour oasis of an unique charm.

The purpose of the present paper is the identification of the ornamental flowers assortment from traditional Romanian gardens, with reference to the specifics of peasant gardens in the NE of Romania, namely Botoşani and Suceava districts.

MATERIAL AND METHOD

In order to reach the paper's target, we have set the following objectives: monitoring the evolution of the species assortment identified over time in the rural garden, determination of the purpose (usefulness) of the used plants; identification of the ornamental plants that are commonly found in the traditional Romanian garden and that contribute to the definition of its character.

In order to draw up this paper, besides the theoretical documentation, we have also used the case study methods for Suceava and Botosani districts. In these areas, we have analysed a series of homesteads where we have monitored several aspects connected to the existent ornamental species, namely: number of individuals, vigour, purpose of the cultivation, associations and position covered in the garden.

RESULTS AND DISCUSSIONS

Even in Romania we can't really talk about an art of gardening, as currently known, until the end of the 19th century, following the study and analysis of the existent documents and papers on this subject, we can draw up a basic pattern of the traditional Romanian garden that has evolved over time and suffered more or less positive influences.

For the Romanian peasant, nature has been a source of inspiration, and a part of nature reproduced in his garden, has always represented beauty, and has been his ideal from this point of view. Nature has been seen as a real "mother" that has taught him the secrets of gardening and to whom he has remained faithful for centuries. "Nature has always seemed unsurpassable to the Romanian individual" (Toma, 2001).

The plants used in the Romanian garden have never been ranked based on value, because the reasons why these plants have been selected for the garden are many and hard to separate. The aspect, flagrance, shape, colour diversity and last but not least the specific connotations (poetical, holly, healing etc.) have made them all equally important. “The roses, calendulas, forget-me-not, tulips, basil, jasmine bushes or cloves are valuable in nature’s kingdom" (Toma, 2001).

The favourite manner to position these in the garden is that inspired from nature, where “the elements cannot be distinct, and lose themselves in each other, forming abundant and wild greenery”. “For us, the entanglement, thickness and vigour of the plants are beautiful, like in a forest, like the mixture of flowers on a meadow" (Toma, 2001).

This preference in the positioning of ornamental plants is kept even nowadays in the traditional Romanian gardens, but there are some differences determined by the ethnographic characteristic of the area, by the ecopedoclimatic and economic conditions, etc. Thus, in Bucovina area, with more favourable climate conditions, the tendency to landscape the gardens with a more varied assortment of flower plants and more specimens is more evident (fig. 1 a-d).



a) b) c) d)

Fig. 1 (a - d) - Manner of positioning ornamental species in the traditional garden from Bucovina (original)

The traditional garden in Botoşani, located in a poorer area with natural conditions that are less favourable for plant culture, we notice a decrease in the number of species, and specimens from the same species (fig. 2 a, b).



a) b)

Fig. 2 (a, b) - Manner of positioning ornamental species in the traditional garden of Botoșani district (original)

Regarding the assortment of flower species characteristic for the traditional Romanian gardens, documents show that at the end of the 19th century, the following plants were among the most loved by the Romanian: basil, tansy, carnation, spleenwort, pelargonium, wormseed, reseda and marjoram (Marian, 2008). At the same time, a series of ornamental species were cultivated in gardens for "the beauty and flagrance of the flowers" the most common being: "tulip, hyacinth, snowdrop, daffodil, lily, viola, rose, gillyflower, sunflower, tuberose, garden balsam, colchicum, marigold" (Marian, 2008).

Analysing the flower species on the Romanian territory from a historic point of view, botanist Al. Borza classified them depending on their origin and age on the Romanian territory.

The oldest botanical inheritance are the species coming directly from the Romanian spontaneous flora (atropa, inula, hellebore, evergreen, wood lily and bluebonnet, peony - *Paeonia romanica*, cranesbill etc.) that are accompanied by a series of plants with large scale spread, that were cultivated more for their flagrance than for decor purposes. This group includes the rose, lily, basil, mint, sage, marjoram, balm, savory, tansy, marigold (Borza, 1960).

The species that were introduced in the Middle Ages (and later) in Western Europe, through boyar courts or by the population that have settled on Romanian territory have enlarged the variety of the plants cultivated in gardens. The Saxons, Hungarians and Germans have introduced many flowers that have in time become very popular in villages, such as: pelargonium (originally from the South of Africa), slippers (of American origin, gilly), sempervivum, gillyflower, carnation, robia, reseda. Hyacinths, mallow and almost all lilacs have entered horticulture due to the Turks, in the 16th century. Marigolds, nowadays very popular in Romanian gardens have come from America, through the Turks as well.

From the category of the flowers brought to Romania for more than two centuries, introduced in Europe from other continents (North America or Far East) we have: the autumn cutleaf coneflower, chrysanthemums, yellow coneflowers, cosmos, sunflower, dahlia, carnation, verbena and lavender.

The range of ornamental plants used for the decoration of Romania gardens varies from one region to the other.

In 1952-1953, following an ethno-botanical campaign carried out in several representative regions of the country the ornamental flower plants species cultivated in peasant gardens at that time were identified: Banat - 71 species; Muntenia - 90 species; North of Moldavia - 54 species; South of Moldavia and North of Dobrogea - 102 species; Oltenia - 123 species; Transylvania – over 200 species (Borza, 1960).

In time, the assortment of ornamental species has evolved, so that some old species, frequently cultivated in the past have disappeared from the traditional garden, along with the customs connected to their cultivation. Others have remained up to present day, and their cultivation is extremely popular.

Among the old species whose culture is no longer popular or has even disappear we can list: velvetleaf (*Abutilon theophrasti*), southernwood (*Artemisia abrotanum*), absinth (*Artemisia absinthium*), sweet wormwood (*Artemisia annua*), milkweed (*Asclepias syriaca*), belladonna (*Atropa belladonna*), safflower (*Carthamus tinctorius*), wormseed (*Chenopodium ambrosioides*), costmary (*Chrysanthemum balsamita*), mugwot (*Chrysanthemum vulgare*), inula (*Inula helenium*), majoram (*Majorana hortensis*), mignonette (*Reseda odorata*).

Basil (*Ocimum basilicum*), mint, savoy (*Satureja hortensis*), lily (*Lilium candidum*), calendula (*Calendula officinalis*), wood lily (*Convallaria majalis*), peony (*Paeonia* sp.) are part of the categories of plants frequently cultivated at present. These can be considered basic species that make up the plant assortment specific for traditional gardens. Besides these, rural gardens from the studied area (North of Moldavia – Suceava and Botoşani district) show at present a large number of ornamental plants that insure the decor for the entire period of vegetation. Flower species such as: common hollyhock (*Althaea rosea*), amaranth (*Amaranthus* sp.), European columbine (*Aquilegia vulgaris*), aster (*Aster* sp.), aster (*Callistephus chinensis*), celosia (*Celosia cristata*), wallflower (*Cheiranthus cheirii*), chrysanthemum (*Chrysanthemum indicum*), ox-eye (*Chrysanthemum leucanthemum*), garden cosmos (*Cosmos bipinnatus*), dahlia (*Dahlia hybrida, D. variabilis*), sweet William (*Dianthus barbatus, D. chinensis*), snow-on-the-mountain (*Euphorbia marginata*), gladiola (*Gladiolus gandavensis*), sunflower (*Helianthus annuus*), yellow lily (*Hemerocallis* sp.), autumn lily (*Hosta plantaginea*), hyacinth (*Hyacinthus orientalis*), garden balsam (*Impatiens balsamina*), lupin (*Lupinus* sp.), four o'clock flower (*Mirabilis jalapa*), daffodil (*Narcissus poeticus, N. pseudonarcissus*), flowering tobacco (*Nicotiana* sp.), poppy (*Papaver orientale*), phlox (*Phlox paniculata*), primula (*Primula* sp.), ricinus (*Ricinus communis*), cutleaf coneflower (*Rudbeckia laciniata*), sage (*Salvia splendens*), houseleek (*Sempervivun tectorum*), marigolds (*Tagetes erecta,*

T. patula, T. signata), garden nasturtium (*Tropaeolum majus*), zinnias (*Zinnia elegans*) are often seen in the studied area.

CONCLUSIONS

1. The ornamental species assortment from the traditional Romanian gardens is varied and rich, including both species from the spontaneous flora and cultivated ones.

2. The traditional garden has evolved through time, from the utilitarian purpose garden to the garden that has a predominantly aesthetic purpose. More and more species are cultivated for exclusively ornamental purposes, which shows the housewives' interest for beauty; the flower garden –simple or mixed, being, oftentimes a visit card for the one taking care of it.

3. Regarding the number of used plants, the geo-climatic conditions and the economic status of the area, differences can be registered from one area to another, so that at the mountains or in smaller villages it is reduced and in the plains or in the villages near urban centres their number is significantly increased.

4. With the development of the peasant homestead, the flower assortment has changed, some species keeping their location in the traditional garden up to the present, while other, whose culture was significant in the past, have either disappeared today, or are cultivated on a sporadic basis. In parallel, a series of new plants have started to be cultivated for several decades, and are always present in the gardens of Romanian villages.

5. The resistant, unpretentious species, with a good breeding capacity (through self-seeding, division of bushes, root suckers, yearling etc.) are preferred by the inhabitants of villages who exchange propagating material among themselves.

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RESEARCH REGARDING RHIZOMES DEVELOPMENT OF THREE*CANNA INDICA* L. CULTIVARS OBTAINEDFROM SEEDS, UNDER THE INFLUENCE OF SUBSTRATE IN CONTAINER CULTURE

CERCETĂRI PRIVIND DEZVOLTAREA RIZOMILOR DE *CANNA INDICA* L., LA TREI CULTIVARE OBȚINUTE DIN SEMINȚE, SUB INFLUENȚA SUBSTRATULUI LA CULTURA ÎN VASE

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Abstract. *In relation to the soil, Canna plants are relatively flexible and can be grown on sandy soils, clay or intermediate. Given that most parental species grow in wetlands, a number of Canna cultivars can be used as water plants. This study aims rhizomes development of three Canna indica L. cultivars obtained from seeds, under the influence of three types of substrate: rotten manure, sludge from wastewater treatment plant in Bistrița mixed with sand (1:1) and for the third type of substrate an aquatic culture was fitted. Following rhizomes measurements, the most relevant results were obtained for aquatic culture at all three cultivars, regarding both mass rhizomes and number of highlighted buds on rhizomes, at harvest.*
Key words: *Canna indica L., rhizomes, rotten manure, sludge, aquatic culture*

Rezumat. *În relația cu solul, plantele de Canna sunt relativ flexibile, putând fi cultivate pe soluri nisipoase, argiloase sau intermediare. Având în vedere faptul că majoritatea speciilor parentale de Canna cresc în zone mlăştinoase, o serie de cultivare pot fi utilizate ca plante de apă. Acest studiu urmăreşte dezvoltarea rizomilor la trei cultivare de Canna indica L. obținute din semințe, sub influența celor trei tipuri de substrat utilizate: mraniță, nămol provenit de la stația de epurare a apelor uzate din municipiul Bistrița în amestec cu nisip (1:1), iar pentru al treilea tip de substrat a fost montată o cultură acvatică. În urma biometrizării rizomilor, cele mai relevante rezultate s-au obținut în cazul culturii acvatice, la toate cele trei cultivare, atât în ceea ce priveşte masa rizomilor formați, cât şi numărul mugurilor evidențiați pe rizomi la recoltare.*
Cuvinte cheie: *Canna indica L., rizomi, mraniță, nămol, cultura acvatică*

INTRODUCTION

Extremely versatile, *Canna indica* L. plants have a wide range of use. Thus, they can be successfully grown directly in the ground or in pots, in private gardens and public green areas, in rounds, flats or spots, offering an exotic note for these plantations. Regarding soil, Cannas grow well on sandy

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soils, clay or intermediate. Given that most parental species grow in wetlands, a growing number of *Canna* cultivars can be used as water plants (Cooke, 2001).

The purpose of this paper aims to establish the influence of culture substrate on rhizome development at *Canna indica* L.plants grown from seed.

MATERIAL AND METHOD

The experiments were conducted in the Public Services Department's production base of Bistrița City Hall, in 2011. The biological material used in experiments, was represented by planting material belonging to three *Canna indica* L. cultivars, grown from seeds: 'Tropical Rose', 'Tropical Bronze Scarlet' and 'Tropical Yellow'.

Seedlings were produced in the greenhouse, where they were kept until May 18, when they were transplanted into pots with a volume of 7,7L and then they were placed in the field.

Three types of substrate were used: rotten manure, sludge from wastewater treatment local plant (Shugeng et al., 2009) mixed with sand (1:1) and for the third type of substrate an aquatic culture (fig. 1) was fitted: the pots with plants were introduced in rubber containers with water, having a volume of 39,5 L.

Plants remained in these containers throughout the whole growing season, and the water level in the recipients was maintained at the substrate level in the pots, respectively 20 cm height. Plant maintenance was ensured by weed removing and daily watering the variants cultivated on rotten manure and sludge + sand (1:1) substrates, not using pesticides or fertilizer products.

At the end of the growing season plantswere extractedfrom potsand biometric measurements were performed on rhizomes, observations mainly aiming mass, lengt hand diameter, as well as clearly defined number of buds, which will provide new shoots in the following year.

Statistical analysis of data was based on the variance calculation on a bifactorial experiment that allowed the significance of differences interpretation between experimental variants (Ardeleanu, 2008).



Fig.1 - Aquatic culture

Each variant was found in the experiments in three repetitions. Organizing the experiment, 12 plants were used for each variant, and for results comparing, it was calculated the average of nine experimental variants, considering it the control.

RESULTS AND DISCUSSIONS

Observations were made on rhizomes parameters, in table 1 being presentedthe average absolute results regardingtheir developmentunderthe influenceof culture substrate and cultivar.

Table1

Rhizomes parametersinharvestingthe*Canna indica* L. plants obtained from seeds, under the influence of substrate and cultivar in container culture

Variant		Mass (g)	Length (cm)	Diameter (cm)	No. of buds
No.	Factor combination				
V1	Rotten manure x *Tropical Rose*	162,1	14,7	1,7	11,5
V2	Rotten manure x *Tropical Bronze Scarlet*	116,3	11,6	1,7	11,1
V3	Rotten manure x *Tropical Yellow*	188,3	19,9	2,0	15,36
V4	Sludge +sand (1:1) x *Tropical Rose*	153,8	14,2	1,9	11,5
V5	Sludge +sand (1:1) x *Tropical Bronze Scarlet*	138,3	11,9	1,9	13,0
V6	Sludge +sand (1:1) x *Tropical Yellow*	294,2	21,0	2,3	19,0
V7	Aquatic cult. x *Tropical Rose*	554,2	21,4	2,3	24,1
V8	Aquatic cult. x *Tropical Bronze Scarlet*	546,3	19,5	2,1	21,8
V9	Aquatic cult. x *Tropical Yellow*	758,8	22,3	2,3	33,9
	Average V1-V9, Control	323,6	17,4	2,0	17,9

Table2

Rhizome mass inharvestingthe*Canna indica* L. plants obtained from seeds, under the influence of substrate and cultivar in container culture

Variant		Rhizome mass		±d	Signif. of difference
No.	Factor combination	Absolute (g)	Relative (%)		
V1	Rotten manure x *Tropical Rose*	162,1	50,1	-161,5	0
V2	Rotten manure x *Tropical Bronze Scarlet*	116,3	35,9	-207,3	00
V3	Rotten manure x *Tropical Yellow*	188,3	58,2	-135,3	–
V4	Sludge +sand (1:1) x *Tropical Rose*	153,8	47,5	-169,8	0
V5	Sludge +sand (1:1) x *Tropical Bronze Scarlet*	138,3	42,7	-185,3	0
V6	Sludge +sand (1:1) x *Tropical Yellow*	294,2	90,9	-29,4	–
V7	Aquatic cult. x *Tropical Rose*	554,2	171,3	230,6	**
V8	Aquatic cult. x *Tropical Bronze Scarlet*	546,3	168,8	222,7	**
V9	Aquatic cult. x *TropicalYellow*	758,8	234,5	435,2	***
	Average V1-V9, Control	323,6	100,0	-	-

LSD 5% = 138,21g LSD 1% = 194,01g LSD 0,1% = 273,89 g

Table 2 data shows that after rhizome weighing, the differences statistically as distinctly significant negative from control are recorded in variant V2, and those very significant positive compared to control, in variant V9. Mass rhizomes was influenced by culture substrate (table 3), in a distinctly negative significant way in rotten manure case and very positive significant way from control in aquatic culture case. The cultivar was not a relevant factor in rhizomes growth. As can be noted from table 4

data, only at 'Tropical Yellow' cultivar a positive significant difference from control was registered.

Table 3

The influence of substrate on rhizome mass inharvesting the*Canna indica* L. plants obtained from seeds, in container culture

Factor A graduations (substrate)	Rhizome mass		±d	Signif.of difference
	Absolute (g)	Relative (%)		
Rotten manure	155,6	48,1	-168,0	00
Sludge +sand (1:1)	195,4	60,4	-128,2	0
Aquatic culture	619,8	191,5	296,2	***
Average V1-V9, Control	323,6	100,0	-	-

LSD 5% = 85,38g LSD 1% = 141,27g LSD 0,1% = 264,42g

Table4

The influence of cultivar on rhizome mass inharvesting the*Canna indica* L. plants obtained from seeds, in container culture

Factor B graduations (cultivar)	Rhizome mass		± d	Signif.of difference
	Absolute (g)	Relative (%)		
Tropical Rose	290,0	89,6	-33,6	–
Tropical Bronze Scarlet	267,0	82,5	-56,6	–
Tropical Yellow	413,8	127,9	90,2	*
Average V1-V9, Control	323,6	100,0	-	-

LSD 5% = 79,80g LSD 1% = 112,01g LSD 0,1% = 158,13g

The length of formed rhizomes is graphic represented in fig.2,the highest value being registered at 'Tropical Yellow'cultivar with an average of 21,1cm, higher than the control (17,4cm), and the lowest at 'Tropical Bronze Scarlet' (14,3cm). Regardingthe diameter of rhizomes (fig.3.), the same cultivar, 'Tropical Yellow', showsan average value of 2,2 cm, higher than the control (2,0cm), while 'Tropical Bronze Scarlet' has1,9 cm diameter rhizomes. In each of three studied cultivars, rhizomes with the largest dimensions were formed in aquatic culture.

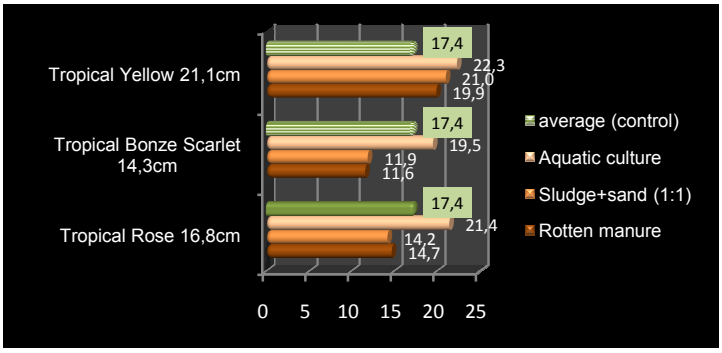


Fig. 2 - Rhizomes length (cm) in harvesting the *Canna indica* L. plants obtained from seeds, under the influence of substrate and cultivar in container culture

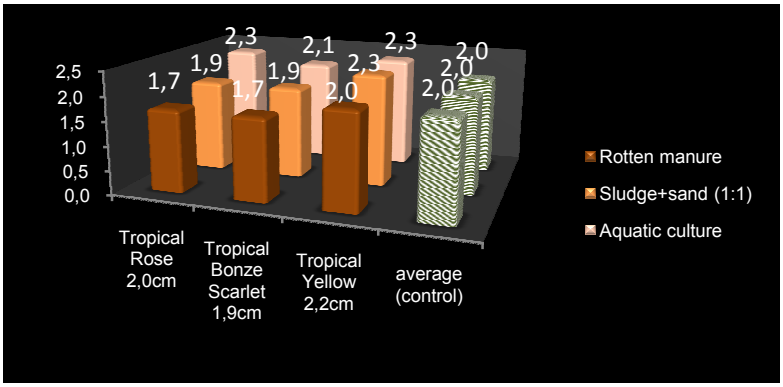


Fig. 3 - Rhizomes diameter (cm) in harvesting the *Canna indica* L. plants obtained from seeds, under the influence of substrate and cultivar in container culture

Analyzing table 5 data can be observed that the number of buds clearly definedatplants harvesting from field at the end of growing season, differsdepending both on culture substrate and on cultivar. The differences from control provided as very significant negative, stand at variants V2 and V4, while those very significant positive, at variants V7 and V9. According to table 6, distinctly negative significant differencesare observed at rotten manure and sludge + sand (1:1) substrates and those very significant positive ataquatic culture. Depending on cultivar (table 7), the highest number of buds was registered at 'Tropical Yellow' with a very significant positive difference from control.

Table5

Number of buds on rhizomesin harvesting the *Canna indica* L. plants obtained from seeds, under the influence of substrate and cultivar in container culture

Variant		No. of buds / rhizome		± d	Signif. of difference
No.	Factor combination	Absolute (pieces)	Relative (%)		
V1	Rotten manure x *TropicalRose*	11,5	64,2	-6,4	–
V2	Rotten manure x *TropicalBronzeScarlet*	11,1	62,0	-6,8	000
V3	Rotten manure x *TropicalYellow*	15,6	87,2	-2,3	–
V4	Sludge +sand (1:1) x *TropicalRose*	11,5	64,2	-6,4	000
V5	Sludge +sand (1:1) x *Tropical Bronze Scarlet*	13,0	72,6	-4,9	00
V6	Sludge +sand (1:1) x *TropicalYellow*	19,0	106,1	1,1	–
V7	Aquatic cult. x *TropicalRose*	24,1	134,6	6,2	***
V8	Aquatic cult. x *Tropical Bronze Scarlet*	21,8	121,8	3,9	*
V9	Aquatic cult. x *TropicalYellow*	33,9	189,4	16,0	***
	Average V1-V9, Control	17,9	100,0	-	-

LSD 5% = 3,04pieces LSD 1% = 4,27pieces LSD 0,1% = 6,02pieces

Table 6

The influence of substrate onbuds numberon rhizomes in harvesting the *Canna indica* L. plants obtained from seeds, in container culture

Factor A graduations (substrate)	No. of buds / rhizome		± d	Signif. of difference
	Absolute (pieces)	Relative (%)		
Rotten manure	12,7	71,1	-5,2	00
Sludge +sand (1:1)	14,5	81,0	-3,4	00
Aquatic culture	26,6	148,6	8,7	***
Average V1-V9, Control	17,9	100,0	-	-

LSD 5% = 1,81pieces LSD 1% = 2,99pieces LSD 0,1% = 5,60pieces

Table 7

The influence of cultivar on buds number on rhizomes in harvesting the *Canna indica* L. plants obtained from seeds, in container culture

Factor B graduations (cultivar)	No. of buds / rhizome		± d	Signif. of difference
	Absolute (pieces)	Relative (%)		
Tropical Rose	15,7	87,7	-2,2	0
Tropical Bronze Scarlet	15,3	85,5	-2,6	00
Tropical Yellow	22,8	127,6	4,9	***
Average V1-V9, Control	17,9	100,0	-	-

LSD 5% = 1,75 pieces LSD 1% = 2,46 pieces LSD 0,1% = 3,48 pieces

CONCLUSIONS

1. Rhizomes with the largest mass at the end of the growing season, wereobtained in aquatic culture, for each of the three studied cultivars; among them, the best results were observedat 'Tropical Yellow' (758,8 g).

2. The longest rhizomes developed at 'Tropical Yellow' cultivarin aquatic culture (22,3 cm), and the highest values of rhizome diameter (2,3 cm) were registered at two cultivars: 'Tropical Yellow' in aquatic culture and sludge + sand (1:1), respectively 'Tropical Rose' inaquatic culture.

3. Regarding the number of buds clearly defined on rhizomes in plants harvesting at the end of growing season, the best results were observed at all three studied cultivars, in aquatic culture, the maximum number of buds occurring at 'Tropical Yellow' cultivar (33,9 pieces).

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STUDIES REGARDING THE BEHAVIOR OF SAME WILD ORNAMENTAL SPECIES INTRODUCED IN CULTURE IN PEDOCLIMATIC CONDITIONS FROM THE IAŞI AREA

STUDII PRIVIND COMPORTAREA UNOR SPECII SĂLBATICE ORNAMENTALE INTRODUSE ÎNCULTURĂ ÎN CONDIȚIILE PEDOCLIMATICE DIN ZONA IAŞI

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Abstract. *Many species of wild plants presents an important decorative value but still undiscovered. The paper presents some aspects related to the introduction in the culture of some species with ornamental characters from the spontaneous flora of Romania (Campanula romanica Săvul., Globularia punctata Lapeyr. and Jasminum fruticans L.), referring to the manner of adaptability in pedoclimatic conditions from the Iaşi area. The study pursued the development and preservation of ornamental morphological characters of the species. Observations have shown that all species studied indicated a good adaptability to pedoclimatic conditions from this area, by preserving ornamental features.*
Key words: *ornamental value, spontaneous flora, Campanula, Globularia, Jasminum.*

Rezumat. *Multe din speciile de plante sălbatice prezintă o importantă valoare decorativă, dar încă nevalorificată. Lucrarea prezintă unele aspecte legate de introducerea în cultură a unor specii cu caractere ornamentale din flora spontană a României (Campanula romanica Săvul., Globularia punctata Lapeyr. şi Jasminum fruticans L.), cu referire la modul de adaptabilitate în condițiile pedoclimatice din zona Iaşi. Studiul a urmărit evoluția şi păstrarea caracterelor morfologice ornamentale ale speciilor. Observațiile efectuate au arătat că toate speciile studiate au prezentat o bună adaptabilitate la condițiile pedoclimatice din această zonă, prin păstrarea însuşirilor ornamentale.*
Cuvinte cheie: *valoare ornamentală, flora spontană, Campanula globularia, Jasminum.*

INTRODUCTION

Spontaneous flora of Romania is known for its richness and diversity of species that may find use in various fields, including decorative purposes, but many of these plants are not known or are not used as ornamentals. The literature found numerous studies on the taking advantage of wild plants from different areas and the possibility of their introduction in culture.

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This paper examines the capacity of multiplication and adaptation of wild plants growing in Dobrogea area in southeastern Romania and characterized by specific environmental and soil conditions. The Dobrogea flora also excels in taxons protected by law or the Red Lists, with the status of rare, vulnerable, endangered species etc. Studies on the value of ornamental flora Romania have been made by the team from UASVM Iasi (Chelariu et al., 2010, 2011; Draghia et al, 2010, 2011). *Campanula romanica* Săvul., *Globularia punctata* Lapeyr. and *Jasminum fruticans* L. are three of the species identified in this area, namely in the counties of Tulcea and Constanta.

Campanula romanica Săvul. (*C. rotundifolia* L. subsp. *romanica* (Săvul.) Hayek) (Dobrogea's bell), Campanulaceae, is an endemic plant discovered by the scientist Traian Savulescu in Twentieth century, in a very restricted area of Dobrogea (reported sporadically in Braila, Tulcea and Constanta counties) and species classified as vulnerable (VU) (Oprea, 2005). It is considered a symbol of Macin Mountains of Dobrogea, being found on rocky land in calcareous rocks cracks or on gravels (Ciocârlan, 2000).

Globularia punctata Lapeyr. (*G. bisnagarica* L.) - globularia - (Globulariaceae) originated in central Europe and sub-Mediterranean area, in Romania being found sporadically on dry and rocky land from Transylvania, Muntenia, Dobrogea. According to IUCN it belongs to the rare species, underendangered (NT) (Oprea, 2005 Ciocârlan, 2000).

Jasminum fruticans L. (jasmin), Oleaceae, is the species of Mediterranean origin, rare in the Romania flora, reported only in a few areas of Constanta and Tulcea counties on skeletal, rocky, limestoned soils. It is classified in sozological group of rare species, underendangered (NT) (Oprea, 2005; Ciocârlan, 2000).

The main aim of the research was to follow the evolution of adaptation to soil-climatic conditions of the Iaşi area, and maintaining decorative performance of these species, so that it can be developed efficient technologies of breeding, establishing and crop management under "ex situ" conditions.

MATERIAL AND METHOD

The experiment was conducted in the field of discipline of Floriculture, within University of Agricultural Sciences and Veterinary Medicine Iaşi, Romania.

As a breeding material for establishing experimental variants it were used seeds harvested from four plant species of wild flora identified in Tulcea (at Babadag and Turcoaia) and Constanța (Cheile Dobrogei) whose ornamental characteristics are provided by flowers, leaves, fruits and standing:

- *Campanula romanica* Săvul. (fig. 1.a) grows as a shrub with many stems, straight or lying at the base, whose height does not exceed 25-30cm, and the leaves are linear lanceolated. It is very decorative through many blue flowers, campanulated, with a length of approx. 1 cm (flowering period in June-August). Seeds were harvested from plants identified in Cheile Dobrogei (Constanta county).

- *Globularia punctata* Lapeyr. (fig. 1.b) is an herbaceous perennial plant with a height of approx. 15 cm, with based leaves arranged in rosette, and with simple, alternate leaves on stems, clustered flowers in globular flower heads, blue coloured (with flowering in May to June) and the fruit being a achene surrounded by persistent

calyx. Plants that were harvested seeds were found in the Babadag woods (Tulcea county).

- *Jasminum fruticans* L. (fig. 1.c) is a small shrub with heights of approx. 1.5 – 2 m. Stems are branched and the leaves are persistent, trifoliate, leaflets are leathery. Decorate both by the standing and by the tiny yellow flowers arranged in racemes and fruits (berries) blackish. It blooms in early summer (May-July). Plants that were harvested fruits were identified in Cheile Dobrogei (Constanta county).



a) **b)** **c)**

Fig. 1 - a) *Campanula romanica* Săvul. (original); b) *Globularia punctata* Lapeyr. (original); c) *Jasminum fruticans* L. (http://ecomuntiimacinului.)

Establishing experiments was carried out in spring 2012 and observations and determinations were made until the end of the growing season of plants (september 2012). Dates regarding establishing experimental cultures are presented in table 1.

Table 1

Dates regarding establishing experimental cultures

Species	Sowing date	Sprout date	Transplanting date	Field planting data
Campanula romanica	1.02.2012	13.02.2012	15.05.2012	31.05.2012
Globularia punctata	1.02.2012	9.02.2012	15.05.2012	31.05.2012
Jasminum fruticans	5.04.2012	10.05.2012	-	21.06.2012

It was sown in the greenhouse in cellular blades, in a substrate made of peat and garden soil in a ratio by volume of 1:1 for *Campanula romanica* and *Globularia punctata* and in a proportion of 1:3 for *Jasminum fruticans*. There were no special treatments applied for the seeds, except for *Jasminum fruticans* seeds that were stratified in winter on field (January-March). The seeds that were not stratified have not germinated. It was followed the dynamics of plant growth in height, diameter of the bush, the number of leaves and branches.

RESULTS AND DISCUSSIONS

Aspects regarding seed germination highlights a number of differences between species, respectively the highest seed germination degree was recorded by species *Globularia punctata* with 87%, followed by the seeds of *Campanula romanica* species with 28% and *Jasminum fruticans* L. with 16.6%. Germination

period ranged between 9 and 37 days (9 days for *Globularia punctata*, 13 days for *Campanula romanica* and 37 days for *Jasminum fruticans*).

When planting in the field, plants of *Campanula romanica* had average height of 4.25 cm, 8.3 leaves / plant and bush diameter of approx. 3 cm. Maximum values recorded at the end of the growing season showed an average height of 32.8 cm, a diameter of 15.8 cm and 73 bush leaves / plant (fig. 2, 3, 4).

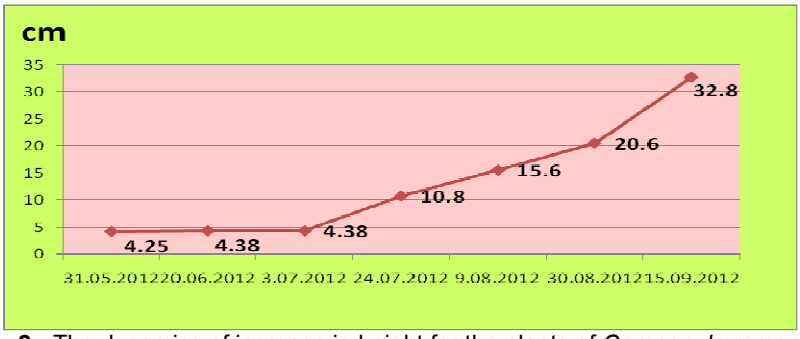


Fig. 2 - The dynamics of increase in height for the plants of *Campanula romanica*

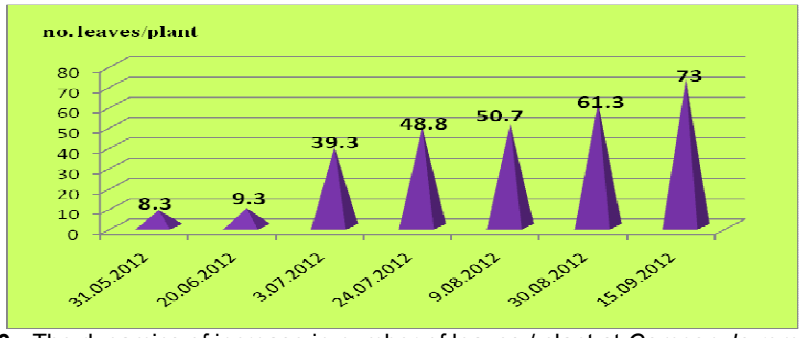


Fig. 3 - The dynamics of increase in number of leaves / plant at *Campanula romanica*

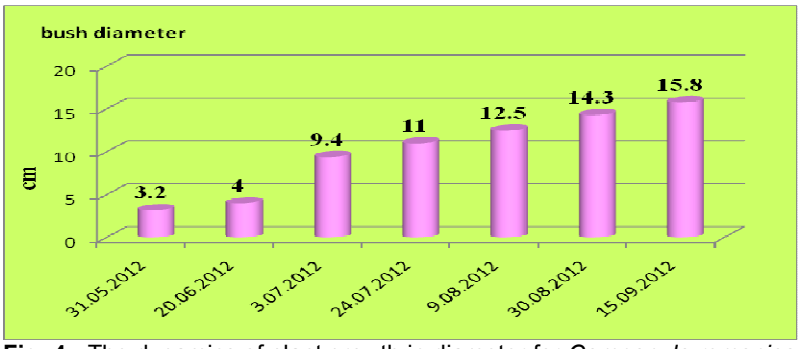


Fig. 4 - The dynamics of plant growth in diameter for *Campanula romanica*

Globularia punctata plants recorded a lower growth in height (up to 9 inches), but formed rosettes with more than 28 leaves and a diameter of 12 cm (fig. 5, 6, 7).

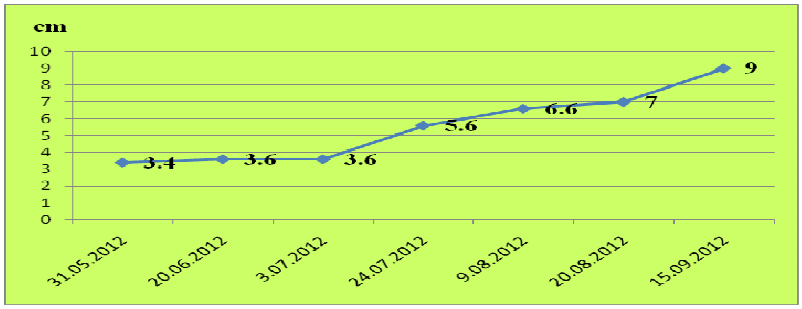


Fig. 5 - The dynamics of increase in plant height for *Globularia punctata*

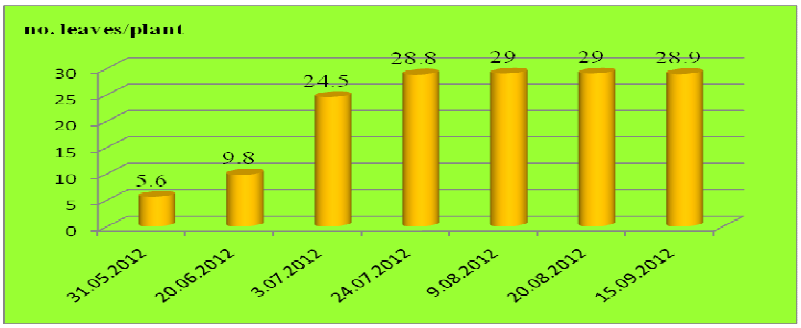


Fig. 6 - The dynamics of increase in number of leaves/plant for *Globularia punctata*

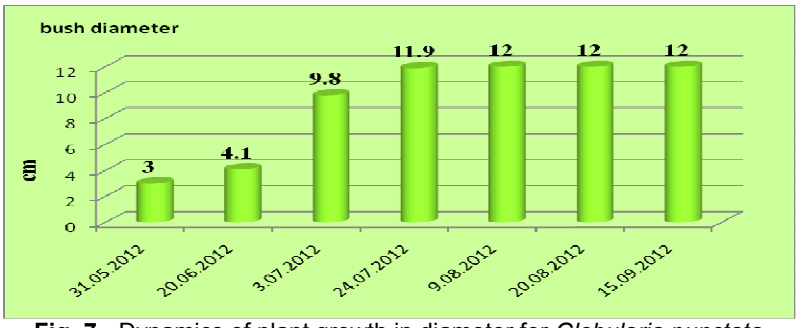


Fig. 7 - Dynamics of plant growth in diameter for *Globularia punctata*

In the first year the maximum height of the plants of *Jasminum fruticans* was 23.5 cm (fig. 8), and the number of branches of the plants ranged from 3 to 5.5.

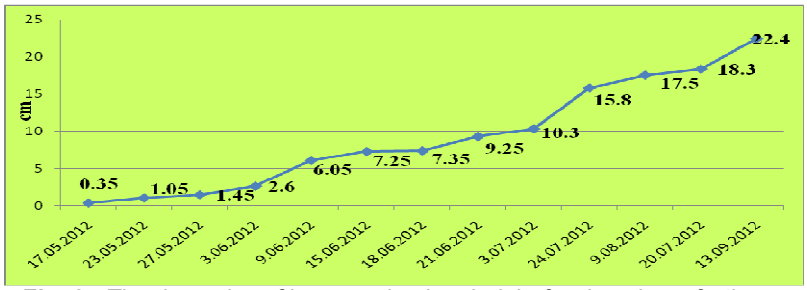


Fig. 8 - The dynamics of increase in plant height for *Jasminum fruticans*

It was also found that from the three species studied only *Campanula romanica* flourished in the first year. Plants formed flowering buds in late July, and after 17 days have blossomed, registering a total of 12 flowers/branch. The other two species recorded only vegetative growth.

CONCLUSIONS

1. Seed germination in three species „ex situ" under study was within the range from 16.6 to 87%, with maximum values for *Globularia punctata* seeds and *Jasminum fruticans* seeds.

2. In the first year of vegetation had flourished only plants of *Campanula romanica* L., those of *Jasminum fruticans* L. and *Globularia punctata* forming only globular rosette of leaves recording only vegetative growth.

3. From the analysis of growth in height, of leaves number formed and of bush diameter, it was found that the species analyzed indicated a good adaptability to climatic conditions in the Iaşi area.

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ORGANOLEPTIC, BIOCHEMICAL AND UVOLOGIC FEATURES OF THE DISTANT HYBRIDS OF VINE (*VITIS VINIFERA* L. *x MUSCADINIA ROTUNDIFOLIA* MICHX.)

PARTICULARITĂŢI ORGANOLEPTICE, BIOCHIMICE ŞI UVOLOGICE ALE HIBRIZILOR DISTANŢI DE VIŢĂ DE VIE (*VITIS VINIFERA* L. x *MUSCADINIA ROTUNDIFOLIA* MICHX.)

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Abstract. *Analyzing the organoleptic features of distant hybrids of vine Vitis vinifera L. x Muscadinia rotundifolia Michx. compared with common species of table grapes, mainly characterized by large grape berries (length, weight, diameter, etc.) it appears that distant hybrids: DRX-M_4-502 and DRX-M_4-578, have medium sized berries (20 mm.), DRX-M_4-571 and DRX-M_4-640, have berries of 21 mm, and DRX-M_4-512, have berries of 22 mm in length. These hybrids don't have the specific characteristics of direct production hybrids, characterised by the foxat taste of the grape berries, caused by the presence of the methyl anthranilate. The distant hybrids studied according to the classical uvologic and technological principles can be classified as follows: 5 distant hybrids are attributed to the table vine species and 2 distant hybrids have mixed properties. According to the physical and biochemical indices of the grapes of the studied distant hybrids, their characteristics are similar to European vine species.*
Key words: *berry, flavor, taste, resveratrol, pectin, sugars, pH, morphology.*

Rezumat*. Analizând particularităţile organoleptice ale hibrizilor distanţi de viţă de vie Vitis vinifera L. x Muscadinia rotundifolia Michx. în comparaţie cu soiurile de viţă de vie tipice de masă, ce se caracterizează în special prin bace de dimensiuni mari (lungime, greutate, diametru etc.) se constată faptul că hibrizii distanţi: DRX-M_4-502 şi DRX-M_4-578 deţin bace de mărimea mijlocie (20 mm.), DRX-M_4-571 şi DRX-M_4-640 deţin bace cu dimensiuni de 21 mm, iar DRX-M_4-512 deţine baca de 22 mm în lungime. Aceşti hibrizi nu posedă caracterele specifice hibrizilor producători direcţi, una din caracteristicile cărora fiind gustul de foxat al bacelor, condiţionat de prezenţa metilantranilatului. Hibrizii distanţi studiaţi în conformitate cu principiile clasice uvologice şi tehnologice pot fi clasificaţi astfel: 5 hibrizi distanţi sunt atribuiţi soiurilor de masă, iar 2 hibrizi distanţi deţin proprietăţi mixte. Conform indicilor fizici şi biochimici ai bacelor hibrizilor distanţi studiaţi, caracteristicile acestora sunt similare soiurilor de viţă de vie europene.*
Cuvinte cheie*: bacă, aromă, gust, resveratrol, pectine, zaharuri, pH, morfologie.*

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INTRODUCTION

Plants, including vines, are one of the main sources of phytochemical compounds with medicinal, aromatic, cosmetic, nutritional properties etc.

As a result of numerous studies over the years, the most chemicals that are found in different anatomical parts of the vine have been identified. The acids, tannins and pigments are chemicals that determine the taste, aroma and color of berries.

Physicochemical peculiarities of grape berries are varied and depend on the characteristics of the soil, the pedo-climatic conditions of the region, agro technical works undertaken and the time of harvest.

Scientific studies have shown that certain plants, such as grapes, blueberries, pomegranate etc. contain a substance called resveratrol, which determines the plant resistance to various unfavorable environmental factors. It was found that this substance is present in large quantities in grapes with berries of red or blue-violet color (especially in their rind) (Alexandrov, 2012).

MATERIAL AND METHOD

Distant hybrids of vine (*Vitis vinifera* L. x *Vitis rotundifolia* Michx Muscadinia.) served as study material.

Botanical description of distant hybrids was performed during all phases of the vegetative stages; the organs of the plants were studied from spring, at bud unfolding, until early autumn, at the fall of the leaves. The bio-morphological characteristics of the organs were studied at the stages of: - bud unfolding – leaf and shoot growth - blossoming – berries growth - grapes ripening, wood maturing and leaf drop. (Alexandrov E., 2010)

The methods exposed in the Technical regulations “Methods of analysis in the domain of wine production” were used while performing the biochemical and uvologic analyzes.

RESULTS AND DISCUSSIONS

Analyzing the features of the distant hybrids of vine (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.) in comparison with common species of table grapes, which are characterized primarily by large berries (length, weight, diameter), it has been found that the distant hybrids DRX-M_4-502 and DRX-M_4-578 have medium-sized berries (20 mm.), DRX-M_4-571 and DRX-M_4-640 have berries of 21 mm and DRX-M_4-512 has berries of 22 mm in length.

According to the consistency of the pulp it has been found that the grapes of the distant hybrid DRX-M_3-3-1 can be used both for direct consumption and for industrial processing, the same as the vine species Chasselas Rose and Muscat Hamburg, which are used for consumption and light wines production.

The distant hybrid DRX-M_4-578 has typical properties of the vine species *Vitis vinifera* L. - berries with a slight floral aroma with savour of quince.

From organoleptic point of view, the studied distant hybrids don’t possess the specific characteristics for the direct production hybrids, for example, the

foxat taste of berries, conditioned by the presence of the methyl anthranilate. According to the studies of Cotea (1985), a high concentration of methyl anthranilate - 0.2 mg/l, which prevents their use for food or wine production, is characteristic for the direct production hybrids. The results of the chromatographic investigations carried out at the National Institute of Vine and Wine have shown that at the majority of intraspecific hybrids this index is 2-5 times lower, so the grapes of these hybrids can be used in food (Gaina, 1990).

According to the taste and aroma characteristics, the distant hybrids DRX-M_3-3-1; DRX-M_4-502; DRX-M_4-512 etc. can be attributed mainly to the species of table grapes.

It has been attested that the distant hybrid DRX-M_4-580 has obvious herbaceous nuances, in their structure the flavour of Melissa prevails. For this hybrid, an optimal, balanced ratio of acidity, sugars and tannin substances is characteristic. The distant hybrid DRX-502-M_4 is characterized by the crisp pulp of the berry with pronounced taste features typical for table grapes. The berry juice of most distant hybrids has a pleasant fresh taste (with moderate acidity), and some have a harmonious, sweet, soft taste, (DRX-M_4-609, DRX-M_3-3-1).

The distant hybrid DRX-M_4-640, which has a lower organoleptic grade (8.6), is characterized by tannic and astringent taste, and its aroma is dominated mainly by sloe and red fruit nuances. A high organoleptic appreciation, of 8.9 points, has the distant hybrid DRX-M_3-3-1, with a well ripe plum aroma and a mellow taste.

In conclusion, we can state that the distant hybrids studied according to the classical technological and uvologic principles can be classified as follows: 5 distant hybrids are attributed to the table grape species and 2 distant hybrids have mixed properties, so they can be used for current consumption and for industrial processing.

These results, being intermediate in the programme of study of distant hybrids, reflect the climatic conditions characteristic for 2012.

The summer of 2012 in Moldova was abnormally warm and dry. The average air temperature for the period from June to August was higher than normal values with 3.0 to 4.5 ° C and it was +21.7 ... +24.8 ° C.

In June, the average air temperature was higher than normal values with 2.9 - 4.4 °C, and, it was +20.7 ... +24.0 °C.

The average daily air temperature in June reached +29 ... +31 º C on the territory of Republic of Moldova and the maximum air temperature this month reached +37.2 ...+40.1 ºC.

July was the warmest month of this year, with a monthly average air temperature of +23.7...+26.7 °C, exceeding the norm with 4.3 - 5.7 º C.

The abnormally warm weather continued in the first 10 days of august. The average air temperature was +24.1...+27.5 ºC; so, it was with 4.1 - 5.6 ºC higher than the normal temperature at this time.

In the summer of 2012, the maximum soil surface temperature reached the value of 71 º C. The number of days with the maximum air temperature of +30 °

C and higher in this summer was 39-62 days (while the norm is about 8-27 days). The number of days with temperatures of 35 º C and higher was generally 16-35 days (the norm is about 1-2 days). Values of air temperature of +40 °C and higher were registered on 40% of the country for the first time, the number of days with such values being 1-3 days.

The quantity of rainfall during the summer in the country was basically 70-145 mm (35-70% of the norm). The total number of days without precipitations throughout the season was about 60 days.

Compared to the summer of 2011, this season was with 1.5 to 2.5 ° C warmer and with considerably less precipitations (with 20-120 mm).

Taking into account the weather conditions during June - August 2012, it was established that the most part of the country showed strong and very strong drought. The hydrothermal coefficient for that period averaged 0.5, which corresponds to strong and very strong drought.

In such climatic conditions, mixed vine varieties acquire easily specific characteristics of table grape varieties and acquire less characteristics of the varieties used in industrial processing (they have less juice and berries are crunchy).

In the years with high humidity and moderate temperatures, the opposite phenomena are observed: pulp is less crunchy and is juicier; the juice is more acidic, with lower carbohydrate concentration (Gaina et al., 2006).

As for the biochemical and physicochemical indicators, according to the concentration of organic acids (tartaric and malic acid) all distant hybrids can be attributed to European vine species Vitis vinifera L., the tartaric acid varying in the range of 3.2 g /dm^3 up to 4.7 g/dm^3 and malic acid varying from 1.9 g/dm^3 up to 3.1 g/dm^3.

The glucose and fructose concentration constitute on average 95.5 - 99.3% of the total concentration of sugars (100%).

The glucose / fructose ratio is typical for European vine varieties, varying in the range of 1.04 - 1.17.

The concentration of phenolic substances denotes the belonging of the obtained distant hybrids to the varieties of table grapes. The amount of these substances in distant hybrids of vine with green-yellow berries varies within the limits from 201 mg/dm^3 up to 293 mg/dm^3 and for hybrids with berries with a blue-violet hue - from 777 mg/dm^3 up to 809 mg/dm^3.

It is worth mentioning that the resveratrol concentration, as a biological compound for human nutrition, is relatively higher compared to classical vine varieties (4.1 - 5.3 mg/dm^3) and it varies at distant hybrids within the limits from 5.7 mg/dm^3 to 11.7 mg/dm^3.

According to physical and biochemical indices of the berries of the studied distant hybrids, their characteristics are similar to European vine varieties: the total nitrogen varies within the limits from 563 mg/dm^3 până la 740 mg/dm^3, phosphorus – 179-263 mg/dm^3, calcium 107-156 mg/dm^3, potassium – 1367-2013 mg/dm^3 and magnesium - 103-144 mg/dm^3.

The colour of vine berries is a very stable morphological character. This index has not only a practical significance for winemaking, but is also used as a character of determination and classification of species and varieties of vine. Some grape varieties can be distinguished only by the colour of the berries.

Analyzing the physicochemical characteristics of the berries of distant hybrids of vine *(Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.*),* in comparison with the berry colour, it was found that the concentrations of chemical substances: phenolic substances, resveratrol, pectin etc. vary depending on the colour of berries.

The concentration of phenolic substances in berries of distant hybrids of vine varies depending on their colour: distant hybrids with green-yellow berries contain on average 268.5 mg/dm^{3}phenolic substances and distant hybrids with blue-violet berries contain on average 793 mg/dm^3.

The resveratrol concentration also varies from 7.03 mg/dm^3 in berries with a green-yellow hue to 10.1 mg/dm^3 in berries with a blue-violet hue.

The mass concentration of pectins also varies from the 567 mg/dm^3 in berries with a green-yellow hue to 705.5 mg/dm^3 in berries with a blue-violet colour. (Fig.1.)

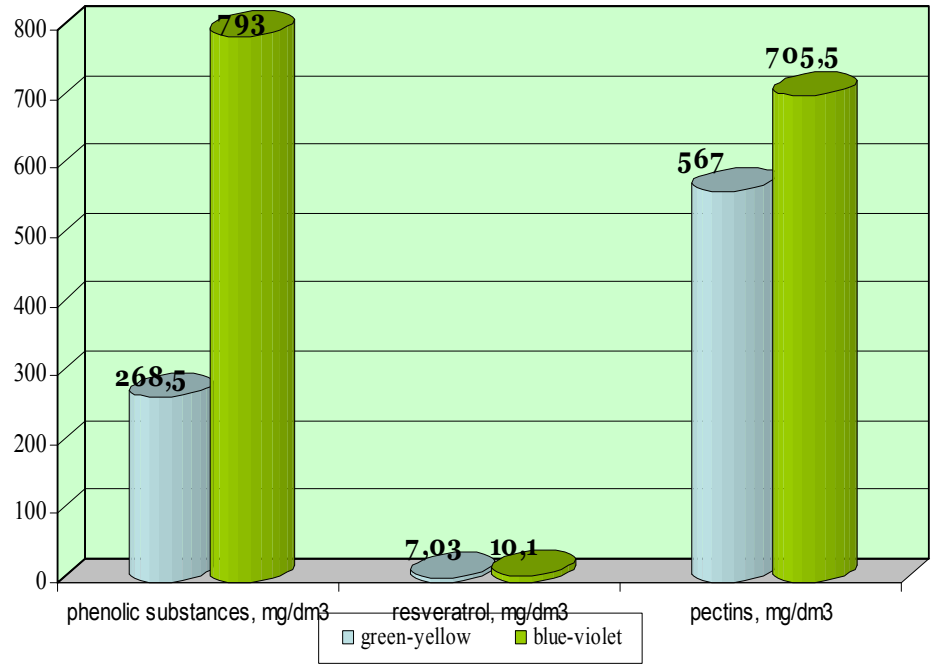


Fig. 1 - Physico-chemical peculiarities depending on the color of distant hybrids' berries (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.)

CONCLUSIONS

1. The distant hybrids of vine (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.), studied according to classical uvologic and technological principles, are classified in the following way: 5 distant hybrids are attributed to the table grapes varieties and 2 distant hybrids possess mixed properties (for current consumption and industrial processing).

2. From organoleptic point of view, the studied distant hybrids of vine (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.) don't posses characteristic features of direct production hybrids, which have a specific taste of foxat (due to the presence of the methyl anthranilate) or herbaceous taste (hexanal, Hexenal, cis-and trans-derivates).

3. According to the concentration of organic acids (tartaric and malic acid), all distant hybrids can be attributed to European vine species Vitis vinifera L., the tartaric acic ranging from 3.2 g/dm^3 to 4.7 g/dm^3 and the malic acid - from 1.9 to 3.1 g/dm^3.

4. The most distant hybrids have crunchy pulp and the taste of the juice is pleasant, harmonious, fresh (with moderate acidity), sometimes sweet and soft (DRX-M_4-609; DRX-M_3-3-1).

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STUDIES ON SOME TECHNOLOGICAL PROPERTIES OF TABLE GRAPE VINE VARIETIES, PAULA AND GELU, GROWN IN THE VINEYARD ECOSYSTEM COPOU IAŞI

STUDII PRIVIND UNELE ÎNSUŞIRI TEHNOLOGICE ALE STRUGURILOR SOIURILOR NOI DE VIŢĂ DE VIE PENTRU MASĂ, PAULA ŞI GELU, CULTIVATE ÎN ECOSISTEMUL VITICOL COPOU

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Abstract. *This paper brings some useful information upon the technological characteristics of the new varieties created at SCDVV Iasi, Paula and Gelu, compared with several local varieties considered witness. Thus, the physical-mechanical analysis determined processing indices of the grapes and the grains, namely: grain index, index of grain structure, grain composition index, resistance to detachment from pedicel grain and grain cracking resistance, the last two indicators serving to measure the table grapes and the grape suitability in terms of transport and storage. The results obtained showed higher values of detachment force from the pedicel and grain cracking for the Gelu variety, of 3.47 (N) and of 19.29 (N), which was higher in comparison to witness varieties. For Paula variety, there were recorded lower values, qualities of resistance to detachment from pedicel and grain cracking and is in a direct correlation with the core composition, thickness and elasticity of the skin.*
Key words: *varieties, grapes, indices, strength*

Rezumat. *Lucrarea de faţă aduce câteva informaţii utile asupra însuşirilor tehnologice ale soiurilor noi create la SCDVV Iaşi, Paula şi Gelu, comparativ cu câteva soiuri autohtone, considerate martor. Astfel, prin analize fizico-mecanice, au fost determinaţi indicii tehnologici ai strugurilor şi boabelor respectiv: indicele bobului, indicele de structură al bobului, indicele de compoziţie a bobului, rezistenţa la desprindere a boabelor de pe pedicel şi rezistenţa la fisurare a boabelor, ultimii doi indici servind la aprecierea soiurilor de masă, sub aspectul pretabilităţii strugurilor la transport şi la păstrare. Rezultatele obţinute în urma cercetărilor efectuate au evidenţiat valori superioare ale forţei de desprindere de pedicel şi de fisurare a boabelor la soiul Gelu, de 3,47(N), respectiv de 19,29(N), superioară soiurilor cu care a fost comparat. Soiul Paula, a înregistrat valori mai scăzute, însuşirile de rezistenţă la desprinderea de pedicel şi de fisurare a boabelor, fiind în corelaţie directă cu consistenţa miezului, grosimea şi elasticitatea pieliţei.*
Cuvinte cheie: *soiuri, struguri, indici, rezistenţă mecanică*

INTRODUCTION

Over the time, there have been many concerns for vine varieties description. By the early nineteenth century, the varieties presentation was

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summarized exclusively at botanical description of vegetative organs, especially leaves and grapes, each author using their own methods and terminology, often confusing (Ravaz, 1902, Branas, 1959, Teodorescu 1939). In order to overcome these shortcoming, in 1984, OIV has unified the methodology for ampelographic description of varieties with IBPGR and UPOV, and has developed new rules of work by establishing three categories of descriptors: 25 for agrobiological characteristics, 94 for ampelographic characters, and 7 for technology characteristics (OIV, 1984, 1997). At table grape varieties, presents interest for valorification and storage some technological properties concerning the resistance of berry at pedicel detachment, which in OIV descriptors is mentioned as a berry ampelographic character, berry crack resistance under a pressure force that occurs during transportation and storage, that can be equated with the firmness (consistency) features of the pulp from the descriptors list as well as berry index, berry composition and grape structure resulting from physico-mechanical analysis of one kilogram grape.

In literature, detachment from pedicel and berry crack resistance are expressed in grams-force (Iftode, 1970, Mihalca, 1978, Calistru şi al., 1997), although it is known that the force is measured in Newtons (N) and is the product of mass and acceleration of gravity, beeing recognized as the only international unit of measurement of force. Through this paper, the authors intend to contribute to the knowledge of technological characteristics, mentioned above, of the new varieties of table grapes Paula and Gelu, created at the SCDVV Iaşi compared to some witness varieties (Milcov, Napoca, Aromat de Iaşi şi Coarnă neagră).

MATERIAL AND METHOD

The biological material used were the grapes harvested at maturity consumption, and determinations were made on 100 berries, 10 berry healthy located in the middle zone of 10 grapes. To measure the strength of the berry pedicel detachment using a device (Figure 1) provided with a alveolus (2) in which the berry is insert (1), clamp mechanism (3) and a thaler (plate) (4) on which are put calibrated masses (5), both set at the end of a lever (8). On plate are put calibrated weights until link dissolution of berry-pedicel occurs. Grape berry due to his weight falls into a receptacle (7), the pedicel being trained in motion by clamping mechanism. Thaler (plate) movement limitation and amortization of gravity force is made by a resort (6). The device is designed so that the force of gravity developed by the masses from the plate to be equal to the detachment force of the berry from pedicel (Fd). Thus F.d. = G = force of gravity, so G = M x g, where M is the mass in kilograms, required for breaking the link bob-pedicel and g = 9.80 m/s ² (acceleration of gravity). Determining experimentaly the mass M, by calculation is obtained the value of detachment force Fd = Mxg = kg. xm / s ² = N. The measures that enter in the calculation relation are expressed in the International System (SI) of units of mass.

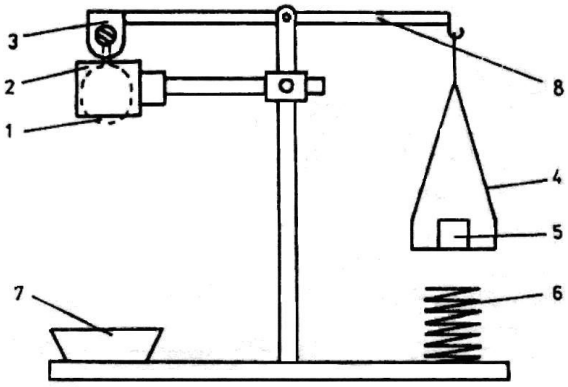


Fig. 1 - Device for measuring the force of berry detachment

Determination of berry cracking force was performed with a device (Figure 2) with a fixed plate (2)in which sits the sample (1), over which acts the force of gravity of the ensemble (fixed plate, stem 4 and pan (thaler) 5) which may not be enough to crack the berries, and therefore on the pan are added calibrated masses (7), until berry bursting occurs.

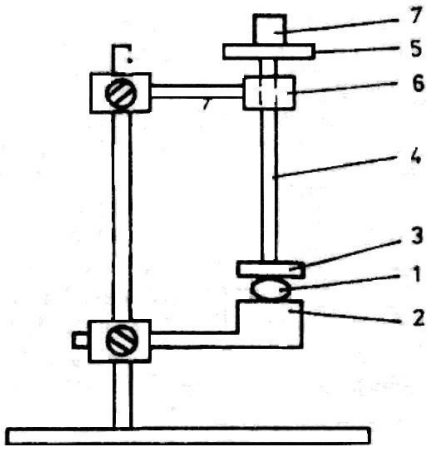


Fig. 2 - Device for determining the force of berry cracking

The force of gravity that compresses the berries is the cracking force (F1) and has the following formula: Ff = G = Go + G, where Go = force of gravity of of the assembly known from construction, Gm = force of gravity due calibrated masses (M - is determined by experiment) and Ff + M = Mo x g x g = N (S.I.). Both devices are own construction of UTI Science, PhD author Baisan I.

By physico-mechanical analysis of one kilogram of grapes were determined other technological indices of berries and grapes which supplement the knowledge

elements of the studied varieties in terms of their suitability for transport, valorification and storage.

RESULTS AND DISCUSSIONS

In the Copou-Iasi vineyard ecosystem the newly varieties created , Paula and Gelu, studied in comparison with reference varieties with close maturation age, have reached specific ampelographic and technology parameters. In terms of technology can be appreciated that they have achieved grapes with large berries, consistent pulp, with sugar accumulation specific for varieties for fresh consumption (table 1).

Table 1

Technological characteristics of the studied varieties compared with the control varieties

Variety	Maturation age of grapes	Sugars g/L	Acidity g/L H_2SO_4	Weight of berry, g	Berry shape	Berry consistency
Paula	II-III-a	160	4,5	3,7	ovoid	SCR*
Gelu	II-III-a	168	3,8	4,2	elliptic	CR**
Napoca (control)	II-III-a	150	3,5	3,7	elliptic-short	CR
Milcov (control)	III-a	165	3,9	2,7	ovoid	SCR
Aromat de Iaşi (control)	II-III-a	190	4,0	2,4	spheric	SCR
Coarnă neagră (control)	IV-a	140	5,4	3,2	elliptic-elongate	CR

*SCR - semicrunchy pulp, **CR - crunchy pulp

The results obtained relating certain physical and mechanical characteristics (Table 2), indicate that these are genetic traits of each variety, but conditioned by the climatic factors that influence both the quantity and quality of the grapes (berry mass, pulp consistency and thickness of the peel, sugar content and acidity). The presented data shows mean values of detachment force of berry from pedicel higher 3.22 (N) at Gelu variety which is superior to compared varieties Napoca 2.10 (N), Milcov2.24 (N) and Coarnă neagră 2.70 (N), the last one being the genitor variety.

At Paula variety, the detachment force was 1.90 (N), below the other varieties, except the variety Aromat de Iaşi 1.32 (N) which is his paternal genitor. It appears that there is a direct relationship between berry weight, pulp consistency and value of detachment force from pedicel, the ones with smaller berry and less crunch pulp, achieved smaller values of this index (Aromat de Iaşi, Milcov) than the varieties with crunch pulp and large berry (Gelu, Coarnă neagră). Determination regarding the resistance to cracking, shows higher values of 3-5 times compared to force of detachment from pedicel, between 4.12 and 16.25 (N).

Better resistance to berries cracking presented Gelu variety 16.23 (N), close to Coarnă neagră 16.25 (N), species with thicker peel and crunchy pulp.

Table 2

The values of physical - mechanical indexes of stadied varieties compared to control varieties

Variety	Detachment force (N)			Berry cracking force (N)		
	min.	max.	average	min.	max.	average
Paula	1,79	2,15	1,90	5,22	5,49	5,35
Gelu	2,87	3,50	3,22	14,55	19,34	16,23
Napoca (control)	1,80	2,58	2,10	8,10	12,28	9,50
Milcov (control)	2,10	2,34	2,24	9,33	10,76	10,15
Aromat de Iaşi (control)	1,16	1,66	1,32	3,78	4,30	4,12
Coarnă neagră (control)	2,56	2,85	2,70	14,13	17,65	16,25

Paula variety with semi crunchy pulp and thin peel achieved a mean value of cracking force of 5.35 (N), superior to paternal genitor, Aromat de Iaşi 4.12 (N).Technological indices resulting from physical - mechanical analysis of grapes, by their one values express the technological, economic and commercial value of studied varieties (table 3).

Table 3

The values of technological indices results from physical - mechanical analysis of one kilogram of grapes

Soiul	Berry index	Composition index of berry	Structure index of grape
Paula	30	8,79	34,75
Gelu	28	10,02	36,03
Napoca (control)	52	4,12	27,6
Milcov (control)	34	6,76	27,6
Aromat de Iaşi (control)	56	4,32	11,6
Coarnă neagră (control)	30	5,47	22,81

Results obtained from the measurements of these indices, shows high levels the of berry index (no. berries/100 g cluster), at the two varieties, Paula (30) and Gelu (28), superior to comparison varieties.

Berry Index composition reached the specific parameters for table grape varieties only at Paula (8.79) and Gelu (10.02), being well below of this to the comparison varieties. Regarding the structure index of grape, its value over 30 at both new varieties which make the research subject, place them in the category of

valuable varieties for table grapes, with well-constituted grapes, with a high berries yield, being superior to new varieties, Milcov şi Napoca (27,6), Coarnă neagră (22,81), Aromat de Iaşi (11,6). Values of physico-mechanical indices corroborated with those of technological indices of grapes, perfects the technological value of new table grape varieties Paula and Gelu, both in terms of grapes production, especially of their suitability for transportation, valorification and storage.

CONCLUSIONS

1. New table grapes varieties, Paula and Gelu, in the Copou - Iaşi vineyard ecosystem have perfect their technological parameters, producing grapes with large berries (3.7 to 5.2 g/grain) with semi crunchy (Paula) and crunchy (Gelu) pulp and with sugar accumulations of 160-168 g/L.

2. Resistance to berry detachment from pedicel was higher at Gelu variety 3.22 (N), with crunchy pulp and large berries who is more suitable to transportation and storage compared to Paula variety, at which that mean value of berry detachment force from pedicel was 1.90 (N), those being in direct correlation with core composition and berry weight.

3. Resistance to berry cracking (N), is a genetic trait of variety, and had the mean value higher at Gelu variety 16.23 (N) versus Paula variety which registered only 5.35 (N), this physical - mechanical feature being in direct correlation with berry weight, core consistency and peel elasticity.

4. Technological indices obtained from physico-mechanical analysis of one kilogram of grapes, by their values, shows that the two varieties may be included in the category of valuable varieties for table grapes, realizing grapes well constituted, with a high yield of berries, superior to those with which they were compared.

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THE UTILISATION OF GIBBERELLIN TYPE BIOSTIMULATING SUBSTANCES AT TABLE GRAPES VARIETIES (*VITIS VINIFERA* L.)

UTILIZAREA SUBSTANȚELOR BIOSTIMULATOARE DE TIPUL GIBERELINELOR LA SOIURILE DE VIȚĂ DE VIE (*VITIS VINIFERA* L.) PENTRU STRUGURI DE MASĂ

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Abstract. *Biostimulating substances are naturally occurring compounds in plants, being synthesized by these, with an important role in the initiation and development of different physiological stages (flowering, fruiting etc.) and which in very small amounts are able to influence plant metabolism. The use of biostimulating substances such as gibberellins in the growing technology of table grapes revealed that applied at specific times and concentrations, it positively affects growth and fecundation processes, size of berries, reduces the number of berry seeds, modifies favorable the content of grapes in sugars and acidity, leading finally to the achieving of high yields quantitatively and qualitatively.*
Key words: *gibberellins, biostimulating substances, Vitis vinifera L.*

Rezumat. *Substanțele biostimulatoare sunt compuşi care există în mod natural în plante, fiind sintetizați de acestea, cu rol important în inițierea şi desfăşurarea diferitelor stadii fiziologice (înflorire, fructificare etc.) şi care în cantități foarte mici sunt capabile să influențeze metabolismul plantei. Utilizarea substanțelor biostimulatoare de tipul giberelinelor în tehnologia de cultivare a strugurilor de masă a evidențiat faptul că aplicate în anumite momente şi concentrații, aceastea influențează pozitiv procesele de creştere şi fecundare, mărimea bacelor, micşorează numărul de semințe în bob, modifică favorabil conținutul strugurilor în zaharuri şi aciditate, conducând în final la obținerea unor producții ridicate cantitativ şi calitativ.*
Cuvinte cheie: *gibereline, substanțe biostimulatoare, Vitis vinifera L.*

INTRODUCTION

Plant hormones (phytohormones) are natural endogenous compounds, transportable, which have the capacity to affect the physiological processes of growth, differentiation and development of plants at concentrations much lower than vitamins and other biologically active substances (Davies, 2004; Jităreanu, 2007). Gibberellins belonging to the group of growth biostimulators hormones with auxins and cytokinins, were identified by Kurosawa in 1926, in the rice plants affected by the "Bakane" - the elongated shoots disease, caused by the fungus *Gibberella fujikuroi* (Jităreanu, 2007). In 1935, japanese researcher Iabuta has isolated from affected plants an active substance which he named it

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gibberellins. Subsequently were separated and identified in superior plants, fungi and bacteria a number of over 126 types of gibberellins, among which the most popular and used form is gibberellic acid (GA_3). As regards the physiological action of gibberellins at the cellular level, it is noted that it stimulates the biosynthesis of nucleic acids, especially messenger RNA (mRNA), being involved in protein synthesis in the transcription process (Milică et al., 1982).

Implementation of some growing technologies of the vine that provide high benefits for producers and consumers, together with the need for the consumption market of qualitative viticultural products, in sufficient quantities and at reasonable prices for the consumer, remains a current issue of local viticulture.

MATERIAL AND METHOD

For the study was necessary to analyze a complex bibliographic material from national and international literature, as well as electronic databases, with recent scientific papers in the field of plant physiology and viticulture. This work allowed the determination of the effects that the gibberellins exerts on vines and on the production of grapes, both qualitatively and quantitatively, depending on the time of application and concentration of biostimulator used.

RESULTS AND DISCUSSIONS

Endogenous gibberellins biosynthesis has as starting point mevalonic acid, which turns successively in a tricyclic diterpenoid named kauren, then kaurenol alcohol, kaurenal aldehyde, acid kaurenoic and gibberellin acid (Jităreanu, 2007). At the vines the content of endogenous gibberellins decreases in dormant buds and increases at the end of this phenophase (Salisbury and Ross, 1991).

Burzo I. et al., 2005, pointed aut the physiological role of gibberellin group compounds on the vine, saying that they directly promote cell division, have a protective action on the activity of auxin (favoring their accumulation in tissues) and a role in cell elongation occurrence. Gibberellins have direct effect on the formation and development of xylem and phloem and probably the most important property of gibberellins is that they help the mobilization of assimilates, especially in the early stages of berries development.

The influence of gibberellin treatments on the vine has been evidenced in several scientific experiments at table grapes varieties with seed and seedless, wine grapes being less examined from this perspective because of the quality requirements that are necessary to obtain the wines.

Gibberellic acid (GA_3) applied to varieties for table grapes caused an increase in sugar content in the berries, as well as a decrease of fruits total acidity (Rusjan D., 2010). Grapes appearance was also improved by the occurrence of larger and uniform colored berries (Peacock, 1999).

Since the beginning of this practice was found that application of gibberellins on table grapes in certain doses and at certain times, had a positive effect on growth and fecundation processes and on the berries size. Thereby, were

obtained higher yields, with a decreasing number of berry seeds and shoot elongation due to the stimulation of internodes elongation.

According to Peacock B., 1999, Flame Seedless variety, respond differently to treatments with gibberellins depending on the time of application. Applied two or three weeks before flowering, treatments leads to cluster elongation, gibberellins reducing its compactness and hastening the flowering by 2-3 days. Treatment applied in full bloom when 40-80% of the flowers are open does not have immediate effect on the small berries, but was found to be the optimum moment for the application of gibberellins. The results can be seen at maturity. GA_3 application after flowering, in the moment of berries growth, leads in generally to cell elongation in berries, but Flame Seedless variety does not respond to treatment with gibberellins applied at this time.

Gibberellins applied during the growth of berries when they reach 5 to 6 mm in diameter have resulted in cell elongation and berries growth (Rotaru et al., 2011). Applied after this time the treatment with gibberellins reduce the accumulation of anthocyanin pigments, influencing negatively the commercial aspect of the grapes and defaults their biological active value.

In Romania, since 1962 was found the positive and in some cases negative influence of the hormone stimulators application, on the main physiological processes of plant, growth and rooting, but also on the production and quality of products obtained. On the line of the same concerns in the period 1966-1967, at Drăgăşani Viticultural Research Station were initiated researches aimed to establish the action of gibberellins on the quality of table grapes variety Muscat de Hamburg. Gibberellin treatments were applied only on the inflorescences at different times: after the appearance of the inflorescence, at the blooming, at the growth berries stage, but also in all three phenological phases of the plant. Although the treatments were applied on the inflorescences were observed influence over the shoots, causing a superior increase in their length.

Applying the hormonal treatments after the appearance of the inflorescences resulted a very rapid growth rate of rachides, so 20 days after application the inflorescences have tripled their initial length, while the inflorescences of the control sample increased only by 3.5 cm. At the same variety the use of gibberellins during the flowering caused a low percentage of flowers binding and the parthenocarpy at 8 to 31% of the berries. In the case of treatment done before flowering, berries weight had higher values, but was observed the massive fall of flowers and the average yield per vine stock was lower then control variant (Negreanu and Lepădatu, 1971).

At Muscat de Hamburg variety, growth in climatic area of the Moldova Republic, the gibberellin treatments was made by immersion of the inflorescences in post fecundation phenophase (berries 3-5 mm) in concentrations of 25 mg/L, 50 mg/L and 100 mg/L. It was established that under the influence of gibberellins there was an increase of grapes weight with 10.0% (25 mg/L), 36.8% (50 mg/L) and 20.1% (100 mg/L), compared with untreated variant. Also, there has been a

reduction in the number of berries in the cluster and increasing weight of 100 berries compared with controls, with 62.0 to 88.8%.

The influence of gibberellin lead to a sudden reduction in the number of seeds in berries from 4.2 to 14.5 times, especially at the concentration of 100 mg/L. Berry index (pulp weight/seed weight) increased from 3.7 to 9.0 times (Nicolaescu et al., 2008).

Using the same treatment scheme at Loose Perlettes seedless variety was observed that under the influence of GA_3 occurred a growing of grape weight by 41.7% (100 mg/L), in the same time with a reducing of the cluster weight compared to the control variant. Treating Loose Perlette inflorescences with gibberellins led to a reduction of berries number per cluster and stem elongation, and finally to obtaining of more lax grapes (Nicolaescu et al., 2008).

Casanova et al., 2009, confirmed by the results of the research at table grape variety Emperatriz, positive influence of the GA_3 treatments on the grapes weight (50-90% increase yield, compared to untreated variant). The response of the plant was dependent on the phenological stage of applied treatment and the concentration of gibberellins.

At the variety Thompson Seedless, the GA_3 treatments were conducted under the the following scheme: at the formation of inflorescences, when they have 2 cm (10 ppm), when 40% of flowers were open (15 ppm), when 80% of flowers were open (15 ppm) and at 7 days after the last treatment (50 ppm), when the grape berry had the size of a pea (50 ppm). The results revealed that the berries and clusters size were higher than those recorded at the control variant (Coelho de Souza and Da Silva, 2010).

At the variety Keshmeshi (syn. Thompson Seedless) the results confirmed that the optimal dose of gibberellins was 60 ppm GA_3, this maximizing the production potential and improving the quality of the grapes. The optimal moment of treatment application was at berries growth; observing that the treatment applied in full bloom had no effect on berries, along with rachis elongation (Mina, 2008).

Regarding the chemical composition of the berries, at Muscat de Hamburg variety, by the application of treatments with gibberellins it was found an increase in sugar content, total acidity having values similar to the control variant or even lower (Negreanu and Lepădatu, 1971). At the same variety, treatment of inflorescence with GA_3 lead to an increase in sugar content of 1.5 to 3.2% (Nicolaescu et al., 2008).

Loose Perlette seedless cultivar responded differently to the gibberellin treatments regarding acidity and sugar content. The content of sugars in grapes dropped from 164 mg/L in the control variant, to 160 mg/L, and even to 146 mg/L. This inconvenience may be eliminated by harvesting the grapes at post maturation, the acidity was increased in comparison to the control variant with 9.2 to 10.6 g/L (Nicolaescu et al., 2008).

At the Cardinal and Michele Palieri varieties grown in the geographical area of Slovenia, the sugar content evolved directly proportional with the increasing of GA_3 concentration applied. From the statistical point of view,

studies have confirmed that treatment with gibberellins affected statistically significant the accumulation of sugars, but the organic acids content could not be correlated with the application of the GA_3. The color of the fruits was also influenced by the application of different doses of gibberellic acid, more intense and uniform colorated fruits were obtained by the application of gibberellins in the average concentration (50 ppm) (Rusjan, 2010).

Positive effects on the chemical composition of the berries generally occurs through an faster accumulation and at higher levels of saccharose, fructose and sucrose, as well as an increase in the absolute amount of water in berries by increasing the diameter of the pericarp cells (Casanova et al., 2009).

From own research of the authors, conducted in 2011 by treating the inflorescences of seven varieties of vine (*V. vinife*ra L.) for table grapes, grown in the vineyard area of Copou, Iasi, performed in the phenophase of flowering with GA_3 in concentrations of 25, 50 and 100 ppm, has shown that in terms of chemical composition of berries, optimal dose was 50 ppm GA_3 (tab. 1).

Table 1

Evolution of some chemical parameters of vine varieties for table grapes under the influence of gibberellic acid treatments (% of control)

No.	Variety	Optimal dose AG_3 (ppm)	Sugars (%)	Acidity (%)	Antocyanins (%)	Total phenolics (%)
1	Gelu	50	+8,61	+5,29	–21,70	+14,62
2	Moldova	50	–9,22	–3,90	–36,39	–19,78
3	Muscat de Hamburg	25	+7,33	–29,31	+43,48	+19,04
4	Coarnă neagră	50	+1,78	–4,91	+10,93	+4,98
5	Coarnă neagră select.	50	+14,20	+0,01	+65,81	+24,15
6	Chasselas doré	50	+10,40	–9,02	N/A	–6,95
7	Xenia	100	+5,77	–11,28	N/A	+59,18

By analyzing the recorded data has been observed significant increase of the amount of sugars in must (mg/L) in parallel with a reduction of titratable acidity content (tartaric acid/100 g fruits) in most of the analyzed cases.

CONCLUSIONS

1. The use of gibberellins lead to a series of *physical* (rachis elongation, increase berries size), *chemical* (increased sugar content, decreased acidity levels, more intense and uniform accumulation of anthocyanins) and *physiological* (intensification of photosynthesis, respiration and transpiration) modifications.

2. Treatment with gibberellins applied before flowering does not affect the quality or size of berries, leading only to the elongation of the rachis.

3. Vine varieties for table grapes have its own responce at the influence of gibberellin treatments. Genetic factor, the concentration of gibberellins applied and the phenophase of application, are "key" factors in the introduction of biostimulating treatments within the current viticultural technologies.

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STUDIES ON THE ADAPTABILITY OF LOCAL GENOTYPES VINE TO CLIMATE CHANGE IN COPOU-IAŞI VINEYARD ECOSYSTEM

STUDII PRIVIND ADAPTABILITATEA UNOR GENOTIPURI AUTOHTONE DE VIŢĂ DE VIE LA SCHIMBĂRILE CLIMATICE DIN ECOSISTEMUL VITICOL COPOU- IAŞI

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Abstract. *The promote of domestic production of vine varieties less vulnerable to climate change is a role to the scientific research that may help to improve the wine assortment by creating new genotypes. In the year 2012, characterized by severe frosts and by very dry and hot weather, six new genotypes were studied, Gelu, Mara, Fetească Regala cl.1Is, Sauvignon 12.9.5., Cabernet Sauvignon 16.6.9. and Golia, or pending the approval in terms of resistance to the cumulative effects of stressful environmental factors, of production and quality. The results obtained revealed that most of them were affected by the climatic factors, droughts leading to yellowing the leaves, the partial drying of the vines, a slow vegetative growth and ultimately, in obtaining lower production than the potential of every known variety. There have proven less vulnerable genotypes: Golia, clonal elites Sauvignon 12.9.5. and Cabernet Sauvignon 16.6.9., which are pending omologation.*
Key words: *genotype, adaptability, climate, resistance*

Rezumat. *Promovarea în producţie a unor soiuri autohtone de viţă de vie mai puţin vulnerabile la schimbările climatice constituie o preocupare a cercetării ştiinţifice, care poate contribui, prin crearea de noi genotipuri la îmbunătăţirea sortimentului viticol. În anul 2012, caracterizat prin geruri aspre, foarte secetos şi vreme caniculară, au fost studiate şase genotipuri noi, Gelu, Mara, Fetească regală cl.1 Iş, Sauvignon 12.9.5., Cabernet Sauvignon 16.6.9. şi Golia, sau în curs de omologare sub aspectul rezistenţei la efectul cumulativ al factorilor de mediu stresanţi, ai producţiei şi calităţii acesteia. Rezultatele obţinute au scos în evidenţă faptul că majoritatea acestora au fost afectate de îngheţ iar seceta a condus la îngălbenirea frunzelor, uscarea parţială a butucilor şi la obţinerea unor producţii mici sub potenţialul cunoscut al fiecărui soi. S-au dovedit mai puţin vulnerabile genotipurile: soiul Golia, elitele clonale Sauvignon 12.9.5. şi Cabernet Sauvignon 16.6.9., ce sunt în curs de omologare.*
Cuvinte cheie*: genotip, adaptabilitate, climat, rezistenţă*

INTRODUCTION

The climatic factors level influence the main biological processes,

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conditioning the grape production and the behavior at biotic and abiotic factors, diminishing the quality and quantity of crops and damaging the vine trunks in vineyards as a result of harsh winter frosts and the destructive effect of spring frosts causing significant losses to viticultural patrimony. (Calistru et. al., 1998; Doina Damian et al., 1995; Gagea et. al., 1991). The damages can be increase when these phenomena are followed by prolonged drought and lack of irrigation possibilities. In Copou vineyard ecosystem, the climate changes which are manifested throughout the world, have led to a heating of the weather, a visible decrease in rainfall and a higher frequency of occurrence of winter frosts. In 2012, in the presence of those factors, was possible to study the genotypes vine, new varieties, clones and elites in the process of homologation due to the cumulative action of climatic factors risk in terms of winter hardiness, production and quality, in order to determined the adaptability to the specific conditions of the ecosystem.

MATERIAL AND METHOD

The research was conducted in Iasi SCDVV biological fields on the table grape genotypes, Gelu and Mara, which were compared to selected variety Coarnă neagră and on the white and red wine varieties Golia, Fetească regală 1 Iş clone, Sauvignon 12.9.5. elite clone, Cabernet Sauvignon 16.6.9. elite clone which all were compared to Fetească regală variety. Experimental plantations, under full capacity of production are located on a chernozem plateau with southeastern exhibition. Planting distances used were 2.2 m / 1.2 m, ensuring a density of 3787 vines / ha. Was performed the culture system on stems of 70-80 cm height, vines were led to the bilateral cordon and the cutting system performed was the short cane of 2-3 eyes, ensuring a load of fruit of 25-35 buds / vine for table varieties and 45-50 buds / vine for wine varieties. At the basis of the vine were preserved safety buds with the aim to regenerate the vine trunk in case of a freeze, protected by the mound in winter time.

To establish the vulnerability of studied genotypes on unfavorable climatic factors and their degree of adaptability on the ecosystem condition, the research focused on the following elements: monitoring the climatic factors by meteorological station AGROEXPERT and determining their level, wintering resistance, phenological spectrum covering in direct correlation with climatic factors, fertility and productivity, production and quality.

RESULTS AND DISCUSSIONS

The climate monitoring of viticultural ecosystem Copou-Iasi, in 2012, shows the presence of stress climatic factors which have conditionated the biological processes of the vine. From their analysis, it is found that the minimum and maximum average temperatures in winter were very low, resulting frosty periods (Table 1). In February, temperatures have decreased below the minimum resistance of grapevine, respectively -26.7°C in air and -33.0°C at the surface of the soil, and temperatures below -20°C were maintained 5 days consecutively.

The average diurnal temperatures were lower (-9.3°C compared to -1.9°C the normal of February) and the daily maximum values between -10.4°C and -14.9°C were emphasized the phenomenon of frost. Spring was cold, with negative temperatures at the beginning of March and then increased towards the end of

April. During May, the values approached to the normal years. Accumulated rainfall in April-May were plentiful, totaling 147.2 mm at which were added about 61 mm from solid precipitation.

Table 1

Values of the main climatic elements registered in 2012 In Iaşi-Copou Vineyard Center

Month	Temperatures ^{0}C, air			Temperatures ^{0}C, soil			Amount degrees of temperature, ^{0}C			Hygroscopicity %	Precipitation mm	Heat stroke, hours
	average	max	min	average	max	min	global	activ	useful			
I	-2,8	11,8	-17,9	-3,2	10,7	-21,8				81	12,3	99,8
II	-9,3	7,2	-26,7	-11,1	1,5	-33,0				80	61,0	150,1
III	3,8	20,4	-9,5	3,4	33,8	-8,6				65	15,8	157,6
IV	12,9	30,0	-1,5	14,2	51,5	-1,9	387,3	340,1	120,1	62	66,2	187,2
V	17,7	31,0	6,3	22,5	56,4	6,1	548,4	548,4	238,4	63	85,0	217,9
VI	22,3	36,0	11,6	29,5	66,8	7,5	670,2	670,2	370,2	56	26,2	314,7
VII	25,4	38,0	14,0	33,3	68,0	10,5	788,7	788,7	478,7	49	29,5	334,4
VIII	22,6	40,1	10,6	26,3	61,2	6,8	700,8	700,8	390,8	53	33,9	227,3
IX	18,6	30,5	8,4	21,3	49,7	4,2	557,4	548,1	258,1	57	46,4	217.6
X	11,7	28,0	0,4	12,1	39,5	-1,8				75	55,2	121,7
XI	6,0	18,6	-2,5	5,8	25,5	-3,8				84	26,8	76,1
XII	-3,8	9,4	-13,7	-4,6	8,9	-21,0				88	77,6	65,1
Total	**10,4**			**11,6**			**3652,8**	**3596,3**	**1856,3**	**68**	**535,9**	**2169,8**

The summer of 2012 was estimated to be very warm, extreme hot and very dry. Daily average temperatures of summer months had high values of 22.3°C in June, 25.4°C in July and 22.6°C in august, with 2-4°C over specific multiannual average of this season. Absolute maximum temperature was 40.1°C in August and in July for 25 days exceeded 30°C, of which 13 days with temperatures above 35°C.

The drought has been settled at the beginning of June, the rainfall were very low in all summer months accumulating just 89.6 liters and the total number of days of rain was 29 of which only two were useful rains above 10 mm, the lack of rainfall leading to atmospheric and pedologic drought installation. Autumn season, also starts with the same warm weather, with average daily temperatures of 18.6°C and absolute maximum of 30.5°C. Analyzing the vineyard climate during the growing season, it can be concluded that in terms of average monthly temperatures, average, minimum and maximum absolute values was a normal and warm springtime, while the summer was very hot and dry. It was a warm autumn, favorable to a good maturation of the grapes. Active and useful global heat balance showed high values, respectively 3652.8°C, 3592.3°C to 1856.3°C. The amount of precipitation during the growing season of 287.6 mm was below the consumption needs of grapevine, during this period the number of days with useful rains (> 10 mm) was 5. Real heatstroke, expressed in number of hours of sun shine was 1449.1.

Under the influence of cumulative stress climatic factors, the studied genotypes were manifested differently depending on each specific genetics. Obtained results regarding the genotypes vulnerability at low (extreme)

temperatures action, assessed by winter bud viability analysis showed a good and very good resistance at Golia variety created at SCDVV Iaşi, where the losses were within with the ones of a normal thermal year, respectively 17% on the 12 buds length cane (Table 2) it can be an alternative to avoid crop losses caused by frost.

Table 2

Winter buds viability of studied genotypes In Iaşi-Copou Vineyard Center

No.	Variety	No. examined eyes	% viable buds – pozition on the cane								
			1 - 3			1 - 6			1 - 12		
			P	S	P + S	P	S	P + S	P	S	P + S
1	Golia	72	83	100	100	83	100	100	83	100	100
2	Gelu	65	31	94	94	18	94	94	19	94	94
3	Cabernet Sauvignon 16.6.9	62	61	100	100	64	100	100	50	100	100
4	Mara	60	6	72	72	6	61	61	7	62	62
5	Sauvignon 12.9.5	58	72	100	100	78	100	100	86	100	100
6	Fetească regală cl 1Iş	64	67	100	100	64	100	100	53	100	100

A good behavior had clonal elites Sauvignon 12.9.5., Cabernet Sauvignon 16.6.9. and royal Fetească 1 Is, at which the main buds losses were 23-39% on the cane position 1-3, being assessed as favorable for Copou - Iasi vineyard ecosystem conditions. On the opposite side, grape varieties for table Mara and Gelu had significant losses which ranged between 61şi 94% primary frozen buds.

Regarding the dynamic of phenological spectrum, was found that analyzed genotypes have completed the vegetation phenophases differently according to each hereditary specificity, being conditioned by the evolution and the level of climatic factors (Table 3).

As a phenophase that mark the beginning of active vegetation, budbursting took place from 26th April to 2th May, within a interval of 6 days, with small difference between varieties, starting with Gelu and Fetească regală 1 Iş varieties (26th April) and ending with Mara variety (2th May) in terms of active thermal balance between 233.2°C - 364.3°C. Under the action of high temperatures in late May, the flowering has been exceeded with three weeks, from 25th May (Fetească regală) until 8th June (Cabernet Sauvignon 16.6.9.), when were accumulated between 459.0°C - 711.1°C active temperatures and between 199.0°C - 321.1°C useful temeratures. Grapes véraison was marked by Gelu variety (15th July) with 10 days earlier than witness variety Selected Coarnă neagră (25th July) due the active temperatures between 986.9°C -1438°C and useful temperatures between 576.9°C - 808°C which rushed grapes véraison with about 10 days earlier than the normal climatic years. Grapes ripening was advanced with two weeks under the action of high temperatures and took place between 23th August - 13th September for table grape varieties and from 5th - 13th September for wine varierties. The leaf fall occurred during 31th October to 5th November.

Active and useful thermal balance values calculated for each phenological stage show that all genotypes studied received a warm climate favorable for grapes ripening and for achieving the quality parameters.

Table 3

Phenological cycle of the grapevines - 2012
in Iaşi-Copou Vineyard Center

Variety	Phenological stages											
	Budburst			Flowering			Veraison			Grape maturity		
	Data	Ta,°C	Tu,°C	Data	Ta,°C	Tu,°C	Data	Ta,°C	Tu, °C	Data	Ta, °C	Tu, °C
Gelu	26.04	233,2	63,2	04.06	711,1	321,1	15.07	986,9	576,9	23.08	936,5	519,9
Mara	02.05	364,3	134,3	28.05	459,0	199,0	27.07	1389,4	789,4	13.09	1068,8	588,7
Coarnă neagră select (ct*)	02.05	364,3	134,3	01.06	524,2	199,0	25.07	268,6	728,6	13.09	1124,4	624,3
Golia	29.04	292,1	92,1	06.06	700,2	320,2	31.07	1331,9	781,9	05.09	810,2	450,5
Fetească regală cl 1Is	26.04	233,2	93,2	25.05	541,5	251,5	24.07	1358,4	758,4	12.09	1130,6	630,5
Sauvignon cl 12.9.5	30.04	316,1	106,0	06.06	572,5	306,3	28.07	1117,6	714,3	06.09	917,8	517,7
Cabernet Sauvignon cl 16.6.9.	30.04	316,1	106,0	08.06	572,5	306,3	01.08	1322,9	795,1	13.09	934,1	504,0
Fetească regală (ct)	26.04	233,2	62,1	25.05	541,5	251,5	27.07	1438,0	808,0	12.09	1210,2	581,0

*ct - control

Grape production achieved by studied genotypes show that Golia variety with increased resistance to frost produced over 10 t/ha, almost double against the witness (5.25 t/ha) followed by Sauvignon 12.9.5. elite with 2.82 kg/vine, respectively 10.68 t/ha and Cabernet Sauvignon 16.6.9. elite with 2.50 kg/vine and 9.50 t/ha, qualities which are recommended for approval and culture expansion. New table grape variety Mara achieved 3.24 kg/vine, respectively 12.3 t/ha, statistically ensured very significant, and Gelu variety achieved 2.4 kg / vine and 9.1 t/ha with an increase of harvest significantly distinct from the control (table 4).

Harvest quality assessed by the average mass of grapes, mass and volume of 100 berries, sugar content and total acidity, reflects the influence of climatic factors on the value of these items. All studied genotypes realized smaller grape, smaller berry weight and volume. Gelu variety had higher values (200 g/grape) then the witness. With Cabernet Sauvignon 16.6.9 elite exception (142 g/grape), the other grape genotypes made grapes far below from each own specific. The high level of temperatures and the low amount of precipitation during the grapes ripening have positively affected the sugar accumulation in must, all varieties achived high concentrations of sugars ranging between 168 and 230 g/L for table varieties and between 182 and 230 g/L for wine varieties.

Under the action of the same factors, total acidity of must was reduced for table varieties (2.1 to 3.2 g/L H_2SO_4) as well for wine varieties (3.3 to 3.9 g/L H_2SO_4).

Corroborating the values of quality and production elements with the climatic conditions of the reference year, can be considered as being more tolerable at cumulative action of stress climatic factors the following genotypes: Mara, Golia, Fetească regală 1 Iş and Cabernet Sauvignon 16.6.9.

Table 4

Grapes production and quality, in Iaşi-Copou Vineyard Center

Variety	Production		Commodity production	Average weight grape	100 berries weight	100 berries volume	Sugars	Total acidity
	kg/vine	t/ha	%	g	g	cm^3	g/L	g/L H_2SO_4
Gelu	2,4**	9,1	80	200	318	300	168	2,1
Mara	3,24***	12,3	85	130	202	160	230	3,2
Coarnă neagră select. (control)	1,15	4,35	78	180	280	260	160	3,9
Golia	2,84	10,75	-	47	70	35	197	4,2
Fetească regală1 Iş	1,8	6,82	-	78	110	102	238	3,4
Sauvignon 12.9.5.	2,82	10,68	-	63	87	80	182	3,3
Cabernet Sauvig. 16.6.9.	2,5	9,46	-	142	87	80	209	3,9
Fetească regală (control)	2,10	7,95	-	66	102	98	212	3,6

DL – grapes table production 5% - 0,84; 1% - 1,20: 0,1%- 1,76
DL – wine variety production 5% - 0,91 1% - 1,25 0,1%- 1,72

CONCLUSIONS

1.The year 2012 was characterized by very cold winter, cold and rainy spring and hot and dry summer.

2. Very low temperatures caused loss of fruit buds in a large percentage 61-94% for table grapes and 23-39% for wine varities.

3. Phenophases of vegetation were brought forward with 10-15 days depending on the specific hereditary of varieties.

4. Showed a greater adaptability at ecosystem conditions the following genotypes: Golia, Fetească regala 1 Iş and Cabernet Sauvignon 16.6.9.

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INFLUENCE OF TECHNOLOGICAL LINKS ON SOIL MOISTURE DYNAMICS IN CONDITIONS OF PROLONGED DROUGHT OF 2012 IN DEALU BUJORULUI VINEYARD

INFLUENȚA UNOR VERIGI TEHNOLOGICE ASUPRA DINAMICII UMIDITĂȚII SOLULUI, ÎN CONDIȚIILE DE SECETĂ PRELUNGITĂ A ANULUI 2012 ÎN PODGORIA DEALU BUJORULUI

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Abstract. *The research was conducted in the R.D.S.V.V. Bujoru, Galati County imposed by the climatic conditions of the year 2012. Studied objectives relate to monitoring the influence ecopedological factors and mulching total /partial soil on the hydric soil vineyards. To establish dynamics of soil moisture, sampling was done in the lunar soil, the profile of 0-100 cm. Were analyzed climatic elements (temperature, precipitation, humidity, heatstroke) which clearly reveal that during the growing season of 2012 the vine underwent temperature and water stress accented and did not benefit from conditions optimal vegetation. High temperatures, combined with poor rainfall during the growing season and diurnal average consumption of grapes, led of soil system maintenance, moisture differentiated. If total mulching with crop residues (straw) and partial mulching interval with grape marc composted, soil moisture is higher compared with the control and especially 0-60cm profile. The further future research are required to capture different climatic conditions and lead to more accurate determination of technological links to maintain optimum soil moisture for vine culture.*
Key words: *vine, moisture, drought, grape marc, mulching total*

Rezumat. *Cercetările s-au efectuat în cadrul SCDVV Bujoru, jud. Galați impuse de condițiile climatice ale anului 2012. Obiectivele luate în studiu se referă la monitorizarea factorilor ecopedologici şi la influența mulcirii totale/parțiale a solului asupra regimului hidric al solului în plantațiile viticole. Pentru stabilirea dinamicii umidității solului s-a procedat la prelevarea de probe de sol lunar, pe profilul 0-100 cm. S-au analizat elementele climatice (temperatura aerului, precipitații, umiditatea relativă a aerului, insolația) care scot în evidență clar că, în perioada de vegetație a anului 2012 vița de vie a suportat un stres termic şi hidric accentuat şi nu a beneficiat de condiții optime de vegetație. Temperaturile ridicate, cumulat cu precipitațiile deficitare din perioada de vegetație şi consumul mediu diurn al viței de vie au condus la umidități ale solului diferențiate în funcție de sistemul de întreținere al solului. În cazul mulcirii totale cu resturi vegetale (paie) şi mulcire parțială pe interval cu tescovină compostată, umiditatea solului este mai ridicată comparativ cu martorul şi în special pe profilul 0-60cm. Pe viitor se impune continuarea cercetărilor, pentru a surprinde condiții climatice diferite şi să conducă la stabilirea celor mai corecte verigi tehnologice care să mențină o umiditate în sol optimă culturii de viță de vie.*
Cuvinte cheie: *viță de vie, umiditate, secetă, tescovină compostată, mulcire totală*

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INTRODUCTION

Vineyards in Moldavia and especially those in the south are increasingly affected by climate change occurred in the last decade. Drought is mainly a problem of meteorology, which determines the level of precipitation, but its intensity depends to a considerable extent and soil characteristics of the territory affected.

Thus, drought may be enhanced by a loss of water from rainfall soils of low water retention capacity (sandy soils with relatively thin frame profile or the ground), the low permeability or compacted or placed on slopes. Most vine crops located in areas with water deficit, achieves its biological potential rate of 35-45%. Drought is harmful for livestock, directly affects the vegetation status and thus vineyard grape production and is characterized by the lack of rainfall, low relative humidity and high potential evapotranspiration.

Temperature factor has a dual role on water consumption: direct transformation of water vapor increases and enhances the ability to keep water vapor saturation state (Popescu, 1978; Popescu and Bucur, 1999). Drought and desertification as a result of increasing temperatures and other anthropogenic reasons have become major causes affecting far (and future) level and quality of crops, and the health of agriculture and the environment generally.

MATERIAL AND METHOD

The research was conducted during 2012 in an experimental device within SCDVV Bujoru which took into account soil maintenance system, developed by experimental scheme:

V1 – black field (autumn plowing, spring plowing, hoeing mechanical interval 5, 5 manual hoeing a row, fertilization with N, P, K optimal dose) (photo 1).

V2 – total mulching with crop residues/straw (straw spread over a time interval and layer thickness of 10 cm, fertilization with N, P, K optimal dose) (photo 2).

V3 –partial mulching interval with grape marc composted (composted pomace spread within the thickness of 10 cm on all post-emergent herbicide - 2 herbicides, fertilization with N, P, K at a dose reduced by 50%) (photo 3).

They made observations on the thermal regime represented by average temperature, maximum and minimum air thermal balance, sun and fluid regime represented by rainfall, relative humidity.

Measurements of soil moisture dynamics and water shortage have been made to determine how the soil affects the maintenance supply of water from the soil. We took samples of lunar soil, the variations and 0-100 cm profile from 20 to 20 cm.



Photo 1 - Black field



Photo 2 - Total mulching with straw



Photo 3 - Partial mulcing with grape marc composted

RESULTS AND DISCUSSIONS

Climatic factors in 2012 correspond to excessively dry year (Table 1). Dealu Bujorului Vineyard is located in the South of Moldova, nature dry area with annual average temperature of 11,5 ° C and rainfall of 453,8 mm multi-annual average.

Evolution of climatic factors

In terms of thermal evolution of the minimum and maximum interest, duration, frequency and comparison with the multi-annual average temperatures. The average temperature compared to the annual average for 2012 shows a surplus of 0,4 ° C. Compared to the vegetation, the excess heat is recorded in June, July, August and September. During the period of vegetative rest absolute minimum temperatures exceeded the strength of the vine. Absolute minimum were recorded on 11 February (-23,6 ° C). The average temperature and maximum temperatures are above previous years and since April have been reported air temperatures above 30 ° C. There is an increasing trend in the number of days with maximum air temperature above 30 ° C (Fig. 1).

Active thermal balance of the vegetation is 3797,8 ° C and shows that are provided Dealu Bujorului Vineyard grape ripening conditions by age V and VI, VII era caution.

2012 was a particularly dry year, with a decrease in rainfall regime and an uneven distribution of rainfall. Maximum rainfall was in May (115,8 mm) and led to a build script, in reality not all the amount was recovered, much of it is lost through leakage to the ground. Since June precipitation decreased considerably.

Deficit rainfall and maximum temperatures above 30 ° C have influenced the relative humidity, during periods that recorded values below 50%, leading to stressful conditions for growing vines.

In terms of hours of sunshine they have a surplus, located mainly in July, August and September.

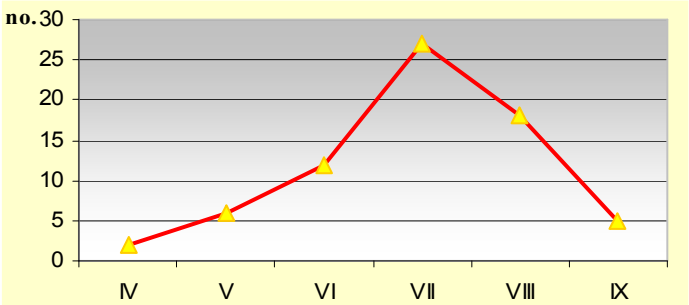


FIG. 1 Number of days with maximum air temperatures above 30 ° C

A soil water reserves at the beginning of the growing season was at the lower level as the field capacity and minimum level of soil moisture (Table 2). This is explained by excessive fluid deficit accumulated during the growing season and the previous year due to insufficient rainfall in winter. In general, water shortage at the beginning of the growing season is accentuated profile 80-100cm, in some versions even at a depth of 60 cm.

The low level of rainfall in April maintains moisture in the soil in early May to values comparable to that of April 1. High temperatures in May combined with vines consumption for the same period in early June led to differences between the versions. If total mulching with plant debris and mulch mulching partial interval marc compost, soil moisture is higher compared with the control and especially 0-60 cm profile. During April-June, soil moisture was below minimum level of soil moisture in all experimental variants was maintained in July due to accentuated water deficit recorded since June.

Deficient rainfall in July, August and September, the cumulative consumption of vines in the same period resulted in increased soil water shortage, soil moisture reaching the wilting coefficient values close to the end of the growing season. Soil moisture was preserved better if total mulching with crop residues (straw), followed by partial mulching mulch marc blank row. At the end of the growing season soil moisture was at values below the minimum level of moisture; although rainfall in September covered the 0-40 cm profile some of the accumulated deficit.

Table 1

The climate data 2012, Dealu Bujorului vineyard

Specification	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Ave-rage
The average air temperature °C	-2,3	-8,0	4,4	12,9	18,0	22,5	28,1	26,1	20,7	14,6	8,2	-1.7	11,9
Multi-annual average	*-1,1*	*0,5*	*5,2*	*11,5*	*18,2*	*22,0*	*23,9*	*23,1*	*17,5*	*11,2*	*5,3*	*1,0*	*11,5*
Difference	**-1,2**	**-8,5**	**-0,8**	**1,4**	**-0,2**	**0,5**	**4,2**	**3**	**3,2**	**3,4**	**2,9**	**-2,7**	**0,4**
Maximum temperature (°C)	10,6	10,7	21,5	30,5	35,7	36,8	38,0	41,5	27,5	30,0	20,0	13,0	26,3
Minimum temperature(°C)	-15,1	-23,6	-11,2	-2,0	8,6	10,1	14,0	10,5	7,5	1,4	-2,0	-17,9	-1,6
Rainffal (mm)	39,3	25,4	9,2	18,6	115,8	13,8	27,1	23,1	24,6	42,0	4,3	102,3	445,5
Multi-annual average	*19,8*	*20,3*	*25,5*	*36,6*	*46,5*	*71,0*	*57,4*	*48,0*	*38,0*	*31,4*	*30,7*	*28,6*	*453,8*
Difference	**19,5**	**5,1**	**-16,3**	**-18,0**	**69,3**	**-57,2**	**-30,3**	**-24,9**	**-13,4**	**10,6**	**-26,4**	**73,7**	**-8,3**
Relative humidity (%)	78,7	76,6	65,9	62,9	64,8	59,3	42,0	43,0	50,0	59,0	68,0	69,0	61,6
Multi-annual average	84,0	80,0	74,0	68,0	63,0	64,0	62,0	64,0	70,0	76,0	82,0	85,0	73.0
∑° ta	x	x	x	331,3	556,4	603,8	867,8	818,4	620,1	x	x	x	3797,8
Multi-annual average	x	x	x	318,3	590,3	683,3	786,1	755,3	552,6	x	x	x	3685,9
∑° tu	x	x	x	11,3	236,4	303,8	557,8	508,4	320,1	x	x	x	2037,8
Multi-annual average	x	x	x	8ţ9,2	273,3	380,3	466,1	435,3	226,1	x	x	x	1870,3
Insolaţion (ore)	68,9	72,2	176,6	209,1	181,6	312,6	337,5	286,0	226,0	134,0	79,4	29,5	2113,4
Multi-annual average	*47,8*	*72,2*	*138,2*	*176,5*	*239,6*	*235,7*	*257,6*	*250,2*	*165,5*	*122,9*	*58,5*	*31,0*	*1795,7*
Difference	**21,1**	**0**	**38,4**	**2,6**	**-58**	**76,9**	**79,9**	**35,8**	**60,5**	**11,1**	**20,9**	**-1,5**	**317,7**

Table 2

Soil moisture dynamics, the profile of 0-100 cm, Dealu Bujorului vineyard

Depth cm	V1							V2							V3						
	IV	V	VI	VII	VIII	IX	X	IV	V	VI	VII	VIII	IX	X	IV	V	VI	VII	VIII	IX	X
0-20	381	306	383	188	149	160	225	333	393	427	195	227	223	306	400	299	433	190	189	189	316
20-40	393	388	408	231	184	180	206	402	315	397	266	233	187	202	402	367	441	278	205	195	205
40-60	361	363	288	199	166	159	177	366	375	327	281	231	159	188	351	348	380	285	189	179	176
60-80	314	343	219	151	152	159	158	343	291	285	225	163	158	190	192	288	231	263	175	168	177
80-100	203	291	295	136	152	159	156	291	224	182	190	112	158	186	192	256	177	148	132	168	176
average	**1652**	**1691**	**1593**	**905**	**803**	**817**	**922**	**1735**	**1598**	**1618**	**1157**	**966**	**885**	**1072**	**1537**	**1558**	**1662**	**1164**	**890**	**899**	**1050**

In conclusion, soil moisture throughout the period under review remained lower minimum level of humidity throughout the 0-100 cm soil profile.

Soil water shortage was reported in the water field capacity (2990 m^3/ha) minimum threshold of soil moisture (1853 m^3/ha) and wilting coefficient (715 m^3/ha) and is emphasized in July for all variants experimental peak occurred in the control, followed by full version with straw mulching and mulching partial composted marc.

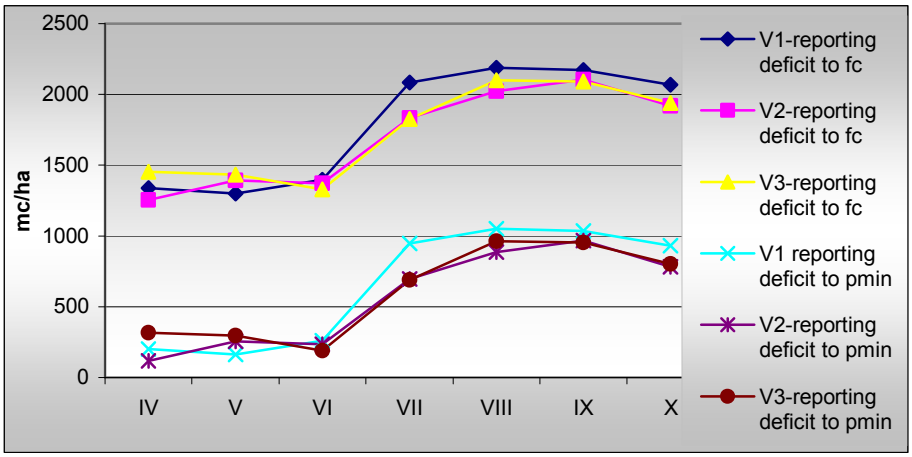


Fig. 2 - Water shortage in the soil (m^3/ha)

CONCLUSIONS

1. Year 2012 in terms of climate was atypical, with a water deficit widened to a surplus thermal regime. Since the end of April there were air temperatures above 30 ° C.

2. Under conditions of prolonged drought, soil moisture is preserved best when total mulching with straw, mulching followed by partial composted marc and then control.

3. At the end of the growing season soil moisture reaches the wilting coefficient values comparable, especially on the profile of 60-80 cm.

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EVOLUTION OF RIPENING GRAPES IN COPOU IASI VITICULTURE ECOSYSTEM IN ATYPICAL CLIMATE CONDITIONS OF 2012

EVOLUȚIA PROCESULUI DE MATURARE A STRUGURILOR ÎN ECOSISTEMUL VITICOL COPOU IAŞI, ÎN CONDIȚIILE CLIMATICE ATIPICE ALE ANULUI 2012

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Abstract. *In this paper we followed the evolution of the maturation process of the wine grapes depending on the annual viticulture climate, the vegetation period climate and the maturation period. The year 2012 was characterized by a very cold winter, when temperatures reached absolute minimum below the frost resistance of the vines, followed by a warmer than normal spring and a dry summer with little rainfalls and an uneven distribution in conjunction with high temperature values. The frequency of the risk factors was higher in July and August, being recorded values of 80.65% and 51.61% respectively. Due to the climatic conditions this year, the full maturation of the grapes and the phenolic maturity where reached much sooner, which led to the outbreak of the harvest campaign 15 days earlier than normal.*
Key words: *climatic factors, drought, grapes varieties, ripening.*

Rezumat. *În prezenta lucrare s-a urmărit evoluția procesului de maturare a strugurilor în funcție de climatul viticol anual, al perioadei de vegetație şi al perioadei de maturare. Anul 2012 s-a caracterizat printr-o iarnă cu temperaturi foarte scăzute, când s-au înregistrat temperaturi minime absolute sub limita de rezistență la îngheț a viței de vie, urmată de o primăvară mai caldă decât normal şi o vară secetoasă, cu precipitații puține şi neuniform repartizate, coroborate cu valori ale temperaturii foarte ridicate. Frecvența apariției factorilor de risc a fost mai mare în lunile iulie şi august înregistrând valori de 80,65 % şi respectiv 51,61 %. Datorită condițiilor climatice deosebite din acest an, procesul de maturare deplină a strugurilor şi maturitatea fenolică s-a atins mult mai devreme, ceea ce a condus la declanşarea campaniei de recoltare a strugurilor cu 15 zile mai repede față de normal.*
Cuvinte cheie: *factori climatici, secetă, soiuri de struguri, maturare.*

INTRODUCTION

In 2012 viticulture climate was particulary compared to previous years. In January, the mean temperature was close to normal, however the mean temperature in February in air, was much lower, with - 9.3°C to the normal value, of -1.9°C. In this month, for 10 days, there were absolute average temperatures below the frost resistance of the vine.

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Spring was warmer than normal. In all months were recorded mean monthly temperature whose value was higher than normal, namely, by 3.8°C to 3.3°C in March, 12.9°C to 10.1°C in April and 17.7°C to 16.1°C in May. Summer months were very hot, monthly mean temperatures being 22.3°C, 25.4°C and respectively 22.6°C. At soil, the absolute highest temperature was reached in July, namely 68°C and the absolute highest temperature of 40.1°C in air was recorded in August. Since June there was a drought period when every month, there have been shortages of rainfall. To characterize ripening grape was considered necessary analysis of the vegetative period climate, the maturation period climate and frequency of risk factor (%) (Cotea, 1985; Pomohaci et al., 2000).

MATERIAL AND METHOD

To analyze specific climate factors of 2012 were used AGROEXPERT meteorological system of Research Development Station for Viticulture and Winemaking Iasi and recorded data of Regional Meteorological Centre Iasi Moldova. Annual viticulture climate was monitored by calculating the mean temperature (oC), the average minimum temperature (°C), the average maximum temperature (oC) and rainfall (mm). Viticultural climate of growing season was determined by mean temperature, sunshine period, Huglin index (Huglin, 1978), the global, active and useful thermic balance. Ripening period climate was characterized by mean air temperature, minimum and maximum temperature (mean and absolute), hygroscopicity, number of days with temperatures above 30°C, the sunshine duration and the cool nights index (Tonietto et al., 2004).

From vineyard of Copou Iasi viticultural center were harvested grape varieties samples Aligoté, Chardonnay, Feteasca albă, Feteasca regală, Riesling Italian, Sauvignon blanc, Cabernet Sauvignon, Busuioaca of Bohotin and Muscat Ottonel. Ripening grapes was analyzed in dynamic, in every five days. In grapes sample was determined the weight of 100 grains. In stum obtained by grapes pressing were determined the sugars content (STAS 6182/17-81) and total acidity (STAS 6182/1-79).

RESULTS AND DISCUSSIONS

Viticultural climate of growing season was analyzed from April to September. During this period there were reached monthly mean temperatures greater than the multiannual values, increasing from 12.9°C in April to 25.4°C in June. June, July and August were the warmest, the averages of maximum temperatures were 28.3°C, 32.8°C, 29.3°C respectively. Since June has been installed drought, on account of high temperatures, when the number of days with precipitation greater than 10 mm was very low, namely two days in April and May, no day in June and one day in July, August and September. Thus, the amount of precipitation during the growing season was 287.2 mm to 350-400 mm as normal in the Copou Iasi viticultural center. The sunshine duration of during the growing season was 1499.1 hours, 1.78% higher than in 2011.

In viticultural area of Copou Iasi center, Huglin index sum was 2541 for six months. Depending on this value has been established climate class for this year, namely warm climate class with values greater than 2400 and less than or equal to 3000. The analysis of global, active and useful thermic balances, in vineyard area Copou Iasi, found that in 2012, these parameters have reached the highest values

compared to those determined in the last 14 years, providing conditions for ripening grapes to the V era of maturation and biological threshold growth vine.

Viticultural climate of the ripening period was analyzed between July to September 2012. During ripening there were normal values for minimum, medium and absolute temperatures (Table 1), however, mean values of maximum temperatures were higher than in 2011, namely 32.8°C in July, 29,3oC in August and 25.3°C in September. These values result that in these months, maximum temperatures were above 30°C for 25 days in July, 16 days in August and three days in September. The maximum mean temperatures have increased during these months, compared with 2011, by 4.8°C in July, 2.5°C in August and 0.8°C in September.

Table 1

The ripering period climate in Copou - Iasi viticultural center

Month	Air temperature					Hygroscopicity (U%)	Days with T>30°C	Insolation (ore)	Index of cool nights
	T med (°C)	T min (°C)		T max (°C)					
		mean	absolute	mean	absolute				
July	25,4	18,6	14	32,8	38	49	25	334,4	-
August	22,6	16,8	10,6	29,3	40,1	53	16	227,3	-
September	18,6	13,2	8,4	25,3	30,5	57	4	217,6	13,2

The drought and high temperatures conditions have led to values lower of hygroscopicity coefficient in 2012 with 2.5% in July, 5.3% in August and 3.3% in September. During the three months were 55 days in which there were frequent temperatures from 33.5 to 36.5°C. The index cool nights was calculated of September only, the value obtained was 13.2, corresponding class environment with cool nights. Depending on the number of days with critical values were calculated frequencies of the risk factor (%). Thus, the highest values of the risk factor, namely 80.65% and 51.61% were recorded in July and August.

The ripening of grapes was followed starting on 01.08.2013 until harvest at nine grape varieties, evaluating, in dynamic, weight of 100 grape berries (g), the total acidity (g/L tartaric acid) and sugar content (g/L), (table 2). At white wine varieties, *weight of 100 grains* increased differently percentage of five in five days. Between 06.08.2012 - 15.08.2012, weight of 100 grains increased significantly by 19.0% - 23.2% in four varieties. The lowest percentage, 11.8%, was recorded at Feteasca regala variety and the highest percentage, 24.2%, was recorded at Chardonnay. Between 20.08.-29.08.2012 the grains weight increased by 5.6% and 10% for Aligoté, Fetească ragala, Fetească alba, Chardonnay, Riesling Italian varieties and only 1.7% for Sauvignon blanc.

On 29.08.2012 it was found that most of the berries weight was obtained in Fetească alba variety, namely 136 g, and the lowest weight, 112 g, was recorded in Riesling italian variety. At Cabernet Sauvignon variety the significant increase in the weight of 100 grains was 26% in the period 06.08.-15.08.2012. The same evolution of the 100 berries weight was found in aromatic wine varieties, Busuioaca Bohotin and Muscat Ottonel. The 100 berries weight evolution during 01.08 - 29.08.2012 highlights the influence of climatic conditions. In July and especially in August 2012, were high temperatures over 30oC, totaling 41 days. In this context, associated with very little precipitation, the weight of the grapes was clearly affected.

Table 2

The grapes ripening evolution, in 2012, in the Copou-Iaşi vineyard center

Wine	Variety	Data	Basic analytical parameters			
			Sugars (g/L)	Weight 100 berries (g)	Total acidity (g/L tartaric acid)	pH
White wines	Aligoté	01.08.	68	79	27,5	2,99
		06.08.	91	85	24,4	3,70
		15.08.	137	108	14,5	3,17
		20.08.	149	117	12,3	3,17
		29.08.	172	125	7,7	3,38
	Chardonnay	01.08.	90	75	17,3	3,16
		06.08.	109	89	17,1	3,11
		15.08.	158	110	13,8	3,31
		20.08.	158	113	10,7	3,24
		29.08.	180	122	7,7	3,55
	Feteasca alba	01.08.	88	81	19,3	3,08
		06.08.	115	96	15,0	3,25
		15.08.	135	125	12,2	3,36
		20.08.	147	125	9,2	3,55
		29.08.	186	136	6,1	3,66
	Feteasca regală	01.08.	70	91	20,7	2,96
		06.08.	102	97	16,8	3,08
		15.08.	138	110	13,8	3,29
		20.08.	153	118	11,5	3,23
		29.08.	174	125	6,9	3,43
	Riesling italian	01.08.	40	60	32,4	2,85
		06.08.	70	71	24,5	2,96
		15.08.	103	90	15,3	3,12
		20.08.	117	100	14,5	3,04
		29.08.	153	112	10,7	3,13
	Sauvignon blanc	01.08.	84	77	18,3	3,05
		06.08.	107	81	17,1	3,01
		15.08.	138	107	13,8	3,23
		20.08.	154	113	12,3	3,11
		29.08.	175	115	6,9	3,33
Red wines	Cabernet Sauvignon	01.08.	38	56	33,5	2,95
		06.08.	56	56	34,2	2,92
		15.08.	98	72	16,8	3,16
		20.08.	115	79	15,6	3,15
		29.08.	160	85	11,5	3,28
Aromatic wines	Busuioaca de Bohotin	01.08.	90	94	19,4	3,07
		06.08.	117	96	16,4	3,12
		15.08.	143	113	12,2	3,32
		20.08.	145	116	11,5	3,43
		29.08.	176	125	7,9	3,52
	Muscat Ottonel	01.08.	76	97	14,7	3,06
		06.08.	87	99	15,3	3,18
		15.08.	103	110	9,9	3,20
		20.08.	105	120	8,9	3,27
		29.08.	152	138	5,4	3,44

The sugars content evolution in the range 01.08.-29.08.2012, was different for white wines and red wines varieties. Increasing sugar content was high between 01.08.-15.08.2012 for all varieties analyzed, highlighting Chardonnay variety with the highest concentration of sugar, 158 g/L, and Riesling Italian variety with the lowest concentration of 103 g/L. In the next period, 15.08.-20.08.2012 the sugars accumulations were lower. On 20.08.2012 the concentration of sugars increased by only 3.0 -11.0 % depending on the variety.

The progressive accumulation of sugars, slow, the next nine days, resulted concentrations of sugars between 172-180 g/L for Aligoté, Chardonnay, Fetească regală and Sauvignon blanc varieties. In 2012 compared with 2011, at the same 29.08.2012 date, concentrations of sugars of grapes for white wines varieties were higher by 31.9% in Aligoté, 11.6 % Chardonnay, 18,3% Fetească albă, 26.4% in Fetească regală, 18.8% Sauvignon Blanc and 38.1% for Cabernet Sauvignon. In contrast, aromatic wine variety, Muscat Ottonel, accumulated the same amount, of 152 g/L sugars, on 29.08. both in 2011 and in 2012.

The values of total acidity of must on 01/08/2012 was ranged between 32.4 to 17.3 g/L tartaric acid. Based on these values, at the time intervals analyzed, total acidity continued to fall differently depending on the variety. In the first period 01.08. - 06.08.2012 total acidity decreased by 6.5 to 18.8% for Sauvignon Blanc, Aligoté, Fetească regală and 22.2% - 24.3% for Fetească alba and Riesling italian. Total acidity values in the next period 06.08.-15.08.2012 declined in all varieties analyzed, namely by 37.5% and 40.5% for Riesling Italian and Aligoté. Between 15.08.-29.08 was accentuated decrease in total acidity so, at the end of period, on 29.08.212, the values of total acidity in white wine varieties, ranged from 6.1 to 10.7 g/L tartaric acid. A similar evolution was found in the case of total acidity in red wine variety, Cabernet Sauvignon, and aromatic wine varieties, Bohotin Busuioaca and Muscat Ottonel. This evolution of total acidity due to high temperatures both during forerunner determinations (June and July) and in August 2012.

An overview of the maturation process data, show that in 2012, full and phenolic maturity reached much faster due to climatic conditions which led to the starting of grape harvest campaign soon about 15 days. The white wine grape varieties were harvested in the first decade of September 2012, namely between 03.09. - 11.09.2012. Cabernet Sauvignon and Busuioaca Bohotin varieties were collected on 13.09.2012 and 14.09.2012 in 2012. Given the conditions of drought and high temperature values, in 2012, yields in stum have been much smaller than in previous years, namely between 71.81% for white wine varieties and 76.00 % in Cabernet Sauvignon.

CONCLUSIONS

1. The year 2012 was characterized by a frosty winter with low temperatures, below the frost resistance of the vine, a warmer than normal spring followed by a dry summer with high temperatures.

2. During April-September, according to vineyard climate of the growing season were recorded average monthly temperatures higher than the multiannual

values, these increasing from 12.9 in April to 24.5 in June. June, July and August were the warmest months, when average maximum temperatures were 28.3°C, 32.8°C and 29.3°C.

3. Ripening period of the grapes was very hot recorded, even in June and during July and August, 55 days, with frequently temperatures from 33.5 to 36.5°C. This period coincided with the installation and maintenance of drought by the end of the ripening period of the grapes.

4. Climatic conditions in 2012 led faster to the achievement of technological and phenolic maturity of grapes, thus, starting grape harvest campaign was earlier almost 15 days.

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TESTING FERTILITY STATUS BY ANALYZING THE LIQUID FROM THE GRAPEVINE "WEEPING" TO FETEASCA ALBĂ IN ŞTEFĂNEŞTI - ARGES AND BREAZA GROW-WINE CENTERS

TESTAREA STĂRII DE FERTILITATE PRIN ANALIZA LICHIDULUI REZULTAT DE LA PLÂNSUL VIŢEI DE VIE LA SOIUL FETEASCĂ ALBĂ, ÎN CENTRUL VITICOL ŞTEFĂNEŞTI - ARGEŞ ŞI BREAZA

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Abstract: *The disbudding phenophase to Fetească albă variety started slowly in intensity, being dependent on environmental factors (air temperature, soil), grow-wine center, applied cutting system, and status of soil with nutrient spring supply. Nutrient supply has been weak, establishing a direct relation between soil mobile NPK content and fluid from weeping wine. The chemical composition of the liquid from the weeping wines quantity and quality was variable, depending on the applied fertilizer dose, grow-wine center and year of the study. Big quantitative differences were recorded in the Breaza grow-wine center, (815,6 ml) and qualitative composition of the liquid from the total N was higher in the Stefanesti grow-wine center (19,6 mg/l) and low differences between centers for the supply of mobile P and a higher supply of mobile K (60,1 mg/l) in the Breaza grow-wine center. Global nutrition showed higher average values (85,7 mg/l) in the Ştefăneşti grow-wine center.*
Key words*: fertility, fertilization, variety*

Rezumat: *Fenofaza dezmuguritului la soiul Feteasca albă a început lent ca intensitate, fiind dependentă de factorii de mediu (temperatura aerului, a solului), centrul viticol, sistemul de tăiere aplicat, precum şi aprovizionarea solului cu nutrienţi primăvara devreme. Aprovizionarea cu nutrienţi a fost slabă, stabilindu-se un raport direct între conţinutul solului în NPK-mobil şi conţinutul lichidului rezultat la plânsul viţei de vie. Compoziţia chimică a lichidului de la plânsul viţei de vie a prezentat variaţii cantitatative şi calitatve, în funcţie de doza de îngrăşământ aplicată, şi anul de studiu. Diferenţe mari cantitative au fost înregistrate în centul viticol Breaza, (815,6 ml), iar compoziţia calitativă a lichidului în N total a fost mai mare în Stefănesti (19,6 mg/l), diferenţele mici între centre privind aprovizionarea cu P-mobil şi o aprovizionare mai mare de K mobil (60,1 mg/l) în centrul viticol Breaza.*
Cuvinte cheie: *fertilitate, fertilizare, soi*

INTRODUCTION

After springtime cutting, grapes start the vegetation period when soil and air temperature are favourable. The accumulation of nutrients in plants depends on the soil fertility.

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Supply of any chemical element from the soil is well balanced with liquid quantity and with nutrients quantity from the liquid resulted from grape crying. A ratio can be notice between the resulted grape crying liquid, nutrition quantity and the supply of soil (Davidescu şi colab. 1972, 1981).

Fertility tests of soil through chemical analysis of soil and plant it is realized for the determination of status supply with nutrients. According to Condei, 1980, optimal supply is:

- PAL – 20-30 mg/P_2O_5 / 100 g soil;
- KAL- 40-50 mgK_2O/100 g soil,
- Ca CO_3 activ < 5 %;
- Mg changeable 15-20 mg/ 100 g soil;
- B hidrosolubil 2,5-5 ppm.

MATERIAL AND METHOD

Experience (trial) I - was located in western site of viticulture center Ştefăneşti – Goleasca, in a Fetească albă variety vineyard grafted on rootstock Berlandieri x Riparia Kober 5 BB, 15 years old. Planting distances were 2.20 / 1.20 m. Applied cutting type was Guyot. Landform plateau was represented by 0% slope, altitude 742 m and rows vines orientation was N-S direction.

Second experience (trial) was placed in the center Breaza vineyard, located in the eastern part of Dealu Mare vineyard, where it was studied Fetească albă variety grafted on rootstock Berlandieri x Riparia Teleki 8 B, 17 years old. Planting distances were 2.20 / 1.20 m. The leading type was middle high and cutting system was mixt, characterized by branch with 12-14 eyes and replacement branches with 2-3 eyes. The soil type was sandy-loam with sandy texture in the surface horizon and underlying clayey. Soil reaction was slightly alkaline to strongly alkaline in underlying horizons, ranging from 6.6 to 7.4. The experiments were conducted in 2002-2004. Chemical fertilizers used for fertilization was:

- Ammonium nitrates 34.55%;
- Simple superphosphate granulated with 18% P_2O_5;
- Potassium salt with 48-50% K_2O.

RESULTS AND DISCUSSION

"Crying" phenophase it was dependent on climate conditions (air temperature, soil temperature), variety, cutting system and soil status supply with nutrients in the spring beginning. The nutrition status can be appreciated by ratio between soil content in mobil NPK and liquid resulted from grapevine "crying".

In Breaza centre, grapevine "crying" start early with a few days by rapport Stefanesti centre, because the soil average temperature had in each year higher values (tab. 1).

Liquid collected was averaged 815.6 ml, wine center Breaza respectively Ştefăneşti 652.0 ml wine center.

Regarding the total potassium content of liquid from grapevines "crying", can observe a weak supply this element, ranging from 57.1 mg / l in wine center Ştefăneşti to 60.1 mg / l at Breaza (Fig.1).

Table 1

The liquid resulted in phenophase "crying" in Fetească albă between 2002-2004

Grapevine center	Liquid quantiti (ml)			
	2002	**2003**	**2004**	**Media**
Breaza	1280,4	520,6	645,8	815,6
Ştefăneşti	925,5	300,0	730,5	652, 0
Crying started				
	2002	**2003**	**2004**	
Breaza	14 III	18 III	20 III	
Ştefăneşti	20 III	26 III	23 III	
Soil average temperature (^{0}C)				
	2002	**2003**	**2004**	
Breaza	10	10	10	
Ştefăneşti	9	8	8,5	

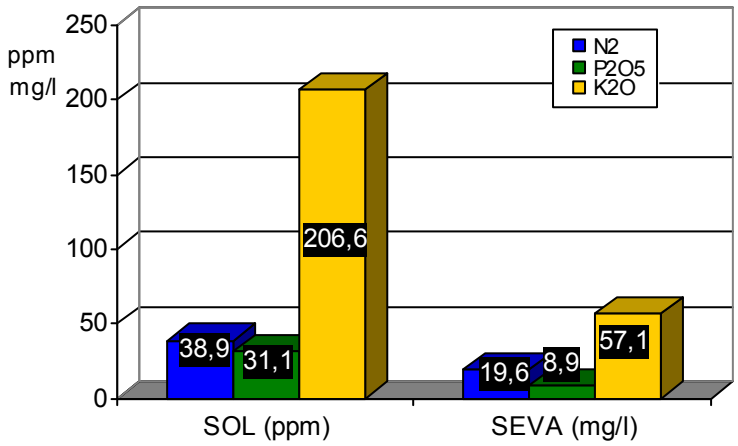


Fig. 1 - The content of the soil and the liquid from the "crying" of vines in total forms NPK - Fetească albă, wine center Ştefăneşti - Argeş (2002-2004)

Total nitrogen supply status increased from 14.1 mg/l in wine center Breaza to 19.6 mg / l in wine center Ştefăneşti (Fig. 2).

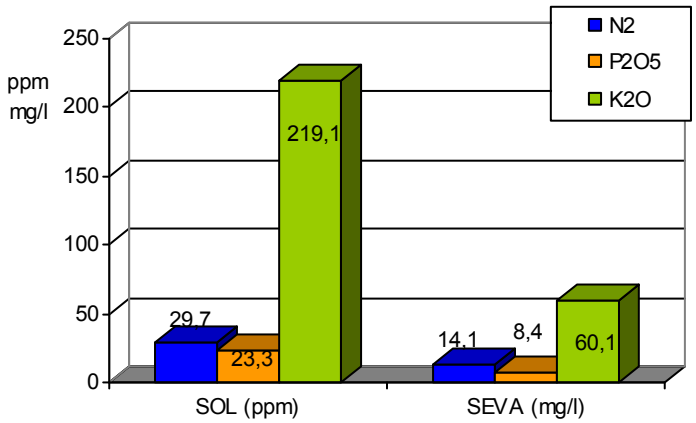


Fig. 2 - The content of the soil and the liquid from the "crying" of vines in total forms NPK - Fetească albă, wine center Breaza (2002-2004)

CONCLUSIONS

1. Supply status of soil and plant, represent the difference regarding the total NPK content by soil type and growing centre.

2. Chemical composition of resulted liquid from grape crying is influenced by the soil supply level.

3. Based on studies showing the necessity of completing the necessary nutrients through fertilization to prevent possible installation of physiological disorder.

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LA TYPICITÉ PHENOLIQUE DES RAISINS NOIR PAR RAPPORT AUX CONDITIONS CLIMATIQUES DE LA MILLÈSIME

TIPICITATEA FENOLICĂ A STRUGURILOR NEGRI IN RELAȚIE CU CONDITIILE CLIMATICE ALE ANULUI DE RECOLTĂ

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Résumé. *La typicité est un terme qui peut être évalué au niveau analytique et sensoriel. La typicité phénolique des raisins noir est analytique. Elle est en relation avec le cépage et les conditions environnementales et donc avec les conditions climatiques de l'année de récolte. La composition phénolique et l'extractibilité définissent la typicité phénolique. Elle montre une grande importance pratique en vinification dans le sens lequel est définitif pour le style du vin et pour la technique de vinification. Ce travail vise de développer une méthodologie pour l'évaluation de la typicité phénolique des raisins noirs et de la définir dans les conditions de l'année 2012, pour l'assortiment spécifique de la région AOC Dealu Mare Valea Călugăreasca. L'information nécessaire pour l'évaluation de la typicité phénolique des raisins noirs a été structurée en 5 éléments : le climat de la période de maturation, la maturation technologique, l'évolution des anthocyanes, la maturité phénolique, la composition mécanique des raisins. Les paramètres climatiques ont été enregistrés à la station météorologique automatique ADCON 753. La dynamique de la maturation a été établi par l'analyse de l'indice de maturité (S/TA). Le potentiel phénolique a été obtenu par l'analyse en laboratoire en utilisant la méthode Glories. La méthodologie a été validée sur les cépages: Burgund Mare, Cabernet Sauvignon, Feteascã neagrã, Merlot et Pinot noir, la récolte de l'année 2012.*

Mots clés*: typicité phénolique, le changement climatique, la maturité phénolique*

Rezumat. *Tipicitatea este un termen abordabil la nivel analitic şi senzorial. Tipicitatea fenolicã a strugurilor negri se poate exprima analitic şi este în relație cu soiul şi condițiile de mediu, implicit cu condițiile climatice ale anului de recoltã. Compoziția fenolicã şi extractibilitatea definesc tipicitatea fenolicã.. Ea prezintã o mare importanță practicã în vinificare în sensul cã este definitoare pentru stilul de vin şi tehnica de vinificare. Lucrarea îşi propune sã defineascã metodologia pentru evaluarea tipicității fenolice a strugurilor negri şi sã o defineascã în condițiile anului 2012 pentru sortimentul specific al arealului cu DOC Dealu Mare Valea Călugăreasca. Informația necesarã pentru evaluarea tipicității fenolice a strugurilor negri pentru vin a fost structuratã in 5 componente: climatul perioadei de maturare, dinamica maturării pulpei, dinamica maturării fenolice, potențial fenolic la recoltare şi analiza mecanicã a strugurilor. Datele de climat viticol au fost colectate cu ajutorul stației meteo automatã ADCON 753. Dinamica maturării pulpei s-a stabilit prin analiza indicelui glucoacidimetric. Dinamica maturării fenolice s-a stabilit pe baza evolutiei concentratiei de antociani. Potențialul fenolic s-a realizat prin analiza de laborator aplicând metoda Glories. Metodologia a fost*

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validată pe soiurile: Burgund mare, Cabernet Sauvignon, Feteascã neagrã, Merlot şi Pinot noir, din recolta anului 2012.
***Cuvinte cheie**: tipicitate fenolicã, schimbări climatice, maturitate fenolicã*

INTRODUCTION

La typicité phénolique des raisins noir peut être évaluée analytique et elle est en relation avec la variété, les conditions environnementales et les conditions climatiques de la période de maturation. La typicité des vins représente toutes les caractéristiques d'un vin comme le résultat de l'interaction entre la variété, le climat, le sol, les techniques de vinification.

Le choix correctement de la date de vendange est un facteur important pour la production des vins de qualité et dépend de la composition physico-chimique et phénolique des raisins. Elle détermine d'autre part le type de vin.

Des nombreuses études montrent l'importance des composés phénoliques sur la qualité et sur les caractéristiques organoleptiques des vins rouges (Cadot, 2011). La formation des composés phénoliques dépend dans une large mesure des conditions environnementales, considérés comme un résultat de l'interaction entre la vigne et son environnement biotique et abiotique. La biosynthèse des composés phénoliques est fortement influencée par la température, les précipitations et l'ensoleillement pendant la période de maturation des raisins. C'est un processus complexe enzymatique qui coule suit: chalcone-flavone-dihidroflavona, leucoantocianidine-anthocyanidines, les anthocyanes (Simon et Robinson Chris Davies, 2000).

La maturation phénolique peut être définie comme le moment de l'évolution des raisins, quand on peut réaliser leur potentiel phénolique maximum et on peut être une bonne capacité de diffusion dans le vin (Glories 1998, cité par Cadot). Cela dépend de la quantité totale de composés phénoliques, de leur structure et de la capacité d'extraction et la diffusion dans le vin lors de la vinification. L'évolution et l'accumulation de composés phénoliques au cours de maturation des raisins est très variée et différente décrite par plusieurs auteurs. Certains d'entre eux pensent que dans le cours de la maturation il ya une augmentation des proanthocyanidines (Kennedy et al, 2002 cité par Cadot), tandis que d'autres décrivent une réduction de ces composés dans cette période (Downey et al, 2003; Gagne et al, 2006; Harbertson et al., 2002) cités par Yves Cadot. L'évaluation de la typicité phénolique des raisins noirs a été realisé par la caractérisation des paramètres physico-chimiques et polyphénoliques des raisins au cours de leur maturation et à la maturité optimale dans des conditions ecoclimatiques de la région de Dealu Mare le centre viticole Valea Călugărească pendant l'année 2012. Le millésime 2012 a bénéficié d'un régime thermique riche avec des multiples influences dans le développement des stades phénologiques de la vigne.

Ce travail a visé l'étude de quatre objectifs:

1. La caractérisation du climat pendant la période de maturation des raisins, le millésime 2012

2. L'évolution de la maturation technologique de raisins
3. L'évolution des anthocyanes au cours de la maturation des raisins;
4. La caractérisation de la maturité phénolique des raisins à la vendange.

MATÉRIEL ET MÉTHODE

Dans cette étude ont été caractérisés les suivant cépages noirs: Cabernet Sauvignon, Merlot, Pinot noir, Fetească neagră, Burgund mare.

Les plantations étudiées sont situées dans la région AOC Dealu Mare, le centre viticole Valea Călugăreasca. Les plantations ont une densité de 4167 pieds / ha.

Pour atteindre le premier objectif a été utilisés les informations sur les conditions climatiques de la base de données de ICDVV Valea Călugăreasca. Pour répondre à la deuxieme objectif les échantillons des raisins ont été realisé dans la période comprise entre la véraison et la maturité optimale à un intervalle de 5-7 jours. L'échantillonnage a été effectué selon le protocole établi par IC-DVV. Les paramètres comme l'accumulation des sucres (^{0}Brix) et l'acidité totale (g d'équivalent d'acide tartrique/l) sont regroupés sous le nom de «Maturité technologique ». Ces paramètres permettent de calculer l'indice de maturité technologique (IMT). L'évolution de poids de 100 baies et des anthocyanes ont été effectués. Pour atteindre l'objectif 3 ont été réalisées les suivant déterminations: la maturité phénolique définie par les polyphénols totaux, les anthocyanes totales, les anthocyanes extractibles, D peau, D pépins, la maturité des pépins. Les déterminations ont été réalisées selon la méthode Glories (2004). La méthode consiste à prélever 300 baies. On choisit 5 baies par souche. Le contrôle de la maturité phénolique est basé sur la différence d'extraction des composes phénoliques des raisins à deux pH différents après broyage des baies : d'une part a pH 3,2 proche de celui des raisins prélèves ce qui permet d'accéder aux composes phénoliques ; d'autre part à pH 1, pH acide qui entraîne la dégradation des cellules de la pellicule et favorise ainsi l'extraction des anthocyanes. La maturité phénolique des pépins est considère comme le pourcentage de la contribution des pépins à la densité optique 280 nm de la solution à pH 3,2.

On définit des valeurs suivantes: le potentiel des composés phénoliques totaux, le potentiel des anthocyanes, extractibilité des anthocyanes et le potentiel de tanins des pépins.

RÉSULTATS ET DISCUSSIONS

Le climat pendant la maturation des raisins millésime 2012

En 2012, la maturation des raisins noirs a été réalisée dans un climat riche en ressources héliothermiques. La température moyenne en Août était de 23,7 ° C et a variée entre 39,7°C la température maximale et 12,8°C la température minimale (Tableau 1). La durée d'ensoleillement en Août était de 326,8 heures. Il y avait des précipitations moyennes (63,1 mm). Les deux premières décades de Septembre ont été caractérisées par une température moyenne de 14,8°C. Les précipitations moyennes en Septembre étaient négligeables. Globalement la période de la maturation des raisins a été caracterisé par un climat sec. Il y a eu 17 jours avec des températures supérieures à 30°C et la hygroscopicité de l'air souvent se tenaient au-dessous de 50%.

Tableau 1

Les paramètres climatiques et les indices d'Août et Septembre de l'année 2012

Mois	Décade	Tmed	T max	no. de jours T>30°C	IH $\sum^0$C	Pp mm	no. de jours Pp	U %
Août	I	26,6	39,7	9	213,5	25,3	1,00	49,2
	II	19,9	31,5	1	138,1	25,4	3,00	59,0
	III	24,7	39,2	6	197,4	12,4	2,00	46,9
Septembre	I	20,5	30,5	1	148,2	0	0,00	50,4
	II	18,9	29,5		126,8	2,2	2,00	59,9

IH-indice héliotermique de Huglin (∑ C); Pp-précipitations (mm); U-humidité relative de l'air (%)

L'évolution de la maturation des raisins

Dans l'annee 2012 le début de la veraison des cepages a été réalisée entre 29.07-03.08. Le taux de la maturation a été rapide pour Fetească neagrã (2.129) et Merlot (2.029), moyenne élevé pour Burgund mare (0.843), Cabernet Sauvignon (1.229) et petit pour le cépage Pinot Noir (0.386) (tableau 2).

Tableau 2

L'évaluation de l'indice de la maturité des raisins

Cepage	L'équation	Le coefficient de régression	Signification
Burgund mare	0.8429x-34947	0.932	**
Cabernet Sauvignon	1.2286x-50958	0.778	*
Fetească neagră	2.1286x-88304	0.817	**
Merlot	2.0286x -84147	0.836	**
Pinot noir	0.3857x-15967	0.992	**

La maturité des raisins a été réalisée entre le 18 août (Pinot noir) et le 2 septembre (Cabernet Sauvignon) (Figure 1).

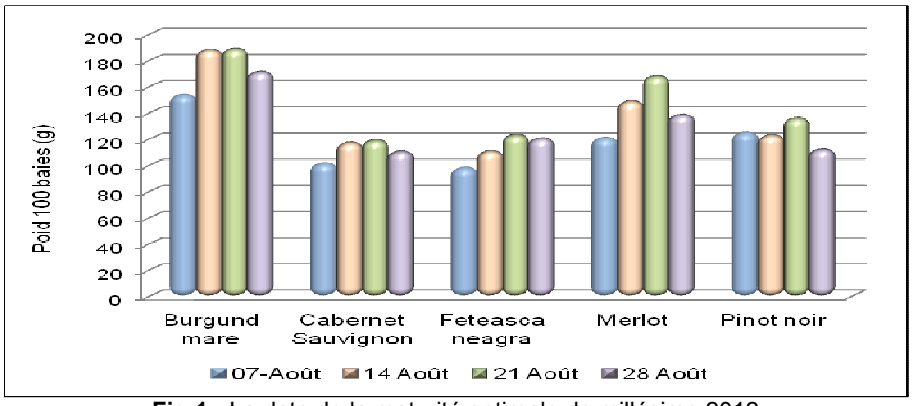


Fig.1 - La date de la maturité optimale de millésime 2012

Le moment de la maturité optimale a été établi comme la date à laquelle le poids de 100 baies (G100) était le plus élevé. Cette valeur a été calculée pour chaque variété basée sur le modèle mathématique associé à l'évolution du G100 (tableau 3). Les coefficients de régression de modèle sont distinctes semnificatifs pour les cépages Burgund mare, Cabernet Sauvignon, Fetească neagră et Merlot et semnificatif pour Pinot noir.

Tableau 3

L'évolution de poids de 100 baies au cours de la maturation des raisins

Cepage	L'équation	Le coefficient de régression	Signification
Burgund mare	$-0.2602x^2+21600x-4E+0.8$	0.986	**
Cabernet Sauvignon	$-0.1224\ x^2+10165x-2E+0.8$	0.996	**
Fetească neagră	$-0.0765\ x^2+6353.7x-1E+0.8$	0.979	**
Merlot	$-0.2908\ x^2+24141x-5E+0.8$	0.934	**
Pinot noir	$-0.1327\ x^2+11011x-2E+0.8$	0.666	*

L'evolution des anthocyanes au cours de la maturation des raisins

Dans le climat sec de la période de maturation de la récolte 2012, l'accumulation des anthocyanes a été rapide, mais faible du point de vue quantitatif (Figure 2).

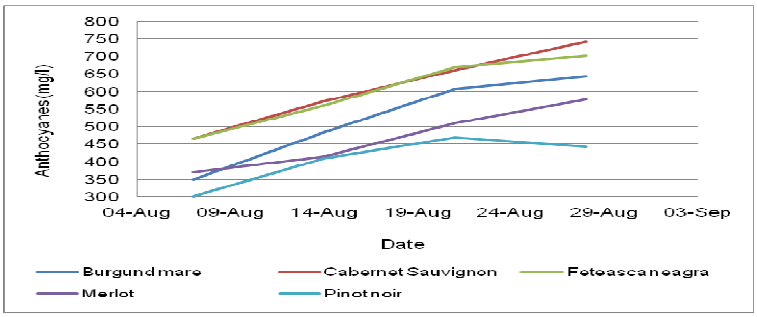


Fig. 2 - L'evolution des anthocyanes au cours de la maturation des raisins

L'allure de la courbe est dépendante du moment de la maturité optimale du cépage.

L'évaluation de la maturité phénolique de raisins noir à la vendange

À la vendange les raisins noir ont présentés une maturité spécifique de cépage. Les paramètres qui définissent les caractéristiques spécifiques sont présentés dans le tableau 4. Les paramètres de la maturité phénolique pour les raisins noirs à la vendange sont les suivants: indice de polyphénols, le potentiel total des anthocyanes totaux extractibles, le potentiel des tanins et la maturation de pépins. En termes d'accumulation des anthocyanes totaux dans la peau ont été enregistrées des valeurs élevées pour Cabernet Sauvignon (1437 mg / l) et Merlot (1281 mg / l) et très faible dans le cas de Pinot noir (480 mg / l), (Figure 3). Feteasca neagra a enregistré en 2012 le plus fort potentiel des anthocyanes extractibles (987 mg / l), suivi par Merlot (780 mg / l) et Cabernet Sauvignon (756 mg / l) (figure 4).

Tableau 4

Les paramètres de la maturité phénolique pour les raisins, millésime 2012

Cépage	IPT (UA)	Le potentiel des anthocyanes totaux (mg/l)	Le potentiel des anthocyanes totaux extractibles (mg/l)	D peau (UA)	D pépins (UA)
Burgund mare	47	1132	576	24	51
Cabernet Sauvignon	46	1437	756	8	26
Feteasca neagra	42	1119	987	7	6
Merlot	46	1281	780	15	32
Pinot noir	62	480	355	48	77

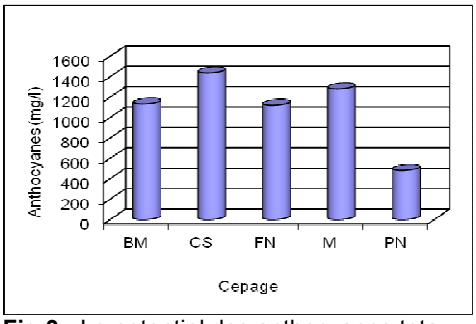


Fig.3 - Le potentiel des anthocyanes totaux

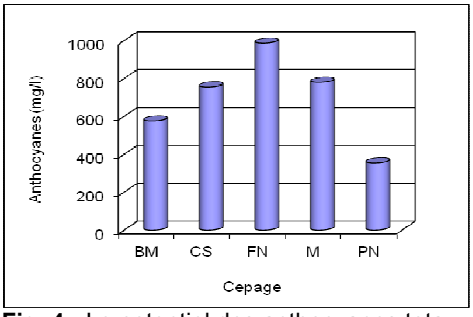


Fig. 4 - Le potentiel des anthocyanes totaux extractibles

CONCLUSIONS

1. Le climat de la période de maturation de raisins pendant l'année 2012 a été très sec et a présenté des températures critiques pour la maturation des pulpes et la maturation phénolique.

2. La maturation de la pulpe de raisins a été réalisée dans un taux élevé pendant une courte période de temps.

3. L'accumulation des anthocyanes a été réalisée avec un faible taux de croissance.

4. L'extractibilité des anthocyanes était excellent pour Fetească neagră (987 mg / l), très bon pour Merlot (780mg / l) et Cabernet Sauvignon (756 mg / l), bon pour Burgund mare (576 mg / l) et faible pour Pinot Noir (355 mg / l).

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STUDIES ON THE BEHAVIOURAL TENDENCIES OF SOME GRAPE VARIETIES FOR WHITE WINES IN MOLDAVIAN VINEYARDS, UNDER THE INFLUENCE OF CLIMATIC CHANGES

CERCETĂRI PRIVIND TENDINȚELE DE COMPORTARE A UNOR SOIURI PENTRU VINURI ALBE CULTIVATE ÎN MOLDOVA, SUB INFLUENȚA MODIFICĂRILOR CLIMATICE

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Abstract. *The singular or cumulative effects of climatic risks and identification of most vulnerable areas are basic criteria in elaborating and founding a decisional system for long term agro-climatic management. In Romania, the highest occurring abiotic stress factors are deficit and excess of rains, low temperatures in winter and soaring temperatures in summer, hails and low fertility of soils. The biotic risk factors are represented by the attacks of diseases, pests and other competitive plants. Because of the global warming process, a change in the biological cycle of the vine is registered, a hastened pace of veraison and grape full maturity, not always in the benefit to the final product. This article presents some mathematical models of Fetească albă grape variety behavioural evolution in the some Moldavian vineyards, influenced by the recent climate changes.*
Key words: *vine, global warming, mathematical modeling*

Rezumat. *Cunoaşterea efectelor singulare sau cumulative ale riscurilor climatice şi identificarea arealelor agricole cele mai vulnerabile la producerea acestora sunt criterii de bază în elaborarea şi fundamentarea agroclimatică a unui sistem decizional de management durabil. În condițiile din România cei mai răspândiți factori de stres abiotic sunt deficitul şi excedentul pluviometric, temperaturile scăzute din perioada de iarnă, dar şi arşițele de vară, grindinele, fertilitatea scăzută a solurilor, iar dintre cele biotice, atacul bolilor, dăunătorilor şi a plantelor concurente. Datorită încălzirii globale la care asistăm în ultima vreme se constată o schimbare a evoluției ciclului biologic anual al viței de vie, cu parcurgerea mai rapidă a fenofazelor de pârgă şi maturare a strugurilor, aceasta fiind deseori forțată, iar implicațiile asupra calității produselor viticole sunt semnificative, însă nu întotdeauna în sens pozitiv. În lucrare sunt prezentate câteva modele matematice de evoluție a comportării soiului de viță de vie Fetească albă cultivat în podgoriile din Moldova, sub influența modificărilor climatice din ultima vreme.*
Cuvinte cheie: *viță de vie, încălzire globală, modelare matematică*

INTRODUCTION

The climatic changes of the last years, more or less at random, can seriously harm the homogeneity of viticultural biocenotic conditions, with unpredictable implications on the quantity and quality of the grape harvest.

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Evaluating the impact of climatic changes on the management of the viticultural resources and areas regarding world-wide geo-viticulture are high-end aims of research in this specific field (Antle J.M., 2008, Deschenes O. and Greenstone M., 2007). Extending the vine culture or introducing grape varieties in a certain area requires the evaluation of ecological favourability of the allocated space towards this purpose. The optimal and restrictive factors are thus underlined, as well as imprinting a certain direction of production, as well as choosing the best adapted grape varieties to the existing environmental conditions.

The changes expected in the Romanian climatic regime are heralded by the global context, but with specificities of the geographical region (Jones G.V. et al., 2007). Compared to the North-West of Europe, for example, where the most accentuated heat is expected during winter, in Romania, an increase in temperature values is expected in summer months.

MATERIAL AND METHOD

The behaviour of Fetească albă grape variety within Cotnari, Iaşi and Dealu Bujorului vineyards, during 2010-2012 was studied, in close regard to the main aspects of quality and quantity of the grape harvest: grape production / trunk, average number of grapes/ vine trunk, average mass of 100 berries, sugar content and total acidity of must. For the eco-climatic characterisation, the following indices were used: useful thermal sum (BTU), rainfall quantity during vegetation period (Pp.pv), mean annual temperature (Tm), absolute minimal temperature (Min.abs.) and absolute maximal temperature (Max.abs.), real helio-thermal index (IHr), hydrothermal coefficient (CH), bioclimatic index of vine (Ibcv), oeno-climatic aptitude index (IAOe).

In order to establish the influence of the climatic factors on the quantity and quality of grape harvest, mathematical modelling was used, based on the Principal Components Regression (PCR), PLS (Partial Least Squares regression) and Correlated Component Regression (CCR) with the help of XL-STAT program.

PCR (Principal Components Regression) can be divided into three steps: first a PCA (Principal Components Analysis) is run on the table of the explanatory variables, then we run an OLS (Ordinary Least Squares regression) on the selected components, then we compute the parameters of the model that correspond to the input variables (Jobson J. D., 1999).

PCA allows to transform an X table with n observations described by variables into an S table with n scores described by q components, where q is lower or equal to p and such that (S'S) is invertible. An additional selection can be applied on the components so that only the r components that are the most correlated with the Y variable are kept for the OLS regression step. We then obtain the R table.

The OLS regression is performed on the Y and R tables. In order to circumvent the interpretation problem with the parameters obtained from the regression, XL-STAT transforms the results back into the initial space to obtain the parameters and the confidence intervals that correspond to the input variables.

PLS Regression: this method is quick, efficient and optimal for a criterion based on covariance. It is recommended in cases where the number of variables is high, and where it is likely that the explanatory variables are correlated (Bastien et al., 2005).

The idea of PLS regression is to create, starting from a table with n observations described by p variables, a set of h components with h<p. The method used to build the components differs from PCA, and presents the advantage of handling missing data. The determination of the number of components to keep is

usually based on a criterion that involves a cross-validation. The user may also set the number of components to use.

Correlated Component Regression (CCR) use fast cross-validation to determine the amount of regularization to produce reliable predictions from data with P correlated explanatory (X) variables, where multi-colinearity may exist and P can be greater than the sample size N. The methods are based on Generalized Linear Models (GLM). As an option, the CCR step-down algorithm may be activated to exclude irrelevant Xs (Tenenhaus M., 1998).

The linear part of the model is a weighted average of K components S = (S1, S2, … , SK) where each component itself is a linear combination of the predictors. For a continuous Y, these procedures provide an alternative to traditional linear regression methods, where components may be correlated (CCR-LM procedure), or restricted to be uncorrelated with components obtained by PLS regression techniques (CCR-PLS). Typically K<P, resulting in model regularization that reduces prediction error.

Traditional maximum likelihood regression methods, which employ no regularization at all, can be obtained as a special case of these models when K=P (the saturated model). Regularization, inherent in the CCR methods, reduces the variance (instability) of prediction and also lowers the mean squared error of prediction when the predictors have moderate to high correlation. The smaller the value for K, the more regularization is applied. Typically, K will be less than 10 (quite often K = 2, 3 or 4) regardless of P. M-fold cross-validation techniques are used to determine the amount of regularization K* to apply, and the number of predictors P* to include in the model when the step-down algorithm is utilized.

RESULTS AND DISCUSSIONS

Figure 1 presents the correlations circle of analysed variables. One notices that the information of the two main components regarding the segregation of registered observations, is very high, namely 92.24%, fact that reflects the high bind between them and the analysed climatic parameters.

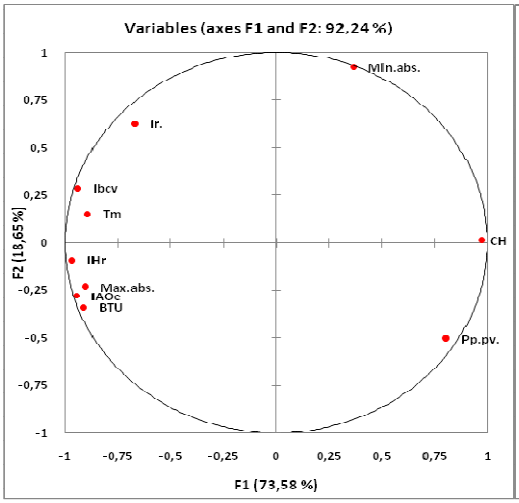


Fig. 1 – Correlations circle

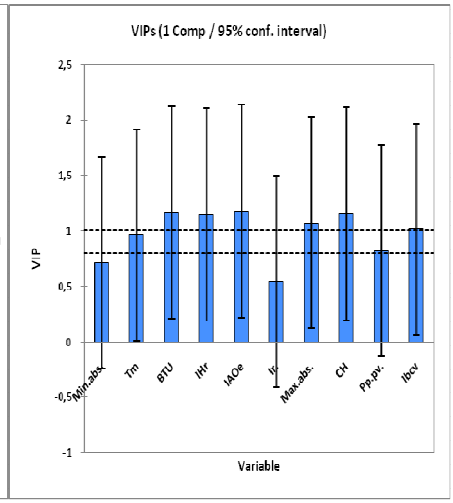


Fig. 2 – Climatic parameters that define the main component 1

Figure 2 presents the role of each climatic factor in defining the main component 1, with the highest segregation capacity of respectively 73,58%. It is registered that the correlations between the useful thermal sum, real helio-thermal index, oeno-climatic aptitude index, hydrothermal coefficient and last but not least the absolute maximal temperature and the viticultural bioclimatic index are positive.

Figure 3 describes the participation of the climatic factors on modelling the behaviour of the Fetească albă grape variety from the three before mentioned vineyards during 2010-2012.

The "production" variable is positively influenced by rainfalls during the vegetation period and negatively influenced by the values of the viticultural bioclimatic index. Therefore, the higher the values of this index (draught), the smaller the production will be.

Regarding the variable "number of grapes" it appears that the rainfall regimen and average temperatures have the maximum positive influence while the real helio-thermal index and real insolation values have the maximum negative effect. Therefore, high values of insolation can contribute to reducing the average number of grapes per vine.

Regarding the variable "average weight of a grape" one can notice that it is positively influenced by high values of the real helio-thermal index and of the hydrothermal coefficient.

A Fetească albă variety cultivated in an area with balanced temperature and water intake can lead to an increase of this variable, while culture in an area where the average annual temperature is low negatively contributes to a growth of this variable.

The "mass of 100 grape berries" variable is negatively influenced by high values of the real helio-thermal index. Corroborated with high values of the insolation regimen and low rainfall quantity within the vegetation period, lower positive values for the berries mass are registered.

In the case of "sugar content" variable, the positive influence of the thermic factor is underlined. The oeno-climatic aptitude index has the biggest influence on the above mentioned variable.

The influence of the useful thermal sum, as well as that of the absolute maximal temperature is beneficial, due to the high values of these two indices grater accumulations of sugar can be registered.

The variable "must total acidity" is influenced by many factors: the high values of useful thermal sum, oeno-climatic aptitude index, the absolute maximal temperature, being conditioned also by the insolation and hydric regimen.

Of all the studied variables, the highest influence has the real helio-thermal index, with a standardised value of the coefficient of 0,614, for the variable "mean mass of a grape".

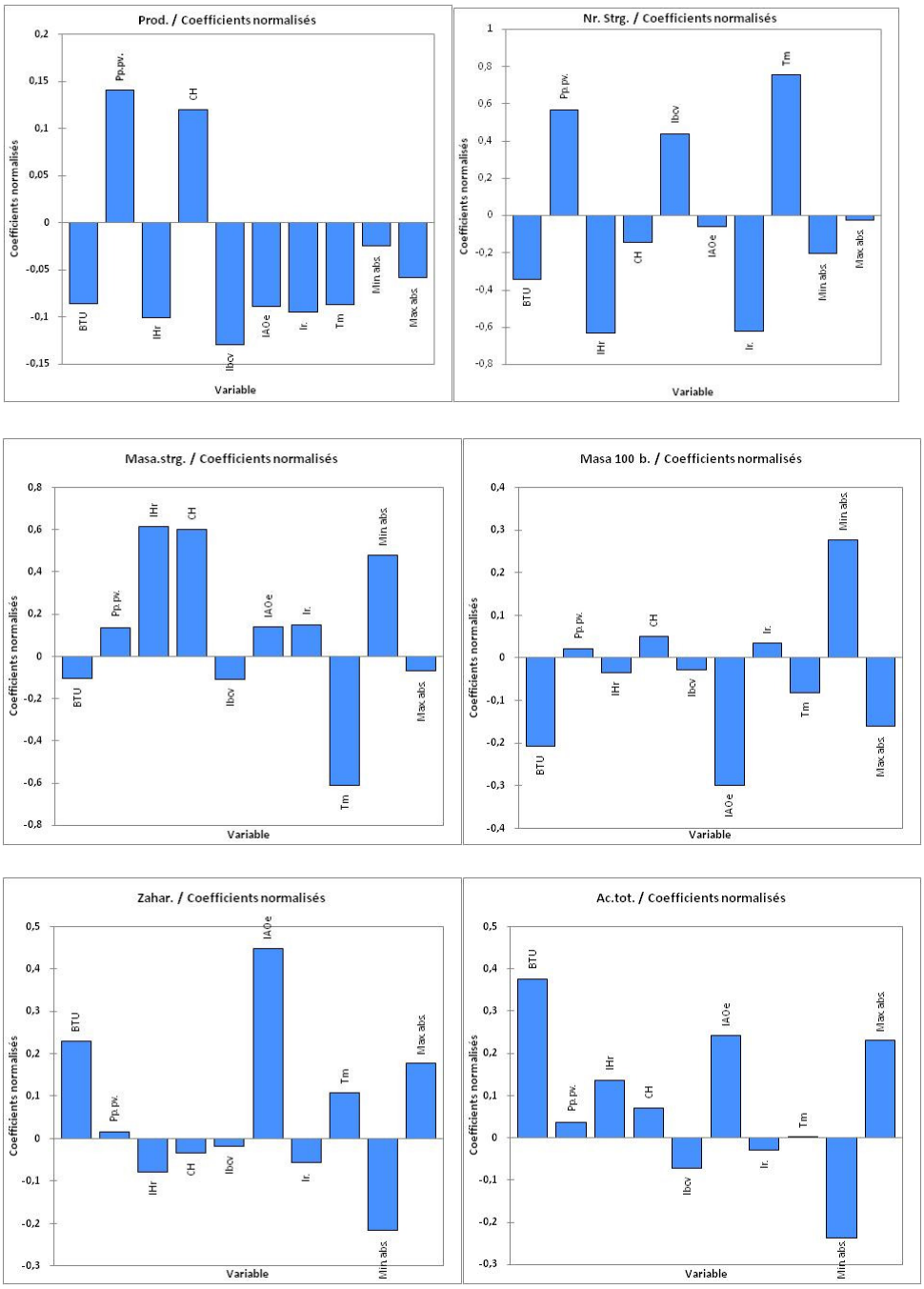


Fig. 3 – Establishing the influence of climatic parameters on modelling the quantitative and qualitative characteristics of Fetească albă grape production, in Cotnari, Iaşi and Dealu Bujorului vineyards, in 2010-2012

CONCLUSIONS

After applying a mathematical model regarding the behaviour of Feteasc㠠albă grape variety, from Cotnari, Iaşi and Dealu Bujorului vineyards during 2010-2012, the conclusion that the use of multi-variation statistics as a predicting method for the conduct of a grape variety in a viticultural area is beneficial.

The eco-climatic influence of a viticultural area is characterized through indices and climatic parameters by establishing the role of each on the vine, with the help of mathematical models based on multidimensional statistics.

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THE SPECIFICITY OF THE AREA DOC DEALU MARE-VALEA CĂLUGĂREASCĂ FOR THERMAL NECESSARY OF VARIETIES FOR RED WINES

SPECIFICITATEA AREALULUI DOC DEALU MARE-VALEA CĂLUGĂREASCĂ PRIVIND NECESARUL TERMIC AL SOIURILOR PENTRU VINURI ROŞII

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Abstract. *The temperature exerts a significant influence on the development of vine and the grapes ripening. The thermal necessary of varieties is an important element which permits the evaluation of area at the level of potentiating wine varieties, but also forecasting based on mathematical models differentiated on varieties harvest date. The temperature evaluation, as part of viticultural climate, is based on parameters and temperature indicators. The objective of this study is to define the thermal necessary of varieties for red wines of the assortment Dealu Mare-Valea Calugareasca viticultural area and shape the grapes ripening in the heat-sugar concentration system resource in the grapes. The assortment studied is the following: Burgund mare, Cabernet Sauvignon, Feteasca neagra, Merlot and Pinot noir. The period of the study was between 1992 and 1996, and the validation of the model was achieved in 2012. Analyses of the correlation between temperature indicator and concentration of sugars in the grapes has shown that Huglin index had the highest correlation. It presented specific values when the grapes had the concentration of sugars of 180 g/l as follows: 1784 at Burgund mare, 1871 at Cabernet Sauvignon, 1685 at Feteasca neagra, 1780 at Merlot and 1675 at Pinot noir. The mathematical model of relationship sugars concentration-Huglin index was linear of the form y = a + bx. Values a and b were specific for each variety.*
Key words: *the thermal neccesary, grape maturity,viticulture climat*

Rezumat. *Temperatura exercită o influenţă semnificativă asupra dezvoltării viţei de vie şi a maturării strugurilor. Necesarul termic al soiurilor este un element important care permite evaluarea la nivel de areal viticol a gradului de potenţare a soiului dar şi prognozare pe baza modelelor matematice a datei de recoltare diferenţiată pe soiuri. Evaluarea temperaturii, ca element a climatului viticol, se face pe baza parametrilor şi a indicatorilor termici. Obiectivul acestui studiu este acela de a defini necesarul termic al soiurilor pentru vinuri roşii din sortimentul arealului viticol cu DOC Dealu Mare-Valea Călugărească şi de a modela maturarea strugurilor în sistemul resurse termice-concentraţie zaharuri în struguri. Sortimentul studiat este următorul: Burgund mare, Cabernet Sauvignon, Fetească neagră, Merlot şi Pinot noir. Perioada de studiu a fost 1992-1996 iar validarea modelului s-a realizat în anul 2012. Analiza corelaţiei dintre indicatorii termici şi concentraţia de zaharuri din struguri a arătat că indicele Huglin a avut cea mai mare corelaţie. El a prezentat valori*

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specifice soiurilor pentru momentul în care strugurii au avut concentraţia de zaharuri de 180 g/l, după cum urmează: 1784 la Burgund mare, 1871 la Cabernet Sauvignon, 1685 la Feteasca neagră, 1780 la Merlot şi 1675 la Pinot noir. Modelul matematic al relaţiei concentraţie zaharuri-Indice Huglin a fost liniar de forma y=a+bx. Valorile a si b au fost specifice fiecărui soi.
Cuvinte cheie: *necesar termic, maturitate struguri, climat viticol*

INTRODUCTION

The thermal necessary of varieties is an important element which permits the evaluation of area at the level of potentiating wine varieties, but also forecasting based on mathematical models differentiated on varieties harvest date.

The temperature exerts a significant influence on the development of vine and the grapes ripening (Coombe, 1987; Watson, 2003). The grapes ripening is typical of the variety and harvest year, the variety reaching maturity at sugar concentrations and at different times. The minimum values of Huglin index for grapes maturity is 1600°C. The literature mentions for grapes maturity at a sugar level between 190 g/l at Cabernet Sauvignon variety and 220 g/l at Merlot variety (Huglin, 1978).

MATERIAL AND METHOD

The study was realized in the period between 1992-1996, in DOC Dealu Mare-Valea Calugareasca viticultural area specialized in the cultivation of black grapes. The analysis was performed on Burgund mare, Cabernet Sauvignon, Feteasca neagra, Merlot and Pinot noir varieties.

Defining the thermal necessary of varieties has been established on the basis of correlation the Huglin index with grape sugar concentration during the period of grapes ripening. We used the information of wine climate and dynamics of the grape maturation from the database of IC-DVV Valea Calugareasca. The thermal necessary of varieties were evaluated on the basis of heliothermal index (HI) proposed by Huglin (1978), calculated from the beginning of bud burst, with the formula:

$$\sum_{M1}^{M2} \frac{[(T-10)+(Tx-10)}{2} * k$$

M1 represents the beginning of bud burst, considered as the moment in which were recorded 3-5 consecutive days with temperature greater than 10°C. M2 is the moment of full maturity of the variety. The variables of the equation include: T = average temperature of the air, Tx = maximum temperature of the air and the length of the day depending on latitude (k) that the conditions in our country, it takes the value of 1.04.

The mathematical model was achieved according to the concentration of sugar by Huglin index during ripening grapes. The information processing was done with the methods of mathematical statistics of XLSTAT program.

RESULTS AND DISCUSSIONS

The primary data of the period 1992-1996 regarding the thermal potential and the grapes maturity are presented in table 1.

Table 1

The evolution of the parameters analyzed in the period of vine vegetation (1992-1996) in DOC Dealu Mare-Valea Calugareasca viticultural area

Year	Date	The parameters analyzed	
		HI	Sugar (g/l)
1992	20.08	1327	99
	25.08	1404	116
	30.08	1503	129
	5.09	1563	143
	10.09	1594	160
	15.09	1637	170
	20.09	1679	181
	25.09	1706	192
	30.09	1753	201
1993	20.08	1651	62
	25.08	1753	90
	30.08	1819	106
	5.09	1872	130
	10.09	1929	149
	15.09	1999	158
	20.09	2058	170
	25.09	2104	181
	30.09	2146	185
	05.10	2160	185
1994	15.08	1364	125
	20.08	1425	139
	25.08	1490	149
	30.08	1558	168
	5.09	1621	174
	10.09	1683	180
	15.09	1755	190
	20.09	1819	197
	25.09	1869	201
1995	15.08	1256	103
	20.08	1322	112
	25.08	1393	125
	30.08	1453	137
	5.09	1489	148
	10.09	1528	157
	15.09	1578	169
	20.09	1605	176
	25.09	1633	186
	30.09	1655	190
	05.10	1661	199
1996	10.08	1262	100
	15.08	1316	124
	20.08	1370	134
	25.08	1424	152
	30.08	1492	160
	5.09	1543	168
	10.09	1569	172
	15.09	1593	182

In DOC Dealu Mare-Valea Calugareasca area the beginning of bud burst was achieved from 1 to 5 April, and veraison was registered during the period 4-13 August, differentiated depending on the variety. Thus, the Burgund mare variety, the beginning of veraison, was registered in average on August 5, with limits of variation between July 29 (1996) and August 11 (1993); the Cabernet Sauvignon the beginning of veraison, was registered on August 13, with the limits of variation between August 6 (1996) and August 18th (1992). Merlot and Pinot noir varieties came into veraison on August 8 and August 7, with limits of variation between July 31 (1996) and August 18 (1993) for Merlot variety and July 30 (1996) and August 16 (1993) in the case of Pinot noir variety. The Feteasca Neagra variety the beginning of veraison occurred on average on August 4, with the limits of variation between August 1 (1996) and August 6 (1995), (Figure 1).

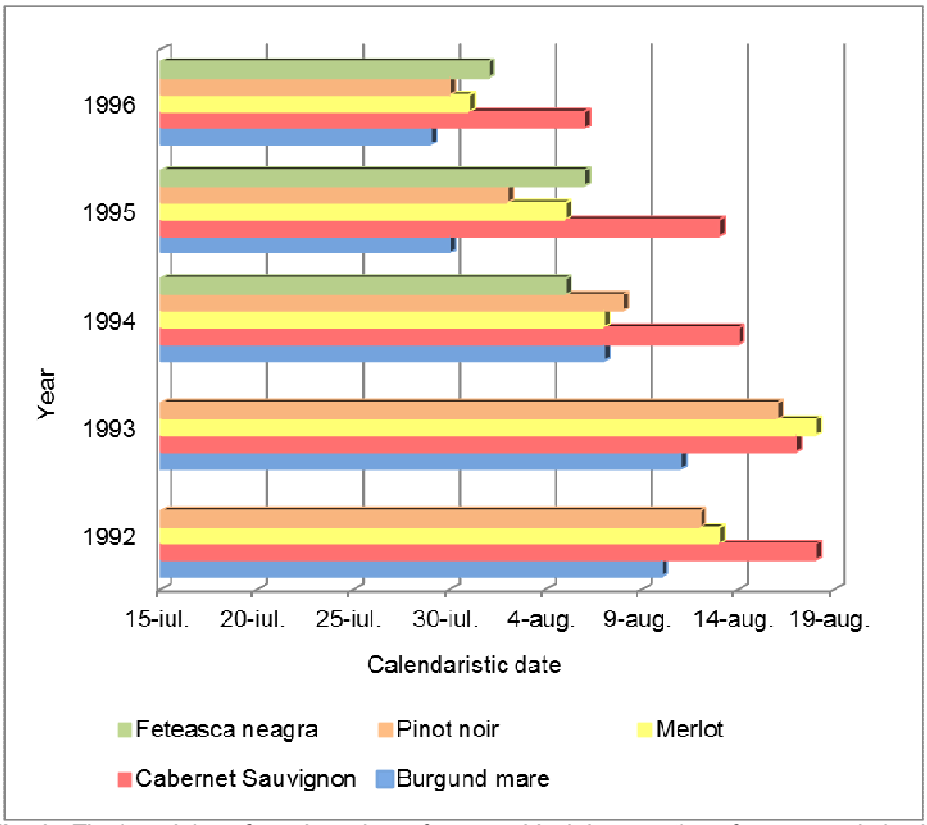


Fig. 1 - The beggining of veraison date of geographical demarcation of grapes varieties in DOC Dealu Mare-Valea Calugareasca viticultural area

The correlation between the sugar concentration and Huglin index to the maturation of the grapes for each variety is shown in Figure 2. Mathematical model for dynamics of ripening varieties in the coordinates of the sugars concentration Huglin index is presented in table 2.

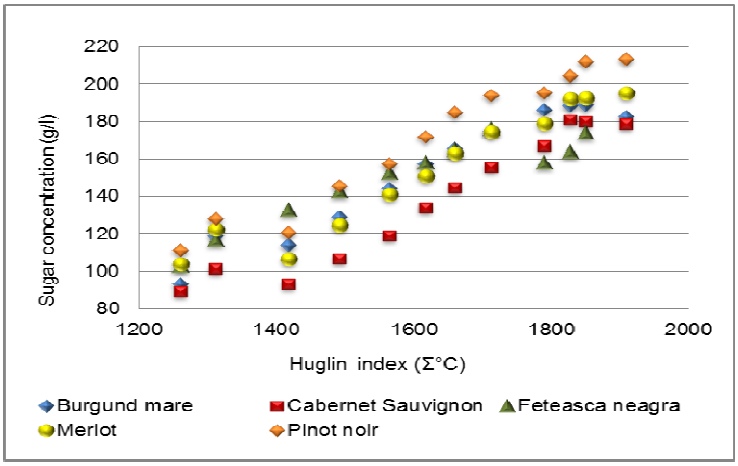


Fig. 2 - Dynamics of sugar concentration

Table 2

The regression equation between Huglin index values and the grapes sugar concentration

Vinifera variety	The equation	The regression coefficient	The significance
Burgund mare	-90.623+0.151*IH	0.97	**
Cabernet Sauvignon	-119.861+0.159*IH	0.97	**
Feteasca neagra	-96.223+0.163*IH	0.98	**
Merlot	-93.189+0.153*IH	0.97	**
Pinot noir	-103.756+0.169*IH	0.98	**

The modeling equation show distinct significant correlations for all analyzed varieties, the regression coefficient showing values between 0.97 in the case of Burgund mare, Cabernet Sauvignon and Merlot varieties and 0.98 for Feteasca neagra and Pinot noir varieties. The rate of increase in the sugar concentration is very high in the Pinot noir (0.169) and Feteasca neagra varieties (0.163) and low to Merlot (0.153) and Burgund mare varieties (0.151).

The thermal necessary of varieties cultivated in DOC Dealu Mare-Valea Calugareasca viticultural area for achieving full maturity result from the reporting sugar concentration to full maturity and Huglin index is presented in table 3.

Table 3

The thermal necessary of varieties depending on sugar concentration at full maturity in DOC Dealu Mare-Valea Calugareasca viticultural area

Vinifera variety	The sugar concentration at full maturity (g/l)	Calculated the thermal necessary
Burgund mare	170	1726
Cabernet Sauvignon	190	1949
Feteasca neagra	210	1879
Merlot	200	1916
Pinot noir	180	1679

The validation of the model for establishing the thermal necessary of varieties for achieving full maturity was made on the 2012 harvest. The validation results are presented in table 4.

Table 4

Comparing the model for establishing thermal necessary with the test for 2012 in DOC Dealu Mare-Valea Calugareasca viticultural area

Vinifera variety	Necessary thermal model	Calculated the thermal necessary
Burgund mare	1726	1693
Cabernet Sauvignon	1949	1913
Feteasca neagra	1879	1852
Merlot	1916	1883
Pinot noir	1679	1636

The relative difference between the model and the test varied between 97% (Pinot noir) and 99% (Feteasca neagra), which shows that the model has a very good reproducibility.

CONCLUSIONS

1. The beginning of bud burst and veraison is typical of the variety and harvest year.

2. The correlation of the sugar concentration and Huglin index of analyzed varieties in the ripening grapes are significant distinct for all varieties, with a value of the coefficient correlation between 0.97 (Burgund mare, Cabernet Sauvignon and Merlot) and 0.98 (Feteasca neagra and Pinot noir).

3. The rate of increase in the sugar concentration is very high, with values of 0.169 (Pinot noir) and 0.163 (Feteasca neagra) and low between 0.153 (Merlot) and 0.151 (Burgund mare).

4. The thermal necessary of varieties in order to achieve full maturity present the specific values: 1679 at Pinot noir, 1726 at Burgund mare, 1879 at Feteasca neagra, 1916 at Merlot and 1949 at Cabernet Sauvignon.

5. The validation of the test made on 2012 harvest shows that the model is replicable.

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THE INFLUENCE OF USED ADJUVANTS OF FINING GRAPE MUST ON EXTRACT OF WHITE WINE

INFLUENȚA UNOR ADJUVANȚI UTILIZAȚI LA LIMPEZIREA MUSTULUI ASUPRA EXTRACTULUI VINULUI ALB

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Abstract. *An important indicator for quality of white wines are considered the unreducible dry extract that for these wines is at least 16.0 g/L. In this context in micro winemaking condition was experienced using different adjuvants to fining must of the variety Chardonnay grape harvest of 2011, namely: Trenolin opti pectolytic enzyme, Lalzime, Zimoclaire PG, bentonites Pluxbenton and Granubent, potassium caseinate Calcazein. Also activated carbon Granucol was used to the fermentation stage partial removal of phenolic compounds. Served as a witness clarified wort by static sedimentation.Research results have shown that the influence of adjuvants used to fining must on unreducible dry extract in raw wine is different, the index values ranging from 17.9 up to 21.7g/L.*
Key words: *adjuvants, enzyme, unreducible extract, degree of fining*

Rezumat. *Un indice important pentru calitatea vinurilor albe este considerat extractul sec nereducător, care penru aceste vinuri este de cel puțin 16,0 g/L. În acest context în condiții de microvinificație s-a experimentat utilizarea diferiți adjuvanți la limpezirea mustului din soiul Chardonnay, recolta anului 2011 şi anume: enzyme pectolitice Trenolin opti, Lalzime, Zimoclaire PG, bentonitele Pluxbenton şi Granubent, cazeinatul de potasiu Calcazein. De asemenea a fost utilizat şi cărbunele activ Granucol la etapa de fermentare pentru înlăturarea parțială a compuşilor fenolici. În calitate de martor a servit mustul limpezit prin sedimentare statică. Rezultatele cercetărilor au demonstrat că influența adjuvanților utilizați la limpezirea mustului asupra extractulu sec nereducător în vinurile brute este diferită, valorile acestui indice variind de la 17,9 g/L pînă la 21,7 g/L.*
Cuvinte cheie:*adjuvanți, enzime, extract nereducător, grad de limpezire*

INTRODUCTION

Forwarding wine export from CIS markets to the European and increasing the rate of Moldovan wines in this market requires a new concept of quality wines. In this context it is appropriate to improve the quality of wines, especially white wines. Extract content for white wine is considered a key indicator of quality. In some countries, such as Germany, France, Spain etc, extractivity of wine is a mandatory indicator for assessing the quality which is taken into account on his sale (Rusu, 2006). It should be noted that optimal content of unreduced extract for dry

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white wines is 18 to 20 g / L but not less than 16 g / L. According Pomohaci wt al (2001), dry extract of wine vary from the sanitary state of the crop, the type of wine and his age and this value allows us to detect falsification of wine. Typically, unreduced extract of white wines for current consumption should be, depending on the type of at least 14 to 16 g / L, and at the superior wines - 18-24 g / L (Cotea et al., 2009). G.G. Valuico (2001) believes that many modern technological processes as fining of musts, reduction of the doses of sulphitation, fermentation at low temperatures, early withdrawal from yeast sediment, treatment with stabilizing substances, lead to reduction of wine extractivity. In this context, a study of the influence of various adjuvants used in must fining on physico-chemical composition, mainly on unreduced extract of white wine was studied.

MATERIAL AND METHOD

Were subjected to research grape must and dry wines made from Chardonnay variety using different adjuvants in the clarification step of must, in total 11 variants:

V1 (control) - clarification by gravity sedimentation, V2 and V3-rinse using pectolytic enzymes Trenolin opti and Lalzime MMX , V4 and V5 fining using bentonite Pluxbenton and Granubent , in dosage - 1 g / L, V6 - fining with caseinate Cal-casein in dose 0.2 g / dal, V7 - gravitational rinse with adding active charcoal Granucol during tumultuous fermentation, 0.5 g / L, V8 - gravitational sedimentation with separation of heavy sediment, V9 - using pectolytic enzymes PG Zimoclaire with subsequent administration of bentonite Pluxbenton to remove the enzyme, V10-clearing using enzyme Zimoclaire PG, V11- gravitational sedimentation with administration of bentonite Pluxbenton during the fermentation. Experimental samples and the control were prepared in season of 2011 in the wine section of Practical Scientific Institute of Horticulture and Food Technology according to the following to the next technological scheme: destemming and crushing grapes → administration of sulfur dioxide up to 50-75 mg / kg (total) → separation of must ravac and pressing → fining grape with using different adjuvants and gravitational sedimentation → inoculate dry active yeast →fermentation at temperature 16-18 ° C → decanting must in fermentation from coarse yeast sediment → postfermentation → keeping wine on fine yeast sediment within 30 days for making batonage every 10 days → drawing wine from the lees. Physico-chemical analyzes were performed in the laboratory Oenology and Wine with Denomination of Origin in the same institute as authorized methods recommended by the OIV.

RESULTS AND DISCUSSION

Must of Chardonnay variety that has undergone to clarification by using different adjuvants, is characterized by the following main physico-chemical: carbohydrates - 215 g / L, titratable acidity - 7.8 g / L, pH - 3.20, total dioxide sulfur - 75mg / L. In grape must and experimental wine was determined optical density at a wavelength of 420 nμ (D420), which served as an index of the degree of clarification and is inversely proportional to clarity of product. Figure 1 presents the results on the influence of adjuvants on the degree of clarification of the must (D420) compared to the control.

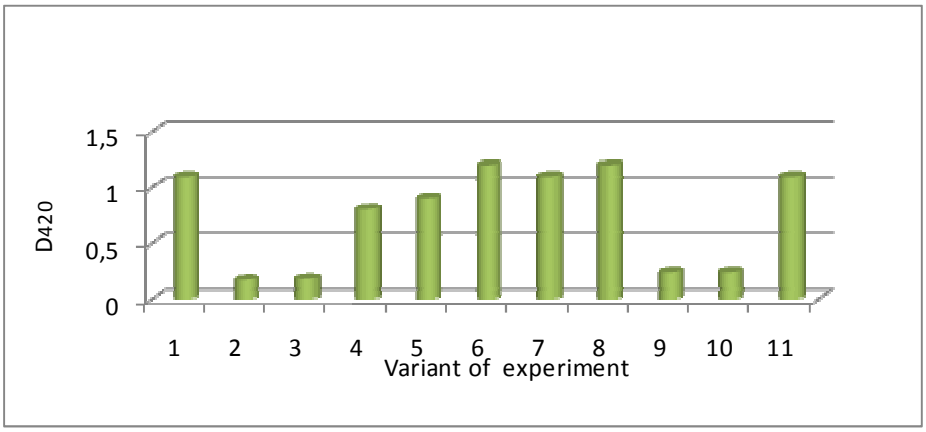


Fig. 1 - Degree of clarification of the musts from Chardonnay variety with using different adjuvants and gravitational sedimentation

From the presented data it can be seen that the highest degree of clarification of must are registered in variants using with pectolytic enzyme V2, V3, V9 and V10, and the D_{420} is between 0.18 and 0.25, followed by those with administration's of pectolytic enzymes V4 and V5 - between 0.80 and 0.90. In other variants of the experiment this index values between 1.10 and 1.20. The grape must sample (V1) - with clarification by gravity sedimentation the degree of must fining is 1.10. The results of physico-chemical investigations of Chardonnay dry white wines obtained by using different adjuvants for fining of must are presented in table 1. The data of table 1 shows that in wines subjected to research the alcoholic degree is found to be 12.5 to 12.7% vol, residual sugars do not exceed 3.3 g / L, and the titratable acidity varies from 7.4 up to 8.3 g / L. pH index of investigated wines reaches values between 3.11 and 3.22, volatile acidity not exceeding 0.33 g / L, representing the optimal content for young dry white wines.

From the results shown in table 1 it can be seen that the content of phenolic substances varies and is wider from 247 up to 405mg / L. The lowest values of this index is found in the wines obtained from clarified must using bentonite Pluxbenton (247 mg / L), the enzyme Trenolin opti and activated carbon Granucol to fermentation (268 mg / L) and enzyme Lalzime MMX (288 mg / L). Mentioned that the highest content of phenolic substances was determined in variant 10 (using enzyme Zimoclaire) - 405 mg / L, followed by variant 9 (using the same enzymes and administration of bentonite Pluxbenton after rinsing to remove enzyme) - 375 mg / L.

Wines subjected to investigation is characterized by different values of the degree of clarification D_{420}. The lowest value of the optical density at a wavelength of 420nμ - 0,065 is documented in three variants (Lalzime) and V7 (charcoal Granucol to fermentation), which means that these wines have the highest degree of clarification. Higher values of D_{420} are recorded in variants 4 (bentonite Pluxbenton) and 11 (gravitational sedimentation with administration of

bentonite Pluxbenton to fermentation) - 0,115 and 0,100 respective. In control wine (V1) the degree of clarification is lower than in the most investigated wines (0.095). Interest the results of determination of unreduced extract in experimental wines.

The values of this index varies between 17.9 and 21.7 g / L, the minimum value of this index are registering in variant 3 - using enzyme Lalzime MMX, and the highest - in variant 10 (enzyme Zimoclaire PG). High value of unreduced extract is observed in variant 8 too (gravitational sedimentation with separation of heavy sediments) - 20.5 g / L, which confirmed the presence in must of the light fragments of pulp and skin is a source of potentiating extractivity of wine (Pomohaci et al., 2001). In control wine the unreduced extract is also high and is 19.8 g / L.

Values slightly lower than in control, but much higher than the minimum permissible for dry white wines, is observed in variants using enzyme Trenolin opti, bentonite Pluxbenton and potassium caseinate - 19.0 to 19.3 g / L. It should be noted that in the investigated wines has been determined the glycerol content too, which is a main constituent of the extract of wine. Figure 2 presents the content in this compound in Chardonnay wines, ranging from 7.2 up to 9.3 g / L, higher amounts are determined in the variants with the highest unreduced extract content (V10, V9 and V8).

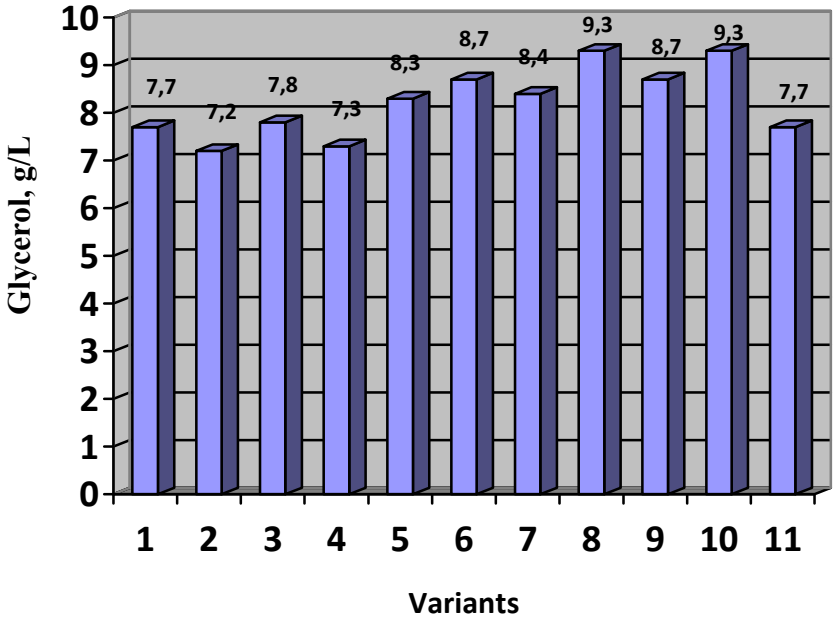


Fig. 2 - The content of glycerol in Chardonnay wines (variants 1-11) obtained by using different adjuvants for fining of must.

Table 1

Physico-chemical indices of dry white wines Chardonnay obtained by using different adjuvants for fining of must, vintage year 2011

Variant nr.	Used adjuvant	Alcohol, % vol.	Sugar , g/L	Titratable acidity (in tartaric acid), g/L	pH	Volatile acidity , g/L	Sulfur dioxide total / free , mg/L	Phenolic substances, mg/L	D_{420}	Unreduced extract , g/L
1	Fining by gravity sedimentation (control)	12,6	2,1	7,7	3,20	0,26	77/9	319	0,095	19,8
2	Enzymes Trenolin opti, 0,2 g/dal	12,6	3,3	7,4	3,22	0,20	87/8	268	0,085	19,3
3	Enzymes Lalzime MMX, 0,2 g/dal	12,6	2,2	7,7	3,20	0,20	83/10	288	0,065	17,9
4	Bentonite Pluxbenton, 1g/L	12,5	2,2	7,7	3,20	0,20	74/9	247	0,115	19,2
5	Bentonite Granubent, 1 g/L	12,6	2,8	7,7	3,20	0,20	79/8	288	0,075	19,9
6	Cal – Cazein, 0,2g/dal	12,5	1,1	7,8	3,16	0,20	70/9	278	0,095	19,0
7	Gravity fining + active charcoal Granucol, 0,5 g/L to fermentation	12,6	1,2	8,3	3,12	0,33	72/10	268	0,065	19,7
8	Gravity sedimentation with separation of heavy sediments	12,6	1,9	8,1	3,20	0,33	81/9	360	0,085	20,5
9	Enzymes Zimoclaire PG, 0,1 g/L + Pluxbenton, 1g/L	12,6	1,5	7,9	3,17	0,20	83/9	375	0,075	21,2
10	Enzymes Zimoclaire PG, 0,1 g/L	12,6	2,3	8,3	3,11	0,20	81/9	405	0,095	21,7
11	Gravity sedimentation + Pluxbenton to fermentation	12,7	0,3	7,9	3,19	0,20	78/8	330	0,100	19,8

CONCLUSIONS

The clarification degree of must of the Chardonnay variety is different depending on the adjuvants used in fining him. More effective action on the this degree exercise pectolytic enzymes Trenolin opti, Lalzime MMX, Zimoclaire PG and bentonite Granubent.

Glycerol content of Chardonnay wines from the harvest of 2011 obtained using different adjuvants of fining must have large enough values and are between 7.2 and 9.3 g / L.

The investigated wines distinguish between them by unreduced extract content, which reaches values between 17.9 and 21.7 g / L.

The highest content of unreduced extract is recorded in wines obtained using pectolytic enzyme of must fining Zimoclaire PG, bentonite Granubent, as well gravitational sedimentation with separation of heavy sediments. In control wine also content of unreduced extract is quite high and is 19.8 g / L. The lowest value of unreduced extract is in wine obtained using enzyme Lalzime MMX for clarification must.

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STUDY OF COMPOUNDS AROMA IN AROMAT DE IAŞI WINES

STUDIUL COMPUŞILOR DE AROMĂ DIN VINURI OBȚINUTE DIN SOIUL AROMAT DE IAŞI

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Abstract: *The volatile compounds in Romanian wines obtained from new grape varieties are not studied enough. This article wants to identify aroma substances in Aromat de Iasi wines from Iasi vineyard. During 2011 harvest, the grapes were processed following the aromatic wines technology. After a two weeks fermentation at 15 °C, the wine samples were filtered and bottled. Gas-chromatography coupled with mass-spectrometry (headspace method) used to determine individual aroma compounds. The wines obtained from Aromat de Iasi grape variety, as expected, have an aroma profile characterized by terpenic compounds, alcohols and esters. The compounds were identified using spectrum libraries NIST 08, Wiley 08 and SZTERP.*
Key words*: local wines, aroma compounds, gascromatography*

Rezumat: *Compuşii volatili din vinurile româneşti obținute din soiuri de struguri noi nu sunt suficient studiate. Acest articol dorește să identifice substanțele de aromă în vinurile obținute din soiul Aromat de Iaşi din podgoria Iași. În cursul anului 2011, strugurii au fost prelucrați folosind tehnologia vinurilor aromate. După o fermentare de două săptămâni la 15 ° C, probele de vin au fost filtrate și îmbuteliate. S-a utilizat gaz-cromatografia cuplată cu spectrometria de masă (metoda headspace), pentru a determina compuşii de aromă Vinurile obținute din soiul de struguri de Aromat de Iași, cum era de așteptat, au un profil de aroma caracterizat prin compuşi terpenici, alcooli superiori și esteri. Compuşii au fost identificați cu ajutorul bibliotecilor de spectre NIST 08, Wiley 08 și SZTERP.*
Cuvinte cheie*: vinuri locale, compuşi de aromă, gaz-cromatografie*

INTRODUCTION

The aroma profile of wine depends on many factors, among which the grape variety, maturity degree at harvest, yeast activity, prefermentative procedures and aging (Ribéreau-Gayon, 2006). Specific literature mentions more than 800, and growing, aroma compounds in wine: alcohols, aldehides, cetones, esters, acids and monoterpenic compounds (Marais and Rapp, 2001).

The analysis of the aroma compounds is done by gaschromatography and mass spectrometry, using different techniques and devices: headspace, solid phase extraction and in-tube extraction, each method specific in its own way (Schneider, 2001).

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MATERIAL AND METHOD

Romanian grape variety Aromat de Iasi from Iasi vineyard has been used. Aromat de Iasi is a grape variety obtained by free fecundation of Tămâioasă românească variety, approved for culture in 1980. The newly developed grape variety originates from a strong sensorial genitor, thus being able to produce aromatic or semi-aromatic wines.

The wine samples were obtained by applying the classical technology for aromatic wines (Cotea et al., 1985): harvested at full technological maturity, sorted, destemmed and crushed. The obtained free fall must was collected separately and divided in half. One half was fermented as such, while the other half was macerated with the grape solids.

The must obtained by pressing the grape marc was collected separately and divided in half, of which a part was fermented as such and the other one macerated with the grape solids.

Maceration was done for 24 hours at 15^{o}C, using beta-glycosidase enzymes with the commercial name of Zymoclaire M® 25g/hL and commercial yeasts Fermactive Muscat® (5 g/hL). Fermentation was kept at 15 ^{o}C and lasted for 2 weeks. Fining was done with bentonite. After filtering and SO_2 addition, the sample wines were bottled. 4 variants were obtained: AI 1 – Aromat de Iasi free fall must, no maceration; AI 2 – Aromat de Iasi free fall must with maceration; AI 3 – press must, no maceration; AI 4 – press must with maceration.

As analysis method, gas chromatography coupled with mass spectrometry, headspace technique, is used.

1000 µL gas from headspace are injected in the GC column, splitless. Analysis conditions: temperature grew from 35 ^{o}C to 250 ^{o}C at a rate of 5 ^{o}C/min. Reaching 250 ^{o}C, it was maintained at this level for 2 minutes. Injector temeprature 220 ^{o}C, detector temperature 250 ^{o}C. Scanning was done in the range of 30 m/z – 200 m/z (detector sensibility 1,0 kv) and 50m/z - 200m/z (detector sensibility 1,1 kV). The analysis lasted 55 minutes.

RESULTS AND DISCUSSIONS

The resulted compounds are presented in table 1, 2, 3 and 4.

Table1

Volatile compounds identified in Aromat de Iasi wine, variant 1

No.	Retention time	Peak area	Identified compound
1	1.368	29246	Ethyl Acetate
2	2.940	18759623	1-Butanol, 3-methyl-
3	3.367	39667	Propanoic acid, 2-methyl-, ethyl ester
4	4.684	99532	Butanoic acid, ethyl ester
5	8.164	356228	1-Butanol, 3-methyl-, acetate
6	12.385	737119	ethyl hexanoate
7	17.473	1307868	Octanoic acid, ethyl ester
8	20.631	387656	Decanoic acid, ethyl ester

Table 2

Volatile compounds identified in Aromat de Iasi wine, variant 2

No.	Retention time	Peak area	Identified compound
1	1.373	631274	Ethyl Acetate
2	1.653	117292	1-Propanol, 2-methyl-
3	2.922	16909287	1-Butanol, 3-methyl-
4	4.683	56417	Butanoic acid, ethyl ester
5	8.123	286734	1-Butanol, 3-methyl-, acetate
6	12.386	463663	Hexanoic acid, ethyl ester
7	16.861	13562	Linalool
8	17.474	730575	Octanoic acid, ethyl ester
	20.632	116820	Decanoic acid, ethyl ester

Table 3

Volatile compounds identified in Aromat de Iasi wine, variant 3

No.	Retention time	Peak area	Identified compound
1	1.930	3808487	1-Propanol, 2-methyl-
2	3.009	43962167	1-Butanol, 3-methyl-
3	3.373	96978	Propanoic acid, 2-methyl-, ethyl ester
4	4.641	153756	Butanoic acid, ethyl ester
5	7.995	492024	1-Butanol, 3-methyl-, acetate
6	12.368	2288426	ethyl hexanoate
7	16.858	68814	linalyl formate
8	17.464	4799274	Octanoic acid, ethyl ester
9	20.628	2121992	Decanoic acid, ethyl ester

Table 4

Volatile compounds identified in Aromat de Iasi wine, variant 4

No.	Retention time	Peak area	Identified compound
1	2.988	36271221	1-Butanol, 3-methyl-
2	3.823	34739	Acetic acid, 2-methylpropyl ester
3	4.626	182527	Butanoic acid, ethyl ester
4	8.023	259325	1-Butanol, 3-methyl-, acetate
5	12.368	1383758	ethyl hexanoate
6	16.858	48288	Linalool
7	17.467	2259926	Octanoic acid, ethyl ester
8	20.629	350790	Decanoic acid, ethyl ester

The only identified tepene in the given conditions, linalool was registered in wine samples obtained with maceration (AI 2 and AI 4). Linalyl formate was identified in the wine samples obtained from the pressed must, proving that even a short contact between must and skins leads to terpenic compounds extraction.

From the volatile alcohols class, isobutyl alcohol and 1-butanol, 3-methyl- were identified. Isobutanol has a strong solvent smell, bitter while 3-methyl-1-butanol is a main ingredient in the production of banana oil, an ester found in nature and also produced as a flavouring substance in industry.

The identified esters are ethyl isobutyrate, ethyl butyrate, isoamyl acetate, ethyl hexanoate, ethyl caprylate, ethyl decanoate.

The esters of fatty acids (ethyl hexanoate, ethyl octanoate, ethyl decanoate) have specific aromas, those of fruit, respectively apple and grape.

Isoamyl acetate smells nice, of bananas and melon, is characteristic of cool-fermented whites.

CONCLUSIONS

The wines obtained from Aromat de Iasi grape variety present a well established aroma profile, composed of superior alcohols (1-Butanol, 3-methyl-), esters (1-Butanol, 3-methyl-, acetate and linalyl formate) and terpenic compounds (linalool).

The influence of the maceration process is clearly visible from the point of view of the number of identified compounds, as well as from the point of view of the specific peak area.

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COMPARATIVE STUDY ON THE INFLUENCE OF MACERATION TECHNOLOGY ON THE RED WINES PHENOLIC COMPOUND

STUDIU COMPARATIV PRIVIND INFLUENȚA TEHNOLOGIILOR DE MACERAȚIE ASUPRA COMPUȘILOR FENOLICI DIN VINUL ROȘU

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Abstract. *The aim of this paper is to study the influence of various types of maceration technology on the red wines phenolic compounds, because of their positive effects on human health. Experimental material used: Băbească neagră grapes was harvested from Cetățuia hill and Fetească neagră from the V. Adamachi farm, harvested in 2010. The wines content of phenolic compounds varied, depending on the technological variant (classical maceration, rotating tank maceration, thermo-maceration and microwave maceration). Following the vinification, eight technologic variants were obtained and also physical-chemical parameters, antiradical activity, D280 index and IFC indices were determined. The quantity of anthocyans and phenolic acids in wines, obtained from grape variety Băbească neagră and Fetească neagră, was determinated by liquid chromatography. The analyses prove that there are quantifiable variations of the phenolic compounds depending on the type of maceration, a high efficiency in extraction of phenolic compounds being registered in thermo-maceration for both grape varieties.*
Key words: *red wines, technological variants, phenolic compounds*

Rezumat. *Obiectivul acestui studiu îl reprezintă influența diferitelor tipuri de macerare asupra compușilor fenolici din vinurile roșii, datorită beneficiilor asupra sănătății omului. Materialul experimental folosit a fost preluat din zona Cetățuia-Băbească neagră și de la ferma Adamachi-Fetească neagră, în anul de producție 2010. Vinurile au un conținut ridicat în compuși fenolici, funcție de varianta tehnologică (macerarea clasică, macerarea- fermentare în cisterne rotative, termo-macerarea și macerarea cu microunde). În urma vinificării s-au obținut opt variante tehnologice, iar la vinul obținut s-au determinat parametrii fizico-chimici, D280, IFC. Cantitatea de antociani și de acizi fenolici ale vinurilor obținute din soiurile Băbească neagră și Fetească neagră a fost determinată prin tehnica lichid cromatografie. În urma analizelor efectuate s-au observat variații ale compușilor fenolici în funcție de tipul de macerare, astfel o eficiență ridicată în extracția compușilor fenolici a avut-o termomaceratia pentru ambele soiuri.*
Cuvinte cheie: *vinul roșu, variante tehnologice, compuși fenolici*

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INTRODUCTION

Red wines are a rich source of different phenolic compounds, which contribute sensorial characteristics (astringency, colour and bitterness as well as ageing ability) to the wines and can exhibit antioxidant properties. Many researches have suggested that polyphenolic compounds present in wine may play a protective role in diseases believed to involve, in part, oxidation, such as coronary heart disease, inflammation and carcinogenesis (Lopez-Velez et. al., 2003).

The growing season, variety, environmental and climatic conditions, plant disease, cultivar, viticulture practices, vinification techniques, soil type, geographic locations and even maturity seem to influence the concentration of phenolic compounds within the same fruit type. Some of the winemaking techniques have been reported to increase phenolic concentration: thermo-maceration and must freezing. In contrast, sulphite and cold maceration have frequently been shown to have a decrease in phenolic levels (Sacchi et. al., 2005).

The aim of this study represents the influence of maceration technology in some red wines phenolic compounds.

MATERIAL AND METHOD

The wines analyzed were obtained from Băbească neagră and Fetească neagră varieties. The grapes were harvested at technological maturity from Cetățuia hill and V. Adamachi, Iași farms.

Different technological variants of maceration were performed: classical (code –V1), rotating tank (code-V2), thermo-maceration (code–V3) and microwave maceration (code –V4).

Classical and rotating tanks versions had a maceration period of 5 days before end-test of maceration (skin colour invariants during maceration fermentation). At the thermo-maceration option the working temperature was 70 °C for about 30 minutes and in the microwave tests the samples were treated to 750 W for 15 minutes.

After its alcoholic fermentation, the wine was racked at room temperature for conducted malolactic fermentation. After 7-8 days the wine was sterile filtered and bottled with the help of an Enomatic Tenco device. Immediately after adding a dose of sulfur dioxide by 40 mg/L per bottle, they were corked with a Mini TS.

At 6 months after bottling wine samples were analyzed for determining the basic physico-chemical parameters (alcohol strength (% vol.), total acidity (g/L $C_4H_6O_6$), volatile acidity (g/L $C_2H_4O_2$), relative density at 20 ^{O}C, reducing sugar (g/L), total dry extract (g/L), non-reductive extract (g/L), free and total sulfur dioxide (mg/L), but also of parameters specific phenolic compounds.

The analytical methods used to characterize the above parameters are in accordance with European standards and stipulated by the OIV.

In order to characterize phenolic compounds have realized a series of spectrometric measurements to evaluate the total polyphenolic index, Folin-Ciocâlteu index, total anthocyanins by pH variation method. Photometric measurements were made using Analytik Jena S200 spectrometer.

For analysis of phenolic acids and other phenolic compounds in wine we have been using monolithic separation columns (Castellari et al., 2002) and samples were processed on a Shimadzu HPLC.

RESULTS AND DISCUSSIONS

The physical-chemical analyses of Băbească neagră and Fetească neagră wines obtain by applying the four fermentation maceration technologies are presented in Table 1.

In case of wines Băbească neagră the lower alcoholic strength presents the variants obtained by microwave maceration (V4-BN-m), 11.26% vol, and the highest concentration of 11.42% vol. variant by thermo-maceration (V3-BN-t). Lowest value recorded in the Fetească neagră rotating tank maceration (V2-FN-r), 13.27% vol. and the highest classical and thermo-maceration variant of 13.67% vol. (V1-FN-c and V3-FN-t).

In determining the total acidity, the results range from 5.02 g/L tartaric acid (V1-BN-c) and 5.99 g/L tartaric acid (V4-BN-m) the variety Băbească neagră, and the Fetească neagră values are much higher and ranged between 7.42 g/L tartaric acid (V4-FN-m) and 9.44 g/L tartaric acid (V2-FN-r).

As regards the volatile acidity are observed higher values for variants obtained from Fetească neagră variety: from 0.22 g/L for V2-FN-m to 0.33 g/L for other options. The variety Băbească neagră, the minimum is 0.27 g/L, recorded in V2-BN-r, and the maximum value at V1-BN-c, of 0.33 g/L.

The highest values at free SO_2 and total SO_2 were identified in Fetească neagră variety, SO_2 content thus demonstrating its protective role against oxidation wines.

Total SO_2 content of the maximum values in V4-BN-m Băbească neagră variety 52.10 mg/L and V1-FN-c,V3-FN-c-t for Fetească neagră variety 72.20 mg/ L. Minimum total SO_2 was determined for V2-BN-r value of 37.78 mg/L.

Red wines that are rich in phenolic compounds (anthocyanins and tannins) are characterized by a power superior antioxidant vitamins C and E (Vinson et. al., 1995).

In terms of composition anthocyanins were identified 9 anthocyanins in each wines sample (Băbească neagră and Fetească neagră): Dp–delphinidin; Cy–cianidin; Pt–petunidin; Po–poenidin; Mv–malvidin; Po-a-poenidin acetylated, Mv-a-malvidin acetylated; Po-cm-poedinidin cumarilated and Mv-cm-malvidin cumarilated (Table 2).

In grapes, musts and wines malvidin constitutes the most part of anthocyanins, as observed in table 2. In case Băbească neagră varietal highest percentage of total anthocyanins was obtained from the classical maceration with a value of 86.43 %, while at Fetească neagră at rotating tank maceration, with a higher value of 94.24 %.

Table 1

Main content characteristics Băbească neagră and Fetească neagră variety 2010

Technological variants	Physical-chemical characteristics								
	Alcohol strength (%)	Total acidity (g/L $C_4H_6O_6$	Volatile acidity (g/L $C_2H_4O_2$)	Relative density (g/cm^3)	Reductive sugar (g/L)	EST (g/L)	EN (g/L)	Free SO_2 (mg/L)	Total SO_2 (mg/L)
Băbească neagră									
Classical maceration (V1-BN-c)	11.34	5,02	0.33	0.99346	2.67	21.6	18.93	7.92	42.04
Rotating tank maceration (V2-BN-r)	11.27	5.14	0.27	0.99331	2.28	22.4	19.72	7.01	37.78
Thermo-maceration (V3-BN-t)	11.42	5.44	0.28	0.99434	3.28	24.5	21.59	12.8	47.22
Microwave maceration (V4-BN-m)	11.26	5.99	0.29	0.99475	2.44	24.8	22.57	10.66	52.10
Fetească neagră									
Classical maceration (V1-FN-c)	13.67	8.98	0.33	0.99884	3.77	42.8	38.53	12.19	72.20
Rotating tank maceration (V2-FN-r)	13.27	9.44	0.33	1.0006	4.04	45.7	41.84	28.33	64.28
Thermo-maceration (V3-FN-t)	13.67	8.31	0.33	0.996794	3.77	42.3	38.53	12.19	72.20
Microwave maceration (V4-FN-m)	13.31	7.42	0.27	0.99587	2.77	34.6	31.83	18.58	57.88

EST(g/L)-Total dry extract; EN(g/L)-Non-reductive extract

Table 2

Percentage values (% of amount) of the 9 anthocyanins in Băbească neagră and Fetească neagră 2010

Technological variants	The quantity of anthocyanins(%)										
	Dp	Cy	Pt	Po	Mv	Po-a	Mv-a	Po-cm	Mv-cm	ΣAnt.	ΣAnt./Mv
Băbească neagră											
Classical maceration (V1-BN-c)	1,04	0,04	3,53	3,12	78,69	1,13	11,42	0,03	0,99	86,43	9,84
Rotating tank maceration (V2-BN-r)	0,94	0,06	2,86	2,79	76,16	1,28	10,80	0,62	4,48	82,81	8,74
Thermo-maceration (V3-BN-t)	1,82	0,13	3,81	4,40	69,94	1,48	10,67	1,19	6,56	80,10	14,53
Microwave maceration (V4-BN-m)	1,32	0,13	3,47	4,49	73,53	1,46	10,50	0,66	4,44	82,94	12,80
Fetească neagră											
Classical maceration (FN-c)	0,98	0,00	0,43	27,07	62,14	1,58	1,11	3,45	3,24	90,63	45,84
Rotating tank maceration (V2-FN-r)	0,19	1,74	0,34	27,12	64,84	1,01	1,62	1,03	2,10	94,24	45,34
Thermo-maceration (V3-FN-t)	5,29	0,50	9,25	8,11	65,46	0,67	2,94	1,92	5,86	88,61	35,36
Microwave maceration (V4-FN-m)	2,71	0,25	6,56	6,83	73,35	0,56	2,75	1,70	5,28	89,70	22,29

ΣAnt.- the amount of the anthocyans; ΣAnt./Mv-report of the amount of anthocyans and malvidin;

In figures 1 are presented content of total phenolic compound (D280) and IFC, where it can be seen that in both varieties maximum value of phenolic compounds was obtain at variant V3 (thermo-maceration), which confirms this methods of maceration is recommended for extracting a high content of phenolic compounds from grapes.

In figure 2 are represented total quantity of anthocyanins (mg/L).Graphical distribution of the evaluation of the figure it can be said that the thermal variations (indexed V3-BN-t and V3-B-FN-t-t) are the large amounts of anthocyanins, share of anthocyanins depends on grape variety which originated wine.

Anthocyanins concentration varies from minimum of 202.79 mg/L at V2-BN-r samples and 172.55 mg/L at V2-FN-r at maximum values of 316.85 mg/L for V3-BN-t and 296.62 mg/L for V3-FN-t.

From comparing data the two figures (1 and 2) it is noted that the highest amount of phenolic compounds and anthocyanins obtained by thermo-maceration for both variety Fetească neagră and Băbească neagră.

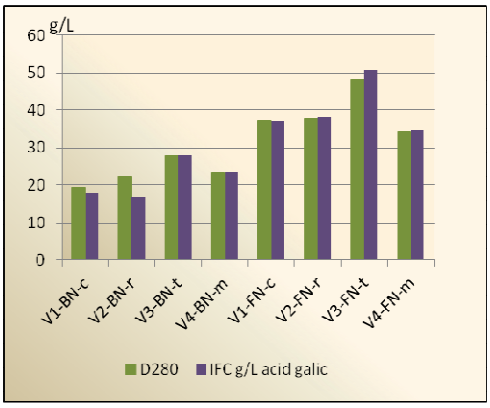


Fig. 1-Index D280 and Folin –Ciocâlteu

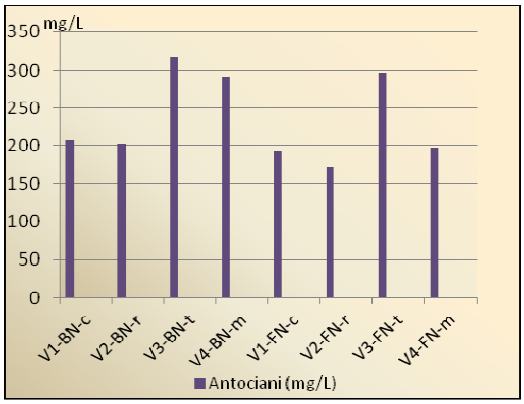


Fig. 2-Total quantity of anthocyanins

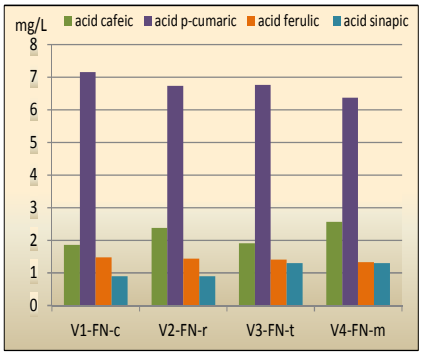


Fig. 3-Values distribution for hidroxicinamics acid at wines Fetească neagră

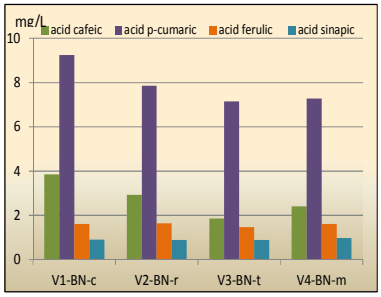


Fig. 4-Values distribution for hidroxicinamics acid at wines Băbească neagră

As can be seen from figures 3 and 4, the values of *p*-coumaric acid are higher in both varieties Fetească neagră and Băbească neagră, in each technological variant, it is important for the protection of wine against oxidative factors. Caffeic, ferulic and sinapic acid have values approximately equal in the two varieties and technological variants.

It is noticed that technological variants have very similar values, so these sample are not influenced by technological factors.

CONCLUSIONS

1. From the data obtained from these experiments we conclude that both in variety Băbească neagră and Fetească neagră maximum of phenolic compounds and anthocyanins obtained by thermo-maceration variants, which confirms this method of maceration is recommended for extracting a high content of phenolic compounds from grapes.

2. As regards of composition anthocyanins were identified nine anthocyanins in each wine sample, malvidina constituting the highest amount of anthocyanins.

3. In terms of representing the values distribution of hidroxicinamics acids is observed that technological variants have relatively equal values, so this paramenter is not influenced by technological factors.

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ANTHOCYANIN MARK OF LOCAL VARIETIES OF RED WINES

AMPRENTA ANTOCIANICĂ A VINURILOR ROŞII DIN SOIURI AUTOHTONE

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Abstract. *Significant for red wines is their colors, which participate in the formation of phenolic compounds extracted from the peel, the main anthocyans. Research interest the profile of anthocyans of red wines made from local varieties in relation to cosmopolitan Merlot variety. Research have undergone red wines produced from 11 local varieties (Fetească Neagră, Rară Neagră, Codrinschi etc.), of cosmopolitan vintage Merlot variety harvest 2011. Anthocyans profile was determined by high performance liquid chromatography (HHPC).For each chromatogram were identified and calculated the relative proportions of anthocyans mono glycoside following: malvidol, petunidol, peonidol, delfinidol and cianidol. Similarly, was calculated the amount of anthocyans glycosides and the amount of free and of acylated anthocyans. It was found that red wines from local varieties are distinguished, as they over wine - Merlot witness through a different of anthocyans profile. Color of local varieties of red wines subject to investigations consists mainly of anthocyanins glycosides, when the wine Merlot is dominated by acylated anthocyanins and free forms, which are more stable and contribute to wine color intensity.*
Key words: *anthocyanin mark, chromatogram, local varieties, monoglicozide*

Rezumat. *Important pentru vinurile roşii este culoarea lor, la formarea căreia participă compuşii fenolici extraşi din pieliță, principalii fiind antocianii. Prezintă interes cercetarea profilului antocianilor vinurilor roşii obținute din soiuri autohtone în raport cu soiul cosmopolit Merlot. Au fost supuse cercetărilor vinurile roşii obținute din 11 soiuri autohtone (Fetească Neagră, Rară Neagră, Codrinschi ş.a.), soiul cosmopolit Merlot din recolta anului 2011. Profilul antocianilor a fost determinat prin metoda cromatografiei lichide de înaltă performanță (HHPC). Pentru fiecare cromatogramă s-au identificat şi calculat proporțiile relative ale antocianilor monoglicozidici ai: malvidolului, petunidolului, peonidolului, delfinidolului şi cianidolului. La fel, s-a calculat suma antocianilor glicozilați, precum şi suma antocianilor liberi şi acilați. S-a constatat, că vinurile roşii din soiurile autohtone se disting între ele, precum şi în raport cu vinul martor Merlot, printr-un profil al antocianilor diferit. Culoarea vinurilor roşii din soiuri autohtone supuse investigărilor este formată cu preponderență din antociani glicozilați, pe când cea a vinului din soiul Merlot este dominată de formele de antociani acilați şi liberi, care sunt mai stabile şi contribuie la intensitatea culorii vinului.*
Cuvinte cheie: *amprenta antocianică, cromatogramă, soiuri autohtone, monoglicozide*

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INTRODUCTION

Color is an important caracteristics of red wines. The phenolic compounds extracted from skin by maceration-fermentation process, wich main of them are anthocyanins give to the wine red color. However, extracted anthocyanins are not stable, they participate in various reactions, as a result their content decreases in the process of the storage of wine. In the first year of storage anthocyanins content is halved after that they become stable. (Pomohaci et al., 2001). The structure of anthocyanins consists of anthocyanidins, anthocyanins that form the coloring matter and carbohydrates. In grapes, must and wine two anthocyanins are met, which are distinguished from each other by the number of hydroxyl groups on the benzene ring side, known as cyanidin and delphinidin, and their methyl esters - peonidin, petunidin and malvidin.

Anthocyanidins are relatively unstable substances, some of them combined with sugars, as a result the dynamic balance is created between the two nonglycosylated forms (anthocyanidins) and the glycosylated (anthocyans). Depending on the number of carbohydrate residues are known anthocyanins monoglycoside and diglycoside. Both categories of anthocyanins can contain in their molecule acylated sugars with one, rarely two scraps of p-coumaric acid, p-hydroxybenzoic acid, p-hydroxy cinnamic acid or acetic acid (Cotea D. V. et al., 2009).

In other words, the formation of color of grapes and red young wine participate various forms of anthocyanins - anthocyanidins, antocyanosides and acylated anthocyanins. Accumulation of anthocyanins in grapes is influenced by many factors, the main being the biological capacity of the variety and climatic conditions of the year (Cotea D. V. et al., 2009). On the other hand, according to Coşofreț et al. (2005), identification the variety from which a red wine can be producted is made through relationships of anthocyanins which is free form or as aglycone, which are specific to each variety. In this context, research interest fingerprints of anthocyanins of red wines made from local red varieties against Merlot cosmopolitan variety.

MATERIAL AND METHOD

The researches was conducted on experimental red dry wines made from indigenous grapes varieties Seină, Rară Neagră, Brează, Negru de Akkerman, Ciorcuță neagră, Bătută neagră, Fetească neagră, Negru de Căuşeni, Kopceak, Busuioacă de Bohotin, Codrinschi (Stăuceni) and Merlot cosmopolitan variety, harvested from the central region of the Republic of Moldova and the variety Codrinschi - from the South of the Republic (Pleşeni). Experimental samples and control sample were prepared in the wine season of 2011 in the department microvinification of the Scientific- Practical Institute of Horticulture and Food Technologies using classic technology of fermentation maceration of the pulp at temperature 25-28 ° C.

Anthocyanins profile in the studied wine samples was determined by high performance liquid chromatography (HPLC) method MA-MD-AS315-11-ANCYAN in accordance with the technical regulations "Analytical methods for the wine production" (2011). Chromatograms were recorded using the chromatograph

Packard1100 Hewlett-type UV-VIS detector, with a Li Chrospher 100 RP 18 separation column.

For every chromatogram the relative proportions of following anthocyanins: delphinidin-3-monoglycoside, cyanidin-3-monoglycoside, malvidin-3 ,5-diglycoside, petunidin-3-monoglycoside, peonidin-3-monoglycoside , malvidin-3-monoglycoside was detected and calculated. Similarly, the amount of glycosylated anthocyanins and the amount of free and acylated anthocyanins for each wine sample are identified and then calculated.

RESULTS AND DISCUSSION

Table 1 reports the values of percentage of anthocyanins in red wines made from indigenous varieties and variety Merlot, which are calculated on the base of the obtained chromatograms. Chromatograms of colorants in wines producted from local varieties Fetească neagră, Codrinschi (Pleşeni) and control sample wine Merlot, are shown in Figure 1 (as an example).

Table 1

Values of reports of anthocyanins in wines made from black local varieties and cosmopolitan variety Merlot harvest of 2011,% of total

No.	Variety name	delphinidin-3-monoglycoside	cyanidin-3-monoglycoside	malvidin-3 ,5-diglycoside	petunidin-3-monoglycoside	peonidin-3-monoglycoside	malvidin-3-monoglycoside	∑ antocyanins free and acylated	∑ glycosylated antocyanins
1	Seină	2,7	<0,5	<0,5	5,6	4,6	64,5	21,4	78,4
2	Rară neagră	2,4	<0,5	<0,5	5,6	2,5	70,0	17,4	81,5
3	Brează	9,3	1,2	<0,5	12,7	4,7	51,7	18,4	80,1
4	Negru de Akkerman	2,2	0,5	0,6	1,9	3,5	36,4	46,8	45,1
5	Ciorcuță neagră	2,3	1,4	<0,5	4,6	2,0	59,4	28,9	70,2
6	Bătută neagră	1,9	<0,5	<0,5	3,4	3,6	52,9	37,1	62,8
7	Merlot	4,6	<0,5	<0,5	4,8	2,8	34,9	48,1	48,1
8	Fetească neagră	6,7	1,3	<0,5	11,2	5,3	53,6	17,6	78,6
9	Negru de Căuşeni	8,9	<0,5	<0,5	9,9	2,7	50,6	22,6	73,1
10	Codrinschi (Stăuceni)	6,9	1,2	2,8	6,8	2,9	48,3	21,4	68,9
11	Codrinschi (Pleşeni)	6,6	1,5	2,7	6,4	3,2	48,1	29,8	68,5
12	Kopceak	7,8	0,8	0,9	10,1	5,2	55,7	15,9	80,5
13	Busuioacă de Bohotin	2,3	2,2	1,6	2,9	10,5	56,2	20,5	75,7

Research shows that investigated wines are distinguished among themselves and in comparison with cosmopolitan variety Merlot, with a different profile of glycosylated anthocyanins. Malvidin-3-monoglycoside is the main component of anthocyanins determined in experimental wines and in cosmopolitan variety Merlot of harvest of 2011 and percentage ratio in sum of anthocyanins varies greatly depending on the variety. Thus, in wine Rară neagră

this index value consists 70.0%, in the wine Seină - 64.5%, Ciorcuță neagră - 59.4%, in Busuioacă de Bohotin - 56.2% and wine Kopceac-55,7%. Lower values of this index were determined in the samples of wine Negru de Akkerman (36.4%) and Codrinschi (48.3%) produced in both regions.

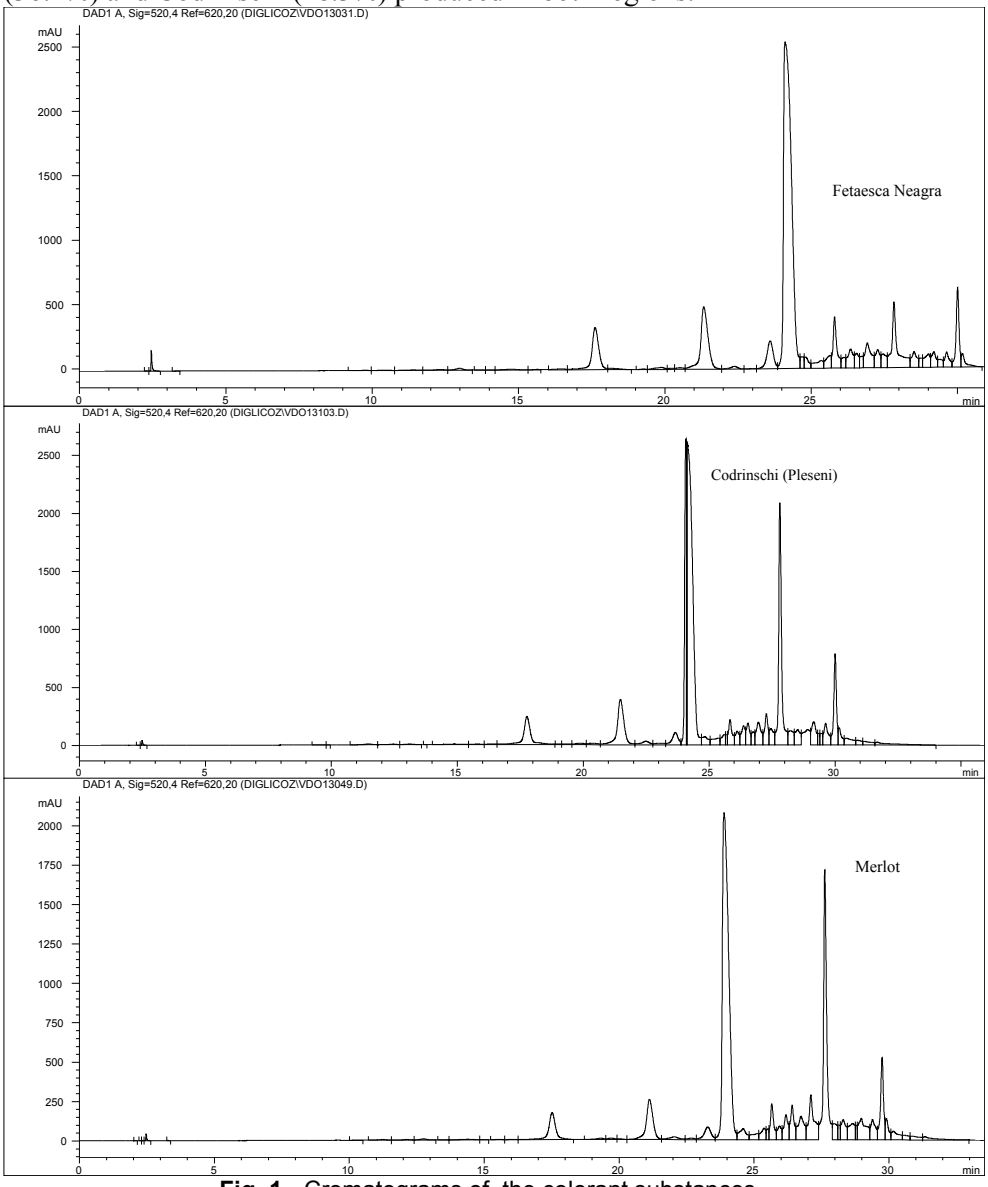


Fig. 1 - Cromatograms of the colorant substances

In the control sample Merlot this index consists 34.9%.

Besides malvidin-3-monoglycoside a significant share in creating the color of red wines has petunidin-3-monoglycoside. Higher percentage values of this compound were determined in wine Breazăă (12.7%), Feteascăă neagră (11,2%),

Kopceak (10,1%) and Negru de Căuşeni (9,9%). In wines Seină and Rară neagră the values of petunidin -3-monoglycoside consists 5.6% and in the variety Codrinschi - 6.8% and 6.4% in the Central and South region respectively. In other samples this compound varies between 1.9% and 4.8%.

In the control sample wine Merlot petunidin-3- monoglycoside value ratio is 4.8% and is lower in comparison with most experimental wines.

It is interesting that the content of the anthocyanin peonidina -3-monoglycoside in wines from local varieties varies less than the petunidin -3-monoglycoside. The percentage values of this compound in studied wine is between 2.0 and 4.7%, excluding wines Kopceac, Fetească neagră and Busuioacă de Bohotin, which has higher levels of peonidin- 3-monoglycoside - 5.2%, 5.3% and 10.5%, respectively. In the cosmopolitan wine Merlot the percentage of peonidin-3-monoglycoside is 2.8%, ranking close to the lower limit of the content of this compound in experimental wine samples.

Higher values of delphinidin-3-monoglycoside were identified in wine variety Breazã (9,3%), Negru de Căuşeni (8,9%), Kopceak (7,8%), Codrinschi in both regions (6.6 % -6.9%) and Fetească neagră (6.7%). The lowest values of this compound (2.3-2.7%) were detected in wines Negru de Akkerman, Busuioacă de Bohotin, Ciorcuţă neagră and Seină. In the cosmopolitan wine Merlot the percentage of delphinidin-3-monoglycoside is small, just like the last named varieties, and it is 2.8%.

The percentage of malvidol-3 ,5- diglycoside in investigated wines is below 0.5%, except for wine Codrinschi in which this index has higher values (2.8%). The quantitative determination of the compound was found up to 1.4 mg / L, which is much less than the maximum allowable value.

According to the data presented in table 1 can be concluded that the amount of glycosylated anthocyanins is very different and depends on the used grape variety. The highest percentage of glycosylated anthocyanins amount is recorded in wine Rară neagră -81.5% and varieties Breazã and Kopceak - about 80%. The higher values of the sum of glycosylated anthocyanins are inregistrated in wine Fetească neagră -78.6%, Seină - 78.4% , Busuioacă de Bohotin - 75.7%, Negru de Căuşeni - 73.1% and Ciorcuţă neagră - 70.1%

As regards to the samples of wine Codrinschi, content in anthocyanins glycosylated is 68.9% and 68.5% for both regions. Of all the studied wines lowest value of glycosylated anthocyanins has wine Negru de Akkerman -45.1% and this value is closer to wine sample Merlot from cosmopolitan variety - 48.1%.

Based on the presented data it can be concluded that the formation of color of wine made from variety Merlot participate less glycosylated anthocyanins. It is predominantly acylated forms, as well as free anthocyanins. However, it is known that acylated anthocyanins are beneficial for color quality of red wines (Cotea D. V. et al., 2009). Process of acylation with glucosydic residues, particularly hydroxycinnamic acids increases the stability of anthocyanins and its ability dye molecule, a phenomenon known as copigmentation. In this context, the analysis showed that the amount of the percentage ratio of the sum of free and acylated

anthocyanins in Merlot wine sample is 48.1% and is higher than in all experimental wines. Among investigated black varieties, wine produced from Negru de Akkerman variety is highlighted by a value closer to witness 46.8%, followed by Codrinschi from South -29.8%. The lowest values of this index were detected in wines Kopceak - 15.9%, Rară neagră -17.4% and Fetească neagră - 17.6%. We assume that this is explained by the greater intensity of the color of the wine from Merlot variety, and and consequently its stability. Indigenous varieties of wine from the mentioned variety Codrischi (Pleseni), which differs from the others by a rich and intense color.

CONCLUSIONS

1. Comparative analysis has shown that the anthocyanin fingerprint of red wines produced from local varieties of the crop of 2011 are distinguished between them, just as they witnessed over wine made from Merlot.

2. It was found that most wines from indigenous varieties are distinguished by the highest percentage values of malvidine, peonidine and delphinidin monoglycosides than Merlot.

3. In the color formation of wine of local grape varieties are involved mainly glycosylated anthocyanins, while the Merlot wine color formation - forms of free and acylated anthocyanins.

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ANALYSE DE LA MIGRATION DES PHTALATES A PARTIR DE POLYMERE DANS LES PRODUITS VITIVINICOLES

ANALIZA MIGRAȚIEI FTALAȚILOR DIN POLIMER ÎN PRODUSELE VITIVINICOLE

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Abstrait: *La santé est une des préoccupations les plus importantes des organisations gouvernementales et non gouvernementales, des écologistes, etc. Un certain nombre d'études ont montré l'impact potentiel de phtalates sur la santé humaine en raison de leurs effets cancérigènes et perturbateurs endocriniens. Plus de 1300 analyses pour la détermination des restes de phtalates dans les boissons alcooliques ont été effectuées dans le laboratoire du Centre National de Contrôle de la Qualité des Vins (République de Moldova) en utilisant la méthode moderne d'analyse comme GC-MS.*
Mots-clés: *phtalates, vin, chromatographie en phase gazeuse, spectrométrie de masse, dibutyl phtalate.*

Abstract: *Una din preocupările cele mai importante ale organizațiilor guvernamentale şi non guvernamentale, precum şi a ecologiştilor, etc. este sănătatea populației. O serie întreagă de studii au demonstrat impactul ftalaților asupra sănătății umane ca urmare a efectului lor cancerigen şi a tulburărlor endocrine. Pentru a determina reziduurile de ftalați în băuturile alcoolice, au fost effectuate peste 1300 de analize în laboratorul Centrului Național de Verificare a Calității Producției Alcoolice (Republica Moldova) utilizîndu-se metoda modernă GC-MS.*
Cuvinte-cheie: *ftalați, vin, cromatografia în faza gazoasă, spectrometria de masă, dibutil ftalat.*

INTRODUCTION

Aujourd'hui les gens ne peuvent pas s'imaginer la vie sans les appareils ménagers, les systèmes de communication, les emballages en plastique, parfums et cosmétiques. La plupart de ceux-ci et beaucoup d'autres produits chimiques ont des propriétés spécifiques comme la résistance, la ductilité, la durabilité, l'incombustibilité, en raison d'un certain nombre de produits chimiques organiques synthétiques. Les phtalates sont parmi les membres de cette série. Phtalates (esters de l'acide phtalique) sont inclus dans les compositions de presque tous les types de plastiques, caoutchouc, peintures et vernis, leur imprimant l'élasticité et résistance. La plupart des phtalates produites sont utilisées exactement comme plastifiants, près de 90% (tableau 1). Aux parfums et produits cosmétiques phtalates agissent principalement comme solvants et fixateurs de saveur.

[1] Centre National de la Qualité des Vins Chişinău, République de Moldova

Tableau 1

La production annuelle et la consommation des phtalates largement répandues dans les pays de l'UE.

Le phtalate	Abréviation	La production annuelle	La consommation annuelle
Diméthylphtalate	DMP	-	10 000-20 000 [5]
Diéthylphtalate	DEP	-	10 000-20 000 [5]
Dibutylphthalate	DBP	26 000 [1]	18 000 [1]
Phtalate de butylbenzyle	BBP	45 000 [2]	19 500 [4]
Bis (2-éthylhexyle) phtalate	DEHP	595 000 [3]	476 000 [3]

[1] : EU RA DBP 2004; [2] : EU RA BBP 2004; [3] : EU RA DEHP 2001; [4] : EU RA BBP 2007; [5] : Harris et al., 1997

La production annuelle de phtalates a été estimée par l'Organisation Mondiale de la Santé (OMS) pour approcher 8 millions de tonnes (par des données de l'année 1992) (Sablayrolles et al., 2005), et 5 milliards de tonnes (par des données de Janvier 2011) (Center for the Evaluation of Risks to Human Reproduction). Environ 95% du phtalates entrent dans la production de matériaux polymères, dans certains d'entre eux le contenu de phtalates atteint 50% en poids du polymère. Les hommes sont toujours entourés de matériaux contenant des phtalates, tels que le linoléum, l'isolation des fils, des tuyaux, des boîtiers en plastique des appareils électroménagers, des jouets, des vernis et des peintures.

Tableau 2

La dose quotidienne de phtalates et ses effets sur les différentes catégories de la population

Catégorie / âge	Les catégories d'âge				
	Enfants 0-1	Enfants 1- 3	Enfants 4- 10	Femmes 18- 20	Hommes 18- 80
Doses quotidiennes, µg /kg PC	55- 380	20- 183	5- 54	8- 124	8- 92

(*PC – poids du corps*)

La plupart des chercheurs de différentes organisations suggèrent que dans la plupart des cas, l'influence des phtalates sur personne est inférieure aux doses quotidiennes tolérables (TDI) (Sablayrolles et al., 2005; CE, 2006; CE JRC, 2008). Mais il est difficile de déterminer avec précision la dose d'exposition comme la propagation des phtalates partout. Selon des études internationales exécutées par le Centre pour l'Evaluation des Risques pour la Reproduction Humaine (Peakall, 1975) ce facteur est dans les limites suivantes (tableau 2). Les femmes et les enfants sont plus sensibles aux phtalates.

Les phtalates sont accumulés dans le corps humain, ce qui affecte négativement les hormones, le foie et les reins, sont aussi responsables des allergies, de l'asthme et de cancer, provoquent des troubles neurologiques et des anomalies dans le développement des enfants (CE, 2004; Lovekamp-Swan and Davis, 2003). Les molécules de phtalates ne sont pas des éléments structuraux des chaînes polymères et sont facilement rejetées dans l'environnement, en pénétrant dans le corps humain à travers de la nourriture, la peau ou par inhalation.

Dans un certain nombre de vins-produits étudiés, libérés par les fournisseurs, il a été détectée la présence de phtalates. Une attention particulière a été accordée à la DBP.

MATÉRIAU ET MÉTHODES

Les méthodes et réactifs

En mesurant la concentration de phtalate de dibutyl en vin et vin de base sur la base de son élimination par extraction au chloroforme, la séparation chromatographique sur colonne capillaire, identifiez le temps de rétention et le spectre de masse, et déterminez la quantité de l'ion caractéristique m/z 149.

Mesurant la concentration de phtalate de dibutyl des boissons alcooliques comme la vodka, brandy, l'alcool de cognac, rectifié alcool éthylique a été basée sur la séparation chromatographique de l'échantillon sur une colonne capillaire en utilisant Aldrin avec une pureté supérieure à 99,3% et fourni par SUPELCO comme standard interne, l' identification a été faite par le temps de rétention et le spectre de masse, la quantification d'ions caractéristique m / z 149 pour le BDP, et 66, 261, 263, 265 pour Aldrin.

La solution de fond (vin synthétique) a été utilisée pour préparer les solutions d'étalonnage. Elle est composée d'une solution aqueuse de 15% d'éthanol et de l'acide tartrique (5 g/dm^3) (acide tartrique, fourni par FLUKA, puriss. p. a. pour la chromatographie ionique) et réalisée pour le pH à 3,5 avec de la soude 5M.

Le vin synthétique a été utilisée pour des solutions standard d'étalonnage avec des concentrations de DBP: 0 - 1,00 mg/dm^3 (dibutyl phtalate, PESTANAL du SIGMA-ALDRICH, 99,8%).

Pour l'extraction de DBP, 100 ml d'échantillon (solution d'étalonnage) a été placé dans un entonnoir distinct de 250 cm^3 avec un ajout de 10 cm^3 de chloroforme (Chloroforme, LGC PROMOCHEM, par HPLC). L'extraction a été mise en œuvre en 10 min en étant agitée en permanence. Après la séparation de la couche organique, la couche inférieure de chloroforme a été drainée à travers d'un filtre en papier avec du sulfate de sodium anhydre (sulfate de sodium

anhydre, STANCHEM, Espagne). 10 ml de l'extrait de chloroforme collecté a été transféré dans un flacon de chromatographie en phase gazeuse, à partir de laquelle 1,0 µl d'extrait par micro seringue a été sélectionné directement pour l'analyse par chromatographie en phase gazeuse avec spectromètre de masse.

Les instruments

SHIMADZU GCMS-QP-2010S (IS) avec un COMBI PAL passeur (CTC ANALYTICS, Zwingen, Suisse) équipé de silice fondue colonne RESTEK - Rtx-5MS (30m/0.25mm/0.25µm 100% de phase dimethylpolisiloxane) a été utilisé pour effectuer des injections et des analyses de chromatographie en phase gazeuse de manière automatisée.

RESULTS ET DISCUSSION

Les études menées dans le laboratoire du Centre National de la Qualité des Vins (République de Moldova) comprenaient plus de 3000 échantillons de vins mis en bouteilles et de vin de base pour la présence de DBP.

Pour établir les sources de pollution DBP dans les vins y ont été étudiés 7 échantillons de moûts concentrés et avec sulfite: <0,01 0,15 ppm de DBP a été détectée. Le plus bas niveau de la concentration de DBP a été caractéristique pour le moût avec sulfite, ensuite concentré - 0,05 0,15 ppm.

Les résultats des enquêtes sur les 15 échantillons de raisins ont été négatifs. En outre, l'eau a été examinée au cours des cinq vignobles utilisée dans la production de vin. Il a été constaté que la concentration de DBP dans l'eau naturelle est inférieure à la LOQ, tandis que la teneur en eau de rinçage est 0,04-0,05 ppm et 0,09-0,11 ppm de DBP dans l'eau adoucie.

La contamination des phtalates a un caractère techno génique, et elle est le résultat d'un contact avec des matériaux polymères. Dans la suite, nous avons étudié des échantillons de matériaux différents, qui ont été en contact avec la production de vin pendant le processus de vinification et de stockage, tels que les peintures, les vernis, les amorces, les tuyaux, les joints en caoutchouc.

Tous ces tests ont été réalisés selon la Directive 2007/19/EG. Également la migration de DBP été étudiée à un modèle de solution - solution aqueuse d'éthanol à 15%, acidifiée avec de l'acide tartrique. Le contenu de DBP a été déterminé dans la solution modèle mise en contact avec le polymère sec pendant 1 jour. Le rapport polymère - modèle était de 1:100. La migration a eu lieu à la température ambiante (20-22^{0}C). Les résultats sont présentés dans le tableau 3.

Tableau 3

Le taux de migration de DBP à partir du polymère (le rapport du polymère: modèle = 1:100)

Migration	Painture	Tubes en plastique	Joints en caoutchouc
mg DBP/kg polymére/jour	Peinture fraîche 867,4[1] 345[2] 339[3] Peinture en contact avec boissons alcooliques pendant environ 1 an 65,7[4] 63,3[5] 63,7[6] 61,2[7] Peinture en contact avec boissons alcooliques pendant 2-3 années 33,2[8] 35,1[9] Peinture en contact avec boissons alcooliques pendant >5 années 0,7[10] 3,4[11] 6,9[12]	Non-utilisés dans le processus d'élaboration 142[13] ont été en contact avec le produit 33,5[14]	Non-utilisés dans le processus d'élaboration 506[15] ont été en contact avec le produit 31,5[16]

[1-16] - matériaux obtenus à partir de différents établissements vinicoles, moyenne de deux mesures parallèles.

La migration des phtalates dans les matériaux, mis en contact avec le vin, est un processus continu qui peut continuer tout au long de la période de production ou de stockage. Le taux de migration a été déterminé en s'appuyant sur ces enquêtes. Des études ont été menées sur les documents soumis par les viticulteurs et les distributeurs moldaves. En plus de la peinture fraîche (destinés au contact alimentaire) les peintures qui ont été en contact avec le vin au cours d'une certaine période de temps ont été analysées. La peinture fraîche (liquide) a été appliquée sur la surface interne du flacon, séché à l'air pendant 2-3 jours, puis une solution de modèle a été placée dans le flacon.

CONCLUSIONS

Dans le cadre d'études effectuées dans le laboratoire du Centre National de la Qualité des Vins plus de 3000 échantillons de vins mis en bouteilles et de vin de base ont été analysés pour la présence de plus répandue et toxiques phtalate - dibutylphtalate. Les résultats affichent les présences de traces de DBP dans 85% des échantillons de vins étudiés. Une teneur de DBP plus de LMA (0,3 mg /dm^3) a été détectée pour 2% des vins blancs et 6% des vins rouges. Les échantillons de

moûts concentré et moûts sulfité, l'eau naturelle et adoucie, échantillons de raisins ont été étudiés pour déterminer les sources de pollution DBP dans les vins. On a déterminé que la contamination des phtalates a un caractère techno gène, et présent le résultat de contact avec des polymères. Les conditions optimales d'extraction de DBP à partir d'échantillons liquides ont été obtenues. En outre, il a été établi une influence significative sur l'extractibilité de la valeur du pH et de taux des sucres. Le contenu de l'alcool dans le vin synthétique n'a pas affiché l'effet significatif. En outre, la migration de DBP à partir de matériaux polymères a été examinée. Dans un futur proche, nous prévoyons de rechercher les bouchons et autres matériaux utilisés dans le processus de vinification par la présence et migration de DBP.

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STUDIES CONCERNING THE INFLUENCE OF THE MACERATION – FERMENTATION TECHNOLOGY ON THE ANTHOCYANS CONTENT AND COLOUR OF SOME RED WINES

STUDII PRIVIND INFLUENȚA TEHNOLOGIEI DE MACERARE – FERMENTARE ASUPRA CONȚINUTULUI ÎN ANTOCIANI ȘI A CULORII UNOR VINURI ROȘII

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Abstract. *This study aims to determine the influence of fermentation maceration technology on anthocyanin content and colour of red wines. Wines were made from Feteasca neagră (Vitis vinifera L.) variety in Iaşi vineyard, harvests of 2007 and 2008, applying four methods of maceration-fermentation (classical maceration, maceration in rotating tanks, thermo-maceration, maceration with microwaves). The test results have shown that the process of maceration-fermentation influences the compositional characteristics of wines. Depending on the content of anthocyanin and wine colour determined by the CIE Lab76, the most coloured wines were obtained by thermo-maceration in 2007 and by maceration in rotating tanks in 2008.*
Key words: *anthocyans, colour, maceration, Fetească neagră.*

Rezumat. *Studiul de față urmărește stabilirea gradului de influență a tehnologiei de macerare – fermentare asupra conținutului în antociani și a culorii vinurilor roșii. Vinurile au fost obținute din soiul Feteasca neagră (Vitis vinifera L.) din Podgoria Iași în anii 2007 și 2008, prin aplicarea a patru metode de macerare-fermentare (macerare clasica, macerare in cisterne rotative, termomacerare si macerare cu microunde). Rezultatele analizelor efectuate au arătat că procedeul de macerare - fermentare influențează caracteristicile de compoziție ale vinurilor. În funcție de conținutul în antociani și culoarea vinului determinată prin metoda CIE Lab76 s-au obținut cele mai bune vinuri prin termomacerare în anul 2007 și prin macerare în cisterne rotative în anul 2008.*
Cuvinte cheie: *antociani, culoare, macerare, Fetească neagră.*

INTRODUCTION

The quantity of phenolic compounds in wines varies in large limits: 180 – 650 mg/L in white wines and 1060 – 5870 mg/L in red wines (Vinson and Hontz, 1995). Anthocyanins represent 38% of the phenolic compounds. Red wines

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contain monoglucosidic and diglucosidic anthocyanin monomers (anthocyanidins). The monoglucosidic anthocyanins are predominate: malvidol 50-60%, petunidol 10 to 15%, peonidol 8 to 10%, delfinidol 5 to 8% and cianidol 1.5 to 3.5%. Diglucosidic anthocyanins are absent or present in very small quantities, up to a maximum of 5-15mg / L.

Red wines are characterized by an anthocyanin mark given by the anthocyanin percentages that make up the colour of the wine. This way, the authenticity of red wines can be controlled (Tardea, 2007; Pomohaci, 2000).

Anthocyanin content of grapes is dependent on grape variety and climatic conditions of the year. It can reach 5000 mg/kg at tinctorial grape varieties, of which 78% in grape skins, 20% in pulp and 2% in seeds. Transfer of colour substances from grapes' skin in musts is done by maceration; the duration of extraction process as well as the quantity of extracted anthocyanins depends on the maceration conditions (Cotea el al., 2009).

Thus, depending on the used maceration-fermentation technology for red wines, the anthocyanins level and wine colour is evaluated; by analyzing and comparing the results one can recommend the most effective maceration variant.

MATERIAL AND METHOD

For this study grapes from Feteasca neagra (*Vitis vinifera L)* variety from Iasi vineyard, harvested in 2007 and 2008 have been used, with following compositional characteristics: 196.2 g/L sugars and 7.86 g/L $C_4H_6O_6$ in 2007, and 182.9 g/L sugars and 7.95 g/L $C_4H_6O_6$ in 2008. Grapes were harvested manually and placed in wooden boxes, then they were transported and processed at the Oenology Laboratory of the University of Agricultural Sciences and Veterinary Medicine, Iasi.

Grapes were crushed and destemmed and the obtained musts were homogenised and processed differently, using four different maceration – fermentation methods: classical maceration, maceration in rotating tanks, thermomaceration and maceration with microwaves.

At the classical maceration and the maceration in rotating tanks the maceration time was 5 days until the grape skin does not release any more colour. At the thermomaceration variant, working temperature was 70ºC for 30 minutes (Cotea, 1985), and at the variant of maceration using microwaves samples were subjected to 750W for 15 minutes.

The musts obtained this way were pressed with a hydraulic press and put in glass containers, where alcoholic and malolactic fermentation occurred. After the malolactic fermentation ended, wines were separated from deposit, conditioned, filtered and bottled.

After six months total antochyans content was determined using the pH variation method, anthocyanin profiles using HPLC technique and wine colour using CIE Lab 76 method. By calculating the chromatic parameters L, a, b, in CieLAB76 system one can evaluate the effect of maceration method on wine colour parameters.

A computer simulation of each wine colour was also conducted with DIGITAL COLOUR ATLAS software 3.0 on the basis of the calculated chromatic parameters.

RESULTS AND DISSCUTIONS

The obtained results after the anthocyanins content determination are presented in fig.1.

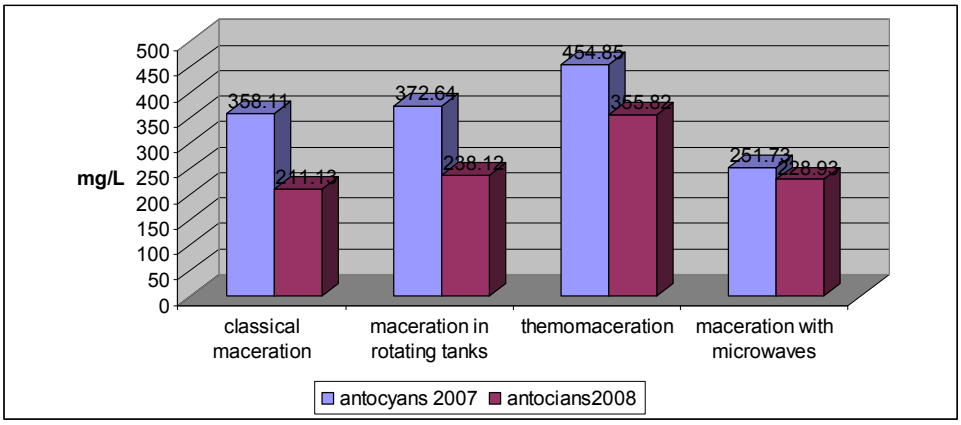


Fig. 1 - Graphical representation of anthocyanin content of wines obtained from Fetească neagră variety in 2007 and 2008

Anthocyanin concentration is highly dependent on grape variety and winemaking technology. Thus, after determining the concentration of anthocyanins in Fetească neagra (*Vitis vinifera* L.) wines it was found that the most extractive maceration tehnology in terms of content of anthocyanins, are thermomaceration with 454.85 g / L in 2007, respectively 355 , 82 g / L in 2008 and maceration in rotating tanks with values of 372.64 g/L in 2007 and 238.12 g/L in 2008.

The diferences betwen the two years regarding the anthocyanins content are due to temperature variations that occurred during grapes ripening and day-night temperature fluctuations, variations that were more favorable in the synthesis of anthocyanins in 2007 than in 2008.

Regardless of the technological process applied in analyzed red wines, one can note that the highest values are recorded for malvidin folowed by peonidin, petunidin, delphinidin and finally cyanidin (Tab. 1 and 2).

Also it is noted that a higher content of malvidin is obtained in the wines made by maceration with microwaves. It is also noted that malvidin, which is a main constituent of colour compounds in wine is more sensitive to thermal degradation, than cyanidin. For this reason, during wine maturation, one must take into consideration the effects of temperature on wine colour, choosing a method to protect it as much as possible.

Chromatic parameters of wine samples were calculated according to CIE Lab 76 method, depending on the absorption spectra recorded for each sample (Țârdea C., 2007). The results of L parameter show that the 2007 wines tend to be more opaque while in 2008 the wines have a higher luminosity (transparency). This is mainly due to anthocyanins content which had a lower concentration in that year (Table 3, 4).

Table 1

Area percentage values of the main anthocyanins in wines made from the Feteasca neagră variety in 2007

Sample	Dp-3-gl [%]	Cy-3-gl [%]	Pt-3-gl [%]	Po-3-gl [%]	Mv-3-gl [%]	Po-3-gl -acet [%]	Mv-3-gl -acet [%]	Po-3-gl -cum [%]	Mv-3-gl -cum [%]	Σ-acet. + Σ - cum.	Σ-acet./ Σ-cum.
Classical maceration	5,87	0,35	11,96	1,51	63,80	2,14	2,99	1,23	10,16	16,52	0,45
Maceration in rotary tanks	4,77	0,90	11,91	1,20	67,55	1,51	2,64	0,95	8,58	13,68	0,44
Maceration with microwaves	4,36	0,09	9,77	1,85	74,64	0,66	2,22	0,53	5,88	9,28	0,45
Thermomaceration	7,69	0,56	14,14	4,04	62,18	1,55	2,23	1,62	5,99	11,39	0,50

Table 2

Area percentage values of the main anthocyanins in wines made from the Feteasca neagră variety in 2008

Sample	Dp-3-gl [%]	Cy-3-gl [%]	Pt-3-gl [%]	Po-3-gl [%]	Mv-3-gl [%]	Po-3-gl -acet [%]	Mv-3-gl -acet [%]	Po-3-gl -cum [%]	Mv-3-gl -cum [%]	Σ-acet. + Σ - cum.	Σ-acet./ Σ-cum.
Classical maceration	10,45	1,63	11,64	11,72	56,65	0,53	0,61	1,97	4,81	7,93	0,17
Maceration in rotary tanks	10,63	3,02	11,98	14,37	52,48	1,85	0,49	1,67	3,51	7,52	0,45
Maceration with microwaves	10,05	1,62	13,74	10,62	55,55	0,87	2,11	1,52	3,92	8,42	0,55
Thermomaceration	11,57	1,14	12,99	11,12	53,34	0,59	1,95	2,08	5,23	9,84	0,35

If you were to order by colour the wines produced in 2007, the most coloured wines were obtained by thermomaceration, secondly wines produced by classical maceration, followed by wines produced by maceration in rotating tanks and last wines obtained by maceration with microwaves. This classification is not the same for wines produced in 2008. In this year, in first place are the wines obtained by maceration in rotating tanks, followed by those produced by maceration with microwaves, thermomaceration and finally wines produced by classical maceration. This sorting according to colour was made possible by colour differences calculated with ΔE 2000 formula (Tab. 5).

Table 3

Chromatic parameters values of wines produced by different maceration fermentation processes of Fetească neagra variety in 2007

Fetească neagră 2007	Computerised colour simulation	Luminosity L*	Cromaticity +a*/-a*	Cromaticity +b*/-b*	Saturation C*	Tonality H*	Intensity	Hue
Clasical maceration		27,47	59,69	40,59	72,18	34,22	7,24	0,44
Maceration in rotating tanks		33,45	62,50	37,93	73.11	31,25	5,43	0,50
Thermomaceration		24,25	57,19	39,18	69,32	34,41	8,60	0,44
Maceration with microwaves		56,55	47,91	22,43	52,90	25,09	2,18	0,75

Table 4

Chromatic parameter values of wines produced by different maceration fermentation processes on Fetească neagra variety in 2008

Fetească neagră 2008	Computerised colour simulation	Luminosity L*	Cromaticity +a*/-a*	Cromaticity +b*/-b*	Saturation C*	Tonality H*	Intensity	Hue
Clasical maceration		79,77	19,87	8,04	21,44	22,03	0,79	0,91
Maceration in rotating tanks		59,70	42,74	14,11	45,01	18,27	1,81	0,77
Thermomaceration		77,76	23,87	6,85	24,84	16,02	0,87	0,83
Maceration with microwaves		70,21	32,05	9,37	33,39	16,30	1,23	0,79

With DIGITAL COLOUR ATLAS 3.0 software based on chromatic parameters computerised colour simulation of each wine was calculated.

Analyzing the results presented in table 5 small colour differences between wines obtained by classical maceration and thermo maceration in 2007 are observed. Another relatively small difference (5.11) was recorded between the wines produced by maceration with microwaves - 2007 and those obtained by maceration in rotating tanks - 2008. It appears therefore that the wines ranked in last place in 2007 have nearly identical colour to wines occupying first place in 2008.

These colour differences recorded in the analyzed wines can not be noticed with the naked eye and therefore determining differences using the formula ΔE 2000 is beneficial.

By correlating the anthocyanin concentration values with wine colour intensity it is found that there is a directly proportional relationship between these parameters, as anthocyanin concentration is higher, the colour intensity will be more pronounced and vice versa.

Table 5

Values of colour sensorial differences with ΔE 2000 formula

FETEASCĂ NEAGRĂ	No.	1	2	3	4	5	6	7	8
Clasical maceration – 2007	**1**	0,00	5,08	2,47	27,38	53,41	32,08	52,16	45,00
Maceration in rotating tanks- 2007	**2**	5,08	0,00	7,40	22,81	46,06	27,57	44,75	38,94
Thermomacertion - 2007	**3**	2,47	7,40	0,00	29,45	57,31	34,02	55,82	47,15
Maceration with microwaves - 2007	**4**	27,38	22,81	29,45	0,00	21,87	5,11	20,16	13,84
Clasical maceration - 2008	**5**	53,41	46,06	57,31	21,87	0,00	18,33	2,95	9,15
Maceration in rotating tanks - 2008	**6**	32,08	27,57	34,02	5,11	18,33	0,00	16,26	9,66
Thermomaceration - 2008	**7**	52,16	44,75	55,82	20,16	2,95	16,26	0,00	6,75
Maceration with microwaves - 2008	**8**	45,00	38,94	47,15	13,84	9,15	9,66	6,75	0,00
FETEASCĂ NEAGRĂ	**No.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

CONCLUSIONS

1. Values obtained by determining the anthocyanins profile reported that malvidin is found in the highest concentration, being influenced by the using of maceration-fermentation technology.

2. The wines produced in 2007 have a more intense coloure than wines produced in 2008; this is due to a lower anthocyanin content;

3. Based on assessments made on technological variants for the production of red wines, maceration in rotating tanks is recommended; the obtained caracteristics corresponds to technological requirements for this category of wines.

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EFFECT OF INDUSTRIAL PROCESSING ON THE LEVEL OF ORGANOCHLORINE PESTICIDE RESIDUES IN GREEN PEAS

EFECTUL PRELUCRĂRII INDUSTRIALE ASUPRA NIVELULUI UNOR REZIDUURI DE PESTICIDE ORGANOCLORURATE DIN MAZĂREA VERDE

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Abstract. *The main objective of this study was to investigate the effect of industrial processing on the level of organochlorine pesticide residues in samples of green peas. Pesticide residues were quantified by gas-chromatographic method (GC-TSD) after each stage technology, including washing, blanching, sorting and sterilization. The results indicated that the reduced amount of waste washing with 12.28 to 50%. Blanching step allowed for a decrease in the concentration of residues between 15.8 to 66.6%. Blanching is an effective step to remove pesticide residues. Heat treatment in combination with large amounts of water improves disposal of the residues. Cumulative loss in concentration varied between 35 and 82.1% for pesticide residues, except β - endosulfan, where content increased from processing green peas bean. Industrial processing tended to reduce or eliminate (aldrin, eldrin) substantially pesticide residues in a synergistic manner.*
Keywords*: organochlorine pesticides, industrial processing, green peas*

Rezumat. *Obiectivul principal al acestui studiu a fost de a investiga efectul prelucrării industriale privind nivelul unor reziduuri de pesticide organoclorurate din probele de mazăre verde. Reziduurile de pesticide au fost cuantificate prin metoda gaz-cromatografică (GC-TSD), după fiecare etapă tehnologică, incluzând spălarea, blanşarea, sortarea şi sterilizarea. Rezultatele au indicat că procesul de spălare a redus cantitatea de reziduuri, cu 12,28 – 50%. Etapa de blanşare a permis o scădere a concentraţiei de reziduuri, între 15,8 – 66,6%. Blanşarea este un pas eficient pentru a elimina reziduurile de pesticide. Tratamentul termic în combinaţie cu o cantitate mare de apă îmbunătăţeşte eliminarea reziduurilor. Pierderea cumulată în concentraţie a variat între 35 şi 82,1% pentru reziduurile de pesticide, cu excepţia β endosulfan, unde conţinutul a crescut în urma prelucrării mazării verzi. Prelucrarea industrială a avut tendinţa de a reduce sau elimina (aldrin, eldrin) în mod substanţial reziduurile de pesticide într-un mod sinergic.*
Cuvinte cheie: *pesticide organoclorurate, prelucrare industrială, mazăre verde*

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INTRODUCTION

Persistent organic pollutants (POPs) are characterized by a long half-life in the environment and a potential bioaccumulation in the food. In this category are organochlorine pesticides (POcl), based on DDT and others, based on chlordane, aldrin, dieldrin, endrin, heptachlor and toxaphene. After 1988, these types of pesticides were not allowed, or were restricted, currently the only organochlorine pesticide lindane used as the base (which is not on the list of the Stockholm Convention on **P**ersistent **O**rganic **P**ollutants). After numerous investigations and public concern about the dangers of their use, the Government has imposed restrictions and bans on this class of pesticides (the proper use of pesticides in relation to the authorisation and registration, as well as compliance with Maximum Residue Limits). Despite the limitation on the use of these pesticides (in the 1970s and 1980s), they continue to persist in the environment today.

The stability of POcl and that residues can remain in foodstuffs, processed or unprocessed, increases the danger to human health. Industrial processing could modify or degrade the chemical structure of analytes and matrix may change in food. Typical stages used in the processing of vegetables and fruits, such as washing, peel, blanching and sterilization plays a role in reducing residues (Geetanjali et al., 2009). Effects of industrial processing of foodstuffs on the pesticides was examined in detail by researchers such as Holland P.T. et al. (1994) and Geetanjali K. et al.; (2009). These authors concluded that there was a reduction in the level of pesticide residues, due to techniques for processing, unless the by-products were concentrated to obtain fruit and vegetables and the pressing or extraction of oil from seeds. It has been suggested that the effects of processing on the levels of pesticide residues may be influenced by the physical location of pesticides and physico-chemical properties such as solubility, volatility, water partition coefficient - octanol (log Kow) and thermal degradation.

This paper was designed to quantify the effects of the washing, blanching, sorting and final sterilization of organochlorine pesticide residues in green peas bean being taken on the technological process of obtaining canned green peas bean in brine.

MATERIAL AND METHOD

In general, production procedures canned green peas bean include four steps, washing, blanching, sorting and final sterilization. In the current study, green peas was analyzed in five stages (green peas - unprocessed, washing, blanching, sorting and final sterilization) and taken to determine and investigate the variation in the content of pesticide residues during processing. Each processing step (see below) was considered a point of sampling for residue analysis.

(i) Washing: Green peas was subjected to washing steps (four washes) with sorting has been done in pre-sorted and hydraulic conveyor.

(ii) Blanching: Stage of scalding (blanching) was carried out in continuous scalding machine at a temperature of 98°C for 3 minutes.

(iii) Final sort: After blanching was carried out in a rapid cooling to a temperature of 30°C for 1 minute; at the same time there was a further washing. After cooling was achieved a final sorting conveyor belts.

(iv) Sterilization has been carried out in an autoclave at a temperature of 120°C for 15-35 minutes, followed by cooling of the vessels (jar) on the outside, cooling is provided at 40 minutes, during which time the product is brought to a temperature of 40°C. Immediately after removal of the unit of processing fruit and vegetables, samples were placed in plastic bags and stored at -20°C until analysis, and analyzed as such.

Criteria for selecting pesticides was based on some of the major organochlorine pesticides (α, β and γ HCH, pp '- DDT, op' - DDT, pp '- DDE, α and β endosulfan and endosulfan sulfate, aldrin, dieldrin, endrin and heptachlor) monitored at EU level monitoring program for pesticide residues. In all cases, the selected pesticides are used in general have been used to control a variety of pests and diseases. Current established maximum residue limits for pesticides in the study were given the limits of admissibility the regulated by the EU Reg EC No 396/2005.

Determination of pesticide residues was carried out according to standards: EN 12393-1, 2, 3:2009 - Foods of plant origin. Multireziduu methods for determining pesticide residues GC. For the quantitative determination of residues of POcl performed in this study was used as the gas chromatography apparatus of Varian 450 coupled to the detector TDS, where the samples were injected automatically separated and purified by a pre-processing thereof by solvent extraction organic (acetonitrile, petroleum ether).

To report levels of pesticide residues were using two parameters: mean value and standard deviation (s) from three identical samples for each sampling point, expressed in mg/kg. Data were subjected to analysis of variance (ANOVA).

RESULTS AND DISCUSSION

Results of the study on organochlorine pesticide residues analyzed along four processing steps are shown in Table 1.

Effect of processing steps on residues of HCH and its metabolites is shown in table 1. The fortified the content in α and γ HCH showed the highest values detected in the raw material, while for β HCH and HCH the highest concentrations were obtained after washing steps. Effect of sterilization phase has proven to be most pronounced on green peas. The washing resulted in decreased concentrations of α HCH and γ HCH respectively 16% and 14%. Blanching stage residue level decreased by 60% for β HCH isomer, 55% for HCH, with up to 16% in the case of 6% for α HCH and γ HCH. Effect of sorting phase was found to be more pronounced on β HCH isomer and the least effect was obtained on γ HCH residues. The process of sterilization decreased α and γ HCH residues up to 67%, the lowest effect was found when HCH residues while β isomer HCH concentration has not changed.

Table 1

Residue levels during processing of green peas, mg/kg (mean ± SD) (n=3)

Pesticide	Unprocessed peas	Whasing	Blanching	Final sorting	Sterilization
α HCH	0,0073±0,001	0,0063±0,002	0,0053±0,001	0,0040±0,001	0,0013±0,001
β HCH	0,0040±0,004	0,0050±0,002	0,0020±0,001	0,0013±0,001	0,0013±0,001
γ HCH	0,0057±0,001	0,0050±0,001	0,0047±0,001	0,004±0,0006	0,0013±0,0003
HCH	0,0023±0,001	0,0067±0,002	0,0030±0,002	0,0020±0,001	0,0013±0,001
pp' - DDT	0,0067±0,002	0,0047±0,002	0,0020±0,001	0,0013±0,001	0,0017±0,001
op' - DDT	0,0013±0,002	0,0010±0,001	0,0013±0,001	0,0010±0,001	0,0013±0,001
pp' - DDE	0,0053±0,001	0,0030±0,002	0,0040±0,001	0,0027±0,002	0,0017±0,001
α endosulfan	0,0040±0,001	0,0020±0,001	0,0013±0,001	0,0013±0,001	0,0013±0,001
β endosulfan	0,0007±0,0003	0,0007±0,001	0,0003±0,001	0,0003±0,001	0,0013±0,0003
Endosulfan sulphate	0,0023±0,001	0,0013±0,001	0,0013±0,001	0,0013±0,001	0,0013±0,001
Aldrin	0,0043±0,001	0,0047±0,001	0,0030±0,002	0,0040±0,001	nd
Dieldrin	0,0033±0,001	0,0033±0,001	0,0010±0,001	0,0003±0,001	0,0007±0,001
Endrin	0,0020±0,001	0,0013±0,001	nd	nd	nd
Heptachlor	0,0047±0,002	0,0033±0,001	0,0023±0,001	0,0013±0,001	0,0013±0,001

Results concerning metabolites DDT's are shown in table 1. Own investigations on the content of pp '- DDT, presented the values that showed a significant decrease it by 57% after blanching stage compared to stage washing of 0.0047 mg/kg to 0.0020 mg/kg and a decrease of 35% after sorting step. The washing step has reduced the content in the pp' - DDT by 29%, from 0.0067 mg/kg (unprocessed green peas) to 0.0047 mg/kg. After the sterilization step has occurred increase in the concentration of pp '- DDT whith up to 31%. The results concerning isomer op '- DDT, is characterized by a different behavior, with small increases and decreases as follows: comparative between stages of blanching vs. washing and sterilizing vs. final sorting noticed an increase of concentration by 30%, from 0.0010 mg/kg at 0.0013 mg/kg. The level concentration of pp '- DDE obtained at samples of unprocessed green peas comparative with samples of green peas taken after the washing, registered a decrease by 43%, a value that after blanching stage increased by 33%, from 0.0030 mg/kg at 0.0040 mg/kg. Process of final sorting has resulted in a decrease in the concentration of 32.5%, from 0.0040 mg/kg at 0.0027 mg/kg. Sterilization phase resulted decrease with 37% in the concentration of pp '- DDE in samples of green peas that have been sorted.

The effect of industrial processing on residues of α and β endosulfan and endosulfan sulphate is shown in table 1. Samples of green peas unprocessed analyzed for content of α endosulfan showed a mean value of 0.0040 mg/kg, a value that subsequently decreased after the washing step by 50% to 0,0020 mg/kg. After the blanching step, the contents decreased by 35%, up to 0.0013 mg/kg. The final sorting step, followed by sterilization did not influence content of α endosulfan, the concentration registered remaining at level of the 0.0013 mg/kg.

The results for the concentration of β endosulfan at raw material and after washing, presented an average content of 0.0007 mg/kg. Blanching stage has

reduced, by 57% to 0.0003 mg/kg. An increase in concentration of β endosulfan was registered by a sterilization step, from 0.0013 mg/kg at 0.0003 mg/kg. The analyzes performed for the average content of endosulfan sulphate indicated a reduction after washing steps, reducing with 43.5% level recorded for this pesticide in unprocessed green peas. Average concentration of 0.00013 mg/kg was recorded in all samples of peas on the technological flow.

Data obtained from analysis for the concentration of aldrin, dieldrin, endrin and heptachlor, statistically processed, are shown in table 1. The values obtained after the washing step had a concentration of 0.0047 mg/kg, content that has been reduced after the step of blanching with 36% to 0.0030 mg/kg. Stage of sterilization to canned green peas completely eliminated aldrin residues in the product.

Throughout the stages of processing green peas investigated for dieldrin content was obtained a decrease in the organochlorine after blanching step, sorting and sterilization (washing steps not reduced dieldrin content). A reduction of 70% of the average content of dieldrin was recorded after the blanching step, from 0.0033 mg/kg (this value was recorded for samples washed peas) from 0.0010 mg/kg. The sterilization step has resulted a decrease with 70% in the concentration of dieldrin, from 0.0010 mg/kg to 0.0003 mg/kg. For the identification residual endrin, only samples of green peas unprocessed, had a concentration of 0.0020 mg/kg, this value was reduced by the washing steps with 35% to a content of 0.0013 mg/kg. Influence stages of blanching, sorting and sterilization that have been evaluated for endrin content of green peas led at getting undetectable values.

Influence of technological process has reduced the average concentration of heptachlor to green peas. There were decreases in the following order: the washing, reduced concentration of heptachlor, by 29.8%, from 0.0047 mg/kg at 0.0033 mg/kg; after blanching step, decreased by 30%, from 0.0033 mg/kg at 0.0023 mg/kg; sorting step for removing remnants vegetable results after blanching products at 98°C, reduced significantly the content with 43%, from 0.0023 mg/kg at 0.0013 mg/kg.

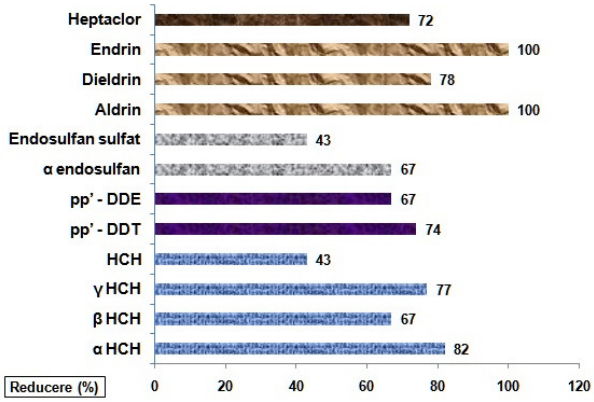


Fig. 1 - Decreased percentage (%) of pesticide residues organochlorine of canned green peas beans in brine

The total amount of pesticides removed by the processing steps combined for each organochlorine (except isomer op '- DDT for which processing effects not changed content in green peas) is shown in figure 1.

In generally removal of residues was more effective (<70%) where α and γ HCH pesticides, pp' - DDT, dieldrin and heptachlor. Following processing green peas, metabolites β HCH, pp' - DDE and α endosulfan were reduced by 67%, while HCH and endosulfan sulphate have shown a reduction of 43% through processing. Residues of aldrin and endrin were completely reduced after subsequent sterilization of canned green peas beans in brine.

CONCLUSIONS

1. Green peas samples taken from the canned green peas beans in brine and analyzed for content in organochlorine pesticide, have resulted in values that significantly decreased after processing raw materials (isomer op' - DDT has not changed concentration after processing).

2. Pesticides aldrin and endrin were recorded as values under detection limit in canned green peas beans in brine;

3. The research results confirms the presence of pesticides in green peas, quantity these being well below maximum limits admissible (MRL's) (EC, 2005).

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EFFET DU TRAITEMENT THERMIQUE SUR LA TRANSFORMATION INDUSTRIELLE DES CERISES GRIOTTES

EFECTUL TRATAMENTULUI TERMIC ASUPRA PRELUCRĂRII INDUSTRIALE A VIŞINELOR

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Abstract. *La teneur en vitamine C des produits horticoles peut être influencée par divers facteurs, tels que les différences génétiques, conditions climatiques et des pratiques agricoles, les techniques de maturation et de récolte et techniques de stockage et de traitement. Le but de cette étude est de suivre la dynamique de l'acide ascorbique, l'activité enzymatique, pH, solides solubles, acidité et humidité tout au long de l'écoulement de l'ensemble du processus. Les échantillons ont été prélevés à différents stades de la procédure d'obtention de la compote de cerise griottes: matières premières, lavage, blanchiment et produit fini. À la suite de l'analyse, on a remarqué que le traitement thermique a eu un effet décisif sur les paramètres de l'étude.*
Mots-clés**:** *l'acide ascorbique, ascorbat oxidase, superoxyde dismutase, pH*

Rezumat. *Conţinutul de vitamina C al produselor horticole poate fi influenţat de diverşi factori, cum ar fi: diferenţele genotipice, condiţiile climatice şi practicile agricole, tehnicile de maturare şi de recoltare, precum şi tehnicile de păstrare şi prelucrare. Scopul acestui studiu este de a monitoriza dinamica acidului ascorbic, activitatea enzimelor, pH-ul, aciditatea, substanţa uscată solubilă şi totală şi umiditatea pe parcursul fluxului tehnologic. Probele au fost prelevate de la diferite etape ale procesului de obţinere a compotului de vişine: materie primă, etapa de spalare, etapa de blanşare şi produsul finit.În urma analizelor efectuate s-a observat că tratamentul termic a avut un efect decisiv asupra parametrilor studiaţi.*
Cuvinte cheie*: acid ascorbic, ascorbat oxidază, superoxid dismutaza, pH*

INTRODUCTION

La transformation des aliments modernes basés sur une série de procédés de conservation qui fournissent une qualité égale à partir du moment de la fabrication jusqu'à la date de consommation. (Ross et al., 2002)

De certains traitements effectués au cours des processus technologiques sont destinés à d'améliorer la qualité du produit fini à la fois en termes d'apparence et de goût. Le traitement spécifique pour l'amélioration de couleur du

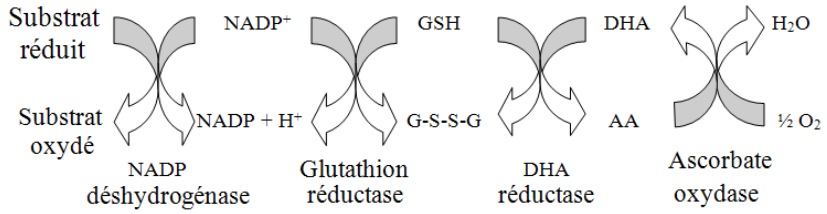
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produit fini et l'inactivation des enzymes est blanchir. Le blanchiment est une des étapes les plus critiques durant au déroulement du processus en termes de perte de teneur en éléments nutritifs. Les deux éléments nutritifs solubles dans l'eau et ainsi que la oxydables peuvent être dégradée si l'opération n'est pas effectuée correctement. Les enzymes peuvent provoquer des changements dans la saveur, la texture ou visuelle si elle n'est pas inactivé.

L'acide ascorbique est un nutriment sensible à l'oxygène et température élevée. Ceci peut être oxydé par l'oxygène en l'acide déhydroascorbique et ensuite hydrolysé en acide dicétogulonique et enfin à acide oxalique. Le taux de dégradation de l'acide ascorbique est affectée par le pH, la température et la quantité d'oxygène disponible. (Salunkhe, 2000)

Les enzymes sont des protéines qui catalysent les réactions dans l'activité biologique, regland l'activité métabolique des organes de la plante et la conduite des processus biochimiques de la vie. La plupart des enzymes sont composées d'une partie de la protéine (apoenzyma) et d'un composant non-protéinique (cofacteur de l'enzyme). Le complexe enzyme-cofacteur, catalytique active, s'appelle holoenzyme et la suppression de la cofacteur conduit à la perte d'activité catalytique. Enzymes sont trouvent dans des compartiments cellulaires à l'intérieur des cellules, qui réglemente spécifiquement certains processus métaboliques.

Le peroxyde d'hydrogène formé par oxydases flavine-dépendantes ou résultant dans le transport des électrons mitochondrial, la photolyse de l'eau, l'action de la superoxyde dismutase ou des différentes réactions d'hydroxylation et l'oxygénation est décomposée par l'un de le deux metaloenzyme avec Fe: catalase et la peroxydase. Avec la superoxyde dismutase, glutathion, carotènes, ces enzymes sont vraiment "scavenger" des radicaux libres d'oxygène, réactives et extrêmement toxiques au niveau cellulaire. La catalase est similaire du point de vue structurelle et fonctionnelle avec peroxydase, elle agit sur la séparation de l'eau oxygénée en eau et en oxygène des molécules, alors que la peroxydase peut être utilisé comme accepteur d'oxygène atomique de diverses substances: l'acide ascorbique, glutathion, les phénols s'oxyder. Acide L-ascorbique, largement répandue dans la cellule végétale, peut agir comme transporteur d'hydrogène en raison du potentiel d'oxydoréduction de l'acide déhydroascorbique. Peut être oxydé par les enzymes telles que la peroxydase, lipoxidase, fenoloxidase, mais un rôle essentiel dans la biodégradation de l'oxydase d'ascorbate a composé qui agit selon le schéma :



Ascorbate oxydase a comme groupe prosthétique l'ion cuivre et l'oxydation de l'acide ascorbique en acide déhydroascorbique agissant comme une oxydase terminale dans le processus de respiration. (Gherghi et al., 2001)

MATÉRIEL ET MÉTHODE

La matière biologique étudié a été prélevé de l'unité de traitement S.C. Contec aliments S.R.L. Tecuci.

Ont analysé des échantillons de la matière première (la première étape de la technologie-réception), une autre série d'échantillons ont été recueillie après le lavage du fruit, la troisième série d'échantillons ont été recueilli dans le stade de blanchir et les derniers spécimens recueillis sur les flux technologique étaient du produit fini.

En outre, il a été examiné et compote de griottes cerises après 3 mois de stockage à température différente.

Échantillons ont été expédiés dans des sacs de polyéthylène et à basse température, puis stockés dans un réfrigérateur à 2 ÷ 4° C jusqu'à l'analyse.

Procédé technologique d'obtenir une compote cerise comprend les étapes suivantes: réception, étalonnage, lavage, nettoyage, échaudage, préparer les récipients (conservation), la préparation du sirop, mettre le produit conservé dans des pots, ajoutant des contenants de sirop, de fermetures, de pasteurisation, d'emballage, le stockage et la livraison du produit fini.

Dans l'élaboration de cette étude ont été utilisées les méthodes suivantes:

- pour calculer la teneur en acide ascorbique a été utilisé ISO 6557-1: 1986, ISO-6557 2:1984 et réflectométrique methode utilisant le dispositif de détermination appelé Reflectoquant ;
- pour la détermination d'ascorbate oxydase, superoxyde dismutase, peroxidase, polifenoloxidase et catalase est utilisée la méthode spectofotometric (Artenie et al, 2008)
- le pH a été déterminé à l'aide de pH-metre conformément à EN 1132 ;

RÉSULTATS ET DISCUSSION

1. Détermination de la vitamine C

Il a été déterminé le contenu de substances interférentes, ces valeurs sont obtenues qu'à partir de l'acide ascorbique total contenu. Matières premières cerises griottes, les participants devront un flux de contenu technologique initialement à 17,5 mg acide ascorbique/100 g produit.

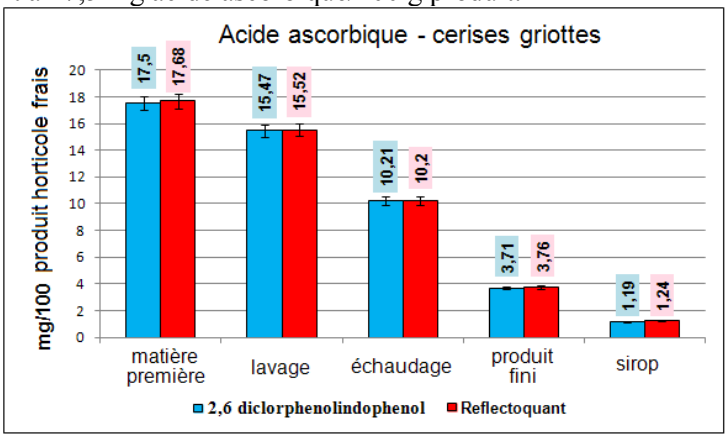


Fig. 1 - La variation de l'acide ascorbique pendant le flux technologique

À la suite les calculs effectués, on a conclu que:

-lavage après une baisse de la teneur en vitamines jusqu'à 15,47 respectivement 15,52 mg/ 100 g de produit ;

-la prochaine étape est une technique d'analyse blanchir, à la fin de cette étape dans de l'acide ascorbique contenu diminue jusqu'à 10,21 respectivement, 10,2 mg/100 g de produit ;

-produit fini affiché la plus grande perte sur le flux technologique du procédé technologique, quand, après avoir contenu des pasteurisateurs en vitamine C atteint la valeur de la 3,71 mg 3,76mg/100 g de produit dans le cas de fruits et 1,19 et 1, 24 mg/100 ml de liquide.

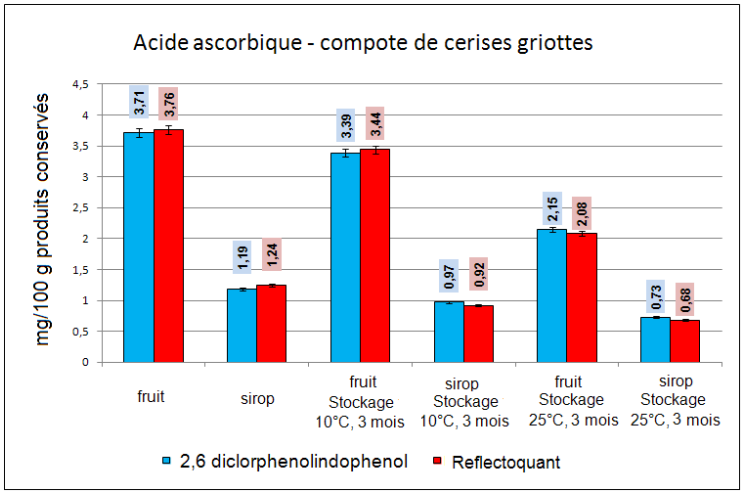


Fig. 2 - La variation de l'acide ascorbique au cours du stockage

Dans la fig. 2. est illustré la dynamique de l'acide ascorbique au cours du stockage.

Au cours de la période de stockage peuvent être observés à la fois analyse le phénomène suivant:

- après une période de 3 mois à une température de 10°C et 75% d'humidité relative, la teneur en acide ascorbique de coupure basse à 3,39 mg/100 g de produit dans le solide et le liquide pour couvrir le montant de stockage 0,97 g/100 ml ;

- en cas de conservation du produit fini à 25°C sont des pertes inférieures; le fruit est de 2,15 mg/100 g de produit et dans le sirop liquide 0,73 mg/100 ml de revêtement.

2. Détermination de l'activité enzymatique

Dans la figure 3 est représente un paramètre qui influe sur la teneur de l'acide ascorbique, qui est ascorbate oxydase. Pendant le déroulement du processus est mis en évidence l'inactivation de l'enzyme en raison du traitement thermique. Ainsi, la matière première a été déterminé que l'activité de l'ascorbate

oxydase atteint 1,6 µM/g/min, mais diminue rapidement après la chirurgie fruit blanchiment et à la fin de ce processus technologique est complètement détruite.

Dans le cas de superoxyde dismutase, catalase, polifenol oxidase et peroxidase rencontre la même tendance que l'oxydase d'ascorbate.

Après détermination de la superoxyde dismutase a été constaté que la matière première, le degré d'inhibition d'un gramme de tissu végétal en 1 minute est de 18,76% d'inhibition/g/min. Au cours du traitement, cette enzyme, enregistre une baisse de jusqu'à de son inactivation.

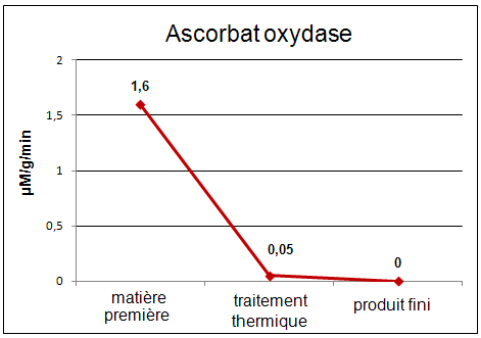


Fig. 3 - Ascorbate oxydase activité variation durant le flux technologique

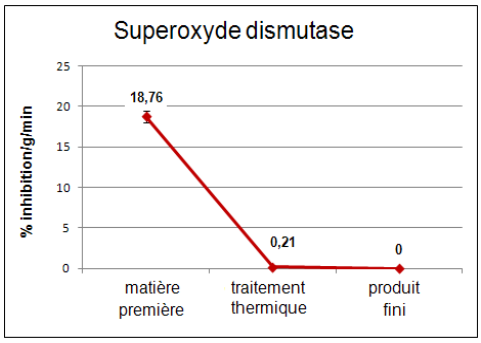


Fig. 4 - Variation de l'activité de la superoxyde dismutase durant le flux technologique

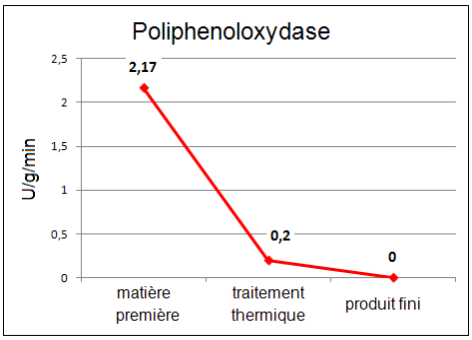


Fig. 5 - Variation de l'activité de la polifenoloxydase durant le flux technologique

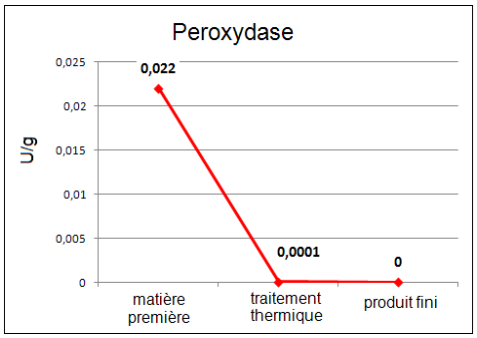


Fig. 6 - Variation de l'activité de la peroxydase durant le flux technologique

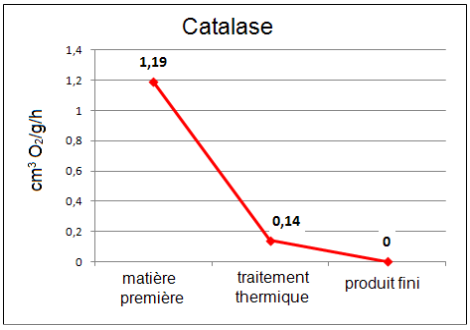


Fig. 7 - Variation de l'activité de la catalase durant le flux technologique

3. La détermination des caractéristiques physico-chimiques

En plus des tests effectués pour la détermination quantitative de l'acide ascorbique et la détermination de l'activité enzymatique ont été effectués des tests de laboratoire pour suivre les changements dans les processus technologiques et les résultats sont indiqués dans le tableau 1.

Le plus grand changement est observé dans le cas de la matière sèche soluble, qui a enregistré 15,4 ° Brix pour les matières premières et la compote de cerises (produit fini), il a enregistré 18,3° Brix.

En ce qui concerne l'humidité, la matière première est enregistré 82,53% d'humidité, augmenter au cours de la technologique, mais le produit fini est une diminution de la valeur de 73,5%.

Tableau 1

Caractéristiques physico-chimiques

	MSS (°Bx)	MST (%)	Humidité (%)
Griottes - matières premières	15,4	17,47	82,53
Griottes - lavage	15,2	16,99	83,01
Griottes - blanchiment	14,7	15,55	84,45
Griottes - le produit fini	18,3	26,5	73,5

CONCLUSIONS

Suivant analyse a conclu que le traitement thermique a un effet décisif sur l'enzyme, ce qui conduit à l'inactivation.

Traitements thermiques appliqués de produits horticoles ont un effet négatif sur la teneur en acide ascorbique. L'extension du traitement thermique entraînant la destruction de l'acide ascorbique.

La teneur en acide ascorbique ont une influence considérable et des conditions de stockage.

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ANTIOXIDANT AND ANTIPROLIFERATIVE POTENTIAL OF ANTHOCYANIN-RICH FRACTION OBTAINED FROM COMERCIAL JUICES

POTENȚIALUL ANTIOXIDANT ŞI ANTIPROLIFERATIV AL FRACȚIEI BOGATE ÎN ANTOCIANI OBȚINUTĂ DIN SUCURI COMERCIALE

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Abstract. *The present study was performed to determine antiproliferative potential of anthocyanin-rich fraction obtained from commercial available juices on A2780 ovarian cancer line. Regarding antioxidant activity of analyzed juices against DPPH radical, chokeberry juice had stronger antioxidant activity than elderberry and beetroot juices. Also it was found that purified glycosilated cyanidin from elderberry and chokeberry could suppressed the A2780 cellular survival by 50% after a 24-h exposure. Purified betalanins from beetroot juice inhibited the proliferation of A2780 cells in a dose dependent manner. This effect was associated with bioactive photochemicals and antioxidant potential of anthocyanins and betalanins, compounds presents in our purified extract.*
Key words: *berries juice, antioxidant activity, cell viability, ovarian cancer*

REZUMAT. *Scopul acestui studiu a fost de a determina potențialul antiproliferativ al fracțiilor bogate în antociani obținute din sucuri comerciale, pe linia de celulară tumorală A2780 (cancer ovarian). În ceea ce privește activitatea antioxidantă a sucurilor analizate împotriva radicalului DPPH, sucul de aronia a demonstrat activitate antioxidantă mai puternică decât sucul de soc şi sfeclă roşie. De asemenea, s-a observat că cianidinele glicozilate purificate din soc şi aronia au suprimat de rata de supraviețuire a celulelor tumorale A2780 cu 50%, după o expunere a acestora la tratament pentru 24 de ore. Betalaninele purificate din sucul de sfeclă roşie inhibă proliferarea celulelor A2780 într-o manieră dependent de doză. Aceste efecte a fost asociate cu moleculele bioactive şi potențialul antioxidant al antocianilor şi betalaninelor, compuşi prezenți în sucurile purificate.*
Cuvinte cheie: *sucuri, activitate antioxidantă, viabilitate celulară, cancer ovarian*

INTRODUCTION

Antioxidants can be definite as molecules which can donate a free electron or hydrogen atoms to reactive free radicals. In a recent study Record et al., 2001 explained very well that the compounds, easier to oxidize are often the best antioxidants. Also this great propriety contributes to the fruit and the vegetable protective effect against degenerative and chronic diseases (Kumpulainen and Salonen, 1998).

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The phytochemical substances which are involved in antioxidant activity are the phenolic compounds (anthocyanins), nitrogenous compounds (chlorophyll derivatives), tocopherols, carotenoids and ascorbic acid (Nichenametla et al., 2006; Fleschhut et al., 2006). Bagchi et al., 2004 revealed that vitamins C and E have a lower antioxidant activity than anthocyanidins and anthocyanins. The mechanism of those compounds is related to their ability to capture free radicals by donation of phenolic hydrogen atoms (Chen et al., 2005). Several studies reported a positive correlation between the values of the antioxidant activity and the anthocyanins content in edible plants (Heinonen et al., 1998). There is a population-based survey hinting the potential activity of anthocyanins on cancer prevention.

It has been suggested that the consumption of colored fruits and vegetables are associated with a reduced risk of human breast cancer (Adlercreutz, 1998), human melanoma cancer (Huang et al., 2008), human ovarian cancer (Abdah et al., 2011). Flavonoids modulates a number of key elements in cellular signal transduction pathways of the apoptotic process, but the specific mechanism for apoptosis induction is unclear (Ramos, 2007).

An comparative study, between berries based diet of elderly individuals, demonstrate that the consumtion of large amounts of strawberries reduce cancer developing (Colditz et al., 1985). The chemopreventive effects of anthocyanins reagarding their supposed action mechanisms in animal and human models are reviewed in several recents studies (Jing and Giusti, 2011; Winny and Valerie, 2011). However, this paper focuses on chemoprotective potential of the anthocyanin-rich fraction from commercial available juices on two different tumor cell lines.

MATERIAL AND METHOD

Anthocyanin HPLC quantification was performed using cyanidin-3-*O*-sambubioside standard. The Equipment used was an Shimadzu HPLC system equipped with a binary pump delivery system LC-20 AT (Prominence), a degasser DGU-20 A3 (Prominence), diode-array SPDM20 A UV-VIS detector (DAD) and a Luna Phenomenex C-18 column (5µm, 25 cm x 4.6 mm). Formic acid (4.5%) in bidistilled water and acetonitrile were used as mobile phase. The gradient elution system was: 10% B, 0-9 min; 12% B, 9-17 min; 25% B 17-30 min; 90% B, 30-50 min; 10% B, 50-55 min. The flow rate was 0.8 ml/min and the analyses were performed at 35°C. The chromatograms were recorded at 520 nm.

Determination of antioxidant activity. The 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging activity was evaluated determined using Brand-Williams *et al.,* (1995) method. The procedure is briefly presented below: DPPH methanolic solution (80 µM) was freshly prepared. A volume of 250 µl of this solution was allowed to react with 35 µl sample and the absorbance was measured at 515 nm, for 30 minutes. The percentage of scavenging effect of purified commercial available juices against DPPH radicals was calculated using the following equation:

DPPH scavenging effect (%) = $[(A_0 - A_s) \times 100]/A_0$, Where, A_0 is absorbance of the blank, and A_s is absorbance of the samples at 515 nm.

Cell culture. Adherent epithelial human ovarian tumor cells A2780 were maintained in RPMI medium supplemented with 10% fetal serum, at 37^0C, 5%, CO2, 90% humidity. Cells, $5x10^3$ cells/well were placed on 96-well microplate and allowed to attach

for 24h. Cells growth medium was replaced next day with complete medium containing different concentrations from 0 to 25 µl/ml purified extracts.

MTT proliferation assay. Cells proliferation was determined using MTT reagent (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide). Growth medium was removed from each well including control, and the cells were whased three times with PBS. This step was followed by 1h of incubation with MTT solution (0.5 mg/ml) in DMEM without phenol red. The formazan particles were solubilized with DMSO. The obtained results were expressed as survival percent comparing to an untreated control.

RESULTS AND DISCUSSIONS

In order to evaluate antioxidant activity of chosen red fruit juices, DPPH assay was used. The DPPH scavenging activity, expressed in % inhibition of analyzed juices is presented in Fig. 1. The obtained results showed no significant differences between all the juices analyzed. The highest antioxidant capacity was determined for (49.1%) follows by elderberry juice (45.6%) and beetroot juice (31.3%). Additionally, statistical differences were not observed between elderberry and chokeberry juice antioxidant capacity (49.1 pmol TE/ml, 645.6 pmol TE/ml respectively). Antioxidant activity of chokeberry juice against DPPH radical was stronger than antioxidant activity of beetroot and elderberry juice. The present data are in agreement with published data (Slatnar et al., 2012) and lower than values obtained by Lidija Jakob et al., 2007, Adriana Bramorski et al., 2012.

Treatment of A2780 cells with berries extracts had effect on cell morphology as cell shrinkage and they became irregular in shape and size. Contrary under normal growth conditions (untreated cells) no any morphological changes were observed (Fig. 3). The treatment with chokeberry anthocyanin-rich fraction inhibited the proliferation of A2780 cells by 42% at the highest concentration (Fig. 2A). We observed that cell viability decreased in a dose dependent manners. Same effects were observed at the treatment with elderberry and beetroot anthocyanin-rich fractions.

Regarding the antiproliferative effects of edible berry juice, in a recent study Boivin et al., 2007, observed a significant inhibition of cell growth for the raspberry, lowbush blueberry and cranberry juices. The tumor cell lines use in this experiment were stomach, prostate, intestine and breast. Khanh Dang Vu et al. 2012 demonstrate that cranberry juice can inhibit growth of two colon cancer (HT-29 and LS-513 cell lines). Moreover, Magdalena Kędzierska et al., 2013 evaluate the protective effects of chokeberry commercial extract. They observed the obtained that the commercial extract from *A. melanocarpa* berries significantly reduced, in *in vitro* system, the oxidative/nitrative stress and hemostasis changes in plasma from breast cancer patient.

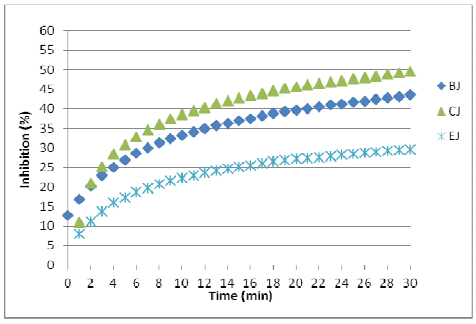


Fig. 1 - Antioxidant activity of blueberry extracts using DPPH method. The inhibition percentage represents the antioxidant activity

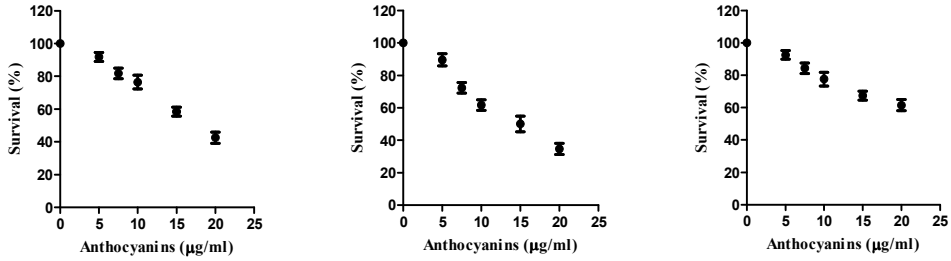


Fig. 2 - Results of MTT proliferation assay (proliferation %) of A2780 human ovarian cancer cells -treated by anthocyanin-rich fraction obtained from comercial juices

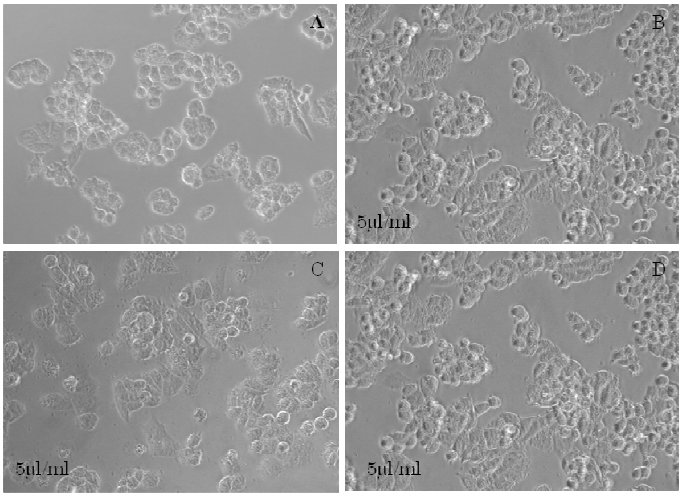


Fig. 3 - Comparative morphology of A2780 cells non-treated and treated with anthocyanin-rich fraction (A)- control, (B)-ckokeberry, (C)-elderberry, (D)-beetroot.

CONCLUSIONS

1. Edible berries are presently becoming very popular for their health benefits.

2. This study demonstrated the high antioxidant power and chemopreventive potential of anthocyanins from commercial juices

3. Is recommended that more research to be done in order to evaluate the benefits of berries consumption because these shows to be a new alternative for the prevention of many types of cancers.

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RESULTS REGARDING THE INFLUENCE OF VARIETY, SOIL TYPE AND CROP YEAR FACTORS ON THE PRODUCTION OF SPRING BARLEY GROWN IN NORTH-EAST BĂRĂGAN

REZULTATE PRIVIND INFLUENȚA FACTORILOR SOI, TIP DE SOL ȘI AN DE CULTURĂ ASUPRA PRODUCȚIEI DE ORZOAICĂ DE PRIMĂVARĂ CULTIVATĂ ÎN BĂRĂGANUL DE NORD-EST

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Abstract *This paper aims to study the influence of variety, soil type and climatic conditions on the production in spring barley. The research was conducted in 2008-2010, in Vădeni area, Brăila county, on two types of soil (typical chernozem and calcaric aluviosoil), on the varieties Annabell, Thuringia, Cristalia and Tunika.*
Keywords *barley varieties, production, soil*

Rezumat. *Lucrarea îşi propune studiul influenţei factorilor soi, tip de sol şi a condiţiilor climatice asupra producţiei la orzoaica de primăvară. Cercetările s-au efectuat în perioada 2008-2010, în zona Vădeni, judeţul Brăila, pe doua tipuri de sol (cernoziom tipic şi aluviosol calcaric), la soiurile Annabell, Thuringia, Cristalia, Tunika.*
Cuvinte cheie *soiuri de orz, producţie, sol*

INTRODUCTION

In order to increase the stability of the yields from year to year, new varieties of cereals must have a superior behaviour under both drought years and in years with normal or excess rainfall, i.e. they must combine high production potential and good resistance to water stress (Plum, 1996, quote by Săulescu N.N. et al., 2006).

MATERIAL AND METHOD

The research was conducted in 2008-2010, in Vădeni area, Brăila county, on two different types of soil, typical chernozem (with the following physical and chemical properties: bulk density (DA): 1.15 g/cm3, 28%, pH (water): 7.60, humus content (H): 3.5%, phosphorus (P_{AL}):45 ppm, Potassium (K_{AL}): 222 ppm and indicate N (IN): 3.55) and calcaric aluviosoil (with the following physical and chemical properties: bulk density (DA): 1.35 g/cm^3, pH (water): 7.75, humus content (H): 2.93%, Phosphorus (P_{AL}):47 ppm, Potassium (K_{AL}): 111 ppm and indicate N (IN): 2.93). Four varieties of spring barley were studied - Annabell, Thuringia, Cristalia and Tunika.

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The precedent plant was corn. The sowing was done in all the years of research, at the optimum age for this area (the first decade of March) at a density of 400 b.g./m^2.

Climatic conditions during the period in which the experiments took place were different from year to year (Table 1). Analysing the annual amount of rainfall compared to the multi-annual average (447 mm), it appears that the agricultural year 2007-2008 was a normal year (481 mm), 2008-2009 was dry (363 mm), 2009-2010 was a year with more precipitation (714 mm) irregularly distributed throughout the year.

In terms of average multi-annual temperatures recorded from the crop years during which the research was conducted compared to the normal (the multi-annual average calculated over 50 years) we can see that the crop years 2007-2008 and 2009-2010 were thermally normal years, registering a positive deviation of 0.7°C to the multi-annual averages. The agricultural year 2008-2009 was a warm year, registering a positive deviation of 1.2°C to the multi-annual averages.

Table1

The main climatic elements for the agricultural years 2007-2008, 2008-2009 and 2009-2010 compared to the normal

Elemente climatice		Valori lunare												Total/media an agricol
		X	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	
Precipitatii (mm)	Normala	31	36	33	27	27	29	36	52	63	47	42	29	447
	2007/2008	81	53	77	7	2	15	44	86	40	7	0	60	481
	Abatere	+50	+17	+44	-20	-25	-14	+18	+34	-23	-40	-42	+31	+34
	2008-2009	21	18	24	64	27	29	11	32	25	43	16	15	363
	Abatere	-10	-18	-9	+37	0	0	-25	-20	-38	-4	-26	-14	-84
	2009-2010	37	22	114	89	70	28	10	54	165	88	19	21	717
	Abatere	+6	-14	+81	+62	+43	-1	-26	+2	+102	+41	-23	-8	+270
Temperaturi in aer (°C)	Normala	11,7	5,6	0,4	-2,5	-0,3	4,6	10,9	16,9	20,7	22,8	22,1	17,5	10,9
	2007/2008	11,8	3,9	0,1	-1,3	2,6	8,3	12,3	16,3	21,6	22,9	24,3	16,3	11,6
	Abatere	+0,1	-1,7	-0,3	+1,2	+2,9	+3,7	+1,4	-0,3	+0,9	+0,1	+2,2	-1,2	+0,7
	2008-2009	12,1	6,6	3,3	0,3	2,5	5,6	11,5	17,5	21,4	24,5	22,6	17,6	12,1
	Abatere	+0,4	+1,0	+2,9	+2,8	+2,8	+1,0	+0,6	+0,6	+0,7	+1,7	+0,5	+0,1	+1,2
	2009-2010	12,8	7,2	0,2	-3,3	0,2	5,1	11,6	17,8	21,2	23,5	25,0	17,5	11,6
	Abatere	+1,1	+1,6	-0,2	-0,8	+0,5	+0,5	+0,7	+0,9	+0,5	+0,7	+2,9	0	+0,7

The researched observed the influence of the soil factor, the variety factor and crop year factor and also of the interactions between those factors on grain production in spring barley (Bîlteanu, 2003).

The experimental results were statistically processed by analysis of variance, the F test and limit differences (Săulescu and Săulescu, 1967). The production data capitalizing was done in a series, following the trifactorial model (2x4x3), as an experiment with two different soil types and four varieties grown in three years.

RESULTS AND DISCUSSION

The analysis of barley production was performed both in terms of influence of each analysed experimental factor, and the interactions between the three factors (soil, variety, crop year). In addition, the analysis of yields was made both by comparison with Thuringia variety – as the control variety (for each type of

soil and crop year) and the experimental average, by establishing the meanings of the differences.

Table 2

The analysis of variance and the F test for the three-year series

Cause of Variance	GL	SP	s^2	The F test		
				Compared to error	Compared to AB	Compared to BC
Total	23	2,93				
Soil type (A)	1	0,73	0,73	57,43** *(5,99; 13,74)*	525,90** (10,13; 13,74)	
Varieties(B)	3	0,43	0,14	11,18** *(4,76; 9,78)*	102,40** *(9,28; 29,46)*	3,14 (4,76; 9,78)
Crop years (C)	2	1,42	0,71	55,70** *(5,14; 10,92)*		205,02** (9,55; 30,82)
Interaction AxB	3	0,004	0,01	0,11 *(4,76; 9,78)*		
Interaction AxC	2	0,010	0,005	0,27		
Interaction BxC	6	0,27	0,045	3,56 *(4,28; 8,47)*		
Interaction AxBxC (error)	6	0,08	0,013			

The analysis of variance for grain yield in spring barley cultivated in 2008-2010, on two types of soil (chernozem and aluviosoil) reveals distinctly significant effects between soil types, between species and between crop years. Compared to the interaction of soil type with the variety (AxB), both the effects of soil and variety are distinctly significant. Compared the interaction of the variety with the crop year (BxC), only the effect of crop years is distinctly significant (Table 2).

Table 3

The influence of soil on spring barley production

Soil	Prod. (kg/ha)	Dev. from mt.		Signif.	Dev. from average		Signif.
		kg/ha	%		kgha	%	
Typical chernozem\(mt)	2495	mt	100		+133	105,6	*
Calcaric aluviosoil	2229	-266	89,3	00	-133	94,3	0
Average	2362				mt	100	
DL 5%=113 DL1%=170 DL 0,1%=274							

Regarding soil factor analysis (A) we see that the difference in production between the two soils is 266 kg/ha, thus being distinctly significant. Regarding the deviation from the average of the research, this is 133 kg/ha, being statistically significant (Table 3).

The Annabell variety had the best behaviour, achieving a distinctly significant deviation from the control variety Thuringia 267kg/ha.

Compared to the average of the varieties, the Annabell variety showed a distinctly significant increase of production by 246 kg/ha, while on the opposite

side, the Cristalia variety showed a distinctly significant deviation in production, this time lower than 246 kg/ha (Table 4).

Table 4

The influence of variety on the production of spring barley

Variety	Prod. (kg/ha)	Dev. from mt.		Signif.	Dev. from the average		Signif.
		kg/ha	%		kg/ha	%	
Thuringia (mt)	2,341	mt	100		-21	99,1	-
Annabell	2,608	+267	111,4	**	+246	110,4	**
Cristalia	2,116	-225	90,3	0	-246	89,5	00
Tunika	2383	+42	101,7	-	+21	100,8	-
Average	2362				mt	100	
DL 5%=159 DL1%= 241 DL 0,1%=388							

Table 5

Influence of the crop year on the production of spring barley

Crop year	Prod. (kg/ha)	Dev. from mt.		Signif.	Dev. from the average		Signif.
		kg/ha	%		kg/ha	%	
2008	2702	mt	100		+341	114,4	***
2009	2153	-549	79,6	000	-208	91,1	00
2010	2230	-472	82,5	000	-131	94,4	-
Average	2361				mt	100	
DL 5%=138 DL1%=208 DL 0,1%=336							

The data in Table 5 shows that, compared to the average yield obtained in 2008, as a control year, the climatic conditions in the other two years of research were less favourable, so that the average production was lower than in the control year, this being very significant statistically. Compared to the average of all years, 2008 registered a very significant production level of 2702 kg/ha, and in contrast to this was year 2009, with a production of 2153 kg/ha, respectively a distinctly significant difference of 208 kg/ha.

Table 6

The influence of soil type x variety interaction on the production of spring barley

Variety – soil		Prod. (kg/ha)	Dev. from mt.		Signif.	Dev. from the average		Signif.
			kg/ha	%		kg/ha	%	
Thuringia (mt)	C	2483	mt	100		+6	100,2	
	A	2200	mt	100		-277	88,8	0
Annabell	C	2758	+275	111,07	*	+281	111,3	*
	A	2458	+258	110,72	*	-19	99,2	-
Cristalia	C	2242	-241	90,29	0	-235	90,5	00
	A	1992	-208	90,54	-	-485	80,4	00
Tunika	C	2500	+17	100,68	-	+23	100,9	-
	A	2,66	+66	103,00	-	-211	91,4	-
Average		2,77				mt	100	
DL 5%=225 DL1%=341 DL 0,1%=548								

C^* - typical chernozem, A^* - calcaric aluviosoil

Analysing the data in Table 6 we see that: compared to the control variety Thuringia, only the Annabell variety obtained a significant production increase on both soil types, and compared to the research average, significant inferior differences were obtained for the Cristalia variety on both soil types and the Thuringia variety grown on aluviosoil. The Annabell variety grown on chernozem obtained a significant production increase of 277 kg/ha from the average of the research.

Table 7

The influence of variety x crop year interaction on the production of spring barley

Variety	Crop year	Prod. (kg/ha)	Dev. from mt.		Signif.	Dev. from the average		Signif.
			kg/ha	%		kg/ha	%	
Thuringia (mt)	2008	2612	mt	100		+250	110,5	-
	2009	2250	mt	100		-112	95,2	-
	2010	2162	mt	100		-200	91,5	-
Annabell	2008	3025	+413	115,81	*	+663	128,0	**
	2009	2337	+87	103,86	-	-25	98,9	-
	2010	2462	+300	103,87	*	+100	104,2	-
Cristalia	2008	2350	-262	89,96	-	-12	99,5	-
	2009	2062	-188	91,64	-	-300	87,2	0
	2010	1937	-225	89,59	-	-425	82,0	00
Tunika	2008	2825	+213	108,15	-	+463	119,6	**
	2009	1962	-288	87,72	0	-400	83,0	00
	2010	2362	+200	109,25	-	0	100	
Average		2362				mt	100	
DL 5%=275 DL1%=418 DL 0,1%=672								

The data presented in Table 7 shows the following: compared to the control variety, Thuringia, there were significant production increases in the variety Annabell in 2008 and 2010. The best yields were obtained from varieties Annabell and Tunika in 2008 with a distinctly significant difference 663 kg/ha, respectively 463 kg/ha compared to the research average.

Table 8

The influence of soil type x variety x crop year on the production of spring barley

Soil	Variety	Crop year	Prod. (kg/ha)	Dev. from mt.		Signif.	Dev. from the average		Signif.
				kg/ha	%		kg/ha	%	
Typical Chernozem	Thuringia (mt)	2008	2725	mt	100		+362	115,3	***
		2009	2400	mt	100		+37	101,5	-
		2010	2325	mt	100		-38	98,3	-
	Annabell	2008	3075	+350	112,84	***	+712	130,1	***
		2009	2450	+50	102,08	-	+87	103,6	*
		2010	2750	+425	118,27	***	+387	116,3	***
	Cristalia	2008	2450	-275	89,90	000	+87	103,7	*
		2009	2200	-200	91,66	000	-163	93,1	00
		2010	2075	-250	89,24	000	-288	87,8	000

	Tunika	2008	3025	+300	111,00	***	+662	128,0	***
		2009	2050	-350	85,41	000	-313	86,7	000
		2010	2425	+100	104,30	*	+62	102,6	-
Calcaric Aluviosoil	Thuringia	2008	2500	mt	100		+137	105,7	**
		2009	2100	mt	100		-263	88,8	000
		2010	2,000	mt	100		-363	84,6	000
	Annabell	2008	2975	+475	119	***	+612	125,8	***
		2009	2225	+125	105,95	**	-138	94,1	00
		2010	2175	+175	108,75	**	-188	92,0	0
	Cristalia	2008	2250	-250	90,00	000	-113	95,2	0
		2009	1925	-175	91,66	00	-438	81,4	000
		2010	1800	-200	90,00	000	-563	76,1	000
	Tunika	2008	2625	+125	105,00	**	+262	111,0	**
		2009	1875	-225	89,28	000	-488	79,3	000
		2010	2300	+300	115,00	***	-63	97,3	-
average			2363				mt	100	
DL 5%=79 DL1%=120 DL 0,1%=194									

Analysing the data in Table 8 the following fact emerges: the highest yields were obtained on chernozem, for the varieties Annabell and Tunika in 2008.

CONCLUSIONS

1. The varieties tested reacted differently to environmental factors, 2008 was the most favourable year, followed by 2010 and 2009 was the most unfavourable.

2. Annabell and Tunika varieties have proven to be superior to the control variety, Thuringia, in terms of production obtained in all three years of research, both on chernozem and aluviosoil, which recommends them for the studied area.

3. The yields obtained on chernozem are higher than those obtained on aluviosoil.

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USE OF VETCH FOR GREYZEMS QUALITY REMEDIATION AND INCREASE OF CROP YIELDS

UTILIZAREA MĂZĂRICHII PENTRU RESTABILIREA CALITĂȚII SOLURILOR CENUȘII ȘI MAJORAREA RECOLTELOR

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Abstract. *Strong degradation of agricultural land in the Republic of Moldova imposes soil quality restoration by use of different methods including phytomelioration. In the present research is analyzed use of vetch for greyzems quality improvement and its influence on the next crops from crop rotation. It was established that vetch improved soil structure and increased aggregates stability. As a result of vetch influence soil bulk density and degree of compaction decreased, total porosity values increased. Vetch had a positive effect on the next crops from crop rotation, significantly increasing their harvest.*
Keywords: *vetch, bulk density, porosity, soil structure, yield.*

Rezumat. *Degradarea puternică a terenurilor agricole ale Republicii Moldova impune necesitatea de restabilire a calității solurilor, inclusiv și prin metode fitotehnice. În cercetarea dată se analizează utilizarea măzărichii pentru ameliorarea stării de calitate a griziomurilor și influența acesteia asupra recoltelor culturilor din asolament. S-a stabilit că măzărichea a favorizat îmbunătățirea structurii solului și a majorat hidrostabilitatea agregatelor structurale. De asemenea s-a micșorat densitatea aparentă și gradul de tasare a griziomurilor, au crescut valorile porozității totale. Măzărichea a avut un efect pozitiv și asupra culturilor din asolament, majorând semnificativ recolta acestora.*
Cuvinte cheie: *măzăriche, densitatea aparentă, porozitatea, structura, recolta.*

INTRODUCTION

Sustainable use of soil resources is a crucial issue for Moldova's economy that relies greatly on agriculture. Continued use of conventional agriculture has resulted in strong degradation of physical, chemical and biological properties of soils (Inspectoratul Ecologic de Stat, 2011). In this context it is strictly necessary to use environmentally safe methods of soil restoration and conservation. In the current research it was tested the possibility of using vetch for improvement of soil quality and assessed its influence on yields of field crops. This crop is widely used in world agriculture (Dogan et. al., 2009; Brook and Sieglinde, 2008) and has already proved to be an effective melioration method and excellent predecessor for field crops.

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MATERIAL AND METHOD

The research was conducted at the experimental station of the Institute of Pedology, Agrochemistry and Soil Protection ""Nicolae Dimo" from Ivancea village, Orhei district. The experiment was established on greyzems with medium humus content of 2.32%, pH=6.3-6.5 and moderate content of phosphorus and potassium in the layer of 0-35 cm.

In the fall 2010 the soil was worked with disk harrow and sown with hairy vetch (*Vicia villosa* Roth), Viola variety. In spring 2011 the vetch was introduced into the soil as green manure by disking and the plot was divided into two parts. The first one was sown with common vetch (*Vicia sativa* L.), variety Vilena. At the second one was continued the crop rotation and sown sunflower. In July, common vetch was mown for hay and its crop residues incorporated into the soil by disking. In the autumn after sunflower harvest the two plots were sown with winter wheat that was harvested in June of 2012. In order to determine the influence of vetch on soil properties soil samples were collected before the foundation of the experiment, after each crop of vetch and before the sowing of winter wheat. The methods of analysis approved in Moldova were used for soil and plant analysis.

RESULTS AND DISCUSSION

Weather conditions of autumn 2010 and spring 2011 did not allowed to obtain high yields of hairy vetch that was only 17 t/ha of green mass. Common vetch had more favorable conditions for development and as a result the yield was 20 t/ha of green mass. Chemical composition analysis of vetch revealed low ratio of carbon to nitrogen (Table 1), which favored high yields of the next crops from the crop rotation.

Table 1

Yields and chemical composition of hairy and common vetch

Parameter	Hairy vetch, aboveground part	Hairy vetch, belowground part (0-30 cm)	Common vetch, aboveground part	Common vetch, belowground part (0-30 cm)
Green mass, t/ha	17,0	-	20,0	-
Moisture content, %	79,5	-	70,5	-
Dry mass, %	20,5	-	29,5	-
Dry mass, t/ha	3,5	3,4	6,0	4,1
Carbon, %	37,1	26,6	37,1	26,6
Nitrogen, %	4,21	2,28	4,29	2,13
C:N	9:1	12:1	9:1	12:1
Phosphorus, %	0,66	0,32	0,71	0,32
Potasium, %	2,29	0,43	2,06	0,45
Ash, %	11,6	17,0	9,6	21,1

Basing on the results of plant chemical composition analysis it can be concluded that after incorporation of hairy vetch in soil remained 6.9 t/ha of dry matter (aboveground part plus roots) containing 2203 kg/ha of carbon. Besides in

the soil were returned about 225 kg/ha of nitrogen, 34 kg/ha of phosphorus and 95 kg/ha of potassium. The amount of introduced nitrogen is equivalent to the application of 40 t/ha of qualitative cattle manure with the nitrogen content of 0.56%.

Common vetch was mown for hay and its crop residues (about 25% from the yield) were incorporated into the soil. Also in the soil remained plant roots. Total contribution of dry matter into the soil was 5.6 t/ha with carbon content of 1647 kg/ha. In this case into the soil were returned 152 kg/ha of nitrogen, 24 kg/ha of phosphorus, 49 kg/ha of potassium. The ratio of carbon to nitrogen in vetch composition was also low.

Effect of vetch on soil physical properties was appreciated comparing bulk density, total porosity and degree of compaction of the soil (Table 2).

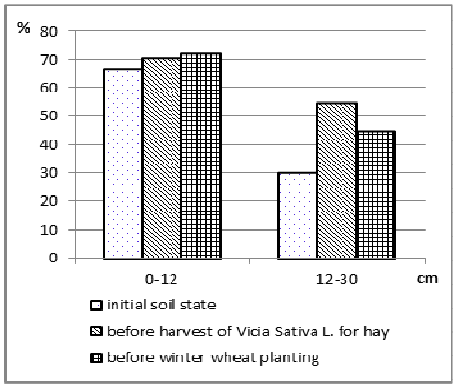
Table 2

Influence of vetch on greyzems physical properties

Depth of sample collection	Initial soil state	One month later after incorporation of hairy vetch in soil	After harvest of common vetch for hay	Before winter wheat planting
Bulk density, g/cm^3				
0-12	1,36	1,17	1,17	1,22
12-20	1,52	1,46	1,45	1,41
20-34	1,56	1,52	1,50	1,51
34-50	1,62	1,61	1,61	1,61
Total porosity, %				
0-12	48,2	55,0	55,0	53,1
12-20	41,8	43,8	44,2	45,8
20-34	40,2	41,8	42,5	42,1
34-50	39,5	39,5	39,5	39,5
Degree of compaction, %				
0-12	5,8	-5,3	-5,3	-1,6
12-20	18,3	15,7	15,0	12,0
20-34	21,5	18,9	17,4	18,2
34-50	24,2	22,9	22,9	22,9

Influence of vetch roots on soil and additional intake of organic matter led to decrease of bulk density and increase of total porosity in layers 0-12 cm and 12-20 cm. In the next 20-34 cm of soil the influence was weaker. Unfortunately roots almost failed to penetrate the 34-50 cm layer due to its initial very high values of bulk density. The degree of compaction in the upper soil layers decreased proportionally to the bulk density values.

It was established the improvement of soil structure and aggregates hidrostability of greyzems (Fig. 1). An increase of agronomic valuable aggregates content and an improvement of aggregates hidrostability were detected.

a) 

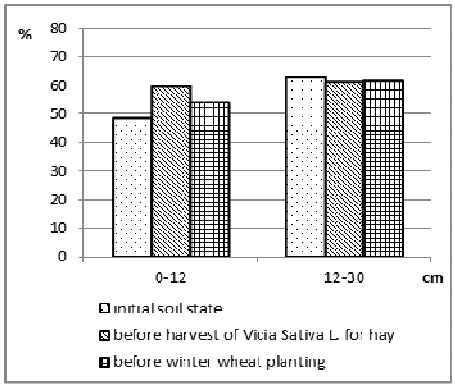
b) 

Fig. 1 - Sum of agronomic valuable aggregates (□10-0,25 mm): a) dry sieving; b) wet sieving.

Incorporation of vetch into the soil as green manure had a positive effect on the crops sown after that. Thus the increase of sunflower sown immediately after hairy vetch incorporation was 0.4 t/ha in comparison with the control plot. The harvest of wheat (the next crop in the crop rotation) sown after sunflower increased by 0.8 t/ha. The increase of wheat yield sown after two crops of vetch was 1.7 t/ha.

CONCLUSIONS

1. Contribution to the soil organic matter content due to incorporation of vetch favored restoration of greyzems structure, increasing soil porosity and structural aggregates hidrostability, reduction of bulk density and degree of compaction of the soil.

2. The main changes occurred in the 0-12 and 12-20 cm layers of the soil where plant roots developed and the vetch was incorporated as green manure.

3. The positive effect on field crops yields sown after vetch was achieved. Sunflower yield growth made 20%, winter wheat sown after sunflower - 33%, winter wheat after two crops of vetch - 70% in comparison with the control plot.

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STUDY REGARDING THE INFLUENCE OF CULTURE ESTABLISHING MANNER ON SOME MORPHOLOGICAL CHARACTERS FOR SEVERAL SPECIES OF THE GENUS *MONARDA L.* CULTIVATED IN MOLDOVA

STUDII PRIVIND INFLUENȚA MODULUI DE INFIINȚARE A CULTURII ASUPRA UNOR CARACTERE MORFOLOGICE LA UNELE SPECII ALE GENULUI *MONARDA* L. CULTIVATE ÎN MOLDOVA

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Abstract. *The study follows the influence of the culture establishing manner on some morphological characters (plant height, number of branches/strain and number of whorls/ inflorescence) from three species of the genus Monarda L.: Monarda didyma L., Monarda fistulosa L. și Monarda citriodora Cerv. ex Lag. The experience was conducted in 2012, in three locations of Moldova, in subdivided plots, in three repetitions, including variants established by seedling and variants established by seed. After biometric measurements, it was found that the highest average values for the pursued characters were reached for the plants from the variants established by seedling.*
Key words: *Monarda, morphological charcaters, seedling.*

Rezumat. *Studiul urmărește influența modului de înființare a culturii asupra unor caractere morfologice (talia plantelor, numărul de ramificații/tulpină și numărul de verticile/inflorescență) la 3 specii ale genului Monarda L.: Monarda didyma L., Monarda fistulosa L. și Monarda citriodora Cerv. ex Lag. Experiența a fost înființată în anul 2012, în 3 zone ale Moldovei, în parcele subdivizate, în 3 repetiții, având variante înființate prin răsad și variante înființate prin semințe. În urma măsurătorilor biometrice efectuate, s-a constatat că valorile medii cele mai mari ale caracterelor urmărite au fost obținute de plantele din variantele înființate prin răsad.*
Cuvinte cheie: *Monarda, caractere morfologice, răsad.*

INTRODUCTION

Monarda L. genus is named in honor and memory of Spanish botanist, physician and explorer of the sixteenth century, Nicolas Bautista Monardes (1493-1588), who made known American medicinal plants across Europe (Sanchez, 2008).

Monarda L. genus, which has its origins in North America is part of the botanical family *Lamiaceae* and contains plants commonly known as bergamot, decorative mint, Indian mint.

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In the literature *Monarda* L. genus species number varies from 12 species (Guşuleac, 1961), 12-20 species (Preda, 1989), 15 species (Brickell, 2004), up to 30 species (Şelaru Elena, 2007).

Monarda L. genus include annual and perennial herbaceous plant species, with simple or branched, four-edged, pubescent or hairless stems. The leaves are opposite, ovate, oblong, sessiled or petioled (McClintock and Epling, 1942). The flowers are grouped in terminals capituliforme whorls with colored bracts, tubular calyx by 5 lobes, bilipped corolla with long tube, slim, with straight or slightly curved upper lip and short lower lip, consisting of three lobes (Grisvard and Chaudun, 1964).

Plants of the genus are heliophile, requiring high light intensity, long day conditions determining flower development, but they can be cultivated also in semidarkness (Teuscher et al., 2005).

MATERIAL AND METHOD

The experiments were conducted in three areas of Moldova pedo-climatic conditions: the experimental field of the Department of Crop Production, within USAMV Iași, the experimental field of Văleni, Vaslui county and the experimental field of Agricultural Research and Development Station Suceava- Pojorâta center.

The experiments were established in the spring of 2011 and 2012 located in subdivided plots in three repetitions, with variants established by seeds and variants established by seedling obtained in the greenhouse of the USAMV Iași Didactic Station.

Experimental factors investigated were:

Factor A – Area; a1- Pojorata area, a2-Iasi area and a3- Vaslui area

Factor B – Species; b1- *M. citriodora* Cerv. ex Lag., b2- *M. didyma* L. și b3- *M. fistulosa* L.

Factor C - The culture establishment manner of, c1-by seeds and c2-by seedling.

Sowing was done in all three location in May and plant emergence occurred in about 3 weeks. Seedling was planted in the same month, with a height of 14 cm, at a distance of 40 cm between plants in the row and 50 cm between rows.

RESULTS AND DISCUTIONS

The culture stablishing manner affected positively and negatively the height at the plants full flowering, resulting in significant differences for seedling established variants and negative very significant for those established by seeds (Table 1). Plants cultivated in variants established by seedling counted on average 5.39 branches/strain, with a very significant difference related to the experience average. Instead, plants from variants established by seed recorded a number of branches / strain lower by 0.71 to control taken into consideration in the study, the difference being negative very significant. Analyzing the influence of the culture establishing manner on the number of whorls / inflorescence, in experimental year 2012, significant differences from the control were obtained at the plants from variants established by seedling (Table 1).

Table1

The influence of culture establishing manner on height, number of branches / strain and on number of whorls / inflorescence for the three species of the genus *Monarda* L. studied

Establishing manner	Height (cm)	% to the control	Difference	Significance
By seeds	57,77	94,38	-3,44	000
By seedling	64,65	105,62	3,44	***
Average	61,21	100,00	control	-
DL 5% 0,7 cm		DL 1% 1,0 cm	DL 0,1% 1,4 cm	
Establishing manner	**Number of branches / strain**	**% to the control**	**Difference**	**Significance**
By seeds	3,98	84,86	-0,71	000
By seedling	5,39	114,93	0,70	***
Average	4,69	100	control	-
DL 5% 0,2		DL 1% 0,3	DL 0,1% 0,4	
Establishing manner	**Number of whorls / inflorescence**	**% to the control**	**Difference**	**Significance**
By seeds	1,77	85,92	-0,29	000
By seedling	2,35	114,08	0,29	***
Average	2,06	100	control	-
DL 5% 0,03		DL 1% 0,10	DL 0,1% 0,14	

In the interaction between cultivated species and culture establishing manner on the plant height at the plants full flowering, *Monarda fistulosa* L. plants obtained very significant differences were from the experience average (61.21 cm) in both the variants established by seeds and those established by seedlings (Table 2). *Monarda didyma* L. plants and *Monarda citriodora* Cerv. ex Lag. recorded average values of height at full flowering phenophase lower than experience average, the differences being less distinct and very significant in minus.

Table 2

The influence of the interaction between species x culture establishing manner on height at full flowering of the three species in 2012

Species	Establishing manner	Height (cm)	% to the control	Difference (cm)	Significance
M. fistulosa	by seeds	70,41	115,03	9,20	***
M. fistulosa	by seedling	77,05	125,88	15,84	***
M. didyma	by seeds	49,68	81,16	-11,53	000
M. didyma	by seedling	56,79	92,78	-4,42	000
M. citriodora	by seeds	53,22	86,95	-7,99	000
M. citriodora	by seedling	60,12	98,22	-1,09	-
Average		61,21	100	control	-
DL 5% 1,5 cm		DL 1% 2,0 cm		DL 0,1% 2,8 cm	

In Table 3 it is observed that the interaction between area and culture establishing manner leads to a distinct and very significant difference related to the average experience (61.21 cm), at the variants cultivated by field direct sowing and at the variants established by seedling, in the Pojorâta area. Negative differences related to the control were recorded by plants from the variants established by seeds in Iaşi and Vaslui counties, measuring at the full flowering phenophase in average 56.71 cm and respectively 50.21 cm.

Table 3

The influence of the interaction between area x culture establishing manner on height at full flowering of the three species in 2012

Area	Establishing manner	Height (cm)	% to the control	Difference (cm)	Significance
Iaşi	by seeds	56,71	92,65	-4,50	00
Iaşi	by seedling	62,77	102,55	1,56	-
Vaslui	by seeds	50,21	82,03	-11,00	000
Vaslui	by seedling	58,55	95,65	-2,66	-
Pojorâta	by seeds	66,39	108,46	5,18	**
Pojorâta	by seedling	72,64	118,67	11,43	***
Average		61,21	100	control	-

DL 5% 2,7 cm DL 1% 4,4 cm DL 0,1% 7,7 cm

Table 4

The influence of the interaction between species x culture establishing manner on number of branches / strain for the three species in 2012

Species	Establishing manner	Number of branches / strain	% to the control	Difference (no.)	Significance
M. fistulosa	by seeds	4,46	95,10	-0,23	-
M. fistulosa	by seedling	5,44	115,99	0,75	***
M. didyma	by seeds	2,78	59,28	-1,91	000
M. didyma	by seedling	3,2	68,23	-1,49	000
M. citriodora	by seeds	4,70	100,21	0,01	-
M. citriodora	by seedling	7,54	160,77	2,85	***
Average		4,69	100	control	-

DL 5% 0,4 DL 1% 0,5 DL 0,1% 0,7

The largest number of branches of the strain, of 7.54 was determined experimentally in 2012, at the species *Monarda citriodora* Cerv. ex Lag. from the variations established by seedling, with a difference to the average experience (2.85 branches / strain) very significant. Still a very significant difference to the control (0.75 branches / strain) was obtained also by *Monarda fistulosa* L. plants from the variants established by seedling (Table 4).

Analyzing interaction between area and culture establishing manner on the number of strain branches, a very significant difference to the experience average was recorded by the culture established by seeds and seedlings in the Pojorâta area

(Table 5). Negative differences very significant were obtained at the plants from the same species cultivated in variants established by seed, in Iaşi and Vaslui.

Table 5

The influence of the interaction between area x culture establishing manner on number of branches / strain for the three species in 2012

Area	Establishing manner	Number of branches / strain	% to the control	Difference (no.)	Significance
Iaşi	by seeds	3,36	71,64	-1,33	000
Iaşi	by seedling	4,32	92,11	-0,37	-
Vaslui	by seeds	3,05	65,03	-1,64	000
Vaslui	by seedling	4,98	106,18	0,29	-
Pojorâta	by seeds	5,53	117,91	0,84	***
Pojorâta	by seedling	6,87	146,48	2,18	***
Average		4,69	100	control	-

DL 5% 0,4 DL 1% 0,5 DL 0,1% 0,8

Table 6

The influence of the interaction between species x culture establishing manner on number of whorls / inflorescence for the three species in 2012

Species	Establishing manner	Number of whorls / inflorescence	% to the control	Difference (no.)	Significance
M. fistulosa	by seeds	1,13	54,85	-0,93	000
M. fistulosa	by seedling	1,32	64,08	-0,74	000
M. didyma	by seeds	1,20	58,25	-0,86	000
M. didyma	by seedling	1,52	73,79	-0,54	000
M. citriodora	by seeds	2,99	145,15	0,93	***
M. citriodora	by seedling	4,22	204,85	2,16	***
Average		2,06	100	control	-

DL 5% 0,10 buc. DL 1% 0,15 DL 0,1% 0,20

Monarda citriodora Cerv. ex Lag. plants from the variants established by seedling and seeds determined the highest number of whorls / inflorescence (4.22 and respectively 2.99 whorls / inflorescence), obtaining significant differences related to the experience average (2.06 whorls / inflorescence) (Table 6).

Table 7

The influence of the interaction between area x culture establishing manner on number of whorls / inflorescence for the three species in 2012

Zona	Establishing manner	Number of whorls / inflorescence	% to the control	Difference (no.)	Significance
Iaşi	by seeds	1,58	76,70	-0,48	000
Iaşi	by seedling	2,11	102,43	0,05	-
Vaslui	by seeds	1,62	78,64	-0,44	000
Vaslui	by seedling	2,34	113,59	0,28	***
Pojorâta	by seeds	2,12	102,91	0,06	-
Pojorâta	by seedling	2,60	126,21	0,54	***
Average		2,06	100	control	-

DL 5% 0,10 DL 1% 0,20 DL 0,1% 0,22

The influence of the interaction between the factors area and culture establishing manner on the number of whorls / inflorescence, produced significant differences compared to the experience average (2.06 whorls / inflorescence) for the plants from variants established by seedling in Vaslui and Pojorâta, and very significant in minus for the plants established by seeds in Iaşi and Vaslui (Table 7).

CONCLUSIONS

1. Plants from variants established by seedling determined the highest average values of height at the plants full flowering, of the number of branch / strain and of the number of whorls / inflorescence in all three species studied in the three areas of culture.

2. *Monarda fistulosa* L. measured highest average height (77.05 cm), and *Monarda citriodora* Cerv. ex Lag. counted the highest number of whorls / inflorescence (4.22 whorls / inflorescence).

3. Variants established by seedling cultivated in the Pojorâta obtained the highest values of height (72.64 cm), number of branches / strain (6.87 branches / strain) and number of whorls / inflorescence (2.60 whorls / inflorescence).

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RESEARCHES REGARDING THE REACTION OF SUNFLOWER LOCAL AND FOREIGN HYBRIDS TO IRRIGATION

CERCETĂRI PRIVIND COMPORTAREA UNOR HIBRIZI DE FLOAREA SOARELUI AUTOHTONI SI STRĂINI LA IRIGARE

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Abstract: *Given the importance of sunflower crop for our country, we consider in this paper we managed to bring a modest contribution to improving research on the behavior of sunflower hybrids to irrigation under stress, to increase crop production and quality. Experiences that have been organized to develop knowledge of the behavior of sunflower hybrids to irrigation under stress, to increase crop production and quality of soil and climate conditions in the South of Moldova. It was also intended as hybrids behaved in the study take in terms of quality indicators*
Key words: *irrigation, stress condition, resistance to drought*

Rezumat: *Având în vedere importanța deosebită a culturii de floarea soarelui pentru țara noastră, considerăm că prin prezenta lucrare am reuşit să aducem o modestă contribuție la îmbunătățirea cercetărilor privind comportarea unor hibrizi de floarea soarelui la irigarea în condiții de stres. Experiențele au avut ca scop principal completarea cunoştințelor privind comportarea unor hibrizi de floarea soarelui la irigarea în condiții de stres, în scopul sporirii producției şi calității recoltei în condițiile de sol şi clima din zona de sud a Moldovei. De asemenea, s-a urmărit cum s-au comportat hibrizii luați in studiu din punct de vedere al indicilor de calitate.*
Cuvinte cheie: *irigare, conditii de stres, rezistenta la seceta*

INTRODUCTION

Sunflower is one of the most valuable cultivated plants due to high productivity and multiple uses of its products to feed people, livestock and industry (Bîlteanu, 1998).

Efficient use of natural resources for sunflower production in order to obtain economic cost, requires rigorous zoning hybrids, depending on climatic resources and their biological requirements. Productions economic optimum is greatly influenced by judicious choice of the most suitable hybrids for each area of culture (Terbea et al., 1995). This paper presents new approaches to technological links sunflower practical relevance of inputs, as a related issue of agriculture in our country.

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MATERIAL AND METHOD

He was placed a sunflower experience culture in a batch experimental field uniform in terms of fertility and relief. Wheat plant was run in all the years of experimentation. Cultivation was performed under optimal technology, culture specific area for seven hybrids: Favorite (blank), PF 100, PRO 229, PR64A15, PR64A89, PR64A83 - Hybrids half later and PR63A90 - Hybrid early. Experimental module type was prepared by the method bifactorial parcels subdivided into three repetitions. The factors studied were:

Factor A: The water supply

a1-unirrigated, a2-irrigated at the minimum humidity threshold of 50% of the IUA-time watering of 850 m3/ha, a3-irrigated at the minimum humidity threshold of 50% of the IUA with reduced watering time by 25% (640 m3/ha).

Factor B: Hybrid cultivated

b1 - Favorite (blank) b2 - P.F. 109, b3 - PRO 229; b4 - PR63A90, b5 - PR64A15, b6 - PR64A89, b7 - PR64A83.

RESULTS AND DISSCUSION

The data presented reveal the same types in each year of experimentation. Due to climatic variations of the three years of experimentation, scientific results are accurate, sunflower being done in a normal year, a dry year (during the growing season) and a wet year. Following these investigations is possible to extrapolate results obtained in the areas of environmental and soil conditions similar to those in the area in which the area south of Moldova.

Comparing the averages from the two experimental factors graduations is apparent that the highest yields were obtained by perfusion culture with standard pedological 850 m3/ha at P min 50% IUA and PR64A89 hybrid cultivation, namely 38.6 q / ha. If you make multiple comparisons between variants and hybrids cultivated irrigation, resulting superiority same options.

Influence of insufficient humidifying water on sunflower production, as an experiment during 2008-2010, is presented in Table 1.

Table 1

Influence of insufficient humidifying water on sunflower production, average in 2008-2010 period

Factor A	Production	Unirrigated		Irrigated at P min 50 % IUA with m=850 m^3/ha	
		Difference q/ha	Significance	Difference q/ha	Significance
A1- unirrigated	22.9	Mt1	-	-13.8	0
A2 - irrigated at P min 50 % IUA with m=850 m^3/ha	36.7	13.8	***	Mt2	-
A3 - irrigated at P min 50 % IUA with m=640 m^3/ha	35.2	12.3	***	-12.3	0

DL 5%= 0.24 q/ha DL 1%= 0.37 q/ha DL 0,1%= 0.59 q/ha

It appears that reduce watering by 25% rule to the rules calculated, has reduced production to 36.7 q / ha to 35.2 q / ha. Taking into account the very high costs of irrigation water reduce watering rule is an economical solution for efficient irrigation application (Jinga et al., 2000; Sisesti-Ionescu and Jinga, 1982*)*.

Influence on the production of hybrid sunflower cultivated as an average during 2008-2010 experiment is shown in Table 2 and Figure 1.

Following analysis of these data shows that hybrid highest production of 33.3 q / ha was PR64A89.

Production growth compared to the control obtained was 3.6 q / ha. Of the seven hybrids studied, averaged over the years by the study were also noted PR64A83 and PR64A15, with production of 32.9 q / ha or 32.3 q / ha.

Table 2

Influence of hybrids on sunflower production, average in 2008 – 2010 period

Factor B	Production	Hybrid Favorit		Hybrid PF100	
		Difference q/ha	Significance	Difference q/ha	Significance
B1 - Favorit	29.7	Mt1	-	-0.7	000
B2 - P.F 100	30.4	0.7	***	Mt2	-
B3 – PRO 229	30.9	1.2	***	0.5	*
B4 - PR63A90	31.4	1.7	***	1	***
B5 - PR64A15	32.3	2.6	***	1.9	***
B6 - PR64A89	33.3	3.6	***	2.9	***
B7- PR64A83	32.9	3.2	***	2.5	***

DL 5%= 0.40 q/ha DL 1%= 0.54q/ha DL 0,1%= 0.69 q/ha

Hybrids obtained lowest yields were favorable and PF 100, 29.7 q / ha or 30.4 q / ha, with significant production minuses.

Analysis of these data lead us to recommend that the climatic conditions in southern Moldova and areas with similar climatic conditions to be cultivated hybrids PR64A89, PR64A83 or PF 100 in irrigated at 50% P min IUA with m = 850 m3/ha.

The climatic conditions of the experimental period 2008-2010, watering norm which provided a high yield of 850 m3/ha was.

Decrease the watering rules with 25% or 640 m3/ha caused decrease production by 4-6%, loss which is offset by the savings to reduce irrigation norm.
It is found that in 2008-2010, the change in climatic elements rise to the application of three to five in both irrigation watering, irrigation norm being

m3/ha 3200-4250, 1920-2250 m3/ha respectively.

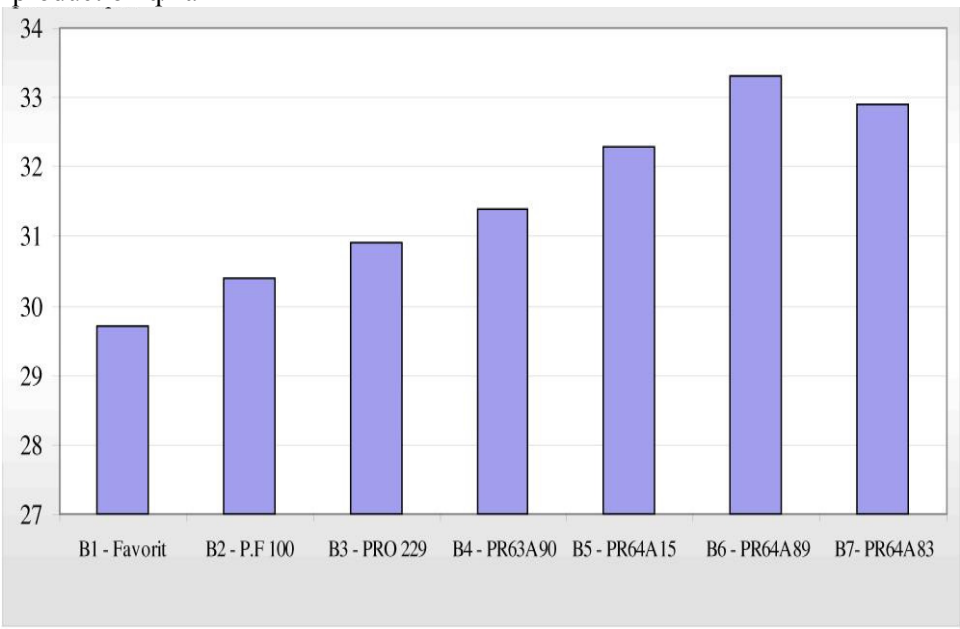


Fig. 1 - Influence on cultivated hybrid sunflower production in 2008-2010 period

Irrigation of all variants studied, the better use of irrigation water was recovered at the time of irrigation irrigated soil, reduced by 25%, the coefficient EVAI with values of 0.51 - 1.67 kg increase/m3 irrigation water (Table 3).

Table 3

Irrigation water use efficiency under insufficient humidifying sunflower hybrids during 2008 - 2010

Factor A	Factor B	Number of waterings	Irrigation norm m^3/ha	Increase production	EVAI kg increase/m^3
A2- irrigated at Pmin 50% IUA with m=850 m^3/ha	B1 – Favorit	5	3400	1310	0.39
	B2 - P.F 100			1470	0.43
	B3 - PRO 229			1600	0.47
	B4 - PR63A90			1720	0.51
	B5 - PR64A15			1700	0.50
	B6 - PR64A89			1180	0.35
	B7- PR64A83			1220	0.36

A3- irrigated at Pmin 50% IUA with m=640 m^3/ha	B1 – Favorit	5	2560	1300	0.51
	B2 - P.F 100			1400	0.55
	B3 - PRO 229			1490	0.58
	B4 - PR63A90			1540	0.60
	B5 - PR64A15			1517	0.59
	B6 - PR64A89			1680	0.66
	B7- PR64A83			1710	0.67

On irrigated with watering time reduced by 25% compared to the soil, ie of 640 m3/ha, EVAI index showed high values. This version PR64A15 growing hybrids, PR64A89 and PR64A83 determined EVAI obtain coefficients of 0.59, 0.66 and 0.67 kg respectively increase/m3 irrigation water, in the context of an acceptable standard savings by reducing irrigation by 25%.

CONCLUSIONS

Based on these results, averaged across experimental period, ie the period of agricultural 2008 - 2010, the following conclusions regarding insufficient humidifying water and hybrid cultivated in climatic conditions in southern Moldova:

- Sunflower crop requirements for humidity are provided by the administration of 3-5 waterings depending on climatic evolution in culture (3 waterings a year of heavy rainfall and 5 watering in a dry year);
- Administration optimal irrigation regime means the application of rules of 850 m3/ha soil watering when soil moisture decreased from 50% IUA Pmin;
- Norma irrigation is 4250-1920 m3/ha, depending on the nature of the agricultural year (dry, normal or wet).
- Insufficient humidifying water principle "to obtain as much with as little" and bringing new social and market requirements, it is possible that this decrease soil standard value stands at 25% of full time and if the hybrid allow the cultivated expression and increased production potential;
- In terms insufficient humidifying water irrigation system components are as follows: Rule 640 m3/ha watering, watering number 3-5 depending on climate evolution in crop agriculture, irrigation norm 1920-3200 m3/ha.
- After use insufficient humidifying water variant provides a reduction in irrigation norm with beneficial implications 630-1050 m3/ha of irrigation water costs.
- Hybrids recommended in irrigated crop in the south of Moldova are: PR64A15, PR64A89 or PR64A83, according to financial possibilities in each farm.

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MEASUREMENTS OF THE VERTICAL DEFORMATIONS AT THE INCLINOMETERS IN THE RIGHT SLOPE OF THE CĂTĂMĂRĂŞTI RESERVOIR DAM, SITUATED ON SITNA RIVER, BOTOŞANI COUNTY – A CASE STUDY

STUDIU DE CAZ – MĂSURĂTORILE DEFORMAŢIILOR VERTICALE LA ÎNCLINOMETRELE DIN VERSANTUL DREPT AL BARAJULUI ACUMULĂRII CĂTĂMĂRĂŞTI, PE RÂUL SITNA, JUDEŢUL BOTOŞANI

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Abstract*: In the framework of the investment „Safety re-inforcement of Cătămărăşti reservoir, located on the Sitna river in Botosani county" a stabilization platform was built on the location of the old surface outlet, equipped with 8 inclinometers wells to monitor the evolution of the vertical deformations and stability in the right embankment. The vertical deformations were monitored after the final acceptance of the safety works carrying out 4 series of measurements on the inclinometer wells. The measurements were performed with P/N 50302510 Inclinometer Slope Indicator and used as guiding mark the upper elevation of the well pipes. The measurements data were processed using the maximum values of displacements (on the two orthogonal directions A0-A180 and B0-B180). The paper presents the comparative results of 4 series of measurements.*
Key words*: inclinometer, surface outlet, embankment, vertical deformations*

Rezumat*: La executarea lucrărilor de investiţii „Punere în siguranţă a acumulării Cătămărăşti, amplasată pe râul Sitna, în judeţul Botoşani" a fost realizată o platformă de stabilizare, pe amplasamentul vechiului descărcător, prevazută cu 8 foraje înclinometrice cu rol de urmărire a evoluţiei deformaţiilor pe verticală şi de monitorizare a stabilităţii umărului drept al barajului. Deformaţiile pe verticală au fost monitorizate dupa recepţia lucrărilor de investiţii prin 4 serii de măsurători pe cele 8 înclinometre. Măsurătorile înclinometrice au fost efectuate cu Înclinometru Slope Indicator, P/N 50302510 şi au avut ca reper de referinţă a datelor, cota superioară tubulatură. Prelucrarea datelor măsurătorilor s-a făcut sub forma valorilor maxime ale deplasării (pe cele doua directii ortogonale A0-A180 si B0-B180). Rezultatele obţinute în cadrul celor patru serii de măsurători, au constituit obiectul studiului de caz.*
Cuvinte cheie*: înclinometru, descărcător, versant, deformaţii pe verticală*

INTRODUCTION

Cătămărăşti reservoir, located on the Sitna river in Botoşani county and administered by Water Management System Botoşani was commissioned in 1979.

The reservoir was aimed to satisfy the following functions: water supply for Botoşani city (industry), irrigation, fishing, flood protection downstream and

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providing a salubrious flow of 0,030 m³/s. The dam was made of clay and silty materials and it has a double trapezoidal section with a front sealing length of 540 m (Romanian Comitee of Large Dams, 2000). The outlets of this reservoir are a surface outlet with a WES curve profile weir and a two wires bottom outlet with a nominal diameter of 1400 mm.

During the construction of the surface outlet located in the right embankment, a landslide of the embankment occurred and it led to the deterioration of tiles in the foundation plate channel. This phenomenon was caused by the fact that during the earthfill construction, the area adjacent to the surface outlet was not systematized, the drain collector was not executed and also pipes weren't installed in the foundation plate channel and in the right embankment (Synthesis Report on Constructions Behavior Monitoring, 2010 p 14 -17).

During the exploitation of the reservoir, landslides of the right embankment were observed in the immediate vicinity of the surface outlet, which resulted in deformations of the weir, materializing in displacements and cracking of the concrete tiles, especially in dam axis area.

Starting the year 1992, the landslides of the right embankment continued to adversely affect the surface outlet, imposing an increased constructions behavior monitoring, according to *Design Rules 087-2003*. After the year 2000, the studies for the stability of Cătămărăşti reservoir were resumed (Stematiuet al., 2010). These studies have established the need for safety re-inforcement of the reservoir, the optimal solution being the construction of a new surface outlet located in central part of the dam body, after the demolition of the old surface outlet and groundwater draining the right embankment of the dam.

In the framework of the investment „Safety re-inforcement of Cătămărăşti reservoir, located on the Sitna river, in Botoşani county" a stabilization platform was built on the location of the old surface outlet. It was equipped with eight boreholes inclinometer. (The acquisition of equipment for behavior monitoring of the dam and the right embakment for safety re-inforcement of Cătămărăşti reservoir-The National Institute for Research and Development in Environmental Protection, 2009). The location of the inclinometers in relation to the dam and its right embankment is shown in Figure 1.

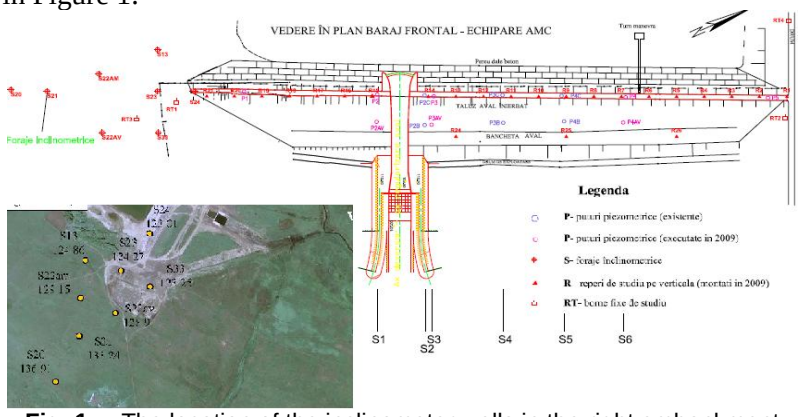


Fig. 1. – The location of the inclinometer wells in the right embankment

The inclinometer wells are aimed to track the evolution of the vertical deformations and monitor the seepage through the dam body and right embankment. They are located on the right embankment, except to the identified as S2.4, which is placed in the dam body.

MATERIAL AND METHOD

Inclinometers reference measurements were carried out in the time frame 08-11.09.2009. The measurements, reported as deviations from a vertical line drawn through the column pipe are the projections of the pipe on the two orthogonal vertical planes: ridge-valley direction, respectively upstream-downstream direction. The conclusions of the report prepared by The National Institute for Research and Development in Environmental Protection shows that the maximum deviation from vertical columns of inclinometers are between 43-410 mm on the ridge-valley direction and 30-540 mm on the upstream-downstream direction. (The acquisition of equipment for behavior monitoring of the dam and the right embakment for safety re-inforcement of Cătămărăşti reservoir-The National Institute for Research and Development in Environmental Protection, 2009).

After the final acceptance of the safety works a contract between the Technical University of Civil Engineering Bucureşti as performer and Water Basinal Administration Prut-Bârlad as beneficiary was signed. Under this contract, 4 series of inclinometers and piezometer measurements on the inclinometer wells were carried out, in the following days: 07/12/2010, 12/20/2010, 10/08/2011, and 11/25/2012. Four measurement reports were drawn.

The inclinometer wells were arranged on approximately parallel lines with the upstream-downstream direction and the monitoring direction A0-A180 for each well is approximately transverse. The data were processed using the maximum values of displacements (on the two orthogonal directions A0-A180 and B0-B180). The measurements used as guiding mark the upper elevation of the well pipes, which is 30 to 70 inches higher than the land surface. *The measurements were performed with P/N 50302510 Inclinometer Slope Indicator (*accuracy class 0.01 mm to 500 mm, double pendulum*).* The measurements were carried out from 0.5 m to 0.5 m and they were read in the two orthogonal directions A and B.

RESULTS AND DISCUSSIONS

Inclinometric monitoring − stage I: 07/12/2010

The results of the measurements compared to the values registered in the year 2009 show the emergence of earth displacements of right embankment subjected to monitoring. The values of the size and direction of the resultant vector are given in Table 1.

Compared to baseline readings on the inclinometer tubes, tube length differences fall within the 0.57 ... 1.5 m, except S2.4 inclinometer tube, where the difference was of 10.0 m. The inclinometer tube S2.4 could only be measured to a depth of 4.5 m (as to 15.0 m depth initially reported). The tube appeared to have been damaged below the depth of 4.5 m, hydrostatic level was recorded bellow this land rate (Technical Report - Inclinometric and Piezometric Monitoring for Cătămărăşti reservoir. Technical University of Construction Bucureşti July 2010, p.5).

Table 1

Size and direction of the resultant vector

Inclinometer well	Displacement size (mm)	Displacement direction
S2.0	231	Downstream to upstream
S2.1	1623	Downstream to upstream
S2.2 upstream	245	Upstream to downstream
S2.2 downstream	485	Upstream to downstream
S2.3	380	Upstream to downstream
S1.3	106	Downstream to upstream
S3.3	60	Downstream to upstream
S2.4	1023	Upstream to downstream

Inclinometric monitoring − phase II: 12/20/2010

The results of the measurements compared to the new reference values from Technical Report - Inclinometric and Piezometric Monitoring for Cătămărăşti reservoir-July 2010 regarding the size and direction of the resultant vector are given in Table 2.

Table 2

Size and direction of the resultant vector

Inclinometer well	Displacement size (mm)	A0-A180 Vector (mm)	B0-B180 Vector (mm)
S2.0	1.51	1.23	0.94
S2.1	4.31	3.28	3.44
S2.2 upstream	6.24	6.14	− 2.50
S2.2 downstream	9.28	9.28	− 2.34
S2.3	8.71	8.47	2.88
S1.3	5.58	2.60	− 4.94
S3.3	14.5	14.37	5.21
S2.4	1.95	− 1.74	− 0.88

Inclinometric monitoring − stage III: 11/08/2011

The results of the measurements compared to the reference values from Technical Report - Inclinometric and Piezometric Monitoring for Cătămărăşti reservoir-July 2010 regarding the size and direction of the resultant vector are given in Table 3.

Compared to the measurement data from the year 2009, there is a general lowering of the surface area being monitored. This is supported by the fact that almost all tubes "remained suspended" - the land showed displacement and the tubes were left "stuck/embedded at the bottom" (Technical Report - Inclinometric and Piezometric Monitoring for Cătămărăşti reservoir. Technical University of Construction Bucureşti November 2011).

The displacements recorded (absolute maximum value) and the direction of displacement vector are at this measurement phase consistent with the position of the wells on the right embankment of the dam and its overall slope.

Table 3

Size and direction of the resultant vector

Inclinometer well	Displacement size (mm)	A0-A180 Vector (mm)	B0-B180 Vector (mm)	Absolute displacement daily rate (mm/day)
S2.0	7.16	7.15	-2.04	0.0193
S2.1	4.31	12.40	-6.26	0.0277
S2.2 upstream	9.71	8.52	5.98	0.0118
S2.2 downstream	27.31	26.83	-7.56	0.0959
S2.3	29.11	29.05	-2.73	0.0699
S1.3	31.25	30.94	-4.42	0.0889
S3.3	38.73	38.53	7.99	0.0829
S2.4	2.90	-2.90	-0.88	0.0193

Inclinometric monitoring − stage IV: 11/25/2012

The results of the measurements compared to the reference values from Technical Report - Inclinometric and Piezometric Monitoring for Cătămărăşti reservoir-July 2010 regarding the size and direction of the resultant vector are given in Table 4:

Table 4

Size and direction of the resultant vector

Inclinometer well	Displacement size (mm)	A0-A180 Vector (mm)	B0-B180 Vector (mm)	Absolute displacement daily rate (mm/day)
S2.0	15.70	15.60	-2.53	0.0206
S2.1	14.58	12.24	13.49	0.0052
S2.2 upstream	17.41	10.79	13.66	0.0186
S2.2 downstream	28.39	28.34	-3.43	0.0516
S2.3	50.47	50.42	-2.89	0.0026
S1.3	35.54	35.50	-2.58	0.0103
S3.3	50.05	49.97	11.52	0.0273
S2.4	2.00	-2.00	-1.02	-0.0022

Compared to measurements data recorded in the year 2011 the general lowering of the surface of the monitored embankment was emphasized, as all the tubes "were left hanging." Earth displacements in the embankment were registered in the horizontal direction (in plane) to the depths between 8.0 m and 11.0 m. The land surface showed curve cracks, a few centimeters wide, parallel with the inclinometers position lines.

The size of the displacements rates shows that earth movements falls in the category of "**extremely slow landslides**". The direction of displacement is transverse to Cătămărăşti reservoir, upstream to downstream, according to the slope of the embankment. The size of the displacement vector of the earth increases from upstream to downstream. The highest values of displacement are presented for the monitoring line in the vicinity of dam.

Compared to the displacements recorded in October 2011, it appears that, at the end of November 2012, after a period of one year between the stages of monitoring, the values of vertical deformations were doubled. In the monitoring stage in November 2012, the value of the depth at which the land may be considered stable, shows that the right embankment is characterized by an instability phenomenon with landslides that were classified as "**shallow slides to deep slides**".

CONCLUSIONS

1. The displacement curves must be verified with the field situation, with reference to the possible cracks in the embankment, especially in the downstream side, cracks that need adhesion in order to avoid rain water infiltration and activation of new earth displacements.

2. We recommend further measurements to be completed with topographic monitoring of inclinometers in the embankment and the surrounding areas.

3. Combining physical surveying methods lead to better construction behavior monitoring, to a deeper understanding of the phenomenon that occur in both the dam body and the surrounding land. It is thus possible to determine the interdependence between environmental factors and changes in shape and absolute position of the structure.

4. The equipment used for the measurements plays a crucial role. This should be of a superior accuracy class and checked the metrologically before collecting field data.

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CONSIDERATIONS FOR USE OF LAND - CASE STUDY - BAHLUI DRAINAGE BASIN

CONSIDERAȚII PRIVIND MODUL DE UTILIZARE AL TERENURILOR - STUDIU DE CAZ - BAZINUL HIDROGRAFIC BAHLUI

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Abstract. *The article presents the use of land, flood control works, dams and bank consolidation, land improvement or water alimentation, to which adds the settlements and transportation networks in Bahlui drainage basin on Corine Land Cover reference European data. Use of specific programs related to GIS analysis specialized software, ArcGIS or TNT Mips allowed use to extract quantitative values of surfaces with different land uses.*
Key words: *GIS, hydrographic basin, Corine Land Cover.*

Rezumat. *Articolul prezintă determinarea modului de folosiere al terenului, lucrările de regularizare, îndiguire şi consolidări de maluri, de îmbunătătiri funciare sau cele legate de alimentarea cu apă, la care se adaugă rețeaua de localități şi căile comunicații din bazinul hidrografic Bahlui pe baza datelor europene de referinta Corine Land Cover. Pe baza utilizării programelor specifice legate de analiza GIS software-ul ArcGIS sau TNT Mips a fost posibilă extragerea-datelor referitoare la modul de folosire al terenurilor.*
Cuvinte cheie: *GIS, bazin hidrografic, Corine Land Cover.*

INTRODUCTION

Real world entities are so complex that they should be classified in classes of objects with certain thematic similarities and modeled in spatial database. Objects from a spatial database are defined as representations of the real world that have associated attributes.

Generally, geospatial data have three major components: location, attributes and time. Attributes are often referred to as "data subject" or "non-spatial data" and related to spatial or geometric data. An attribute has a defined characteristic of the entity in the real world.

Attributes can be classified as normal, ordinal, numeric, conditional or who describe other features. The attributes values are often listed in attribute tables that establish the attributes and spatial data such as the point, the line and the area and between attributes (Kyaw et. al., 2012).

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MATERIAL AND METHOD

Bahlui hydrotechnical system manages a total of 11 permanent reservoirs and 7 temporary reservoirs with a total attenuation volume of 79.7 million cubic meters.The embankment works on a length of 50 km, remove from the flooding effect the industrial area of Iasi, the Tg. Frumos, and the communes Ceplenita, Tomeşti, Holboca respectively 900 ha of arable land.

In Romania, Bahlui catchment is located in the north-east region of the country, overlapping an area with a central position in northeastern Moldova Plateau, integrating in hydrological relation to the system of the middle Prut River (figure 1).

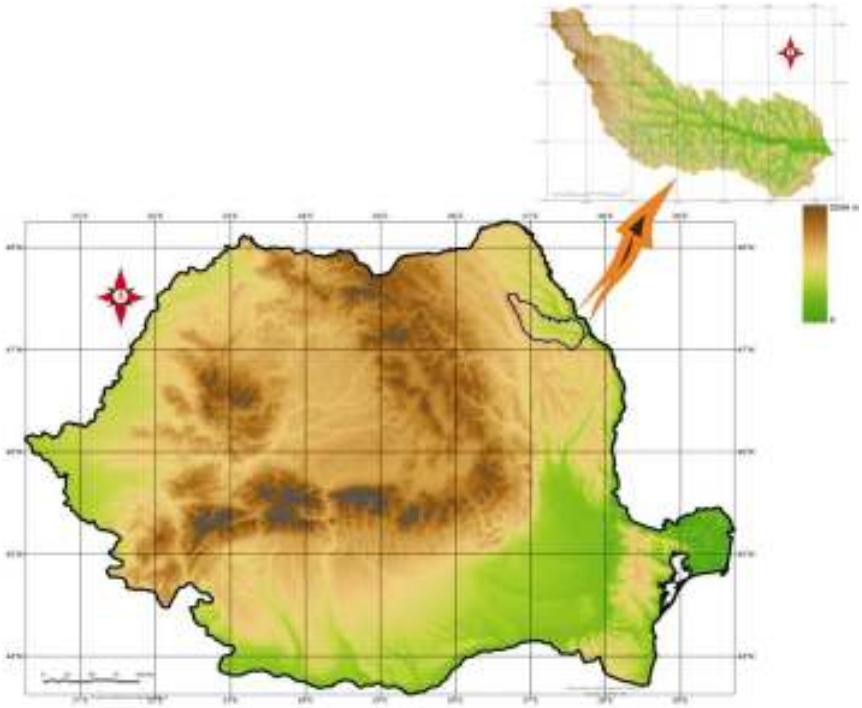


Fig. 1 - Geographical location of Bahlui basin in Romania
(Ionuț Minea, 2010)

One of the most used sources for the construction of spatial databases is represented by the existing classic cartographic fund. In Romania the most topographic maps presents on the north an indicator called nomenclature, consisting of a sequence of letters and digits. It is found both on the maps / plans in Gauss-Krüger projection and on those in the 1970 stereographic projection in the and on those in the 1970 stereographic projection and is derived based on the maps distribution system adopted by Romania in 1952 (www.earth.unibuc.ro/).

Cartographic framing of Bahlui catchment on existing topographic maps and plans on analog support is given with the geographic frame sizes in (table 1).

Table 1

Cartographic framing of Bahlui catchment on existing topographic maps

No.	Scale topographic maps and plans	Number of sheets contained in Bahlui basin	The scoring sheets	Geographical frame dimensions	
				$\Delta\varphi$	$\Delta\lambda$
1	1:1 000 000	1	-	$4^0$00'00"	$6^0$00'00"
2	1:500 000	2	A,B,C,D	$2^0$00'00"	$3^0$00'00"
3	1:200 000	4	I,…,XXXVI	40'00"	$1^0$00'00"
4	1:100 000	5	1,2,…,144	20'00"	30'00"
5	1:50 000	13	A,B,C,D	10'00"	15'00"
6	1:25 000	36	.a,b,c,d	5'00"	7'30"
7	1:10 000	120	1,2,3,4	2'30"	3'45"
8	1:5 000	519	I,II,III,IV	1'15"	52",5

The Bahlui catchment area is fits geographically in the Moldavian Plateau, Moldavian Plain subunit (Jijia Depression), represented only by its southern sector. It is characterized by a relief with hilly interfluves or as low plateaus with normal altitudes of 125-150 m, which is repeated on large areas. The shapes with extended gradients to the southeast, with only one side steeper towards north and northeast, as well as the large valleys with floodplains and slopes affected by landslides, degraded by the water rushed from the summer rains, are the most representative morphological features.

One of the biggest projects in Europe in terms of land use and detection of changes occurring in a certain period of time is the "Corrine Land Cover". This is a project involving all the countries of Europe. The project uses data from digital sources such as satellite imagery (Landsat, SPOT HRV) and cartographic sources, such as land use maps, topographic maps and even forestry maps. The data resulting after interpretation are offered at a scale of 1:100000. The smallest unit mapped is about 25 ha, and the changes that occur during the study are reported only if they occur in an area less than 5 hectares. So far in this project, data were obtained for the period 1990-2000-2006 (www.eea.europa.eu).

LANSAT space program was an initiative of NASA and is currently considered the longest program for remote sensing of earth resources.

Usually a thematic classification of an image involves several steps: entities extraction, sampling, labeling. The end result is a transformation of the numerical image into descriptive data that show different types of materials or conditions. Under the labeling process, the data is converted to a form that has an information value (R. Schowengerdt, 2007).

LNDSAT ETM + satellite scene (table 2) can be defined as a square surface within which simultaneously scanning and detection of the spectral response of objects and phenomena are performed. Through the digital conversion in pixels matrix system, of 8-bit, results digital images result, on a gray scale, as they appear upon taking the scene.

The surface of a satellite scene is about 34,000 km^2, which means a much larger area than an aerial photo. In fact it would include the equivalent space occupied by 1,600 aerial photograms of common format (23x23 cm). Images are compatible with a resolution of 30m, with 1:200 000 scale topographic map.

Inlay and redesign of data was done using ArcGIS.

Table 2

Technical data sensors

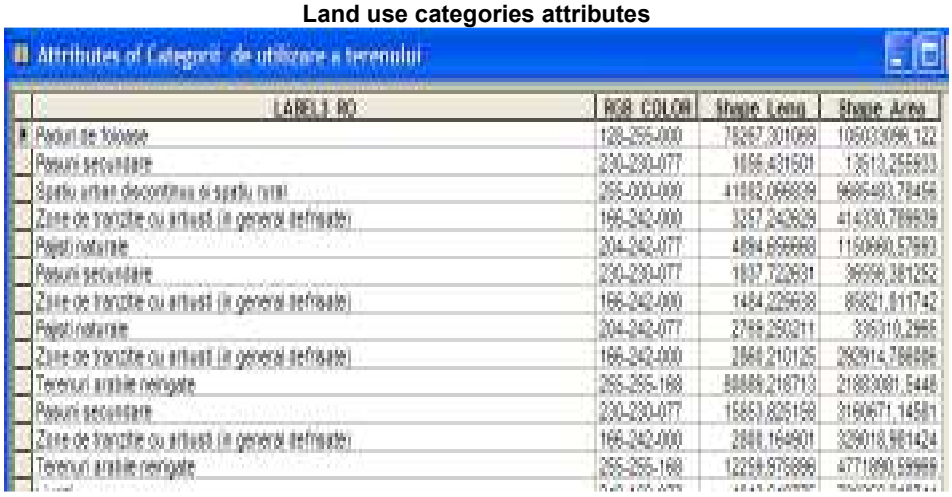
Landsat ETM+ Enhanced Thematic Mapper +		
Channel	**Wavelength [nm]**	**Spatial resolution [m]**
Blue	450-515	30
Green	525-615	30
Red	630-690	30
NIR	750-900	30
SWIR1	1550-175	33
TIR	1040-1250	60
SWIR2	1550-1250	30
PAN	500-900	15
705 km 185 x 185 km		

RESULTS AND DISCUSSIONS

The major part of the catchment surface is used in agriculture (67.5%). The analysis of the surface for the land use categories from Bahlui catchment (Table 3) showed the predominance of agricultural land (occupying 67.5%) of the total area, of which 58.7% is arable land.

Table 3

Land use categories attributes



Other areas of agricultural land are occupied by vineyards and orchards, occupying 8.75%. Other areas of land identified in the case study were forests, occupying 11.8%. It was also highlighted the area covered by natural and artificial lakes, with an area of 2420 ha and unproductive lands, about 1630 ha (Figure 3).

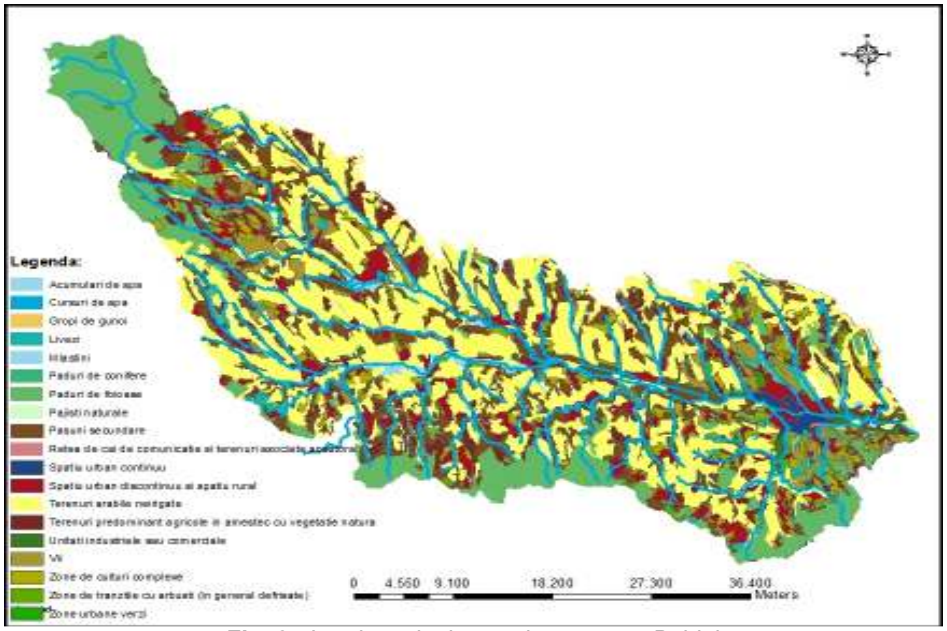


Fig. 3 - Land use in the catchment area Bahlui

The expansion of agricultural land was performed over time at the expense of forest areas, more extensive in earlier stages of agriculture development. In this context, there has been a significant decrease of the moderating factor of the forest, in the system of disturbance factors, of great magnitude, involved in the morphological changes of the Bahlui catchment.

Also to be highlighted is the role that forest litter has in retaining a portion of rainfall, especially the role of forested areas, characterized by a much higher natural drainage compared to the soils of agricultural land.

The implementation of this modern information system, based on known technical data for Bahlui catchment allows query by the beneficiaries for various digital information.

Figure 4 shows the digital information represented by relating the absolute plane rectangular coordinates of various planimetric details as follows:

- query for the hydrographic network and railways (figure 4a);
- query for rectification of the hydrographic network in Bahlui catchment (figure 4b);
- query for the hydrographic network, for the embankments and soil erosion control works (figure 4c);
- query for the hydrographic network and underground water abstraction in Bahlui catchment (figure 4d)

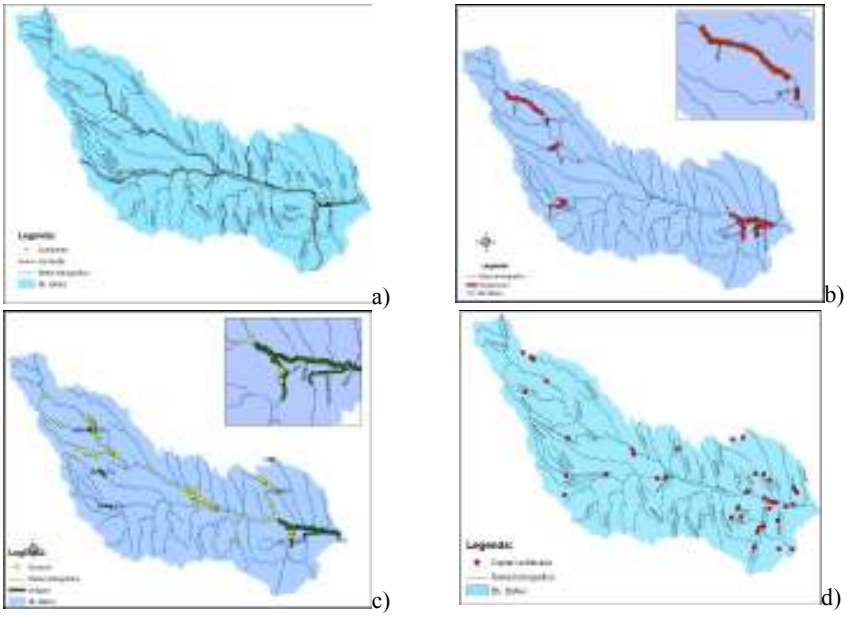


Fig. 4 - Geospatial query of the Bahlui river basin

CONCLUSIONS

1. Achieving the Access database format, including how the land use, adjustment works, soil erosion control works and groundwater abstractions, is a modern computer system that can be used by farm owners and other beneficiaries.

2. Based on ArcGIS software, a fully automatic algorithm to detect land cover and also provides the possibility to obtain high precision data was developed.

3. The implementation of this modern computer system, besides ensures high economic efficiency due to the speed of operations for input, storage and operation of any changes and also to the possibilities to visualize and print at the required scale.

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HYDROLOGICAL RISK PHENOMENA CAUSED BY EXCESS RAINFALL ON THE PRUT RIVER

FENOMENE DE RISC HIDRIC ASOCIATE REGIMULUI PLUVIOMETRIC EXCEDENTAR PE RÂUL PRUT

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Abstract :*Prut Basin is an objective with an international importance. The river which drains this area is the eastern border of the European Union and NATO. Devices to monitor water resources are unevenly distributed within the three states : Ukraine, the Republic of Moldova and Romania. Flood risk assessment is difficult as the genesis of this phenomenon is a complex process. Climatic factors have an essential influence on floods. The heavy rainfall of the Wooded Carpathians triggered large quantities of water on Prut River in 2008 and 2010. They were significantly reduced in Romania after the construction of the dam at Stanca – Costesti. The upstream sector has been affected by floods due to a large volume of water stored behind the dam. The diminishing role was decisive for the downstream flood waves: they did not have the same impact. Unauthorized exploitation of gravel from the riverbed and deforestation increased floods damage, so the anthropogenic impact is highlighted.*
Key words : *rainfall, flood, hydrographer, management, risk*

Rezumat : *Bazinul Hidrografic Prut este un obiectiv de importanță internațională. Râul care drenează această suprafață este granița de est a Uniunii Europene și a NATO. Infrastructura de monitorizare a resurselor de apă din bazin este inegal distribuită în cele trei state pe care se întinde: Ucraina, Republica Moldova și România. Evaluarea riscului la inundații este dificilă deoarece geneza unei viituri este un process complex. Factorul climatic influențează decisiv viiturile. Ploile torențiale căzute în Carpații Păduroși au declanșat inundațiile pe râul Prut în 2008 și 2010. Ele au fost diminuate, pe teritoriul României, după construirea acumulării Stânca – Costești. Sectorul situat în amonte a fost afectat de inundații din cauza stocării unui volum însemnat de apă în spatele barajului. Rolul de atenuare a fost hotărâtor pentru viitura să nu aibă un impact la fel de puternic în aval. Exploatările neautorizate de pietriș din albia minoră și defrișările au amplificat pagubele provocate de inundații.*
Cuvinte cheie : *precipitații, viitură, hidrograf, management, risc*

INTRODUCTION

Flash floods occur in the river valleys when the water level exceeds the rate banks of the riverbed or accidentally, when defense constructions are discharged or they fail to static or dynamic action of water currents. Natural flooding happens

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regularly and the land area affected depends on the variation of the land rates, high water level, the flow and duration of the flood wave (Hâncu et al., 1971).

Floods impact has grown in the contemporary period as a result of climate change and urbanization, and there have been significant economic damages and casualties (Pandi, 2010). In the last years the main rivers in Eastern Romania recorded their historic flows: Siret (2005) – 4650 m^3/s, Suceava (2008) - 1946 m^3/s and Prut (2008) – 4240 m^3/s.

Prut Basin is an objective with an international importance. The river which drains this area is the eastern border of the European Union and NATO. Devices to monitor water resources are unevenly distributed within the three states: Ukraine, the Republic of Moldova and Romania, as well as the distribution of qualitative and quantitative water properties. The differences between the three states result from quality management policies, economic requirements, control of environmental pollution. The number of devices with the role of wastewater treatment which are located along the tributaries is also unequal.

In Europe, the Prut River Basin is located in the extreme eastern part of the Danube Basin. Prut River is a left tributary of the first order. It flows from the Wooded Carpathians and it enters Romania north of Oroftiana, after scouring 251 km in Ukraine.

MATERIAL AND METHOD

This paper aims to highlight the characteristics of fluid flow in July – August 2008 and 2010, knowing the values recorded at hydrometric stations, placed along the Prut River, upstream and downstream of the Stânca – Costești Lake : Rădăuți – Prut, Stânca – Aval. This information was supplemented with data from journeys made by authors in the field. We made average daily flow hydrographs to compare significant values with the average flow for the months under discussion. The hydrograph shape ilustrates two types of floods: simple and compound. (Minea et al, 2007)

This paper analyses the hydrological risks following two aspects: recorded values and the flood type.

RESULTS AND DISCUSSION

Flood risk assessment is difficult as the genesis of this phenomenon is a complex process. The Romanian authorities' effort to plan Prut River Basin by damming and building Stânca – Costești Lake illustrates the climatic factor, without diminishing the importance of others that cause floods (geological, morphological and morphometric) (Rusu, 2007).

The heavy rainfall in the Wooded Carpathians triggered large quantities of water on Prut River in 2008 and 2010. In 2008 the average rainfall values recorded at meteorological stations in Romania were between 150 mm and 200 mm in 40 days (At Botoșani station the average was 178 and at Cotnari the value

achieved 209,1 mm) (Romanescu et. al., 2010). Precipitation amounts have increased the flood in Rădăuți – Prut section and the same scenario was repeated in 2010, when the flood peak had a value of 2137 m^3/s.

Currently the anthropogenic intervention on the Prut basin is represented by unauthorized exploitation of gravel in the riverbed and deforestation, which have increased the damage from floods (Soroceanu et al, 1997 - 1998).

In 2008, the flood started on 24th July at Rădăuți – Prut, the initial flow value registered 217 m^3/s and on the hydrograph we observed a simple flood. In late July, the flow was 589 m^3/s, but the flood continued in the first decade of August. The final flow value was 176 m^3/s on 7th August 2008, and the base flow reached 196,5 m^3/s. The July average was 568 m^3/s obtained from flow values between 39,2 m^3/s (10th July, 2008) and 4240 m^3/s (28th July, 2008). The inhomogeneous nature of the records determined significant differences between the average flow and the values recorded during the flood event.

The average flow for 2008 was 137 m^3/s, higher than the multiannual average flow, which in the range from 1950 to 2008 was 81.2 m^3/s. In 2010, the annual average reached a higher value than in 2008, 156 m^3/s.

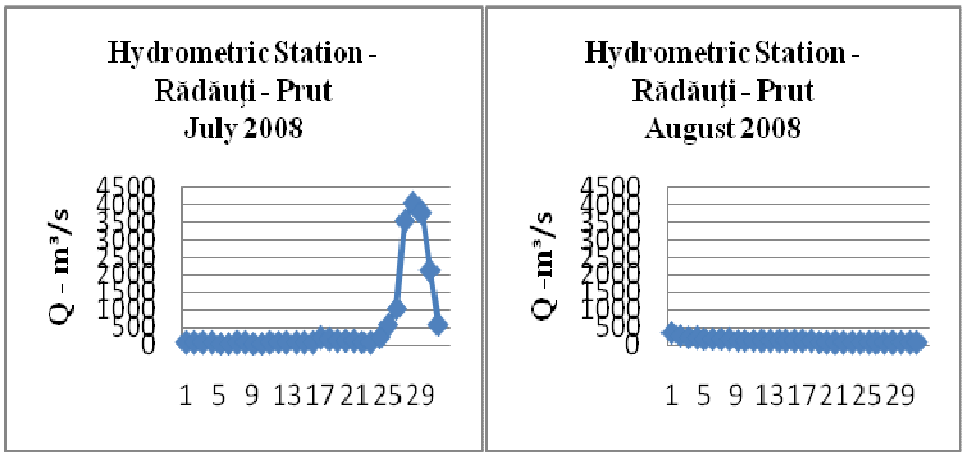


Fig. 1 - Liquid flow hydrographs - Prut River

The danger level (CP) at Rădăuți – Prut station was reached on 27th July, 2008, with a value of 1088 cm (+ 488 cm above CP) and maintained a rising trend in the next two days (1188 cm, 1134 cm respectively). To the confluence with the Danube, Prut river rates were maintained at levels between 500 and 650 cm, +10, +20 cm above the danger level.

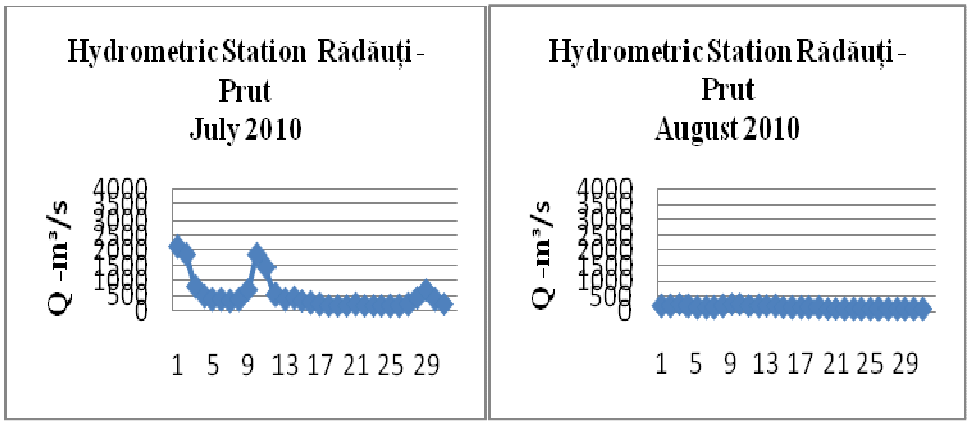


Fig. 2 - Liquid flow hydrographs – Prut River

Every two years in the same section, the flood hydrograph shows two successive peaks, but the phenomenon occurred in first half of July 2010. The first flood peak recorded a lower value than in 2008, but it is a significant one – the maximum of July in that year. The average flow registered 530 m^3/s and was obtained from values between 135 m^3/s (26th July, 2010) and 2137 m^3/s (1st July, 2010). The second peak, with a flow rate of 1878 m^3/s, recorded on 10th July 2010, is a significant value compared with the average of July in the same year.

In 2008 the impact of the flood at Radauti - Prut was due to the aggregation of contrary forces: the flood wave coming from the territory of Ukraine and the remuu wave which was originated in the lake and propagated upstream to a distance of about 70 km (Romanescu et. al. 2010).

The downstream section of the Stânca – Costeşti Lake illustrates the flood defense role. In the Romanian Register of Large Dams, Stânca – Costești ranks 49 in the order of height and 2 according to the volume of lake (1290 hm^3, after the 2100 hm^3 of Porțile de Fier I).

At normal retention (NNR - 90.80 m) the length of the reservoir is 70 km and the maximum (Nmax - 99.50 m) should not exceed 90 km. The lake surface at normal retention level is 5900 ha and 9200 ha at maximum reach. The flow calculation, providing 0.1%, is set at 1560 m^3/s and corresponds to a level of 99.50 m .

At the end of July 2008, the lake water level values were 98.21 m (30th July 2008) and 98.20 m (31st July 2008), and the maximum amount retained was 745 million m^3, a value that exceeds the gross volume of accumulating normal retention level (735 million m^3).

According to the rules of operation, flood control is achieved by the slice volume of 550 million m^3, which can be build between the normal upper retention and the high rate damper barrier, plus the slice of 115.0 million m located above

the upper edge of stem damper.The flood with a probability of 1% is attenuated from 2940 m^3/s to 700 m^3/s, which together with the existing embankments on the Prut River downstream of the reservoir, get under the effect of flood 100,000 hectares of meadow land.

At the hydrometric station Stânca – Aval, the flood of 2008 had a peak of 1050 m^3/s, while the damming of the Prut River allows a discharge flow of 756 m^3/s In 2010 values observed on the hydrographs do not exceed this flow in the range July-August 2010.

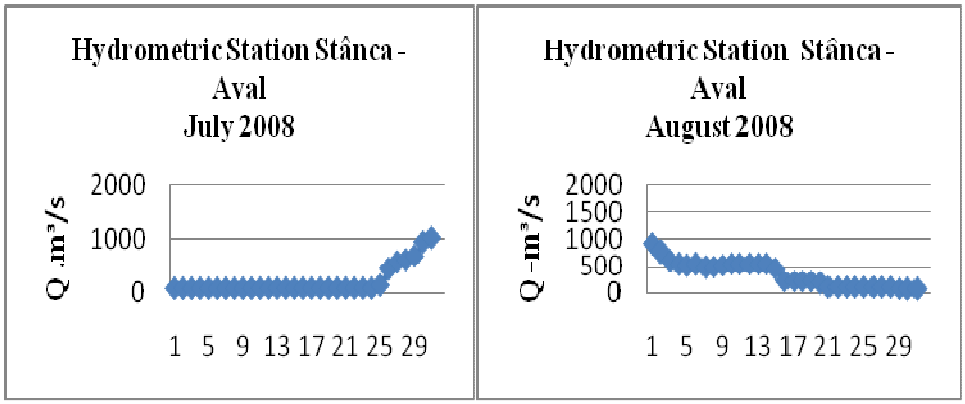


Fig. 3 - Liquid flow hydrographs - Prut River

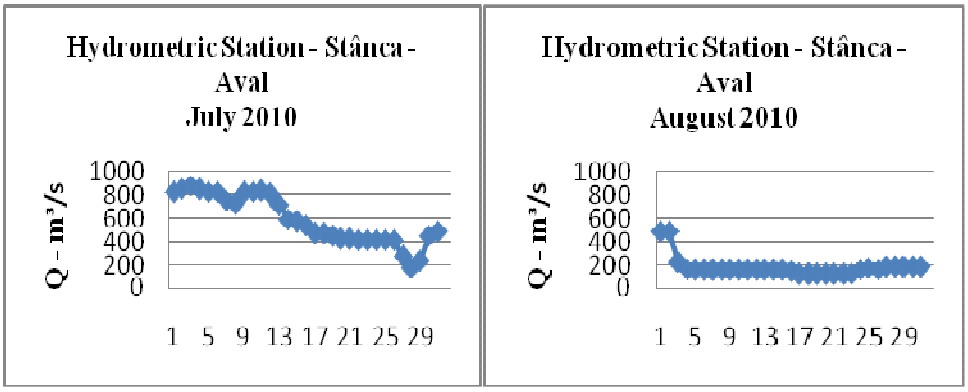


Fig. 4 - Liquid flow hydrographs - Prut River

In 2010, significant values were recorded in the first half of July: 879 m^3/s, respectively 839 m^3/s, for the average flow of 588 m^3/s. Comparing to 2008, when the average of July was 212 m^3/s and the maximum flow reached 1050 m^3/s, in 2010 the differences between the average flow and significant values are lower.

The annual average flow recorded at Stânca - Aval was 133 m^3/s, close to the maximum annual average since 1980 (139 m/s). Between 1950 – 2008, the annual average flow in this section was 83.5 m^3/s.

CONCLUSIONS

Flash floods are typical when the hydrographic network is richly supplied. Large amounts of water enter the system from the high intensity rainfall and/or sudden melting of snow, depending on the climate of the region (Pandi, 2010).

1. Prut floods were significantly reduced in Romania after the construction of Stânca – Costești reservoir. The impact of flooding on the upstream sector was emphasized by storing a significant amount of water behind the dam. The diminishing role was decisive for the downstream flood waves: they did not have the same impact.

2. Unauthorized exploitation of gravel in the riverbed and deforestation have increased the damage made by the floods in the Prut River. Anthropogenic intervention triggered negative reactions, and these imbalances made floods emerge stronger.

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RESEARCH ON MALT DRYING AT LOW TEMPERATURES TO PRESERVE VITAMINS

CERECETĂRI PRIVIND USCAREA MALȚULUI VERDE LA TEMPERATURI JOASE IN VEDEREA CONSERVARII VITAMINELOR

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Abstract. *It is known for hundreds of years as the malt is a made from barley, and is a natural product, rich in enzymes and vitamins. Experimental researches were done using a germination Jacobsen plant and a dryer, for various conditions. The main goal of this work was the maintenance and conservation the vitamins in malt by drying at low temperatures in order to use human nutrition in a wide range of products. Green malt layer was 5 cm and initial moisture content at 46,1%. Main parameters follow the humidity and temperature were working both germination and drying(Stroia I., 1998).. Maximum drying temperature was 60 °C. Following more charts for germination and drying, it was succeeded to obtain a malt with a moisture content of not more than 10% that preserve vitamins.*
Keywords*: malt, germination, moisture, vitamins, conservation.*

Rezumat. *Se ştie de sute de ani în urma că malțul este un semifabricat obținut din orz, şi reprezintă un produs natural bogat în enzime şi vitamine. Cercetările experimentale au fost facute cu ajutorul mesei de germinare Jacobsen şi o instalație de uscare, pentru diferite condiții de lucru. Scopul principal în cadrul acestei lucrări a fost conservarea vitaminelor în malț în urma uscării la temperaturi joase în vederea folosirii în alimentația omului într-o gamă largă de produse. Stratul de malț verde a fost de 5cm şi umiditatea inițială de 46,1% . Parametrii principali urmăriți au fost umiditatea şi temperatura de lucru atât la germinare cât şi la uscare. Temperatura maximă de uscare a fost de 60 grade C. Urmând mai multe diagrame atât pentru germinare cât si pentru uscare dinainte stabilite s-a reuşit obținerea unui malț cu umiditate de maxim 10% care ii asigură conservarea vitaminelor.*
Cuvinte cheie: *malț, germinare, umiditate, uscător, vitamine, conservare.*

INTRODUCTION

Of the many old and new springs on the use of various products from barley we stopped at two sources: the book "1000 years of Beer existence in Austria" (Trumler, 1996) and the German Purity Law (Kunze, 1996) existing since 500 years ago, which clearly says that „beer ingredients must only be water, barley and hops". These two sources show that barley has not been used as such, but was made to yield sprouting germinated barley, which was then dried and named malt (Stroia, 1998). The main technological stages to obtain malt are barley reception, cleaning and sanitizing barley, soaking and germinating barley (green

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malt), drying green malt, resulting dry malt (Diaconescu and Theiss, 2004). In the experiments we followed technological stages but soaking/sprouting and drying diagrams was made at different parameters than those used.

MATERIAL AND METHOD

Materials (used equipment)

- Moisture analyzer series MAC determining grain moisture before germination, while germination and during drying malt (*Fig. 3*); pH meter: pH determining green malt extract; thermocouple Thermometer: For determining the temperature inside the layer of barley during the germination process and the drying process; galvanized vase 5 liters fitted with an overflow which acts gently soaking in miniature. KERN electronic scale 440-49N with 0.1 g accuracy: for weighing raw material; Heat balance
- Cylindrical cassettes (diameter 24 cm and height 10 cm) bottom of galvanized mesh that put barley in layers of 5 cm (*Fig. 2*).
- Jacobsen table in which the zinc cassettes were added containin barley (*Fig. 1*). Parameters of the water temperature, water level and soaking times were controlled by air conditioning built into the Jacobsen table.

Experimental facility for drying green malt (vertical laboratory dryer - Figure 4, belonging to the Department of Agricultural Mechanization, University of Agricultural Sciences and Veterinary Medicine), was equipped with electronic digital display for controlling and monitoring the drying process parameters: drying agent temperature to 120^0C, the speed of the drying agent up to 2.5 m/s and time.



Fig.1 - Jacobsen – germination plant



Fig. 2 - Cylindrical cassettes with barley



Fig. 3 - Heat balance



Fig.4 - Vertical dryer

Raw material: **Barley type Andreea**

Table 1

Analyzed barley characteristics

No.	FEATURES	Andreea Barley
1	Test weight	63,5 kg/hl
2	Foreign bodies in sieve	0,2%
3	Organic foreign bodies	0,4%
4	Seeds defects - smashed	1,5%
5	Seeds defects - cliffs	0,6%
6	Seeds defects undeveloped	0,3%
7	Moisture	13,2%
8	Uniformity	92,5%
9	Aspect	Normal
10	Color	Specifică
11	Smell	Plăcut
12	Taste	Normal
13	Germination speed	5 zile
14	Percentage of germinated seeds	97%

Method:
Drying. At the bottom of the dryer are located three resistors that heat the air making 1.5kW of heat and mass transfer by convection. The fan constituting dryer which is under resistors, draws air from the outside and then it goes back inside into the dryer from the bottom up. Dryer operation is discontinuous and follow these steps:

- Supply of green malt in a box with the bottom of the galvanized mesh distributed in layers of about 1 cm
- Inserting a cassette into the drying room;

- Sealed drying room, turning on the fan, electrical resistance switching and keeping dry green malt drying the diagram
- Cooling the dried malt;
  Removal of the product.

The dryer is provided with: a thermostat, which controls the independent heating and the temperature is kept constant cu temperature sensors (which monitor the dryer inlet air temperature and the air temperature in the dryer grill); humidity sensors (intake air humidity in the dryer and the humidity of the air at the outlet of the dryer). According to a moisture control chart weight loss due to water removal products are tracked using electronic scales mounted above the drying chamber. Velocity is adjusted of the touch screen interface of the dryer by adjusting fan speed.

In laboratory tests with the device plus Merck 1.16980001 RQflex reflectometer, on several samples of malt in the laboratory of physicochemical analysis of the discipline of oenology at the farm Adamachi USAMV was able to determine the presence of vitamin C.

Material and method (recommended by the manufacturer Merck 1.16980001 plus RQflex Reflectometer) to determinate vitamin C.

Materials:

- Malt sample up to 50 g.
- 0.5% trichloroacetic acid solution in an amount of 50g
- PH 7 buffer solution in an amount of 0.8 ml
- 1,4-dithiothreitol aqueous solution (15.4 mg of 1,4-dithiothreitol dissolved in 1 ml of distilled water) in an amount of 0.1 ml
- Aqueous solution of N-ethylmaleimide (50 mg Nethylmaleimide dissolved in 1 ml of distilled water) in an amount of 0.1ml

Reagents:

Cat.No. 116981 Reflectoquant ® test ascorbic acid, Cat.No. 116 970 RQflex ® reflectometer, Cat.No. 116 955 Reflectometer RQflex ® plus, Cat.No. 109 439 pH 7 buffer solution, Cat.No. 111474 1,4-Dithiothreitol, Cat.No. 100 807 trichloroacetic acid, Cat.No. 34115 N-ethylmaleimide.

Preparation of samples: solid material (the sample of malt) ascorbic acid was extracted with trichloroacetic acid before the final determination of ascorbic acid. Add 50 g of a solution of trichloroacetic acid 0.5%, 50 g of malt and stirred in a glass vessel with ultrasound for 8 minutesIt is then filtered through a paper filter and it is analyzed only the liquid part. Adding 0.8 ml of pH 7 buffer solution and 0.1 ml of 1,4-dithiothreitol aqueous solution (15.4 mg 1,4-dithiothreitol dissolved in 1 ml distilled water) to 1 ml of sample (or filtered), mixed well and allowed to react for 15 minutes. Then add 0.1 ml aqueous solution of N-ethylmaleimide (50 mg Nethylmaleimide dissolved in 1 ml of distilled water) and stir again. This mixture (sample as solution) is analyzed with the reflectometer after 1 minute. Review: Press the START button and simultaneously test paper pretreated mixture is introduced into the sample solution (5-30 °C) for approximately two seconds, ensuring that the two areas are fully submerged the solution analyzed. Excess fluid from the long edge of the strip will be absorbed by blotting on an absorbent paper towel. Wait 15 seconds and then the test paper strip is inserted into the reflectometer slot. The result with the value [mg / l] total ascorbic acid it is automatically stored in the reflectometer's memory and it is displayed digitally. The recommended calculation by the equipment manufacturer is

as follows: Total content of ascorbic acid [mg/l] = the measured value and it is displayed on the reflectometer [mg/l] x 4. (Determination Method of vitamin C)

RESULTS AND DISCUSSIONS

The values results from analyzes are found in Table 2 for the drying operation, the and vitamin content of different types of malt in Table 3.

Table 2

Malt drying diagram

No	Date	Time	Speed (m/s)	Air temperature under grill (^oC)	Product core temperature (^oC)	Moisture (%)
1	4.04.13	16^{00}	1,5 m/s	40^0C	20^0C	46,10
2	4.04.13	17^{00}	1,5 m/s	40^0C	38^0C	40,91
3	4.04.13	18^{00}	1,5 m/s	42^0C	40^0C	36,12
4	4.04.13	19^{00}	1,5 m/s	45^0C	43^0C	31,42
5	4.04.13	19^{30}	1,5 m/s	50^0C	48^0C	26,23
6	4.04.13	20^{00}	1,5 m/s	55^0C	$53,5^0C$	20,58
7	4.04.13	21^{15}	1,5 m/s	57^0C	56^0C	16,23
8	4.04.13	22^{15}	1,5 m/s	58^0C	57^0C	13,64
9	4.04.13	23^{15}	1,5 m/s	58^0C	57^0C	11,82
10	5.04.13	0^{00}	1,5 m/s	59^0C	58^0C	10,44
11	5.04.13	2^{00}	1,5m/s	60^0C	58^0C	9,04

Table 3

Results regarding malt's content of vitamin C in different stages of maturation

No.	Malt type	Fabrication date	Moisture (%)	Vitamin C content (mg/l)	Maximum drying temperature ^oC
1	Green malt	03.04.2013	44,34	96	22
2	Blond malt	02.02.2013	9,96	48	60^0C
3	Blond malt	04.04.2013	9.04	56	58^0C
4	Blond malt	24.04.2013	6,52	8,8	75^0C
5	Blond malt	29.04.2013	4,73	0	85^0C
6	Blond malt	28.09.2012	10,10	44	$59^o C$
7	Blond malt	08.10.2012	9.90	40	60^0C

Vitamin C content according moisture content of malt and drying temperature is represented in figure 5.

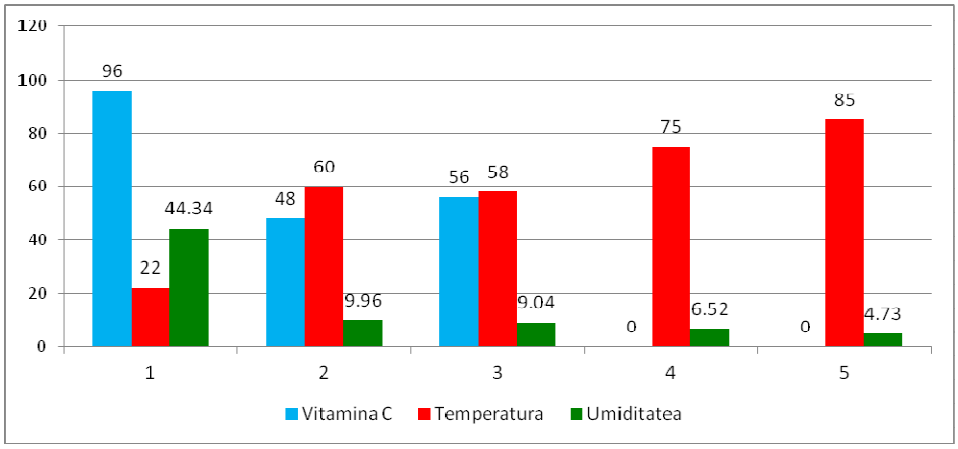


Fig. 5 - Vitamin C content according to the moisture of the product and drying temperature

CONCLUSIONS

1. Drying up to a temperature of 60 ° C, β-amylase continues its activity and the exo-β-glucose reacts like β-amilose, the existing enzimatic equipment in barley grain and the one that apeared during germination remain in malt (Kunze W., 1996) , also a significant content of vitamin B complex remains present in malt (Diaconescu Maria Daniela, Theiss F., 2004).

2. After the obtained results it can be seen highest quantity of vitamin C contained by green malt, with a high water level at a temperature close to 22 ^{o}C. Until temperature reaches 59 ^{o}C an important quantity of vitamin C of 44,4mg/l is kept. When the temperature reaches 60 ^{o}C and the moisture level drops, can be observed a decrease of malt's quantity of vitamin C until it reaches 40mg/l.

3. It is pleasing that vitamin C was maintained in the old malt made weight months ago in the amount of 40 mg/l.

4. At temperatures over 85 ^{o}C vitamin C disapeared.

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RESTORATION OF LEACHED CHERNOZEMS FERTILITY UNDER THE INFLUENCE OF GREEN AND ORGANIC FERTILIZERS

RESTABILIREA FERTILITĂȚII CERNOZIOMURILOR LEVIGATE SUB INFLUENȚA ÎNGRĂȘĂMINTELOR VERZI ȘI ORGANICE

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Abstract. *The paper presents the results of implementation the economic and available agrofitoameliorative procedures to remedy and long-term preservation the quality state of arable chernozems. As a result of incorporation of vetch green mass as intermediate crop and 50 t ha^{-1} of manure was established that: have increased the organic matter in soils, changed the physical parameters increased the harvest of winter wheat and sunflower.*
Key words: *humus content, physical parameters, manure, vetch*

Rezumat. *În lucrare sunt prezentate rezultatele implementării procedeelor agrofitoameliorative, economic accesibile privind remedierea şi păstrarea pe termen lung a stării de calitate a cernoziomurilor arabile. În rezultatul încorporării masei verzi de măzăriche, ca cultură intermediară şi a 50 t ha^{-1} de gunoiul de grajd s-a stabilit că: au crescut valorile fluxului de substanţă organică în soluri; s-au modificat parametrii însuşirilor fizice; a sporit recolta culturilor de grâu de toamnă şi floarea soarelui.*
Cuvinte cheie: *conținut de humus, gunoi de grajd, măzăriche, parametri fizici*

INTRODUCTION

The existing system of agriculture does not ensure long-term preservation of soil quality status and lead to worsening economic and environmental situation in the country. The physical, chemical and biological degradation of chernozems contributes to the extension of land desertification processes and decrease the volume of agricultural production. (Cerbari, 2011).

Researches regarding the restoration of arable layer quality of leached (cambic) chernozems under the influence of vetch used as green fertilizer and manure were conditioned by the following considerations:

- food security of the country depends on the quality status of chernozems which covers about 80 percent of the land surface;
- intensive tillage of chernozems (often with heavy machinery) led to loss of humus content, structure damage, strong secondary compaction of arable layer, decreased of agricultural production;
- the productivity of fine textured soils is high, if that their structure is agronomic valuable and ensures the favorable aerates of the arable layer.

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Maintaining a equilibrated or positive balance of humus contributes to tackling the physical quality of soils and this possibility can be made by the systematic application of organic fertilizers or growing perennial grasses with dominate of grasses in its composition on the arable soils. Given decreasing of cattle numbers by 6 times, the quantities of accumulated manure are respectively by 6 times lower than in 1990 (Cerbari V., 2010). Unfortunately, these small amounts of organic fertilizer not used on the land for agricultural purposes. Therefore it was necessary to find alternative sources of local organic fertilizers. The most effective source of organic fertilizer is intermediates crops used as green fertilizers. As a result of investigations it was established that for chernozems zone the best crop as green manure is winter vetch - as intermediate crop, and spring vetch – as the crop insertion into rotation for a follow field, which is incorporated two crops of vetches in the soil as green manure (Borontov, 2004,).

Researches in the Balti steppe established that radical remedial factor of typical chernozems characteristics is those, that leading to the formation of this subtype of soil - steppe vegetation with grasses domination in its composition, the plants with highly developed fasciculate root system. Typical chernozems with whole profile being grassing 60 years restored completely humus profile and properties characteristics for typical virgin soils under the influence of natural herbaceous vegetation. Recovery rate of humus in the arable layer of typical chernozems grassing 15 years under the action of perennial herbs without discharge their air mass is 0.06% annually in the 0-30 cm layer and 0.04% annually in the 0-50 cm layer (Cerbari and Balan, 2010, Tzandur et.al., 2011).

In Moldova, due to lack of free land, this variant remediation of degraded arable layer characteristics of chernozem will not be accepted. In this connection, is assessing interest the rate to restore damaged soil characteristics under the influence of perennial herbs and organic fertilizers. The purpose of this research is test the procedures to remedy agrophytotechnical soil characteristics that will contribute to long-term preservation of their quality and lead to increase the volume of agricultural production.

MATERIAL AND METHOD

For the entire purposes of the researches at the Experimental Station "Ivancea" of Institute "N. Dimo", in Centre of Moldova) were founded four experimental plots concerning the testing of phyto-technological procedures. Parcels - strips (width – 10.5 m, length - 700 m) testing vetch and manure (50 t ha^{-1}) on the leached chernozem in autumn 2010. The vetch sowing was done in the second decade of September, and spring in the last decade of April, vetch green mass was incorporated into the soil by disking. The soil was proceeding cultivated for base crop sowing. Strip was divided into 2 sectors. The first section width of 7 m was sown again with spring vetch for hay and the second, width 3.5 m - with sunflower.

RESULTS AND DISCUSSIONS

To highlight the initial parameters of soil characteristics in the autumn of 2010 until the founding of experience on the experimental field was located the soil profile in 200 cm of deep and 4 semi deep soil profiles by 50 cm. Investigated profile of arable cambic chernozem is characterized by the type Ahp1-Ahp2-Ah-Bhw1-Bhw2-BCk1-BCk2-Ck. Effervescence - from 96 cm. Carbonates as pseudomycelia from 100 cm to 200 cm, from 150 cm deeper - rare accumulations of bieloglasca. Ahp2 horizon of soils as a result of structural damage and humus loss under the influence of agricultural heavy machinery and aggregate is compacted and is characterized by unfavorable physical properties. Humus profile (Ah + Bhw) and sometimes upper horizon BC is leached of carbonates. Bhw1 and Bhw2 horizons are characterized by reddish-brown hue due process of iron siallitization "in situ" of mineral part of these soils.

Investigated leached chernozems are characterized by clayey – loamy texture, poorly differentiated in profile, moderate quality of structural composition, moderate compaction of newly arable layer, high compaction of Bhw2 and Bhw1 horizons (relict feature of former eluvial horizon of forest soils). The humus profile is decarbonated. Humus content in soil profile is: 3.2 - 3.5% in the arable layer, 2.2 - 2.5% in the Bhw1, 1.0 - 2.0% - in the Bhw2, 0.7 – 1.0% in BCk1 horizon. Value ratio C: N is medium - from 8.9 to 9.4, confirming that the intensity of the annual flow of organic matter in soil is low. Investigated soils are moderately supplied with mobile forms P_2O_5 and K_20. Hydrolytic acidity of these soils is relatively low - 1.7 to 2.5 *me (mg.equiv.)*. Content and composition of exchangeable cations in the soil adsorption complex is typical for chernozems of Moldova. The cation exchange capacity: from 31 *me* in Ahp1 to 22 *me* in the Ck.

According to results on the strip sown with winter vetch used as green manure, in the soil was incorporated 7 t ha^{-1} of organic matter absolutely dry with nitrogen content of about 3.3%. On the sector strip width 3.5 m, in the spring, after incorporation the vetch into the soil was sown sunflower. On the 7 m width strip was again sown the spring vetch for hay. As a result, after the mowing of hay in the soil were still returned the 6.7 t ha^{-1} of dry plant debris with an average nitrogen content of about 2.9%. In total, on the sector of the strip with vetch (7 m width) in the agricultural year were applied in the soil 13.7 t ha^{-1} of organic waste of vetch with nitrogen average content 3.1% (table 1).

Table 1

Vetch harvest on the experimental strip, 2011

Harvest, date	Green mass, t/ha	Humidity, % of wet green mass	Dry mass, t/ha	Cereal units, t/ha	Ash	N	P_2O_5	K_2O	C
					% of dry mass				
Vetch harvest, green mass incorporated into the soil as fertilizer (K=0.2)*									
The I harvest: 22.04.2011	**19**	**79.5**	**3.9**	**3.4**	13.4	4.25	0.71	2.36	37.1
Plant roots fixing in 0-30 cm of layer			**3.1**	-	16.8	2.19	0.32	0.40	26.6
The total amount of plant debris			**7.0**	-	**14.9**	**3.30**	**0.54**	**1.49**	**32.5**

Continuing tab.1

Vetch harvest, green mass used as hay (K=0.2)*. In the soil were incorporated only main crop organic waste and roots of vetch.									
The II harvest: 12.07.2011	**24**	70.5	**7.1**	**4.8**	9.3	4.0	0.6	2.10	37.1
Vegetal waste, t/ha (25% from harvest)	**6.0**		**2.8**	-					
Plant roots fixing in 0-30 cm of layer			**3.9**	**-**	25.2	2.10	0.32	0.45	26.6
Total harvest per year	**43**	**76.0**	**11.0**	**8.2**	10.8	4.09	0.68	2.28	37.1
Vegetal waste applied into the soil, t/ha		total	6.7	-					
Roots, total mass in the layer 0-30 cm			*7.0*	-	21.5	2.11	0.32	0.43	26.6
Total mass (two crops, one for hay) of organic residues remaining in the soil			13.7	-	16.3	3.12	0.50	1.34	34.7

*Note: **K=0.2** - transformation coefficient of vetch green mass in units of conventional cereals. Humification coefficient - 0.25. Amount of 13.7 t ha^{-1} of organic waste of vetch can synthesize about 3.2 t ha^{-1} of humus.*

Harvest of principal crop on the strip width of 3.5 m, sown in spring of 2011 with sunflower (after incorporation the vetch green mass into the soil) is presented in table 2.

Table 2

Sunflower harvest (absolutely dry mass) after vetch as green fertilizer (numerator) and harvest on the control unfertilized strip (denominator)

No. of plot, surface -15 m²	Harvest on the plot (kg)	Harvest (t/ha)	Average harvest on the strips (t ha^{-1})	Growth rate of harvest (t ha^{-1})
1	3.8 / 3.0	2.5 / 2.0	2.4 / 1.9	+0.5 (0.7 t ha^{-1} of cereal units)
2	3.4 / 2.8	2.3 / 1.9		
3	3.6 / 2.9	2.4 / 1.9		
4	3.7 / 2.8	2.5 / 1.9		
5	3.4 / 2.9	2.3 / 1.9		

The data show that in 2011 the growth rate of sunflower harvest in result of use the vetch as green fertilizer was 0.5 t ha^{-1} or 0.7 t ha^{-1} of cereal units, confirming the high efficiency of this method. After harvest of vetch hay (sector of width 7 m) and sunflower culture from across the field (where is located the parcel with 50 t ha^{-1} of manure into the soil), the land was prepared for sowing, but due to severe drought in autumn, the winter wheat was sown in the third decade of October. Repeated spring drought, affected adversely the crop development. However, it was found a positive influence of vetch green fertilizer and manure on winter wheat harvest even in this dry year (table 3).

Table 3

Winter wheat harvest (t ha^{-1}) on the experimental variants, 2012

No.	Variant	Average harvest, t ha^{-1}	Growth rate compared to the control variant	
			t ha^{-1} / %	probability of difference, %
1	Control	2.3	-	-
2	Winter wheat after vetch, I year	3.2	0.9 / 39.1	99.9
3	Winter wheat after vetch, II year (I year – sunflower)	2.7	0.4 / 17.4	95.0
4	Winter wheat on the plots with manure, 50 t ha^{-1}, II year; (I year – sunflower)	3.1	0.8 / 34.8	99.9

It was established that vetch green fertilizer and manure contributed to a partial correction of degraded arable layer characteristics of chernozems. Intensifying flow of organic matter in the soil led to a partial remedy structure; increase the favorable agronomic hydrostabile aggregates, decrease the apparent density values (table 4-6).

Table 4

Changing the value of apparent density (g/cm3) of arable layer of chernozem leached influenced by vetch green fertilizer and manure

Horizon and depth (cm)	Control	Winter wheat after vetch, I year	Winter wheat after vetch, II year; (I year – sunflower)	Winter wheat on the plots with manure, 50 t ha^{-1}, II year; (I year – sunflower)
Ahp1 0-12	1.24	1.14	1.15	1,.17
Ahp1 12-20	1.46	1.33	1.45	1.32
Ahp2 20-35	1.48	1.44	1.49	1.43
Ah 35-50	-	1.42	-	-

Table 5

Changing of the structural state of chernozem cambic arable layer

Horizon and depth (cm)	The sum of agronomic favorable aggregate (numerator) and hydrostabile aggregates (denominator),%			
	Control	Winter wheat after vetch, I year	Winter wheat after vetch, II year; (I year – sunflower)	Winter wheat on the plots with manure, 50 t ha^{-1}, II year; (I year – sunflower)
Ahp1 0-12	65.3 / 50.4	76.3 / 61.2	66.3 / 58.6	74,.1 / 61.8
Ahp1 12-20	50.3 / 70.4	58.8 / 76.4	53.9 / 76.0	58.0 / 77.0
Ahp2 20-35	46.5 / 70.2	47.7 / 74.6	46.4 / 73.4	46.0 / 72.8
Ah 35-50	-	68.5 / 75.2	-	-

Organic matter content in the soil layer 0-12 cm of the variant whit winter wheat after vetch and manure (50 t ha^{-1}) increased by 0.2%. Incorporation in one year in the arable layer of soil a quantity of 13.7 t of vetch green mass with 3.1% nitrogen content created conditions for the synthesis of about 3.2 t ha^{-1} of humus.

Table 6

Changing of humus content (%) in the arable layer of chernozem leached

Horizon and depth (cm)	Control	Winter wheat after vetch, I year	Winter wheat after vetch, II year; (I year – sunflower)	Winter wheat on the plots with manure, 50 t ha^{-1}, II year; (I year – sunflower)
Ahp1 0-12	3,39	3,62	3,46	3,60
Ahp1 12-20	3,15	3,30	3,26	3,36
Ahp2 20-35	3,00	3,06	3,02	3,06
Ah 35-50	-	2,87	-	-

The advantage of the proposed technology to remedy the degraded characteristics of arable layer of chernozem is that it is accessible and expensive for farmers, contributing to increase the harvest and restoration of soil quality. To implement this technology is required to create the seeds base of vetch. Technology is recommended to be gradually implemented in central and southern areas of Moldova at least 100 000 hectares, 10 hectares annually.

CONCLUSIONS

The winter vetch as intermediate crop using as green fertilizer, it is recommended to be sown every two years, after the culture that creates this possibility. This technology leads to:

- creation the preconditions for implementation of minimum tillage system, that in combination with this technology will contribute to soil protection and remediation of degraded characteristics;
- formation of equilibrated balance of organic matter and nitrogen in the soil: annual is return in the arable layer with crop of vetch about 7 t ha^{-1} of dry plant residues, containing 3.3% of nitrogen, which provides a synthesis of 1.75 t ha^{-1} of humus or 1.0 t ha^{-1} of carbon and sequestration of 3.7 tons of CO_2;
- increasing humus content in arable layer 0-35 cm by 0.11%, improving physical quality of 0-12 cm layer formed by disking, increasing the volume of agricultural production by 20-30 per cent.
- ensuring the agricultural production increase at least 0.9 t ha^{-1} of cereal units in the I^{st} year and by 0.4 t ha^{-1} of units in the II^{nd} year after incorporation;

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RADIAL INCREMENTS DISTRIBUTION ON SILVER FIR TREES' STEMS AFFECTED BY MISTLETOE (*VISCUM ALBUM* SSP. *ABIETIS*). A CASE STUDY IN EASTERN CARPATHIANS

DISTRIBUȚIA CREȘTERILOR RADIALE PE FUSUL ARBORILOR DE BRAD PARAZITAȚI DE VÂSC (*VISCUM ALBUM* SSP. *ABIETIS*). STUDIU DE CAZ ÎN CARPAȚII ORIENTALI

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Abstract. *Viscum album ssp. abietis (Wiesb) Abrom L. has negative effects on forests and trees health. The present study, regarding the influence of mistletoe infection on radial increments distribution on silver fir trees stems, was carried out in natural stands of Forest District Solca (North part of Eastern Carpathians). The mistletoe infection was presented according to the damage degree of silver fir trees from 0 (healthy trees) to 3 (heavily infected trees). The measurements were carried out on twelve trees, three trees for each infection class. It was found that mistletoe's impact on the radial growth distribution on the stem is higher once the infection degree goes up.*
Key words*: Viscum album ssp. abietis, silver fir, radial increments distribution, damage degree*

Rezumat. *Viscum album ssp. abietis (Wiesb) Abrom L. are un efect negativ asupra sănătății arborilor si arboretelor de brad. Prezentul studiu, care urmărește influența atacului de vâsc asupra distribuției creșterilor radiale pe fusul arborilor de brad parazitați a fost realizat în Ocolul silvic Solca (partea nordică a Carpaților Orientali). Impactul atacului de vâsc este prezentat în acord cu gradul de infecție al arborilor de la 0 (arbori sănătoși) la 3 (arbori puternic parazitați). Măsurătorile au fost realizate pe un număr de 12 arbori, câte 3 arbori pentru fiecare clasă de infecție. S-a constatat că impactul vâscului asupra distribuției creșterilor radiale pe fus crește pe măsură ce crește gradul de infecție.*
Cuvinte cheie*: Viscum album ssp. abietis, arbori de brad, creșteri radiale, gradul de infecție*

INTRODUCTION

Viscum album ssp. *abietis* is one of the three subspecies of *Viscum album* parasitizing species of *Abies*. The mistletoe impact on the host trees can be seen from physiological and anatomical point of view, mistletoe affecting trees growth on the one hand and wood quality on the other (Hawksworth et Wiens, 1996).

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The presence of the cortical strands and of the haustors causes a host reaction manifested by tissue hypertrophy - thickening of the branches or trunk - on the area of mistletoe infection (Anonyme 1934; Plagnat , 1950; Barbu , 2009).

According to Barbu, 1995 and Noetzli K. et. al., 2003, silver fir trees become susceptible to mistletoe infection after 70 years, others authors considering that the host trees are infected after 120 years (Plagnat,1950).

The present study analyzes the distribution of radial increments on silver fir trees with different infection degree. The main objective was to show whether infected and uninfected trees show differences in their growth behavior.

MATERIAL AND METHOD

The research was carried out in a sample plot of one hectare placed in a 120 years old silver fir stand from Forest District Solca (North part of Eastern Carpathians, Romania), where more than 70% of the trees have mistletoe related damages. The coordinates of study plot are: $47^0 43' 17''$ latitude, $25^0 49' 57''$ longitude and 520 meters altitude.

For each tree of the sample plot the degree of mistletoe infection was assessed using 4 class rating system: (i) class 0 - healthy trees; (ii) class 1 - low infection; (iii) class 2 - moderate infection and (iv) class 3 – heavy infection (Barbu, 2009). Diameter at breast height (DBH) and height were measured as well. For the measurements, 12 trees - pre-dominant and dominant (according to Kraft's classification) (Kramer et. Ak□a , 1987) were selected and felled, three tree of each infection class. The crown condition, DBH and height were similar for each triple of trees (Barbu, 2012).

After felling each tree was cross-cut at different levels on the stem (0.3 m, 1,3 m, 12 m, 20 m, 23 m, 26 m, 29 m). A stem disk was taken from each cross section. Annual growth increment was measured on four representative radii of each stem disk (in areas with and without haustors) using a tree-ring analysis machine (LINTAB, Rinntech) with a precision of 0.001 mm.

The age of mistletoe attack was determined using the "laboratory method" (Noetzli et. al., 2003). With this method it was possible to count the number of growth rings of the host stem penetrated by mistletoe haustors. This number corresponds with the number of years since the mistletoe has been established on the tree.

RESULTS AND DISCUSSIONS

In the evolution of the radial growth of **healthy trees (A0)**, three periods of ascending growth can be observed (1915-1930, 1945-1965, 1990-2000), alternated by three descending growth periods (1930-1945, 1960-1985, 2000-2005). Out of these periods, the most pronounced decrease in growth can be observed between 1975 and 1987 (figure 1A, B, C, D). This is the period when, all across Europe forests were in crisis, as a consequence of high pollution levels. After 1987, the intensity of die-back of the trees has decreased significantly, due to the improvement in environmental conditions.

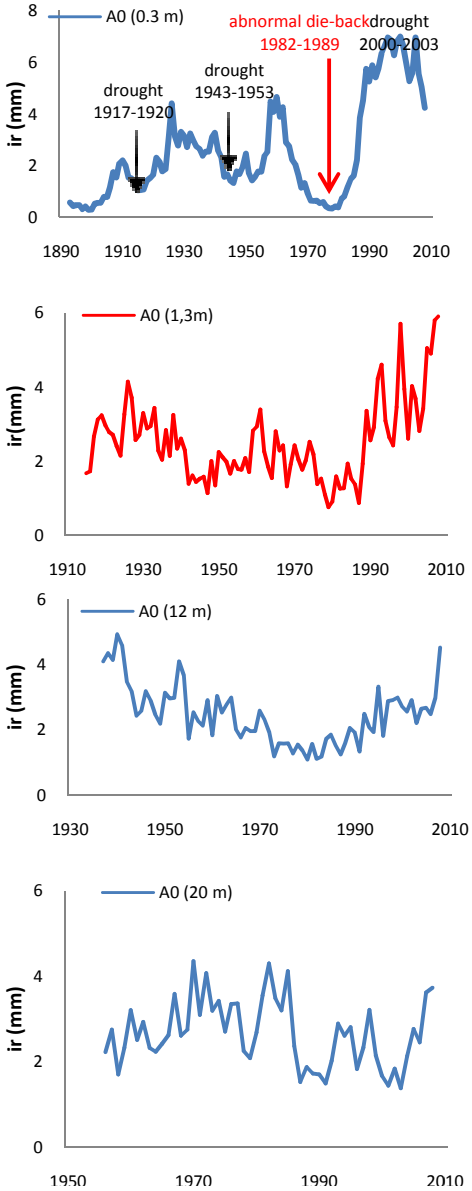


Fig. 1 - Mean radial increments for healthy trees – A0 (class 0 of infection) at different levels on the stem

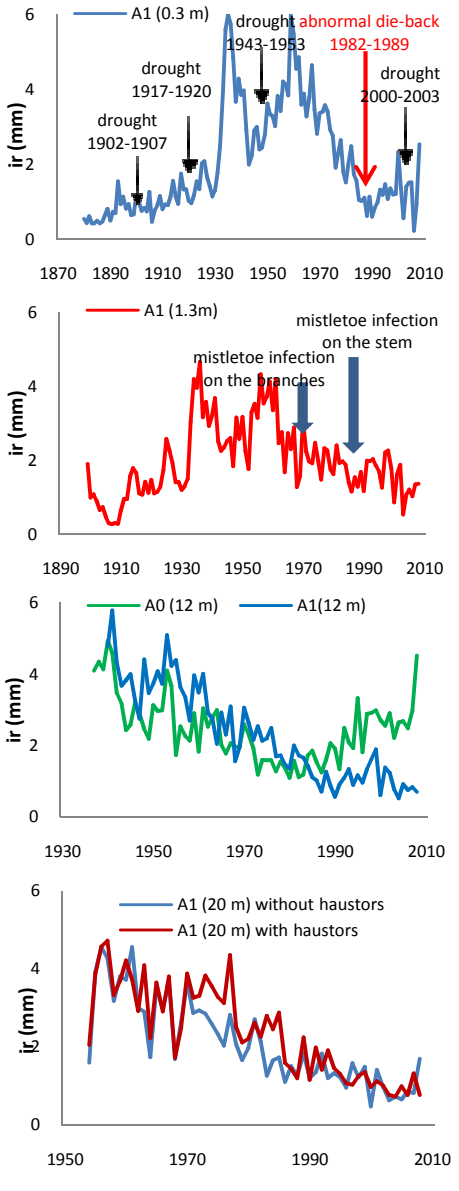


Fig. 2 - Mean radial increments for the trees of 1st infection class – A1 (low infection) at different levels on the stem

For the trees of 1st class of infection (low infection) (A1) the age of mistletoe infection is 20-25 years. In this case, we estimate that the infection on the branches dates back to 1965, with a descent to the stem (by endophytic system – cortical strands and haustors) in 1985 (figure 2 A, B). After this date, the radial

growth in the 1.3 m section remains very low and shows no signs of recovery. The same trend can be observed in all the others sections (figure 2 C, D).

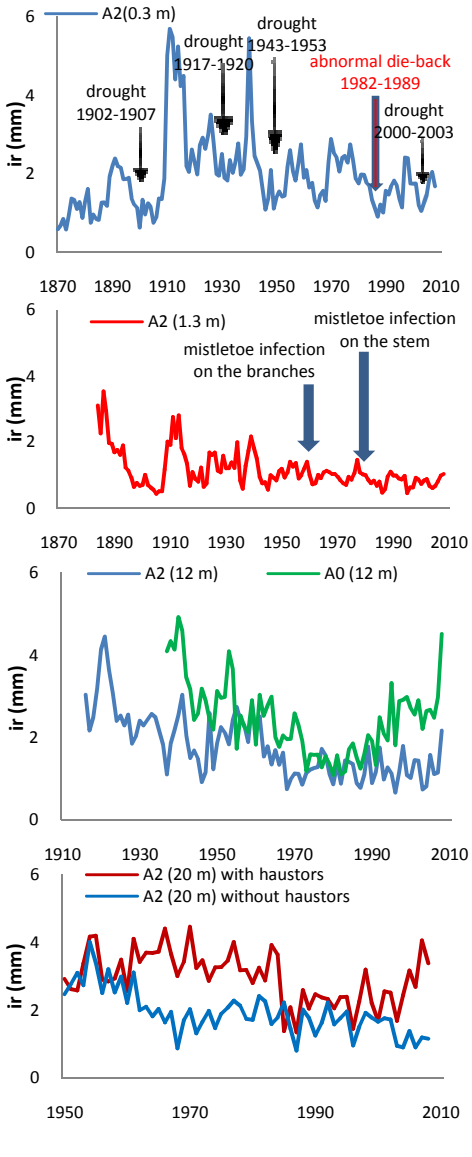


Fig. 3 - Mean radial increments for the trees of 2nd infection class – A2 (moderate infection) at different levels on the stem

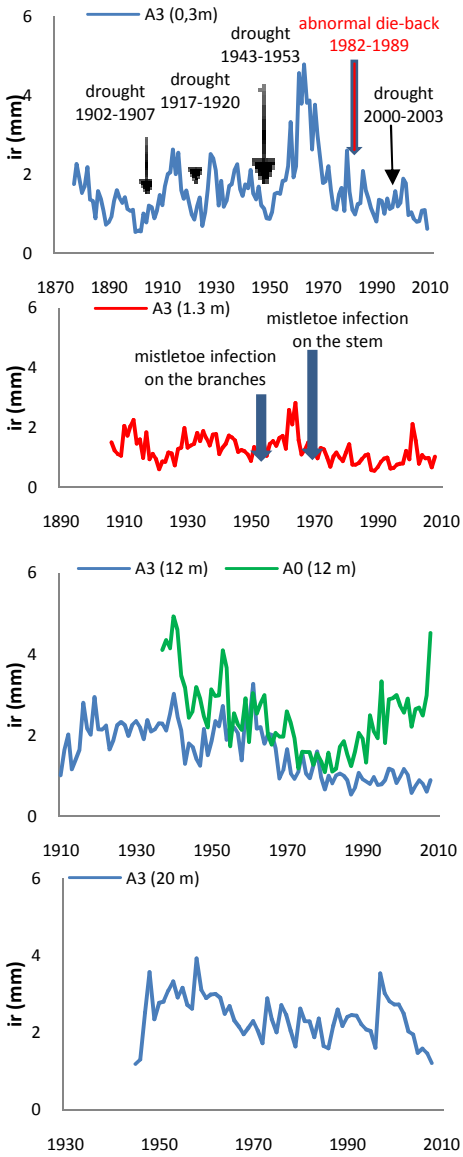


Fig. 4 - Mean radial increments for the trees of 3rd infection class – A3 (heavy infection) at different levels on the stem

For the trees of 2nd class of infection (moderate infection) (A2) the age of the infection has been estimated at 40-45 years. In this case, the infection on the

branches dates back to 1953-1955, after the drought of 1943-1949 (Topor N.,1963). The infection spread to the stem between 1960 and 1970. The downward trend of the radial growth after this period is visible not only in the section located at the base of the stem, but in all the other analyzed sections (figure 3 A, B, C, D). After the mistletoe infection has settled, the growth of the tree is close to minimum, similar to the growth during the 1945-1947 drought. This suggests that the mistletoe infection has the same effect as a severe drought, as noticed in the growth rings after 1970.

For the trees of 3rd class of infection (heavy infection) (A3) the age of the infection has been estimated at 45-50 years. The infection settled on the branches between 1950 and 1955, after the 1943-1949 drought. The infection became systemic in the 1960-1970 interval. After 1965, a noticeable decrease in growth can be observed (figure 4 A, B, C, D).

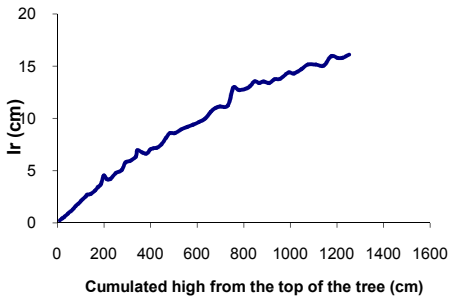


Fig. 5 - Height and radial increment in the first 15 meters from the top of healthy trees (A0)

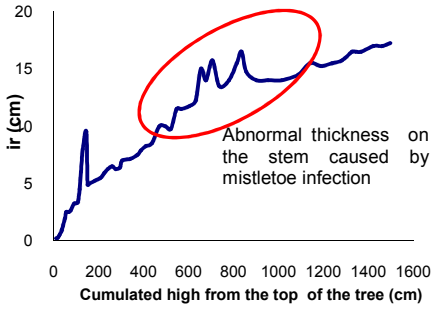


Fig. 6 - Height and diameter increment in the first 15 meters from the top of trees from 1st infection class (A1) – low infection

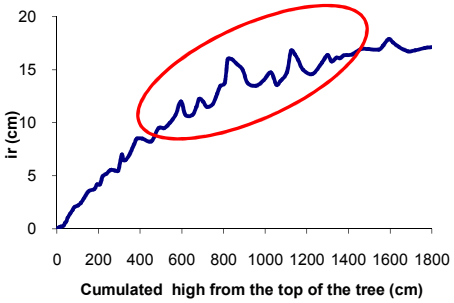


Fig. 7 - Height and diameter increment in the first 20 meters from the top of trees from 2nd infection class (A2) – moderate infection

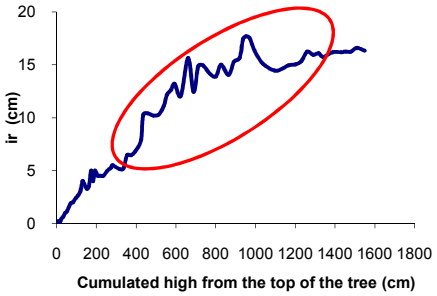


Fig. 8 - Height and diameter increment in the first 18 meters from the top of trees from 3rd infection class (A3) – heavy infection

Initially, the infection manifests itself on the branches. At this time, the influence of the parasite on the host tree increments is negligible. Once the

mistletoe descends through its endophytic system to their insertion point on the stem and then to the stem itself, the effect is visible compared to healthy trees. Once the infection of the stem is complete, the growth becomes uneven, with infected areas showing a much higher increase in wood mass (figures 5, 6, 7, 8). This abnormal growth inhibits the normal growth in diameter and instead forms thickenings around the sinkers.

CONCLUSIONS

1. Before the onset of infection, trees currently assessed into 1st, 2nd and 3rd class of infection had similar growth with healthy trees.

2. Although the radial growth in areas with haustors are higher, overall radial growth of infected trees is much smaller.

3. The mistletoe have a more negative impact on its host's radial growth distribution once the infection degree goes up.

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ISOLATED MICROMYCETES FROM SOME SOILS OF MOLDOVA PLATEAU

MICROMICETE IZOLATE DIN UNELE SOLURI ALE PODIȘULUI MOLDOVEI

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Abstract. *Micromycetes are distributed on a large geographical scale and have been observed in a wide range of habitats mainly located in soil and decaying vegetation. This study shows wich are the most common genera and species of micromycetes isolated and identified from soil. Soil samples were collected from different types of soil in terms of their composition and their importance in agriculture. The study shows the most common species of micromycetes occurring in the soil of mold greyic, solonchak, cambic chernozem and cambic chernozem psamic. The research led to the description of a number of ten fungal species. Six of them belong to genus Aspergillus, two to genus Penicillium, one to genus Stysanus (Stysanus medius Sacc.) and the last on to genus Verticillium (Verticillium cellulosae Dasz.). Based on the fact that many species of Aspergillus have been reported in over 250 studies that have as main topic micromycetes from soil and litter, we found wich are the most common species of Aspergillus and what other types of predominant fungi are in the different studied soils types.*
Key words: *micromycetes, soil, isolation*

Rezumat. *Micromicetele sunt distribuite pe scară geografică largă şi au fost observate în numeroase habitate, în principal soluri şi vegetaţia aflată în descompunere. Acest studiu arată care sunt cele mai frecvente genuri şi specii de ciuperci izolate şi identificate din sol. Probele au fost prelevate din soluri de diferite tipuri, diferenţiate din punct de vedere al alcătuirii cât şi a importanţei lor agricole. Studiul arată care sunt cele mai frecvente specii de fungi prezente în solurile de tip cernoziom gleic, solonceac, psamic şi cernoziom cambic. Cercetările efectuate au condus la descrierea unui număr de 10 micromicete dintre care şase speciii aparţin genului Aspergillus, două specii genului Penicillium şi speciile Stysanus medius Sacc. şi Verticillium cellulosae Dasz. Bazându-ne pe faptul că numeroase specii de Aspergillus au fost menţionate în peste 250 de studii ce au ca principal subiect microfungii din sol şi litieră, am identificat care sunt cele mai frecvente specii de Aspergillus, şi ce alte genuri de fungi predomină în solurile luate în studiu.*
Cuvinte cheie*: micromicete, sol, izolare*

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INTRODUCTION

The role of micromycetes in soil is an extremely complex one and is fundamental (Suhail et al., 2006). Soil microorganisms have an important role in the decomposition of organic matter, increase nutrient uptake by some plants, improv plant resistance and their hyphae bind together the soil particles to make water-stable aggregates. Aggregates in turn create pore spaces in the soil which improves water drainage.

Studies regarding soil micromycetes are not evenly distributed worldwide (Klich, 2002). Most published studies considering the distribution of soil micromycetes from subtropical and temperate climate areas are focused on forest and cultivated soil.

The present study is an attempt to isolate and identify which species of fungi dominate some of the Moldavian Plateau soils.

MATERIAL AND METHOD

Studied soil samples were collected from Iasi-Ezareni and Vanatori, Vaslui-Rosiesti and Galați-Matca and are from the following types of soil: mold greyic, solonchak, cambic chernozem and cambic chernozem psamic

Soil samples were collected from a depth of 10-15cm after the surface plant remains have been removed. Soil samples were gathered in paper bags, by means of a metallic spatula and the used material was previously sterilized (Ulea et al., 2012).

The soil samples were preserved at 4^0C until analysis. For the isolation and determination of micromycetes from soil we have used the culture method in Petri dishes. Species isolated from soil were then transferred on Czapek medium for identification.

RESULTS AND DISCUSSIONS

During the macroscopic and microscopic investigations several species of micromycetes were isolated and identified.

1. *Aspergillus candidus* Link, in Observationes, p.16 (1809); Thom and Church, A Manual of the Aspergillus, p.157, (1926) Thom and Raper, A Manual of Aspergilli, p.207-210, Plate 6A, Figs. 59, 60 (1945); Gilman, A Manual of Soil Fungi, p.231 (1957); Raper and Fennell, The Genus Aspergillus, p.347, figs. 72, 73 (1965).

Developed micromycete on Czapek medium is white at start and after the appearance of the sporifere heads the color becomes cream but the fungus are colorless on the back. Conidiophores height is approximately of 900µm with smooth walls and thickness between 6-8µm. Terminal vesicle of the conidiophor is spherical, 25-35µm in diameter and is lined by two series of sterigme: the former has 12.5µm in height and the latter 5x2.5µm. Conidias that occur in long chains are globular, smooth and have 2.5µm in diameter.

The micromycete forms brown sclerotia with diameter by 62.5-70µm.

The micromycete was isolated from psamic soil collected from Matca-Galati and solonchak from Vanatori-Iasi.

2. *Aspergillus funiculosus* Smith, in Brit. Mycol. Soc. Trans. XXXIX, p.111-114, fig. 1 (1956); Gilman, A Manual of Soil Fungi, p.220 (1957); Raper and Fennell, The Genus Aspergillus, p.440, fig. 91, f-h (1965).

The colony isolated on Czapek medium grows with difficulty at 20-24^{0}C reaching 3cm only after 10-14 days. The colony surface is smooth and the color is olive green. The radial sporophore heads measure 300µm and are supported by smooth, colorless conidiophores, or lightly colored in pale green under the globular vesicle. It is up to 1µm in diameter and supports a single row of sterigma by 5-7.5µm, lightly colored in green-brown. The spherical conidias are rough and have a diameter by 2.5-3µm.

The micromycete was isolated from gleyic chernozem soil collected from Rosiesti-Vaslui.

3. *Aspergillus niger* van Tieghem, Ann. Sci. Nat. Botan., Ser. 5, VIII, p.240 (1867); Thom and Church, The Aspergilli, p.167-170 (1926); Thom and Raper, A Manual of Aspergilli, p.216-219, Figs. 61A, 62A (1945); Gilman, A Manual of Soil Fungi, p.228 (1957); Raper and Fennell, The Genus Aspergillus, p.309, Fig. 68, 69 (1965).

Micromycete colonies on Czapek medium held at 24-26^{0}C reach 3cm in diameter after 10 days. Mycelium is smooth, hyaline, the colony reverse is white and with many black sporophore heads. These sporophore heads are typical, globular between 700-800µm, supported by conidiophores of 1500-1520µm in height with smooth walls and 2.5µm in width. Under the sporophore head the conidiophor is lightly colored in brown. The vesicle is globular, by 50µm in diameter, with sterigme arranged in two series: the former has 30x5µm and the latter 7x3µm that eliminate 4-5µm conidia that in the beginning have smooth walls that later on become lightly rough.

The micromicete was isolated from cambic chernozem soil collected from Ezareni, Iasi.

4. *Aspergillus okazaki* Okazaki, Fungi isolated from Manitoba soil by the plate method, Canadian Jour. Res. VIII, p.253-275 (1933); Gilman, A Manual of Soil Fungi, p.232 (1957); Raper and Fennell, The Genus Aspergillus, p.350-356 (1965).

The grown colonies on Czapek medium are white, soft, with numerous sclerotia, but on the reverse the colony is yellow-sulfur. The mycelia are hyaline and from it numerous smooth conidiophores grow 2-3µm in height supporting sporophore heads up to 100µm in diameter. The vesicle is 35-40µm in diameter and has two rows of sterigme: the former 10-12µm in height and the latter 5µm. Conidias are smoot and small by1.5µm.

The micromycete was taken from Canadian soil in 1933. It is hard to separated *Aspergillus candidus* from *Aspergillus okazaki* because of the small differences in the spores size, but the color on the reverse of mature colony clearly distinguishes between them.

The micromycete was isolated from cambic chernozem from Ezareni-Iasi.

5. *Aspergillus proliferans* G. Smith, Brit. Mycol. Soc. Trans., XXVI, fig. 26, Plate III (1943); Thom and Raper, A Manual of Aspergilli, p.117 (1945); Gilman, A Manual of Soil Fungi, p.218 (1957); Raper and Fennell, The Genus Aspergillus, p.186 (1965).

In 1957 Gilman cites this micromycete as a synonym for *Aspergillus repens* (Corda) by Bary, but the last description belongs to K. Raper and Fennell Dorothy in 1965.

The colony grows with difficulty on Czapek medium at 20^0C reaching only 2-3cm in diameter two weeks after subculturing procedure. The aerian hyphae look fluffy and grow from colony up to the lid of Petri dishes. The colony is yellow-orange with the edges gray and its back is light yellow-orange. The sporophore bodies are radially arranged with sterigme proliferating branches. The conidiophores have smooth walls, 4-6µm in diameter or even wider. Occasionally, under the sporophore head we can notice bumps by 20µm. The sterigme by 8-10x3.5µm appear on a single line, often elongated. The conidias are globular or subglobular, dark colored, 5-7.5µm and echinulated.

The micromycete was isolated from psamic soil collected from Matca-Galati and solonchak from Vanatori-Iasi.

6. *Aspergillus terreus* var. *aureus*, Thom and Raper, A Manual of Aspergilli, p.198-200, fig. 57B (1945); Gilman, A Manual of Soil Fungi, p.225 (1957); Raper and Fennell, The Genus Aspergillus, p.572, Fig. 128-D (1965).

The fungal colonies hardly reach 3-4cm in diameter and they look flocculent. The colony reverse color is golden yellow. The conidiophores can reach 500µm in height; their sporophore heads are cream, with vesicles of 13-18µm supporting sterigme arranged in two series: the former 5-7x2µm and the latter of 5x1.5-2µm. The conidias have smooth walls and 1.8-2µm in diameter.

This micromycete was isolated from cambic chernozem from Ezareni-Iasi.

7. *Penicillium coryophilum* Dierckx, Essai de revision du genre Penicillium Link., Soc. Sci., Bruxelles, XXV, p.86 (1901); in Biourge, Monogr., La Cellule, XXXIII, fasc. 1, p.266-267, Pl. IX and XIV, fig. 83 (1923); Thom, The Penicillia, p.254-255 (1930); Gilman, A Manual of Soil Fungi, p.251 (1957); Raper, Thom and Fennell, A Manual of the Penicillia, p.341, figs. 90, 91 (1968).

The colonies developed on Czapek medium have 2.5-3cm in diameter; at first they are white, then white with bluish gray, soft, small, easily radiated with white edges. The colony reverse is colored in light brown. The conidiophores are 50-75x2.5µm; they have branches with metule in the whorl or on both sides, with smooth walls. The penicilii are typically biverticilate, asymmetric, with 2-3 metule of 12-20x2.5µm and fialides of 10x2µm. The conidias are subglobular, smooth with diameter of 2.2mm, arranged in short chains.

The micromycete was isolated from cambic chernozem from Ezareni, Iasi.

8. *Penicillium frequentans* Westling, Arkiv för Botanik, XI:58, p.133-134, figs. 39, 78 (1911); Biourge, Monograph., La Cellule, XXIII, fasc. 1,

p.292-293, fig. X et XVII (1923); Thom, The Penicillia, p.216-217 (1930); Gilman, A Manual of Soil Fungi, p.241 (1957); Raper and Thom, A Manual of the Penicillia, p.172, Pl. IX -D, fig. 49 (1968).

The fungal colonies grow rapidly on the medium, having about 5cm in diameter after 10-12 days of incubation at 20^0C. The colonies are gray, soft, with brown reverse at maturity. The conidiophores are 200x2.5µm and conidias of 2.5-3µm in diameter with a slightly warty surface are arising from the phialides of 10x2µm.

This micromycete was isolated from cambic chernozem from Ezareni, Iasi.

9. Stysanus medius Saccardo, Syll. ung. IV (1886); Gilman A manual of Soil Fungi, p.352 (1957).

On Czapek medium the fungus develops black colonies, that are in the begining and submerged on the surface it grows black coremii composed of hyphae of 3µm in diameter. Conidiophores have ovate spores, unicellular, of 5x3µm, arranged in divergent gray-black chains.

The micromycete was isolated from solonchak soil from Vanatori-Iasi.

10. *Verticillium cellulosae* Daszewska, Etude sur désegrégation de la cellulose dans la terra de bruyere et la tourbe, Bul. Soc. Geneva, II-4, pag.294 (1912); Gilman, A Manual of Soil fungi, p.303 (1957).

The micromycete colony developed on Czapek medium is white, but becomes dark green at maturity. Mycelium has 5µm in diameter. Three phialides in whorls apper on conidiophores and they measure 6x3µm and eliminate the conidias that are forming sporophore heads of 18-20µm in diameter. The dispersed or associated green conidias are slightly rough by 5x4µm.

The micromycete was isolated from cambic chernozem from Ezareni-Iasi.

CONCLUSIONS

1. From cambic chernozem, a subtype of soil that contains "calcium mull", the following species of micromycetes: *Aspergillus niger*, *Aspergillus okazaki*, *Aspergillus terreus* var. *aureus*, *Penicillium coryophilum*, *Penicillium frequentans* and *Verticillium cellulosae* were isolated and identified.

2. The solonchak soils have very low humus content with a neutral or low alkaline reaction and from this type of soil *Aspergillus candidus*, *Aspergillus proliferans* and *Stysanus medius* were isolated and identified.

3. Both species *Aspergillus candidus* and *Aspergillus proliferans* were isolated and identified from psamic soil. From gleyic chernozem the species *Aspergillus funiculosus* was identified.

4. The micromycetes presence in these soils is not necessarily an indicator of soil quality, although it is known that the cambic chernozem soil is very high in quality, but rather shows that the micromycetes tolerate variations in soil reaction.

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SOME ASPECTS OF CONTROL FOLIAR AND SPICE DISEASES OF WINTER WHEAT IN CONDITIONS OF BRĂILA PLAIN

UNELE ASPECTE PRIVIND COMBATEREA BOLILOR FOLIARE ŞI ALE SPICULUI LA GRÃUL DE TOAMNĂ ÎN CONDIŢIILE CÃMPIEI BRĂILEI

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Abstract: *Wheat is one of the oldest cultivated plants and most important food plant, bread from wheat flour based food accounted for a large proportion of the world population. Wheat production, record special damages due to various infectious diseases, crop quantity and quality are strongly influenced by the number of pathogens that attack the system in different foliar stages of development and ear throughout its development. Fighting pathogens that cause infectious diseases of foliage and spice goes by chemical, biological, genetic and combining them with agrophytotechnical methods. Given the high degree of attack of pathogens in Câmpia Brăilei agricultural area during 2010-2012 were tested a number of substances to protect winter wheat, just to reduce this crop damage of economic importance.*
Key works: *Winter wheat, foliar diseases and ear, combating*

Rezumat: *Grâul este una din cele mai vechi plante de cultură şi cea mai importantă plantă alimentară, pâinea din făina de grâu constituind hrana de bază pentru o mare parte a populaţiei globului.Producţia grâului, înregistrează pagube deosebite datorită diferitelor boli infecţioase, cantitatea şi calitatea recoltelor sunt puternic influenţate de numărul agenţilor patogeni care atacă atât sistemul foliar în diferite stadii de dezvoltare cât şi spicul pe tot parcursul dezvoltării acestuia. Lupta împotriva agenţilor patogeni care produc boli infecţiase ale foliajului şi spicului se duce prin metode chimice, biologice, genetice şi combinarea acestora cu metodele agrofitotehnice. Având în vedere gradul mare de atac al agenţilor patogeni în arealul agricol Câmpia Brăilei în perioada 2010-2011 au fost experimentate o serie de substanţe de protecţie a grâului de toamnă, tocmai în vederea reducerii pagubelor produse acestei cultură de mare importantă economică.*
Cuvinte cheie: *grâu, combatere foliară şi spic, agenti patogeni*

INTRODUCTION

Crop yields and quality of cereals, particularly wheat, are strongly influenced by the number of pathogens of major importance, but also those of secondary importance. (Popov, 2007; Trotuş, 2007)

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Fight against pathogens of wheat both foliage and the ear goes by chemical, biological, genetic and their combination with the methods agrophytotechnical being integrated fight against pathogens. Strategy for fighting pathogens of winter wheat is needed Understand the morphology, biology and ecology, as well as simpmalotologia disease. (Negulescu, 1984, Popov, 2005; Trotuş, 2006)

In this paper we present experimental results on the reduction of crop losses caused by some pathogens that affect foliage and winter wheat is grown by using chemical method.

MATERIAL AND METHOD

The research was conducted in Brăila Plain in 2010-2011. The experiments were located by randomized block method.

Winter wheat protection against pathogens *(Erysiphe graminis, Septoria tritici, Puccinia spp and Fusarium spp*) that cause foliar and ear diseases was performed by using the fungicides: Ardent 50SC (0.75 l ha), Mystic extra (0.5 l/ha) and Nativo (1.0 l/ha)

For foliar diseases were conducted two treatments and three ear diseases.

Observations and measurements were made from plant emergence to harvest experience. Based on measurements performed to calculate the degree of attack

Scientific data obtained were calculated and statistically analyzed using analysis of variance, the multiple comparison , regressions and correlations (statistical package SAS / SAT, PASW)

RESULTS AND DISCUSSIONS

Using fungicides to combat *Erysiphe (Blumeria) graminis* caused a significant decrease (R = 0,9643 ***) the degree of attack by 8,1% regardless of fungicide experienced. (fig. 1)

Fungicides Ardent 50SC, 300SC Nativo Mystic extra and caused decreases the attack of *Erysiphe (Blumeria) graminis* between 1.1-1.4% compared to the average attack experiment (2,5%)

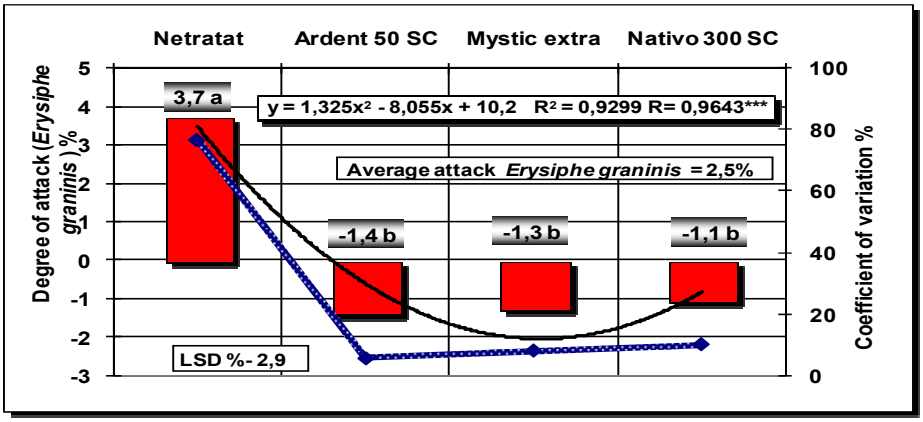


Fig. 1 - Influence of fungicides on the attack of *Erysiphe (Blumeria) graminis* on winter wheat foliage

All the protective substances being on the same level of significance. However, one can observe a slight tendency to level against this pathogen in the case of Ardent 50 SC.

In figure 2 it appears that in the case of attack by *Septoria tritici* the use of fungicides results in a decrease in the degree of attack greater than 96,6% (R = 0,9645 ***)

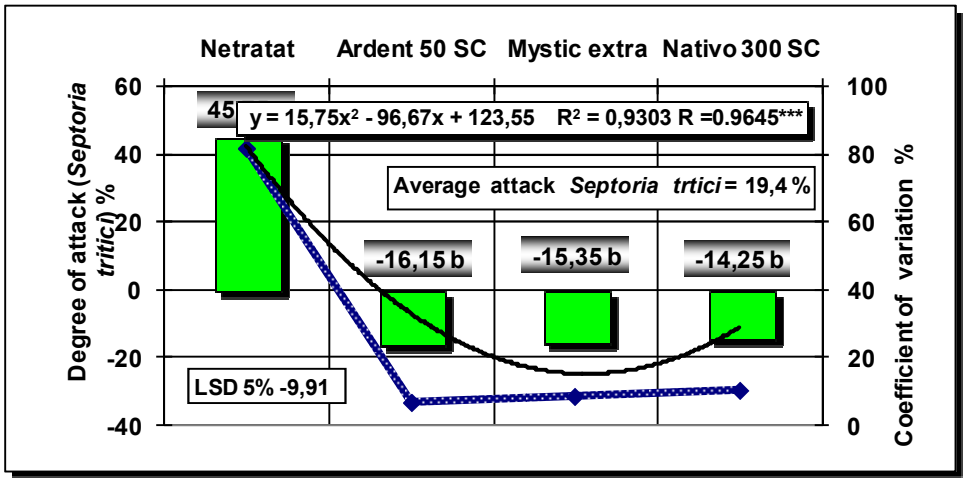


Fig. 2 - Influence of fungicides on *Septoria tritici* attack degree of the foliage in winter wheat

The three protective substances being placed at the same level scădări statistically significant between 14,2-16,1% from the average level of 19,4% attack experiment

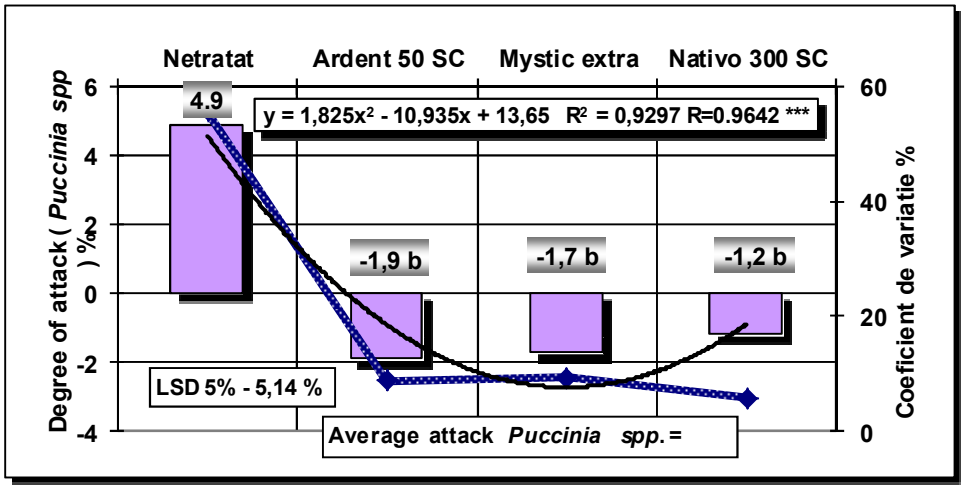


Fig.3 - Influence of fungicides on the attack of *Puccinia spp* on foliage in winter wheat

In regarding the degree of pathogen attack other study (*Puccinia spp*) (fig. 3) shows that the decrease, regardless of fungicide experienced was significant (R = 0.9642 ***) of 10.93% .

At the same time it appears that there are significant differences between protective substances used this situation to the same statistical level. Decrease the attack of the pathogen hovering between 1,2 to 1, 9% from the average level of attack of the experiment. There is however a slight decrease in the attack when Ardent 50 SC but insignificant.

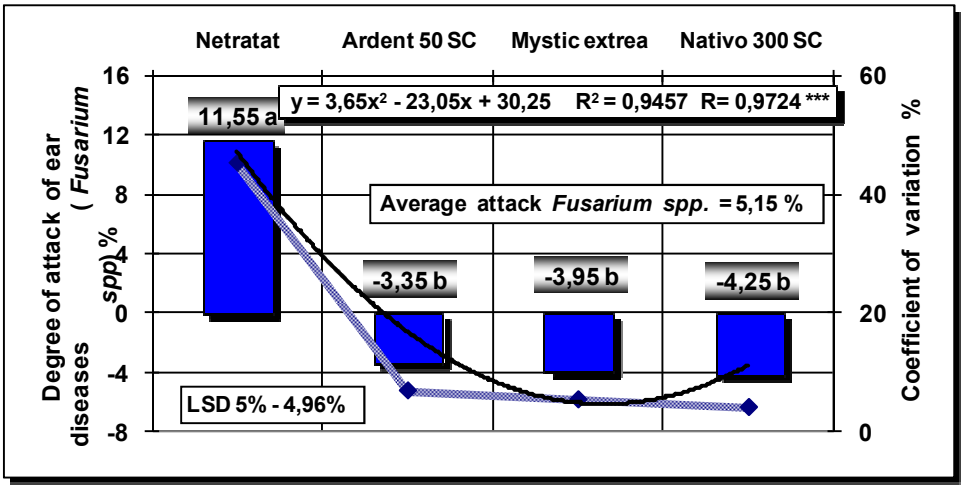


Fig.4 - Influence of fungicides on the attack of *Fusarium spp.* the ear in winter wheat

If the pathogen *Fusarium spp* (fig. 4) particularly affecting winter wheat is grown, it is found that applying fungicides studied the degree of attack decreased significantly (R = 0.9724 ***) with 23,05 % regardless of preservatives experiment.

Regarding the effect of each fungicide use is found that the decrease in attack ranged from 3,35 to 4,25%, compared with the average level of this pathogen attack (5,15%), being at the same level statistically there were no significant differences between them. We note, however, when his combat *Fusarium spp* (ear disease) that Nativo 300 SC has a slight tendency to overcoming the protective effect of other substances.

Figure 5 shows that the use of protective substances foliar disease control in winter wheat production increased significantly Câmpia Brăilei (R = 0.9509 ***) with 3,09 t / ha regardless of fungicide experienced.

The largest increase in foliar application during the growing season realizes Ardent 50 SC with an increase of 0,602 t / ha, compared to the average production experiment.

On the second level of meaning lies Nativo 300 SC Mystic extra and increases the yield of 0,437 t / ha and that 0,348 t / ha

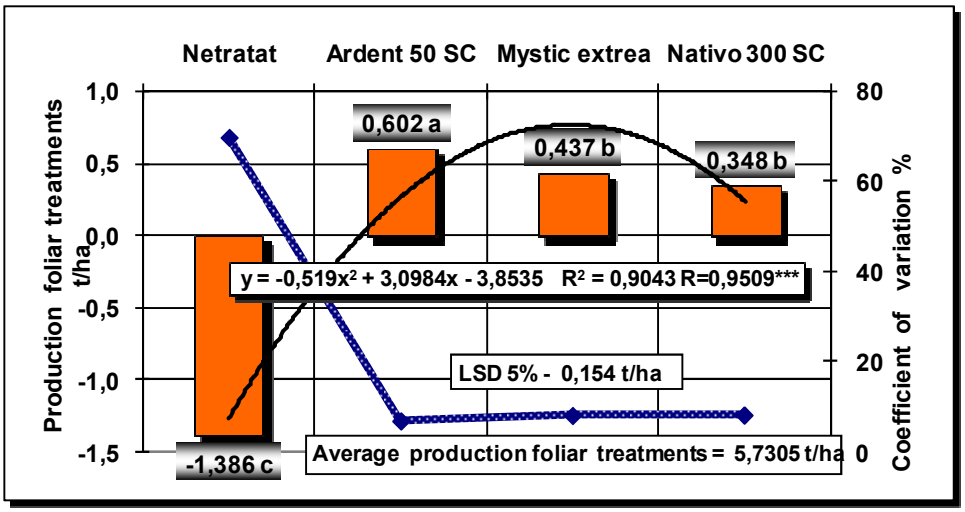


Fig.5 - Influence of foliar treatments on yield of winter wheat

In regard to disease control in winter wheat ear in figure 6 shows that applying fungicides significant production increases (R = 0,9463 ***) of 2,95 t / ha.

Increased production of winter wheat ear combating diseases are recorded by Ardent50 SC and Nativo 300 SC with an increase of harvest of 0,664 t / ha respectively 0,525 t / ha compared to the average treatment (5,928 t / ha) experiments , placing these fungicides first of significance

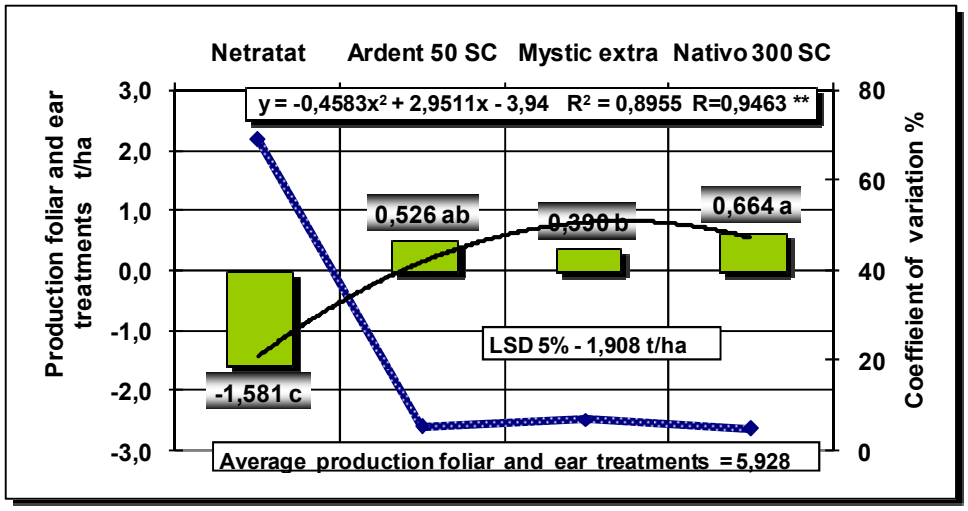


Fig. 6 - Influence of foliar and ear on winter wheat production

CONCLUSIONS

1.All protective substances tested in foliar disease control and ensured a good ear against specific pathogens of winter wheat.

2. By applying fungicides have been achieved significant production increase both in combating ear diseases of the foliage and throughout the experimental period.

3. Ardent 50 SC fungicide provided a better production when applied foliar treatments

4. The highest production values in the case of ear protection substances being made by Ardent Nativo 300 SC and 50 SC.

5. It is necessary to integrate chemical combat pathogens of winter wheat in the integrated control them.

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PRELIMINARY INVESTIGATION ON THE EARTHWORM SPECIES (*OLIGOCHAETA-LUMBRICIDAE*) PRESENT IN SOILS FROM THE PERIMETER OF CIUREA- IAŞI, IN THE CONDITIONS OF THE YEAR 2012

INVESTIGAȚII PRELIMINARE PRIVIND SPECIILE DE LUMBRICIDE (*OLIGOCHAETA-LUMBRICIDAE*) PREZENTE ÎN SOLURILE DIN PERIMETRUL COMUNEI CIUREA- JUD. IAŞI, ÎN CONDIȚIILE ECOLOGICE ALE ANULUI 2012

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Abstract: *Earthworm fauna (Oligochaeta-Lumbricidae) is an important component of the soil fauna, useful Species î may show different biological particularities ,may be small, medium or large, porfirinic, smoky pigment or may be lacking pigment, can consume or produce humus etc.Also their contribution to changing the structure and composition of soils may be different, some species can be important indicators of the degree of pollution of the soil, the other being the evolution of indicators such as soils. In the period of vegetation of 2012. I started investigating lumbricide species existing in the surrounding pasture soils have the Ciurea County, this investigation arise for 3 years in succession, in order to confirm the results.*
Key words: *Earthworms, environment, biodiversity, faunal investigation.*

Rezumat: *Fauna de lumbricide (Oligochaeta-Lumbricidae) reprezintă o componentă important a macrosegmentului numit faună utilă din sol. Speciile întâlnite pot prezenta particularități biologice diferite, pot avea talie mică, medie sau mare, pigment porfirinic, fumuriu sau pot fi lipsite de pigment, pot consuma humus sau pot produce humus etc. De asemenea, contribuția lor la modificarea structurii şi compoziției solurilor poate fi diferită, unele specii pot fi indicatori importanți ai gradului de poluare din sol, altele fiind indicatori ai evoluției solurilor respective în timp. În perioada de vegetație a anului 2012 am demarat investigarea speciilor de lumbricide existente în solurile din păşunile limitrofe ale comunei Ciurea, urmând ca investigarea sa decurgă timp de 3 ani succesiv, pentru confirmarea rezultatelor.*
Cuvinte cheie*: râme, mediu, biodiversitate, investigarea faunei*

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INTRODUCTION

The main component of terrestrial ecosystems is the soil, and the main component of the soil invertebrate fauna is represented by earthworms. They belong to the phylum *Annelida*, class *Oligochaeta* and are known for their beneficial effects on the soil, either by aeration or by enriching it with humus (Pop, 1949).

The density of individuals of different species of earthworms in a year depending on how land use, environmental factors, and of course depending on the species that are there. Generally there is some density peaks recorded in rainy and cooler months of the year, like April, June, September and November.

MATERIAL AND METHOD

Biological material sought was collected from an orchard of apple, cultivated in classical system, grass silage, 12 years old, belonging to the perimeter of a particular , in Ciurea, Iasi County.

Sampling was done randomly at each harvest are preferred other areas of the orchard.

Sampling of biological material was performed by the classical method, ie digging of pits of various sizes, with depths up to 50 manual sorting of individuals. This method has been extracted and endogeic and epigeal earthworm species. For anec earthworms extraction was done by using irritating substances.

Biological material collected was then analyzed and determined in the laboratory, and the data were interpreted ecologically.(Pop et al., 2003;Pop and Wink, 2004)

Collection of biological material was carried out monthly from April to October.

RESULTS AND DISCUSSIONS

On soils orchards number density of earthworms individuals varies between 125,000 and 150,000 / ha. In general, these soils are the three groups of worms known as: epigeal, endogeic and anec.

Epigeal species are active on the surface, under fallen logs, under rocks or river banks, endogeic species can be found up to 2 m deep and the anecic at greater depths.

Because of these features and the fact that research in the field is limited by the lack of efficient means, had dug pits up to 50 cm deep, so species were only collected sporadically epigeal and endogeic.

The growing season of 2012 was extremely difficult to develop this group of invertebrates. Thus they received in April of moisture produced by earlier snow and there was a peak of their activities, including reproductive activity, then came extremely dry months with temperatures alternating with short periods of heavy rainfall and destructive.

All of these climate changes have reduced the number of harvest and number of individuals collected. They were thus collected and determined five species with a total of 66 individuals (table 1).

Table 1

Lumbricide species (*Oligochaeta, Lumbricidae*) collected in 2012

No.	Species	April	May	June	July	August	Sept.	Oct.
1	*Eisenia fetida*	16	2	-	-	-	2	4
2	*Lumbricus rubellus*	14	4	1	-	-	6	2
3	*Lumbricus terestris*	7	2	-	-	-	2	1
4	*Dendrobaena octaedra*	2	-	-	-	-	-	-
5	*Dendrobaena submontana*	1	-	-	-	-	-	-
6	Cocoons	67	18	-	-	4	46	-

Were also collected and a number of 135 cocoons, distributed mainly at the onset of spring and autumn.

Among the species collected species with the largest number of individuals collected was Lumbricus rubellus-27 individuals, followed by Eisenia fetida 24 individuals (table 2).

Table 2

Numerical and percentage share of species collected

No.	Species	N. individuals	% from total
1	*Eisenia fetida*	24	36,35
2	*Lumbricus rubellus*	27	40,90
3	*Lumbricus terestris*	12	18,18
4	*Dendrobaena octaedra*	2	3,03
5	*Dendrobaena submontana*	1	1,51
	Total	66	100

CONCLUSIONS

Year 2012 was not a favorable year for the developmental earthworms and excessive drought prevented proper collection of biological material.

However identified five species *Eisenia fetida*, *Lumbricus rubellus*, *Lumbricus terestris Dendrobaena octahedra*, *Dendrobaena submontane* with a total of 66 individuals.(Pop, Victor, 1949)

Maximum of individuals collected was recorded in April, that since May report the individuals to be fewer in number.

Also in May was recorded and a maximum reproduction formations, respectively cocoons. Another peak was recorded in September.

The species with the highest number of individuals collected were *Lumbricus rubellus* with 40.9% of the total individuals and *Eisenia fetida* with 36.35% of individuals. Research will continue in the coming years.

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THE ECOLOGICAL INDICATORS ANALYSIS OF THE HARMFUL INSECTS COLLECTED FROM THE RAPE FIELDS IN A.R.D.S. SECUIENI CONDITIONS

ANALIZA INDICILOR ECOLOGICI A SPECIILOR DE INSECTE DĂUNĂTOARE COLECTATE DIN CULTURILE DE RAPIȚĂ ÎN CONDIȚIILE DE LA S.C.D.A. SECUIENI

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Abstract: *The rape currently occupies a very important place in the global economy as a source of vegetable oils used in food industry and especially in industry by creating some alternative energy solutions. At A.R.D.S. Secuieni, during 2010 – 2012, were conducted researches, which aimed to determine the pests which affect the rape crops from Moldavian Central Plateau, the application of some phytosanitary measures and the analysis of the ecological parameters of the harmful insect species from this crop.*
Key words: *rape, abundance, dominance, constancy, index of ecological significance.*

Rezumat. *Rapița ocupă în prezent, un loc deosebit de important în economia mondială, ca sursă de uleiuri vegetale cu utilizare în alimentație şi mai ales în industrie prin crearea unor soluții alternative de energie. La S.C.D.A. Secuieni, în perioada 2010 – 2012, s-au efectuat cercetări, care au avut drept scop determinarea dăunătorilor care afectează culturile de rapiță din zona Podişului Central Moldovenesc, aplicarea unor măsuri fitosanitare şi analiza parametrilor ecologici a speciilor de insecte dăunătoare din această cultură.*
Cuvinte cheie: *rapiță, abundența, dominanța, constanța, indicele de semnificație ecologică.*

INTRODUCTION

Successful establishment of oilseed rape crops and ensuring the production is conditioned by compliance with all technological links for plant protection against harmful organisms, which commonly reduce production by up to 35%, in some cases leading to losses of over 60% (Geană, 2011; Raranciuc et al., 2007).

The knowledge of harmful insects presents special practical interest, because the time of the attack is difficult to discern due to the small size, sometimes milimeter of phytophagous species and their stages, and due to the specific parasite attacks hidden within or between plant tissues, in soi land sometimes blurred by the vegetative growth and phenological development of plants (Tălmaciu et al., 2010; Trotuş et al., 2009).

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In this paper we present data on the inventory of rapeseed pests affecting rape crops, and ecological parameters values of these species.

MATERIAL AND METHOD

The research were conducted on rapeseed crops from A.R.D.S Secuieni, during 2010 – 2012 and consisted in observations and determinations on the collection and identification of harmful organisms.

The collection of harmful organisms was performed using yellow bowl trap type installed in rapeseed crops, in the period from the formation of leaves rossette and until plant maturity.

The results from the field were calculated and interpreted using different environmental parameters: abundance (A), dominance (D), constancy (C) and ecological significance index (W).

The abundance (A) represents all the individuals of a species from the capture in a certain place and at a certain time. On the basis of this indicator value are calculated the others indicators.

The dominance (D) shows the percentage of participation of each species in the catch. This indicator is calculated as follow:

$$D_A = \frac{N_A \times 100}{N_1}$$

The dominance classes include species whose rate of spread fall within the following values:

D_1 – subrecedent species – spreading percentage P<1.1%;
D_2 – recedent species P=1.2 – 2.0%;
D_3 – subdominant species P=2.1 – 5.0%;
D_4 – dominant species P=5.1 – 10.0%;
D_5 – eudominant species P>10.1%.

The constancy (C) expresses the continuity of a species in the analyzed habitat. This feature is a structural indicator because presents the participation proportion of a species in the biocenosis structure realization.

The constancy is calculated by the mathematical formula:

$$C_A = \frac{n_p A}{N_P} X100$$

Depending on the value of this indicator, the species are distributed in the following classes:

C_1 – accidental species (1 – 25%)
C_2 – accessories species (25.1 – 50%)
C_3 – constant species (50.1 – 75%)
` C_4 – euconstant species (75.1 – 100%)

The ecological significance index (W) represents the relation between the structural indicator (C) and the production indicator (D). The ecological significance index is given by:

$$W_A = \frac{C_A X D_A X100}{10000}$$ where

Depending on the values obtained, the species are divided into the following classes:

W_1 – values below 0.1%
W_2 – with values between 0.1 – 1.0%

W_3 – with values ranging from 1.1 – 5.0%
W_4 – with values between 5.1 – 10.0%
W_5 – with values above 10.0%

W_1 class corresponds to the accidental species, W_2 and W_3 classes to the accessories species, and W_4 and W_5 classes corresponding to the characteristics species for the analyzed biocenosis.

The experience was made from two experimental variants:

V1 – untreated variant (control);

V2 – rapeseed in which were made chemical treatment of seed (Cruiser OSR = 15 l/t) and treatments during the growing season (T1 – Decis Mega = 0,15 l/ha; T2 – Biscaya 240 OD = 0,3 l/ha; T3 – Proteus OD 110 = 0,35 l/ha).

RESULTS AND DISCUSSIONS

The observations and measurements have shown that in the rapeseed crops were met 19 species of insect pests.

The collected material was subjected to a mathematical analysis resulting a series of ecological indicators which highlights the features of the analyzed biocenosis.

By using the yellow bowl type traps the collected entomofauna, at the untreated variant, totalized 19 species, whose abundance (A) ranged from 2114 specimens (*Meligethes aeneus* F.) and 1 specimen (*Oulema melanopa* L.) (tab. 1).

The dominance (D) according to the calculated percentage, the species are distributed in the following classes (tab. 1):

- 8 species in D1 class – subrecedent species, with values below 1.1% (*Ceuttorhynchus pleurostigma* Marsham*, Crepidodera feruginea* Scopoli*, Sitona lineatus* Germ.*, Chlorops pumiliones* Bjerkander*, Athalia rosae* L.*, Eurydema ornatum* L.*, Oulema melanopa* L.*, Tanymecus dilaticolis* Gyll.*);*

- 3 species in D2 class – recedent class, with values between 1.1 – 2% (*Phyllotreta nigripes* Fabr.*, Psylliodes chrysocephala* L.*, Oscinella frit* L.*);*

- 7 species in D3 class – subdominant species, with values between 2.1-5% (*Phyllotreta atra* Fabr.*, Phyllotreta nemorum* L.*, Ceuttorhynchus napi* Gyll.*, Ceuttorhynchus assimilis* Paykull*, Epicometis hirta* Poda*, Baris chlorizans* Germ.*, Lygus pratensis* L.*);*

- 1 species in D5 class – eudominant species, with values above 10.1% (*Meligethes aeneus* F.*).*

The constancy (C) – depending on the value of this indicator, the species are distributed in the following classes (tab. 1):

- 7 species are accidental species with the indicator value between 1 – 25% (*Ceuttorhynchus pleurostigma* Marsham*, Crepidodera feruginea* Scopoli*, Sitona lineatus* Germ.*, Chlorops pumiliones* Bjerkander*, Eurydema ornatum* L.*, Oulema melanopa* L.*, Tanymecus dilaticolis* Gyll.*);*

- 6 species are accessories species with the indicator value between 25.1 – 50% (*Phyllotreta nigripes* Fabr.*, Psylliodes chrysocephala* L.*, Baris chlorizans* Germ.*, Lygus pratensis* L.*, Oscinella frit* L.*, Athalia rosae* L.*);*

- 5 species are constant species with the indicator value between 50,1 – 75% (*Phyllotreta atra* Fabr.*, Phyllotreta nemorum* L.*, Ceuttorhynchus napi* Gyll.*, Ceuttorhynchus assimilis* Paykull*, Epicometis hirta* Poda*);*

- 1 species is an euconstant species with the indicator value between 75.1 – 100% *(Meligethes aeneus* F.*).*

The index of ecological significance (W) – depending of the calculated percentage value, the species are distributed into the following classes (tab. 1):

- 7 species are accidental species, with values below 0.1% (*Ceuttorhynchus pleurostigma* Marsham*, Crepidodera feruginea* Scopoli*, Sitona lineatus* Germ.*, Chlorops pumiliones* Bjerkander*, Eurydema ornatum* L.*, Oulema melanopa* L.*, Tanymecus dilaticolis* Gyll.*);*

- 5 species are accessories species, with values between 0.1 – 1.0% (*Phyllotreta nigripes* Fabr.*, Psylliodes chrysocephala* L.*, Lygus pratensis* L.*, Oscinella frit* L.*, Athalia rosae* L.*)* şi 6 specii au valoarea indicatorului între 1,1 – 5,0% (*Phyllotreta atra* Fabr.*, Phyllotreta nemorum* L.*, Ceuttorhynchus napi* Gyll.*, Ceuttorhynchus assimilis* Paykull*, Epicometis hirta* Poda*, Baris chlorizans* Germ.*);*

- 1 species is a characteristic species with the indicator value above 10.0% (*Meligethes aeneus* F.*).*

Table 1

The ecological parameters analysis of the species collected at the untreated variant

Species name	A	D		C		W	
		%	CI	%	CI	%	CI
Meligethes aeneus F.	2114	70,30	D_5	100,0	C_4	70,30	W_5
Phyllotreta atra Fabr.	124	4,12	D_3	74,07	C_3	3,05	W_3
Phyllotreta nemorum L.	110	3,66	D_3	55,56	C_3	2,03	W_3
Phyllotreta nigripes Fabr.	35	1,16	D_2	27,78	C_2	0,32	W_2
Psylliodes chrysocephala L.	53	1,76	D_2	46,30	C_2	0,82	W_2
Ceuttorhynchus napi Gyll.	81	2,69	D_3	66,67	C_3	1,80	W_3
Ceuttorhynchus assimilis Paykull	108	3,59	D_3	64,81	C_3	2,33	W_3
Ceuttorhynchus pleurostigma Marsham	6	0,20	D_1	9,26	C_1	0,02	W_1
Epicometis hirta Poda	112	3.72	D_3	57,41	C_3	2,14	W_3
Baris chlorizans Germ.	79	2,63	D_3	50,00	C_2	1,31	W_3
Crepidodera feruginea Scopoli	12	0,40	D_1	18,52	C_1	0,07	W_1
Lygus pratensis L.	64	2,13	D_3	40,74	C_2	0,87	W_2
Oscinella frit L.	62	2,06	D_2	29,63	C_2	0,61	W_2
Sitona lineatus Germ.	5	0,17	D_1	9,26	C_1	0,02	W_1
Chlorops pumiliones Bjerkander	2	0,07	D_1	3,70	C_1	0,00	W_1
Athalia rosae L.	31	1,03	D_1	27,78	C_2	0,29	W_2
Eurydema ornatum L.	4	0,13	D_1	5,56	C_1	0,01	W_1
Oulema melanopa L.	1	0,03	D_1	1,85	C_1	0,00	W_1
Tanymecus dilaticolis Gyll.	4	0,13	D_1	7,41	C_1	0,01	W_1

The entomofauna collected, from the second variant, with the help of yellow bowl type traps totalized 16 specii, whose abundance (A) ranged between 499 specimens (*Meligethes aeneus* F.) and 1 specimen (2 specii) (tab.2):

The dominance (D) according to the calculated percentage, the species are distributed in the following classes (tab.2):

- 4 species in D1 class – subrecedent species, with values below 1.1% (*Ceuttorhynchus pleurostigma* Marsham*, Lygus pratensis* L.*, Sitona lineatus* Germ.*, Athalia rosae* L.*);*

- 1 species in D2 class – recedent species, with values between 1.1 – 2% (*Phyllotreta nigripes* Fabr.*);*

- 6 species belong to D3 class – subdominat species, with values between 2.1 – 5% (*Phyllotreta nemorum* L.*, Psylliodes chrysocephala* L.*, Ceuttorhynchus napi* Gyll.*, Epicometis hirta* Poda*, Baris chlorizans* Germ.*, Oscinella frit* L.*);*

- 2 species in D4 class – dominant species, with values between 5.1 – 10% (*Phyllotreta atra* Fabr.*, Ceuttorhynchus assimilis* Paykull*);*

- 1 species in D5 class – eudominant species, with values above 10.1% (*Meligethes aeneus* F.).

The constancy (C) – depending on the value of this indicator, the species are distributed in the following classes (tab.2):

- 6 accidental species with values between 1 – 25% (*Phyllotreta nigripes* Fabr.*, Ceuttorhynchus pleurostigma* Marsham*, Lygus pratensis* L.*, Oscinella frit* L.*, Sitona lineatus* Germ.*, Athalia rosae* L.*);*

- 7 accessories species, with values ranging from 25.1 – 50% (*Phyllotreta atra* Fabr.*, Phyllotreta nemorum* L.*, Psylliodes chrysocephala* L.*, Ceuttorhynchus napi* Gyll.*, Ceuttorhynchus assimilis* Paykull*, Epicometis hirta* Poda*, Baris chlorizans* Germ.*);*

- 1 euconstant species, with values between 75.1 – 100% (*Meligethes aeneus* F.*).*

The ecological significance index (W) – depending on the calculated percentage value, the species are distributed in the following classes (tab.2):

- 4 accidental species, with values below 0.1% (*Ceuttorhynchus pleurostigma* Marsham*, Lygus pratensis* L.*, Sitona lineatus* Germ.*, Athalia rosae* L.*);*

- accessories species, with values between 0,1 – 1% are 5 species (*Phyllotreta nemorum* L.*, Phyllotreta nigripes* Fabr.*, Psylliodes chrysocephala* L.*, Baris chlorizans* Germ.*, Oscinella frit* L.), and those with index values ranging from 1.1 – 5.0% are 4 species (*Phyllotreta atra* Fabr.*, Ceuttorhynchus napi* Gyll.*, Ceuttorhynchus assimilis* Paykull*, Epicometis hirta* Poda);

- 1 characteristic species, with values above 10.1% (*Meligethes aeneus* F.*).*

Table 2

The ecological parameters analysis of the species at the V2

Species name	A	D		C		W	
		%	Cl.	%	Cl.	%	Cl.
Meligethes aeneus F.	499	67,25	D_5	100,00	C_4	67,25	W_5
Phyllotreta atra Fabr.	43	5,80	D_4	37,04	C_2	2,15	W_3
Phyllotreta nemorum L.	22	2,96	D_3	25,93	C_2	0,77	W_2
Phyllotreta nigripes Fabr.	11	1,48	D_2	14,81	C_1	0,22	W_2
Psylliodes chrysocephala L.	19	2,56	D_3	27,78	C_2	0,71	W_2

Ceuttorhynchus napi Gyll.	30	4,04	D_3	37,04	C_2	1,50	W_3
Ceuttorhynchus assimilis Paykull	38	5,12	D_4	38,89	C_2	1,99	W_3
Ceuttorhynchus pleurostigma Marsham	1	0,13	D_1	1,85	C_1	0,00	W_1
Epicometis hirta Poda	27	3,64	D_3	35,19	C_2	1,28	W_3
Baris chlorizans Germ.	22	2,96	D_3	25,93	C_2	0,77	W_2
Lygus pratensis L.	5	0,67	D_1	7,41	C_1	0,05	W_1
Oscinella frit L.	19	2,56	D_3	11,11	C_1	0,28	W_2
Sitona lineatus Germ.	1	0,13	D_1	1,85	C_1	0,00	W_1
Athalia rosae L.	5	0,67	D_1	7,41	C_1	0,05	W_1

CONCLUSIONS

1. During 2010 – 2012, the rapeseed crops from Central Moldavian Plateau were attacked by 19 species of harmful insects.
2. The highest abundance, has shown in the untreated variant, at the *Meligethes aeneus* F. species of 2114 specimens.
3. The highest dominance of 70,30% has shown in the untreated variant, at the *Meligethes aeneus* F. species. The insect species collected from the winter rapeseed crops were classified into the 5 classes of dominance: D1 – subrecedent species, D2 – recedent species, D3 – subdominant species, D4 – dominant species, D5- eudominant species.
4. The highest constancy of 100% was evidenced in the both variants at *Meligethes aeneus* F. species.
5. The highest ecological significance index (W) of 70,30% highlighted in the untreated variant at the *Meligethes aeneus* F. species.

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OBSERVATIONS ON *ADOXOPHYES ORANA* (FISCH.V.ROSL.) IN APPLE ORCHARDS IN THE NE AREA OF THE COUNTRY

OBSERVAȚII ASUPRA SPECIEI *ADOXOPHYES ORANA* (FISCH. V. ROSL.) ÎN PLANTAȚIILE POMICOLE DE MĂR DIN ZONA DE NORD EST A ȚĂRII

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Abstract: *Apple is attacked by more than 30 species which can affect fruit production. In recent years, a major problem is a special group of defoliating butterfly of the family Tortricidae. Adoxophyes orana F.R. is a common species in apple orchards in our country. Skin gall caused by larvae of fruit in addition to direct damages are wearing the penetration of various pathogens and especially fungus Sclerotinia fructigena.As a result data obtained can see that chemical group from the SCDP - Falticeni in 2011, have identified a large number of samples of the species were collected 225 larvae in the 6 harvests which indicate an attack on the whole vegetation period (the buds, leaves, young and mature fruit). Following increases in laboratory samples collected have resulted ware 44 adults. In the conditions of Farm Teaching "Basil Adamachi" Iasi due to chemical treatments performed warnings and weather conditions, there was no attack. In untreated plots due to the number of parasites and predators attack was reported just buds.*
Key words: *Adoxophyes orana, tortricides, apple orchards, pests*

Rezumat: *Mărul este atacat de peste 30 specii care pot influența producția de fructe. În ultimii ani o problemă majoră o reprezintă un grup aparte de lepidopterele defoliatoare din familia Tortricidae. Adoxophyes orana F.R. este o specie des întâlnită în livezile de măr din țara noastră. Rosăturile produse de larve asupra pieliţei fructelor pe lângă pagubele directe, constituie porți de pătrundere a diferiților agenți patogeni şi în special a ciupercii Sclerotinia fructigena. În urma datelor obținute se poate observa că în lotul chimic din cadrul S.C.D.P. – Fălticeni s-au identificat un număr mare de exemplare ale speciei fiind colectate 225 larve în cele 6 recoltări ceea ce indică un atac pe toată perioada de vegetație (la muguri, frunze, fructe tinere şi mature). În urma creşterilor în laborator din exemplarele colectate au rezultat 44 de adulți. În condițiile Fermei didactice „Vasile Adamachi" Iaşi datorită tratamentelor chimice efectuate la avertizare şi a condițiilor climatice, nu s-a semnalat atac. În loturile netratate datorită numărului mare de paraziți şi prădători, a fost semnalat atac doar la muguri.*
Cuvinte cheie: *Adoxophyes orana, tortricide, plantații pomicole, dăunători*

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INTRODUCTION

In the past years apple orchards damages some species of lepidopteran defoliators important part of the family Tortricidae (Alexinschi and Peiu, 1966). After genus Cydia, *Adoxophyes orana* FR is the most important pest of this family doing significant damage especially in intensive orchards where chemicals are applied treatments (Charmillot, 1989).

Adults have accentuated sexual dimorphism. Wingspan is 15.0 to 22.0 mm in females, males are smaller 15.0 to 19.0 mm. The male's previous wings yellow ocher clear red-brown design, consisting of a basic field lines.

The female is blackish brown with wings drawing much darker earlier and often reduced to a few slashes. Hind wings are pale gray to brown-gray males and females.Mature larva is 18.0 to 20.0 mm in length, having variable color from yellow-green to dark green. The body has warts than yellow. Head and chest plate are black in young larvae and brown to yellow in mature larvae.Typically, this malicious attack recorded three periods, namely: spring in the vegetation, on the larvae hibernating buds, in summer, the leaves, growing tips and young fruit by larvae of various ages and autumn prior to harvesting the fruit to mature young larvae before withdrawal to sleep.

It is a polyphagous pest, attacking various species of fruit trees: apple, pear, peach, apricot, plum, and forest species: maple, hornbeam, beech, alder, birch. Abrasions caused by larvae of the fruit peel in addition to direct damages are wearing the penetration of various pathogens and in particular the fungus Sclerotinia fructigena (Diaconu 1997; Diaconu, 2007).

MATERIAL AND METHOD

Research on *Adoxophyes orana* F.R. in apple orchards have been made in the Research and Development Station for Fruit Growing Fălticeni and Teaching Station "Vasile Adamachi" University in 2011.In S.C.D.P. Fălticeni were studied two groups namely:

- A group that chemical treatments were applied according to warnings issued by the Plant Protection Centre, represented by the apple orchard on the farm "Center Grove" orchard established in 1990 with an area of -53 ha. Jonatan predominant varieties, Golden and Starkimson to 90% and the remaining 10% are Ionared varieties, Florina, Rădăşeni and Fălticeni.
- And a control group that were removed with a chemical treatment area of -0.5 ha being represented all the three varieties (Jonatan, Golden and Starkimson).The same was done in the Teaching Station "Vasile Adamachi" Iasi, were all studied two groups (chemically treated) surfaces of about 1 ha and 0.5 ha, being Jonatan predominant varieties, Golden and Starkimson

Observations were made by collecting larvae or pupae in the crown of trees in a selective manner by which were analyzed in the laboratory by increases creations themselves thus following the evolutionary cycle of the species.Larvae were collected with leaves that feed or shelter where they were feeding and pupae with împupare shelter, taking care to be with last exuvie larvae (Fig. 1).

After harvesting samples were transported to the laboratory where growth begins propriuzisa material collected material is subject to mandatory work stages

(larvae age grouping, labeling, preparing food for growth, increase site preparation, etc..) Being kept under continuous observation until the emergence of adult parasitoids or carnation leaf-rollers.



a b

Fig. 1(a,b) - Collecting, classifying and increase *Adoxophyes orana* FR in laboratory

The first phase is separated and the recording larvae, which was isolated in tubes, usually one copy of each of the tubes, but can be grouped and growth of larvae of the same age (less than 10 samples / test tube), depending on the species , the age of the larvae and the extent of the tube. Each tube is inserted a label stating the place, from which fruit tree species was collected, date of collection, species and number of fish that are in the test tube (if applicable) larvae age assessed by body length and other features on color, chetotaxie, behavior, etc. (Fig. 1B).Pupae were separated and recorded as larvae, but we took care of the last larval exuvie which confirms the determination of the Parasitoids species. are preserved specimens showing individual tube and label attached notations are noted as much information on: type of parasitoid, parasite mode, number of samples, etc. It should be noted also that the rest of the larval or pupal host store for subsequent establishment as a whole and the exact species of carnation leaf-rollers.

After recording the data on the label and isolation is introduced larvae feed inside it, food that consists of 2-3 leaves from your access fresh fruit tree species where collections occurred (in this case 2-3 leaves of apple) then tube is closed with a plug of cotton wool for the larvae to have air and are placed in cartons.

Changing food and excrement tube cleaning or replacement is done every 2-3 days or even daily if food is consumed entirely, at which point is marked morphological changes occurring while data recorded at the date of transition age in another, the size of the capsule body and the cephalic, the color of the frame and in particular the parts chitin, some elements and others chetotaxie

The individuals who die from various causes are removed from the tube and kept as dry material or 70% alcohol. For pupae, the morphological changes are not essential, we need to just turning into adults identifying sex.

RESULTS AND DISCUSSION

In S.C.D.P. Fălticeni were made throughout the growing season of 2011 a total of 10 crops of active larvae or pupae in apple canopy belonging Adoxophyes orana FR: June harvesting chemical group and four harvests in untreated group.

In the teaching farm "Vasile Adamachi" Iasi were made 10 harvests, that is 4 in chemical lot and 6 harvest untreated lot. Situation collecting belonging to chemical group SCDP Fălticeni is as follows (table 1):

- - First harvest took place on 29.04, when seven specimens were collected larval stage;
- - II of harvesting took place on 09.05, when 42 specimens were collected in the larval stage;
- - In a third crop of 26.05 date have been collected a total of 54 copies of the 49 specimens were collected at the stage of larval and pupal stage 5 copies;
- - The harvesting of 14.06 IV 12 specimens were collected in the larval stage;
- - Harvesting the fifth held on 30.06, when the collected specimens of 8 larvae stage;
- - In the sixth 14.07 harvesting of date have been collected a total of 102 copies, 99 copies 3 copies larval stage and at the stage of pupal.

Table 1

Situation monitoring Adoxophyes orana FR under S.C.D.P. Fălticeni - chemical group

Data harvest	Colected samples	Development stage collected	Adult ssamples after growth
29.04	7	Larvae	2
09.05	42	Larvae	5
26.05	54	Larvae 49 ex.	2
		Pupae 5 ex.	5
14.06	12	Larvae	3
30.06	8	Larvae	2
14.07	102	Larvae 99 ex.	25
		Pupae 3 ex.	

A total of 225 specimens were collected of which 217 copies in the larval stage and eight copies pupa. Following increases in the laboratory resulted:

- The first collection of the seven samples collected at the stage of larvae, resulted in two adults;
- At the second harvest of the 42 specimens collected in the larval stage resulted in 5 adults;
- The collection of 54 exemplary III of the 49 specimens collected from the larval stage resulted in 5 copies 2 adults and pupal stage, resulted in 5 Adults;
- From harvesting the fourth of 12 specimens collected in the larval stage resulted in 3 adults;
- We have a collection of 8 specimens collected in the larval stage resulted in 2 adults;
- The sixth collection of 102 specimens collected, 99 3exemplare stage larva and pupa stage, resulting 25 adults.

In the group treated in the S.C.D.P. Fălticeni took place four collections from the following: 09.05, 26.05, 14.06, last harvest taking place on 30.06 (table 2).

- The first collection since 09.05 there were 18 copies of Adoxophyes orana FR in the larval stage, at harvest of 26.05, 14.06, 30.06. not recorded any samples.

Of the 18 samples collected from monitoring growth and resulted in 4 adults.

Table 2

Situation monitoring *Adoxophyes orana* Fisch.V.Rosl. under S.C.D.P. Fălticeni - untreated group

Data harvest	Colected samples	Development stage collected	Adult ssamples after growth
09.05	18	Larvae	4
26.05	0	-	-
14.06	0	-	-
30.06	0	-	-

With didactic farm "Vasile Adamachi" University, the chemical group in 2011 were made of 4 harvest, the first harvest is performed at the other harvest data on 11.05, 30.05, 13.06 and 27. 06.

Following the comments made were not reported larvae orana FR Adoxophyes

The untreated sample collections were made 6 on 29.04, 11.05, 13.06, 27.06, 11.07 and 25.07, when this species was collected larvae (Table 3):

- The first collection of 29.04 was collected on a total of 26 larvae which resulted in 8 adult,
- In the second collection since 11.05. of the 40 specimens collected from 36 adult growth resulted,
- The harvest of 13.06, 27. 06, 11.07 and 25. 07 not recorded any samples.

The data obtained it can be seen that the chemical group of the SCDP - Fălticeni have identified a large number of individuals belonging Adoxophyes orana FR 225 specimens were collected, which show that there was attack especially in April - early July, the buds, leaves, growing tips, young fruit is known that this carnation leaf-rollers produce extensive damage in intensive orchards (Bovey, 1966). Following increases in the laboratory of the 225 specimens collected (larvae + pupae) have resulted in a number of 44 adults.

The chemical group, while didactic farm "Vasile Adamachi" Iaşi in 2011 due to chemical treatments carried out warnings and weather conditions, there was no attack.

Table 3

Situation monitoring Adoxophyes orana FR under Teaching Farm "Vasile Adamachi" Iasi - untreated group

Data harvest	Colected samples	Development stage collected	Adult ssamples after growth
29.04	26	Larvae	8
11.05	40	Larvae	36

13.06	0	-	-
27.06	0	-	-
11.07	0	-	-
25.07	0	-	-

In untreated plots in both areas have highlighted a few examples because of the large number of parasites and predators attack signaled the buds in April-May with the entry into vegetation. Thus, the S.C.D.P. Fălticeni were made of 4 harvests were collected 18 larvae which resulted in 4 adults and in Iasi were made 6 harvests were collected 66 specimens in the larval stage where they resulted in 44 adults.

CONCLUSION

1. In S.C.D.P. Fălticeni in the chemical lot attack has occurred throughout the growing season in the months of April to July, there were a total of six harvests identifying a large number of individuals being collected a total of 225 specimens belonging *Adoxophyes orana* FR

2. Because chemical treatments performed in warning and climate conditions in the chemical lot, while didactic farm "Vasile Adamachi" Iaşi in 2011 there was no attack.

3. In untreated plots, due to the number of parasites and predators in both areas were significantly reduced as the number of copies of the four harvests made at SCDP Fălticeni 18 samples were collected and larval stage of the Science of six harvests were made 66 samples collected throughout the larval stage.

4. Following the increases made in 225 specimens collected (larvae + pupae) from chemical lot 44 resulted in a number of adults which is 19.5%. While the total of 84 specimens collected from untreated plots resulted in a total of 48 adults which is 57%.

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MONITORING *LYMANTRIA MONACHA* L. DEFOLIATOR ON CONIFEROUS TREES, FOR AN ALERT OUTBREAK OCCURRENCE

MONITORIZAREA DEFOLIATORULUI *LYMANTRIA MONACHA* L. ÎN CUPRINSUL ARBORETELOR DE RĂŞINOASE, ÎN VEDEREA SEMNALĂRII ÎN TIMP UTIL A APARIȚIEI GRADAȚIILOR

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Abstract. *Lymantria monacha (L.) (Lepidoptera: Lymantriidae) may produce extremely dangerous defoliations to conifers, because – even at low intensities – the physiological processes of trees are heavily disturbed, leading to weaknesses of the infested specimens which are subsequently attacked by species of Scolytidae. Populations are monitored in the entire forest with pure coniferous trees and with mixtures of conifers and beech, regardless of ownership, by the national network of pheromone traps. According to the regulations in force, pheromone traps density is 1/50 ha, 1/100 ha and 1/200 ha, depending on the vulnerability of the area to outbreak occurrence. Data are collected throughout the country from the state and private forests administered by the National Forest Administration (R.N.P.)*
Key words: *Lymantria monacha, heavily disturbed, trap density.*

Rezumat. *Lymantria monacha poate produce defolieri la răşinoase extrem de periculoase, deoarece chiar la intensități scăzute, procesele fiziologice ale arborilor sunt puternic perturbate, producându-se debilitarea exemplarelor infestate care ulterior sunt atacate de specii de Scolytidae. Populațiile sunt monitorizate la nivelul întregului fond forestier cu arborete de răşinoase şi de amestec a acestora cu fagul, indiferent de natura proprietății, prin rețeaua națională de curse feromonale. Conform instrucțiunilor în vigoare, desimea curselor feromonale este de 1/50 ha, 1/100 ha şi 1/200 ha, în funcție de vulnerabilitatea zonei la gradații. Centralizarea datelor din cuprinsul țării din pădurile de stat cât şi cele private administrate de Regia Națională a Pădurilor, privind numărul mediu şi maxim de fluturi capturați la cursele amorsate cu nade* ***Atralymon****, permite urmărirea evoluției populațiilor defoliatorului, atât în diferite zone din țară, cât şi la nivel național si acest studiu este cuprins în lucrare.*
Cuvinte cheie: *Lymantria monacha, puternic perturbate, desimea curselor*

INTRODUCTION

The nun moth *Lymantria monacha* L. is a widely distributed species, almost all over Europe, up to Western Siberia, more numerous in the center (Poland, Germany, Czech Republic, Slovakia), and in the eastern part of the

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continent (Belarus, Ukraine, Russia, Lithuania) (Karsholt et al., 2007). Polyphagous (feeding on the foliage of over 200 species), it attacks especially resinous, but it can also be found on many deciduous trees. L. *monacha* prefers and most frequently damages *Picea abies* (L.) (Norway spruce), *Pinus sylvestris* L. (Scots pine), *Abies alba* Mill. (silver fir), *Larix decidua* Mill. (European larch) and *Pseudotsuga menziesii* Mirb. (Duglas fir). The insect is a particularly important pest, one caterpillar causing defoliation damage in the case of about 300 pine or 1000 spruce needles during its development (Kolk & Starzyk, 1996).

Some researchers consider that the forest areas infested with nun moth *Lymantria monacha* are increasing, and outbreaks have become more frequent since the 19th century (Khanislamov et al., 1962). Grijpma (1989) provides data on outbreaks for the period 1972 – 1987, which show an expansion of the infested areas. Germany reported 305000 ha and Poland over 6.3 million hectares. In 1982, over 2.3 million hectares of forest areas were chemically treated, representing a quarter of the forest areas of Poland (Sliwa & Sierpinski, 1986). During the same period, in Germany, only 300 000 ha were chemically treated (Majunke et al., 1985; Alternkirch 1986).

The earliest attestations of the defoliator in our coniferous forests originate in the the the north of the country. There are reports from Zachar, Guzman and others (1901) stating that forests have been jeopardized by *Xylura monacha*. Professor Iacobescu (1927) wrote on the occurrence of this pest attack in 1893, in Ciuc district, in 1898 in Tarcău, in 1924 in Tulgheş and Moldovița, where a significant presence of this insect was registered on conifers, without any mention on the cases of defoliation (Mihalciuc 1988). A large outbreak of the nun moth *Lymantria monacha* occurred in Romania in the period 1953 – 1959, in the Borsec – Broşteni area, on conifers, and the total infected area was of 60420 ha.

In order to avoid defoliation of coniferous stands, chemical treatments have been performed, using airplanes and ground equipment, on 55,000 ha (Mihalciuc et al., 2000).

MATERIAL AND METHOD

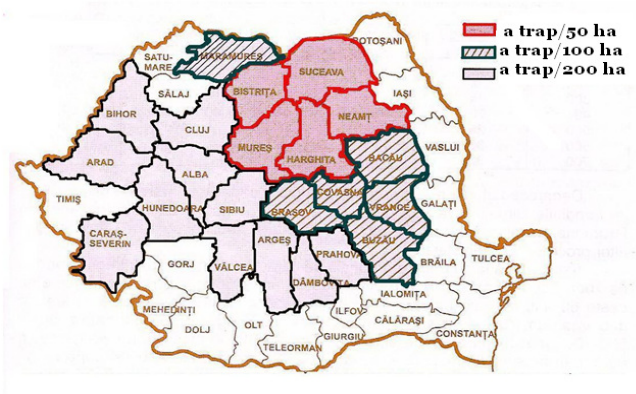


Fig. 1 - Network of pheromone traps

The aim of the study was the control of *Lymantria monacha* L. populations, in various stages of development. A series of aspects have been analyzed, such as insect detection, duration and dynamics of the flight, the color of the wings, as an important qualitative element of outbreaks prognosis and the activity of insectivorous birds, whose contribution to reducing density is unquestionable.

The defoliator was monitored in the entire forest area with stands of conifers and mixture with beech, regardless of the nature of the property (Figure 1). According to the instructions, pheromone traps density is of 1/50 ha, 1/100 ha and of 1/200 ha, depending on the vulnerability of the area to gradations (Order 454/2003).

Detection was performed by using moth sex pheromone (Atralymon – synthesized by the Institute of Chemistry Raluca Râpan – Cluj), approved exclusively for *Lymantria monacha*. Depending on the number of captures, insect egg and larvae detection in different stages can continue or not. In order to make an identification by adults, panel traps have been used, with glue on one side (30 x 40 cm), located on trees, at a height of 1.8 to 2.1 m, which have been placed in the forest monitoring system of spruce, fir or beech forest mixture of these species, where resinous trees contribute with more than 30%, regardless of the age of the trees. For afforested areas, up to 800 m altitude, the date of traps installation must not be later than July 1st, between 800-1400 m not later than July 6th, and for the areas of over 1400 m starting from July 11th.

Traps control was performed starting with their installation, until the end of the flight period (mid September). Traps have been checked in the field every 4-7 days, and captured adults have been recorded continuously, registering the wing hue of males. Gradation assessment must be made only after the control in the egg and larvae stages.

When a pheromone trap captures from 200 to 500 males in stands younger than 60 years, and from 500 to1000 males in stands over 60 years, in the following year, the insect is identified in larvae stage and the number of pheromone traps is doubled (Order 454/2003).

RESULTS AND DISCUSSIONS

Annually, in the detection activities carried out within the stands of spruce, fir and beech mixed forest, in both state (National Forest Administation - Romsilva) and private forests owners, traps have been installed in numbers varying from one year to another, from 24.787 in 2001, to 16.410 in 2009, and 489.771 (2001) to 689 249 (2009) moths have been captured during the flight period.

In the Eastern Carpathians, including the county forest administrations of Suceava, Neamț, Bacău, Harghita and Mureş, significant outbreaks have been registered in the past, and traps have been set in a dense network (1 trap/50 ha). A total number of 12.263 traps have been set in the forest and the largest number of *Lymantria monacha* moths captured have been registered (600.700 males), resulting in an average of 48.98 adults / trap (3% higher than last year). The surface on which the defoliator was found in latency in this area was estimated at 613 150 ha, in 2012 (Table 1).

In the adjacent area to the above mentioned one, including the county forest administrations of Baia Mare, Bistrița-Năsăud, Covasna and Focşani, 959 pheromone traps have been set (with a density up to a trap/100 ha), and a total

number of 25.128 moths have been captured, resulting in an average of 26.2 males/ trap (22% more than in the previous year). The surface where the defoliator was found in latency in this area was estimated at 95000 ha for 2012.

In other county forest administrations – Ploieşti, Piteşti, Vâlcea, Deva, Sibiu, Alba, Caraş - Severin, Cluj and Oradea, traps (2005 units) have been set in a sparse network (one trap/200 ha.), and 47.840 adults have been captured, scoring an average of 23.8 males/trap, 34% higher than the number recorded in the previous year. The area on which the insect was found is of about 401.000 ha. Overall, *Lymantria monacha* has been identified on an area of 1.110.050 ha.

In 2012, 15793 panel traps for tracking have been installed, and 690 489 moths have been collected during the flight period, resulting in a national average of 43.72 males per trap, a higher number than in 2011 (40.8 males/trap).

Table 1

Catches of *Lymantria monacha* pheromone traps (Atralymon) in 2012

County forest administration	No. of traps installed	No. of males captured xx)	Average number	Maximum number	Location		
					O.S.	U.P.	u.a.
Suceava	5672	241630	42,6	180	Broşteni	VIII	95A
Neamț	3073	153595	50,2	79	Poiana	VI	92C
Bacău	797	35012	44,7	161	Moineşti	II	61A
Mureş	1545	75378	58,0	104	Fâncel	II	73 A
Harghita	1176	95085	80,85	500	M.Ciuc	IX	1D
Covasna	185	7255	39,2	266	Comandău	VI	105 B

The inventory of annual males captured in pheromone traps allowed keeping track of the population development in the last 37 years in Romania (Figure 2). Following the diagram of the captures, at large, we can notice fluctuations in the levels of population. During the intervals 1979, 1984-1985, 1988, 1990, 1993-1996 and 1999-2000, an increase in the level of population was registered; in the interval 2001-2002, we can notice a clear decrease in this level (of approximately 40%, comparative to the year 2000). In 2003, there was an increase in the level of *L. monacha* population, in the entire area of conifers, of 1.6, comparative to 2002, and, also, in the last 4 years, we can notice a clear tendency of increase in the levels of captures. A change in the level of captures, per decade, during the flight period, from 2000 to 2012, is illustrated in Table 2. There is a similarity in these changes in 2000, 2003, 2007, 2008 and 2009, when there was a concentration of captures in the last decade of July and the first decade of August. In 2001, 2002, 2004, 2005, 2006, 2010 and 2011, we can generally notice a shift and a higher concentration of these captures in the decades I - III of August.

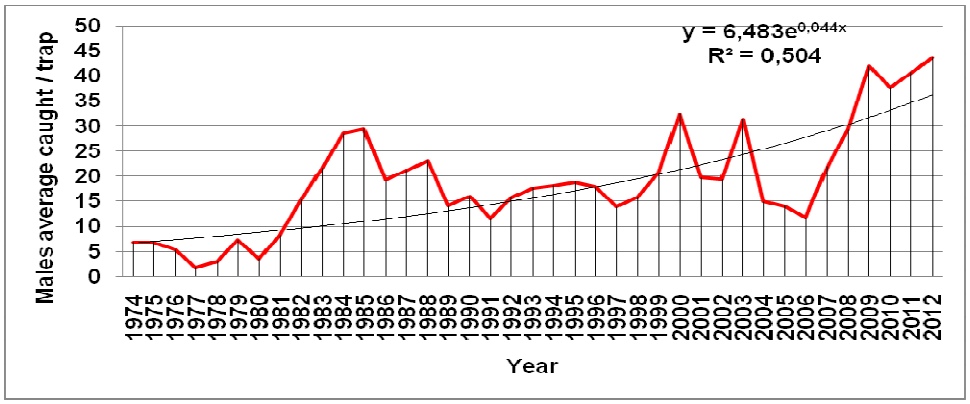


Fig. 2 - *Lymantria monacha* average captures in Romania

Table 2

Decades variations of catch (%) at *Lymantria monacha* pheromone traps

Year	July			August			September		
	I	II	III	I	II	III	I	II	III
2000	0,0	8,2	39,9	30,0	6,2	2,4	0,0	0,1	0,0
2001	0,0	0,1	15,5	34,4	25,3	12,5	3,9	0,0	0,0
2002	0,0	1,4	31,0	31,7	22,3	13,2	0,5	0,0	0,0
2003	4,3	14,8	30,5	25,4	15,2	4,6	2,3	0,1	0,0
2004	0,0	0,0	16,6	23,5	36,0	16,2	6,9	0,7	0,0
2005	-	0,0	4,1	39,6	31,0	20,6	3,7	1,0	0,0
2006	0,0	0,4	6,0	58,1	21,3	11,0	3,2	0,0	0,0
2007	0,0	42,3	36,3	12,0	6,6	2,4	0,3	0,1	0,0
2008	-	10,5	34,7	30,0	20,2	4,1	0,4	0,1	0,0
2009	-	2,4	28,6	16,7	27,5	19,2	5,6	0,0	-
2010	-	3,5	25,3	30,0	32,5	5,7	2,8	0,2	-
2011	-	7,5	26,8	23,7	21,1	10,4	8,6	1,7	0,2
2012	8,8	25,1	38,3	18,9	4,6	4,2	0,1	-	-

CONCLUSIONS

1. The monitoring of *Lymantria monacha* is necessary in order to track and study the dynamics of the defoliator population in Romania. Thus, we can make a more accurate estimation of the outbreak occurrence.

2. This year (2012), adults' flight began in the second decade of July, sometimes sooner or later, depending on local conditions and forest site. Flight activity took place mostly in July and during the first half of August, when 80-90% of all adults were captured.

3. In the last 4 years, we can notice a clear tendency of growth in the average number of moths captured, by using glue panels for monitoring.

4. Insectivorous birds score a 25-30% reduction in the density of male adults captured on glue panels and equipped with pheromone lures.

5. Based on field observations, in 98% of cases, butterflies with light colored wings have been captured, and this demonstrates that the insect is in the latent period.

6. Maintaining a network of pheromone traps in the country, in forest areas belonging to owners outside the National Forest Administration – Romsilva is extremely important, given the level of danger of the pest *Lymantria monacha*.

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STUDY ON COMBATING THE PESTS OF GRAPEVINE PHYTOSANITARY TREATMENTS AFFECT BIODIVERSITY AND FAUNA OF VINEYARD PLANTATIONS DEALU BUJORULUI

STUDIU PRIVIND COMBATEREA DĂUNĂTORILOR VIȚEI DE VIE ȘI INFLUENȚA TRATAMENTELOR FITOSANITARE ASUPRA BIODIVERSITĂȚII FAUNEI DIN PLANTAȚIILE VITICOLE ALE PODGORIEI DEALU BUJORULUI

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Abstract. *Biodiversity is a specific feature of our planet, which ensures the smooth functioning of the ecosystems, the existence and development of the biosphere in general. Lately, the problem of protecting of biodiversity at the ecosystem, species and populations has become increasingly vital for reducing human impact on the biosphere. Viticultural ecosystem is defined as being the functional unit of biosphere created and controlled by man in order to obtain high yields of grapes quality and economic and social conditions more favorable. Pesticides used to combat of pathogens of grapevine, in addition to their positive effect, increase their level of aggression and contribute to environmental pollution and the grape harvest, when not used rationally. In the last two decades, public opinion in general and Romanian scientific research proved particularly sensitive to the environment and human health. This paper presents research carried out at the R.S.D.V.V Bujoru. Observations were made in the experimental groups compared with vines grown: ecologic technology (Merlot) and conventional technology (Witness). Epigenous fauna research focused study of vine plantations, that any pesticide treatment has a greater or lesser influence on its specific structure, but also the quantity of individuals within the same species that are found in different agroecosystems (D. Ball et al., 1986).*
Key words: *ecosystem, vines, biodiversity, pathogens, pesticides.*

Rezumat. *Biodiversitatea reprezintă o particularitate specifică a planetei noastre, care asigură funcționarea optimă a ecosistemelor, existența și dezvoltarea biosferei în general. În ultima perioadă, problema protejării biodiversității la nivel de ecosisteme, specii și populații a devenit tot mai vitală pentru reducerea impactului uman asupra biosferei. Ecosistemul viticol este definit ca fiind acea unitate funcțională a biosferei creată și controlată de către om, în vederea obținerii unor producții ridicate de struguri, de calitate superioară și în condiții economice și sociale tot mai avantajoase. Pesticidele folosite în combaterea agenților patogeni ai viței de vie, pe lângă efectul lor favorabil, sporesc gradul de agresivitate al acestora și contribuie la poluarea mediului și a recoltei de struguri, atunci când nu sunt utilizate rațional. În*

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ultimele două decenii, opinia publică în general şi cercetarea ştiinţifică românească în special s-au dovedit sensibile la problemele mediului înconjurător şi al sănătăţii oamenilor. Lucrarea prezintă cercetările realizate la S.C.D.V.V Bujoru. Observaţiile s-au efectuat în mod comparativ pe două loturi experimentale cultivate cu viţă de vie: tehnologie ecologică (soiul Merlot) si tehnologie clasică (Martor). Cercetările au vizat studiul faunei epigee din plantaţiile de viţă de vie, cunoascând faptul că orice tratament cu pesticide are o influenţă mai mică sau mai mare asupra structurii specifice a acesteia, dar şi asupra cantităţii de indivizi din cadrul aceleiaşi specii care se întâlnesc în diferite agroecosisteme (Ball D. şi col., 1986).
Cuvinte cheie: *ecosistem, viţa de vie, biodiversitate, agenţi patogeni, pesticide.*

INTRODUCTION

The technology culture of the vine against pathogens and pests is one of the crucial technological links for obtaining high yields of grape and wine quality.

After penetration of pathogens and pests in the American continent growing in the countries in Europe, growers, both practitioners and researchers alike have sought ways and means to prevent and fight as effectively (Talmaciu and Georgescu, 1998).

In this regard were crystallized technologies to fight against the key pathogens and pests that have become classics and the lead role is held by plant protection substances in recent years have seen a diversification (Rosca et al., 2008).

Pesticides used to combat pathogens of grapevine, in addition to their positive effect, increase their level of aggression and contribute to environmental pollution and the grape harvest, when not used rationally. In the last two decades, public opinion in general and Romanian scientific research proved particularly sensitive to the environment and human health (Talmaciu et al., 1996 a-b).

Epigenous wildlife research focused study of vine plantations because any pesticide treatment has a greater or lesser influence on its specific structure, but also the quantity of individuals within the same species that are found in different agroecosystems (Ball et al., 1986).

MATERIAL AND METHOD

The research was conducted between April-June, in the Research and Development Station for Viticulture and Winemaking Bujoru, in a vineyard planted with Merlot aged 32 years.

The experiment was conducted on a land surface with a slope of 3-5%, chernozem soil type, with a humus content between 1,14 to 1,86% in the A horizon with a weak alkaline reaction (pH ,44 to 8,30) and a sandy loam texture; with the land surface facing east and about 170-200 m altitude. The rows'orientation was north to south, with a planting distance of 2,1 m x 1,2 m, and a provided density of 3968 vines / hectare. The rootstock used was Berlandieri x Riparia rootstock, Telecky Openheim SO4-4 selection. The experiment was conducted in two parcels with Merlot and Băbească gri grown in the Dealu Bujoru vineyard ecosystem.

The experimental variants of the research were as follows: V1 - clean technology (soiul Merlot), V2 -classic technology (soiul Merlot) and V3 MARTOR (soiul Băbească gri). In order to establish the quantitative and qualitative structure of the epigenous fauna on the ground surface, Barber soil type traps have been installed on the vine rows, being 2/3 filled with solution of formalin (formaldehyde) of 4%, and installed in 6 repetitions.

During the research, one of the parcels was treated according to conventional technology, with chemical pesticides, and the other was organically treated (with pesticides accepted in the organic viticulture) to combat mildew (copper sulphate), powdery mildew and mites (liquefying sulfur, powdery sulfur) and grape moth (synthetic sex pheromone traps type ATRABOT).

The entomological material was labeled, collected and transported to the laboratory where it was washed under running water, then was passed through 7% alcohol solution. To identify and count the epigenous fauna the magnifying trinocular glass (KRÜSS) with two 10x20 WF magnifiers was used.

RESULTS AND DISCUSSION

The entomologic material was collected as with the help of Barber soil traps. The relative numeric abundance (A.r.%) of a population is defined as the proportion represented by the number of individuals of a species or group to the total number of individuals belonging to all species of that sample.

In the material collected from the ground (during April-June) it has been found that:

At **V1 -** (organic) were identified 12 species or groups of arthropods belonging to the classes: Myriapoda, Insecta and Arachnida, but most of the class Insecta. The highest relative abundance of the species was recorded by the Formicide family (27.6%), followed by Lycosidae family (18.1%), Vespidae (14.0%), Curculionidae (8.8%), Carabidae (7,1%) and other species (7.1%) (table. 1).

At **V2 -** (classical) the fauna from the ground level was represented by a number of 11 species or groups of arthropod belonging to the classes: Insecta and Arachnida. Most populous family was the Formicide family (34.6%), Vespidae (15.6%), Fam.Staphylinidae (12.3%) and Carabidae (10.2%).

At **V3** - Witness - (Băbească gri) most populous was the Formicide family (38.3%), family Lycosidae (13.7%) and family Tettigoniidae (8.4%).

The treatments against pathogens and pests were done as follows:

In the **V1 -** plot (organic), treatments with biological fungicide against: mildew (Triumf 40 WG, copper sulphate), powdery mildew (Sulfavit 80 PU, PP Sulfavit 95) and grape moth (synthetic sex pheromone traps ATRABOT type) (table 2);

In the **V2-**plot (classical), control treatments were done with conventional chemical pesticides that are specific to the traditional production technology. To combat the mites one acaricide called Nissorun has been used, while to combat the grape moth, the insecticide Vip 50 SC (table 3) has been used.

In the **V3** – Witness **(**Băbească gri) the treatments of diseases and pesticides have made conventional technology of manufacturing chemical processes. To combat pests no insecticide was used (table 4)

Table 1

Invertebrate species collected by soil type traps Barber in the period 15.05.2009 - 30.06.2009

No	Systematic framing (Species, Family, Order)	Variant/ Relative numerical abundance					
		V1	A.r.%	V2	A.r.%	V3	Ar%
1	*Gryllus campestris*/ fam. *Gryllidae*/ Order Orthoptera	16	3,8	0	0	1	0,2
2	*Apis* sp./ fam. Apidae/ Order Hymenoptera	5	1,2	0	0	4	0,8
3	Fam. *Vespidae*/ Ord. Hymenoptera.	39	14,0	67	15,6	24	5,1
4	*Alopecosa pulverulenta*/ familia. Lycosidae/ Order Araneae	76	18,1	18	4,2	64	13,7
5	*Formica rufa*/ fam.Formicide/ Order Hymenoptera	116	27,6	149	34,6	179	38,3
6	*Carabus* sp./ fam. Carabidae/ Order Coleoptera	30	7,1	44	10,2	16	3,4
7	Ord. Diptera	21	5,0	57	13,2	36	7,7
8	Cicada viridis/ fam. Cicadidae/ Order Homoptera	21	5,0	18	4,2	6	1,3
9	*Saga pedo* / fam. Tettigoniidae / Order Orthoptera	5	1,2	0	0	39	8,4
10	Fam. *Staphylinidae* / Order Coleoptera	1	0,2	53	12,3	12	2,6
11	*Gryllotalpa gryllotalpa* / fam. Gryllotalpidae / Order Orthoptera	1	0,2	0	0	0	0
12	*Eurigaster Maura,* Subordinul Geocoridae, Order Heteroptera	0	0	0	0	2	0,4
13	Fam. *Curculionidae*/ Order Coleoptera	37	8,8	8	1,8	13	2,8
14	*Coccinella septempunctata/* fam. Coccinellidae / Order Coleoptera	0	0	4	0,5	2	0,4
15	*Forficula auricularia* / fam. Forficulidae / Order Dermaptera	0	0	2	0,4	0	0
16	*Myriapoda*	0	0	1	0,2	0	0
17	*Melolontha m.,*fam.Scarabaeidae,Order Coleptera	0	0	0	0	1	0,2
18	Order Lepidoptera	0	0	0	0	1	0,2
19	Species other	30	7,1	9	2,1	67	14,3
Total		**420**	100	**430**	100	**467**	100

Table 2

Phytosanitary intervention program V 1 (organic) in 2009

No.	Pheno-phase	Pathogen combated	The used product	UM (kg,l)	The dose (ha)
1.	Debudding - Vine shoot 10-15 cm	Mildew	Sulfavit 80 PU	kg	4,00
2.	Vine shoot 30 cm	Mildew Grape moth G I	Sulfavit 95 PP Type traps ATRABOT	kg buc	10,00 9,00
3.	Before the blooming	Manna Midlew	Triumf 40 WG Sulfavit 95 PP	kg kg	2,00 15,00
4.	End of blooming	Manna Midlew	Triumf 40 WG Sulfavit 95 PP	kg kg	2,500 25,00
5.	Growth of grapes	Manna Midlew Grape moth G II	Triumf 40 WG Sulfavit 95 PP Type traps ATRABOT	kg kg buc	2,500 15,00 9,00
6.	Compacting of grapes	Manna Midlew Grape moth GIII	Copper sulphate Sulfavit 95 PP Type traps ATRABOT	kg kg buc	10,00 25,00 9,00

Table 3

Phytosanitary intervention program V 2 (classic) in 2009

No.	Pheno-phase	Pathogen combated	The used product	UM (kg,l)	The dose (ha)
1.	Debudding - Vine shoot 10-15 cm	Mildew	Sulfavit 80 PU	kg	4,00
2.	Vine shoot 30 cm	Mildew The mites	Sulfavit 95 PP **Nissorun**	kg l	10,00 0,50
3.	Before the blooming	Manna Midlew Grape moth G I	Salomea75WG Sulfavit 95 PP **Vip 50 SC**	kg kg l	3,00 15,00 0,25
4.	End of blooming	Manna Midlew	Armetil M Pen100 EC	kg l	2,50 0,25
5.	Growth of grapes	Manna Midlew	Selene + Vitra Falcon 460EC	l kg l	0,25 1,50 0,30
6.	Compacting of grapes	Manna Midlew	Copper sulphate Sulfavit 95 PP	kg l	10,00 30,00

Table 4

Phytosanitary intervention program V 3 (Băbească gri) in 2009

No.	Phenophase	Pathogen combated	The used product	UM (kg,l)	The dose (ha)
1.	Debudding - Vine shoot 10-15 cm	Mildew	Sulfavit 80 PU	kg	4,00
2.	Vine shoot 30 cm	Mildew	Sulfavit 95 PP	kg	10,00
3.	Before the blooming	Manna Midlew	Salomea75 W Sulfavit 95 PP	kg kg	3,00 15,00
4.	End of blooming	Manna Midlew	Armetil M Pen100 EC	kg l	2,50 0,25
5.	Growth of grapes	Manna Midlew	Selene + Vitra Falcon 460EC	l kg l	0,25 1,50 0,30
6.	Compacting of grapes	Manna Midlew	Copper sulphate Sulfavit 95 PP	kg l	10,00 30,00

CONCLUSIONS

1. Epigenous fauna captured in the vineyard with the Barber soil type traps was represented by 420 copies in the V1 parcel, 430 copies in the V2 parcel and 430 copies in the V3 parcel.

2. The highest relative numerical abundance of all species was recorded by *Formica rufa* / *Formicide* family (38,4%) in the V3 ,(27.6%) in the V1 parcel, and 34.6% in the V2 parcel, respectively.

3. Of predatory species collected, insects of the order Coleoptera, (7.1%) in V1 and (10.2%) in V2, have been found.

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INFLUENCE OF NUTRITIVE SUBSTRATE ON ACTIVITY OF SOME HYDROLASES FROM FUNGUR *RHIZOPUS STOLONIFER*

INFLUENȚA SUBSTRATULUI NUTRITIV ASUPRA ACTIVITĂȚII UNOR HIDROLAZE LA CIUPERCA *RHIZOPUS STOLONIFER*

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Abstract*. Amylases are some of the most important industrial enzymes that have a wide range of applications. Although they come from different sources and have different patterns of action, in industry are mainly produced by microorganisms. Enzymes from microbial sources meet industrial demands due to their higher efficiency and thermostability. The purpose of this study is to investigate the influence of nutrient substrate represented by grinded cereal caryopses on α amylase, β amylase and γ amylase activity from saprophytic fungus Rhizopus stolonifer. Enzymatic determinations were made using culture liquid of fungus, at 3 time intervals: 3, 6 and 9 days. After data interpretation it was observed that the activity of the three enzymes was influenced by the nature and concentration of nutritive substrate and by fungal culture age. Thus, the highest values were obtained for glucoamylase in barley medium variants at concentration of 30 g/l in the first time period.*
Key words*: Rhizopus stolonifer, amylases, cereal caryopses*

Rezumat*. Amilazele sunt unele dintre cele mai importante enzime industriale, ce au o gamă largă de aplicații. Deși acestea provin din diverse surse și prezintă modele diferite de acțiune, în industrie sunt produse în principal din microorganisme. Enzimele din surse microbiene îndeplinesc cerințele industriale datorită randamentului lor superior și a termostabilității. Scopul acestui studiu constă în investigarea influenței substratului nutritiv reprezentat de cariopse de cereale măcinate asupra activității α amilazei, β amilazei și γ amilazei la ciuperca saprofită Rhizopus stolonifer. Determinările enzimatice au fost realizate, utilizând lichidul de cultură al ciupercii, la 3 intervale de timp: 3, 6 și 9 zile. În urma interpretării datelor s-a observat că activitatea celor trei enzime a fost influențată atât de natura și concentrația substratului nutritiv cât și de vârsta culturii. Astfel, cele mai ridicate valori au fost obținute în cazul glucoamilzei la variantele de mediu cu orz la o concentrație de 30 g/l în primul interval de timp.*
Cuvinte cheie*: Rhizopus stolonifer, amilaze, cariopse de cereale*

INTRODUCTION

Amylases are some of the most important industrial enzymes that have a wide variety of applications ranging from conversion of starch to sugar syrups, to the production of cyclodextrins for the pharmaceutical industry. These enzymes

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represent approximately 30% of global enzymes production (Sivaramakrishnan et al., 2006). Although they come from different sources (plant, animals, microorganisms) and have different patterns of actions (Hagenimana et al., 1992), in industry are produced mainly from microorganisms. Enzymes from microbial sources meet industrial requirements due to their higher efficiency and thermostability. Due to the increasing demand for these enzymes in various fields of human activity, there is interest in the development of enzymes with superior proprieties such as raw starch degrading amylases suitable for industrial applications and their production techniques with low cost (Burhan et al., 2003).

Extent of involvement of biological catalyst in various industry fields, agriculture, environmental protection, medical and environmental diagnosis, development of medicinal remedies based on enzymes, and/or their activators, the obtain and use of renewable sources of energy and biofuels motivates the importance and actuality of investigation that are related to the selection of new active producers of enzymes and development of modern processes for increase/stabilize their biosynthetic capacity (Ciloci et al., 2011).

Many *Rhizopus* species are capable of producing α amylases and glucoamylases, and are important in the industrial production of glucoamylase and production of various alcoholic beverages (Mertens and Skory, 2007; Soccol et al., 1994; Higgins, 1995).

Various chemical and physical factors are affecting growth and amylase production, such as temperature, pH, incubation period, moisture, agitation, but above all the cultivation medium composition (carbon and nitrogen sources). Interactions of these parameters can have a significant influence on the enzyme production (Sivaramakrishnan et al., 2006; Grata et al., 2008). To meet the growing demands of the industries is required amylase production with low cost. Synthetic media are very expensive and unprofitable, so they must be replaced with agricultural byproducts more economical and available which are considered to be good growth substrates for amylases producing microorganism (Kunamneni et al., 2005; Saxena and Singh, 2011). The objective of this study was to monitor the influence of nutritive substrate represented by grinded cereal caryopses from three species: wheat, corn and barley on α, β and γ amylases activity produced by fungus *Rhizopus stolonifer*.

MATERIAL AND METHOD

Microorganism used for conducting experiments - *Rhizopus stolonifer* was isolated from germinated cereal caryopses. For this purpose were used three species of cereals: wheat, corn and barley. Wheat and corn caryopses came from the storage place of the Enterprise of Cereal Products from Chișinău, Republic of Moldova and the barley caryopses were taken from a private household in Grebleşti village, from Străşeni aria, Republic of Moldova. The fungus was inoculated in the form of 8 mm in diameter discs on liquid Leonian medium (K_2HPO_4 1.25 g, $MgSO_4$. $7H_2O$ 0.625 g, peptone 1 g, glucose 20 g, distilled water 1000 ml) (Constantinescu, 1974), from whose composition carbon source – glucose was replaced with different amounts of grinded cereal caryopses, resulting three medium variants: V1 with 10 g/l, V2 with 20 g/l and V3 with 30 g/l, plus a control version where medium composition remained

unchanged. Liquid, stationary cultures of *Rhizopus stolonifer* were incubated under the dark conditions at 28 C. Enzymatic determinations were made at three time intervals: 3, 6, and 9 days using fungus culture liquid. The determination of α and β amylases was performed using the Noelting-Brenfeld method (Artenie VI., et al., 2008), and the γ amylase measurement was made using dinitrosalicylic reagent method (Cojocaru, 2009). Enzyme activity was reported to the amount of total soluble protein determinate by Bradford method (Artenie et al., 2008). Experiments were performed in triplicate and for graphical representation of the data averages were calculated.

RESULTS AND DISCUSSIONS

The use of carbohydrates as carbon source is a common practice in the microbial fermentation process. Composition and concentration of the medium plays an important role in the growth and productions of extracellular α amylases in fungi and bacteria. The rate at which carbon sources are metabolized can often influence the production of biomass or production of primary or secondary metabolites from microorganisms (Zhou and Jiang, 1991; Laoide and McConel, 1989; Srivastava and Baruah, 1986).

The influence of nutritive substrate on the α amylase activity determined at three time intervals in culture liquid of *Rhizopus stolonifer* is illustrated in figure 1. In the first time interval α amylase values are quite high, the highest values being observed in medium variants with barley caryopses and the lowest in those with corn. Maximum value was recorded in variant V3 from barley (1.2115 UA/mg protein). There is no definite correlation between nutritive substrate concentration and enzyme activity, except for wheat samples where α amylase activity increases with cereal caryopses amount from culture liquid. In the next time interval there is a decrease in enzyme activity in all experimental variants, regardless of nutritive substrate used, except variant V3 from corn, where α amylase activity intensifies (0.5965 UA/mg protein). In the last time interval a slight increase in enzyme activity takes place, maximum value being observed at V3 variant form barley (0.6682 UA/mg protein).

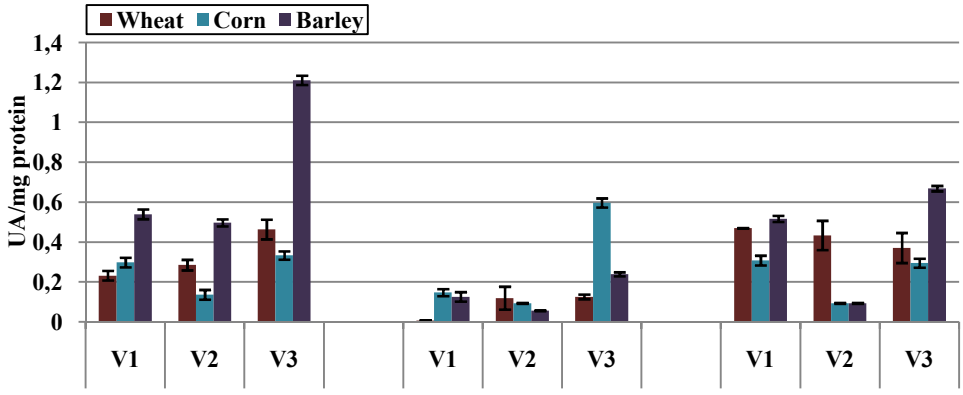


Fig. 1 - Influence of nutritive substrate on the α amylase activity in fungus *Rhizopus stolonifer*

As shown in figure 2, β amylase activity recorded significantly lower values compared with α amylase activity, and in many of the variants could not be detected. In the first time interval was possible to measure enzyme activity only in 3 experimental variants (V2 wheat – 0.0591 UA/mg protein, V2 corn – 0.2109 UA/mg protein, V3 corn – 0.221 UA/mg protein) and only in 4 in the next 2 time intervals (at 6 days: V1 wheat – 0.1986 UA/mg protein, V1 barley – 0,0863 UA/mg protein,V2 corn – 0.2325 UA/mg protein, V2 barley – 0.0231 UA/mg protein; at 9 days: V1 corn – 0.0725 UA/mg protein, V2 corn – 0.1025 UA/mg protein, V2 barley – 0.1864 UA/mg protein, V3 corn – 0.0891 UA/mg protein). Maximum value was observed after 6 days of incubation at a 20 g/l concentration of grinded corn caryopses.

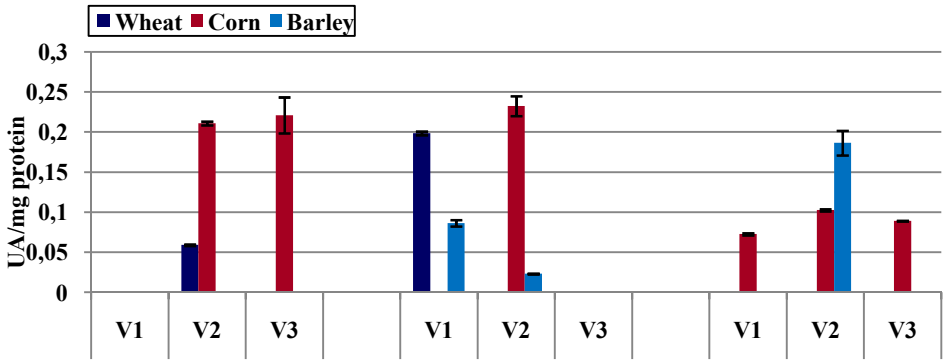


Fig. 2 - Influence of nutritive substrate on β amylase activity in fungus *Rhizopus stolonifer*

γ-Amylase activity recorded in the first time interval the highest values for all medium variants regardless of the nature of nutritive substrate used (fig. 3). Maximum activity was recorded in variant V3 barley (27.553 U/ml/mg protein), and the minimum in variant V1 wheat (9.089 U/ml/mg protein). There is no obvious correlation between concentration of cereal caryopses and the enzyme activity in most experimental variants, except medium variants with barley, where glucoamylase activity increases with nutritive substrate concentration. Although the higher is amount of grinded caryopses, the higher is starch concentration, the amylase production may not follow this pattern and maximum amylase activity, maximum biomass and protein concentration can be obtained at different concentrations of nutritive substrate. We could obtain the maximum biomass amount at a higher concentration of nutritive substrate, but not a maximum amylase activity (Ayogu and Amadi, 2010). In the next time interval enzyme activity decreases in most work variants, except variant V3 (26.012 U/ml/mg protein) from corn, where a slight increase in enzyme activity takes place. Lowest values are also recorded in medium variants with wheat caryopses. In the last time interval enzyme activity decreases more. The highest value was recorded in variant V1 from corn (9.111 U/ml/mg protein) and the lowest in variant V1 from barley (0.5242 U/ml/mg protein).

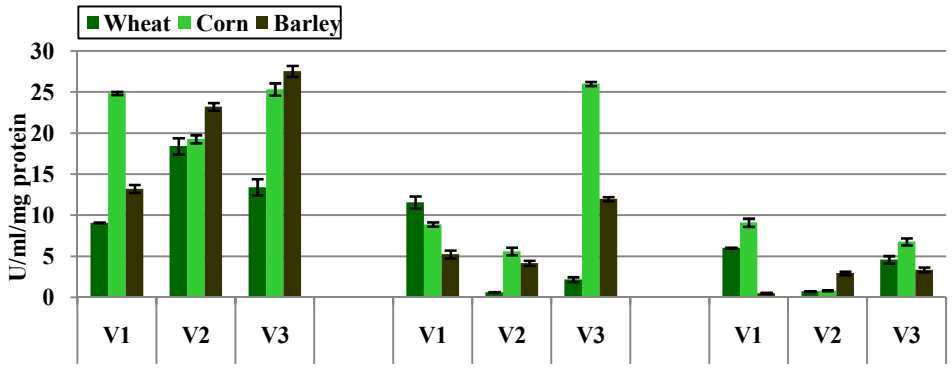


Fig. 3 - Influence of nutritive substrate on γ amylase activity in fungus *Rhizopus stolonifer*

CONCLUSIONS

Most favorable nutrient substrates for amylase synthesis are represented by grinded barley and corn caryopses, as the highest values of the three studied enzymes activity were observed in medium variants that contained barley and corn caryopses, and the maximum value of enzymatic activity was recorded for glucoamylase at a 30 g/l concentration after three days of incubation. Also fungal culture age had a strong influence on amylase synthesis, thus the highest activity was observed after three days of incubation.

Fungus *Rhizopus stolonifer* is not a good β amylase producer, the activity of this enzyme recording low values throughout the experiment, and in many variants enzyme activity could not be detected.

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EVALUATION OF SOME PARAMETERS AFFECTING ENDOGLUCANASE ACTIVITY OF THE FUNGUS *TRICHODERMA REESEI* QM9414

EVALUAREA UNOR FACTORI CE INFLUENȚEAZĂ ACTIVITATEA ENDOGLUCANAZEI SPECIFICĂ FUNGULUI *TRICHODERMA REESEI* QM9414

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Abstract: *Trichoderma reesei is a cellulolytic fungus, well known for its ability to degrade cellulose. The fermentation process for cellulase production is affected by various factors. In this context, we analysed some parameters which influence endoglucanase activity of Trichoderma reesei QM9414: the substrate type and its concentration, the pH of the medium, the nitrogen source and the incubation time. Lignocellulosic biomass, resulting from agricultural practices, such as wheat, barley straws and maize stalks, were used for their great potential as cheap substrate for enzyme production. Endoglucanase activity was higher when Trichoderma reesei QM9414 was grown on medium with wheat straws and maize stalks and at substrate concentration of 40g/L. The addition of some amino acids, namely glutamic acid and asparagine improved endoglucanase activity. The initial pH of the medium is an important factor which shapes endoglucanase activity, Trichoderma reesei displaying an optimum in enzyme activity depending on the nutritional substrate used*
Keywords: *Trichoderma reesei, endoglucanase, wheat straws, barley straws, maize stalks*

Rezumat: *Trichoderma reesei este o ciupercă celulozolitică bine cunoscută pentru capacitatea sa de a degrada celuloza. Procesul de fermentație pentru producerea de celulaze este influențat de diverși factori. În acest context, am analizat o serie de parametri ce modulează activitatea endoglucanazei la specia Trichoderma reesei QM9414: tipul substratului și concentrația acestuia, pH-ul mediului, sursa de azot și timpul de incubare. Biomasa lignocelulozică, ce rezultă din diferite practici agricole, precum paiele de grâu, de orz și cocenii de porumb au fost utilizate pentru potențialul mare de substrat ieftin in producerea de enzime. Activitatea endoglucanazei a fost ridicată când Trichoderma reesei a fost cultivată pe mediu cu paie de grâu și coceni de porumb, la o concentrație de 40g/L. Adiția în mediu a unor aminoacizi precum acidul glutamic și asparagina sporesc activitatea endoglucanazei. PH-ul inițial al mediului reprezintă un factor important ce modelează activitatea endoglucanazei, Trichoderma reesei etalând un optim al activității enzimatice în funcție de substratul utilizat*
Cuvinte cheie: *Trichoderma reesei, endoglucanaza, paie de grâu, paie de orz, coceni de porumb*

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INTRODUCTION

Cellulose is the most abundant renewable resource in the world. Chemical and biochemical conversion is needed to transform cellulose to glucose. Through bioconversion, cellulose is hydrolysed with minimal byproduct formation, low energy requirement and minimal operating conditions (Acebal et. al., 1986). Waste cellulose, resulting from various agricultural practices (e.g. sugar cane bagasse, corn stover and stalks, or wheat, barley and rice straws), industries and as forest residues (e.g., sawdust), represents a promising substrate for cheap enzymatic hydrolysis. A variety of filamentous fungi and bacteria are known to produce enzymes, called cellulases, which are capable to hydrolyse cellulose. Most studied organisms known to produse cellulolytic enzymes include fungi belonging to *Trichoderma, Humicola*, *Penicillium, Aspergillius* and bacteria-*Bacillus, Pseudomonas* (Sukumaran et. al., 2005).

One of the most studied cellulase system is the one produced by *Trichoderma reesei*, a filamentous fungus known for its ability to produce a full set of cellulases involved in the hydrolysis of cellulose to glucose monomers. *T. reesei* produces two cellobiohydrolases, Cel6A (CBH II) (Teeri T. Et. al., 1987) and Cel7A (CBH I) (Shoemaker et. al., 1983a; Teeri et. al., 1983). Also, *T. reesei* produces five endoglucanases, the most studied are Cel7B (EG1) (Penttilä et. al., 1986) and Cel5A (EG II) (Saloheimo et. al., 1988), and also Cel12A (EG III), Cel45A (EG5), and last but not least Cel61A (EG IV). Endoglucanases hydrolyse the cellulase chains internally, providing new chain ends for cellobiohydrolases (Miettinen-Oinonen et. al., 2005). In the fermentation process for cellulase production, environmental and nutritional factors are essential. For example, cellulases are repressed when glucose is present and expressed when the organisms starves or certaing inducers are present (Ilmén, 1997).

In this context, our study aims to analyse various factors that may increase endoglucanase activity of the fungus *Trichoderma reesei*, factors such as: initial pH of the growth environment, nitrogen source (e.g. amino acids), cultivation period and concentration of substrate used in the growth environment.

MATERIAL AND METHOD

Trichoderma reesei was maintained on potato dextrose agar (PDA). To determine endoglucanase activity, the fungus was grown on a liquid medium, distributed in 250 ml Erlenmeyer flasks, each of these containing 100 ml of a modified Mandels medium (Ferreira et. al., 2009).

The influence of the substrate was analyzed by replacing the carbon source-glucose with different concentration of grinded wheat straws, barley straws and maize stalks, resulting four working variants: V1-10 g/L, V2-20 g/L, V3-30 g/L and V4-40 g/L. The influence of the initial pH was analyzed by changing the carbon source-glucose with 30g/L of grinded wheat straws, barley straws and maize stalk, and the initial pH of the medium was modified to 3,4,5,6, and 7, respectively. The influence of amino acids on endoglucanase activity was assayed by replacing the nitrogen source of the Mandels medium, e.g. peptone, urea and ammonium sulfate with the following amino acids: alanine, asparagine, glutamic acid, serine, methionine, histidine, serine and a

control variant without any nitrogen source. To determine the importance of pretreatment on endoglucanase activity, the agro wastes were treated with 1% H_2SO_4, 2% H_2SO_4, 1% NaOH and 2% NaOH, then placed in an autoclave for 30 minutes at 121°C. A control variant was made in which no pretreatment was performed.

Liquid medium was inoculated with 8 mm in diameter discs from the solid medium and incubated at 28°C for 12 days. During this period, 3 ml of culture liquid were withdrawn every three days, and used as enzyme solution. The experiments were carried out in triplicate and mean values were calculated. To estimate endocellulase activity within the collected supernatant carboxymethyl cellulase assay was used, as described by Cojocaru (2008). One unit of cellulase activity (EU) was defined as the amount of enzyme required for liberating 1 mg of reducing sugar per mililiter per minute.

RESULTS AND DISCUSSIONS

It is well known, that several environmental factor affect enzymatic activity of filamentous fungi, thus we assayed how factors such as substrate type and concentration, pH of the growth environment, the nitrogen source represented by several amino acids and chemical pretreatment of the agro wastes used in the experiment influence endoglucanase activity of *Trichoderma reesei*.

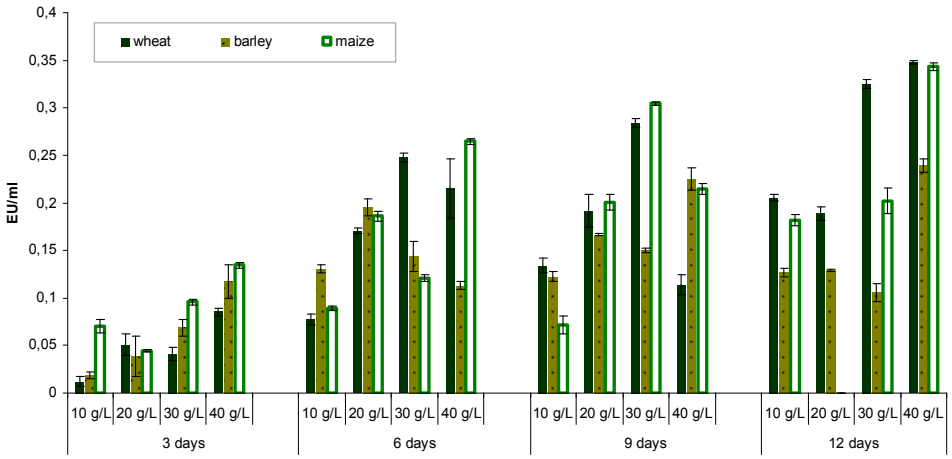


Fig. 1 - The influence of nutritional substrate on endoglucanase activity of *Trichoderma reesei* grown on media with wheat straws, barley straws and maize stalks.

Endoglucanase activity of *Trichoderma reesei* is presented graphically in Figure 1. Enzyme activity shows a variation during the incubation of the fungus. Thus, in the first 3 days endoglucanase activity was lower, increasing progressively in the next 9 days. Maximum activity was reported at a substrate concentration of 40 g/L wheat straws (0,3474 UE/ml) and 40 g/L maize stalks(0,3431 UE/ml).

Depending on the nature of the carbon source, used to improve cellulase activity in *Trichoderma* reesei, different initial pH values of the growth medium may be optimal to induce maximum cellulase yield. As shown in figure 2,

endoglucanase activity was increased at pH values ranging between 3.0-5.0, these values can be correlated with the optimum pH for fungal growth for *Trichoderma* species (Harman and Kubicek, 1998).

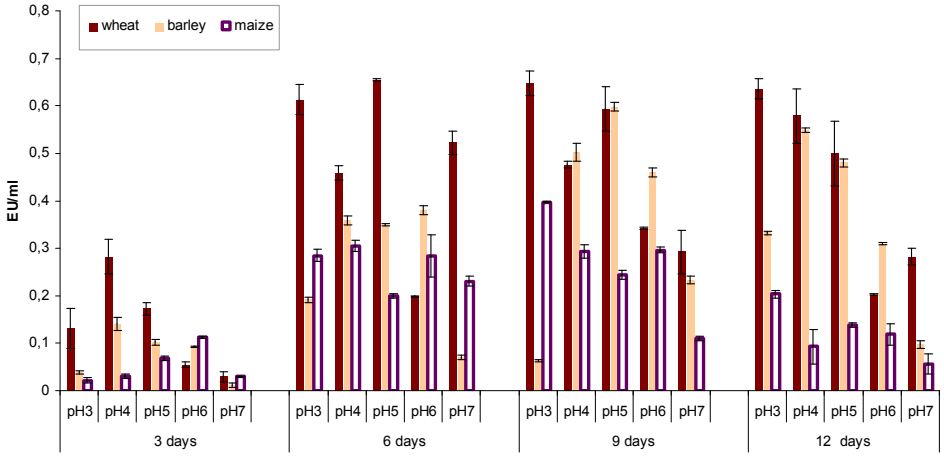


Fig. 2 - The influence of the initial pH of the cultivation medium on endoglucanase activity of *Trichoderma reesei* grown on media with wheat straws, barley straws and maize stalks.

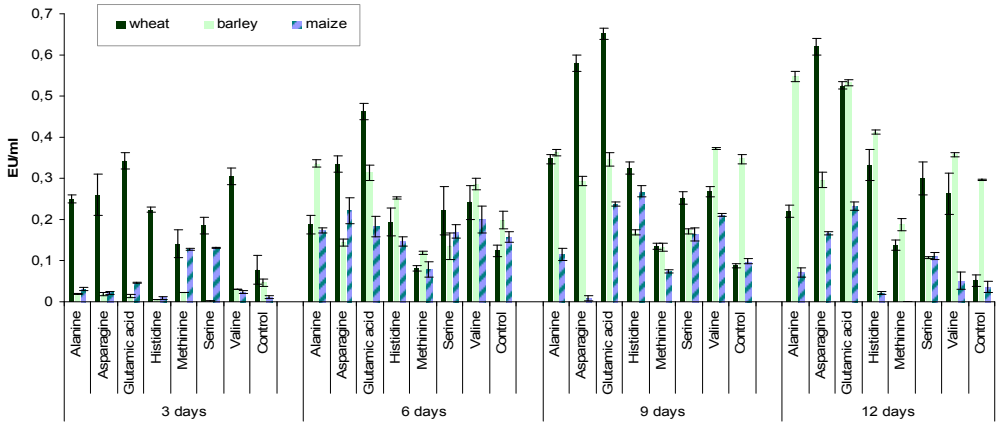


Fig. 3 - The influence of amino acids on endoglucanase activity of *Trichoderma reesei* grown on media with wheat straws, barley straws and maize stalks.

It is known that commercially available endoglucanases produced by *T. reesei* display a optimum activity between a pH of 4.0 to 6.0, and these enzymes are inactive at a higher alkaline pH (Wang et. al., 2005). Since *T.reesei* produces more then one endoglucanase, each has a different pH optimum, ranging between 3.0 and 5.0. Endoglucanase activity decreases by about 50% at pH 7.0 (Karlsson et. al., 2002). In agitated cultures, pH control is essential, and is achieved by adding phosphate buffer solutions. Thus, maintaining a pH greater than 4.0 enhances

cellulase activity in *Trichoderma reesei* RUT C-30 and growing this organisms at pH 5.0 increases endoglucanase activity (Tagnu et. al., 1981).

Cellulase synthesis in *Trichoderma reesei* is reduced unless urea, peptone or ammonium sulphate are added to the growth medium, these substances are known for their ability to stimulate enyzme productivity (Haapala et. al., 1996). We examined if other nitrogen sources, such as amino acids can stimulate endoglucanase activity. Results depicted in Figure 3 underline that by adding in the medium amino acids such as glutamic acid, asparagine, histidine and alanine, endoglucanase activity is increased. In contrast, the addition of methinonine inhibits endoglucanase activity in *Trichoderma reesei*.

Lignocellulosic materials, such as agro wastes, are composed of cellulose, and hemicellulose held together by lignin, which is known to form a barrier against enzymatic attack (Fan et. al., 1982). Through pretreatment, the lignin content and crystallinity of the cellulose is reduced and the surface area is increased (Hatakka 1983). In our study we analised two pretreatment methods: acid hydrolysis, using 1% and 2% H_2SO_4 and alkaline hydrolysis using 1% and 2% NaOH.

Endoglucanase activity was higher when wheat, barley and maize residues were treatead with 2% sulfuric acid instead of 1% (table 1). In a similar manner endoglucanase activity was higher when 2% NaoH was used, compared to 1% NaoH.

Table 1

The influence of some chemical pretreatments applied to the substrate on endoglucanase activity of *Trichoderma reesei*

Treatment	wheat	barley	maize
H_2SO_4 1%	0,2143	0,2957	0,4354
H_2SO_4 2%	0,2628	0,3837	0,5104
NaOH 1%	0,2567	0,2753	0,2764
NaOH 2%	0,2999	0,2787	0,2758
Control	0,3248	0,1499	0,3045

CONCLUSIONS

1. Endoglucanase activity is profoundly influenced by environmental factors. The nutritional substrate, represented by three agro wastes (wheat straws, barley straws, maize stalks) proved to be effective in stimulating endoglucanase activity, of which wheat straws are the most effective, at a concentration of 40 g/L.

2. Favorable pH range for endoglucanase activity in *Trichoderma reesei* is set between 3.0 and 5.0.

3. Some amino acids increase endoglucanase activity, such as glutamic acid, asparagine, histidine and alanine, while methionine causes the opposite effect.

4. Chemical pretreatment of the agro wastes with 2% NaOH and 2% NaOH increases endoglucanase activity.

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EFFECT OF DIFFERENT SOLID SUBSTRATES ON MASS PRODUCTION OF *BEAUVERIA BASSIANA*

STUDIUL EFECTULUI DIFERITELOR SUBSTRATE SOLIDE ASUPRA PRODUCȚIEI DE BIOMASĂ FUNGICĂ DE *BEAUVERIA BASSIANA*

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Abstract*. The objective of this study was to select an optimal culture system for the production of the Beauveria bassiana fungal biomass with high virulence, in order to realize a compound which will be used in the biological control of phylloxera galicola. The influence of different solid substrates on the production of Beauveria bassiana fungal biomass was analyzed using the diphasic liquid–solid fermentation technique. The liquid phase, represented by a spore suspension with fungitoxic effect of Beauveria bassiana, in an active growth phase, was mixed, in a ratio of 1/1 with the solid substrates represented by: barley, rice, broken maize and wheat. The best results were obtained on solid substrate represented by wheat which was selected for the production of fungal biomass. The worst results were obtained on broken maize. The selected culture substrat will be applied to ensure enough spores in order to achieve the compound which will be used in the vineyard.*
Key words: *viticulture, phylloxera, substrate*

Rezumat*. Studiul a urmărit selecția unui sistem de cultură optim pentru producerea de biomasă fungică de Beauveria bassiana cu virulență mare, pentru realizarea unui biopreparat ce va fi utilizat în combaterea biologică a filoxerei galicola. Influența diferitelor substraturi solide asupra producerii de biomasă fungică de Beauveria bassiana a fost analizată folosind tehnica de fermentație în sistem difazic: lichid–solid. Faza lichidă, reprezentată de o suspensie de spori de Beauveria bassiana, cu efect fungitoxic, aflată în faza de creştere activă a fost amestecată în proporție de 1/1 cu un substrat solid reprezentat de: orz, orez, mălai granular şi grâu. Cele mai bune rezultate au fost obținute pe substratul solid grâu, substrat selectat pentru obținerea biomasei fungice, iar cele mai slabe pe mălai granular. Substratul de cultură selectat va fi aplicat pentru a se asigura o cantitate suficientă de spori pentru realizarea biopreparatului fungicid ce va fi aplicat în plantație.*
Cuvinte cheie: *viticultură, filoxera, substrat*

INTRODUCTION

The application of the biological methods for the pest control represent an alternative to the chemical control. One of the most effective methods of the pest control applied in the last time is based on the using of the bio-fungi

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preparations based on the entomopathogenic fungus *Beauveria bassiana*. They act on the insect populations, belonging to various orders: Coleoptera (Liuel Bauer, 2008), Homoptere (Dara et al., 2007), and hemiptere (McGuire et Leland, 2006).

The production of the *Beauveria bassiana* stable conidia, with high stability and viability over time can be achieved by the application of the fermentation technology in difazic system: liquid-solid, in 1/1 ratio. This system consisits in the mixing of a suspension of blastospores in the liquid medium with a solid nutritional substrate.

The solid phase represents the support for the development of aerial conidia. The conidia produced by the fungus in this way can be directly used in the form of suspension or like apores powder obtained after filtration and drying .

This study aimed to establish a method that can ensure the production of *Beauveria bassiana* fungal biomass with high virulence in order to be used to perform the treatments in the vineyards.

MATERIAL AND METHOD

For the production of the fungal biomass, the technique of fermentation in difazic system: liquid-solid, developed within the LUBILOSA project was used (Lutte Biologique contre les Locustes et Sauteriaux, Lomer et al., 1997).

The scheme of the experiment is presented in Figure 1.

A liquid conditioned bio-product of *Beauveria bassiana* Bb01 (micelles and blastospori) was used in the experiment. The bio-product was in the active growth phase, on the medium having the following composition: lactose (20 g), peptone (20 g), crumbled *Tenebrio molitor* (0.5 g), sterile distilled water (1000 ml).

The bio-product has been obtained by The Research and Development Institute for Plant Protection, Bucharest and was maintained by repeated subcultivation every three months, in the sporulated form in the germplasm collection of The Reserch and Development Institute for Viticulture and Enology, Valea Calugareasca, on Potato Dextrose Agar medium, at 4°C.

The reactivation of the bio-product was achieved by the cultivation on Potato Dextrose Agar medium until a purity of 100% was achieved.

Four solid substrates: barley (a1), rice (a2), broken maize (a3) and wheat (a4). were used in the experiment. 250 g of each substrate were distributed into special bags and in Erlenmayer of 1000 ml. The rice was boiled gently until the beans became soft. The barley, broken maize and the wheat were wetted with sterile distilled water. The solid substrates were then sterilized by autoclaving at 121°C and 1 atm, for 30 minutes.

Three replicate were carried out for each treatment. The bags and Erlenmayer vessels containing the solid substrates were inoculated with a suspension of *Beauveria bassiana* (liquid phase) (ratio 1:1), were then shaken and incubated in a thermostat at a temperature of 25°C for the development of the fungal hyphae.

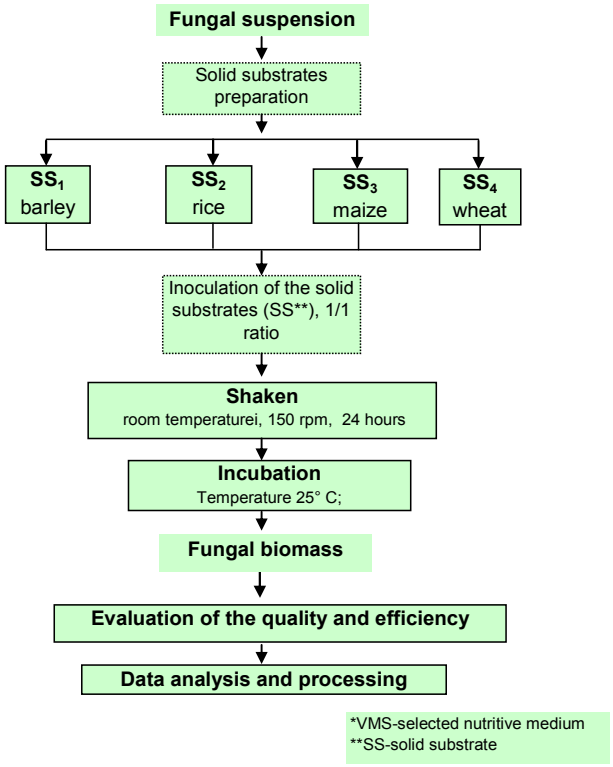


Fig. 1 - The scheme of the experiment

After 15 days of culturing, the substrates were aerated by the removing the plugs of wool, respectively by the opening of the the bags in order to stimulate the sporulation. The harvest of the spores developed in the liquid medium was performed after 22 days of culturing of the fungal suspension by the filtration of the fungal suspension through a piece of lint in order to retained and remove the micelles.

The selectivity of the conditioned bio-product of *Beauveria bassiana*, in the liquid form related to the nutritive substrate was determined on the basis of the following observations and measurements:

- the vegetative growth rate
- the ability for colonization
- the viability
- the insecticide titer (virulence)

The vegetative growth rate was determined by the analysis of the capacity of the growth of fungal mycelium per unit time, respectively 24 hours.

The colonization ability was established by the determination of the time required for the fungal mycelium to cover a certain amount of nutrient substrate - 100 grains in the case of the barley, rice and wheat substrates, and 100 g for broken maize.

The conidiogenesis represent the number of the conidia which was developed in a millilitre of the fungal suspension and was established by the decimal dilutions method. The determinations were made after 7, 12, 17 and 22 days of culturing.

The viability was determined by analyzing the percentage of the germination capacity of conidia by the method developed by Inglis et al., 1993.

The titer insecticide (virulence) was determined in the laboratory conditions on the larvae of phylloxera radicicola. The lethal concentration (DL_{50} – the dose which determine the lethal effect for 50% of the larvae tested) and the lethal time (TL_{50}) were determined.

The testing was performed by using the fungal suspensions with different concentrations of conidia: 0 ; 1 x 10^2 ; 1 x 10^4 ; 1 x 10^6 ; 1 x 10^8 ; 1 x 10^9 which were used for the treatment of 20 larvae of phylloxera galicola. After 2 hours of treatment, the larvae were placed on the growth medium. During 7 days, the observations regarding the larval mortality were made. For each concentration three repetitions were made. The experience was of monofactorial type. The results were statistically processed by analysis of variance based on the „XLSTAT" programme.

RESULTS AND DISCUSSIONS

The solid culture substrate significantly influenced the capacity of fungal mycelium to growth. There were very significant differences, in the positive way in case of the variant with wheat, the daily mycelium groth rate being 0.69 cm/day. The worst evolution has been observed in case of the utilization of the broken maize as a substrate, with a daily rate of the mycelium of 0.07 cm/day. The other two variants, respectively barley and rice culture, have determined a similar evolution in the development of the mycelium with an average capacity of growh of 0.31 and 0.35 cm, respectivelly.

The fungal strain showed the best ability to populate the solid substrate on wheat (100 grains were covered by the fungal mycelium on the average 19.33 hours) and barley (the full coverage of the grains lasted on average 27 hours), the differences being very significant in comparison with the media values of the observations. The lowest capacity of colonization (an average of 113.33 hours) was observed on the broken maize substrate (table 1).

Table 1

Influence of the substrate on the colonization ability of the fungal strain

Variant	The time required to cover 100 grains (hours), (average)	D +/-	Signification
a_1 - barley	27,00	-20,92	B
a_2 - rice	32,00	-15,92	b
a_3 – broken maize	113,33	65,41	A
a_4- wheat	19,33	-28,59	B
Average	47,92	0,00	
Control	47,92	0,00	
DL 5% = 8.45; DL 1.0 % = 12.80; DL 0.1 % = 20.57			

A, B: $p<0.01$; a, b: $p<0.05$ indicate the significance of the comparison in the same row

The observations concerning the number of conidia developed in one millilitre of fungal suspension after 22 days of culturing revealed the very significant differences in the positive way for the wheat variant, and in a negative way for rice and broken maize variants (Table 2, Figure 2).

Table 2

Influence of the substrate on the conidiogenesis

Variant	Conidia number x 10^9 (average)	D +/-	Signification
a_1 - barley	7,60	0,90	
a_2 - rice	4,90	-1,80	B
a_3 - broken maize	1,63	-5,07	B
a_4 - wheat	12,95	6,25	A
Average	6,70	0,00	
Control	6,70	0,00	
DL 5% = 0.66; DL 1.0 % = 1.00; DL 0.1 % = 1.60			

A, B: $p<0.01$; a, b: $p<0.05$ indicate the significance of the comparison in the same row

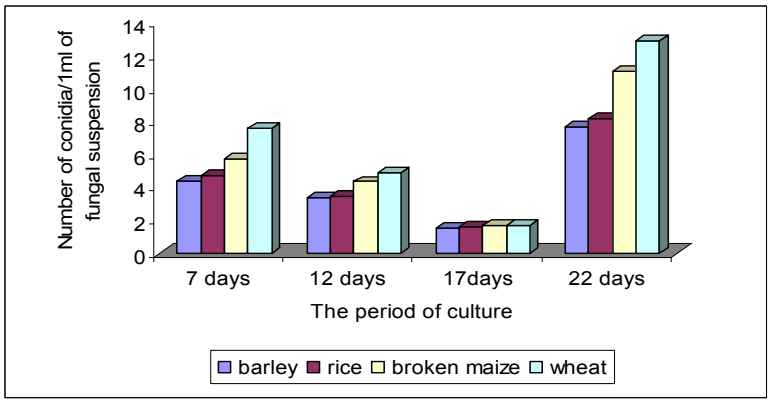


Fig. 2 - The dynamic of the conidiogenesis

The culture of the fungal suspension on wheat substrate has determined the best score of the spore viability (95%). The lethal concentration (DL_{50}) of the strain developed on the wheat (the best variant) was $7.0x10^6$ conidia/ml and the lethal time (TL_{50}) was 5 days. DL_{50} has the value of $5x10^8$ for barley and rice. For the broken maize a value greater than $5x10^8$ was registered (Figure 3).

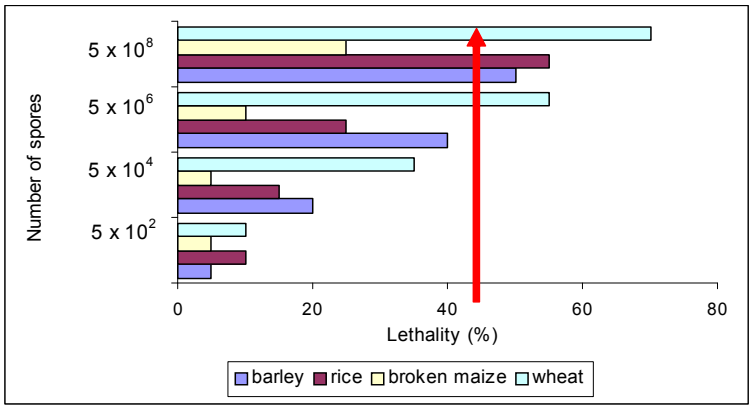


Fig. 3 - The lethal concentration of the strain depending on the nature of the solid substrate

CONCLUSIONS

1. The solid culture substrate significantly influenced the capacity of fungal mycelium to growth, the conidiogenesis and the viability of the spores.

2. The best results were obtained on the solid substrate represented by wheat, which was selected for the obtaining of the fungal biomass. The worst evolution has been observed in case of the utilization of the broken maize as a substrate.

3. The selected culture difazic system will be further applied in order to ensure a sufficient quantity of spores which will be used for the bio-fungi preparation that will be applied in the vineyard.

Acknowledgments: *This study was conducted during the program of doctoral studies, financed through POSDRU/107/1.5/S/76888 project.*

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SOIL BIOTA QUALITY IMPROVEMENT BY INTRODUCING INTO THE CROP ROTATION OF LEGUME-CEREAL GRASS MIXTURES

ÎMBUNĂTĂȚIREA CALITĂȚII BIOTEI SOLULUI PRIN INTRODUCEREA ÎN ROTAȚIE A AMESTECURILOR DE IERBURI LEGUMINOASE ŞI GRAMINEE

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Abstract. *The effective restoration of biota in degraded arable chernozems occurs as a result of the multiannual grasses application. The use of alfalfa and ryegrass mixture during 3-5 years helps to restore the natural soil biota activity at the expense of exudates contribution in soil and roots of perennial crop residues. This procedure has favored the revival of population of invertebrates and microorganisms. The number of invertebrates on average was 2.5 times higher compared with the control, total biomass - by 1.6 times. This method is especially effective to restore the Lumbricidae family. Their number increased by 3.0 and biomass by 2.0 times. Invertebrates' diversity has improved. The microbial biomass content and dehydrogenase activity in the 0-25 cm layer were increased in average by 1.4 times. Perennial grass mixtures can be used in rows of perennial fruit crops for the biota's restoration in degraded soils.*
Key words: *soil biota, perennial grasses, restoration*

Rezumat. *Restabilirea efectivă a numărului şi biomasei biotei cernoziomurilor arabile degradate are loc în rezultatul înţelenirii cu ierburi multianuale. Utilizarea amestecului de lucerna+raigras timp de 3-5 ani contribuie la restabilirea naturală al activităţii biotei solului din contul aportului în sol al exudatului rădăcinilor şi resturilor vegetale al plantelor multianuale. Acest procedeu a favorizat renaşterea populaţiei de nevertebrate şi microorganisme. Numărul nevertebratelor în medie a fost de 2,5 ori mai mare comparativ cu martorul, biomasa totală – de 1,6 ori. Această metodă este deosebit de efectivă pentru restabilirea fam. Lumbricidae. Numărul lor se măreşte de 3,0 ori, iar biomasa – de 2,0 ori. Diversitatea nevertebratelor s-a îmbunătăţit semnificativ. Conţinutul biomasei microbiene şi activitatea dehidrogenazei în stratul 0-25 cm s-a majorat în medie de 1,4 ori. Amestecurile de graminee perene pot fi folosite în rândurile culturilor pomicole multianuale pentru restaurarea biotei în solurile degradate.*
Cuvinte cheie: *biota solului, graminee perene, restabilire*

INTRODUCTION

Soil biota plays an important role in the generation of soil ecosystem services and land productivity (Lavelle et al., 2006; Barrios, 2007). Soil invertebrates and microorganisms provide intermediate services in the agriculture, supply

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nutrients to plant (Fragoso et al., 1997), maintain the soil structure, improve the water infiltration, and participate in the soil organic matter decomposition (Swift et al., 2004; Barrios, 2007). Indices of the soil biota are the global indicators of soil quality and sustainability of ecosystems. The preservation of soil ecosystem services depends upon the preservation of soil biota. This may be achieved by using of environmentally friendly agricultural technologies based on the utilization of perennial grasses.

The purpose of this research was to determine the influence of the perennial legume-cereal grass mixtures cultivation on the biota's recovery process in chernozems degraded as the result of the long-term agricultural utilization.

MATERIAL AND METHOD

Experimental sites. The soil biota has been tested in two experimental sites located in different zones of the Republic of Moldova.

The first site was located in the center of the country, in the Ivancha village, Orhei region. The long-term arable soil with crop rotation without fertilizers (control), and grass mixtures (ryegrass+lucerne and ryegrass+sainfoin) cultivation were tested. Plots under mixtures of perennial grasses (ryegrass+lucerne) were founded in the autumn of 2007. The mixture of ryegrass+sainfoin was seeded in the autumn of 2010.

The soil is the leached chernozem with humus content of 3.43 % and pH = 6.6 in the 0-25 cm layer.

The second site was located in the southern zone, in the Tartaul de Salchie village, Cahul region. These were plots with long-term arable (control) and mixture of ryegrass and lucerne and mixture of ryegrass and sainfoin. Plots under mixtures of perennial grasses (ryegrass+lucerne and ryegrass+sainfoin) were founded in the spring of 2010.

The soil is the ordinary chernozem with humus content of 3.16 % and pH = 7.1 in the 0-25 cm layer (Cerbari et al., 2012).

Soil samples were collected from the 0-25 cm layer of the experimental plots during 2010-2012 years.

Status of invertebrates. The state of invertebrates was identified from test cuts by manually sampling the soil layers to the depth of soil fauna occurrence (Gilyarov and Striganova, 1987). The identification of invertebrate's diversity at the level of families was carried out with the implementation of Gilyarov and Striganova's method (1987).

Microbiological properties. The microbial biomass carbon was measured by the rehydratation method based on the difference between carbon extracted with 0.5 M K_2SO_4 from fresh soil samples and from soil dried at 65-70^oC for 24h, with Kc coefficient of 0.25 (Blagodatsky et al., 1987). K_2SO_4 - extractable carbon concentrations in the dried and fresh soil samples were measured simultaneously by dichromate oxidation; K_2SO_4-extractable carbon was determined at 590 nm spectrophotometrically.

Enzymatic activity. The (potential) dehydrogenase activity was determined by the colorimetric technique on the basis of triphenylformazan (TPF) presence from TTC (2, 3, 5-triphenyltetrazolium chloride) added to air-dry basis of soil (Haziev, 2005).

The biological indices were evaluated statistically using the variation analysis. Statistical parameters of the state of soil invertebrates were calculated taking into account the depth of soil fauna occurrence, parameters of the microbial biomass and dehydrogenase activity – for the layer of 0-25 cm.

RESULTS AND DISCUSSIONS

The application of perennial legume-cereal grass mixtures led to the restoration of the total number of invertebrates and the *Lumbricidae* family (Table 1; Figure 1, 2). The post-restoration recovery of the invertebrate community is slow. The biomass of populations under grass mixture (1-2 year-old) was smaller than those under traditional arable management, but the number of invertebrates sometimes was significant. This demonstrates the reproduction of young invertebrates' populations and the occurrence of the initial stage of successional changes.

Table 1

Statistical parameters of invertebrates in the leached chernozem in conditions of the land management with perennial grasses

Index	Unit measure	$\bar{x}$	S^2	V, %	$S_{\bar{x}}$	Confidence intervals, $p \le 0.05$	n
Control (arable)							
Number of invertebrates	ex m^{-2}	55.0	966.18	56.5	8.98	35.2-74.8	12
Number of *Lumbricidae* family		38.0	781.09	73.6	8.07	20.2-55.8	12
Biomass of invertebrates	g m^{-2}	13.3	235.43	115.4	4.43	3.5-23.1	12
Biomass of *Lumbricidae* family		8.3	197.34	169.3	4.06	0-17.2	12
Ryegrass+lucerne (3-5 year-old)							
Number of invertebrates	ex m^{-2}	136.4	2227.38	34.6	14.92	102.7-170.1	10
Number of *Lumbricidae* famil		112.4	1722.49	36.9	13.12	82.7-142.1	10
Biomass of invertebrates	g m^{-2}	21.0	142.08	56.8	3.77	12.5-29.5	10
Biomass of *Lumbricidae* family		16.8	126.33	66.9	3.55	8.8-24.8	10
Ryegrass+sainfoin (1-2 year-old)							
Number of invertebrates	ex m^{-2}	80.0	3814.40	77.2	25.21	15.2-144.8	6
Number of *Lumbricidae* family		64.0	3104.00	87.1	22.75	5.5-122.5	6
Biomass of invertebrates, g m^{-2}	g m^{-2}	4.2	7.41	64.8	1.11	1.4-7.1	6
Biomass of *Lumbricidae* family		3.4	7.41	80.1	1.11	0.6-6.3	6

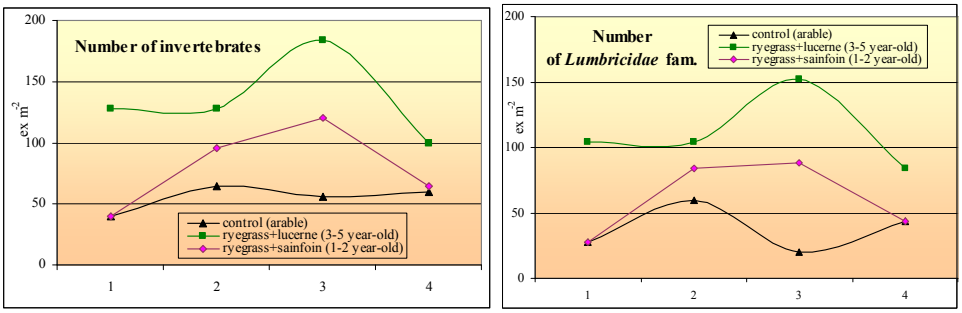


Fig. 1 - Dynamics of invertebrates and *Lumbricidae* family in the leached chernozem by the perennial grasses' application:
1 – 12.05.2010; 2 – 25.05.2011; 3 – 13.09.2011; 4 –14.06.2012

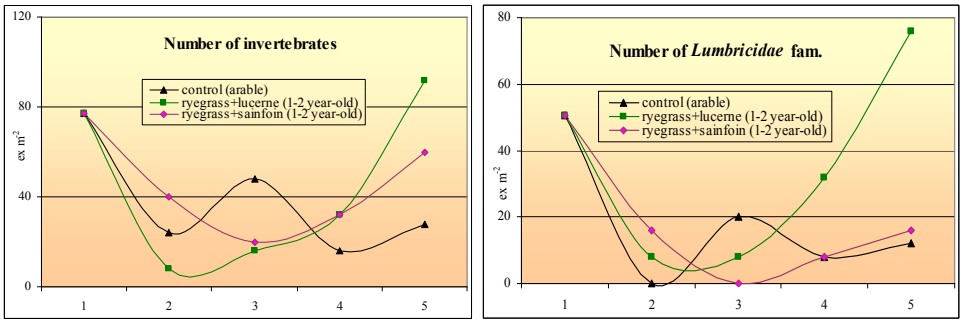


Fig. 2 - dynamics of invertebrates and *Lumbricidae* family in the ordinary chernozem by the perennial grasses' application:
1 – 23.04.2010; 2 – 24.06.2010; 3 – 17-18.05.2011; 4 – 20.09.2011; 5 – 24.04.2012

Statistically significant growth of zoological indicators has been registered after the third year of investigations on plots with grass mixtures of ryegrass and lucerne. The number of invertebrates on average was 2.5 times higher compared with the control plot, the total biomass – 1.6 times respectively. This method is especially effective for restoring the *Lumbricidae* family. Earthworm populations in the grass cultivation by ryegrass and lucerne during 3-5 years were significantly larger than those in the arable management, both in terms of earthworm abundance and biomass. Their number in the leached chernozem increased by 3.0 and biomass – by 2.0 times. The population growth over 5 years constitutes 74.4 ex m^{-2} (744.000 ex ha^{-1}) or 14.9 ex m^{-2} (149.000 ex ha^{-1}) annually.

The diversity of invertebrates was different depending on the agricultural management. The grass cultivated soil is characterized by a greater diversity of invertebrates. In addition to the *Lumbricidae* family, species of the *Formicidae, Gloremidae, Scarabaeidae, Elateridae, Geophilidae, Araneae, Coccinelidae* and *Carabidae* families were found. *Lumbricus terrestris* and *Allolobophora terrestris* species are the most typical representatives of the *Lumbricidae* family in the chernozem under perennial grasses. The abundant presence of the *Formicidae*

family representatives is observed. In general, the soil under grass mixture with ryegrass and lucerne contains 5-6 families of invertebrates, while the soil under arable only 2-4 families of edaphic fauna.

The use of phytorestoration procedures with legume-cereal grass mixtures creates advantageous conditions for the existence and functioning of autochthonous microorganisms and activates the internal reserves of microbiological systems of degraded soils. Microbial biomass in chernozems increases significantly from 216.2-275.8 to 262.7-388.3 μg C g^{-1} soil according to the average data (Table 2). The maximum values have been registered in the leached chernozem with the application of the mixture of ryegrass and lucerne grass mixtures during 3-5 years.

Table 2

Microbial biomass (μg C g^{-1} soil**) in the long-arable chernozems in conditions of the land management with perennial grasses**

Variant	$\bar{x}$	S^2	V, %	$S_{\bar{x}}$	Confidence intervals, P ≤ 0.05	n
Leached chernozem						
Control (arable)	275.8	4793.92	25.1	19.99	213.8-319.8	12
Ryegrass+Lucerne (3-5 year-old)	388.3	12681.43	29.0	32.51	316.8-459.8	12
Ryegrass+sainfoin (1-2 year-old)	279.3	2601.88	18.3	17.00	237.0-318.6	9
Ordinary chernozem						
Control (arable)	216.2	851.00	13.5	4.84	205.8-226.6	15
Ryegrass+lucerne (1-2 year-old)	262.7	3758.50	23.3	15.83	228.7-296.7	15
Ryegrass+sainfoin (1-2 year-old)	282.7	3801.01	21.8	15.92	248.5-316.9	15

Table 3

DEHYDROGENASE ACTIVITY (mg TPF $10g^{-1}$soil $24h^{-1}$**) IN THE LONG-ARABLE CHERNOZEMS IN CONDITIONS OF THE LAND MANAGEMENT WITH PERENNIAL GRASSES**

Variant	$\bar{x}$	S^2	V, %	$S_{\bar{x}}$	Confidence intervals, P ≤ 0.05	n
Leached chernozem						
Control (arable)	1.13	0.07	23.1	0.29	0.49-1.77	12
Ryegrass+lucerne (3-5 year-old)	1.58	0.09	18.5	0.09	1.38-1.78	12
Ryegrass+sainfoin (1-2 year-old)	1.29	0.17	31.5	0.14	0.97-1.61	9
Ordinary chernozem						
Control (arable)	1.49	0.20	29.7	0.26	0.93-2.05	15
Ryegrass+Lucerne (1-2 year-old)	2.03	0.27	25.6	0.13	1.75-2.31	15
Ryegrass+sainfoin (1-2 year-old)	1.94	0.22	24.4	0.12	1.68-2.20	15

The use of the mixture of perennial grasses had a stimulating effect regarding to the dehydrogenase in both soils (Table 3). Dehydrogenase activity

increased on average by 1.4 times in the conditions of the ryegrass and lucerne mixture application. The cultivation of ryegrass and sainfoin mixture led to the stimulation of the dehydrogenase activity in the leached chernozem by 14%, in the ordinary chernozem – by 30% respectively.

CONCLUSIONS

1. The effective restoration of the biota in degraded arable chernozems occurs as a result of the cultivation of perennial grasses. Perennial grass mixtures can be used both in arable soils and in rows of perennial fruit crops to create oases and migration corridors for the soil biota.

2. The restoration of the lost components of the soil biota in the long-term arable chernozems is a long process. The reproduction of young populations of invertebrates in conditions of the use of perennial grasses during 1-2 years testifies the initial phase of the biota's succession.

3. The use of the mixture of ryegrass and lucerne during 3-5 years has resulted to the growth of the number of invertebrates and *Lumbricidae* family by 2.5 and 3.0, their biomass – by 1.6-2.0 times in comparison with the traditional arable management. Invertebrates' diversity has improved, the number of invertebrates' families increased from 2-4 to 5-6. The microbial biomass content and dehydrogenase activity in the 0-25 cm layer increase in average by 1.4 times. The microbial biomass accumulates in the soil in amounts of 132.5 kg ha^{-1} annually. The annual population growth of earthworms reaches of 14.9 ex m^{-2}.

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THE GARDEN IN THE EVOLUTION OF MOLDAVIAN MANORS

GRĂDINA ÎN EVOLUȚIA CURȚII BOIEREȘTI DIN ZONA MOLDOVEI

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Abstract: *The challenging theme of Moldavian manor houses is paradoxically almost untouched in the research of Romanian architectural history. In remote places, on forgotten roads, in villages less connected with the advantages of the civilized world and almost hidden, one can find most of the Moldavian manor houses. The beauty of the landscape they inhabit contrasts in most cases to the stark image of the actual run-down or perished manor houses. Between these relics, often fated to extinction due to systematic demolition or facing devastating unseasonable interventions and ignorance, one can find exceptions of very high value, which include both the building and the exterior arrangements – the estate parks. Along with the architecture style, these parks prove the cultural synchronicity of the Moldavian aristocrats with the European civilization.*
Keywords: *Moldova manor houses, architectural heritage, landscape design*

Rezumat: *Subiectul de real interes al curților boiereşti de pe teritoriul Moldovei a rămas în mod paradoxal aproape neatins în cercetarea istoriei arhitecturii româneşti. Majoritatea reşedințelor boiereşti din Moldova se găsesc în locuri retrase, pe drumuri uitate, ascunse în sate care par rupte de civilizația contemporană. Pitorescul peisajelor naturale înconjurătoare apare adesea în contrast cu imaginea dezolantă a conacelor devastate sau complet dispărute. Multe din aceste vestigii au fost condamnate la dispariție prin demantelare efectivă sau prin intervenții devastatoare prin prost gust şi ignoranță. Există însă şi fericite excepții în care se păstrează atât edificiul istoric, cât şi fragmente de amenajări exterioare, şi anume din parcurile marilor domenii. Pe lângă stilul arhitectural al clădirilor, acestea reprezintă o dovadă a sincronismului cultural al boierilor din Moldova cu civilizația europeană a epocii.*
Cuvinte cheie: *conace boiereşt imoldovenești, patrimoniu arhitectural, design peisager*

INTRODUCTION

Between the 18th century and the beginning of the 20th century, on the Moldavian territory there were built many boyar dwellings with manors, additional buildings and gardens, ensembles of historical, architectural and landscape design significance. Due to the political changes of the communist period and the poor preoccupation for the heritage which followed,many of these buildings were inadequately changed, deserted or even destroyed. The danger of the complete loss of this cultural heritage imposes some studies that would

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analyse the value of such ensembles and prove the importance of their preservation.

MATERIAL AND METHOD

The study is based on the sketches left from different periods and the written documents (travel notes made by European personalities, writings by Romanian authors, history and genealogy works, architectural history works, archive documents, monographs) on field research of 23 boyar manors in Moldavia from the 18th century to the beginning of the 20th century.

RESULTS AND DISCUSSIONS

The study highlights two categories of boyar manors, differentiated by the specific of their layout, according to the building period.

A. Archaic-medieval manors, built between the 18th century and the first half of the 19th century;

B. Modern-type manors, which were built starting from the second part of the 19th century, more precisely during the regulation period, until the beginning of the 20th century.

Archaic manors

The descriptions made for the buildings from that period show that the aesthetic aspect was of no particular concern. According toEfrosinaRoset's memoirs, written by her grandson, RaduRosetti, the Bohotin estate, in Raducaneni had a"poor and sad yard, with no plants around it".

General Langeron, a guest in the Moldavian manors at the end of the 18th century describes the same austere image: „Theboyars made stone houses and the yard «is very large, but little adorned »."(Iorga, 1981)

The organisation was mainly of a practical character, probably due to the insecure times which did not leave the necessary free time to take care of the aesthetic part.

"The aspect on the whole is rather severe, less daring, an expression of the times which in spite of all their artistic preoccupations were rather tough" (Cantacuzino, 1977)

"The usual boyar dwellings organised a working environment with vegetable gardens, fruit trees, buildings for the numerous staff, yards and stables. I can imagine such a dwelling looking more like a patriarchal farm rather than a park. Maybe the house was surrounded by flowers, the orchard must have been looked after, the walking paths cleaned, but all these do not imply the art of gardening." (Cantacuzino, 1977)

Radu Rosetti remembers that the park from the Raducaneni manor was arranged only after the times had settled down.

Having placed the house on the outskirt of the whole estate, the living room having a view on the orchard compensated the owners for the lack of an aesthetic form of the garden.

Modern-type manors

During the 19th century the boyar estates went through a series of changes as a result of the modernisation taking place on the whole of the Moldavian society as it had opened up to the west European civilization. An important change in the precinct from this period is the design of gardens and parks inside the estates.

The first information about the parks designed in the Moldavian boyar estates date from the 18th century when the princes coming from Constantinople brought along the fashion of the gardens, so precious for the rich dwellings in the Ottoman Empire.

Prince de Ligne said about the gardens from the end of the 18th century: „«ç'étaient de beaux jardinsr omantiques», while G. M. Cantacuzino, who quoted him, added: "probably the gardens were designed following the eastern model, with abundant vegetation, pavilions lost at the back of the paths, ponds with heavy boats floating. Maybe a ceramic statue was coming out of the bushes, a wooden bridge lay above running water and marble vases brought from Italy added a western hue to our civilization of kaftans and Turkish pipes." (Cantacuzino, 1977)

Nevertheless, the boyar gardens from Moldavia were mostly similar to those from the 18th century in Bohotin,"poor and sad, with no green parts around it".When the second wife of hetman RăducanuRoset,"a young lady from Tsarigrad", „[...] raised inFanar, namely one of the most refined places in the world", was in charge she promised that she would not live there unless "a garden had been planted there to cheer up the view" (Cantacuzino, 1977).

Apart from this fashion from Tsarigrad, practiced by the people who had been raised there, towards the half of the 19th century, the design and layout of gardens and parks after the western model became a habit.Once the *arhitecton* change the face of the manors, the boyars would also bring gardeners from the Austrian Empire to look after the parks.

„Digging beautiful gardens [...] dates from the regulation period, it was the work of a few talented German gardeners who replaced the orchards and meadows that used to surround the boyar yards" (Cantacuzino, 1977).

„There was hired a German gardener who planned and dug and planted around the yard, towards the east, a small but too beautiful garden *à la française*, including a nice fountain with running water. This garden seemed very soon much too small for grandmother. After 1830, when the surroundings got quieter, the western wall was brought down and there were laid the bases for an English garden and there was built a large flower house to host a great number of trees and other plants brought by grandmother from abroad." (Cantacuzino, 1977).

The parks from Răducănenileft only a drawing (Ion, 2007) of the garden in front of the manor which was built at the half of the 19th century by Lascarache Rosetti, son of hetman Răducanu Roset, and today some trees from the old plantation are still present.

The first information from Miclauseni regarding the layout of the park is related to the works done by Dimitrie Sturdza, who brought ”famous gardeners from Austria” especially to look after the park at the beginning of the 19th century (Ion, 2007).

His son, Alexandru Sturdza Miclăuşanul (1803-1845) arranged a park in the English style at Miclauseni, „with a lake, an island and a tower surrounded by a wall” (Ion, 2007) and today there can still be seen a small part of it from the entrance towards the motorway. He also „widened the flower alleys, planted ornamental trees and by dismantling the peasant houses around the manor and the church, created the frame of a charming park” (Merişca, 1996).

Once the gothic palace was built, at the end of the 19th century, George Sturdza also rearranged the park which had reached the impressive area of 30 hectares. A photograph without a date (Ion, 2007), before the second world war catches the image of the garden in front of the main entrance, with palm trees and other exotic plants, proving once again the trend favouring this kind of vegetation during that time.

The estate from Ruginoasawas also surrounded by a huge park of 27 hectares. Going by the fashion, the Sturdzafamily hired a German gardener called Mehler who led the works of rearranging the park, designed wide paths and brought exotic plants, like the ones from Miclauseni and Răducăneni. The park was devastated after the warand all the trees were cut. The present design was conceived during the restoration works from 1978.

There are visible signs from the manors in Deleni, Popeşti (fig.1), Maxut (fig. 2), Miroslava and Ţibăneşti proving the layout of the former parks. There are kept some ruins of the basins and fountains, traces of the old paths that followed a geometric pattern which can be noticed on the ground. Many of the gardens under study have kept even today part of the tree vegetation, an element which gives the particularity of the place, making it visible from a great distance, due to the presence of decorative trees such as fir trees, pine trees, chest nuts and linden trees.

There are manors which lack any trace of vegetation whatsoever, although it had been sketched on thesurvey plans from 1975, such as Budeşti, Corneşti, Grieşti, HărpăşeştiandScheia. The poet DimitrieAnghel makes a note about the garden from Corneşti, which inspired many of his poems: ”I chose the world of the flowers since it was in their world that I had spent my childhood. I could remember the wonderful garden where I stayed, the sound of the running water, the rustle of the trees, that waste of petals that were endlessly spread by the wind.” (Anghel, 1998).



Fig. 1 - Popesti Manor house Plan of the park and detail of former water fountain



Fig. 2 - Maxut Manor House – image of the actual park

During the 19th century, starting especially from the regulation period, the aspect of the precincts was changed, the aesthetic quality and the representative function of the garden became a priority. This new vision led to rigorous organization of the space. From that moment on, the widest surface was occupied by an English-style park, where the trees and bushes were mostly planted following a free-style design. It often surrounded the manor on several sides. In front of the main entrance there was usually designed a French garden, with symmetrical and geometrical beds of low vegetation, exotic flowers and bushes. The area of the workshops and warehouses was still kept in groups buton one side of the manor, as in the case of Dagâța, Hărpăşeşti, Miclăuşeni and Popeşti. The service area and the dwellings of the staff were organized in an additional building, built during that time, as it happened for Cozia, Dagâța, Maxut and Popeşti. In Cozia and Vânători, the additional building area is behind the manor, opposite the main entrance whereas in Deleni, Maxut and Scheia, the service yard was kept in front of the house, the aspect being enhanced by flower beds.

Among the estates under study, the parks from Cozia, Maxut, Miclăuşeni and Miroslava are continued by small forests situated close by.

Obviously, many of these yards were drawn in medieval times, at the shade of the forests which covered the Moldavian hills at the time, but when the boyars turned from warriors into workers, the nature around the dwellings was changed

and the parks appeared as a sign of evolution from the status of camouflage to an object of aesthetic contemplation.

CONCLUSIONS

The analysis of the old boyar yards spread along the Moldavian territory is a complex and rather difficult endeavour due to the fact that the information sources are dispersed and many of the estates are in decay. The study clearly shows that there was a general concern for the design of parks of real aesthetic value on the boyar estates. These parks represent a heritage in itself, a valuable heritage which should be kept and restored.

The analysis of the boyar estates proves beyond doubttheir value, a historical, architectural, landscape design value, clearly ranking the civilization of their époque in the same context of the European values from that time.

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LANDSCAPING THE EASTERN ORTHODOX ECCLESIASTICAL SPACE: NATION'S CATHEDRAL BUCHAREST (CONTEST PROPOSAL) AND METROPOLITAN CATHEDRAL IASI

PEISAGIZAREA SPAȚIULUI ECLEZIASTIC ORTODOX: CATEDRALA MÂNTUIRII NEAMULUI BUCUREŞTI (PROPUNERE DE CONCURS) ŞI ANSAMBLUL CATEDRALEI MITROPOLITANE DIN IAŞI

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Abstract. *One of the particularities ragrding Orthodoxy is that it preserves the tradition defined by the seven Holy Councils, in doctrine and in the spacial organization. Today, working properly with these special spaces, it can become quite a challenge, as we all can imagine. In this paper we focus on two examples, both personal works, attempts of reconciliating nature with architecture. At The Nation's Cathedral (contest proposal) in Bucharest, the landscaping concept was to transpose the physical Cathedral into a metaphysical one (The Church in the Nature - a controversal theological attempt). The other project, at Iaşi Metropolitan Assembly, a milestone both in the history and in the city silhouette, attempts to correct certain deficiencies in the current landscape language trough interventions especially on vegetal composition. Well received by the beneficiary, through implementation, this project may become a first step to a well deserved urban reconsideration of the Iaşi city center.*
Key words: *Spiritual becoming, Church, Eastern christianity, Ecclesiastic space, Landscaping, Church in Nature*

Rezumat. *Ortodoxia a păstrat nealterată tradiția aşa cum a fost ea definită de cele şapte Sinoade, nu numai în dogmă ci şi în organizarea spațiului sacru bizantin. Să lucrezi în ziua de azi cu un astfel de spațiu extrem de special poate fi o importantă provocare, după cum ne putem închipui. Cele două exemple încercă o împăcare a naturii cu obiectul de arhitectură. Catedrala propusă pe Dealul Arsenalului. are un concept de peisagizare pornind de la transpunerea biseriicii în natură, o imagine răsturnată a noii Catedrale. Ansamblul Mitropolitan din Iaşi este un reper atât în istoria cât şi în silueta oraşului. Proiectul încearcă să corecteze anumite deficiențe ale limbajului peisagistic actual prin intervenții mai ales asupra compoziției vegetale dar şi la nivelul celei minerale. Bine primit de beneficiar, prin implementare, acest proiect poate constitui un prim pas către o mult meritată reconsiderarea a spațiului urban din centrul Municipiului Iaşi.*
Cuvinte cheie: *Devenire spirituală, Biserică, Ortodoxie, Spațiu ecleziastic, Peisaj, Peisagizare*

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INTRODUCTION

Orthodoxy insisted on a space that was defined by the seven Holy Councils. Thus, The Church is an interface between the sacred and the profane, a complex relationship containing aesthetic experiences, customary practices and rational solutions. Deciphering this informational maze is made thru FAITH. The strong symbol of The Holy Trinity has a profane correspondance in the perception of the ecclesiastical space: expression as a purpose, constructive system as a mean and form as an intrinsic connection between the first two. The desideratum both in architecture and, possibly in the landscaping of sacred space is to transcend the rational structuralist spatiality into mystical architecture.

The Byzantine sacred space is divided for centuries by its immutability itself in the same canonical matrix. This body of laws leads to the special usage of the interior space and light. Predilection for the interiority will gradually acquire an exterior correspondent. The church is a miniature universe, obtained through **dematerialization.** The reduction of masses: the massive Greek architrave accommodates the full arch, both internally and externally.

The expressivity was expanded by polishing or traforation. Size was also potentiated: the rectangular plan and columns emphasize building's length, the gradually ascending of the roof on ships amplifies the sensation of height Unfiltered light penetrates through small holes in the wall or the glazed drum of the dome producing scenic effects which lead to religious excitement. The principle of ascending levels is figured in architecture by the in stair-progression of structural elements that make a church / cathedral: butant arch – aisle's hemisphere - dom. Church rooms are designed by the same symbolical algorithm (Ciolacu and Budescu, 2011).

MATERIAL AND METHOD

These projects are pioneers in terms of landscaping the ecclesiastical urban spaces in our country. Leaving the fear for outside space, it promotes the uninterrupted call for symbol. The junction between architecture, landscape and theology creates for the instructed consumer a digestible language that Bible enriches it with various signs and symbols. The resulting symbolistic network has the main decryption in the **spiritual becoming trough Church**.

The utopian model is represented by the Garden of Eden, a symbol of eternity, of Paradise. It is not a geographical place, but rather a symbol of God's original approach to man and in the same time, the place of committing the original sin. This symbol of approaching the Deity can be revived and may become subject of contemplation, reflection and meditation to park visitors. But gestures must be extremely well calculated, because all layers of landscaped space present a paramount importance in creating the desired atmosphere.

The usage of natural building materials is mandatory: stone, wood, glass, iron/metal. Vegetation should coonserve the note of solemnity, the choice of species not beeing easy. The relationship with architecture must also be carefully studied.

RESULTS AND DISCUSSION

The title proposes two concepts and not without courage it joins them. We're talking about *landscaping* and *ecclesiastical space*. An attempt to define these concepts proves more difficult than we originally thought. Analyzed historical, Byzantine ecclesiastical space had a centripetal development, with overwhelming introversion, leading sometimes to the neglection of the exterior. Analyzed theological, this space has a binary nature (see St. Maximus the Confessor): *Cosmos* and *Soul*. The Holy Church is the model and the image of the world, composed of visible and invisible essences into a unity and diversity of binary sequence. St. Maximus finds an inexhaustible variety of multivalent meanings in the sacred space through analog or interpretation of scripture, postulated by the holy fathers. We can now walk outside the Church in its proximity and quit the millennial fear for outdoors. Here occurs the junction with the second concept. Landscaping is the complex process of *in situ* transforming an area, by equipping it with aesthetic and philosophical meanings, then offer it to the consumer (a mandatory trained subject) that uses models (*in mentu*) previously asimilated (Grigorovschi and Rachieru, 2011). The individuals will finally transform that certain space into a landscape through look itself (*in visu*). Training of these subjects is a decisive factor into the producing of a landscape. Outside the Church, the instruments of the negative space will seem few, but maybe that's why more special, more lenient, less definitive. Of these, vegetation, used here as a valuable building material, allows us to establish a deeper relationship with the site, suggesting thus a sincere reconciliation with the architectural objects.

Why pioneering church landscaping? In a local context, landscaping the ecclesiastical space is almost nonexistent. With a few exceptions, and here we mwntion the monastic ensembles (on which however the vernacular phenomenon is very pronounced), Orthodox sacred urban space seems to disregard this aspect. The traditional continence for the exterior and the much greater attention paid for interior, made landscape architecture to not find a canon similar to the matrix that architecture founds in the dogma. This lack of a solid theoretical corpus determines an empirical practice with current condescension, which is doubled by a poor professional representation.

The biblical heritage reveals a strong relation between man and Creator, mediated by Nature, relation that seems now extinct. God created man and gaved him the utopian Garden of Eden, depicted in the Old Testament. It is a symbol of approchement between Man and Divinity. The New Testament abounds in references regarding nature, abbounds in landscapes depictions. Nature played an essential role in the anatomy of sacred space; we all know that the first temples were the nature itself. Retreat to interiority is happening slowly but surely. Tumultuous history of Christianity (paleochristianity) canonizes this interiority, but an armistice should be nowadays concluded. In order to formulate this armistice's conditions we must not forget the uniqueness of the church as an architectural program. Trought symbol, it seeks to transcend the matter into

spirit, the usage of biblical heritage beeing an axiom. Symbolizing the initiating path (trought church) to spiritual becoming is a goal, proposing thus a reconciliation of nature with the architectural features. For an efficient reception, the language of spaces should be clean, fair, consistent and readable. The church is a comunity program, a landmark, an urban refuge.

Based on this hypothesis, we will analyze below the competition proposal for the People's Salvation Cathedral in Bucharest (2010) and the rehabilitation and restoration of Iasi Metropolitan Park (2009-2013). The landscaping concept started from the canonical progression: Telluric – Church - Celestial (or, in other words, Sacred - Temple - Profane). Overall composition of the ensemmble is the expression of the cultic symbol of a European capital. The solving solution invokes the specificity of Romanian Orthodoxy. We know that is the only country with neo-Latin language of orthodox religion with a large diaspora disseminated in the West. The Cathedral must be both an expression of national dignity in the twenty-first century, a meaningful spiritual response and should expect the presence of many believers. Hence, an extended space is indispensable to provide a complementary framework, a cultic expression of a special atmosphere.

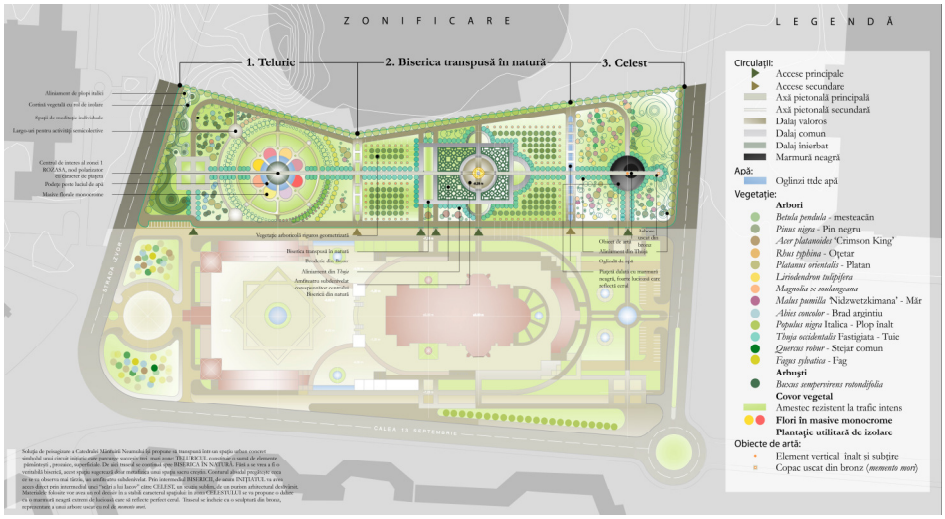


Fig. 1 – Landscaping plan for Nation's Salvation Cathedral Bucharest (contest proposal 2010)

The Cathedral's site is structured trough a main axis (a contrast line) that divides the site in two major subareas (fig. 1): 1. the mineral component - Cathedral's Ensemble and and 2. The vegetal component – The Park, a mirror image of the real Cathedral, that is evoking the biblical heritage of Eden. It was solved trough a solution that aims to translate into physical space the symbol of an initiating circuit that passes through three major areas of interest: 1. *Telluric* gathers *earthly, prosaic, superficial* elements. It is limited by an urban circulation

artery (Calea Izvor) which contains heavy-rate traffic and it is separated by this trough a thick plant curtain. The compositional center of this area consists in a small square surrounded by a ring of water, reacheable through footbridges. Vegetation and paths are folowing the concentric contour of the square thus accentuating the ordinating power of the place. The drawing of the alleys in this section of the park suggests a flower form. Each *petal* contains monochrome flower island and then the ring of water, reacheble trough footbridges. The character of this place sends to interiority, to introspection, to reconsederation.

The route continues straight to the Church in Nature. It suggests a metaphysical Christian sacred space, called the *Summer Shrine*; it is only implied by several lightweight structures on which ivy can climb. It can serve processions which traditionally take place outside. It can be visited, lived, experimented of all meanings and it symbolizes the opening of the Church for peaple. Arboreal vegetation now consists of a rigorous geometrization. Area also contains vegetable geometric embroidery. The Church in Nature stands for the proof that Orthodoxy must align to contemporary living, must leave the fear for outside space.

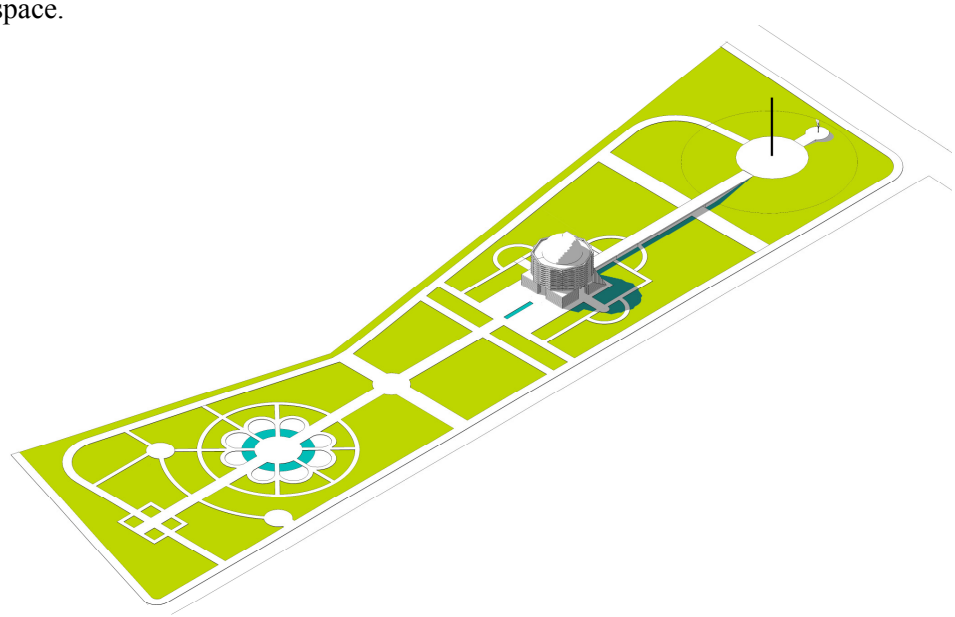


Fig. 2 – Landscaping solution for Nation's Salvation Cathedral Bucharest – axonometry (contest proposal 2010)

Through the Church, we are now initiated. Using a "Jacob's ladder" we arrive to *Heavenly*, a space of sublime aspirations, a perfect architectural purism. The materials used will have a decisive role in determining the nature of space: the area will offer a celestial pavement with a high gloss black marble that perfectly reflects the sky. The image of the sky reflected in the glossy pavement, may suggest the image of The Creator (Manolescu, 2003). The route ends with a sculpture, representing a dead tree, a *memento mori* (fig.2).

The other studied site, Iaşi Metropolitan Ensemble of Moldavia and Bukovina is a lesson of Romanian spirituality structured during two centuries of searches for identity varying between East tradition and temptation of the West as a modernist vector. Analysis of this short study certifies that Metropolitan Park is chaotic, old, and unkempt and argued with proximal buildings. The need rehabilitation is undoubtedly and it entails a significant investment that would be achieved through: Creating a global composition in sacred key to complete the ensemble's spirit; restoring natural-built balance; releasing the perspective on the National Theatre - Cathedral Mitrpolitana axis; removing visual obstacles near historical monuments; meticulous organization of compositional elements to obtain a readable landscape language; creating an suitable atmosphere; providing a constant color show through flowers, leaves, bark and grass; assigning a solemnity note to the natural element; rejuvenation of species; zoning of the park; removal of the typical landscaping tendencies of the city; efficient irrigation system to maintain the garden to the highest aesthetic level.

CONCLUSIONS

1. Church remains a very fresh program (this fact needs to be understud by the Church as an institution), maintaining a privileged place. A material development with such a timeline is genetic and finally merges with spirituality which serves.

2. This landscape architecture program is becoming more and more necessary, but made in the appropriate key. Landscape architecture must find a conon similar to the one in architecture that will be folowed afterwards by all landscape professionals.

3. A church park is loaded with a whole range of signs and symbols, but the axiom that guverns them is the spritual becoming trough Church.

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THE IMPORTANCE OF RURAL LANDSCAPE IN RURAL DEVELOPMENT. CASE STUDY BOTOSANI COUNTY

IMPORTANȚA PEISAJULUI RURAL ÎN DEZVOLTAREA RURALĂ. STUDIU DE CAZ: JUDEȚUL BOTOȘANI

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Abstract. *Countryside are important for the harmonious development of space, such as the European level is addressed and integrated into the organizational policies and spatial planning and territory. Disparities occurring globally due countryside influenced the implementation of local rural landscape and creating an aesthetic. Botosani is in a process of development and creation of carrying out its policies and strategies. Thus rural areas shows the most numerous malfunctions, which means that identity has striking countryside and require special attention by its integration policies and strategies in rural dezvolltarii. Harmonious development and organization of rural space will create a rural landscape aesthetic and integrated European and global level.*
Key words: *countryside, rural development, spatial development policies, The European Landscape Convention.*

Rezumat. *Peisajul rural prezintă importanță pentru dezvoltarea armonioasă a spațiului, astfel că la nivel European este abordat şi integrat în politicile de organizare şi amenajare a spațiului şi teritoriului. Disparitățile apărute la nivel mondial datorită peisajelor rurale a influențat implementarea strategiilor de dezvoltare a peisajului şi crearea unei estetice rurale. Județul Botoşani se afla într-un process de dezvoltare şi creare a politicilor şi strategiilor efectuării acesteia. Astfel spațiul rural prezintă cele mai numeroase disfuncționalități, ceea ce înseamnă că peisajul rural nu are identitate pregnantă şi necesită o atenție deosebită prin integrarea acestuia în politicile şi strategiile dezvolltarii rurale. Dezvoltarea şi organizarea armonioasă a spațiului rural va crea un peisaj rural estetic şi integrat la nivel european şi global.*
Cuvinte cheie: *peisaj rural, dezvoltare rurală, amenjarea teritoriului, politici de dezvoltare, Convenția Europeană a Peisajului.*

INTRODUCTION

The term landscape was first used by painters in the Renaissance, and was defined as a painting nature from the perspective of human rights. He developed the term landscaping from the nineteenth century to define art gardens and their setting (Socol and Rădulescu, 2006).

History of the origin of „landscape" shows that painting belongs to replicate nature, but with the evolution of science and research, it was the board and to other areas: geography, history, art, arhtectură, ecology, ethnology, medicine and so on, addressing different sides of this concept and create the

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appearance of diversifying their classification landscapes: natural, anthropogenic landscape, cultural landscape, urban landscape, countryside, etc. ethnographic landscape.

We can identify several scientific disciplines that studies the landscape: landscape architecture studies „organization and building upon certain principles and techniques of outer space by associating the natural elements of landscape (ground, rocks, water, vegetation) with artificial elements (movement, decorative and utility construction, furniture, etc.) to achieve specific functions of these spaces " (Vijulie, 2010) landscape ecology and Geoecology study mutual relations overall between ecosystems in geographically and ecologically (Nicului, 1990) and studying geography landscape landscape integration with the social, natural bioecosistemele changing man according to his needs, the level of organization and development of the community.

MATERIAL AND METHOD

The study aims to highlight the importance of rural landscape and rural development need to integrate aspects of the countryside socio-economic development strategies and development plans and landscaping. A brief history of the concept was analyzed landscape approach in the European Landscape Convention, European Spatial Development Scheme, the European Charter of rural areas, the Territorial Agenda, the European Charter for Regional Planning and then integrate the objective of the install of the territory aimed a harmonious rural landscape of socio-economic development strategy of Botosani and Spatial Plan of Botosani.

Such was the case study chosen Botosani, to observe the importance of the countryside in rural development because it is an area with a pronounced rurality and many difficulties in planning. Include objectives for Spatial development strategies provides a redefinition of the countryside and its coherent structure.

RESULTS AND DISCUSSIONS

European Landscape Convention clarifies the importance of the European landscape and sets a major objective for Member States for the protection and enhancement of the landscape. So this is the promoter include indirect protection and landscape conservation in development policies at EU level.

The aim of the European Landscape Convention is achieved through economic and social arrangements to achieve sustainable development based on a fair and harmonious relationship between social needs, economic activity and the environment, noting that participating in a landscape important to the interest general regarding the cultural, ecological, environmental and social.

The landscape is an important part of quality of life, but the evolution of techniques of agricultural production, forestry, industrial and mining and spatial policies, planning, transport, infrastructure, tourism and recreation, and global economic change transforms landscapes most or negative.

While the European Landscape Convention reflected its importance at European level and the need for the development policies and spatial planning official documents of the European Union, which includes plans for the

development and reducing disparities include indirect protection and landscaping. Thus in Europe the major objectives are to create a competitive space through socio-economic development policies and strategies rational cohesive landscaping that will result in a structured and harmonious countryside (fig.1).

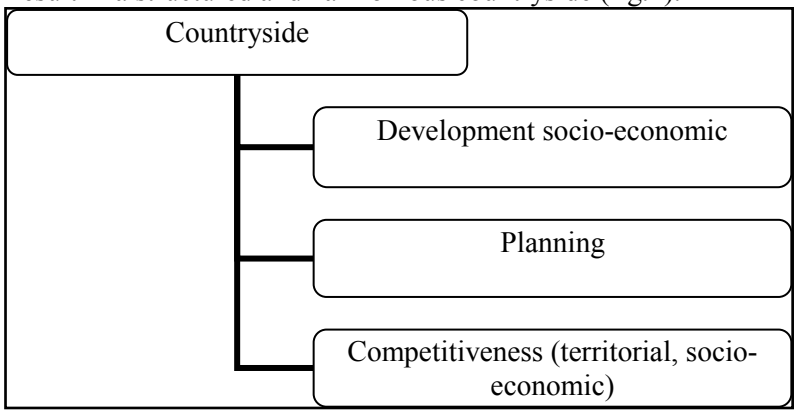


Fig.1 - Synthesizing European policy objectives for creating a structured rural countryside

The scheme Spatial Development and Territorial Agenda attaches great importance to the protection of rural landscapes, their identity but it highlights the need for spatial planning and policy implemntarea resource recovery, modernization, creating a competitive economy and a modern society.

Case study: Botoșani County

Rural development attaches great importance to the landscape of this area, as there are numerous socio-economic and territorial disparities which causes disruptions in the countryside, making him incoherent, and may not be classified and without retaining traditional culture. Botosani County faces numerous problems at rural demographic, social, economic, territorial and landscape bear the consequences of the above. Rurality facing adds a note of authenticity to be preserved countryside, but the socio-economic and rural development policy requires dmeografic so they must be designed and implemented to reduce the gaps in this area but without affecting rural characteristics .

The main documents existing in Botosani county rural development are socio-economic Strategy and Plan of Arrangement Teritoiului performing diagnosis and provides rural development strategies, recovery of resources and optimization of space.

Development strategies based on reducing socio-economic disparities at the county and regional planning advocates that range in a rational and effective to implement socio-economic policies. It attaches importance to both official documents are official support for the realization of rural development for the economic, social, infrastructure, health, tourism, cultural education and highlights the need to improve planning for recovery and valorisation. It is noted that the proposed policy for the rural countryside will be conserved, and its characteristics have a decisive role in creating strategies for rural development. Thus the

correlation between the true and the need to preserve the rural landscape rural development highlights the influence of these two coordinates and their interdependence.

Although the countryside is an indirect object in all development strategies and spatial plans, it is vital to underpin socio-economic development of rural areas and to preserve the traditional rural landscape specific. Botosani County, now faces a rehabilitation countryside due to the integration into the European Union and rural development policies. After 1990, the rural landscape and visual identity has lost its collective property due to changes on the abolition of collective farms (Centers Agricultural Production).

Implementation of a capitalist economy in rural Botosani the destruction of the space aesthetics as economic reforms have had negative effects on core activities, agriculture, because aging process. Thus there were socio-economic and demographic changes, causing a reorganization of agriculture through land laws, (Land Law 18/1991) had two functions: one for the return of land ownership and a dissolution of agricultural cooperatives .

Rural landscape in the study area is chaotic, losing the identity due to changes after 1990, but 2007 is starting his reconstruction of his realcătuirea a coherent and having visual identity. Land parceling, maintaining rural morphology of each component of the village județuțui Botosani occur without significant rehabilitation, has triggered an archaic countryside without structure, which has captured the attention of the authorities to develop policies to redefine the countryside.



Fig.2 - Typical rural landscape in Botoșani County, Photo: Cuciureanu Simona, 2011

We can identify some problems of the countryside in the area of study: the land (determined by reîmproprietărire practicing subsistence agriculture because each individual had a small area of land and cultivate as many crops to households) and rural residence (form specific county is rectangular, but because of the economic situation dwellings were not rehabilitated and upgraded a long time).

The dominant features of the countryside in the county of Botosani are locuițele typical Romanian village without being upgraded, practicing subsistence culture, using traditional farming techniques (horse, plow, wagon), using small plots of land etc..



Fig. 3 - Rural landscape in Botoșani County, Source: Cuguat-TIGRIS, 2003)

Existing problems of the countryside can be reduced by adopting rural development policies, European funds provided for rural disparities, optimizing specific features by creating coherence village landscape, modernized homes by increasing comfort is technically upgrading rural infrastructure. Thus in Botosani County countryside can be redefined and can highlight the uniqueness through a uniform and integrated rural development machines.

CONCLUSIONS

1. Interdependence between landscape and existing problems in rural areas highlights the need of rural development strategies that meet European targets on territorial competitiveness and socio-economic cohesion.

2. Countryside conservation is a priority at European level, which should be implemented in Botosani County which has an authentic countryside with traditional characteristics currently stored, despite the intrusion of modernity. Philosopher H.R. Patapievici believes that this complex traditions were kept pure, not yet victims of modern influences.

3. Influence is indirect countryside rural development strategies and policies, but is an important aspect for achieving rural development, EU cohesion policy objectives and socio-economic and territorial competitiveness and preserve the identity of authentic countryside Botosani.

4. Countryside in Botosani county may retain the rural character by: developing and promoting companies „large landowners ” land to lease all of the rural communities, creating in this way an aesthetic geometry plots in terms of

landscape, then upgrading rural infrastructure, technical and utilities increased comfort, keeping specific rural housing (rectangular shape), and lower penetration constructțiilor "kitch" (mansions), etc. This ensures a competitive rural development, but keep local identity and landscape, improving them and redefining them.

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9. *** Schema de Dezvoltare a Spațiului Comunitar

THE AESTHETIC AND SYMBOLISM OF ARCHITECTURAL LANDSCAPE FORMS

ESTETICA ŞI SIMBOLISTICA FORMELOR ARHITECTURALE PEISAGERE

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***Abstract**: If for the man "in the beginning was the word", and for each word he can find a grafic representation by symbols, then is shore that Nature "speaks" through form, color, light, sound, - whatever suggestive expressions of life that we humans are made it with native perception sensibilities. Art of landscape planning was subject more or less to the same attributes of Nature, loaded by ancestral, sacred or secular symbolism, with traditional or ganed value. Knowledge of symbolic forms: geometric or tortuous, natural or man-made, pure or vicious, lead landscape designer and architect, through educated or intuitive actions to create the necessary space for human life, dictated by aesthetic and utility.*
***Key words:** aesthetic of landscape, simbolism of landscape forms*

***Rezumat.** Dacă pentru om „la început a fost cuvântul”, şi fiecărui cuvânt acesta i-a găsit o reprezentare grafică prin simboluri, atunci cu siguranță Natura „vorbeşte” prin formă, culoare, lumină, sunet – expresii sugestive ale vieții, la care noi, oamenii suntem făcuți cu sensibilități native de percepție. Arta amenajării peisajelor a fost subordonată mai mult sau mai puțin aceloraşi atribute date de Natură, încărcate de simbolism ancestral, sacru sau laic, cu valoare tradițională sau dobândită. Cunoaşterea simbolisticii formelor: geometrice sau sinuoase, naturale sau antropice, pure sau alterate conduce peisagistul şi arhitectul, prin acțiuni educate sau intuitive, la crearea de spații necesare vieții omului, dictate de estetică şi utilitate.*
***Cuvinte cheie:** estetica peisajului, simbolistica formelor peisajului*

INTRODUCTION

Considering the study of italian philosopher Assuto Rosario, admits that "landscape is the space that is the object of aesthetic experience as the subject of aesthetic judgment" (Rosario, 1982). The space is a priori determined by the game of natural forms of relief and vegetation or that of anthropomorphic forms, which at the beginning were constructed intuitive with exact utility and significance, but, by spiritual and cultural development, technological and social development of mankind, has become forms and meanings of constructed landscapes increasingly sophisticated.

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MATERIAL AND METHOD

Following technical and artistic creation (architectural) becoming of the human being during its historic, we can finds the constant presence (subject to the cycle event - oblivion - retrieval) and some of the same reasons, and some of the same archetypal forms, suggesting implicitly or explicitly some and the same obsessions return to origins, the origins of cosmic world, the human birth, the path of a repetitive cycle: ontogenesis repeats phylogenesis, which in turn repeatedly Cosmogenesis.

On the basis of such epistemological / ontogenetic considerations, a key hypothesis of our research can now be formulated:

- In all human cultural events, with a conspicuously more or less obvious, find the constant presence of the symbolic forms of Cosmogenesis;
- These symbolic forms are subordinated to essential forms present everywhere in the physical, biological.

Trying to explain this hypothesis, the present context only allows intuitive argument by reviewing the main features of mentioned symbolic speech types and their examples with landmarks of human creation (paying prevalence to architectural forms and landscaping).

Reported to the creator /architectural act, archetypal symbolic forms can be recovered intuitive (Poenaru, 2007):

(1) Symbolism of magic and ritual speech (experiential), characterized by the situation where archaic man - manifesting initially as homo faber (who lives in unconscious harmony with the cosmic - transforms spontaneously / intuitive (magic) the natural and geographical landmarks (sky dome or pit in the ground, treetop, cave canopy, mountain cornice etc.) in forms / spaces for utility functions, such as housing, recreation, food, etc..

- Paleo-rupestral images by tectiformes type (France), abstract prints (Spain) or syncretic funerary stelae (Romania);
- Ritualico-totemic symbolism, universally present in the motif of the tree (cosmic, celestial, of life), motif of cosmic serpent (terrestrial, aquatic, fiery, air) or the sun motif

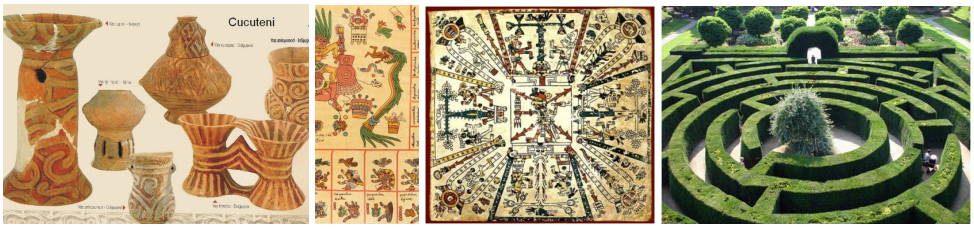


Fig. 1 - Cosmological archaic motif: Cucuteni Neolithic period vases, (III millennium BC), Symbolic Aztec culture frescoes, Chatsworth Castle gardens, England

(2) The symbolism of mythical - Initiative discourse (holistic) - developed by homo significans, the first that really began to shape the world through action and not only experience, but also discursive language (stating mythical scenario, for example) - aimed at symbolic transformation of natural resources in to archetypal forms, able to intuitively explain phenomena with hidden causes such cosmogony and institutionalize their first initiation teaching systems.

Using cosmological symbols / archetypal to achieve afterwards the first objects according to sacred architecture (temples, churches and initiation etc.) Characterize

this paradoxical period in which people has formulating intuitive / holistic, symbolic but correct solutions to the problems witch are not assumed in analytical, rational terms.

In this regard, it should be noted:

- Mythical symbolism of cosmological scenarios, aiming at the creation of organizational reasons chaos by an angular, the genesis ovulation or artifactual / modeling etc..

- Religious motif of the Genesis of light present in the biblical creation through "light of the world" epitomized by Jesus, will be represented by the wave symbol (of fish) and the Vedic creation by "golden germ" (Hiranya-Garbha) from witch the world will be born, and therefore symbolized by various forms of mandala-cosmogram (yantra) used as a default plan of oriental temples.

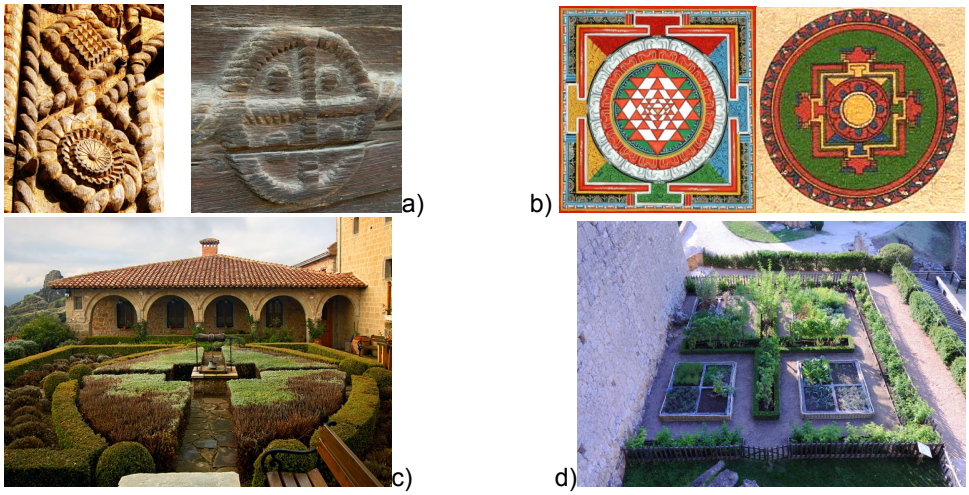


Fig. 2 - Ethnic archetypes of cosmogonic symbolism: a) details of carved wooden door (Maramures), representing a set of archetypal cosmological reasons, b) forms of mandalas translated into Hindu temple plan c) St Stephen monastery garden. Meteora, Greece, d) Maison Forte de Reignac monastery garden, France

(3) The philosophical symbolism of "world unity" attempts to justify rational / analytical - in terms of an already refined *homo sapiens sapiens*, respectively through contributions of some historical materialists and spiritualists philosophers - few key ideas, namely:

a) structural unit of the world, namely the existence of a substrate / single principle for all forms of the world, material (such as the four cosmological fire, air, water, earth) or spiritual ("idea" from Plato) integrated unified by the "five elements" model of Chinese philosophy;

b) unity of shape / morphology of the world, due to the action of principles / unic actionable laws unifying such as "form" at Aristotle or "nous" in Kant's laws of "becoming creative" at Hegel or Bergson, respectively contributions showed by Cantemir in Romanian philosophy trough "increase and decrease" motif, by Conta in "universal undulation theory" on the one hand, the description of fractal models of the world, on the other hand;

c) the idea of man as "a measure of world unity," recorded as a imperative at the frontispiece of Delphi temple: "Know yourself and you will know the universe ...".

Of course, all these attitudes can be recovered in terms of the history of architecture, the line of "philosophers of shapes / harmonic proportions" (including architecture) as a Leonardo da Vinci and Le Corbusier.

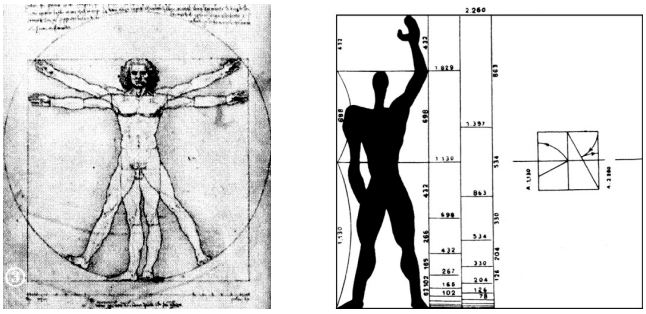


Fig. 3 - Modulor Man in vision of Leonardo Da Vinci and Le Corbusier

(4)The symbolism of experimental discourse developed by scientific and technical vision of homo technicus / architeckhton - both analytically and experimentally on: macrocosmic universe, whose genesis undertake essential forms trough an integrating spiral of their appearance and disappearance; microcosmic universe and the human world, where the architecture, with its numerical alchemy and beyond is measure of the man.

RESULTS AND DISCUSSIONS

On the assumption of a "metaphysical (onto) genesis", "sacred geometry" made possible manifestation of the world concrete forms. These properties, which can be learned inductively from empirical reality research, imposed by some "specific evidence" (the concrete forms of expression), the almost universal presence of three types of properties that enable utility and beauty to blend in nature:

- Symmetry of natural forms has the effect of order and stability of space / natural and implicit human;
- Integrating presence of the spiral, the dynamic event (evolutionary) archetypal forms;
- Highlighting the golden proportion of some constant harmonic ratios that provide ideal proportionality of archetypal forms.

Sacred Geometry reveals that symmetry is a principle to provide order in space, which gives it stability and harmony. The property of symmetry, shape the world, forms constructed are themselves nice and stable. Researching the structural properties can be realized mathematically (by numerical and geometric criteria) (Gheorghiu, 1991).

Thus, as shown by another ancient Greek geometry, all the physical and biological structures (plant, animal and human) may be subject to rules of numerical modeling on the one hand, correlations with angular or circular geometric shapes on the other hand.



Fig. 4 - The shapes of the physical world, vegetable, animal or anthropomorphic are harmonious as follow the Law of organic growth or Law of golden ratio, giving them the attribute of beauty, the structural strength and operational efficiency.

The fact that everything - from the cosmic matter to the biological matter and "social matters" - evolving on a helical path, is a truth which is highlighted both by the natural sciences and society.

It can be concluded that the spiral / helicoide is a "form generating forms" or "shape in motion".

Living matter keeps growing archetypal form, which turns by preserving its constant proportions (Schneider, 1994). This form observed in the snail shell is a spiral, that geometry, to distinguish it from many others, have called it logarithmic spiral, this, even more that any natural spiral and whatever the effects - is lovely, since that respect the rule of archetypal "golden section".

Law of “Golden number” has a special significance. We can say with certainty that the proportions of the golden number accompanying creative manifestations of nature and the human being, giving them the attribute of beauty, the structural strength and functional efficiency (in capitals details or structural elements of Greek temples, in sizeing Egyptian pyramids, Leonardo da Vinci's artistic creation, etc.).

In his *Aesthetische Forschungen* (1855), German esthetician Zeysing note: "For a whole divided into two unequal parts, to appear beautiful in terms of form, should be that between the smaller and biger part to have the same ratio as between the biger part and the whole" (Ghyka 1981).

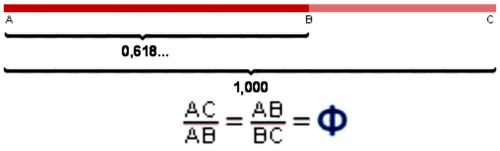


Fig. 5 - Golden Ratio

This *sectio aurea*, describing a relation with the force of law - because it is found involved in fundamental forms of living and non-living world - it is focus on the field of the sciences, maths first.

Due to these relation, were born human mimetic forms of sacred architecture, incorporating buildings and built landscapes, proportions, relationships and symbols of sacred geometry, optimally harmonized with human.

The effects of such compatibility are felt in the human being, both physical -biological support and the psychological-emotional.

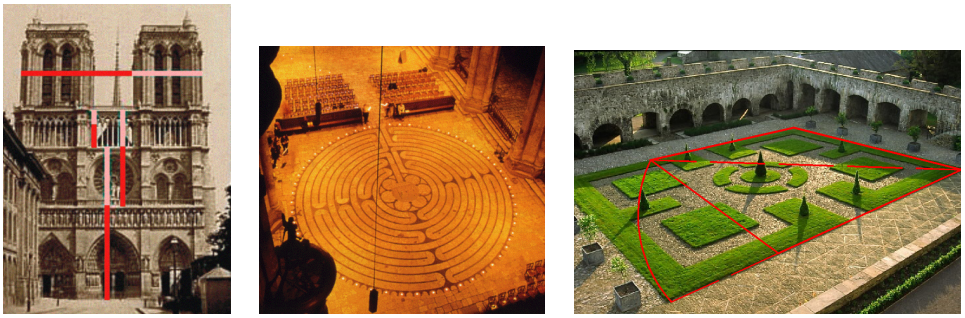


Fig. 6 - Summary of architectural harmony: Notre Dame de Paris (left), Celtic Maze (middle), Garden of the Aberglasny estate, England (right)

CONCLUSIONS

In conclusion, creating an estetic architecture for our environment, the architect can influence decisively the harmony status of all people, on the one hand, and the balace between man's kind and cosmos, on the other hand.

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FUNCTIONAL AND AESTHETIC LANDSCAPE QUALITY: URBAN SQUARE CRITICISM – FOCȘANI

CALITATEA FUNCȚIONALĂ ȘI ESTETICĂ A PEISAJULUI: STUDIU CRITIC PRIVIND PIAȚA URBANĂ – FOCȘANI

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Abstract. *Middle size provinces reflect in a dramatic manner the gap between Romanian landscape culture and the European urban standards. Environmental culture lacks, the shallow civic involvement, the lack of management and administrative culture and the shame toward national and local models are only some of the symptoms of a crushed society with major landscape impacts. This paper analyses urban square designs in a representative town using aesthetic, environmental and social criteria, in an attempt to trace specific responsibilities for landscape architects targeting urban sites. In the end it is concluded that stronger landscape architect's professional ethics is needed to suSLort cultural development, urban life quality and social wounds healing.*
Key words: *cultural identity, landscape education, landscape quality, social program, urban open space*

Rezumat. *Orașele medii de provincie reflectă într-o manieră dramatică decalajul dintre cultura peisajului din România și standardele urbane europene. Lacunele în domeniul culturii peisajului, slaba implicare civică, lipsa culturii manageriale și administrative și rușinea asociată reperelor naționale și locale sunt doar câteva dintre simptomele unei societăți strivite, ce gerenează impacturi importante în peisaj. Această lucrare analizează designul unor piețe urbane reprezentative după criterii estetice, ecologice și sociale, într-o încercare de a identifica responsabilități specifice ale peisagiștilor ce abordează situri urbane. La final se concluzionează că o deontologie profesională întărită a arhitecților peisagiști este necesară pentru susținerea dezvoltării culturale, a calității vieții urbane și pentru vindecarea rănilor sociale.*
Cuvinte cheie: *calitatea peisajului, educație peisagistică, identitate culturală, program social, spații deschise urbane*

INTRODUCTION

The Romania's municipal administrations concern for landscape begins in the 19th century, in the dawn of the modern state (Toma, 2001), as it was anticipated by the historical reforms carried out by the suzerain empires – Austrian-Hungarian policy in the west and the Russian protectorate Organic Regulation in Moldova and Muntenia. The historic moment haSLens at the same moment with important collective mental changes, mainly induced by

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Illuminism inspired reformative policies. This development, tardy started as regarding the Western Europe, instead of constantly consolidate the cultural and social local values has suffered major swerves, associated with the scales of history. The soviet occupation in the 20th century, the deepest ever national catastrophe whose impacts remain unfaded, has induced ideologically justified structural and functional landscape changes (*ideology is the smatterer's refuge* - Pleșu, 2013). As a high social impact, wide-targeted cultural expression medium, urban landscapes have been seized firstly by invaders' propaganda, followed later by the new socialist-nationalist propaganda of the 1970-1980's: the landscape's elements relevant for the local/national identity have been distorted, replaced or simply wiped off the landscape to rebuild their carried message in the spirit of the occupation ideology, thus loosing the old connections between landscape, territory and urban functionality.

The glaring contrasts between the Romanian urban landscapes and their Western European counterparts' development since the second half of the 20th century emphasize the need to analyze causes, anticipate tendencies and straight up further developments. Historic fracture moments have caused radical changes of urban landscaping – regarding its drivers, the way the (re)forming pressures are exercised, the focus shift regarding the change targeted elements, the impact of the development policies and programs on landscapes and the urban system's reaction to change.

MATERIAL AND METHOD

The paper investigates the connection between the urban square's identity function and the urban system's sustainability, starting from the hypothesis that square landscapes are a factor determining the town's social, cultural and spiritual identity, thus decisively contributing to the settlement's development or decay.

The research method aSLroaches the functional-aesthetic development analysis of mid-sized towns' illustrative squares, concerning the cultural-aesthetic, social and economic urban development impact upon squares' landscape.

The town of Focșani was picked for study, as it was found to be representative through dimension, the national grade historic significance and the mid-size towns' development perspective: former capital city of the newborn Romanian state, included under the reign of Carol I in the defensive line Focşani-Năməloasa-Galaţi (Stroea and Băjenaru, 2010), it used to be a national pole of geo-strategic, politic, economic, social and even cultural significance. Architecture monuments and landscape elements that have been kept and valued within urban landscape are significantly fewer today compared to their inter-war based potential, representative fact for Romanian provinces, and indicating landscape vulnerabaility in occupation times.

RESULTS AND DISCUSSIONS

Considering that public squares have been traditionally imposing maximum impact on collective counscience in relation to other features of urban landscape, this study follows their evolution from the mid 19th century up to present times, mutual relations in historical production of urban squares' landscapes (**SL**) and society thus being aSLroached on a DPSIR framework (table 1). The three major today's city squares have been conventionally called **PU** (*Piața Unirii* – The Union Square), **PM** (*Piața Moldovei* – The Moldova's Square) and **PG** (*Piața Gării* – The Railstation's Square).

Table 1

DPSIR landscape evolution analysis (functional-aesthetic) of the squares in Focșani in realation to the urban system

Historic moment	***Drivers*** **(external and within the urban system)**	***Pres-sures*** **(exerted upon the SL)**	***States*** **(functional and aesthetic landscape state)**	***Impacts*** **(upon the SL)**	***Responses*** **(urban system reaction to SL changes)**
February the 5th, 1859 (between the prince's elections in Moldova and Muntenia)	The one-night visit of the 2 principates' common election candidate, in the 2 mirrored towns – Focșani Moldoveni and Focșani Munteni	People's enthusiasm; local administration political lobby targeting the raising princes (a still living tradition actually)	Middle Age urban tissue, set mainly along the Iași-București road (Ulița Mare, then Strada Mare and Strada Mare a Unirii), including: **PU –** civic, commercial and spiritual southern town's center (Focșani Munteni), dominated by St. John the Baptist's monastery belfry, on the southern shore of the Milcov canal – former border mark between the first 2 Romanian principates – and **PM** – civic, spiritual and comercial center in the northern town, dominated by Cuvioasa Paraschieva church	Torches have been diplaced to light up the streets, triumph arcs have been placed along the north-south axis on the lane connecting the two sections of the town for the great people's celebration **PU** – has been hosting the first *Union's* hora, perhaps circling around the bell tower; **PM** – the *Cuvioasa Paraschiva* church bells have been also involved in the people's celebration	Urban tissue regulation and landscape change in response to the settlement's new-found national calling; **PU** – the Milcov canal gets diked; On the former borderline there is set up a small memorial (1931), later to be replaced with today's *Union Memorial*; the *Union's hora* becomes a central theme of the square's systematization, established as civic center in the new town (1862) thus containing the town-hall side by side with the old St. John's church, turning it into a *landscape of power* (Lazăr-Bâra A., 2012); **PM** – commercial pole and informal civic center

1863: the secularization of the cloistral properties	Priesthood influence drops, state power grows	The new state's consolidation in relation to the foreign powers (Russian orthodoxy)	There were over 20 churches and monasteries brandig the 1789 urban landscape (Austrian-Hungarian map), former tools of the tsarist propaganda	Laic monuments – state insistutions mainly – raise above /replace the monuments of cult	**PU** – dominating laic architecture: Admin.Palace (1913) și *Union Memorial* (replacing old belfry, demolished in 1905) **PM** – market hall set-up; the church is outshined than lost forever in 1977
1880	Railstation set-up – along the Court House, the building represents the new state's authority	King Carol inspects the town coming by train	The strategic importance of the town, set on the anti-Russian defense line Focșani-Nămoloasa-Galați is acnowledged and valued by the monarchy	**PG** – axial composition, monumental architecture, electric light; **PU** – consolidated civic pole; adjacent garden and theatre (Neorom.)	**PG** – buffers the social demand while PU turns inaccessible; **PU** – *Unirea* hotel, 10 storeys high, sows up in the 70's to serve high ranked guests; **PM** – church decay
March the 4th, 1977	The Great Earthquake provides a reason for a radical urban reconfiguration	Ideology and political obedience	Functionally refurbished ciry following Soviet occupation (industrial.), but keeping inter-war landscape	**PU** –old city hall is lost; **PM** –most of the pre- and inter-war houses are replaced by communist architecture	**PM** – functionality preserved: identity connection with neigboring villages; **PU** – Middle Age tunnels are lost; the square hosts national grade solemnities

The community's sustainability – composed of governance, society – cutlure, habitation – built environment, economy, environment, services – transport and connectivity (Woodcraft et. al., 2011) is more affected by the main squares rather than the other elements of public space, because they include the most social sustainability parameters. They reflect governancea, also being one of its tools, they aggregate social life, propagate cultural identity, they contribute to habitation and built environment quality, reflect and support economy, they are parts of the urban ecologic infrastructure, promote services and rely on transports.

The three urban poles states are reflected in landscape as following: *Unirii Square* (former *St. John the Baptist*) is today identified with the town's civic center – the landscape mimics western spatial and functional composition principles; the identity landscape features are manipulated by circumventing, faking or distroying historic and cultural monuments. The square's aesthetics is less liable to criticism, but the unconsistent identity basis qualifies it for a *beautiful kitsch* (a moral issue according to Roger Scruton); the civic center's cultural and spiritual contribution could be evaluated by monitoring the fiction sales of the only two bookshops in the 73868 inhabitants' town in 2011, dropping

from 103219 in 2002. *Moldovei Square* (turned to market place) is today the most socially dinamic public open space (Colantonio et. al., 2009), but without affecting the town's landscape policy. *The Railstation's Square* remained a minor social pole, losing its cultural, national, economic and social representativeness.

The squares' responsivity on political pressures reflects their structural vulnerability – while power abuse prevention mechanisms are formal. This way public squares, subject to antidemocratic political propaganda, are a weak link of the urban system and of the society as a whole.

CONCLUSIONS

1. Despite recent landscape's details, the urban structure of Focșani reflects its political and administrative hardening in the half 19th century state, when for the first time in history, politics came before the merchant's and smuggler's economic interests. The identity landmarks shortcoming in the urban landscape is owed to political power abuses, to planning incompetence and to civic passivity.

2. The general value of the urban square is not only reflected in the sum of the services it provides to society, for there are chances that negative impacts might affect the town on the long run (depopulation, poverty).

3. As a central element of urban landscape identity, the square is subject to social manipulation pressures. Landscape involved specialists must deal with these pressures on ethical basis as well as on the basis of the urban landscape planning, design and execution technical rules:

- Critical analysis followed by the compliance with the existing urban development strategies or, if required, their sustainable amendment;
- The substantiation of any analysis on the holistic approach of the urban system, according to exhaustive, competently provided data – endorsed by certified specialists; giving up on any pressure that urban development actors might inflict – be they political, economic or social – determines sectorial, unsustainable landscape attitudes toward landscape, opposed to the missions and ethics of landscape architecture and urban planning.
- The use of cost-benefit analysis to test the promoted designs.

4. Civic passivity must bring in the public squares' propaganda control, starting from the very first fazes of their design.

5. Starting from the general principles of sustainable development, urban squares' landscape architecture must obey to sectorial performance criteria, subscribed to the systemic approach:

- The town's aesthetic identity, desirable to blend harmoniously with the territorial landscape (Peyrache-Gadeau V., Perron L., 2010), is determined by the squares' design to a large extent; this way, they would have to reflect the dominant territorial landscape models for the town's site through direct or indirect references, through manifesto-attitudes or through valorisation of some representative

features of the territory within square's (small) landscape composition.

- The most important potential contribution of the urban square to the protection and conservation of natural heritage is through environmental culture; this design program's opportunities comes from the public presence quality and from the landscape representativeness.
- Urban squares are usually associated to social poles, thus, the mission for their planning and management must answer directly to present and prospect community issues; individual freedon, diversity, the freedom of expression, democracy and tolerance are reference values of the European cultural space, but promoting them in an emergent society requires educational methodology that assigns to landscape a specific sector.

6. In the following decades, urban landscape must respond growing pressures from consumerism, climate change and politic expansionism. The re-spiritualisation of the landscape concepts in local and national context, necessary to the cultural and identity site referencing, is thus an increasingly accute necessity.

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THE ECOLOGICAL EVALUATION OF THE LANDSCAPED PROJECTS IN SOFTWARE PROCEDURE

EVALUAREA ECOLOGICĂ A PROIECTELOR PEISAGERE ÎN PROCEDURĂ SOFTWARE

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Abstract. *The urban landscape architecture and territorial establishment are ensembles with diverse functions, in harmony with the human life and the environment. Vegetation, with all its features, constitutes the bond that physically incorporates the urban buildings. In the competitions of projects proposals, the evaluation in order to select the recipient solution takes into account some factors: the implementation of the functionality criteria, aesthetical value, costs etc. An additional evaluation of the projects method, that of the ecological impact, can be accomplished digitally, by means of some subroutines created under the license of original software, through out a sequence of commands. The procedure takes into account the capacity of the species introduced in the project to reduce the level of pollutants (Pollution Removed, Tree Rainfall Interception, Carbon Storage, etc.), and the evaluation of its beneficial effect both on the human life quality and on the physiological parameters of plants (Canopy Cover, Leaf Area, Tree Condition, Leaf Biomass).*
Key words: *ecological evaluation, software subroutines, pollution removed.*

Rezumat. *Amenajările peisagere urbanistice şi teritoriale sunt ansambluri cu funcţiuni diverse, armonizate vieţii umane şi mediului, iar vegetaţia, cu toate atributele ei, constituie liantul care înglobează fizic construcţiile urbane. În concursurile propunerilor de proiect, la evaluarea realizată în vederea selecţionării soluţiei câştigatoare, se iau în calcul mai mulţi factori: îndeplinirea condiţiilor de funcţionalitate, valoare estetică, costuri, ş.a. O metodă de evaluare suplimentară a proiectelor, cea a impactului ecologic, poate fi realizată digital, cu ajutorul unor subrutine construite sub licenţa softurilor originale, printr-o succesiune de comenzi. Procedura ia în considerare capacitatea diferită a speciilor introduse în propunerile de proiect de a reduce nivelul unor agenţi poluanţi (poluanţi, cantitatea de precipitaţii captate, carbon stocat, ş.a.) şi evaluarea efectului benefic, atât asupra calităţii vieţii umane, cât şi asupra parametrilor fiziologici ai plantelor (sprafaţa coroanei, suprafaţa foliară, volumul coroanei, biomasa foliară).*
Cuvinte cheie: *evaluare ecologică, subrutine software, poluanţi eliminaţi*

INTRODUCTION

The presence of trees and bushes in urban sites where more than 80 source of pollution (Garrec, 1999), have been detected is known to have benefic effects: it ameliorates the microclimate due to photosynthesis, it reduces the ambient temperature, the amelioration of people's psychic condition (chromotherapy,

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aromatherapy), it reduces the pollution with toxic gas and suspended powders, it helps bactericidal effect, it attenuates the noise, etc. (Ulrich et al., 1991).

The choice of vegetal species for landscape use, especially trees and bushes, is a important phase of landscape projects which takes in consideration various factors: aesthetic composition, functions, adaptability to environmental conditions, growth speed, size, possibilities of crown shape, flowering period, water and nutrients needs, resistance to diseases and worms, nearby buildings, species peculiarities, etc. All these factors are important if we want to implement the concept of durative development (Konijnendijk et al., 2005).

MATERIAL AND METHOD

For a correct choice of ornamental tree and bush species used in an polluted urban ambient complex, interdisciplinary information are required, using synthetic methods that generate analytic results of landscape projects starting from the conception planning.

The Software Products, original solutions of the platforms AUTODESK and UFORE, have been used as a working base to create an integrate procedure building some functions under CAD license in Microsoft Visual Basic. This procedure is aimed to "externalize" the ecological impact. Three different tree species *(Tilia cordata, Aesculus hippocastanum* and *Prunus serotina),* were used in the experiment to measure the ecological impact on urban ambient and individual physiological parameters.

This method allows both the analysis of each tree and a cumulative analysis of the tree areas. In the end, an "ecological shaping" can be generated for every "landscape solution", that can be analyzed and modified under various parameters.

RESULTS AND DISCUSSIONS

The interaction between ornamental vegetal species and pollutant agents is considered from two perspectives: first, planting trees and bushes in urban sites helps to reduce pollution; second, we have to create conditions for plant development and chose the appropriate species for a particular site and in the same time allow trees to accomplish their aesthetic and functional purpose.

The need to measure the polluting agents and plant physiological parameters during the interaction pollution-plant-ambient-man determined the elaboration of software programs based on mathematical models. USDA Forest Service developed a software platform (McPherson, 2010) aimed to measure the annual benefits that trees and bushes bring to the ambient and life quality. This method consists in the collection of information (*Survey Information, Plot Information, Shrub and Tree Information, Meteorological and Pollution Data*) and allows a final synthesis of the situation (*Pollution Removed, Tree Rainfall Interception, Carbon Storage, Gross Carbon Sequestration, Canopy Cover, Leaf Area, Tree Condition, Leaf Biomass*) (Maco and McPherson, 2003; Xiao et al., 2000).

The elaboration of landscape projects implies drawings. We realize most of these drawings on CAD platforms (graphic and assisted projection) or, in special cases, under other licenses. We intend to use these drawings (.dwg, .dxf files) to

stock starting from the project phase some data that can generate the ecological evaluation of the potential landscape solution when imported in USDA (Maco and McPherson, 2003).

In digital drawings (.dwg files) CAD commands are used to build the entire ensemble. For vegetation in particular, the pieces are graphically suggested using predefined blocks of great aesthetical value that sometimes have the "mark" of the landscaper.

Using a friendly interface represented by suggestive icons, we created two subroutines in Microsoft Visual Basic named *PutTrees* Button and *GetTrees* Button that can be instantly activated and are represented in the same Toolbar Trees (Fig. 1.). These two commands have been used experimentally by introducing three different tree species, *Tilia cordata, Aesculus hippocastanum* and *Prunus serotina* (Fig. 3.) in CAD support.

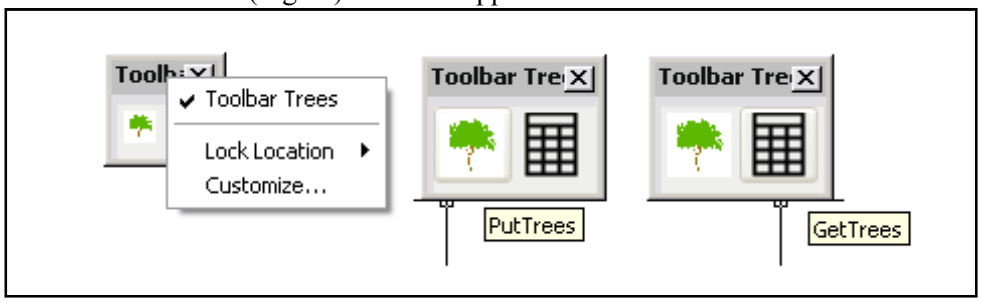


Fig. 1 - Toolbar Trees, PutTrees Button and GetTrees Button – created using Microsoft Visual Basic language

The first step in the construction of a command structure is the creation of a template file (.dwt) that must be loaded just after the opening of the CAD files. The template file contains an editable block with 33 parameters, individualized for each of the three trees: *Tilia cordata*, *Aesculus hippocastanum*, and *Prunus serotina* and structured in layers with distinct characteristics named *Tree Name*, *Project Name*, *Location/Address*, *Height*, *Crown Attributes*, *Tree/Building Energy Interactions*, *Tree Site*, (Fig. 2.). Text insertion points are localized in a table form (Fig. 3.).

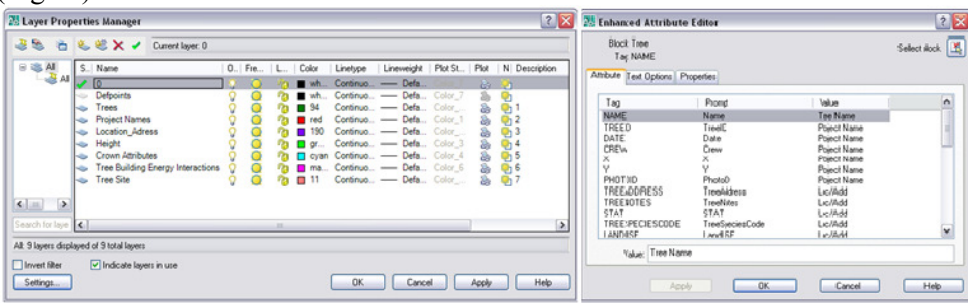


Fig. 2 - Template File Layers Structure and Dialog Box for Parameters

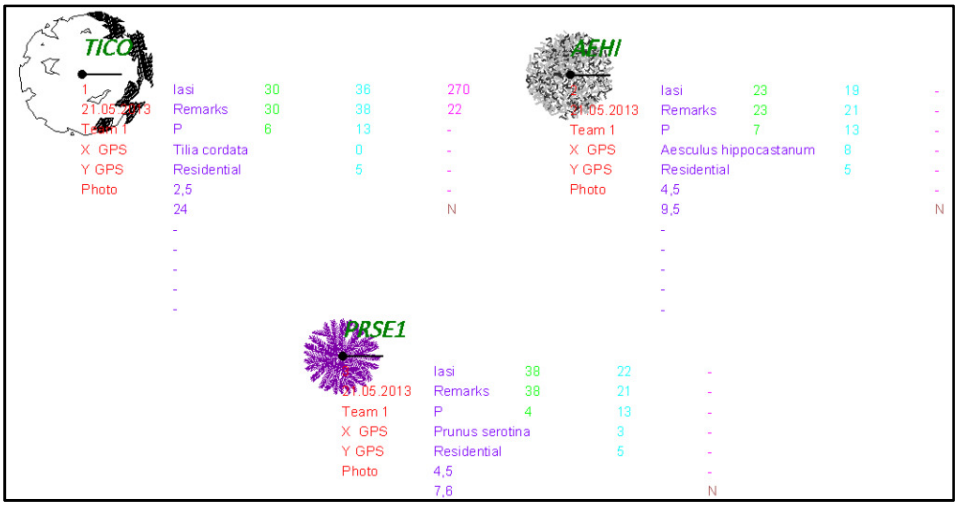


Fig. 3 - Template File Text Structure for *Tilia cordata, Aesculus hippo.* and *Prunus serotina*

By activating the *PutTrees* Button we insert in the CAD drawing space a template block with a mobile insertion point, followed by the automatically opening of a dialogue box (Fig. 2.). In the columns of this dialogue box (*Tree Name, Project Name, Location/Address, Height, Crown Attributes, Tree/Building Energy Interactions, Tree Site)* we introduce the 33 parameters for the three trees used in our experiment (*Tilia cordata, Aesculus hippocastanum* and *Prunus serotina).*

After the insertion of projection data and indices, if we activate the *GetTrees* Button we instantly generate a Microsoft Office Excel file (in .xls format) that contains all the projected parameters of the three trees that we introduced using the *PutTrees* Button in table format as a predefined structure. This format is compatible with the requirements of the USDA Forest Service ecological evaluation program.

The resulting Microsoft Office Excel file (predefined as *Trees.xls* and renamed if necessary) is the initial data base for USDA Forest Service Platform (McPherson, 2010). It will be used through data importation, as the "next step" together with the values of the parameters of pollutants and the climatic values, in order to obtain preliminary results that will be analyzed by the deciders.

The results obtained after ruling the last software platform, UFORE (Table 1. and Table 2.), reveal the different capacity of the species that we used in our experiment to reduce the level of some polluting agents (Table 2.) and the evolution of physiological parameters in the conditions that have been imposed in the projection phase (Table 1.). In this way the values can both be appreciated individually for each of the three trees used in the experiment and cumulatively in some landscape complex solutions.

Table 1.

Data Results from UFORE – Individual Tree Characteristics

Tree ID	Species Name	DBH (cm)	Height (m)	Ground Area (m^2)
TICO	*Tilia cordata*	63	15.8	98.7
AEHI	*Aesculus hippo.*	24.3	7.2	31.2
PRSE1	*Prunus serotina*	19.5	12.2	34.2
Leaf Area (m^2)	**Leaf Biomass (Kg)**	**LAI**	**C Storage (Kg)**	**Gross C Seq.(Kg/yr)**
660.48	49.47	6.61	649.34	15.42
151.09	10.57	5.18	106.35	6.6
292.59	22.69	8.67	76.91	6.08

Table 2.

Data Results from UFORE – Individual Tree Pollution Effects

Tree ID	Species Name	CO Rem (g/yr)	O3 Rem (g/yr)	NO2 Rem (g/yr)
TICO	*Tilia cordata*	14.6	652.8	125.3
AEHI	*Aesculus hippo.*	3.3	142.6	27.5
PRSE1	*Prunus serotina*	6.8	289.3	56.8
SO2 (g/yr)	**PM10 (g/yr)**	**PM2.5 (g/yr)**	**Vocs (g/yr)**	**Water Inter. (m^3/yr)**
57.9	331.2	33.9	0	5.91
12.4	81.1	8.7	0	1.42
26.6	142.1	14.3	5.47	2.63

The entire chain of commands using professional original software programs, together with created as integrated subroutines, is a consecrate method in other domains too (for example: Innovyze Products, smart wet infrastructure modeling and management tools) (www.innovyze.com, 2013), generically denominated *„simulation and modeling",* ecological in this case („Ecological Modeling and Simulation Management Solutions").

CONCLUSIONS

1. The results obtained in this experiment using three trees of three species with different individual characteristics (*Tillia cordata*, *Aesculus hippocastanum* and *Prunus serotina*) lead to different answers on the reduction of the level of urban pollution and of the evolution of physiological parameters.

2. Digital use of parameters in software doesn't affect the project conception, despite the imposed requirements. It offers perfect freedom to imagination, the virtual medium "supports" the originality, even under its abstract form, and retouch can be made in any ulterior moment.

3. The functions of created subroutines, integrated in the existing command chain, facilitate the possibility of an analysis of landscape solutions that are in

project phase, after the criteria "ecological impact", with the possibility of intervention and modification in real time of such solutions.

4. Introducing and extracting data with the subroutines that we mentioned above, and presenting them under a original, suggestive, friendly interface dedicate makes the results uniform due to utilization of the same parameters, in stationary conditions of pollution/climatic conditions.

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NOISE POLLUTION MONITORING IN CLUJ-NAPOCA PARKS BY GPS MAPPING

MONITORIZAREA POLUĂRII FONICE ÎN PARCURILE DIN CLUJ NAPOCA PRIN IMPLEMENTAREA MAPĂRII GPS

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Abstract. *According to demographic statistics afferent for 2006, in the city of Cluj-Napoca were recorded in the local government 305.620 residents, resulting an average density of inhabitants per km^2, located around 1771. The most important Romanian auditor in acoustic measurements, show that in all cities with over 250.000 inhabitants, there we have about 2.9 million people exposed to noise beyond the limit set in the auditing standards. Thus, for more than 60% of the population, quality of life is considerable affected by phonic pollution. The determinations aimed the existence of noise pollution in Cluj-Napoca parks based on standard measurements using a digital sound level meter and a ground GPS recording data such as: noise level day-evening-night L_{zsn} in decibels (dB), night noise L_{night}. The data collected were entered into mapping programs resulting maps related to real databases, efficient in future landscape works for reducing this type of pollution.*
Key words: *sound pollution, GPS, noise level, mapping, parks.*

Rezumat. *Conform statisticilor demografice aferente anului 2006, în Municipiul Cluj-Napoca erau înregistraţi în evidenţa administraţiei locale 305.620 locuitori, rezultând o densitate medie de locuitori/km^2 situată în jurul valorii de 1771. Cel mai important auditor român în domeniul măsurătorilor acustice, arată că din toate oraşele cu peste 250.000 de locuitori, avem aproximativ 2.900.000 de persoane expuse la zgomot peste limita prevăzută în standardele de auditare. Astfel, pentru mai mult de 60% din populaţie, calitatea vieţii este afectată considerabil de poluarea fonică. Determinările efectuate în cadrul disciplinei de Proiectare Asistată de Calculator de către colectivul lucrării, în perioada 01.03.2013 - 30.03.2013, au vizat existenţa poluării fonice în parcurile din Cluj-Napoca cu ajutorul unui sonometru digital şi a unui GPS terestru înregistrând date precum: nivelul de zgomot zi-seară-noapte L_{zsn} în decibeli (dB), nivelul de zgomot noapte L_{noapte}. Datele prelevate au fost introduse în programe de mapare rezultând hărţi corelate cu baze de date reale, eficiente în munca viitorilor peisagişti pentru reducerea acestui tip de poluare.*
Cuvinte cheie: *poluare fonică, GPS, nivel de zgomot, cartare, parcuri.*

INTRODUCTION

According to a study by the European Heart Journal, Romania is considered one of the most "noisy" countries of the European Union with the predisposition of the inhabitants of this country prone to heart attack due to noise (Bluhm et. al., 2004). In our country are recorded high levels of noise pollution, especially in large cities, where

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uncontrolled urban development says it's word. European Directive 2002/49 requires the Member States to create „strategic noise maps" using harmonized noise indicators such as noise L_{den} day-evening-night (L_{den}) and L_{night} (L_{night}).

Also according to this Directive noise maps will be drawn up for cities with a population greater than 250,000 inhabitants, road with an estimated average traffic more than 6.000.000 vehicles/year, railways with annual average of more than 60,000 trains/year and airports (http://ec.europa.eu/environment/noise/directive.htm).

Following the development of noise maps authorities are obliged to inform and consult the public about noise exposure, its effects and the measures that can be taken to control noise pollution. Romanian regulations in the area represented by HG 321 of 14.04.2005 provide strict limits for noise levels in curve A with values of 70 dB for L_{zsn} records and 60 dB for L_{night} wanting to reduce this value by 2012 at 65 dB L_{zsn} and 50 dB L_{night} (Dumitraş et. al., 2012).

MATERIAL AND METHOD

The paper proposes to monitor noise pollution in the central park from Cluj-Napoca, aiming registration standard indicators L_{den} and L_{night}. After processing the recorded data using a digital sound level meter Testo 815 and a terrestrial GPS, will be able to generate a digital sound map that highlights areas with risk of noise pollution in the park taken in study, as well as possible proposals to reduce the noise risk pollution. As a result of study undertaken were recorded curves values of the sound level A (35-100 dB). Thus, „the curve of sound level A" deals with recording and monitorisation of sound values supported by the human ear.

Phonic noise determinations were correlated with the standard required in the acoustic field ISO 8297:1994 (http://www.primariacj.ro/docs/Harta.de.zgomot.pentru.municipiul.Cluj.pdf).

The drawing up noise map was made daily by daily measurements for a period of 7 days consisting of diurnal (in the morning 800) (in the afternoon 1500) and nocturnal observations (hour 2000). Using the terrestrial GPS, have been highlighted on the map of noise data sampling points. Sampling points that have achieved identical values of noise level were linked through various mapping programs resulting polygons of dispersion of sound associated with the help of a chromatic map (Lubos et. al., 2006; Henrique et. al., 2006). Central Park taken in the study, it's bordered by the Municipal Stadium in the west, the Hungarian state theater to the east, the river Someșul Mic at north, namely street Iuliu Hossu (formerly Pavlov) at south. It is entered on the list of historical monuments in Cluj County, prepared by the Ministry of Culture and National Heritage of Romania in 2010 (www.wikipedia.org). After 1989 the park has been assigned the name of Central Park „Simion Bărnuțiu". In 2011, during the mandate of Mayor Sorin Apostu were concrete alleys and were destroyed several secular trees, which caused discontent and protests at local level by various NGO's. Sound determinations made during February-March 2013 want to highlight noise pollution in a central park full of trees with irrational toilet without the existence of foliage at deciduous species, noise pollution barrier being non-existent. Figure 1 treats graphically the neighborhood of central park „Simion Bărnuțiu" highlighted in the text, by emphasizing the accentuated graphic of park framing in the urban tissue and the registration points of phonic values.



Fig 1 - Framing in the area of the studied dig and the GPS positioning points of observations (original)

RESULTS AND DISCUSSION

According to the 15 observation points (from m_4 to m_{19}) established with the help of a GPS during the study were obtained the average values related to the table1. The average of the three stages of recording sound on values between 8^{00}-15^{00}-20^{00} show that the area with the lowest noise recorded value is generated by the observation points m_8, m_9, m_{17}, m_{18}, m_{19}, with mean values ranging between 50.4 and 58.4 dB.

Table 1

Average values of recordings obtained in central park Simion Bărnuțiu Cluj Napoca (dB) (after Singureanu V. et al.,)

No.	Phonic curve A (dB)		Average	Phonic curve A (dB)		Average	Phonic curve A (dB)		Average
	min.	max.		min.	max.		min.	max.	
	8^{00}			15^{00}			20^{00}		
m4	54,5	57,2	55,9	57,3	60,2	58,8	60,2	63,4	61,8
m5	57,7	58,1	57,9	58,2	59,2	58,7	61,7	63,2	62,5
m6	60,0	62,3	61,2	64,9	66,8	65,9	65,8	67,4	66,6
m7	58,6	59,2	58,9	63,7	65,5	64,6	67,9	69,2	68,6
m8	50,0	53,5	51,8	54,2	56,2	55,2	58,5	60,2	59,4
m9	51,6	53,4	52,5	53,1	55,5	54,3	55,7	57,6	56,7
m10	49,9	52,5	51,2	58,8	60,1	59,5	60,1	62,3	61,2
m11	62,9	64,2	63,6	66,4	68,2	67,3	68,8	69,1	69,0
m12	66,3	67,1	66,7	70,4	72,1	71,3	72,4	74,2	73,3
m13	70,1	72,1	71,1	73,2	74,2	73,7	72,6	73,8	73,2
m14	65,2	69,2	67,2	68,2	73,4	70,8	70,1	76,3	73,2
m15	58,8	59,5	59,2	62,1	63,7	62,9	68,8	70,3	69,6
m16	61,5	66,3	63,9	63,6	67,2	65,4	69,2	70,5	69,9
m17	48,8	54,4	51,6	50,5	56,2	53,4	59,8	60,6	60,2
m18	47,6	50,2	48,9	53,4	55,2	54,3	57,7	58,5	58,1
m19	46,2	48,2	47,2	56,7	57,2	57,0	57,4	58,1	57,8

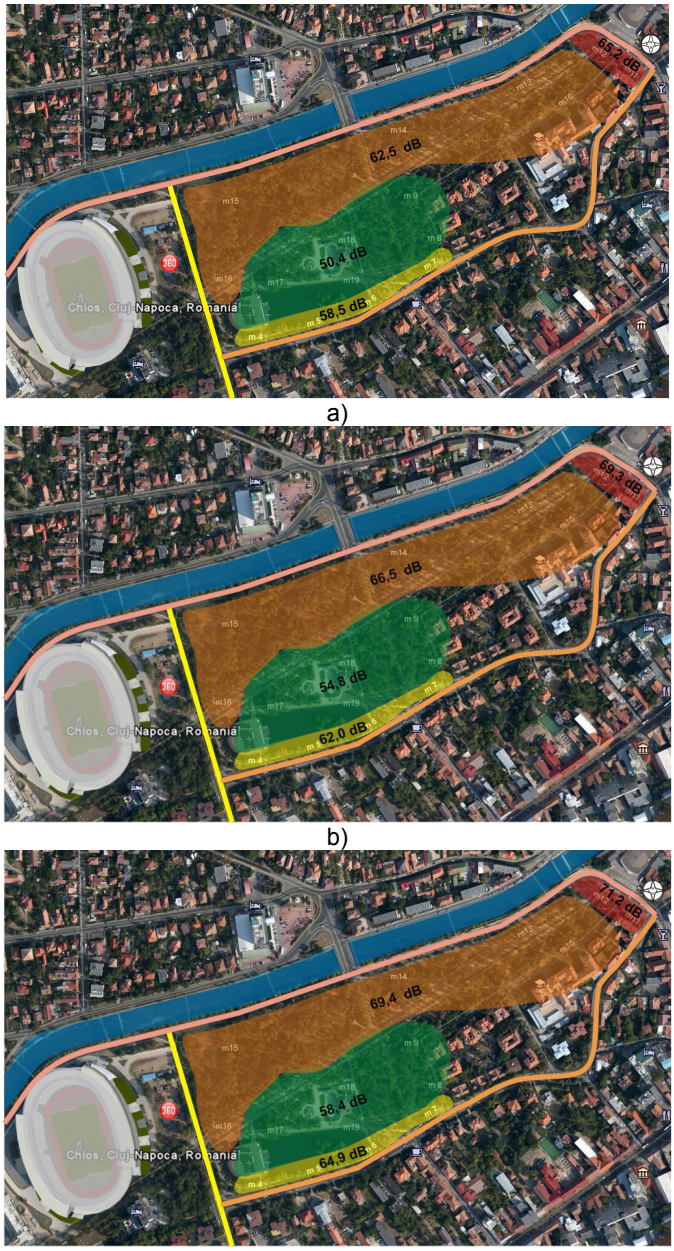


Fig. 2 - Average values of the observation points limits on the noise level in dB - central park „Simion Bărnuțiu" Cluj-Napoca (a - 8^{00}; b - 15^{00}; c - 20^{00}) (original)

Graphics corresponding to figure 2 highlights chromatic noise zoning related to central park „Simion Bărnuțiu" providing quantifiable data on range of sound to which potential visitors of the park can be exposed. Thus, red, orange and yellow highlights areas with risk of noise pollution from central park.

According to recorded data chromatic green zone highlights the legal values of the sound level. The observed noise values curve presents a continuous descent during the study period with reaching maximum values at 20^{00} with the increase of traffic in the area (Mihăiescu et. al., 2007).

The study area consists of the observation points m_{11} and m_{12} records the highest values of the noise from study, being located at the eastern entrance of the park near the Hungarian Theatre and a central point of intersection car with an average of 65.2 dB noise values at 8^{00}, 69.2 for 15^{00} and 71.2 for 20^{00} with a peak sound of +21.2 dB versus L_{night} admitted by the legislation in force.

The chromatic orange color represented by the observation points: m_{13}, m_{14}, m_{15}, m_{17}, located along Emil Isaac street in the northern part of the of Central Park, record high average noise values during the study due to their proximity to road artery frequently circulated by public transport (trams, buses) as well as small tonnage machines. The values of car traffic are high due to the two-lane road going towards the direction of stadium „Cluj Arena". Obtained values recorded an ascending curve starting at time 8^{00} (62.5 dB) and ending with the hour 20^{00} (69.4 dB) with a peak sound of +19.4 dB from L_{night} permitted by the legislation in force.

The only area in central park „Simion Bărnuțiu" relatively „safe" in terms of noise pollution is represented chromatically on plan with green and is composed of the observation points m_{17}, m_{18}, m_{19}, m_9 and m_8 indicating that this area also shows a peak of +8.4 dB sound to L_{night} allowed by law for values specific for observation hour 20^{00}.

CONCLUSIONS

In addition to aesthetic effect totally desolate (fig. 3), irrational trimming of existing trees within the Central Park „Simion Bărnuțiu" in Cluj-Napoca, lead to increased noise through lack of roof trusses or under roof trusses entirely developed on trees in the park.



Fig. 3 - Chaotic trimming trees in Central Park „Simion Bărnuțiu" (original)

Hedges that border the park, executed from different deciduous species with obsolete foliage, poorly developed, does not ensure attenuation of the effect

of noise pollution during the cold season. We recommend planting a hedge using evergreen species such as *Taxus bacatta* or *Thuja occidentalis* 'Danica'.

Where the topography permits, we recommend insertion of resting places in the park at the base of some uplifted landforms (on the slopes). Also recommend planting in park slope with plagiotrope evergreen species such as *Lonicera pileata* or *Juniperus horizontalis* 'Andorra Compact'. Recognized for their outstanding ability to filter rainwater, and absorbing effect, we recommend changing the main alleys material layer concrete slabs current grass.

Recognized for their particular ability to filter rainwater and phono-absorbing effect, we recommend changing the material alleyway from the actual concrete layer in the grassed tiles.

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CONTROL OF SOME QUALITY INDICATORS OF PRUT RIVER IN TWO MONITORING SECTIONS (RĂDĂUȚI AND DARABANI) (SPRING SEASON)

CONTROLUL UNOR INDICATORI DE CALITATE AI RÂULUI PRUT ÎN DOUĂ SECȚIUNI DE MONITORING (RĂDĂUȚI ŞI DARABANI) (SEZONUL DE PRIMĂVARĂ)

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Abstract. *The paper describes proper experimental results concerning the control and analysis of some important quality indicators (i.e. general physical-chemical indicators, oxygen regime indicators, and some specific and/or toxic chemical indicators) during the spring season (March-May, 2009), in two monitoring sections of Prut River (i.e. Rădăuți-Prut and Darabani-Prut), together with its local potential pollution sources. The performed results permitted the evaluation of water quality, integration of each analyzed quality indicator in a specific quality category, in each monitoring section, and estimation of pollution level in spring season, but also of further actions for protection and conservation of this natural water resource.*
Key words: *monitoring section, pollution level, surface water categories, quality indicator, Prut River, spring*

Rezumat. *Lucrarea descrie rezultatele experimentale proprii privind controlul şi analiza unor indicatori de calitate importanți (i.e. indicatori fizico-chimici generali, indicatori ai regimului de oxigen şi câțiva indicatori chimici specifici şi toxici) în timpul primăverii (martie-mai, 2009) în două secțiuni de monitoring ale râului Prut (i.e. Rădăuți-Prut şi Darabani-Prut), împreună cu sursele locale potențiale de poluare. Rezultatele obținute au permis evaluarea calității apei, încadrarea fiecărui indicator de calitate analizat într-o categorie de calitate specifică, în fiecare secțiune de monitoring şi estimarea nivelului de poluare în anotimpul de primăvară, dar şi acțiuni viitoare pentru protecția şi conservarea acestei resurse naturale de apă.*
Cuvinte cheie: *secțiune de monitoring, nivel de poluare, categorii de apă de suprafață, indicator de calitate, râul Prut, primăvară*

INTRODUCTION

The water importance in the existence of human species and, in general, of vegetal and animal living world must be understood and accepted as a definitory element of our whole planet sustainable development in conditions of diminishing the natural resources of fresh water, and manifesting of some pollution episodes more and more various as form and complexity. The accumulation of pollutants in the natural water resources, self-purification or insufficient self-treat-

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ment of them, the necessity of new modern technologies more and more complex, and also expensive for treatment of natural water resources for different purposes are realities of modern world pointed out by majority of specialists in the field.

The definition of aquatic environment quality is made priority by appreciation of natural water resource quality with which is contacting, or wishes to consume. From international statistical estimation, the fresh water proportion is relatively low in comparison with salty water from seas, oceans, and is accessible as surface water in a percentage lower than 0.2 % from the total water resources of Earth (Zaharia, 2011). As result, the importance of water must be evaluated taking in consideration the repartition or distribution of natural water resources, composition of substances and organisms present in water as well its utilizations in different activities as industrial, agricultural or zoo-technical productive activities, domestic consumption, transport or energetically use (*i.e.* global utilization of water constitutes of an average 250 m^3/year. inhabitant, with extreme discordances in different geographic zones) (Surpățeanu, 2007; Teodosiu et al., 2010).

The quality of water varies also very much in different geographical regions, and are numerous organoleptic, physical-mechanical, chemical and microbiological aspects which must be considered in determination of its acceptability and viability as pure resource of consuming water (Zaharia, 2011).

The control and analysis of water quality represents one of important tools of water resource management for conservation, assuring the natural vital resource for present and future generations. This fact imposes the maintaining of specific normal physical-chemical-biological (microbiological) balances, and avoiding/reduction of more and more various pollution episodes of a higher number of rivers and lacks.

The water quality is usually appreciated by general, specific and/or toxic quality indicators of physical, chemical, biological (especially microbiological) origin, or ecotoxicological indicators (Zaharia, 2011; Zaharia and Teslaru, 2012).

The crossing through some urban and rural locations of different watercourses leads to them loading with numerous pollutants as a result of different productive activities, in general, of local socio-economical development. Therefore, the watercourse quality experiences modifications, negative from qualitative point of view, and needs different types of monitoring programs, and also hydro-fitting out for making its better. The population concern (*i.e.* citizens with different ages) but firstly of reknown, and/or in formation specialists (*i.e.* students at Bachelor, Master, PhD programs), and also the real need of certainty and/or clarifying of noticed vagueness, initiated numerous individual studies for control of some pollutants in different monitoring sections alongside some important watercourses (*e.g.*, Prut River) for evaluation of pollution level, initiation of some advanced monitoring programs, and also depollution actions for solving of different environmental and hydrological problems in different urban zones (Danalache, 2009).

This paper proposes the presentation of proper experimental results, obtained by laboratory analysis and its interpretation, for appreciation of water quality of Prut River in two monitoring sections (*i.e.* Rădăuți-Prut and Darabani-Prut). Some general physical-chemical quality indicators (*i.e.* color, pH, tempera-

ture, turbidity, suspended solids, total hardness, indicators for oxygen regime (*i.e.* dissolved oxygen, chemical oxygen demand-COD_{Mn} or permanganate index-I_{Mn}, biochemical oxygen demand-BOD_5), salty indicators (fixed residues), specific indicators for the content of some anionic and cationic representative constituients (nitrites, nitrates, phosphates, chlorides, sulphates, ammonia), and some toxic chemical indicators (phenol derivates, extractible substances in organic solvents) were controlled by periodic analysis in spring season (March-May, 2009).

MATERIAL AND METHOD

1. Characterization of Prut River and the two monitoring sections

Prut River (953 Km length) springs from Wood Carpatian (Ukraine), and flows into Danube nearly Reni (at East of Galați), disposing of a hydrographic basin of 27,500 km^2 spreading on territory of three states: Ukraine, Romania (10,990 km^2), and Republic of Moldova. On Romanian territory has a length of 742 km, an average multi-annual flow of 110 m^2/s (before springing), and disposes of a hydroenergetic fitting out at Stânca-Costeşti, built together with Republic of Moldova.

Prut River is controlling in 10 monitoring sections (*i.e.*, monitoring sections in monthly, weekly, and daily rapid monitoring sections) for supervision (S), operative (O), and reference (R) actions (*e.g.*, the best available monitoring section, or international monitoring sections together with Republic of Moldova, and also Ukraine, or TNMN transnational monitoring network, EIONET network, etc.). Data from annual statistic reports indicate a framing of Prut River in II^{nd} and III^{rd} quality category (from physical-chemical and biological point of view), with small exceptions.

Darabani-Prut control section is considered the best available section, water quality of Prut River being maintained in this section of II^{nd} quality category (since 2006, relatively clean water), with improvements of physical-chemical indicators concerning oxygen regime, nutrients, salinity, and biological indicators (biological indicators quarterly controlled for phytoplankton, microfitobentos, and macrozoobentos; absence of aquatic macrofites and halophytes) (Danalache A.E., 2009).

Rădăuți-Prut control section is considered as an operative supervision section, placed at a distance of 27 km from the previous one, qualitatively and quantitatively analyzed in the frame of Protocol between Romania and Republic of Moldova. The water quality of Prut River is maintained in this section of II^{nd} quality category refering to oxygen regime, salinity, heavy metal ions (Cd^{2+}, total Cr^{3+} and CrO_4^{2-}, Cu^{2+}, Ni^{2+}, Pb^{2+}, Zn^{2+}), and biological indicators (phytoplankton, microfitobentos and macrozoobentos; absence of aquatic macrofites and halophytes, quarterly control).

2. Materials and physical-chemical analysis methods

In this paper are analyzed only few physical-chemical indicators, the applied analysis methods being Romanian standard (SR) methods internationally approved (ISO or EN), as well as the reference materials, chemical reagents, stock solutions, and operating parameters for gravimetric, titrimetric, or spectrophotometrical analyses used (Surpateanu and Zaharia, 1999, 2002; Zaharia and Teslaru, 2012):

- *General indicators* of physical-chemical nature: hydrogen ions concentration – pH (SR ISO 10523-97, HACH OneLine Laboratory pH-meter, with reference electrode); temperature (thermometer); color (SR ISO 7887/1997, absorbance or Hazen color units, HU); turbidity (SR EN ISO 7027: 2001), suspended solids (STAS 6963-81); total hardness; oxygen regime as dissolved oxygen (SR EN 25814/1999), chemical oxygen demand (COD_{Mn}) (SR EN 1484/2001, SR ISO

6060/1996), biochemical oxygen demand (BOD_5) (SR EN 1899/2002); salinity indicators as fixed residues (STAS 6963-81);
- *Specific chemical indicators* for the content of some anions and cations as nitrites (STAS 3048/1-96), nitrates (STAS 8900/1,2-96), phosphates (SR EN 1189/2000);
- *Specific toxic indicators* as phenol and phenol derivates (SR ISO 6439/2001 or SR ISO 8165-1/2000) and extractible substances in organic solvents (SR 7587/1996).

All chemical reagents used have high purity degree (p.a.). The pH adjustment was done using 0.1M HCl, and 0.1M NaOH solutions. The analytical control of water sample quality was performed with help of different individual and multifunctional apparatuses (Hach One-Laboratory pH-meter; DRELL DR/2000 spectrophotometer, Hach Company), conventional methods for COD_{Mn}/I_{Mn}, BOD_5, sulphates, total hardness, extractibile substances, fixed residues, as well as spectrophotometrical methods for nitrates, nitrites, phosphates, and phenol derivates (Zaharia and Teslaru, 2012).

The collected samples were kept in specific conservation and storage conditions (refrigeration) more than 7 days for data validation. The analysis method sensibility depends of type, standard materials, used apparatuses, and the accuracy and precision are good enough for evaluation of water quality (0.01-0.0001 M).

RESULTS AND DISCUSSIONS

For the water quality control of Prut River were weekly collected water samples (March-May, 2009) which were preserved (for determination of extractible substances and nitrites, using specific chemical reagents) (Surpățeanu and Zaharia, 1999, 2002), transported to the environmental analysis laboratory, and refrigerated for subsequent laboratory analysis. The analysis of studied physical-chemical indicators facilitated the evaluation of water pollution status in the two control sections, and the specific framing in the corresponding quality categories.

The performed experimental results are presented in table 1(a) for the physical and salinity indicators (color, turbidity, suspended solids, and fixed residues), and in table 1(b) for some specific and toxic chemical indicators (pH, total hardness, oxygen regime indicators: COD_{Mn}, BOD_5, nitrites, nitrates, phosphates, extractible substances in oil ether, and phenol index).

The pH values are low alkaline in the studied two monitoring sections (except in April for Darabani-Prut section, and in May for Rădăuți-Prut section when were low acid, but framing in the admissible limits of 6.50-8.50).

The content of dissolved organic substances expressed by COD_{Mn} and BOD_5 exceeded frequently the admissible limits, but no more than 1.96-5.29 times, and were closed to the values registered in the last three years. The content of nitrites and nitrates as an indicator of oxidative transformations of nitrogen, and its derivates (NO_2^- transformed in the most stable oxidizing form of NO_3^-) is higher in the Rădăuți-Prut section exceeding of 2.4-38 times the admissible limits for nitrites, those for nitrates being generally in the admissible limits. Also, the content of phosphates is extremely high exceeding with more than 7.02-33 times the admissible limits in Darabani-Prut section, and 0.2-430 times in Rădăuți-Prut section, respectively (sign of wastewater discharges loaded with high quantities of phosphorus derivates as o-phosphates, tensioactive constituents from different cleaning, washing services etc., as well as organic phosphorus). In April and May

months were presented more extractible substances in organic solvents as a presence sign of oils and greases, and phenol derivates in much higher content than the admissible limit (exceeding of 150-890 times) in each spring month.

Table 1

The values of physical-chemical quality indicators of Prut River in the two studied monitoring sections (March-May, 2009)

Quality indicator	Measured value *(average value of weekly analysis results)*						M.A.C.*(I)
	P_1(*bridge*) – Darabani-Prut			P_2 (*bridge*) – Rădăuți-Prut			
	March	*April*	*May*	*March*	*April*	*May*	
(a) General physical-chemical indicators							
Color A436	0.125	0.042	0.024	0.093	0.048	0.022	< 50
A525	0.105	0.030	0.016	0.076	0.060	0.018	
A620	0.084	0.028	0.015	0.060	0.038	0.013	
HU (456)	90.00	32.50	13.30	59.16	40.00	15	
Turbidity, FTU	17	17	2	8	8	2	-
Suspended solids, mg/L	139	59	35	70	27	21	30 (60)
Fixed residues, mg/L	530	1060	340	420	100	180	500
(b) Specific and toxic chemical indicators							
pH	6.60	7.67	7.37	7.39	7.39	6.91	6.50-8.50
COD_{Mn}, mg O_2/L	9.76	9.64	9.48	19.52	16.48	4.56	5
BOD_5, mg O_2/L	2.023	6.401	7.232	15.480	15.871	3.283	3
Total hardness, °G	18.48	10.19	8.74	17.70	9.18	8.40	> 5
Nitrites, mg/L $N\text{-}NO_2^-$	0.094	0.029	0.024	0.061	0.039	0.031	0.01
Nitrates, mg/L $N\text{-}NO_3^-$	1.036	0.959	0.383	1.177	1.241	0.485	1
Phosphates, mg/L P	0.351	0.40	1.694	0.010	0.50	2.148	0.05
Extractible substances, mg/L	3.33	2	2	2	5	5	-
Phenol index, mg/L phenol	0.876	0.547	0.275	0.624	0.896	0.159	< 0.001
M.A.C.*(I) – maximum admissible concentration, Ist quality category, MO No. 161/2006							

Table 2

Water quality categories of Prut River for the studied physical-chemical indicators

Quality indicator	Water quality categories of Prut River						
	P_1(*bridge*) – Darabani-Prut			P_2(*bridge*) – Rădăuți-Prut			General observations
	March	*April*	*May*	*March*	*April*	*May*	
pH	I	I	I	I	I	I	I, in all months
COD_{Mn}	II	II	II	II	III	III	II, in P_1 all months II-III, in P_2
BOD_5	I	II	III	III	III	II	I-III, in P_1, all months II-III, in P_2,all months
Nitrites	III	II	II	II	II	II	II, in all months, except in March, in P_1
Nitrates	II	I	I	II	II	I	I, in P_1, all months, except in March, and in P_2, all months
Phosphates	III	III	D	I	II	III	III, in P_1, all months, except March (D) I-III, in P_2, all months
Phenol Index	D	D	D	D	D	D	D, in P_1 and P_2, all months
Fixed residues	III	III	I	II	I	I	I-III, in P_1, all months I-II, in P_2, all months
D – degraded water; I-III quality categories of water bodies (I-drinking water, II-irrigation/bathing, III-affected by anthropogenic uses in different ways)							

The framing of indicators in the corresponding quality categories (referring to Environmental Ministry Ordinance No.161/2006, and No.1146/2002), is synthetically presented in table 2, and permits the estimation of real situation of surface water quality in the two studied monitoring sections, in spring (2009).

For the majority of quality indicators in the two investigated monitoring sections, the highest values were obtained in March. The water quality of Prut River can be generally framed in IInd quality category for COD_{Mn}, BOD_5, nitrites, nitrates, fixed residues, or in IIIrd quality category for phosphates, and D-degraded for phenol index. A strict and efficient control, preventive treatment measures of all effluents discharged in Prut River, as well as the penalizations for local throwing of solid wastes and liquid residues must be always considered.

Moreover, our practice analysis concludes that the principal pollution source of Prut River in the representative influence zone of the two studied monitoring sections is SC Apa Grup SA Botoşani, Darabani sector, and few local individual housekeepings, and farms.

CONCLUSIONS

1. There were analyzed at laboratory scale set-up some physical-chemical quality indicators using standard methods internationally approved, as well as certified and abroad recognized apparatuses.
2. In the first spring month (March) were registered the highest values of the analyzed quality indicators which permitted the framing of each indicator in a proper quality category.
3. The Prut River quality in the two monitoring sections is evaluated to be of IInd quality category, with two exceptions (for content of phosphates, and also phenol derivates). As result, it is imposing the permanent monitoring of water quality in the two studied monitoring sections for identification of local potential pollution episodes.

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ASSESSMENT OF WASTEWATER BIOSOLIDS MANAGEMENT OPTIONS AT REGIONAL LEVEL, USING GIS TECHNIQUES

EVALUAREA OPȚIUNILOR DE GESTIONARE A BIOSOLIDELOR LA NIVEL REGIONAL, UTILIZÂND TEHNICI GIS

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Abstract. *Wastewater biosolids are the byproduct from wastewater treatment process that contains nutrient – rich organic matter used in recycling and beneficial agricultural purpose. This paper aims to present the evaluation of biosolids management options at regional level, after the implementation of various wastewater and biosolids treatments by using GIS software package. The first analyzed solutions are biosolids field application as organic fertilizer and energy recovery by incineration or in industrial processes, depending on local conditions. Also, the factors taken into account for determining the suitability of agricultural lands to the application of biosolids are represented by land slope, soil pH and soil laden with heavy metals.In the new economy based on knowledge that is required in competitive societies, informational systems for organizing data becomes essential in decision making processes.*
Key words*: assessment, wastewater, biosolids, GIS, pH, heavy metals*

Rezumat. *Biosolidele reprezintă produsul secundar rezultat în urma procesului de epurare al apelor uzate care conține substanțe nutritive - bogate în materie organică, utilizate în scopuri agricole şi pentru reciclare. Lucrarea de față îşi propune să prezinte evaluarea opțiunilor de gestionare a biosolidelor la nivel regional, în urma implementării diferitelor metode de tratament a apelor uzate, prin utilizarea pachetului software GIS. Primele soluții analizate constau în utilizarea biosolidselor ca îngrășăminte organice pe terenurile agricole şi recuperarea de energie prin incinerare sau în procese industriale, în funcție de condițiile locale. De asemenea, factorii care s-au avut în vedere pentru stabilirea pretabilității terenurilor agricole la aplicarea biosolidelor sunt reprezentați de panta terenului, pH-ul solului si gradul de încărcare a solului cu metale grele.În cadrul economiei actuale, bazate pe cunoaştere, necesară în societățile competitive, sisteme informaționale pentru organizarea datelor devin esențiale în procesul de luare a deciziilor.*
Cuvinte cheie*: evaluare, ape uzate, biosolide, GIS, pH, metale grele*

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INTRODUCTION

Wastewater biosolids are the byproduct from wastewater treatment process that contains nutrient – rich organic matter used in recycling and beneficial agricultural purpose. It is one of the best sources of soil conditioner and source of slow release nutrients and microelements. For long term sustainable improvement of environmental quality factors by minimizing the adverse impacts of inadequate management of biosolids the development of a national strategy was required.

The main principle adopted in the development of biosolid management strategies at national and regional level, is to ensure, as far as possible, that the sludge is used as organic fertilizer or as renewable energy source.

The first analyzed solutions are biosolids field application as organic fertilizer and energy recovery by incineration or in industrial processes, depending on local conditions. Biosolids disposal in ecological landfills is always the last option and is recognized as unsustainable solution being subject to some legal restrictions in the European Union. In the new economy based on knowledge that is required in competitive societies, informational systems for organizing data becomes essential in decision making processes. Geographic Information System (GIS) develops more and more strongly, GIS is being applied in many areas of life, including agriculture.

MATERIAL AND METHOD

In accordance with national and EU policy, biosolids should be used beneficially through the most practical and efficient ways in order to avoid, as much as possible the disposal in landfills.

Potential methods of biosolids management in Romania consist of sustainable long term application of sludge on agricultural lands, on forestry plantations and lands rehabilitation, for energy recovery and through co-composting together with solid waste.This paper presents two methods of biosolids management at regional level, ie: agricultural use and energy recovery.

Agriculture. The factors that have been considered for determining agricultural lands suitability to the application of biosolids are: slope, soil pH, soil heavy metal load and biosolid quality (figure 2). For this study a GIS database was created, using ArcView, a GIS software package. One of the main shapefiles in the GIS database was the maximum permitted values for agricultural land application of biosolidsshapefile according to OM 344/2004. It was used Romania soil Map (scale 1:200,000) and EU reference dataset for land cover -Corine Land Cover 2000 (CLC200) (figure 1).

Energy recovery.The most used technology for energy recovery during the biosiolids treatment process is utilization of methane produced by anaerobic digestion process which generates heat and energy, called biogas.In the same database previously presented was created another shapefile representing potential locations in Romania for biogas production (figure 3).Other options for energy recovery from biosolids are incineration and co-combustion, made in cement factories and power plants.

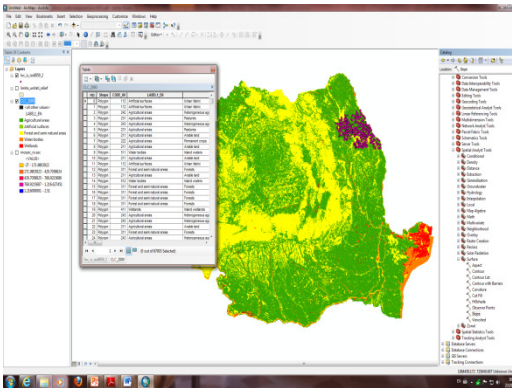


Fig. 1 - Corine Land Cover 2000 soil map

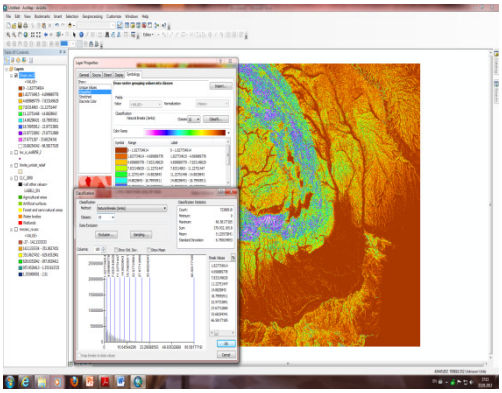


Fig. 2 - Creating terrain slope with Spatial analyst extension

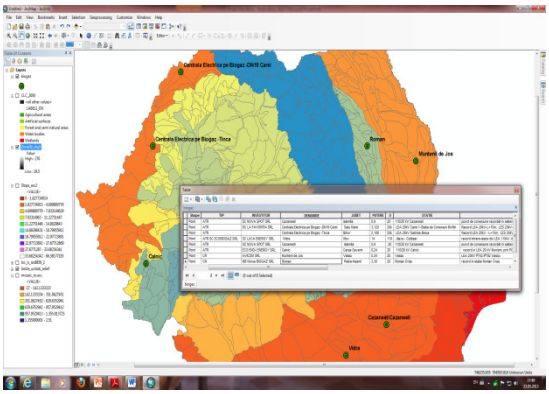


Fig. 3 -
Creating biogas shapefile in ArcMap

RESULTS AND DISCUSSION

The slope is closely linked to the protection of water sources due to potential risk for producing leakage in the case of heavy rains. Land with slope lower than 5% has the lowest risk, but OM 344/2004 allows biosolids application on lands with slopes up to 15% with conditioning that there are no additional risk factors.Table 1 present the assessment using GIS techniques of areas with slopes lower than 5% and 10%.

Soil pH strongly influences the mobility degree of heavy metals, by increasing or reducing the plants absorption. Romania chose a pH limit more restrictive than other EU countries and as result the biosolids can be only applied to soils that have a pH value of at least 6.5. EU Directive allows biosolids application on soils that have a pH>5.5, with the adjustment of maximum allowed heavy metal concentrations.Table 2 shows the evaluation results of arable land where soils pH is greater than 6.5.

Table 1

The share of arable lands with slope lower than 5% and 10% in each region

Region	Total area (ha)	Arable area (ha)	Arable land with slope < 5		Arable land with slope < 10	
			(ha)	(%)	(ha)	(%)
N – E	3685282	1219868	383114	31.4	1172689	96.1
S - E	3576047	1967166	1354854	68.9	1892508	96.2
S	3446639	2034674	1711345	84.1	1989435	97.8
S – W	2921483	1191866	900205	75.5	1153471	96.8
W	3203416	1010940	852107	84.3	974660	96.4
N – W	3416182	829800	423854	51.1	789796	95.2
Center	3408703	580550	241126	41.5	484022	83.4
Bucharest - Ilfov	180528	103855	93799	90.3	103844	100.0
Total	23838281	8938719	5960404	66.7	8560424	95.8

Table 2

The share of arable land with a soil pH greater than 6.5

Region	Total area (ha)	Arable area (ha)	Arable land with pH > 6.5		Arable land with pH > 6	
			(ha)	(%)	(ha)	(%)
N – E	3685282	1219868	811535	66.5	1046681	85.8
S - E	3576047	1967166	1856851	94.4	1910422	97.1
S	3446639	2034674	1374892	67.6	1769352	87.0
S – W	2921483	1191866	551415	46.3	881115	73.9
W	3203416	1010940	328281	32.5	602120	59.6
N – W	3416182	829800	222714	26.8	360327	43.3
Center	3408703	580550	307038	52.9	357454	61.6
Bucharest - Ilfov	180528	103855	5456	5.3	89085	85.8
Total	23838281	8938719	5458181	61.1	7016555	78.5

Given the multitude of sources of soil heavy metals load (industrial emissions, fertilizers, irrigation water, manure, etc.) and the fact that some sources can't be removed, being important links in the production process, it is necessary to limit their quantity. Whereare appliedbiosolidsshould be avoided fields that has reached a level of 80% of the maximum allowable load of heavy metal in soil. Loading the soil at a level above the maximum admissible limits leads to the pollution phenomenon manifested by decreasing the production, accumulation of heavy metals in plants, disorder of biological balance in soil, groundwater loading with heavy metals etc.

Figures 4, 5 and 6 shows the suitability criteria for biosolids land application depending on land slope, soil pH and heavy metals loads.

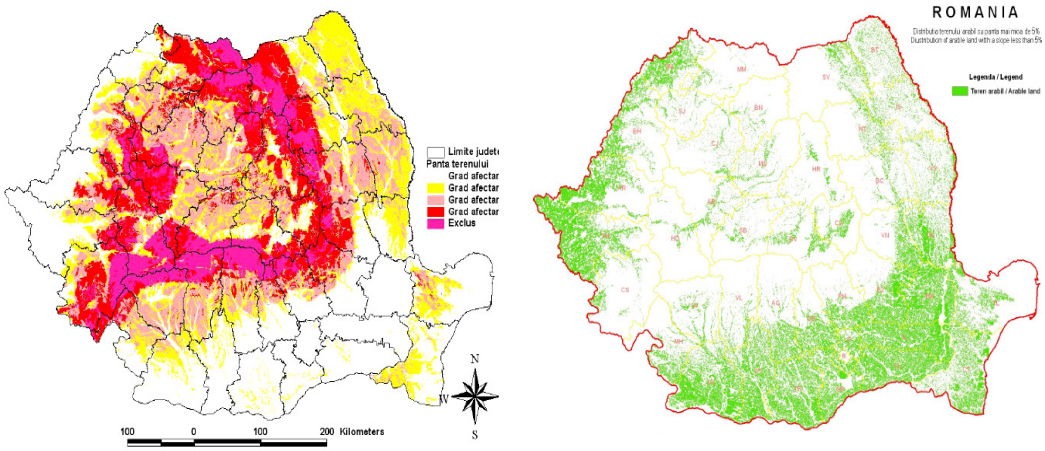


Fig. 4 - Suitability criteria for biosolids land application depending on slope

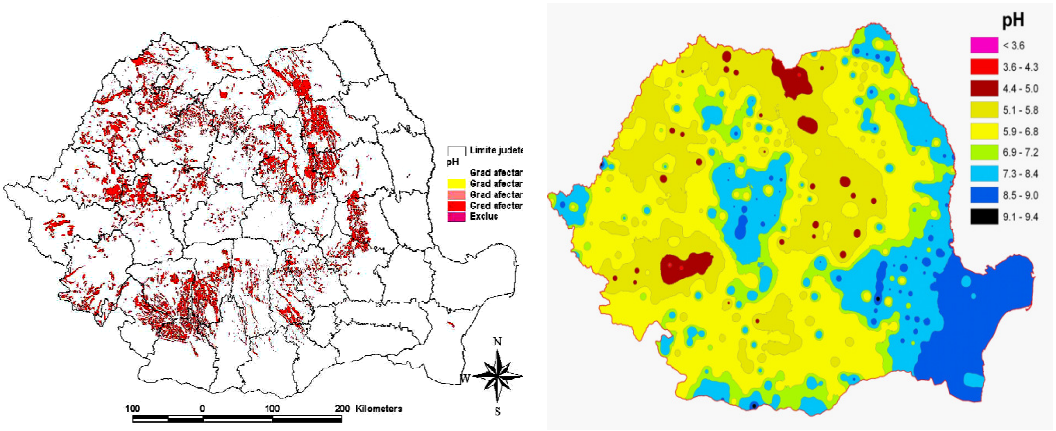


Fig. 5 - Suitability criteria for biosolids land application depending on soil pH

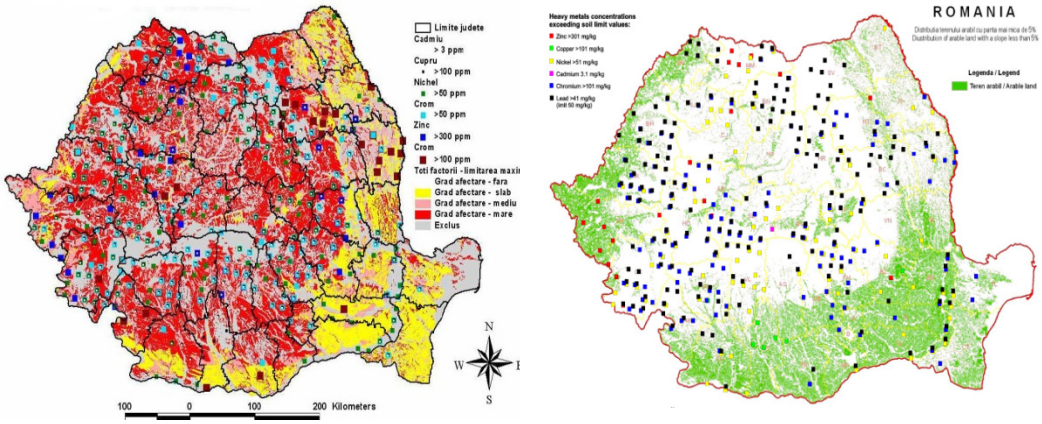


Fig. 6 - Regional distribution of heavy metals concentration compared to allowed values

CONCLUSIONS

The use of biosolids in agriculture is the most comprehensive solution. Regionally, data reflects that the number of areas where the land has a slope ≤10% and a pH≥6.5 are more compared to the areas that have a slope ≤5% and pH ≥ 6.5, especially in the regions NE, NW and Central. In the case of fields with a slope ≤ 10% where pH value was reduced to 6.0, suitable lands for biosolids application would increase both in the NW and SE, due to the presence in these areas of acid soils.

The use of biosolids for energy recovery will be made where feasible (technically and economically), but will not be widely adopted until 2020 because the landfill disposal costs are lower than those for co-processing in the cement factories.

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THERMODYNAMIC CALCULATIONS OF COMPLEX CHEMICAL EQUILIBRIA IN SOILS CONTAINING ALUMINIUM MINERALS

CALCULE TERMODINAMICE ALE ECHILIBRELOR CHIMICE COMPLEXE ÎN SOLURI CARE CONȚIN MINERALE DE ALUMINIU

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Abstract. *A thermodynamic method for calculating complex chemical equilibria in soils containing aluminium minerals under the real, non-standard conditions has been developed. The expression for calculating the change in real Gibbs energy was deducted. Heterogeneous systems with simultaneous reactions involving aluminium soluble and insoluble (minerals) species have been investigated. Comparisons of thermodynamic stability of Al oxysulfate minerals and gibbsite were carried out. The developed approach for calculating the Gibbs energy may be successfully applied for the prediction of complex chemical processes in soil.*
Key words: *aluminium minerals, complex formation, Gibbs energy, thermodynamic stability.*

Rezumat. *A fost elaborata o metodă termodinamica de calcul ale echilibrelor chimice complexe in soluri care conțin minerale de aluminiu in condiții reale, diferite de cele standarde. S-a dedus expresia de calcul a energiei Gibbs in condiții reale. Au fost studiate sisteme eterogene cu participarea speciilor solubile şi insolubile (minerale) ale ionului de aluminiu. S-a efectuat o comparație a stabilității termodinamice a mineralelor de oxisulfați de aluminiu cu gibbsitul. Metoda elaborata de calcul a energiei Gibbs poate fi aplicată cu succes pentru prezicerea unui şir de procese chimice complexe in sol.*
Cuvinte cheie: *energia Gibbs, formarea complecşilor, minerale de aluminiu, stabilitatea termodinamica.*

INTRODUCTION

Soils are open heterogeneous (multiphase) multicomponent systems in which a large number of mutually dependent chemical reactions take place with involvement of the soil biota as well. The physicochemical complexity of soils, the main characteristics of their chemical behavior can be understood on the basis of thermodynamic principles and methods of research of the complex chemical reactions in aqueous heterogeneous systems. In this paper, the mathematical expressions for calculating the Gibbs energy for systems "aluminium mineral (solid phase) – aqueous saturated solution", in the presence of a series of chemical species that react with the Al^{3+} ions, especially in acid soil solutions, have been derived.

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In aqueous media aluminum can be found in a variety of soluble and insoluble forms. The high concentrations of aluminum may affect the buffer capacity and transport of elements in aquatic ecosystems, this element being toxic for aquatic organisms. Although understanding the chemistry and effects of aluminum in aqueous environment has substantially increased in recent years, some additional researches are required to identify the sources of aluminum and mechanisms of its transport from the soil solution to ground surface waters in order to assess the effects of aluminium on phosphorus compounds, trace metals and organic carbon cycle, as well as the action of different aluminum-containing species on aquatic organisms. Ecologically significant concentrations of aluminum were identified in surface waters due to acidic deposition. Mineral acids derived from rainfalls mobilize aluminium from minerals formed as a result of the soil evolution, which is transported to the adjacent surface waters.

The soluble aluminium in soil solutions is found as the Al^{3+} ions along with chemical combinations with OH^-, F^-, SO_4^-, PO_4^{3+} and organic compounds. Although the recent investigations have often ignored the presence of aluminum non - hydroxylic complexes, it can be assumed that the complex organic species and fluorides are the predominant forms of aluminum in dilute acidic surface waters (with a low ionic strength). The concentration of inorganic aluminum forms increases exponentially with decreasing the pH of solution. This phenomenon is analogous to the theoretical dependence of the solubility of mineral phases on pH values. At the same time, the concentration of organic aluminium species correlates better with the variations in the organic carbon concentration from surface waters than with the environmental pH. High concentrations of aluminum in dilute acidic waters are of interest from several points of view: aluminium is an important buffer of pH; aluminum can influence the cycle of important elements, such as phosphorus, organic carbon and metal ions; aluminum is potentially toxic to aquatic organisms.

THEORETICAL PART

As insoluble species of aluminium a series of minerals with general composition $(K,Na)_n Al_x(OH)_y(SO_4)_z(H_2O)_m$ has been investigated. Their solubility can be controlled by the following dissolution-precipitation equilibrium:

$$(K,Na)_n Al_x(OH)_y(SO_4)_z(H_2O)_m + yH^+ \leftrightarrow n(K^+,Na^+) + xAl^{3+} + zSO_4^{2-} + (m+y)H_2O,$$

$$K_S = [K,Na]^n[Al]^x[SO_4]^z/[H]^y \qquad (1)$$

where K_S is the solubility product of aluminium mineral. The ionic charges and influence of ionic strength are omitted for simplicity.

The Al^{3+} concentration can be calculated from the K_S expression (1):

$$[Al] = K_S^{1/x}[K,Na]^{-n/x}[SO_4]^{-z/x}[H]^{y/x}. \quad (2)$$

In this paper the following mineral have been investigated: 1) jurbanite $Al(OH)(SO_4)\cdot 5(H_2O)$, 2) basaluminite $Al_4(OH)_{10}(SO_4)\cdot 5(H_2O)$, 3) alunite $KAl_3(OH)_6(SO_4)_2$, 4) alunogel $Al_2(SO_4)_3\cdot 17(H_2O)$ and 5) gibbsite $Al(OH)_3$. Concomitantly with the process (1) a large set of possible equilibria in the system „mineral – soil solution" has been considered. In the soil solution *Al* is found in different soluble forms, including Al^{3+} and its hydroxo, fluoride, sulfate and organic complexes. There are also the phosphate complexes and polymeric species of aluminium. Iron (III) forms with the Org^{3-} ligand two complexes. As polynuclear species of aluminium, the dimer $Al_2(OH)_2^{4+}$ and trimer $Al_3(OH)_4^{5+}$ have been taken into account. The polymeric species with the great molecular masses $Al_i(OH)_j^{3i-j}$, where *i* = 6, 8 and 13 are not examined since they practically are not formed in the soil solution due to the low polymerization kinetics. At the same time, the organic acids in soil solution inhibit their formation (Povar and Rusu, 2012). The phosphate complexes of aluminum can be presented as $AlH_2PO_4^{2+}$. The silicate complexes of aluminium are ignored because of their weak complexation properties. The mass balance (MB) conditions in the examined systems have been formulated within the method of residual concentrations (RC) (Povar, 1994; Povar, 1997):

$$C_{Al}^0 = C_{Al}^r + \Delta C_{Al} = \sum_{i=1}\sum_{j=0} i[Al_i(OH)_j^{3i-j}] + \sum_{j=1}[AlF_j^{3-j}] + [AlSO_4^+] + [Al(SO_4)_2^-] + [AlOrg^0] + [AlHOrg^+] + [AlH_2PO_4^{2+}] + \Delta C_{Al} \quad (3)$$

$$C_F^0 = [F^-] + [HF^0] + \sum_{j=1} j[AlF_j^{3-j}] = [F^-] + K_{HF}[H^+][F^-] + K_S[H^+]^3 \sum_{j=1} jK_{f,j}[F^-]^j \quad (4)$$

$$C_{SO_4}^0 = [SO_4^{2-}] + [AlSO_4^+] + 2[Al(SO_4)_2^-] + \Delta C_{SO_4} \quad (5)$$

$$C_{Org}^0 = \sum_{m=0}[H_mOrg^{m-3}] + [AlHOrg^+] + [AlOrg^0] \quad (6)$$

$$C_{PO_4}^0 = \sum_{l=0}[H_lPO_4^{l-3}] + [AlH_2PO_4^{2+}] \quad (7)$$

$$C_K^0 = [K^+] + \Delta C_K \quad (8)$$

$$C_H^0 = C_H^r + \Delta C_H = [H^+] - [OH^-] - \sum_{i=1}\sum_{j=1} j[Al_i(OH)_j^{3i-j}] + [AlHOrg^+] + 2[AlH_2PO_4^{2+}] + [HF^0] + \sum_{m=1} m[H_mOrg^{m-3}] + [HCO_3^-] + 2[H_2CO_3^0] + \sum_{l=1} l[H_lPO_4^{l-3}] + \Delta C_H \quad (9)$$

The quantities C_i^0 and C_i^r (mol/L) in equations (3)-(8) represent respectively the analytical and residual concentrations of component *i* in the heterogeneous system, while ΔC_i symbolizes its quantity in the precipitate in one liter of solution (Povar, 1997). Within the RC method, the relations $\Delta C_{OH} = -\Delta C_H$ and $C_{OH}^r = -C_H^r$ are applicable. In the

equation (9) C_H^0 denotes the excess of H^+ ions versus hydroxyl ions in biphasic mixtures, $C_H^0 = -C_{OH}^0$ [4]. From the stoichiometric composition of minerals of type $(K, Na)_n Al_x (OH)_y (SO_4)_z (H_2O)_m$ the following relations are derived:

$$\frac{1}{y}\Delta C_{OH} = \frac{1}{z}\Delta C_{SO_4} = \frac{1}{n}\Delta C_K = \frac{1}{x}\Delta C_{Al}. \quad (10)$$

The equilibrium concentration of ion Al^{3+} is determined from the relation (2). From the MB equations BM (3)-(8) for a certain pH value, taking into account the relations (10) and the equations of the law of mass action (LMA), one can obtain a system of five nonlinear equations (or 6 equations, in the case of alunite $KAl_3(OH)_6(SO_4)_2$) with 5 or 6 variables, respectively $[F], [Org], [SO_4], [PO_4]$, ΔC_i and $[K^+]$, that can be easy solved by computerized numerical methods (Povar, 1994; Povar, 1998; Povar, 2000; Povar, 2001). Then, the residual concentrations of the component *i* are calculated, C_i^r, knowing the initial composition of heterogeneous mixture, e.g. the quantities C_i^0.

Within the thermodynamic approach, previously developed (Fishtik et al., 1986; Fishtik and Povar, 1987; Fishtik et al., 1987; Fishtik et al., 1989; Povar, 1994; Povar and Rusu, 2012) and extended in this paper for the solid phases with a more complex composition, it has been demonstrated that the values of the total Gibbs energy $\Delta G_{S,tot}$ for the examined complex processes, where a large set of simultaneous reactions take place, can be calculated by the following equation:

$$\Delta G_{S,tot} = -xRT \ln \frac{C_{Al}^r}{C_{Al}^0} - zRT \ln \frac{C_{SO_4}^r}{C_{SO_4}^0} - nRT \ln \frac{C_K^r}{C_K^0} \quad (11)$$

In order to compare the $\Delta G_{S,tot}$ values for different minerals, the Gibbs energy referred to one mole of aluminium, $\Delta G'_{S,tot}$, has been calculated:

$$\Delta G'_{S,tot} = -RT \ln \frac{C_{Al}^r}{C_{Al}^0} - \frac{z}{x} RT \ln \frac{C_{SO_4}^r}{C_{SO_4}^0} - \frac{n}{x} RT \ln \frac{C_K^r}{C_K^0} \quad (12)$$

The solid phase $(K, Na)_n Al_x (OH)_y (SO_4)_z (H_2O)_m$ is stable if $\Delta G_{S,tot} > 0$. The condition $\Delta G_{S,tot} = 0$ corresponds to the beginning of mineral dissolution/precipitation.

RESULTS AND DISCUSSIONS

Fig. 1 shows the variation of the Gibbs energy versus pH in the "aqueous saturated solution - mineral" systems for different concentrations of individual components. This proves that the aluminium residual concentration can vary

within the large limits for the same pH value. Therefore, the pH value is not the exclusive factor controlling the soluble aluminium concentration.

The analysis of obtained data shows that the thermodynamic stability areas of studied soil minerals become considerably larger at increasing total (analytical) concentrations. Calculations also show that significant amounts of inorganic ligand F^-, as well as organic ligand Org^{3-} affect significantly the solubility of minerals. Under the examined conditions alunogel is thermodynamically unstable.

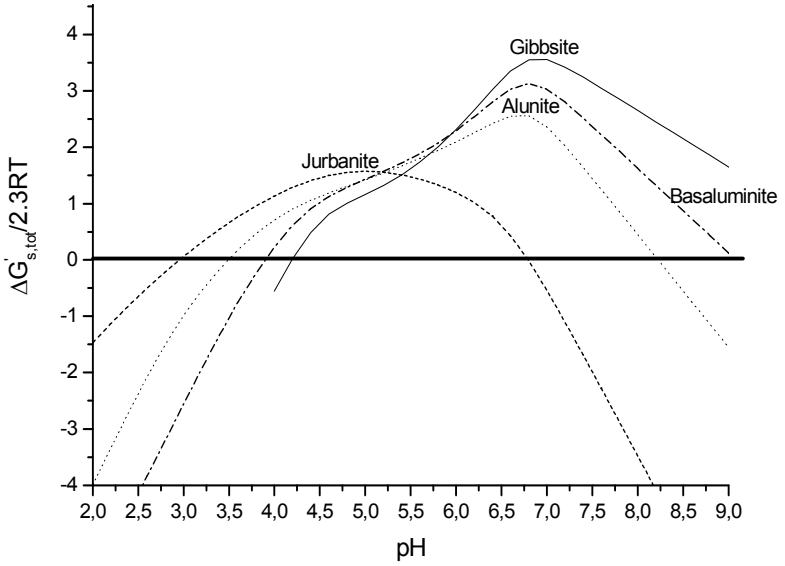


Fig. 1. - Gibbs energy versus pH of soil solution (C_{Al}^{3+} = 1 x 10^{-3}M, C_{SO4}^{2-} = 1 x 10^{-3}M, C_F^- = 5 x 10^{-6}M, C_{Org} = 10^{-4}M, C_{PO4} = 10^{-4}M)

For high concentrations of the aluminum and sulfate ions $C_{Al}^0 = C_{SO_4}^0 = 1 \cdot 10^{-3} M$ (Fig. 1) and different pH values, the condition $\Delta G_{S,tot} > 0$ occurs for all the minerals, except for alunogel. In Fig. 1 one can identify the pH areas in which the aluminium minerals are thermodynamically stable: alunite (3.2 ÷ 8.6), basaluminite (4.0 ÷ 9.0), gibbsite (4.2 ÷ 10.6) and jurbanite (3.0 ÷ 6.8). Furthermore, the maximal thermodynamic stability of minerals varies as a function of the pH of heterogeneous mixtures. In the pH area of 3.0 ÷ 5.0 the most stable mineral is jurbanite, then for the pH values of 5.2 ÷ 5.8 is basaluminite, and for the pH values greater than 6.0 is gibbsite.

The obtained data, based on thermodynamic calculations, explain the following experimental results: (a) the increase in sulfate concentration in soil solutions leads to a considerable decrease of the aluminium residual concentration and (b) high concentrations of SO_4^{2-} and basic cations play an important detoxification role for aquatic organisms (Bi et al., 2001).

CONCLUSIONS

1. A thermodynamic method for calculating complex chemical equilibria under the real conditions in soils containing aluminium minerals has been developed. The mass balance equations, derived within the method of residual concentrations, take explicitly into account all the soluble and insoluble chemical species in biphasic systems "mineral – soil solution".

2. The expression for the variation of Gibbs energy under real, non-standard conditions has been derived.

3. The areas of thermodynamic stability of different aluminium-containing minerals with the general composition $(K, Na)_n Al_x (OH)_y (SO_4)_z (H_2O)_m$ have been determined for a large area of pH variation and different values of aluminium and sulfate concentrations. The obtained data fitted well with the experimental data previously obtained.

4. The thermodynamic method developed and used in this paper contributes to elucidate the mechanism of controlling aluminum concentration in dilute acid soil solutions.

5. The developed approach for calculating the Gibbs energy may be successfully applied for the prediction of complex chemical processes in soil.

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USE OF REMOTE SENSING IN MONITORING WATER QUALITY

UTILIZAREA TELEDETECȚIEI ÎN MONITORIZAREA CALITĂȚII APELOR

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Abstract. *Environmental pollution has become one of the most debated issues of the contemporary and one first order for the company management. Man and environment are inseparable entities, human existence is dependent on the environment, and environmental factors (air, water, soil) may change as a result of their use by humans. Such pollution occurs, dimension of life, in the course of which some products resulting from physiological processes and human activity and animal residues are likely to interfere with the welfare of the nature and quantity. With the great scientific advances, the amount and nature has changed dramatically. In recent decades, the degradation of the environment from all over the planet has fared increasingly worrying amount of pollutants reaching in excess of imagination. Removing pollution is a problem that causes error correction To study the effects of water pollution on the river, we chose Arges River. The aim is to show the changes caused by pollution on water quality using remote sensing images.*
Key words*: basin, confluence, decay, wastes, pollution, environment*

Rezumat. *Deoarece în ultimele decenii, spațiul românesc s-a confruntat cu reale aspecte ce țin de poluarea mediului, acum este momentul aprecierii corecte, reale a situației pe care o regăsim atât în sfera calității aerului, a solului şi bineînțeles a apei, astfel încât protecția mediului să fie o problemă de actualitate prin abordare şi prin înțelegerea tuturor fenomenelor naturale şi a celor influențate sau produse de om. Pentru studiul efectelor poluării asupra apelor unui râu, am ales râul Argeş. Scopul este de a arăta modificările produse de poluare asupra calității apelor cu ajutorul imaginilor de teledetecție. Pentru studiul efectelor poluării asupra apelor unui râu, am ales râul Argeş. Scopul este de a arăta modificările produse de poluare asupra calității apelor cu ajutorul imaginilor de teledetecție.*
Cuvinte cheie: *bazin hidrografic, confluență, degradare, deşeuri, poluare, mediu*

INTRODUCTION

Environmental pollution has become one of the most debated issues of the contemporary and a first order for the company management. The man and the environment are inseparable entities, human existence is dependent on the environment, and environmental factors (air, water, soil) can change as a result of their use by humans. Such pollution occurs, dimension of life, conduct which some products of physiological processes and human and

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animal activity are residues that may interfere with the welfare, depending on the nature and quantity.

Environment, the space in which we operate daily, the place where we want to develop and progress, or to relax, is the vast sphere that must defend the implementation of all levers and environmental policies and updating environmental legislation, both internal and international. Considering that the environment is "all elements of physical, chemical or biological, natural and artificial, which makes human life, animal or plant, or species" (Le Petit Larousse, 2003). or an essential factor for the continuity of the human race (Mancino et al., 2009), Michel Prieur shows that the environment is now a "**chameleon concept**" with specific meanings and dimensions.

Environmental Protection Law no. 137/1995 defines "environment" as "the set of conditions and natural elements of the Earth: air, water, soil and subsoil, the characteristics of the landscape, all layers of the atmosphere, all organic and inorganic materials, as well as living beings interacting natural systems, including the items listed above, including material and spiritual values, quality of life and the conditions that may affect human health and welfare.

In the same manner, the current Romanian legislation, pollution-from the Latin-polluoere-is defined as "the direct or indirect introduction, as a result of human activities, of substances, vibrations, heat and / or noise into the air, water or soil that can harm human health or the environment, which may damage property or cause damage or prevent the use of the environment for recreational or other legitimate purposes (Environmental Protection Law no. 137/1995 republished) pollutant being "any solid, liquid, gas, vapour or any kind of solid, liquid, gas or vapour matter or any kind of energy introduced in the environment which modify the balance of constituents.

MATERIAL AND METHOD

Characterisation of river basin Arges Arges basin has rich water resources sufficient to major users in the area, but unevenly distributed in time and space. The main sources of water in the basin of Arges surface waters represented by rivers, lakes and groundwater (groundwater and deep).

Total water resources in the basin are evaluated theoretically 2.656 billion m^3 (of which 1.96 billion m^3 from surface water and 696 million m^3 of groundwater). Approximately 85.5% of the theoretical resources can be used in technically (2.271 billion m3, of which 1.671 billion m^3 from rivers, lakes and reservoirs and 600 million m^3 of groundwater

Arges River is a major river that flows inside the Fagaras Mountains and flows into the Danube near Oltenița, through the mouth (Figure 1 and 2).

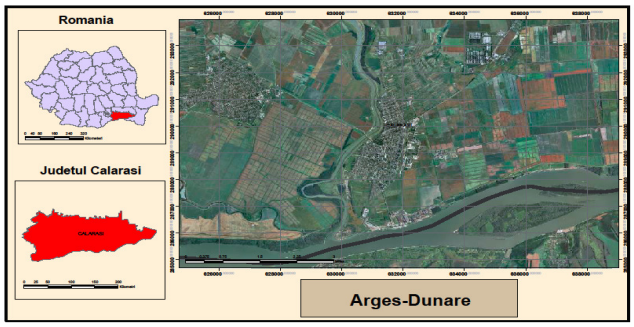


Fig.1 - Arges River confluence with the Danube

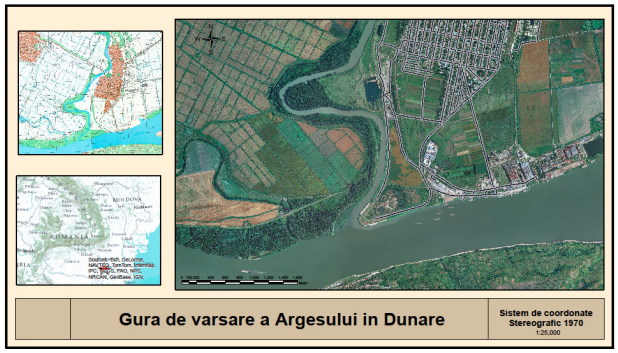


Fig 2. - Picture of the mouth

Analysis of Arges River polluation situation where this river flows into Danube River was done by using remote sensing images. We used Landsat TM/ ETM +. satellite images.

Using remote sensing images to monitor water quality Water quality is an important indicator in the treatment for human consumption. Analysis of water samples is made by analysing various physic-chemical parameters by which we can determine the degree of pollution. Collecting water samples can provide synchronous data for large areas. For a spatial and temporal approach from a distance without contact with that surface, remote sensing can be used.

Remote sensing can be defined as the science and art of obtaining information about the analysis of data acquired without coming into contact with the object, area or phenomenon under study.

The first studies that have used remote sensing to monitor water quality began in the 70s (Ritchie 1974).

Ritchie proposed an empirical equation by using the approximation that can be made on the amount of sludge in suspension:

$$Y = A + BX$$

or $Y = AB^X$

where:

Y - measured wavelength (radiation, reflection, energy)

X - water quality, represented by a parameter (suspended sediment, turbidity)

A, B- empirically determined parameters, obtained using statistical relationships between the spectral reflectance and in situ determination of a water quality parameter

In recent years, this equation was developed to estimate each parameter water quality.

RESULTS AND DISCUSSION

Eutrophication can be defined as the concentration of the chlorophyll contained in the plankton algal cells; chlorophyll is one of the colouring agents in water. In remote sensing mapping chlorophyll is used as a parameter for assessing water quality. To determine the amount of chlorophyll with remote sensing techniques we use the ratio of different spectral bands:

The ratio of green (0.50 to 0.60 μm) and red (0.60 to 0.70 μm) or inverse relationship between red and green. One can use the ratio of blue (from 0.40 to 0.50 μm) and red and vice versa (Mancino, 2009).

Vegetation is green because it absorbs red and blue, reflecting the green. Chlorophyll absorbs radiation with wavelengths between 0.45 to 0.67 mm. If, for various reasons, the vegetation does not produce enough chlorophyll unable absorb the red and blue give a reflection having a wavelength between them yellow.

Turbidity is a measure of the clarity of water due to the amount of particulate matter (soil, sediment or plankton). Turbidity can be defined as an expression of the optical properties of water. Water causes more light to be reflected and absorbed rather than being transmitted in straight lines. Turbidity can be calculated using the suspended sediment concentration. The best results of correlation between turbidity and reflectance, which is consistent with reality, are obtained in the red spectral band.

Turbidity can be determined using the following spectral bands:

- Green band and red band
- Green Tape
- Blue and red tape strip

In figure 3, the reflectance curves are presented for three types of elements: vegetation (health), soil (dry) and water (clean). The lines represent the average reflectivity. In general, the curve shape is an indicator of the type of item and its physical properties. With regard to the ground, the reflection is influenced by the following factors: moisture, texture (the proportion of sand and clay), surface roughness, the presence of iron oxide, the content of organic matter. These factors are complex, varied and interrelated. Clean water reflects the blue – green radiation and other radiation are mostly absorbed them reflected. The presence of turbidity in water due to organic matter or suspended organic matter will produce another reflection curve.

Each spectral band is used for a precise application type. UV band is mainly used in mineral exploration and detection of oil; IR band in the 0.7 to 1.5 mm is used for the detection of polluted vegetation, pests, etc., IR in the 1,5 to 3

mm is a mixture of reflected solar energy and the energy emitted by Earth and it is used in the atmosphere to detect snow reside the clouds.

The data used are provided by the satellite Landsat TM / ETM + and are acquired in different spectral bands: blue 0.40 to 0.50 μm, 0.50 -0 green, 60 μm, red 0.60 to 0.70 μm, infrared 0 , 60 to 0.70 μm, the thermal infrared from 0.70 to 0.90 μm. Images are pre-processed in terms of atmosphere and atmospheric corrections.

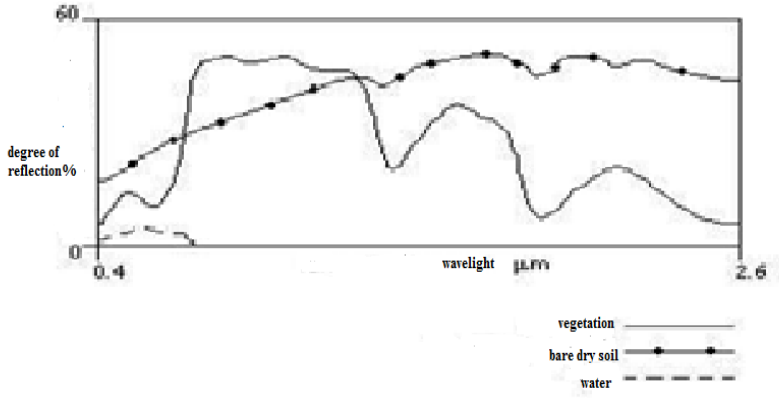


Fig. 3 - The curves of reflectance

A degradation of river banks was found because there had not been executed embankment works and bank protection in the area. In the area Oltenita city there is no water treatment plant. Sluice image no. 4 is heavily degraded and interior waters are eutrophicated.



Fig.4 -Sluice

CONCLUSIONS

Measures to improve water quality and pollution control:

1. Short term: - greening the area - recover useful materials from wastewater, thus having the advantage of ensuring a true source of raw materials by recycling plastic waste.

2. Medium term: - informing citizens of the area and find those who throw garbage, expanding collection procedures and evacuation of dry wastes, especially from animal farms.

3. Long term: - tangible results: scientific articles, leaflets, manual "best practice" recommendations to attract people's attention on protecting the environment;

- anthropogenic activities have decreased water quality and remote sensing techniques can provide information about the degree of pollution;

- monitoring by remote sensing can provide information on water quality parameters while monitoring large areas in situ is limited to the sampling points;

- using satellite imagery provided by Landsat, SPOT, IKONOS, depending on the resolution, you can create thematic maps;

- each water quality parameter (particulate matter, turbidity, amount of organic matter) has its own reflection in the range of 400-800 μm;

- water quality issues can be quickly resolved by using the tools offered by remote sensing for sustainable management of water resources.

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AN INFORMATION SYSTEM FOR WATER RELATED PROTECTED AREAS IN JIJIA RIVER BASIN

REALIZAREA UNUI SISTEM INFORMAȚIONAL AL ARIILOR PROTEJATE DIN BAZINUL HIDROGRAFIC JIJIA

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Abstract. *According to the Water Framework Directive and the Romanian Water Law, the European Union reporting requirements have led to the need for protected areas identification and mapping within river basins, în order to achieve a unitary spatial database în Europe. ArcGIS software was used for mapping. This software offers many possibilities for information storage, analysis and graphical representation. Thus, 121 drinking water protected areas, 20 zones for protection of habitats and species (Special Protection Areas, Special Areas of Conservation and Natural Reservations) and 90 localities în nitrate vulnerable zones have been identified în Jijia river basin.*
Key words: *Information system, protected areas, quality criteria*

Rezumat. *Pe baza prevederilor Directivei Cadru a Apei şi a Legii Apelor, respectiv a cerinţelor solicitate de către Uniunea Europeana, s-a trecut la identificarea şi cartarea ariilor protejate din cadrul bazinelor hidrografice, prin realizarea unei bazei de date spaţiale unitare la nivel european. Pentru cartarea acestora a fost utilizat programul ArcGIS, care oferă numeroase posibilităţi de stocare, analiză şi reprezentare grafică a informaţiilor. Astfel, în bazinul hidrografic Jijia au fost identificate 121 arii protejate pentru captările de apă destinate consumului uman, un număr de 20 zone destinate protecţiei habitatelor şi speciilor unde apa este un factor important (arii de protecţie specială avifaunistică, arii speciale de conservare şi rezervaţii) şi 90 localităţi în zone vulnerabile la nitraţi.*
Cuvinte cheie: *sistemul informaţional, arii protejate, criterii de calitate*

INTRODUCTION

A protected area is a clearly delimited geographical space, recognized, designated and managed on the basis of legal acts or other effective means, aiming to achieve long term conservation of nature as well as for the environmental services and cultural associated values. (Introduction to protected areas in Romania, 2009).

The requirement to reach the good water status of water bodies in the European Union countries according to the Water Framework Directive has imposed separately analysis of bodies that are included in, coincide with, or include protected areas (Water Framework Directive, 2000) in order to monitor the water specific parameters.

[1] Prut-Barlad Water Basinal Administration, Iasi, Romania

In Romania the identification and analysis of protected areas related to water is carried out by the „Romanian Waters" National Administration. The River Basin Management Plan includes a special chapter where these protected areas are identified and mapped. This paper presents the protected areas in the Jijia river catchment.

MATERIAL AND METHOD

Jijia basin is located in the North-Eastern part of Romania, in Botosani and Iasi Counties. Jijia River springs west of Pomîrla, on the Western slope of Bour Massif, Ukraine. The length of Jijia river belonging to Ukraine is about 4 km. It is the most important tributary of the Prut River, with a length of 275 km and a catchment area of 5757 km^2 in Romania.

The basin's layout has a lengthen shape and Jijia river has a lateral position in it. More than 75% of the basin's total area is developed on the right, from where it receives the most important tributaries of the Prut River: Bahlui, Jijioara, Miletin and Sitna (Pantazică M., 1974).

The hydrographic network of the basin includes 144 rivers with a total length of 2181 km. More than 80% of the rivers have temporarily flow. On these rivers 110 surface water bodies were designated, of which 18 are lakes. 28 of these water bodies are on permanent rivers and 82 are on temporary rivers *(*Prut - Bārlad hydrographical Area River Management Plan, 2010*)*.

Water Framework Directive impose a specific monitoring of the protected areas, especially for water bodies used as drinking water sources, water dependent habitat areas and species protection areas.

In order to deliver reports in a unitary information system at European Union level WISE system, "Water Information System for Europe" has been introduced.

In accordance with the requirements of the Water Framework Directive (2000) and the Water Law (107/1996, further amended), the categories of protected areas where water is an important factor shall be: areas used as drinking water sources, areas for the protection of economic important aquatic species, recreational areas - including swimming areas, nutrient sensitive areas - including vulnerable zones and areas for the protection of habitats and species.

In the studied catchment area there are no areas for the protection of economic important aquatic species, or bathing areas.

Article no. 51 of the Water Law contains the Methodology for achieving the registry of protected areas (2005).

Protected areas are zones with special protection established under the law for the protection of surface water and groundwater or for conservation of habitats and species directly depending on water.

The data sources for achieving database of protected areas at national level are: the National "Romanian Waters" - for the areas designated as drinking water sources, Forests National Administration "Romsilva" – for the areas designated for protection of the aquatic economic important species, the Directorates for Agriculture and Rural Development - for the nutrient-sensitive areas, including areas designated as vulnerable zones, the Environmental protection agencies – for the areas designated to protect habitats or species where the maintenance or improvement of water status is an important factor for protection, including zones important for Natura 2000.

ArcGIS software was used for inventory and representation of different types of protected areas in the studied basin. ArcView is a GIS component which provides tools for exploring, selecting, editing, displaying, analyzing, symbolization and

classification of data, updating of metadata being a very useful tool in mapping of protected areas; for example:

- mapping the locations of water supplies started from the simple knowledge of the spatial position of a water source, one of the facilities of the software consisting in the possibility to use multiple coordinate systems within the same project. The user may choose the system of coordinate for submitting the results, thus for reporting to the European Commission in Romania it was agreed the ETRS89 coordinate system - geographic coordinate system, and for internal reporting the Stereographic projection system 1970 is used (figure 1).

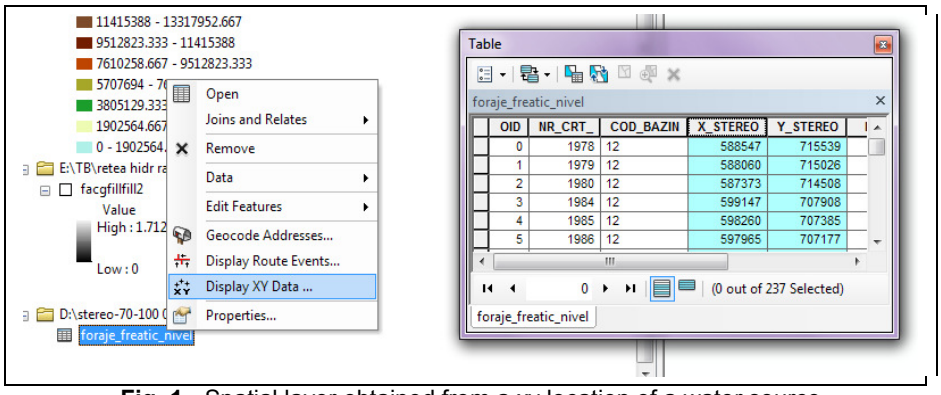


Fig. 1 - Spatial layer obtained from a xy location of a water source

- the software allows the introduction of new information on the graphically represented objects as attributes, through a common link column between their spatial databases and other database existing in a different format.

The source of data used in this paper is the Prut-Bārlad Water Basinal Administration.

RESULTS AND DISCUSSION

Water related protected areas have been identified by overlaying in GIS the informational layers containing the water bodies with the layers containing the protected areas designated by the national legislation. Three types of protected areas resulted in the studied catchment:

• Drinking water protected areas

The designation of drinking water protected area, adjacent to the surface water intakes, was based on the following criteria: providing more than 10 m^3/day or serving more than 50 people.

In Jijia catchment three drinking water protected areas from surface sources have been designated. The main characteristic of the water intakes from surface water are shown in table 1.

Also the 118 wells which are the starting point for the ground drinking water protected areas were graphical represented, the associated information being presented in a table format similar to those in Table 1, by generating reports tools (figure 2).

Table 1

Characteristics of water intakes from surface sources

Water intake	Location	Administrator/supplied localities	Flow (l/s)	Supplied population
Halceni reservoir	Miletin river, in Halceni	APAVITAL Iasi / Sectia Vladeni / Vladeni	1,53	650
Parcovaci reservoir	Bahlui river, în Pircovaci area	APAVITAL Iasi/ Sectia Harlau/Harlau, Ceplenita	20,1	6982
Tansa – Belcest reservoir	Bahlui river, în Belcesti area	APAVITAL Iasi/ Sector Belcesti/ Belcesti, Focuri, Coarnele Caprei	3,84	1151

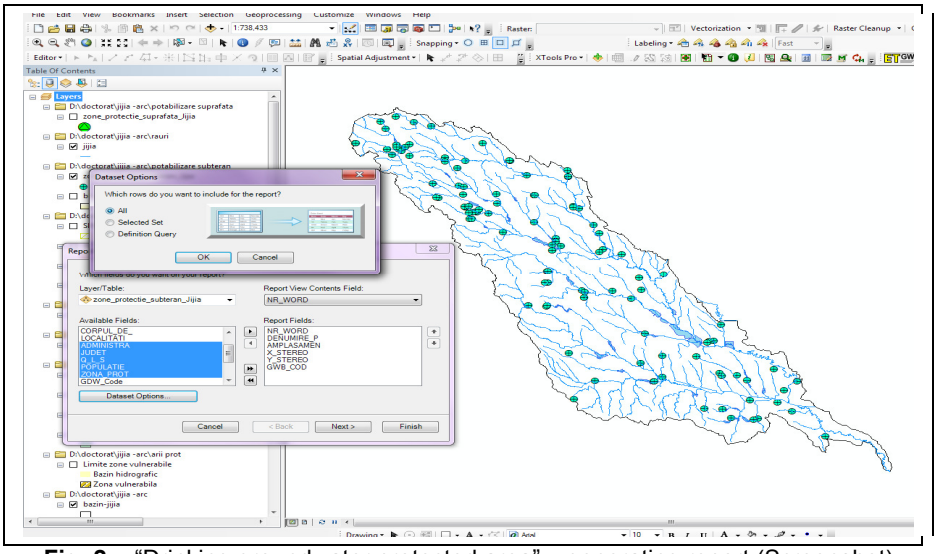


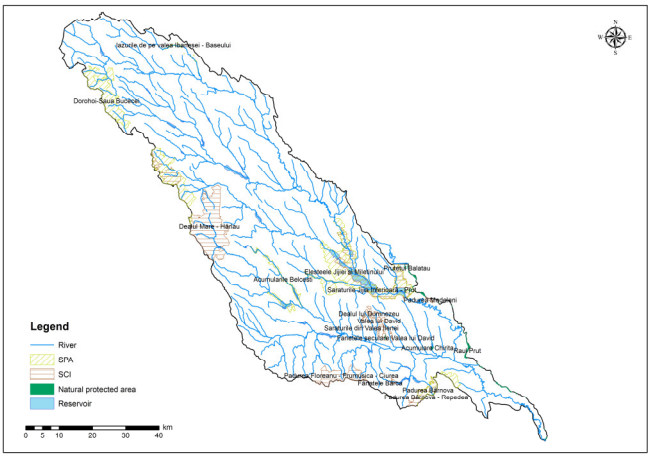
Fig. 2 - "Drinking groundwater protected area" – generating report (Screenshot)

• **Water dependent habitat and species protection areas -** there are 20 protected areas for the protection of habitats and species, which are totally or partially included within Jijia catchment: SPA Dorohoi Şaua Bucecei, SCI Dealu Mare Hârlău nature reserve Pădurea Tudora, Eleşteele Jijiei şi Miletinului: (SPA şi SCI Sărăturile inferior Jijia natural reserves Teiva Vişina şi Pruteţul Bălătău), SCI and Prut River nature Reserve, SPA Belcesti Accumulations, Medeleni Forest SCI, SCI Dealul lui Dumnezeu, SCI Sărăturile din Valea Ienei, SCI Valea lui David, nature reserve Chirita accumulation, SCI Pădurea Floreanu-Frumuşica-Ciurea, SCI Pădurea Bârnova-Repedea, SPA Pădurea Bârnova, SCI Fâneţele Bârca, SPA Pădurea Micleşti.

In Figure 3 the thematic map of the spatial distribution of protected areas mentioned above was presented.

Some of these are included in the Nature 2000 network - the European Union's main instrument for nature conservation, a network of natural or semi-natural areas, where vulnerable plant, animal species and natural habitats must be

protected. In these areas are protected: 2 species of mammals, four amphibians, one of fish, two invertebrates, 30 species of birds and other 62 important flora and fauna species.





Pruteţul Bălătău Natural Reservation



Pârcovaci reservoir Natural Reservation

Fig. 3 - Protected areas of habitats or species in Jijia catchment area

• **Nitrate pollution vulnerable zones** are areas of agricultural land that drain into nitrate polluted waters or waters which could become polluted by nitrates from agricultural sources and contribute to the pollution of groundwater.

In Jijia river basin 90 Cities/Localities in the Upper Prut vulnerable area were identified.

Figure 4 shows the spatial distribution of vulnerable areas and a query example of data contained in the informational layers.

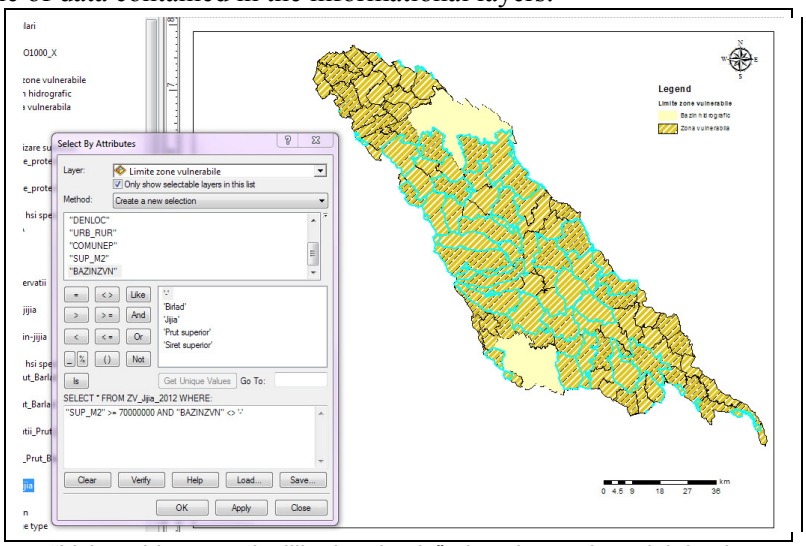


Fig. 4 -"Vulnerable zones in Jijia river basin" - location and spatial database query example

The information regarding the types of the protected areas, contained in spatial databases can be also used for reporting, e.g. WISE system, as it can be seen in Figure 5.

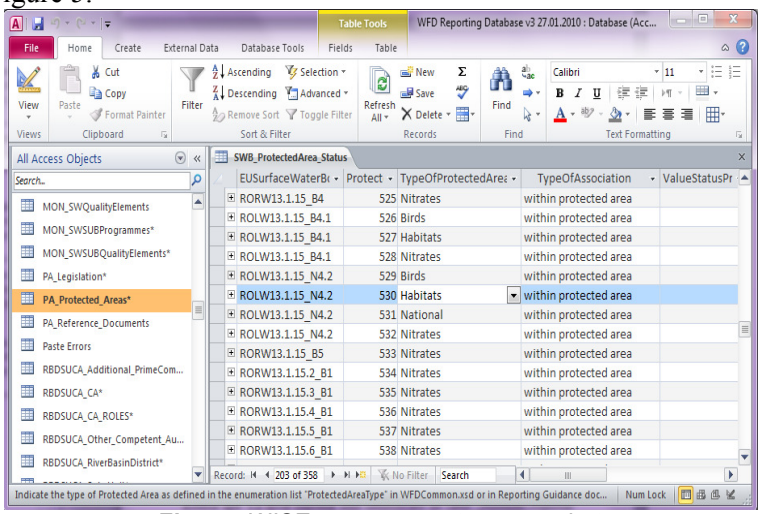


Fig. 5 - WISE system report - screenshot

CONCLUSIONS

1. The inventory and the update of the information on protected areas constitute at present a requirement on ensuring biodiversity, conservation of natural resources and protection against natural disasters.

2. ArcGIS software is very useful for updating databases containing different types of protected areas, because it provides the possibility of overlapping informational layers, allowing interrogation and analysis, enabling users to obtain both accurate visual information and extracting reports. Based on the analysis performed, we can conclude that in Jijia catchment area there are a number of 121 drinking water protected zones, the protected areas for species and habitats cover 11% of the catchment area and 89% of the basin area is vulnerable to nitrate pollution.

3. The information contained in the spatial databases can be presented both graphically as maps or easily integrated in reports or other databases in specific EU reporting system (WISE), or used for other water management analysis required for the achievement of the sustainable development program.

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MODELING AND OPTIMIZATION OF A REAL TEXTILE EFFLUENT TREATMENT BY SORPTION ONTO SAWDUST AS 'LOW COST' SORBENT

MODELAREA ŞI OPTIMIZAREA EPURĂRII UNUI EFLUENT TEXTIL REAL PRIN SORBȚIE PE RUMEGUŞ CA SORBENT,IEFTIN'

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Abstract. *An experimental planning of sorption on sawdust (as 'low cost' sorbent) applied for a real textile effluent (i.e. collected after the dyeing and rinsing steps of cotton fabrics manufacturing) is discussed using a 2^3 central compositive rotatable planning. It was elaborated an empirical model considering the sorbent concentration, pH and temperature of textile effluent as indepen-dent variables, while the decoloration degree (color removal) was chosen as optimization criterion. The highest decoloration degree was 65.815 % after 24 hours of continuous static sorption. The proposed model was found adequate for the real effluent treatment by sorption on sawdust as primary treatment step.*
Key words: *decision variables, empirical model, experimental planning (2^3), optimization criterion, real textile effluent, sawdust, sorption*

Rezumat. *În lucrare este discutată o programare experimentală a unui proces de sorbție pe rumeguş aplicat unui efluent real textil (i.e. colectat după treptele de vopsire şi clătire de la fabricarea țesăturii de bumbac), bazată pe aplicarea unei planificări central compoziţional rotabile de ordinul 2^3. A fost elaborat un model empiric considerând concentrația de sorbent, pH-ul şi temperatura ca variabile independente, în timp ce gradul de decolorare (îndepărtarea culorii) din efluentul textil a fost ales drept criteriu de optimizare. Cel mai mare grad de decolorare găsit a fost de 65.815 % după 24 ore de sorbție statică continuă. Modelul propus a fost găsit adecvat pentru epurarea efluentului real folosind sorbția pe rumeguş ca procedeu primar de epurare.*
Cuvinte cheie: *variabile de decizie, model empiric, planificare experimentală (2^3), criteriu de optimizare, efluent real textil, rumeguş, sorbție*

INTRODUCTION

The avoidance, minimization or reduction of pollution is a necessary action for assuring the sustainable management of water resources, or the conservation of natural aquatic environment for future generations. In order to reduce pollution is required the treatment of final effluents, among others, either individually or mixed with domestic wastewaters, in a modern and performant treatment plant.

All industrial sectors are discharging final effluents, either in the urban sewage system or in different natural receptors. The environmental protection requirements directed researches to development of new production processes

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with lower consumption level of water and raw materials, and also efficient treatment of individual and/or mixed final effluents for in-side recycling (Zaharia et al., 2012). The removal of pollutants from industrial effluents by adsorption on „low cost" materials became an interesting objective (*i.e.* a relative simple and cheap 'end-of-pipe' solution, fulfilling the strict demands imposed by the environmental regulator of industrial effluent quality) (Zaharia, 2012b).

Numerous studies concluded that the adsorbents which contain high quantities of celluloses adsorb different organic substances, dyes, heavy metals, etc., by processes of physical ('physical sorption'), chemical (‚chemisorption') or biological nature (‚biosorption'), respectively complex mixed processes of all these (Zaharia and Suteu, 2012a). From economic and performance reasons (costs-adsorption performance), the cheap adsorbents which contain either high quantities of carbon in their chemical structure of inorganic nature (*i.e.* ash, sludge) (Zaharia and Suteu, 2012b; Zaharia et al., 2012) or prevalent inorganic material of carbonate, phosphate type (*i.e.* rests of marine carcasses, seashells) or organic material of ligno-cellulosic type (*i.e.* sawdust, peat, wasted raw coal, industrial lignin, rests of non-living vegetal – dead algae, branches, leafs, fibrous trunks or stalks, rests of pips, seeds), available in nature or as production wastes, were applied for removal of polluting loads from different industrial effluents (Zaharia et al., 2012; Zaharia and Suteu, 2012b).

This paper is a continuation of authors' researches in which is presented a study of modeling and classic optimization applied for the sorption step on sawdust (one-single stage treatment) of a real textile effluent. An experimental central compositive rotatable design of three order (2^3) was applied in the experimental laboratory researches.

MATERIAL AND METHOD

1. Materials, reagents and characteristics of the studied sorption process

The principal materials, chemical reagents, analysis apparatus and characteristics of textile effluent and of sorption process are synthesized below (Zaharia C. et al., 2012, Zaharia C., Suteu D., 2012a).

Sawdust. It is a fibrous production waste (produced in the mechanical processing of conifer wood), which contains different functional groups and organic compounds (10-16% hemicelluloses, 48-57% cellulose, 27-33% lignin with polyphenolic groups and ionizing carboxylic groups (uronic acids) as the most important adsorptive constituents). Sawdust (humidity of 4%) is dried in air, breaked in pieces, mortared and sieved in two fractions: SD-1 (particles of 1-2 mm) and SD-2 (dust, < 0.1 mm). It was worked with SD-1 sawdust fraction.

pH adjustment. It was performed with 0.05N H_2SO_4, and 0.01N NaOH.

Dyestuff. The dyestuff contains 2 textile dyes (Remazol Arancio 3 R, 33 g/L, Remazol Rose RB, 22 g/L), Kemapon FRD (tensioactive agent, 3 g/L), pH buffer solution (Na_2CO_3, 20 g/L), additives (NaOH, 5 g/L) and other auxiliaries (electrolyte, anti-crust agent, reducing agents). The dyestuff bath capacity is 3.69 m^3/day.

Textile effluent. It is a real textile effluent collected from a private textile unit from NE Romania after dyeing and rinsing of cotton fabrics. The average flow of textile effluent collected individually and treated is of 15-16 m^3/day. *Principal characteristics of textile effluent* are: pH-7.30, color (A_{436}=0,614), suspended solids-289 mg/L, turbi-

dity-93 FTU, COD_{Cr}-665 mg O_2/L, BOD_5-386 mg O_2/L, chlorides-98 mg/L, sulfates-365 mg/L, total N-23.12 mg/L, total P-14.54 mg/L, phenol-26.23 mg/L, extractable substances in solvents-45 mg/L, detergents-1.56 mg/L, total heavy metal ions < 4 mg/L.

Laboratory installations and apparatuses. Digital HACH One Laboratory pH-meter, VIS SP 830 Plus 1.06 spectrophotometer (Metertech), UV-VIS multifunctional DRELL 2000 spectrophotometer (HACH Company, SUA) with kits, water bath, distilation installation, thermo-oxidation installation for COD_{Cr} determination, Partner WPS 510/C/2 digital balance, TZS First heating range, Austria.

Sorption working methodology. It was used the cvasi-static ‚batch' technique, in which is considered the sorption as a physical-chemical process-*sorption* (*i.e. physical* – by van der Waals, hydrogen, hydrophobic, coulombic forces, and *chemical* –electrostatic attraction, ionic exchange and complexation). *Working conditions*: sorbent doses of 16-40 g/L, pH of 0.35-4.0, temperature of 5°-40°C, and 24 h of sorption.

2. Modeling methodology and experimental planning

It is considered that the principal real variables which influence the decoloration process by sorption on sawdust are: quantity of sorbent (Z_1, g per 25 mL), pH (Z_2, pH unit), and sorption temperature (Z_3,°C). As optimization criterion (decision function) was chosen the decoloration degree or color removal (Y, %). It was used a mathematical model of "n=3" variables, and an experimental central compositive rotatable planning of 2^3 order (equation (1)) (Zaharia C., Suteu D., 2009, 2011).

$$Y= b_0+\sum b_{i.}x_{i+}\sum b_{ii}x_i^2+\sum b_{ij}x_ix_j \qquad (1)$$

where: *Y* represents the decission function (optimization criterion); x_i, x_j, x_{ii}, x_{ij} are the coded model variables, and b_0, b_i, b_j, b_{ij} are the model coefficients (i, j= 1, 2, 3), calculated with the response surfaces methodology in 20 experimental points, using the central compositive rotatable design of 2^3 order (Macoveanu M., Nicu V., 1989; Zaharia C. et al., 2006, 2007).

In table 1 are indicated the values attributed to coded variables (*i.e.* $X_i = (Z_i - Z_{i0})/\Delta Z_{i0}$; ($Z_{i0}$) – basic values of real variables and (ΔZ_{i0}) – variation step).

Table 1

Codification of independent variables in experimental adopted planning (2^3)

Value / Variable	Coded variable (X_i)	Real variable (Z_i)	Real basic variable (Z_{i0})	Variation step (ΔZ_{i0})
Sorbent concentration, g per 25 mL	X_1	Z_1	0,75	0,15
pH	X_2	Z_2	2	1
Temperature, °C	X_3	Z_3	20	10

The values of coded variables are: 0, ±1, ±α_i (*i.e.* ±1.682 for experimental central compositive rotatable planning of 2^3 order). The Fisher constant, multiple correlation coefficient or Fisher test are calculated, and applied for establishing the correlation between the three independent variables (Z_i) and dependent decission function (*Y*, decoloration degree, %). The average deviation of calculated values with the proposed model in comparison with the experimental ones must be between +10% and -10% for a good agreement of all processed data.

RESULTS AND DISCUSSIONS

The textile effluent samples of 25 mL were treated with different quantities of sawdust at different values of pH and temperature in order to study the decoloration performance by sorption on sawdust according to an experimental central compositive rotatable planning of 2^3 order. The results are synthezed in table 2. The proposed model is presented in equation (2), and the calculation of model coefficients was achieved with specific calculation formulas from statistics and described in previous papers (Zaharia et al., 2006, 2007).

Table 2

Experimental matrix in the central compositive rotatable planning of 2^3 order

Exp. No.	Z_1	Z_2	Z_3	X_1	X_2	X_3	Y_{exp}	Y_{calc}	Deviation
1	0.60	1	10	-1	-1	-1	5.69	23.12	-3.06
2	0.90	1	10	1	-1	-1	0	19.78	0
3	0.60	3	10	-1	1	-1	1.57	17.06	-9.878
4	0.90	3	10	1	1	-1	0	20.30	0
5	0.60	1	30	-1	-1	1	57.76	52.74	0.087
6	0.90	1	30	1	-1	1	63.65	63.44	0.003
7	0.60	3	30	-1	1	1	37.92	33.42	0.119
8	0.90	3	30	1	1	1	52.85	50.70	0.041
9	0.498	2	20	-1.682	0	0	29.67	23.12	0.221
10	1.002	2	20	1.682	0	0	49.901	34.84	0.302
11	0.75	0.318	20	0	-1.682	0	65.815	54.18	0.177
12	0.75	3.682	20	0	1.682	0	48.33	38.37	0.206
13	0.75	2	3.18	0	0	-1.682	43.418	7.37	0.830
14	0.75	2	36.82	0	0	1.682	43.418	57.85	-0.332
15	0.75	2	20	0	0	0	49.312	50.61	-0.026
16	0.75	2	20	0	0	0	53.242	50.61	0.0495
17	0.75	2	20	0	0	0	46.758	50.61	-0.0823
18	0.75	2	20	0	0	0	51.277	50.61	0.0131
19	0.75	2	20	0	0	0	50.491	50.61	-0.0023
20	0.75	2	20	0	0	0	48.919	50.61	-0.0345

$$Y=50.606+3.485X_1-4.698X_2+15.005X_3-7.644X_1^2-1.531X_2^2-6.360X_3^2+1.645X_1X_2+3.510X_1X_3-3.312X_2X_3 \quad (2)$$

The value of Fisher constant is F= 18337.82 for Y in comparison with statistic value from tables, F_{tab}= 4.6 (α=99, ν_1=n-1=19 and ν_2=k-1=2, in which: n– number of experiments, and k– number of independent variables) (Macoveanu M., Nicu V., 1989). Because $F>F_{tab}$ is considered that the deviation of experimental values from the average value is not the results of experimental errors, but is determined by the influence of independent variables on decision function (Y).

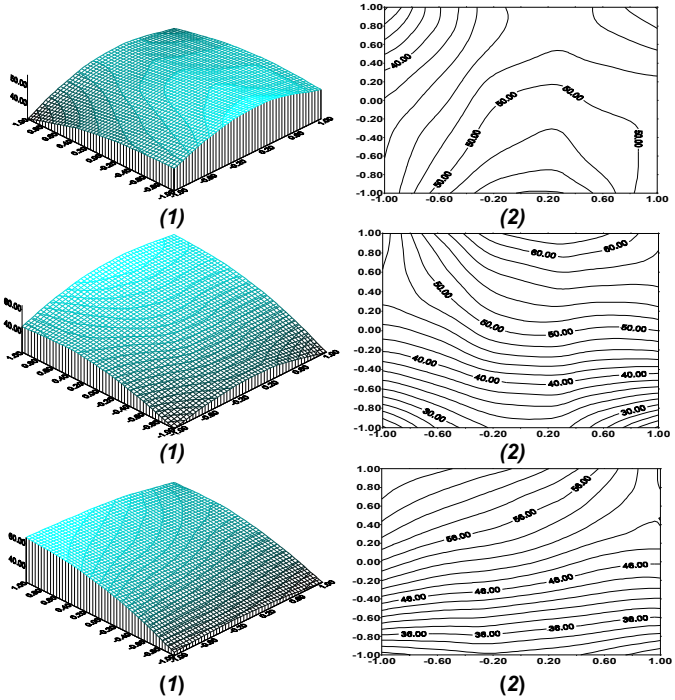
The correlation coefficient is $R_{YX1X2X3}$= 0.772, and demonstrates that all independent variables are important for dependent function - decoloration degree of textile effluent in the whole experimental variation domain.

The value of Fisher test is F_{calc}= 7.84, comparing with F_{tab} = 6.59 from statistic data (freedom degree of ν_1 = n-k-1=16, and ν_2 =k=3), value higher than statistic one, providing that the independent variables have a significant influence

on dependent function. It is considered that a good agreement exists between the experimental and calculated data, the average deviation being of -0.568 %.

Analysis of proposed model. The application of classical optimization method leads to conclusion that the *Y* function has a *local maximum* at $X_1^* = 0$, $X_2^* = -1.608$ and $X_3^* = 0$ (Y= 65.815 %). Transposed in real variables, these values correspond to some optimal values of the independent variables as follows: sorbent concentration (sawdust) of 30 g/L (*i.e.* 0.75 g per 25 mL textile effluent), pH of 0.392, temperature of 20°C, after 24 h of sorption. Because in practice is difficult to work at pH ≤ 0.40, it is usually worked at pH ≅ 2.

The analysis of *Y* decision function concludes that all X_i independent variables (quantity of sawdust, pH and temperature) are important for the decoloration of textile effluent. The figures 1(a-c) illustrate the dependence of effluent decoloration (*Y*) on each two of independent variables (X_i, X_j, j=1, 2, 3).



(a) Variation of *Y* vs. X_1, X_2:

(1) Y=Y(X_1,X_2,0),
(2) Isoline

(b) Variation of *Y* vs. X_1, X_3:

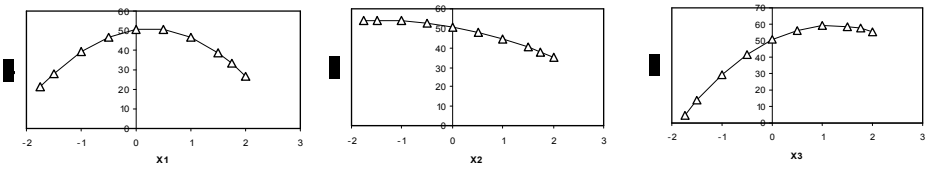
(1) Y=Y(X_1,0,X_3),
(2) Isoline

(c) Variation of *Y* vs. X_2, X_3:

(1) Y=Y(0,X_2,X_3),
(2) Isoline

Fig. 1 - Influence of each two X_i, X_j independent variables vs. decoloration degree (*Y*)

The decoloration variation vs. sorbent concentration can be observed in the graphical representation of *Y* vs. X_i (Fig. 2(a-c)). Thus, it exists a *distinct decoloration maximum* (51.003 %) for $\boldsymbol{X_1}^* = 0.228$ (*i.e.* a sorbent quantity of 0.784 g per 25 mL, at pH= 2 and $T_{sorption}$= 20°C) (Fig. 2(a)), or a *local decoloration minimum* (35.085%) for $\boldsymbol{X_2}^* = +2{,}00$ (*i.e.* a local minimum at pH= 4.00, sawdust concentration of 30 g/L, and temperature of 20°C) (Fig. 2(b)), or a *distinct decoloration maximum* (59.456 %) for $\boldsymbol{X_3}^* = +1.1796$ (*i.e.*, a sorption temperature of 31.80°C, pH=2 and sorbent concentration of 30 g/L)(Fig. 2(c)).



(a) Y=Y(X_1,0,0) **(b) Y=Y(0,X_2,0)** **(c) Y=Y(0,0,X_3)**

Fig. 2 - Influence of each X_i independent variable vs. effluent decoloration degree (Y)

The best decoloration efficiency of a single-stage sorptive treatment of the real textile effluent with sawdust corresponds to a relative high sorbent concentration of 30 g/L, at pH of 0.392 (in practice is used pH ≅ 2), and t=20°C.

CONCLUSIONS

1. The decoloration of textile effluent by sorption on sawdust ("low cost" sorbent) represents a viable removal alternative of colored pollutants.

2. An empirical modeling by 2^3 central compositive rotatable planning was used, and the optimal values of decision variables correspond to 30 g/L sawdust, pH= 0.392, $t_{sorption}$=20°C, for decoloration of 65.815 %.

3. The graphical representations permit the localization of optimal variation domain, in specific operating conditions of textile unit.

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THE BEHAVIOR OF *ZANTEDESCHIA* AND *GLORIOSA* GROWN IN POTS

COMPORTAREA PLANTELOR DE *ZANTEDESCHIA* ŞI *GLORIOSA* CULTIVATE LA GHIVECE

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Abstract. *Originating from tropical areas of Africa and Asia, Zantedeschia and Gloriosa genus include species which are grown in protected areas, when present in temperate climate conditions, as plants in pots, or as cut flowers. Gloriosa is growing lush and pretentious to environmental factors, especially to light intensity, which influences the quality and quantity of flowers. Zantedeschia, more common known as Cala, is very appreciated as cut flower. This paperwork presents aspects of the culture in pots of Zantedeschia hybrids ('Picasso', 'Cameo', 'Black Eyed Beauty' and 'Black Star') and Gloriosa superba species and its four cultivars ('Rotschildiana', 'Greenii', 'Lutea' and 'Orangerie'). Biological material was imported from Holland and observations were made on underground organs characteristics (diameter, mass), planting period up to the appearance of floriferous stems, production of flowers/plant.*
Key words: *Gloriosa, Zantedeschia,* culture in pots

Rezumat. *Originare din zonele tropicale ale Africii şi Asiei, genurile Zantedeschia şi Gloriosa cuprind specii care în condiţiile de climat temperat continental se cultivă în spaţii protejate, ca plante la ghivece sau pentru valorificare ca flori tăiate. Gloriosa are o creştere luxuriantă şi este pretenţioasă faţă de factorii de mediu, îndeosebi faţă de intensitatea luminii, care influenţează calitatea şi cantitatea florilor. Zantedeschia, mai des întâlnită sub numele de cala, este foarte apreciată ca floare tăiată. Lucrarea prezintă aspecte privind cultura la ghivece atât a unor hibrizi de Zantedeschia ('Picasso', 'Cameo', 'Black Eyed Beauty' şi 'Black Star'), cât şi a speciei Gloriosa superba şi patru cultivaruri ale acesteia ('Rotschildiana', 'Greenii', 'Lutea' şi 'Orangerie'). Materialul biologic a fost importat din Olanda şi au fost realizate observaţii privind caracteristicile organelor subterane (diametru, masă), perioada de la plantare până la apariţia tijelor florifere, producţia de flori/plantă.*
Cuvinte cheie: *Gloriosa, Zantedeschia,* cultura la ghivece

INTRODUCTION

Zantedeschia and *Gloriosa* are two genres that include tropical plants with high ornamental value because of the beautiful flowers which are distinguished by elegance, vivid colors and interesting shape. They are perennials (underground organs such as tubers or rhizomes), in temperate climate conditions there are grown in protected areas, as plants in pots or in the ground of the greenhouses.

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The genus *Zantedeschia*, commonly known as the arum or calla lily, is originates from the African continent. *Zantedeschia* species and their hybrids feature a range of cultivars with flower colour from dark red through pink, to orange, yellow and white. *Zantedeschia* is a commercial cut flower and potted plant (Funnell K.A., 1993 citat by Chen J., 2013). *Gloriosa superba* is known as a medicinal plant since ancient times in countries in Africa and tropical Asia. As an ornamental plant it is cultivated and valued as a cut flower, ranking among house plants due to unique elegance of flowers. Studies on species and cultivars of *Gloriosa* were made in terms of their taxonomic classification (Maroyi and van der Maesen, 2012), the anatomy of flowers (Vaik NP, Pai RM, 1986), methods of propagation (Khandel et al, 2011), etc.

In this paper it is presented a number of aspects about culture in pots of *Gloriosa* and *Zantedeschia* plants.

MATERIAL AND METHOD

Zantedeschia and *Gloriosa* plants were grown in pots in the floricultural greenhouse of the University of Agricultural Sciences and Veterinary Medicine Iasi, Romania. In the experiment there were used four cultivars of *Zantedeschia*: 'Picasso' (fig. 1a), 'Black Eyed Beauty' (fig. 1b), 'Cameo' (fig. 1c) and 'Black Star' (fig. 1d).

There were also used *Gloriosa* tubers, from *G. superba* species (fig. 2a) and its four cultivars: *G. superba* 'Rotschildiana' (fig. 2b), *G. superba* 'Greenii' (fig. 2c), *G. superba* 'Lutea' (fig. 2d), *G. superba* 'Orangerie' (fig. 2e).



a) ,Picasso' **b)** ,Black- Eyed- Beauty' c) ,Cameo' **d)** ,Black Star'

Fig. 1 (a-d). *Zantedeschia* hybrids used in the experiment



a) *G. superba* **b)** 'Rothschildiana' **c)** 'Greenii' **d)** 'Lutea' **e)** 'Orangerie'

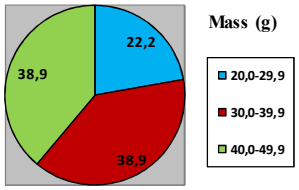
Fig. 2 (a-e) –*Gloriosa superba* cultivars used in the experiment (original)

Crop establishment was done in 2012, between 27th and 30th of March with tubers purchased from specialized companies in the Netherlands, and planting was done in 5L pots in a substrate made of red peat and garden soil (3:1). Determinations

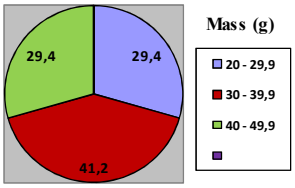
that were made targeted tuber mass, length of time from planting until the entry into vegetation, number of flower buds and mature flowers.

RESULTS AND DISCUSSIONS

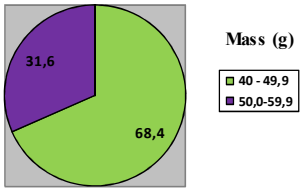
Tubers used for crop establishment were classified by size, based on mass recorded. On calla, the average weight of tubers varied depending on cultivar, from 36.5 g to 'Black-Eyed Beauty' and 91.4 g at 'Black Star'. Distribution of the categories of weight of tubers in these four cultivars is shown in fig. 3. At 'Cameo' cv. approx. 78% of the tubers had weight over 30 g, the rest being registered in the category of 20 to 29.9 g (fig. 3). 'Black-Eyed Beauty' cv., with the lowest average weight of tubers, recorded approx. 70% of the tubers weighing between 20 and 40 g and 29.4% of the tubers weighted from 40 to 49.9 g (figure 3b). Tubers of 'Picasso' cv. were assigned in a 2:1 ratio between the categories of 40 to 49.9 g, 50 to 59.9 g (fig. 3c). The 'Black Star' cv. have registered the largest tubers, their mass was between 60 and 110 g, 70% from the total of the tubers had more than 90 g and 30% of the tubers had between 60 and 70 g (fig. 3d). After weighing, the biggest tubers from each cultivar were used for planting: 40 to 49.9 g in 'Cameo' cv. and 'Black-Eyed Beauty' cv., from 50 to 59.9 g in 'Picasso' cv. and from 60 to 109.9 g in 'Black Star' cv.



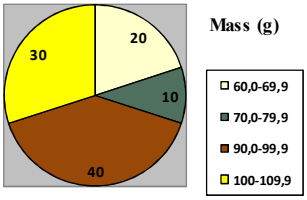
a) Cv. ,Cameo'



b) Cv. ,Black- Eyed- Beauty'



c) 'Picasso' cv.

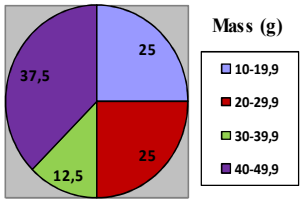


d) 'Black Star' cv.

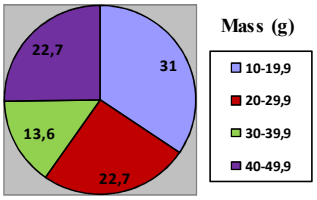
Fig. 3 (a-d) - Share of calla tuber weight classes

At gloriosa, the tubers were smaller than those from calla, the mass was between 10 and 48 g. The share of calla tuber weight classes is represented graphically in fig. 4. At *Gloriosa superba,* 50% of the tubers had between 10 and 30 g, and 50% had between 30 and 50 g (fig. 4). The 'Rothschildiana' cv. had more than half (53.7 %) from the tubers under 30 g, 13.6 % were between 30 and 39.9 g, 22.7 % were between 40 and 49.9 g (fig. 4b). The 'Orangerie' cv. had small tubers,

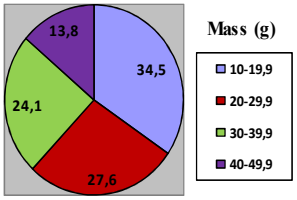
only 13.8 % from the total number had more than 40 g, 34.5% were between 10 and 19.9 g, 27.6% were between 20 and 29.9 g, 24.1% were between 30 and 39.9 g (fig. 4c). The 'Lutea' cv. have 53.3% from tubers that weight between 10 and 30, the rest being distributed in proportion of 26.7% for group 30 - 39.9 g and 20% weight between 40 and 49.9 g (fig. 4d). More than half of 'Greenii' cv. tubers have over 30 g (66.6%) and 16.7% were assigned to categories 10 - 19.9 g and 20 - 29.9 g (fig. 4e). At *Gloriosa*, as well as at *Zantedeschia*, have been used to establish the crops the biggest tubers, except that, in this case, all varieties were from the same category (30-39.9 g and 40-49.9 g), but with different proportions between the two groups from one variety to another (higher proportion of superior category of *G. superba*, *G. s.* 'Greenii' and *G. s.* 'Rothschildiana').



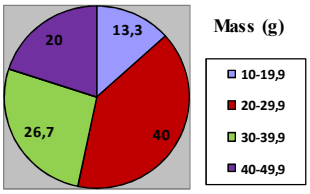
a) *Gloriosa superba*



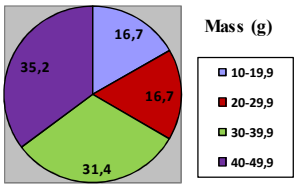
b) *G. superba* 'Rothschildiana'



c) *G. superba.* 'Orangerie'



d) *G. superba* 'Lutea'



e) *G. superba* 'Greenii'

Fig. 4 (a-e) - Share of *Gloriosa* tuber weight classes

The period from tubers planting to flowering is shown in figure 5. Among the *Zantedeschia* cultivars, the earliest was 'Picasso' cv. (66 days) and the belatedly was 'Cameo' (98 days). Cultivars of *Gloriosa* required a shorter period to flowering (between 61 and 72 days), the earliest being 'Greenii' and the belatedly 'Orangerie'.

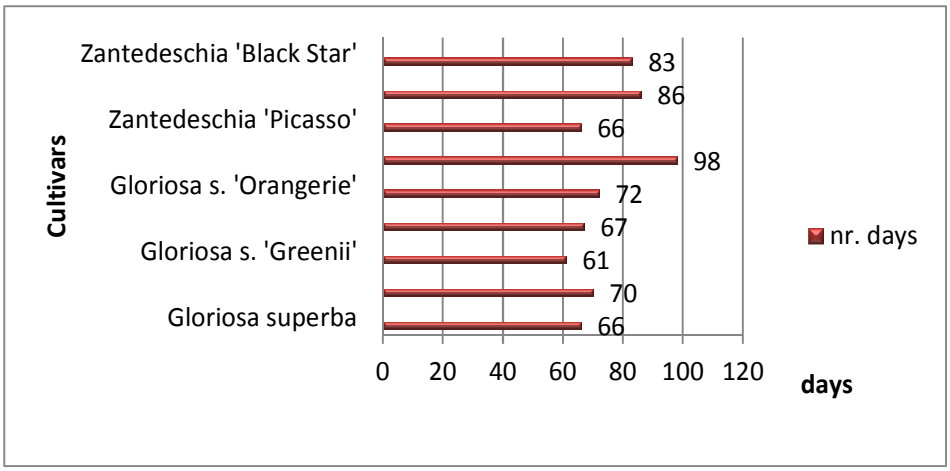


Fig. 5 -. The period of time from planting to flowering (no. of days)

Production of flowers per plant registered at *Zantedeschia* (table 1) shows the highest production in 'Black Star' cv., followed by 'Picasso' cv., the average differences of variants (cultivars) being positive (very significant or distinct significant). 'Black-Eyed Beauty' cv. and 'Cameo' cv., with productions of 1-1.1 flowers/plant are below average, with very significant negative differences.

Table 1

Production of flowers/plant at *Zantedeschia*

Cultivar	No. of flowers/ plant	% compared to the average	Diff.	Signif.
‚Cameo'	1.1	47.83	-1.2	**000**
‚Picasso'	3.0	130.43	+0.7	**XX**
‚Black- Eyed- Beauty'	1.0	43.48	-1.3	**000**
‚Black Star'	4.2	182.61	+1.9	**XXX**
Average	**2.3**	**100.0**	**control**	**control**

LSD 5% = 0.4; LSD 1% = 0.6; LSD 0,1% = 1.0

Table 2

Production of flowers/plant at *Gloriosa*

Cultivar	No. of flowers/plant	% compared to the average	Diff.	Signif.
Gloriosa superba	10.0	151.52	3.4	XXX
Gloriosa s. 'Rothschildiana'	6.2	93.94	-0.4	-
Gloriosa s. 'Orangerie'	3.2	48.48	-3.4	000
Gloriosa s. 'Lutea'	4.2	63.64	-2.4	000
Gloriosa s. 'Greenii'	9.2	139.39	2.6	XXX
Average	**6,6**	**100,00**	**control**	**control**

LSD 5% = 1.1; LSD 1% = 1.6; LSD 0,1% = 2.3

At *Gloriosa*, the number of flowers / plant varied between 3.2 and 10 (table 2). Above the average of variants were located *Gloriosa superba* (10 flowers/plant) and 'Greenii' cv. (9.2 flowers/plant), with significant differences; below average, with very significant negative differences were cultivars 'Orangerie' (3.2 flowers/plant) and 'Lutea' (4.2 flowers/plant). With a production of 6.6 flowers/plant, cv. 'Rothschildiana' showed significant differences compared to average.

From the data analysis in tables 1 and 2 there is a positive correlation between tuber size and flower production. Thus, at calla, cultivars 'Cameo' and 'Black-Eyed Beauty', which had smaller tubers (40- 49.9 g) had much lower yields compared to 'Black Star' cv. which had more than 60 g tubers. At gloriosa, differences are noted according to the proportion of tubers weighing over 40 g (the largest flowers production was at *G. superba* and *G. s.* 'Greenii' that predominant tubers were between 40 and 49.9 g).

CONCLUSIONS

1. There is a positive correlation between the size of tubers used for crop establishment of *Zantedeschia* and *Gloriosa* and the flowering ability.

2. Flowering period of *Zantedeschia* and *Gloriosa* down menus after about 60 days after planting, the earliest being *Gloriosa* cultivars (61-72 days); callas requires 83-98 days from planting to flowering, except for 'Picasso' cv. (66 days).

3. Flowering capacity is differentiated among species and cultivars. *Gloriosa* form from 3.2 to 10 flowers / plant, whereas cultivars of *Zantedeschia* formed, on average, 2.3/plant (1 to 4.2 flowers/plant).

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