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CONTENT

CUPRINS

THE USE-POTENTIAL OF *CORNUS MAS* L. IN URBAN PLANTATIONS IN NORTH-WEST EUROPE BASED ON HABITAT STUDIES IN NORTH-EAST ROMANIA AND REPUBLIC OF MOLDOVA

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Abstract: *Traditionally, a limited number of species and genera dominate the tree stock in streets and urban sites. Over the past few decades, a growing proportion of those commonly used species have shown increasing difficulties in coping with the conditions at urban sites. Impermeable surfacing increasing storm water run-off and the urban heat island effect has resulted in tree decline and an increase in disease in urban tree habitats. This negative trend, combined with the challenges of climate change and the threat of further disease and pest attacks in the future have led to considerable and persistent argumentation for the necessity of using a more varied and stress-tolerant selection of tree species at urban sites. From the perspective of northern parts of Central Europe and adjoining milder parts of Northern Europe (in the following abbreviated to the CNE-region), it is unlikely that the species-poor native dendroflora can contribute a large range of tree species with extended tolerance of the environmental stresses characterising to e.g. paved sites within urban areas of the region. This paper present extensive fieldwork carried out in north-east Romania and in the adjacent part of the Republic of Moldavia 2009 in order to identify the use-potential of Cornus mas L. as a city-tree through dendroecological studies. The data obtained in the field were compared with corresponding data from paved and park environments in urban Copenhagen. In this comparison the result shows that the study trees experience warmer and drier site conditions than park environments in Copenhagen while the paved environment in Copenhagen experience drier site conditions than the case in the studied sites. However, if a proper design and technique is used in paved sites with a greater infiltration into the planting pits the site situations gets much more similar to the studied sites indicating that Cornus mas have also a use potential in paved environments in the CNE-region where they can develop into old and healthy trees where the space for high and broad trees does not fit.*

Key words: urban trees, *Cornus mas* L., dendroecology, urban environments, site adapted species use

INTRODUCTION

Traditionally, a limited number of species and genera dominate the tree stock in streets and urban sites, and recent surveys in European and North American cities show that a few species/genera continue to dominate (Pauleit et al., 2002; Raupp et al., 2006; Bühler et al., 2007). Over the past few decades, a growing proportion of those commonly used species have shown increasing difficulties in coping with the conditions at urban sites. Impermeable surfacing increasing storm water run-off and the urban heat island effect has resulted in tree decline and an increase in disease in

urban tree habitats (Pauleit, 2003). This negative trend, combined with the challenges of climate change and the threat of further disease and pest attacks in the future (e.g. Tello et al., 2005; Raupp et al., 2006), have led to considerable and persistent argumentation for the necessity of using a more varied and stress-tolerant selection of tree species at urban sites (Duhme and Pauleit, 2000; Pauleit, 2003).

Water stress is widely argued to be the main constraint for tree growth and health in the urban environment (e.g. Whitlow and Bassuk 1986; Craul 1999). Research on the drought tolerance of trees has classically focused on physiological reactions in the water balance/water use in terms of transpiration rates, sap flow measurements and the hydraulic architecture of the tree (e.g. Kozlowski et al., 1991; Sperry et al., 1998; Breda et al., 2006; David et al., 2007; West et al., 2007). These investigations give valuable information at the tree level but they are limited in their practical everyday use for urban tree planners, arborists etc. (Roloff et al., 2009). Dendroecological studies, as presented in this paper, can contribute to an ecological knowledge that will help evaluate the reaction, tolerance and performance of different trees species to different stressors. It would be a first step in the selection process for 'new' tree species for urban sites, and according to Roloff et al. (2009), this kind of dendroecological description is seldom or never available for most species.

In natural habitats, trees have been stress-tested and selected over evolutionary periods of time. Some species have developed an extensive plasticity and tolerance to a range of environmental conditions, while others have specialised in certain habitat types (Rabinowitz 1981; Gurevitch et al. 2002). For instance, steep south-facing mountain slopes with thin soil layers or warm and dry steppe environments represent distinct habitat types where the environmental parameters that define the particular habitat and separate it from other habitats have shaped the evolution of plants. Such environmental parameters also screen out many potential colonising species not suited to the particular habitat. Investigating the ecological background and performance of species growing in habitats where they experience drought during the growing season and winter temperatures similar to inner-city environments of a particular area/region could be a great help in the identification of trees for future selection for use at urban sites (Flint 1985; Ware 1994; Ducatillion and Dubois 1997; Sæbø et al. 2005; Roloff et al. 2009).

From the perspective of northern parts of Central Europe and adjoining milder parts of Northern Europe (in the following abbreviated to the CNE-region), it is unlikely that the species-poor native dendroflora can contribute a large range of tree species with extended tolerance of the environmental stresses characterising to e.g. paved sites within urban areas of the region (Duhme and Pauleit 2000). However, other regions with a comparable climate but with a rich dendroflora may have the potential to contribute new tree species and genera for this purpose (Takhtajan 1986; Breckle 2002; Roloff et al. 2009). In northeast Romania and in the Republic of Moldavia, on the eastside from the Carpathian Mountains, large areas of steppe vegetation occur due to warm and dry climates (Breckle 2002) with a climate and site situation comparable to inner city environments in the CNE-region.

Cornus mas L. is a medium sized tree which has had an increasingly greater use in public greeneries the last decades in the CNE-region based on its generous spring flowering and popular fruit settings and autumn colours. However, since the experience of the species in public plantations is limited new innovating research methods have to been developed in order to gain larger knowledge and experience of the species. This paper present extensive fieldwork carried out in north-east Romania and in the adjacent part of the Republic of Moldavia 2009 in order to identify the use-potential of *Cornus mas* as a city-tree through dendroecological studies. The study especially focused on:

- Identification of habitats in north-east Romania and in the adjacent part of the Republic of Moldavia where tree species are exposed to seasonally dry and warm conditions.
- Characterisation of the performance of *Cornus mas* in these geographical area.
- Presentation and discussion the use-potential of *Cornus mas* regarding use in urban sites in northern Europe.

The findings from the field survey were compared against two different site situations in the inner city environment of Copenhagen (Denmark), which was used as an example to illustrate growth conditions in a large city of the northern CNE-region: 1) The present climate and site situation of urban paved sites; and 2) urban park environments.

MATERIAL AND METHODS

Case study area

North-east Romania and the Republic of Moldavia have a temperate-continental climate with hot summers, long, cold winters and very distinct seasons. Due to the higher summer temperatures and lower rainfall compare to Western Europe, large steppe forest systems are located in this area (Breckle 2002). The field studies were carried out in these steppe forests during September-November 2009 in six different areas, all with a climate similar to that at urban sites in the CNE-region. Data on the climate in the field study areas were taken from the nearby meteorological stations of Iasi (Sîrbu, 2003; Ursu, (2005), while data for Copenhagen were taken from DMI (2009). In selecting the exact location of the plots for the study, special attention was paid to areas with homogeneous site conditions with mature forest trees, including *Cornus mas*. Total 13 study plots were including in the study, strategically placed within recognised forest stands. Plot size was 20 m x 20 m.

Measurement of plot data

In order to link the match between the natural habitats and the urban conditions in the CNE-region, soil texture, humus content and pH value were determined. Soil samples were collected at three different depths (0-20, 20-30, 30-50 cm) from 10 pits randomly distributed in each field plot (Klute, 1986; FAO, 2006). The replicate samples for each depth and site were pooled before analysis (FAO, 2006). Soil texture was analysed using the soil grain analyser method, organic matter using the $K_2Cr_2O_4$ method (Sims and Haby 1971), and pH using the potentiometric determination method (soil/water = 1:2).

In order to evaluate the growth and performance of the tree species in the study plots, trunk diameter at breast height (DBH) at 1.3m height, total tree height and tree age were determined for each individual tree in the plots. The tree heights were measured with a clinometer (Haglöf Vertex IV). To establish age, all trees were subjected to drilling for year ring counts as close to the ground as possible (Grissino-Mayer, 2003). Moreover, the trees positions in thevegetation structure were surveyed to distinguish canopy from understorey.

Calculation of potential water stress and growth

In order to evaluate the growth pattern of *Cornus mas* at the study sites, the height and DBH were divided by age, allowing annual tree growth for the sites to be calculated (figure 2). Since water stress is the main concern for urban trees (e.g. Whitlow & Bassuk, 1986; Craul, 1999) the potential water stress (water netto difference) in the study plots was calculated (figure 1). In calculating potential evapotranspiration the regression by Thornthwaite (1948) where used, with monthly potential evapotranspiration based on the values of temperature, number of sunshine hours per day and cloudiness. Sunshine hours per day were estimated on a monthly basis by combining information about day length (Meeus, 1991) and days with rainfall as an indicator for cloudiness (Ursu, 2005). Estimates of water run-off for the studied woodlands were based on P90 (2004) with an assumed 10% run-off.

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Iasi	24,3	48,9	63,2	44,4	-26,9	-103,5	-189,6	-287	-331,8	-336	-317	-285,5
Copenhagen (Paved sites)	10,8	18	11,1	-11,7	-67,6	-137	-204,1	-278,8	-320,3	-342,7	-342	-333
Copenhagen present (Park environments)	32,4	54	67,5	65,7	33,8	-8,6	-41,5	-83,2	-92,9	-87,1	-55,2	-18

Fig. 1. Calculated potential evapotranspiration (mm) in the study area and in urban paved environments and park environments of Copenhagen today.

RESULTS

Site conditions

The soil texture was comparable at all study plots, with high levels of clay (mean 24.0%) and silt (mean 49.6%) and low organic matter content (mean 3.5%). In terms of climate the study forests in Northeast Romania and Moldova have a lower precipitation compare to Copenhagen additionally with a much warmer summer climate with a much more effective evapotranspiration as a result. This uneven match between the study area and Copenhagen is visibly in figure 1, where the water net difference between study plots and park environments in Copenhagen has a clear discrepancy. The water net in the study plots show negative figures in May and the remaining season while park environments in Copenhagen show a negative water net in June with a less dramatically trend during the remaining season (fig. 1). However, when comparing the water net difference between the study plots and paved sites in Copenhagen a much closer matching is visibly due to much drier site conditions in paved sites due to effective water runoffs. In paved sites in Copenhagen the calculated water net show negative figures already in April and the remaining season. Moreover, the negative water net

difference is larger in paved sites of Copenhagen from April to July while the study plots show larger negative water nett during August and September (fig. 1).

Plant development and performance

In total, there were 84 individuals of *Cornus mas* in the studied plots. The age range of the *Cornus mas*, including in the study, where 12-64 years, the height range where 2-11 meter and the diameter size (DBH) range where 1.6-10.8 centimetres. All the individuals of *Cornus mas* in the studied plots where located in the lower tree layer with other high growing tree species above them. The calculated growth, presented in Figure 2, show a yearly average height growth of 0.16 meters and a yearly average diameter increment of 0.17 centimetres. Based on these average growth numbers it can be concluded that *Cornus mas* in this climate and on this soil can reach to 2.4 meters high individuals in 15 years while they can reach 8 meters in height in 50 years.

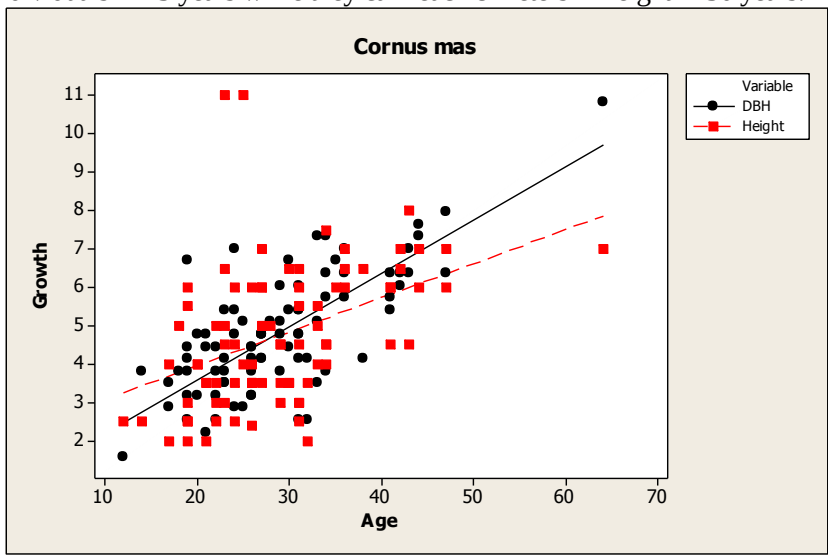


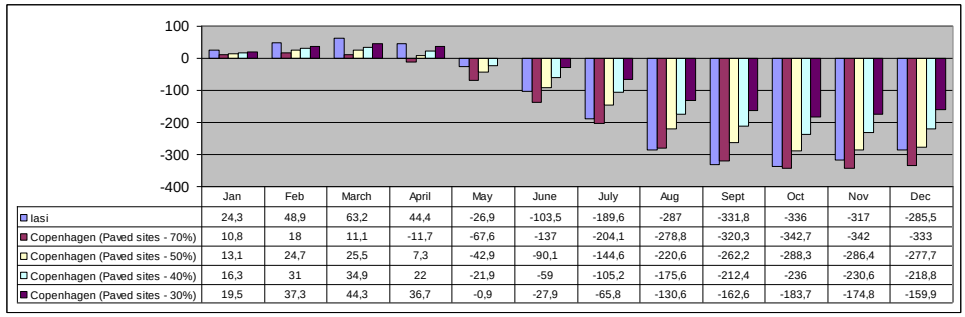
Fig. 2. Height increment (m) and DBH increment (cm) of all *Cornus mas* in the study plots.

DISCUSSIONS

Site conditions

The evaluation of site conditions revealed high levels of clay and silt in all plots. Although the soil humus content at the sites was low (mean 3.5%), the water-holding capacity in the study sites can be considered very good (Craul, 1999). These favourable growth conditions counteracted the cumulative water deficit calculated for the study sites (figure 1). For example, although there was a 26.9 mm deficit, water was probably accessible to the trees for much longer periods due to the good water-holding capacity of the soil. Moreover, since silt has very good capillary water transporting capacity, groundwater can be transported upwards from depth and become accessible for the trees. Therefore, the apparent close match between cumulative water deficit between the study sites and paved sites in Copenhagen is actually inaccurate in terms of the drought stress experienced by the trees. Moreover, it is anyhow accurate to conclude that *Cornus mas* in the study sites experience

warmer and drier site conditions then trees in park environments in Copenhagen. Further, based on the result in this study it is possible to conclude that *Cornus mas* can tolerate more stressful growth conditions than park environment in the CNE-region and in order to include the species also in paved environment it is necessary to design and construct suitable growth conditions with greater water infiltration which increase the use-potential for the species. In an attempt to evaluate the match between urban paved sites in Copenhagen and the natural study sites, calculations were made for different rates of water run-off at the urban paved sites (figure 3). The results showed a much smaller net water deficit when run-off was reduced, from 70% in the original calculations to 50, 40 or 30%, which clearly shows the importance of proper planning and design for provide suitable site conditions and prevent run-off.



	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
lasi	24,3	48,9	63,2	44,4	-26,9	-103,5	-189,6	-287	-331,8	-336	-317	-285,5
Copenhagen (Paved sites - 70%)	10,8	18	11,1	-11,7	-67,6	-137	-204,1	-278,8	-320,3	-342,7	-342	-333
Copenhagen (Paved sites - 50%)	13,1	24,7	25,5	7,3	-42,9	-90,1	-144,6	-220,6	-262,2	-288,3	-286,4	-277,7
Copenhagen (Paved sites - 40%)	16,3	31	34,9	22	-21,9	-59	-105,2	-175,6	-212,4	-236	-230,6	-218,8
Copenhagen (Paved sites - 30%)	19,5	37,3	44,3	36,7	-0,9	-27,9	-65,8	-130,6	-162,6	-183,7	-174,8	-159,9

Fig. 3. Table 1. Effect of reducing run-off rate to 50%, 40% or 30% on cumulative net water balance in paved sites in Copenhagen compared with the study area.

Plant development and performance

In total, 84 *Cornus mas* were included in 13 study plots. All of the *Cornus mas* in the study occurred in the lower tree layer where they experience cooler conditions since the above standing trees crown modify positively the wind, humidity, and temperature microclimate for the species in the understorey layer (Oliver, Larson 1996). However, due to *Cornus mas* position in the understorey the species show great abilities to tolerate shady growth conditions which is important in the use of the species in urban environments where the urban structure with buildings create local really shady conditions.

The experience of *Cornus mas* in culture is that the species have a rather slow growth which the results from the study confirm where the study trees have a average yearly height growth of 0.16 meters.

Moreover, due to earlier and not recorded variation in the species compositions in the stands additionally with earlier competition situations, the analyse of the growth data presented in the paper should be interpreted with some consideration. However, the growth and development data can anyhow act as a guideline in the species development in these climate and site situations. To get even more accurate data it is important to test *Cornus mas* origin from this area in urban plantations in the CNE-region. From these plantations local experiences can be gained but dendroecological studies in climates and in natural site situations similar as urban environments of the

CNE-region can be used as a first selection step in order to concentrate on species with a high potential instead testing randomly since selection of trees is a time-consuming process.

CONCLUSIONS

This study examined the potential of *Cornus mas* for use as an urban tree in northern parts of Central Europe and adjacent, milder parts of Northern Europe (the CNE-region), based on habitat studies in north-east Romania and in the adjacent Republic of Moldavia.

The data obtained in the field were compared with corresponding data from paved and park environments in urban Copenhagen.

In this comparison the result shows that the study trees experience warmer and drier site conditions than park environments in Copenhagen while the paved environment in Copenhagen experience drier site conditions than the case in the studied sites. However, if a proper design and technique is used in paved sites with a greater infiltration into the planting pits the site situations gets much more similar to the studied sites indicating that *Cornus mas* have also a use potential in paved environments in the CNE-region where they can develop into old and healthy trees where the space for high and broad trees does not fit.

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CONTRIBUTIONS TO THE STUDY OF FOREST VEGETATION FROM THE SUPERIOR BASIN OF PUTNA RIVER

CONTRIBUŢII LA STUDIUL VEGETAŢIEI PĂDURILOR DIN BAZINUL SUPERIOR AL RÂULUI PUTNA

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Abstract. *This paper presents one vegetal forest association identified in the Putna river superior basin:* ***Hieracio transsilvanico –Fagetum*** *(Vida 1963) Täuber 1987 described in a phytocoenological table and analysed from the point of view of bioforms, floristic elements and ecological indices.*
Key words: forest vegetation, phytocoenology, Putna river basin.

Rezumat. *Lucrarea prezintă o asociaţie vegetală care a fost identificată în bazinul superior al râului Putna:* ***Hieracio transsilvanico –Fagetum*** *(Vida 1963) Täuber 1987. Această asociaţie a fost descrisă prin tabelul fitocenologic şi analizată prin spectrul bioformelor, elementelor floristice şi a indicilor ecologici.*
Cuvinte cheie: vegetaţia pădurilor, fitocenologie, bazinul superior al râului Putna.

INTRODUCTION

The presentation of this paper contains the result of the studies made in the superior basin of the Putna until the Valea Sării, Vrancea County, between 2005-2009, regarding the vegetation meadows (Grumăzescu H. et al., 1970; Mateescu Şt. I., 1970; Resmeriţă I. et al., 1977).

MATERIAL AND METHOD

The results of field research conducted between 2005 -2009 in the superior basin of the river Putna, which were realized by making the school spirit of reports in the central European flora, supplemented and adapted to local conditions. Taxonomic nomenclature, organic forms and floristic elements were outlined by V. Ciocârlan (Ciocârlan V., 2000). Regarding phytocoenosystem were used appointments of T. Chifu (Chifu T. et al., 2006) and V. Sanda (Sanda V., 2000). Analysis of ecological indices based on the system adopted by H. Ellenberg (Ellenberg H., 1974).

RESULTS AND DISCUSSIONS

This paper presents one vegetal forest associations included in the following phytocoeno –system by Chifu T. and collaborators, 2006:

Cls. ***Querco – Fagetea*** Br. – Bl. et Vlieger in Vlieger 1937
Ord. ***Fagetalia sylvaticae*** Pawlowski in Pawlowski et al. 1928
Al. ***Symphyto cordati –Fagion*** Vida 1963

Table 1

As. *Hieracio transsilvanico –Fagetum* (Vida 1963) Täuber 1987

Number of relevée	1	2	3	4	5	6	7	8	9	10	11	
Altitude (m.s.m.)							600		600			
Expoziţion	V	E	E	SE	SE	V	S	S	NE	S	-	
Înclination in degree (·)	60	70	70	35	35	60	50	60	50	70	-	
Coverage of arborescent layer (%)	95	95	95	80	80	95	80	70	90	85	85	K
Coverage of shrubs layer + str. juvenile (%)	5	15	15	20	20	5	5	5	5	5	10	
Coverage of herbaceous layer (%)	5	10	10	5	5	5	5	35	5	10	15	
Surface of relevée (m^2)	400	400	400	400	400	400	400	400	400	400	400	
Number of species	32	24	19	20	23	32	27	14	26	14	17	
Caract. ass.												
Hieracium transsylvanicum	+	-	-	-	-	+	+	+	1	1	+	IV
Calamagrostio -Fagenion												
Luzula luzuloides	1	1	1	1	1	1	+	1	1	1	1	V
Pteridium aquilinum	-	-	-	-	-	-	-	+	-	+	-	I
Vaccinium myrtillus	-	-	-	-	-	-	-	-	-	-	+	I
Veronica officinalis	-	+	-	-	+	-	-	-	+	+	-	II
Epipactido -Fagenion												
Campanula persicifolia	-	-	-	-	-	-	+	-	+	+	+	II
Epipactis helleborine	-	+	-	-	-	-	+	-	-	-	-	I
Symphyto cordati -Fagion												
Abies alba juv.	-	1	1	+	+	-	+	-	+	-	-	III
Pulmonaria rubra	+	+	+	-	-	-	+	-	+	-	-	III

Tilio platyphyllae –Acerion pseudoplatani												
Acer pseudoplatanus juv.	+	-	-	-	-	+	+	-	+	-	-	II
Lathyro hallersteinii -Carpinion												
Carex pilosa	+	-	-	-	-	+	+	2	+	-	-	III
Carpinus betulus	+	2	2	-	-	+	2	2	+	-	+	IV
Carpinus betulus juv.	-	+	+	-	-	+	1	-	+	+	-	III
Laser trilobum	-	-	-	-	-	-	+	-	-	-	-	I
Fagetalia sylvaticae												
Asarum europaeum	-	+	+	-	-	-	-	-	-	-	-	I
Campanula rapunculoides	+	+	+	-	-	+	-	-	-	-	-	II
Carex sylvatica	-	-	-	+	+	-	-	-	-	-	-	I
Euphorbia amygdaloides	-	-	-	+	+	-	-	-	+	-	-	II
Fagus sylvatica	5	5	5	5	5	5	3	3	5	5	5	V
Fagus sylvatica juv.	1	1	1	2	2	1	1	-	1	1	1	V
Hieracium murorum	-	-	-	+	+	-	-	-	-	-	-	I
Mercurialis perennis	-	+	-	-	-	-	-	-	-	-	-	I
Oxalis acetosella	+	-	-	+	+	+	-	-	+	-	-	III
Platanthera bifolia	-	-	-	-	-	-	-	-	-	-	+	I
Rubus hirtus	+	-	-	+	+	+	+	-	+	-	-	III
Salvia glutinosa	+	+	+	+	+	+	-	+	+	+	-	V
Sanicula europaea	-	-	-	+	+	-	-	-	-	+	-	II
Alnion incanae et Alno -Fraxinetalia												
Glechoma hederacea	+	-	-	-	-	+	-	-	-	-	-	I
Fraxinus excelsior	-	-	-	-	-	-	+	-	-	-	-	I
Fraxinus excelsior juv.	+	-	-	-	-	+	-	+	+	-	-	II
Impatiens noli -tangere	-	-	-	+	+	-	-	-	-	-	-	I

Querco -Fagetea												
Acer campestre	+	-	-	-	-	+	-	-	-	-	-	I
Acer campestre juv.	+	-	-	-	+	+	+	+	-	-	-	III
Acer platanoides juv.	+	+	+	+	+	+	-	-	-	-	-	III
Athyrium filix -femina	-	-	-	+	+	-	-	-	-	-	-	I
Carex digitata	+	-	-	-	-	+	-	-	-	-	-	I
Cerasus avium juv.	+	-	-	-	-	+	-	-	-	-	-	I
Cruciata glabra	+	-	-	-	-	+	+	-	+	-	-	II
Dentaria bulbifera	-	+	+	+	+	-	-	-	-	-	-	II
Epilobium montanum	+	-	-	-	-	+	-	-	-	-	-	I
Galium schultesii	+	+	+	-	-	+	-	-	1	-	-	III
Geum urbanum	-	-	-	-	-	-	-	-	-	+	-	I
Mycelis muralis	+	+	+	+	+	+	+	-	+	+	-	V
Neottia nidus –avis	+	-	-	-	-	+	-	-	-	-	-	I
Poa nemoralis	+	+	+	+	+	+	1	-	+	1	1	V
Quercus robur juv.	-	-	-	-	-	-	-	-	-	-	+	I
Quercus robur juv.	-	-	-	-	-	-	+	+	-	-	+	II
Viola reichenbachiana	+	+	+	+	+	+	+	+	+	+	+	V
Rhamno -Prunetea												
Cornus mas	-	-	-	-	-	-	+	-	-	-	-	I
Corylus avellana	+	+	-	-	-	+	-	-	-	-	-	II
Corylus avellana juv.	-	-	-	-	-	-	+	+	+	-	-	II
Crataegus monogyna juv.	-	-	-	-	-	-	+	-	-	-	-	I
Evonymus verrucosus	-	-	-	-	+	-	-	-	-	-	-	I
Senecio ovatus	+	+	+	-	-	+	-	-	+	-	-	III
Vaccinio –Piceetea s. l.												
Betula pendula	+	-	-	+	+	+	-	-	-	-	+	III
Picea abies juv.	-	-	-	-	-	-	-	-	+	-	+	I
Sorbus aucuparia	-	-	-	-	-	-	-	-	-	-	+	I

Epilobietea angustifolii												
Calamagrostis epigeios	+	-	-	-	-	+	-	-	-	-	-	I
Digitalis grandiflora	-	-	-	-	-	-	-	+	-	-	+	I
Fragaria vesca	+	+	+	+	+	+	+	+	-	-	-	IV
Galio -Urticetea												
Aegopodium podagraria	+	+	+	-	-	+	+	-	+	-	-	III
Variae syntaxa												
Calluna vulgaris	-	-	-	-	-	-	-	-	-	-	+	I
Spiraea chamaedryfolia	-	+	-	-	-	-	-	+	-	-	-	I

Relevée place: 1.Lepşa, 31.07.2007; 2.Cheile Tişiţei, 18.06.2007; 3.Cheile Tişiţei,18.06.2007; 4.Culmea Porcului, 18.06.2008; 5.Culmea Porcului, 18.06.2008; 6.Lepşa, 26.07.2008; 7.Lepşa, 17.06.2009; 8.Lepşa, 17.06.2009; 9.Lepsa, 22.06.2009; 10.Cascada Putnei, 24.06.2009; 11.Tulnici, 25.06.2009

Subal. ***Calamagrostio –Fagenion*** Boşcaiu et al. 1982

Ass. *Hieracio transsilvanico –Fagetum* (Vida 1963) Täuber 1987

Chorology: Cascada Putnei, Cheile Tişiţei, Culmea Porcului, Lepşa, Tulnici.

Ecology: The association populating the abrupt slopes, with acid brown soil, with moderate moisture, covering a wide altitudinal range from 400 -1000 meters.

The floristic composition and the analysed phytocoenosis (table 1): ***Fagus sylvatica*** is the main species in this association, realizing coverings of 80 - 95%.

The species characteristic is constantly accompanied of *Betula pendula, Carpinus betulus, Acer campestre* etc.

The shrub layer are found isolated examples of *Corylus avellana, Rubus hirtus*.

The herbaceous layer are few species, among which we mention: *Aegopodium podagraria, Campanula rapunculoides, Dentaria bulbifera, Galium schultesii, Luzula luzuloides, Oxalis acetosella, Mycelis muralis, Poa nemoralis, Salvia glutinosa, Senecio ovatus, Viola reichenbachiana* etc.

Comments: The association is first mentioned in the superior basin of Putna river.

CONCLUSIONS

This phytocoenosis identified in the superior basin of Putna river have very similar floristic and phytocoenologic composition to those described from the Oriental Carpathians and, in particular with those described from the basin of Milcov and Şuşiţa river.

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THE STRUCTURE OF THE VEGETATIVE ORGANS OF *GENTIANA ASCLEPIADEA* L.

STRUCTURA ORGANELOR VEGETATIVE DE LA *GENTIANA ASCLEPIADEA* L.

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***Abstract**: The paper is focused on the structure of the conductive tissues belonging to the vegetative organs of a potential ornamental spontaneous plant, Gentiana asclepiadea L., collected from Bistritei Mountains. The plant has simple, tall stem of 20 – 60 (100) cm. All the features identified in the conductive tissues of the stem attest the taxonomy of the species: two concentric regions of xylem and numerous locations of the phloem with various structures. The foliar limb presents simple vascular bundles, usually structured.*

Key words: *Gentiana asclepiadea*, conductive tissues

***Rezumat**: Lucrearea se axează pe prezentarea structurii ţesuturilor conducătoare din organele vegetative ale unei specii spontane potential ornamentale, Gentiana asclepiadea L., colectată din Munţii Bistriţei. Specia prezintă o tulpină simplă, înaltă de 20 – 60 (100) cm. Toate elementele identificate la nivelul ţesuturilor conducătoare din tulpină atestă taxonomia acestei specii: două regiuni concentrice de lemn şi numeroase locaţii ale liberului, cu structuri diferite. Limbul foliar prezintă fascicule conducătoare simple, obişnuit structurate.*

Cuvinte cheie: *Gentiana asclepiadea*, ţesuturi conducătoare

INTRODUCTION

Gentiana asclepiadea belongs to *Gentianaceae* family. It bears a simple, tall (20-60-100 cm) stem, opposite, ovate-lanceolated, sessile and acuminated leaves. Flowers are short pedicelated, of 3-5 cm, isolated or clustered 2-3 in the axils of the upper leaves. Corolla is campanulated, blue, with some dark dots at the inner part. It grows on lawns, edges of forests, from hills to the alpine regions (Ştefan N. & Oprea A., 2007; Tiţă I., 2008). The aim of the present study is to describe the structure of some conductive tissues from gentian root, stem and leaf, underlining the characteristic elements for *Gentianaceae* species.

Several studies have been initiated in *Gentianaceae* species: wood anatomy was described by means of light microscopy and scanning electron microscopy (Carlquist Sh. & Grant J. R., 2005); the presence of vestured pits in the secondary xylem of some species of *Gentianaceae* family was, also, reported (Jansen St. & Smets E., 1998). The morphology and ultrastructure of orbicules, which can be observed on the innermost tangent and radial walls of secretory tapetum cells, was emphasized; they

have been investigated using transmission electron microscopy and scanning electron microscopy technologies (Vinckier St. & Smets E., 2003).

Floral movements in response to environmental changes were observed and described in *Gentiana algida* (Bynum M. R. & Smith W. K., 2001). Secretory hairs from the calyx, corolla and leaves of some *Gentiana* species were investigated by means of light microscopy (Renobales G. et all., 2001), as well as other anatomic details regarding the entire body of *Gentianaceae* species (Metcalfe C. R. & Chalk L., 1972) and a complex description upon the development, dilatation and subdivision of cortical layers of *Gentiana asclepiadea* root (Sottníková Anna & Lux Al., 2003).

MATERIAL AND METHOD

In order to investigate from histo-anatomic point of view, the material has been fixed and preserved in alcohol 70%, then processed upon the methods used in vegetal anatomy studies (Andrei M. & Paraschivoiu Roxana Maria, 2003; Şerbănescu-Jitariu Gabriela et all., 1983).

The material was cut manually, using microtome and elder pith as support. The histological sections were washed in sodium hypochlorite, acetic acid and distillate water. Then they passed through iodine green (1 minute), which colours all suberified and lignified walls, and ruthenium red (1 minute) which colours all cellulosed walls of the cells. In order to obtain the permanent slides, the histological sections were mounted in gel; then they were analyzed in Optika light microscope. The light micrographs were performed using a Canon A540 camera.

RESULTS AND DISCUSSIONS

The young roots show a primary structure (fig. 1): the central cylinder bears three xylem vascular bundles (which consist of xylem vessels with thickened and lignified walls and a few parenchyma cells) and three phloem vascular bundles. The mature roots show secondary structure (fig. 2), appeared due to the cambial activity, expressed in: exodermis having uniformly thickened walls, secondary endodermis and central cylinder consisting of only a few solitary or clustered xylem vessels, with thickened and lignified walls and small phloemic isles. This time, the cortical parenchyma is reduced to a single layer of big, fleshy cells. All conductive elements are surrounded by cells with thickened cellulosed walls.

The stem shows a secondary structure, with characteristic elements for the species belonging to *Gentianaceae* family. In the upper part of the stem (figs. 3 and 4), the xylem is like a complex cylinder formed of two distinct regions, with no medullar rays: an inner region, with numerous wide vessels with thickened and strongly lignified walls, accompanied by parenchymatic cells of various dimensions (they are bigger near the axial part of the stem and smaller near the xylem vessels) and bear thickened and lignified walls; there is an outer region of xylem, too, which consists of a ring full of fibers (with uniformly thickened and lignified walls). There are two locations for the phloemic elements: clusters of sieved tubes embedded in the xylem cylinder and an outer ring of phloem, situated at the external part of the xylem fibers. In the middle part of the stem (figs. 5-8), the structure of the vascular tissues is

similar to that of the upper part, but the xylem ring is wider, with more parenchymatic cells in the xylemic part, as well as with wider pith.

In the lower part (figs. 9-12) the stem is wider, with wider pith and the xylem still consists of two well developed regions: a ring of xylem fibers, with uniformly thickened walls and a ring which consists of wide, lignified vessels and lignified xylemic parenchyma; the phloem still have clusters of sieved tubes embedded in the xylemic parenchyma and a phloem ring, at the external part of the xylemic lignified fibers. This time, a third category of phloem appears, represented by clusters of phloemic elements in the pith, very closed to the xylemic parenchymatic cells, which is called medullar phloem (Metcalfe C. R. & Chalk L., 1972).

The foliar limb from the leaves belonging to the upper, middle and lower regions of the stem has been analyzed (fig. 13-18). In all levels, the limb is hypostomatic, with ranunculaceous (anomocytic) stomata. In cross section, the middle vein is strongly prominent at the abaxial face and bears a single big vascular bundle. The xylem is represented by numerous narrow vessels with thickened and lignified walls, disposed as radiary rows which form an arch and cellulosed xylemic parenchyma. The phloemic elements (sieved tubes and guard cells) are disposed on an arch, too.

The lateral parts of the middle vein show homogenous mesophyll (lacunary type) with numerous small vascular bundles, but with no arch disposition of their elements. Each small vascular bundle is surrounded by one-layered parenchymatic sheath.

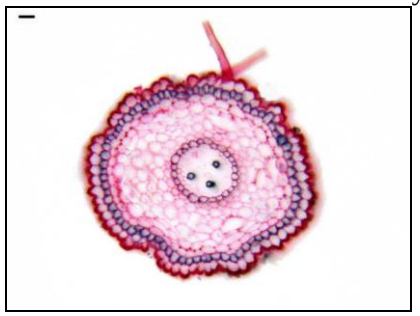

Fig. 1. Primary root structure

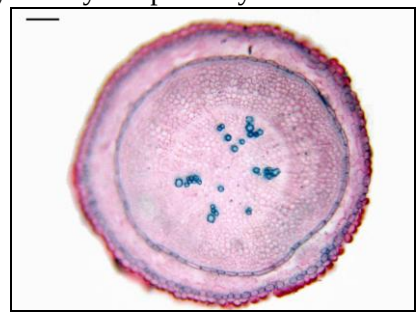

Fig. 2. Secondary root structure

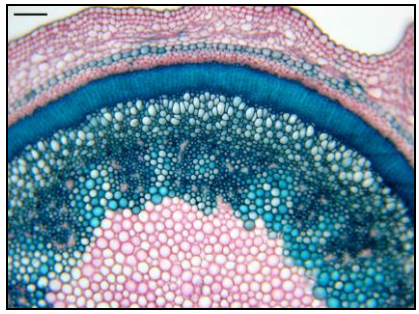

Fig. 3. Stem structure in the upper level

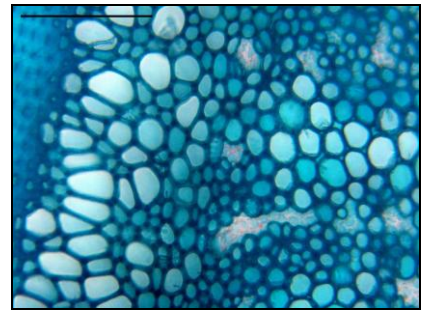

Fig. 4. Xylem structure in the upper level of the stem

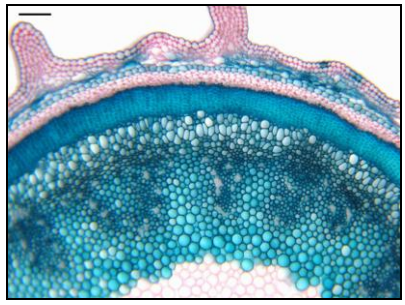

Fig. 5. Stem structure in the middle level

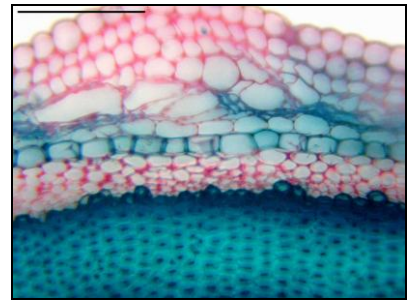

Fig. 6. Outer phloem ring and fibers ring

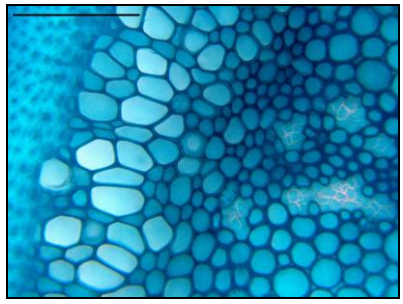

Fig. 7. Xylem structure in the middle level of the stem

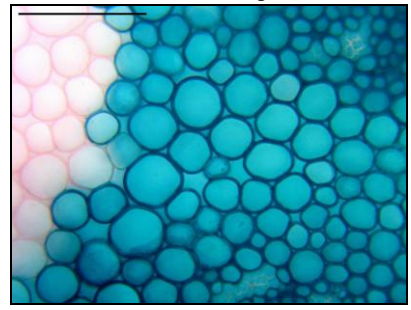

Fig. 8. Parenchymatic lignified cells in the middle level of the stem

Fig. 9. Stem structure in the lower level

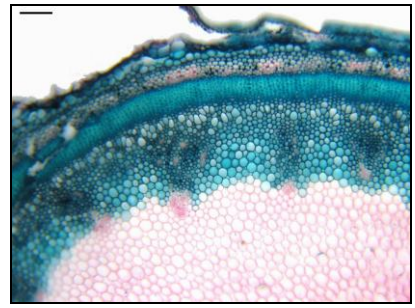

Fig. 10. Stem structure in the lower level

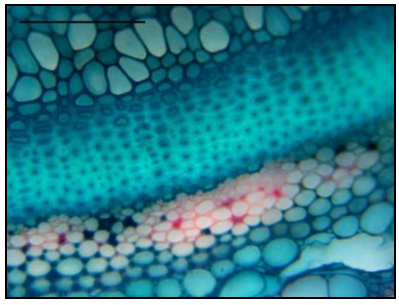

Fig. 11. Xylem vessels, xylem fibers and phloem ring

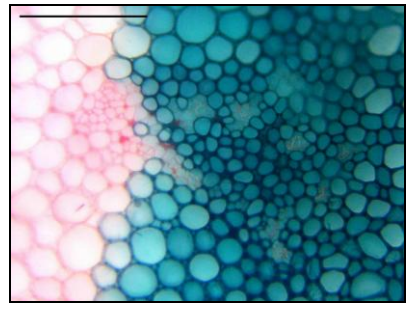

Fig. 12. Medullary phloem and sieved tubes embedded in xylem parenchyma

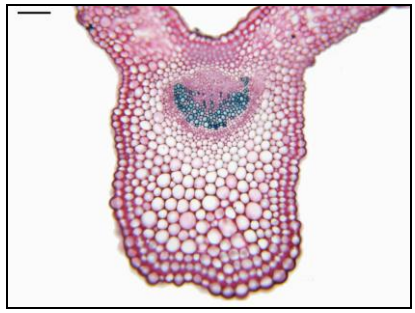

Fig. 13. Leaf structure in the upper level of the stem

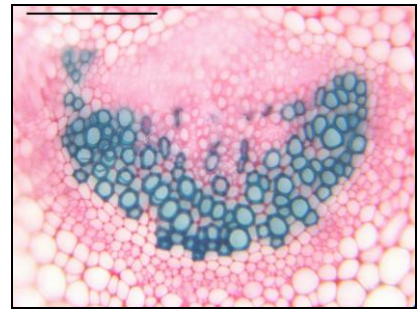

Fig. 14. Middle vein of leaf from the upper level of the stem

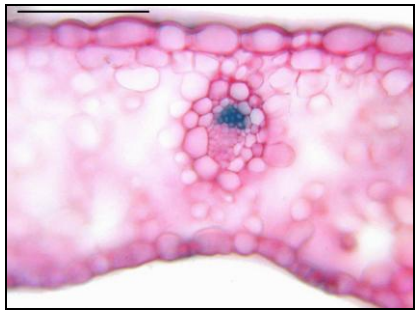

Fig. 15. Small bundle in the mesophyll of the leaf from the upper level of the stem

Fig. 16. Leaf structure in the middle level of the stem

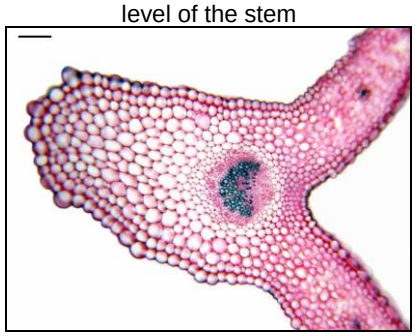

Fig. 17. Leaf structure in the lower level of the stem

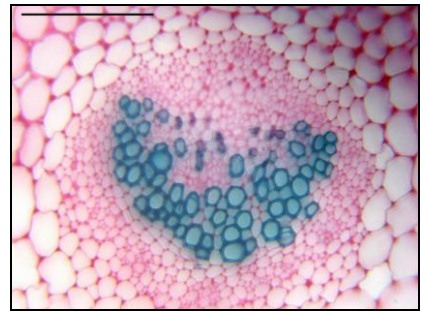

Fig. 18. Middle vein of leaf from the lower level of the stem

CONCLUSIONS

The young roots show a primary structure, while the mature roots show a secondary one.

The xylem of the stem displays two regions: an inner region, formed by numerous vessels and parenchymatic cells of various dimensions, all of them bearing thickened and lignified walls, and an outer region represented by fibers with thickened and lignified walls.

The phloem of the stem has two locations: clusters of sieved tubes in the xylem parenchyma and a ring of phloemic elements at the external part of the

xylem fibers. Only in the lower part of the stem a new type of phloem appears: the medullar phloem, at the frontier between pith and xylemic parenchyma.

The foliar limb shows a bifacial-izofacial structure, with normal dorsi-ventrality, due to the normal location of the xylem and phloem in the vascular bundles.

ACKNOWLEDGEMENTS

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ANATOMIC ASPECTS IN *PARNASSIA PALUSTRIS* L.

ASPECTE ANATOMICE LA *PARNASSIA PALUSTRIS* L.

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Abstract*. The authors emphasize a detailed presentation of the anatomic characters of Parnassia palustris L. The root has a primary structure. The stem has a star profile, with 5 long and narrow branches. The central cylinder starts with a pericycle as a sclerenchymatic ring, while the conductive tissue consists of three vascular bundles. Leaves are petiolated, numerous, oval, with chordate base and straight edges. The petiole has a crescent profile in cross section; in the fundamental parenchyma three vascular bundles are embedded, each one of them being surrounded by a primary endodermis, with casparian thickenings in the component cells. The foliar limb is hypostomatic, with bifacial-heterofacial structure and normal dorsiventrality.*

Key words*: Parnassia palustris,* star profile

Rezumat*. Studiul are ca scop prezentarea detaliată a elementelor anatomice caracteristice speciei Parnassia palustris L. Rădăcina prezintă structură primară. Tulpina are forma unei stele cu 5 braţe lungi şi înguste. Cilindrul central începe cu un periciclu de tip inel sclerenchimatic, iar fasciculele conducătoare sunt în număr de trei. Frunzele bazale sunt peţiolate, numeroase, ovale, cu baza profund cordată şi margini întregi. Peţiolul are formă de semilună în secţiune transversală; în el sunt implântate trei fascicule conducătoare libero-lemnoase, fiecare fiind înconjurat de o endodermă de tip primar, în pereţii dintre celulele componente observându-se îngroşări Caspary. Limbul foliar este hipostomatic, având o structură bifacială-heterofacială cu dorsiventralitate normală.*

Cuvinte cheie: *Parnassia palustris,* formă de stea

INTRODUCTION

Grass of Parnassus is the English name for the genus *Parnassia*, also known as Bog-stars, because of the shape of the flowers (Kopyt'ko Ya. F., 2003).

Parnassia palustris L. is a herbaceous dicotyledonous species belonging to *Saxifragaceae* family. It bears numerous small roots and un-branched erect ribbed stem. Leaves are numerous, ovate with chordate basis and straight edges. Flowers are white, solitary, of 1.5-4 cm diameter. It prefers wet meadows, from plain regions to the mountain regions. It is a hemicryptophyte, with circumpolar origin; it prefers full light and can support large variations of temperature. It is frequently seen in Romanian mesohygrophile and mesophile lawns.

Species of *Parnassia* genus have always attracted the interest of numerous researchers. Arber A. (1915) tried to emphasize the anatomy of the stamens in

certain species of *Parnassia*, while Cunnell G. J. (1959) explained the arrangements of sepals and petals of *Parnassia palustris*. The same species were investigated from biochemical point of view by Kopyťko Ya. F. (2003) who determined the composition of amino-acids and fatty acids in homeopathic matrix tinctures of grass of Parnassus prepared from fresh or dry plants of *Parnassia palustris*. The author also reminds the importance of homeopathic preparations made of grass of Parnassus in the treatment of eye disorders, epilepsy and pulmonary hemorrhage.

The morphology of leaf epidermis in some *Parnassia* species was investigated by means of light microscopy and scanning electron microscopy; this study (Wu Ding, Wang Hong, LU Jin-Mei, LI De-Zhu, 2005) mentioned that all examined species bear anomocytic stomata on abaxial epidermis and only a few bear stomata on both (abaxial and adaxial) epidermis. Metcalfe C. R. & Chalk L. (1972) showed a few anatomic characters for *Saxifragaceae* species.

The level at which populations interact as well as the levels of inbreeding and local adaptation were investigated in the endangered species *Parnassia palustris* living in contrasted habitats, more exactly in 14 populations of northern France, in order to set up conservation policies.

MATERIAL AND METHOD

The paper is focused on a detailed presentation of the anatomic characters of *Parnassia palustris*. In order to carry out the histological analysis, the vegetal material represented by the vegetative organs of *Parnassia palustris* has been fixed and preserved in 70% ethylic alcohol and then washed with sodium hypochlorite, acetic acid and coloured with iodine green and ruthenium red, as in the methods used in vegetal anatomy studies (Andrei M. & Paraschivoiu Roxana Maria, 2003; Şerbănescu-Jitariu Gabriela et all., 1983).

The histological sections were mounted in gel; then they were analyzed in Optika light microscope. The light micrographs were performed using a Canon A540 camera.

RESULTS AND DISCUSSIONS

The cross section through the young roots presents a primary structure. The epidermis consists of big isodiametric cells and few stomata (fig. 7). The cells of the exodermis are flattened; the cortical parenchyma bears 9-11 layers of cells bigger than those of the exodermis. There is no layer as an endodermis. The central cylinder has three xylem bundles and three phloem bundles. All xylem vessels have thickened and lignified walls. The rhizome (figs. 1 and 2) is thick in cross section, with isodiametric cells in the epidermis, a short cortex and vascular bundles disposed as two rings (a xylem ring and a phloem ring). The xylem vessels have thickened and lignified walls, as well as most of the xylemic parenchyma.

The upper part of the stem has a star profile (fig. 3) in cross section, with 5 long and narrow branches. Epidermis is formed of cells of various dimensions and small stomata. The cortical parenchyma of the stem has small cells which form big meatus; in the branches, the parenchyma is collenchymatized (fig. 4). At the

outer part of the central cylinder there is a pericycle, represented by a few layers of sclerenchyma (fig. 5 and 6) disposed on a ring; the fibers bear thickened and lignified walls. The central cylinder bears three vascular bundles which seem to consist, each one of its own, of two smaller bundles (fig. 6). Xylem consists of vessels with thickened and lignified walls and few cells of cellulosed xylemic parenchyma, while phloem of sieved tubes and guard cells. The centre of the cylinder is occupied by medullar cellulosed parenchyma (fig. 8) with cells of various dimensions.

The other regions of the stem (figs. 9 and 10) show no particular elements in comparison to the upper region.

The petiole (fig. 11) has a crescent form in cross section. The epidermis bears isodiametric cells, having the external walls covered by thick cuticle. The fundamental cellulosed parenchyma is thick, formed of big cells. Here are present three vascular bundles, each one of them being surrounded by a primary endodermis, with casparian thickenings (fig. 12) in the component cells. Xylemic elements, represented by vessels of small diameter, have thick and lignified walls and are disposed on an arch. Almost the entire arch is surrounded by phloemic elements (sieved tubes and guard cells).

In front side view, the epidermis of the foliar limb shows big cells with waved lateral walls (figs. 13 and 14), more waved in the lower epidermis, where anomocytic stomata are present (fig. 14), so the foliar limb is hypostomatic.

The foliar limb has a linear shape (fig. 15) in cross section. The epidermis consists of big cells. The middle vein has a single vascular bundle (fig. 16) with a similar structure to that of the bundles from the petiole. In the lateral parts of the middle vein, the mesophyll is differentiated into palisade tissue with short cells towards the upper epidermis and lacunary tissue, towards the lower one, formed of small cells which form lacunae of various dimensions between them.

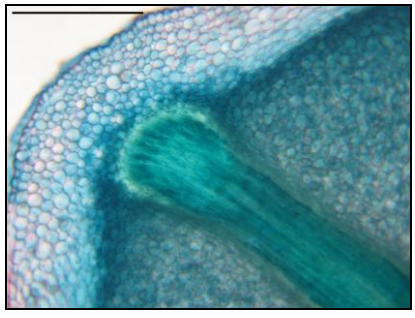

Fig. 1. Rhizome

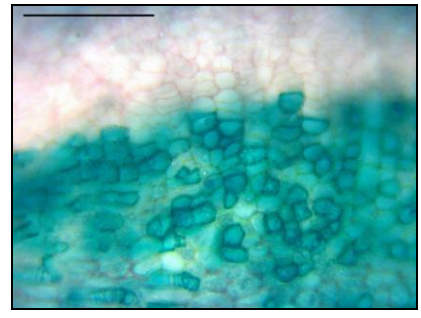

Fig. 2. Xylem and phloem of the rhizome

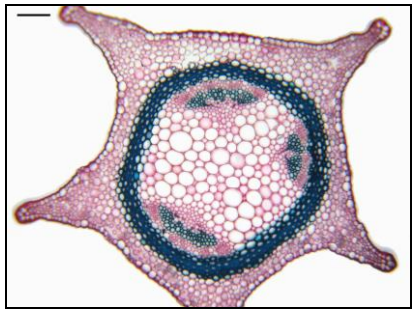

Fig. 3. Structure of the stem in the upper region

Fig. 4. Collenchyma in one branch of the stem

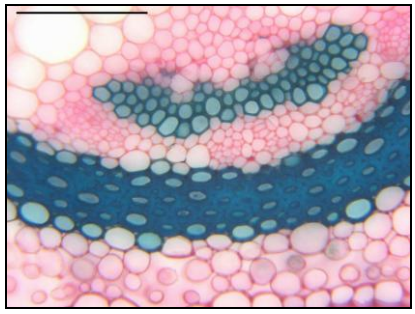

Fig. 5. Pericycle and vascular bundles of the stem

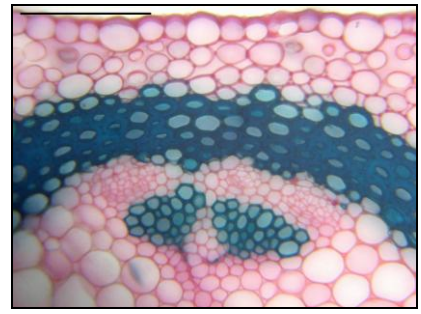

Fig. 6. Pericycle and vascular bundles of the stem

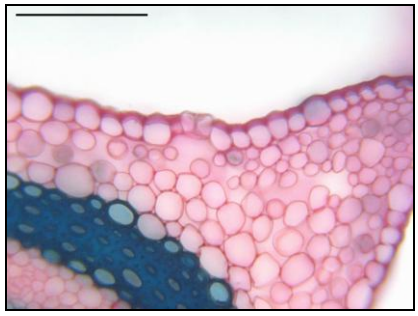

Fig. 7. Stomata in the epidermis

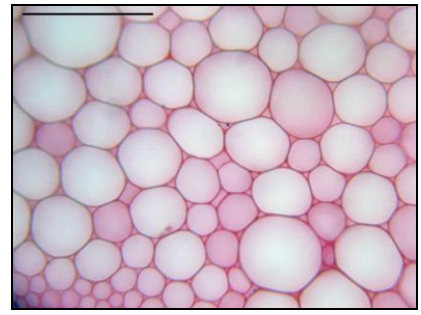

Fig. 8. Medullary parenchyma

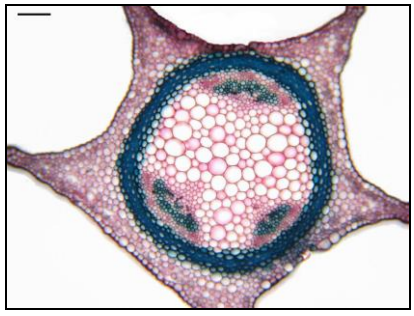

Fig. 9. Structure of the stem in the lower region

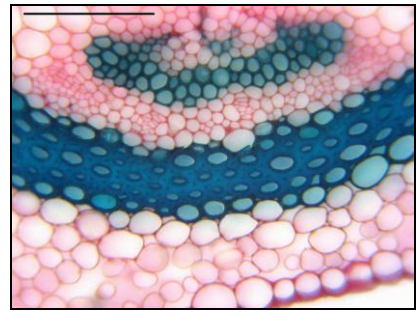

Fig. 10. Pericycle and vascular bundle of the stem

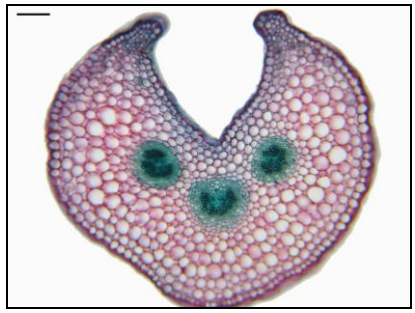

Fig. 11. Cross section through the petiole

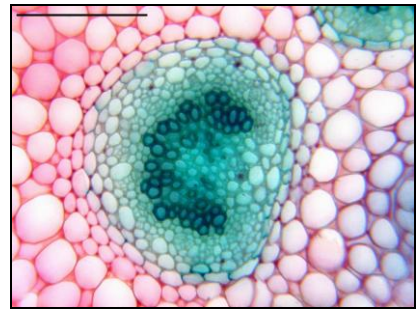

Fig. 12. Vascular bundle of the petiole

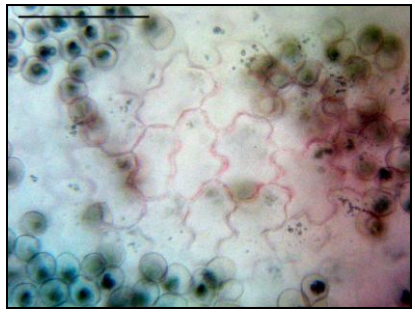

Fig. 13. Upper epidermis of the foliar limb

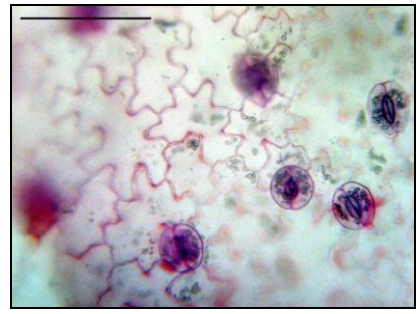

Fig. 14. Lower epidermis of the foliar limb

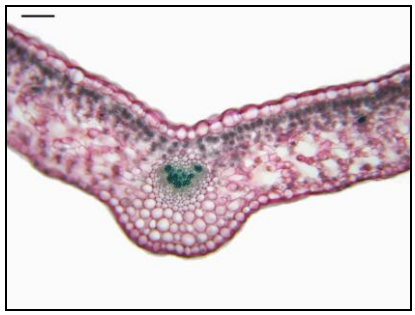

Fig. 15. Cross section through the foliar limb

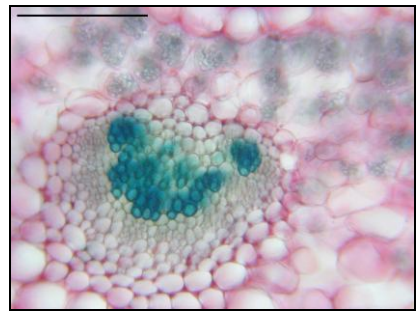

Fig. 16. Cross section through the middle vein

CONCLUSIONS

The cross section through the young roots presents a primary structure.

The rhizome is thick in cross section.

All parts of the stem have a star profile in cross section, with 5 long and narrow branches, where the parenchyma is collenchymatized. The pericycle is represented by a few layers of sclerenchyma disposed on a ring. The central cylinder bears three vascular bundles.

The petiole has a crescent form in cross section and three vascular bundles, each one of them being surrounded by a primary endodermis, with casparian thickenings in the component cells.

The foliar limb is hypostomatic and has a bifacial-heterofacial structure, with normal dorsiventrality.

ACKNOWLEDGEMENTS

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THE COMPOSITION OF FREE AMINO ACIDS IN PLANT ORGANS OF SOYBEAN (*GLYCINE MAX* (L.) Merr.) INOCULATED WITH *BRADYRHIZOBIUM JAPONICUM* RELATED TO THE ACTION OF WATER STRESS

COMPOZIŢIA AMINOACIZILOR LIBERI DIN ORGANELE PLANTELOR DE SOIA (*GLYCINE MAX* (L.) Merr.) INOCULATE CU *BRADYRHIZOBIUM JAPONICUM*, ÎN FUNCŢIE DE ACŢIUNEA STRESULUI HIDRIC

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Abstract. *The composition of free amino acids in the plant organs of soybean (Glycine max* (L.) Merr*) inoculated with Bradyrhizobium japonicum 646 depending on the action of water stress has been studied in this work. The results showed that water stress of 35% soil humidity induced reduction in the free amino acids content of nodules and shouts and increased their content in roots and leaves. The water stress conditions have also led to changes in the qualitative composition of free amino acids. Water stress was observed to decrease the level of aspartic acid (Asp) of the nodules by approximately 12% and to increase its content in roots and shoots by about 4% and 2% respectively. However, the content of γ – amino butyric acid (GABA) increased in all soybean organs: nodules, roots, shoots and leaves of the stressed plants, comparing with the GABA values of the organ plants growing under a soil humidity level of 70%. The water stress also influenced the concentration of essential amino acids, the content and quality of which is determined by the type of vegetative organs.*

Key words: soybean, water stress, free amino acid composition, nodules, roots, shoots, leaves

Rezumat. *În lucrarea de faţă s-a studiat compoziţia aminoacizilor liberi din organele plantelor de soia (Glycine max* (L.) Merr.*) inoculate cu Bradyrhizobium japonicum 646, în funcţie de acţiunea stresului hidric. Rezultatele obţinute au demonstrat că stresul hidric de 35% din capacitatea totală de reţinere a apei (CTRA) din sol a condus la diminuarea conţinutului aminoacizilor liberi din nodozităţi şi tulpini şi la majorarea conţinutului acestora in rădăcini şi frunze. Condiţiile stresului hidric au provocat, de asemenea, şi modificări în compoziţia calitativă a aminoacizilor liberi. S-a observat că stresul hidric a diminuat conţinutul de acid aspartic (Asp) în nodozităţi cu aproximativ 12% şi a majorat conţinutul acestuia în rădăcini şi tulpini cu aproximativ 4% şi respectiv 2%. Conţinutul de acid γ-aminobutiric (GABA) s-a majorat în toate organele: nodozităţile, rădăcinile, tulpinile şi frunzele plantelor, expuse acţiunii stresului hidric, în comparaţie cu valorile GABA din organele plantelor cu nivelul umidităţii solului de 70 % CTRA. Stresul hidric a influenţat de asemenea şi concentraţia aminoacizilor esenţiali, conţinutul calitativ al cărora este determinat şi de tipul organului vegetativ*

Cuvinte cheie: soia, stres hidric, aminoacizi liberi, nodozităţi, rădăcini, tulpini, frunze.

INTRODUCTION

Soybean (*Glycine max* (L.) Merr.*)* belongs to the *Fabaceace* family, which comprises more than 18,000 species. Legume plants have a unique feature – that of establishing mutualistic associations with some bacterial groups of the *Rhizobiaceae* family, including the *Bradyrhizobium* genera. Soil *Rhizobia* bacteria colonizing legume roots induce the formation of nodules. Inside nodules, bacteria, being transformed into bacteroids (B), are enclosed within peribacteroid space (PBS) with plant-derived peribacteroid membrane (PBM), forming new structures - simbiosomes, which carry out the process of nitrogen fixation.

Ammonia represents the first stable product of N_2 reduction and it is released from bacteroids to the plant tissues, where is assimilated into amino acids in exchange for plant–derived organic compounds (Mergaert P. et al., 2006; Prell J, Poole P., 2006). So, the metabolism of amino acids and other N compounds in symbiotic legumes depends on the intensity of nodule nitrogen fixation, which, in its turn, is determined by its providing with photosynthetic products as carbon and energy sources, on the one hand, and on the other hand, on the action of environmental factors, including that of water stress (Zahran H. H., 1999)

This study was focused on the distribution of free amino acids in the plant organs of soybean (*Glycine max* (L.) Merr.), inoculated with *Bradyrhizobium japonicum* 646 in relation to the action of edaphic drought.

MATERIAL AND METHOD

Growth conditions. A pot experiment in control conditions was carried out to investigate drought induced changes in amino acid composition of soybean organs.Soybean seeds, cv *"Bucuria"* were inoculated with effective nitrogen fixing bacteria *Bradyrhizobium japonicum* 646 and then sown into pots containing 6 kg of soil. After sowing, soil humidity in all the pots was maintained at 70% of the soil capacity level. The experiment was performed when the plants were at the budding stage of soybean development. At that time, the pots with plants were divided into two sets - control and water stress plants. The soil humidity level of the control plants was continuously maintained at 70%, whereas that of the stress ones was maintained by withholding watering until the soil water content in pots had reached 35 %. Both water regimes at 35 % and 70 % soil humidity were kept daily by replacing the amount of water lost, estimated by weighing each pot. The duration of water stress was 10 days. After the onset of drought period, the plant samples were collected and immediately fixed and kept in liquid nitrogen until their analysis.

Free amino acid determination. Plant samples preparations for amino acid analysis were effectuated according to the Krisshenco method (7). The quantitative and qualitative content of free amino acids in soybean organs was determined, using the amino acid analyzer – AAA 339 (Czechoslovakia).

RESULTS AND DISCUSSIONS

The results of the water stress action on the content of free amino acids in soybean organs are given in table 1. It can be observed that the plants exposed to the action of edaphic drought – 35% soil humidity level

are characterized by a reduced content of free amino acids in nodules and shouts and by an increased one in roots and leaves.

Table 1

Influence of water stress conditions on content of total free amino acids in soybean organs

Soil humidity	Total free amino acids, mg/ 100 mg FW			
	Nodules	Roots	Shoots	Leaves
70%	419,67 ± 0,018	82,575 ± 0,003	179,71 ± 0,02	110,07 ± 0,006
35 %	340,375 ± 0,02	100,69 ± 0,009	103,37 ± 0,007	119,04 ± 0,01

It has been widely demonstrated that drought seriously affects biological nitrogen fixation (Zahran H. H., 1999) and that three factors such as: oxygen limitation (Del Castillo L.D. et al., 1994), carbon shortage (Arrese-Igor C. et al., 1999), and regulation by nitrogen metabolism (Purcell L.C. et al., 2000, Vadez V. et al., 2000, King C.A., Purcell L., 2005), can be involved in this inhibition. Particularly, such nitrogen compounds as nodule ureide, nodule aspartate and several amino acids in leaves are considered as potential candidates for feedback inhibition of biological nitrogen fixation (King C.A., Purcell L., 2005).

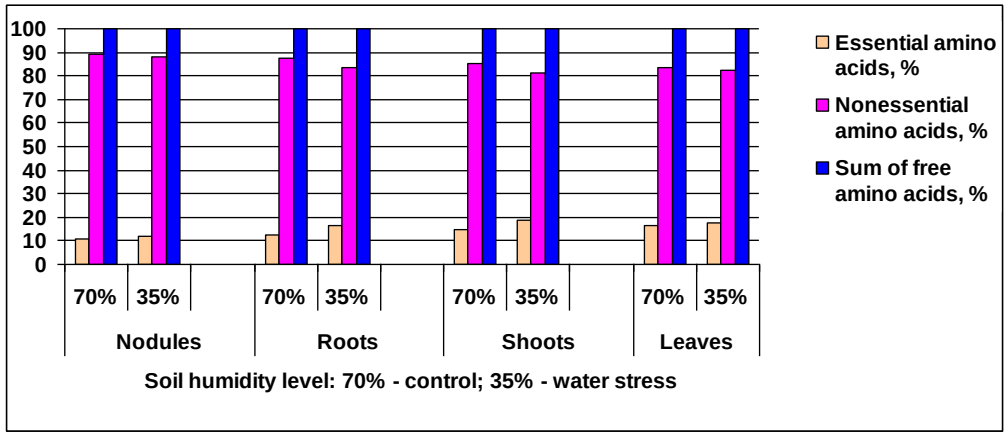

Fig.1. The content of essential and nonessential free amino acids in soybean organs in response to soil water deficit

Soil water deficit also influences the content of essential and nonessential amino acids (fig.1). The ratio between these two amino acid groups is determined by the type of plant organ. In the nodules of the plants grown under both soil water regimes (70% and 35%), the concentration of essential and nonessential amino acids makes about 10% and 90%, respectively, while in roots and shoots, the ratio between essential and nonessential amino acids is changed by the soil water regimes. Soil water deficit led to a decrease in total nonessential free amino acids and an increase of free essential amino acids in roots and shoots, but in-well

watered plants, a reverse situation takes place – declining of essential amino acids and increasing of nonessential ones (fig. 1).

Table 2

Impact of water stress on distribution of nonessential amino acids nitrogen compounds in soybean organs. Soil humidity level: 70% - control; 35% - water stress

Nonessential amino acids	Abbreviations	Nodules		Roots		Shoots		Leaves	
		70%	35%	70%	35%	70%	35%	70%	35%
Cysteic acid	Cyc.ac.	0	0	2,5	4,1	0,8	0,7	5,6	7,0
Aspartate	Asp	34,1	22,2	7,2	11,3	5,0	7,1	1,5	0,7
Serine	Ser	4,6	5,4	5,9	7,1	5,0	6,1	1,9	1,9
Asparagine	Asn	0	0	39,8	24,9	53,1	40,1	1,8	1,5
Glutamate	Glu	10,7	12,5	11,9	9,5	0	0	6,5	4,3
Glutamine	Gln	0	0	0	0	3,6	4,0	1,3	1,1
Proline	Pro	0,4	0,4	0	0	1,2	1,6	1,7	1,8
Glycine	Gly	2,6	3,1	1,4	1,0	0,5	0,7	2,2	2,1
Alanine	Ala	16,9	24,0	10,3	8,7	5,7	7,4	15,2	13,6
Cysteine	Cys	6,2	7,0	0	0	0	0	0	0
Tyrosine	Tyr	1,5	2,0	0	2,7	1,2	2,6	1,9	1,5
β-Alanine	β-Ala	1,2	1,3	0	0	0,5	0,9	0,7	0,6
γ- aminobutyric acid	GABA	7,6	8,5	8,2	9,5	15,3	16,2	50,8	54,2
Ornithine	Orn	0	0	0	0	0,7	1,3	1,0	1,1
Ethanolamine	EA	2,5	3,0	3,3	7,1	2,5	1,9	3,9	3,8
Ammonia	NH_3	7,0	6,6	7,4	7,5	1,9	4,5	2,9	3,5
Histidine	His	2,2	2,1	2,1	3,8	1,7	2,9	0,3	0,3
Arginine	Arg	2,5	1,9	0	2,8	1,3	1,8	0,8	1,0
Sum, %		100	100	100	100	100	100	100	100

The action of soil water deficit is also reflected on the distribution of individual nonessential free amino acids by plant organs (table 2). It can be observed that both at soil humidity levels-70% and 35%, Asp contains the highest concentrations -34.0% and 22.2% - of the total nonessential free amino acids in nodules, respectively. These results show that soil water deficit reduces the content of Asp in nodules, while the content of other nonessential amino acids followed Asp by their concentrations such as Ala, Glu, GABA, Cys and Ser is enhanced under water stress conditions. In roots and shoots, the Asp concentration is much lower than that in the nodules, though soil water deficit led to the increasing of Asp content in these organs. At the same time, a sharp increase in Asn concentration is observed in roots and shoots for both soil humidity levels (70%, 35%), though the water stress conditions declined the content of Asn. So, our results show that after 10 days of water stress, the Asp level in nodules is declined in comparison with that of control – well-watered

plants. The recent publication (King C.A., Purcell L., 2005) illustrated that soil water deficit during 2 days led to the accumulation of Asp in soybean nodules. The discordance in the results on Asp concentration in nodules under water stress, perhaps, can be due to the duration of the stress, soybean cultivar or other factors.

The content of Ala in roots and shoots is less than in nodules and leaves. The edaphic drought conditions decreased Ala concentration in roots and leaves (Table 2). The conditions of soil water deficit resulted in the increase of GABA concentration in all the soybean organs tested: nodules, roots, shoots, and leaves. Remarkably, the content of GABA in nodules and roots makes about 7% - 9%, in shoots – about 15% - 16%, but in leaves GABA reached the concentration of about 50% - 54% of the total nonessential free amino acids. GABA is considered to accumulate in plant tissues as a response to diverse stress factors (Bown A.W., Shelp B.J., 1997, Cholewa E. et al., 1997**).** It is suggested that GABA may also serve as a source of carbon and nitrogen in Glu biosynthesis **(**Turano F.J, Fang T, 1998).

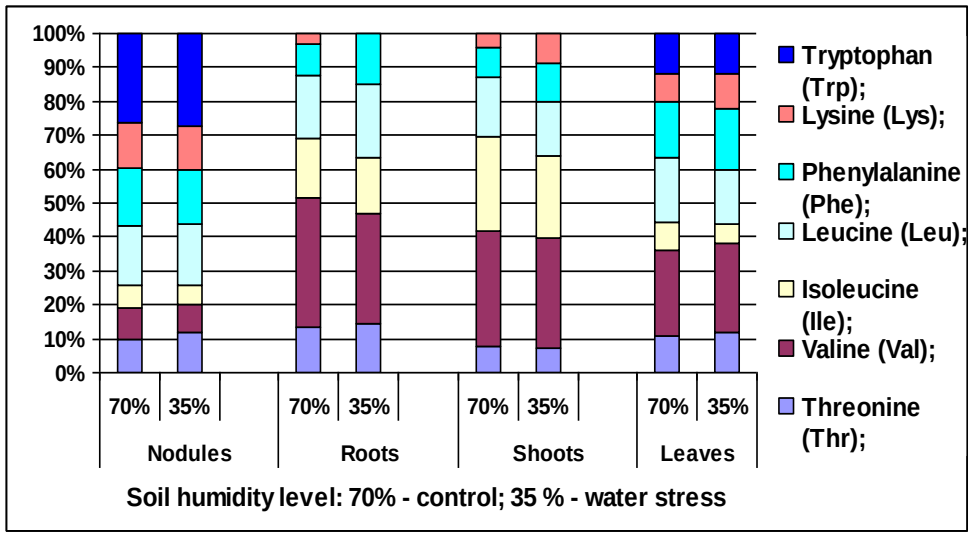

Fig.2. Impact of water stress on essential amino acid composition in soybean organs.

The composition and distribution of essential free amino acids in soybean plants presented in Fig.2 show that this group of free amino acids mostly depends on plant organs, with the exception of some amino acids which are influenced by soil water deficit. The nodules, containing all 7 measured essential amino acids, are characterized by a low level of Val and high level of Trp, comparing to roots, shoots and leaves, where an increasing concentration of Val is observed. The Trp concentration in leaves is less than in nodules and it is absent in roots and shoots.

CONCLUSIONS

1. Water stress conditions led to lower total content of free amino acids in nodules and shoots and increased their content in roots and leaves.

2. The action of water stress was accompanied by significant changes in the quantitative and qualitative distribution of nonessential amino acids, in particular, the content of Asp, Asn and Ala. However, the GABA content increased in all the organs: nodules, roots, shoots, and leaves of plants, exposed to the water stress action, compared with the amino acid values in control plant organs.

3. Water stress also influenced the concentration of essential amino acids, the qualitative content of which is determined by the vegetative organ type.

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RESEARCH REGARDING THE MINERAL ELEMENTS CONTENT IN SOME HERBAL SEASONING FROM THE BANAT'AREA

CERCETĂRI PRIVIND CONŢINUTUL ÎN ELEMENTE MINERALE A UNOR PLANTE CONDIMENTARE DIN CÂMPIA BANATULUI

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Abstract. *In this paper were studied by comparison the macroelements ((Na, K, Ca, Mg) and microelements (Fe, Cu, Zn, Cd, Ni, Mn, Pb, Co, Cr) content of some herbals seasoning from Banat's geographic area. For this purpose, the mineral elements mentioned were quantified by atomic absorption spectrometry and there arised from the roots and the leaves of: dill (Anethum graveolens), parsley (Petroselinum crispum), lovage (Levisticum officinale) and celery (Apium graveolens). Among macroelements, K and Ca were found in the highest concentration in whole investigated vegetable material mostly in leaves. Regarding the microelements, Fe was detected in high concentration in plant leaves. Co and Cd were not found in any samples analysed.*

Key words: mineral elements, atomic absorption spectrometric, herbal seasoning

Rezumat. *In prezenta lucrare s-a studiat comparativ conţinutul în macroelemente (Na, K, Ca, Mg), respectiv microelemente (Fe, Cu, Zn, Cd, Ni, Mn, Pb, Co, Cr) al unor plante condimentare din arealul geografic al Câmpiei Banatului. În acest scop, elementele minerale menţionate au fost cuantificate prin spectrofotometrie de absorbţie atomică din radăcinile şi frunzele de: mărar (Anethum graveolens), pătrunjel (Petroselinum crispum), leuştean (Levisticum officinale) şi ţelină (Apium graveolens). Macroelementele K şi Ca s-au regăsit în concentraţiile cele mai mari în întreg materialul vegetal investigat, cu preponderenţă în frunze. Dintre microelemente, Fe a fost detectat în concentraţie mare în frunzele plantelor. Co şi Cd nu s-au regăsit în nici una din probele analizate.*

Cuvinte cheie: macroelemente, microelemente, spectrometrie de absorbţie atomică, plante condimentare

INTRODUCTION

Functioning of living organisms can be done optimally only in the presence of adequate amounts of macro and micronutrients (Garban, Z., 1999). Their presence in insufficient quantities or exceeded certain permissible limits can affect the human body due to the emergence of nutrition diseases.

Some microelements: As, Pb, Cd, Hg, even in very low concentrations, has toxic for the human body (Hoog, C.L., 2001). These considerations reveal the

importance to investigate the macro and micronutrients content in different biological and environmental systems. Optimal determining of their can be achieved only using performance analytical methods (Mohamed, A.E., 2003).

This paper presents an evaluation of the content of macro and microelements: K, Na, Ca, Mg, respectively Mn, Fe, Co, Ni, Cu, Zn Cr, Pb and Cd from different spicy herbs by atomic absorption or emission spectrometry. The studies plants have a strong spicy seasoning, being employed as bulbs, roots, leaves, fruits or stems, in food industry for seasoning various dishes.

The dill (*Anethum graveolens* L.), the parsley (*Petroselinum crispum*), the lovage (L. *Koch Levisticum officinale*) and the celery (*Apium graveolens*) were in ancient times a wide use in food, as well as herbs.

On the basis of obtained data it was found that the plant roots and leaves of fresh spices are, by their contribution of macro and micronutrients, an important source of nutrients. In other point of view, due to high levels of heavy metals, of inadequate treatment during cultivation, spicy plants can become potential sources of contamination by toxic elements.

MATERIAL AND METHOD

For analysis of four samples were used for seasoning, fresh herbs: dill, parsley, lovage and celery collected from Gataia, Timis county.

Fresh samples were dried at 105˚C for three hours, were then calcined at 650˚C for four hours. Samples calcined were treated with 5 ml 0.5 N HNO_3 and evaporated to dryness. After cooling mineral residues were dissolved in 25 ml 0.5 N HNO_3, filtered and brought to the mark with distilled water (Gergen, I., 2004).

For determination of macro elements were used diluted 1:100 working solution in distilled water for dilute solutions of potassium and calcium and sodium and magnesium if 1:10. The standard solution of 0.1 mg element / mL Pipette 1-5 mL, 5-25 mL respectively in 100 ml flasks. Add 10 ml of monopotassium phosphate solution to ensure a roughly equal acidity of the. Make the mark with distilled water and mix. Standard solutions stored in sealed bottles (Gogoasa, I., 2004).

Na and K were determined by atomic emission spectroscopy, and Mn, Fe, Co, Ni, Cu, Zn, Cr, Pb, Cd, Mg and Ca by atomic absorption spectroscopy using an atomic absorption spectrometer AA 300 using the following standard working conditions: Flame type: C2H2/aerw; Flame height: 6 mm; Air flow: 568l/h; Acetylene flow: 80l/h for determination of As, 70l/h for Mg, 60l/h for Fe, 50l/h for other minerals.

Dominant wavelength (λ) for each chemical elements were: Na - λ = 588 nm, K - λ = 766 nm, Ca - λ = 422 nm, Mg - λ = 285 nm Fe - λ = 248 nm Mn - λ = 279 nm, with - λ = 324 nm, λ = 213 nm Zn, Ni - λ = 232 nm, Pb - λ = 217 nm (Gogoasa, I., 1999).

RESULTS AND DISCUSSIONS

The results obtained in the case of macro-and microelements determining in plant roots and leaves of fresh spices, using atomic absorption spectrometry, are shown in tables 1 and 2.

Table 1

Macroelements content (ppm) in roots and leaves of herbal seasoning R - root; F – leaves

No. crt.	Sample	K (ppm)	Na (ppm)	Ca (ppm)	Mg (ppm)
1	Dill (R)	6370	588	1914	428.25
2	Dill (F)	6820	153	2158	643
3	Parsley (R)	4683	147.65	517	497.85
4	Parsley (F)	7145	180	857	621
5	Lovage (R)	4884	248.55	1508	485.3
6	Lovage (F)	5690	163.4	1641.5	494.55
7	Celery (R)	3878.5	184.45	245	177
8	Celery (F)	6485	458.7	2101	761

Table 2

Content of microelements (mg/kg sample) of roots and leaves of some herbal seasoning (R - root; F – leaves)

No. crt.	Sample	Mn (ppm)	Fe (ppm)	Co (ppm)	Ni (ppm)	Cu (ppm)	Zn (ppm)	Cr (ppm)	Pb (ppm)	Cd (ppm)
1	Dill (R)	2.38	43.25	-	0.125	1.46	7.94	0.52	0.032	-
2	Dill (F)	8.14	19.17	-	0.115	1.33	9.10	0.25	0.048	-
3	Parsley (R)	1.81	15.07	-	0.116	1.11	5.46	0.56	0.139	-
4	Parsley (F)	2.82	24.38	-	0.125	1.11	8.71	0.41	0.015	-
5	Lovage (R)	1.77	31.16	-	0.171	1.25	9.71	0.59	0.031	-
6	Lovage (F)	2.75	37.85	-	0.118	0.97	5.85	0.45	0.057	-
7	Celery (R)	1.66	4.43	-	0.031	0.95	5.15	0.48	-	-
8	Celery (F)	13.20	101.90	-	0.102	2.70	12.35	-	0.025	-

It appears that the most concentrated mineral elements K and Ca were both roots and leaves as seasoning plants analyzed for K values were within the range 3878.5 -7145 ppm, while that between 517 to 2158 ppm.

Calcium, predominantly minerals element in the body, is found in higher concentrations (2100 - 2160 ppm) in leaves of dill and celery. Other spicy herbs have lower Ca concentrations (245 - 1914 ppm).

Sodium, an important element for human body, is present in relatively low concentrations (147.65 - 588 ppm) from literature data (600 to 1400 ppm) in leaves especially dill, celery and parsley.

Potassium, an important macro element for human cells, is found in concentrations between 5500 and 7150 ppm in the leaves of dill, parsley, lovage and celery, and a lower proportion (from 3800 to 4890 ppm) was determined the roots of parsley, lovage and celery, fennel root exception being a K-rich content (6370 ppm).

Magnesium, essential macro body was found in the limits between 170 to 760 ppm. The lowest values are observed in celery root (below 200 ppm).

Iron was determined in relatively small concentrations (4.43 - 43.25 ppm) than was found for Fe-rich celery leaves (101.9 ppm).

Manganese is well represented in the leaves of celery (13.2 ppm) and the other samples analyzed, manganese was determined in the range 1.60 - 8.14 ppm.

Chromium is the only microelement whose concentrations exceeded the limit of 0.2 ppm in all samples (0.25 - 0.59 ppm).

Nickel is present in very small quantities (less than 0.2 ppm) in all samples analyzed, the lowest amount of nickel can be found in celery root (0.031 ppm). In the cobalt, it is not in any of the samples subjected to spectrometric analysis.

Are listed on potentially toxic metals like zinc and copper micro, if their concentration in plant fresh seasoning to exceed the limit of 5 ppm to 15 ppm Cu and Zn. Since the values obtained for copper is in the range 0.95-2.70 ppm and for zinc 15-12.35 ppm, shows that the analyzed samples are not toxic if used in food.

Lead and cadmium are considered toxic heavy metals, Pb is why the maximum permissible limit is 0.5 ppm and 0.1 ppm for Cd. Cadmium is not in the eight samples analyzed in this paper and the values were below 0.1 ppm in the case of lead.

CONCLUSIONS

In can observed the relatively high concentrations as: Na, K, Ca and Mg, potassium being the highest content macro in all samples. It is noted that highest values of macro and trace elements were found in the leaves of dill, parsley, lovage and celery than their roots.

It appears that celery leaves have the highest content of micro elements: Mn (13.20 ppm), Fe (101.90 ppm), Cu (2.70 ppm) and Zn (12.35 ppm). In samples of leaves and roots of herbal seasoning were analyzed spicy exceeded maximum allowable concentrations for micro, exception being Cr concentrations at which the maximum permissible limit has been exceeded.

The concentrations of micro elements are important in terms of food safety and environmental ecology.

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PLANT GROWTH AND SOME PHYSIOLOGICAL RESPONSES TO PHOSPHORUS SUPPLY OF SOYBEAN (*GLYCINE MAX.L*) UNDER SUBOPTIMAL SOIL WATER REGIME

CREŞTEREA PLANTELOR DE SOIA (*GLYCINE MAX.L)* ŞI UNELE REACŢII FIZIOLOGICE LA APLICAREA FOSFORULUI ÎN CONDIŢII SUBOPTIMALE DE UMIDITATE

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Abstract. *Phosphorus (P) application is a common practice for improving crop production in soil with P deficiency and to reduce environmental stresses. A greenhouse experiment was conducted on soil to evaluate response of P application and water regimes in a factorial combination on growth, phosphorus concentrations and uptake by soybean (Glycine mx L.) plants. Soybean (cv Zodiac) plants were grown in a soil very low in available P. P application significantly increased dry weights of plants and leaf area. Plants at P deficiency and low levels of P supply had lower growth rates, nitrogen and P concentrations in plant tissues than plants grown at adequate supply (100 mg P kg^{-1} soil). Maximum dry weight of plants and nutrient uptake were obtained at 100 mg P kg^{-1} soil under normal water regime (70% WHC) and suboptimal level (35% WHC). Hence, adequate P nutrition maintained greater DM, leaf area and P uptake under drought conditions.*

Key words: plant growth, *Glycine max L.*, leaf area, phosphorus, suboptimal water regime.

Rezumat. *Aplicarea fosforului contribuie la sporirea productivităţii plantelor de cultură pe solurile cu deficit de fosfaţi mobili şi reduce impactul negativ al factorilor stresogeni de mediu. S-a efectuat o experienţă în condiţii căsuţei de vegetaţie pentru a evalua reacţia plantelor de soia la aplicarea fosforului în condiţii suboptimale de umiditate. Plantele de soia (*cv Zodiac*) au fost crescute pe un sol cu un conţinut inferior de fosfaţi accesibili pentru plante. Administrarea fosforului a sporit semnificativ masa uscată a pantelor şi suprafaţa foliară. Plantele fără aplicarea P precum şi celea ce au fost fertilizate cu doze mici au înregistrat rate joase de creştere precum şi de acumulare a P. Acumularea maximă de substanţe organice s-au înregistrat în varianta cu aplicarea 100 mg P kg^{-1} sol indiferent de nivelul de umiditate a solului. Deci, efectuarea nutriţiei suplimentare cu P atât în condiţii optimale, cât şi insuficiente de umiditate contribuie la menţinerea creşterii plantelor, asigură o suprafaţă de asimilare mai mare şi menţine productivitatea plantelor la un nivel mai ridicat.*

Cuvinte cheie: creşterea plantelor, *Glycine max* L., suprafaţa foliară, fosfor, umiditate suboptimală**.**

INTRODUCTION

Phosphorus (P) deficiency is a common problem in many soils (Marschner, 1995) and it is considered a major constraint for the production of legumes in majority of agricultural regions. Among plant nutrients, P is one of the important macronutrients controlling plant growth and development, and has a vital role in the large range of physiological processes (Raghothama, 1999). It was reported that insufficient P nutrition can affect cell division in growing tissues and restrict expansion growth of organs (Chiera et al., 2002), increase ABA translocation in the xylem and reduce translocation of nitrate to sink organs. Positive effects of P application on plant performance under stress environments have been reported in chickpea (Samiullch and Fatma, 1995), clusterbean (Burman et al., 2009).

It is well established that legumes, in particular soybean, in comparison with other species required high P nutrition level. Nutrient uptake and use efficiency is controlled not by plant heredity but by other abiotic constraints especially by water availability in soil. Mineral nutrient availability and uptake are adversely affected by low soil water level (Atkinson, 1985).

In many agricultural regions P deficiency is often accompanied by shortage of soil moisture. Inadequate water regime has a negative impact and affects both vegetative and reproductive growth of plants resulting in essential yield losses. According to research of *Desclaux et al*., (2000) soybean is very sensitive to water shortage during reproductive stage development. Evidence in the literature suggests that drought tolerance of cotton, white clover is enhanced by stimulated root growth and root functioning in response to increased P supply (Radin and Eidenbock, 1984, Singh and Sale, 2000). Although these environmental factors are extremely important in cropping systems as a rule in majority of cases they have been studied separately. Hence, the objective of present research was to examine the effects of P application on biomass production, leaf area development and P uptake of soybean plants in relation to soil water regime.

MATERIAL AND METHOD

A pot experiment was conducted in a glasshouse with P deficiency soil. Treatments included the factorial combination of four P levels and two soil water regimes (control and water stress). There were four P application rates namely as 0, 10, 20 and 100 mg P kg^{-1} soil which were termed as P deficiency (P0), low phosphorus (P10), moderate low P (P20), and higher P (P100). All pots with P application received potassium (K) as KCL to equivalent potassium level. Each pot was filled with 6 kg soil of P deficient soil that was sieved before. The content of available phosphorus was 4.4 mg kg^{-1} (CAL method). Soybean seeds (cultivar Zodiac) were treated with *Bradyrhizobium japonicum* at sowing time and after emergence plants were thinned to three per pot. The water treatments were 70% water holding capacity (WHC) as normal level and 35% WHC as stress drought. The all plants were grown till 4 weeks at normal water regime (70% WHC). Suboptimal moisture of soil was imposed to half of plants for 2 weeks after 4 weeks of growth. At harvest plants were separated into leaves, stem plus petioles, roots and nodules and leaf area was determined**.** The ground materials were dry-ashed at 550 C for overnight and the concentration of P was determined using molybdovanadate yellow

method. Total N concentration in the plant parts ground was determined on a 50 mg-sample using the vario MAX CNS analyzer (GmbH, Germany).

RESULTS AND DISCUSSIONS

Dry matter (DM) production of soybean plants was significantly inhibited by both abiotic factors P deficiency and water shortage (fig. 1). However the amount of DM was reduced by P deficiency more evidently than by water stress.

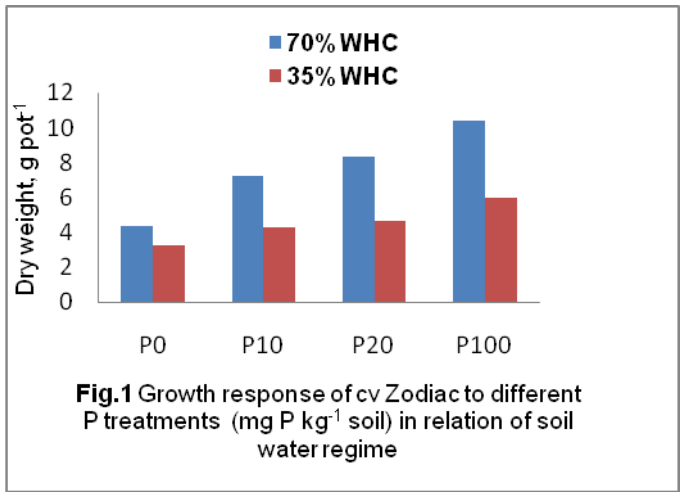

Fig.1 Growth response of cv Zodiac to different P treatments (mg P kg^{-1} soil) in relation of soil water regime

Under P deficiency the reduction in DW was 39.5% against low P supply. Plant growth responded more significantly to P fertilization in normal of water regime (70% WHC). Cultivar Zodiac gave the highest response to P application with plant weight at P0 being only 60.5% and 54.5% of the maximum yield at P100 at normal and water stress. Likewise, water regime affected the pattern of biomass partition within plant organs. Dry weights of roots were also lower at P0 as compared with treatment 100 mg P, but the decrease in root weight by P deficiency was less than the nutrient effect on shoots weight. High P level increased the root biomass and enabled plants to extract more water from drying soil for their growth. Leaf area development was very sensitive response of crop growth to P deficiency and water shortage. The values of leaves area in all treatments increased significantly with increasing P levels (fig. 2). The largest area was registered in plants receiving high level of P nutrition (100 mg P).

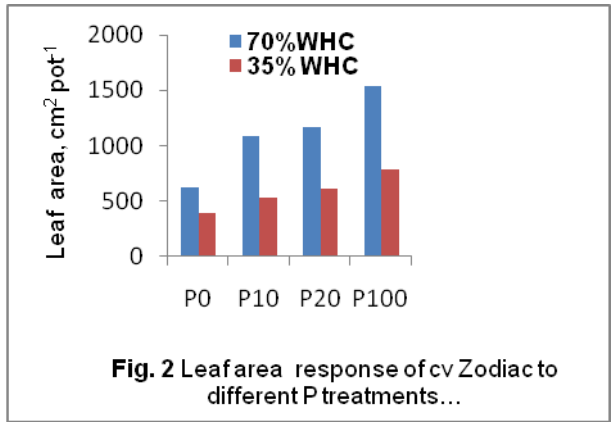

Fig. 2 Leaf area response of cv Zodiac to different P treatments…

The positive effects of P application were evident in both water regimes normal and stress (35% WHC). Suboptimal soil water regime reduced drastically leaf area. The lowest leaf area was observed under P deficiency and had lower value by 40,2 and 49,9% under well watered and stress treatments respectively compared with high P treatment. Drought diminished the leaf canopy approximately by twice regardless of P supply (fig. 2). Our results are consistent with investigations performed by Israel and Rufty (1988). In several studies (Guterez-Boem and Thomas, 1999, Chiera et al., 2002) have been demonstrated that P insufficient supply reduced leaf area of legumes, decreased the number of leaves and the relative leaf appearance rate.

Experimental data demonstrated that nutrient supply and water conditions affected considerably P concentrations and partitioning within plants. Leaves and roots P concentrations of plants grown with 100 mg P were higher than for plants grown at P deficiency.

Table1

The effect of P supply on P concentrations in leaves, stems and roots of soybean in relation of soil moisture level, mg P g^{-1} DW

Treatments	Leaves	Stems	Roots	Leaves	Stems	Roots
	70% WHC			35% WHC		
P0	1.04	0.62	1.56	0.98	0.57	1.26
P10	2.78	1.28	2.13	1.32	1.24	1.50
P20	3.08	1.43	4.07	1.85	1.13	1.64
P100	3.71	1.84	4.77	3.19	1.59	3.66

The addition of 100 mg P per kg soil increased roots P content by 48% with respect to the P0 in the drought stressed plants (table 1). It was emphasized that P partitioning could play an important role in determine P utilization efficiency. Vesteragr et al., (2006) found that DM production correlated positively with the P uptake. Likewise it was suggest that the translocation ability of P from roots to leaves blades during P deprivation could be used to select for low P-tolerant cultivars within species (Chaudhary and Fujita, 1998). The rates of P

uptake by soybean plants were severely affected by P supply at two water regimes (fig. 3). Phosphorus-deficient plants showed low rates of P uptake value, than these of P-sufficient (P100) ones.

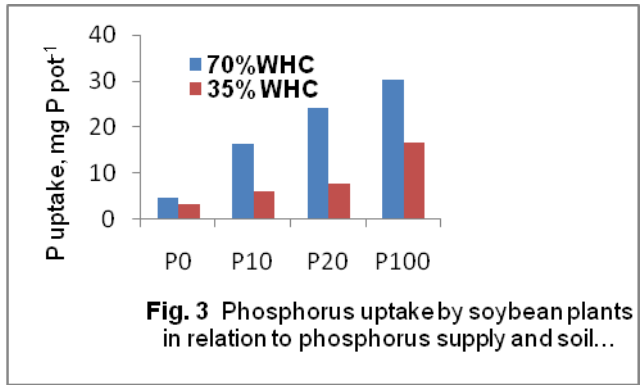

Fig. 3 Phosphorus uptake by soybean plants in relation to phosphorus supply and soil…

In this study it was observed that the rate of phosphorus use efficiency (PUE) was susceptible to soil moisture level. At high level of P treatment phosphorus PUE decreased by 3 times under water stress conditions compared to without P application treatment. Nitrogen concentrations in leaves and roots were affected by both factors P treatments and water regime (fig. 4).

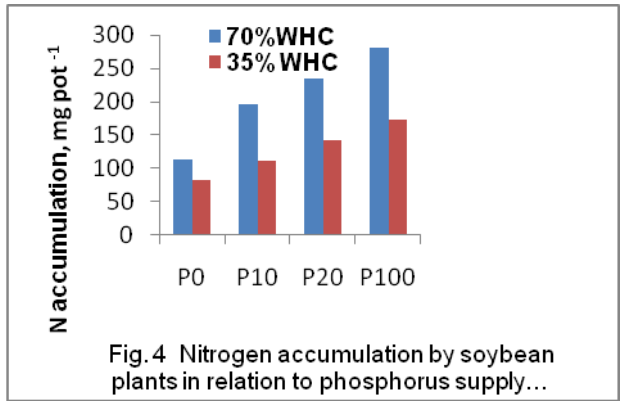

Fig. 4 Nitrogen accumulation by soybean plants in relation to phosphorus supply…

Phosphorus application increased significantly the rate of nitrogen assimilation. Stimulator effects of P supply were revealed in both water regimes. Total N accumulation during vegetative growth was 38,3% higher at 100 mg P kg^{-1} soil than at P0. The improved P status of several legumes solely dependent on symbiotic N fixation has been reported to increase tissue N concentration as well as overall host plant growth (Israel and Rufty, 1988). P insufficient supply (P0-P10) led to a decrease in whole plant N accumulation in particular under water low regime of soil. Hence, a comparison of the rates of N accumulation for

control and water–deficit treatments showed significant differences irrespective of P supplemental nutrition.

CONCLUSIONS

Phosphorus application reduced adverse effects of low water regime on plant biomass production and selected physiological parameters of soybean cultivar. Results showed that there were significant growth, nitrogen and phosphorus partitioning in soybean plants in relation to P supply and soil moisture level demonstrating the requirement of adequate soil moisture for better growth of grain legume.

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STUDY OF HERITABILITY FOR MAIN QUANTITATIVE CHARACTERS IN SOME HYBRID POPULATIONS OF GARDEN BEANS (*PHASEOLUS VULGARIS* L.)

STUDIUL HERITABILITĂŢII PRINCIPALELOR CARACTERE CANTITATIVE ÎN CADRUL UNOR POPULAŢII HIBRIDE LA FASOLEA DE GRĂDINĂ (*PHASEOLUS VULGARIS* L.)

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Abstract. *Research conducted during 2005 - 2009, in Braila Plain, led to obtain garden beans hybrids, which were compared with genitors, in terms of quantitative production. Initially the local populations were collected for productive performance, and then were compared with the approved varieties, followed the selection of the best genitors and then by hybridization and the study of hybrids in F1 and F2 generations. Cultivation technology throughout the research has been organic, without application of chemical treatments. Heritability coefficient (h^2) ware calculated using the correlation coefficient (r) between mean quantitative phenotypic character of genitors and hybrid combinations. Also was calculated the rate of recurrence (CR), establishing how selection could be made for quantitative characters in these species.*
Key words: heritability, french bean, hybrid populations

Rezumat. *Cercetările efectuate în perioada 2005 – 2009, în Câmpia Brăilei, au condus la realizarea unor hibrizi de fasole de grădină, care au fost comparaţi cu genitorii, din punctul de vedere al producţiei cantitative. Iniţial s-au colectat populaţii locale performante productiv, apoi s-au comparat cu soiuri omologate, a urmat selecţia celor mai buni genitori, urmată de hibridare şi studierea hibrizilor în generaţiile F1 şi F2. Tehnologia cultivării pe tot parcursul cercetărilor a fost ecologică, fără aplicare de tratamente chimice. Coeficientul de heritabilitate (h^2) a fost calculat cu ajutorul coeficientului de corelaţie (r), intre media caracterului cantitativ fenotipic la genitori şi la descendenţi. De asemenea, a fost calculat şi coeficientul de repetare (CR), stabilindu-se în ce mod ar putea fi efectuată selecţia pentru caracterele cantitative în cadrul acestei specii.*
Cuvinte cheie: heritabilitate, fasole de grădină, populaţii hibride.

INTRODUCTION

Cultivation of garden bean (*Phaseolus vulgaris* L.) plays an important role in Romanian agriculture, both for high protein content, amino acids and vitamins necessary for a balanced diet and for being a good run, freeing the land early and leaving a loose soil, weeds and clean enriched with nitrogen (about 70 kg / ha). Meanwhile, garden bean plants can be used to fodder, medicine (dry pod), and the

leaves can get citric acid; and aerial parts of plants after harvest, can melt and incorporate into the soil, and it is a very good organic fertilizer also.

This is a good reason for increased interest in the culture of legumes in sustainable systems, including ecological, biological or organic, determined the need for studies to improve the species, with the aim of creating new varieties and hybrids resistant to stress of both biotic and environmental factors. Heritability is a property of the population because it depends on the frequency and gene action and is influenced by variance due to environmental, is expressed by the proportion of phenotypic variance attributable to total or average effects of genes or the proportion of total variance that can be transmitted hereditary.

The researches undertaken by us and described in this paper were made in order to increase production quantity and quality of *Phaseolus vulgaris* L. in Romania conditions. To this end, we have pursued a number of objectives including: a hybridization between genitors having good productive characters and high adaptability to environmental conditions, one productive variety and other adapted cultivar used in zone of Braila Plain.

MATERIAL AND METHOD

To achieve these objectives we used four varieties approved (Carson, Inka, Jutta and Lingua di Fuoco) and three local populations (Movila Miresii, Tichileşti and Vadeni), increased resistance to biotic and abiotic stress factors existing in the Plain of Braila.

Hybrids obtained were analyzed with genitors in field conditions, Vadeni area, applying an organic culture technology, without application of fertilizers and phytosanitary treatments. Experience has been placed by randomized block method in three repetitions, each experimental plot having 25 plants.

Were conducted field observations and biometric measurements at technological maturity for plant height and pod length, and biometric measurements in the laboratory at physiological maturity (after harvest) for number of pods per plant and number of grains in pods.

Experimental data processing was performed using limit differences and regression study referred to the variable parent characters; regression coefficient and coefficients of heritability.

RESULTS AND DISCUSSIONS

Pods length is a decisive character for the quantitative production of garden beans, along with number of pods per plant and number of beans in pods. Compared to the parents, hybrid Inka ♀ x Carson ♂ presented a more significant length of pods, Lingua di Fuoco ♀ x Movila Miresii ♂ hybrid presented a very significantly larger pods length and hybrids Tichileşti ♀ x Carson ♂ and Movila Miresii ♀ x Carson ♂ obtained a very significantly lower pod length in both studied generations. Compared with the father, the hybrid Lingua di Lingua ♀ x Jutta ♂ presented significantly higher pod length in F2 generation, while the hybrid Tichileşti ♀ x Carson ♂ presented a very significantly lower pod length in both generations (fig. 1).

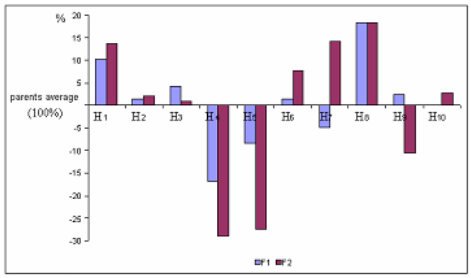


Fig 1 – The pods length at F1 and F2 hybrid progenies comparative with average value of parents

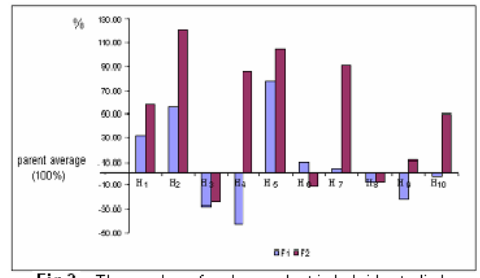


Fig 2 - The number of pods per plant in hybrids studied comparative with average parent

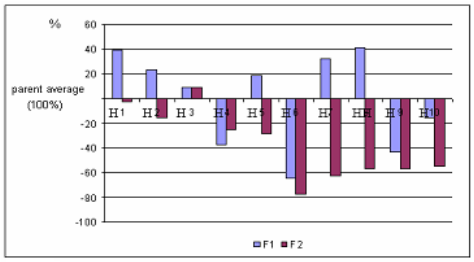


Fig 3 · Plant height of hybrids compared with average parents

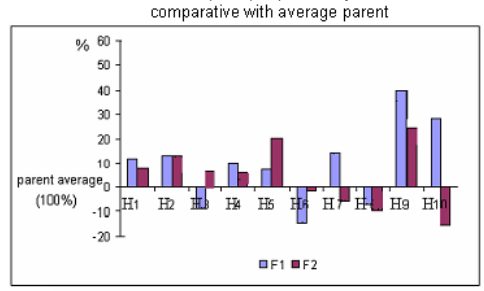


Fig 4 - The number of beans in pods compared parental average

Only five out of the ten hybrids obtained showed heterosis in the first two generations for pods length, best positive differences of heterosis have been at the hybrids: H8 – Lingua di Fuoco ♀ x Movila Miresii ♂, H1 – Inka ♀ x Carson ♂ and H6 – Vădeni ♀ x Lingua di Fuoco ♂. Surprising was that the H7 hybrid - Inka ♀ x Vădeni ♂ obtained a negative difference in F1 (- 4.77%) and in the F2 it obtained a positive difference, 14.3% comparative with average value of parents .

The regression study of hybrids in F1 and F2 generations, from parent variable (table 1) shows that heterosis was low for this trait, only 5 hybrids obtained good results comparative with parents average.

It were registered maximum growth at the hybrid Lingua di Fuoco ♀ x Movila Miresii ♂ (18.4% in both F1 and F2) were then followed by hybrids: Inka ♀ x Carson ♂ (10.3% in F1 and to 13.7% in F2) and Jutta ♀ x Carson ♂ (1.3% to 2.1% in F1 and F2). Three hybrids showed very significantly higher values in both F1 and F2 generations (Inka ♀ x Carson ♂, Jutta ♀ x Carson ♂) comparative with mother, and only two hybrids showed very significantly higher values in both generations (Lingua di Fuoco ♀ x Jutta ♂ and Inka ♀ x Jutta ♂) comparative with father. Regression study F1 and F2 hybrids comparative with variable parent is found that the heterosis of pods number per plant had a very important value of 84.2% in F1 and 163.1% in F2 to hybrid Inka ♀ x Jutta ♂ , and 78.2% in F1 and 104.3% in F2 to hybrid Lingua di Fuoco ♀ x Jutta ♂ (table 2 and fig. 2).

Table 1

Regression Study in F1 and F2 hybrids from variable parent for pod length trait

Specification	Pj	(Fn)ij		$\frac{Pi+Pj}{2}$	$Fn-\frac{Pi+Pj}{2}$		Heterosis	
		F1	F2		F1	F2	F1	F2
Carson ♂ - Pi	**15.6**							
Inka ♀	14.3	16.5	17	14.95	1.55	2.05	110.3	113.7
Jutta ♀	13	14.8	14.6	14.3	0.5	0.3	101.3	102.1
Lingua di Fuoco ♀	14.3	15.6	15.1	14.95	0.65	0.15	104.3	101
Tichilesti ♀	19	14.4	12.3	17.3	-2.9	-5	83.2	71.1
Movila Miresii ♀	21.5	17	13.5	18.55	-1.55	-5.05	91.6	72.7
Total Average	**97.7 16.28**	**78.3 15.6**	**72.5 14.5**	**80.05**				
Lingua di Fuoco ♀-Pi	**14.3**							
Jutta ♂	13	13	15.6	13.65	-0.65	1.95	95.23	114.3
Movila Miresii ♂	21.5	21.2	21.2	17.9	3.3	3.3	118.4	118.4
Total Average	**48.8 16.26**	**44.2 22.1**	**36.8 18.4**	**31.55**				
Inka ♀-Pi	**14.3**							
Jutta ♂	13	14	12.2	13.65	0.35	-1.45	102.5	89.37
Vădeni ♂	15.9	15.1	15.5	15.1	0	0.4	100	102.6
Total Average	**43.2 21.6**	**29.1 14.55**	**27.7 13.85**					

Table 2

Regression Study in F1 and F2 hybrids comparative with variable parent for number of pods per plant

Specification	Pi and Pj	(Fn)ij		$\frac{Pi+Pj}{2}$	$Fn-\frac{Pi+Pj}{2}$		Heterosis	
		F1	F2		F1	F2	F1	F2
Carson ♂ - Pi	**23**							
Inka ♀	15	25	30	19	6	11	131.6	157.9
Jutta ♀	7.5	11	11.5	15.25	-4.25	-3.75	72.13	75.4
Lingua di Fuoco ♀	15.5	11	36	19.25	-8.25	16.75	57.14	187
Tichilesti ♀	14.5	14.5	21	18.75	-4.5	-7.2	77.33	112
Movila Miresii ♀	17	19.5	30	20	-0.5	10	97.5	150
Total Average	**92.5 15.41**	**81 16.2**	**128.5 25.7**	**92.25**				
Lingua di Fuoco ♀ - Pi	**15.5**							
Jutta ♂	7.5	20.5	23.5	11.5	9	12	178.2	204.3
Movila Miresii ♂	17	15	15	16.25	-1.25	-1.25	92.3	92.3
Total Average	**147.91 49.3**	**35.5 17.75**	**38.5 18.25**	**27.75**	**9.75**	**12.75**		
Inka ♀ - Pi	**15**							
Jutta ♂	7.5	17.5	25	9.5	8	13.5	184.2	263.1
Vădeni ♂	16.2	16.5	30	15.1	1.4	14.9	109.3	198.7
Total Average	**235.91 78.63**	**34 17**	**55 27.5**	**24.6**				

Table 3

Regression Study in F1 and F2 hybrid generations comparative with variable parent for plant height trait

Specification	Pi and Pj	(Fn)ij		$\frac{Pi+Pj}{2}$	$Fn-\frac{Pi+Pj}{2}$		Heterosis	
		F1	F2		F1	F2	F1	F2
Carson ♂ - Pi	**36**							
Inka ♀	73	76	53	54.5	21.5	-1.5	139.4	97.24
Jutta ♀	39.5	41	41	37.75	3.25	3.25	108.6	108.6
Lingua di Fuoco ♀	65.5	32	38	50.75	-18.75	-12.75	63.05	74.87
Tichilesti ♀	224.5	73.5	56	130.25	-56.75	-74.25	56.42	42.99
Movila Miresii ♀	187	94.5	50.5	111.5	-17	-61	84.75	45.3
Total Media	**625.5 104.25**	**317 63.4**	**238.5 47.7**	**384.75**				
Lingua di Fuoco ♀ - Pi	**65.5**							
Jutta ♂	39.5	62.5	37.5	52.5	10	-15	119.0	71.42
Movila Miresii ♂	187	178	55	126.25	51.75	-71.25	141	43.56
Total Media	**292 97.3**	**240.5 120.2**	**92.5 46.2**	**178.75**				
Inka ♀ - Pi	**73**							
Jutta ♂	39.5	69.5	47.5	56.25	13.25	-8.75	123.5	84.4
Vădeni ♂	212.5	188.5	54	142.75	45.75	-88.75	132	37.82
Total Media	**325 108.3**	**258 129**	**101.5 50.75**	**199**				

Table 4

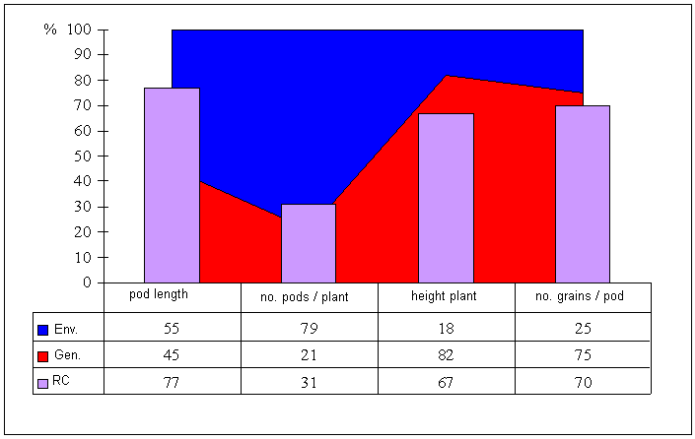
Regression Study in F1 and F2 hybrids generation compared with variable parent for the number of grains in pod

Specification	Pi and Pj	(Fn)ij		$\frac{Pi+Pj}{2}$	$Fn-\frac{Pi+Pj}{2}$		Heterosis	
		F1	F2		F1	F2	F1	F2
Carson ♂ - Pi	**3.2**							
Inka ♀	6.1	5.2	5.0	4.65	0.55	0.35	111.8	107.5
Jutta ♀	4.5	3.5	4.1	3.85	-0.35	0.25	90.9	106.5
Lingua di Fuoco ♀	6.8	5.5	5.3	5	0.5	0.3	110	106
Tichilesti ♀	6.1	6.5	5.8	4.65	1.85	1.15	139.8	124.7
Movila Miresii ♀	7.4	6.8	4.5	5.3	1.5	-0.8	128.3	84.9
Total Media	**34.1 5.68**	**27.5 5.5**	**24.7 4.9**	**23.45 4.69**				
Lingua di Fuoco ♀ - Pi	**6.8**							
Jutta ♂	4.5	7.3	6.8	5.65	1.65	1.15	107.3	120.3
Movila Miresii ♂	7.4	6.6	6.4	7.1	-0.5	-0.7	92.9	90.1
Total Media	**18.7 6.23**	**13.9 6.95**	**13.2 6.6**	**12.75 6.37**				
Inka ♀ - Pi	6.1							
Jutta ♂	4.5	6.0	6.0	5.3	0.7	0.7	113.2	113.2
Vădeni ♂	5.8	6.8	5.6	5.95	0.85	-0.35	114.3	94.1
Total Media	**16.4 5.46**	**12.8 6.4**	**11.6 5.8**	**11.25 5.62**				

where: Pi = stable parent; Pj = variable parent; (Fn)ij = hybrid between Pi and Pj; n = hybrid generations

Analyzing the heterosis value for number of pods per plant compared with the average parent, in F1 generation 5 hybrids showed heterosis, the largest increase being 78.26% in hybrid H5 - Lingua di Fuoco ♀ x Jutta ♂ (20.5 pods / plant comparative with 11.5 pods / plant -the parents average), while in the F2 generation 7 hybrids showed heterosis, the largest increase being 122.2% in hybrid H2 - Inka ♀ x Jutta ♂ (25 pods / plant comparative with 11.25 pods / plant - the parents average). Regression study of hybrids in F1 and F2 comparative with variable parent for plant height (table 3) showed that six hybrids in F1 generation obtained heterosis of plant height compared average parent (H1, H2, H3, H5, H7 and H8). All hybrids in F2 generation obtained lower values compared average plant height of parents, except that H3 hybrid that remained the same as in F1 (8.6%) (fig. 3). In table 4 it can be see the regression study for number of grains per pods. All hybrids obtained heterosis over the father form, but only three hybrids obtained heterosis over the mother form, namely: H7 (Inka ♀ x Vădeni ♂ with heterosis value 11.4%), followed by in descending order of H5 (Lingua di Fuoco ♀ x Jutta ♂, with 7.3%) and H9 (Tichilești ♀ x Carson ♂, with 6.5%), in F1 generation. In F2 generation all hybrids had lower values for the number of beans in the pod, compared the average parental genotypes (fig. 4).

Inheritance or heritability coefficient (h^2) for pod length is $h^2 = 0.45$ which means that pod length is determined 45% of genotype and 55% of environmental factors. As a result, elites selection only for pod length does not reliable indications that this character will be transmitted to descent generations, although the calculation of the coefficient obtained in both successive generations CR = 0.77. Heritability (h^2) obtained for the number of pods per plant is $h^2 = 0.21$ which means that this character is determined 21% of genotype and 79% of environmental factors. Repetition factor, calculated by the correlation between the results in both hybrid generations was CR = 0.31 (fig. 5).



	pod length	no. pods / plant	height plant	no. grains / pod
Env.	55	79	18	25
Gen.	45	21	82	75
RC	77	31	67	70

Fig. 5. Heritability and repeat coefficient of quantitative characters studied

For the plant height and number of grains in pod traits were obtained inheritance factors (heritability) of 0.82 and 0.75 respectively. Both these values and repeated factors (0.67 and 0.70) gives us the information about the fact that

these traits are influenced by environment only at the rate of 18% for plant height to 25% for number of grains in pods, which means that the elites selection will could do for these characters because their descent generations will inherit with high probability.

CONCLUSIONS

1. Studying the values of the three characters involved in production capacity (pod length, number of pods per plant and number of grains in pods) we found that the most valuable hybrids obtained were: Lingua di Fuoco ♀ x Carson ♂, with a height average of 37 ± 2 cm and pods per plant average of 35 ± 2, Movila Miresii ♀ x Carson ♂, with height average of 49 ± 3cm and 29 ± 2 pods per plant, followed in decreasing order of Inka ♀ x Vădeni ♂, Inka ♀ x Carson ♂ şi Inka ♀ x Jutta ♂. The largest heterosis values compared the average parents of the number of pods per plant, was obtained by five hybrid in F1 generation, the highest value was 78.26% of the hybrid H5 - Lingua di Fuoco ♀ x Jutta ♂ (20.5 pods / plant compared to 11.5 pods / plant as parents average).

3. Seven hybrids showed heterosis in F2 generation with largest increase heterosis value 122.2% in hybrid H2 - Inka ♀ x Jutta ♂ (25 pods / plant compared to 11.25 pods / plant as average of parents).

4. Study of heritability (h^2) for quantitative characters showed that plant height, number of branches per plant and number of grains in pods are characters who depend largely on the genotype, which recommends choosing plants with dwarf size and number of branches increased for the arid climate conditions from Braila Plain.

5. Based on these correlative links, we could said that the application of a selection of garden beans, in order to obtain dwarf plants size and increased number of branches could obtained a direct increase in the number of pods per plant, very significantly positively correlated with number of grains per plant.

6. In selection will be retained plants with most numerous pods per plant, and secondly with most length of the pod, because production per plant is positively correlated with number of pods per plant and not with the pods length.

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RESEARCH ON SEGREGATION OF FORM AND COLOR GRAIN CHARACTERS IN F2 HYBRID GENERATION OF *PHASEOLUS VULGARIS* L. SPECIES

CERCETĂRI PRIVIND SEGREGAREA CARACTERELOR FORMA ŞI CULOAREA BOBULUI, ÎN GENERAŢIA HIBRIDĂ F2, LA SPECIA *PHASEOLUS VULGARIS* L.

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Abstract. *In the South - East of Romania has a great potential for growing garden beans, so that explains that during the initial collection of biological material (in 2005) was found many cultivars with pronounced morphological and physiological variability. If the grain morphological characters were considered the results of crosses between parental types showing different characters in the shape (round grain or flat grain) and color (light grain or color grain). The hybrids obtained in the F1 generation showed intermediate characters from parental forms only five hybrids produced. These hybrids were crossed among themselves to see how segregated pairs characters of shape and color grains. To see if this segregation is purely coincidence or it is a legitimate segregation, we applied χ2 test (for comparing the theoretical distribution of characters followed by the experimental).*

Key words: segregation of characters, french bean

Rezumat. *În zona de Sud – Est a României există un potenţial deosebit de cultivare a fasolei de grădină, motiv care explică faptul că în perioada de colectare a materialului biologic iniţial (adică în anul 2005) s-a găsit un număr mare de cultivare cu o variabilitate morfo-fiziologică pronunţată. În cazul caracterelor morfologice privind bobul, s-au avut în vedere rezultatele încrucişărilor între formele parentale prezentând caractere diferite în privinţa formei (bob rotund sau bob aplatizat) şi a culorii (bob deschis sau bob colorat). Dintre hibrizii obţinuţi, în generaţia F1 au prezentat caractere intermediare faţă de formele parentale doar cinci dintre hibrizii obţinuţi. Aceşti hibrizi au fost încrucişaţi între ei pentru a observa modul de segregare a perechilor de caractere privind forma şi culoarea boabelor. Pentru a vedea dacă această segregare are un caracter pur întâmplător sau este vorba de o legitate a segregării, am aplicat testul χ^2 (pentru a compara distribuţia teoretică a caracterelor urmărite cu cea experimentală).*

Cuvinte cheie: segregarea caracterelor, fasole de grădină

INTRODUCTION

The literature mentioned as responsible for the color grains several genes, among which the most important are: ASP - for opaque skin, rough (H. Lamprecht, 1960), B - for the white skin with purple tinge (Br, Vir), Bip and bip in combination with Arc - extend the color of skin, C with P - yellow skin, Cma (M,

RMA) - uniform drops, which not segregates; Cr - mottled skin, Cres - drops or spots on the skin; Crho - diamond spots; cst - and with stripes on seeds - creamy, The (prpse) with TPV produces seeds brown wrapper, with a strong effect of linkage with green pods with purple stripes, Cr (r) - White skin , Cav - folds in skin, only homozygous, J (Sh) with P gives yellow-brown skin or light ocher, L - inhibit or restrict the partial coloring of skin, with t - bleaching occurs entirely, L and L in combination with z Z and give more color spots, P - Basic color gene Points - points on skin, T - one color and t - (z - l) - skin model, St ts - without streaks, St Ts - st Ts and ts st - full stripes, V (BL) - from violet to black, v - Brown, Z - the size of the background skin spots at the stained - L and T - is spot number 7 .

The aim is to study segregation of traits shape and color grains in F1 and F2 generations, for the hybrids derived from different genitors in terms of these morphological traits.

MATERIAL AND METHOD

Experimental method was hybridological analysis, based on visual observation of shape and color grains of hybrids obtained in F1 and F2 hybrid generations, compared to parental forms.

To see if this segregation is purely coincidence or it is a legitimate segregation was applied χ2 test (for comparing the theoretical distribution of characters followed by the experimental).

Because of the ten hybrids obtained, only five were different from the parents for traits studied, application χ2 test was performed to, respectively: H1 - Inka ♀ x Carson ♂, H2 - Inka ♀ x Jutta ♂, H4 - Lingua di Fuoco♀ x Carson ♂, H5 - Lingua di Fuoco ♀ x Jutta ♂ şi H8 - Lingua di Fuoco ♀ x Movila Miresii ♂.

The statistical method of calculation was to calculate indices: number of grains observed number of grains calculated theoretically (e) difference (d) square difference (D2) and the ratio of square difference and number theory d2 / e.

χ2 test was performed formula: $\chi^2 = \Sigma d^2/e$

RESULTS AND DISCUSSIONS

From hybrids obtained in the F1 generation showed intermediate traits of parent plants (fig. 1 and fig. 2) the hybrids: H1 (Inka ♀ x Carson ♂); H2 (Inka ♀. x Jutta ♂); H4 (Lingua di Fuoco ♀ x Carson ♂); H5 (Lingua di Fuoco ♀ x Jutta ♂); H8 (Lingua di Fuoco ♀ x Movila Miresii ♂).

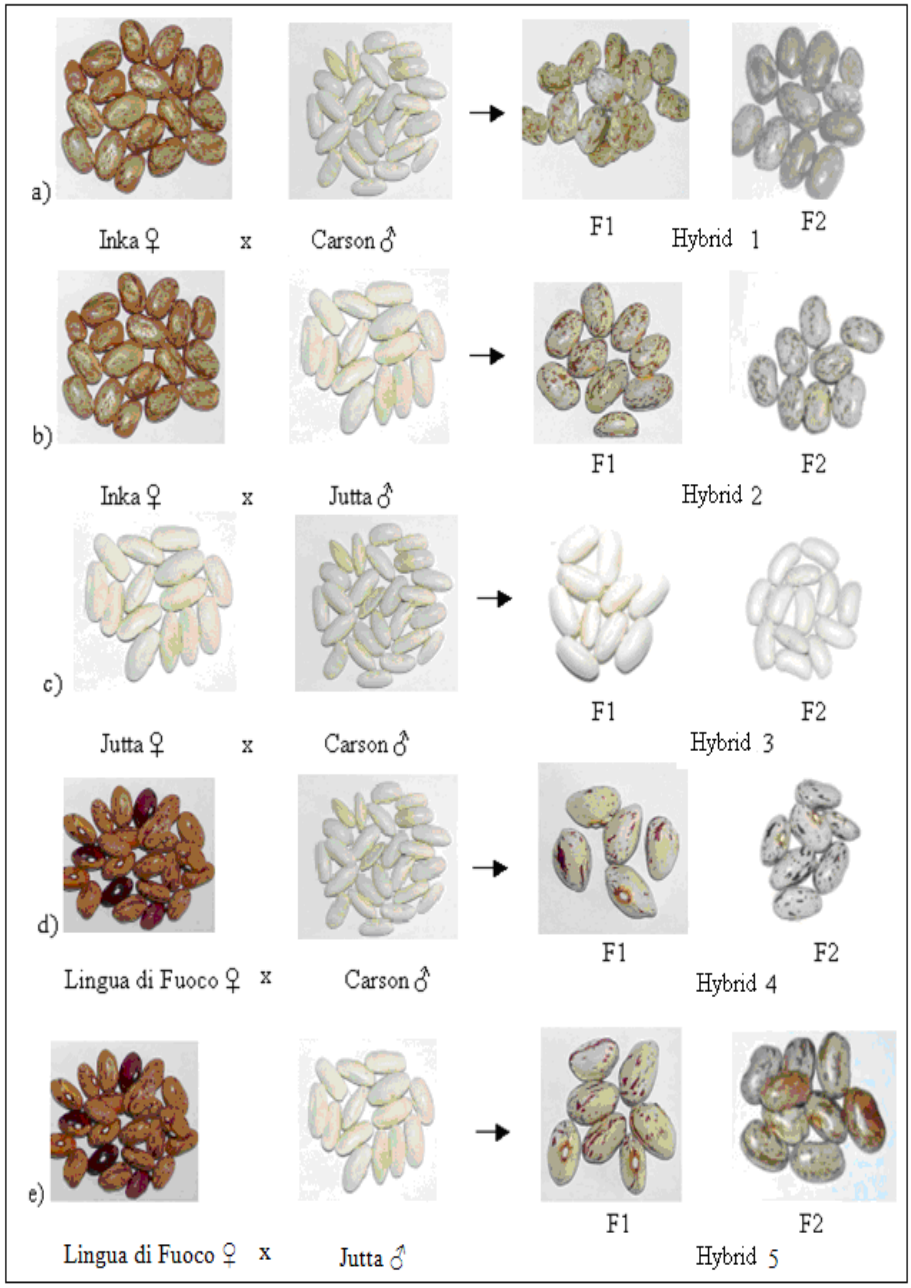

Fig. 1. Shape and color of the grains in hybrids H1 - H5, compared with parents

These hybrids were crossed among themselves to see how the segregation of pairs of characters on shape and color grains.

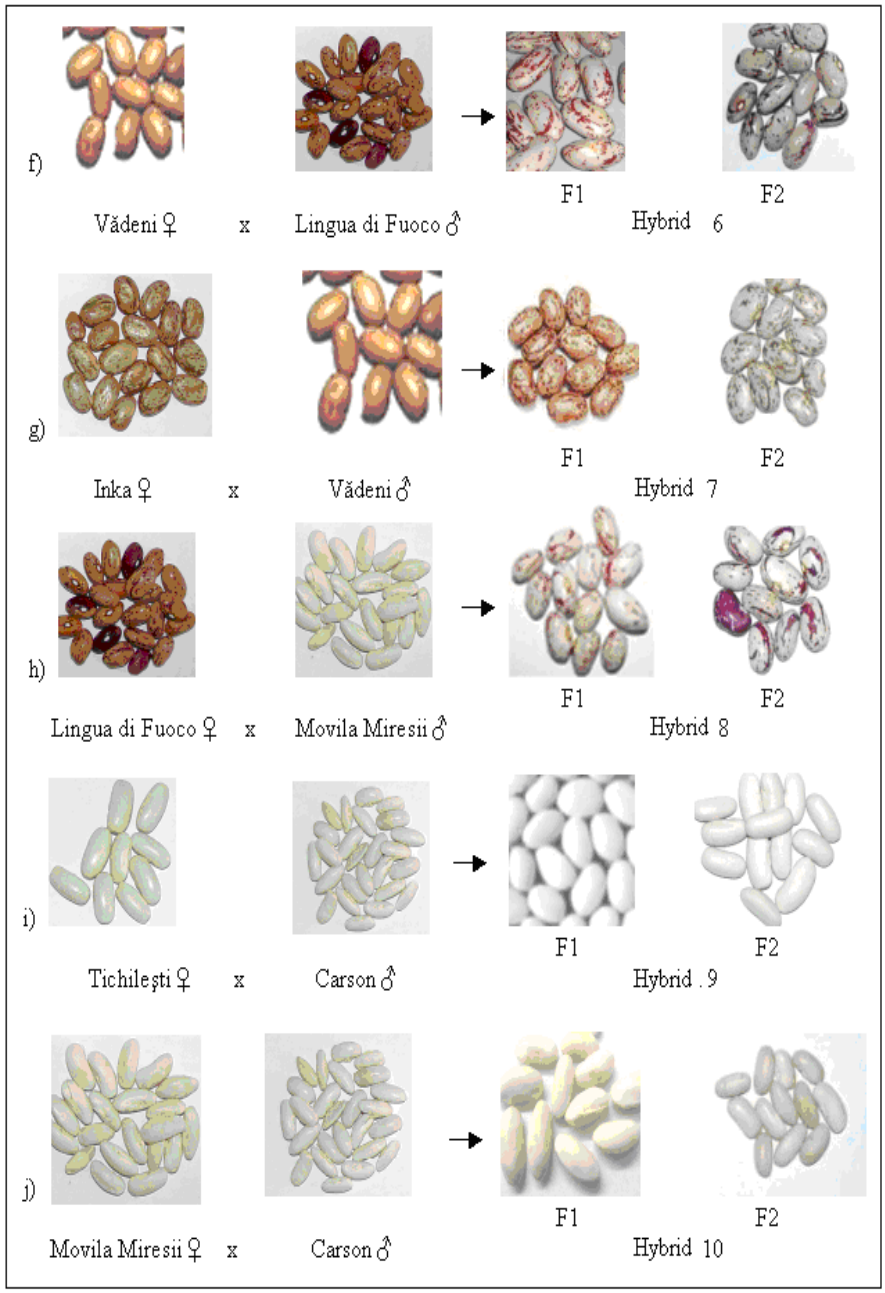

Fig.2. The shape and color grains of H6 - H10 hybrids compared parents

To see if this segregation is purely coincidence or it is a legitimate segregation, we applied the $\chi 2$ test (for comparing the theoretical distribution of characters followed by the experimental distribution).

Estimating the probability of repetition of these two pairs of characters of the seeds, using $\chi 2$ test for the 5 hybrids, we found that segregation of the two pairs of characters held in the ratio 9: 3: 3: 1 (table 1).

Table 1

Calculation results on grains shape and grains color using $\chi 2$ test

Hybrid	Data	Number of grains				$\chi^2 = \Sigma d^2/e$
		Round and colorful	Round and white	Flat and colorful	Flat and white	
H1	Observed	108	36	41	15	1.066
	Calculated (e)	112.5	37.5	37.5	12.5	
	Difference (d)	4.5	1.5	-3.5	-2.5	
	d^2	20.25	2.25	12.25	6.25	
	d^2/e	0.18	0.06	0.326	0.5	
H2	Observed	110	40	35	15	0.881
	Calculated (e)	112,5	37,5	37,5	12,5	
	Difference(d)	2.5	-2.5	2.5	-2.5	
	d^2	6.25	6.25	6.25	6.25	
	d^2/e	0.055	0.16	0.166	0.5	
H4	Observed	107	40	42	11	1.154
	Calculated (e)	112,5	37,5	37,5	12,5	
	Difference (d)	5.5	-2.5	-4.5	1.5	
	d^2	30.25	6.25	20.25	2.25	
	d^2/e	0.268	0.166	0.54	0.18	
H5	Observed	115	36	40	9	1.261
	Calculated (e)	112,5	37,5	37,5	12,5	
	Difference (d)	-2.5	1.5	-2.5	3.5	
	d^2	6.25	2.25	6.255	12.25	
	d^2/e	0.055	0.06	0.166	0.98	
H8	Observed	107	42	38	13	0.834
	Calculated (e)	112,5	37,5	37,5	12,5	
	Difference (d)	5.5	-4.5	-0.5	-0.5	
	d^2	30.25	20.25	0.25	0.25	
	d^2/e	0.268	0.54	0.006	0.02	

Thus, the hybrids H2 and H8, which $\chi 2 = 0.881$ and 0.834 respectively, included in the Fisher table between 0.58 and 1.01, meaning between probability P = 0.9 and 0.8, it can say that if we will repeat this experience we will obtain similar results in 90 to 80% of cases.

Similarly, it can say that for hybrids H1 (Inka ♀ x Carson ♂); H4 (Lingua di Fuoco♀ x Carson ♂); H5 (Lingua di Fuoco ♀ x Jutta ♂) the probability to obtaining similar results is 75 -80%.

CONCLUSIONS

1. Study on segregation of grain shape and grains color traits in hybrids produced, supplemented by comparing the theoretical distribution of the phenomenon that obtained experimentally ($\chi 2$ test) received a report of

segregation, like Mendelian theory, 9: 3: 3: 1, corresponding dominant relationship in case of dihybridization.

2. Hybrids obtained can be used in obtaining new lines of beans, grain shape and color traits watching as required and the results obtained for these traits until now.

3. It can make further studies on the relationship between these two traits studied and the protein content and resistance to pathogen or pest attack, also.

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THE INFLUENCE OF SOME LIGNIN PRODUCTS ON THE PROCESS OF PLANT DEVELOPMENT

INFLUENŢA UNOR PRODUSE LIGNINICE ASUPRA PROCESULUI DE DEZVOLTARE A PLANTELOR

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Abstract. *This paper presents some results referring to the influence of some natural products based on lignins and of their derivatives upon the process of plant growth and development. As base one used a culture medium made up of quartziferous sand and unmodified lignin products and lignin products chemically modified thruogh the hydroxymethylation reaction. The experiment took place in laboratory conditions. As biological material one used seeds of different plants: tomatos, radish and garden lettuce. The evolution of plants was monitorized for 30 day and during this period one realized some analyses as: the capacity of germination, the quantity of green and dry biomass, which offer indices upon the possible stimulative effect of the products used. According to this research one has established that on the one based. The unmodified lignin products but especially those hydroximethylated significantly stimulate the growth and development of plants as tomatos and radish and on the other hand they inhibit the evolution of the garden lettuce.*

Key words: lignin, hydroxymethylation, biomass, plants, germination.

Rezumat. *În lucrare sunt prezentate rezultatele unui studiu privind influenţa unor lignine şi a derivaţilor acestora asupra procesului de creştere şi dezvoltare a plantelor. Ca suport s-a folosit un mediu de cultură format din nisip cuarţos şi produse ligninice nemodificate şi modificate chimic prin reacţia de hidroximetilare. Experimentul s-a desfăşurat în condiţii de laborator. Ca material biologic, s-au folosit seminte de: tomate, ridiche şi salată. Evoluţia plantelor s-a urmărit timp de 30 de zile, perioadă în care s-au efectuat analize, cum ar fi: capacitatea de germinare şi cantitatea de biomasă verde şi uscată, care oferă indicii asupra posibilului efect stimulativ al produselor luate în lucru. În urma studiilor efectuate s-a constatat ca produsele ligninice nemodificate şi mai ales cele hidroximetilate stimulează semnificativ creşterea şi dezvoltarea plantelor de tomate şi ridiche, şi inhibă evoluţia plantelor de salată.*

Cuvinte cheie: lignină, hidroximetilare, biomasă, plante, germinare.

INTRODUCTION

The higher plants contain lignin, which is deposited in the cell walls and in the intercellular spaces whereas inferior plants such as: algae, lichens, moss and fungi do not contain this compound as an agent of incrustation. The structure of lignin is that of a complex polymer characterized by the multitude of monomeric units and the diverse ways in which these units can be linked. The presence of phenolic and aliphatic OH groups in the macromolecule of lignin made it possible

to be used as partial substituent of phenol in the synthesis of some products with multiple applications. Through its slow microbiological action, lignin from vegetal waste is transformed in the soil, into organic products, which have a physiological action on plants (Ulea, 2003).

Researches show that within the process of degradation in soil, the lignin can be seen as an initial product for the formation of humic acids which represent an important component of the soil humus. Under these circumstances the activity of the plant's hormones is affected and, implicitly, the formation of the roots, the buds, the fruit and the size and shape of the plant and the cellular metabolism. In order to study the effect of some natural products (lignosulfonates, polyphenols) on the growth and development of vegetal systems some strategies of research have been initiated (M. Dumitru et al., 2006, 2007). Testing by experiments of cultivation in vegetations pots in green house conditions. The fertility of the soil and the mineral nutrition of the plants are conditioned in the first place by the nutritional elements produced during the biological cycle through the process of mineralization of organic waste (M. Dumitru et al., 2006, 2007). Nowadays when an ecological approach to the environment is of crucial importance it is normal to use more and more biological and biochemical processes of transformation of polyphenolic and lignin products. It is known that lignin plays an important part in the development of plants taking into account is participation in the formation of humus.

Through its slow microbiological action the lignin from vegetal waste is transformed, in the soil, into micromolecular organic products, which have a physiological action on plants thus contributing to the improvement of the soil fertility.

The research carried on and the results presented in this paper refer to the influence of five types of lignin of different origins and that of the hydroxymethylated derivatives on the growth and development of the plants in laboratory conditions.

MATERIAL AND METHOD

For the experiments we have used lignin of different origins produced in the process of alkaline delignification of annual plants: wheat straw lignin- L1 (wheat straw 100-W-A), grass lignin- L2 (Sarkanda grass 100-S-A) and the commercial products: Protobind 1000 (Pb1000), Protobind 2000 (Pb2000), Protobind 3000 (Pb3000), offered by Granit Co., Switzerland. The initial products were modified by the reaction of hydroxymethylation with formaldehyde under alkaline conditions (Th. Măluţan et al., 2008, A.M. Căpraru et al., 2009).

We preparated five pots with sandy soil as reference (M) and five pots for each type of lignin, with sandy soil and one gramme of lignin. In each pot we sowed the seed of the plants (tomatos, radish, lettuce) chosen for testing; they were periodically watered for 30 days, establishing the degree of germination and in the end the quantity of biomass (green and dry). The lignin and its derivatives in the pots used for the growth and development of the plants was recovered after six months using a solution NaOH 0.2 N.

The solution obtained was separated by filtering. The dissolved lignin in the alkaline solution was the precipitated with a solution of HCl 1 N, at pH=2. The product obtained was centrifugated at 2000 rpm for 10 minutes and, after having been washed, it was dried in determined conditions at 30° C. The experimental data it is processing with *Mathcad Professional 2001* program (Diaconescu R., 2001).

RESULTS AND DISCUSSIONS

The germmination of the seeds is influenced by temperature each plant having a lowest level , an optimum level and a highest level of the thermic values between which this process takes place. Figure 1 presents the tomato plants 30 days after sowing in the presence ligninic substrata.

Fig.1. The tomato plants 30 days after sowing

One of the first parameters used in the research was the analysis of the degree of germination of the three types of seeds on the layer of lignin and sandy soil. The germination test represents the way to estimate the nutritional qualities of a product when it was used as nutritional element in the growth and development of plants.

The capacity of germination represents one of the most sensitive parameters of evaluation both of the toxicity and of the degree of degradation of the lignin. Figure 2 presents the variation of the capacity of germination of the tomatoes depending on the number of days and figure 4 presents the variation of the green and dry biomass for the lignins used.

As we can observe in figure 3, the highest capacity of germination corresponds to Protobind commercial products and for wheat straw lignin. The highest quantity of green biomass was obtained in the case of wheat straw lignin, and therefore a better development of the plants as compared to the others samples. The capacity of germination was also followed on radish plants in the same conditions.

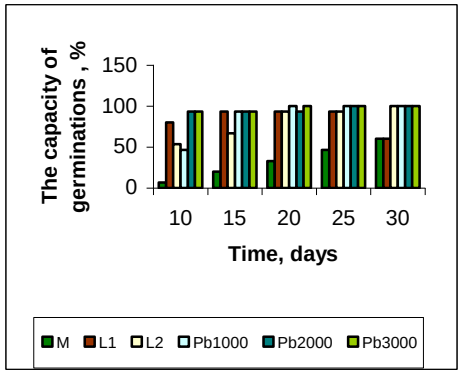

Fig. 2. The variation of the capacity of germination for tomato plants in presence of lignin

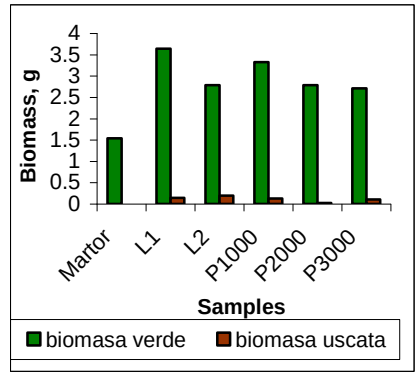

Fig. 3. The variation of the biomass of tomato plants in presence of lignin

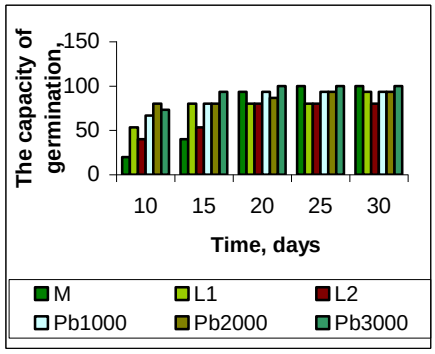

Fig. 4. The variation of the capacity of germination for radish plants in presence of lignin

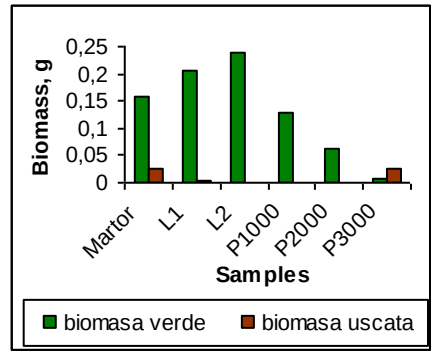

Fig. 5. The variation of the biomass of radish plants in presence of lignin

For this plant we can observe a slight difference for the first 20 days, where Pb 3000 lignin offers a maximum capacity of germination, and then we can notice a very slight difference of about 20%, between the samples, after 30 days. The influence of lignin on these plants was studied so that we could notice their behaviour in a shortperiod of time because they present a higher sensitivity as compared to the tomatoe plants. Figure 4 shows that not all types of lignin used as a substrate for the development of the plants lead to a maximum capacity of germination (100%) after 30 days as in the case of the tomatoe plants.

Figure 5 shows that for the pots that have as a layer Sarkanda grass lignin the quantity of green biomass is higher and the quantity of dry biomass is insignificant which confirms a better resistance to the environmental conditions and the treatment applied. Another type of plants chosen for testing was lettuce. The experiment was carried on through the same stages.

In figures 6 and 7 we can notice the variation of the capacity of germination for lettuce in the presence of a layer of sandy soil and unmodified and modified

lignins by hydroxymethylation, as a function of time. The lettuce plants are very sensitive and the products used caused an inhibition of their development on the substrate as we can notice in figures 6 and 7 where the maximum capacity of germination is presented. The presence of lignin leads to an inhibition of the plants development.

The situation can be correlated with the different solubility of lignin products and their accessibility to the action of microorganisms which appear in the soil in the presence of plants. The obtained results demonstrate that the effects depend both on the type of lignin and on the kind of plant. The products resulted in the soil after degradation of the lignin represents both the source of carbon for microorganisms and agents influencing the metabolic processes in the plants.

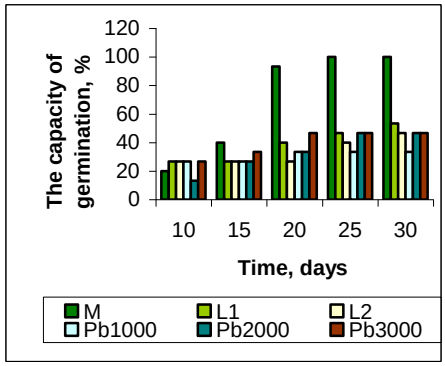

Fig. 6. The variation of the capacity of germination for lettuce plants in presence of lignin

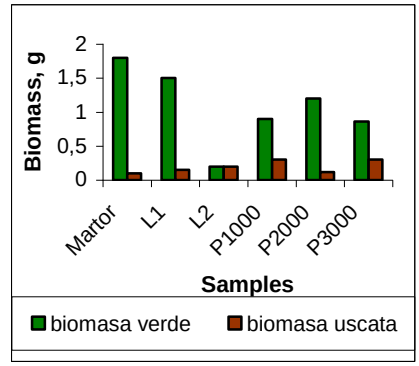

Fig. 7. The variation of the biomass of lettuce plants in presence of lignin

The different evolution of plants is the results of the stimulating effect, generally speaking, of the products with aromatic structure which influences both the growth, development and fruition of plants, and the metabolism of microorganisms that accumulates in the cultivation environment up to a certain level of addition after which there is a contrary effect leading to the inhibition of the growth and development of the plants as in the case of lettuce plants.

CONCLUSIONS

1. Unmodified lignin and especially the modified ones present an action of significant stimulation for the energy of germination in tomatoe and radish seeds and lower values for the energy of germination in lettuce seeds. This situation can also be correlated with the different degradation and solubility of the lignin products which influences their accessibility to the biological agents in the soil.

2. The transformation of lignin in the soil leads to products that influence the metabolism of plants which can be seen in their development, and the same time a different sensitivity against lignins is observed depending on the cultivated plant.

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ASPECTS CONCERNING THE TREATMENT OF BIRCH VENEER WITH LIGNINS EPOXY DERIVATIVES WITH BIOCIDES PROPERTIES

ASPECTE PRIVIND TRATAREA FURNIRULUI DE MESTEACĂN CU DERIVAŢI DE LIGNINĂ EPOXIDAŢI CU PROPRITETĂŢI BIOCIDE

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Abstract. *The paper presents the results regarding the interactions between birch venner and some biocides based on lignin epoxy derivatives and copper ions. Lignin derivatives have been synthesized using annual plant lignins (wheat straw and Sarkanda grass) and commercial products (Protobind 1000, 2000, 3000) offered by the Granit Recherche Developement SA company, Lausanne-Schwitzerland. The treatments with unmodified and epoxy lignins were applied to birch veneer strips by immersing them in copper chloride solutions. The lignin products were dissolved in fufuryl alcohol of 5% concentration. The biostability of treated veneer have been tested by burying into soil for six months. The samples were than characterized by the loss of weight and the contact angle values. The results obtained show that the treatment of veneer with complex of lignin epoxy derivatives and copper solutions offer a high stability of the woody substrate compared with the unmodified products*

Key words: lignin, epoxydation, veneer, biocides, biostability, contact angle.

Rezumat. *Lucrarea prezintă rezultatele privind interacţiunea dintre furnirul de mesteacăn şi o serie de biocizi pe bază de derivaţi de lignină epoxidaţi şi ioni de cupru. Derivaţii ligninici au fost sintetizaţi folosind ca substrat lignine din plante anuale (paie de grâu şi Sarkanda grass) şi produse comerciale (Protobind 1000, 2000, 3000) oferite de firma Granit Recherché Dévelopement S.A. Lausanne-Schwitzerland. Tratamentele cu lignine nemodificate şi epoxidate, au fost aplicate furnirului de mesteacan şi s-au bazat pe imersarea acestuia în soluţii de clorură de cupru. Produsele ligninice utilizate au fost dizolvate în alcool furfurilic în concentraţie de 5%. Biostabilitatea probelor de furnir astfel tratate a fost testata prin îngroparea lor în sol timp de şase luni şi caracterizate prin pierderile de masă şi valorile unghiului de contact. Rezultatele obţinute evidenţiază că tratamentul aplicat furnirului folosind complecşi ai derivaţilor epoxidaţi de lignină cu ionii de cupru, oferă o stabilitate ridicată a substratului lemnos studiat comparativ cu produsele nemodificate.*

Cuvinte cheie: lignină, epoxidare, furnir, biocizi, biostabilitate, unghi de contact.

INTRODUCTION

Nowadays, the methods used for the protection of wood and wood product are based on the utilization of several substances toxic for microorganism and insects, but usually all these products present a huge inconvenience being incompatible with the environment. The natural wood suffers biodegradation processes under the action of biological agents determined by environmental factors and conditions of storage or use after processing. Thus, depending on their structure, the chemical constituents of wood will be degraded in order: hemicelluloses, cellulose and lignin. Studies performed in this field have shown that preservative agents penetrate only less ordered areas of cellulose and hemicelluloses polymers. In the case when copper is used in ammonia systems, ammonia is wholly or partially evaporated and as the result, copper is precipitated. A part of copper ions are fixed in the substrate timber through carboxyl or hydroxyl groups or wood which are present in ionized state at high pH conditions.

The present study is taking in consideration the remarkable properties of the lignin polymer, especially its resistance to biological attack, and also the toxic potential of copper ions. The main purpose is to investigate the biostability of birch wood and how it is influenced by the systems created from renewable products: unmodified lignin or chemically modified lignin (Th. Măluţan et al., 2007, 2008, A.M. Căpraru et al., 2008, 2009, V.I Popa, 1983), in the absence or presence of copper ions. The functionality of lignin is involved especially by its complexation capacity of copper ions, which explains the formation of synergistic process, which contributes to an increase of the biostability. That is why the outher sphere of copper (II) ions used in the treatment (chloride or tetra amino copper hydroxide) seems play a role in the surface protection process (E. Ungureanu et al., 2008).

MATERIAL AND METHOD

In this investigation the following materials have been used: birch veneer samples with 1x10 cm dimensions, Wheat Straw lignin (L1), Grass lignin (L2) and three commercial products as: Protobind 1000, Protobind 2000 and Protobind 3000 (Pb) (also the same products modified by epoxidation reaction (LE) and (PbE) provided by Granite Company (Switzerland) and copper chloride ($CuCl_2$), tetra amino copper hydroxide (Cuam) and furfuryl alcohol (AF).

The same dimensions birch veneer samples have been used in the investigation. All aforementioned substances have been dissolved in furfuryl alchohol (5% concentration). The following treatments were applied:

1. Immersion of the samples during five minutes in different solutions prepared preliminarily, followed by drying in laboratory conditions (25^0C).

2. Immersion of the samples in copper containing solutions and drying of the samples followed by tratament with lignin and lignin derivatives and another drying. The samples with one of these trataments applied were weighed to determine the quantity of material retained on the surface of birch veneer samples. After that, the samples were buried in soil and were maintained in laboratory conditions for a period of six months with regular watering in order to maintain specific soil moisture. The

degree of biodegradation was evaluated by determining the mass loss and contact angle variations for the treated samples, using goniometer Krüss Model FM40 Easy Drop. The experimental data it is processing with *Mathcad Professional 2001* program (Diaconescu R., 2001).

RESULTS AND DISCUSSIONS

Firstly, the mass loss was determined for each birch veneer samples after six months of burial in soil. The results of mass loss for different veneer samples treated with various biocides containing unmodified lignin or epoxy lignin and copper ions are presented in figures 1-3. It can be observed that in the case of the samples containing lignin or lignin derivatives and copper ions the degradation process is inhibited, and the degree of biostability is higher for the complex combinations, of treatments components.

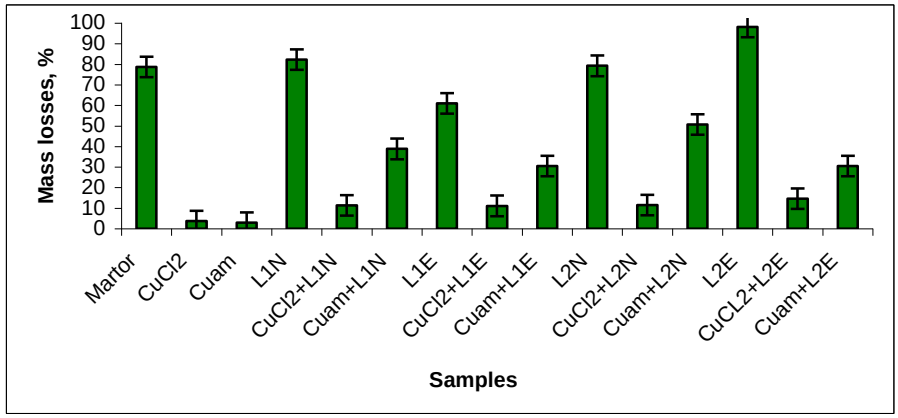

Fig. 1. Variation of mass losses for the veneer samples non-treated and treated

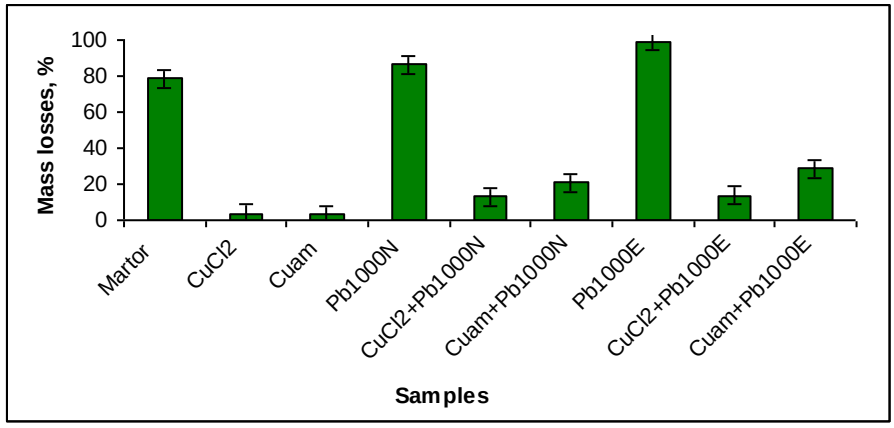

Fig. 2. Variation of mass losses for the veneer samples non-treated and treated

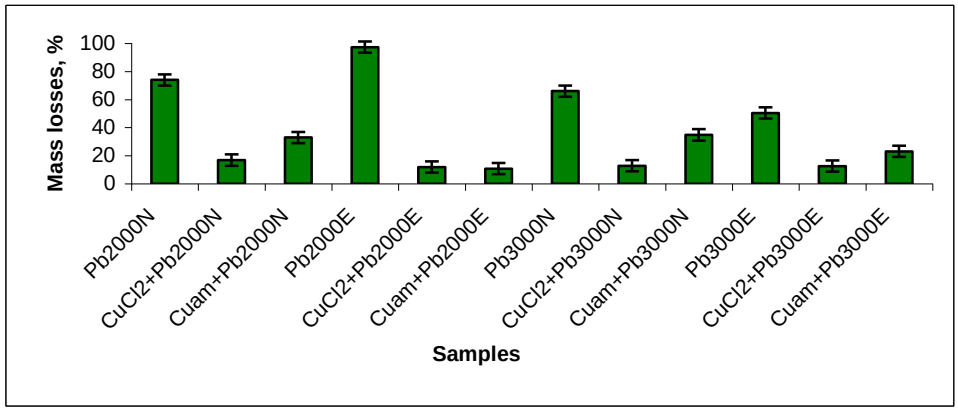

Fig. 3. Variation of mass losses for the veneer samples non-treated and treated

The presented results have lead to the idea that the effectiveness of the surface treatment of wood product depends on the type of the treatment components and the degree of functionality of the samles. The analysis of the mass loss variations seem to indicate that the slightest mass loss occurred in specimens treated with copper ions and complexes epoxydated lignins. At the same time, the birch veneer samples treated only with copper ($CuCl_2$ or Cuam) present a high inhibition degree of biodegradation. Copper-based compounds are substances that produce an effective bioprotection on timber. The obtained results indicate that efficiency is the highest for the samples treated with the following biocides: $CuCl_2$ > Cuam, > $CuCl_2$L1E > $CuCl_2$Pb1000N > CuamPb2000E > $CuCl_2$Pb3000E, presenting mass losses in the range of 3-12 %.

Most significant mass loss occurred in the case of the veneer samples treated with epoxy lignin and unmodified lignin, the mass losses reaching almost 99 % (the case of Pb1000 E lignin). This situation may be determined by the low level of the interaction between the veneer and the product used for the treatment and higher accessibility of several components from the tested samples to the action of soil microorganisms, which can find favorable conditions for the development and deep attack on the wood substrate. To enquire the effectiveness of the applied treatments on the veneer surface, another parameter was determined - the contact angle. The decrease of the contact angle is good evidence for the substrate hydrophilic and for the increase of the wetting capacity. The variation of the contact angle for samples of birch plywood treated with various biocides systems based on copper ions, modified and unmodified lignin and their complexes is presented in figures 4 and 5.

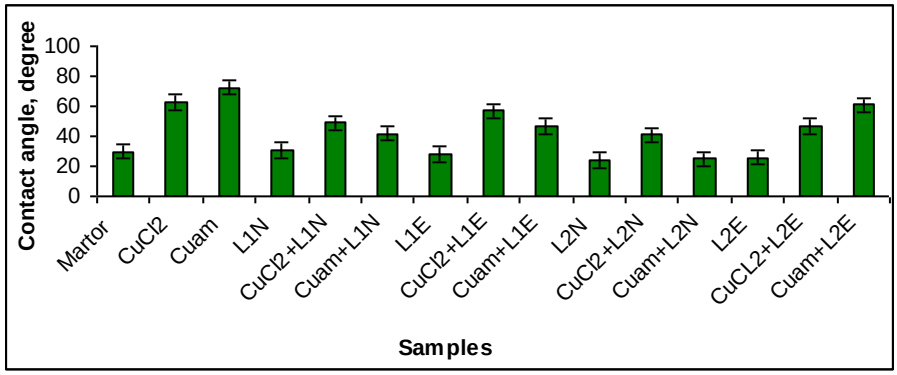

Fig. 4. Variation of contact angle for the veneer samples non-treated and treated

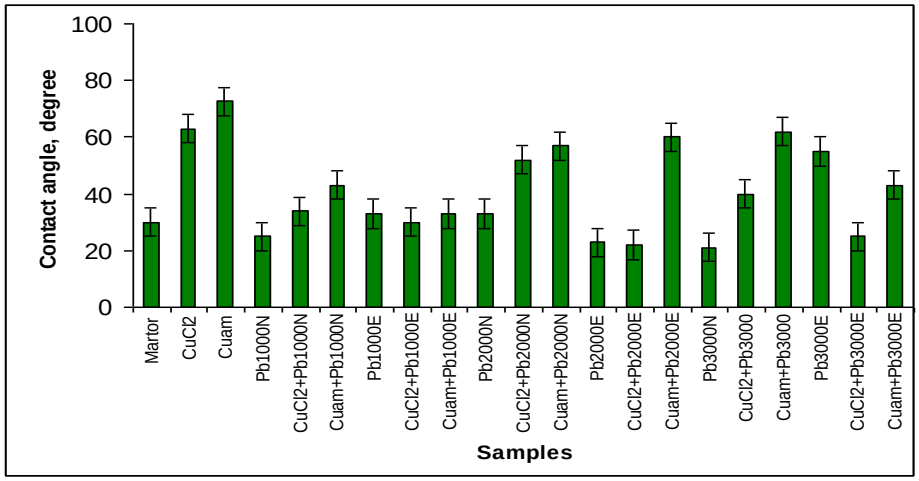

Fig. 5. Variation of contact angle for the veneer samples non-treated and treated

As it can be observed from figures 4 and 5, the treatments performed using only unmodified and epoxidated lignins in the treatment of wood surface produce a penetration capacity even higher than of distilled water in solid media. On the contrary, the treatments with copper (II) solutions especially tetra amino copper hydroxide (Cuam) also their complexes with various epoxidized lignins, determined a low degree of the wetting, the contact angle being high, ensuring a high biostability. The highest values for the contact angle are observed in the case of the samples treated with the following biocides: Cuam > CuamL2E, > CuamPb1000N > CuamPb2000E > CuamPb3000N > CuamPb3000E > $CuCl_2$ and are consistent with the lowest values of mass losses.

The surfaces of these materials are very difficult to analyze because of a highly advanced level of the degradation in some samples and the contact angle values decrease sharply during the measurement, this being caused by a very hydrophilic surface. Although the contact angle value is higher in the case of the samples mentioned above, the water penetrates rather rapidly the wood substrate,

and only if the samples treated only with copper ions, the contact angle showed a slighter decline during the determination. It can be concluded that the chemical modification of lignin ensures a higher biostabilisation of the wood surface in comparison with the cases where unmodified lignins are used as the components of the treatment.

CONCLUSIONS

1. The modification of lignin by epoxidation provides higher biostability of wood substrate than unmodified products; the mass losses being munch lower in this case.

2. The treatments with different solutions of copper ions ensure a higher degree of protection, as expected, the biostability being even higher than in the case of lignin products.

3. The complexation of lignin and their derivatives (epoxidated lignins) with copper (II) ions increases stability of the veneer samples, but it is still lower in comparison with that offered by the simple copper ions.

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THE EFFECT OF SOME CHLORO-PHENOXYACETIC SULPHONOAMIDIC DERIVATIVES AS GROWTH STIMULATORS ON TOMATO SEEDLINGS' ROOT FORMATION AND DEVELOPMENT PROCESSES

EFECTUL UNOR DERIVAŢI CLOR-FENOXIACETICI SULFONAMIDAŢI CA STIMULATORI DE CREŞTERE ASUPRA ÎNRĂDĂCINĂRII ŞI DEZVOLTĂRII RĂSADURILOR DE TOMATE

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Abstract. *Into the frame of the increased industrial requests for agricultural rough materials, in this paper we observed the effect of some growth stimulators with sulphonoamidic group, with multiple action spectrum including stimulating effects, growth regulating and auxinic, lacking toxicity towards humans, bees, fish, without cumulative effects and also biodegradable. The experiment observed the influence of the treatment applied on tomato seeds with solutions of stimulators from the sulphonamidic phenoxyalkyl carboxylic acids' class (BCO 2 and BCO 4), conditioned as kalium and dimethyl-amine salts, in concentrations of 20 and 25 ppm, on root formation speed and seedlings development compared to controls treated with water and zinc acetate solution 5 ppm. We observed that BCO 4 leads to a more rapid development of the plants especially for the seeds treated for six hours, and both stimulators as dimethyl-amine salts, lead to taller plants.*
Key words:growth stimulators, tomatoes, root formation, phenoxyacetic

Rezumat. *In contextul cerintelor crescute de materii prime de provenienta agricola pentru industrializare inregistrate in ultimii ani,in prezenta lucrare am urmarit efectul unor stimulatori de crestere cu grupare sulfonamidica, cu spectru larg de actiune incluzand efecte biostimulatoare, regulatoare de crestere si auxinice, lipsite de toxicitate pentru om, albine, pesti, necumulative si biodegradabile. Experimentul a urmarit influenta tratamentului aplicat semintelor de tomate prin inmuiere in solutii de biostimulatori din clasa acizilor sulfamoil-fenoxialchil carboxilici (BCO 2 si BCO 4) conditionati sub forma de saruri de potasiu si dimetil-amina, la dilutiile de 20 si 25 ppm, asupra vitezei de inradacinare si a dezvoltarii rasadurilor comparativ cu martorii inmuiati in apa distilata si in solutie de acetat de zinc 5 ppm. S-a observat ca biostimulatorul BCO 4 conduce la dezvoltarea mai rapida a plantelor in special la semintele tratate sase ore, iar ambii biostimulatori ca saruri de dimetilamina, conduc la plante mai inalte.*
Cuvinte cheie:stimulatori de creştere, tomate, înrădăcinare, fenoxiacetic

INTRODUCTION

The increase of the agricultural production, quantitative and qualitative, is an essential preoccupation all over the world but also in our country. In the context of doubling the Earth's population pana until 2030 and of higher demands for raw agricultural material for industrial processing, the development of the agriculture is a

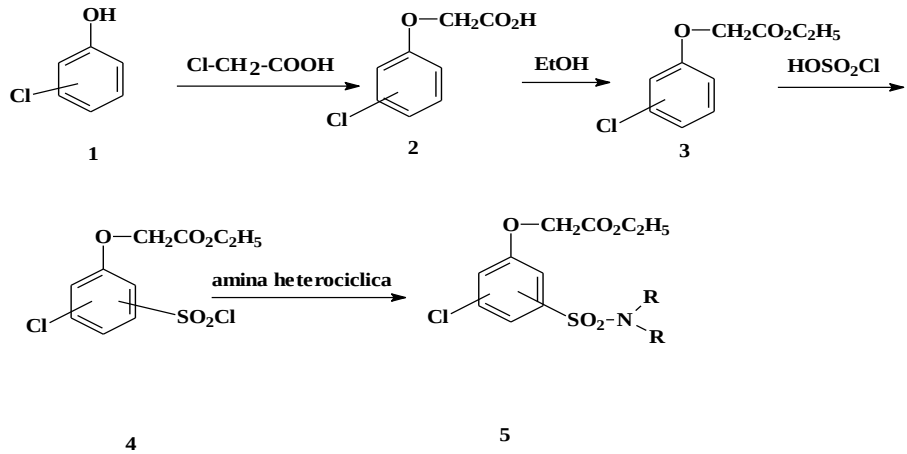
primary goal. In present, we try to obtain new growth stimulators with sulphonamidic group, with a wide range of action including stimulative, growth regulating and auxinic effects, non-toxic for human, bees, fish, non-cumulative and biodegradable.

We chose as support for the sulphonamidic group the phenoxyacetic derivatives because they have low toxicity, are biodegradable, they are non-cumulative in organism, do not generate side effects, and the chloro substituted derivatives are used today in practice as selective herbicides.

The sulphonamides are a very important class of chemical compounds characterized by herbicide effect or growth regulating and auxinic effect, by the lack of toxicity and biodegradability. Their main characteristic is represented by the fact that the sulphonamidic group introduced into an aromatic or heterocyclic ring determines a pronounced decrease of the toxicity and, related with the existing substituted in these rings, a wide range of biological actions.

MATERIAL AND METHOD

The synthesis of the new growth stimulators from the phenoxyacetic derivatives sulphonamidic esters' class will follow the next reaction steps (fig.1):



1 2 3 4 5

Fig. 1. The synthesis of the phenoxyacetic derivatives sulphonamides scheme

The experiment observed the influence of the treatment applied on tomato seeds by soaking in solutions of growth stimulators from the sulphonamidic phenoxycarboxyliclic acids' class (BCO 2 and BCO 4), conditioned as potassium and dimetyl-amine salts, in dilutions of 20 and 25 ppm, on the root formation process's speed the general development of the seedlings compared to controls soaked in distilled water and in zinc acetate solution 5 ppm. The experiments was conducted in vegetation pots with soil sterilized for one hour at 100^0C and moisturized after seeding with boiled and cooled water. The variants were placed on rows, 20 treated and dried seeds on each row.

The required humidity was maintained by daily sprinklings with boiled and cooled water, during all 30 of observation. We observed the appearance of the gemula and the 2, 4 and 6 leaves plantlets.

RESULTS AND DISCUSSIONS

The results obtained in four measurement sessions conducted every other seven days are presented in table 1.

At the beginning, after seven days from seeding, the observations regarding the development of the seedlings showed the following:

- for BCO 4 growth stimulator, the variants with the most 2 leaves plantlets risen from 3 hours treated seeds , after seven days, were: v_{3-1} - BCO 4 K – 20 ppm; v_{3-2} - BCO 4 K – 25 ppm; v_{3-7} - BCO 4 DMA+Zn – 20 ppm. Also, for all variants, we registered as average less plantlets appeared on a row than for the variants with six hours treated seeds, same growth stimulator, where, apart from one variant, we numbered 18, 19 or 20 plantlets out of 20 seeds. The variants with 100% risen plantlets were: v_{6-2} - BCO 4 K – 25 ppm; v_{6-7} - BCO 4 DMA+Zn – 20 ppm;

- for BCO 2 growth stimulator, the variant with the most 2 leaves plantlets risen from 3 hours treated seeds , after seven days, was: v_{3-2} - BCO 2 K – 25 ppm; between the variants with six hours treated seeds, we noticed the variant v_{6-8} - BCO 2 DMA+Zn – 25 ppm. Also, for all variants treated with this growth stimulator for three or six hours, apart from one variant for each treatment period, ained over three quarters of the total possible number of plantlets on one row;

- in what regards the plants' height related to the treatment variant, we obtained higher plants for the following variants: for three hours as treatment period - v_{3-3} - BCO 4 K+Zn – 20 ppm; v_{3-7} - BCO 4 DMA+Zn – 20 ppm, and for six hours as treatment period - v_{6-2} - BCO 4 K – 25 ppm; v_{6-7} - BCO 4 DMA+Zn – 20 ppm and v_{6-8} - BCO 2 DMA+Zn – 25 ppm;

- the controls with seeds treated with distilled water presented less plants risen on a row, especially for the three hour variant, where the plants were also very small. The controls with seeds treated with zinc acetate solution lead to a higher number of tall plants on a row (18, respectively 19), for both treatment periods;

- after four weeks of seedlings development, the variants with the best results were the following, for each of the growth stimulators: ***BCO 4 – 3 hours treatment*** - v_{3-1} - BCO 4 K – 20 ppm (20 plants with 4 and 6 leaves/20 seeds, low in height); v_{3-3} - BCO 4 K+Zn – 20 ppm (15 plants with 6 leaves/20 seeds, tall); v_{3-7} - BCO 4 DMA+Zn – 20 ppm (20 plants with 4 and 6 leaves/20 seeds, smaller); ***BCO 4 – 6 hours treatment*** - v_{6-2} - BCO 4 K – 25 ppm (20 plants with 4 and 6 leaves/20 seeds, low in height); v_{6-6} - BCO 2 DMA 25 ppm (19 plants with 6 leaves/20 seeds, taller) and v_{6-7} - BCO 4 DMA+Zn – 20 ppm (20 plants with 4 and 6 leaves/20 seeds, tall); ***BCO 2 – 3 hours treatment*** - v_{3-1} - BCO 2 K – 20 ppm (19 plants with 5- 6 leaves/20 seeds, small), v_{3-2} - BCO 2 K – 25 ppm and v_{3-3} - BCO 2 K+Zn – 20 ppm (15 plants with 5-6 leaves/20 seeds, medium height) and v_{3-8} - BCO 2 DMA – 25 ppm+Zn – 25 ppm (19 plants with 5-6 leaves/20 seeds, medium height) ; ***BCO 2 – 6 hours treatment*** - v_{6-4} - BCO 2 K+Zn 25 ppm (19 plants with 4 and 6 leaves/20 seeds, medium height) and v_{6-7} - BCO 2 DMA+Zn – 20 ppm (18 plants with 6 leaves/20 seeds, tall);

Table 1

The influence of the growth stimulators treatment, with or without zinc added, on root formation process and seedlings development

No. crt.	Variant	7 days								28 days							
		3 hours				3 hours				3 hours				6 hours			
		2 lv.	4 lv.	5 lv.	Height	2 lv.	4 lv.	5 lv.	Height	2 lv.	4 lv.	5-6 lv.	Height	2 lv.	4 lv.	5-6 lv.	Height
1	BCO 4 K – 20 ppm	20	-	-	3.25	19	-	-	3.5	-	4	16	12.5	-	7	12	14.5
2	BCO 4 K – 25 ppm	20	-	-	4	20	-	-	4.5	-	5	13	14	-	1	19	10
3	BCO 4 K+Zn –20 ppm	15	-	-	5	14	-	-	4	-	-	15	18	-	-	15	15
4	BCO 4 K+Zn –25 ppm	12	-	-	4	19	-	-	3.75	-	-	14	12.5	-	19	-	11.5
5	BCO 4 DMA – 20 ppm	14	-	-	4	18	-	-	3.5	-	16	-	13	-	-	18	12
6	BCO 4 DMA – 25 ppm	18	-	-	4.25	19	-	-	3.75	-	18	-	14.5	-	-	19	15.5
7	BCO 4 DMA+Zn –20 ppm	20	-	-	5	20	-	-	4.5	-	6	14	13.75	-	3	17	15.5
8	BCO 4 DMA+Zn –25 ppm	18	-	-	4.25	19	-	-	4,5	-	18	-	12	-	19	-	12.5
9	BCO 2 K – 20 ppm	19	-	-	3.5	18	-	-	3.25	-	-	19	11.5	-	3	15	14.5
10	BCO 2 K – 25 ppm	20	-	-	4.5	5	-	-	1	-	5	15	13.75	-	8	-	4.5
11	BCO 2 K+Zn –20 ppm	18	-	-	3.5	17	-	-	3	-	3	15	14	-	4	13	14
12	BCO 2 K+Zn –25 ppm	19	-	-	4	19	-	-	4.5	-	19	-	11	-	3	16	14

13	BCO 2 DMA – 20 ppm	17	-	-	3	17	-	-	3.5	-	7	10	10.5	-	2	15	14.5
14	BCO 2 DMA – 25 ppm	14	-	-	4	15	-	-	2.75	-	6	8	15	-	2	14	14.5
15	BCO 2 DMA+Zn –20 ppm	18	-	-	2.5	18	-	-	3.25	-	4	14	12	-	-	18	15.5
16	BCO 2 DMA+Zn –25 ppm	19	-	-	3.5	20	-	-	5	-	-	19	14	-	20	-	14.5
17	Control water	6	-	-	1.25	16	-	-	4	-	10	-	6.5	-	-	16	15.5
18	Control zinc salt	18	-	-	4.5	19	-	-	3.5	-	8	10	14.5	-	19	-	12.5

- also, after four weeks, the controls with seeds treated with distilled water presented, at three hours treatment period, only 10 very small plants with 6 leaves/20 seeds, and for six hours treatment, 16 tall plants with 5-6 leaves/20 seeds; the controls with seeds treated with zinc acetate solution presented, for three hours treatment period, 18 tall plants with 4-6 leaves/20 seeds and for six hours treatment period, 19 smaller plants with 4 leaves/20 seeds.

CONCLUSIONS

1. We observe that BCO 4 growth stimulator leads to a more rapidly development of the plants (5-6 leaves stage), especially for the seeds treated six hours, and as dimetyl-amine salt, the plants are usually taller; the potassium salt register higher values for the plants' height only for the 20 ppm dilution;

2. The same effect is noticed for the BCO 2 growth stimulator, even if the number of 5-6 leaves plants is smaller, especially for the variants treated for six hours. Here also, the dimetyl-amine salt leads to plants usually taller, also the variants treated with 20 ppm dilution;

3. The control treated with distilled water develop better in the six hour treatment variant, even if the plant number is inferior to most of the treated variants, and the control treated with zinc acetate solution develop better only in the three hour treatment variant; for the six hours treatment variant in this case we noticed a slower plant development rhythm.

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AZAHETEROCYCLES – SYNTHESIS AND THEIR ACTIVITY IN STIMULATING GROWTH AND DEVELOPMENT OF WHEAT PLANT

AZAHETEROCICLII – SINTEZĂ ŞI ACTIVITATEA LOR IN STIMULAREA CREŞTERII ŞI DEZVOLTĂRII PLANTELOR DE GRÂU

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Abstract. *One of the strategies adopted for the synthesis of the pyridazine derivatives involves nitrogen ylides, as reactive species in organic chemistry. The reaction pathway involves, in the most frequent cases, a [3+2] dipolar cycloaddition of ylides to dipolarophiles (activated alkenes and alkynes). Pyridazine compounds have an intense biological activity, being used as anticancer, antituberculosis, antihypertensive, antimicrobial agents, or antifungal. Therefore, several studies to test the biologic effect of some new pyridazine derivatives have been done using simple experiments of wheat germination/ develop of the wheat plantlets. The results showed that all the tested compounds displayed a large variety of biological activities; germination percentage, shoot and root length, fresh weights, varied as a function of structure of each investigated compound.*

Key words: pyridazine compounds, biological activity, wheat, germination, total height.

Rezumat. *O metodă accesibilă în sinteza derivaţilor piridazinici constă în folosirea cicloimoniu ilidelor, copuşi reactivi în sintezele organice. Majoritatea acestor sinteze implică cicloadiţii 3+2 dipolare ale ilidelor cu diferiţi dipolarofili (alchene şi alchine activate). Derivaţii piridazinici obţinuţi prezintă o interesantă activitate biologică, fiind utilizaţi drept agenţi cu proprietăţi anticancerigene, antituberculoase, antihipertensive, antimicrobine sau antifungice. Prin urmare, au fost efectuate diferite studii cu privire la efectul biologic pe care îl prezintă derivaţii piridazinici în germinarea seminţelor de grâu/dezvoltarea plantelor de grâu. Rezultatele obţinute au demostrat o activitate biologică variată a acestor compuşi; procentul de germinare, lungimea şi greutatea plantelor, în stare proaspătă, a variat în funcţie de structura fiecărui compus investigat.*

Cuvinte cheie: derivaţi piridazinici, activitate biologică, grâu, germinare, înălţimea totală.

INTRODUCTION

Plants are hosts to a wide range of pathogens (as fungus, bacteria, viruses), wich are responsible for various infectious diseases, causing infection of the growth and crop destruction, having significant production losses worldwide. For

this reason, plants are considered good indicators of toxic and mutagenic effects of some chemical elements and compounds, being used successfully in the detection of harmful compounds (Granata, 1999; Iqbal et al., 1998).

Also, synthesis of compounds with broad biological activity and low toxicity is an important issue in the field of biochemistry research, because pathogen agents suffer continuous mutations and even more, preparatates used in different treatments generates over time the phenomenon of resistance and/or are leading to appearance of toxic effects.

According to recent studies from the literature, the azaheterocycles derivatives are successfully used in various branches of science (analytical chemistry (Urbano et al., 1984), polymer chemistry (Mangalagiu, 2001; Surpateanu et al., 1999), physics (Kawamura, 1990), science and technology of materials (Tanaka, 1997) etc), but one of the most important applications is as intermediates in the synthesis products with pharmacological properties (Allad, 1963).

Furthermore, the dates presented in the literature testify the phytotoxic action of the pyridazine derivatives (azaheterocycles compounds) and demonstrates the possibility to use them as potential biostimulant in growth and development of horticultural plants with potential practical applications as insecticides, herbicides and pesticides) (Druta et al., 2001; Irimia et al., 2003; Mangalagiu et al., 2005; Risca et al., 2006).

In this respect, we expected that at least a part of the byproducts obtained (bioisosters with pyridazinic structure) to present possible practical applications as biologically active compounds. For this reason we tested the antibacterial and antifungal action, (Butnariu (Tucaliuc) et al., 2007; Butnariu (Tucaliuc) et al., 2009) and the effect on germination and growth of these products plantelor (Butnariu (Tucaliuc) et al., 2008).

Therefore, this paper reports the biological activity of some pyridazine derivatives on wheat germination and seedling growth.

MATERIALS AND METHODS

In synthesis of pyridazine cycloadducts, first we obtained the corresponding cycloimmonium salts, using salt method proposed by Kröhnke (Kröhnke, 1935). Therefore, we realized N-alkylation reations, by treating pyridazine with ω-bromacetophenone-p-R-substituited. After that, an accessible method for obtaining pyridazine cycloadducts is using the ylides as intermediaries. The ylides are generated *in situ*, in classical heating or under microwaves energy, in alkaline medium (TEA – in liquid phase and KF/Aliquat 336 – in interphasic catalysis / PTC) (fig. 1).

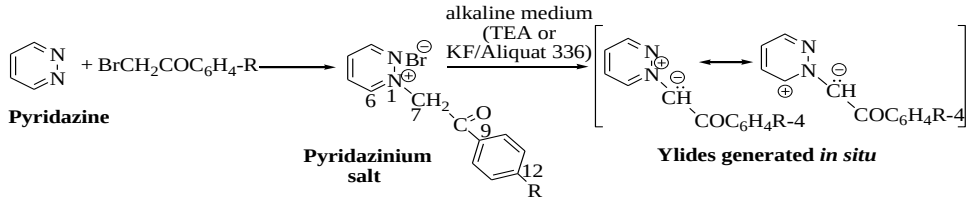

Fig. 1. Cycloimmonium salts used as precursors in the cycloaddition reaction.

By treating pyridazinium ylides, obtained *in situ*, with different activated dipolarophiles symmetrical and non- symmetrical substituted (ex. N-Phenylmaleimide, dimethyl maleate and dimethyl fumarate, acrylonitrile, dimethyl acetylendicarboxylate and ethyl propiolate) reactions occur as 3+2 dipolar cycloaddition. We obtain azabicycles derivatives (**3-8**), wich have a rapid systemic effect on plants and are active at very low concentration (fig.2).

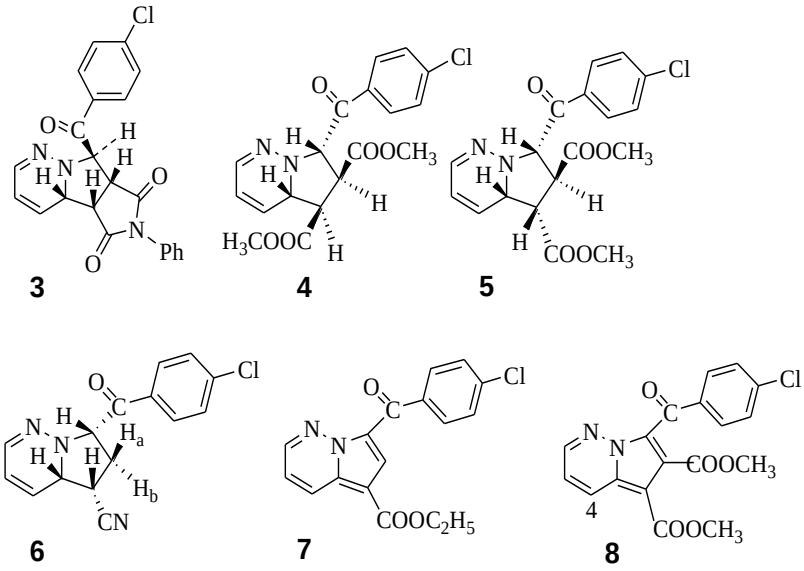

Fig. 2. Pyridazine derivatives

Germination tests were performed in a growth chamber Conviron MP4030 model G30 with programmed temperature, humidity and light. We used seed samples of wheat (*Triticum aestivum*), with specific weight 37.2 g/1000 seeds.

Thus, for this experiment, 50 seed samples of wheat were treated with 5 mL of each $5 \cdot 10^{-3}$ M solutions of pyridazine derivatives obtained in parallel with a redistilled water blank (**B**).

All the determinations were performed in triplicate or duplicate. Initially, the seed with analyzed solutions, were shaken in the tubes, at short time interval, for one hour.

Then, the seeds with their treatment solutions, were taken out and put into Petri dishes on double filter paper together. The seeds were periodically watered and the percent of germinated seeds were reported 3 days later (energy of germination, **EG**); respectively, 7 days later we reported the germination rate (**GR**). A seed with visible coleorhizae was considered germinated. After, the harvest of young wheat plants, from their seeds, was measured height (**H**, expressed as cm) and weight (**W**, expressed as grams).

RESULTS AND DISCUSSIONS

The data were validated using the Tukey test (Snedecor, 1994), with a probability of 95 %.

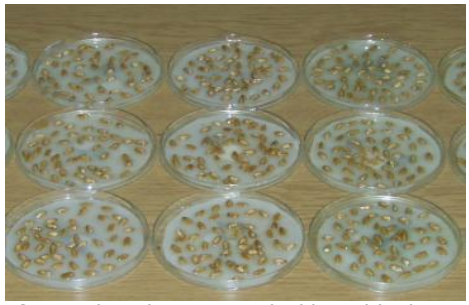

Fig. 3. The wheat treated with pyridazine derivatives in the first day of treatment.

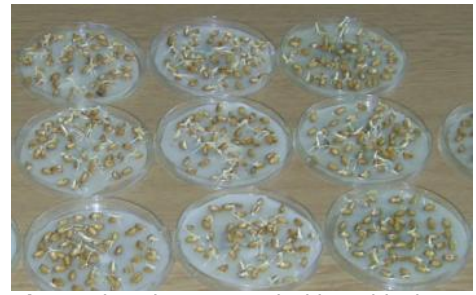

Fig. 4. The wheat treated with pyridazine derivatives in the 3rd day of treatment

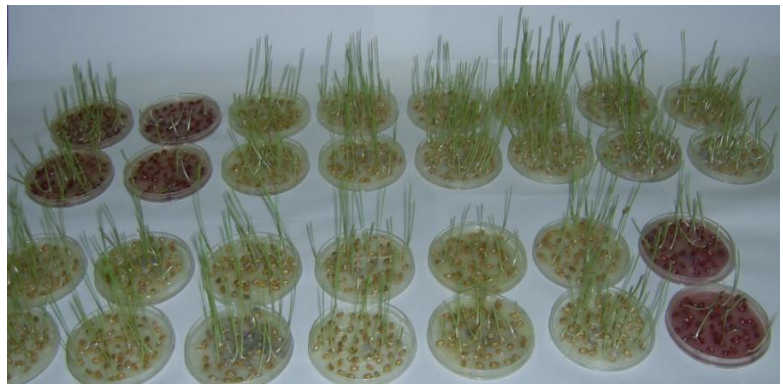

Fig. 5. The wheat treated with pyridazine derivatives in the 7rd day of treatment

The results showed that germination percentage, root length and weight of seedlings, fresh, varied as a function of the structure of each investigated compound.

Table 1

The effect of pyridazine derivatives on wheat germination (RG)

Comp.	Germination Rate (GR, %)	Number of plantlets	Comp.	Germination Rate (GR, %)	Number of plantlets
2	29 ± 4	9 ± 2	**6**	52 ± 5	23 ± 3
3	70 ± 4	25 ± 1	**7**	81 ± 3	34 ± 4
4	59 ± 6	22 ± 1	**8**	80 ± 4	34 ± 3
5	40 ± 5	20 ± 5	**B**	88 ± 5	39 ± 2

Table 2

The effect of pyridazine derivatives on wheat germination and seedling growth (the total height and the mean height of plantlets in the lot (H, Hm), (W, Wm))

Comp	H (cm)	H_{med} (cm)	W (g)	W_{med} (mg)
2	52.4 ± 13.3	4.4 ± 0.9	0.47 ± 0,41	40.03 ± 2.67
3	178.2 ± 17.2	5.9 ± 0.6	1.03 ± 0.12	34.32 ± 1.65
4	136.4 ± 3.4	5.8 ± 1.3	0.98 ± 0.08	42.32 ± 3.36
5	111.3 ± 0.3	5.5 ± 0.01	0.80 ± 0,01	39,84 ± 0,01
6	120.4 ± 4.8	6.8 ± 0.8	0.80 ± 0,13	40.35 ± 0.07
7	197.6 ± 7.2	5.3 ± 0.6	1.11 ± 0.15	28.52 ± 3.30
8	233.5 ± 25.9	6.6 ± 0.7	1.37 ± 0.14	37.05 ± 3.85
B	223.7 ± 23.2	6.5 ± 0.7	1.42 ± 0.19	41.66 ± 5.93

According to dates presented, all the pyridazine derivatives influenced dramatically the germination process of the wheat seeds and they can be divided into activators and inhibitors of plant growth of wheat.

From the class of toxic substances is considered the compound (**2**) / growth inhibitor, because the value of total plant height is only 52,4 cm, compared to the total plant height obtained for blank (223,7 cm). In terms of biochemical, it is considered that this compound disrupts plant metabolism and causes a disequilibrium in protein content and amino acids. In usually plants there is a well established proportion between the two levels, wich varies with plant age.

Compounds (7 and 8) can be considered activators of plant growth since total plant height value is very high; more, for compound (8) the total plant height exceed the value for the blank.

Good results were obtained for compounds (3) where the total plant height is 80% of the blank.

CONCLUSIONS

Experiments with wheat seed germination, showed their sensitivity to the action of substances tested and the effect of pyridazinic compounds in seed germination / growth and development of seedlings.

Pyridazine derivatives may influence germination rate and fresh plant weight, depending on the structure of each investigated compound.

Most toxic pyridazinic derivative of the series is compound (2). It presented the strongest inhibitory effect on plant growth and development. At the opposite end are compounds (**7** and **8**), good plant growth stimulators. The rest of the compounds showed a range of biological activity.

However, further research is needed to evatuate the impact of pyridazine derivatives on living organisms and especially of wheat germination.

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POSSIBILITIES OF CARRYING OUT MODERN SANITARY EDUCATION WITHIN LESSONS OF BIOLOGY

POSIBILITĂŢI DE REALIZARE A EDUCAŢIEI SANITARE MODERNE ÎN CADRUL LECŢIILOR DE BIOLOGIE

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Abstract. *Modern sanitary education is one of the "new educations", defined in the UNESCO programs as answers of the educational systems to the imperatives of contemporary world. One of the most targeted objectives of the governamental policies and strategies from all the world, mentioned by the World Health Organization, is to achieve and maintain a healthy state for whole population of the world, allowing all the people to have a productive life from an economic point of view. Within the pre-university education, transmission of sanitary knowledge is carried out during both school activities, and out of school activities. Studying themes of biological sciences, during gymnasium and high school, gives numerous opportunities of approaching some subjects concerning fields of modern sanitary education. In this paper, we wish to emphasize that nutritional education, as a component of the modern sanitary education, can be realized at the same time with studying some themes of plant biology and human anatomy.*

Key words: nutritional education, fruits, vegetables, bioelements.

Rezumat. *Educaţia sanitară modernă este una dintre „noile educaţii", definite în programele UNESCO ca răspunsuri ale sistemelor educaţionale la imperativele lumii contemporane. Unul dintre obiectivele cele mai vizate de politicile şi strategiile guvernamentale din întreaga lume, menţionat de Organizaţia Mondială a Sănătăţii, este realizarea unei stări de sănătate a întregii populaţii a Globului, care să permită tuturor oamenilor să ducă o viaţă productivă din punct de vedere economic. În învăţământul preuniversitar, transmiterea cunoştinţelor de educaţie sanitară modernă se realizează atât în cadrul activităţile şcolare, cât şi extraşcolare. Studierea temelor de ştiinţe biologice, în gimnaziu şi liceu, oferă numeroase ocazii de abordare a unor subiecte privind unele domenii ale educaţiei sanitare moderne. Educaţia nutriţională, ca şi componentă a educaţiei sanitare moderne, se poate realiza odată cu studierea unor teme de biologie vegetală şi de anatomie umană, fapt ce va fi evidenţiat în acest articol.*

Cuvinte cheie: educaţie nutriţională, fructe, legume, bioelemente.

INTRODUCTION

"New education", defined in UNESCO programs, represent an assembly of specific answers in educational plan to the imperatives indicated by the problems of contemporary world. These prioritary pedagogical objectives are aiming at: education in relation to the environment or ecological education, education for change and development, education for technology and progress, education for mass media, education on the matter of population or demographical education,

education for peace and cooperation, education for democracy, and modern sanitary education (Văideanu, G., 1996, p. 65, 66).

Modern sanitary education „is aiming at the formation and cultivation of specific capacities of projection and rational organization of life, in conditions of solving some problems specific to the education for spending the spare time, modern family life education, nutrition education, sex education" (Joiţa, E., (coord.), 2003, p.19). M. Minder mention two other particular contents of this „new education": education for a judicious medication, and education for valorization of therapeutic information (Cristea, S., 2005, p. 62).

Nutrition education, as a component of modern sanitary education, is aiming at „the modification of nutrition behavior of individuals in the context of new existence conditions, economic and cultural, specific to postindustrial society" (Cristea, S., 2005, p.62). For reaching this general objective is needed to inform the people about the food nutritional value, importance of selecting and rational food dosing, its adequate preparation, as well as about the importance of identifying authentic foods (Cucoş, C., 2002, p. 57). In school, the indoor and outdoor activities offer numerous ocassions for nutrition education of young generation. Also, the pupils have the opportunity to study as a module, during I-XII classes, the chosen discipline „Education for health". For elaborating of the curriculum for „Education for health", were taken into consideration both the necessity of informing the pupils about the food importance in order to preserve the body health, and the necessity to educate the pupils for adopting a correct, balanced, and adequate food regime, which assure the normal functioning of the whole human body. Themes studied within this discipline assure the progress in formation of capacities and acquisition of notions specific to nutrition education, in accordance to the assembly of knowledges corresponding to the contents of disciplines studied during the compulsory education. Among the themes included in the curriculum for this discipline there are: diversity of foods – condition for health, food expiration date (1st class); influence of plant and animal foods, effects of unilateral nutrition (3rd class); food pyramid (6th class); factors disturbing the metabolism (sugar, protein, fat, mineral), deficiences, food additives and their influence on health (9th and 10th classes); nutrition and heart diseases (11th and 12th classes).

Taking into consideration the decrease of the number of schools in which this chosen discipline is studied in recent years, the aim of our study was to identify the ways and possibilities of carrying out nutrition education within the Biology lessons. The main objectives of this study was the identification of that biology themes studied in gymnasium and high school, within which notions of nutrition education could be transmitted.

MATERIAL AND METHOD

In recent time, a special attention is given to the education of pupils towards a healthy eating and balanced nutrition, which must contain all groups of nutrients. As it is generally known, fruits and vegetables represent an important source of biolements and chemical elements, indispensable for normal functioning of human body. Bioelements are classified in macroelements and microelements. Macroelements are

the minerals which the human body requires in relatively large quantities. This category include calcium (Ca), magnesium (Mg), phosphorus (P), potassium (K), sodium (Na), chloride (Cl) and sulphur (S). Microelements or oligoelements are the minerals which are needed by the body in very small quantities, such as: iron (Fe), zinc (Zn), iodine (I), fluoride (F), copper (Cu), manganese (Mn), selenium (Se), cobalt (Co), chrome (Cr), molibdene (Mo), silicon (Si), lithium (Li), nickel (Ni), arsenium (As), bromine (Br) tin (Sn) and vanadium (V).

Due to their composition, fruits and vegetables are recommended both in the nutrition of healthy people, for maintaining their health, and people having various disorders, for attenuating or even curing them.

In order to emphasize the possibility that the teacher of biology have to transmit and consolidate notions of nutrition education, we analyzed the content of Biology mannuals used in gymnasium and high school at present, and identified themes of plant biology and human anatomy, within which the importance of fruits and vegetables in human nutrition, as well as the importance of some minerals (macroelements and oligoelements) and eventually vitamins for the human body, could be emphasized.

RESULTS AND DISCUSSIONS

Transmission of knowledge about the importance of fruit and vegetables in nutrition can be carried out within the lessons of Biology, during the 5th class, but without realizing interdisciplinary connections with the chemistry notions. When studying the theme "The fruit and seed" and chapter "Angiosperms" can be emphasized the importance of fruits and vegetables for health preservation and/or curing of some diseases. These knowledge can be presented by: a) the teacher, at the end of lesson, under the form of "curiosities"; b) pupils, if they have been asked to elaborate together or in groups, in the classroom, by independent study, a material based on information from various sources (brochures, journals, books) offered by the teacher, or materials selected by themselves from the Internet; c) pupils, if they have been asked to elaborate, individually or in groups, various materials (summary, essay, report), as homeworks. In the case when the presentation of notions is done by pupils, is necessary to assure their fixation by elaboration of a cluster or table, together by the teacher and pupils, on the black (or white) board, mentioning the fruit/vegetable, and therapeutic indications. With this ocassion can be emphasized also the advantages of a diversified nutrition, including "alive foods" constituted from vegetables and fruits, as compared to the unilateral nutrition or oriented only on certain "favorite" foods, due to the taste they have. In the 9th class, this subject of nutrition education can be resumed when studying the dicotyledonous and monocotyledonous plants within the theme "Angiosperms". This time, taking into consideration that the pupils acquired the concepts "chemical element" and "mineral", and also of the chemical formulas, during the 7th class, they can be asked to additionally mention the macro- and oligoelements, eventually the vitamins, from the fruit (table 1) and vegetable (table 2) composition.

Table 1

Composition in bioelements and vitamins of some fruits and their importance for human health

Fruits/ Plant	Macro-elements/ 100g	Oligo-elements/ 100g	Vitamins	Therapeutic indications
Blueberries *Vaccinium myrtillus*	Ca (6 mg), Mg (6 mg), P (12 mg), K (77 mg), Na (1 mg)	Fe (0,3 mg), Zn (0,2 mg)	A, C, E., K, PP, B6, B9	circulatory disorders, atherosclerosis, enteritis, biliary insufficiency, improvement of nocturnal eyesight
Apricots *Prunus armeniaca*	Ca (13 mg), Mg (10 mg), P (23 mg), K (259 mg), Na (1 mg) S, Cl	Fe (0,4 mg), Zn (0,2 mg), Cu, Br, F, Ni	A, C, E., K, PP, B1, B2, B6, B9	physical asthenia, depressions, anemia, insomnia, diuretic, constipation
Black currants *Ribes nigrum*	Ca (61,60 mg), Mg (26,90 mg), P (66,10 mg), K (361 mg), Na (2,20 mg), Cl	Fe (1,7 mg), Zn (0,3 mg), Cu, Co	A, C, E, K, B1, B2, PP, B6	anemia, atherosclerosis rheumatism, gastritis, heart and respiratory insufficiency, nephritis
Lemons *Citrus limonum*	Ca (26 mg), Mg (8 mg), P (16 mg), K (138 mg), Na (2 mg)	Fe (0,6 mg), Zn (0,1 mg), Si, Mn, Cu	A, C, E, PP, B1, B2, B3, B6, B9	pulmonary infections, intestinal infections, rheumatism, anemia, arteriosclerosis, asthenia, hypertension
Olives *Olea europaea*	Ca (94 mg), Mg (4 mg), P (3 mg), K (9 mg), Na (898 mg)	Fe (3,3 mg), Zn (0,2 mg), Mn, Cu, Si	A, C, E, K	anemia, insuficienţă hepatic insufficiency, biliary litiasis, diabetes, rachitism, allergies
Apples *Malus communis*	Ca (6 mg), Mg (5 mg), P (11 mg), K (107 mg), Na (1 mg), Cl, S	Fe (0,1 mg), As, Mn, Co, Si, Br	A, C, E, K, PP, B1, B2, B9	reumathism, feverish state, gout, diabetes, anemia, asthenia, insomnia
Walnuts *Juglans regia*	Ca (44 mg), Mg (130 mg), P (690 mg), K (510 mg), Na (2 mg)	Fe (2,4 mg), Zn (2,4 mg), Cu (0,2 mg), Se, Mn	E, B1, B2, PP, A, C,	diabetes, tuberculosis, intestinal parasites, dermatosis, renal litiasis
Figs *Ficus carica*	Ca (35 mg), Mg (17 mg), P (14 mg), K (232 mg), Na (1 mg)	Fe (0,4 mg), Zn (0,2 mg), Mn, Br	A, C, D, K, B1, B2, PP, B6, B9	asthenia, gastritis, colitis, feverish state, bronchitis, laryngitis, constipation
Grapes *Vitis vinifera*	Ca (10 mg), Mg (0,70 mg), P (20 mg), K (191 mg), Na (2 mg)	Fe (0,4 mg), Zn (0,1 mg), I, Co, Ni, Br, F	A, C, E, K, B1, B2, PP, B6, B9	anemia, asthenia, gout, reumathism, litiasis, nephritis, dermatosis, oedema, intoxications

(after Grigorescu, E., 1996; Chirilă, P., 1997; http://dieta.romedic.ro/alimente/Fructe_011/filtru)

Table 2

Composition in bioelements and vitamins of some vegetables and their importance for human health

Vegetable/ Plant	Macroelements/ 100g	Oligoelements/ 100g	Vitamins	Therapeutic indications
Green Pepper *Capsicum annum*	Ca (10 mg), Mg (10 mg), P (20 mg), K (175 mg), Na (3 mg)	Fe (0,30 mg), Zn (0,10 mg), Cr, Si	A, C, E, K, B1, B2, PP, B6, B9	vitaminizing, intestinal colic, muscular cramps, meteorism
Green onion *Allium cepa*	Ca (61 mg), Mg (20 mg), P (33 mg), K (260 mg), Na (4 mg) , Cl	Fe (1,90 mg), Zn (0,50 mg), I, Ni, Si	A, C, E, K, B1, B2, PP, B6, B9	respiratory problems (cold, bronchitis, asthma), flu, oedema asthenia, diabetes, rheumatism, aterosclerosis
Carrot *Daucus carota*	Ca (35 mg), Mg (12 mg), P (35 mg), K (320 mg), Na (69 mg), S	Fe (0,30 mg), Zn (0,20 mg), I, Co, As, Ni, Cu, Br	A, C, E, K, B1, B2, PP, B6, B9	anemia, enterocolitis, gastroduodenal ulcer, pulmonary disorders, rheumatism
Parsley *Petroselinum sativum*	Ca (138 mg), Mg (50 mg), P (58 mg), K (554 mg), Na (56 mg), S	Fe (6,20 mg), Zn (1,10 mg), Cu, Br, I	A, C, E, K, B1, B2, PP, B6, B9	anemia, asthenia, ischemic cardiopathy, oedema, rheumatism
Spinach *Spinacia oleracea*	Ca (99 mg), Mg (79 mg), P (49 mg), K (558 mg), Na (79 mg), S	Fe (2,70 mg), Zn (0,50 mg), Cu, I, As, Ni, Mn	A, C, E, K, B1, B2, PP, B6, B9	anemia, rachitism, convalescence, scurvy, astenia, burns
Cabbage *Brassica oleracea*	Ca (40 mg), Mg (12 mg), P (26 mg), K (170 mg), Na (18 mg), S	Fe (0,50 mg), Zn (0,20 mg), I, Co, As, Ni	A, C, E, K, B1, PP, B6, B9, D2	gastritis, gastric and duodenal ulcer, bronchitis, asthma, diabetes, eczema chilblains, wounds

(after Grigorescu, E., 1996; Chirilă, P., 1997; http://dieta.romedic.ro/alimente/Legume_010.html)

Also, taking into consideration that the pupils have acquired knowledge of human anatomy and physiology during the 7th class, at the time of filling out the cluster/table, can be questioned about the role of some macro- and oligoelements in the make-up and good functioning of the organism. For instance: Which elements confer rigidity to the bones? (Ca and P); Which element is especially important for the formation of hemoglobin from the red blood cells? (Fe); Which element is essential for the synthesis of the tyroid hormones? (I); Which element is found in saliva, gastric juice and bile? (Cl).

The tables realized in the 9th class can be saved and used subsequently in the 10th and 11th classes, in the moment when different human disorders will be discussed. Based on the analysis of data from tables, the pupils will be able to indicate, for instance, which fruits or vegetables can be consumed for curing some

disorders of the digestive system (gastritis, gastro-duodenal ulcer, enterocolitis, biliary litiasis etc.), respiratory (bronchitis, laryngitis, bronchitic asthma), circulatory (aterosclerosis, arterial hypertension, varicose vein), excretory (urinary litiasis), or some endocrine disorders (diabetes).

In the 11th class, within the theme "Vitamins", the pupils can select from the tables the source of various vitamins presented in the textbook. As a completion of the knowledge transmitted within the chapter "Metabolism", after the presentation of vitamins, could be realized a table or cluster regarding the source and importance of minerals for the human body. For activating the pupils, the work can be organized in groups, each group realizing a cluser for a certain bioelement, mentioning the chemical symbol, foods containing it, and its role in the organism. At the end of lesson, the clusters realized can be assembled into a final cluster, starting from the concept of bioelement.

CONCLUSIONS

1. Nutrition education, as a component of modern sanitary education, can be realized both during teaching of the chosen discipline "Education for health", and within Biology.

2. Together with studying some themes of plant biology, in gymnasium and high school, can be emphasized the importance of fruits and vegetables for the health of human body, as natural source of minerals, and vitamins.

3. In the college, within some themes of human anatomy can be emphasized the importance of macro- and oligoelements for curing some disorders and for maintaining the health of human body.

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STUDENT VISIONS ON THE INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN TEACHING AND LEARNING BIOLOGICAL SCIENCES

VIZIUNEA STUDENŢILOR DESPRE INTEGRAREA TEHNOLOGIEI INFORMAŢIEI ŞI COMUNICAŢIILOR ÎN PREDAREA ŞI ÎNVĂŢAREA ŞTIINŢELOR BIOLOGICE

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Abstract. *Modernization of the education system involves primarily the change and improvement of education tools used within the activity of teaching-learning and school children's evaluation. In this respect, at present, the computerized informational system has an essential role as didactic tool, and as a source of documentation and access to the information as well, both for the teachers and school children. Through computer mediation, the biology teacher can use a various range of educational software for teaching this discipline, with different contents and functions. Besides these types of educational software, the biology teacher can also use CDs with various topics, including encyclopedia of plant or animal world, as well as atlases of human anatomy, either purchased or realized by themselves. In this paper we discuss the student's point of view concerning the use of Information and Communication Technologies at various moments of the lesson and during the entire lesson.*

Key words: computer, Information and Communication Technologies, biological science, student, lesson.

Rezumat. *Modernizarea învăţământului impune în primul rând schimbarea şi perfecţionarea metodelor şi mijloacelor de învăţământ folosite în activitatea de predare-învăţare şi evaluare a elevilor. În acest sens, în prezent, sistemul informaţional computerizat are un rol esenţial în optimizarea activităţii şcolare ca mijloc didactic, precum şi ca sursă de documentare şi acces la informaţie, atât pentru cadrele didactice cât şi pentru elevi. Prin intermediul calculatorului, profesorul de biologie poate utiliza o gamă variată de softuri educaţionale, cu conţinuturi şi funcţii diferite în cadrul predării acestei discipline. Pe lângă aceste tipuri de softuri educaţionale, profesorul de biologie mai poate folosi CD-uri cu diverse tematici, inclusiv enciclopedii ale lumii plantelor şi animale, precum şi atlase de anatomia omului, cumpărate sau realizate personal. În articol se va prezenta punctul de vedere al studenţilor referitor la utilizarea Tehnologiei informaţiei şi comunicaţiilor în diferite momente ale lecţiei şi pe întreaga durată a acesteia.*

Cuvinte cheie: computer, Tehnologia informaţiei şi comunicaţiilor, ştiinţe biologice, student, lecţie

INTRODUCTION

At present, it is recognized the fact that ICT can be used in various contexts and in numerous modalities for supporting the teaching and learning activities (Woollard, J., 2007).

In the didactical activity, the personal computer or its portable variant, named laptop, is a modern didactic tool which can perform the teaching activity carried out usually by the teacher, when an educational soft is used. Moreover, is an didactical tool which can be used by the teacher for writing of documents, creating data banks, graphical representation of data, PowerPoint presentations, by using of some multimedia facilities, or as a tool of teaching within the lessons, in which case the computer is used for projecting some materials in order to transmit new knowledge, or to systematize the knowledge.

ICT (Information and Communication Technologies) are defined as "a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information" (Blurton, C., 1999, p.1). The contemporary technologies used in education includes "learning aided by computer, Internet, visual classes and digital colaboration by all the electronic tools of information. The techniques and tools can be applied by CD-ROM, DVD, video, television and computers, communication by satellite, digital networks (by cable and radio), in other words a range of various information tools and software. Both offline technologies (tutorials, CD-ROMs, video, transmisions) and online technologies (Internet, e-mail, audio and video conferences, etc.) can be used (Adăscăliţei, A., 2007, p. 156).

In our country, the endowment of schools with computers, laptops, video projectors, television sets, establishment of informatics rooms and installation of AeL platform, created favourable conditions for using computers and information technologies within the activities carried out with pupils.

Taking into consideration modernization of education, the practicant students are encouraged to use within the lessons both a diverse methodological register, and an assembly of various didactical methods, in order to assure the success in teaching the pupils. As future teachers, who must know "how, where and when to use the technologies (and also when should not use) for class activities and presentations, [...] for obtaining supplementary information related to the content of their subject and pedagogical knowledge which can support their professional development", the practicant students are stimulated to use some technologies, various tools and contents in digital format within the didactical activities carried out during the pedagogical practice. In this way is aiming at the development of their "technological alphabetization" (UNESCO, 2008, p. 8).

In order to optimize the projection and realization of some didactic activities by the practicant students during the pedagogical practice they are carrying out in gymnasium, we investigated the student's opinion concerning the use of ICT in teaching-learning of biology.

The objectives of our research were the following:

1. investigating the use of ICT in the projection of lessons by the practicant students.
2. finding the mode of using computer within the lessons;
3. evaluating the level of student's interest for using ICT within the lessons.

MATERIAL AND METHOD

In order to find the point of view of students from the Faculty of Science of the University of Pitesti, concerning the use of computer and integration of ICT in teaching-learning biological sciences, an empirical research was done, based on the questionnaire method. The questionnaire was filled in by students at the end of first semester, after the pedagogical practice, during which each of them was teaching two lessons. The questionnaire contained questions concerning information sources for projecting the lessons, didactical tools used within the lesson, moments of the lesson in which computer was used, didactical methods associated with the content of materials realized and presented by using the computer, interest and pro and against arguments concerning the use of ICT within the lessons.

The starting hypothesis was the following: the use of technologies in teaching-learning of biological sciences is conditioned by the number of hours dedicated to the study of a certain discipline per week, theme of the lessons which must be teached, number of pupils in the class, age and individual particularities of the pupils in the class, and also the interest of students for their integration within the lesson.

The sample used in the research comprised 54 students from the Faculty of Science of the University of Pitesti, in the 3-rd year of study, from the academic year 2009 - 2010, out of which: 17 students in Biology (who have been teaching notions of zoology and ecology), 24 students in Ecology and environment protection (who have been teaching notions of botany and ecology), 7 students in Horticulture (who have been teaching notions of botany), and 6 students in Nursing (who have been teaching notions of human anatomy and physiology).

RESULTS AND DISCUSSIONS

In projecting the lessons, all the practicant students have used the biology manual as primary documentation source. For supplementary information they used the following sources: specialty books (18.51% from the students), specialty atlases (14.81% from the students), information from the Internet sites (70.37% from the students), photographs taken from the Internet (81.48 % from the students) and AeL collection of biology lessons (9.25 % from the students).

Within the lessons they have been teaching, the students have used a large diversity of didactic tools (table 1), taking into consideration the importance of their use in understanding and acquiring of scientific concepts by the pupils.

The data presented in table 1 shows that 37.03% from the students have used during the lessons information stored on electronic support (CD or memory stick) and that 5.55% from them have used the interactive lessons offered by the AeL software. The presentations realized in PowerPoint by the practicant students, comprising texts and/or photographs, have been used for the formation to the pupils of the scientific concepts specific to all the biological sciences studied as disciplines in gymnasium. The AeL interactive lessons have been used only for transmitting knowledge of human anatomy and physiology.

Other aspects considered by application of the questionnaire reffered to moments of the lesson in which the students have used the computer and didactical methods associated to the content of realized and presented materials.

Table 1

Didactical tools used by the students within the lessons

Didactical tools	Biological discipline teached	Students (%)
Plant collections	Botany, Ecology	12,96
Collections of preserved animals	Zoology, Ecology	9,25
Microscopy slides	Botany, Human anatomy and physiology	3,70
Mouldings	Botany, Zoology, Human anatomy and physiology	18,51
Sketches	Botany, Zoology, Human anatomy and physiology, Ecology	64,81
Transparencies, by using the overhead projector	Botany, Zoology	12,96
Photographs printed from the Internet	Botany, Zoology, Human anatomy and physiology, Ecology	46,29
CD, by using the computer/laptop and video projector	Zoology, Ecology	12,96
Memory stick, by using the computer and video projector	Botany, Zoology, Human anatomy and physiology, Ecology	24,07
AeL software, by using the computer	Human anatomy and physiology	5,55

We found that the computer was used in lessons for communication new information, for oral verification of the knowledges acquired by the pupils from previous lesson by 9.25% from the students. A slightly higher percentage of the students (12.96%) have used computer and their own materials for psychological preparation of pupils for receiving of the new contents, while about a third of the practicant students (33.33%) used them for communicating/acquiring new contents, and 18.51% for fixation of the knowledge. In the case of recapitulation and systematization lessons, 3.70% from the students have used own information stored in electronic form for the systematization of the pupil's knowledge within the two lessons of recapitulation which they have realized. In the case of AeL based interactive lessons, the computer and didactical tools were used for transmitting new knowledge by 5.55% from the students, the pupils being tested and evaluated after each of the informational content presented.

Analysing these data, it is obvious the fact that the majority of practicant students who have choosen to use the computer within the lesson, used their own materials for communicating/acquiring new contents (33.33%). Only 9.25% from the practicant students carried out oral verification of the knowledge acquired by the pupils within the previous lesson.

Concerning the didactical methods which the students have associated to the content of presentations made using the computer and Internet, and presented by using the either the computer/laptop and the video projector in various types of lessons or in different moments of the lessons, as shown in table 2, we found that a diversity of didactical methods have been used. Moreover, the practicant students proved originality in creating their own presentations for lessons and also

in applying certain methods of teaching. In the case of AeL interactive lessons, the practicant students have used conversation, and sometimes explanation.

Table 2

Association of didactical methods with the content of materials realized and presented by students within the lessons

The lesson's stage in which computer was used	Didactical methods	Students (%)
Lesson for communication/acquiring new knowledge		
verification of knowledge	conversation	9.25
psychological preparation of the pupils for receiving new contents	conversation	9.25
	problematizarea	3.70
communication/acquiring new contents	explanation, demonstration, observation, conversation	18,51
	observation, conversation, learning by discovery, explanation	9.25
	observation, conversation, problematization, explanation	3.70
	virtual experiment, observation, conversation, explanation	1.85
knowledge fixation	conversation	18.51
Recapitulation and systematization lesson		
recapitulation of the content based on an established plan	conversation, explanation	3.70

Concerning the interest of students in using ICT within the lessons, 61.11% of them prefer to use the computer as support for teaching based on their own materials, 18.51% prefer to use the AeL interactive lessons, while 20.37% did not want to use the computer and ICT within the lessons.

From the questioned students, 61.11% considered that it is easier to use the computer as support for teaching, using their own materials, than using AeL lessons, the reason being that in the case when only one hour is allocated to that discipline is difficult for the other students who are following them to practise teaching, to return to notions which proves to be not enough understood by the pupils. As an disadvantage of the use of computer was mentioned the fact that the repeated application of the same scenario of the lesson lead to boring and monotony. Therefore, some contents are better understand by the pupils if some other didactical methods and tools are used.

Among the advantages of using AeL lessons, the practicant students mentioned presentation of some virtual experiments and simulation of some human physiological processes, which otherwise can not be observed. As disadvantages of using AeL lessons, the students have mentioned the following: prolonged activity with the computer is affecting the sight of pupils; too many pupils are working with a single computer, and if one of them is finishing earlier an instruction sequence, he is disturbing the rest of pupils; the pupils have not enough space to take notices; some tests can be correctly solved by the pupils even by moving the mouse at random, without knowing the informational content.

CONCLUSIONS

The students are considering that:

1. ICT can be used:

- in projecting the lessons:
  - for supplementary documentation;
  - for preparing PowerPoint presentations.
- in teaching-learning biological sciences:
  - for presenting their own materials carried out in PowerPoint, by using the videoprojector in the laboratory of biology or in the classroom; in this case, the students can use a diversified methodology for presenting original materials;
  - by using AeL interactive lessons, in the laboratory of informatics.

2. is easier to use the computer as a support for teaching, than AeL lessons; at the end of first pedagogical practice, the percentage of students interested in the use of computer within the lessons increased

3. the use of ICT within the lessons during the first pedagogical practice has:

- advantages, such as: the presentation of some virtual experiments and simulation of some human physiological processes;
- disadvantages, such as: the case when only one hour is allocated to that discipline; affecting the sight of pupils; too many pupils are working with a single computer; the pupils have not enough space to take notices; some tests can be correctly solved by the pupils even by moving the mouse at random, without knowing the informational content.

In order to optimize projection and realization of the lessons would be recommended for the practicant students to study additionally the biology lessons from the INTUITEXT colection and the cooperation among the students who are using ICT in teaching and the other students, who are avoiding to use their own material for presenting informational content of the lesson although they are able to create it.

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CURRICULAR DESIGN BASED ON RATIONAL STRUCTURAL PATTERNS

PROIECTAREA CURRICULARĂ BAZATĂ PE MODELE STRUCTURALE RAŢIONALE

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Abstract. *Curricular design represents today one of the major concerns for education sciences specialists as well as for the teachers involved in regular instructional actions. In this challenging context, the present paper aims at exploring some of the most important ways of instruction projection. It begins with a series of projection models launched by specialists from the Anglo-Saxon area who consecrated a certain style which has to be followed in the process of curricular projection. The perspective proposed within this paper originates in the Model of Rational Projection launched by Ralph W. Tyler and follows the evolution of instruction curricular projection. The author has in view the foundamentation of curriculum at school decision, the opening towards non-formal and informal resources, the elaboration of unitary lines of educational policy, the orientation of the educational system towards competences development, as well as centering the instructive-educative process on the learner.*

Key words: curriculum design, rational projection, reconceptualization

Rezumat. *Proiectarea curriculară reprezintă astăzi una dintre preocupările majore atât a specialiştilor în ştiinţele educaţiei cât şi a cadrelor didactice implicate în desfăşurarea curentă a procesului instructiv-educativ. În acest context provocator, articolul de faţă îşi propune să exploreze unele dintre cele mai importante modalităţi de proiectare a instruirii. Pleacă de la o serie de modele de proiectare lansate de specialişti din zona anglo-saxonă care au consacrat un anumit stil ce trebuie urmărit în procesul proiectării curriculare. Perspectiva propusă în cadrul acestei lucrări porneşte de la Modelul proiectării raţionale lansat de Ralph W. Tyler şi urmăreşte evoluţia proiectării curriculare a instruirii. Se are în vedere fundamentarea curriculumului la decizia şcolii şi deschiderea spre resurse nonformale şi informale, elaborarea unor linii unitare de politică educaţională, orientarea învăţământului spre formarea de competenţe, precum şi centrarea procesului instructiv-educativ pe cel ce învaţă.*

Cuvinte cheie: design curricular, proiectare raţională, reconceptualizare

INTRODUCTION

Curriculum design represents today one of the most important concerns for specialists and practitioners in the sciences of education field. It is a main

trend in education evolution constituting itself in a curriculum paradigm that implies an axiomatic argumentation. (S. Cristea 2003, p.221). According to *The International Encyclopedia of Education*, this thing presupposes a concentration and expanding area that can be found in the following components:

1. theoretical foundations that sustain the educator – educated correlation in a social and open context,
2. educational purposes assumed at the system level (aims) and at the process level (objectives),
3. the selected and pedagogical organized contents,
4. teaching and learning methodologies,
5. evaluation/self-evaluation methods and techniques integrated in the teaching/learning strategy (1994, p. 1147).

For these reasons, as a main trend in the evolution of education, curriculum design represents an axiomatic value for the entire educational system that allows the orientation of the proposed activities toward life long learning and self- education, the premise for full capitalization of the maximum potential of educability of every human personality.

Recent studies offer the teacher a central role in curricular design, as he/she takes all decisions in the class. According to J. Snyder, F. Bolin, et all. (1992, p. 402-435), it is because curriculum design represents "the educational experiences created by teachers and students together". Therefore, curriculum presupposes "a network of relations" (Fried R. L., 2001), specific of the way teachers and students position themselves in the content of learning.

For Dewey (1902), curriculum gains the sense of a pedagogical project organized by correlating disciplines with direct or indirect learning experiences of the student, extended beyond the formal environment. This perspective on curriculum is to be developed later on by F. Bobbitt (1918) who relates curriculum to an assembly of objectives (abilities, attitudes, and knowledge), necessary for realizing the activities specific of education. F. Bobbitt's perspective is extended by W. W. Charters (1923) who proposes a structure of curriculum that lies on concrete objectives and activities established by social consensus at the level of the community.

This perspective lies at the basis of our research and it aims at outlining the axiomatic and epistemic character of the curricular design.

MATERIAL AND METHOD

Our research is founded on qualitative strategies, combining the content analysis, the qualitative data analysis and the study of specialty documents. From this perspective, understanding the curricular model proposed by Ralph W. Tyler starts from four questions, which must find an answer in the curricular design:

1. What educational aims should school attain?
2. What educational experiences can be offered for attaining these goals?
3. How can be educational experiences effectively organized?
4. How can we determine whether these goals are fulfilled?

Starting from here, with the help of the answers offered to these four questions, the principles which fundaments any curriculum design are established.

Therefore, the rational model of curriculum design does not limit the behaviors required from students as regards realizing the specific activities, but creates strategies of thinking, action and reaction schemes, ways that allow for a profound development of student's personality. The expected results represent fundamental ways of cultivating models of problem solving as well as reaction types to diverse educational situations.

The objectives established are general, representing ways of thinking and social skills. If we consider efficiency, we aim at multiple results obtained from objectives generally, formulated and logically integrated, aspects, which, oftentimes, are not taken into, account by the critics of the curriculum rational design. In curricular construction, development and design the authors should take into account all these data while establishing the objectives and the way in which they all can be initially established or formulated (others) during the activity depending on he efficiency offered by the continuous process of evaluation.

Ralph W. Tyler's model has been extended by Hilda Taba (1962, p.12), who applied and refined the rational design, adding more steps:

- diagnosis of needs
- formulation of objectives
- organization of objectives
- selection of learning experiences
- organization of learning experiences
- determining the object, ways and means of evaluation realization.

Adding the realization of a diagnosis of needs before establishing the objectives and their subsequent organization, the author realized a higher flexibility of curricular structural sequences.

He argues in favor of the interaction between these steps rather than their order, observing that teachers do not follow the order proposed by the model in curricular design, but they have individualized ways of approaching elements specific of these models (C. Mutch, 2003, p.80).

RESULTS AND DISCUSSIONS

An analysis of curriculum should be based on the fully understanding of what happens in schools, to lead to justified modifications while they occur but to also evaluate the intended results in order to make us understand what happens, being able to progress. M. Skilbeck (1976) describes three variants of curriculum design: the deductive rational design, the interactive rational design and the intuitive model.

1. *The deductive rational design*. It fits a centralized curricular system where the objectives of educational policy, the detailed programs, learning resources, evaluations, personnel are hierarchical controlled from the center. The fundamental mission of school is to interpret central indications. The strong points of this design are: establishing clear goals and roles anticipation, a balanced distribution of resources, objective evaluation, evaluation reserve at the level of the system as a premises of efficiency and effectiveness of the programming action (*ibidem* p.157-158).

2. *The interactive rational design*. It can be found in a mixed situation, where more participants, including local authorities, teachers and sometimes parents and students, take decisions. This design benefits of supplementary resources for learning and counseling systems. Evaluation is partly under teachers' control and learning is centered more on problem solving. Teachers have a more complex role than in the previous design to the extent to which they have to form competences which are related to the curricular development, such as: the capacity of working with objectives, self-reflexive critic, team work skills, the ability of optimal formative and summative evaluation depending on the context.

3. *The intuitive design.* It requires teachers' immediate judgment, spontaneity, inductive processes and creativity. Within this design, the class becomes the context in which decisions are to be taken. Objectives cannot be predetermined, as the concrete learning experiences have not taken place. The representatives of this type of curriculum projection are Neill, Goodman and Freinet. Intuitive judgments replace the rational planning of curriculum and teachers' qualities group in the area of knowledge, integrity, vitality and less in the area of management, organization, taking formal decisions.

All these models, designs present diverse possibilities which can substitute each other depending on concrete action contexts. The decisions to be taken will never correspond exclusively to one or another of these models. If we consider, for instance, the active role-played by the teacher in education, we have another reason to choose the rational-interactive design. If we consider student's integration in social life, the rational-deductive design is preferred.

The design promoted by Malcolm Skilbeck is the rational-interactive one which presupposes not only simple adjustments previously made to some elements of the curriculum, but also a total, global and efficient planning. We can estimate the model proposed as a starting point (J. Walton, J. Welton, 1976, p.15) for describing in detail the major components implied by the interactive rational planning, as well as becoming a useful design for schools in various contexts specific of post-industrial society.

The curricular projection design includes several componets, such as: rationing or mission, goals, the nature of the content, students and their relations with the content, general objectives (other than the goals). The most important, which cannot lack from a curricular project are the first three:

Mission represents the axiological position of the school, with an adjustment role. It has to start from an extended defining of curriculum, "including all the learning processes which take place in the formal, non-formal and informal environment" (J. Walton, J. Welton, 1976, p.20). Therefore, curriculum becomes that content and process which produces learning with a personal and social significant educational value. It includes all that is taught and the means of teaching, as well as all that contributes to forming values,

feelings, interpersonal relations from the perspective of efficient instruction and continuous evaluation required in a psychological and social context.

R. W. Forward (apud J. Walton, J. Welton, 1976, p.28), using the principles of the curriculum rational design proposes a model of adapting/renewing of curriculum in the context of a permanent changing society. He begins from the idea that school has to be child-focused. In order to do so, the process of curricular development starts with:

- aligning the general goals to the exigencies of the social environment. The general goals should incorporate the central philosophy of the respective school in areas such as intellectual-academic, physical, of social and personal development as well as the aesthetic one (1976, p.30). They should be classified depending on the importance and priority offered to a certain field or educational approach.

- emphasizing the requests, exigencies or restrictions necessary to goals achievement. It presupposes learning individualization, cooperation and teamwork, considering child's needs, rethinking the role of the teacher as regards the control of student's activity. Of equal importance are the necessary resources, the means of implementing the concept of team teaching, the capacities of curriculum projection by teams of teachers.

- redimensioning the necessary resources and the context in which curricular activities are unfolding. According to J. W. Welton (1976, p.132) curricular planning and development should be seen as a continuous process.

The elements presented show the complex interrelations which appear in the process of curricular development, between curricular theory and practice.

CONCLUSIONS

1. This way of curriculum approach is very systematic and has a strong organizing force. The centre of this approach is the formulation of behavioral objectives, which offer a clear image of the results so that the contents and methods can be organized and the results evaluated.

2. In curricular projection, after clarifying the objectives and after establishing the ways of contents structuring an important role is played by the activities to be unfolded for attaining the objectives proposed.

3. It is important to see which are the activities unfolded within the curriculum and how it contributes to fulfilling the final goals.

4. The designs representative of curriculum projection can serve to various goals and usages.

5. The ones that centers on the conceptualization of various curricular aspects leads to designing an action model or a plan;

6. Some will be applied for solving concrete tasks such as those focusing on recreating the consensus at the level of the pursued objectives; others will be centered on solving problems regarding curricular development.

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INTEGRATED PERSPECTIVES ON SCHOOL BASED CURRICULUM

PERSPECTIVE INTEGRATE ASUPRA CURRICULUMULUI LA DECIZIA ŞCOLII

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Abstract. *The new curricular vision of present education brings the necessity of adapting school curriculum at the needs of the community the school institution serves. In this context, the problem of curricular offer the school has to analyze requires a special attention. The present paper aims at emphasizing the ways through which school curriculum can be adapted and realized in order to satisfy this desideratum. School based curriculum becomes therefore the main link instrument between school organization and community. It answers the exigencies of education post-modernity of integrating, at the level of curricular projection, the non-formal and informal context. The study focuses on the concrete ways of integration, at the level of school based curriculum, of all forms of social organization of education. It is also highlighted the methodological dimension of CSD by stressing the existent relations between the sources of curriculum and the didactic strategies used in the class.*

Key words: curricular design, postmodern curriculum, school based curriculum

Rezumat. *Noua viziune curriculară a educaţiei actuale aduce în prim planul preocupărilor necesitatea adaptării curriculumului şcolar la nevoile comunităţii pe care instituţia şcolară o deserveşte. În acest context, problematica ofertei curriculare pe care şcoala trebuie să o realizeze necesită o atenţie deosebită. Lucrarea de faţă îşi propune să evidenţieze modalităţile prin care curriculumul şcolar poate fi adaptat şi realizat pentru a satisface aceste deziderate. Curriculumul la decizia şcolii devine astfel, instrumentul principal care leagă organizaţia şcolară de comunitate. El răspunde punctual exigenţelor postmodernităţii educaţiei de a integra la nivelul proiectării curriculare contextul nonformal şi informal. Articolul se centrează asupra unor modalităţi concrete de integrare la nivelul curriculumului la decizia şcolii a tuturor formelor de organizare socială a educaţiei. Este accentuată şi dimensiunea metodologică a CDŞ prin evidenţierea relaţiilor existente între sursele curriculumului şi strategiile didactice folosite în clasa de elevi.*

Cuvinte cheie: curriculum la decizia şcolii, curriculum postmodern, design curricular

INTRODUCTION

Curriculum post-modernity begins with the revolution proposed by Ralph W. Tyler's design (1949). This period will produce multiple approaches of curriculum theory and methodology. We can position the various conceptions in this period in two stages:

- the stage of elaboration and application from the perspective of permanent education (1950-1980)
- the stage of designs multiplications from contesting the rational design to rethinking it (1980-1990).

Having in view an argumentation of an axiomatic type, S. Cristea (2003, p.221) analyzes the paradigm of curricular projection and presents it as a fundamental direction of education evolution.

Therefore, curricular projection presents an axiomatic value available at the level of the whole educational system, allowing for the orientation of the activities proposed in the direction of permanent education and self-education, the premises of the fully capitalization of educability of every human personality.

This perspective represents one of the reasons for which our research refers to the delimitation of the axiomatic and epistemic design of curricular projection and its effects on curriculum at school decision.

Latest studies (Clandinin & Connelly, 1992, Schoonmaker, 2002; Schwab, 1969/1997) offer teachers a central role in curriculum projection (curriculum making, curriculum enactment), they being those who take decisions at the level of the class. According to J. Snyder (1992, pp. 402-435), it is because of the fact that curricular projection represents "the educational experiences created by teachers and students together". Therefore, curriculum presupposes "a network of relations" (Fried R. L., 2001) of the way teachers and students position themselves towards the content of learning.

The present paper aims at emphasizing the ways through which school curriculum can be adapted and realized in order to satisfy these criteria. The curriculum paradigm offers the vision and the necessary guidelines for designing the CSD.

MATERIAL AND METHOD

The research pursued qualitative strategies combining the content analysis, the qualitative analysis of data and the study of specialty documents. Having this perspective on the object and methodology specific of curriculum, it requires a hermeneutical approach. It represents the major way through which the esentialization of the object research can be provided.

A clear epistemic object, stabilized and consolidated at the level of globality and depth cannot be recognized through empirical methods borrowed from the experimental model specific of nature sciences (S. Cristea, 2004, 2006, 2007).

Only if we have in view such vision, curriculum at school decision will answer the necessities of the open educational context in which manifests school nowadays. According to S. Cristea (2004, p.4), post-modernity, regarded as a cultural pattern, promotes a new way of understanding the relation between knowledge and experience, between theory and practice at the level of human action. It presupposes the permanent reconstruction of the necessary correlations between the main actions at the level of educational processes and their individualized development in psychosocial contexts and situations that are extremely variable and diversified.

As regards the content, curriculum is related to student's learning experience. Only in this way the traditional pedagogy will be surpassed, pedagogy within "the textbook and the teacher compete in order to present the child the study object as it

appears for the specialist" (J. Dewey, 1902). Curriculum is understood as a pedagogical project organized by correlating the study disciplines with the student's direct and indirect learning experiences, extended beyond the formal environment.

This vision adapts the school matter to child's experiences and life environment. Therefore, curriculum at school decision serves these finalities by offering more flexible instruction activities and their higher educational capitalization.

In the context of capitalization, equally of the formal, non-formal and informal environment, the activities programmed, which involve school responsibility in the direction of individual, psychological and social development of student's personality become possible.

RESULTS AND DISCUSSIONS

The definition and choosing the educational objectives of curriculum cannot avoid the informal-local community the student lives in. Therefore, the curricular project of the school contains the result of negotiations with local authorities that can estimate the requirements of the labor market, the interests of the companies such as students' optimal integration in society to be realized.

If we consider the curriculum at school decision (CSD), its projection starts from identifying students' needs and researching their interests. They constitute in a source of education goals. Taking into account students' interests in learning results is caused by considering education "an active process which involves the active efforts of he who learns". The main goal is that of involving the student (based on his interests) in the process of education; it is justified by the fact that "when school situations present interesting elements for he who learns, he will actively get involved and will learn to treat them efficiently" (R. Tyler, 1949, p.11).

School should not limit to students' interests in certain areas of study, especially because they can vary depending on the various stages of development. It should widen and deepen students' interests such as they can continue their studies after finishing their formal training. Therefore, the openness towards permanent education and instruction is anticipated.

An efficient variant is that in which the interests represent the starting point of instruction and their lack can be the reason for realizing education.

The guiding idea to be followed is that of defining students' training needs that have to be met (*ibidem* p.13). Curriculum at school decision can be realized through certain research methodologies and strategies such as:

- the social investigation at the level of the community the students belong to hat has to identify the generality or specificity of the needs; this method could offer a series of data about school activities, social relations, school habits etc.

- interviewing students and parents. Informal data can be obtained, data about the way students think, about their attitudes, life philosophy, by realizing questionnaires regarding attitudes, interests, needs, abilities etc.

The results of these investigations related to the socially accepted standards and norms should represent a solid basis for formulating objectives and structuring curriculum at school decision.

CONCLUSIONS

1. Postmodern curricular projection offers the informal context an important role, including the learning experiences offered by school as well as those realized outside school by the student in the environment that represents a major part of his development.

2. Therefore, it is promoted the extension of learning experience offer towards those outside school, they representing an important source of curriculum at school decision.

3. We should identify the extent to which researches can offer viable data or the weight schools (individually, locally, regionally) can hold in establishing the priorities of the local curriculum. The projection of curricular objectives represents the crucial moment of CSD. If the objectives do not reflect all these determinations, the resulted curriculum will not be efficient.

4. Establishing curricular objectives represents a principle that should be reflected in CSD projection and not the elaboration of a predetermined and abstract set of objectives.

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LA LECTURE DES IMAGES – MOYEN DE DEVEPOPPEMENT DE LA CAPACITE LANGAGIERE

LECTURA DE IMAGINI - MIJLOC DE DEZVOLTARE A CAPACITĂŢII DE COMUNICARE

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Abstract. *The paper presents the part played by fixed and mobile images in foreign language teaching-learning. The functions they meet lead to affective, emotional or participative reactions. In this respect, we perform a description of the manner that textless images are employed, as well as text-accompanied, cropped or complete ones, only to finally present the importance of film exploitation, which essentially resides in meeting the oral-writing-image complementarity need.*
Key words: images, communication ability, film

Rezumat. *Lucrarea de faţă prezintă rolul pe care îl joacă folosirea imaginilor fixe şi mobile în predarea- învăţarea unei limbi străine. Prin funcţiile pe care le îndeplinesc, ele provoacă reacţii afective, emotive, participative. Descriem apoi modul în care se utilizează imaginile fără text, cele însoţite de text, imaginile trunchiate şi cele complete, pentru ca în final să prezentăm importanţa exploatării filmului care este aceea de a răspunde nevoii de complementaritate oral- scris- imagine.*
Cuvinte cheie: imagini, competenţă de comunicare, film.

INTRODUCTION

L'étude d'une langue étrangère a comme but principal le développement de la compétence de communication.

La gamme de documents utilisables dans la classe de langue est très grande. Aux méthodes didactiques d'étude de la langue et aux cours télévisés, on peut ajouter des documents que le professeur produit lui-même, en fonction des objectifs établis. Pour les méthodes didactiques et les cours télévisés, le but didactique n'en est pas un simple divertissement. On vise l'apprentissage à long terme suivant une progression linguistique, l'organisation du plus simple au plus complexe. Il faut également envisager les difficultés d'utiliser un seul épisode hors de son contexte : chaque leçon se constitue dans un élément d'apprentissage, caractérisé parfois par la pauvreté de l'image et même des dialogues. L'aspect didactique en est très apparent et peut provoquer un certain ennui surgi de la lenteur ou de la lourdeur des répétitions, du manque de spontanéité. Tout est mis au service du verbal: bon modèle linguistique, mais peu naturel.

Au pôle opposé se situent les émissions télévisées et les documents authentiques (par exemple, le reportage). Celles-ci témoignent d'une grande diversité (publicité, feuilleton, journal télévisé…) et ont comme but premier celui

de divertir avec des histoires. L'objectif en est de toucher, de se faire comprendre d'un très grand nombre de personnes, d'où une certaine redondance image/son, un certain langage standard. Y sont présents et visibles des conventions socio-culturelles (connivence, complicité entre le document et le spectateur, recours à des clins d'œil) et des normes techniques qui découlent des conventions classiques de montage et de style.

MATERIEL ET METHODE

Dans la pratique de l'enseignement - apprentissage d'une langue étrangère, il est indiqué d'utiliser fréquemment les images (fixes et mobiles) parce qu'elles ont une fonction ethno pédagogique et culturelle particulière; elles provoquent des réactions affectives, émotives et participatives. Pour ce qui est du type choisi, on peut opter entre schémas, graphiques, tableaux, plans de villes et de quartiers, reproductions de peinture et de photo romans, dessins humoristiques. La question qui se pose est comment «lire» et «interpréter» les images? En voilà quelques suggestions:

a) L'image seule (sans texte)

- approche dénotative (utilise la description, elle est «neutre»)

Il faut identifier:

- le support: s'agit-il de la reproduction d'un tableau, d'un dessin, d'un montage d'images, d'une photo,…?
- l'origine: même si elle est souvent imprécisable, elle donne des indications sur l'émetteur et le destinataire
- la composition: le cadrage est-il centré sur un décor, des personnages, des objets? Pour la mise en page utilise-t-on des techniques cinématographiques d'angles de prise de vue? Peut-on décrire ce que l'on voit au premier, au second, à l'arrière plan? Les couleurs sont-elles chaudes (dominantes de rouge, jaune), froides (bleu, vert), vives ou atténuées?
- la représentation: il s'agit de décrire les personnages (nombre, sexe, âge, habillement, actions, gestes, regards), les objets et le décor, d'indiquer leur rôle.
- Approche connotative (elle est influencée par notre perception du monde)

Il s'agit de:

- la lecture contextuelle: l'image d'une plage bordée de palmiers, par exemple, ne sera pas perçue de la même façon au mois de juin ou au mois de décembre. En plus, elle sera lue différemment par les habitants d'un pays tropical ou par les Nordiques.
- les facteurs socio- culturels: la lecture sera influencée par notre connaissance du sujet, l'interprétation de l'image dépendant de l'expérience du lecteur.
- les facteurs personnels: suivant les sensibilités individuelles, une image peut provoquer des réactions diverses: dégoût/plaisir, colère/enthousiasme,…
- la lecture symbolique: pour les chrétiens, par exemple, l'image d'une pomme est le symbole de la perte du paradis, etc.
- la notion d'indice qui génère des énoncés sur ce qui n'est pas présent dans l'image: par exemple, la fumée fait parler du feu…

La synthèse de ces deux approches et l'association de certains facteurs précisent, pour tout lecteur, le sens du message que l'image lui délivre. On peut dire que l'image est polysémique.

b) L'image accompagnée de texte

Dans ce cas, il y a quelques éléments de plus qui doivent être pris en considération:

- la forme: l'écrit utilise l'image de sa mise en forme par la calligraphie, la typographie (grosseur des caractères, italiques,…), la ponctuation et la disposition du texte.
- l'ancrage: le texte «ancre» le sens de l'image, réduit considérablement le champ des interprétations. Il peut être redondant par rapport aux informations données, ou bien, il ne fait que répéter le message délivré par l'image. Le texte et l'image s'illustrent l'un l'autre.
- le relais: le texte apporte d'autres informations. Il identifie les lieux, les personnages, il est complémentaire à l'image, il ouvre le sens.

Il est évident que le texte, bien qu'il permette d'accéder à un sens plus précis, réduit considérablement la polysémie de l'image.

Exemplification: Analyse d'images

- niveau: moyen
- aptitudes mises en œuvre: expression orale, formulation de phrases, formulation d'hypothèses et de certitudes.
- objectifs : faire découvrir deux niveaux de lecture : la dénotation et la connotation, montrer que la juxtaposition des deux images permet de confirmer ou d'infirmer les suppositions (de réduire le champ des interprétations possibles) et d'amorcer le récit.
- démarche en deux temps

1. travailler sur l'image tronquée. On aura préalablement caché la partie gauche, ne laissant voir que la photo de la jeune femme et non pas son portrait. On présente l'image et on énonce devant les étudiants la consigne: «vous devez donner le maximum d'informations concernant cette photo. Ne faites pas de phrases trop longues» On fixe un délai temporel pour le travail des étudiants et ensuite on procède de la manière suivante:

- on écrit toutes les productions au tableau noir
- on fait ensuite distinguer tout ce qui appartient au domaine des certitudes (ex.: c'est une femme âgée de 20-30 ans, brune, aux yeux noirs; elle a une queue de cheval, des sourcils très noirs; elle porte un vêtement sombre) et tout ce qui appartient au domaine des suppositions (elle est triste, rêveuse, elle a sans doute un problème, elle s'en va, elle est mannequin,…)

On opère une activité de classement, pendant laquelle chacun doit justifier son énoncé.

2. travailler sur l'image complète. Il s'agit de découvrir la partie cachée et de demander aux étudiants de la décrire (portrait dans un cadre, accroché au mur, représentant une jeune fille de profil gauche, brune, aux sourcils longs et bruns, aux cheveux longs, au nez droit,…) et d'interpréter ce qu'ils voient (le portrait de la jeune fille de droite qui tourne le dos à son portrait,… on dirait un Picasso,…; elle tourne peut-être le dos à un passé, elle est peut-être triste que Picasso soit mort, c'est peut-être sa femme,…elle doit refaire sa vie sans lui,…c'est pour cela qu'elle a un visage grave,…)

Il faut donc, distinguer deux dominantes: la description et l'interprétation. Il faut également faire prendre conscience aux élèves que deux images juxtaposées permettent de préciser le sens de la première et d'amorcer le récit.

Un possible «prolongement» sera le suivant: on distribue aux étudiants une autre série d'images; on demande à chacun d'en choisir deux et de composer une histoire courte à leur sujet.

RESULTATS ET DISCUSSIONS

De nos jours, lorsque la culture par l'image est devenue hégémonique, il faut accorder plus d'importance au film répondant ainsi au besoin de la complémentarité: oral- écrit -image. L'intérêt pédagogique de l'image dans la classe est très grand parce qu'on introduit la variété et les enseignants d'aujourd'hui doivent militer pour la variété professionnelle. Pourquoi l'importance du film devient de plus en plus grande? Parce que, dans un premier temps, l'utilisation du film sert comme support d'élocution: construction des phrases, enrichissement du vocabulaire. Dans un deuxième temps, il peut servir comme exercice de lecture, mais cette fois-ci l'observation doit être exacte. Troisièmement le film sert comme support de grammaire:

Je crois		parce que	
Je suppose		puisque	
Je pense	Hypothèse	comme	Cause
Je dirais		car	

Dans un dernier temps, le film peut être lanceur de rédaction. Par exemple on a le point de départ (l'amorce) et puis il faut continuer, il faut avoir une suite logique. On peut continuer dans l'imaginaire, par exemple un conte de fée.

L'avantage du film c'est qu'il peut y avoir un grand public, mais il faut:

1. il faut travailler sur des séquences très courtes et de la sorte on regarde le film plusieurs fois;
2. il faut bien choisir les films;
3. li faut maîtriser le rythme;
4. il faut lire exactement;
5. la lecture du film doit être active et non pas passive comme à la télé;
6. il faut travailler dans la rigueur.

Le professeur peut intervenir, il prépare, conduit un échange, demande des réponses justifiées de même qu'un regard affûté. Ce qu'il cherche c'est de susciter l'intérêt, de réfléchir.

En utilisant le film, on a toutes les forces en présence: le film, le groupe, le professeur. Il ne faut pas raconter le film avant de le voir, mais il faut laisser le film travailler, il faut laisser la force du groupe. On partage la classe en plusieurs groupes avec des consignes précises et ainsi la lecture sera bien plus riche. La lecture doit être structurée et conduite par le professeur qui est l'animateur du groupe. Il doit savoir conduire le travail.

1. lanceur- inducteur- provocateur
   défi aux idées reçues
   film- questions- film à problèmes- film énoncé
2. bilan partiel- illustration-
   contrepoint par rapport à l'amont- renforcement
   apport d'information complémentaire
   reformulation- relance
3. bilan- synthèse- variante- relance
4. film lu mais pas exploité ce jour

travail individuel hors groupe
ouverture

5. référence à ce film vu auparavant par tous
6. référence à un film qui sera vu par tous.

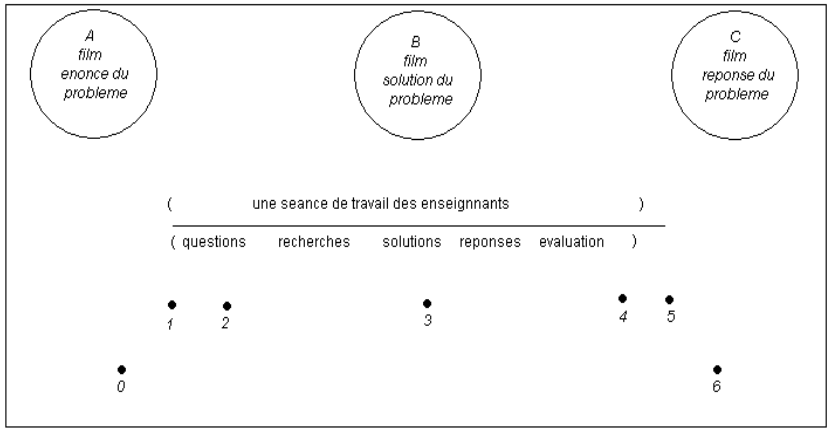

Fig. 1. Fonction du film et moment d'utilisation dans une stratégie pédagogique de formation

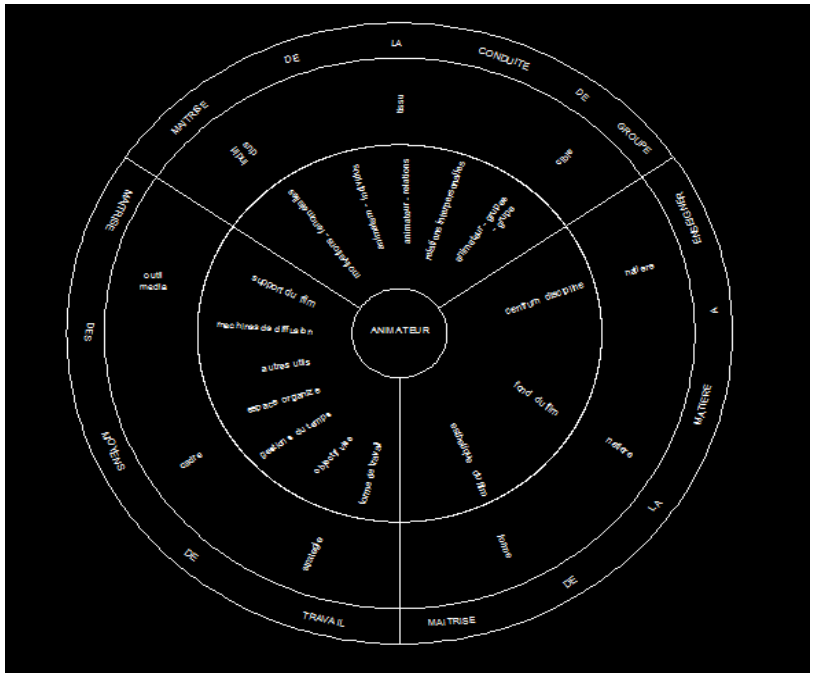

Fig. 2. Exploitation du film

CONCLUSIONS

1. Pour assurer le développement de la capacité langagière, il faut utiliser une gamme variée de documents si possible authentiques. Par leurs fonctions ethno pédagogiques et socio culturelles, les images provoquent des réactions affectives, émotives et participatives.

2. Les images fixes et mobiles, les images accompagnées de texte ou sans texte, les images tronquées ou complètes, si on sait les lire et interpréter ce sera sans doute un instrument précieux dans le développement de la capacité langagière.

3. Dans la stratégie pédagogique de formation et l'exploitation du film, les deux schémas ont un rôle essentiel et sont un aide précieux pour tous ceux qui voudraient utiliser cette méthode.

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"CROSS-COMPLIANCE" - A SELECTIVE TERMINOLOGICAL APPROACH WITHIN THE COMMON AGRICULTURAL POLICY IN ENGLISH VS. ROMANIAN

"CONDIŢIONALITATEA ECOLOGICĂ ŞI SANITARĂ" - ABORDAREA TERMINOLOGICĂ SELECTIVĂ ÎN CADRUL POLITICII AGRICOLE COMUNE ÎN LIMBA ENGLEZĂ ŞI LIMBA ROMÂNĂ

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Abstract. *Among other practical dimensions, the Common Agricultural Policy (CAP) also resides in the translation, interpretation and application of the community acquis. These are decisive steps towards the true integration of our country within the EU structures. As such, the accuracy of translation and interpretation cannot be reached but through the qualitative exploration of legal documents and by establishing translation and interpretation standards. These standards can shed light on any confusions triggered by several possible translation variants. The approach of the "cross-compliance" concept provides with such a model for literal and contextual interpretation, as well as the setting of a translation standard, considered to be "condiţionalitate ecologica". Setting such translation and interpretation standards can only ease the way towards a unitary interpretation of the CAP, its apprehension, as well as CAP application, the access to the benefits and responsibilities of this European policy.*

Key words: cross-compliance, translation accuracy

Rezumat. *Traducerea, interpretarea şi aplicarea acquis-ului comunitar în domeniul Politicii Agricole Comune (PAC) sunt paşi decisivi în procesul de integrare al României în structurile Uniunii Europene. Astfel, acurateţea traducerii şi interpretării este un deziderat care nu poate fi atins decât prin explorarea terminologică calitativă a documentelor legislative şi elaborarea unor standarde de traducere şi interpretare. Acestea pot spulbera orice confuzii generate de multiple variante posibile de traducere. Abordarea conceptului de "cross-compliance" oferă un asemenea model de interpretare literală şi contextuală, dar şi de elaboare a standardului de traducere, stabilit a fi "condiţionalitate ecologică şi sanitară". Elaboarea mai multor astfel de standarde de traducere şi intepretare nu poate decât facilita interpretarea unitară a PAC, înţelegerea ei, familiarizarea cu PAC în procesul de informare, dar şi în aplicarea PAC, accesul la beneficiile şi responsabilităţile acestei politici europene.*

Cuvinte cheie: condiționalitate ecologică şi sanitară, acurateţea traducerii

INTRODUCTION

When considering the legislation and complex mechanisms of the Common Agricultural Policy (CAP), the European debate operates with PAC terminology (with economic, agricultural and environmental terms). Towards

complete European integration, the apprehension of these terms by decision and law-makers, specialists involved in interpreting, translating or popularizing this policy, agricultural producers, rural population and, to a certain extent consumers, is certainly necessary. Knowledge of CAP terminology is essential within the legislative process, for the regulation of this domain, in CAP application and finally, for an access to CAP and its mechanisms.

MATERIAL AND METHODS

This paper is part of a larger integrated analysis of CAP terminology and approaches the analysis of a single concept- "cross-compliance" (~criteria, ~requirements, ~conditions, ~standards) throughout the CAP material scrutinized, on a comparative basis, in English and in Romanian. In this respect, the EC Regulation 1782/2003 was initially analyzed, as it offers an integrated image of the entire community acquis regarding "cross-compliance". In addition - within this qualitative approach – legislative texts (48 Directives and Regulations on "cross-compliance"), impact studies and bibliographical material were also analyzed, according to generality, importance and relevance criteria, as well as European, national and regional specificity.

The analysis can proceed from two complementary methods of general approach, interpretation and analysis of (CAP) legislative texts and terms. Therefore, we can make use of the literal method, according to which, the meaning of concepts and thus, the meaning of legislative texts is given by words and not the context. This method has a limited use, because on the one hand, law provisions are equally authentic in all EU official languages and linguistic differences make it difficult for a unitary interpretation, while on the other hand, community law consists of general terms and thus, an overall meaning assessment becomes difficult. The second interpretation method for community law terminology is applied to the context and it is closely related to the intention of the authority issuing the document under discussion.

Within this methodology for an extensive approach and interpretation of community texts, the analysis undertaken aims at clarifying a term, an operating concept and eventually the language of CAP texts. Furthermore, the compatibility degree in the two languages will be evaluated. In this respect, we will not limit ourselves to the strict translation of the term, but essential reference should be made to the definition, the significance of this term for each of the two languages, within the text it belongs to, within the specific domain that it belongs to, according to the situation of this specific domain when the act was issued and eventually according to the intention of the emitting authority. These elements will be approached selectively, due to space restrictions, bearing in mind that this research is part of a more extensive, complex and more comprehensive research study.

Furthermore, the analysis will show if meanings in the two languages coincide, the similarities, the differences, accompanied by their adequate motivations and explanations. This critical approach will eventually signal possible ambiguities arising in the employment of this term (if it proves to have distinct meanings in the two languages), within the context of a certain legislative text. Finally, this analysis will lead to spotting or foreseeing certain difficulties in the interpretation and application of this legislative text, as a consequence of its inaccurate employment in Romanian.

RESULTS AND DISCUSSIONS

Literally, "compliance" as a general individual term, is defined as: "conforming to a specification, standard or law that has been clearly defined; an act of willingly carrying out the wishes of others" (The American Heritage Dictionary of the English Language, 2000) or "a form of direct motivation, which relies on the use of extrinsic rewards and punishments"(Oxford Dictionary of English, 2005) or finally a "regulation, in management, namely the act of adhering to and demonstrating adherence to laws, regulations or policies" (www.en.wikipedia.org.). In Romanian, "compliance" is translated as "consimţământ, asentiment, învoială; îngaduinţă, flexibilitate, maleabilitate; concesie, cedare, supunere; complezenţă, ascultare; respectare, conformare, conformitate"(English-Romanian Dictionary, 2004). In order to suit the context at hand, the last translation bulk of "respectare, conformare, conformitate" should be insisted upon and can thus be defined unitarily as "punere de acord, adaptare, supunere unui ordin, legi, urmarea unor prevederi, potrivire, concordanţă" (DEX, 1998) (=an accord, adaptation, submission to an order, law; the adherence to certain provisions, concordance, congruity, adjustment to certain provisions).

If we move further and approach the specific term of "cross-compliance", it is of rather recent nature. It emerged as a defining element of the 2003 CAP reform, namely EC Regulation 1782/2003. It was not a new concept, but it was applied on a voluntary basis before 2003, and it made reference exclusively to environmental standards. "Cross-compliance" is now compulsory and refers to the statutory management requirements (according to 19 EU Directives and Regulations), the good agricultural practices and environmental conditions (in accordance to Annex IV of the EC Regulation 1782- e.g. soil protection). There are 18 standards and conditions that have to be met by farmers in order to prove their eligibility for EU funds. All farmers receiving direct payments (even if they are not part of the Single Payment Scheme) are subject to "cross-compliance", starting with 2005. Failure by farmers to respect these conditions can result in deductions from, or complete cancellation of, direct payments

These standards and requirements cover such areas as: "public, animal and plant health, environment and animal welfare" (Official Journal of the EU, 2003), such as the maintenance of all agricultural land in good agricultural and environmental conditions and the prevention of land abandonment. "Cross-compliance" inaugurates a new direction in terms of CAP and Rural Development, regarding food quality and certain standards for environmental health and animal welfare (Zahiu et al., 2005) that were not previously under close scrutiny. The term "cross-compliance" is often used interchangeably with "environmental or eco-conditionality" to describe the linking of a farmer's eligibility for agricultural subsidies to environmental conditions. However, nowadays, the meaning of the concept cannot be limited only to environmental conditions, as it has moved way beyond, covering other areas.

Member States are responsible for the application of "cross-compliance" criteria. This responsibility involves the establishment of a definition of good

agricultural and environmental conditions for each of their agricultural circumstances (at national and regional level), for each characteristics of the areas concerned (such as soil and climatic conditions), farming systems, land use, farming practices and farm structures. States must inform farmers of the definition, provide them with the list of statutory management requirements and set up management, control and sanction systems for "cross-compliance" requirements.

This is the reason why, in the definition, information and application processes, an accurate interpretation and translation of "cross-compliance" and all "cross-compliance" standards in a Member State's native language, in our case Romanian, is a requirement. In the official translation of the EC Regulation 1782/2003, as well as other simultaneous or following regulations such as Regulation 796/2004, the term "condiţionalitate" is employed for "cross-compliance". Another term, "eco-condiţionalitate" is employed in official translations of a 2007 Proposal for the Modification of the EC Regulation 1782/2005 and other EU legislative texts. It is the occurrence of these two terms that is most frequent (for "cross-compliance"). Out of 48 official EU documents scrutinized (also including directives 79/409/EEC, 80/68/EEC, 86/278/EEC, 91/676/EEC, 92/43/EEC, to mention only a few) which employ either "condiţionalitate" (29%) or "eco-condiţionalitate" (36%), there are instances where both are used simultaneously and interchangeably in the same document (35%). Both terms are employed in referential bibliographical work (Dumitru, 2004; Zahiu et al., 2005), alongside their appropriate definitions and explanations.

These two terms considered, there is a literal translation of "cross-compliance", which is "conformitate încrucişată". This term is rarely employed in official translations of EU documents. It appears as such in a translation of a Parliament proceedings act of 2007, but does not occur in any official translation of EU regulations, directives or acts that have to be undertaken by Member States. However, "conformitate încrucişată" appears in the translation of the Good Agricultural and Environmental Conditions Code (www.icpa.ro), alongside the original English term and its definition, which can eventually shed light on any inaccuracies that the translation might give rise to. The official translation norm of EU regulations, directives and acts has not officially established "conformitate încrucişată" as a translation variant for "cross-compliance". It is a rarely used literal translation, lacks clarity and expansion and should not be popularized as such. Its occurrence in the above-mentioned code is and should be isolated and restricted or, if possible, corrected, to avoid inaccuracy and confusion in the employment of "cross-compliance" in Romanian.

Furthermore, there are cases of the employment of "cross-compliance" in English (Giurcă et al., 2006), even if a translation in Romanian exists. Needless to point out that this employment of an originally English term causes confusion for non-English speakers. Also, it does not establish the proper Romanian concept in the mind of the reader, especially the non-specialist, who is not familiar with the specific English term.

These options being brought to attention, there is a need to decide on a standard of translation for "cross-compliance" that will eliminate any inaccuracies and confusions. We have two viable options to choose from: either "eco-condiţionalitate" or "condiţionalitate". The first is more specific and makes clear reference to the set of environmental requirements therein, but at the same time, it is restrictive as it makes exclusive reference to these environmental and ecologic requirements. Therefore, "condiţionalitate" is a more accurate standard of translation, as it comprises all conceptual dimensions of "cross-compliance" acquired as of 2003, and does not disregard the other components, such as public and animal health.

To extend the matter even further, until the term becomes familiar in the mind of the Romanian specialist and public, it is perhaps necessary to provide more explicit references to the exact meaning of this concept and at the same time, attempt at incorporating all meanings of the term. As such, the more explicit variant of "eco-condiţionalitate", "condiţionalitate ecologică şi sanitară" is suggested. This term not only incorporates the environmental and ecological dimension, but also includes the public and animal health dimension. It is, no doubt, as explicit as it can be and some might argue it is too explicit and rather redundant. But, as long as European terminology is as yet unclear for the Romanian user, this variant can be considered the most accurate and clear in this respect.

CONCLUSIONS

We can observe similarities and a desired accuracy and compatibility in this respect, even if linguistic differences lead to slight distortions. As shown, however, there are certain instances when Romanian does not provide us with the appropriate term translation, or provides us with no translation at all and thus, certain ambiguities or difficulties in the understanding, interpretation and even application of a certain legislative text might appear. These difficulties in the application of CAP community texts can only be foreseen for the time being, as Romania is still at a start point in the EU.

An analysis of this issue is to be undertaken in the future and it will show if a poor translation, definition, interpretation of CAP terms and texts can be a factor influencing the access of Romania and Romanian farmers to CAP, to its mechanisms, responsibilities and benefits. Furthermore, the terminological analysis of the meaning, definition and translation of "cross-compliance" in English and Romanian makes reference to only one concept - analyzed within selective sources- and it is thus far from being an exhaustive approach. To exhaust all sources and possible interpretations is perhaps too much of an ideal target.

However, its aim is to offer interpretation and definition variants and unitarily construct or choose a standard variant ("condiţionalitate ecologică şi sanitară") of translation, definition and interpretation that can be used in Romanian. This analysis can be applied to any CAP concept in its specific

context and thus, bring a contribution to the understanding and familiarization with CAP concepts, to the CAP information process and therefore, a better integration into CAP.

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BUSINESS PRESENTATIONS WITHIN FOREIGN LANGUAGE COURSES

PREZENTĂRI DE AFACERI ÎN CADRUL CURSURILOR DE LIMBI MODERNE

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Abstract. *The present paper is the result of the concern for developing oral presentation skills of students of economics within foreign language courses. It explains the basics of oral presentation skills in general that apply across domains including those of "business" and "management". It discusses the three main stages to an effective oral presentation: the preparation, the delivery, and the questions and answers that follow the delivery. The business presenter, like the academic presenter, has to go through the same processes of collecting, selecting, organizing, and illustrating his data, and has to keep in mind the purpose of his presentation, and the needs and interests of his audience. The ingredients of an effective business presentation are approximately the same as those of any other presentation. The purpose of this paper is to help students of economics, but it can be helpful to anyone aspiring to be an effective public speaker.*

Key words: presentation, speaker, audience, business, management, purpose, skills

Rezumat. *Lucrarea de fata este rezultatul preocuparii pentru dezvoltarea abilitatilor de exprimare orala a studentilor de la sectiile economice in cadrul cursurilor de limbi straine. Sunt abordate deprinderile elementare de exprimare orala general valabile domeniilor "business" si "management". Lucrarea ia in discutie cele trei etape clasice ale unei prezentari orale: pregatirea, expunerea si intrebarile si raspunsurile care urmeaza expunerii. Speaker-ul care face o prezentare de business, ca si speaker-ul academic, trebuie sa treaca prin aceleasi procese de colectare, selectare, organizare si ilustrare a datelor, sa aiba mereu in vedere scopul prezentarii si nevoile si interesele auditoriului. Ingredientele unei prezentari de business sunt aproximativ aceleasi ca ale oricarei prezentari.Scopul acestei lucrari este de a ajuta studentii de la sectiile economice, dar lucrarea poate fi folositoare pentru oricine doreste sa devina un bun speaker.*

Cuvinte cheie: prezentare, speaker, public, afaceri, management, scop,abilitati

INTRODUCTION

In a world dominated by strong competition and increasing globalization, students of economics are aware that, business depends on alliances and partnerships. Future business executives, these students know that expressing ideas effectively and efficiently is the key to success; some of them have

brilliant proposals, but they have trouble explaining them to others. The ability to give a great presentation can be a tremendous career booster, while the inability to do so can keep one on a dead-end path. No wonder managers, whether experienced or new to the office, would like to hone their presentation skills. This paper aims at giving some suggestions on how to make effective presentations. At the same time it offers some ideas, tips and strategies, which will help the presenter become more capable, efficient, and effective in his presentation.

MATERIAL AND METHOD

The first step in the preparation of any presentation is the choice of a topic, which should be appropriate for the audience, for the speaker and for the speech occasion. Topic is one of the main aspects of a presentation: content and code, matter and manner, subject and style. Code, manner, and style refer to language and body language. Content, matter, and subject refer to ideas, thoughts, opinions, and information. We can say that topic is the soul of a presentation. In a good presentation we find a perfect fusion of matter and manner, subject and style. If a presenter fails to integrate the two, his performance falls short of being effective. Different students are good at attacking different types of themes. Some students are good at statistical presentations, some are good at analytical presentations, and some are good at powerful persuasive speeches. Students have their preferences, strengths and weaknesses. So, the individual speaker is the best person to know his own interest areas. He may be quite comfortable with certain topics and talk about them with facility. On the contrary, he may not feel at ease with some other subjects. If he thinks he cannot handle a particular area, it would be a wise gesture to tell the organizer frankly.

The next element a speaker should take into account is the audience profile: their age, gender, education level, job type, experience, domicile, religious and political affiliation, their role models, their personality types, and of course, their expectations. Audience profile is necessary and has many advantages. It can help one make good choices in terms of what to say and how to say it. The choice of the language and illustrations will be determined by the educational level, and job profile of the listeners. Audience is central to communication as all communication is targeted at them. We cannot afford to ignore our audience or be indifferent to them or undermine their role. A presenter is a presenter by virtue of their existence and their attendance. In the absence of the listener, the speaker loses her identity as a presenter. The audience will listen willingly if the topic is of concern to them. Therefore, it is necessary to perceive their individual interests and their interest as a group.

At the same time, one needs to have a clear understanding of his objectives. He can grab the attention of his audience and sustain their interest only if the objectives are clear. When the presenter knows his audience and his objectives, he can use a variety of techniques to maintain audience attention: inviting them to participate, exercising their imagination, arousing their curiosity, role playing, stating striking facts and statistics, and telling a story.

It is common knowledge that some occasions are informal and some occasions are formal. For example, a friendly gathering is an informal occasion and a business meeting or conference is a formal occasion. The topic, the style, and the occasion should match with one another. The speaker who loses sight of this

common sense principle projects a poor image of himself. The audience will tend to conclude that the speaker is so much engrossed in himself that he forgets the demands of the occasion. In all probability, such a speaker would turn out to be a big bore. When the presenter knows the nature and type of the occasion, it is easier for him to choose a topic that suits it. The presenter should visit the place of the presentation a day or two before and should familiarize himself with the location.

The next step in the preparation of the presentation is to gather material. The first great source of material is the speaker's own culture. He can brainstorm on the topic and jot down his own ideas. He can recollect his ideas, thoughts, experiences, and observations and look for more ideas in *newspapers, magazines, books, and encyclopaedias.* Fortunately, there is no famine of ideas; they are floating around all the time. One needs to catch them and internalize them, personalize them, and support them with your own experience and observations. Furthermore, the presenter may *interview* some public speaker, specialist or expert, or discuss his subject with his friends, colleagues and family. Yet another source is the *audio-visual library*. He can have a look at his catalogues to identify relevant cassettes/DVDs, view them and select portions, which he thinks will add spice to his presentation. The audio-visual impact will enliven the speech.

The presenter must be well prepared and the information thoughtfully presented and pertinent to the listeners' needs. This implies that the presenter cannot display the bagfuls of material he has collected. He shouldn't be over-ambitious; he should be pragmatic. Minor points can be combined under major ones. Three or four points are easy to remember. Let's remember what Plutarch said: "I do not think him a good shoemaker, who makes a great shoe for a small foot."

All this requires the selection of the material keeping in mind

(i) the time limit
(ii) audience interest, and
(iii) purpose of the talk.

As a result, the presenter has to separate the essential from the inessential. You have to sift through the material to distinguish important information from disposable information.

Thus, the introductory part of the presentation catches the attention of the audience and provides signposting from which they can extrapolate the direction of the speech. The audience gets a clear map of what they will encounter. Here are several strategies are for introducing a presentation. The speaker can start with a quotation, saying, proverb, epigram, joke, anecdote, aphorism, story, folk-tale, or a dramatic and controversial statement. He can open the talk in any way that can arrest the attention of the audience. Having introduced the topic in an interesting way, the speaker can proceed to develop the main body of his presentation. An effective body of a speech can be informative, persuasive, or amusing. An informative speech adds to the listener's knowledge; a persuasive talk presents a problem and proposes solutions.

According to the type of presentation, the speaker can develop his speech using various strategies: he can advance his arguments, supply the data, and provide examples. He can quote experts to support his argument, because authority, testimony, quotation, and evidence help him sell his ideas effectively. Moreover, it is a good strategy to support every idea with an illustration that is germane to the purpose of the talk. Being specific, definite and clear, a good illustration expresses the meaning forcefully.

The concluding part of the presentation is also very important. The conclusion should be planned in advance because if the speaker thinks about it at

the last moment, he might end up projecting a poor image of himself.

The foregoing discussion attests to the several advantages the structure of a presentation gives us. First, it draws audience attention and brings things into focus. Secondly, it holds people's interest. Experience tells us that it is difficult to hold human attention and interest for a long time, but structure helps us do that. Thirdly, a methodically presented speech helps people understand the message and perceive the links easily. Fourthly, it makes the message stay in public memory for a longer time. In brief, an organized presentation grabs and sustains audience attention, and achieves a lasting impact.

One may be a very confident, fluent and eloquent speaker, but one cannot make a point as effectively as a picture or a diagram does. A visual conveys an idea faster and better. There are several visual aids that can be used: pictographs, line graphs, photographs, diagrams, bar graphs, charts, blackboard, flannel board, transparencies, motion pictures, and so on. Some presentation aids are readily available to be bought. If suitable aids are not available, then the presenter can use his creativity and imagination to produce those that suit his topic, audience, occasion, and purpose.

RESULTS AND DISCUSSIONS

After the presenter has chosen the topic, has prepared profiles of his audience, occasion, and location, after he collected, selected and organized his material and created presentation aids he can go to the podium and make the presentation. However, a rehearsal is useful for a beginner or for a presenter who is not fully confident. He can rehearse in front of a mirror or request some relatives, friends or colleagues to attend the presentation and be ruthlessly critical of the content and the manner. He can request a speechmaker, and a presenter to attend his talk. Or, he can do it by himself: record his speech and play it again. The advantages are obvious: practice makes perfect. Rehearsal improves performance. The rehearsal audience can give feedback on pronunciation, vocabulary, grammar, and organization of ideas, body language, and time management. They can comment on the strengths and the weaknesses of the presentation. They can tell which part of speech was effective and which ineffective. In the light of their suggestions, you can edit your speech, refine the content and language, and get rid of faults in the structure, errors of logic, poor usage, irrelevant examples and quotations, and so on. Furthermore, rehearsal will help the presenter check his timing and reduce his nervousness. Thus rehearsal brings an improvement of the presentation skills through peer rating, self-rating and reflection.

Once the presentation started, the speaker must use all his resources to maintain a grip on the audience. The two major resources that the speaker can handle are *language* and *body language*. Good delivery involves much more than mere fluency in speaking. It includes the effective use of many visual and vocal cues: eye contact, hand gestures, posture, and general physical appearance as well as vocal quality, pitch, volume and rate of speech. Language most shows a man. Nothing renders a man's form, or likeness so true as his speech. Obviously, language plays a very crucial role in a presentation.

Although the level of formality of the language will vary from occasion to occasion and topic to topic, a good public speaker usually employs the familiar language of person-to-person conversation. He uses positive and polite language to bridge or at least reduce the distance between him and his listeners. The use of "I", "my," and "me" has distancing effect; on the contrary, "we," "our" and "us" have a zoom in effect. Thus his talk is personal and familiar like a chat. Everyone understands his meaning, because every sentence is plain and simple. It is necessary to use short, simple words, and familiar examples. A good speaker uses technical language only when it is unavoidable. He uses words that say exactly what he means and uses images to sharpen his points. If his subject is abstract and complicated, he should try to present it in concrete and simple language. Occasionally, he can use sensual images and figures of speech. His main guiding principle, however, should be what Emerson said: "Speech is power to translate a truth into a language perfectly intelligible to the person to whom you speak".

Another facet of communication is body language, which is equally important, or perhaps more important. Let us take the case of eye contact, for instance. Our eyes send messages and receive impressions from another person's eyes. We can see a lot in our audience's eyes. We can read a whole lot of messages - interest, willingness, comprehension, satisfaction, incomprehension, boredom, irritation, etc., because all our souls are written in our eyes. The interchange of looks is the first step toward rapport. If the speaker reads his speech his eyes will be riveted on the text and he will not be able to look at the audience. Eye contact is like a lubricant; it reduces friction, acts as an adhesive and binds people together; it speeds up the listener's comprehension. When the speaker looks them in the face, they understand faster and better. Gestures and facial expressions greatly contribute to the effectiveness of a speech. Nobody would like to listen to a speaker with a stone face. Gestures and expressions help the speaker illustrate his ideas, express his attitudes, and regulate his interaction with his audience. Moreover, gestures can emphasize, highlight, complement or contradict the verbal message.

The speaker's job as a presenter is not over after he has finished delivering his speech. The audience will surely have several questions, which he will need to answer. The presentation will be complete when the speaker has answered everybody's questions. Obviously, not every question will be sensible. Only one in five may be an intelligent question. However, the speaker cannot afford losing his patience; he has to keep calm. Poise is very important, because poise is the ability to continue speaking fluently while the other fellow is picking up the cheque. Asking intelligent and probing questions is an art; answering them convincingly is an art too. The first thing the speaker should do is to welcome the question. If necessary, compliment the questioner on his question. First, say that it is a probing, intelligent, good question and then answer it.

CONCLUSIONS

To sum up – the paper points out the various stages in the preparation of a presentation. First, the speaker needs to select a subject of the presentation: it is the anchor of his presentation. Secondly, he needs to be clear about the purpose of his speech: to give a general introduction to lay people, to describe findings to experts, or to engage in a dialogue with the audience. Thirdly, he needs to familiarize himself with the location, occasion, and audience. The more he knows about them, the better. He needs to familiarize himself with his audience too, because his presentation is a joint venture, a common pursuit, and a co-operative endeavour between him and his audience.

For the next phase of preparation the speaker pools his ideas, views, statistics, etc. He needs some incubation period to internalize the information. During this stage, he can test the validity of his ideas, think about them, and look for illustrations to support those ideas. He can present his ideas in a narrative way, in the form of a story. But, his story must be relevant to his objectives.

The presenter will require other resources such as graphics to enhance the impact of the structure of his presentation. It is common knowledge that presentation aids add spice to a presentation. The speaker can use them to demonstrate a process or an event, to add a professional touch to his talk and to make it memorable.

The speaker needs to rehearse the presentation in order to be mentally ready for the job. After the rehearsal is over he can establish rapport and camaraderie with his audience, entertain them, and make them feel comfortable. The speaker needs to create a co-operative climate, be courteous, receptive, flexible, responsive and professional in his approach. He needs to maintain a right degree of formality, control his enthusiasm, display a good sense of humour and move his presentation forward step by step.

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TEACHING ENGLISH FOR SPECIFIC PURPOSES COMMUNICATIVELY – A CHALLENGE?

PREDAREA COMUNICATIVĂ A VOCABULARULUI ENGLEZ DE SPECIALITATE – O PROVOCARE?

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Abstract. *The present paper aims at analyzing how the communicative method could be successfully applied in the process of teaching English for Specific Purposes. In doing so, we have started from the assumption that the aim of learning a foreign language is none other than communicating in the respective language and that there is no fundamental difference between the ways in which general terminology and specialized vocabulary are acquired. After a brief presentation of the main principles the communicative theory is based on, we tried to exemplify some of the ways in which its methods could be successfully used in our particular case, laying special emphasis on the advantages of choosing such an approach, among which that of meeting the students' learning needs and that of offering them the chance to become truly competent and efficient language users.*

Key words: communication; English for specific purposes; learning needs; linguistic competence

Rezumat. *Scopul prezentei lucrări este acela de a analiza modul în care metoda comunicativă poate fi aplicată cu succes în procesul predării vocabularului de specialitate în limba engleză. Punctul de pornire al acestui demers a fost aserţiunea că scopul învăţării unei limbi străine este acela de a comunica în respectiva limbă şi că nu există diferenţe fundamentale între modalitatea de achiziţionare a terminologiei generale şi cea a vocabularului de specialitate. După o scurtă prezentare a principiilor de bază pe care se sprijină teoria comunicativă, am încercat să exemplificăm felul în care metodele acesteia ar putea fi folosite cu succes în acest caz particular, accentuând avantajele utilizării unei astfel de abordări, printre care se numără acela de a răspunde nevoilor de învăţare ale sudenţilor şi acela de a le oferi acestora şansa de a deveni cu adevărat utilizatori competenţi şi eficienţi ai limbii.*

Cuvinte cheie: comunicare; vocabular de specialitate; nevoi de învăţare; competenţă lingvistică

INTRODUCTION

Generally speaking, communication is based on the existence of a speaker and of a listener, between which there is an information gap which will be filled in the communication process, so that, in the end, both the speaker and the listener will have the same information. In other words, the aim of all communication is

to adequately convey an intelligible message to a speaker, within a larger social and situational context.

The aim of learning a foreign language in general, but also in particular, that is of its sublanguages, is as concrete and pragmatic one as possible – more specifically, that of being able to communicate using the language or specialized vocabulary in question.

MATERIALS AND METHOD

Teachers have always been on a continuous search for the most adequate and efficient teaching method, even though, in reality there is no such a thing as a "perfect" teaching/learning recipe, maybe except for the one indicated by the American journalist Dave Barry (1992:20): [in learning Japanese] "the method recommended by experts is to be born as a Japanese baby and raised by a Japanese family, in Japan". For all others, less fortunate, there is nevertheless the possibility of being included in a learning context that resembles real life situations as much as possible. This is the very general principle the communicative teaching/learning method is based upon, a method focused on making the student acquire communicative competence. Its declared purpose is that of enabling the students to use the appropriate language in a given real-life like context (appropriate from the point of view of the communication situation), and to make themselves understood by communicating efficiently, while establishing at the same time the process of negotiating meaning with the listener.

To attain this, the communicative method is based upon a few clear, well-defined principles that guide the entire teaching/learning process, that is:

1. the aim of all verbal interactions is to communicate;
2. linguistic competence must be doubled by the competence/ability to adequately convey meaning in various contexts;;
3. communication of all kinds occurs in social and situational contexts, which is why language must also be learned in authentic, real-life like situations;
4. for an efficient communication in a language it is necessary to acquire communication abilities and skills, as well as all four communication competences, that is: reading, speaking, listening, writing;
5. all verbal interactions have an aim;
6. one remembers better familiar, interesting and relevant (to the learner) situations;
7. one remembers better things that one performs.

For the above stated reasons, the teaching/learning process is seen from this perspective as being focused on an efficient language use – with special emphasis on content, not structure – on the students, with their needs, interests and preoccupations, and not on the text itself. Thus, the emphasis is laid on verbal interactions among students (using the target-language) working in pairs or groups, on the initiation of real-like like communicative situations and on the frequent use of the discovery techniques in the learning process (the student will understand on their own from the examples given), as well as of authentic materials. By authentic materials one understands all written or oral materials containing "real", not processed language, produced by a real speaker for a real audience and in a real situation. These can be grouped as: published material (paper-based) (magazines, journals, etc), audio-visual material (radio, T.V.) or materials available on the Internet (an almost limitless resource varying from news to the latest articles available on-line).

The advantages of using authentic materials are significant not only from a pedagogical perspective, but also from a psychological one: the students become more confident, since they realize that they can "survive" in a real life communication situation, they will also see a point in learning (it really is of use to them in real, concrete, veridical situations as compared to the sterile, abstract ones presented in textbooks) and will feel motivated (can find the things they need for themselves). Furthermore, as the students will be exposed to situations they are likely to come across in real life, they will be forced to use the respective foreign language in the same way as a native speaker would.

Moreover, the language – in all its aspects, from structure to vocabulary – will be presented in interesting, adequate, relevant contexts that are close to the students' every-day experience, and the teaching/learning process will be structured on 5 stages, that is: introduction, presentation, practice, application and ending. Although all 5 stages are compulsory, the most important stage from the perspective of the communicative method is "application", in which students have to use the knowledge and skills acquired in a creative way in a new situational context.

RESULTS AND DISCUSSIONS

Naturally, in spite of its numerous and indisputable advantages, this method also has a series of disadvantages, such as: the fact that it requires very rigorous and clear previous planning and setting of the aimed objectives, of the desired results and of the priorities (even though they may be and have to be adjusted in the course of the teaching process), as well as the fact that this type of activities are time-consuming. All these must be nevertheless considered from the point of view of their benefits, among which: those of facilitating thorough learning and those of turning the students into competent users of the language in question.

The method has also been criticized for setting the teacher on a second position in the teaching/learning process and for not allowing the teacher to control the whole of the activities - as they are not omnipresent and the students discuss in pairs/groups. These criticisms disregard the fact that what really matters in the end, is not so much a perfect use of the structures, but an efficient conveyance of the message, as well as the fact that the aim is to make the students (and not the teacher) communicate.

Finally, when discussing the teaching English for specific purposes this is treated as if it had a special status and therefore as if it required special teaching methods. In fact, a word is a word regardless of the way and frequency with which it is used, and the practical means of teaching/learning it should not differ. Knowing a word – no matter which – means being able to recognize, understand, and use it in a given context. Therefore, English for specific purposes is not something abstract and unnatural, but a part of the larger communication process (even if better delineated). In other words, English for specific purposes too is more than an aim in itself, a means of attaining a communicative aim, which is why it too can be taught communicatively.

As a matter of fact, by restricting the linguistic area, the specificity of the vocabulary helps concentrating and focusing the communicative activities (which take up quite a lot of time, anyway). Certainly, an issue which always comes up

when discussing teaching vocabulary is, regardless of the method employed in teaching it, that of not being able to cover but a small part of it – both when tackling the general and the specialized language. An aspect that is worth bringing up is the fact that, in reality, we do not use but a small part of the vocabulary of our mother tongue – as words we actually use (the so called active vocabulary) – and we do not even understand but a part (larger than the first one but still a part) of the words existing in our own native language. We may not therefore expect our students to know all the words (even if we refer to just one type of vocabulary, such as specialized vocabulary) of a language that is not even their own. The solution is helping the students reach a language level at which they should begin to acquire knowledge autonomously, which is possible especially if they have grown confident in their own abilities as foreign language users. As a matter of fact, how many of the words we use (regardless of the language or sublanguage) have been actually taught? The communicative method tries to fill in this perfectly justifiable and natural gap.

Moreover, in the case of a language such as English, in the present context of computer and media communication boom that present a large part of the information in English (from entertainment – music, films, games – to specialized language), foreign language teachers are faced with the situation in which their students recognize (but cannot use) a large number of words (even specialized language). The general directions to be followed in the teaching/learning process are both the introduction of new vocabulary and the transformation of a large part of the passive vocabulary into active vocabulary. This is also the aim of the application stage largely used by the communicative method.

Furthermore, the teacher must establish the segment of the target-vocabulary to be taught, depending on the level of the students, but also taking into consideration the communicative needs of the students. In other words, what and how much of the specialized vocabulary must be taught, so as to meet the students' interests and communication needs at an elementary, intermediary or advanced level. It is crucial that both the teacher and the student realize that knowledge is acquired gradually and selectively.

Secondly (though not less important) one must also clearly establish the concrete results to be achieved: what exactly do we understand by "knowing a word"? If by this we normally understand knowing its spelling, its pronunciation, its grammatical functions, its meaning or meanings, its correct use in various contexts, as well as its connotation and collocations, the expectations from a, say elementary student, cannot cover, at least not from the beginning and most certainly not theoretically, all of the above. We cannot expect - nor is there any point in forcing a student still making the first steps in as far as the target-language is concerned - to remember all the meanings and ways of using all the new words. This would only have a negative effect on the respective student and would in no way help them become competent in the language in question. Though we may repeat ourselves, but so as to underline the importance of it, from the point of view of the ways in which words are learned, specialized language is

no different from the general terminology, which basically means that the learning principles valid for the latter are also valid in this case.

Once agreed upon this, one can start the selection of the materials to be used, as well as of the types of communicative teaching/learning activities. As already mentioned before, finding authentic material in the teaching of specialized vocabulary not only does it not represent a problem, especially now, when we can use the Internet, but also it increases the chances of finding material that meets the students' interests and preoccupations, and thus of being relevant.

Therefore, English for specific purposes can be taught resorting to a series of such materials, ranging from realia, to pictures, documentaries available on-line or on CDs or on videotapes, materials which the students will undoubtedly come across in everyday life, as well as in the course of practicing their present/future job. The ways in which this material can be used is up to the teacher who can adopt the solution they consider to be most appropriate to the given teaching/learning situation (students, level, etc) and who will be able to select from a large series of practical activities – from matching (names/definitions), to labeling parts of a picture using the words newly learned, to fill in the gaps exercises (with the missing information) or even role-play (in pairs or in groups) transposing the respective situation into practice. As already underlined before, in the process of teaching/learning from a communicative perspective, special emphasis is laid on the ways in which the students, once familiarized with the newly presented vocabulary, will be able to use it themselves in new contexts created by them. Among the most frequently used means of achieving this (and extremely adequate to the teaching/learning of specialized vocabulary) there is project or presentation draw-up, in pairs or in groups. In order to finalize them, the students will work together using the target-language, the newly acquired vocabulary, personalizing and internalizing the way in which this is used, in a natural way, without worrying about the formal part, similarly to the way in which they learn words in the native language.

A final aspect that is worth considering refers to the importance of using varied authentic materials, ranging from publications to the Internet and especially to the audio-video materials. As already mentioned, the communicative method emphasizes the importance of developing all four competences, which is why the student must also be exposed to listening and writing activities, and not just to reading and speaking ones. While exercises of the project-draw-up kind (in groups or pairs) answers both the question of the reading and that of the speaking part, the teacher must find a way to introduce listening to authentic text –exercises (which can also be found on the Internet or on CDs/videotapes). The audio-visual material represents a key ingredient in the process of foreign language teaching/learning as, on the one hand it helps the students get the correct, natural pronunciation and improve their listening skill and, on the other hand the impact of the visual element (especially when combined with the sound) is an extremely powerful one that will undoubtedly help the students remember the information

presented. Moreover, the use of varied materials will help the students focus better and maintain their interest alive.

CONCLUSIONS

To conclude, one must say that, as demonstrated, the use of the communicative method in teaching English for specific purposes is not just possible, but also recommended, since:

1. it manages to meet the students' learning needs;

2. to offer them the chance of becoming truly competent in a foreign language;

3. to stimulate personal motivation;

4. to ensure the much needed mental comfort and confidence;

5. to ensure the acquisition of the segment of vocabulary in question in the form of active vocabulary.

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IMPLICATIONS OF SUSTAINABLE DEVELOPMENT ON THE MANAGEMENT OF FARMS IN IASI COUNTY

IMPLICAŢIILE DEZVOLTĂRII DURABILE ASUPRA MANAGEMENTULUI EXPLOATAŢIEI AGRICOLE DIN JUDEŢUL IAŞI

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Abstract. *Sustainable development has become a political objective of the European Union, through its inclusion in the Maastricht Treaty. The objective of Romania's Sustainable Development for 2007-2013 is the expansion of the sustainable agriculture farms and meets the priorities set by our country in the present rural development policy guidance in accordance with the Community Strategic Guidelines. The sustainable agriculture is one that can be profitable, economically speaking, but also compatible with constraints such as the environmental ones. Closely intimate knowledge of the mechanisms of sustainable agriculture, perfectly integrated into the overall harmony of nature can be an asset, not at all negligible, in the fight for food security of the population. The paper refers to farm work, (which is characterized by sharing labour and material resources), the types of agricultural exploitations, how they are organized and their functions. In Iasi county there are 1101 farms which predominantly cultivate wheat. The agriculture of Iasi is still in a state of decline due to excessive fragmentation of ownership (subsistence farms predominating), with weak machinery, the precarious situation of rural infrastructure, reduced use of chemical or natural fertilizers and pesticides, reduce of irrigated areas, soil degradation and chronic shortages of financial resources and credit.*

Key words: *sustainable development, management, farms, agricultural areas*

Rezumat. *Dezvoltarea durabilă a devenit un obiectiv politic al Uniunii Europene, prin includerea sa în Tratatul de la Maastricht. Obiectiv al Strategiei României de Dezvoltare Durabilă pentru 2007-2013 este extinderea agriculturii durabile la nivelul fermelor agricole răspunde priorităţilor formulate de ţara noastră în actuala orientare a politicii de dezvoltare rurală în conformitate cu Liniile Directoare Strategice Comunitare. Agricultura durabilă este cea care poate funcţiona profitabil din punct de vedere economic, dar compatibil cu constrângerile de natură ecologică. Cunoaşterea mai îndeaproape a mecanismelor intime ale agriculturii durabile, perfect integrate în armonia generală a naturii, poate constitui un atu de loc neglijabil în lupta pentru asigurarea securităţii alimentare a populaţiei. Lucrarea face referire şi la activitatea exploataţiilor agricole, (care se caracterizează prin utilizarea în comun a forţei de muncă şi a mijloacelor materiale), la tipurile de expoataţii agricole, modul lor de organizare şi funcţiunile acestora. În judeţul Iaşi funcţionează 1101 exploataţii agricole din care preponderente sunt cele cerealiere.Agricultura Iaşului se află încă într-o situaţie de declin determinată de fragmentarea excesivă a proprietăţii (gospodăriile de subzistenţă fiind predominante), dotarea slabă cu maşini şi utilaje, situaţia precară a infrastructurii rurale, folosirea redusă a îngrăşămintelor chimice sau naturale şi a pesticidelor, reducerea a suprafeţelor irigate, degradarea solului şi deficitul cronic de resurse de finanţare şi creditare.*

Cuvinte cheie: *dezvoltare durabilă, maangement, exploataţii agricole, suprafeţe agricole*

INTRODUCTION

Within the concept of sustainable development there can be included that of sustainable agriculture, elaborated by scientific research and developed and validated by the practice of developed countries, which essentially refers to the harmonization of agricultural development with the preservation of ecological balance.

Sustainable development has become a political objective of European Union, through its inclusion in the Maastricht Treaty. In 2001, the European Council at Gothenburg adopted the Sustainable Development Strategy of the European Union, to which it was added an external dimension in Barcelona in 2002.

In 2005, the European Commission launched a review of the Strategy, published in February, a critical assessment of progress since 2001, which scored a number of lines of action to take next. The document also pointed to some unsustainable trends, with negative environmental impacts that could affect the future development of the European Union, namely climate change, threats to public health, poverty, and social exclusion, depletion of natural resources and biodiversity erosion. As a consequence of the identification of these problems, in June 2005, the presidents of states and governments of EU countries adopted a statement on guidelines for sustainable development, incorporating the Lisbon Agenda, revised economic growth and creating jobs as an essential component of the overarching objective of sustainable development. After wide consultation, the European Commission presented on 13 December 2005 a proposal for revision of the Gothenburg strategy of 2001.

MATERIAL AND METHOD

To present the results obtained by the agricultural farms in the county of Iasi were used DARD statistical data records, from the North East RDA and the European Union's official documents and for processing and interpretation there were used diagnostic method, investigation and correlation.

RESULTS AND DISCUSSIONS

The main objective of the Sustainable Development Strategy for Romania for 2007-2013 is to extend sustainable agriculture within farms in order to meet the priorities set out by our country in the current orientation of rural development policy in accordance with the Community Strategic Guidelines. Given that the rural areas represent 89% of Romanian territory and there are a high number of villages (over 12,000) and a population in such an overwhelming proportion of rural (46.6%), it turned out we need a new rural development policy reflecting the orientations of the European restructuring of agriculture, regional/local development and environment integration.

The proportion of population employed in agriculture, in 2006, in North-Eastern region is very high 40.74% (29.69% higher than the national one). Of the

total population employed in agriculture at the national level, 20.19% comes from North-Eastern Region.

Although North-Eastern Region has a large area of agricultural land (14.54% in 2006) of the total land area of the country, this resource can not be effectively used, productivity is low in all cultures, because of the influence the following factors: the quality of the land, with a pronounced diversification, alternating groups of soil and their fragmentation, in comparison with other units of similar area in the country, aging workforce (more than 28% of rural population is over 60 years) and the youth migrate to urban centres, poverty rate of non-owners who have difficulty in achieving crops and livestock, lack of capital for restructuring and modernization of agriculture, soil instability and erosion, numerous landslides (Brezuleanu S., 2008).

Table 1 shows the distribution of agricultural and forest areas during 2006-2008.

Iaşi County has some features in terms of agricultural activities due to general and specific factors that influence it (Anuarul Statistic).

Table 1

Distribution of agricultural and forested areas

Territorial unit	Total area	Agricultural area, 2006	Agricultural area, 2007	Agricultural area, 2008	% 2008/2006
România	23.839.071	14.711.552	14.741.214	14.730.956	100,1
North-east region	3.684.983	2.130.876	2.130.767	2.142.507	100,54
Bacău	662.052	320.589	320.601	320.552	99,9
Botoşani	498.569	393.472	393.468	393.193	99,9
Iaşi	**547.558**	**381.445**	**381.396**	**394.404**	**103,4**
Neamţ	589.614	284.051	284.033	284.030	99,9
Suceava	855.350	349.810	349.762	349.310	99,8
Vaslui	531.840	401.509	401.507	401.018	99,8

The counties in the region with the largest areas of farmland are Vaslui, Botosani and Iasi.

The data in table 1 show that in Iasi County the agricultural area in 2008 increased slightly by 3.4% in comparison with 2006.

There are 1101 farms, of which 240 are cereal farms, 14 viticulture and mixed farms, 26 fruit growing farms and 210 in bee keeping, 3 in vegetable growing and 708 are in animal husbandry.

As for the livestock production capacity, 98% of livestock belong to the private sector.

The utilised agricultural area that has returned on average in 2007, on an agricultural farm has increased from 3.5 hectares in comparison with 3.3 hectares in 2005 and with 3.1 hectares in 2002. On the categories of farms, the agricultural area used was an average of 2.3 hectares on a single farm, compared to 2.2 ha in 2005 and 1.7 ha in 2002. According to INS, the number of small individual farms, which used agricultural area of up to one hectare, decreased in 2007 compared to 2005 with about 166,000 farms (9%), they still holding a significant share (about 44% of individual farms).

Even if the profitability by selling grain is much smaller than at other crops, farmers from Iasi preferred to cultivate over half the county's agricultural land

with cereals. Of the approximately 242,905,000 hectares of farmland, over 152,620,000 were planted with cereals. The maize still remains the most cultivated plant, being present this year on almost 40% of farmland (tab.2).

Table 2

Areas planted with major crops in exploiting profile

	2004	2005	2006	2007	2008	2009
Iaşi county						
Cultivated area - total	253493	248840	236783	238669	223182	242905
Grain cereals	172816	154583	172473	160055	144482	152620
Wheat and rye	46409	25466	39461	39129	33298	42194
Two-row and six-row barley	7477	1640	2266	4685	3365	5380
Maize	113454	122350	127262	111294	102599	99382
Oily plants	23137	34614	31406	37837	30548	45207
Sun-flower	19036	26995	25067	29210	20916	28243
Sugar beet	3303	3333	1111	1661	4299	2910
Potatoes	9551	9633	8993	9031	9484	9980
Vegetables	13494	13582	11651 1)	11773 1)	12940 1)	12253 1)

The area of Iasi county is occupied primarily with cereal grains, which in the period 2004 - 2009 showed different values, the highest being in 2004 with an area of 172,816 ha, followed by 2006, the smallest area planted with grain cereals being in 2008, as farmers begin to focus on more profitable crops.

Based on statistical research on plant production of main crops, the National Institute of Statistics, in 2008, compared with 2007, the vegetal agricultural production recorded growth in most vegetable crops and decreases in soybean and potato. According to INSEE, production increases in 2008 compared to the previous year were recorded, among others, at barley, two-row barley, maize, cucumber, carrots, watermelons, melons, onions (Anuarul Statistic).

One of the calculation methods of the economic efficiency indicators of Iasi County agricultural societies is based on the calculation of the average production per hectare for the main crops in table 3.

In Iasi County as for the situation of the cultivated areas with cereal crops by 167,279 hectares, the average production achieved last year was 2260 kg/ha for wheat and rye and 2890 kg / ha of maize grains.

The area of 9773 hectares planted with vineyards gave a total production of 51,987 tonnes of grapes, from an average of 5341 kg/ha. Table 4 presents the total grape production in tonnes.

Thus, after detailed studies of the economic indicators that characterize the production of fruit, five areas were defined (Ciurea, Ţibăneşti, Răducăneni, Holboca and Hîrlău) and two fruit centres (Tîrgu Frumos and Paşcani), which concentrates 90.6% of fruit-growing heritage of Iaşi County (Brezuleanu S., 2008).

Table 3

Average yield obtained at the main crops *(kg / ha)*

Iaşi County	2006		2007		2008	
	Total	Of which: mostly private property	Total	Of which: mostly private property	Total	Of which: mostly private property
Wheat and rye	3081	3081	2694	2689	1286	1286
Two-row and six-row barley	2110	2108	2181	2181	917	917
Maize	3261	3263	3322	3321	738	737
Peas	1793	1809	2037	2037	1057	1057
Beans	1089	1097	1191	1191	676	676
Sun-flower	1359	1361	1737	1744	621	613
Soy	1925	1943	2075	2061	427	421
Sugar beet	24088	24088	31087	31089	22313	22313
Winter potatoes	12109	12195	14560	14561	4890	4889
Tomatoes	18023	18419	14364	14355	13855	13856
Dry onion	13488	13581	10037	10041	7189	7192
Cabbage	22372	22497	30103	30128	17618	17618

Table 4

Total production of grapes *(tonnes)*

Iaşi County	2006		2007		2008	
	Total	Of which: mostly private property	Total	Of which: mostly private property	Total	Of which: mostly private property
Vines on fruit – total	40893	40561	51021	49069	26740	24984
Grafts and native vines	23763	23431	31102	29174	25145	23390
Hybrid vines	15551	15551	18825	18804	1595	1594

The fact that after 1989 the fruit growing in Iasi county underwent a series of negative phenomena (abandonment of plantations and deforestation, low yields, giving up some fruit quality treatment plant and depreciation, etc.) justifies the initiation measures to revive the production of fruit, a new approach based on the structure of the species, the apple, pear, cherry and sour cherry should have a higher weight, by reducing apricot plum, apricot and peach, for whom the climatic conditions are less favourable, and in terms of economic efficiency are usually unprofitable (Brezuleanu S. and col., 2008).

In table 5 is presented the total fruit production in Iasi in the years 2007-2009.

Table 5

Total fruit production in the years 2007-2009 on Iasi *(tone)*

Iaşi County	2007		2008		2009	
	Total	Of which: mostly private property	Total	Of which: mostly private property	Total	Of which: mostly private property
Fruits - Total	85972	50103	56764	48993	26912	26828
Plums	22404	12728	13186	12984	3492	3484
Apples	36696	18131	24770	18331	11920	11847
Pears	5988	3521	2645	2639	1760	1760
Peaches	81	14	88	67	2	2
Cherries and sour cherries	14635	12658	12922	11822	7136	7133
Apricots	2002	1138	836	833	1114	1114
Nuts	2555	1594	1568	1568	992	992
Strawberries	70	70	137	137	107	107
Other fruits	1541	1541	612	612	382	382

CONCLUSIONS

1. From the foregoing it follows that the implications of sustainable development on farm management in Iasi county depend on many factors such as development funds, farm managers, agricultural production of agricultural goods and services, regional development policy of Iasi county, strategy of the European Union for sustainable development.

2. Iasi County is able to cover, for the most part, the need for agricultural products from its own plant production (self-consumption and sales to the market), but with a significant decrease in the technical plant.

3. The excessive fragmentation of ownership has led to a decrease in the degree of mechanization and equipment, lower agricultural productivity and ultimately led to the practice of agricultural subsistence. Therefore they must use agricultural associations, the vast agricultural areas, building ownership and ensuring the predominance of market mechanisms.

4. Stimulating and convincing the owners to lease land to farmers in the county as agricultural farms as large agricultural areas, resulting in a higher profit but also to create new jobs is one way to revitalize the agriculture of Iaşi County.

5. One of the most important levers of development which Iasi County can count on is exploiting the potential of the agricultural sector, for vegetable, fruit, viticulture and animal husbandry.

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DIAGNOSIS ANALYSIS REGARDING THE MANAGEMENT OF PRODUCTION, SUPPLY AND PRODUCTS DISPOSAL TO SC COTNARI S.A.

ANALIZA DIAGNOSTIC PRIVIND MANAGEMENTUL PRODUCŢIEI, APROVIZIONĂRII ŞI DESFACERII PRODUSELOR LAS.C.COTNARI S.A.

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Abstract. *A primary requirement of modern viticulture and oenology is the ensurance of a dynamic economic growth both on a wide productive scale and on each individual wine species. A profound impact on economic efficiency of production management is exercised by choice of the optimum combination of factors available at the enterprise level and quality management through the improvement of quality of products offered and by the high confidence provided to potential customers. The present work shows the importance of precisely these reasons. The paper includes theoretical concepts and principles of management of production, supply and disposal, and all analytical methods and techniques that constitute tools for management decision making in SC Cotnari SA, a unit that has as main activity the production of grapes, wines and marketing wine products.*

Key words: production management, viticulture, economic efficiency, Cotnari

Rezumat. *O cerinţă primordială a viticulturii şi oenologiei moderne o constituie asigurarea unei creşteri dinamice economice productive atât la scara întregii producţii, cât şi la nivelul fiecărei specii viticole. Un impact profund asupra eficienţei economice îl exercită managementul producţiei prin alegerea variantelor optime de îmbinare a factorilor disponibili la nivelul întreprinderii şi managementul calităţii prin ridicarea gradului de calitate al produselor oferite şi prin plusul de încredere acordat potenţialilor consummator. Importanţa realizării lucrării de faţă reiese tocmai din aceste considerente. Lucrarea cuprinde în plan teoretic conceptele şi principiile managementului producţiei, aprovizionării şi desfacerii, precum şi ansamblul metodelor şi tehnicilor de analiză ce se constituie ca instrumente de lucru pentru luarea deciziilor manageriale în SC Cotnari S.A., unitate ce are ca obiect de activitate producerea strugurilor, a vinurilor şi comercializarea produselor viniviticole.*

Cuvinte cheie: managementul producţiei, viticultură, eficienţă economică, Cotnari

MATERIAL AND METHOD

To present the results obtained by the SC Cotnari SA there were used statistical data from the records and official documents of the company and for processing and interpretation, analysis methods were used diagnostic investigation and correlation. In order to analyze the balance sheet at SC Cotnari SA Iasi, we have considered the financial statements of the accounting firm over a period of three years i.e. 2007, 2008 and 2009.

RESULTS AND DISCUSSIONS

SC. COTNARI S.A. is the leading producer of COTNARI vineyard. Cotnari SA is profiled towards producing white wines with denomination of controlled origin (DOC) and the designation of controlled origin and quality levels (harvested later, picked fully ripe, picked noble grapes).

The area of vine held by COTNARI SA is 1300 ha. The annual production is 1000 wagons of grapes (10 million kg.) which are obtained from the 7 million liters of wine (Monografia Cotnari).

Statement of Assets growth in 2007-2009 is presented in table 1.

Table 1

Analysis of the SC Cotnari Assets during 2007 – 2009 *(lei)*

Specification	2007	2008	2009
Tangible assets	24024764	35186508	38664514
	100%	146.46%	160.94%
Financial assets	879	879	879
	100%	-	-
Fixed assets	24025643	35187387	38665411
	100%	146. 46%	160.93%
Stocks	611078	678502	662059
	100%	111%	108.3%
Claims	1353626	1499378	2139317
	100%	110.77	158.04
Cash Money	645.205	2.239.893	696.617
	100%	347.16	107.97
Current Assets	2029224	2401869	2871038
	100%	18.36	141.48
TOTAL ASSETS	4431789	5920608	6737577
	100%	118.36	141.48

At the level of 2009 the emphasis was placed on both the investment costs for the preparation and establishment of plantations owned by increasing the amount of land and purchases of machinery, office equipment. We noticed the overall upward trend throughout the period under consideration of the current assets and which in 2009 increased with 60% from base year 2007.

SC Cotnari SA Iasi, stocks have been assessed and accounted for by applying the FIFO method. In the period under consideration the value of stocks increased by 11% in 2008 compared to 2007. In 2009 it shows a slight tendency to reduce them. If in 2007, the stock was 611087lei in 2009 it was 662,059 lei, an increase of 8%.

The claims have experienced strong growth in the year 2009, over 50% compared to 2007. This had a strong impact on cash.

During the period under review, the claims made by the company were primarily composed of various clients and debtors.

If at the end of 2007, the company claims were 1,353,626 lei (99% of customers), in 2008 they rose by 1%. In structure, the share of customers experienced a 2.9% decrease.

As for the liquidity means, we can notice a strong increase of cash in 2008, increasing sales and especially the reduction effect of policy limits the collection of receivables. This shows the first strong orientation towards new investment costs required for profitable activities, in accordance with EU standards, payment

at the end of all social obligations and recorded by failures to receive negative appearance on term debt (Brezuleanu S., 2009).

Analysis of the patrimonial liability SC Cotnari SA - Iasi, during 2007 - 2009 we considered the concentrated study of equity held by the company, and total debt accounted for at the end of the three years taken into account. These issues are listed in table 2.

Table 2

Analysis of the patrimonial liability of SC Cotnari 2007 - 2009

Specification	2007-lei	2008-lei	2009-lei
Capital	3288508	4221290	4957328
	100%	128.36	150.75
Total Liabilities	1143280	1699317	1780250
	100%	128.36	155.71
Total libilities	4431789	5920608	6737577
	100%	118.36	141.48

At the end of 2007, total capital was 1,719,153 lei and 435,228 shares, each consisting of 39.50 euro / each.

In the period under consideration is observed trend of equity. If 2007 was 3,288,508 lei, in 2008 recorded an increase of 28% in the year 2009 at a 50% increase compared to 2007.

This increase is the result of effective work in all sectors.

If they were in 2007 amounted to 1,143,280 lei, at the end of 2008 recorded an increase of 55,600 lei. The category of debt, over half of them are commercial liabilities.

By using the criteria, size of capital, number of employees, value of fixed assets and turnover, SC Cotnari S.A. belongs to the category large societies (Brezuleanu S., 2005).

In order to determine the overall economic state of SC Cotnari S.A. we took into account changes in turnover, management and use of material resources during the past four years. The results are summarized in table 3.

Table 3

Evolution of turnover

Specification	U/M	2006	2007	2008	2009
Turnover	lei	6187175	11990041	23401861	50454579
	%	100	193.79	378.23	815.60

The turnover at current prices has continuously grown and the growth rate was significant, which shows the special activity of the company management team of Cotnari SA

The feature of S.C. Cotnari S.A. is the structural stability of revenue, meaning concentration more than 95% of revenues in the respective operational turnover.

One of the competitive advantages of the company they represent in these circumstances, the high stability of income sources, which led to the reduction of sales uncertainty.

Table 4 presents the indicators that are used systematically in the management of material resources:

Table 4

Indicators used for materials management

Nr. ctr.	Specification	U/M	2006	2007	2008	2009
1	Total revenues	lei	6434252	14539755	20155450.	46886340
2	Total costs	lei	6423382	14438856	28148039	45365850
3	Material costs	lei	1603262	6732996	12659234	14532567
4	Total costs of revenues at 1000 lei	lei	998.31	993.06	965.45	967.57
5	Material costs in 1000 lei revenue	lei	249.18	463.07	434.20	309.95
6	Profit	lei	100870	1008990	10074110	15204900
7	Profit rate	%	16.0	69.0	49.0	32.4
8	Dynamics of the total costs 1.000 lei	%	100	99.47	96.71	96.92
9	Dynamics of material costs to 1000 lei	%	100	185.84	174.25	124.39
10	Dynamics of profit	%	100	431.2	306.2	202.5

In the above calculations we have taken into account when determining costs 1,000 lei revenue the producer prices (without VAT) and profit rate we took into account the total revenues reported gross profit.

Analyzing the results presented we see that the dynamics of the total costs 1,000 lei income, the amount of 998 lei increased in 2006 and decreased to 965 lei in 2008, which concern the collective management of SC Cotnari S.A. to counter rising prices of the base material, to resist wage pressures and establish a system of prices and rates to match market requirements.

Management and human resources is done with the following indicators presented in table 5.

Table 5

Indicators used for human resources management

Specification	U/M	2006	2007	2008	2009
Turnover at current prices	lei	6187175	11990041	23401861	50454579
Index of turnover	%	100	193.79	378.23	815.47
Number employees	Pers.	426	397	395	372
Number index employees	%	100	93.19	92.72	87.32
Labour productivity	lei	14524	23286	27684	41972
Index productivity work	%	100	160.33	190.61	288.98

As we took this diagnosis we also considered permanent employees of the company. The evolution of value with activities in the period 2006 - 2009, shows that it is because, in all due to the analyzed period, the company managed to secure an increase in the real workload. This reflects mainly the positive influence of the managerial policy of the company, with significant results to the program, set proper position with the specifics of our business. The main product obtained is a diverse wine range, from dry wine to semi-sweet, semidry and sweet, flavored and sent until liqueur wines, from wine to 2 years old, up to wine collectors with over 45 years old. The share of total exports is about 25% delivery with clear growth trends during 2007 - 2009.

The domestic market has managed to create networks of authorized dealers in all counties countries.

Below supply specific materials recovery evolution of different types of wines such as: bottles of different capacities, labels, corks and boxes (tab. 6).

Table 6

Supply materials for wine selling

Name Product	Manufacturer	Kind	2007		2008	
			Quantity pcs.	Price lei	Quantity pcs.	Price lei
BOTTLES	T.C. Romglass	0,75 L	6 800 000	0.6	7 600 000	0.7
		0.75 L selections	300 000		150 000	
		1.5 L şi 1 L	1 100 000		3 000 000	
LABELS	Masterprint Iaşi	Frâncuşă	650 000	0.0061	900 000	0.0061
		Fetească albă	700 000	0.0060	700 000	0.0060
		Selection 1.5 L and 1 L	1 150 000	0.0055	2 500 000	0.0055
		Dealul Cătălina	550 0000	0.0061	400 000	0.0050
		Grasă de Cotnari	3 800 000	0.0060	1 000 000	0.0050
		Tămâioasă românească	1 500 000	0.0061	500 0000	0.0070
		Selections	650 000	0. 007	3 200 000	0.0060
CORKS	Amorim-Spania	bottles of 0.75L	7 000 000	0.3	1 400 000	0.4
		bottles of 1 L	1 000 000		150 000	
		bottles of 1.5 L	1 500 000		100 000	
BOXES	Vrancart Vrancea Europa Expres	for 6 bottles	600 000	0.70	650 000	0.80
		for 12 bottles	800 000	0.80	900 000	0.90

The data analysis presented in Table 6 shows that in 2008 the supply of 0.7 bottles grew by about 800,000 pieces, while in the 1L and 1.5L bottles was more than doubled the number of consumers due to increased demand for these types of wine.

Analyzing the sales of wine calendar months can be seen that both in 2007 and 2008 CLE months with higher sales were in September and December (fig.1).

Profit is the economic efficiency indicator that reflects how resources were used and were recovered products are usually the only indicator that reflects and efficient management of a firm. The data analysis presented in figure 2 we can see that the big twist was recorded in Grasă profit in 2007 and 2008 as well as at Tămâioasă in 2008.

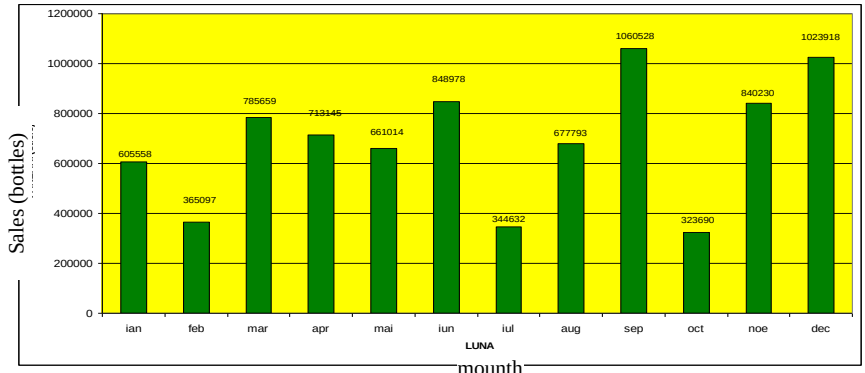
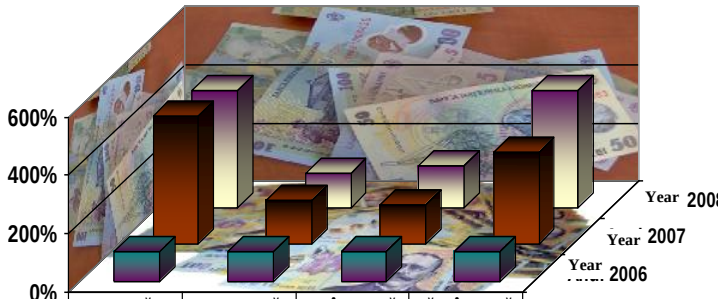


Fig. 1. An analysis of sales in 2008



	GRASĂ	FETEASCĂ	FRÂNCUŞĂ	TĂMÂIOASĂ
Year 2006	100%	100%	100%	100%
Year 2007	441%	150%	134%	316%
Year 2008	401%	116%	143%	399%

Fig. 2. Dynamics of profit achieved per total production at SC COTNARI S.A. during 2006 - 2008

CONCLUSIONS

1. The results obtained by S. C. Cotnari S.A. up to now allow the approach of a program of restructuring and modernization relatively good chances to succeed, with the objectives: the need for relatively large reorganization and quality assurance personnel; start of commercial marketing activities, improving management and performance of new investment.

2. Improving the quality of management can be achieved by following three strategies: making decisions will be based on studies of convenience and efficiency tests conducted with the participation of all company departments and transparency regarding the allocation and spending of financial resources.

3. In terms of company analyzed, S.C. Cotnari SA, stands out by a complex activity, which has managed to maintain its reputation and also the one of the vineyard and wine quality. The fame of the products made in this company is supported by distinctions obtained at various national and international competitions.

4. The feature of SC Cotnari represents, from the analysis, structural stability of the income by concentrating a large part of the income to exploitation.

5. The company's competitive advantage has led to reduction of uncertainty level of sales, at present holding one of the highest shares on the market.

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STUDY REGARDING THE INTEGRATION OF VEGETABLE PRODUCTION IN TECUCI MICROZONE, GALATI COUNTY

STUDIU PRIVIND INTEGRAREA PRODUCȚIEI LEGUMICOLE ÎN MICROZONA TECUCI, JUDEȚUL GALAȚI

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Abstract. *Microzone Tecuci includes the urban center, neighboring municipalities and Cosmeşti queen and related villages, which constitute an important vegetable nationally recognized for the variety, but especially the quality of vegetables produced. The area studied is located in Tecuci Plain and hold soil and climatic conditions particularly favorable for the development of vegetable growing. Of the total arable area of 16,480 hectares, the area planted with vegetables and solariums field during 2009 was 1934 hectares, which is an area of 955 hectares planted with watermelons and yellow, together representing 17.53% of the arable area analyzed. From an organizational perspective, agriculture area includes all types of structures. Share of arable land that hold individual farms (which produce and most of the vegetable production) 80.66%, followed by agricultural companies which own 19.34%. Since the market can not absorb the entire production of vegetables in certain times, it leads to impairment and recovery with low prices, the village queen - kernel vegetable area, is necessary to build a storage space for fresh vegetables, with time spent and therefore retain their recovery period.*

Key words: structure, profitability, trends, trade

Rezumat. *Microzona Tecuci cuprinde centrul urban Tecuci, comunele limitrofe Matca şi Cosmeşti, precum şi satele aferente, care constituie un important centru legumicol recunoscut la nivel naţional prin varietatea, dar mai ales prin calitatea legumelor produse. Zona luată în studiu este situată în Câmpia Tecuciului şi întruneşte condiţii pedologice şi climatice deosebit de favorabile pentru dezvoltarea legumiculturii. Din totalul suprafeţei arabile de 16.480 hectare, suprafaţa cultivată cu legume în câmp şi solarii în cursul anului 2009 a fost de 1.934 hectare, la care se agaugă o suprafaţă de 955 hectare cultivată cu pepeni verzi şi galbeni, împreună reprezentând 17,53% din suprafaţa arabilă a zonei analizate. Din punct de vedere organizatoric, agricultura zonei cuprinde toate tipurile de structură. Ponderea ca suprafaţă arabilă o deţin gospodăriile agricole individuale (care produc şi cea mai mare parte din producţia legumicolă) 80,66%, urmate de societăţile comerciale agricole care deţin 19,34%. Având în vedere că piaţa nu poate absorbi intreaga productie de legume, în anumite momente, se duce la insuficienţă şi la o recuperare investitiei dar cu preturi mici, De asemenea este necesar pentru a construi un spaţiu de depozitare pentru legume proaspete, cu timpul petrecut şi, prin urmare, îşi prelungeste perioada de păstrare.*

Cuvinte cheie: structură, rentabilitate, tendinţe, piaţă

MATERIAL AND METHOD

For this study were used as official statistics from DADR Galati City, Cosmeşti, Matca and Tecuci communes, forming part of vegetable area. Were also made direct field investigations designed to complement the set of information obtained by the official.

Among the indicators used to mention the area planted with vegetables in the area examined, vegetable species structure, average yields and total production and use of vegetable derived.

RESULTS AND DISCUSSIONS

Growing vegetables has an important sector of agriculture, because of the role food plays in human.

General aspects in the study area

Area under study, namely the administrative territories of Cosmeşti, Matca and Tecuci communes are part of the basin of vegetable production Tecuci.

Climatic condition, soil quality, tradition in this area which is transmitted from generation to generation and profitability, have boosted the production of vegetables, are an important sector in the area of agriculture economy.

Geographically, the micro basin in the study Tecuci vegetable, is located west of Galaţi County, Cosmeşti and Matca communes, being adjacent to the east and west of the city center Tecuci.

Geographical unit that is found on major administrative territories analyzed, the Romanian Plain. Regarding the Romanian Plain, in relation to morphological, is the Tecuci plain bounded by the brook Geru and Siret River.

Tecuci Plain is the extreme northeast of the Romanian Plain, penetrating deep into the south-west of the Plateau of Moldavia, being a terrace plain.

The climate is temperate continental with excessive colours (hot, dry summers, cold winters and are marked by strong storms), with large variations of heat and uneven rainfall regime. Average annual rainfall recorded their lowest levels in the country and are between 420-426 mm, with a very uneven distribution during the year.

Wet and dry winds, hot and cold stresses differences between humidity and temperature. Most frequently have winds from the northwest and north.

Hydrographical network in the region is dependent solely Barlad River, a tributary of the Siret River. Groundwater resources are good.

Regarding soils, the share is held cernoziom providing favourable conditions for agricultural plant development.

Structure of agricultural land use category

The most important category of agricultural land use is the arable land, which holds 88.96% of the surface (fig. 1).

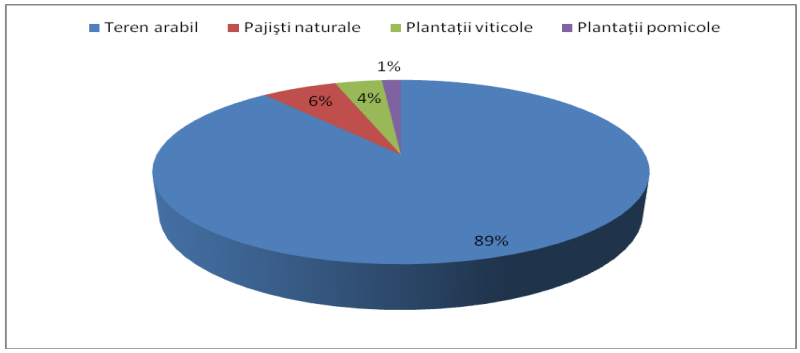

Fig. 1. Structure of agricultural land use category

Other categories of use, natural grassland, vineyards and orchards are 11.04% of total agricultural land, orchards occupying significant areas.

The structure of arable land and total area occupied by vegetable crops

Vegetable Basin Tecuci the micro analysis, in 2009, the total arable area of 16,480 hectares, the area planted with vegetables and solariums field was 1934 acres plus an area of 955 hectares planted with watermelons and yellow amounting to a percentage of 17.53% of total arable investigated area (table 1).

Table 1

The structure of arable land cultivated with vegetables

Specification	Agricultural land	Arable land	%	Of which:	
				vegetables	watermelons
TECUCI	7.106	5.801	81,63	628	90
G.I.		3.969		354	50
S.C.		1.766		274	40
C.L.		66		-	-
MATCA	8.047	7.506	93,27	950	800
G.I.		5.839		950	800
S.C.		1.667		-	-
C.L.		-		-	-
COSMESTI	3.371	3.173	94,12	356	65
G.I.		2.110		228	20
S.C.		1.052		128	45
C.L.		11		-	-
TOTAL ZONE	18.524	16.480	88,96	1.934	955

Specific to this area is that the vegetables are grown only in the private sector, individual households and agricultural businesses.

Among the main species of vegetables grown on top of the area, 49.12% fall tomatoes, cabbage with 25.85% -10.34% peppers, cucumbers - 2.58%, eggplant - 9.32%, cauliflower - 2.79% (table 2) and the graphical representation is shown in figure 2.

Other vegetable crops like: onion and dried garlic, carrots, pea pods and beans were grown on small areas for their own consumption, with attempts to exploit the free market.

Table 2

Surface structure of the main vegetable species of vegetable the analyzed microzone

Specification	Total zone	%	Of which:		
			Tecuci	Matca	Cosmeşti
Vegetables in field and hothouses:	1.934	100,00	628	950	356
tomatoes	950	49,12	170	600	180
cabbage	500	25,85	278	124	98
pepper	200	10,34	98	92	10
cucumbers	50	2,58	10	30	10
eggplants	180	9,32	60	80	40
cauliflower	54	2,79	12	24	18
Watermelons	955		90	800	65
TOTAL	2.889		718	1.750	421

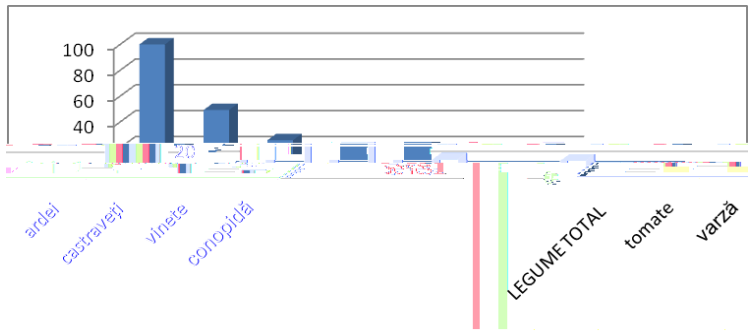

Fig. 2. Vegetable surface structure on species

The largest areas of vegetables are grown, regardless of the crop year, favourable or capricious in terms of weather, the Matca village, but also significant areas of green and yellow melons. As regards the areas planted with vegetable species each year, there is great variation in their main cause is the free market capitalization with difficulty.

An important feature in Matca commune are associated with successive crops, onions and green garlic, lettuce, radishes that resemble the month and planted in green houses arranged around the annexes, and Tecuci Cernicari the district where they produce greens : dill and parsley leaves, lovage, orach, patience is harnessed to link the town market, is a traditional occupation of the population.

Also, in recent years has taken a large cultivation of vegetables, watermelons, and yellow in protected land, as an incentive to production, its quality and not least the higher prices of recovery.

The highest share in their culture have vegetable structure in the open - and early winter tomatoes, cabbages and early autumn cabbage, cauliflower, green pepper, green pepper and pimiento peppers and eggplant culture.

A future trend since 2010, in micro analysis is bulbous, dried onion, culture to be established by sowing directly in the field and requires a low volume of manual work but its recovery time, not a culture that devalues easy.

Average yields

Average yields are generally good and very good.

Turning vegetable production

Turning vegetable production is obtained mostly through the sale on the open market or in the system wholesale outlets and Cosmeşti queen, either directly in the markets of cities in the country or through contracts with companies in Tecuci, S.C. Contec Foods S.R.L., S.C. Arghicon S.R.L. and S.C. Atfab S.R.L.

Lately we are witnessing growing competition to the detriment of EU products because local products marketing strategies practiced by large chains, the lack of space for storage of fresh vegetables, and seasonality of vegetable production.

On indicators of economic efficiency, to an average production of 30,000 kg / ha of summer-autumn tomato produced in the village queen, the main production costs were 14 822 lei recovery price of 650 Euro / tonne, achieved a profit 4678 lei per hectare in terms of 2009 the price of tomato was an average of 0.65 euro / kg.

CONCLUSIONS

1. Since the market can not absorb the entire production of vegetables produced in adulthood recovery, leading to its depreciation and recovery with lower prices, it is necessary to build storage facilities with technical conditions to extend the period for keeping them fresh.

2. Combination of vegetable producers, producer groups' legal personality to ensure disposal market fresh vegetables of all production obtained at a price that covers production costs and provides financial resources to resume a new cycle production for each crop and farm basis.

3. Factor limiting production in developing and encouraging producers is water. Necessary rehabilitation of old irrigation systems in parallel with the establishment of new ones, while adapting to modern technology can provide very good quality productions.

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THE EVALUATION OF THE ASSURANCE SYSTEM OF PRODUCTS QUALITY AND SERVICES OFFERED BY THE COMMERCIAL BANKS IN ROMANIA

EVALUAREA SISTEMULUI DE ASIGURARE A CALITĂŢII PRODUSELOR ŞI SERVICIILOR OFERITE DE BĂNCILE COMERCIALE DIN ROMÂNIA

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Abstract: *The banking system is a true industry of services having a more pronounced specific comparative with other services. Therefore, to approach the products and the banking services effectively, are necessary some prior fundamental knowledge to facilitate the understanding of the role and function mechanism of the bank. Starting from these premise it was considered necessary that the questionnaire questions to be formulated so as to get relevant answers from respondents least relatively familiarized with the techniques and banking instruments, answers on the base of which is possible a conclusive analysis of the market products and banking services. Accordingly, the questionnaire was designed to address to those individuals who are having the experience of relationship with at least one bank, has some knowledge concerning their functioning of these institutions and the characteristics of their offer of products and banking services*
Key words: banking system, banking services, commercial bank

Rezumat: *Sistemul bancar reprezintă o adevărată industrie a serviciilor având un specific mult mai pronunţat comparativ cu alte servicii. De aceea, pentru a putea aborda produsele şi serviciile bancare în mod eficient, sunt necesare unele cunoştinţe prealabile fundamentale, care să faciliteze înţelegerea rolului şi a mecanismelor de funcţionare ale băncii. Pornind de la această premisă, s-a considerat necesar ca întrebările chestionarului să fie formulate astfel încât să se poată obţine răspunsuri pertinente de la respondenţi relativ puţin familiarizaţi cu tehnicile şi instrumentele bancare, răspunsuri pe baza cărora să fie totuşi posibilă o analiză concludentă a pieţei produselor şi serviciilor bancare. În consecinţă, chestionarul a fost conceput astfel încât să se adreseze acelor persoane fizice care, având experienţa relaţiei cu cel puţin o bancă, posedă unele cunoştinţe privind funcţionarea acestei instituţii şi caracteristicile ofertei sale de produse şi servicii bancare.*
Cuvinte cheie: sistem bancar, servicii bancare, banca comerciala

INTRODUCTION

The questionnaire was designed to be addressed to those individuals who having are having the experience of relationship with at least one bank, has some knowledge concerning their functioning of these institutions and the

characteristics of their offer of products and banking services. The evaluation questionnaires of the customer satisfaction, containing six categories of questions, aims the individuals' customers and are based on the main requests, expectations and necessities of those, considered as referential. The questionnaire contains questions identified by numbers or by numbers and letters. The question identified by numbers requires to the respondents a qualitative evaluation, while those identified by numbers and letters aims the collecting of some quantifiable data. It had in view the psychical person client, whereas in the last time it became increasingly obvious the tendency of many banks to increase the products share and services offered by this categories of clients, in the conditions of unprecedented intensification of competition on the banking market.

MATERIAL AND METHOD

To achieve the purpose of the study the used method for obtaining information was the research based on questionnaires.
To determine the minimum sample size was used the following formula:

$$n = \frac{t^2 \times p \times (1-p)}{\Delta\omega}$$

Where:
n = minimum sample size
t= the coefficient that corresponds to the probabilities that guarantees the results (from the statistical tables of Student distribution)
p = proportion of sample components that have the researched characteristic (when the "p" value isn't known, is considered equal with 0.5 – corresponding to the maximum dispersion);
$\Delta\omega$ = acceptable error limit

Given the number of the commercial banks from Romania and of the possibilities relatively limited of transmission of the questionnaires, in the formula for calculating the chosen acceptable error limit was of 9.5%. To determine the minimum sample, the coefficients in the formula for calculating mentioned are having the following values:
t = 2 (corresponding to some probability of 0.95);
p = 0.5 (corresponding to the maximum value of dispersion);
$\Delta\omega$ = (error limit)

By introducing the quantities values t, p and $\Delta\omega$ in the formula has resulted the following value for the minimum sample size

$$n = \frac{2^2 \times 0{,}5 \times (1-0{,}5)}{0{,}095^2} = 111 \text{ respondents}$$

To achieve the research purpose, were distributed 325 questionnaires. Were completed and returned 236 questionnaires. The questionnaire was tested on a sample of 20 physical persons, clients of some banks, before being distributed to collect

information. Subsequently, in the interval October 2008 – December 2008, were collected 236 questionnaires of evaluation o the customer satisfaction. They aimed the banks and their branches mentioned below.The mentioned banks were selected having in vie both the products offer and services addressed to individuals, and their location, so that the collected data and information to be more representative and relevant for the followed purpose.The visited banks branches are: Romanian Commercial Bank, Romanian Bank of Development – Groupe Societe Generale, Bancpost, Unicredit Tiriac , Romanian Bank, Transylvania Bank, Piraeus Bank, Raiffeisen Bank, ING Bank, Alpha Bank, Volksbank

Whereas, in accordance with the international standards ISO 9000, the concept of quality means „ the measure to which a set of intrinsic characteristics fulfills the requirements", the questionnaire questions aimed to evaluate the degree of adequacy of the current products offer and services of the bank at the requests, necessities and expectations of its customers – individual.

RESULTS AND DISCUSSIONS

The received questionnaires were verified in term of way of filling and were retained for analysis those who had all the data completed. The results from the questionnaires were centralized and processed. The data and information provided by respondents concerning the above mentioned aspects have allowed the identification of the way in which the most important banks from Romania understand, design and ensure the product quality and the offered services to their clients, in the conditions of continuous accentuating of the competition on the banking market from our country. To asses the responses, was used a scale with five levels of appreciation of the way of fulfill of the respective requirements (from 1 to 5), with the following signification: 1 – at all, 2 – a little, 3- medium, 4 – much, 5 – very much.

In the situation in which the question allowed multiple answers, so that a respondent could list two or more answers which considered appropriate, these were considered in view at each category of reference.

The quality of the offered information to the clients about the products and banking services

To collect the necessary information, were taken into account the following aspects:

- **Assessment of the consistency of provided information and reality**

The first category of questions has endorsed the appreciation of the information quality provided by banks. This information are obtained in fact, at the initial contact with the customer's bank, so of the quality of these information depends in a decisive way the first impression of the client. The first question aimed the assessment "measure in which the individual customers of the banks consider that the information that are having at disposal concerning the product offer and banking services correspond to reality". The results of the researched made on questionnaire base are presented in the table 2.

Table 2

The central data of the answers at the question 1.1 from the questionnaire

Nr. Crt.	Question content	Share of the given notes (%)				
		1	2	3	4	5
1.1	In what measure the information available to the current or potential clients (trough leaflets, advertising media, posters, internet, etc.) correspond to reality?	4,1	6,4	30,6	44,4	14,5

From the effectuated research has resulted that the respondents have appreciated thus the information provided by banks: 44% from the interviewed appreciates that these information correspond to a large extent to reality; 30. 6% from respondents consider that is an average correspondence with reality of the provided information; 14.5% among the interviewed ones appreciates that the information correspond to a large extent with the reality, 6.4% of the respondents believe that the information corresponds in less measure with reality; 4,1% of respondents appreciates that the information doesn't correspond to reality at all.

- **The differences found in what concerns the provided information by banks**

The second question ("what important aspects found within the assessed bank and interesting the clients aren't correspond to the information available at their disposal?") aimed identifying those information offered by banks to their clients that this consider as being inadequately to reality. For being easier the systematization, the answers were grouped on categories of information. The results of the effectuated research based on questionnaire are presented bellow. The centralized data fort the answers at the 1A questions from questionnaire are the following with an inadequate information offered to customers is referring at the following with the respective share: credits (56.3%), cards (18.8%), Saving products (12.5%), Level of fees, charges, commissions and of interest rates (6.2%), Procedures of obtaining the products and services (6.2%).To note, that the question allowed multiple answers, so that a respondent could list two or more variants of answer that considered adequate. Therefore, if a respondent mentioned more answers, these were considered at each category of reference. In consequence, the data were centralized taking into account the total number of variants at which was answered and the number of filled questionnaires.

Thus, from the effectuated research has resulted that: 56.3% of respondents appreciate that the information about some credits doesn't correspond with those available to them (e.g.: interest rates charged, the time for repayment, commissions, necessary documentation for obtaining the credit etc.); 18.8% of respondents appreciates that some information about cards (e.g. the maximum amount that can be retrieved from the ATM, the maximum possible number of daily transactions on a card, commissions, etc.) don't correspond to those available on various channels of communication; 12.5% of those interviewed consider that the information about some saving products interesting the customers doesn't correspond with those available to their disposal; 6.2% of those interviewed consider that some information about the

level of fees, the charges, commissions and at interest rates doesn't correspond with those communicated trough various channels; 6.3% of respondents appreciates that the information relating to the procedures for obtaining products and services interesting the customers doesn't correspond with those available on various ways.

- **Additional information that should be offered to customers**

The question "what aspects could be envisaged in the materials containing the information destined to customers" aimed the identification of those category of information not offered by the banks to their clients but which they consider as being necessary. To be more easily processed, the answers were grouped on categories of information. The results of the effectuated research based on questionnaire are presented bellow. The centralized data of the answers at the question 1B from the questionnaire should be provided to customers additional information concerning with the respective shares: the level of fees and commissions (54.2%), the characteristics of the offered products and services (28.1%), necessary documents to benefit of a product or a service (12.5%), the address of territorial units and work program with the customers (3.5%), other information (1.7%). To note, that the question allowed multiple answers, so that a respondent could mention one or more possibilities that he considered appropriate. Therefore, if a respondent mentioned more variants of answer, these were considered at the category of products and services at which was referring. In consequence the data were centralized taking into account the total number of variants at which was answered. The distribution of the received answers at the question no. 1B from the questionnaire is represented in fig. 1.

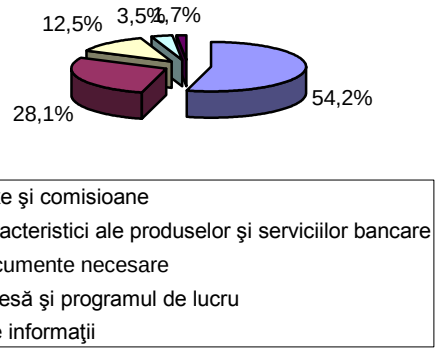

Fig. 1. Categories of supplementary information which should be provided by the banks to their customers

Thus, from the developed research has resulted that: 54.2% of respondents appreciates that the information about the level of fees and commissions are important and should be communicated to the customers (including trough leaflets and brochures); 28.1% of respondents believe that the information about the characteristics of the offered products and services should be madder available to customers; 12.5% of respondents appreciates that the information about the necessary documents for opening an account, obtaining a credit, card issuance etc, should be made available to the customers; 3.5% among those interviewed believe that the

information relating to the address of territorial units of bank (branches, agencies), as well as and their program of work with the public should be communicated to the customers; 1.7% of the respondents appreciated that other information should be made available to the customers (e.g. such as the availability of the bank for granting free consultancy, web address of the bank, etc).

CONCLUSIONS

1. 75% of respondents are grouped into the category of those that consider that the information provided by banks correspond to reality in a large and average measure.

2. From 10.5% respondents which appreciates that the information available to the customers disposal correspond in less measure or not at all to reality, 75.1% believe that the information about some credits and cards fall into the two categories.

3. With reference at other aspects which could be envisaged in the materials containing the information destined to the customers, all respondents were of opinion that are and information that could be communicated. 82.3% of respondents appreciates that it could be included and data about fees and commission as well as and about the characteristics about the offered products and banking services.

4. Even at the first making contact with the bank – trough the information available from it as regards the offer of the products and banking services – the respondents aren't fully satisfied with the content.

5. We believe that the banks should take into account the needs, requirements and expectation of customers since the time of writing and presentation of information intended for them, giving evidence of empathy and taking into account the fact that the first step in wining a new customer or maintaining the confidence of the current customers is in generating trust by providing reliable and useful information. It finds that there is a spread between what the customers actually want and what are given to them , which leads logically to the conclusion that the banks offers aren't taking into account all the requirements and expectation of the customers. But, is very possible to be certain limitation imposed by the applicable legislation in force or by the informatics technology reflected in the characteristics of the products and banking services. We consider that the banks should take into account the needs, requirements and expectations of the customers destined to those, giving evidence of empathy. The first step in wining a new client or in maintaining the confidence of the clients is in generating trust by providing reliable and useful information.

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MONITORING OF THE FOOD PRODUCTS MARKET TROUGH MARKET RESEARCH

MONITORIZAREA PIEŢEI PRODUSELOR AGROALIMENTARE PRIN STUDII DE PIAŢĂ

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Abstract: *The market study is a way by which the knowledge, needs, desires, preoccupations and the community plans can be estimated and represents the starting point in taking decisions within all the organizations. The constituent elements of the market, which makes the subject of the market research, may be the consumers, the channels of distribution, competition. The market studying is one of the major components of the marketing research. A selection of the market studies of the other marketing researches is surprised in two aspects: 1. one of quantitative order, which summarizes the rest of the marketing researches at the carried out investigations in the upstream market, in the sphere of needs and consumption, and the downstream market, in the sphere of products behavior at consumer or in the post-consumption; 2.one of qualitative order, which includes in the marketing researches, other then the market studies, the investigations of great complexity comprising the entire field of the consumer, before and after the administration of the market study.*

Key words: market study, food products, consumer

Rezumat: *Studiul de piaţă este o cale prin care cunoştinţele, nevoile, dorinţele, preocupările şi planurile comunităţii pot fi estimate si reprezintă punctul de plecare în adoptarea deciziilor în interiorul tuturor organizaţiilor. Elementele constitutive ale pieţei, care fac obiectul studiului de piaţă pot fi consumatorii, canalele de distribuţie, concurenţa. Studierea pieţei face parte dintre componentele principale ale cercetărilor de marketing. O departajare a studiilor de piaţă de alte cercetări de marketing este surprinsă în două aspecte: 1. unul de ordin cantiatativ, care rezumă restul cercetărilor de marketing la investigaţiile desfăşurate în amonte de piaţă, în sfera nevoilor şi a consumului, şi respectiv, în aval de piaţă, în sfera comportării produselor la consumator sau în cea a post-consumului; 2. unul de ordin calitativ, ce include în cercetările de marketing, altele decât studiile de piaţă, investigaţiile de mare complexitate, ce cuprind întregul câmp comportamental al consumatorului, înainte şi după înfăptuirea studiului de piaţă.*

Cuvinte cheie: studiu de piaţă, produse agroalimentare, consumator

INTRODUCTION

Without SMEs it wouldn't exist a enterprise market, and implicit without enterprise market, there wouldn't exist market researches. The constituent elements of the market which makes the object of the market study can be the consumers, the

distribution channels, competition. Studying the market is one of the main components of the marketing research.

MATERIAL AND METHOD

The main techniques of market study are: the qualitative studies, documentary studies; surveys and panels.The qualitative market studies allow understanding the act of purchase, shaping the company image, innovation. To uncover the hidden motivations of the consumers is resorting to the indirect methods of obtaining the information (free discussions, semi direct discussions, group meeting etc.).

RESULTS AND DISCUSSIONS

The market study is a way by which the knowledge, needs, desires, concerns and the community plans can be estimated. It represents the point of starting in taking decisions in all the organizations. The constitutive elements of the market, which makes the object of the market study, can be the consumers, the distribution channels, competition. Studying the market is one of the main components of the marketing research. The most important companies are from the market researches domains are:

Table 1

Top ten firms specialized in market research

Company	Country	Number of countries in which it has branches
1. AC Nielsen Corp.	USA	80
2. IMS Health Inc.	USA	74
3. The Kantar Group	Great Britain	59
4. Taylor Nelson Sofres plc.	Great Britain	41
5. Information Resources Inc.	USA	17
6. VNU Inc.	USA	21
7. NFO World Group Inc.	USA	38
8. GFK Group	Germany	34
9. Ipsos Group S.A.	France	24
10. Westat Inc.	USA	1

A selection the market studies by other marketing researches is captured in two aspects:

a) one of quantitative order, which summarizes the rest of the marketing researches at the carried out investigations in the upstream market, in the sphere of needs and consumption, and the downstream market, in the sphere of products behavior at consumer or in the post-consumption;

b) one of qualitative order, which includes in the marketing researches, other then the market studies, the investigations of great complexity comprising the entire field of the consumer, before and after the administration of the market study.Worldwide the Organization for Agriculture and Alimentation (FAO) divides the alimentary products, in term of nutritive value, in three main groups agro-nutritional, according to the table nr. 3.

c)

Table 3

Agro-nutritional groups

Agro-industrial groups	Proteins %	Lipids %	Carbohydrate %
Rich products in carbohydrates			
Cereals	10	4	86
Tuber	5	2	93
Sugar and honey	-	-	100
Fruits and vegetables	12	6	82
Rich products in proteins			
Legumes	25	6	69
Meat and eggs	23	75	2
Fish and sea fruits	59	32	9
Milk and milk products	24	50	26
Rich products in lipids			
Nuts and oilseeds	20	61	19
Fat material	-	100	-
Vegetable products	8	12	80
Animal products	22	70	8

The milk and milk products, nuts and oilseeds may be considered as being products with balanced nutritional function. They provide carbohydrates and proteins in approximately equal amounts (20-25%), the rest being represented by lipids.The third category, comprising about one type of basic nutritive substances (carbohydrates, lipids, proteins), is represented by the fat material (100% lipids), sugar and honey (100% carbohydrates), as well as and tuber (93% carbohydrates). This division of the alimentary products according to their nutritional value helps in determining the daily menus and targeting the food consumption in various situations.

Monitored categories

The monitored category by the M.E.M.R.B. Romania is divided into three major classes: bi-monthly long, by-monthly short and monthly. In the monthly (the short visit), which is the most important category, the ideal timing of the visits is at an interval of thirty calendar days, and if from objective reasons can't be respected this term, the scheduling can still frame between twenty-five and thirty-five days.In the short by-monthly and the long one, the ideal programming of the visits is at sixty calendar days, but it may fall between fifty-five and sixty-five days. Not respecting the visit dates, both in short visit and in the long one, leads to the apparition of another factos which contributes at the errors increase.For all monitored categories by M.E.M.R.B. Romania are recorded:

NAME/ VARIANT/ TYPE/ NET WEIGHT/ PACKAGING/ PRODUCER

At *name* is specified the recorded brand, and if it doesn't have is passing the manufacturer of that product. *Variants* are having only certain products. Usually the variant is immediately written after the product name. At the *product type* is specified certain subdivisions which could frame the respective product. The *net weight* is the product weight included on the packaging. If on the packaging are more measure

units, are recorded all in the description.The *packaging* can take several forms, after the description and M.E.M.R.B standards, namely: plastic bag (Plbag); bag of aluminum (Albag); paper bag (Pabag); glass packaging (Glass), which may be non-returnable (Gnrb), or returnable (Grb); plastic bottle (Pet or Plbottle); plastic bottle with metal lid (Qpack); barrel, which is found only in Hoerca type stores; carton box (TP or papbox); metal box (Can); Plastic box (Plbox);The *producer* may be local or international and is specified in the product description. To understand better these issues of description, we give and example, such as describing the still juices.Recorded name: Cappy, PrigatType: still drink, which contains fruit pulp by 24%; nectar, with fruit pulp more than 25%; juice, which contains fruit pulp 100%The flavor, meaning the fruit from which the product is made.Weight is specified on the packaging.Packaging: still juices may exist in canister (Can), plastic bottle (PET), carton box (TP), returnable bottle (Grb), at not returnable bottle (Gnrb), at plastic cup (Plcup). For these types of packaging is noted that corresponds to the monitored product, found in the respective shop. Producer: is noted the producer from the package and is mentioned that is local or international. In the view of the comparative analysis are taken into account the market studies carried out at two stores, completely different, both in terms of the store type and from sales point of view. The purpose of this analysis is to see the sales reports of the two stores, of different surface. It will be taken into account the acquisitions in a month in the range of Danone products, products which are part of the group I proposed by the Gontea professor, and the acquisitions in a month at the sour soft drinks from the Coca-Cola range, drinks which are found in the last group of classification of the alimentary products, after the Gontea professor. The proposed stores for this analysis are "Givis Prod", which has a sales are of 16 square meters and is a small grocery, and "Comir International", with a sales surface of 100 square meters, which is a superette. Both stores are in Bucharest. The presented purchases in the table, are acquisitions made by the two stores between 29.03.2008 – 29.04.2008.The comparative analysis of the two stores in terms of purchasing several products from Danone range is presented in the following table:

Table 5

The acquisitions of the two stores at few products from Danone range

Danone Products	Givis Prod	Comir International
Activia Musli 125 g	-	12
Actimel Multifruit 4x 100g	-	10
Danone Cremosso 125g	8	60
Danone Cremosso 400g	-	15
Delicious cherries/ fruit woods 4x125g	3	6
Delicious strawberry/ apricot 4x125g	3	18
Frutissima strawberry 4x125g	-	3
Danonino vanilla/raspberries4x50g	-	6
Natural yougurt 4,4% 4x150g	6	80
Natural yougurt 4,4% 400g	6	84

It can be seen clearly from this table that the acquisition of Danone products in a period of one month varies greatly from one store to another. From the table 5 is observed that the store "Givis Prod" doesn't purchase all the Danone products, that "Comir" is purchasing, which it urges the consumers to purchase products that open a much wider range, the stores were they can choose. A big difference, of several dozens of pieces is and the natural yogurt of 400 g, both and at the natural small yogurt of 4x150 g, products purchased by the two stores always in a month. In conclusion, referring to these values we can say that the "Comir" store sells Danone products several times more than the "Givis" shop. Similar with the acquisition analysis of Danone products, it will be made a comparison and in what concerns the acquisition of some products from Coca-Cola range, comparison presented in the Table 6.If at the milk products from Danone range the acquisition difference in a month was very big, in the case of soft drinks from Coca-Cola range isn't noted a very big difference on the acquisitions level, and implicitly on the level of sales, which can be observed in the figure number 1, which graphically illustrates the data from the table.

Table 6

The acquisition of the two stores from the Coca-Cola range

Coca-Cola products	Givis Prod	Comir International
Cola 0,5 L	36	36
Cola 1 L	18	18
Cola 2 L	120	120
Cola light 0,5 L	-	12
Cola light 1 L	-	9
Cola light 2 l	-	36
Fanta orange 0,5 L	12	24
Fanta orange 1 L	9	27
Fanta orange 2 L	36	48
Sprite 0,5 L	12	24
Sprite 1 L	-	18
Sprite 2 L	12	24

And from the table both from the graphic number 1 it can be seen clearly what differences are between the two stores at the Coca-Cola products acquisition. A notable difference is the fact that the "Givis" store didn't acquired in the period 29.03.2008 – 29.04.2008 products from the Coca-cola Light range, of any kind. There are some differences in the number of pieces purchased by the two stores, but there aren't considerable differences. We can conclude that most customers of milk products prefer to supply from stores that open a wide range of products, and in the case of refreshing drinks, the consumers buy from anywhere, because the soft drinks are the products with the highest prevalence in almost all types of stores. Having in view the values from the two tables, we can say that both the volume of purchase and the implicitly the volume of sales is much higher in the Comir store. In this case is remarked a direct proportionality between the volume of purchase and sales of the store.

CONCLUSIONS

1. Studying the phenomena and the economic processes within the market is a vital necessity for the modern enterprise. The market study covers a very broad thematic area, caused by many phenomena and market particularities, as well as and the objectives that the enterprise can fix them.

2. The comparative analysis is a main part in the management company trough which is taken decisions concerning the quality strategy, in relation to the market fluctuations.

3. After the market study made at the two stores, it can be observed that the purchase level in the period 29.03.2008 – 29.04.2008 and implicitly the sales level, in the case of milk products from Danone range is much larger that at "Givis" store.

4. In the case of Coca-Cola refreshments the differences of acquisitions and at sales aren't so bug, because these products, which enters in the category of the alimentary products, are having a percent of opening much higher, in almost all the types of monitored stores by the M.E.M.R.B, because these products are mostly consumed.

5. At the milk products from Danone range is remarked, both from the table nr. 6 and from the afferent chart of the table, a direct proportionality between the surface of the store and sales level.

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STRATEGIC OPTIONS ON FRUITS FRUIT GROWERS IN THE NE REGION

OPŢIUNI STRATEGICE ALE POMICULTORILOR PE FILIERA FRUCTELOR DIN REGIUNEA DE NE

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Abstract. *Production of fruit depends on a number of factors operating on the fruit tree branch. Thus, the production is represented by individual farmers, households, non-specialized in producing fruits, specialized companies, family farms and cooperatives. In countries where food system operates on market principles, product chain starts at the "gate" the farmer (farmer) and "ends" to the consumer of the product, manufactured or not, get it on the table. Throughout the period of agricultural products are transported, processed, packed, preserved and presented to consumers. All these activities fall within the sphere of agricultural and food distribution, which is facing many difficulties and is more complex than the distribution area of industrial products. In this paper we addressed the NE Region market using a series of criteria and tools to determine the actual content and its main dimensions. Only a proper evaluation of such dimensions, including: market structure, market location, market capacity, provide sound guidance to business premises, effective reporting of the company, expressed in terms of business and market relationships by highlighting the main ways of developing it.*

Key words*:* tree growing strategies, channel, fruits, consumer

Rezumat. *Producerea de fructe depinde de un şir de factori care activează pe filiera pomicolă. Astfel, sistemul productiv este reprezentat de producătorii individuali, gospodării nespecializate în producerea fructelor, firme specializate, gospodării familiale şi cooperative. În ţările în care sistemul agroalimentar funcţionează pe principiile economiei de piaţă, filiera de produs începe de la "poarta" fermierului (producătorului agricol) şi se "încheie" la consumator, când produsul, prelucrat sau nu, ajunge pe masa acestuia. Pe tot acest parcurs produsele agricole sunt transportate, transformate, condiţionate, retransportate, păstrate şi prezentate consumatorilor. Toate aceste activităţi ţin de sfera distribuţiei produselor agricole şi alimentare, care se confruntă cu multe dificultăţi şi este mult mai complexă decât sfera distribuţiei produselor industriale. În cadrul lucrării am abordat piaţa Regiunii de NE folosind o seama de criterii si instrumente pentru a-i stabili conţinutul concret si dimensiunile sale principale. Numai o corecta evaluare a unor asemenea dimensiuni, intre care: structura pieţei, localizarea pieţei, capacitatea pieţei, oferă premisele orientării judicioase a activităţii economice, raportării eficiente a întreprinderii, exprimata prin prisma raporturilor de piaţa ale întreprinderii si prin evidenţierea principalelor căi de dezvoltare a acesteia.*

Cuvinte cheie: pomicultură, strategii, filiera, fructe, consumator

MATERIAL AND METHOD

The research methodology used in this paper has considered the following aspects:

- A bibliographic study of national and international literature;
- Concrete intelligence of the investigated area;
- Ordering, processing and presentation of results in summary form;
- Analysis and interpretation of results, conclusions and recommendations.

RESULTS AND DISCUSSIONS

According to a study coordinated by Prof. Dr. N. Constantinescu and D. Teaci (1967) to delimit the natural ecosystems of regions with large fruit after a similar geographical structure, the NE region of Romania is the largest and most representative fruit growing region in the country. In addition, the region also includes Barlad Plateau and part of Suceava Plateau, east of Siret. The climate is continental, annual average temperature being 8.5 to 9.50 C and means annual precipitation amounts to 500-600 mm.

North East Region holds 14.30% of total agricultural area of the country and 18.70% of the area covered by forests. Looking counties in the region with the largest areas of farmland are Vaslui, Botosani and Iasi, and those that have the largest forest areas are Suceava, Bacau and Neamt. Land erosion control works are carried out on land is limited in comparison with the degraded due to high costs and insufficient equipment.

Table 1

Distribution of agricultural land and forests in 2008 (ha)

Territorial unit	Total area	% from total	Agricultural area	% from total	Woodland	% from total
Romania	**23839071**	**100**	**14852341**	**100**	**6605690**	**100**
% from total	**100**		**100**		**100**	
Nord Est Region	**3684983**	**15,458**	**2130720**	**14,346**	**1232070**	**18,65**
% from total	**15,46**		**14,35**		**18,65**	
Bacău	6.621	0,028	323478	2,178	279048	4,22
Botoşani	4.986	0,021	392860	2,645	57194	0,86
Iaşi	5.476	0,023	380810	2,564	99022	1,49
Neamţ	5.896	0,025	283803	1,911	261330	3,95
Suceava	8.553	0,036	349131	2,351	456579	6,91
Vaslui	5.318	0,022	400538	2,697	78897	1,19

Source: Statistical Yearbook of Romania, 2009

Selling end products of the fruit chain occurs through wholesale channels and retail distribution. The price of this phase of the pathway is addition of trade. This includes expenditure and revenue traders.

Therefore, any economic activity, including that in fruit growing, must result

in a high economic efficiency. This requires performing quantitative calculations and value, nature and especially prospective outcome, to determine the extent to which economic agents can contribute to efforts to establish a certain level of economic efficiency. Analysis steps on pathway contribution to achieving value fruits final products to the population, shows the following: Manufacturing - 23.01%, processing - 41.48%, trade - 16.6%. Economic efficiency of processed fruit is shown in tables 2 and 3. The total value of the final product of the highest profit in absolute returns processors and trade is the lowest.

Table 2

Value added chain fruit *

Nr.crt.	Stage of pathway	Rol/t	%
1	Production	124,80	23,01
2	Processing	230,39	42,48
3	Trade	187,19	16,6
4	Total pathway	542,38	100,00

*Source: ble, * data were the starting point in the production of processed fruit.*

Table 3

Cost, price and profit on the fruit pathway

Stage of pathway	Indicators	Rol/t	%
Producţie	Average cost of production	520,78	107,4
	Sale Price	635,98	131,2
	Profit	115,20	23,7
	The profit rate,%	22,1	
Processing	Expenditure on raw material	129,60	26,7
	Industrializing Expenditure	141,60	29,2
	Total expenditure processing	271,19	55,9
	Average cost of production	271,19	55,9
	Sale Price	395,99	81,6
	Profit	124,80	25,7
	The profit rate,%	46,0	
Trade	Acquisition costs	395,99	81,6
	Expenditure on marketing	26,40	5,4
	Average cost commercial	422,39	87,1
	Price	484,78	100,0
	Profit	62,40	12,9
	The profit rate,%	14,7	

Source: ble, * data were the starting point in the production of processed fruit compote

Currently, the development of scientific criteria for fruit production is directly reflected on the financial-economic status of producers. In this way it increases economic efficiency, rationally exploiting the land, better use of material and labor.

Table 4

Profit rate on the fruit pathway -%

Stage of pathway	%
Production	22,1
Processing	46,0
Trade	14,7

Improved cultivation technologies applied in recent years, offers vast possibilities of mechanization of work and reduce operating costs at a unit area, achieving increased production, stable and higher proportions than the classic culture. These systems provide a pronounced increase production and ensure a high economic efficiency.

Production of fruit depends on a number of factors operating on the fruit tree branch. Thus, the production is represented by individual manufacturers, not specialized in the production of fruit farms and research stations and specialist manufacturers.

Fruit production by individual producers, whose output is intended to satisfy personal consumption, is a very common form in conditions of developing countries, where rural population is majority. Typically, these farms are small (up to 2 ha). However, properties (farms) of this kind, persists in some developed countries.

In France, for example, 18% of the fruit comes from individual farms.

Average prices of fruits have a tendency to increase due to the fact that the national market is not saturated, and price increases imports of these products. Romania's main fruit suppliers are the EU (31%) and Turkey (43%). These major manufacturers pay duty on the Romanian market from 20 to 40% and pressuring prices upward fruit. Also imported fruits produce a strong competition on the Romanian market because of the appearance, packaging and appearance of the season.

Table 5

Fruit profit chain structure

Nr. crt	Stage of pathway	Rol/t	%
1	Production	115,2	38,10
2	Processing	124,8	41,27
3	Trade	62,4	20,64
4	**Total**	302,39	100,00

Source: Quote

The main problem is the organization of the pathway fruit market and manufacturers, so that Romania to launch the global market with these products having potential as a starting point of production.

Creating and using forms of exploitation of the fruit is influenced by the following aspects:

A production of fruit is placed in a permanent and dispersed. Supply arises from the market products that appear simultaneously with a highly perishable and demand is inelastic; 2 fruit distribution is costly due to the territorial dispersal of

large investments in order to maintain transport and storage products and seasonal;

Three horticultural products are under state supervision, it was forced to intervene by various actions in several directions for phasing investment efforts, income horticulture, while ensuring consumer protection.

The third direction is to export the fruits of recovery. Currently valued partizile fruit, fresh or processed, were insignificant compared to total production of fruit produced. The situation is explained mainly by Romanian fruit quality, standards do not meet export requirements, worldwide, but especially to those of the EU.

Given that international trade is generally marked by protectionism, tariff and non-tariff barriers, our country will have to resume and expand exports of fruit on a new vision that takes into account the specialization in certain varieties of fruits and preparations fruits that can benefit from economic and currency.

New approach to superior capitalization decisions on export of fruit products cannot be achieved in the absence of external market research, a few years to overtake exports, to have time to take appropriate measures to determine the species and varieties fruit required and beneficial in terms of prices obtained in foreign markets. With a good knowledge of foreign markets through the development of studies made by experts in marketing, manufacturers can be directly involved in meeting the requirements of external markets. Therefore, in order to exploit higher fruit and fruit preparations, especially for export, it is necessary for producers to have information on species, variety and assortment structure of industrial products, fruit, most requested, the duration of exports markets with the highest absorption, developments at European and world prices.

Table 6

Structure perspective fruit exports (thousand tons fresh equivalent)

Nr. crt.	Fruits	Total (thousards tons)	which for recovery (thousand tons of fresh equivalent)				
			Dehydrated	Canned	Fresh	Frozen	Juices
1	Apples	200,0	5,4	36,6	7,6	0	150,4
2	Pears	5,0	1,0	1,0	1,0	0,0	2,0
3	Plums	120,0	20,0	60,0	40,0	0,0	0,0
4	Cherries	15,0	2,0	8,0	0,0	2,0	3,0
5	Cherries	17,0	2,0	5,0	0,0	3,0	7,0
6	Peaches	7,0	0,0	5,0	0,0	0,0	2,0
7	Apricots	16,0	1,0	9,0	3,0	0,0	3,0
8	Nuts	6,0	6,0	0,0	0,0	0,0	0,0
9	Other fruit	7,0	2,0	5,0	0,0	0,0	0,0
10	Fruit trees	6,0	2,0	1,0	0,0	2,0	1,0
11	Strawberries	15,0	5,0	6,0	0,0	2,3	1,7
12	Total	414,0	46,4	136,6	51,6	9,3	170,1
	%	100	11,21	33,00	12,46	2,25	41,09

*Source: Isaac I, Op. cit, 2002, p. 81. *) Including jam, jam, semi-**) including nectar, vinegar, cider*

Measures will be taken next on the line between radical improvement of fruit quality, but their presentation will result in export growth expected to reach 414,000 tons. This is actually the export structure will be established in the strategy development of fruit growing (table 6).

Quality fruit production problem concerns not only exports but also other destinations in the process of economic recovery. This is because the quality is an intrinsic attribute of any economic good, which expresses the social utility of its content, essential aspect of product policy, and price.

CONCLUSIONS

Seasonality of fruit production leaves its mark on the organization of the recovery circuit although scientific research has made it possible to mitigate or eliminate the seasonality of production.

Objective of the seasonal nature of production process is determined by the discontinuity of fruit production to build up resulting in both seasonal in production and circulation. The offer replaces the lack of production from these stocks in some periods of the year.

The seasonality results in the formation of fruit stocks requiring accounting requirements of the law related to economy of time, preparation and packaging process development and production of the consumer movement in the shortest time.

An efficient pathway is providing the consumer the best product at the best price at the desired time and place. To achieve and maintain a high level of performance, economic activity on the pathway to be effective in all phases of agriculture, food industry and distribution. At each stage, resources must be used efficiently, economically optimum seeking to achieve the desired level of competitiveness, overall.

At least three notions have been mentioned on the pathway to express performance: efficiency, competitiveness and economic optimum.

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DÉMARCHES EXPÉRIMENTALES DE VALORISATION DU POTENTIEL INTELLECTUEL DES ÉTUDIANTS EN I^{ère} ANNÉE DANS LE CADRE DES SÉMINAIRES DE PSYCHOLOGIE DE L'ÉDUCATION. SUGGESTIONS MÉTHODOLOGIQUES SELON L'APPROCHE DE LA THÉORIE DES INTELLIGENCES MULTIPLES

DEMERSURI EXPERIMENTALE DE VALORIFICARE A POTENŢIALULUI DE INTELIGENŢĂ AL STUDENŢILOR DIN ANUL I ÎN CADRUL SEMINARIILOR DE PSIHOLOGIA EDUCAŢIEI. SUGESTII METODOLOGICE DIN PERSPECTIVA TEORIEI INTELIGENŢELOR MULTIPLE

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Abstract. *The communication aims to present some examples of methodological approaches on the exploitation of the intelligence potential of 1st year students. Theoretical foundations of communication are provided by the multiple intelligences theory formulated by the American psychologists H. Gardner and D. Goleman. From the perspective of multiple intelligences theory (TIM), first year students were divided into groups of intelligence and had to tackle the same subject during a seminar of educational psychology. The experimental approach circumscribes the effort of developing the metacognitive competence of first year students (Partnerships, no. 92106/2008). We also offer detailed suggestions that are applicable to other disciplines of education and can promote education with higher training valences consistent with the demands of a post-modern society.*

Key words: multiple intelligences, collectivity, metacognitive skills, didactic strategies.

Rezumat. *Comunicarea îşi propune să prezinte cateva exemple de demersuri metodice privind valorificarea potenţialului de inteligenţă al studenţilor din anul I. Fundamentele teoretice ale comunicării sunt asigurate de teoria inteligenţelor multiple formulată de către psihologii americani H. Gardner şi D. Goleman. Din perspectiva teoriei inteligenţelor multiple (TIM), studenţii din anul I au fost împărţiţi pe grupe de inteligenţe şi au abordat aceeaşi temă în cadrul unui seminar de psihologia educaţiei. Demersul experimental se circumscrie efortului de dezvoltare a competenţei metacognitive la studenţii din anul I (Parteneriate, nr. 92106/2008). De asemenea, oferim sugestii metodologice cu aplicabilitate şi la alte discipline de învăţământ, de promovare a unor demersuri didactice cu mari valenţe formative în concordanţă cu exigenţele unei societăţi postmoderne.*

Cuvinte cheie: inteligenţe multiple, grup, colectivitate, competenţă metacognitivă, strategii didactice.

INTRODUCTION

La valorisation du potentiel humain constitue la clé fondamentale du progrès socio-économique et culturel dans une société postmoderne.

Claparède considérait que l'intelligence est «un instrument d'adaptation» qui entre en jeu lorsque font défaut les autres intruments d'adaptation (l'instinct et l'habitude). Pour Bergson, l'intelligence est «la faculté de fabriquer des objets artificiels» et d'en varier infiniment la fabrication. Binet (le créateur, avec Simon, de l'échelle métrique de l'intelligence) considérait que l'intelligence est «une fonction générale» à laquelle toutes les autres sont subordonnées. Conçu comme aptitude générale, le fonctionnement de l'intelligence implique l'action interdépendante et émergente d'un certain nombre de facteurs (Thurstone): de raisonnement (inductif et déductif); de mémoire; la capacité de calcul; la rapidité perceptive; le facteur spatial; la compréhension rapide des notions; la fluidité verbale.

Les plus connues approches théoriques concernant l'intelligence sont celles de Piaget, Gardner (les intelligences multiples) et la théorie triarchique (Sternberg).

MATÉRIEL ET MÉTHODE

1. La critique des théories classiques de l'intelligence

Avant de présenter son propre paradigme, Howard Gardner, professeur de psychologie à Harvard (Etats-Unis), a réalisé une lecture critique des principales théories classiques de l'intelligence.

1.1. Une place importante est accordée à la théorie de Piaget (bien connue en Roumanie). Selon Piaget, l'intelligence est la forme supérieure d'adaptation de l'individu aux exigences toujours plus complexes de l'environnement, qui se réalise par l'intermédiaire de deux mécanismes interdépendants (l'assimilation et l'accommodation). H. Gardner relève également quelques faiblesses de la théorie de Piaget: «il ne s`agit toujours que d`une seule sorte de développement» ; les stages «individuels se réalisent d`une façon beaucoup plus continue et progressive que Piaget ne l´a indiqué» (31); «il prétendait que les différentes opérations qu`il avait découvertes pouvaient s`appliquer indifféremment à tout contenu»; «es tâches auxquelles il s`est intéressé supposaient en fait de langage», «malgré son scepticisme à l`égard des tests de QI qui sont essentiellement verbaux»; «il n`a presque rien dit de la créativité et de l`originalité». Sa conclusion est que Piaget a «échoué à construire un modèle universel du développement cognitif» (Gardner, 1997, pp. 31-32).

1.2. La psychologie cognitive donne «une vision beaucoup plus dynamique de ce qui arrive au cours de la résolution d`un problème». Cependant, «elle ne dit pas comment les différentes formes de la cognition entrent en rapport les unes avec les autres» (33); «cette approche est aussi trop mécaniste» (*ib.*, 33-34).

1.3. Selon Gardner, l`utilisation du symbole «a joué un rôle central dans la nature humaine» et elle a été centrale dans «les plus hautes créations humaines» (*ib.*, p. 35).

2. La théorie des intelligences multiples. Considérations générales

Howard Gardner a élaboré cette théorie à partir de l'observation systématique d'un nombre important de sujets de catégories différentes: des patients souffrant de maladies neurophysiologiques, des «idiots savants», des enfants et des adultes normaux, des enfants précoces, des adultes prodiges entraînés dans des

activités diverses. Sa théorie a été exposée dans l'ouvrage *Frames of mind: The theory of multiple intelligence,* 1983 (réédité 10 fois).

L'homme possède plusieurs «compétences intellectuelles *relativement autonomes*», que H. Gardner appelle les «intelligences humaines» (H. Gardner, 1997, p. 18). Être intelligent «c'est être capable de résoudre des problèmes et de créer des produits, auxquels un cadre culturel ou plusieurs donnent de la valeur» (*ib*., p. 406).

Gardner propose plusieurs critères destinés à délimiter les types d'intelligence: la localisation dans le cerveau; l'existence des «idiots savants»; l'identification des opérations spécifiques de traitement des informations; les performances liées à la valeur dans différentes cultures; les déterminations psychométriques; les recherches de la psychologie expérimentale etc.

RÉSULTATS ET DISCUSSIONS

3. Les caractéristiques des types d'intelligences

A partir de ces fondements, Gardner décrit huit types d'intelligences (talents): verbale/linguistique; visuelle/spatiale; corporelle/kinesthésique; logique/mathématique; intrapersonnelle; interpersonnelle musicale/rythmique et naturaliste (MEC, 2001). Nous ajoutons à ce tableau l'intelligence émotionnelle (Daniel Goleman, 2001).

Tableau 1

Les caractéristiques des types d'intelligences

Types d'intelligence	**Caractéristiques**	**Professions compatibles**	**Modalités de valorisation**	**Personnalités**
1.*Linguistique* 	- l'aptitude à utiliser le langage pour comprendre les autres et pour exprimer ce que l'on pense;	-enseignant; -sociologue; -avocat; -journaliste; -écrivain; -porte-parole;	- présentations, discours, dialogues, jeux de rôle, rédaction d`un texte et de documents;	W.Shakespeare, M.Eminescu, N. Stănescu, N.Iorga
2.*Logico-mathématique* 	-la capacité de calculer, de mesurer, de résoudre des problèmes; -analyser les causes et les conséquences d'un phénomène ou d'une action;	-chercheur dans le domaine des sciences exactes; -économiste; -ingénieur; - informaticien;	-résoudre des problèmes, -expérimenter -explorer, -élaborer des logiciels etc.	A.Einstein, G. Cantor, A.N. Whitehead, K. Gödel, David Hilbert
2. Spatiale 	- "les capacités à percevoir correctement le monde visuel";	-pilote; -artiste; -architecte; -paysagiste; -photo-graphe; -caméra-man;	-situation de création spécifique pour les arts plastiques; -élaboration de projets urbanistiques; -montage vidéo et film;	Léonard de Vinci, Le Corbusier, Pablo Picasso

			-élaboration de cartes, etc.	
4.*Kinesthésique/ Corporelle* 	-la capacité d'utiliser son corps ou une partie de son corps pour communiquer ou s'exprimer;	-athlète; -chirurgien; -gymnaste; -mécanicien; -masseur; -danseur; -patineur;	-jouer un rôle, danser, -situations spécifiques pour différents sports, -interventions chirurgicales; -activités de réparations, etc.	Nadia Comăneci; Pelé, Fred Astaire
5. *Musicale* 	- la capacité de penser en rythmes et en mélodies, de reconnaître des modèles musicaux, de les interpréter, d'en créer;	-interprète; -musicien; -compositeur; -chef d'orchestre;	-exercices variés d`inter-prétation de partitions musicales; -activités de création musicale;	Mozart, Bach, Enescu, Celibidache, Céline Dion, Ray Charles
6. *Naturaliste* 	- la capacité de classifier, de discriminer, de reconnaître et d'utiliser ses connaissances sur l'environne-ment; -il a un souci de conservation de la nature;	-biologiste; -spécialiste en agriculture; -météoro-logue; -spécialiste en écologie; -explorateur;	activités d'exploration et de protection de l'environne-ment;	Jacques Cousteau
7.*Intraperson-nelle* 	-l'aptitude à faire de l'introspection; -« permet de dé-tecter et de sym-boliser des sentiments complexes et hautement diffé-renciés »	-psycho-logue; -théologien ; -philosophe;	-activités de connaissance de soi; -activités concernant les problèmes humains;	Platon, Kant, Hegel, Piaget, Freud, Gandhi, Thomas d`Aquin
8.*Interperson-nelle* 	-permet à l'individu d'agir et de réagir avec les autres de façon correcte;	-enseignant; -sociologue; -vendeur; -infirmier; -conseiller; -médiateur;	-activités d`éducation et de formation, de suivie ; -jeux de rôle; analyse transactionnel -le;	Mère Thérèse

9.*Emotionnelle* (D. Goleman) 	-comprendre ses émotions; gérer ses émotions; s'auto- motiver; reconnaître et comprendre les émotions des autres; gérer les relations avec les autres en gérant leurs émotions**;**	-psychothéra-peute, -conseiller scolaire, -manager	-activités de résolution des conflits ;	Daniel Goleman, Jeanne Segal, Tara Bennett-Goleman

Chaque individu a un profil unique (il sera meilleur dans un domaine et moins bon dans un autre). Nous avons tous ces types d'intelligences dans des circonstances différentes.

4. Les suites d'ordre pédagogique de la théorie des intelligences multiples

a) Chaque individu se caractérise par **trois types d'apprentissage** interdépendants: apprentissage intuitif; apprentissage scolaire; expert disciplinaire (Gardner, 1991).

b) Gardner identifie **quatre** étapes dans le développement des premières intelligences: la représentation des événements (apparaît à 18-24 mois), ce qui lui permettra de raconter l'expérience accumulée; la symbolisation typologique (vers 3 ans) lui permettra de comprendre les formes et les dimensions des objets, ainsi qu'un début de cartographie des relations temporelles; les relations digitales seront saisies vers 4 ans et, sur cette base, l'enfant pourra déterminer les relations quantitatives; une fois avec l'entrée à l'école, se développera la capacité de symbolisation par l'intermédiaire du langage écrit.

c) Chaque type d'intelligence a son historique et se construit selon son propre rythme. Du point de vue d'une pédagogie de la valorisation de l'humain, les éducateurs ont pour mission d'offrir une variété de contextes de sorte que différents types d'intelligences se manifestent à un niveau optimal. L'accomplissement des fonctions sociales implique «un mélange de compétences intellectuelles et symboliques» (*ib*., p. 329) «L'éducation est essentielle dans toutes les cultures; elle est, aussi, le meilleur secteur pour observer les intelligences» (*ib*., p.342). Une décision stratégique générale s'impose en tout premier lieu: il faudra mettre l'accent sur la valorisation des intelligences supérieures des individus, renforcer les points de ceux-ci ou agir dans les deux directions en même temps? (*ib*., p.398)

d) J'ai suivi durant les années universitaires 2007-2008, 2008-2009 et 2009-2010 la valorisation des intelligences multiples dans le cadre des séminaires de psychologie de l'éducation. Après la présentation du cadre théorique général des intelligences multiples, dans le cadre de chaque séminaire j'ai établi une liste de thèmes possibles qui pourraient être abordés. On a décidé d'un thème (le changement des mentalités, la théorie du jeu, le réchauffement climatique, comment obtenir ce qu'on veut et vouloir ce que l'on a, etc.), les étudiants ont été

distribués en groupes d'intelligences et ils ont commencé à réfléchir au cadre général de l'approche. Le prochain séminaire, ils ont continué l'approche et ont présenté par des moyens spécifiques à chaque type d'intelligence les conclusions des travaux en groupe. Ils peuvent essayer également les zones où ils se sentent novices, mais aussi là où ils considèrent qu'ils peuvent mieux s'exprimer.

CONCLUSIONS

1. Il nous faudra changer le point de vue sur l'intelligence humaine, la concevoir comme un moyen de résoudre des problèmes ou de produire des biens qui ont une valeur dans une ou plusieurs communautés ou cultures.

2. Chaque individu possède plusieurs types d'intelligences, chaque personne a un profil unique.

3. L'activité instructive-éducative devra mettre en valeur les points forts de chaque individu.

4. L'activité sociale, professionnelle devra permettre la valorisation des intelligences multiples des individus, en privilégiant les activités dans des groupes hétérogènes.

5. La planification de démarches didactiques différenciées et individualisées pour les élèves et les étudiants qui ont des capacités supérieures ou des difficultés d'apprentissage.

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A FLORAL SURVEY OF SHAKESPEARE

PREZENŢA FLORILOR ÎN OPERA LUI SHAKESPEARE

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Abstract. *Though not as a botanist, but as a poet and dramatist, William Shakespeare wrote many memorable lines about flowering plants. These have inspired artists over the ages, such as Keats and Shelley. It was natural for Shakespeare to include the familiar flowers and plants of his childhood in his writings, from buttercups to daisies, lilies, cowslips and acorn cups. And, of course, no proper garden would be complete without roses, which are mentioned at least seventy times in Shakespeare's plays and sonnets. In the present study we put forward the main flowers that are recurrent in William Shakespeare's works and submit the meaning of some flowers as they were perceived during the Renaissance. For example, all the flowers played a major role in Midsummer's Eve celebrations as it was the custom to deck out the houses with white lilies, birch or fennel in order to repel evil. Some flowers symbolize love, remembrance, while others insincerity or everlasting suffering.*

Key words: Shakespeare, literary work, flower names, comparison, rose

Rezumat. *Deşi nu ca botanist, ci ca poet şi dramaturg, William Shakespeare a scris multe versuri memorabile despre flori. Acestea au inspirat mulţi scriitori de-a lungul deceniilor, printre care Keats şi Shelley. Era firesc pentru Shakespeare să includă în scrieri florile şi plantele familiare copilăriei lui, de la pintenul cocoşului la margarete, crini, ciuboţica-cucului şi ghinde. Şi, bine înţeles, nici o grădină adevărată nu ar fi completă fără trandafiri, care sunt menţionaţi de cel puţin şaptezeci de ori în piesele şi sonetele lui. În acest studiu prezentăm florile cele mai importante ce sunt frecvente în opera lui William Shakespeare şi semnificaţia unor flori aşa cum era percepută în timpul Renaşterii. De exemplu, toate florile aveau un rol important în sărbătorile Solstiţiului de vară, când exista obiceiul împodobirii caselor cu crini albi, mesteacăn sau chimen-dulce pentru a îndepărta răul. Unele flori simbolizează iubirea, amintirea, pe când altele făţărnicia sau suferinţa continuă.*

Cuvinte cheie: Shakespeare, operă literară, denumire de flori, trandafir, comparaţie

MATERIAL AND METHOD

The basic materials for the research consisted in the writings of William Shakespeare, with special interest in Hamlet and A Midsummer Night's Dream. The working methods we used were the selection of texts, the structure as well as the interpretation of the works under study.

RESULTS AND DISCUSSIONS

Shakespeare's images have constantly been picked out and drawn upon in order to illustrate one aspect or another of the poet's thought or mind. The images form a world in themselves for they mirror a very rich experience and a very

profound and soaring imagination. He visualizes human beings as plants and trees either choked with weeds or well trained and bearing ripe fruits, sweet smelling as a rose or noxious as a weed.

Innumerable passages from Shakespeare provide evidence of his love and knowledge of plants and herbs. His knowledge of flowers was not that of a botanist, but rather of a countryman gifted with a keen sense of observation which noted the colour, the form and the smell of particular flowers and plants. We do know that he spent his childhood in the English countryside, surrounded by meadows of wild flowers and simple house gardens as well as masterpieces of horticultural design and beauty. He also had a charming garden at his residence in Stratford, where he spent his last years and where he wrote *The Winter's Tale* which includes many garden references.

It was but natural for Shakespeare to include the familiar flowers and plants of his childhood in his writings. If we consider an alphabetical list we find plants from "aconitum", a member of the buttercup family to "yew" save for plants representing "q" and "z". More than 180 different species are mentioned in Shakespeare's works which sometimes make us believe we read a horticultural text. There is a great amount of flowery adjectives while each plant has a specific purpose in his prose or poetry. Some became backdrops, others metaphors, while some even played the roles of minor protagonists in his literature. Many plants mentioned, such as carnations, roses, daisies, daffodils and rosemary are familiar to gardeners, while others like oxlips, elderberries, stonecrop are lesser-known native of the writer's home country.

Shakespeare mentions roses more frequently than any other flower, particularly the red and white ones, emblems of the Houses of York and Lancaster. He also makes reference to the Tudor rose which resulted when the two roses were united to create this rose.

The rose is mentioned at least 70 times in his plays and sonnets. It is considered one of nature's most beautiful creations. He wrote about the musk-rose, the Provencal cabbage rose and the englantine or sweet-brier rose in particular. Shakespeare compares Romeo to a flower that smells sweet to the sense just as he does to her. Juliet knows that he is as sweet as a flower. Unfortunately, his name is not so sweet and she says that if a rose were called by another name, it would still be a rose. So, no matter what Romeo's name may be, he would be the same beloved and sweet person. It is the most familiar quote about roses:

"What's in a name? what which we call a rose

By any other name would smell as sweet."

Lady Capulet compares Paris with a flower that is so beautiful that even summer cannot offer up a flower that is so beautiful. Shakespeare brilliantly uses the flower and the rose as symbols for the two suitors for Juliet's hand. Romeo is given the symbol of a specific flower and Paris just a flower. It means that Juliet sees Paris as just one flower in the garden, while Romeo is the rose for her.

After the famous balcony scene, Juliet compares her affection for Romeo to a "bud of love" which the next time they meet will be a "beauteous flower". This shows that Juliet understands that their love is in its infancy but it may blossom into fully developed love.

Shakespeare used flowers and plants as images to illustrate his ideas. For instance Ophelia used flowers as symbols of her deep sorrow and grief. Being very upset because her father , the King's Lord Chamberlain had just been killed, she expressed herself by passing out flowers to the court in her seeming state of mind: rosemary, pansies, fennel, columbines, rue (herb of grace), daisies and violets. By doing this, she accused the king and the queen of the guilt in an indirect way which was safer than stating her opinions directly.

But Ophelia did not choose the flowers hazardously. They have certain symbolic meanings. Rosemary, *rosemarinus officinalis*, means to remember and faithfulness:

"there's rosemary, that's for remembrance;
pray you, love, remember"

She wants her brother, Laertes, to help her discover who killed their father. She tells him:

"remember think back on what's being going on."Pansy, *viola tricolour*, is the symbol for thoughts and faithfulness: "and there is pansies, that's for thoughts". When we say that someone is pensive we mean that the person is thoughtful and contemplative.

Fennel, *foeniculum vulgare*, stands for marital infidelity, flattery, while columbine, *aquilegia vulgaris*, is the symbol for male adultery and ingratitude being the emblem of deceived lovers. We refer to the point when Ophelia walks to the king and while handing him some fennel, says:

"there's fennel for you and columbines".

She knew that the new king loved flattery and this is what she did first but then she accused him of foolish adultery which was a frightening thing at the time if we think of the king's power who could take someone's life. Rue, *ruta graveolens*, means adultery and repentance of all transgressions for women and everlasting suffering. Walking over to the queen Ophelia says:

"there's rue for you; and here's some for me".

So she insults both the queen and king in front of witnesses. The daisy, *bellis perenis*, is often to be found in Shakespearian works. It symbolises innocence. When Ophelia

sees a daisy and says “there’s a daisy”, and picks it up, looks sadly and puts it back, she is actually saying “there is no innocence here”.

Flower symbolism was surely known to Ophelia so she knew exactly what she was doing when she hended out flowers in that scene.

There is a reference to crow flowers nettles and daisies in Hamlet, where the queen informs Laertes of Ophelia’s death:

“Queen: Your sister is drown’d, Laertes
Laertes: Drown’d! O! Where?
Queen: There is a willow grows aslant a brook,
that shows his hoar leaves in the glassy stream;
there with fantastic garlands did she come
crow flowers, nettles, daises, long purples.”

(*Hamlet*, Act IV, Scene 7)

The crow flower is also known as crowfoot, a name coming from the resemblance between the leaves of this plant and the crow’s feet. It is *Ranunculus scleratus*, of the buttercup family, *Ranunalacee* a semi- quatic plant. These flowers must have been picked up from the waterside where Ophelia was roaming about.

Cowslips, which are closely related to primrose is refer to in *Cymbeline* and it is a reference which leads to a tragic end. The flowers are of a golden yellow with an orange patch at the base of each petal.

One of the earliest of flowers in the English literature marshes and damp meadows is the cuckoo flower, so called because it blooms at about the same time as the bird reaches England. Gone mad at the ingratitude of his two elder daughters, King Lear was roaming about in the wild near Dover, while searching for him his youngest daughter Cordelia, who really loved him, describes the King as one wearing a crown of wild flowers:

“Crown’d with rank fumitor and furrow weeds
With burdocks, hemlock, nettles, cuckoo flowers,
Darnel, and all the idle weeds that grow
In our sustaining corn.”

(*King Lear*, Act IV, scene 4)

Shakespeare seems to have been fascinated by the ancient traditions and customs of the midsummer and solstice celebrations which celebrated love, romance and the fantasy world of the fairy people. He wrote *A Midsummer Night’s Dream* being probably inspired by the magic of the midsummer night, the fairy magic and the special powers of the summer flowers. It is that magical midsummer time of the year, when fairies were “little people” as Shakespeare called them come out to play in the moonbeams of the summer solstice.

We find in this enchanting comedy set in Athens, a magical world of fairies, fantasy and romance where the characters are surrounded with traditional

flowers as well as other popular flowers and plants of the time: wild thyme, oxlips, violets, woodbine, sweet musk-roses, eglantine, pansies and others. Of course, the rose could not have missed from the summer garden. Even the dew from rose petals was highly coveted, especially the dew of Midsummer's day which made the ladies who washed their face in it become more beautiful in the coming year.

We did an analysis of the flowers that are mentioned in *A Midsummer Night's Dream* and we could see that there are no less than nine different species of flowers.

Table 1

Flowers mentioned in *A Midsummer Night's Dream*

Type of flower	Recurrence		Quotation
	No.	%	
Rose	7	39%	"But earthlier happy is the rose distill'd" "How chance the roses there do fade so fast?" "Far in the fresh lap of the crimson rose" "With sweet musk-roses and with eglantine" "Some to kill cankers in the musk-rose buds" "Of colour like the red rose on triumphant brier" "And stick musk-roses in thy sleek smooth head"
Cowslips	3	16.7%	"The cowslips tall her pensioners be" "And hang a pearl in every cowslip's ear" "These yellow cowslip cheeks"
Eglantine	1	5.5%	"With sweet musk-roses and with eglantine"
Lily	1	5.5%	"Most radiant Pyramus, most lily-white of hue"
Oxlips	1	5.5%	Where oxlips and the nodding violet grows
Primrose	1	5.5%	"Upon faint primrose-beds were wont to lie"
Thyme	1	5.5%	"I know a bank where the wild thyme blows"
Violet	1	5.5%	"Where oxlips and the nodding violet grows"
Woodbine	2	11.3%	"Quite over-canopied with luscious woodbine" "So doth the woodbine the sweet honeysuckle"
TOTAL	18	100	

As we could see in the table 1, that the flower that appears most frequently is the rose, with 7 entries (39%) as in all his literary works, followed by the cowslips with 3 entries (16.7%) and woodbine with 2 (11.3%). All the other six flowers appear only once.

The favourite flowers of the fairies were the cowslips, also known as fairy's cups. A wild flower, member of the primrose family, once covered entire meadows throughout Europe in Shakespeare's time. Let us see what the fairy tells Puck. She is the servant of the fairy queen and is on her rounds of service and her duty for the knight was:

"And I serve the fairy Queen,
To dew her orbs upon the green.
The cowslips tall her pensioner's be;
In their gold coats spots you see;
Those be rubies, fairy favours,
In those freckles live their savours."

(*A Midsummer Night's Dream*, Act 2, Scene 1)

Another flower which was enjoyed by Shakespeare is **Dianthus**, a popular summer plant. Its botanical name is derived from the Greek words *dios,* meaning divine and *anthos* meaning flowers, but it is more commonly known as carnation, pink, or Sweet William. Shakespeare referred to it as gillyflower.

Cupid's flower also known as **heartsease, pansy**, and **violet** is *Viola tricolor,* of *Violaceae*. Under the name cupid's flower there is only one reference to this plant in *A Midsummer Night's Dream.* With Dian's bud (bud of *Agnus castus*, a verbanaceous tree), the cupid's flower was employed by Oberon to disenchant Titania, his queen.

Shakespeare refers to violets and daisies dozens of times, but very often he refers to clusters of flowers, sometimes in a brief poetic description like Oberon's, sometimes in a song like that near the end of *Love's Labour's Lost* or as the subject of a dialogue with action, at the centre of which is "a flower-maiden" as in the case of Ophelia in her mad scene in *Hamlet*.

So, we can state that a common idea of Shakespeare's works is the flow of life through all things, in nature and man alike. A close reading and interpretation of the text shows us what kind of visual richness can be wrought from Shakespeare's works.

CONCLUSIONS

1. Shakespeare mentions more than 180 different types of flowers in all his work.

2. The flowers that appear most frequently in A midsummer Night's Dream are roses, followed by cowslips, woodbine, primrose, thyme, oxlips, lily, violet, and eglantine.

3. Shakespeare's flowers have different symbols, ranging from pure endless love to adultery or foreshowing tragic ends.

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LE VIN DANS LES ÉCRITS DE VOYAGE (DU RÉEL À LA RÉ-STRUCTURATION DU RÉEL)

VINUL ÎN SCRIERILE DE CĂLĂTORIE (DE LA REAL LA RESTRUCTURAREA REALULUI)

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Abstract. *Travel writings have a special place among the types of literary productions and, if the name of genre still generates hesitation among specialists, the existence of individualizing features is incontestable. At the level of form and content, certain procedures, codes and strategies can be identified to define the adventure the traveller passes through and accordingly the writing act. In the literary construction plan, the stopover of the traveller means the transition from descriptive to narrative, and the articulation is firstly realized through the food code - dishes, but especially wine playing the role of connecting between the story levels. Our analysis is interested in Victor Hugo's travel diary Le Rhin, considered by the modern Hugolian criticism as one of the most profound and exciting writings due to its complexity. The examples illustrate the importance of this element - wine - in the progress of a travel and in the combination of the literary levels, its place among the other components serving to re-structuring the reality.*

Key words: travel writings, narrative procedures, wine, Victor Hugo's Le Rhin

Rezumat. *Scrierile de călătorie deţin un loc aparte între tipurile de producţii literare, iar, dacă denumirea de gen generează încă ezitări din partea specialiştilor, existenţa trăsăturilor particularizante nu poate fi contestată. La nivel de formă şi de conţinut, anumite procedee, coduri şi strategii pot fi identificate, pentru a defini aventura prin care trece călătorul şi actul scriiturii. În planul construcţiei literare, popasul călătorului înseamnă trecerea de la descriptiv la narativ, iar articularea se realizează prioritar prin intermediul codului alimentar – bucatele, dar, mai ales, vinul jucând rolul de releu între planurile povestirii. Analiza noastră are ca obiect jurnalul de călătorie Le Rhin al lui Victor Hugo, considerată de critica modernă hugoliană drept una dintre scrierile cele mai profunde şi captivante prin complexitate. Prin exemplele extrase şi studiate ilustrăm importanţa acestui element – vinul – în desfăşurarea unei călătorii şi în îmbinarea nivelurilor literare, locul său printre celelalte componente care servesc la re-structurarea realităţii.*

Cuvinte cheie: scrieri de călătorie, procedee narative, vin, Rinul de Victor Hugo.

INTRODUCTION

Manifesté surtout à partir de l'époque des Lumières, chez des écrivains tels Montesquieu, Voltaire, Rousseau, Diderot, Swift, Herder, l'intérêt pour le voyage, pour la connaissance directe de la vie et de la culture d'autres pays, devient une véritable mode avec les romantiques. Qu'il s'agisse de notes, impressions, relations

ou récits de voyage, la littérature qui découle de cette disponibilité dynamique enregistre une variété de formes et de techniques. La richesse du matériel n'exclue pas les classements et les typologies et, si l'appellation de «genre» – littérature de voyage – suscite encore des hésitations de la part des spécialistes, on a identifié les caractères d'une écriture de voyage – le «style d'itinéraire» (Mureşanu Ionescu, 2009). Il en résulte que le propre de la littérature de voyage est «la primeité», c'est-à-dire l'existence des «signes, perçus dans leur dimension extérieure, apparente», la «prépondérance indicielle», la «dominante temporelle – le présent» et les «interprétants immédiats» (Mureşanu Ionescu, 2009). Durant son trajet, le voyageur vient en contact avec des événements, des gens, des lieux et des expériences, tous des éléments avec lesquels il entre en relation – et qui lui provoquent des sensations, des impressions qu'il note –, mais par rapport auxquels il reste néanmoins extérieur, étranger. Cette étrangeté même lui permet de surprendre les tranches de réalité et de les retransmettre ensuite au lecteur. Ici les spécialistes ont identifié le problème clé de ce type d'écriture : la référence, le rapport au vécu et les moyens à même de rendre la réalité du réel. A l'encontre de la littérature de fiction, dans les écrits de voyage, «il ne s'agit plus de créer [le réel] d'après un modèle, mais de nommer le plus fidèlement possible celui qui existe déjà» (Mureşanu Ionescu, 2009). Si le voyageur des Lumières cherchait le nouveau, qu'il fallait souvent nommer, le voyageur romantique ne cherche pas à tout prix les aspects inconnus, mais ceux pas encore dits; leur rapport au vrai n'implique pas l'opposition au mensonge, mais à l'ignoré (Mihalache, 2009).

MATERIEL ET METHODE

En l'absence de règles précisément définies, car il s'agit ici des aléatoires du déplacement, la littérature de voyage pourrait laisser l'impression d'une écriture dépourvue de toute contrainte. La diversité des manifestations n'a pas empêché les critiques d'identifier, au niveau de la forme et du contenu, certains procédés, codes et stratégies pour caractériser l'aventure du voyageur et l'écriture qui en découle (Mureşanu Ionescu, 2009). Au niveau de la construction littéraire, l'arrêt du voyageur implique le passage du descriptif au narratif, dont l'articulation se réalise prioritairement à travers le code alimentaire – les plats et, surtout, le vin jouant le rôle de «relais» (Mureşanu Ionescu, 2009) entre les plans du récit. Notre analyse s'appuie sur des exemples tirés du journal de voyage *Le Rhin* de Victor Hugo, une œuvre que la critique hugolienne moderne considère comme l'un des textes les plus profonds et les plus fascinants en raison de sa complexité. Les extraits étudiés nous permettent d'illustrer l'importance de cet élément – le vin – dans le déroulement d'un voyage et dans l'articulation des plans littéraires, ainsi que sa place parmi les autres composants qui participent à la ré-structuration de la réalité.

RESULTATS ET DISCUSSIONS

Dans la première moitié du XIX^{e} siècle, le modèle pour les voyageurs et pour leurs écrits est représenté, plus que par l'épopée napoléonienne, par Chateaubriand et Byron, puisque, selon le critique Nicole Savy, partir devient synonyme de «fuir un quotidien désenchanté et prosaïque», mais également

«chercher la beauté, l'aventure ou les sources de la civilisation chrétienne» et «tenter le destin» (Savy, 1997). Le voyage devient alors quête de soi et construction de l'identité grâce au regard porté sur soi dans le miroir de la réalité.

Bien qu'il affirme, à l'époque des *Feuilles d'automne*: «Ce que je voudrais voir je le rêve si beau!», Victor Hugo aime les voyages, qu'il entrepend à travers son pays et en Europe, plus précisément dans l'Europe du nord-ouest, dans les pays avoisinés à la France. Constitué par les fragments de trois voyages entrepris en compagnie de Juliette Drouet, en 1838, 1839 et principalement 1840, ainsi que de plusieurs chapitres écrits à Paris, le volume *Le Rhin* est rédigé sous la forme de «lettres à un ami» (sa femme, Adèle, et son ami, le peintre Louis Boulanger). Bien accueillie par les contemporains, l'œuvre résiste aujourd'hui non plus en raison de sa Conclusion politique – quoique cette relecture implique la reconnaissance de la prophétie de Hugo sur une Europe que nous pouvons voir aujourd'hui (Savy, 1997) – mais pour «le grand, l'immense art de Hugo d'évoquer le Rhin et sa civilisation, l'admirable journal de voyage dans lequel l'érudition, poussée jusqu'aux excès ultimes, se mêle à un sens très moderne du reportage simple et direct, ainsi qu'à la méditation romantique d'un profond lyrisme» (Hugo, 1983, notre trad.).
En caractérisant l'attitude du voyageur Hugo, Nicole Savy identifiait trois situations: «Le grand poète romantique se conduit d'abord comme un homme des Lumières, qui médite sur l'Histoire et sur l'avenir de l'humanité, puis comme une sorte de bouddhiste plaçant sans hésitation le brin d'herbe qui se trouve à ses pieds dans sa pensée du cosmos, en compagnie de Dieu. Enfin comme un mystique qui s'abolit dans le vertige de l'Être, en hypnose, frissonnant au vent du mystère des gouffres et des cieux.» (Savy, 1997; Mihalache, 2009).

Car le voyageur Hugo regarde autour de lui poussé par la curiosité de «lire» le monde visible – d'où les descriptions amples et finement détaillées des monuments – mais le côté d'«antiquaire» est particulièrement doublé et prolongé chez lui par sa vocation de «poète»: la description d'une ruine, d'un monument ou d'un coin de la nature se transforme chez Hugo en méditation philosophique, car le monde visible cède la place au monde invisible et les choses dévoilent leur signification cachée: «Comme la nuit tombait, je me suis assis sur une pente de gazon. Aix-la-Chapelle s'étalait tout entière devant moi, posée dans sa vallée comme dans une vasque gracieuse. Peu à peu la brume du soir, gagnant les toits dentelés des vieilles rues, a effacé le contour des deux beffrois, qui, mêlés par la perspective aux clochers de la ville, rappellent confusément le profil moscovite et asiatique du Kremlin. Il ne s'est plus détaché de toute cette cité que deux masses distinctes, l'hôtel de ville et la chapelle. Alors toutes mes émotions, toutes mes pensées, toutes mes visions de la journée, me sont revenues en foule. La ville elle-même, cette illustre et symbolique ville, s'est comme transfigurée dans mon esprit et sous mon regard. La première des deux masses noires que je distinguais encore, et que je distinguais seules, n'a plus été pour moi que la crèche d' un enfant; la seconde, que l'enveloppe d' un mort; et par moments, dans la contemplation profonde où j'étais comme enseveli, il me semblait voir l'ombre de ce géant que nous nommons Charlemagne se lever lentement sur ce pâle horizon de nuit, entre

ce grand berceau et ce grand tombeau.» (Hugo V., 1880 – 1926). Cette unité du réel et du fantastique est accessible uniquement au visionnaire, qui enregistre des analogies, des correspondances et des symboles. L'insertion des fragments qui servent l'effet de réel (inscriptions, dessins etc.) – procédé «typique pour la littérature de la primeité» (Mureşanu Ionescu, 2009) et dont Hugo se servira jusque dans ses romans, l'enregistrement du fait quotidien, évoqué tel quel sur une tonalité neutre, l'abondance des termes spécialisés dans les descriptions d'églises, châteaux etc., témoignent de la volonté hugolienne d'authentifier son récit et de réduire l'écart entre l'immédiateté de la notation et la lecture du destinataire. Hugo voyage «en solitaire», sans chercher à trouver des interlocuteurs ou des compagnons, en poursuivant des buts précis, en fonction de ce qu'il veut voir, et non pas de la norme, sans tenir compte des détours auxquels ce trajectoire l'oblige. Pragmatique, il poursuit son objectif, en restant un voyageur averti, intéressé de voir et de noter le plus possible, plutôt que de vouloir fusionner avec le spectacle des gens ou de la nature. Derrière la notation brève et exacte, le lecteur peut deviner un Hugo connaisseur des réalités enregistrées: «Après Huy recommence ce ravissant contraste qui est tout le paysage de la Meuse. Rien de plus sévère que ces rochers, rien de plus riant que ces prairies. Il y a là quelques collines hérissées de ceps et d'échalas qui donnent un vin quelconque. C'est, je crois, le seul vignoble de la Belgique.» (Hugo V., 1880 – 1926); «Aujourd'hui Oberwesel n'est plus qu'un vieux soldat qui s'est fait vigneron. Son vin rouge est excellent (Hugo V., 1880 – 1926).

La notation se charge parfois de pittoresque: «Le blé proverbial de Spire est toujours aussi beau et aussi doré que du temps de Charles-Quint, et l'excellent vin rouge pied-d'oison est toujours digne d'être bu par des princes-évêques en bas écarlates et des électeurs à chapeau d'hermine.» (Hugo V., 1880 – 1926). En respectant les règles du voyageur qui rapporte les ouï-dire, les croyances et les rumeurs du lieu, Hugo mêle humour et légende: «Du reste, je dois déclarer que ni le géant, ni la cloche d'argent, ni le spectre de Falkenstein, n'empêchent les vignes et les échalas de monter de terrasse en terrasse fort près de la souris. Tant pis pour les fantômes qui se logent dans les pays vignobles! On leur fera du vin leur porte, et les vrilles de la vigne s'accrocheront gaîment à leur masure. À moins pourtant que ce coteau de Velmich ne soit cultivé par les esprits eux-mêmes, et qu'il ne faille appliquer à ces fantastiques vignerons cette phrase que je lisais hier dans je ne sais quel guide tudesque des bords du Rhin: -"derrière la montagne de Johannisberg se trouve le village du même nom *avec près de sept cents âmes qui récoltent un très bon vin*." Il faut d'ailleurs que le passant même le plus altéré se garde de toucher à ce raisin, ensorcelé ou non. A Velmich, on est dans le duché de M. de Nassau, et les lois de Nassau sont féroces à l'endroit des délits champêtres. Tout délinquant saisi est tenu d'acquitter une amende égale à la somme des dommages causés pour tous les délits antérieurs dont les coupables ont échappé. Dernièrement un touriste anglais a cueilli et mangé dans un champ une prune qu'il a payée cinquante florins» (Hugo V., 1880 – 1926).

Le spectacle des gens signifie code vestimentaire, surtout pour sa particularité qui individualise et fixe l'image sur la rétine du passant: «Dans les villages, les vieilles paysannes passent comme des spectres, enveloppées dans de

longues mantes d'indienne grise ou rose tendre dont le capuchon se rabat sur leurs yeux; les jeunes, en jupons courts, coiffées d'un petit serre-tête couvert de paillons et de verroteries qui cache à peine leurs magnifiques cheveux rattachés au-dessus de la nuque par une large flèche d'argent, lavent allègrement le devant des maisons, et, en se baissant, montrent leurs jarrets aux passants comme dans les vieux maîtres hollandais. Pour ce qui est des hommes, ils sont ornés d'un sarrau bleu et d'un chapeau tromblon, comme s'ils étaient les paysans d'un pays constitutionnel.» (Hugo V., 1880 – 1926). Mais également, le spectacle humain acquiert dans la perspective hugolienne des dimensions fantastiques, en raison du code alimentaire: «Dans une jolie petite ville carrée, flanquée de murailles de briques et de tours en ruine, qui est à moitié chemin et dont j'ignore le nom, j'ai fort admiré quatre magnifiques voyageurs assis, croisées ouvertes, au rez-de-chaussée d'une auberge, devant une table pantagruélique encombrée de viandes, de poissons, de vins, de pâtés et de fruits; buvant, coupant, mordant, tordant, dépeçant, dévorant; l'un rouge, l'autre cramoisi, le troisième pourpre, le quatrième violet, comme quatre personnifications vivantes de la voracité et de la gourmandise. Il m'a semblé voir le dieu Goulu, le dieu Glouton, le dieu Goinfre et le dieu Gouliaf attablés autour d'une montagne de mangeaille.» (Hugo V., 1880 – 1926).

L'auberge est un espace privilégié, associé au code alimentaire, parce que, au moment de l'arrêt du voyageur, celui-ci y trouve une table bien garnie et une chambre pour se reposer. Le vin devient alors un élément de la structuration narrative, puisqu'il organise le récit selon deux coordonnées fondamentales: le temps et l'espace. Le voyageur interrompt son déplacement, la description est suspendue et l'espace de l'auberge et le temps du repas entraînent le contact humain: c'est à cette occasion-là que les plats et le verre de vin deviennent un prétexte pour l'échange, pour apprendre des histoires ou, comme il est le cas dans le récit hugolien, rapporter des paroles: «Je vis d'ailleurs comme un parfait allemand. Je dîne avec des serviettes grandes comme des mouchoirs, je couche dans des draps grands comme des serviettes. Je mange du gigot aux cerises et du lièvre aux pruneaux, et je bois d'excellent vin du Rhin et d'excellent vin de Moselle, qu'un français ingénieux, dînant hier à quelques pas de moi, appelait du *vin de demoiselle.* Ce même français, après avoir dégusté sa carafe, formulait cet axiome : *l'eau du Rhin ne vaut pas le vin du Rhin.*» (Hugo V., 1880 – 1926). Le vin délie les langues et facilite les contacts humains, les confidences et les opinions personnelles: «Comme la fin de mon perdreau coïncidait avec la fin de sa phrase, je répondis en me tournant vers le garçon: *une autre assiette*. Cette réponse lui parut suffisante pour lier conversation, et il continua: […] je ne l'estime qu'à cause de son vignoble, qui donne le vin liebfrauenmilch. Buvez-en, monsieur, il y en a d' excellent dans cette auberge. Ah! Français! Vous êtes de bons vivants, vous autres! Et goûtez aussi, croyez-moi, du vin de Katterloch et du vin de Luginsland. Ma foi, rien que pour trois verres de ces trois vins, je viendrais à Worms.» (Hugo V., 1880 – 1926).

L'arrêt autour du vin se transforme d'une fin en un début; c'est le passage du descriptif au narratif et la transition entre les deux plans constitutifs de tout récit de

voyage se réalise par l'intérmédiaire de ce «relais» universel qu'est le vin, chez Victor Hugo, comme chez tant d'autres voyageurs (Mureşanu Ionescu, 2009): «Le voyageur a marché toute la journée, ramassant, recevant ou récoltant des idées, des chimères, des incidents, des sensations, des visions, des fables, des raisonnements, des réalités, des souvenirs. Le soir venu, il entre dans une auberge, et, pendant que le souper s'apprête, il demande une plume, de l'encre et du papier, il s' accoude à l'angle d'une table, et il écrit. Chacune de ses lettres est le sac où il vide la recette que son esprit a faite dans la journée, et dans ce sac, il n'en disconvient pas, il y a souvent plus de gros sous que de louis d'or» (Hugo V., 1880 – 1926; Munteanu, 1986).

CONCLUSIONS

Le regard du voyageur Hugo surprend le paysage naturel et humain dans sa matérialité qu'il explore attentivement, en la prolongeant grâce à sa capacité d'y englober la dimension spirituelle profonde. Comme il l'affirmait dès la première lettre: «Vous le savez, mon ami, ce ne sont pas les événements que je cherche en voyage, ce sont les idées et les sensations; et, pour cela, la nouveauté des objets suffit.», Hugo porte sur le monde un regard qui veut découvrir, enregistrer mais aussi passer au-delà de la surface concrète des choses. Le spectacle de la nature devient poésie des paysages et des monuments, tandis que le spectacle humain acquiert une dimension théâtrale. Et, dans ce changement des plans, le code alimentaire – et surtout le vin – joue son rôle de médiateur…

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STUDY ON SUSTAINABLE RURAL DEVELOPMENT STRATEGY VÂNĂTORI VILLAGE, NEAMŢ COUNTY

STUDIU PRIVIND STRATEGIA DE DEZVOLTARE RURALĂ DURABILĂ A COMUNEI VÂNĂTORI, JUDEŢUL NEAMŢ

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Abstract. *The Vânători commune of is one of the most important rural human settlements county of Neamt. Situated in the pre-mountainous area, near the town of Targu Neamt, it has certain features that individualize it from the rest of the communes. It is one of the largest communities of the county, with an area of 16.709 hectares and a total of 8748 people. Being placed in the pre-urban area, the commune has a diversified economy, the agricultural occupations are intertwined with those of services, and small industry. In the study, based on specific indicators, it is made a diagnostic analysis on the natural, economic and social potential of the commune. The diagnostic analysis is accompanied by a SWOT analysis where there are highlighted on the one hand strengths and opportunities for development of the village, and, on the other hand, weaknesses and threats on the medium and long term development. The data obtained were the basis for design guidelines for rural development policies of the village.*

Key words: mountainous zone, rural area, Neamţ county

Rezumat. *Comuna Vânători reprezintă una dintre aşezările umane rurale importante ale judeţului Neamţ. Situată în zona pre-montană, în apropierea oraşului Târgu Neamţ, prezintă câteva caracteristici care o particularizează faţă de restul comunelor judeţului. Este una dintre cele mai mari comune ale judeţului, având o suprafaţă de 16.709 ha şi un număr de 8748 locuitori. Fiind amplasată în zona preurbană, comuna prezintă o economie diversificată, în care ocupaţiile agricole se întrepătrund cu cele ale serviciilor, precum şi cu mica industrie.În cadrul studiului, pe baza unor indicatori specifici, este efectuată o analiză diagnostic asupra potenţialului natural, economic şi social de care dispune comuna. Analiza diagnostic este însoţită de o analiză SWOT prin care sunt puse în evidenţă pe de o parte punctele tari şi oportunităţile de dezvoltare a comunei, iar pe de altă parte, punctele slabe şi ameninţările privind dezvoltarea pe termen mediu şi lung. Datele obţinute au stat la baza proiectării liniilor strategice de dezvoltare rurală a comunei.*

Cuvinte cheie: zonă montană, dezvoltare rurală, jud. Neamţ

MATERIAL AND METHOD

For the study were used statistical data and descriptions of various monographic publications, informative and the official statistical documents. Some statistical data were taken from Vanatori Town Hall -Neamt and from direct investigations in the territory.

Among the methods used, we mention the monograph, comparison method, graphical method. Indicators and indices used were of specific nature and related to diagnosis countryside (Ciurea I., at al., 2005).

RESULTS AND DISCUSSIONS

Vânători-Neamt village occupies the northwestern part of Neamt Depression, the most northern division of the Carpathians depression Moldova. This geomorphologic unit is typical of the Carpathian depressions range in this part of the country.

Its name comes from the body of soldiers who guard the nearby Castle Neamt and mountain passes, with the additional tasks of hunting supply royal court cuisine.

From the administrative point of view, it consists of four villages: Vânători Neamţ, Lunca, Nemţişor and Mănăstirea Neamţ..

The village is bordered to the west of the Oriental Carpathians are located at the boundary between the hilly and mountainous areas.

Neamt Depression is situated in Vânători-Neamţ commune, closed in the north by Culmea Pleşului in the north of and Dealul Corni in the south (603 m) a hill with cumbersome forms like hills of the plateau.

In the north Dealul Corni ends with a fold similar to the Moldavian Plateau.

Curechiştea Ghindăoani Coast with unfolded structure was considered by some experts as an insight to the west of Moldavian Plateau. A northern slope of Dealul Corni, consisting of Miocene marls with gips explains the frequency of pieces of land, manifested in the form of leaks and bumpy slides, which gave rise to a micro-relief deleted. Forested with beech and oak with some portions, Dealul Corni was a place hardly accessible and even has a low altitude, the roads avoiding it. The village is crossed by rivers Ozana, Nemţişor and Cacovea.

The total area of the village is 16,709 hectares.

A. Population

Vânători-Neamţ commune in late 2008 had a population of 8713 inhabitants.

We present in table 1 the evolution of the total population and separately by sex in 2006-2008.

In the reported period, the municipality's population registered a slight growth of 0.9% in 2008 compared with 2006.

In all years, sex ratio is in favour of men, accounting for 50.96% of its total population in 2006 and 50.77% in 2008. In both categories of persons have been slight increases, higher for women (1.3%) compared with 0.5% for men.

Table 1

Evolution of population and of demographic indicators

Nr. crt.	Specification		Years		
			2006	2007	2008
1.	Total population	nr.	8637	8679	8713
		%	100,0	100,5	100,9
	Of which: -men	nr.	4402	4406	4424
		%	100,0	100,1	100,5
	- women	nr.	4235	4273	4289
		%	100,0	100,9	101,3
2.	Born	nr.	80	107	91
		%	100,0	133,7	113,8
3.	Deceased	nr.	102	70	101
		%	100,0	68,6	99,0
4.	Coming to settle in the commune	nr.	108	149	155
		%	100,0	138,0	143,5
5.	Leaving from the commune	nr.	90	107	126
		%	100,0	118,9	140,0

If we look at the demographic indicators they reveal that the lower number of children born was deceased. Index birth in 2006 saw the value of 0.92% versus 1.18% mortality index. In 2008, the situation is similar (birth rate - 1.04% 1.16% mortality). But in 2007 the mortality recorded lower values than childbirth. And yet the population has not decreased in number. Population growth was due to increasing number of people who have established residence in the village, number of departures was higher in other localities. Thus in 2006 the number of „arrivals" was of 108 people and the departure of only 90 people in other years while maintaining approximately the same ratio.

B. Housing indicators

Housing indicators refer to the number of dwellings, habitable area, equipped with electricity networks, water and gas. Data are presented in tab. 2.

Table 2

Housing indicators

Nr. Crt.	Specification	UM	Anii		
			2006	2007	2008
1.	Existing houses	nr.	2613	2635	2649
		%	100,0	100,8	101,4
2.	Living area - total	nr.	114376	116085	117484
		%	100,0	101,5	102,7
3.	Average area of a house	nr.	43,8	44,1	444
		%	100,0	100,7	101,4
4.	Water quantity distributed to consumers	nr.	75	62	64
		%	100,0	82,7	85,3
5.	Natural gases distributed	nr.	-	103	45
		%	-	100,0	43,7

Analyzing the number of housing developments, there is a tendency to increase its recording a growth rate of 1.4% in 2008 compared to 2006, which is expressed in absolute terms in 36 new homes. It is a significant number for a period of two years only.

In parallel with the number of dwellings has increased the total area surface with slightly higher percentage, which shows an increase in level of comfort. Calculations show that in the 22 new homes built in 2007, the average area was 77.6 m2 to 43.8 m2 total number of dwellings in the previous year. In 2008 the average area of 14 homes is a new house was built 100 m^2 higher than in older housing (128%), but also to those constructed in the previous year (28.8%).

Vânători commune has running water network with a length of 22 km. The quantity of water supplied to residents decreased slightly from 75 000 cm. (2006) to 64,000 m (in 2008). The cause is the policy of rationalization of people determined by the increases due to specific cost.

Since 2007, the municipality benefits from a natural gas network. The volume of gas consumed, after a year, was drastically reduced, all economic reasons.

C. Employment of Human Resources

Working age population (15-64 years) represent 86.0% of the total population of the village. Of this population, employees have a share of 11.9%. Difference, except the high school students (4.1%) had occupations in agriculture or other activities with higher character.

We show in figure 1 structure staff person for groups of occupations.

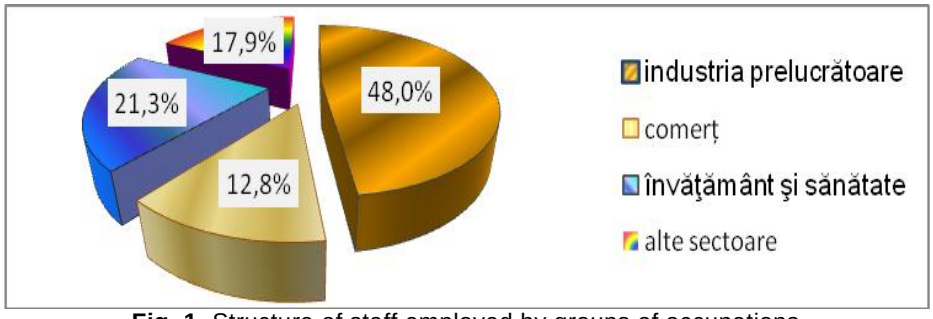

Fig. 1. Structure of staff employed by groups of occupations

Staff employed in the structure, it holds the largest number staff busy in manufacturing (48.0%), followed by education and health personnel (21.3%) and commerce (12.8%). Remaining staff in total, had 17.9%, is occupied in administration, travel and transport activities.

D. Education and Health

In the village there are two schools, one high school and a school of arts and crafts. Total number of students enrolled was 1208, in 2008, with a slight downward trend compared to previous years. Of the total number of students, about 32% were enrolled in primary and secondary schools in as many and in

secondary education - 25.7%. The difference is the students enrolled in arts and crafts.

In the commune there is also a kindergarten with a total of 214 preschoolers. The school system has 58 classrooms and school offices, 10 school laboratories, 6 school workshops, three gyms and four sports.

Regarding health, there are four doctors, one dentist and a pharmacy. The whole healthcare system is staffed with qualified personnel in adequate number.

E. Farming

Vânători – Neamţ Commune has a total area of 4185 hectares. Surface structure by use categories is shown in figure 2.

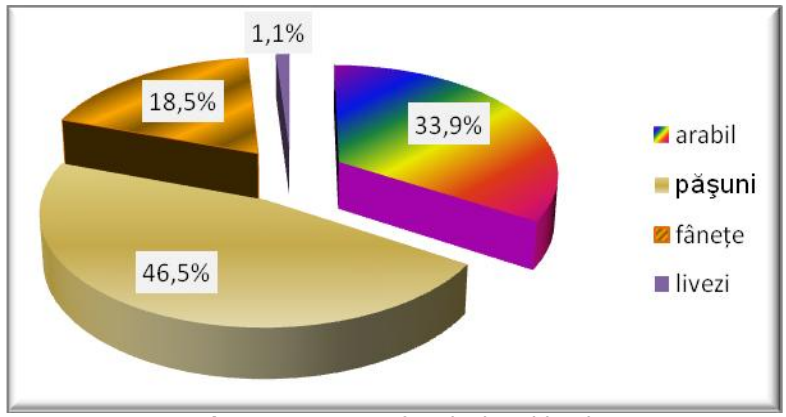

Fig. 2. Structure of agricultural land

Vânători-Neamţ commune is situated in the pre-mountainous area and has left its mark on the structure of categories of use. First, as a share, lies natural pasture land - 46.5%, followed by 33.9% of arable land. Natural grassland and orchards have 18.5%, only 1.1%.

It is a structure that promotes breeding. Compared to other localities, animal husbandry is well developed, with a total of 2094 cattle, 1301 pigs, 4320 sheep and 265 horses. LU processed, this effect is 3121 heads and indicator LU density is 74.5 per 100 ha of agricultural land.

There is an inadequate endowment with mechanical means, such as returning some 100 hectares of farmland to a tractor and there are a few of the other machinery. (E.g. only two harvesters).

F. Culture and Art

In the commune there are eight libraries, one public and five museums (Museum Village, Vasile Găman-Lunca Museum, Mihail Sadoveanu Memorial House, Neamt monastery Museum and Museum of Secu monastery). In the commune there are also twomonuments of the heroes and four monasteries (Neamt, Secu, Hermit and „Sf. Ioan Iacob Herezitul"). There is also the bison reserve Dragos Voda.

Among the strengths of that municipality, in a picturesque location, the presence of several religious goals (4 monasteries), the existence of many centres, museums, and the presence of interest surrounding the numerous cultural, historical and tourism (e.g. City Neamt, Ion Creanga Memorial House etc.). Weaknesses relate to poor network equipment with water and gas, lack of modern roads to, poor integration of agricultural production, lack of focused measures to increase the sustainability of the locality. One of threats is the trend of migration perspective of human resources.

Directions for sustainable rural development in the locality

The study outlined several main directions of development of Vânători-Neamţ commune. They concern:

• continued investment to develop water and sewerage networks;

• Extension of supply;

• modernization, by asphalting of secondary roads (within the four towns that comprise the municipality);

• setting up of processing agricultural products and handicrafts.

• initiation of qualification and retraining programs for human resources professionals, in particular non-agricultural nature.

CONCLUSIONS

1. Vânători-Neamţ commune is located at the eastern extremity of the mountain area of Eastern Carpathians. The administrative structure - extent and population - is an important human settlement in the county of Neamt.

2. Due to its proximity to the town of Targu Neamt it has some features that customize the remaining rural areas. We mention here the higher degree of urbanization, occupational structure atypical trend of population growth and housing.

3. The diagnostic study identified some "weaknesses" that formed the basis of sustainable housing development directions aimed at increasing quality of life, the skills and the integration of agricultural production.

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THE DISTRIBUTION AND MOBILITY OF CADMIUM IN SOILS CULTIVATED WITH VEGETABLES. (I) TRADITIONAL CROPS

DISTRIBUŢIA ŞI MOBILITATEA CADMIULUI ÎN SOLURI CULTIVATE CU LEGUME. (I) CULTURI TRADIŢIONALE

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Abstract*. A number of 16 samples of soils cultivated with vegetables (tomato, cucumber, pepper, cauliflower and celery) using traditional technologies, in open filed and plastic tunnels, was used for this experiment. Soil samples were taken from a depth of 0-20 cm from the plant row and the interval between the rows. In studied soils, the total cadmium content varied between 1.28–2.61 μg.g^{-1}. The average cadmium content in mobile fractions is 0.4717 μg.g^{-1} (24.72 % from Cd(T)), in fractions with medium mobility is 1.2808 μg.g^{-1} (6.05 % from Cd(T)), and in fix fraction is 0.1561 μg.g^{-1} (7.98 % from Cd(T)), respectively. The experimental results indicates that in studied soils are not polluted with cadmium, but the risk potential is significant, due to the high weight of mobile fractions from total cadmium content. According to the obtained results, 24.72 % is directly accessible to the plants (major risk potential) and 67.05 % is indirectly accessible to the plants (latent risk potential).*

Key words: cadmium, chemical speciation, vegetables cultures.

Rezumat*. Pentru studii s-au utilizat 16 probe de sol cultivat cu legume (tomate, castraveţi, ardei iute, conopidă şi ţelină), după tehnologii tradiţionale, în câmp şi în solarii. Probele de sol au fost prelevate de la adâncimea de 0-20 cm, de pe rândul de plante şi de pe intervalul dintre rânduri. În solurile studiate, conţinutul total de cadmiu variază între 1,28–2,61 μg.g^{-1}. Conţinutul mediu de cadmiu în fracţiunile mobile este 0,4717 μg.g^{-1} (24,72 % din Cd(T)), în fracţiunile cu mobilitate medie este 1,2808 μg.g^{-1} (67,05 % din Cd(T)), iar în fracţiunile fixe este 0,1561 μg.g^{-1} (7,98 % din Cd(T)). Datele experimentale indică faptul că solurile studiate nu sunt poluate cu cadmiu, însă potenţialul de risc a cadmiului este semnificativ, datorită ponderii ridicate a fracţiunilor mobile: din conţinutul total de cadmiu, în medie, 24,72 % este direct accesibil plantelor (potenţial major de risc), iar 67,05 % este indirect accesibil plantelor (potenţial latent de risc).*

Cuvinte cheie: cadmiu, speciaţie chimică, culturi legumicole

INTRODUCTION

The problems regarding the distribution and biodisponibility of cadmium in soils cultivated with vegetables has an important place in agrochemical studies, due to high toxicity and major perturbations that this heavy metal may caused in

mineral and biologic systems from soils (Alloway, 1990, Bulgariu, 2006, Pedias, 1992, Ross, 1994). Cadmium is one of the most toxic heavy metal (being included in A.I toxicity class, is very mobile and has a high biodisponibility, in the conditions of most soils types (Adriano, 2001; Bourg, 1995). In soil-plant-water systems, the cadmium has a remarkable tendency for concentration in soil solution, colloids and organic matter (as chemical species with high mobility), and progressive bioaccumulation in plants and animal organisms. Under these conditions, the cadmium can manifest, simultaneous, both toxic effects on the biological systems, and some high harmful effects on the dynamics of nutritive and microelements, organic matter or of biochemical processes from soils. The toxic effects are conditioned by different limits of cadmium concentration, but the harmful effects are restricted, not only by cadmium concentration, but also by type and content of speciation forms of this element (Bulgariu, 2007, Kabata-Pendias, 1992).

In agricultural soils, the normal content of cadmium varied between 0.01 and 2.00 $\mu g.g^{-1}$ (average: 0.35 $\mu g.g^{-1}$), and the maxim admissible concentration of cadmium in such soils is < 1 $\mu g.g^{-1}$, value accepted as reference in most of the countries. In Romania, according to The Order of Water, Forest and Environmental Protection Ministry no 756/1997, it has been establish the following limits for cadmium: normal content 1 $\mu g.g^{-1}$, alert threshold 3 $\mu g.g^{-1}$ and intervention threshold 5 $\mu g.g^{-1}$. For the countries from European Union, it was proposed, as limit value of cadmium in agricultural soils, especially for those cultivated with vegetables, to be < 0.1 $\mu g.g^{-1}$. The cadmium content in vegetables varied between 0.016 and 0.130 $\mu g.g^{-1}$ (average: 0.028 $\mu g.g^{-1}$), and these are higher than in case of other agricultural products (Adriano, 2001).

In soils cultivated with vegetables, the speciation, migration and inter-phases distribution processes of cadmium have a particular character, due mostly to the frequent modification, more or less severe, of the lithology and of the chemical-mineralogical characteristics of these soils. In consequence, the mobility, biodisponibility and risk potential of cadmium, in soils cultivated with vegetables are difficult to estimated, and the experimental data have not always a convergent character.

MATERIAL AND METHOD

For experiments a number of 16 samples of soil cultivated with vegetables (tomatoes, cucumbers, pepper, cauliflower and celery) in the field and plastic tunnels using traditional technologies (table 1) was used. Soil samples were taken from 0-20 cm depth (A horizon), from the plants row and the interval between rows, in August 2009, from AS Maxim Tg. Frumos Ranch. The determination of total cadmium content was done on average samples (triplicate) by flame atomic absorption spectrometry (Vario 6 FL Spectrometer, with mono-element lamp), after the soil samples weathering with HNO_3 conc. + $HClO_4$ conc. mixture (Dean). The fix and mobile cadmium fractions (table 1) have been separated from soil samples by sequential solid/liquid extraction in seven steps (Bulgariu, 2008, Sahuquillo,2003), in aqueous two-phase PEG 2000 – inorganic salt systems (Bulgariu,2005). From obtained extracts, the cadmium was determined by flame atomic absorption spectrometry.

The internal control of analytical data was performed on parallel samples by X-ray fluorescence spectrometry (Epsilon 5 XRF Spectrometer). The results presented in this paper the arithmetic mean of three determinations made on the same sample. Supplementary information about the speciation and occurrence forms of cadmium in studied soils have been obtained by microscopy, IR and Raman spectrometry, performed on soils samples, after marking cadmium with p,p'-dinitro-Sym-diphenylcarbazide (Bulgariu, 2007).

RESULTS AND DISCUSSIONS

Total cadmium. In studied soils, the total cadmium content, Cd(T), varied between 1.28 and 2.61 $\mu g.g^{-1}$, and these values are higher than the normal content of cadmium in soils, and lower than the value of alert threshold for sensitive soils (table 1). The cadmium content from soils is higher in case of crops from solariums (1.63–2.97 $\mu g.g^{-1}$) than in case of crops from the field (1.28–1.68 $\mu g.g^{-1}$). In function of types of vegetables, the total cadmium content in soils follows the order: tomatoes – Balett (2.16–2.97 $\mu g.g^{-1}$) > tomatoes-Venice (1.95–2.61 $\mu g.g^{-1}$) > tomatoes – Izmir (1.73–2.15 $\mu g.g^{-1}$) > cucumbers (1.63–2.17 $\mu g.g^{-1}$) > cauliflower (1.41–1.68 $\mu g.g^{-1}$) > celery (1.28–1.35 $\mu g.g^{-1}$). In case of crops from plastic tunnels, the content of cadmium from soils samples on the row is higher than for the samples of the interval between the rows – the difference between these being by 1.63–2.97 $\mu g.g^{-1}$ (average: 0.46 $\mu g.g^{-1}$). In case of crops from the field, the content of cadmium from the samples on the row is lower than for the samples from the interval between the rows – the difference between these being by 1.28–1.68 $\mu g.g^{-1}$ (average: 0.17 $\mu g.g^{-1}$). The cadmium content do not presents significant correlations with the main chemical-mineralogical components, pH, redox potential or soluble salts content of studied soils.

Mobile fractions of cadmium. The cadmium concentration in mobile fractions (with high biodisponibility, F.1 and F.2 fractions) varied between 0.2094 and 0.7323 $\mu g.g^{-1}$ (average: 0.4717 $\mu g.g^{-1}$), and the weight of these fraction at total cadmium content is 16.35–31.73 % from Cd (T) (average: 24.72 %). The data presented in table 1 indicate that the weight of mobile fractions at total cadmium content is higher than the residual fractions (inaccessible for plants, F.7 fraction), but is lower than the "pseudo-mobile" fractions. This observation is in good agreement with literature data and shows that the total amount of cadmium existing in the studied soils, on average only 24.72% is direct accessible to the plants, and this value determined the effective risk potential of cadmium for vegetables crops.

In case of crops from the field, the cadmium concentration from mobile fractions (0.2094–0.4246 $\mu g.g^{-1}$, average: 0.3244 $\mu g.g^{-1}$; 16.35–25.27 % from Cd(T), average: 22.46 %) is lower than in case of cultures from plastic tunnels (0.4092–0.7323 $\mu g.g^{-1}$, average: 0.5208 $\mu g.g^{-1}$; 17.46 % from Cd(T), average: 25.47 %). The concentration of cadmium from soil samples on the row (0.2094–0.7323 $\mu g.g^{-1}$, average: 0.4628 $\mu g.g^{-1}$; 16.35–27.89 % from Cd(T), average: 22.17 %) is lower than in case of soil samples on the interval between the rows (0.3668–0.6350 $\mu g.g^{-1}$, average: 0.4806 $\mu g.g^{-1}$; 21.53–31.73 % from Cd(T), average: 27.27 %).

In function of cultivated vegetables type, the concentration of mobile cadmium in studied soils follows the order: celery (0.2094–0.3668 $\mu g.g^{-1}$; 16.35–27.17 % from Cd(T)) < cauliflower (0.2971–0.4246 $\mu g.g^{-1}$; 21.07–25.27 % from Cd(T)) < pepper (0.3850–0.5132 $\mu g.g^{-1}$; 22.78–27.89 % from Cd(T)) < cucumbers (0.4092–0.5320 $\mu g.g^{-1}$; 21.53–31.73 % from Cd(T)) < tomatoes – Venice (0.4559–0.5734 $\mu g.g^{-1}$; 17.46– 9.40 % from Cd(T)) < tomatoes – Izmir (0.4821–0.5340 $\mu g.g^{-1}$; 22.42–30.86 % from Cd(T) < tomatoes – Balett (0.6350–0.7323 $\mu g.g^{-1}$; 24.65–29.39 % from Cd(T)).

Fractions with medium mobility (pseudo-mobile; with latent mobility) of cadmium. The concentration of cadmium in pseudo-mobile fractions (from which cadmium can be only partial mobilized in the conditions of studied soils; F.3, F.4, F.5 and F.6 fractions) varied between 0.9029 and 1.9608 $\mu g.g^{-1}$ (average: 1.2808 $\mu g.g^{-1}$), and the weight of these fractions at the total cadmium content is 59.74–76.11 % from Cd(T) (average: 67.05 %). These results indicate that the total amount of cadmium existing in the studied soils, on average only 67.05 % is indirectly accessible to the plants (only in certain conditions), and this value determined the latent risk potential of cadmium for the vegetables cultures. The higher part from pseudo-mobile cadmium is bonded by organic matrix (F.6 fraction; 26.28–39.21 % from Cd(T), average: 35.14 %) and by the organic-mineral complexes (F.4 fraction; 15.08–23.29 % from Cd(T), average: 18.52 %) – table 1. In case of cultures from the field, the cadmium concentration in the pseudo-mobile fractions (0.9029–1.1322 $\mu g.g^{-1}$, average: 0.9982 $\mu g.g^{-1}$; 66.88–76.11 % from Cd(T), average: 70.03 %) is lower than in case of cultures from solariums (0.9817–1.9608 $\mu g.g^{-1}$, average: 1.3750 $\mu g.g^{-1}$; 59.74-71.91 % from Cd(T), average: 66.06 %). The concentration of pseudo-mobile cadmium from soil samples on the row (0.9743–1.9608 $\mu g.g^{-1}$, average: 1.4171 $\mu g.g^{-1}$; 62.46–76.11 % from Cd(T), average: 69.01 %) is higher than in case of soil samples from the intervals between the rows (0.9029–1.3723 $\mu g.g^{-1}$, average: 1.1444 $\mu g.g^{-1}$; 59.74–70.71 % from Cd(T), average: 65.10 %). In function of cultivated vegetables type, the concentration of pseudo-mobile cadmium follows the order: celery (0.9029–0.9743 $\mu g.g^{-1}$; 66.88–76.11 % from Cd(T)) < cauliflower (0.9835–1.1322 $\mu g.g^{-1}$; 67.39–69.75 % from Cd(T)) < pepper (1.1951–1.1493 $\mu g.g^{-1}$; 62.46–70.71 % from Cd(T)) < cucumbers (0.9817–1.4409 $\mu g.g^{-1}$; 60.22–68.66 % from Cd(T)) < tomatoes – Izmir (1.1017–1.5461 $\mu g.g^{-1}$; 63.68–71.91 % from Cd(T) < tomatoes – Venice (1.1651–1.8848 $\mu g.g^{-1}$; 59.74–70.81 % from Cd(T)) < tomatoes – Balett (1.3723–1.9608 $\mu g.g^{-1}$; 63.53–66.02 % from Cd(T)).

CONCLUSIONS

In studied soils, the total cadmium content varied between 1.28 and 2.61 $\mu g.g^{-1}$, and these values are higher than the normal content of cadmium in soils, but lower than the value of alert threshold for sensitive soils.

Table 1

The cadmium contents (μg.g^{-1}) of fix and mobile fractions in studied soils

No.	Details	Loc.[1]	Cd(T)	F.1	F.2	F.3	F.4	F.5	F.6	F.7
TFMax.1	Solar / cucumbers	Interval	1.90	0.1324	0.2768	0.0701	0.3290	0.1871	0.7185	**0.1848**
TFMax.2	Solar / cucumbers	Row	2.17	0.1553	0.3767	< LD*	0.4346	0.2241	0.7822	**0.1942**
TFMax.3	Solar / tomatoes -Izmir	Interval	1.73	0.2017	0.3323	0.0754	0.3219	0.1088	0.5956	**0.0892**
TFMax.4	Solar / tomatoes -Izmir	Row	2.15	0.1876	0.2945	0.1348	0.4762	0.1055	0.8296	**0.1154**
TFMax.5	Field / cauliflower -Fremont	Interval	1.68	0.1547	0.2699	0.1206	0.2929	0.1034	0.6153	**0.1164**
TFMax.6	Field / cauliflower -Fremont	Row	1.41	0.0892	0.2079	0.0912	0.2243	0.1229	0.5451	**0.1276**
TFMax.7	Field / celery-Mentor	Interval	1.35	0.1063	0.2605	0.1236	0.2037	0.0579	0.5177	**0.0766**
TFMax.8	Field / celery-Mentor	Row	1.28	0.0756	0.1338	0.0633	0.2982	0.1108	0.5020	**0.0911**
TFMax.9	Solar / cucumbers -Merengue	Interval	1.63	0.2166	0.3007	0.0857	0.2563	0.0828	0.5569	**0.1248**
TFMax.10	Solar / cucumbers -Merengue	Row	2.09	0.2217	0.2587	0.1897	0.4510	0.1329	0.6604	**0.1703**
TFMax.11	Solar / pepper	Interval	1.69	0.1103	0.2747	0.1451	0.3199	0.0866	0.6435	**0.1076**
TFMax.12	Solar / pepper	Row	1.84	0.1486	0.3646	0.1722	0.4060	0.0874	0.4837	**0.1768**
TFMax.13	Solar / tomatoes-Venice	Interval	1.95	0.2687	0.3047	0.0854	0.3355	0.1474	0.5968	**0.2043**
TFMax.14	Solar / tomatoes -Venice	Row	2.61	0.2067	0.2492	0.2513	0.4084	0.2202	0.9685	**0.2946**
TFMax.15	Solar / tomatoes -Balett	Interval	2.16	0.2607	0.3743	0.1185	0.3514	0.2188	0.6836	**0.1531**
TFMax.16	**Solar / tomatoes -Balett**	**Row**	**2.97**	**0.3145**	**0.4178**	**0.2129**	**0.5666**	**0.1983**	**0.9830**	**0.2714**

[1]Location. Place of sampling: interval – samples of the interval between the rows, row – samples on the row. **F.1** - soluble fraction in water (extractant: H_2O). **F.2** – easy extractable fraction (extractant: CH_3COONH_4 1.0 M, pH=7). **F.3** – fraction sensitive to the acidification processes; bonded by carbonates (extractant: CH_3COONa 1.0 M, pH=5; CH_3COOH). **F.4** – fraction sensitive to the complexation; bonded by non-silicates mineral phases (extractant: CH_3COONa -CH_3COOH / EDTA 10^{-2} M). **F.5** – easy reducible fraction; bonded by Fe and/ or Mn oxides (extractant: $(NH_4)_2C_2O_4$ / $H_2C_2O_4$). **F.6** – oxidisable fraction; bonded by organic matter and / or sulphurs (extractant: $K_4P_2O_7$). **F.7** – fraction bonded by matrix and silicates / aluminosilicates mineral phases; fix fraction, residual (extractant: $HClO_4$+HNO_3). LD- detection limit of atomic Absorption Spectrometer. Cd(T) – total cadmium content.

The average cadmium content in mobile fractions is 0.4717 μg.g^{-1} (24.72 % from Cd(T)), in the fractions with medium mobility is 1.2808 μg.g^{-1} (67.05 % from Cd(T)), and in fix fractions is 0.1561 μg.g^{-1} (7.98 % from Cd(T)). The higher part of cadmium with latent mobility is bonded by organic matter (26.28–39.21 % from Cd(T)) and by organic-mineral complexes (15.08–23.29 % from Cd(T)).

The experimental results indicate that the studied soils are not polluted with cadmium, but the risk potential of this is significant due to the high weight of mobile fractions: from total cadmium content, an average of 24.72 % is directly accessible to the plants (major risk potential), and 67.05 % is indirectly accessible to the plants (latent risk potential).

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THE DISTRIBUTION AND MOBILITY OF CHROME IN SOILS CULTIVATED WITH VEGETABLES. (I) TRADITIONAL CROPS

DISTRIBUŢIA ŞI MOBILITATEA CROMULUI ÎN SOLURILE CULTIVATE CU LEGUME. (I) CULTURI TRADIŢIONALE

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Abstract. *Research bring a series of new data concerning the speciation and distribution processes and risk potential of chrome in soil cultivated with vegetables. A number of 16 samples of soils cultivated with vegetables (tomatoes, cucumbers, pepper, cauliflower and celery), in the open field and plastic tunnels, using traditional technologies (was used for thi experiment). Soil samples were taken from 0-20 cm depth interval of the row and the interval between rows. The experimental results have indicates that the studied soils are not contaminated and have a high supply level of chrome. Towards to chemical-mineralogical components of soils, the chrome has a heterogeneous distribution, and the speciation and distribution inter-phases equilibriums are very sensitive to the variation of physic-chemical conditions. The risk potential of chrome is very low, due to the reduced mobility and biodisponibility of speciation forms and due to high probability of reducing Cr(IV) to Cr (III), in the conditions of studied soils.*

Key words: chrome, chemical speciation, vegetables cultures.

Rezumat. *Studiile aduc o serie de date noi referitoare la procesele de speciaţie şi de distribuţie, respectiv potenţialul de risc a cromului în solurile cultivate cu legume. Pentru studii s-au utilizat 16 probe de sol cultivat cu legume (tomate, castraveţi, ardei iute, conopidă şi ţelină), după tehnologii tradiţionale, în câmp şi în solarii. Probele de sol au fost prelevate din intervalul de adâncime 0-20 cm de pe rândul de plante şi de pe intervalul dintre rânduri. Datele experimentale au arătat că solurile studiate nu sunt contaminate şi au un nivel ridicat de aprovizionare cu crom. În raport cu componenţii chimico-mineralogici ai solurilor, cromul prezintă o distribuţie heterogenă, iar echilibrele de speciaţie şi distribuţie interfazică sunt foarte sensibile la variaţiile condiţiilor fizico-chimice. Potenţialul de risc a cromului este foarte mic, datorită mobilităţii şi biodisponibilităţii reduse a formelor de speciaţie şi probabilităţii ridicate de reducere a Cr(IV) la Cr(III) în condiţiile solurilor studiate.*

Cuvinte cheie: crom, speciaţie chimică, culturi legumicole

INTRODUCTION

The chrome is a common trace element for most of soil types, with an important role in pedogenetic processes, plants nutrition and animal metabolism. The chrome content in soils varied in relatively large limits, as a function of type

of soil and the utilization way of these. Worldwide is considered that the normal values of the chrome content for agricultural soils are between 10 and 150 $\mu g.g^{-1}$ (average: 40 $\mu g.g^{-1}$) (Adriano, 2001). In Romania, according to The Order of Water, Forest and Environmental Protection Ministry no 756/1997, the normal chrome content in agricultural soils is $30 \mu g \cdot g^{-1}$. The maxim admissible contents of chrome in agricultural soils, accepted by most of the countries from the European Union, are 100 $\mu g.g^{-1}$ for Cr(III) and 4 $\mu g.g^{-1}$ for Cr(VI). In case of soils cultivated with vegetables, for the countries from European Union, was proposed that the limit values of Cr(VI) in soil to be < 1 $\mu g.g^{-1}$ (Kabata-Pendias, 2007). The chrome content in vegetables varied between 0.16 and 0.5 $\mu g.g^{-1}$ (average: 0.09 $\mu g.g^{-1}$), values which situated the vegetables, in the category of agricultural products with the high chrome contents. According to the data from literature can be mentioned that even the soils have, generally, high chrome contents, in agricultural products the chrome content is low (Davidescu, 1992).

The chrome distribution in soils is realized as species derivate from two oxidation states, which are thermodynamically stable: (i) Cr(III) with reduced mobility and toxic potential (similarly with Al and Fe), and (ii) Cr(VI) very mobile and with a high toxic potential, even at low concentrations (Katz, 1993). The toxicity of Cr(VI) (specially his mutagen and canceries effects) is by 10 – 100 times higher than Cr(III) (Lewis, 1982). The behaviour of chrome in soils is characteristic for each oxidation state, being determined by the influence of environment on the equilibrium between Cr(III) and Cr(VI), and by the interaction mechanisms of the species derivate from these oxidation states with the mineral and organic components of soils (Pantsar-Kallio, 2001; Stewart, 2003).

The data from literature regarding the distribution and mobility of chrome in soils cultivated with vegetables are mostly contradictories and insufficient for the formulation of some generalities. Ours studies bring a series of new data, concerning to the speciation and inter-phases distribution processes, the mobility, biodisponibility and risk potential of chrome, in soils cultivated with vegetables.

MATERIAL AND METHOD

For experiments have used 16 samples of soil cultivated with vegetables ((tomatoes, cucumbers, pepper, cauliflower and celery) in the field and solariums, using traditional technologies (table 1). Soil samples were taken from 0-20 cm depth (A horizon), on the plant row and the interval between rows, in August 2009, from AS Maxim Tg. Frumos Ranch. The drawing of samples, the sampling, the determination of pH and redox potential were performed according with usual methodology for soil analysis (Bulgariu, 2005; Bulgariu, 2007).

The determination of chrome was done on average samples, in the following way: (**i**) the total chrome – by flame atomic absorption spectrometry (Vario 6 Fl, with mono-element lamp), after samples weathering with HNO_3 conc. + $HClO_4$ conc. mixture; (**ii**) Cr(VI) – by UV-VIS molecular absorption spectrometry (Rayleigh V/9200 Spectrophotometer) with diphenil-carbazide, after extractive weathering with chorhidrate of hydroxylamine and 2 % HNO_3; (**iii**) Cr(III) – by X-ray fluorescence spectrometry (Epsilon 5 XRF Spectrometer) on parallel samples; (**iv**) mobile and fix fraction of chrome – have been separated from soil by sequential solid/liquid extraction in seven steps (table 3); in

extracts the total chrome was determined by flame atomic absorption spectrometry (Bulgariu, 2007;Ure, 1993). The results presented in this paper represent the arithmetic mean of three determinations made on the same sample. Supplementary information about the speciation and occurrence forms have been obtained from microscopic analysis, X-ray diffraction, IR and Raman spectrometry, performed on soil samples.

Table 1

The soil samples used for the experiments

No. sample	Details	Loc.	pH		E_h[3]; mV
			$pH(H_2O)$[1]	$pH(KCl)$[2]	
TFMax.1	Solar / cucumbers	Interval	6.83	6.05	591.61
TFMax.2	Solar / cucumbers	Row	6.91	6.07	587.08
TFMax.3	Solar / tomatoes-Izmir	Interval	7.19	6.31	619.55
TFMax.4	Solar / tomatoes-Izmir	Row	7.23	6.28	603.71
TFMax.5	Field / cauliflower-Fremont	Interval	7.11	6.54	573.67
TFMax.6	Field / cauliflower-Fremont	Row	7.16	6.65	584.03
TFMax.7	Field / celery -Mentor	Interval	6.98	6.35	463.88
TFMax.8	Field / celery -Mentor	Row	6.95	6.26	461.27
TFMax.9	Solar / cucumbers-Merengue	Interval	6.73	5.92	589.18
TFMax.10	Solar / cucumbers -Merengue	Row	6.89	6.10	596.77
TFMax.11	Solar / pepper	Interval	6.57	5.76	620.48
TFMax.12	Solar / pepper	Row	6.63	5.81	622.04
TFMax.13	Solar / tomatoes -Venice	Interval	7.31	6.19	569.34
TFMax.14	Solar / tomatoes -Venice	Row	7.24	6.26	576.69
TFMax.15	Solar / tomatoes -Balett	Interval	7.15	6.28	580.60
TFMax.16	Solar / tomatoes -Balett	Row	7.22	6.16	587.28

[1]pH determined in distilled water, [2]pH determined in 0.1 M KCl solution [3]Redox potential – potentiometric method, suspension procedure: 10 g soil / 50 mL solution; grain size < 0.01 mm; contact time: 30 min. Loc. – location (Borlan, 1981; Bulgariu, 2005).

RESULTS AND DISCUSSIONS

In studied soils, the total chrome content, Cr(T), varied between 47.53 and 81.39 $\mu g.g^{-1}$, values higher that the normal content of chrome in soils (40 $\mu g.g^{-1}$), but lower than the value of alert threshold for sensitive soils (100 $\mu g.g^{-1}$) (table 2).The Cr(III) content varied between 46.32 and 79.55 $\mu g.g^{-1}$ and represent 94.35–98.46 % from Cr(T). The content of Cr(VI) varied between 1.20 and 3.16 $\mu g.g^{-1}$ and represent 1.52–5.62 % from Cr(T). For all soil samples the content of Cr(VI) is lower than the value of alert threshold for sensitive soils.

The results presented in table 2 show that: (**i**) the content of Cr(T) is higher in case of vegetables crops from field (76.35–81.39 $\mu g.g^{-1}$), than in case of the crops from plastic tunnels (47.53–72.29 $\mu g.g^{-1}$); (**ii**) in function of cultivated vegetables type, the content of Cr(T) in soil follows the order: tomatoes (47.53–59.19 $\mu g.g^{-1}$) < cucumbers (60.87–69.29 $\mu g.g^{-1}$) < pepper (68.71-72.29 $\mu g.g^{-1}$) < celery (76.35-80.11 $\mu g.g^{-1}$) < cauliflower (79.04-81.39 $\mu g.g^{-1}$); (**iii**) with the exception of soil samples 7 and 8 (the cauliflower culture in field), the content of Cr(T) from soil samples on the row is higher that those on the interval – the differences of these varied between 2.35 and 6.59 $\mu g.g^{-1}$ (average: 4.41 $\mu g.g^{-1}$);

(**iv**) the content of Cr(VI) is lower in case of crops from field (1.22–1.83 $\mu g.g^{-1}$) than in case of cultures from solariums (1.20–3.16 $\mu g.g^{-1}$); (**v**) in function of cultivated vegetables type, the content of Cr(VI) in soil follows the order: tomatoes – Izmir (2.96–3.16 $\mu g.g^{-1}$) > pepper (2.76–2.85 $\mu g.g^{-1}$) > cucumbers (1.80–2.04 $\mu g.g^{-1}$) > cauliflower (1.68–1.83 $\mu g.g^{-1}$) > tomatoes – Venice (1.20–1.83 $\mu g.g^{-1}$) > tomatoes – Balett (1.60–1.64 $\mu g.g^{-1}$) > celery (1.22–1.25 $\mu g.g^{-1}$); (**vi**) the contents of Cr(T), Cr(III) and Cr(VI) do not have significant correlations with the main chemical-mineralogical components of studied soils.

Table 2

The contents of chrome from studied soil samples

sample			Cr(T); $\mu g.g^{-1}$	Cr(III)		Cr(VI)	
No.	Details	Loc.[2]		$\mu g.g^{-1}$	%[1]	$\mu g.g^{-1}$	%[1]
TFMax.1	Solar / cucumbers	Interval	60.87	59.06	97.02	1.8	2.95
TFMax.2	Solar/ cucumbers	Row	64.22	62.17	96.80	2.04	3.17
TFMax.3	Solar / tomatoes	Interval	52.60	49.63	94.35	2.96	5.62
TFMax.4	Solar / tomatoes	Row	59.19	56.02	94.64	3.16	5.33
TFMax.5	Field / cauliflower	Interval	79.04	77.35	97.86	1.68	2.12
TFMax.6	Field / cauliflower	Row	81.39	79.55	97.73	1.83	2.24
TFMax.7	Field / celery	Interval	80.11	78.88	98.46	1.22	1.52
TFMax.8	Field / celery	Row	76.35	75.09	98.34	1.25	1.63
TFMax.9	Solar/ cucumbers	Interval	65.70	63.81	97.12	1.88	2.86
TFMax.10	Solar/ cucumbers	Row	69.29	67.38	97.24	1.9	2.74
TFMax.11	Solar / pepper	Interval	68.51	66.17	96.58	2.76	4.02
TFMax.12	Solar / pepper	Row	72.29	69.99	96.81	2.85	3.94
TFMax.13	Solar / tomatoes	Interval	47.53	46.32	97.45	1.2	2.52
TFMax.14	Solar / tomatoes	Row	52.85	51.01	96.51	1.83	3.46
TFMax.15	Solar / tomatoes	Interval	50.37	48.76	96.80	1.6	3.17
TFMax.16	Solar / tomatoes	Row	56.29	54.64	97.06	1.64	2.91

[1]% from total content of chrome. [2]Loc. – location. Drawing place of soil samples.

The experimental results from table 3 indicate that: (**i**) the weight of mobile fractions (with high biodisponibility) of chrome (F.1 and F.2 fractions) is relatively reduced (5.04–23.52 % from Cr(T), average: 10.02 %), and lower than the weight of fix fractions (residual, inaccessible for plants; F.7 fraction; 10.11–27.15 % from Cr(T), average: 20.45 %), and respectively lower than the weight of pseudo-mobile fractions (from which the chrome can be only partial mobilized in conditions of studied soils, F.3, F.4, F.5 and F.6 fractions; 61.65–82.15 % from Cr(T), average: 75.91 %); (**ii**) in case of crops from the field, the weight of mobile fraction of chrome (5.0–9.11 % from Cr(T)) is lower than in case of cultures from solariums (5.21–23.52 % from Cr(T)); (**iii**) the contents of chrome in mobile fractions in case of soil samples from the row (3.04–10.56 $\mu g.g^{-1}$) are lower than those from the intervals between rows (5.29–16.11 $\mu g.g^{-1}$); (**iv**) in function of cultivated vegetables type, the relative content of chrome in mobile forms, follow the order: pepper (10.56–16.11 $\mu g.g^{-1}$) > cucumbers (4.16–10.03 $\mu g.g^{-1}$) > celery (3.84–7.29 $\mu g.g^{-1}$) > cauliflower (4.95–6.63 $\mu g.g^{-1}$) > tomatoes (3.04–5.94 $\mu g.g^{-1}$); (**v**) Cr(VI) is mostly distributed (> 90 % from

total content of Cr(VI)), in the F.2, F.3 and F.7 fractions, predominantly as species with relatively reduced mobility (biodisponibility).

Table 3

The contents of chrome (µg.g^{-1}) in mobile and fix fractions from studied soils

No.	Details	F.1	F.2	F.3	F.4	F.5	F.6	F.7
TFMax.1	Solar / cucumbers (I)	3.87	5.24	3.07	5.08	15.49	18.19	9.95
TFMax.2	Solar / cucumbers (R)	1.89	2.26	2.30	10.12	14.07	16.95	16.35
TFMax.3	Solar / tomatoes (I)	1.67	3.88	1.70	5.46	15.44	16.67	7.70
TFMax.4	Solar / tomatoes (R)	1.21	1.86	0.54	9.25	16.04	15.89	14.31
TFMax.5	Field / cauliflower (I)	1.48	5.14	7.41	7.44	27.41	17.41	12.68
TFMax.6	Field / cauliflower (R)	1.01	3.93	5.47	9.17	25.11	14.92	20.90
TFMax.7	Field / celery (I)	2.53	4.75	5.96	10.46	23.33	16.90	16.07
TFMax.8	Field / celery (R)	1.06	2.78	4.23	11.70	17.01	17.59	21.84
TFMax.9	Solar / cucumbers (I)	3.08	6.95	4.06	8.41	21.31	15.26	6.64
TFMax.10	Solar / cucumbers (R)	1.39	3.02	3.22	13.21	18.64	13.65	15.85
TFMax.11	Solar / pepper (I)	5.93	10.17	1.95	10.16	15.11	15.39	9.70
TFMax.12	Solar / pepper (R)	3.85	6.71	1.22	15.44	14.94	13.29	16.85
TFMax.13	Solar / tomatoes (I)	1.44	3.84	2.20	4.69	14.78	14.13	6.58
TFMax.14	Solar / tomatoes (R)	1.02	2.02	0.56	9.23	13.17	12.87	13.91
TFMax.15	Solar / tomatoes (I)	1.99	3.94	2.00	5.56	14.23	13.22	9.30
TFMax.16	Solar / tomatoes (R)	1.21	2.22	1.04	9.32	13.90	12.97	15.28

(I) – soil samples from the interval between rows. (R) – soil sampled on the row. **F.1** – soluble fraction in water (extractant: H_2O). **F.2** – easy extractable fraction (extractant: CH_3COONH_4 1.0 M, pH=7). **F.3** – fraction sensitive to the acidification processes; bonded by carbonates (extractant: CH_3COONa 1.0 M, pH=5; CH_3COOH). **F.4** – fraction sensitive to the complexation; bonded by non-silicates mineral phases (extractant: CH_3COONa - CH_3COOH / EDTA 10^{-2} M). **F.5** – easy reducible fraction; bonded by Fe and/ or Mn oxides (extractant: $(NH_4)_2C_2O_4$ / $H_2C_2O_4$). **F.6** – oxidisable fraction; bonded by organic matter and / or sulphurs (extractant: $K_4P_2O_7$). **F.7** – fraction bonded by matrix and silicates / aluminosilicates mineral phases; fix fraction, residual (extractant: $HClO_4$+HNO_3).

CONCLUSIONS

In relation to the contents of Cr (T), Cr (III) and Cr (VI) determined experimentally, the studied soils are not contaminated and have high levels of chromium supply. In relation to chemical and mineralogical components of studied soils, chromium all have a heterogeneous distribution, atypical compared with other micronutrients. This behaviour of chrome in soils cultivate with vegetables is determined by: (i) relatively reduced mobility of chrome; (ii) in the inter-phases distribution processes and in the adsorption processes by plants, the chrome interact antagonist with most of the essential macro- and micro-elements; (iii) the high sensitivity of speciation and distribution equilibriums of chrome at relatively reduced variation of physic-chemical conditions. The risk potential of chrome is very low, due to reduced mobility and biodisponibility of his speciation forms, and to the high reduction probability of Cr(VI) to Cr(III), in the conditions of studied soils.

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INFLUENCE OF FOLIAR APPLICATION OF FERTILIZATION AND FRUIT THINNING ON FRUIT PRODUCTION AND QUALITY

INFLUENŢA APLICĂRII FERTILIZĂRII FOLIARE ŞI RĂRIRII FRUCTELOR ASUPRA PRODUCŢIEI DE FRUCTE ŞI CALITĂŢII LOR

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Abstract. *He studied the quantity and quality of fruit of apple varieties Golden Delicious and Idared, grafted on M26, between growth and fructification, according to foliar fertilization and fruit thinning. Trees were led by slink spill. To slow chemical product used Bioprzerzedzacz SL 060 and the leaf nitrogen fertilization was used as Urea with 46% and Poly-Feed. Average harvest in the 2008-2009 years was 19,9-26,8 t / ha for the variety Golden Delicious and 16,3-25,9 t / ha in variety Idared. Fruit quality indices have been subject to variety, the production method of thinning of fruit and foliar fertilizer application.*

Key words: apple, foliar fertilizer, chemical thinning, hand thinning, harvest.

Rezumat. *S-a studiat cantitatea şi calitatea fructelor de măr de soiurile Golden Delicious şi Idared, altoite pe M26, în perioada de creştere şi rodire, în funcţie de fertilizarea foliară şi rărirea fructelor. Pomi au fost conduşi după fusul subţire .Pentru rărirea chimică s-a folosit produsul Bioprzerzedzacz 060 SL, iar pentru fertilizarea foliară azotul a fost utilizat sub formă de Uree cu 46% şi Poly - Feed. Recolta medie în anii 2008-2009 a constituit 19,9-26,8 t/ha la soiul Golden Delicious şi 16,3-25,9 t/ha la soiul Idared. Indici de calitate a fructelor au fost condiţionaţi de soi, nivelul producţiei, metoda de rărire a fructelor şi aplicarea îngrăşămintelor foliare.*

Cuvinte cheie: măr, îngrăşăminte foliare, rărit chimic, rărit manual, recolta.

INTRODUCTION

In determining the intensity of thinning reproductive organs must ensure a reserve of flowers to prevent any losses caused by late spring frosts. Fruit thinning is performed to increase the capacity of recovery of the remaining fruit trees and reduce the tendency to enter the frequency of fructification (V. Balan et. al., 2001; M. Stop 2004). Thinning fruit in developing only a single fruit per inflorescence reduces competition among fruits (competition for light, nutrients and water), allowing each individual fruit to obtain the desired size, large fruit (I. Grosu, 2005; A. Peşteanu, 2007, V., Balan, R., Şaganian, 2008). Developing too many fruits generates small fruits and poor quality. In the U.S., growers try to obtain only one fruit for every two inflorescences (FG Dennis, 2000; M. Iancu, O., Găgeanu, 2007). Getting a large production of fruit and competitive largely depends on the

variety of biological features and the technology applied. Foliar fertilization, chemical and manual thinning of fruit have a significant contribution to maintaining the physiological balance between growth and fructification and increase the quantity and quality of fruit (V. Balan, 2009).

MATERIAL AND METHOD

Planting of trees was established in spring 2003 with a one year trees in SA "Zubreşti" district Străşeni. The trees of Golden Delicious and Idared varieties grafted on rootstock M 26 were planted at 4x2 m distance and led by Slim manage. Clayey soil carbonate mold, maintaining the estate worked. Variants are located every 32 trees in random variation. To enhance the quality of the fruit in mining technology in bearing apple orchards were held following (table 1). For slow chemical product Bioprzerzedzacz 060 SL was used in concentration 0.075%, the fruit of the flower center had a diameter of 10-12 mm, and manual thinning was conducted after the fall of physiological, when fruits have reached 16-18 mm in diameter. Chemical and manual thinning of fruit has been applied to the background application of foliar fertilization and for operating conventional technology intensive apple orchards.

Table 1

Type of the mineral fertilizers, concentration and performance of the foliar treatments

variant	Fruit thinning method	Period performance treatments and foliar nutrients concentration,%				
		When 75% of the flowers have fallen, $(NH2)_2$ CO	When the fruits have a diameter of 10-12 mm, $(NH2)_2$ CO	When the fruits have a diameter of 25-30 mm, $(NH2)_2$ CO	When fruits are ripe stage, Poly-Feed	With 4 weeks before harvest, $CaCl_2$
V1	Control - no thinning	Water	Water	Water	Water	Water
V2	Control - no thinning	0,5	0,8	1,1	0,1	0,6
V3	Chemical thinning	Water	Water	Water	Water	Water
V4	Chemical thinning	0,5	0,8	1,1	0,1	0,6
V5	Chemical + hand thinning	Water	Water	Water	Water	Water
V6	Chemical + hand thinning	0,5	0,8	1,1	0,1	0,6
V7	Hand thinning	Water	Water	Water	Water	Water
V8	Hand thinning	0,5	0,8	1,1	0,1	0,6

For leaf nitrogen fertilization was used as Urea with 46% active substance, consuming 1000 liter per hectare in that concentration (tab1). The first treatment was applied after flowering (75% of the flowers have fallen) in a dose of 0.5%, second - when fruit were 10-12 mm in diameter in a concentration of 0.8% and the third - when fruits were diameter of 25-30 mm. In treatment 4, during ripen stage fruit, Poly-Feed

product to use a dose of 0.1% having constituted the report 19:19:19 NPK nutrients and micronutrients 6 (Fe, B, Mn, Zn, Cu, Mo).

Four weeks before harvesting the fruit, to use calcium chloride concentration of 0.6% in the treatment 5.

Investigations of foliar fertilization and the normalization of a load of fruit from apple or methods of research conducted through field and laboratory stationary Golden Delicious, Idared varieties, grafted on M26 rootstock.

Establishing harvest is done for each tree separately, weighing the production of the 32 trees and making the arithmetic mean. Average weight of fruit is determined by weighing the balance of a sample of 100 apples, which represents both shape and degree of maturity. Soluble solids is determined using the device GAZ-20, titrated acidity - by neutralizing an aqueous extract of fruit volume with a solution of NaOH - 0.1 N in the presence of phenolphthalein as indicator and expressed as percents malice acid-dominant (E. P. Şirocov, 1985).

RESULTS AND DISCUSSIONS

Stimulation fructification or removal of part of the yield (Standardization) is a necessary and required surgery to obtain quality fruits especially the apple, pear and peach. (I. Grosu, 2005; Gheorghe Petre et. Al. 2007; V. Balan, R. Şaganian, 2008)

Manual fruit thinning is not possible due to labor intensive and slow chemical means is already common practice in intensive fruit plantations (table 2). During growth and fruit-bearing trees and Workloads foliar fertilization of fruit load had a significant influence on average fruit weight and productivity and insignificant on the number of fruit per tree. Thus, in 2008, the number of fruit per tree, for example, the tree of the variety Golden Delicious in version control was 162-165 fruit/tree, whereas this indicator was 133-135 fruit/tree the version with chemical thinning, of 136-138 fruit/tree in versions with chemical thinning and maintenance manual of 134-135 fruit/tree in the version with a slow hand. This difference is explained by the application of hand thinning of fruit. The average mass of fruit was significantly influenced by foliar fertilization and fruit thinning method.

In 2008, for example, the tree of the variety Golden Delicious, in version control, average fruit weight was 98-109 g, while the trees of the same variety, but the versions with the application of thinning the fruit, the value of this index up 120-150 g for chemical thinning, 133-139 g - chemical thinning and revision of textbooks and 135-136 g - hand thinning. The variety Idared, compared to the control, the variations of chemical thinning (V3, V4) and chemical thinning and manual revision (V5, V6) recorded increases in fruit weight from 100 g to 140-172 g in 2008 and from 102 g to 144-173 g in 2009.

Regardless of the method of thinning the fruit, average fruit weight is increased in variants foliar fertilization application. Thus, the overall mass of the variety Golden Delicious fruit, for example, the variant with chemical thinning without using mineral fertilizers (V3) was 150 g and the version where they applied foliar fertilization (V4) this index was 120 g. The average mass of fruit, the variations with chemical thinning and maintenance manual (V6) and manual

thinning (V8) with foliar fertilization was higher by 3.5% compared with variants (V5, V7) without foliar fertilization.

In 2009, the Golden Delicious variety average fruit weight was from 89 g (V1) up to 125 g (V4) exceeding witness in ferilizare leaf variants with 19.9 %. Fruit weight was higher compared Idared variety Golden Delicious variety. If, for example, the tree of the variety Idared to variants which applied a slow manual (V7, V8) The average fruit weight was 178-180 g (2008 year) and 188-197 g (2009 year), when the trees of Golden Delicious variety - was 135-136 g (2008 year) and 137-140 g (2009 year).

Table 2

Fruit production by variety and fruit thinning on foliar fertilizer application background (Rootstock M 26, 4x2 m planting distance, SA Zubreşti, 2008-2009)

Variant	Number of fruits at the tree		The average mass 1 fruit, g		Yield t/ha	
	2008 year	2009 year	2008 year	2009 year	2008 year	2009 year
Golden Delicious variety						
V1	165	180	98	89	20,2	**20,0**
V2	162	150	109	111	22,0	**20,7**
V3	133	144	150	156	25,2	**26,8**
V4	135	138	120	125	19,9	**22,5**
V5	136	142	139	143	24,0	**25,9**
V6	138	145	133	138	22,5	**24,5**
V7	135	148	135	140	22,8	**25,9**
V8	134	148	136	137	22,8	**25,4**
DL 95%	3,55	3,40	4,83	5,84	1,36	**1,21**
Idared variety						
V1	175	128	100	102	21,9	**16,3**
V2	150	100	137	143	25,6	**17,8**
V3	143	95	140	156	22,5	**17,1**
V4	120	93	150	144	25,9	**18,1**
V5	100	77	172	173	23,6	**16,1**
V6	110	80	165	167	20,6	**17,3**
V7	111	82	179	188	24,8	**19,3**
V8	100	85	180	197	22,5	**20,9**
DL 95%	**4,45**	**4,76**	**6,31**	**3,36**	**1,28**	**0,76**

Applying methods of fruit thinning has a direct impact on fruit production. Thus, the Golden Delicious variety in chemical thinning options (V3, V4), chemical thinning and maintenance manual (V5, V6), or manual thinning only increase production ranged between 12.8% and 24.8% in 2008 and 12.5% and 34.0% in 2009 compared to the control (V1) without any special intervention. The variety Idared fruit ranged between 20.6 and 25.9 t/ha in 2008 and 16.1 and 20.9 t/ha in 2009 year to provide high definition of quality fruit. Use of foliar fertilizers while chemical thinning of fruit or plant protection treatments also had an impact on fruit production. On the background of the application of 4 treatments with

foliar fertilizers containing nitrogen production growth in version control (V2) compared to the control (V1) with no special intervention was 8.1% higher in the variety Golden Delicious, and 14,4% in variety Idared.

Application of foliar fertilizers to variants chemical thinning, chemical thinning and manual or manual thinning but also helped increase production by 13.5% from the variety Golden Delicious and 12.7% in variety Idared. Obtain optimum fruit production and quality constant is determined by cultural and technical progress to date. The application of foliar fertilization, chemical and manual thinning of fruit is determined decisively both quantity and quality fruit production.

For a fair assessment of fruit quality was determined by weight, content of soluble solids, titrated acidity and firmness (table 3). Fruit quality indices have been conditioned by variety, the production method of fruit thinning and application of foliar fertilizers. Fruit firmness in comparison, in the framework of the same methods of fruit thinning, it is found that it ranged between 7.5 and 8.3 kg/cm^2 at the variety Golden Delicious and between 7.2 and 8.0 kg/cm^2 in variety Idared .

Table 3

Quality fruit indices thinning method based on the background of their foliar fertilizer application. (Rootstock M 26, 4x2 m planting distance, SA Zubreşti, 2008-2009).

Variant	Quality fruit indices					
	Firmness, Kg/cm^2		Titrated acidity,%		Soluble dry matter,%	
	2008 Year	2009 Year	2008 Year	2009 Year	2008 Year	2009 Year
Golden Delicious variety						
V1	**8,2**	**7,9**	**0,27**	**0,26**	**14,1**	14,3
V2	**9,3**	**7,8**	**0,34**	**0,33**	**14,6**	14,4
V3	**7,5**	**7,8**	**0,24**	**0,24**	**14,4**	15,6
V4	**8,1**	**7,8**	**0,32**	**0,33**	**13,9**	14,3
V5	**8,1**	**7,8**	**0,31**	**0,32**	**14,4**	14,3
V6	**8,3**	**7,9**	**0,32**	**0,29**	**14,3**	14,4
V7	**8,3**	**8,1**	**0,33**	**0,33**	**14,4**	14,4
V8	**8,1**	**7,9**	**0,31**	**0,34**	**14,2**	14,2
Idared variety						
V1	**8,0**	**7,7**	**0,6**	**0,5**	**14,0**	14,1
V2	**7,2**	**7,4**	**0,52**	**0,50**	**14,1**	14,7
V3	**7,3**	**7,2**	**0,47**	**0,47**	**13,5**	13,3
V4	**7,4**	**7,4**	**0,48**	**0,46**	**14,1**	14,5
V5	**7,3**	**7,4**	**0,47**	**0,46**	**14,2**	14,2
V6	**7,4**	**7,4**	**0,46**	**0,48**	**14,3**	14,5
V7	**7,5**	**7,5**	**0,45**	**0,43**	**14,2**	14,1
V8	7,3	7,4	0,47	0,48	14,1	14,1

Analyzing the values of soluble solids content and titratable acidity of fruit presented in Table 3 compared to the data presented in the literature (E, P, Şirocov,

1985, V. Balan et. al. 2001), we can state that they are mean those that are considered normal, without reaching the limits considered as symptoms of deficiency and varies from year to year in the framework of the variety, the fruit thinning method and application of foliar fertilization.

Regardless of the method of thinning titrated acidity content ranged between 0.26% and 0.34% in Golden Delicious variety and between 0.43% and 0.52% in variety Idared. Content of dry substances soluble variety Golden Delicious apples are from 13.9 to 14.7%. The study presented evidence that quality fruit of the varieties Golden Delicious and Idared least vary thinning methods applied in the experiment.

CONCLUSIONS

1. Application Workloads chemicals to harvest the apple varieties Golden Delicious and Idared causes slight reduction in production, together with improving the quality of fruit.

2. Average harvest in the years 2008-2009 was 19,9-26,8 t/ha for the variety Golden Delicious and 16,3-25,9 t/ha in variety Idared. To increase the quantity and competitiveness of the fruit, it is necessary to exploit technology intensive apple orchards practiced foliar fertilization with mineral fertilizers in 5 stages, chemical thinning of fruit product Bioprzerzedzacz 060 SL when fruit flower center has between 10 and 12 mm, supplemented with a slow hand, the fruit of the flower center reached 16-18 mm in diameter.

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BIOCHEMICAL ASPECTS OF SCION – ROOTSTOCK INTERACTION ON SOME APRICOT CULTIVARS IN FIRST VEGETATION YEAR

ASPECTE BIOCHIMICE PRIVIND INTERACŢIUNEA DINTRE ALTOI ŞI PORTALTOI LA UNELE SOIURI DE CAIS AFLATE ÎN PRIMUL AN DE VEGETAŢIE

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Abstract. *The purpose of the determinations was to emphasize some modifications in the relation scion – rootstock in the case of four varieties of apricot tree (Tudor, Umberto, Goldrich, NJA42) grafted on Prunus cerasifera and Armeniaca vulgaris stock. We performed biochemical analyses regarding the accumulation of nitrogen, soluble glucides and content of gross protein in the grafted combinations in the first vegetation year. The results showed differences regarding the transport of nitrogen and soluble glucides on the level of the grafting area.*

Key words: scion, rootstock, nitrogen total, soluble sugars.

Rezumat. *Determinările au avut ca scop evidenţierea unor modificări în relaţia altoi - portaltoi la patru soiuri de cais (Tudor, Umberto, Goldrich, NJA42) altoite pe portaltoi de Prunus cerasifera şi Armeniaca vulgaris. S-au efectuat analize biochimice privind acumularea azotului, a glucidelor solubile şi a conţinutului de proteină brută la combinaţiile altoite aflate în primul an de vegetaţie. Rezultatele au scos în evidenţă diferenţe privind transportul azotului şi a glucidelor solubile la nivelul zonei de altoire*.

Cuvinte cheie: altoi, portaltoi, azot total, glucide solubile.

INTRODUCTION

The incompatibility to grafting shown by some apricot tree combinations on certain rootstocks represents an economic issue and an important phenomenon that must be taken into account during the selection process (Ermel and colab., 1995). Generally, the trees are products of the combination between a scion and a rootstock. In order for this combination to be successful, it requires a good joining between the scion and the rootstock. (Errea and colab., 2001). Some varieties of apricot tree grafted on rootstocks of *Prunus cerasifera* show incompatibility symptoms.

In order to emphasize the early incompatibility phenomenon, both different biochemical and physiological processes have been studied on the level of the grafting area, as well as different compounds and mineral substances that are transported through the joining area. In this context, we have also studied the transport of the carbohydrates reserves that are extremely important for the development of the trees with falling leaves in the initial growth stages (Gaudillere

and colab., 1992). For example, it can be noticed that in the case of young plum trees, the content of carbohydrates is influenced by the used rootstock, but also by the vegetation season (Gaudillere and colab., 1992).

The grafting also influences the transport of the minerals from the root to the stalk and to the leaves that, at their turn, interact with the assimilation and the distribution of carbon and finally, influence the biomass ratio between the root and the stalk. It can be noticed that in the case of the combinations of peach tree/plum tree, the availability of the carbohydrates in the roots and the assimilation of the nitrogen greatly depends on the compatibility between the scion and the rootstock (Yano and colab., 2002). Thus, the compatibility between the scion and the rootstock is essential for the production and the use of the carbohydrates and nitrogen reserves which reflects the strength of the plant and the economic efficiency.

MATERIALS AND METHODS

The experiment was conducted on the experimental field from "Ion Ionescu de la Brad" Agricultural Sciences and Veterinary Medicine University, Iasi from „Vasile Adamachi" S.D.E. The used biological material originated in the collection of the Faculty of Horticulture, consisting in four varieties of apricot tree (Tudor, Umberto, Goldrich, NJA42) grafted on a rootstock of *Prunus cerasifera* and *Armeniaca vulgaris*. The analyses were done in 2009 in June, July and September, the plating material being in the first vegetation year.

Three sets of biochemical analyses were done that aimed at the content of soluble glucides (through Schoorl method), total nitrogen and gross protein (through Kjeldahl procedure) on the level of the grafting area.

REZULTS AND DISCUSSIONS

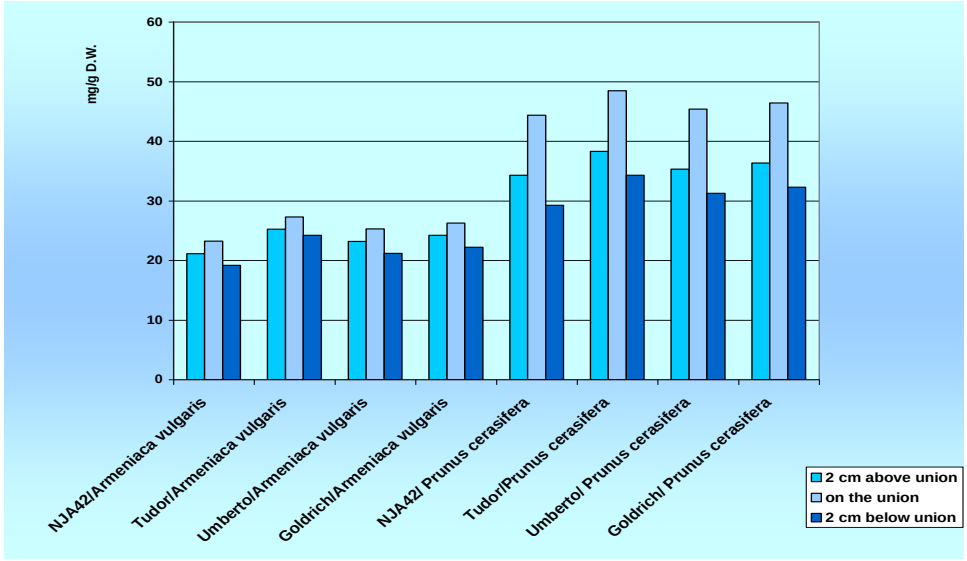
Following the grafting process, the physiological influence between the partners determines the synthesis potential of the scion, as well as the distribution of the substances in the organs of the tree.

The glucides are substances synthesized during the photosynthesis process that through oxidation are transformed into fatty acids that represent the basic compounds in the formation of the protein substances. The distribution of the carbohydrates in the young trees implies the production of glucides in the photosynthetic organs, the further translocation through the floem on the level of the growth and storage organs.

Following the analysis of the obtained data (fig.1) both for the varieties grafted on *Armeniaca vulgaris*, and on those grafted on *Prunus cerasifera*, it can be noticed a higher quantity of soluble glucides in the grafting area. For the variant grafted on the rootstock *Armeniaca vulgaris* (rootstock known as being compatible with the 4 studied varieties), the average content of soluble glucides per variant in the scion has values close to those of the rootstock.

The highest content of soluble glucides on the level of the grafting area has been emphasized for the Tudor variety (27,28 mg/g DW) followed by the Goldrich variety (26,27 mg/g DW). The smallest value of the content of soluble

glucides on the level of the grafting area has been registered for NJA42 variety of 23,21 mg/g DW. For the varieties grafted on *Prunus cerasifera* (rootstock known as being incompatible with the 4 studied varieties), in the scion, the content of soluble glucides is higher than in the rootstock but smaller than in the grafting area. This fact suggests that in the joining area of the two partners there are some barriers in the anatomical structure that hinder the transport of the photoassimilates towards the rootstock. Because these deficiencies have been noticed on both variants, we can say that the transport of the soluble glucides towards the root is disturbed by the grafting itself which determines the retention of glucides on the level of the joining area.



DW – dry weight

Fig. 1. Sugar content average values on 'NJA42', 'Tudor', 'Umberto', 'Goldrich' apricot cultivars

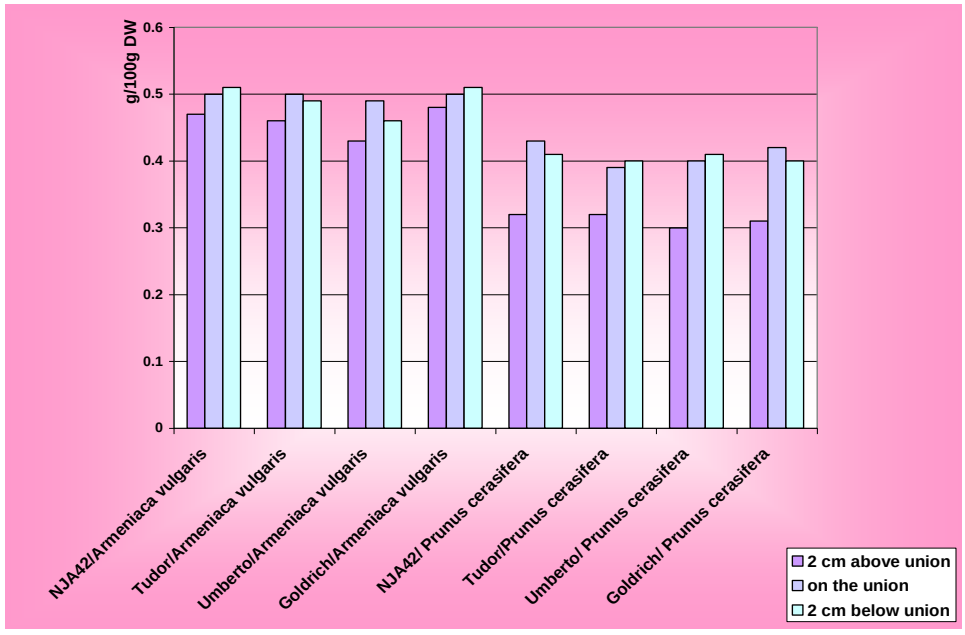
The minerals necessary for the nutrition of the plants are extracted under inorganic form from the soil through the roots and they are accumulated in different tissues and organs. Following the analysis of the ash obtained through the calcinations of the tissues of the plants, we can determine quantitatively and qualitatively the content of minerals accumulated in the vegetal organisms.

Among the minerals, nitrogen has the greatest influence on the growth and productivity of the plants. It holds the main role in several biological and physiological processes of plants. Nitrogen is part of the composition of several main organic compounds such as enzymes, hormones, phenolic compounds, pigments, nucleic acids, etc. The nitrogen deficiencies have a higher impact on the photoassimilation processes than the deficiencies of other nutrients because it enters in the composition of the chlorophyll molecule that plays a decisive role in photosynthesis.

Regarding the content of total nitrogen (fig.2), both for the variant grafted on the rootstock *Armeniaca vulgaris*, and for the variant grafted on *Prunus cerasifera*, the highest values have been registered in the rootstock and in the joining area.

In the case of the variant grafted on *Armeniaca vulgaris* the highest quantity of total nitrogen obtained on the level of the rootstock has been shown by NJA42 and Goldrich varieties of 0,51 g/100g DW. On the variant grafted on *Prunus cerasifera* the highest content of total nitrogen has been obtained for Umberto and NJA42 varieties, respectively 0.41 g/100g DW. On the level of the grafting point, the maximum value has been 0.50 g/100g DW for the variant grafted on *Armeniaca vulgaris*, respectively 0.43 g/100g DW for the variant grafted on *Prunus cerasifera*).

In the scion, the content of total nitrogen has minimum values, for the variant grafted on *Armeniaca vulgaris* the values range between 0,48 g/100g s.u. for Goldrich variety and 0.43 g/100g DW for Umberto variety. Regarding the variant grafted on *Prunus cerasifera* the highest value has been obtained for Tudor and NJA42 varieties of 0.32 g/100g DW, and the smallest value for Umberto variety of 0.30 g/100g DW. Thus, regarding the circulation of nitrogen, a nitrogen retention can also be noticed on the level of the grafting area that can be caused by not such a good recovery of the ligneous vessels.



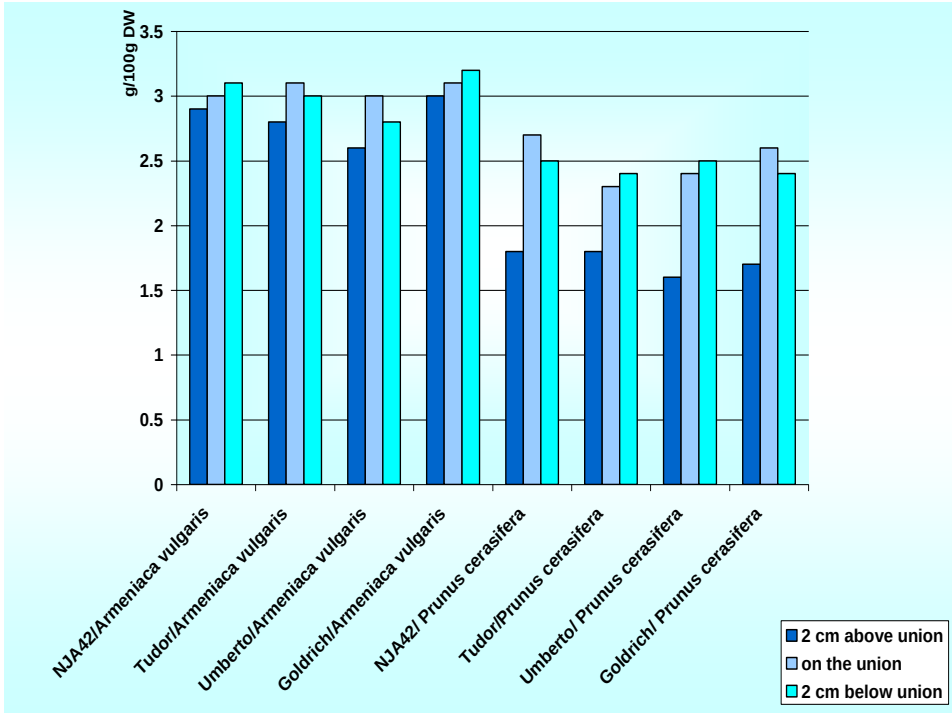
DW – dry weight

Fig. 2. Nitrogen content average values on 'NJA42', 'Tudor', 'Umberto', 'Goldrich' apricot cultivars

The determinations regarding the total content of gross protein (fig. 3) for the studied varieties have shown, in the case of the variant grafted on *Armeniaca vulgaris*, a higher average gross protein content both on the level of the rootstock and on the grafting point and in the scion. For this variant, higher values of the total content of gross protein in the rootstock have been registered for Tudor variety (3.25 g/100 g DW).

On the level of the grafting area in the case of the varieties grafted on *Armeniaca vulgaris*, the content of gross protein ranges between 3.19 g/100 g DW for NJA 42 variety and 2.63 g/100 g DW for Umberto variety. In the scion, the content of gross protein has smaller values than in the rootstock and the joining area. Here, the values range between 2.61 g/100 g DW for Goldrich variety and 2.06 g/100 g DW for NJA 42 variety.

For the variant grafted on *Prunus cerasifera* the highest content of gross protein has been obtained in the joining area (2.69 g/100 g DW) for NJA 42 variety. In the rootstock, the content of gross protein has been higher than in the scion. Thus, the analyses regarding the total content of gross protein on the level of the grafting area emphasize the existence of an impediment on this level that determines the uneven distribution of the proteins in this area of the trees.



DW – dry weight

Fig. 3. Crude protein content average values on 'NJA42', 'Tudor', 'Umberto', 'Goldrich' almond cultivars

CONCLUSIONS

The biochemical analyses done on the apricot tree varieties in the first vegetation year, grafted on the two rootstocks (*Armeniaca vulgaris)* known as being compatible with the studied varieties and *Prunus cerasifera* – incompatible) emphasize the existence of some barriers on the level of the grafting area that hinder the circulation of the synthesis compounds and the minerals on this level. This hypothesis aims at the not so perfect continuity of the leading Liberian and ligneous vessels from the joining area.

Thus, it can be explained the retention from the grafting area, both of the soluble glucides and the proteins that are synthesized in the aerial part of the trees (transported through the liberian vessels), and of the nitrogen that is transported through the ligneous vessels from the roots to the aerial part of the tree.

Acknowledgement:

This study has been financed by the National Authority for Scientific Research, Grant PN-II-ID-PCE-2007-1. No. 378/2007 with title "*In vitro and in vivo researches regarding the rootstock-scion interaction for the early detection of incompatibility biomarkers in fruit trees"*.

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EVALUATION OF FLOWER BUDS FROST SUSCEPTIBILITY IN COMMERCIAL CHERRY CULTIVARS, UNDER 2009/2010 WINTER CONDITIONS

EVALUAREA REZISTENŢEI LA GER A MUGURILOR FLORIFERI LA SOIURILE COMERCIALE DE CIREŞ, ÎN CONDIŢIILE IERNII 2009/2010

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Abstract. *Study's aim was to evaluate the frost susceptibility and effect of low temperature on the viability of cherry flower buds in 15 cultivars, commercially grown in Romania and some other European countries, in 2009/2010 winter climatic conditions, when, recurrently and with a large amplitude between day/night, temperature descended below - 20ºC, phenomenon which, by his severity, occurs with low frequency in the subcarpathian hilly area of Romania. To attain this goal Kordia, Summit, Newstar, Kristin, Decanca, Viscount, Van, Rivan, Daria, Ponoare, Superb, Rubin, Stella, 2D 28-31, Ferrovia cultivars, have been tested regarding their response to our agro-climatic and technological conditions, in the main fruit growing area of the country. Evaluation of the winter hardiness of flower buds shows the sensitivity of Decanca, Newstar, Kordia and partly Van cultivars to low temperature registered during the winter season. Data regarding percent of damaged flower buds at two high levels in tree canopy are presented.*

Key words: *Prunus avium*, cultivars, winter hardiness

Rezumat. *Studiul şi-a propus aprecierea sensibilităţii la ger şi a efectului temperaturilor scăzute asupra viabilităţii mugurilor floriferi de cireş, la 15 de soiuri din sortimentul comercial cultivat în România şi unele state europene, în condiţiile în care, în mod repetat şi cu mare amplitudine termică între zi/noapte, acestea au scăzut sub – 20ºC , fenomen care, prin severitatea lui, se înregistrează cu frecvenţă redusă în zona dealurilor subcarpatice din România. Au fost evaluată comportarea soiurilor Kordia, Summit, Newstar, Kristin, Decanca, Viscount, Van, Rivan, Daria, Ponoare, Superb, Rubin, Stella, 2D 28-31, Ferrovia ca răspuns al acestora la condiţiile agro-climatice şi tehnologice specifice principalei zone de cultură a pomilor din ţară. Studiul a evidenţiat sensibilitatea soiurilor Decanca, Newstar, Kordia şi parţial Van la temperaturile scăzute înregistrate în iarnă. Sunt prezentate date privind determinarea procentului de muguri afectaţi, pe trei paliere de înălţime în coroana pomilor.*

Cuvinte cheie: *Prunus avium*, soiuri, rezistenţă la ger

INTRODUCTION

In Romania, commercial cherry growing represents 8% of total fruit growing surface being located in the hilly area, where are the most favorable agro-climatic conditions concurring to high, good quality crop obtaining. Even if Romanian total cherry yield represents about 7% (60,000 t/year; FAO, 2005),

export is fluctuated and limited. From many other reasons, one of the main motives was considered the outdated cultivar's assortment (Budan, 2000). Therefore, in order to improve this situation, in the last years, commercial cherry assortment was significantly changed by introduction of new autochthonous and especially foreign cultivars, which are supposed more suitable to exigencies of global market. But, to speed up this process, many foreign varieties have been imported as planting material in default of their previous agro-ecological adaptability probation to local agro-climatic conditions.

MATERIAL AND METHOD

To eliminate this lack of knowledge, at the Research Institute for Fruit Growing, Pitesti, was initiated a study to evaluate agro-ecological adaptability to local climatic environment of some new foreign varieties as Kordia, Summit, Newstar, Kristin, Decanca, Viscount, Ferrovia and 2D 28-31 comparative with some autochthonous or old, foreign cultivars as Daria, Ponoare, Superb, Rubin, Stella, Van and Rivan.

Experimental field was organized in the germplasm cherry ex situ collection, where each genotype are represented by 4-5 trees of 8-10 m high, grafted on mahaleb, spaced at 5X4.5m.

The main reason was to evaluate tolerance or susceptibility to local climatic stress factors, using the common evaluation methodology as is presented in Cherry Descriptor List (IPGRI) (Lipman, 1997). In this particular case, information concerning flower buds susceptibility to low winter temperature was recorded by examination of viability of internal primordial generative organs, in longitudinal and cross-sectioned buds, gathered from three canopy elevations (100 buds from each elevation), on February 28, 2010, when trees have been in the facultative dormancy period.

Study was accompanied by meteorological observation of the daily air temperature, humidity, wind, sunshine evolution.

Meteorological data for 2009-2010 periods were compared with a database stored in MS Office Excel, consisting of 41 years (1969-2009) daily values of meteorological parameters (Chitu, 2009). To provide more consistency in terms of statistical interpretations of the paper, the probability density function was tested (distribution of daily mean values around the monthly average or monthly averages specific to each year around the multiannual average values of the same month). To this reason we used specialized statistical tests Shapiro-Wilk and D'Agostino, computed with SPSS 14.0 statistical analysis program. Once the normality of the distribution was accepted instead of the meteorological parameters values, we used the probability of occurrence due to gain further information made by comparison with the entire set of values. To calculate the probability of average, monthly and annual values, NORMDIST function of Microsoft Office Excel 2007, was used.

RESULTS AND DISCUSSIONS

Preparing trees for dormancy period depended (in circumstances where the health of the foliar apparatus, in October, was good) by the evolution of meteorological factors specific to October 2009. In 2009 the length of the growing season was normal, the first frost occurring on October 15 (average date of first frost in Maracineni, Arges is October 18). Air temperature in October 2009 was higher than normal (the probability of recording lower values being

79.8% for mean temperatures and 89.5% for minimum): Minimum temperature of October 2009 was 6.5°C compared with normal value 4.8°C (1969-2009). Also sunshine duration was very small (probability 2%), being recorded only 90.5 hours in October 2009, versus 165.6 hours normal value. Meanwhile rainfall and air humidity were very high (98% probability for rainfall - 147.8 mm versus 45.5 mm normal value and 95% probability for air humidity).

These weather conditions characterized by low light intensity and high temperature and humidity were not so favorable for the accumulation and storage of carbohydrates in the multiannual organs tissues of fruit trees (roots, trunk and branches), extending the vegetation period and negatively impacting the resistance to severe frosts from the dormancy period.

The same warm and cloudy weather continued in November, switching then to the winter period generally characterized by maximum temperatures below normal values and high rainfall.

On this monthly background there were two periods with very low temperatures: the first on 21 and 22 December 2009 (figures 1 and 2) when trees were in deep dormancy period and the second on days 25 and 26 January (figures 3 and 4) the late period of over wintering stage.

In December (fig. 1) after the first 15 days of the month with higher mean and even minimum temperatures (93.6% minimum temperature probability for the first five day period and 94.6% for the second), with high rainfall (five day period probability between 73 and 95%) and cloudy days (probability between 4.9 and 9.6%), minimum temperatures suddenly dropped on 21 of December at -20°C outside the shelter and at -18°C in the shelter at 8 o'clock (Figure 2).

If on December 20 at 14 o'clock, temperature was positive (1°C), and at 23 o'clock already down below -10°C, after 3 o'clock (December 21) dropped below -15°C and has maintained under this value for 7 hours.

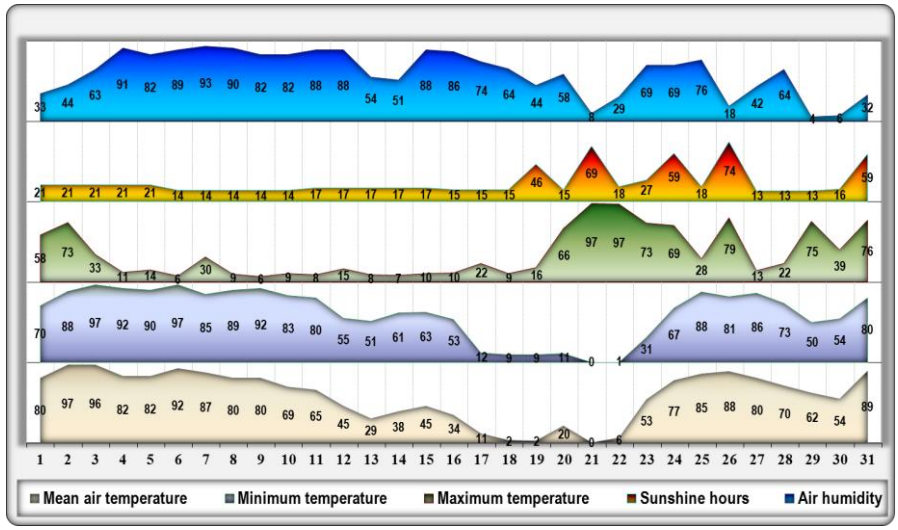

Fig. 1. The probability of recording daily values equal to or less than those occurring in December 2009 at Maracineni, Arges

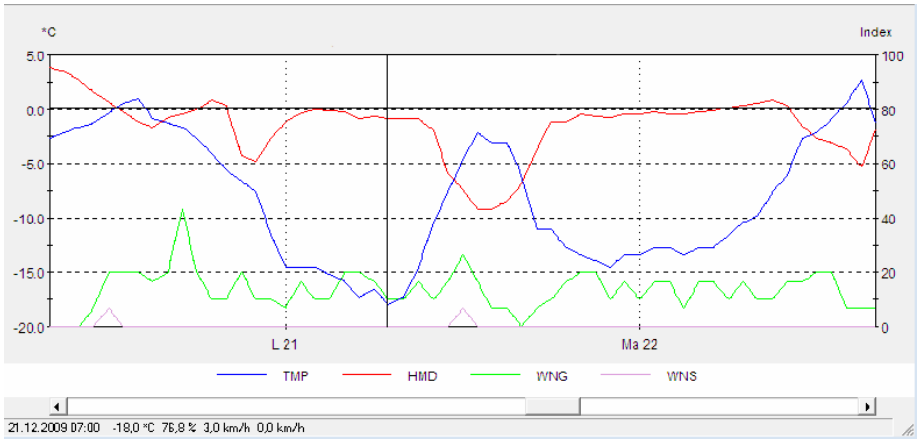

Fig. 2. The evolution of air temperature (TMP), humidity (HMD) and wind speed (WNS) on 21 and 22 of December, 2009 (Maracineni, Arges)

So in January 2010 the temperature dynamics were similar. After a first half of the month warmer than normal (probability of minimum temperatures of up to 95%, in nine days from 20 being over 80%) since January 21, temperatures dropped sharply and remained at this level for 8 days (figure 3). Lowest value was reported by January 25, 5 am, when the outside shelter temperature fell to -23.9°C, being only 0.5°C higher than the absolute minimum of the station (-24.4°C), and in the shelter at -22.6ºC (figure 4). On days 25 and 26 January the air temperature outside the meteorological shelter remained below the level of -20°C for about 24 hours. If the negative air temperature record of the station has not been exceeded, this happened, however, at snow level. Thus on December 26 the temperature from the surface of the snow dropped to -25.5°C, 0.7°C lower than the station record (1969-2010) dated January 5, 1993 (-24.8°C).

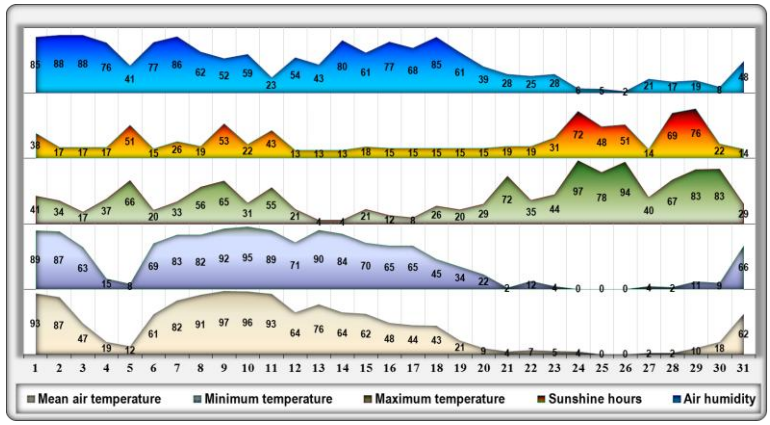

Fig. 3. The probability of recording daily values equal to or less than those occurring in January 2010 at Maracineni, Arges

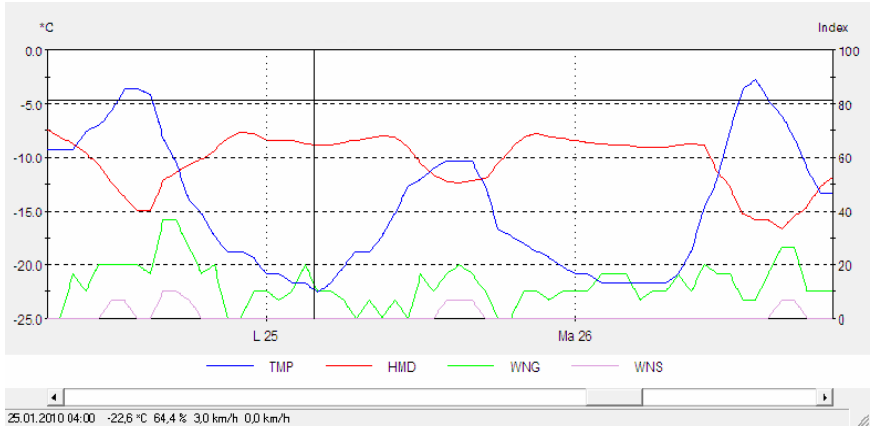

Fig. 4. The evolution of air temperature (TMP), humidity (HMD) and wind speed (WNS) on 25 and 26 of January, 2010 (Maracineni, Arges)

In this conditions every cultivars behaved oneself, according to their genetic background (table 1).

Table 1

Percent of demaged flower buds by low winter temperature at tree canopy levels

Current no.	Cultivar	Inferior canopy third	Medium canopy third	Upper canopy third	Average	Significance
1	Kordia	55	40	48	47,67	***
2	Rivan	7	3	2	4,0	ooo
3	Ponoare	21	6	5	10,67	ooo
4	Ferrovia	26	18	21	21,67	-
5	Summit	27	25	24	25,34	-
6	New Star	60	57	50	55,67	***
7	Decanca	76	70	73	73,0	***
8	Kristin	38	30	34	34,0	-
9	Van	41	37	39	39,0	**
10	Viscount	27	25	29	27,0	-
11	2D 28-31	40	30	35	35,0	*
12	Superb	1	0	0	0,33	ooo
13	Daria	21	17	19	19,0	oo
14	Rubin	20	19	20	19,67	o
15	Stella	10	5	9	8,0	ooo
	Media				28,01	
	Abatere standard				20,04	
	CV %				71,58	

DL 5% = 6,912; DL 1% = 9,318; DL 0,1% = 12,368

Damaging bud's degree varied in the large limits, from 0,33% (Superb cv.) to 73% (Decanca cv.).

Analyzing in ensemble obtained values, it can be observed that the low and upper canopy thirds were the most affected. If, in the first case, phenomenon is

justified by the air stratification according his density, cooler air being heavier, in the second case, explanation is the deficiency of phytosanitary protection of the top of the old, high, low spaced trees, caused by machine's technical limits. As a result, in the upper canopy, in the vegetative period, occurs a high infection by *Blumeriella jaapii* (Rehm.) Arx., lives fall early, in August, and buds preparing process for dormancy was made in the lack of carbohydrates accumulation. In this done situation, Decanca cv. with 73% damaged buds can be considered maladapted to climatic Romanian conditions. (fig. 5 and 6).

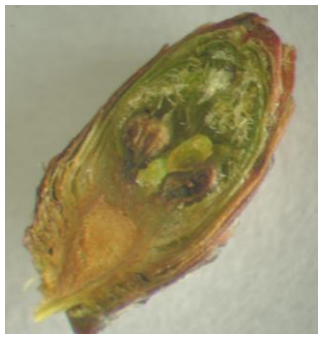

Fig. 5. Longitudinal section in a demaged by winter frost (Decanca cv.)

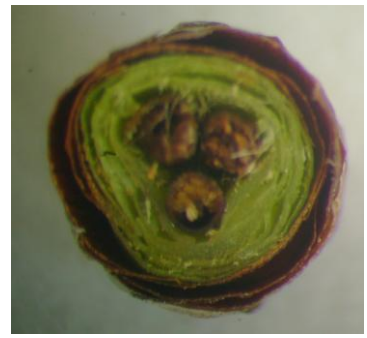

Fig. 6. Cross section in a flowerflower bud bud demaged by winter frost (Decanca cv.)

Newstar and Kordia cvs. have a serious risk to partly lose yield in severe, hard winters.

The less affected cultivars were Superb (0,33%), Rivan (4%), Stella (8%) and Ponoare (10,67%) which can be considered adapted to local, subcarpathion agro-climatic conditions.

Daria and Rubin cvs. released by autochthonous breeding program, confirm one more time, that the selection was properly made, in specific climatic conditions of Romanian cherry growing environment.

Ferrovia, Summit,Viscount and Kristin can be grown in Romania but it is necessary to pay a special attention to accurate choice of fair site for new orchard establishments, with diminishing risk of low temperature emergence or accumulation of cold air.

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NEW SWEET CHERRY HYBRID ELITES WITH PERSPECTIVES FOR PATENTED AS NEW CULTIVARS OBTAINED AT FRUIT GROWING RESEARCH STATION IASI

ELITE HIBRIDE DE CIREŞ CU PERSPECTIVE DE OMOLOGARE CA SOIURI NOI OBŢINUTE LA SCDP IAŞI

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Abstract: *The new creations respond to the amelioration objectives for the sweet cherry. They are focused on the obtaining of new cultivars with precocity for fruit-bearing, productive, high fruit quality, according to the latest calibre exigency, fermity fruit, very good taste, with different skin colour and maturation ages for the sweet cherries:* ***HC. 840808*** *is precocious, with medium vigor, productive, with large size fruits (10,9 g). It's colour is dark red and it has excellent tasting qualities;* ***HC. 840933*** *is precocious, with medium to great vigor, productive, with large size fruit (9,1 g), a dark red skin colour and it has excellent tasting qualities;* ***HC. 871616*** *is precocious, with medium vigor, very productive, with large size fruits (8,9 g), yellow skin colour, with firm pulp. It has excellent tasting qualities which it recommends them in special for industrialisation;* ***HC. 893705*** *is precocious,with small vigor, very productive, with large size fruits (8,0 g), intense dark red skin colour, with firm pulp and it has excellent tasting qualities.*

Key words: hybrid elites, sweet cherry, patent, quality.

Rezumat: *Noile creaţii răspund obiectivelor ameliorării la cireş, focalizate pe obţinerea de soiuri cu precocitate de rodire, productive, calitate superioară a fructelor, conform ultimelor exigenţe de calibru, fermitate, gust, culoare şi epoci diferite de maturare a cireşelor:* ***elita hibridă HC. 840808*** *este precoce, cu vigoare medie, productivă, cu fructul foarte mare (10,9 g) de culoare roşie închisă şi cu calităţi gustative deosebite;* ***elita hibridă HC. 840933*** *este precoce, cu vigoare medie spre mare, productivă cu fructe mari (9,1g), de culoare roşie închisă, pietroase şi cu calităţi gustative deosebite;* ***elita hibridă HC. 871616*** *este precoce, de vigoare medie, foarte productivă, cu fructe mari (8,9g), de culoare galbenă, pietroase şi cu calităţi deosebite ale fructelor care le recomandă în special pentru industrializare;* ***elita hibridă HC. 893705*** *este precoce, de vigoare mică, foarte productivă cu fructe mari (8,0 g), intens colorate în roşu închis, pietroase şi cu calităţi gustative deosebite.*

Cuvinte cheie: elite, cireş, soiuri, omologare, calitate.

INTRODUCTION

Assortment of sweet cherry grown in our country, although improvements in the last 35 years by renewing and extending the offer of cultivars, is still poor concerning to ensuring fresh fruits, with different

periods of consumption and processing (Budan S., Balaci Raveca, Petre L., 1997).

After 1990, the objectives of improvement programs were geared to early fruit-bearing cultivars, more productive, self-fertil, with high fruit quality, especially as regards fruit size, firmness, taste and skin colour, with periods of maturation between very earlier to very late sweet cherry season (Branişte N., 2007, Budan S., Grădinariu G., 2000, Cociu V., 1990, Gozob T., 1987, Ivan I., 1994, Petre L., 1995, 1997, 2000).

To achieve some of these objectives, between 1981-2009 at FGRS Iasi, were made work of hybridization and positive selection, after which it noted a number of sweet cherry elites hybrids which have been approved and homologated until 2010, like: Cetăţuia, Cătălina, Golia, Maria, Marina, Radu, Oana, Ştefan, Tereza, Bucium, Iaşirom, Lucia and George (Petre L., 1995, 1997, 2000, 2007).

This paper aims to improve the existing assortment with new creations made from Iasi, Romania adapted to specific conditions of NE area.

MATERIALS AND METHODS

As biological material were used sweet cherry genotypes present in the national collection. Germplasm were made in 1981, the collection is then enriched by new genotypes. At end of 2009, national collection have 555 genotypes in which 101 are native.

Method used mainly simple sexual hybridization. Genotypes that meet certain qualities required by the objectives of improvement were used as hybridization parents.

Rich biological background for the recovery of existing genotypes in spontaneous and cultivated flora of the Iassy area, throughout the period studied works were carried out intensive clonal selection of the main cultivars of sweet cherry grown in the area and selection of bitter cherry biotypes. Genotypes were planted in the national collection and comparative culture of competition that have sought employment in the objectives of genetic fruit culture improvement.

RESULTS AND DISCUSSIONS

Following observations and determinations made in the national collection of sweet cherry were established many potential genitors for different characters and useful features, which were used in controlled intraspecific and interspecific hybridization.

Based on these features were held annual programs of hybridization with the participation of 178 genotypes of which were frequently used 31 maternal and paternal genitors, aiming at 14 tree and fruit traits.

Results using germplasm to created new sweet cherry cultivars between 1981-2009 are presented in table 1.

They made 645 combinations with 176 genitors, was made pollination at 709,409 flowers, were harvested 131,544 hybrid fruits and finally were obtain 89,425 seeds for seedling.

Table 1

Results using germplasm to created new sweet cherry cultivars (1981-2009)

Year of hybridization	Nr. combinations	Nr. genitors ♀	Nr. genitors ♂	Nr. flowers pollinated	Nr. hybrid fruits harvested	Nr. seeds resulted	Nr. tree seedlings	Nr. hybrids on bearing	Nr. hybrids selected	Nr. hybrid elites	Nr. cultivars homologated	Nr. hybrid elites proposed for homologation
1981	17	12	13	13698	1059	593	26	16	6	1		
1982	21	16	10	15038	4183	2695	108	28	8	3		
1983	10	8	9	6531	485	401	46	12	26	2		
1984	25	5	11	23620	4674	4092	294	210	39	24		
1985	28	10	13	15094	4377	3716	382	15	2	2		
1986	28	11	10	19789	6256	4954	371	14	2	1		
1987	47	19	10	37939	11067	7728	1397	845	28	24		
1988	62	35	26	77525	16988	12765	823	270	8	7		
1989	42	28	24	70466	14761	10654	954	120	12	5		
1990	34	22	25	36673	2123	853	88	70	8	2		
1991	42	36	22	62721	5340	1742	151	50	4	1		
1992	36	23	23	73225	10440	5354	397	70	2	3		
1993	23	22	20	23307	4184	2762	469					
1994	25	23	19	24170	2934	1994	377					
1995	32	24	15	31922	5418	2533	75					
1996	7	8	7	15901	2031	1645	-					
1997	19	19	13	9694	1125	954	283					
1998	22	22	20	26966	3139	2189	227					
1999	25	23	19	21713	2167	1100	250				2	
2000	28	25	16	32418	6639	5297	454					
2001	20	19	11	20891	6138	4755	271				3	
2002	20	20	11	21078	7521	6202	20					
2003	18	17	15	26097	5183	4368	50					
2004	8	7	7	4392	1157	828	35					
2005	10	10	10	15553	3343	2119	47					
2006	3	3	-	2102	796	226	95				4	
2007	8	8	6	3275	1704	545	10				4	4
2008	4	4	4	4957	1419	831	4					5
2009	6	6	4	3254	843	582	-					
Total 1981-2009	645	178		709409	131251	89164	7634	1720	145	75	13	9

From they 7646 they have sprung and 1680 hybrids have fruit-bearing. After selections made were promoted 74 hybrids elites, which are 38 of propagated and planted in microcultures of competition.

Between 1999-2007 have been approved 13 new cultivars of sweet cherry: Cetăţuia, Catalina, Golia, Maria, Marina Radu, Oana, Stefan, Teresa, Bucium, Iaşirom, Lucia and George.

Between 2007-2008 have been proposed 9 hybrid elites of sweet cherry for approval to The State Institute for Variety Testing and Registration, Romania (ISTIS). Four of them: HC 840808., HC.840933, HC. 871616 and HC. 893705 are being pursued for their approval as new cultivars, the observations and measurements performed on the 41 characters under the current test methodology of *Prunus avium* L. (***, 2006).

The data on the vigor of trees in four hybrid sweet cherry elites are given in table 2. The hybrids elites more vigorous in 2009 were HC. 840933 with 182.9 cm^2 as trunk section surface (TSS) and HC. 840808 162.2 cm^2 TSS with very significant differences above average and the least vigorous was HC. 893705 with 115.9 cm^2 TSS with very significant difference.

We must say that the low vigor trees allow decrease planting distances, increasing the number of trees per hectare and could made intensive sweet cherry culture.

Table 2

The data on the vigor of trees in four sweet cherry hybrid elites (2009)

Hybrid elite	TSS (cm2)	Calculated towards average of hybrid elites		
		%	Difference	Significance
HC 840933	182.9	119.4	29.7	+++
HC. 840808	162.2	105.9	9	+++
X (average)	153.2	100	0	
HC. 871616	151.9	99.2	-1.3	
HC. 893705	115.9	75.7	-37.3	ooo

LSD 5% = 1.98 cm^2 LSD 1% = 2.86 cm^2 LSD 0.1% = 4.20 cm^2

Main growth stages is shown in table 3. Early flowering began at the earliest hybrid elites HC 840808, 840933 and 893705 (April 16) and latest was HC. 871616 on April 18. End of flowering was recorded between April 30 and May 2 and its duration was 15 days.

Table 3

Growth stages to four sweet cherry hybrid elites obtained at FGRS Iasi

Growth stages	Sweet cherry hybrid elite:			
	HC. 840808	HC. 840933	HC. 871616	HC. 893705
Swollen bud	14.03	14.03	14.03	14.03
Bud burst	7.04	7.04	7.04	8.04
Early flowering	16.04	16.04	18.04	16.04
Late flowering	30.04	30.04	2.05	30.04
Duration of flowering (days)	15	15	15	15
Fruit maturation	22.06	19.06	27.06	20.06
Duration between late flowering to fruit maturation (days)	53	50	56	51
Falling leaves	14.11	15.11	16.11	15.11
Vegetation period (days)	245	246	247	246

Fruit maturation was staggered over a period of 9 days, the earliest hybrid elite is HC 840933 (June 19) and the latest HC 871616 (June 27).

Number of days since the end of flowering to fruit maturation was between 50-56 days and the duration of vegetation period between 245-247 days. Date of leaf fall occurred between 14 -16 November.

We must specify that the drought of 2009 has hastened the ripening fruit with 7-10 days toward normal years.

In 2009, sweet cherry hybrid elites in 8th year after planting showed good yields ranging from 15.8 kg / tree respectively 11.3 t / ha to HC 840808 and 20.8 kg / tree respectively 14.8 to / ha to HC 871616. It can be said that hybrid and other elites have made good yields ranging from 16-17 kg / tree, respectively 11-12 t / ha (table 4).

Regarding all hybrid elites fruit size in the study were between 8 and 10.9 g, giving rise to large and very large fruits.

Fruit skin colour are very dark red even brown at three hybrid elites (HC 840808, HC 840933, HC 893705) and one of them are yellow (HC 871616). Soluble solids content (SSC) was between 16% and 18%, and average weight of a stone was 0,4-0,5 g, that meens 3,7-6,3% by weight of the fruit, being small to medium in size.

Table 4

Yield and qualities features of fruits at four sweet cherry hybrid elites obtained at FGRS Iasi

Yield and physical and chemical features of fruits		Hybrid elite			
		HC. 840808	HC. 840933	HC. 871616	HC. 893705
Yield	kg/tree	15.8	17.2	20.8	16.1
	to/ha	11.3	12.3	14.8	11.5
Average of fruit weight (g)		10.9	9.1	8.9	8.0
Skin colour		Dark red	Dark red	Yellow	Dark red
SSC (%)		18	17	16	17
Average of stone weight (g)		0.4	0.5	0.5	0.5
Stone/fruit ratio (%)		3.7	5.5	5.6	6.3

CONCLUSIONS

Three from all sweet cherry hybrid elites have a medium vigor, but only HC 893705 has a small vigor, so that could be planted in intensive plantations.

Three of the four sweet cherry hybrid elites has medium maturity only HC 871616 has late maturity.

Hybrid elites studied have special fruit qualities: fruit size 8 to 10.9 g, with dark red skin colour to HC 840808, HC. 840933, HC. 893705 and yellow skin colour to HC 871616, a high content of soluble solids (16-18º Bx) and low to medium weight of stone at all of them.

Those four hybrid elites (HC 840808, HC. 840933, HC. 893705 and HC 871616) have quality features so can be approved as new sweet cherry cultivars which will complement the current assortment.

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THE EFFECT OF ROOTING SUBSTRATE ON THE DEVELOPING OF TOP CUTTING OF *PILEA* SPECIES

EFECTUL SUBSTRATULUI DE ÎNRĂDĂCINARE ASUPRA DEZVOLTĂRII BUTAŞILOR DE *PILEA*

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Abstract. *Pilea genus, are grouping around 600-715 species belonging to the family Urticaceae are indoor plants, with less finicality to environmental conditions. Grows and develop well in partial shade, are decorating by colored foliage, which varies from silver, green, red to brown and appears in different shapes and sizes. Species multiply relatively quickly and easily, by cuttings. It has a high resistance to disease attack but often is attacked by spiders. In our research, has studied the effect of rooting substrate in the case of three species: P. cadierei, P. mollis, P. spruceana. It was followed the degree of rooting and development of cuttings in three substrates: perlite, peat + sand, peat + perlite.*
Key words: *Pilea* species, top cuttings, rooting substrate

Rezumat. *Genul Pilea, grupează aproximativ 600-715 specii care fac parte din familia Urticaceae şi sunt plante de interior, puţin pretenţioase faţă de condiţiile de mediu. Cresc şi se dezvoltă bine la semiumbră, decorează printr-un foliaj divers colorat, care variază de la argintiu, verde, roşu până la maro şi se prezintă în diferite forme şi mărimi. Speciile se înmulţesc relativ repede şi uşor, vegetativ, prin butaşi. Prezintă o rezistenţă ridicată la atacul bolilor însă deseori sunt atacate de păianjeni. În cercetările efectuate, s-a studiat efectul substratului de înrădăcinare în cazul a trei specii de Pilea: P. cadierei, P. mollis, P. spruceana. S-a urmărit gradul de înrădăcinare şi dezvoltare a butaşilor în trei substraturi: perlit, turbă+nisip şi turbă+perlit.*
Cuvinte cheie: specii de *Pilea*, butaşi de vârf, substrat înrădăcinare

INTRODUCTION

The three species studied have different morphological characters, originating from tropical forests in Asia. Grow and develop well in shady and humid places.

The studied species are less known and cultivated in our country, although very adaptable to the different environmental conditions and requires minimal maintenance work (Cantor, 2008). All the studied species are recommended as indoor plants, but *Pilea cadierei* is recommended also for miniature gardens under glass (terrariums), even aquariums (Macke, 2004). The goal of the research was to disseminate *Pilea* species and to improve the assortment of indoor plants, with species with less finicality and special morphological characteristics. In this way, we used vegetative multiplication and we studied the influence of substrate on rooting of three *Pilea* species. Once with making the study of these new species is envisaged to improve technology and their culture.

MATERIAL AND METHOD

The biological material used in this experience in was represented by the three species: *P. cadierei, P. mollis, P. spruceana* (fig. 1) from the didactical collection of the Department of Floriculture. As rooting substrate were used following: perlite, peat+sand and peat + perlite. *Pilea cadierei* or Aluminium plant is a herbaceous plant about 10-40 cm tall, native to China and Vietnam. It is commonly cultivated as an ornamental plant and it has green leaves with gray spots, far, is the most common species. Sometime loses its basal leaves becoming less attractive, but it is powerful branching and make a beauty bush (Reimherr, 2008). *Pilea mollis* has a size of 20-25 cm, strongly branched embossed and spiny leaves. The variety "Moon Valley" is green colored leaves that contrast with dark brown narrows (Şelaru, 2006). *Pilea spruceana* is a species of medium size (30-40 cm), well branched, with oval leaves, embossed and brightly colored. The variety "Norfolk" has brownish or green leaves with red-purple veins.

Fig. 1. The studied *Pilea* species

The experience was founded in 2009 in the didactical greenhouse of UASVM Cluj, at the Department of Floriculture. The top cuttings have been made on 10.02.2009, harvested from healthy mother biological pure plants. The cutting was performed 1-2 mm below the basal node and after that was removed the upper third leaves to reduce transpiration. The average of cuttings length was different: 6.60 cm at *Pilea cadierei,* 5.50 cm at *Pilea mollis* and 6.90 cm at *Pilea spruceana*. From each variant was made 30 cuttings. Another important experimental factor in this experience was the rooting substrate. Thus, three substrates were used following: a) perlite; b) peat+sand (in equal percent of 1:1); c) peat+perlite (in equal percent of 1:1). The prepared cuttings for rooting were treated with a Radistim (root stimulator).

RESULTS AND DISCUSSIONS

Regarding the period of rooting of cuttings, we can conclude that: *P. spruceana* rooted fastest (18 days), in the substrate composed by peat + sand. It was followed by *P. cadierei*, which rooted in 19 days in peat + sand. *P. mollis* has rooted in 20 days, in the same substrate. There is a delay of roots, in the substrate composed by peat + perlite (table 1). In the table 2 are presented the morphological characters of cuttings before rooting. The total number of prepared cuttings, in the each substrate was 30. The highest cuttings length was made at *Pilea spruceana* an average of 6.90 cm. It was followed by *Pilea cadierei* with an average of 6.62 cm. The shorter cuttings were made at *Pilea mollis*, with a length of 5.49 cm.

Table 1

The situation of *Pilea* cuttings, in the three rooting substrate

Species	Rooting substrate	Date of making cuttings	Date of rooting	Number of day of rooting
P. cadierei	Perlite	10.02.2009	-	-
	Peat+sand	10.02.2009	01.03.2009	19.0
	Peat+perlite	10.02.2009	04.03.2009	22.0
Average (Control)				20.5
P. mollis	Perlite	10.02.2009	-	-
	Peat+sand	10.02.2009	02.03.2009	20.0
	Peat+perlite	10.02.2009	06.03.2009	24.0
Average (Control)				22.0
P. spruceana	Perlite	10.02.2009	-	-
	Peat+sand	10.02.2009	26.02.2009	18.0
	Peat+perlite	10.02.2009	03.03.2009	21.0
Average (Control)				19,5

Table 2

Centralized table concerning the observation of cuttings, before rooting

Species	Rooting substrate	Number of prepared cutting	The length of cutting (cm)	The number of leaves
P. cadierei	Perlite	30	7,04	6,02
	Peat+sand	30	6,44	5,40
	Peat+perlite	30	6,38	4,40
Average (Control)		30	6,62	5,27
P. mollis	Perlite	30	5,70	8,20
	Peat+sand	30	5,78	6,00
	Peat+perlite	30	5,00	6,20
Average (Control)		30	5,49	6,80
P. spruceana	Perlite	30	7,40	7,00
	Peat+sand	30	6,60	6,60
	Peat+perlite	30	6,70	6,00
Average (Control)		30	6,90	6,53

Table 3

The influence of rooting substrate on morphological characteristics at three species of *Pilea*

Species	Rooting substrate	Number of prepared cutting	The length of cutting (cm)	The number of leaves	The length of roots (cm)
P. cadierei	Peat+sand	30	16,9	10,2	10,6
	Peat+perlite	30	17,2	8,8	10,0
Average (Control)		30	17,0	9,5	10,3
P. mollis	Peat+sand	30	12,0	13,2	6,4
	Peat+perlite	30	9,9	11,0	4,6
Average (Control)		30	10,9	12,1	5,5
P. spruceana	Peat+sand	30	12,4	16,8	6,0
	Peat+perlite	30	14,6	16,8	8,2
Average (Control)		30	13,5	16,8	7,1

The dates from table 3 show that the rooting substrates influence different three *Pilea* species. Regarding the total length of the cuttings we can conclude that *P. cadierei* reach high values in the mixt substrate of peat + perlite (17.2 cm), *P. mollis* have lower values in this mixt substrate (9.9 cm) and *P. spruceana*, also in peat + perlite, achieved the best results (14.6 cm).

Analyzing the number of leaves at every species, *P. spruceana* is remarking through a high number of leaves (16.8), in the both rooting substrate. This species was followed by *P. mollis*, which formed 13.2 leaves in the substrate of peat + sand, and in the substrate formed by peat + perlite has a few leaves (11.0). *P. cadierei* evolve in the same direction, in peat + sand recorded a high number of leaves in the second substrate, forming only 8.8 leaves. Studying the influence of root system, it appears that *P. cadierei* have the longest roots, in both rooting substrates. *P. mollis*, recorded higher values in peat + sand, but in the peat + perlite, presents low values. *P. spruceana* formed the longer roots (8.2 cm) in peat + perlite.

CONCLUSIONS

1. *Pilea spruceana* rooted fastest (18 days), in the substrate composed of peat + sand. The *P. mollis*, rooted at the latest, within 24 days in peat + perlite.

2. Regarding the influence of rooting substrate on the morphological characters of cuttings, we can say that both the total length of cuttings and the rest of the characters analyzed were favorably affected by both rooting substrates (peat + sand and peat + perlite).

3. Longest root system was formed in peat + sand (*P. cadierei* and *P. mollis*), and *P. spruceana* formed the richest roots in peat + perlite.

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EVALUATION OF POTENTIAL BIOLOGICAL AND MORPHOLOGICAL TO SOME *CHRYSANTHEMUM X HORTORUM* Bailey. VARIETIES IN SOLARIUM

EVALUAREA POTENŢIALULUI BIOLOGIC ŞI MORFOLOGIC LA UNELE SOIURI DE *CRYSANTHEMUM X HORTORUM* BAILEY. ÎN SOLAR

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Abstract. *China and Japan over 5,000 years, favourite flowers are roses and chrysanthemums. Chrysanthemums are an important crop in the world flower assortment and our country. Special qualities of this flower are: beauty, great range of shapes and colors, keeping the water resistance of cut flowers, malleability in terms of culture system, the possibility of cultivation throughout the year. All these qualities determine the extensive use of Chrysanthemums. In special protected areas, which can create certain environmental conditions the chrysanthemums can be grown throughout the year, enriching the assortment of flowers in all seasons. Due to these reasons experiments were carried out for 2 years (2008-2009) in the solarium, in a private firm from Cluj County. The studies were performed on 5th of Chrysanthemum varieties type Turner, referring to the main morpho-decorative characteristics. All data obtained were interpreted statistically by calculating the average and the significance of differences was tested using the test version "Duncan."*

Key words: characteristics, cultivars, type Turner, observations

Rezumat. *În China şi Japonia, de peste 5000 de ani, florile favorite sunt trandafirul şi crizantema. Crizantemele reprezintă o cultură importantă în sortimentul floricol mondial şi din ţara noastră. Calităţile deosebite ale acestei flori constau în: frumuseţe, gamă deosebită de forme şi culori, rezistenţă la păstrare în apă a florilor tăiate, maleabilitatea în ceea ce priveşte sistemul de cultură, posibilitatea cultivării în tot timpul anului. Toate aceste calităţi determină o largă utilizare a crizantemelor. În spaţii protejate, unde se pot crea anumite condiţii de mediu, crizantema se poate cultiva în tot timpul anului, îmbogăţind sortimentul de flori din toate anotimpurile. Datorită acestor considerente experimentările s-au efectuat timp de 2 ani (2008-2009) în solar, in cadrul unei ferme private din judeţul Cluj. Studiile s-au efectuat asupra a 5 soiuri de crizanteme tip Turner, referindu-se la principalele caracteristici morfo-decorative. Toate datele obţinute au fost interpretate statistic, calculându-se media şi s-a testat semnificaţia diferenţelor dintre variante cu ajutorul testului "Duncan".*

Cuvinte cheie: caracteristici, soiuri, tip Turner, observaţii

INTRODUCTION

Chrysanthemums are second only to roses in length of time used as ornamental plants. Their written history extends back almost 3,000 years, with references to them appearing in the writings of Confucius (Vidrascu and Teodorescu, 1993).

Chrysanthemum x hortorum, often called mums or chrysanths, are a genus (*Chrysanthemum*) of about 30 species of perennial flowering plants in the family Asteraceae, native to Asia and northeastern Europe.

Chrysanthemums were first cultivated in China as a flowering herb as far back as the 15th century BC. (http://www.mums.org.). An ancient Chinese city was named Ju-Xian, meaning "chrysanthemum city". The plant is particularly significant during the Double Ninth Festival. The flower was introduced into Japan probably in the 8th century AD, and the Emperor adopted the flower as his official seal. There is a "Festival of Happiness" in Japan that celebrates the flower (http://en.wikipedia.org).

The flower was brought to Europe in the 17th century. They were introduced to Europe in about 1688 and to England in 1764 but their history in North America extend back less than 200 years. Linnaeus named it from the Greek word *chrysous* - golden (the colour of the original flowers), and *anthemon*, meaning flower. In 1789 a French navigator, who came from the Far East China, has a collection of chrysanthemums which gave Paris Museum of Natural Sciences. In 1875 it established Chrysanthemum French Company that operates today. Thereafter concerns appear first finding of this flower growing technologies in Europe ecoclimatic conditions. We can say, based on numerous written testimonies that in 1829 it was known throughout the cone chrysanthemum the European continent. In 1842, China brought new types of chrysanthemums, which led to increasing interest in this flower, Chrysanthemum culture since that time to the attention of specialists from the main centers of Europe. In 1842, China brought new types of chrysanthemums, which led to increasing interest in this flower, culture chrysanthemum since that time, to the attention of specialists from the main centers of Europe.

In Romania for the first were mentioned in 1750 under the name “margareta de toamna”. The first imports were made in Bucharest before the 1st world war.

The flowers are good cut flowers as well. Modern chrysanthemums are much showier than their wild relatives. The flowers occur in various forms, and can be daisy-like, decorative, pompons or buttons. This genus contains many hybrids and thousands of cultivars developed for horticultural purposes. In addition to the traditional yellow, other colors are available, such as white, purple, and red. The most important hybrid is *Chrysanthemum* × *morifolium* (syn. *C.* × *grandiflorum*), derived primarily from *C. indicum* but also involving other species. Yellow or white chrysanthemum flowers are boiled to make a sweet drink in some parts of Asia. The resulting beverage is known simply as "chrysanthemum tea". Chrysanthemum tea has many medicinal uses, including an aid in recovery from influenza. In Korea, a rice wine flavored with chrysanthemum flowers is called *gukhwaju*.

Chrysanthemum leaves are steamed or boiled and used as greens, especially in Chinese cuisine. Other uses include using the petals of chrysanthemum to mix with a thick snake meat soup in order to enhance the aroma. Chrysanthemum plants have been shown to reduce indoor air pollution by the NASA Clean Air Study (Wolverton B.C, Rebecca C. McDonald, and E. A. Watkins, Jr. 2006). Extracts of Chrysanthemum plants (stem and flower) have been shown to have a wide variety of potential

medicinal properties, including anti - HIV-1 (Collins et al., 1997), antibacterial (Sassi et al., 2008) and antimycotic (Marongiu et al., 2009). In the world Chrysanthemums are different cultural significance and symbolism. Thus in some countries of Europe (e.g., France, Italy, Poland, Croatia), white chrysanthemums are symbolic of death and are only used for funerals or on graves - similarly, in China, Japan and Korea, white chrysanthemums are symbolic of lamentation and/or grief. In some other countries, it represents honesty. In the United States, the flower is usually regarded as positive and cheerful.

MATERIAL AND METHOD

The subjects of the research in our experimental field at the solarium from a private firm named SC Flox / Art, close to Cluj-Napoca (Fig 1.), during 2009 periods were the study of **5** new *Chrysanthemum* cultivars, belong to Turner type: 'White Snowdon', 'Escort', 'Robiam', 'Regan Sundi' and 'Escapade'. We used rooting cuttings, 60 plants /variant in 3 randomizing variants, total 300 plants. The moon plants were bought from Holland.

The biological materials were planted in the solarium in July 5-12, 2009, and then where applied the culture technology specific of chrysanthemums. So after preparing the soil, beds were marked with a width of 120 cm and 40-50 cm path between them (Cantor and Pop, 2008). In order to support plants a support system was installed that was provided with four levels of nets (fig. 1). For planting rooted cuttings were used which had 3 to 4 leaves and roots 5-6 cm long. Planting was done manually in pits. After planting a watering was done for promote better rooting. During the growing season were made more watering according to season and in relation to other environmental factors. To achieve soil loosening and keep clean of weeds culture were performed three weeding. When plants have grown we make fertilization with Polyfeed 1% concentration and nitrogen. A new fertilization was performed in three weeks with complex III, the relationship between elements being 1:2:1.5. During the growing season were applied to specific works of the plant: pinching tip growth; choosing flower stems and remove the lateral flower buds.

Fig.1. Experimental field of *Chrysanthemum* cultivars

These entire cultivars were monitoring and investigated in solarium conditions, for the main morpho-decorative characteristics: blooming time, colour of flowers, plant height, and circumference of plant, number of stems, number of flower, flower diameters and number of ligules. The observations were made for 60 plants from each cultivars and were calculated the average. All data were statistically interpreted for each character, were calculated by statistical analysis methods average - M, standard deviation - s and coefficient of variability - s% to determine the variety and variability of

the character stability in subsequent generations and test significance of differences between the test versions using Duncan (Ardeleanu et al., 2002).

RESULTS AND DISCUSSIONS

The observations and the measurements achieved concerning the main morphological characteristics of new 5 cultivars *Chrysanthemum x hortorum* type Turner studied at the experimental field in a solarium are presented in the following tables (1-6). Analyzing the tables, we can conclude the following:

The *Chrysanthemum* cultivars presented a large variety of color for the flowers. The cultivars investigated are monocolour, such as: 'White Snowdon' - white, 'Robiam' - yellow, 'Escapade' – pink, 'Escort' – red and 'Coniac' – orange - cognac. Concerning the vigor of the plants, we can show the different height between the cultivars of *Chrysanthemum* and also between the diameters of flowers. All of the Chrysanthemum cultivars had over 100 cm height of the plant, the cultivar 'Robiam' is the highest (119.6 cm), while 'White Snowdon' had only 100.8 cm. We can observe that between the height of plant and floral stem it is a positive correlation, generally the cultivar vigor had also a longer stem. The coefficient of variability is values less than 10% for the characteristics height and floral stem length which indicate high stability of varieties for this character.

The diameter of the flower also differs as a function of varieties, thus have between 10.3 cm ('Robian' and 'Coniac') and 13.4 cm ('White Snowdon'). The coefficient o variability denote a medium stability for this character, the value are situated between 10-20%. Coefficient of variability that has values less than 10%, indicating high stability of varieties. The difference between any two alternatives is not significant if those options are followed by the same letter or letters.

Table 1

Coefficient of variability of the main characteristics of *Chrysanthemum* varieties

Cultivars	Color of flowers	Coef. of variab.	Height of plant (cm)	Floral stem length (cm)	Diameter of flower (cm)
Escapade	Roz	M	108,8	97,40	10,40
		S	3,97	4,44	2,07
		S%	3,66	4,57	19,94
Robiam	Galben	M	119,6	117,0	10,30
		S	3,81	3,81	1,34
		S%	3,17	3,25	12,66
White Snowdon	Alb	M	100,8	96,3	13,40
		S	7,62	9,16	2,41
		S%	6,63	8,8	17,97
Coniac	Oranj	M	111,8	106,8	10,30
		S	4,67	10,23	1,34
		S%	4,43	9,58	12,66
Escort	Rosu	M	110,0	106,9	11,50
		S	9,45	10,22	1,41
		S%	8,54	9,52	12,86

Table 2

Summary of experimental results including the differences between variants and their significance.
The average height of Turner plants

Variants	Height average (cm)	Variants and height (cm)			
		4	5	1	3
		111,8	110,0	108,8	100,8
2	Robiam	7,8*	9,6*	10,8*	18,8*
4	Coniac	---	1,8*	3*	11*
5	Escort		---	1,2*	9,2*
1	Escapade			---	8*
3	White Snowdon				---

Table 3

Summary tables

Variants	Cultivars	Height average of plant (cm)	Signification of results
2	Robiam	119,6	a
4	Coniac	111,8	b
5	Escort	110,0	b
1	Escapade	108,8	b
3	White Snowdon	100,8	c

Table 4

Nr. var.	Cultivars	Length of floral stem (cm)	Signification of results
2	Robiam	117.0	a
5	Escort	106.8	b
4	Coniac	106.9	b
1	Escapade	97.4	c
3	White Snowdon	96.3	c

Table 5

Nr. var.	Cultivars	Diameter of flower (cm)	Signification of results
2	White Snowdon	13.4	a
4	Escort	11.5	b
5	Escapade	10.4	c
1	Robian	10.3	c
3	Coniac	10.2	c

Table 6

Synthesis of experimental results (Duncan test) at *Chrysanthemum x hortorum,* type Turner

Cultivars	Studied characters		
	Height of plant (cm)	Length of floral stem (cm)	Diameter of flower (cm)
White Snowdon	$100,8^{c}$	$96,3^{c}$	$13,4^{a}$
Robiam	$119,6^{a}$	$117,0^{a}$	$10,3^{c}$
Escapade	$108,8^{b}$	$97,4^{c}$	$10,4^{c}$
Coniac	$111,8^{b}$	$106,9^{b}$	$10,2^{c}$
Escort	$110,0^{b}$	$106,8^{b}$	$11,5^{b}$
DS 5%	4,63 – 5,06	5,5 – 5,95	0,88 – 0,95

Note: Different letters between cultivars denote significant differences (Duncan test, $p < 0.05$).

Analyzing the table 6 we can conclude that between 'Escapade', 'Coniac' and 'Escort' is not difference concerning the height of plant. The length of plants depend of cultivars, 'Robian' had the bigger stem. Diameter of flower is around 10 cm for 'Robiam', 'Escapade' and 'Coniac' and bigger for 'White Snowdon' and 'Escort'.

CONCLUSIONS

The floral collection of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Department of Floriculture was enriched with some new cultivars of *Chrysanthemum x hortorum* Turner type, which have been not cultivated by now in Romania.

The knowledge of the morphology and biology of the new cultivars is very important because those can be recommended for new varieties that will be adequate to the Romanian local conditions.

The analyzed cultivars in the experimental field have a great diversity of morphological characteristics. The studies of their characteristic behavior under the solarium conditions have an essential role concerning the ornamental value of some cultivars belonging to this specie.

These varieties can be special as cut flowers ('Robiam', 'White Snowdon' şi 'Escapade') for any occasions or make beautiful in the vase, most of them have a very unique color, and are recommended for shows and excellent commercial culture.

The results will be also used by a large number of commercial growers which will be able to obtain substantial profits from this research activity (using new varieties for cut flowers).

The students of U.S.A.M.V. Cluj-Napoca can be using the researches obtained for their graduate thesis. The most representative varieties can also be used in our future breeding program as genitors for hybrid combinations in order to obtain new hybrids.

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IMPROVEMENT AND DIVERSIFICATION OF THE ASSORTMENT OF ORCHIDS FROM *CYMBIDIUM* GENUS

ÎMBOGĂŢIREA ŞI DIVERSIFICAREA SORTIMENTULUI DE ORHIDEE LA GENUL *CYMBIDIUM*

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Abstract. *Cymbidiums have been cultivated for thousands of years, especially in China. They became popular in Europe during the Victorian era. One feature that makes the plant so popular is the fact that it can survive during cold temperatures and in temperate climates appreciate the fact that they can bloom in winter, when few other orchids are blooming. Researching activity for diversification of floral plants assortment by introducing of the most competitive tropical floral cultivars is one of the objectives of our experiments. This paper describes new Cymbidium spp. cultivars grow in greenhouses at the SCDP Cluj. These where and recorded for the main characteristics. The data obtained will be statistical interpretation. The most representative Cymbidium spp. cultivars can be used for indoor as potted plants or can be used as cut flowers in vase or different arrangements.*
Key words: cultivars, characteristics, collection

Rezumat. *Orhideele au fost cultivate de mii de ani, in special in China. Ele au devenit foarte populare in Europa in epoca Victorana. Ceea ce le face foarte populare este faptul ca ele pot trai la temperaturi scăzute si in climat temperat si înfloresc iarna când puţine orhidee sunt înflorite. Cercetări privind activitatea de diversificare a sortimentului de plante floricole prin introducerea celor mai competitive soiuri din zonele tropicale este unul din obiectivele cercetărilor noastre. Acesta lucrare descrie noi soiuri de Cymbidium cultivate in serele de la SCDP Cluj. Acestea au fost monitorizate privind principalele caracteristici. Toate datele obţinute au fost interpretate statistic. Cele mai reprezentative soiuri de Cymbidium vor putea fi utilizate ca plante la container sau ca flori tăiate in vase sau diferite aranjamente.*
Cuvinte cheie: soiuri, caracteristici, colecţie

INTRODUCTION

Cymbidium is one of the most popular and desirable orchids in the world because of the beautiful flowers. Since the time of ancient China, orchids were cultivated for their beauty and symbolized friendship, perfection, nobleness and femininity. Confucius was a well-known admirer of the perfume of these plants. In Europe, "Orchidmania" started only in the 18^{th} and 19^{th} centuries, when noblemen competed for the most beautiful and special plants. Orchids are not parasite plants. They are epiphytic and use the trees just to grow on their trunks and in the treetops. From this point of view, Orchids are much like Bromelias and Tilandsias (http://www.orchidclub.ro/en/en_orhidee.htm).

Cymbidium or **boat orchids**, is a genus of 52 evergreen species in the orchid family Orchidaceae. It was first described by Olof Swartz in 1799. This genus is distributed in tropical and subtropical Asia and northern Australia. The larger flowered species from which the large flowered hybrids are derived grow at high altitudes (Cribb and du Puy 2007).

Cymbidium plants are sympodial and grow to a height of 60 cm and the racemes as high as 90 cm. The raceme grows from the base of the most recent pseudobulb. They bloom during the winter, and each plant can have up to fifteen or more flowers. They show very diverse color patterns, different for every species (Cantor and Pop, 2008).

Cymbidiums are terrestrial orchids epiphytes or lithophytes, usually large, with pseodobulbi. Orchids have drawn attention to horticulture and tried to cultivate in greenhouses. While until 1800 only grew wild orchids, a major achievement was the first artificial hybrid obtain mid-nineteenth century (http://en.wikipedia.org/wiki/Cymbidium).

Nowadays, owing to the local technical and economical conditions and to the lack of a competitive market in the field of orchids, *Cymbidium* has become an important and viable promoter of the orchid cult in Romania.

MATERIAL AND METHOD

The experiments were performed at the Fruit Research Station Clu-Napoca (S.C.D.P. Cluj), Floriculture laboratory (Fig. 1) and the observations were obtained lasted two years (2008-2009). The floral collection of *Cymbidium* was improved with four cultivars which are representative for this experiment: 'Golden Buddha', 'Lady Spring', 'Violet Purple' and 'Green Spectable', obtained from Holland.

Fig. 1. Experimental field of *Cymbidium* at SCDP Cluj

We carried out a set of observations and determinations measurements on those characteristics of the plants that are in direct connection with their quality (leaf length and width, number of leaves per plant, spike length and width of flower). The dates were statistically interpreted with the help of the DL test and "t" test (Ardeleanu et al., 2002). The observations were made for 10 plants from each cultivars and were calculated the average of experiment.

RESULTS AND DISCUSSIONS

The observations and the measurements of main morphological characteristics of new four cultivars belonging to Cymbidium spp. were monitoring and investigated in greenhouse conditions. The new cultivars have a great diversity of color of spike: 'Golden Buddha' has a yellow color, flowering early April-May (fig. 2), 'Lady Spring' is white, blooming at the beginning of June (fig. 3), 'Violet Purple' is violet and 'Green Spectable' has a green banana color.

Fig. 2. Golden Buddha

Fig. 3. Lady Spring

Concerning the length and width of leaves of orchid cultivars, we can show the different between these characters (table 1). The cultivar 'Green Spectable' has the biggest leaf with 69.6 cm length and 3.3 cm of width while the cultivar 'Violet Purple' has the small leaves (58.0/2.1cm). The average of experiment was 65.85 cm for length of leaves and 2.55 cm for the width of leaves. The number of leaves varied between 98 ('Violet Purple') and 114 ('Golden Buddha'), with an average of experiment 107.75 leaves/plant.

Table 1

Morphological observations of the main characteristics of Cymbidium cultivars

Cultivar	Leaf			
	Length (cm)	Width (cm)	Number of leaves	
			number	% of average of exp.
Golden Buddha	69.6	3.3	114	105.80
Lady Spring	65.8	2.5	108	100.23
Violet Purple	58.0	2.1	98	90.95
Green Spectable	70.0	2.3	111	103.02
Average (Control)	65.85	2.55	107.75	100.0

Under separate matter statistically significant positive difference in the varieties recorded 'Golden Buddha' and 'Green Spectable'. In terms of leaf length proved to be very significant negative 'Violet Purple' variety (table 3). Under the statistical aspect of the three varieties of *Cymbidium* leaf width are insignificant (table 4). Analyzing the table 5 under statistical point variety 'Golden Buddha' and 'Green

Spectable' have a very significant positive difference on the number of leaves. 'Violet Purple' variety has proved to be very significantly negative.

Table 2

Morphological observations on the flower at the *Cymbidium* cultivars

Cultivar	Flower			
	Length (cm)	Width (cm)	Length of stem	
			(cm)	% % of average of exp.
Golden Buddha	6.7	3.7	56.28	121.63
Lady Spring	6.3	3.3	54.17	117.07
Violet Purple	5.9	3.2	42.44	91.72
Green Spectable	6.2	2.9	32.20	69.59
Average (Control)	6.27	3.27	46.27	100.00

Table 3

Experimental data concerning length of leaves

Cultivar	Variant	Length of leaf		Difference (± cm)	Significatio n of difference
		Absolute (cm)	Relative (%)		
Golden Buddha	v-1	69.6	105.70	3.75	**
Lady Spring	V-2	65.8	99.92	-0.05	-
Violet Purple	v-3	58.0	88.08	-7.85	ooo
Green Spectable	v-4	70.0	106.30	4.15	**
Average (Control)		65,85	100.00		

DL 5% = 2.6 DL 1% = 3.5 DL 0,1 = 4.6

Table 4

Experimental data concerning width of leaves

Cultivar	Variant	Width of leaf		Difference (± cm)	Signification of difference
		Absolute (cm)	Relative (%)		
Golden Buddha	v-1	3,3	129,41	0,75	-
Lady Spring	v-2	2,5	98,04	-0,05	-
Violet Purple	v-3	2,1	82,35	-0,45	-
Green Spectable	v-4	2,3	90,20	- 0,25	-
Average (Control)		2,55	100,00		

DL 5% = 1.68 DL 1 % = 2.25 DL 0,1% = 2.9

Table 5

Experimental data concerning number of leaves

Cultivar	Variant	Number of leaves		Difference ±	Signification of difference
		Absolute (No)	Relative (%)		
Golden Buddha	v-1	114	105.80	6.25	***
Lady Spring	v-2	108	100.23	0.25	-
Violet Purple	v-3	98	90.95	-9.75	ooo
Green Spectable	v-4	111	103.02	3.25	***
Average (Control)		107.75	100.00		

DL 5% = 0.64 DL 1 % = 0.86 DL 0,1% = 1.12

Table 6

Experimental data concerning length of flower (petal)

Cultivar	Variant	Length of flower (petal)		Difference (± cm)	Significati on of difference
		Absolute (cm)	Relative (%)		
Golden Buddha	v-1	6.7	106.86	0.43	*
Lady Spring	v-2	6.3	100.48	0.03	-
Violet Purple	v-3	5.9	94.09	-0.37	-
Green Spectable	v-4	6.2	98.88	-0.07	-
Average (Control)		6.27	100.00		

DL 5% = 0.3 DL 1% = 1.0 DL 0,1% = 1.4

In terms of leaf length, proved that the variety 'Golden Buddha' is significantly positive and the other varieties are not significant in terms of character study (table 6).

Statistical analysis of data from the other varieties is found as follows: in terms of leaf width, all varieties studied are insignificant (table 7).

Table 7

Experimental data concerning width of petals

Cultivar	Variant	Width of petals		Difference (± cm)	Signification of difference
		Absolute (cm)	Relative (%)		
Golden Buddha	v-1	3.7	113.15	4.30	-
Lady Spring	v-2	3.3	100.92	0.03	-
Violet Purple	v-3	3.2	97.86	-0.07	-
Green Spectable	v-4	2.9	88.68	-0.37	-
Average (Control)		3.27	100.00		

DL 5% = 0.54 DL 1% = 0.72 DL 0,1% = 0.95

Table 8

Experimental data concerning length of flower stem

Cultivar	Variant	Length of flower stem		Difference (± cm)	Signification of difference
		Absolute (cm)	Relative (%)		
Golden Buddha	v-1	56.28	121.63	10.01	**
Lady Spring	V-2	54.17	117.07	7.90	*
Violet Purple	v-3	42.44	91.72	-3.83	-
Green Spectable	v-4	32.20	69.59	-14.00	oo
Average (Cntrol)		46.27	100.00		

DL 5% = 7.45 DL 1% = 9.97 DL 0,01% = 14.15

In table 8 observe the length of flower stem vary in range from 32.20 cm ('Green Spectable') to 56.28 cm at 'Golden Buddha'. From a statistical viewpoint, 'Golden Buddha' variety is distinct significantly positive in terms of this character. Regarding the variety 'Green Spectable' is distinct significant negative differences. In table 9 the mean of four varieties were correlated with the average of all plants pursued. Differences 'Golden Buddha' and 'Violet Purple'

and the average are insignificant. 'Lady Spring' and 'Green Spectable" forms shows a distinct significant difference.

Table 9

Productivities of *Cymbidium* cultivars/plant (test «t»)

Nr. Var.	Cultivar	Mean production of floral stem/plant $x \pm s_x$	D	T	Signification of difference
v-1	Golden Buddha	2,2 ± 0,385	0.10	0.22	-
v-2	Lady Spring	0,8± 0,428	1.50	3.13	**
v-3	Violet Purple	2,6 ± 0,262	0.38	1.13	-
v-4	Green Spectable	0,8 ± 0,428	1.50	3.13	**
	Average (Control)	2,3 ± 0,212			

CONCLUSIONS

The floral collection of Fruit Research Station Cluj-Napoca, Department of Floriculture was enriched with new cultivars of *Cymbidium*, which have been not cultivated by now in Romania.

The knowledge of the morphology, biology and productivity of the new cultivars is very important because those can be recommended for new varieties that will be adequate to the Romanian local conditions.

Hence, following the carried research, the 'Green Spectable' cultivar became highly notable at leaf length, with 70 cm long leaves. 'Golden Buddha' stands as the most important *Cymbidium* from the point of view of leaf width (3.3 cm). At leaves number, it is the 'Golden Buddha' cultivar again that comes first, with 114 leaves growing on a plant. The length of a flower is a characteristic directly linked to the overall aspect of a plant and the longest *Cymbidium* flower belongs to the 'Golden Buddha' cultivar (6.7 cm); also, the widest cymbidium petals were found, again, at the 'Golden Buddha' cultivar, 3.7 cm. The *Cymbidium* plant with the most stems belongs to the 'Violet Purple' cultivar, with 2.6 flowers per plant. The same cultivar has the greatest production of flower buds per plant.

Due to their great variety of colors and to their superior traits, the *Cymbidium* cultivars that were considered in this study make up excellent choices for the decoration of homes and offices, both as cut flowers or different arrangements, placed individually or mixed to other species.

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THE BEHAVIOUR IN CROP OF SOME SPECIES WITH ORNAMENTAL FEATURES FROM SPONTANEOUS FLORA OF ROMANIA

COMPORTAREA ÎN CULTURĂ A UNOR SPECII CU POTENŢIAL ORNAMENTAL DIN FLORA SPONTANĂ A ROMÂNIEI

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Abstract. *In the paper are presented the preliminary results of a study which have as a main goal the introduction in crop of some certain species from the spontaneous flora of NE and E area of Romania. The analysed species belonged to Liliaceae family (Allium ursinum L., Lilium martagon L., Polygonatum multiflorum (L.) All., Polygonatum latifolium (Jacq.) Desf.). In comparison with their behaviour in natural eco-system were analyzed the main phenophases, enlighten the ornamental characters. The obtained results show a very good adaptability in crop of species Allium ursinum L. and of species from kind Polygonatum. Lilium martagon L. show a small tendency of decreasing of certain ornamental characters (dimension and number of flowers per plant).*

Key words: spontaneous flora, ornamental potential, adaptability.

Rezumat. *În lucrare sunt prezentate rezultatele preliminare ale unui studiu care are ca obiectiv principal introducerea în cultură a unor specii identificate în flora spontană din zona de NE şi E a României. Speciile analizate aparţin familiei Liliaceae: Allium ursinum L., Lilium martagon L., Polygonatum multiflorum (L.) All., Polygonatum latifolium (Jacq.) Desf. Comparativ cu comportarea în ecosistemul natural, s-au analizat principalele fenofaze, cu evidenţierea caracterelor ornamentale reprezentative. Rezultatele obţinute au evidenţiat o adaptare bună în cultură a speciilor Allium ursinum L. şi a speciilor din genul Polygonatum. În cazul speciei Lilium martagon L. s-a înregistrat o uşoară tendinţă de diminuare a anumitor caractere ornamentale (dimensiunea şi numărul florilor pe plantă).*

Cuvinte cheie: flora spontană, potenţial ornamental, adaptabilitate.

INTRODUCTION

Plants with decorative potential from the spontaneous flora offer a valuable source of germplasm to enrich the assortment of species used in landscape design and floriculture. Those plants have as a supplementary advantage the adaptability features to local and regional conditions, fact which allows having new opportunities on ornamental flowers market.

Capitalization of biologic and ornamental potential of the spontaneous flora from N-E area of Romania was a main target for some research and education institutions, which identify and cultivate in collections such plants, but many of them

remained at the level of "collection plants" without being promoted in ornamental plants nurseries.

The aim of the present paper is to put in light some species from spontaneous flora brought in collection and studied in aim to maintain their ornamental features in "ex situ" conditions, so to be able to establish if could be recommended for cropping.

MATERIAL AND METHOD

Research was carried out in the experimental field of Floriculture Discipline from USAMV Iaşi. Biologic material was represented by species from Liliaceae family (*Allium ursinum, Lilium martagon, Polygonatum latifolium, Polygonatum multiflorum, Polygonatum officinalis),* with natural habitat in Moldova area (Iaşi, Vaslui and Neamţ counties) and brought in collection in the autumn of 2008. All five species are herbaceous plants, from perennial geophyte category.

Crop establishment was realised in October, with vegetative material (bulbs and rhizomes) gathered from spontaneous flora, and the observations took place during vegetation period in 2009. In table 1 are presented in a synthesis the main data regarding biologic material, its source and the date of experimental crop establishment.

Table 1

Source and synthetic data regarding crop establishment

Nr. crt.	Specie	Source of material	Biologic material	Date of experimental crop establishment
1	*Allium ursinum*	Dobrovăţ forest Iaşi, Neamţ	Bulbs	20.10.2008
2	*Lilium martagon*	Bârnova forest Iaşi, Neamţ	Bulbs	16.10.2008
3	*Polygonatum latifolium*	Dobrovăţ forest Iaşi, Vaslui	Rhizomes	20.10.2008
4	*Polygonatum multiflorum*	Dobrovăţ forest Iaşi, Vaslui	Rhizomes	20.10.2008
5	*Polygonatum officinale*	Dobrovăţ forest Iaşi, Vaslui	Rhizomes	20.10.2008

Experimental crops were placed in blocks with variations superimposed linear bunk, each variant represented specie.

The proposed methodology for evaluations of the analysed taxons had as base the following:

- phenologic studies to establish vegetation period;
- quality biometric studies (analyse of the phenotypic expression by using index of plant and flower morphology, plants' waist and diameter, aspect, compactness, number of flowers per plant etc.);
- studies regarding plants' multiplication capacity, to establish the optimal variants for multiplication of the material, as a main aim in promoting the valuable taxons.

Multiplication capacity of the plants in crop conditions was analysed both for vegetative methods (bulbs and rhizomes), and also for seed multiplication.

In the case of using seeds as multiplication material, was tested the classical method, sowing was realised in field and in greenhouse, and also the modern methods with obtaining explants from seeds germinated "*in vitro*".

For "*in vitro*" germination, the utilised seeds were gathered from their natural habitat. Their sterilization was made by treatment with Topsin for 10 minutes, followed by three washes with distillate water and a treatment with a solution of calcium hypochlorite (10-15 min.). After these operations, under the laminar flow hood were effectuated three washes with sterile water, the seeds were immersed in alcohol 70% (around 1 min.), and before passing on the germination medium were washed only once with sterile water. Inoculation was realised on a MS solid medium (Murashige-Skoog). Until seeds germination, the vials were kept at dark, at temperature of 24^0C, and after germination were passed in vegetation chamber, light intensity conditions of 30 μmol/m^2/sec., temperature 25 ± 1^0C and photoperiod of 16 hours light/8 hours dark.

RESULTS AND DISCUSSIONS

Plants brought in crop were monitories during vegetation period, having in view, first of all, a series of morphologic features which defines them as ornamental plants (decorative organs, colour of the flowers, growing method etc.). *Allium ursinum* and species of *Polygonatum* grow under the form of bushes and decorates both by flowers and also through the rich foliage. *Lilium martagon* present as the main decorative part the flowers, at which could be attached the elegant port. Data regarding plants' behaviour in crop conditions appreciated through the recorded biometric measurements for some features (waist, growing characteristics and plants' port) and through some specific ornamental features (flowers' colour, plants' port) are presented in table 2.

In the first year of vegetation in "ex situ" conditions plants manifested a relatively good level of adaptability, their growing and development parameters being very close to the ones from originate habitat. At *Lilium martagon* was recorded a decrease tendency of plants' vigour (lax aspect of the bushes, reduced height, decreases of flower number and leaf).

Table2

Morphologic observations effectuated in 2009

Nr crt	Specie	Life cycle	Port	Flowers' colour	Decorative part*	Observations
1	*Allium ursinum*	perennial	bush	white	L, Fl,	normal
2	*Lilium martagon*	perennial	erect	rose with purples patches	P, Fl	lax
3	*Polygonatum latifolium*	perennial	bush	white	Fl, L	normal
4	*Polygonatum multiflorum*	perennial	bush	white-green	Fl, L	normal
5	*Polygonatum officinalis*	perennial	bush	white	Fl, L	normal

*Decorates through: P - port; L – leaf; Fl – colour of flowers.

The effectuated biometric measurements on plants' height and on number of flowers were compared with the ones recorded at the plants in their originate habit.

A tendency remarked at all species is the one of reducing plants' waist, but the differences aren't significant at *Allium ursinum* (mean height of cultivated plants being of 22.8 cm, in comparison with 26.3 cm in natural habitat), at *Polygonatum latifolium* (30.7 cm face to 33.6 cm), at *Polygonatum multiflorum* (26.7cm face to 34.9cm) and at *Polygonatum officinalis* (20.5cm face to 25.8cm). But at *Lilium martagon*, were recorded negative significant differences at the plants brought in collection, by reducing the height with around 30% (fig. 1).

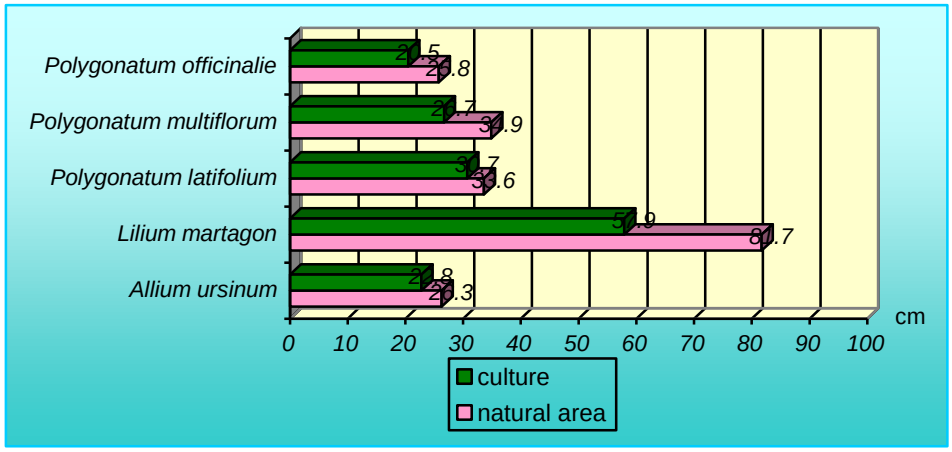


Fig. 1. Plants' height

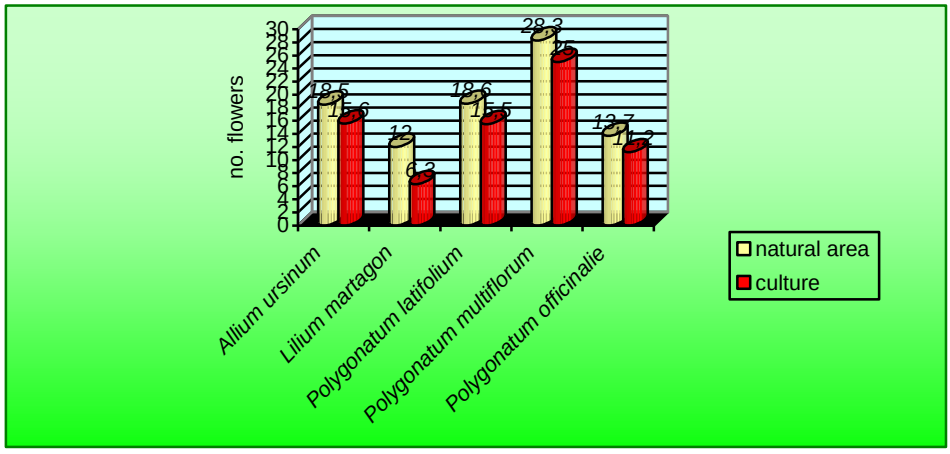


Fig. 2. Number of flowers

Also as regarding the flowering capacity the obtained results showed a decrease of the flowers number at the plants from collection, being different for each of them (fig. 2). So, at *Allium ursinum* the mean number of flowers in inflorescence decreased with around 15%, at *Polygonatum latifolium* with about

11%, at *Polygonatum multiflorum* with 12%, and at *Polygonatum officinalis* with 18%. At these species the recorded differences were non-significant. At *Lilium martagon*, the number of flowers reduced to one half determined negative significant differences.

Tracking the flowering period, in experimental field, could be observed that the studied species cover almost the same decoration period as in natural habitat, decorating from spring till the beginning of summer. Could be remarked a light delay of flowering (with around 5-8 days) in crop conditions (table 3).

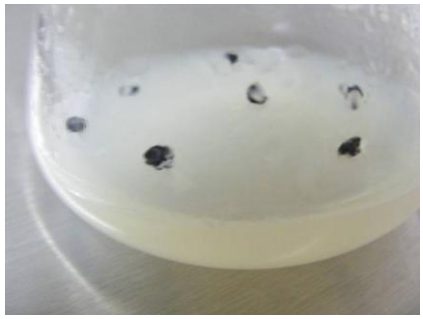
Table 3

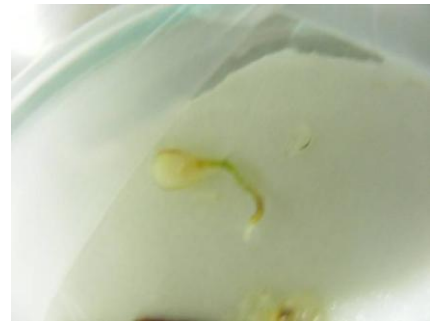
Flowering period of the studied species

Month / Decade / Specie		IV			V			VI			VII			VIII			IX		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Allium ursinum	natural area																		
	crop																		
Lilium martagon	natural habit																		
	crop																		
Polygonatum latifolium	natural area																		
	crop																		
Polygonatum multiflorum	natural area																		
	crop																		
Polygonatum officinale	natural area																		
	crop																		

Research regarding multiplication capacity of the plants by different methods is a starting point in establishing the optimum variants for material multiplication, having as main aim to promote the valuable taxons. Vegetative multiplication through subterranean organs, used in autumn of 2008 for establish the experimental field, is the simple method and with the best results, over 95% from the used biologic material (bulbs, rhizomes) assured the staring in vegetation in the next year.

Due to the weak results obtained at seed germination in conditions of conventional crop (direct sowing in field or seedling producing), especially at *Allium ursinum* and *Lilium martagon*, we tested also "in vitro" multiplication methods. At these species we recourse at aseptic germination of seeds, to obtain vegetal material needed for starting "in vitro" cultures. Also in this case the results were unsatisfactory, in conditions in which *Lilium martagon* seeds germinated in a rate of only 42.7% and the ones of *Allium ursinum* didn't germinate, the suspected causes being the composition of culture medium, maturation degree of the seeds or their storage conditions, aspects which will be clarified in our future research. In figure 3 are presented photos with seeds in "in vitro" mediums (at 15 days from inoculation).





a). *Allium ursinum* **b).** *Lillium martagon*

Fig. 3 (a-b). Seeds on "in vitro" culture mediums

CONCLUSIONS

At all the studied species the main decorative element is represented by flowers or inflorescences. Subsidiary plant height, number of stem ramifications, dimensions, shape and layout mode of leaf is other ornamental characters, which justify the introduction in crop of these species.

The study of taxons behaviour in crop conditions shows a good adaptability of them, and biometric features which were recorded and correlated during all the period of growing and development of the plants will be at the base of technologic crop recommendations for each specie.

Acknowledgments. This work was supported by CNMP, project number PNII – 52174/2008.

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BIOLOGICAL PECULARITIES OF GROWING AND DEVELOPMENT OF *WEIGELA FLORIDA* 'STYRIACA' VARIETY IN CONTAINER CONDITIONS

PARTICULARITĂŢILE BIOLOGICE DE CREŞTERE ŞI DEZVOLTARE A CULTIVARULUI *WEIGELA FLORIDA* 'STYRIACA' ÎN CONDIŢII DE CONTAINER

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Abstract. *The biological peculiarities of growing and development of Weigela florida* 'Styriaca' *variety in container conditions experimented with more culture mediums, also the fertilizer's influence with slow realizing action used in two norms of administration too were described.*
Key words: culture medium, slow release fertilizer, *Weigela florida*

Rezumat. *Sunt descrise particularităţile biologice de creştere şi dezvoltare a cultivarului Weigela florida* 'Styriaca' *în condiţii de container, experimentându-se mai multe substraturi de cultură, precum şi influenţa fertilizantului cu acţiune lentă folosit în două norme de administrare.*
Cuvinte cheie: substrat de cultură, fertilizator cu acţiune lentă, *Weigela florida*

INTRODUCTION

From the agronomic point of view the culture substrate is a mixture of organic compounds alone or in combination with mineral components, specifically tested for growing plants, usually in containers, especially for woody plants.

For this reason, the species grown in pots and containers, such as woody plant, where gradually in the technology culture, the soil was replaced with substrates, mostly organic materials. Culture substrates can provide aeration to the root system and a balanced amount of water and nutrients (Florescu, 1999).

Plant culture in the container is a technology of a major need for both horticulture and, the economy as a whole Republic of Moldova. In this article we proposed the study comportment of *Weigela florida* 'Styriaca' containerized plant on different substrates, under the administration of slow-release fertilizer Osmocote Plus.

Weigela florida 'Styriaca' – small, perfect funnelform-campanulate, abruptly narowed belowt he middle, with rounded spreading lobes, carmine-rose flowers freelz born on arching branches, single or several in axillary cymes on short twings from last year branches, the flowers occur in great profusion during May and June and sporadically throughout the growing season, prune after flowering, cultivar often retain dead branches and require tidying, smaller shrub, foliage light green. None serious, viruses have been reported. Best used in the shrub border, for grouping or massing.

MATERIAL AND METHOD

The researches on the territory of the Botanical Garden (Institute) of ASM, Chisinau, during the growing seasons 2006-2007 were performed. In our study as a biological material the cultivar *Weigela florida* 'Styriaca' served.

Following the growing media were established: V_1 - mould, leaves compost, peat, sand, in proportions of 2:2:2:1, V_2 - peat, leaf soil, sod soil, sand in the proportion 1:1:1:0.5; V_3 - peat, leaves compost, sand 1:0,8:0,2 proportion. Components that are part of the substrate have been thoroughly mixed, the peat previously was moistened for not to leave on the substrate surface during watering.

Biological material aged 3 years were transplanted from containers of 2 liters in containers of 5 liters. Before transplanting, the plants, with the entire container they were kept for 20-30 minutes in a volume of weak solution of $KMnO_4$. The root system was shaped.

In mixture tested recipes, the variant of solid fertilization with slow-release fertilizer under the trade name of Osmocote Plus of 5-6 months longevity of action (the substrate temperature ≈ 21^o C) was applied.

The chemical composition of this fertilizer is as follows: NPK 15+9+9 (+3 Mg); 15% N - (7,1% NO_3; 7,9% NH_4); 9% P_2O_5 (4.0% P); 7,1% P_2O_5 (3,1% P); 9% K_2O (7,5% K); 3,0% MgO (1,8% Mg); 1,5% MgO (0,9% Mg); 0,02% B; 0,047% Cu; 0,40% Fe; 0,06 % Mn; 0,020% Mo; 0,015% Zn. For determining the effectiveness of applying the rate of administration of solid slow-release fertilizer was tested rates of 4 and 5 kg/m^3 per substrate for both periods of experimentation and research. Fertilization rates with control variant were compared.

The variants were placed by 20 units, according to the method of subdivided parcels. Registration containerized plants and the aerial parts of biometric measurements were made at the time for the moment of planting in containers and were concluded at the end of the second cycle of vegetation. To achieve the objectives proposed, measurements and determinations were made on average increase plant growth container on various substrates. The growth increase of the aerial part of plants in containers was determined through measurements, also the difference between plant height grown throughout the period of vegetation and their initial of the plant. Based on these measurements were calculated growth parameters of aerial part and the influence of fertilizer given to these rhythms (Ceapoiu, 1960, Dospehov, 1985).

RESULTS AND DISCUSSIONS

The results obtained in plant growth and development of *Weigela florida* 'Styriaca' were statistically processed and are presented in table 1. Statistical analysis of results showed that the cultivar studied ornamental plants differed at all levels of statistical assurance. In the years of study the higher efficiencies of growth containerized plants under the administration of fertilizer experimented, compared with control, unfertilized were established.

In the case of plants grown on the culture substrate V_1 was revealed that the final height of the highest value was found in the standard administration of 4kg/m^3, recording the final value of the average height of 72,4 cm in first year culture and 92,8 cm in the second year of cultivation (table 1).

Table 1

Tags *Weigela florida* 'Styriaca' cultivar growth in terms of container

Variant substrate	Control			4 kg/m^3			5 kg/m^3		
	Year of vegetation 2006								
	Variants of fertilizer management								
	Initial height, cm	**Annual growth, cm**	**Final height, cm**	**Initial height, cm**	**Annual growth, cm**	**Final height, cm**	**Initial height, cm**	**Annual growth, cm**	**Final height, cm**
V_1	54,1 ± 0,87	11,4 ± 0,57	65,5 ± 0,65	54,9 ± 0,75	17,5 ± 0,57	72,4 ± 0,88	55,3 ± 0,68	16,2 ± 0,61	71,5 ± 0,75
V_2	54,4 ± 0,57	10,2 ± 0,68	64,6 ± 0,86	55,0 ± 0,53	14,6 ± 0,52	69,6 ± 0,83	55,1 ± 0,60	13,8 ± 0,36	68,9 ± 0,38
V_3	54,4 ± 0,67	8,7 ± 0,48	63,1 ± 0,80	54,3 ± 0,70	12,2 ± 0,35	66,5 ± 0,56	54,7 ± 0,60	12,9 ± 0,53	67,6 ± 0,52
Year of vegetation 2007									
V_1	65,5 ± 0,65	13,1 ± 0,60	78,6 ± 0,80	72,4 ± 0,88	20,4 ± 1,05	92,8 ± 1,70	71,5 ± 0,75	18,8 ± 0,74	90,3 ±1,39
V_2	64,6 ± 0,86	12,5 ± 0,52	77,1 ± 1,27	69,6 ± 0,83	17,8 ± 0,70	87,4 ± 0,53	68,9 ± 0,38	16,4 ± 0,70	85,3 ± 0,73
V_3	63,1 ± 0,80	11,4 ± 0,67	74,5 ± 0,86	66,5 ± 0,56	15,6 ± 0,67	82,1 ± 0,89	67,6 ± 0,52	15,9 ± 0,66	83,5 ± 0,95

the same phenomenon was noted for plants grown in substrate culture V_2, recorded an average final height of 69,6 cm in the first year of cultivation and 87,4 cm in the second (table 1). In the case of plants grown on the culture substrate V_3 best outcome for growth at the end of two growing seasons were recorded in containerized plants under fertilization administration of 5 kg/m^3, recorded values of 67,6 cm in 2006 and 83,5 cm in 2007 (table 1).

Table 1 gives an overview of annual growth, depending on the substrate of culture, rates application of fertilizer with slow-release action in two seasons of vegetation, winning that plants grown in substrate of culture V_1 fertilized with Osmocote Plus in the rate of 4kg/m^3 recorded the largest increases. At *Weigela florida* 'Styriaca' the differentiation of annual growth in the experiments was determined by the used substrate and, the rate of fertilization thus, the plants grown on the substrate of culture V_1 showed a higher annual average growth (13,1 cm unfertilized version, 20,4 cm with 4 kg/m^3 and 18,8 cm by 5 kg/m^3 in 2007), than in V_2, V_3 in 2006 - 2007 seasons of vegetation.

CONCLUSIONS

At the cultivar *Weigela florida* 'Styriaca' the maximum annual increase occurred in plants grown on the substrate of culture V_1 mould, leaves compost, peat, sand, in proportions of 2:2:2:1 proportions, on the base of administration the rate of 4 kg/m^3 of Osmocote slow-release fertilizer. After the administration of Osmocote fertilizer, the value of annual growth of containerized plants is much higher, compared with the plants that received no fertilizer, resulting in a significant difference in annual growth indices between fertilized and unfertilized plants.

Annual growth of *Weigela florida* 'Styriaca' cultivar showed higher values in the second year of culture, this phenomenon being explained by the fact that in the first year of cultivation, the plants were transplanted to the container, therefore, had a period of the so-called physiological stress because of injuring the root system during its transplanting.

Plant growth and development in container conditions depends on rate of fertilizer administration and biological temperament (rhythm) of plant growth, found out to be an inverse correlation between plant growth and the rate of fertilizer administration.

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IN VITRO MICROPROPAGATION OF *GYPSOPHILA MURALIS* L. FROM COTYLEDON EXPLANTS

MICROPROPAGAREA *IN VITRO* DIN EXPLANTE DE COTILEDON LA *GYPSOPHILA MURALIS* L.

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Abstract. *This study examined the effects of different exogenous auxins and cytokinins at 1.0-5.0 mg·l-1 concentration on morphogenetic response of cotiledonary nodes of Gypsophila muralis seedlings. Their sensitivity to the auxins varied and showed concentration-dependent behavior, and the response differed between two used auxines. The number of responding explants was higher on the media supplied with 2,4D but on the media suplimented with IAA produced fast growing yellow and green compact callus, which showed beneficial effect on the cell growth of morphogenic cultures. Increased cytokinins led to differentiation of shorter shoots. The culture media fortified with BAP in combination with IAA produced yellow-green compact morphogenic callus witch develop multiple shoots*

Key words: *Gypsophila muralis*, in vitro, auxins, cytokinins

Rezumat. *Prezentul studiu a avut ca scop evaluarea efectului unor concentraţii diferite de auxine şi citochinine exogene asupra reacţiei morfogenetice ale explantelor de noduri cotiledonare obţinute din plantule de Gypsophila muralis. Reacţia obţinută denotă o dependentă atât în funcţie de concentraţia cât şi de tipul regulatorilor de creştere adaugaţi în mediul de cultură. Astfel, proliferarea cea mai intensă a calusului s-a obţinut pe mediile suplimentate cu 2,4D, în schimb adăugarea AIA în mediul de cultură a condus la obţinerea unui calus verde, compact, cu potenţial organogen ridicat. Creşterea conţinutului de citochinine induce diferenţierea lăstarilor, cele mai bune rezultate pentru acest proces fiind obţinute prin utilizarea combinaţiei de BAP şi AIA.*

Cuvinte cheie: *Gypsophila muralis*, in vitro, auxine, citochinine

INTRODUCTION

Plant tissue culture can be applied to the rapid propagation and ex situ conservation of rare, endemic, and endangered plant as explained by several authorities (Purohit et al, 1994; Krishnan et al., 1995; Sudha and Seeni, 1996). Moreover, biotechnology offers tools which are capable of surpassing some limitations found by traditional plant breeding methods, by developing new material, through tissue culture techniques. However, for the use of these possibilities it is necessary to develop of *in vitro* plant regeneration protocols, allowing the recovery of improved material for further propagation.

Gypsophila muralis is a plant that for a long time has been ignored by gardeners, but very suitable for preparing impressive baskets and patio containers

or for bedding. Forming neat and tidy compact bushes of a delicate light- green foliage, this plant is covered all summer by numerous soft pink flowers.

Besides its ornamental characteristics, this specie has a great adaptive potential to a variety of environmental conditions. These features offer a good reason for using this specie to enlarge the ornamental plant pool through in vitro propagation.

The conventional method of propagation of *Gypsophila muralis* is through seed and is not attractive approach for producing a large number of elite plants within short period. Further its starting material for research is met solely from the wild natural population this leads to their gradual depletion, and as a result of which many plants is now listed as a rare species. Therefore, the measures to develop micropropagation protocols for elite stocks of rare and economical important species are urgently needed. Some studies have reported *in vitro* plant regeneration and micropropagation of *Gypsophila paniculata* (Han *et al*.1991a, Zamorano-Mendoza and Mejia-Munoz, 1994, Song *et al*. 1996, Lee and Bae, 1999 etc.), but no information exists on in vitro cultivation for *Gypsophila muralis* specie.

This work was therefore aimed at investigating the effects of supplementing the basal medium with different growth regulators on *Gypsophila muralis* cotyledonary nodes explants cultured *in vitro*.

MATERIAL AND METHODS

The basal MS media supplemented with different concentrations of plant growth regulators in various combinations have been given in Tables 1. All the initial culture media were formulated with 30.0 g L-1 sucrose and 7.5 g L-1 agar and autoclaved at 121^0C under 1.1 kg cm-2 for 20 min after adjusting the pH to 5.6 ± 0.1 with 1 N NaOH. Readymade MS medium were procured from Sigma, US.

Seeds of *Gypsophila muralis* collected from the Buzău area in 2009, were thoroughly washed under running tap water for five minutes before surface sterilizing with 70 % (v/v) ethanol for 1 min followed by a treatment of 0.1 % (w/v) HgCl2 for 3 min and finally 4-5 times rinsing with sterilized water. Surface sterilized seed were inoculated in culture tubes containing agar gelled water (7.5 g L-1 agar) under diffused luminance of 16µ mol m-2 s-1 provided with PAR for seven days. Cotyledonary node explants were obtained from 5- or 7-day-old seedlings and were plated in glass tubes containing 40 ml of MS (Murashige and Skoog, 1962) basal medium and incubated under complete darkness at 25 ± 2ºC for 1 week. Later the cultured tubes were subjected to 16 h photoperiod regime of 30 µmol m-2 s-1 luminance provided with white PAR lamps.

Table 1

MS media used in the experiments

Growth regulators	MS1	Ms2	Ms3	Ms4	Ms5	Ms6	MS7	MS8	MS9
2,4D	1	1	1				1		
AIA			1	2	5	1	1	5	1
K	1						1	2	2
BAP		1	1	1	2	2			

The variables studied in the three experiments were percent of responsive explants and morphogenetic response of plants placed on different media formula.

RESULTS AND DISCUSSIONS

All the cultured explants enlarged during initial 7-8 days and no callus proliferation was observed. During this period explants responded in a similar manner mostly independent from culture media and conditions. During second week of culture, morphogenetic response of explants was different and depends of growth regulator balance of culture media. Where as from some explants profuse callus growth started from the cut ends. The calli from various explants generated on different media combinations varied in texture and color. Discrete phenotypes of proliferated calli were observed viz. wet, rough, fragile, dense and glossy in texture and white, dark/ light green and yellow in color.

Visual selection and sub-cultures of these pheno-variants produced cultures where plantlet regenerated repeatedly and competently (fig.1 A-I). In *Gypsophila*, although, plants from tissue cultures have been regenerated on an array of basal medium such as MS (Rady, 2005) and MH3 medium (Gevrenova et al., 2010**)**, in our experiments, MS basal medium was used throughout the experiments, as it was found responsive to *Gypsophila muralis* specie.

During course of present investigations two auxins (IAA and 2,4-D) and two cytokinins (BAP and Kinetin) were used singly as well as in a number of combinations and concentrations (table 1) for culture establishment. Results clearly indicated varying response of growth regulators on explants morphogenetic reaction. Higher callus initiation was observed on culture media fortified with an cytokinins or at the minimum on 1/1 auxine cytochinines ratio. At lower levels both the auxins 2,4-D or IAA have been found to initiate callus proliferation, however, such calli failed to produce normal plants. At higher levels of auxins (2 0 mg L-1) callus turned blackish with retarded growth and cell mortality was observed. At 5 mg L-1 of IAA no callus formation is observed. The meristematic apex is growing, and develops shoots.

Maximum callus initiation was observed on culture medium containing 2,4D. Culture media containing IAA produced fast growing yellow and green compact callus, which showed beneficial effect on the cell growth of morphogenic cultures.

Callus produced in media supplemented with kinetin resulted in the formation of hairy roots with lower frequency of shoot formation during the advanced phase of cultures. Among two levels of cytokinins tested, lowest level (1 mg L-1) stimulated growth of morphogenic tissues

With a higher levels of BAP multiple shoots proliferated from meristematic zones without intervening callus phase. Rate of recurrence of callus was higher when an auxin was supplemented to the cytokinin in culture medium. However in both the cases, frequency of morphogenic calli was found to be low.

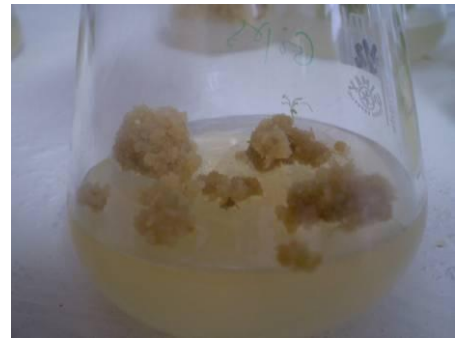
Medium containing 2,4-D with BAP or K did not initiated much of the morphogenic cultures and they fail to regenerate in the regeneration medium in spite of being large and pale yellow in colour. On the other hand, the culture media fortified with BAP in combination with IAA produced yellow-green compact morphogenic callus.

Table 2

Response of cotyledonary nodes explants of *G. muralis* in MS with BAP, KN, IAA and 2,4 D

Variant	Response of cotiledonary nodes explants (after 35 days)	%
MS1	White friable callus, non-regenerative	98
MS2	Green friable callus developed from the cut end of the explant	95
MS3	Green compact callus	95
MS4	Dark compact callus, non-regenerative	86
MS5	A few rows of cells emerged in the margin of explant and multiple shoots developed from meristematic apex	89
MS6	Shoots proliferated from meristematic zones without intervening callus phase	91
MS7	Yellowish green friable callus	99
MS8	Green multiple shoots developed on green friable callus	97
MS9	Green granular callus	97

a)



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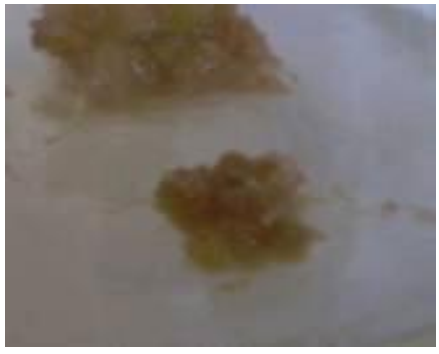

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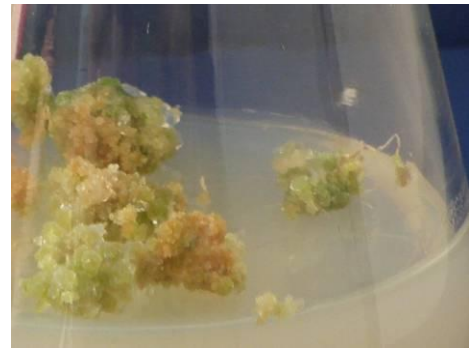
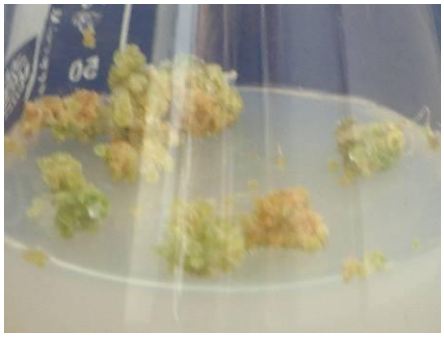
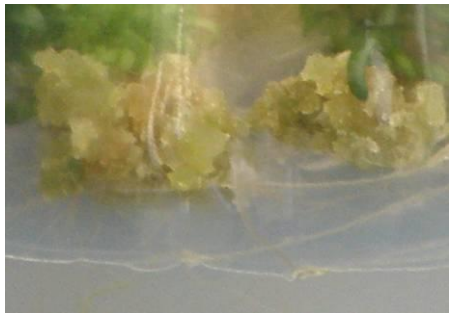


d)



e)

f)



g)

h)

i)

Fig. 1 (a-i). Morphogenetic response of cotiledonary nodes of *Gypsophila muralis* on MS media with different growth regulators: a) white friable callus, non-regenerative on MS1 variant; **b)** non-regenerative, Dark compact callus on MS4 variant; **c)** green granular callus on MS9 variant, **d)** green compact callus on MS3 variant; **e)** yellowish friable callus on MS7 variant; **f)** a few rows of cells emerged in the margin of explant and multiple shoots developed from meristematic apex on MS5 variant; **g)** green friable callus developed from the cut end of the explant on MS2 variant**; h)** green multiple shoots developed on green friable callus on MS8 variant; i) shoots proliferated from meristematic zones without intervening callus phase on MS6 variant,

CONCLUSIONS

1. Higher callus initiation was observed on culture media fortified with an cytokinins or at the minimum on 1/1 auxine cytochinines ratio.

2. At lower levels both the auxins 2,4-D or IAA have been found to initiate callus proliferation, however, such calli failed to produce normal plants but at higher levels of auxins cell mortality was observed.

3. Callus produced in media supplemented with kinetin resulted in the formation of hairy roots with lower frequency of shoot formation during the advanced phase of cultures.

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THE ECO-PEDOLOGICAL DIAGNOSIS MATRIX OF SOIL TROPHICITY IN A VEGETABLE SYSTEM UNDER ECOLOGICAL CONVERSION I. PEDO-BIO-ENZYMATIC GENERAL INDICATORS

MATRICEA DIAGNOZEI ECOPEDOLOGICE A TROFICITĂŢII RESURSELOR DE SOL DINTR-UN SISTEM LEGUMICOL ÎN CONVERSIE ECOLOGICĂ I. INDICATORI GENERALI PEDO-BIO ENZIMATICI

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Abstract. *The vegetable areas from the part of NE Romania are adapted to re-conversion toward the ecological system of producting of the new vegetables under crop. Consequently, the soil quality in these areas is analyzed by the pedo-biological and pedo-enzymatic indicators . Biological indicators of soil fertility pointed out high level for ecological system, comparatively with the conventional. On the interval, the biological potential decreases more than 30%, comparatively with the series of plants. The values decrease more than 25% comparatively with the protected crops.*

Key words: ecological specific, ecological diagnosis, conventional vegetable, organic vegetable

Rezumat. *Calitatea resurselor de sol, din areale legumicole ale NE României, pretabile la reconversie spre sistemul ecologic de producere a legumelor proaspete cultivate în câmp şi cultură protejată este analizată prin matricea de specific ecologic, indicatorii pedo-biologici şi pedo-enzimatici. Indicatorii biologici de fertilitate au valori ridicate pentru sistemul ecologic comparativ cu cel convenţional. Pe intervalul dintre rândul de plante, potenţialul biologic scade cu peste 30% faţă de terenul de pe rândul de plante din solar. La culturile de câmp, valorile scad cu peste 25% faţă de culturile protejate.*

Cuvinte cheie: specific ecologic, diagnoza ecologică, legumicultură convenţională, legumicultură ecologică.

INTRODUCTION

Within the ecosystem, between biotope and biocenosis they achieve reversible and permanent changes of substances, energy and information which determine the stability or instability of natural and anthropogenic ecosystems (Bireescu *et al.*, 2008).

Ecological interpretation of the soil defines, from the quantitative and qualitative point of view, two important and realistic characteristics of its: trofic potential and ecological specific where the soil can manifest completely or restricting, seasonal and local (Chiriţă, 1974; Doran *et al.*, 1994; Bireescu *et al.*, 2009).

MATERIAL AND METHOD

The main characteristics of quality of the biotope were analysed within ecological context, zonal and regional, by the study of the main physical, chemical and biological properties of soil samples collected from plastic tunnels and field on the lines of plants and interval between lines.

We performed the study of soil trophicity, from the quantitative and qualitative point of view, for reconversion to organic vegetable production characteristics of the biotope was performed by observations and determinations of some physico-mechanical, chemical and biological properties of soil resources both, from plastic tunnels and field (colour, structure, soil reaction, electroconductivity) and laboratory.

We consider that the file of soil quality assessment must contain the most important 10 pedo-ecological factors and determinants: soil texture-Tx; edaphic volume-Ve and soil consistency-Con; Biological Sinthetic Indicator-BSI, total nitrogen content-Nt, available phosphorus content-P_{AL} and exchangeable potassium content-K_{AL}; three eco-pedo-chemical determinants (soil reaction-pH_{H2O}, soil organic matter content-SOM and base saturation-BS). These soil properties were included into the six ecological size classes, noted with scores from 0 to 10 points. Effective trophicity of the soil is the resultant of the action and interrelations of physico-mechanical, chemical and biological properties, at the same time considered indicators of soil fertility and quality.

RESULTS AND DISCUSSIONS

The ecological analysis for Târgu Frumos stationary, where it practiced conventional vegetable production, and for Didactic and Experimental Stationary-UAVM Iaşi where it practiced organic vegetable production, pointed out the followings:

- In the class of low ecological size are included: low level of summer precipitations, low level of summer relative humidity, with stressful and limitative effect, together with soil acidity and air porositty, correlated with fine soil texture, having a stressful and negative role, both, on the lines of plants and especially on interval between lines.
- In the class of excessive ecological size is included the hard and very hard soil consistency in the summer season, especially on the interval between lines of plants. The soil humidity is an ecological factor that determine the soil consistency in the moist and dry condition, having a special role in the functioning of soil and plants to optimum capacity, especially under the climate changes (Feiziene et al., 2008).
- In the class of very low ecological favorability for the vegetable crop field are included the hard and very hard soil consistency and air porosity, low level of precipitations and relative humidity in the summer season, excessive droughty;

Table 1

The matrix of eco-pedological diagnosis ecopedologice of effective trophicity of the soil, under conventional system

Indicators	**Grades**	**Târgu Frumos – A.F. Maxim**					
		solarium				**field**	
		tomatoes	cucumbers	cucumbers small solarium	hot pepper	cauli flower	celery
0	1	2	3	4	5	6	7
Soil texture	value	37	35	35	33	39	39
	class	IV	IV	IV	IV	IV	IV
	score	6	6	6	6	6	6
Consistency of moist soil	value	hard	hard	hard	hard	very hard	very hard
	class	IV	IV	IV	IV	III	III
	score	6	6	6	6	4	4
Soil reaction (pH_{H2O})	value	6.7	6.6	7.1	6.7	6.4	6.4
	class	V	V	VI	V	IV	IV
	score	8	8	10	8	6	6
Base saturation (%)	value	84	88	90	86	76	78
	class	V	V	V	V	IV	IV
	score	8	8	8	8	6	6
Soil organic matter content (%)	value	3.3	2.5	2.8	3.2	2.5	2.4
	class	IV	III	III	IV	III	III
	score	6	4	4	6	4	4
Total nitrogen content (%)	value	0.16	0.17	0.15	0.18	0.14	0.13
	class	IV	IV	IV	IV	III	III
	score	6	6	6	6	4	4
Available phosphorus content-ppm	value	22	24	23	18	16	18
	class	IV	IV	IV	III	III	III
	score	6	6	6	4	4	4
Exchangeable potassium (ppm)	value	171	152	167	158	130	125
	class	IV	IV	IV	IV	III	III
	score	6	6	6	6	4	4
Air porosity (%)	value	20	19	17	15	11	10
	class	IV	IV	IV	III	III	III
	score	6	6	6	4	4	4
Biological Synthetic Indicator -%	value	22	27	22	18	17	15
	class	IV	IV	IV	III	III	III
	score	6	6	6	4	4	4
Genetic type of soil		hortic antrhosol				haplic chernozem	
(EPDETSR-points)	points	64	62	64	58	46	46
	estimate	good	good	good	medium	medium	medium

Table 2

The matrix of eco-pedological diagnosis ecopedologice of effective trophicity of the soil, under organic system

Indicators	Grades	Didactical and Experimental Station – UAVM IAŞI						
		plastic tunnels				field		
		mild pepper	egg plants	toma toes	cucum bers	toma toes	mild pepper	egg plants
0	1	2	3	4	5	6	7	8
Soil texture	value	34.6	33.9	35.1	34.3	37.5	39.3	38.1
	class	IV	IV	IV	IV	IV	IV	IV
	score	6	6	6	6	6	6	6
Consistency of moist soil	value	friable	friable	friable	friable	hard	hard	hard
	class	V	V	V	V	IV	IV	IV
	score	8	8	8	8	6	6	6
Soil reaction (pH_{H2O})	value	6.4	6.6	6.8	6.9	7.3	7.2	6.7
	class	IV	V	V	VI	V	VI	V
	score	6	8	8	10	8	10	8
Base saturation (%)	value	91	91	92	90	86	85	87
	class	VI	VI	VI	V	V	V	V
	score	10	10	10	8	8	8	8
Soil organic matter content (%)	value	3.74	3.65	3.71	3.62	3.21	3.15	3.26
	class	V	V	V	V	IV	IV	IV
	score	8	8	8	8	6	6	6
Total nitrogen content (%)	value	0.24	0.29	0.23	0.25	0.18	0.17	0.18
	class	VI	V	VI	VI	V	V	V
	score	10	10	10	10	8	8	8
Available phosphorus content (ppm)	value	72	53	71	48	27	30	33
	class	VI	V	VI	V	IV	IV	IV
	score	10	8	10	8	6	6	6
Exchangeable potassium (ppm)	value	193	241	203	232	165	158	143
	class	V	VI	V	VI	IV	V	IV
	score	8	10	8	10	6	8	6
Air porosity (%)	value	21	22	18	19	15	14	15
	class	V	V	IV	IV	III	III	III
	score	8	8	6	6	4	4	4
Biological Synthetic Indicator (%)	value	37	37	36	34	29	27	28
	class	V	V	V	V	IV	IV	IV
	score	8	8	8	8	6	6	6
Genetic type of soil		hortic anthrosol				haplic chernozem		
(EPDETSR-points)	points	82	84	82	82	64	68	64
	estimate	very good	very good	very good	very good	good	good	good

- The most representative ecological factors and determinants are included into the middle ecological size classes (III-rd and IV-th) and middle and high ecological favorability classes for Tg.Frumos stationary with conventional system. In case of Didactical and Experimental Station-UASVM Iaşi, with organic system, the most representative ecological factors and determinants are included into the midde and high ecological size classes (III-rd IV-th and V-th) and middle and high ecological favorability classes.
- In the class of high ecological size, with positive ecological effects, are included the annual average temperature and two eco-pedological factors of space and time (edaphically volume of the soil and bioactive length period) for Tg.Frumos stationary with conventional system, plus synthetic indicator of potential trophicity of the soil for Didactical and Experimental Station-UASVM Iaşi, with organic system;
- In the class of low ecological favorability are included the growth pedo-ecological factors (available phosphorus, exchangeable potassium, soil organic matter content) and the low level of soil biological activity for Tg.Frumos stationary with conventional system, plus low level of synthetical indicators of potential and effective trophicity, stressed by excessive drought of July 2009, in case of Didactical and Experimental Station-UASVM Iaşi, with organic system;
- In the class of high ecological favorability are included the annual average precipitations, winds, low level of soil acidity and soil reaction for Tg.Frumos stationary with conventional system, plus soil organic matter content, base saturation, soil biological activity and nutrient content in the case of samples collected in June 2009, from Didactical and Experimental Station-UASVM Iaşi, with organic system;
- In the class of very high ecological favorability are included annual average temperature, edaphically volume of the soil and bioactive length period for Tg.Frumos stationary with conventional system, plus soil reaction, in case of Didactical and Experimental Station-UASVM Iaşi, with organic system.

CONCLUSIONS

1. According to ecological specificity files, the most ecological factors and determinants are included into medium ecological size classes and medium and high ecological favorability classes for vegetable crops.

2. There is a distinction between the values obtained on the lines of plants and interval between lines. Thus, on the interval, the values of air porosity and summer consistency of the soil are decreased with 50% becoming risk factors, limiting and stressful, for extension and nutrition of lateral roots. The background of qualities is not turning to good account under compaction and lack of moisture, on the interval between lines. On the lines of plants it focuses on a limited space overall activity of roots and useful microflora lateral root development being restricted mainly to conventional stationaries.

3. Under the field conditions it pointed out the stressful effect of summer drought in July 2009, corroborated with the low relative humidity of air in the summer season.

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THE ECO-PEDOLOGICAL DIAGNOSIS MATRIX OF SOIL TROPHICITY IN A VEGETABLE SYSTEM UNDER ECOLOGICAL CONVERSION II. DIAGNOZE OF EFFECTIVE TROPHICITY

MATRICEA DIAGNOZEI ECOPEDOLOGICE A TROFICITĂŢII RESURSELOR DE SOL DINTR-UN SISTEM LEGUMICOL ÎN CONVERSIE ECOLOGICĂ II. DIAGNOZA TROFICITĂŢII EFECTIVE

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Abstract. *The vegetable areas from the part of NE Romania are adapted to re-conversion toward the ecological system of producting of the new vegetables under crop. Consequently, the soil quality in these areas is analyzed by the eco-pedological diagnosis of effective troficity. In case of the protected crops, the matriceal indicator of eco-pedological diagnosis shows us a suitable effective trophicity (over 65 points). In case of unprotected crops from Târgu Frumos, this indicator shows us a medium effective trophicity (over 45 points), because of negative anthropogenic impact in conventional system. On the other hand, in case of the ecological system from UASMV Iaşi, the soil has a very good effective trophicity (over 80 points) in the protected system and suitable effective trophicity (over 65 points) on field crops.*

Key words: ecological specific, ecological diagnosis, conventional vegetables, organic vegetables

Rezumat. *Calitatea resurselor de sol, din areale legumicole ale NE României, pretabile la reconversie spre sistemul ecologic de producere a legumelor proaspete cultivate în câmp şi cultură protejată este analizată prin diagnoza eco-pedologică a troficităţii efective. Indicatorul matriceal al diagnozei eco-pedologice indică o troficitate efectivă bună (peste 60 puncte), pentru culturile protejate, şi medie (peste 45 puncte) pentru culturile din câmp, la Tg. Frumos, datorită impactului antropic negativ în sistemul convenţional. În sistem ecologic, la USAMV Iaşi, solul are o troficitate efectivă foarte bună (peste 80 puncte) în sistemul protejat şi bună (peste 65 puncte) la legume în câmp.*

Cuvinte cheie: specific ecologic, diagnoza ecologică, legumicultură convenţională, legumicultură ecologică.

INTRODUCTION

Agrarian Policy of European Union, jointly agreed between the Department of Agriculture and Sustainable Development, Department of Environment, General

Directorate Joint Research Centre and the European Environment Agency, stipulate the improving of agricultural environment in the EU states, the monitoring of quality over 35 agro-ecological indicators with direct impact on vegetation, soil and water (Gobin *et al.*, 2001; Zdruli *et al.*, 2002; Marmo, 2006; Montanarella, 2006).

Within national development and environmental strategies, especially in recent years, more countries have taken into consideration, the solving of complex problems related to damage of environmental quality by anthropogenic impact, by use of intensive technologies.

MATERIAL AND METHOD

The value of Eco-Pedological Diagnose of Efective Trophicity of Soil Resources (EPDETSR-points) is obtained by sum of the score of each of 10 quality analyzed indicators:

$$\text{EPDT} = \sum_{1}^{10}(Tx + AP + Con + BSI + pH + SOM + BS + Nt + P_{AL} + K_{AL})$$

The 10 main pedo-ecological factors and determinants that compose this formula being above-mentioned.

With a view to comparing of the resulted values we gave an assessment scale, with 5 levels. On their basis we gave the qualificatives (very good, good, medium, satisfactory and low):

- less than 20 points – low effective trophicity, oligo-trophic soil; qualificative: low;
- 21-40 points – than medium effective trophicity, oligo-mezotrophic soil; qualificative: satisfactory;
- 41-60 points – medium effective trophicity, mezotrophic soil; qualificative: medium;
- 61-80 points – good effective trophicity, eutrophic soil; qualificative: good;
- 81-100 points – very good effective trophicity, mega-trophic soil; qualificative: very good.

RESULTS AND DISCUSSIONS

On the basis of eco-pedological analyses we pointed out the analysis and assessment of effective trophicity, with the matrix of eco-pedological diagnosis of the soil, in case of vegetable systems in various stages of evolution to organic system, within representative and traditional vegetable lands from NE Romania (tables 1 and 2).

The analysis of Eco-Pedological Diagnosis of Efective Trophicity of Soil Resources (EPDETSR) as synthetic indicator of the correlation and interaction of ecological factors (climatical and pedological) of the biotopes point out the effects of the uncontrolled and negative anthropogenic impact in case of conventional system from Târgu Frumos.

Table 1

The matrix of eco-pedological diagnosis ecopedologice of effective trophicity of the soil, under conventional system

Indicators	Grades	Târgu Frumos – A.F. Maxim						Târgu Frumos – A.F. Vavilov		
		solarium				field		solarium		
		tomatoes	cucumbers	cucumbers small solarium	hot pepper	cauliflower	celery	tomatoes	mild pepper	cucumbers
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Soil texture	value	37	35	35	33	39	39	33	35	36
	class	IV	IV	IV	IV	IV	IV	IV	IV	IV
	score	6	6	6	6	6	6	6	6	6
Consistency of moist soil	value	hard	hard	hard	hard	Very hard	very hard	friable	hard	hard
	class	IV	IV	IV	IV	III	III	V	IV	IV
	score	6	6	6	6	4	4	8	6	6
Soil reaction (pH_{H2O})	value	6.7	6.6	7.1	6.7	6.4	6.4	6.7	6.9	6.6
	class	V	V	VI	V	IV	IV	V	VI	V
	score	8	8	10	8	6	6	8	10	8
Base saturation (%)	value	84	88	90	86	76	78	90	88	87
	class	V	V	V	V	IV	IV	V	V	V
	score	8	8	8	8	6	6	8	8	8
Soil organic matter content (%)	value	3.3	2.5	2.8	3.2	2.5	2.4	3.4	3.0	3.1
	class	IV	III	III	IV	III	III	IV	III	IV
	score	6	4	4	6	4	4	6	4	6
Total nitrogen content (%)	value	0.16	0.17	0.15	0.18	0.14	0.13	0.15	0.16	0.16
	class	IV	IV	IV	IV	III	III	IV	IV	IV
	score	6	6	6	6	4	4	6	6	6
Available phosphorus content-ppm	value	22	24	23	18	16	18	17	18	17
	class	IV	IV	IV	III	III	III	III	III	III
	score	6	6	6	4	4	4	4	4	4
Exchangeable	value	171	152	167	158	130	125	143	152	138

	1	2	3	4	5	6	7	8	9	10
potassium (ppm)	class	IV	IV	IV	IV	III	III	IV	IV	IV
	score	6	6	6	6	4	4	6	6	6
Air porosity (%)	value	20	19	17	15	11	10	18	15	17
	class	IV	IV	IV	III	III	III	IV	III	IV
	score	6	6	6	4	4	4	6	4	6
Biological Synthetic Indicator -%	value	22	27	22	18	17	15	24	21	21
	class	IV	IV	IV	III	III	III	IV	IV	IV
	score	6	6	6	4	4	4	6	6	6
Genetic type of soil		hortic antrhosol				haplic chernozem		hortic anthrosol		
EPDETSR-points	points	64	62	64	58	46	46	64	60	62
	estimate	good	good	good	medium	medium	medium	good	medium	good

Table2

The matrix of eco-pedological diagnosis ecopedologice of effective trophicity of the soil, under organic system

Indicators	Grades	Didactical and Experimental Station – UAVM IAŞI						
		solarium				field		
		mild pepper	eggplants	tomatoes	cucumbers	tomatoes	mild pepper	eggplants
0	1	2	3	4	5	6	7	8
Soil texture	value	34.6	33.9	35.1	34.3	37.5	39.3	38.1
	class	IV	IV	IV	IV	IV	IV	IV
	score	6	6	6	6	6	6	6
Consistency of moist soil	value	friable	friable	friable	friable	hard	hard	hard
	class	V	V	V	V	IV	IV	IV
	score	8	8	8	8	6	6	6
Soil reaction (pH_{H2O})	value	6.4	6.6	6.8	6.9	7.3	7.2	6.7
	class	IV	V	V	VI	V	VI	V
	score	6	8	8	10	8	10	8

0	1	2	3	4	5	6	7	8
Base saturation (%)	value	91	91	92	90	86	85	87
	class	VI	VI	VI	V	V	V	V
	score	10	10	10	8	8	8	8
Soil organic matter content (%)	value	3.74	3.65	3.71	3.62	3.21	3.15	3.26
	class	V	V	V	V	IV	IV	IV
	score	8	8	8	8	6	6	6
Total nitrogen content (%)	value	0.24	0.29	0.23	0.25	0.18	0.17	0.18
	class	VI	V	VI	VI	V	V	V
	score	10	10	10	10	8	8	8
Available phosphorus content (ppm)	value	72	53	71	48	27	30	33
	class	VI	V	VI	V	IV	IV	IV
	score	10	8	10	8	6	6	6
Exchangeable potassium (ppm)	value	193	241	203	232	165	158	143
	class	V	VI	V	VI	IV	V	IV
	score	8	10	8	10	6	8	6
Air porosity (%)	value	21	22	18	19	15	14	15
	class	V	V	IV	IV	III	III	III
	score	8	8	6	6	4	4	4
Biological Synthetic Indicator (%)	value	37	37	36	34	29	27	28
	class	V	V	V	V	IV	IV	IV
	score	8	8	8	8	6	6	6
Genetic type of soil		hortic anthrosol				haplic chernozem		
EPDETSR-points	points	82	84	82	82	64	68	64
	estimate	very good	very good	very good	very good	good	good	good

Also, this diagnosis shows us that the trophic background of studied soils is high, but it's not turning to good account, both, nutrition and physiological processes of plant development and soil biological activity being limited and stressful, especially in case of field crops, in the summer season, excessive droughty. This is the reason for the conventional system of representative and traditional area from Târgu Frumos was taken for research, for its re-conversion to vegetable organic system.

There are evident the higher values in case of Didactical and Experimental Station-UAVM Iaşi (table 2) with organic vegetable system which indicate a high trophicity, much closer to what can ensure the potential of natural soil resourcess. In this way, it highlights the efficiency of organic system, comparatively with conventional system, thus reducing the limitative and stressfull effects which acting, both, on soil quality and plant and vegetable production under environmental protection and sustainable development in NE Romania.

CONCLUSIONS

1. The qualitative values of EPDETSR within studied vegetable ecosystems greatly differ, depending on the stage of re-conversion to organic vegetable and protected system or field, on the one hand, and ecological specific of studied areas, on the other hand.

2. In case of ecological vegetable stationaries they pointed out high values that indicate a high trophicity, much closer to what can ensure the potency of the soil natural resources.

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PRODUCTION RESULTS AN ASSORTMENT OF SOME LOCAL POPULATIONS OF RUNNER BEAN (*PHASEOLUS COCCINEUS* L.)

REZULTATE DE PRODUCŢIE ALE UNUI SORTIMENT DE POPULAŢII LOCALE DE FASOLE MARE (*PHASEOLUS COCCINEUS* L.)

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Abstract. *Seven local populations of runner bean of white seeds were studied in the environmental conditions from Iassy county. The local populations showed a large variability regarding vigurosity, size, seed shape etc. The highest yields were obtained by the local populations Coccineus 5 (3097 kg/ha), Coccineus 2 (2823 kg/ha) and Coccineus 9 (2714 kg/ha).*

Key words: production, assortment, population of runner bean

Rezumat. *Şapte populaţii locale de fasole mare, cu seminţele de culoare albă, au fost studiate în condiţiile de cadru natural ale judeţului Iaşi. Populaţiile locale au prezentat o mare variabilitate în ce priveşte vigoarea plantelor, dimensiunea, forma seminţelor etc. Cele mai ridicate producţii s-au înregistrat la populaţiile Coccineus 5 (3097 kg/ha), Coccineus 2 (2823 kg/ha) şi Coccineus 9 (2714 kg/ha).*

Cuvinte cheie: productie, sortiment, populatii de fasole mare

INTRODUCTION

Runner bean (*Phaseolus coccineus* L.) is a species well known in our country, but on areas relatively small, being met especially into population gardens from rural area. The plant is grown especially for its dried or green grains. The forms cultivated for pods are less known.

The species is original from South America, being brought at the same time with common bean (*Phaseolus vulgaris* L.), without making a net distinction between those two species. In Europe it is known since $17_{th} - 18_{th}$ century and in our country since $18_{th} - 19_{th}$ century (Munteanu, 1985). In Romania are known exclusively climbing forms.

Runner bean found favourable conditions for growing and this fact was demonstrated by its in all country areas. Its alimentary and ornamental utilities contributed to a good knowledge by the countryside communities. Despite of all these aspects, the species did not imposed as a species with an economical importance, probably because of the following factors: low attractiveness for

climbing forms of bean, less suitable for mechanization, the lack of an ameliorated assortment (being cultivated only local populations) (Kaloo, 1995 Salinas, 1988). variable yields from one year to another (depending on meteorological conditions), the lack of a modern or/and standard growing technology and others.

The lack of systematized (scientific) knowledge about biology and ecology of the plant in the specific conditions from our country was also an element that had a contribution to the reduced "progress" of this species.

Previous studies (Munteanu, 2006, Munteanu, 2007, Popa Diana, 2006) underlined the large diversity of the existent populations in the collection of University of Agricultural Sciences and Veterinary Medicine Iasi from different perspectives: morphological, physiological and agro productive. The yield is considered to be a determining factor for the promotion of a new cultivar. Therefore, our research aimed to evaluate yield capacity of some valuable local populations.

In order to accomplish the proposed aim, some objectives have been settled: (O_1) – general characterization of studied populations and (O_2) – comparative evaluation of dried beans production for these local populations.

MATERIAL AND METHOD

The research was carried out in the experimental field of Faculty of Horticulture, during 2008-2009. The experiences were settled on an average leached chernozem (cambic) with an average supply of nutritive elements, 3,8% organic matter and an pH of 5,8.

Experimental variants consisted in seven local populations of white seeds (table 1), considered to be as "perspective" forms from the productivity point of view (based on the evaluation made in the collection).

Table 1

Experimental variants

Variant		Source (county/country)	Reference data: flowers and seeds colour
no.	**specification**		
1.	Coccineus 1	Great Britain	White flowers, white seeds
2.	Coccineus 2	Great Britain	White flowers, white seeds
3.	Coccineus 3	Galaţi	White flowers, white seeds
4.	Coccineus 4	Bacău	White flowers, white seeds
5.	Coccineus 5	Vaslui	White flowers, white seeds
6.	Coccineus 9	Bacău	White flowers, white seeds
7.	Coccineus 10	Iaşi	White flowers, white seeds

The experience was settled in a experimental plot of randomized blocks with three replicants and the size of each variant from repetition being of 8 m^2 (1,60 m x 5,00 m). The crop was established by direct sowing, during 3^{rd} –10^{th} of May, depending on meteorological conditions of experimental years. The sowing was accomplished in nests, each of them with three seeds at 50 cm, on equidistant rows at 80 cm, resulting a density of 25 000 nests/ha (75 000 plants/ha. In each plot – variant from the replicants 20 nests (60 plants) were placed.

The plants were tied with synthetic strings as in figure 1 (Munteanu, 1985) on an individual trellis for every row.

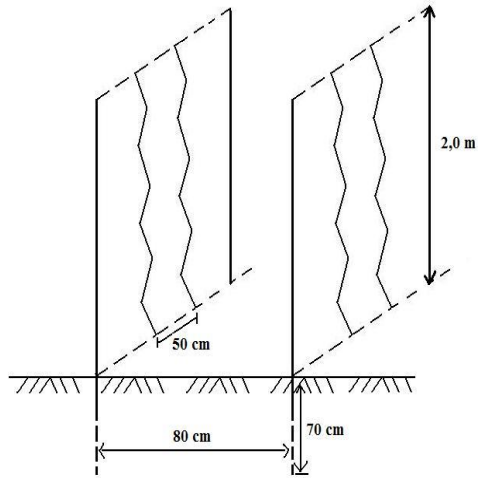

Fig.1. Stringing the plants of runner bean

During fertilization period were applied common care operations: 3-4 annual hoeing, phase fertilization with almost 300 kg of complex chemical fertilizers (NPK), drip irrigation once a week, treatments to control bean's ladybug (three times at two weeks during blooming period).

During vegetation period, some observations and biometric determinations were accomplished regarding the main morphological, physiological and yields characteristics. Experimental data regarding the yield were statistically processed by using analysis of variance and yield differences were appreciated by using limited significant differences (LSD) based on Student (t) test (Saulescu, 1967).

RESULTS AND DISCUSSIONS

General, morphological and physiological characterization of the studied assortment is presented in table 2.

In accordance with data presented above, it can be noticed a variation of morphological characters into those seven populations taken for this study. Comparatively, physiological characters presented a relatively restrained variability; this aspect could be determined of high temperatures which made uniform the behaviour of the populations.

Table 2

Morpho-physiological characterization of the assortment from comparative crop (average data, 2008-2009)

Variant	Morphological characters								Physiological characters (days no.)				
	no.of ramifications	leaves colour	vigour	Flower colour	pod size (L/l) (cm)	no.of see in pod	seed size (mm)	seed colour	Sowing rising	rising-first leaf with three lobes	rising-first flowers	rising-first pods	rising-the end of vegetation
C_1	3-4	dark green	big	white	22/1,7	5-7	22	white	7-10	7	35	71	120-125
C_2	4-7	dark green	big	white	18/1,9	4-6	2	white	7-10	8	35	66	120-125
C_3	3-4	green	big	white	11/1,9	2-3	17	white	7-10	3	34	74	120-125
C_4	3-4	green	big	white	12/1,8	3-4	18	white	7-10	3	34	74	120-125
C_5	2-3	dark green	big	white	11/1,9	3-4	19	white	7-10	3	35	73	120-125
C_9	2-3	green	mean	white	12/1,8	2-4	18	white	7-10	4	35	70	120-125
C_{10}	2-3	green	mean	white	10/1,7	2-3	20	white	7-10	4	33	70	120-125

Referring to the dried seeds/beans production, this is presented for each experimental year and as an average for two years of research.

Table 3

Synthesis data regarding seeds yield

Variant		Dried beans quantity (kg/ha)		
no.	**specification**	**2008**	**2009**	**average**
1.	Coccineus 1	2902	2412	2657
2.	Coccineus 2	3006	2639	2823
3.	Coccineus 3	1837	1780	1809
4.	Coccineus4	1612	1561	1587
5.	Coccineus 5	3152	3041	3097
6.	Coccineus 9	2790	2637	2714
7.	Coccineus10	2489	2260	2375
Experience average *x*		2541	2332	2437

According to table 3, total yield of dried beans varied in large limits, being of 1561 – 3152 kg/ha, during those two experimental years with an average of experience of 2437 kg/ha.

Table 4

Comparative analysis of data production (average dates 2008-2009)

Variant		Yield		Differences face to *x*	Differences significance
no.	**specification**	**kg/ha**	**% face to *x***		
5	Coccineus 5	3097	127	+660	xxx
2	Coccineus 2	2823	116	+386	xx
6	Coccineus 9	2714	111	+277	x
1	Coccineus 1	2657	109	+220	-
Experience average *x*		**2437**	100	0	
7	Coccineus10	2375	97	-62	-
3	Coccineus 3	1809	74	-628	000
4	Coccineus 4	1587	65	-850	000

LSD 5% = 249 kg/ha LSD 1% = 382 kg/ha LSD 0,1% = 517 kg/ha

As it can be noticed in table 4, the highest yield registered in the case of Coccineus 5 population (3097 kg/ha) with a very significant positive difference toward the experimental mean (2437 kg/ha). In the same time, the lowest value registered at Coccineus C_4 (1587 kg/ha), with very significant negative differences face to the experimental mean. Growth face to experimental mean also registered at C_2, C_9, C_1, populations, while inferior yields being obtained in the case of C_{10}, C_3, C_4 populations.

CONCLUSIONS

1. The dried beans yield (over two experimental years) varied in large limits (between 1561-3152 kg/ha) into the assortment taken for study.

2. For both years, taken as average, the highest yield was accomplished at Coccineus 5 local population with an multiannual average of 3097 kg/ha. Coccineus 5 obtained in all yield years results that framed between 3041-3152 kg/ha with very significant positive differences than experimental average.

3**.** Comparing with Coccineus 5 population, during experimental period, Coccineus 2, Coccineus 9 and Coccineus 1 populations assured yields with positive differences than average while Coccineus 3, Coccineus 4 and Coccineus 10 populations registered yields with negative differences than average.

Acknowledgements.

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COMPARATIVE BEHAVIOR FOR A NEW TOMATO ASSORTMENT FOR POLYTUNNEL, IN ORGANIC SYSTEM AT S.D.E. IASI

COMPORTAREA ÎN CULTURĂ COMPARATIVĂ A UNUI NOU SORTIMENT DE TOMATE PENTRU SOLAR, ÎN SISTEM ECOLOGIC LA S.D.E. IAŞI

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Abstract. *In this paper are presented six cultivars of tomatoes for polytunnels in the experimental conditions of Teaching Station "V. Adamachi" Iasi. During the experiments were conducted observations and biometric measurements for the main features agroproductive: early and total yield, harvest on dynamic. The best results were obtained early production of Galina F1 cultivar (40.16 t/ha) compared with the Brillante F1 (35.70 t/ha). Total yield was remarked Primadonna F1 (134.36 t/ ha), while F1 Brillante witness obtained 89.25 t/ ha.*

Key words: assortment, tomatoes, comparative crop

Rezumat. *În lucrarea de faţă sunt prezentate şase cultivare de tomate pentru solar, în condiţiile experimentale ale Staţiunii Didactice „V. Adamachi" Iaşi.Pe parcursul experimentării s-au efectuat observaţii şi determinări biometrice pentru principalele însuşiri agroproductive: producţia timpurie şi totală de fructe, dinamica recoltei s.a. Cele mai bune rezultate pentru producţia timpurie au fost obţinute de cultivarele Galina F1 (40,16 t/ha), în comparaţie cu martorul Brillante F1 (35,70 t/ha). Pentru producţia totală s-a remarcat cultivarul Primadona F1 (134,36 t/ha), în timp ce martorul Brillante F1 a obţinut 89,25 t/ha.*

Cuvinte cheie: sortiment, tomate, cultură comparativă

INTRODUCTION

While promoting organic vegetable (organic, biological), the cultivar is the most important factor of production, which is directly related to environmental plasticity and consumer preference. Mean while, the cultivar is also an element of biodiversity crops expression, under a permanent change in the assortment of cultivars. The paper present a relatively new variety assortment of tomato for protected crop, consisting of six high production hybrid cultivars.

MATERIAL AND METHOD

Research was done at the University of Agricultural Sciences and Veterinary Medicine Iasi, during 2008 and 2009 years. An assortment of six tomato hybrids: Galilea F1, Margarita F1, Primadonna F1, Winona F1 and Galina F1, compared with the control Brillante F1 was studied. The experiment was placed in an individual polytunnel of 5.4 m from SDE Iasi. Soill tillage and plant teding were performed in accordance with technologies of organic crops.

Planting was done in the second decade of April, using seedlings produced in

pots of 620 cm^3 and 55 days old. Establishment of crop was based on a scheme with three bands of two rows; the plants have been driven by a single stem and individually strain. The crop density was 27,778 plants /ha. For Galilea and Galina, plants growth was ensured through the last prefloral offshoot. During the experiments were carried out observations and measurements to ensure the implementation of biometric for general characterization of the cultivars. Also, early production (at 30 July) and total production at the end of the growing season were considered. The experimental data have been processed by specific methods (Saulescu and Saulescu, 1967).

RESULTS AND DISCUSSIONS

A brief agrobiological characterization of assortment is shown in table 1.

In 2008-2009, the early yield of tomatoes produced in organic ranged from 28.59 t/ha to Primadonna F1 at 40.16 t/ha for Galina F1. The Brillante F1 hybrid (control) obtained an early production estimated at 35.70 t/ha (table 2). Distinctly positive significant differences compared to the control variant was obtained by Galina F1 cultivar, Brillante F1, mean difference being of 4.46 t/ha.

Negative significant differences and very significant were obtained by F1 Margarita (4.23 t/ha), Winona (6.74 t/ha) and Primadonna (7.10 t/ha). Although, Galilea F1 hybrid has achieved significant results compared to the control, remains a high appreciated hybrid for early production, and fruit shape. Lower early yield Primadonna and Winona compared to control, could be explain by the fact that these hibrids are more belated and produce large fruits.

Total yield of tomatoes obtained in the experiment is presented in table 3. This varied in very wide limits, because of ecological plasticity of the hybrids and the type of growth.

The total yield of tomatoes in 2008-2009 ranged from 62.65 t/ha at Galilea F1 to 134.36 t/ha Primadonna F1 hybrid, while Brillante witness obtained an average yield of 89.25 t/ha.

Referring to total yield, very significant positive differences are obtained at variant Primadonna F1 , the difference being 45.11 t/ha over control. Very significant negative differences were obtained compared with the control by variants: Galilea F1 (26.60 t/ha), Margarita F1 (26.32 t/ha) and Galina F1 (17.53 t/ha).

Table 1

The characterization of comparative crops assortment of tomatoes

Cultivar	Precocity	Potential of yield (t/ha)	Plant		Fruit characteristics						
			type of growth *	height (cm)	shape	height (cm)	diameter (cm)	number of lodges	color	weight (g / pcs)	resistance **
Galilea F1	early	60-70	D	70-80	oval	9,2	5,1	4	red	112-115	TM, C, V, A
Brillante F1	early	80-90	ID	190-200	round	6,7	6,4	5	red	160-165	TM, N, V, A
Margarita F1	mid-early	65-75	ID	180-190	round	5,8	5,5	4	dark red	113-118	TM, V, F, A
Primadona F1	mid-early	120-140	ID	200-220	rotund flat	7,4	8,2	5	red	360-370	TM, C, N, V, F, A
Winona F1	mid-early	85-90	ID	200-210	round	6,2	6,5	5	red	150-160	TM, V, F, A
Galina F1	early	70-80	D	80-100	rotund flat	5,8	6,5	5	light red	160-170	TM, V, F, A

* D- determined, ID - indetermined

** TM – *Tomato mosaic virus*; F – *Fusarium*; C – *Cladosporium*; A – *Alternaria*; V – *Verticilium;* N – *Nematodes*

Table 2

Early yield of tomatoes and significance of differences to control (2008-2009)

Crt. no.	Variant	Early yield t/ha	% to control	Differences to control	Significance
1	Galilea F1	36,34	101,79	0,64	-
2	Margarita F1	31,47	88,15	-4,23	oo
3	Galina F1	40,16	112,49	4,46	**
4	Winona F1	28,96	81,12	-6,74	ooo
5	Primadona F1	28,59	80,08	-7,1	ooo
6	Brillante F1 (control)	35,70	100	0,00	-

DL 5% = 1,97; DL 1% = 3,76; DL 0,1% = 5,84.

Table 3

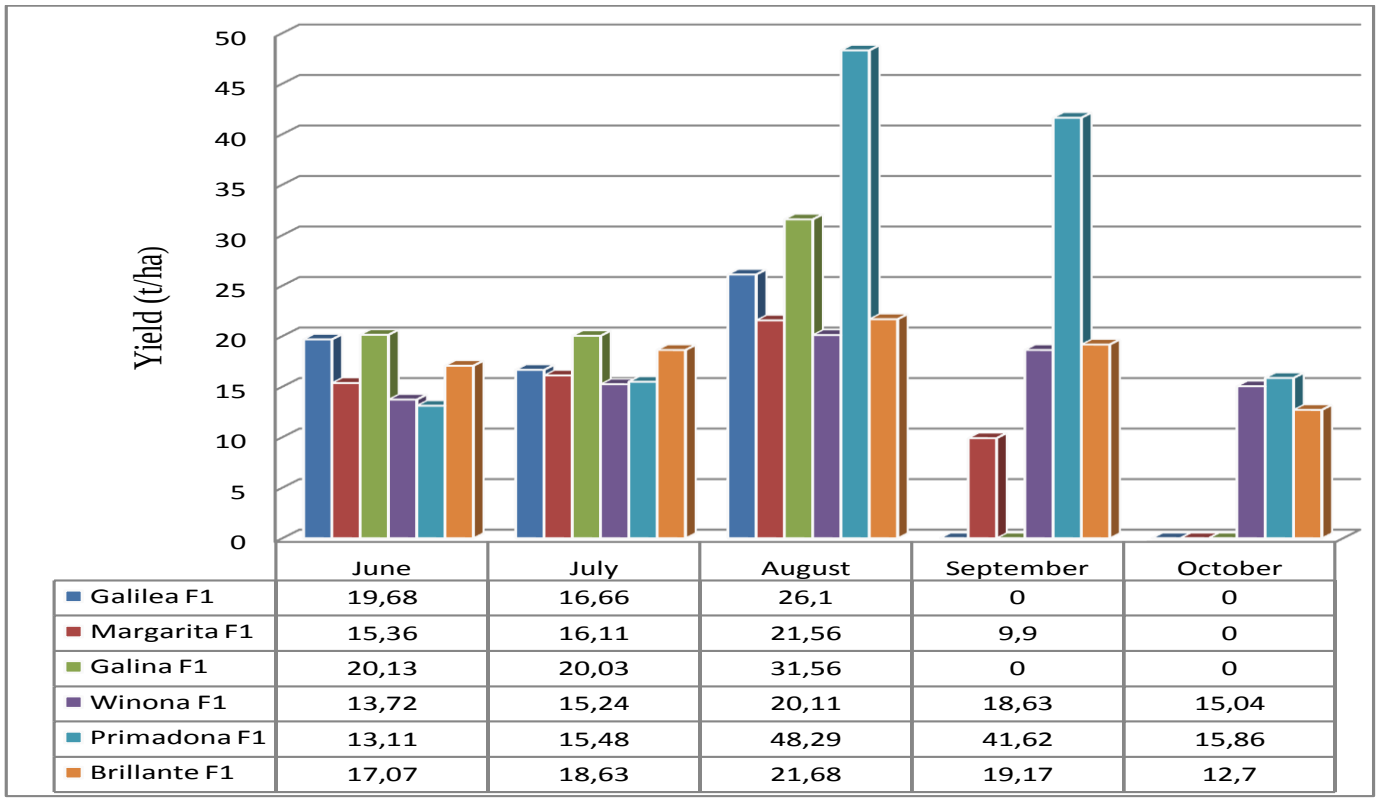
Total yield of tomatoes and significance of differences to control (2008-2009)

Crt. no.	Variant	Total yield t/ha	% to control	Differences to control	Significance
1	Galilea F1	62,65	70,19	-26,60	ooo
2	Margarita F1	62,93	70,50	-26,32	ooo
3	Galina F1	71,72	80,35	-17,53	ooo
4	Winona F1	82,74	92,70	-6,51	-
5	Primadona F1	134,36	150,54	45,11	***
6	Brillante F1	89,25	100	0,00	-

DL 5% = 7,48; DL 1% = 9,67; DL 0,1% = 13,64.

Analyzing the monthly dynamics of tomatoes yields, it is remarked that in June, the largest early yields were gotten by Galina F1 (20.13 t/ha), Galilea F1 (19.68 t/ha) and Brillante F1 (17.07 t/ha) (fig. 1). In economic terms, early hybrids is a positive aspect because the value of production per unit area increases and benefit per kg of product is higher, to same cost of production. The same three hybrids made up and early production in July, which shows that biological earliness of cultivar is expressed in terms on organic production.

In June and July, late as hybrids carried smallest tomato production. In August, the highest yields are produced by the hybrids: Primadonna F1, Galina F1 and Galilea F1. The determinated type of cultivars Galilea and Galina F1 do not obtain yield in September and October, it suggests that these hybrids are susceptible to tomato crops in two crops (cycles) per year. The Brillante F1 (Mt) and Winona F1 achieved tomato yields relatively constant throughout the growing season (14-20 t/month/ha).



	June	July	August	September	October
Galilea F1	19,68	16,66	26,1	0	0
Margarita F1	15,36	16,11	21,56	9,9	0
Galina F1	20,13	20,03	31,56	0	0
Winona F1	13,72	15,24	20,11	18,63	15,04
Primadona F1	13,11	15,48	48,29	41,62	15,86
Brillante F1	17,07	18,63	21,68	19,17	12,7

Fig. 1. Dynamics of tomato yield on months

CONCLUSIONS

1. Early tomato yield in the assortment varies between 28.59 t / ha and 36.34 t / ha.

2. Higher total yield compared to the control Brillante F1 (89.25 t / ha), was very significant Primadonna cultivar F1 (134.36 t / ha).

3. Maximum amount of yield was in June and July (Galina, Margarita and Galilea), July-August (Primadonna). The cultivars Brillante F1 and Winona F1 achieved during the growing season constant yield in all months.

4. The largest fruit (on average 300 g) were obtained by the cultivar Primadonna F1.

5. The average fruit weight, shape, external appearance, internal structure and other characteristics varied within normal limits, giving a high range studied.

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STUDIES AND RESEARCHES CONCERNING THE GROWING OF THE REAL AND FINAL FERTILITY AT THE ONION SEED CULTURE

STUDII ŞI CERCETĂRI PRIVIND CREŞTEREA FERTILITĂŢII REALE ŞI FINALE LA SEMINCERII DE CEAPĂ

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Abstract. *Because of the climatic changes concretized in prolonged atmospheric drought, abrupt temperature changes, lack of precipitations, winds etc., the pollination of the onion seed culture is deterrent. The researches made at S.C.D.L. during 2000 – 2010 had shown that there is a great difference between real and potential fertility, thus, during the latest 10 years, 4 years were favorable to the onion seed culture, and the other 6 years did not presented optimum conditions for this culture. There material used was the onion variety called Diamant, to which were applied three pollination variants (V_1 – free pollination, V_2 –classic pollination and V_3 – pollination by using bio stimulators). Each experimental variant had a surface of 5000m^2, and there were observed significant differences between the three experimental variants. Comparative to V_1, where there were obtained 600kg seed/ha, V_2 had an impregnation percent over 20%, and for V_3 the impregnation percent was over 50%.*

Key words: onion, seed culture, biostimulator

Rezumat *Datorită schimbărilor climatice apărute în ultima perioadă, concretizate prin secetă atmosferică prelungită, schimbările bruşte de temperatură, lipsa precipitaţiilor, vânturile etc. împiedică polenizarea în condiţii optime a semincerilor de ceapă. Cercetările efectuate la S.C.D.L. Buzău în perioada 2000 – 2010 au arătat că există o mare diferenţă între fertilitatea reală şi potenţială, astfel, în ultimii 10 ani, patru ani au fost favorabili semincerilor de ceapă, iar ceilalţi şase nu au prezentat condiţii optime pentru această cultură. Materialul folosit a fost soiul de ceapă Diamant la care s-au organizat trei variante de polenizare(V_1 – polenizare liberă, V_2 – polenizare clasică şi V_3 – polenizare prin folosirea biostimulatorilor). Fiecare variantă experimentală a avut o suprafaţă de 5000m^2 şi s-au constatat diferenţe semnificative între cele trei variante experimentale. Comparativ cu V_1, la care s-au obţinut 600kg sămânţă/ha, polenizarea clasică efectuată a avut un procent de fecundare de peste 20%, iar V_3 prin folosirea biostimulatorilor de peste 50%.*

Cuvinte cheie: ceapă, cultură din sămânţă, biostimulator

INTRODUCTION

The researches made at S.C.D.L. Buzău during 2000 – 2010, concerning the seed culture, dignified the fact that the plants manifest significant differences between the potential fertility (F_p) and the real one (F_r). This fact leads to significant differences between initial and final productivity (F), which is similar to the yield capacity (Leonte, 1996). The greatest differences were registered at the

allogamy plants (onion, cabbage, carrot etc.) especially during the years which are difficult from the climatically point of view, with low temperatures, precipitation or up wind during the flowering, conditions which limit and endanger insects circulation, bees specially, the main pollinator of these plants.

The researches made at S.C.D.L. Buzău had in view finding optimum solutions in order to increase real fertility of the vegetables seed culture, especially the onion seed culture. By means of the researches made, there was followed the quality and quantity increase of the seeds obtained with unpollutant and cheap methods. In the conditions of the climatic changes for the last period, the vegetables seed culture, especially onion, it had registered significant production losses; implementing the technological link can cure this phenomenon.

MATERIAL AND METHOD

The species studied in the frame of these experience, was the onion seed culture to which the parent plant were obtain by direct seeding. The biological material was the onion variety *Diamant*, created at S.C.D.L. Buzău. This variety, which is the most performing Romanian onion variety, occupies the largest surface cultivated in Romania.-For the onion seed culture, there was applied the specific crop technology, with the peculiarity that at each eight lines there was let a furrow. On this furrow, there was seed as well onion to facilitate the tractor's access L445 + MSPP in order to apply treatments (Ciofu, 2003). There were chosen three experimental variants in a 1000m^2 surface:

V_1 – free pollination;

V_2 – manual classic pollination;

V_3 – pollination in bio stimulators conditions.

There were used ecological bio stimulators that have no negative impact on plants and environment and contain sugar, honey and water. There were made studies and researches concerning the solution concentration, the quantity of substance used for the surface unit and the solution applying moment. During the vegetation period, there were made observations concerning the main fenophases (table 1).

Table 1

The main fenological data for *Diamant onion variety* (mean values 2000 – 2010)

FENOPHASE	Culture	
	Butaşi	**Seed culture**
Sowing/planting	14.03	28.11
Plants rising	10.04	–
Vegetation start	–	10.03
Bulbs forming	25.05	–
Stems issuance	–	21.04
Bulbs sweeping	06.08	–
Flowering	–	07.06
Seeds forming	–	15.07
Bulbs/ flourish harvest	14.09	24.08

The main biometric determinations made at the plants from the experimental crop are shown in table 2.

Table 2

The main characteristics followed

Followed character	Mean values (2000 – 2010)
Plant's stem (cm)	58,13
No. of stem/plant	4,88
Stem length (cm)	111,042
Flourish diameter (cm)	7,439
No. flowers/flourish	613,1
Seed quantity/plant (g)	33,2

At the beginning of the experience there was in view that V_3, variant, to which was applied the bio stimulation solution, to be situated at enough distance from in order to not influence the results of the other experimental variant.

The experimental variants were set conforming to the Latin square with three repetitions.

RESULTS AND DISCUSIONS

Because of the lately climatic changes, there was observed that during last 10 years, - 4 years were favorable for the onion seed culture and 6 years were not favorable (there were registered production losses.

After the researches made, there was observed the fact that there are significant differences between the three experimental variants. Thus, V_2 variant has registered a yield increase proxy. 20% higher than V_1 variant (115kg/ha). There must be specified the fact that for V_2 variant there was applied the classical pollination method, and in order to not disturb and destroy the flowers, there was made a bunny fur glove in order to palpate the flourishes.

V_3 variant had obtained an distinct significant yield increase than V_1 (322kg/ha), having the highest fertility quotient, 54,64%, from the din experience (table 3).

Table 3

Onion plants fertility potential (mean values 2000 – 2010)

Experimental variant	No. flower/flourish	Fecundate flowers		Yield (kg/ha)
		No.	%	
V_1	613	215	35,07	600
V_2	613	262	42,74	715
V_3	613	335	54,64	922

When using bio stimulator there must have in view the following aspects:

1. the concentration of the bio stimulator must be 10% sugar or bee honey;

2. the optimum applying moment is in the morning between 7 and 9, in order to have enough time to attract insects. Thus, around noon and after-noon, when the flowers are open, there has been observed a great presence of the pollinating insects;

3. there is recommended that the bio stimulator to be applied in a quantity of 300 l/ha in sunny days;

4. during the flowering, there are recommended two treatments/week.

The values presented are mean values for the studied interval of time, but, during the favorable years, by applying bio stimulator, the seed yield can surpass 1200kg/ha.

Recent studies of the beekeepers show that in conditions of hydric stress (atmospheric drought) the onion becomes from melliferous plant, a plant that secretes repellent substances for insects. For this reason, using bio stimulators contributes to attract insects and to obtain positive results even in unfavorable years.

Carefully analyzing the fertility potential not capitalized for this species, our researches will extend upon finding other technological variants with the purpose to valorize this potential.

Fig. 1. General aspect of the onion seed culture

a) **b)**

Fig. 2. Onion flouring from the V_3 variant: a) after applying bio stimulator; b) during pollination

V_1 V_2 V_3

Fig. 3. Onion flouring obtained in unfavorable conditions for the seed culture

CONCLUSIONS

1. The onion yield potential is big, but low capitalized (35 – 54%).

2. Applying bio stimulator on the onion flouring during the flouring period constitutes a success variant for increasing the seed production. From our researches we can observe that this method can be successfully applied to the seed culture of other vegetables.

3. The bio stimulation solution favors insects attraction that ensure pollination.

4. The bio stimulator used is a natural product which can be used in ecological cultures.

5. From the economic efficiency analysis, there was observed that from the three experimental variants, V_3 is the most convenient method.

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INFLUENCE OF FERTILIZATION SYSTEM ON THE QUALITY MAINTAINING OF PEACH FRIUTS IN DIFFERENT STORAGE CONDITIONS

INFLUENŢA SISTEMULUI DE FERTILIZARE ASUPRA MENŢINERII CALITĂŢII FRUCTELOR DE PIERSIC, ÎN DIFERITE CONDIŢII DE PĂSTRARE

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Abstract. *The researches had as theirs principal objective to establish the more suitable fertilization system and storage methods for peach fruits, in order to maintain fruit quality a long period post-harvest. There were tested two peach varieties proceed from SCDP Constanta (Cardinal, Southland), which were fertilized with organic fertilizers and chemical fertilizers, applied on soil or on leafs. The peaches were stored at ICDIMPH-Bucuresti in three variants: ambient temperature (T = 26-28^{0}C), low temperature (T=2-4^{0}C - refrigerating storage), refrigerated and modified atmosphere. There has been determinate the quantitative and qualitative losses during fruits preservation. In case of chemical fertilization – on soil + on leaves, the fruit storage capacity was better for both variety of perch. The organic fertilization places on the second position. The result point out the superiority of the storage in a modified atmosphere over the other methods. In this case, the losses are most reduced. The refrigerating storage, without modified atmosphere, gave also good results. It may be successfully used in the case when air gas composition in storage space can not be modified.*

Key words: Cardinal, Southland, fertilizers, refrigerating storage, modified atmosphere, mass and depreciation losses.

Rezumat*. Cercetările au avut ca obiectiv principal stabilirea celor mai adecvate sisteme de fertilizare şi metode de păstrare a piersicilor, în scopul menţinerii calităţii fructelor o perioadă cât mai îndelungată după recoltare. S-au experimentat două soiuri de piersic provenite de la SCDP Constanta (Cardinal si Southland), care au fost fertilizate cu îngrăşăminte organice şi îngrăşăminte chimice, aplicate la sol şi foliar. Piersicile au fost depozitate şi păstrate la ICDIMPH-Bucureşti în trei variante: la temperatura mediului ambiant (26-28^{0}C), în condiţii frigorifice (T=2-4^{0}C) şi în condiţii frigorifice + atmosferă modificată. S-au făcut determinări în dinamică a pierderilor cantitative şi calitative pe durata păstrării piersicilor. Dintre variantele de fertilizare, varianta de fertilizare chimică - la sol + foliară induce capacitatea de păstrare cea mai bună, la ambele soiuri de piersici. Pe locul 2 din acest punct de vedere se situează varianta de fertilizare organică. Rezultatele obţinute indică superioritatea păstrării fructelor în atmosferă modificată, unde s-au înregistrat cele mai mici pierderi pe durata păstrării. Păstrarea frigorifică simplă a dat de asemenea rezultate foarte bune şi poate fi utilizată cu succes în cazul în care nu există posibilitatea modificării compoziţiei gazoase a aerului din spatiul de păstrare.*

Cuvinte cheie: Cardinal, Southland, fertilizare, păstrare frigorifică, atmosferă modificată, pierderi cantitative şi calitative.

INTRODUCTION

Because of the great taste attributes, aspect and specifically flavors, plus their importance in nutrition, peaches occupy an important place in consumption in both fresh and processed. Their superior dietary attributes are determined by their content of vitamins, minerals, cellulose, acids and pectin substances.

The achieving and maintaining the quality of the fruit depends on complex of factors involved in all links of culture and valorization technology, from the choice of variety, crop maintenance, till to harvest, conditioning and expedition.

The peaches are highly perishable fruit and that is why the maintaining of their quality after harvest, is an important issue for the valorization sector, considering the share of this species from total fruit.

The peaches storage capacity is dependent on the quality of material used to preserve, and on the conditions of storage. The chemical composition of peaches, which determine the biochemical processes during storage and, therefore, the storage capacity is strongly influenced by the fertilization regime. Based on the research results, it was proved that the dose in which is applied the organic and mineral fertilizer affect the chemical composition of fruit, having an effect on storage capacity (Salunke, 1974; Ion, 2004).

The way in which the technological factors during storage are realized (temperature, humidity, air composition, etc.) exert a great influence on shelf life of peaches and losses recorded (Gherghi, 1977, Gherghi et al., 2001).

In valorization technologies there are recommended the application of technological methods of storage (low temperatures, changing the gaseous composition of air, etc.) that determines the inhibition of physiological and biochemical processes of fruit, leading to maintain their commercial value as a longer period (Burzo,1986; Burzo, 2005; Lille and King, 1999).

To underline how to turn up the influence of the culture fertilization and the storage fruits conditions, on maintaining quality of peach, were organized adequate experiences at ICDIMPH - HORTING, in collaboration with SCPP Constanta.

MATERIAL AND METHOD

The necessary research fruits were obtained from SCDP Constanta. The tested peach varieties are Cardinal (early variety) and Southland (semi early variety).

Fruits were harvested at a mature stage "parga ".

Each variety has benefited, in orchard, by four different types of fertilization:

- V1 - control (unfertilized);
- V2 - organic fertilization (fermented manure);
- V3 - chemical fertilization (NPK complex fertilizers in relation to: 15:15:15.);

- V4 - chemical fertilization + foliar feeding (NPK 15:15:15 complex fertilizers in soil and with foliar fertilizer in plant – Murtonik 20:20:20).

In Research and Development Institute for Processing and Marketing of the Horticultural Products, the fruits were stored in 3 storage variants:

- at ambient temperature (T = 26-28^{o} C, RH = 65-70%) in 1kg packaging - keep warm;

- in refrigeration room (T = 2-4^{o} C, RH = 83-87%), in packs of 1 kg covered with perforated polyethylene film - cold storage;

- in refrigeration room (T = 2-4^{o} C, RH = 92-96%), in hermetic packs of 1 kg, so that the composition of atmosphere inside them has modified, meaning reduction the O_2 content and increased CO_2 content and the air relative humidity - storage in modified atmosphere - MA.

The storage period (days) varied depending on the storage variant, such:

- warm storage: 7
- refrigeration storage: 28
- MA storage : 35.

After removal the peaches from storage space we made observations on general appearance of the fruits and determinations regarding the mass losses (quantitative) and the depreciation losses (qualitative) suffered by fruits during their storage.

RESULTS AND DISCUSSIONS

The losses of the peaches recorded during the storage in normal temperature - warm (ambient temperature) for 7 days are presented in table 1.

Table 1

Losses in peaches during the warm storage

Variant	Losses - %					
	totals		mass		depreciation	
	Cardinal	Southland	Cardinal	Southland	Cardinal	Southland
V1	27,25	43,11	9,88	14,42	17,37	28,69
V2	22,35	23,07	7,80	13,12	14,55	9,95
V3	26,98	32,54	7,49	14,24	19,49	18,30
V4	19,51	18,85	8,04	2,09	11,47	16,76
Variety average	**24,02**	**29,39**	**8,30**	**10,97**	**15,72**	**18,42**

It found that total losses are higher in all four types of fertilization, due to both mass losses, but especially those by depreciation. At the V1 variant – control we meet the highest losses (27.25% of the Cardinal variety, 43.11% of the Southland variety), and at the V4 variant - chemical fertilization in soil + foliar feeding, the lowest (19.51% - Cardinal, 18.85% - Southland).

But skipping the variant of the fertilization, the total losses recorded during the warm peaches storage of the Cardinal variety are 24.02%, of which 8.30% mass losses and 15.72% depreciation losses. In Southland variety peaches, total losses are 29.39% (10.97% weight loss and 18.42% by

impairment losses).

The fruit impairment, in case of peaches, are due to late infections caused by fungi *Monilinia laxa* and *M. fructigena* before harvest, when they are too little visible. After harvest, during transport and storage, the attack rapidly evolves (depending on temperature) and the entire fruit rots.

Moreover, during the storage can lead to the rotting of the surrounding healthy fruit, mycelium penetrating into them directly or through injuries almost invisible.

The fruits can also be infected through wounds, blows or pressure produced during harvest and handling by the molds *Rhizopus stolonifer* and *Botrytis cinerea*.

By using cold storage of peaches, losses were recorded both quantitative and qualitative, much smaller than warm keeping (table 2). Thus, the values found at the Cardinal variety, were: mass losses = 1.87%, depreciation losses = 5.40% and total losses = 7.27%.

Table 2

Losses in peaches during the cold storage

Variant	Losses - %					
	totals		mass		depreciation	
	Cardinal	Southland	Cardinal	Southland	Cardinal	Southland
V1	**14,55**	**15,05**	**3,20**	**1,49**	**11,35**	**13,56**
V2	**5,34**	**6,65**	**1,05**	**1,45**	**4,29**	**5,20**
V3	**7,39**	**7,41**	**1,44**	**2,10**	**5,95**	**5,31**
V4	**1,79**	**4,91**	**1,79**	**1,61**	**-**	**3,30**
Variety average	**7,27**	**8,50**	**1,87**	**1,66**	**5,40**	**6,84**

From the fertilization variants, V4 variant performed best in cold, with 1.79% total losses and the worst, V1 variant, with 14.55% total losses. On the second place, V2 variant was located, with 5.34% total losses.

At the Southland variety the losses were also significantly reduced by this method of storage, reaching an average of 8.50% total losses, 1.66% mass losses and 6.84%, depreciation losses. V4 variant is also remarkable, with 4.91% total losses (1.61% mass losses + 3.30% quality losses), followed by V2 variant (losses: 6.65%, 1.45% and 5.20%, respectively). On last place, with total losses of 15.05% ranks V1 variant.

The losses determined after 35 days of storage in modified atmosphere conditions were significantly lower values compared with the others methods of storage (table 3).

Table 3

Losses in peaches during storage in MA

Variant	Losses - %					
	totals		mass		depreciation	
	Cardinal	Southland	Cardinal	Southland	Cardinal	Southland
V1	**9,24**	**7,90**	**0,20**	**0,20**	**9,04**	**7,70**
V2	**1,91**	**0,22**	**0,19**	**0,22**	**1,72**	**-**
V3	**5,65**	**3,35**	**0,19**	**0,32**	**5,46**	**3,03**
V4	**0,16**	**0,19**	**0,16**	**0,19**	**-**	**-**
Variety average	**4,24**	**2,91**	**0,19**	**0,23**	**4,05**	**2,68**

The average of the total losses at the Cardinal variety in these conditions is 4.24% (0.19% mass losses and 4.05% quality losses). From the fertilization variants, the first place, with the lowest total (0, 16%), mass (0.16%) and qualitative losses (0%) is occupied by V4 variant, followed by V2 variant (1.91%, 0.19% and 1.72% respectively).

The Southland variety recorded total losses of 2.91% (0.23% mass losses + 2.68% by depreciation losses) only. The V4 variant of fertilization was not reported losses of quality and the quantitative losses were almost zero (0.19%). A similar situation is found in the V2 variant too, with total losses of 0, 22%. Even in the V1 variant the losses were significantly reduced, those being of 7.90%, 0.20% and 7.70% respectively.

From experimental data results that the fertilization variant of orchard peaches, at the two studied varieties, the best results in terms of losses during storage, from all the three technological methods, is V4 variant, followed by V2 variant, and the worst results were obtained in V1 variant.

CONCLUSIONS

1. The ability to maintain the quality of peach fruit varies depending by the fertilization system, variety and storage conditions of the environment and especially by temperature and gaseous air composition.

2. From the fertilization variants, the V4 variant (chemical fertilization on soil + foliar feeding) induces the best storage capacity, to both tested varieties of peaches. Foliar fertilizers provide, besides the contribution of macro-and micronutrients and other organic substances that stimulate the metabolism of chlorophyll assimilation, energy efficiency and ultimately the quality of the fruits. On the second place, in this respect, stands V2 variant (organic fertilization), which has also the advantage of obtaining organic fruits.

3. There are also differences between varieties in terms of storage capacity and their response to applied storage technology. Thus, while at the Cardinal variety total losses are: 24.02% to warm, 7.27% to cold and 4.25% in modified atmosphere, at Southland varieties these are higher in warm (29.39%) and cold (8.50%) and lower in modified atmosphere (2.91%).

4. In the conditions in which it is practice the adequate methods of fruits storage (optimal temperatures for storage or modified atmosphere characteristic for a species or a variety), biochemical processes are inhibited, maintaining product quality. From the three methods of storage (ambient temperature, refrigeration room and refrigeration room + modified atmosphere) the best results were obtained in the case of the 3rd method, in which were recorded the lowest losses during storage.

5. Refrigeration storage can be successfully used for peaches in case there is no possibility of modifying the air gaseous composition storage space. Low temperatures inhibit or slow down the growth of fungi and mold and slow the rate of biochemical processes during their storage, so the depreciation losses are greatly reduced.

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ANATOMO-MORPHOLOGICAL SYMPTOMS CAUSED BY THE INCOMPATIBILITY TO GRAFTING IN THE CASE OF THE PEAR TREE

SIMPTOME ANATOMO-MORFOLOGICE CAUZATE DE INCOMPATIBILITATEA ALTOIRII LA PĂR

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Abstract. *The anatomo-morphological observations aimed at identifying the structural modifications on the level of the grafting point of the scion-stock associations that presented the incompatibility phenomenon. We used the varieties Contesa de Paris and Untoasa Bosc grafted on Cydonia oblonga stocks which were incompatible with the studied varieties and Pyrus sativa, a stock compatible with the two varieties. The observations showed the calusogenesis process, the formation of the new cambium elements and the vascular tissues and the recovery degree of the continuity of the vessels. In the case of the incompatible associations, the presence of the histological anomalies determined the appearance of some clear symptoms of localized incompatibility.*

Key words: scion, rootstoks, incompatibility

Rezumat. *Observaţiile anatomo-morfologice au urmărit identificarea modificărilor structurale la nivelul punctului de altoire al asociaţiilor altoi-portaltoi la care s-a manifestat fenomenul de incompatibilitate. S-au folosit soiurile Contesa de Paris şi Untoasă Bosc altoite pe portaltoii Cydonia oblonga, portaltoi incompatibil cu soiurile studiate şi Pyrus sativa, portaltoi compatibil cu cele două soiuri. Observaţiile efectuate au evidenţiat procesul de calusogeneză, formarea noilor elemente de cambiu, a ţesuturilor vasculare şi gradul de refacere al continuităţii vaselor. În cazul asociaţiilor incompatibile prezenţa anomaliilor histologice determină apariţia unor simptome certe de incompatibilitate localizată.*

Cuvinte cheie: altoi, portaltoi, incompatibilitate

INTRODUCTION

The incompatibility to grafting is one of the most important issues that the fruit growing practice must deal with. The mechanism of the incompatibility to grafting is considered to be a result of the mutual influence between scion and rootstock.

The approach of the researches on this phenomenon must start from the knowledge of the mechanism of the interaction between scion and rootstock. These researches refer to the cytological and biochemical responses in an incipient stage in the grafting process, as well as to the consequences of these events regarding the future of the evolution of the partners.

In the case of the ligneous plants, the main reason of the incompatibility is considered to be the inability of the symbionts to establish new vascular

connections as well as the small differentiation when the connections are established (Errea and colab., 1994).

In these cases, an abnormal differentiation process of the neocambium leads to a cambial involution and a lack of differentiation of the new vascular elements, as shown in the case of the grafting of the pear tree on the quince tree (Ermel et al., 1999) and of the apricot tree on *Prunus* rootstock (Errea and colab., 1994). Nevertheless, incompatible symbionts can grow for many years without showing external incompatibility symptoms which indicates the presence of the vascular connections in the case of the incompatible combinations (Hartmann and colab., 1997).

The researches aimed at identifying the structural modifications on the level of the grafting point of the scion-stock associations that presented the incompatibility phenomenon.

MATERIAL AND METHOD

The experiment was conducted on the experimental field from "Ion Ionescu de la Brad" Agricultural Sciences and Veterinary Medicine University, Iasi from „Vasile Adamachi" S.D.E.

The used biological material originated in the collection of the Faculty of Horticulture, represented by two varieties of pear tree (Untoasă Bosc and Contesa de Paris) grafted on the rootstocks *Pyrus sativa* and *Cydonia oblonga*.

The observations were done during the vegetation period, the planting material being in the first vegetation year. In order to make the histo-anatomical observations, the vegetal material was fixed in ethanol 70%, sectioned under the semiautomatic microtome, colored with methylene blue and ruthenium red.

The assembling of the sections was done in Canada balm and the observations were made with the optical microscope Motic, using the eyepiece 10 and the lens 4.

RESULTS AND DISCUSSIONS

The phenomenon of the incompatibility to grafting determines the failure to reconstruct a system of vascular tissues that is continuous, functional and resistant to the mechanical action.

From the anatomical point of view, the incompatibility phenomenon determines an imperfect recovery of the leading tissues in the grafting area by replacing them with incompletely lignified radial tissue that has discontinuities of the cambium and the vascular tissues which leads to an increase of the vulnerability of the tree to the mechanical action.

The microscopic observations made on the transversal sections through the grafting point have shown the presence of the callus and the non-differentiated parenchimatic tissue.

Both in the case of the compatible variant (fig 1, fig 2) and in the case of the incompatible one (fig 3, fig 4) the callus is formed on the wounded surfaces of the two symbionts, filling the empty spaces between the scion and the rootstock.

Non-differentiated parenchimatic tissue

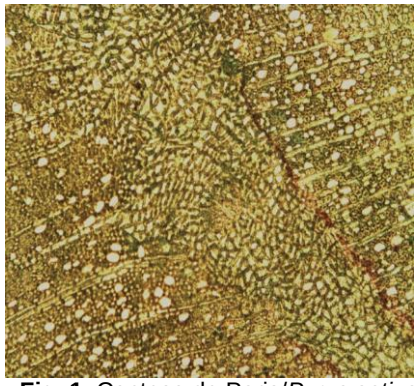


Fig. 1. Contesa de Paris/*Pyrus sativa*

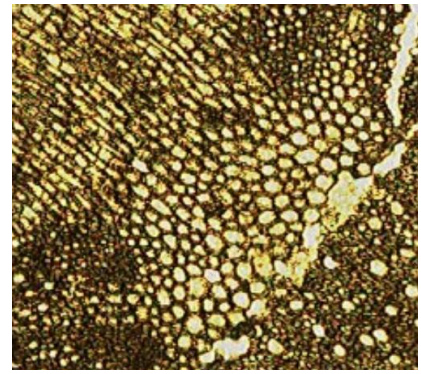


Fig. 2. Contesa de Paris/*Cydonia oblonga*

Fig. 3. Contesa de Paris/*Pyrus sativa*

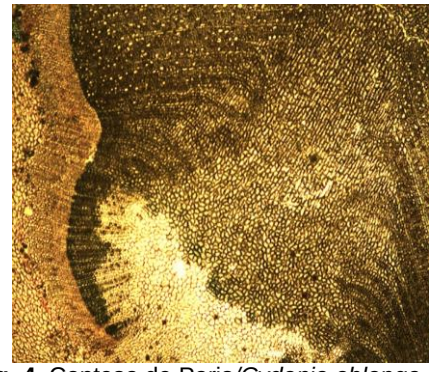
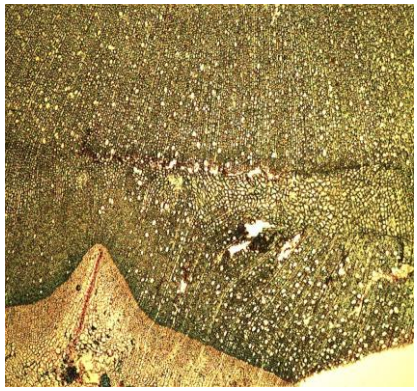


Fig. 4. Contesa de Paris/*Cydonia oblonga*

In the case of the compatible combinations (Contesa de Paris/*Pyrus sativa*, Untoasă Bosc/*Pyrus sativa*) the meristematic cells generate new leading tissues: Liberian vessels towards the exterior and wooden beams towards the interior. Once the leading tissues are formed, the two partners can be called symbionts (fig 5, fig 6). The forming of the vascular connections is considered by most of the authors the basic requirement for a successful grafting.



`Fig. 5. Contesa de Paris/*Pyrus sativa*

Fig.6. Untoasă Bosc/*Pyrus sativa*

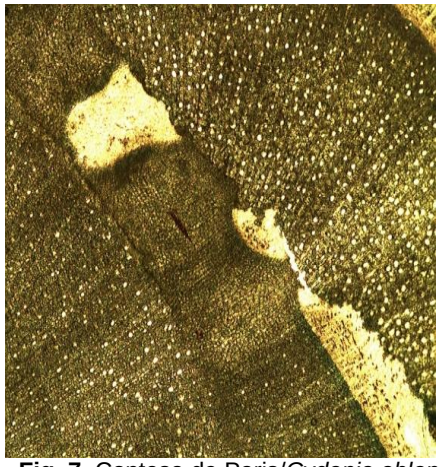


Fig. 7. Contesa de Paris/*Cydonia oblonga*

Fig. 8. Untoasă Bosc/*Cydonia oblonga*

In time, the incompatible combinations (Contesa de Paris/*Cydonia oblonga*, Untoasă Bosc/*Cydonia oblonga*) manifest a low affinity degree.

In the same places, the callus has not differentiated itself in the cambium and the vascular tissue which leads to extended areas of non-differentiated callus cells on the level of the grafting point. (fig. 7, fig. 8).

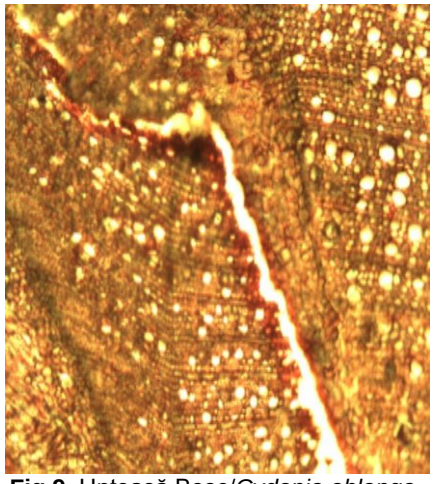


Fig.9. Untoasă Bosc/*Cydonia oblonga*

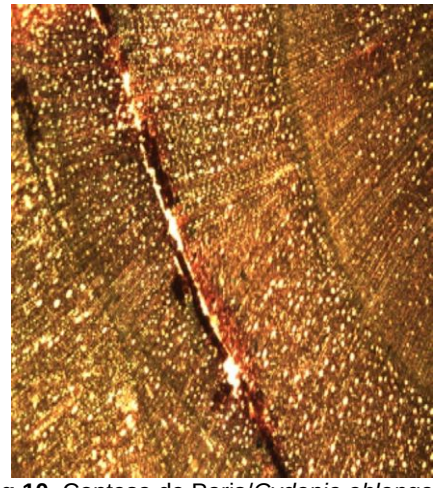


Fig.10. Contesa de Paris/*Cydonia oblonga*

During the growth and the development of the tree, the lack of the cambial activity in some areas of the grafting point affects the integrity of the newly formed xylem and floem, as a result of the discontinuity of the cambium and the forming of a strip of non-differentiated parenchimatic cells (fig. 9, fig. 10).

The presence of this strip of non-differentiated parenchimatic cells, between the two partners, interrupts the vascular connection, determining a weak

joining between them and the reduction of the circulation of the sap through the grafting point, shortly generating incompatibility symptoms.

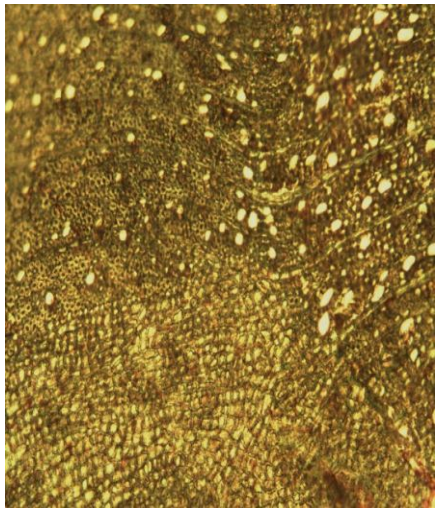


Fig. 11. Contesa de Paris/*Pyrus sativa*

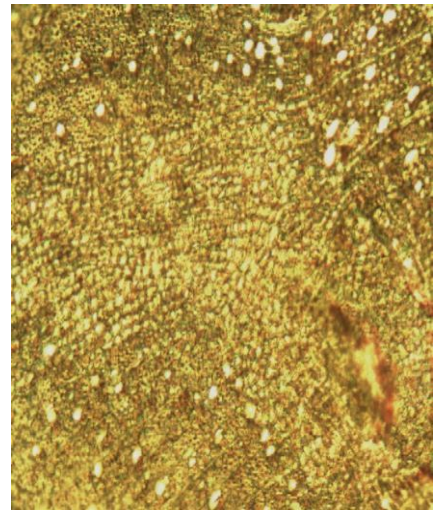


Fig.12. Untoasă Bosc/*Pyrus sativa*

Regarding the compatible variant (fig.11, fig. 12), where the joining and the vascularization have already been done, we can notice a continuity between the cambial tissue of the rootstock and that of the scion.

Following the activity of the meristematic tissue, new leading tissues resulted (ligneous and liberian), thus providing both the water and the mineral supply to the scion, as well as the best transport of the photoassimilates to the rootstock.

The perfect joining and vascularization on the grafting point shows the existence of the compatibility between the two symbionts.

CONCLUSIONS

1. The microscopic observations made on the transversal sections through the grafting point show an initial normal development of the callus both in the case of the compatible variant and in the case of the incompatible one.

2. In the case of the compatible variant, it can be noticed a complete recovery of the leading vessels of the two partners which reflects a normal activity of the physiological and biochemical processes of the tree.

3. In the case of the incompatible variant, even though initially the joining on the level of the grafting point is good, the recovery of the vascular tissues is not perfect. In some areas, we can notice non-differentiated parenchimatic cells in the leading vessels of the scion and of the rootstock which renders difficult the circulation of the sap between the two partners.

4. From the anatomical point of view, the two incompatible combinations have not shown serious incompatibility symptoms during the first year after

grafting but, nevertheless, the growth and the development of the trees is not satisfying.

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RESEARCHES REGARDING THE EFFECT OF SOME ECOLOGICAL PRODUCTS ON GRAFTING SUCCESS AT SOME PEAR AND PLUM CULTIVARS

CERCETĂRI PRIVIND EFECTUL UNOR PRODUSE ECOLOGICE ASUPRA PROCESULUI DE PRINDERE LA ALTOIRE LA UNELE SOIURI DE PĂR ŞI PRUN

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Abstract: *This paper study influence of ecological products treatments on some fruit tree species grafting success. Rootstocks from species pear and plum were grafted in 2008-2010 with scions of pear (Curé, Williams and Comptesse) and plum (Stanley, Pescăruş and Tuleu gras) which had different grafting compatibility degrees. In grafting moment treatments with ecological products P1 and P2 were made. Biometric measurements concerned grafting success (%), trees length, average number of shoots/tree, stem diameter above and below grafted point, scion: rootstock diameter ratio. Results made in evidence a positive influence of treatments with both ecological products in grafting moment, especially when P2 was used.*

Key words: ecological products, incompatibility, scion, rootstock, grafting

Rezumat: *Lucrarea studiază influenţa aplicării tratamentelor cu produse ecologice asupra procesului de prindere la altoire la unele specii pomicole. Portaltoi din speciile păr şi prun au fost altoiţi pe parcursul anilor 2008-2010 cu soiuri de par, (Curé, Williams şi Comptesse de Paris) şi prun (Stanley, Pescăruş şi Tuleu gras) ce prezintă diferite grade de compatibilitate la altoire, În timpul altoirii au fost aplicate tratamente cu două produse ecologice P1 şi P2 în zona de altoire. Masuratorile biometrice au vizat procesul de prindere la altoire, înălţimea pomilor, numărul mediu de lăstari pe pom, diametrul pomilor, raportul dintre diametrul altoiului şi cel al portaltoiului. În urma determinărilor efectuate s-a constatat o influenţă pozitivă a aplicării tratamentelor cu cele două produse ecologie, în special în cazul utilizării produsului P2.*

Cuvinte cheie: produse ecologice, incompatibilitate, soi, portaltoi, altoire

INTRODUCTION

High quality nursery trees are essential for success in production systems where early production is the prime goal. Many papers focus on this problem in order to understand the mechanisms of graft development, referring to both cytological and biochemical responses occurring at an early phase in response to grafting, as well as to the consequences of these events on the future graft response. Incompatible grafts can grow for several years without any external symptom of incompatibility indicating the presence of functional vascular connections (Errea and Felipe, 2001). For this reason, the delayed appearance of the symptoms increases the time required for detection of graft-compatibility and

slows down new rootstock selection programs. The aim of this study is to determine the effect of treatment with some ecological products on grafting success at some rootstock scion combination with different compatibility degrees.

MATERIAL AND METHOD

To perform the experiment, three pear cultivars Curé, Williams and Comptesse de Paris, grafted on Pyrus sativa and Cydonia oblonga and three plum cultivars Stanley, Pescăruş and Tuleu gras grafted on Prunus domestica and Prunus cerasifera were used. The experiment was conducted in the "V. Adamachi" didactic farm of the University of Agricultural Sciences and Veterinary Medicine Iasi from 2008 to 2010. Rootstocks were planted at a spacing of 0.9 x 0.2 m and budded by chip budding method.

At the grafting moment treatments with ecological products P1 and P2 (produced by Institute for Research and Development for bio-stimulators Bios Cluj) were made, by applying the product around the grafted area.

Biometric measurements made on grafted trees concerned grafting success (%), trees length, average number of shoots / tree, stem diameter above and below grafted point, scion: rootstock diameter ratio. The results were statistically interpreted by variance analysis method. The trial consisted of three replicates with 50 trees in each. Variance analysis of main quality traits was done.

RESULTS AND DISCUSSIONS

A first aspect of this study was the analysis of the grafting success which had a higher percentage when grafting was made on *Pyrus sativa* and *Prunus domestica*. Also, an increasing of the grafting success percentage at the variants treated with ecological products, comparing with control (untreated), especially when Product 2 was used (tab. 1) has been observed.

Table 1

Average of the grafting succes pergentage at some pear and plum cultivars with different grafting compatibility degrees

Rootstock/scion	V1- untreat (control)	V2 – treat. with P1	V3 – treat. with P2	Limit differences		
				DL 5%	DL 1%	DL 0,1%
Curé/ Pyrus sativa	84,56	91,7$^{(x)}$	93,59$^{(xxx)}$	2.33	4.57	7.98
Curé/ Cydonia oblonga	82,38	89,2$^{(x)}$	89,88$^{(xx)}$	2.52	4.97	8.68
Williams/ Pyrus sativa	83,85	91,0$^{(x)}$	91,82$^{(xx)}$	3.54	6.96	12.15
Williams/ Cydonia oblonga	75,88	82,1$^{(x)}$	82,94$^{(xx)}$	2.50	4.97	8.68
Comptesse de Paris/ Pyrus sativa	84,01	90,9$^{(x)}$	91,99$^{(xx)}$	2,21	3,27	3,89
Comptesse de Paris/ Cydonia oblonga	75,12	81,2$^{(x)}$	81,88$^{(xx)}$	2,35	3,48	4,14
Stanley/Prunus sativa	87,49	94,66$^{(x)}$	96,86 $^{(xxx)}$	1.32	2.58	4.51
Stanley/Prunus cerasifera	85,65	90,96	92,75 $^{(xx)}$	1.12	2.19	3.82
Pescaruş/Prunus sativa	89,01	93,99	96,89$^{(x)}$	1.74	3.38	5.90
Pescăruş/Prunus cerasifera	78,29	81,58	83,11	1.23	2.39	4.17
Tuleu gras/Prunus sativa	88,13	92,62	93,76	1.15	2.19	3.82
Tuleu gras/Prunus cerasifera	77,63	81,67	81,85	1.43	2.78	4.86

Scion length was measured three times during the vegetation period in May, July and October, and variations had been observed due to rootstock, and treatment variant (tab. 2).

Table 2

Scion length at some pear and plum cultivars with different grafting compatibility degrees

Rootstock / scion	Scion average length (cm)			Limit differences		
	MAY					
	V1-untreat (control)	V2 – treat. with P1	V3 – treat. with P2	DL 5%	DL 1%	DL 0,1%
Curé/ Pyrus sativa	57,86	66,64 (xxx)	67,12 (xxx)	1.85	3.67	6.42
Curé/ Cydonia oblonga	48,42	55,45 (xxx)	55,97 (xxx)	1.48	2.93	5.13
Williams/ Pyrus sativa	51,63	58,06 (xx)	58,60 (xx)	1.81	3.59	6.28
Williams/ Cydonia oblonga	43,37	48,23 (xx)	48,31 (xx)	1.81	3.59	6.28
Comptesse de Paris/ Pyrus sativa	56,62	63,22 (xx)	64,09 (xx)	1.4	2.78	4.86
Comptesse de Paris/ Cydonia oblonga	50,05	55,20 (xx)	55,86 (xx)	1.66	3.29	5.76
Stanley/Prunus sativa	55,30	61,95 (xx)	63,10 (xxx)	1.70	3.37	4.49
Stanley/Prunus cerasifera	61,99	69,03 (xx)	71,23 (xxx)	1.83	3.62	4.83
Pescaruş/Prunus sativa	52,97	59,18 (xx)	60,65 (xxx)	1.99	3.94	5.25
Pescăruş/Prunus cerasifera	65,35	72,53 (xx)	73,98 (xx)	1.76	3.47	4.63
Tuleu gras/Prunus sativa	53,58	59,83 (xx)	60,89 (xx)	1.50	2.97	3.96
Tuleu gras/Prunus cerasifera	61,03	67,57 (xx)	67,83 (xx)	1.21	2.39	3.18
	JULY					
	V1-untreat (control)	V2 – treat. with P1	V3 – treat. with P2	DL 5%	DL 1%	DL 0,1%
Curé/ Pyrus sativa	132,22	144,41 (x)	147,2 (xx)	1.5	2.99	5.23
Curé/ Cydonia oblonga	110,27	119,48 (x)	121,54 (xx)	1.65	3.29	5.76
Williams/ Pyrus sativa	115,44	126,90 (x)	128,36 (xx)	1.91	3.81	6.66
Williams/ Cydonia oblonga	95,18	104,01 (x)	105,42 (xx)	2.04	4.07	7.12
Comptesse de Paris/ Pyrus sativa	126,26	138,53 (x)	141,54 (xx)	2.5	4.98	8.72
Comptesse de Paris/ Cydonia oblonga	110,04	119,26 (x)	121,12 (xx)	2.32	4.62	8.09
Stanley/Prunus sativa	124,30	139,86 (xx)	141,75 (xxx)	2.76	5.45	7.27
Stanley/Prunus cerasifera	140,32	155,25 (xx)	156,48 (xx)	2.76	5.46	7.29
Pescaruş/Prunus sativa	119,48	132,19 (xx)	135,2 (xx)	2.66	5.27	7.02
Pescăruş/Prunus cerasifera	145,73	157,81 (x)	164,32 (xx)	2.86	5.66	7.55
Tuleu gras/Prunus sativa	119,96	131,39 (x)	136,25 (xx)	2.58	5.10	6.80
Tuleu gras/Prunus cerasifera	133,63	145,55 (x)	148,15 (xx)	2.55	5.05	6.73
	OCTOBER					
	V1-untreat (control)	V2 – treat. with P1	V3 – treat. with P2	DL 5%	DL 1%	DL 0,1%
Curé/ Pyrus sativa	192,36	199,03	206,94 (x)	4.25	8.46	14.80
Curé/ Cydonia oblonga	162,61	175,65 (x)	178,10 (x)	2.75	5.47	9.58
Williams/ Pyrus sativa	171,32	181,71	181,85	3.45	6.87	12.02
Williams/ Cydonia oblonga	164,33	170,72	172,48	2.35	4.68	8.19
Comptesse de Paris/ Pyrus sativa	182,45	195,44 (x)	197,32 (x)	4.51	8.97	15.71
Comptesse de Paris/ Cydonia oblonga	165,02	173,37	175,90	4.86	9.67	16.93
Stanley/Prunus sativa	203,29	216,27	216,31	3.53	6.99	9.32
Stanley/Prunus cerasifera	199,06	210,31	213,97 (x)	3.06	6.06	8.08
Pescaruş/Prunus sativa	205,96	215,62	220,17	4.07	8.05	10.73
Pescăruş/Prunus cerasifera	173,51	179,75	185,14	4.17	8.25	11.00
Tuleu gras/Prunus sativa	190,69	204,80 (x)	207,64 (x)	4.37	8.64	11.52
Tuleu gras/Prunus cerasifera	167,41	175,13	180,12 (x)	3.96	7.84	10.45

Analyzing this scions length at compatible and incompatible combination of pear/quince we didn't observe significant variations of this parameter, values recorded being contiguous. But in case of plum, incompatible association scion /rootstock (Pescarus/P. cerasifera and Tuleu gras/P. cerasifera) had smaller values than compatible association, which can suggest an accentuation of incompatibility at this species. Rootstock influence has been observed at all the studied species. Grafting on *Pyrus sativa* and *Prunus domestica* lead to the obtaining of vigorous trees, with longer shoots, than grafting on *Cydonia oblonga* and *Prunus cerasifera.* Since the starting of the vegetation period an intense growing of shoots at variants treated with Product 2 has been observed, especially when grafting was made on *Pyrus sativa* and *Prunus domestica.* During the vegetation period differences become smaller, although at the end of growing period treated variants recorded higher values of scion shoots than untreated variants.

Scions branching degree is influenced mostly by rootstock, which becomes responsible of the individual length of the shoots and angle, influencing in a great measure trees habitat. These trees give fruit earlier, and this fact has a significant influence on branches by modifying the branching angle.

Regarding average number of shoots/tree, results revealed a distinct influence of rootstock. At pear trees a higher featuring degree was recorded at variants grafted on *Pyrus sativa*, but in case of plum trees a better ramification degree was recorded at trees grafted on *Prunus cerasifera* (tab.3).

Table 3

Average number of shoots/tree at some pear and plum cultivars

Rootstock / scion	V1- untreat (control)	V2 – treat. with P1	V3 – treat. with P2	DL 5%	DL 1%	DL 0,1%
Curé/ Pyrus sativa	6,08	6,11	6,1	0,25	0,37	0,44
Curé/ Cydonia oblonga	4,73	4,74	4,7	0,45	0,67	0,79
Williams/ Pyrus sativa	6,47	6,48	6,48	0,86	1,27	1,51
Williams/ Cydonia oblonga	4,56	4,57	4,56	0,75	1,11	1,32
Comptesse de Paris/ Pyrus sativa	5,85	5,88	5,87	0,56	0,83	0,99
Comptesse de Paris/ Cydonia oblonga	4,34	4,35	4,34	0,32	0,47	0,56
Stanley/Prunus sativa	7,80	7,83	7,82	0,89	1,32	1,57
Stanley/Prunus cerasifera	8,04	8,07	8,1	0,66	0,98	1,16
Pescaruş/Prunus sativa	8,10	8,10	8,15	0,91	1,35	1,60
Pescăruş/Prunus cerasifera	8,30	8,33	8,34	0,96	1,42	1,69
Tuleu gras/Prunus sativa	8,25	8,29	8,3	0,88	1,30	1,55
Tuleu gras/Prunus cerasifera	8,36	8,60	8,54	0,25	0,37	0,44

Irrespective of specie and rootstock, treatment with ecological products did not influence significantly the number of shoots/tree, values of this parameter being close in both treated and untreated variants.

Coalescence of grafting partners is accompanied by changes in anatomic structure both level of the rootstock and scion due to reciprocal interaction, preponderance being observed at the scions level (Schmid, Heiner, 1999). Because of these reason stem diameter (measured above and below the grafing point) and the ratio between these indicators offer a complex image regarding vigour of grafted tree and coalescence degree.

Stem diameter was higher at pear both scion and rootstock level when grafting was made on *Pyrus sativa* than *Cydonia oblonga* (tab 4.). At plum trees bigger values of this parameter were recorded when grafting was made on *Prunus cerasifera*, which may be due to higher vigour of this rootstock comparing with *Prunus domestica.*

Table 4

Stem diameter at some pear and plum cultivars with different grafting compatibility degrees

Rootstock / scion	Rootstock diameter (2 cm below grafted area) (mm)					
	V1- untreat (control)	V2 – treat. with P1	V3 – treat. with P2	DL 5%	DL 1%	DL 0,1%
Curé/ Pyrus sativa	23,39	24,53	24,85	1,21	2,38	3,17
Curé/ Cydonia oblonga	21,75	22,67	23,87	1,85	3,66	4,88
Williams/ Pyrus sativa	23,58	25,20	25,23	0,90	1,78	2,38
Williams/ Cydonia oblonga	21,60	22,68	24,08	1,35	2,67	3,56
Comptesse de Paris/ Pyrus	21,63	22,89	23,51	1,62	3,21	4,28
Comptesse de Paris/ Cydonia	21,91	22,87	24,44	1,92	3,80	5,07
Stanley/Prunus sativa	23,69	24,83	24,8	1.25	1,85	2,20
Stanley/Prunus cerasifera	26,97	28,13	28,21	1.67	2,47	2,94
Pescaruş/Prunus sativa	25,05	25,85	25,86	1.61	2,38	2,83
Pescăruş/Prunus cerasifera	28,65	29,52	29,95	1.7	2,52	2,99
Tuleu gras/Prunus sativa	23,74	24,88	24,56	1.58	2,34	2,78
Tuleu gras/Prunus cerasifera	26,79	29,36	28,45	1.44	2,13	2,53
	Scion diameter (2 cm above grafted area) (mm)					
Curé/ Pyrus sativa	19,85	20,17	20,75	1,83	3,56	4,75
Curé/ Cydonia oblonga	17,90	18,92	19,72	1,52	3,01	4,01
Williams/ Pyrus sativa	18,71	20,19(x)	21,03	0,94	1,86	2,48
Williams/ Cydonia oblonga	17,07	19,61(xx)	20,66	1,27	2,51	3,35
Comptesse de Paris/ Pyrus	18,17	19,12	20,05	1,24	2,46	3,27
Comptesse de Paris/ Cydonia	17,04	18,35(x)	20,09	1,95	3,86	5,15
Stanley/Prunus sativa	20,70	20,87	21,56	1,44	2,13	2,53
Stanley/Prunus cerasifera	19,07	21,64(xx)	21,81	1,86	2,75	3,27
Pescaruş/Prunus sativa	19,56	21,31(x)	21,15	1,49	2,21	2,62
Pescăruş/Prunus cerasifera	19,73	21,44(x)	22,18	0,91	1,35	1,60
Tuleu gras/Prunus sativa	18,86	20,26(x)	21,10	1,33	1,97	2,34
Tuleu gras/Prunus cerasifera	21,96	22,49	22,72	1,27	1,88	2,24

Scion/rootstock stem diameter ratio is used as an important parameter in grafting success evaluation. Values close by 1 of this parameter suggest a good coalescence of the two grafting partners and a further good development of the trees. A slight increasing tendency of the values of scion/rootstock stem diameter ratio it has been observed at the variants treated with ecological products (both Product 1 and Product 2) irrespective of graft compatibility degree (tab.5). At pear incompatible variants scion/rootstock stem diameter ratio values were close to those recorded at compatible combinations. Instead at plum trees, a net differentiation of this parameter values between compatible and incompatible combinations has been recorded, higher values being noted at compatible association scion rootstock Pescaruş/*Prunus sativa*, Tuleu gras/*Prunus sativa*, Stanley/*Prunus sativa* and Stanley/*Prunus cerasifera*..

Table 5

Scion/rootstock stem diameter ratio at some pear and plum cultivars with different grafting compatibility degrees

Rootstock / scion	V1-untreat (control)	V2 – treat. with P1	V3 – treat. with P2
Curé/ Pyrus sativa	0,85	0,82	0,84
Curé/ Cydonia oblonga	0,82	0,83	0,83
Williams/ Pyrus sativa	0,79	0,80	0,83
Williams/ Cydonia oblonga	0,78	0,79	0,80
Comptesse de Paris/ Pyrus sativa	0,84	0,84	0,85
Comptesse de Paris/ Cydonia oblonga	0,78	0,80	0,82
Stanley/Prunus sativa	0,87	0,84	0,87
Stanley/Prunus cerasifera	0,71	0,77	0,77
Pescaruş/Prunus sativa	0,78	0,82	0,82
Pescăruş/Prunus cerasifera	0,69	0,73	0,74
Tuleu gras/Prunus sativa	0,79	0,81	0,86
Tuleu gras/Prunus cerasifera	0,76	0,77	0,80

In Romania, ecological products are used in orchards in the last decencies, but their utilization in grafting process is relatively new, and these results has to be verified by the furtherer studies.

CONCLUSIONS

1. Irrespective of specie and rootstock, an increasing of grafting success percentage has been observed at treated variants comparing with untreated (control), especially when **Product 2** was used.

2. At the end of the growing season treated with ecological products had a higher shoots length comparing with control, but a difference regarding featuring degree between treated and untreated variants was not observed.

3. Scion diameter recorded higher values when **Product 2** was applied comparing with control and those treated with product 1, which leaded to an increasing of scion/rootstock stem diameter ratio so we selected **Product 2** for furtherer researches.

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INFLUENCE OF FERTIGATION ON FRUIT YIELD IN HIGH DENSITY APPLE ORCHARDS UNDER GLOBAL CLIMATIC CHANGES

INFLUENŢA FERTIRIGĂRII ASUPRA RECOLTEI DE FRUCTE ÎN LIVEZILE INTENSIVE DE MĂR ÎN CONTEXTUL SCHIMBĂRILOR CLIMATICE GLOBALE

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Abstract. *The large increase of air temperature, in number of sunshine hours and lower rainfalls in the summer months, leads to the necessity of irrigation application using water saving techniques. This work goal is to present and recommend some orchard fertigation systems in apple and to highlights some results obtained in high density orchards. At Research Institute for Fruit Growing Pitesti-Romania, according to variety, the fruit productions obtained in an experimental high density apple orchard (3,077 trees ha^{-1}), were 19.3 t ha^{-1} up to 30.0 t ha^{-1}, in the second year after planting, and 29.7 t ha^{-1} to 38.5 t ha^{-1}in the third year from orchard establishment. For all fertilizer graduations, the cultivar 'Golden Delicious' clone B yielded the highest production 30.0 t ha^{-1}, followed by 'Jonagored' cultivar with 22.3 t ha^{-1} and respectively 'Fuji Kiku' Clone 8 with 19.3 t ha^{-1}, the differences being statistically insured.*

Key words: drip irrigation, environmental stress, rainfall deficit

Rezumat. *Tendinţa de creştere a temperaturii aerului şi a insolaţiei, asociată cu scăderea regimului de precipitaţii din lunile de vară, a impus treptat necesitatea aplicării irigărilor localizate, caracterizate prin eficienţă sporită în aplicarea udărilor. Această lucrare prezintă şi recomandă un astfel de sistem de fertirigare la specia măr şi evidenţiază câteva rezultate obţinute într-o livadă intensivă. La I.C.D.P. Piteşti - România, în funcţie de soi, producţia de fructe obţinută într-o plantaţie experimentală de măr de mare densitate (3.077 pomi/ha, plantaţi la 3,25 m x 1,0 m), a fost cuprinsă între 19,3 t/ha şi 30,0 t/ha, în anul II de la plantare, iar în anul III între 29,7 t/ha şi 38,5 t/ha. În medie pentru variantele de fertirigare, soiul 'Golden Delicious' clona B a înregistrat cea mai ridicată recoltă de fructe (30 t/ha), urmat fiind de soiul 'Jonagored' cu 22,3 t/ha şi soiul 'Fuji Kiku' Clona 8 cu 19,3 t/ha, diferenţele dintre ele fiind asigurate statistic.*

Cuvinte cheie: irigare localizată, stres ambiental, deficit pluviometric

INTRODUCTION

Under the climatic conditions from Central and South-Eastern Europe, periods of increasing frequent droughts become a limiting factor in increasing fruit production. Previous studies have shown that the impact of climate change on fruit trees species is already felt. By the end of 1990, the onset of fruit trees flower bud blossom in Germany has advanced a few days (Chmielewski et al., 2005) and the growing season in Europe was extended by 10 days in the last 10 years. Mateescu *et al.*, 2009, estimated that, in Pitesti, Romania, according to projections made by

regional climate model RegCM3/SRES A1B, annual average air temperature will increase by 1.5°C from 2020 to 2050 compared to the current conditions. The biggest increases are expected in the warm period of the year respectively during April-August period (1.6°C in May, 2.6°C in June, 2.8°C in July and 1.0°C in August). Annual amounts of rainfalls will decrease by an average of 91.1 mm, the largest decreases being projected, again, in the summer period. Chitu et al., 2009, stated that in Maracineni between 1969 and 2009, there was a statistically assured trend of weather warming, of sunshine hours and rainfalls deficit increasing and of the annual rainfalls decreasing. The months having the highest abnormal weather were June, July and August. The largest slope of temperature and Penman-Monteith potential evapo-transpiration increase has been registered, however, in August. Under these conditions, even if in climatic areas favourable for growing fruit trees, is increasing the rainfall deficit in summer months, growing fruit trees in high density systems require more efficient methods of irrigation and fertilization.

Fertigation, although widespread in arid areas, until now, little research have been performed on the application of fertigation in wetter areas (Treder, 2006). Many authors have argued that a highly accurate application, both for water and fertilizers, can be achieved by simultaneous administration by fertigation. Thus we obtain the advantage of simultaneous supply of mineral elements in accordance with the trees needs (Neilsen et al. 2001; Weinbaum et al. 1992). It creates favourable conditions for reducing the amounts of fertilizers applied and to minimize adverse impacts of excess application on the environment (Neilsen and Neilsen, 2002). From morphological point of view, fruit trees species are characterized by a low density of roots per unit of soil surface (10 to 100 times lower than the weeds), especially apple trees grafted on low vigour rootstocks (Neilsen et al., 1997). Consequently, a high efficiency in the distribution of fertilizers requires repeated applications, precise placement and high retention rates in the area explored by the great mass of roots.

Given the need to reduce the adverse effects of changes in the recent years of meteorological factors and phenological dynamics, through allocation and more stringent control of technological factors, we have undertaken at the Research Institute for Fruit Growing Pitesti - Romania, a study regarding the effect of different fertigation systems on apple trees.

MATERIAL AND METHOD

The researches were carried out at RIFG Pitesti - Romania during 2007-2009 periods. In the spring of 2007 a trial was established in a high density apple orchard with the trees planted at 3.25 x 1.00 m (3,077 trees ha^{-1}). The trial was a bifactorial one and included 18 variants (3 x 6) with 5 trees in repetition plot, following the subdivided plots design. The experimental factors taking into the study included: A factor, the cultivar: the biological material was represented by 'Jonagored', 'Fuji Kiku' Cl. 8 and 'Golden Delicious' clone B cultivars, grafted on M9 T 337 rootstock; B factor, the nutrients doses applied together with irrigation water and has had six graduations: b1 - untreated control, and treated with the annual fertilizer rates (kg ha^{-1}): b2 - $N_{(20)}:P_2O_{5-(10)}:K_2O_{(30)}:MgO_{(10)}$, b3 - $N_{(40)}:P_2O_{5-(20)}:K_2O_{(60)}:MgO_{(20)}$, b4 - $N_{(60)}:P_2O_{5-(30)}:K_2O_{(90)}:MgO_{(30)}$, b5 - $N_{(80)}:P_2O_{5-(40)}:K_2O_{(120)}:MgO_{(40)}$, b6 - $N_{(100)}:P_2O_{5-(50)}:K_2O_{(150)}:MgO_{(50)}$.

The experimental plot was placed on a plane terrain, located on the second terrace of the Arges River, the soil being brown eumesobasic, slightly podzolic şi pseudogleic one. As regards the texture, in the experimental plot soil was a sandy loam one, with a good aeration and water holding capacity. The soil reaction was slight acid (pH=5.8 - 6.8). Generally, the humus content was under 3%, indicating a low supply in nitrogen of the soil. The mobile phosphorus ranged between 8-10 ppm, showing a medium supplied soil. Analysis of the soil degree of bases saturation indicated that the soil had a low to medium natural fertility. The nitrogen index value was under 2%, revealing a low supplied soil with nitrogen. The orchard soil training system was a combination of grasses cover between the trees rows and herbicides in stripes of 1.0-1.2 m wide, along the trees rows.

The influence of the experimental factors was quantified using the following set of biological indicators: trees cross trunk section area (CTSA, cm^2), annual increase of trees cross trunk section area (AICTSA, cm^2), mean number of flower buds per tree (MNFB), percent of harvested fruits versus total number of flowers per tree (HFN/FLN, %), mean number of harvested fruits per tree (HFN), fruits mean weight at harvest time (FMW, g), and fruits mean production (PROD, t ha^{-1}). The high amount of the experimental data was stored and processed by the variance analysis, using the specialised program SPSS 14.0 with its bifactorial ANOVA calculation model and by correlations method (Pearson coefficients').

RESULTS AND DISCUSSIONS

Effect of experimental variants on fruit bearing processes in the second year after orchard establishment. The fruits production registered in the experimental device were pretty high for an orchard in the second year: 19.3 - 30.0 t ha^{-1} according the cultivar (fig. 1).

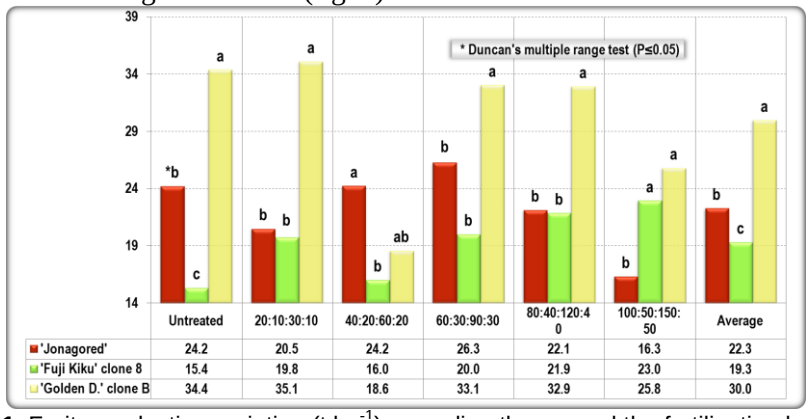
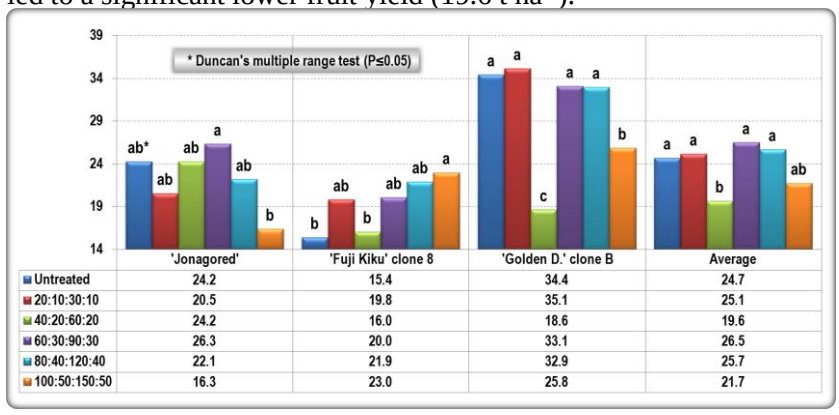


Fig. 1. Fruits production variation (t ha^{-1}) according the cv. and the fertilization levels

With few exceptions (fertilization with $N:P_2O_5:K_20:MgO$ in rates of 40:20:60:20 kg ha^{-1}), for all fertilizers graduations, 'Golden Delicious' clone B cultivar registered the highest fruit yields, over 30.0 t ha^{-1}, followed at statistical assured differences, by the cvs. 'Jonagored' with 22.3 t ha^{-1} and 'Fuji Kiku' with 19.3 t ha^{-1} respective, if the average values of fertilization levels are analyzed (Fig. 1).

If we analyze the fruits production variation (t ha^{-1}) according the fertilization level, for different cultivars (fig. 2), has been found that the yield

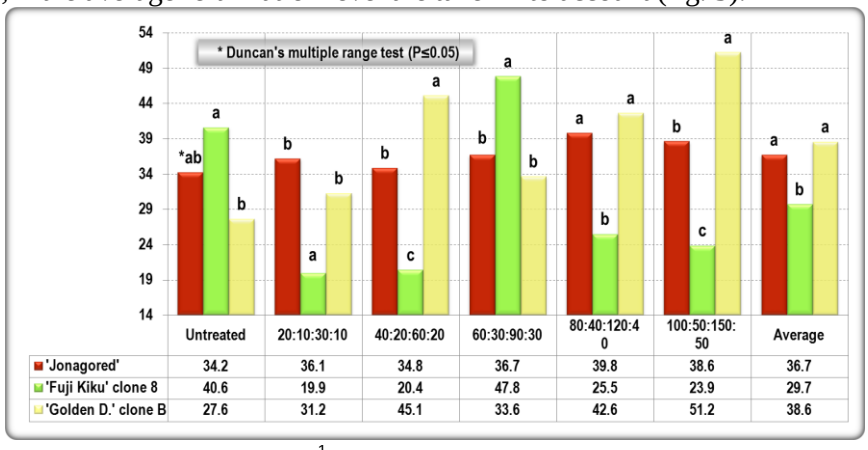
levels induced by different quantities of fertilizers applied in the second year after orchard establishment, are similar from the statistical point of view (21.7 – 26.5 t ha^{-1}), except the fertilization level of $N:P_2O_5:K_20:MgO$, 40:20:60:20 kg ha^{-1}, which led to a significant lower fruit yield (19.6 t ha^{-1}).



	'Jonagored'	'Fuji Kiku' clone 8	'Golden D.' clone B	Average
Untreated	24.2	15.4	34.4	24.7
20:10:30:10	20.5	19.8	35.1	25.1
40:20:60:20	24.2	16.0	18.6	19.6
60:30:90:30	26.3	20.0	33.1	26.5
80:40:120:40	22.1	21.9	32.9	25.7
100:50:150:50	16.3	23.0	25.8	21.7

Fig. 2. Fruits production variation (t ha^{-1}) according to fertilization level, for different cultivars

Effect of experimental treatments on fruit bearing process in the third year after orchard establishment. Although did not bear the highest number of fruits per trees, 'Jonagored' cultivar together with 'Golden Delicious' clone B registered the highest fruit yields (36.7 and respective 38.6 t ha^{-1}), which are significantly different compared to the one obtained by 'Fuji Kiku' cultivar (29.7 t ha^{-1}), if the average fertilization level are taken into account (fig. 3).



	Untreated	20:10:30:10	40:20:60:20	60:30:90:30	80:40:120:40	100:50:150:50	Average
'Jonagored'	34.2	36.1	34.8	36.7	39.8	38.6	36.7
'Fuji Kiku' clone 8	40.6	19.9	20.4	47.8	25.5	23.9	29.7
'Golden D.' clone B	27.6	31.2	45.1	33.6	42.6	51.2	38.6

Fig. 3. Fruit yield variation (t ha^{-1}) according to cultivar and different fertilization levels

Assessment of the fertilizers influence (fig. 4), reveal that in the third year after orchard establishment, the yield tends to be higher by increasing the quantity of fertilizers, the fruits productions ranging between 36.0 – 39.4 t ha^{-1}, on the cultivars average. The highest influence was registered on 'Golden Delicious' clone B cultivar. In this case, the indicator fruits yield (t ha^{-1}), in the variant

fertilized with N:P_2O_5:K_20:MgO, 100:50:150:50 kg ha^{-1} was almost double, (51.2 t ha^{-1}) versus untreated control (27.6 t ha^{-1}).

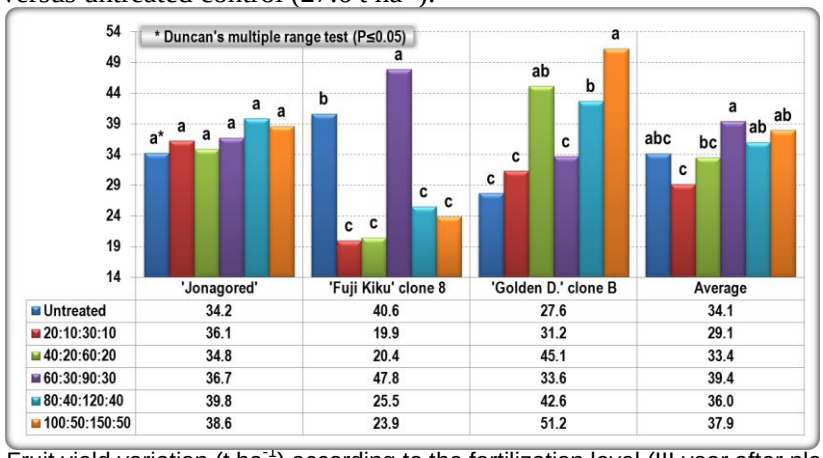


Fig. 4. Fruit yield variation (t ha^{-1}) according to the fertilization level (III year after planting).

Assessment of the correlations between the increasing fertilizers quantities applied in the orchard and the indicators defining the fruits production in the second and third years after orchard establishment (Table 1), evidenced the fertilizers favourable effect on MNFB in 2008 (r=0.107*), MNFB'09 (r=0.138**), on HFN'09 (r=0.178**) as well as on PROD'09 (r=0.146**). PROD'09 of the three apple cvs. was influenced with 86.1% (r=0.928**, with the extreme values between 0 and 74.5 t ha^{-1}) by the HFN (extremes between 0 and 142 fruits $tree^{-1}$) and insignificantly by FMW'09 variation, (r=0.012, extremes between 105 and 315 g $fruit^{-1}$).

Table 1

The correlation matrix between the fertilizers applied and the productivity indices in the IInd year (2008) and IIIrd year (2009) from orchard establishment (simple Pearson coefficients)

	N, P_2O_5, K_2O, MgO (kg/ha/year)	CTSA '08	MNFB '08	HFN '08	AICTSA '08	MNFB '09	HFN '09	HFN/FLN '09	FMW '09	PROD '09
N, P_2O_5, K_2O, MgO	1	-0.068	0.107*	0.034	-0.072	0.138**	0.178**	-0.048	-0.065	0.146**
CTSA '08	-0.068	1	-0.589**	-0.702**	0.912**	0.308**	0.080	-0.196**	0.276**	0.212**
MNFB '08	0.107*	-0.589**	1	0.826**	-0.676**	-0.360**	-0.070	0.275**	-0.164**	-0.156**
HFN '08	0.034	-0.702**	0.826**	1	-0.807**	-0.416**	-0.074	0.301**	-0.131**	-0.148**
AICTSA '08	-0.072	0.912**	-0.676**	-0.807**	1	0.413**	0.129**	-0.266**	0.232**	0.247**
MNFB '09	0.138**	0.308**	-0.360**	-0.416**	0.413**	1	0.264**	-0.643**	-0.007	0.292**
HFN '09	0.178**	0.080	-0.070	-0.074	0.129**	0.264**	1	0.167**	-0.312**	0.928**
HFN/FLN '09	-0.048	-0.196**	0.275**	0.301**	-0.266**	-0.643**	0.167**	1	-0.150**	0.117*
FMW '09	-0.065	0.276**	-0.164**	-0.131**	0.232**	-0.007	-0.312**	-0.150**	1	0.012
PROD '09	0.146**	0.212**	-0.156**	-0.148**	0.247**	0.292**	0.928**	0.117*	0.012	1

Figure 5 is representative for the results obtained in the high density apple orchards established at RIFG Pitesti - Romania, and presented in this paper.

a) b)

Fig. 5. High density apple orchard, in the third year after establishment: a) 'Golden Delicious' clone B cultivar and b. 'Jonagored' cv.

CONCLUSIONS

Early in the third year after orchard establishment the tendency of fruits production increase was noticed as a consequence of the applied fertilizers quantities ($N:P_2O_5:K_20:MgO$), from unfertilized to 100:50:150:50 kg ha^{-1}, the obtained fruits production ranging between 36.0 - 39.4 t ha^{-1}, on cvs. mean values.

The highest fruits production increase was registered at 'Golden Delicious' clone B cv., on which in the variant fertilized with $N:P_2O_5:K_20:MgO$ at the rates of 100:50:150:50 kg ha^{-1}, the production was almost double (51.2 t ha^{-1}) compared to the one obtained in the untreated control variant (27.6 t ha^{-1}).

It was noticed the favourable effect of the fertilizers application by fertigation on the number of flower buds in the second year (r=0.107*) and in the third year (r=0.138**), on the fruits number per tree (r=0.178**) and on fruits production (r=0.146**), in the third year after orchard establishment.

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STIMUSOIL 200 PRODUCT APPLICATION EFFECT ON GROWTH AND FRUITING OF BLUERAY BLUEBERRY CV.

EFECTUL APLICĂRII PRODUSULUI STIMUSOIL 200 ASUPRA CREŞTERII ŞI FRUCTIFICĂRII SOIULUI DE AFIN BLUERAY

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Abstract. *Studies regarding the effect of Stimusoil 200 dual-action product application (biostimulator and fertilizer) at RIFG Pitesti, during 2005-2006 periods, were performed. The experiment was organized in a 20 years old plantation, with 4,000 plants ha^{-1}, according to the following scheme: T1) ground application with incorporation; T2) ground application without incorporation; T3) control, water application. Each trial was linearly designed in 3 replications (10 bushes per replication). The product was applied in June 2005, at a dose 0.1 ml m^{-2}. Measurements were carried out on vegetative growth yield and fruit quality. The results showed the positive effect of Stimusoil 200 ground incorporation on vegetative growth and yield of bushes, which increased with 52% and 62% respectively, compared with control. In both treated plots, the fruit quality was improved.*

Key words: yield, fruit weight, chemical composition

Rezumat. *Studii cu privire la efectul aplicării produsului cu acţiune dublă (biostimulator şi fertilizant) Stimusoil 200 s-au efectuat la ICDP Pitesti-Mărăcineni în perioada 2005-2006. Experienţa s-a organizat într-o plantaţie în vârstă de 20 de ani cu 4000 de plante /ha, după următoarea schemă: V1 aplicare la sol cu încorporare, V2 aplicare la sol fără încorporare, V3 martor tratat cu apă. Fiecare variantă a fost dispusă liniar în 3 repetiţii cu 10 tufe/repetiţie. Produsul s-a aplicat în luna iunie 2005, în doză de 0,1ml/m^2. S-au efectuat determinări privind creşterile vegetative, producţia şi calitatea fructelor. Rezultatele obţinute au evidenţiat efectul pozitiv al produsului asupra creşterilor vegetative, care au fost cu 52% mai mari şi a producţiei de fructe care a crescut cu 62 % în varianta cu încorporarea în sol faţă de martor. În ambele variante tratate calitatea fructelor a fost îmbunătăţită.*

Cuvinte cheie: producţie, greutate medie, compoziţie chimică

INTRODUCTION

High blueberry bush is native from North America and in Europe started into culture at 1925 and in 1968 was introduced in Romania too. The first blueberry cultures have been done at Research Institute Pitesti Maracineni and at research stations Baia-Mare, Iasi and Fagaras. One aspect of technology, the fertilization as important factor with major effects in terms of fruit production, has been widely studied abroad (Ciovatta and Benedetti, 2000, Clarkson and Lüttge, U.

1990, Mengel, 2002, Andrew in 2002), at home at Pitesti Maracineni and in the fruit growing research network (Mladin, et al., 2008, Borlan, 1988; Chitu E., 2000, Platon, 2006, Cardei E. 2006, Iancu et al., 2008, Chitu V., et al., 2008). This paper is part of that research, and is goal is to obtain a balance between growth and fructification by additional nutrition and to stimulate the yield production by product application.

MATERIAL AND METHOD

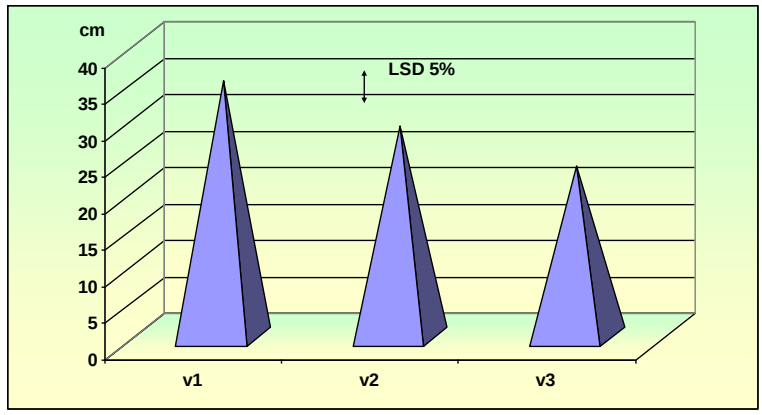
Studies regarding the effect of product with double action application (bio-stimulator and fertilizer) Stimusoil 200 was made at Research Institute for Fruit Growing Pitesti - Maracineni in 2005-2006 periods. The experimental field was placed in a 20 years old plantation with 4,000 plants ha^{-1}. The following trial scheme was done:T1 – application of the Stimusoil 200 product in June 2005, at a dose of 0.1 ml m^2, with soil incorporation, T2-Stimusoil ground application without soil incorporation, T3 - control treated with water. The soil from experimental plots was pseudogleic vertic type, medium-textured up to 60 cm deep and compact clay deeper than 60 cm. Soil has a moderate acidity, medium supplied with nutrients and a low concentration in humus. Each trials plot has been ordered linearly in 3 replications, with 10 bushes per each replication. Observations and tests were carried out related to vegetative growth, production, fruit quality and flower bud induction for the next year (biometric method were used). To evaluate the vegetative growth, shoots from all bushes were measured. Fruit production was determined in each replication and trial. To determine the fruit weight, 100 fruits were collected from each replication and trial. Fruit dry matter and pH were determined in the laboratory on 50 fruits from each replication and trial. The number of inflorescences was determined on the control branches and was reported at a length of 20 cm of 2 years stems. The data were processed by analysis of variance.

RESULTS AND DISCUSSIONS

Foliar application of nutrients to the soil or plant is based on the ability of the plant to absorb nutrients and transport them to their points of growth. Stimusoil 200 is a liquid organic fertilizer with a joint action – fertilizer and biostimulator, to meet the requirements of sustainable agriculture. Results obtained following the application of this product are shown in Figures 1-6. Growth is a quantitative accumulation process leading to increase the vegetative plant biomass. The longest blueberry shoots are generated from the buds located at the upper third part of the bushes stems and usually have had 2 waves of growth. The first wave duration was of 30 days from the end of flowering period, and the second was of 30 days before harvesting. Stimusoil 200 applications had a favorable effect in increasing the shoot length, the differences being statistically assured. The largest growth of the shoots were recorded in the trial in which the product was incorporated into the soil (T1 - 52% longer than control, differences being very significant), and a growth with only significant differences compared with the T2 trial (without product incorporation, figure 1). The best results obtained in the plot when the product was incorporated into the soil, could be

attributed to the fact that once placed in the root zone, the product was immediately absorbed from the root surface.

Also, from figure 1 one can see that differences statistically assured were obtained between the trial without product incorporation (T2) and control, the shoots lengths being increased with 24**%.**



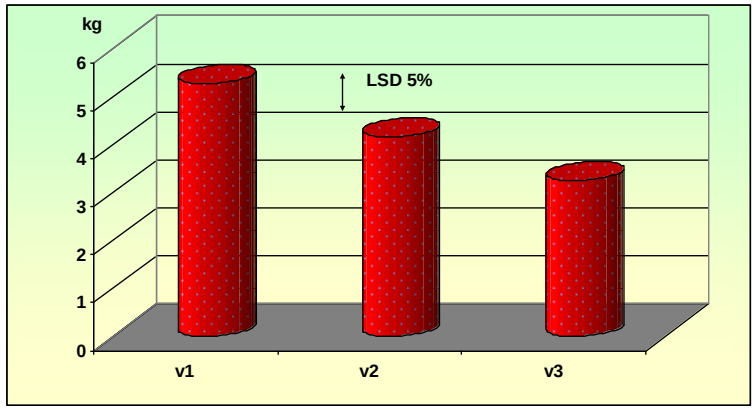
DL 5%= 2.765

Fig.1. The effect of Stimusoil 200 application on the shoots length

Regarding the fruit production obtained in the experimental plots, one can see from figure 2 that the best results were obtained in the trials in which the product was incorporated into the soil (T1), the fruit production per bushes being very significantly higher with 62% compared to control (T3) and significantly bigger with 27% compared to the plot without product incorporation (T2). Significant differences were also obtained between the plot without product incorporation into the soil and control, fruit production in this case being with 28% higher (figure 2).

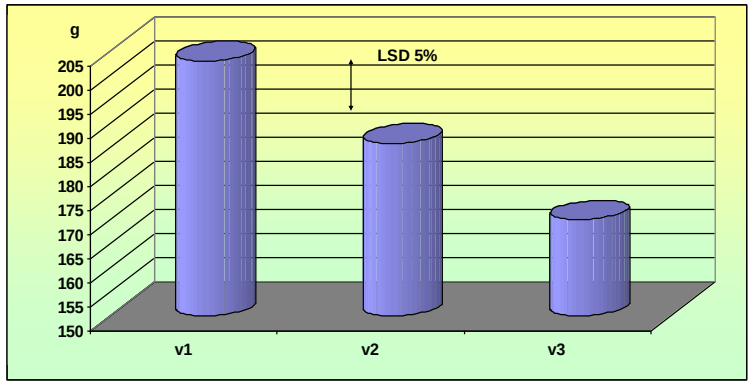
Analyzing the effect of Stimusoil 200 application on the average weight of 100 fruits, one can see from Figure. 3 that the 100 fruits average weight was positively influenced in both treated plots, compared with control. However, in the plot with product incorporation into the soil were recorded the best results, very significantly higher (19% vs. control), and significantly distinct compared with plot without product incorporation into the soil where the weight of 100 fruit was 9% lower (figure 3).

Positive effects on fruit dry matter were recorded in the treated plots, too. One can see in figure 4 that the percentage of fruit dry matter increases very significantly by 29.5% in plot with product incorporation into the soil and by 22.2% in the plot without product incorporation, compared with fruits from untreated plot. There were not statistically assured differences between the treated plots fruits dry matter.



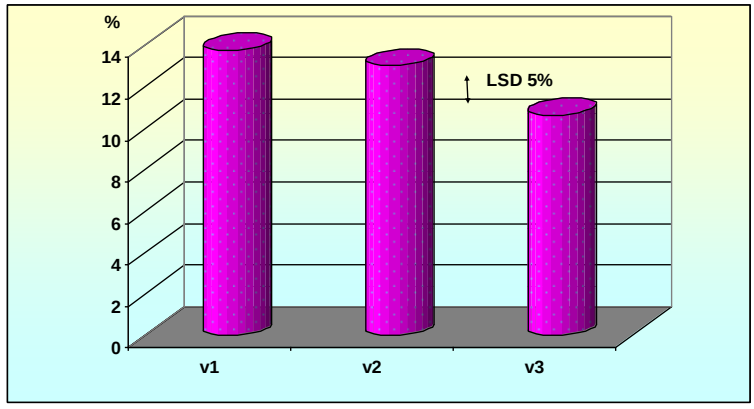
DL 5%= 0.745

Fig.2. Effect of Stimusoil 200 application on fruit production (kg / bush)



DL 5%= 10.690

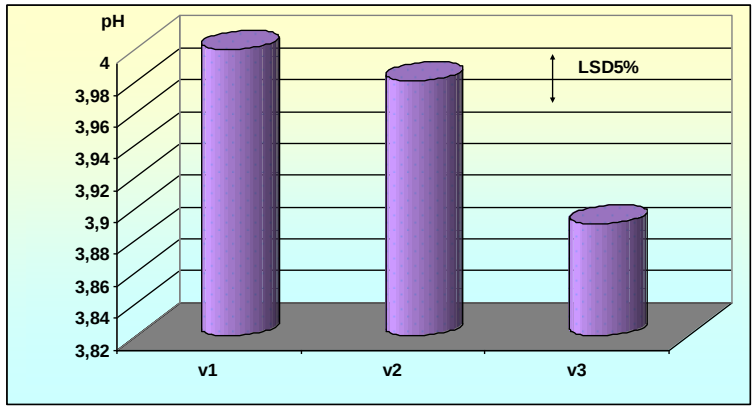
Fig.3. Effect of Stimusoil 200 application on average of 100 fruits weighs (g)



DL 5%= 1.810

Fig. 4. Effect of Stimusoil 200 application on fruits dry matter

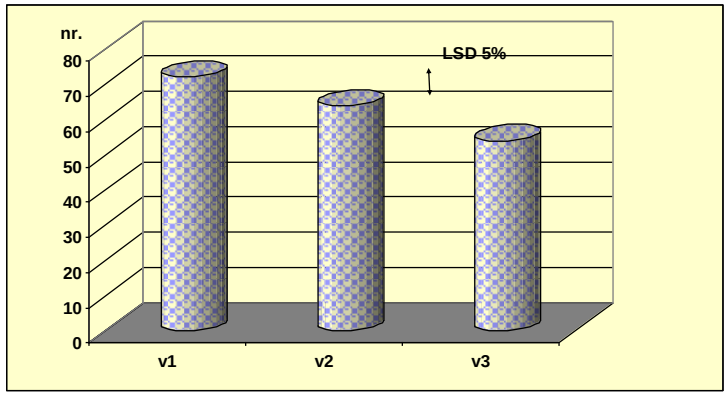
One recorded statistically assured in fruit pH (determined in fresh juice fruit) between treated plots and control and without statistically differences between the two methods of application (figure 5).



DL 5%=0.32

Fig. 5. Effect of Stimusoil 200 application on fruits pH

Analyzing the effect of Stimusoil 200 application on flower buds, one can see in figure 6, that the product have had a positive influence. The number of inflorescences per bush in treated plots were with 33% (T1) and 19% (T2) higher than control. Regarding this indicator statistical differences were obtained between the treated plots. However, in the plots in which the product was incorporated into the soil, the number of inflorescences was 13% higher compared with the plot without product incorporation into the soil.



DL 5%= 2.829

Fig 6. Effect of applying Stimusoil 200 of the number of inflorescences

CONCLUSIONS

By applying the liquid organic fertilizer Stimusoil 200 in dose of 1l ha^{-1} were obtained the following results:

1. The length of shoots was with 52% higher in the plot with product incorporation into the soil (T1), compared with control (T3);

2. The fruit production increased by 62% in the plot with product incorporated into the soil (T1), versus control. Stimusoil 200 application, induced an higher average fruit weight and also a higher fruit dry matter content and a higher fruit juice pH compared with control.

3. Number of inflorescences per two years old stems was with 33% higher in the plots with product incorporated into the soil, compared with control and with 13% higher versus the plot without product incorporation.

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ASPECTS CONCERNING THE RELATIONSHIP BETWEEN PHOTOSYNTHETIC PIGMENTS AND SOLUBLE SUGARS AMOUNT OF SOME *PRUNUS AVIUM* CULTIVARS

ASPECTE PRIVIND RELAŢIA DINTRE CONŢINUTUL DE PIGMENŢI ASIMILATORI ŞI CANTITATEA DE GLUCIDE SOLUBILE LA UNELE SOIURI DE *PRUNUS AVIUM*

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Abstract. *The life essence of a photosynthetic organism is its assimilating pigments. Without them the light can`t be absorbed and thus no energy can be stored. This is why chlorophylls have been the subject of many years of research. Since more than two thirds of woody plant dry matter consists of processed sugars, their growth and development depends fundamentally by the synthesis of carbohydrates, their transport to the 'sinks' from 'sources' and systematic uptake by new tissues. Analyzing the results obtained we found differences in assimilating pigments contents of the cherry varieties taken in the study. The values of assimilating pigments quantities ranged from 5.222 mg·g^{-1} (DW) in the 'Germersdorf' variety to 10.358 mg·g^{-1} (DW) in the 'Van' variety. There were also significant differences in the levels of soluble carbohydrate content present in the leaves and cherry fruits of the same cherry varieties.*

Key words: chlorophyll a, chlorophyll b, carotenoids, soluble sugars.

Rezumat. *Esenţa vieţii unui organism fotosintetic sunt pigmenţii asimilatori ai acestuia. Fară ei lumina nu poate fi absorbită şi, astfel, nici energia nu poate fi stocată. De aceea, clorofilele sunt de mulţi ani subiectul numeroaselor cercetări. Deoarece mai mult de două treimi din substanţa uscată a plantelor lemnoase constă din zaharuri transformate, creşterea şi dezvoltarea lor depinde fundamental de sinteza carbohidraţilor, transportul acestora de la 'surse' la 'utilizatori' şi asimilarea sistematică în ţesuturile noi. Analizând rezultatele obţinute, am constatat diferenţe ale conţinutului de pigmenţi asimilatori la soiurile de cires luate în studiu. Valorile cantităţilor de pigmenţi asimilatori au fost cuprinse între 5.222 mg·g^{-1} (S.U.) la soiul Germersdorf şi 10.358 mg·g^{-1} (S.U.) la soiul Van. De asemenea, au fost înregistrate diferenţe semnificative ale valorilor conţinutului de glucide solubile prezente in fruzelele şi fructele soirilor de cireş luaţi în studiu.*

Cuvinte cheie: clorofila a, clorofila b, carotenoizi, glucide solubile.

INTRODUCTION

The lifeblood of a photosynthetic organism is its pigments. Without them light cannot be absorbed, and therefore energy cannot be stored. The biological process whereby the Sun's energy is captured and stored by a series of events that convert the pure energy of light into the biochemical energy needed to power life was called *photosynthesis*. Photosynthesis means literally "synthesis with light"

as such it might be construed to include any process that involved synthesis of a new species of chemical compounds under the action of light. The most common form of photosynthesis involves chlorophyll-type pigments, and operates using light-driven electron transfer processes. The organisms will be considered to carry out what we will term "chlorophyll-based photosynthesis".

Photosynthesis uses light from the Sun to drive a series of chemical reactions. The Sun, like all stars, produces a broad spectrum of light output that ranges from gamma rays to radio waves. Only some of the emitted solar light is visible to our eyes, consisting of light with wavelengths from 400 to 700 nanometers (nm). The entire visible range of light, and some wavelengths in the near infrared (700 to 1000 nm), are highly active in driving photosynthesis in certain organisms, although the most familiar chlorophyll *a*-containing organisms cannot use light longer than 700 nm. The spectral region from 400 to 700 nm is often called *photosynthetically active radiation*, although this is only strictly true for chlorophyll *a*-containing organisms.

Thus, knowing the importance of assimilating pigments and their role in the life of plants, we aimed to determine their content in 14 cherry varieties and hybrids, the ratio of the chlorophyll pigments and carotenoids, and correlate the results with pedo-climatic zone of culture. Also, we intended to pursue the relationship between the content of assimilating pigments and soluble carbohydrates content to highlight a possible correlation between these two parameters of studied cherry varieties and hybrids.

MATERIAL AND METHOD

Our analysis was performed on 10 varieties and 4 hybrids (hybrids` author is Ph.D. Petre Ludovic) from Cherry National Germplasm Collection of Research and Development Department of Pomology, Iasi, Romania.

Assimilating pigments extraction has been realized in 85 % acetone. The readings were done using T70 UV-VIS Spectrophotometer.

Soluble sugar measurement has been made as follows: from cherry trees leaves fine grinded samples soluble sugars were extracted by hot ethanol (3 replicates). Five mL of 70% (v/v) ethanol were mixed by shaking it with 300 mg of grinded stem tissues in a test tube. The sample was then incubated at 80 ˚C for 20 min. by shaking and then centrifuged for 5 min. at 1500×g. Freshly prepared anthrone reagent (0.2% anthrone in concentrated H_2SO_4) was pipetted into a test tube and chilled in ice water. The extract was thoroughly mixed with the anthrone reagent, the tube heated in boiling water for 15 min. and then rapidly cooled. The absorbance was read at 630 nm. Total soluble sugar content was calculated as *g* per 100*g* biomass unit.

REZULTS AND DISCUSSIONS

The molecular chemical formula for chlorophyll *a* is $C_{55}H_{72}N_4O_5Mg$. This simple representation is entirely inadequate to convey the essential properties of this extraordinary molecule. It is a squarish planar molecule, about 10 Å on a side. The Mg atom in the center of the planar portion is coordinated to four nitrogen atoms. The nitrogen atoms are each part of a substructural element of the

molecule that is derived from pyrrole, a cyclic organic compound with a nitrogen atom in a five-numbered ring with four carbons. For this reason, chlorophylls and related compounds are often referred to as tetrapyrroles. A fifth ring is formed in the lower right corner, and a long hydrocarbon tail is attached to the lower left (in the standard representation). Chemically, the chlorophylls are related to the porphyrins, which are also tetrapyrroles, but the porphyrins are generally more symmetric molecules.

Chlorophyll *b* is identical to chlorophyll *a* except at the C-7 position, where a formyl group replaces the methyl group. This change shifts the maximum absorption to shorter wavelengths.

Carotenoids are found in all known native photosynthetic organisms, as well as in many nonphotosynthetic organisms (Frank *et al*., 2000). There are many hundreds of chemically distinct carotenoids. However, there are some consistent structural features that are common to most photosynthetic carotenoids. They are extended molecules with a delocalized *p* electrons system.

Experimental results from *table 1* show significant differences of the assimilating pigments content to the varieties and hybrids of cherry note study. The lowest values of chlorophyll amounts were recorded in variety Germersdorf and were around 3.18 $mg \cdot g^{-1}$ (DW) for chlorophyll *a*, 0.90 $mg \cdot g^{-1}$ (DW) for chlorophyll *b* and 1.14 $mg \cdot g^{-1}$ (DW) carotenoid pigments. Thus, registering a total amount of about 5.22 $mg \cdot g^{-1}$ (DW) pigments assimilated into the leaves of this variety of cherry. Maximum values of chlorophyll pigments and carotenoids was registered on Van cultivar and were about 5.47 $mg \cdot g^{-1}$ (DW) for chlorophyll *a*, 2.85 $mg \cdot g^{-1}$ (DW) for chlorophyll *b* and 2.04 $mg \cdot g^{-1}$ (DW) for carotenoids. Total assimilating pigments reached 10.358 $mg \cdot g^{-1}$ (DW).

Although the chlorophyll *b* is the major accessory light-absorbing pigment in the majority of eukaryotic photosynthetic organisms, with the exception of the red and brown algae, we obtained some higher values of carotenoids (a quantosome contains 160 chlorophyll *a* molecules + 70 chlorophyll *b* molecules + 48 molecules of carotenoids etc. (Park R.B. and Biggins J. 1964) in all varieties and hybrids. It is known that carotenoids have several well-documented essential functions in photosynthetic systems. First, they are accessory pigments in the collection of light, absorbing light and transferring energy to a chlorophyll-type pigment. Most antenna complexes contain carotenoids. Second, carotenoids function in a process called *photoprotection*. Carotenoids rapidly quench triplet excited states of chlorophylls before they can react with oxygen to form the highly reactive and damaging excited singlet state of oxygen. They also quench the singlet oxygen if it is somehow formed.

Table 1

Assimilating pigments content of some cherry varieties and hybrids (*Prunus avium* L.)

Varieties	Chl. *a* $mg \cdot g^{-1}$ *DW*	Chl. *b* $mg \cdot g^{-1}$ *DW*	Carotenoids $mg \cdot g^{-1}$ *DW*	Σ
Van	5.47±0.52	2.85±0.18	2.04±0.17	10.36
Stella	4.75±0.42	1.35±0.12	1.48±0.12	7.58
Maria	3.78±0.36	1.20±0.10	1.34±0.11	6.32
Bucium	4.36±0.38	1.20±0.11	1.47±0.12	7.03
Rivan	4.58±0.41	1.27±0.14	1.46±0.12	7.30
George	3.90±0.33	1.08±0.08	1.30±0.11	6.28
Golia	3.63±0.31	1.10±0.09	1.22±0.10	5.95
New Star	4.74±0.44	1.42±0.12	1.45±0.12	7.61
Boambe de Cotnari	3.78±0.35	1.15±0.11	1.25±0.11	6.17
Germersdorf	3.18±0.29	0.90±0.06	1.14±0.10	5.22
H.C. 840808	3.59±0.31	1.02±0.08	1.29±0.13	5.91
H.C. 840933	4.23±0.39	1.20±0.10	1.44±0.12	6.87
H.C. 871616	4.60±0.42	1.34±0.11	1.51±0.13	7.44
H.C. 893705	4.80±0.45	1.42±0.12	1.63±0.14	7.85

Each value is shown as the mean ± S.D. of 12 samples.
DW – dry weight.

Finally, carotenoids have recently been shown to be involved in the regulation of energy transfer in antennas. So, as a preliminary conclusion, we can say that both cherry varieties and hybrids had a high photosynthetic activity and efficiency and also, due to high concentration of carotenoids, an effective photoprotection mechanism.

All chlorophyll-based photosynthetic organisms contain light-gathering antenna systems (Green and Parson, 2001). These systems function to absorb light and transfer the light's energy to a trap, which quenches or deactivates the excited state. Light-induced electron transport generates ATP and NADPH, which are high-energy compounds of intermediate stability. But they are not suitable for long term storage of energy, such as building plant biomass, or for storage in seeds, tubers or fruits. For these, it is necessary to convert the energy into a more stable form. Most plants produce sugars or more complex carbohydrates such as starch for long-term energy storage, although some plants produce large quantities of proteins or oils. Some of these conversions are carried out within the chloroplast, while in other cases they take place in the cell cytoplasm from building blocks that are exported from the chloroplast.

Carbon fixed by the Calvin cycle is processed for longer-term storage in two distinct forms. One of these forms is starch, which is made and stored, during the day, in the chloroplast. The other form is sucrose, which is made in the cytoplasm. Both processes take place at significant rates and the interplay between them is highly regulated. In both cases, the storage product is a nonreducing oligosaccharide that is not phosphorylated. The monosaccharide glucose is rather easily oxidized and it's not suitable as a storage product.

Soluble sugars (fructose, glucose, raffinose, sorbitol, stachyose, sucrose) content synthesized in leaf cells (*table 2*) ranged out 3.78% (DW) on cherry hybrid HC 893705 and 7.89% (DW) on 'Golia' variety. A higher amount of foliar soluble sugars (over 7% DW) showed on varieties 'Stella' (7.85%), 'Boambe de Cotnari' (7.39%), 'Georgia' (7.25%), cherry hybrids HC 840808 (7.17%) and H.C. 871616 (7.04%). That's why we tend to believe that a higher amount of sugars is produced by trees which have a bigger content of assimilating pigments in their leaves. But, analyzing *figure 1* we can see another picture from which we expect. So, for example, variety 'Van' had the biggest content of assimilating pigments (10.36g·100g^{-1} DW) but soluble sugars amount is far to be the biggest one in leaves (5.86g·100g^{-1} DW) and fruit flesh (12g·100g^{-1} DW). On the other hand, variety 'Golia' showed almost the lowest content of assimilating pigments (5.95g·100g^{-1} DW) and the biggest amount of soluble sugars in leaves (7.89g·100g^{-1} DW) and, also, a bigger one in fruit flesh (14g·100g^{-1} DW).

Table 2

Soluble carbohydrate content of leaves and fruits of some sweet cherry varieties and hybrids (*Prunus avium* L.)

Varieties	Leaf soluble sugars *g·100g^{-1} DW*	Fruit flesh soluble sugars *g·100g^{-1} FW*	Leaf soluble sugars/fruit flesh soluble sugars ratio
Van	5.86±0.47	12±0.87	2.0
Stella	7.85±0.68	14±0.95	1.8
Maria	6.23±0.56	14±0.93	2.2
Bucium	5.49±0.42	14±0.98	2.6
Rivan	4.64±0.33	16±1.02	3.4
George	7.25±0.61	15±1.07	2.1
Golia	7.89±0.65	14±0.99	1.8
New Star	6.84±0.54	13±0.98	1.9
Boambe de Cotnari	7.39±0.61	17±1.21	2.3
Germersdorf	6.95±0.56	14±1.03	2.0
H.C. 840808	7.17±0.60	14±0.89	2.0
H.C. 840933	6.65±0.53	15±1.12	2.3
H.C. 871616	7.04±0.59	15±1.17	2.1
H.C. 893705	5.86±0.47	16±1.18	4.2

Each value is shown as the mean ± S.D. of 12 samples for leaves and 3 for fruits.
DW – dry weight.

So, by performing this analysis we found that it is not necessary for a bigger content of assimilating pigments to have a higher amount of soluble sugars in tree`s leaves cells. We believe that it is rather due to cells osmotic pressure pattern and stress adaptation. Therefore, a certain average concentration of soluble sugars in leaves cells during vegetative period can be considered a marker for each species and their varieties. Plants resort many adaptive strategies in response to abiotic environmental stress such as dehydration and excessive osmotic pressure.

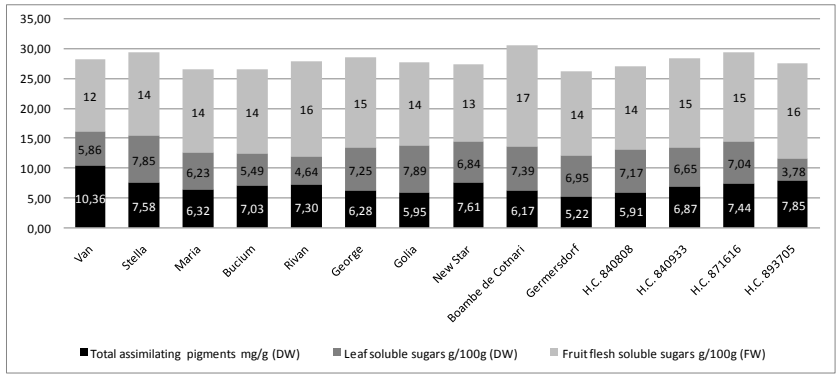

Fig. 1. Assimilating pigments, leaf and fruit soluble sugars amount of some *Prunus avium* L. varieties and hybrids

These adaptive mechanisms include changes in physiological and biochemical processes. Adaptation to stress is associated with metabolic adjustments that lead to the accumulation of several organic solutes like sugars, polyols, betaines and proline (Yancey et all, 1982).

CONCLUSIONS

Performing our analysis data on 10 cherry varieties and four hybrids we observed that the assimilating pigments average content during vegetative period are not correlated with leaves soluble sugars amount.

We believe that the content of soluble sugars in leaves is rather due to cells osmotic pressure pattern and stress adaptation of each studied varieties.

Acknowledgement:

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THE ECONOMIC EFFICIENCY ON PRODUCING „KNIP-BAUM" APPLE TREES IN THE FRUIT NURSERY

EFICIENŢA ECONONICĂ A PRODUCERII POMILOR DE MĂR DE TIPUL „KNIP-BAUM" ÎN PEPINIERA POMICOLĂ

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Abstract. *The investigations were made during the period of three years (2005-2007) in the fruit nursery of the Moldovan-Dutch enterprise „Fruit Nurseries" Ltd. The economic efficiency on producing „knip-baum" apple trees in the fruit nursery was determined by three varieties (Idared, Jonagored and Golden Reinders), bench-grafted on rootstock M 9, based on the efficiency, freight quality and selling trees. It was established that the income from selling the „knip-baum" apple trees for all the studied varieties and on average for all the investigation years represented 1426,24-1495,84 thousand lei/ha, the profit was between the limits of 868,78-938,38 thousand lei/ha and the production rentability – 156-168 %.*

Key words: economic efficiency, „Knip-baum" apple trees, income, profit, production rentability

Rezumat. *Investigaţiile au fost efectuate pe parcursul a trei ani (2005-2007) în pepiniera pomicolă a întreprinderii moldo-olandeze SRL „Fruit Nurseries". Eficienţa economică la producerea pomilor de măr de tipul „knip-baum" a fost determinată pe trei soiuri (Idared, Jonagored şi Golden Reinders), altoite la masă pe portaltoiul M 9, în baza randamentului şi calităţii biologice a pomilor. S-a stabilit că venitul din vânzarea pomilor de tipul „knip-baum", la toate soiurile studiate şi în medie pe anii de investigare, a reprezentat 1426,24-1495,84 mii lei/ha, profitul a fost de 868,78-938,38 mii lei/ha iar rentabilitatea producţiei de 156-168 %.*

Cuvinte cheie: eficienţa economică, pomi de măr de tipul „knip-baum", venit, profit, rentabilitatea producţiei

INTRODUCTION

New stage development of fruit growing domain in the Republic of Moldova foresees to restore and set new forms of organization of producing fruits, introduce rapidly the science's achievements, promote new perspective varieties in the orchards with high productivity (grafted on dwarf rootstocks) and implement technological modern elements that will increase the yield and ameliorate fruits quality according to the market requirements (Balan V. şi colab., 2008; Barbaroş Nadejda, 2007).

All these tasks are foreseen to be solved in a limited term that requires in a considerable mode to increase the plant material production, especially that of grafted apple trees on dwarf rootstock and with crown (Babuc V., Rapcea M., 2002; Balan V. şi colab., 2001).

Nowadays, in countries with a developed pomology as Poland,

Netherlands, Italy, etc., the superintensive apple orchards are established with two-year old trees with crown base already formed the nursery (Werth K., 2003; Wilton J., 2001; Bielicki P., Czynczyk A., 1999). Trees of this type and planted in the orchard, have an earlier fruit production and manifest an early fructification (Peşteanu A., 2007).

The aim of the study is to determine the economic efficiency on producing „knip-baum" apple trees in the fruit nursery in the Republic of Moldova.

MATERIAL AND METHOD

The researches were made in the period of 2005-2007 years in the fruit nursery of the Moldovan-Dutch Joint stock company "Fruit Nurseries". As biological material were used the apple trees of Golden Reinders, Jonagored and Idared varieties, bench-grafted of rootstock M 9.

Bench-grafting was made in March by using the method of perfected copulation with detached branch. The place of grafting was tied with a porous polyethylene, specialty destined to graft, and the grafting was paraffined. The grafted marcotes were stratified by placing them in vertical position into containers, so as the base part of marcote (20-25 cm) to be in a moist sand layer. The stratification temperature in the refrigerator is +2…+4^{o}C. For grafting, were used marcotes with a diameter of 10.0 mm and virus free branches imported from Holland.

The first field of the fruit nursery was founded in the second part of April with bench-graftings. The distance of plantation of grafted trees was 90x35 cm. During the vegetation period, the grafting was tied to a bamboo stick.

In spring, in the second field, the annual shoots of grafts were shortened at a height of 50-60 cm from the grafting place. Simultaneously with the appearance of lateral shoots was cleared up from the trunk, leaving only the terminal shoot. With the aim to obtain sylleptic shoots on the central axle, when they have reached the length of 15-20 cm, it was made the periodic remove of apical leaves 6-7 times without affecting the growth terminal bud (according to "knip-baum" system). This operation was repeated every 5-7 days.

The researches were made according to methods unanimously recognized and used to evaluate the economic efficiency in agriculture.

RESULTS AND DISCUSSIONS

The investigations made demonstrate that the apple trees production output in the second field of the fruit nursery depends on the degree of grafting pinning in the year of plantation and applied agro-technical measurements.

During the researches (tab. 1) the highest output of apple trees formed by "knip-baum" method was obtained in 2005 where the mentioned index of the varieties taken into study constituted 30.63-31.38 thsnd pcs/ha.

In 2006 and 2007 the apple trees output of the studied varieties decreased non-significantly.

At the varieties taken into study, in 2005 and 2006, high values of apple tree production output have registered the Golden Reinders variety (31.05 thsnd pcs/ha and 31.04 thsnd pcs/ha) and in 2007 the Idared variety (31.19 thsnd pcs/ha).

Jonagored variety registered average values between 29.77 and 31.38 thsnd

pcs/ha.

In 2005-2006 at Idared variety was registered the lowest output of apple trees (29.11-30.63 thsnd pcs/ha), and in 2007 at Golden Reinders variety (29.46 thsnd pcs/ha).

Table 1

"Knip-baum" apple trees output and freight quality in the fruit nursery

Variety	Output, thsnd pcs/ha	Freight quality			
		I		*II*	
		thsnd pcs/ha	*%*	thsnd pcs/ha	*%*
2005					
Golden Reinders	31.05	29.40	94.68	1.65	5.32
Jonagored	31.38	30.73	97.93	0.65	2.07
Idared	30.63	27.88	91.02	2.75	8.98
2006					
Golden Reinders	31.04	29.80	96.00	1.24	4.00
Jonagored	29.77	28.68	96.37	1.09	3.63
Idared	29.11	26.49	91.00	2.62	9.00
2007					
Golden Reinders	29.46	28.63	97.18	0.78	2.82
Jonagored	30.74	30.31	98.60	0.43	1.40
Idared	31.19	28.95	92.82	2.24	7.18

Biological quality of obtained apple trees in the second field of the fruit nursery depends on the variety's biological peculiarities.

During the researches, the weight of first category apple trees at the studied varieties was constant (91.00-98.60%). The biggest quantity of first quality apple trees was registered Jonagold variety (96.37-98.60%). Further on, with a non-significant diminution was placed Golden Reinders variety (94.68-97.93%), and the lowest values of studied index registered Idared variety (91.00-92.82%). The highest weight of second category apple trees was obtained Idared variety (7.18-9.00%), and the lowest one at Jonagored variety (1.40-3.63%).

The economic efficiency of productivity "knip-baum" apple trees in the second field of the fruit nursery obtained through bench-grafting depends on produced planting material quantity and quality.

The obtained results on the bases of the investigations made in average on three years (2005-2007) demonstrate that the highest income from selling apple trees (fig. 1) was registered by Jonagored variety (1495.85 thsnd lei/ha), then was followed by Golden Reinders variety with 1463.80 thsnd lei/ha, and respectively, Idared variety with 1426.24 thsnd lei/ha.

The profit from apple trees commercialization has a direct dependence on the output of obtained trees per one surface unit and their quality. The biggest quantity of first category apple trees was obtained by Jonagored variety (tab. 1), registering a greater profit when marketing them – 938.38 thsnd lei/ha (fig. 2). Because at the Idared variety the 1st category apple trees weight was the lowest,

but at the second category – the biggest, and the obtained profit was diminuted to 868.78 thsnd lei/ha. Golden Reinders variety registered average value of the profit of 906.34 thsnd lei/ha.

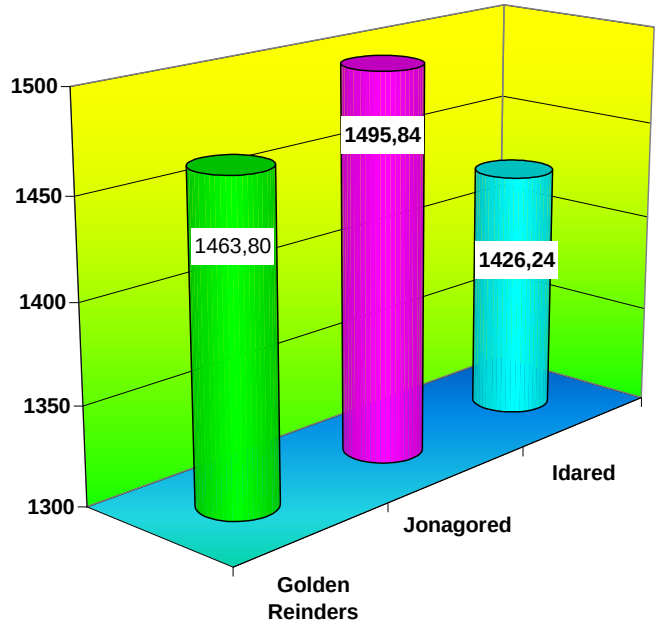

Fig. 1. Income from trees' sale, *thsnd lei/ha. average on 2005-2007 years.*

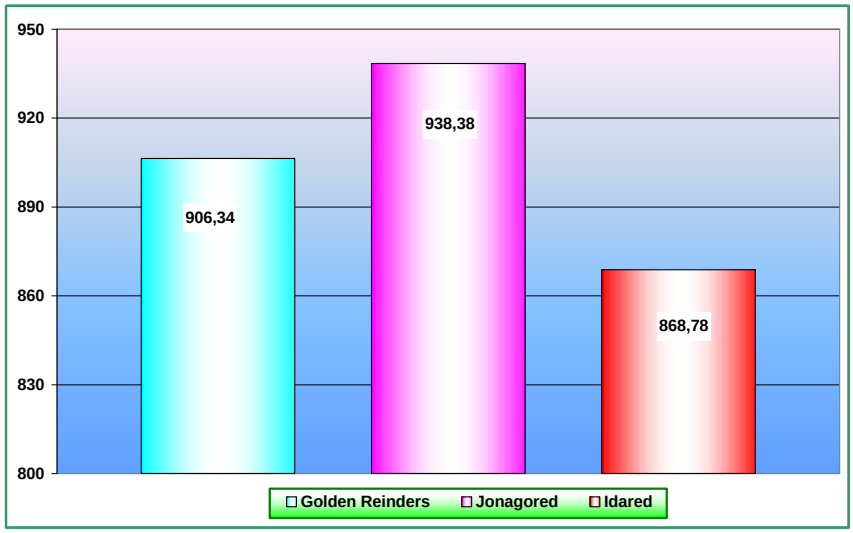

Fig. 2. Obtained profit from trees' sale, *thsnd lei/ha. average on 2005-2007 years.*

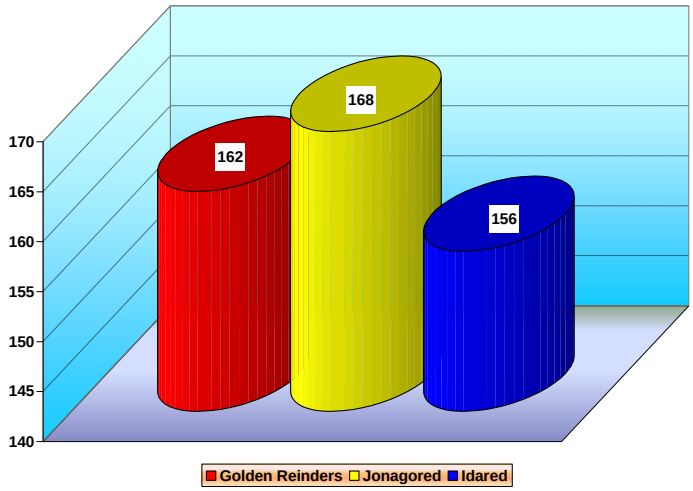

Fig. 3. Production rentability, *%. average on 2005-2007 years.*

The production rentability depends directly on registered profit from trees commercialization and their cost to obtain this planting material.

The investments made in the studied period demonstrate that at Jonagored due to its bigger profit, the production rentability was 168% (fig. 3), followed by Golden Reinders (162%) and respectively Idared variety (156%).

CONCLUSIONS

1. The output and quality of the apple trees in the second field of fruit nursery is into a direct correlation with the degree of graftings pinning and the variety's biological peculiarities. As the vigor of variety's development is greater, so it increases the output of the obtained apple trees and their quality is better.

2. The rentability of apple trees production in the fruit nursery depends on 1st quality apple trees' weight that is influenced by the biological peculiarities of the variety, the lowest rentability of production was obtained by Idared variety (156%), and the biggest one – by Jonagored (168%). The variety Golden Reinders registered average values of production rentability.

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RESEARCH LOOKING THE CHANGE OF SOME PHYSICO-CHEMICAL PARAMETERS DURING FRUIT MATURATION TO SOME SWEET CHERRY CULTIVARS

CERCETĂRI PRIVIND MODIFICAREA UNOR PARAMETRI FIZICO-CHIMICI PE PERIOADA MATURĂRII FRUCTELOR LA UNELE SOIURI DE CIREŞ

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Abstract. *The research had been done in 2009, between May 14 – June 15, having as biological material four new sweet cherry cultivars with medium maturation ('Bucium ', 'Ştefan', 'Iaşirom' and 'Radu'), where it had in view the changes of some physical and chemical parameters during maturation. There had been made determinations about the equatorial diameter and about the fruit's weight in three stages corresponding to some different maturation stages sized between 30 and 56 days after full bloom. There had been recorded changes of these parameters between the first and the third maturation stage in this way: the fruit's weight increase on 'Ştefan' from 1.81 g at 30 days after full bloom to 7.27 g at 56 days after full bloom; the equatorial diameter increase on 'Bucium' from 12.67 mm to 22.25 mm. The soluble dry substance (DS%) determination had been made in 2 stages sized between 43 and 56 days after full bloom. At 'Bucium' had been recorded an increase of DS from 12.8% to 15.25%.*

Key word: sweet cherry, cultivars, parameters, maturation phase.

Rezumat. *Cercetările au fost efectuate în anul 2009, în perioada 14 mai - 15 iunie, având ca material de cercetare patru soiuri de cireş cu maturare medie, (Bucium, Ştefan, Iaşirom şi Radu), la care s-a urmărit modificarea unor parametri fizici şi chimici pe perioada maturării. S-au realizat determinări privind diametrul ecuatorial şi greutatea fructului în trei faze corespunzătoare unor stadii diferite de maturare cuprinse între 30 şi 56 zile de la înflorirea deplină. S-au înregistrat modificări ai acestor parametri între prima fază şi a treia fază de maturare, astfel: greutatea fructului a crescut la soiul Ştefan de la 1,81 g la 30 zile de la înflorirea deplină la 7,27 g la 56 zile de la înflorirea deplină; diametrul ecuatorial la soiul Bucium a crescut de la 12,67 mm la 22,25 mm. Determinarea substanţei uscate solubile s-a realizat în 2 faze cuprinse între 43 şi 56 zile de la înflorirea deplina. La soiul Bucium s-a înregistrat o creştere a S.U. de la 12,8% la 15,25%.*

Cuvinte cheie: cireş, soiuri, parametri, faze de maturare.

INTRODUCTION

Sweet cherry tree is sort of fruit-growing tree with a great economical importance, which can find in the N-E of Romania, optimal conditions for showing its both agricultural and biological potential.

Sweet cherries are the first fresh fruits of the year and by the raised content of vitamins, minerals, sugars, attractive aspect and good refreshing taste, they

make the object of one of the most efficient commercial activity which takes place from the second part of May to July, without having any competition from other sorts of fruit-growing tree (Petre, 2006; Budan & Grădinariu, 2000).

On the fresh fruits market there are preferred the "bigarreau" fruit cultivars, which are shining red with a weight of over 7 g (Grădinariu, 2002).

As the cultivars closes to the maturity of consumption, the fruit's size and its soluble dry substance are increasing (Sîrbu et al, 2009) and the fruit's colour parameter is setting up the optimal moment for harvesting (Petre, 2006; Rudi, 1992; Vulpe, 1995).

At the sweet cherry cultivars from the medium season (June 10 – June 31) the fruit's size classifies in four categories: extra – more than 20 mm in equatorial diameter, the first and the second – minimum 17 mm in equatorial diameter and the third – minimum 15 mm in equatorial diameter (Ghena & Branişte, 2003).

Object of this study aims at the improvement of the sweet cherry assortment for the N-E of Romania by promoting the new created cultivars at FGRS Iassy and by setting up the optimal period for harvesting, in the study of the dynamics of physico-chemical parameters on the maturation period.

MATERIAL AND METHODS

The research have been made in 2009, during May 14 and June 15, hading as biological material four cultivars of sweet cherry with medium maturation, created at FGRS Iassy, patented in 2008-2009 ('Bucium ', 'Ştefan', 'Iaşirom' and 'Radu') and grafted on mahaleb.

The fruit-growing trees were planted at the distance of 5 x 4 m, with the form of a free flat fan-shaped espalier crown without sustaining system and they are in the 18^{th} year from the planting.

There have been made measuring looking the fruit's size as equatorial diameter and fruit weight and the soluble dry substance (DS%).

The equatorial diameter of the fruit was determined by measuring the samples of 15 fruits in four repetitions in three different maturation phases, at intervals of 14 days using a vernier caliper reading to 1 mm.

For determining the fruit's weight there have been weighed samples of 15 fruits in four repetitions, in three different maturation phases, using an electronic Radwag balance with the precision of 0,01 g.

The content in soluble substance has been determined refractometric on samples of 15 fruits in four repetitions, in two different maturation phases, using an handle refractometer Zeiss.

The performed determinations used to statistical processing of the data by analysing the variance ('t' test) for bifactorial experiences.

A factor is represented by the maturation phase and it has three graduations in the case of the determinations looking the equatorial diameter and the fruit weight: a_1= 30 days after full bloom, a_2=43 days after full bloom, a_3=56 days after full bloom.

When the content in soluble dry substance has been determined, the A factor had two graduations: a_1=43 days after full bloom, a_2 =56 days after full bloom.

B factor is represented by the cultivar and it has four graduations: b_1='Bucium', b_2= 'Ştefan', b_3='Iaşirom' şi b_4='Radu'.

RESULTS AND DISCUSSIONS

From the statistical point of view in the first maturation phase (30 days after full bloom), by comparing the cultivars, the equatorial diameter differences were significative positive for 'Iaşirom' (0,92 mm) toward 'Bucium' and significative negative for 'Radu' (0,84 mm) toward 'Iaşirom'.

Between 30-43 days after full bloom (the second phase of maturation), 'Ştefan' (1.81 mm), 'Iaşirom' (1.22 mm) and 'Radu' (1.44 mm) were very significant toward 'Bucium'. Between 43-56 days after full bloom (the third phase of maturation) the diameter differences was insignificant, exception making 'Radu' which registered negative values (1.08 mm and 0.75 mm) toward 'Bucium' and 'Ştefan' (table 1).

Table 1

Differences of the fruit equatorial diameter (mm) at different cultivars in same maturation phase

Comparison between cultivars	The difference (mm) and the signification	Comparison between cultivars	The difference (mm) and the signification
a_1b_2-a_1b_1	0.68	a_2b_4- a_2b_1	1.44^{+++}
a_1b_3-a_1b_1	0.92^{+}	a_2b_4- a_2b_2	- 0.43
a_1b_3-a_1b_2	0.24	a_2b_4- a_2b_3	0.16
a_1b_4-a_1b_1	0.08	a_3b_2- a_3b_1	- 0.33
a_1b_4-a_1b_2	- 0.6	a_3b_3- a_3b_1	- 0.66
a_1b_4-a_1b_3	$- 0.84^{o}$	a_3b_3- a_3b_2	- 0.33
a_2b_2- a_1b_1	1.81^{+++}	a_3b_4- a_3b_1	-1.08^{oo}
a_2b_3- a_2b_1	1.22^{+++}	a_3b_4- a_3b_2	$- 0.75^{o}$
a_2b_3- a_2b_2	- 0.59	a_3b_4- a_3b_3	- 0.42

LSD 5%= 0.73 mm **LSD 1% = 0.99 mm** **LSD 0.1% = 1.22 mm**

a_1= 30 days after full bloom; a_2= 43 days after full bloom; a_3= 56 days after full bloom

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

Table 2

Differences of the equatorial diameter (mm) for the same variety in different maturation phases

Comparison between maturation phases	The difference (mm) and the signification	Comparison between maturation phases	The difference (mm) and the signification
a_2b_1- a_1b_1	5.29^{+++}	a_3b_1- a_2b_1	4.29^{+++}
a_2b_2- a_1b_2	6.42^{+++}	a_3b_2- a_2b_2	2.15^{+++}
a_2b_3- a_1b_3	5.59^{+++}	a_3b_3- a_2b_3	2.41^{+++}
a_2b_4- a_1b_4	6.62^{+++}	a_3b_4- a_2b_4	1.80^{+++}

LSD 5%= 0.76 mm **LSD 1% = 0.93 mm** **LSD 0.1% = 1.55 mm**

a_1= 30 days after full bloom; a_2= 43 days after full bloom; a_3= 56 days after full bloom

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

About difference of the fruit's equatorial diameter at the same cultivar in different maturation phases, all the cultivars registered very significant positive values (table 2).

The fruit's weight differences at different cultivars in the same maturation phase were insignificant from the statistic point of view (table 3).

Table 3

Differences of the fruit's weight (g) at different cultivars in the same maturation phase

Comparison between cultivars	The difference (g) and the signification	Comparison between cultivars	The difference (g) and the signification
a_1b_2-a_1b_1	0.32	a_2b_4- a_2b_1	0.05
a_1b_3-a_1b_1	0.37	a_2b_4- a_2b_2	-0.44
a_1b_3-a_1b_2	0.05	a_2b_4- a_2b_3	- 1.12
a_1b_4-a_1b_1	0.03	a_3b_2- a_3b_1	0.88
a_1b_4-a_1b_2	-0.29	a_3b_3- a_3b_1	- 0.33
a_1b_4-a_1b_3	-0.34	a_3b_3- a_3b_2	- 1.21
a_2b_2- a_1b_1	0.49	a_3b_4- a_3b_1	- 0.4
a_2b_3- a_2b_1	1.17	a_3b_4- a_3b_2	- 1.28
a_2b_3- a_2b_2	0.68	a_3b_4- a_3b_3	- 0.07

LSD 5%= 2.02 g **LSD 1% = 2.74 g** **LSD 0.1% = 3.65 g**

a_1= 30 days after full bloom; a_2= 43 days after full bloom; a_3= 56 days after full bloom

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

In the second maturation phase, there were registered very significant positive differences of the fruit's weight at 'Iaşirom' (3.67 g) and distinct significant positive at 'Bucium' (2.87 g), 'Ştefan' (3.04 g) and 'Radu' (2.89 g) comparative to the first maturation phase (30 days after full bloom) (table 4).

In the third maturation phase, there were registered significant positive differences of the fruit's weight at 'Bucium' (2.03 g) and 'Ştefan' (2.42 g) comparative to the second maturation phase of the fruit (table 4).

Table 4

Differences of the fruit's weight (g) at the same variety in different maturation phases

Comparison between maturation phases	The difference (g) and the signification	Comparison between maturation phases	The difference (g) and the signification
a_2b_1- a_1b_1	2.87^{++}	a_3b_1- a_2b_1	2.03^{+}
a_2b_2- a_1b_2	3.04^{++}	a_3b_2- a_2b_2	2.42^{+}
a_2b_3- a_1b_3	3.67^{+++}	a_3b_3- a_2b_3	0.53
a_2b_4- a_1b_4	2.89^{++}	a_3b_4- a_2b_4	1.5

LSD 5%= 1.81 g **LSD 1% = 2.49 g** **LSD 0.1% = 3.42 g**

a_1= 30 days after full bloom; a_2= 43 days after full bloom; a_3= 56 days after full bloom

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

In the interval of 30-43 days after full bloom, there have been registered soluble dry substance differences distinct significant positive at 'Ştefan' (0.47 %) and 'Radu' (0.75 %) comparative to 'Bucium ' and 'Iaşirom' (table 5).

In the interval of 43-56 days after full bloom, there have been registered soluble dry substance distinct significant positive at 'Ştefan' (0.5 %) and 'Radu' (0.58 %) comparative to 'Bucium' (b_1) and 'Iaşirom' (b_3) (table 5).

Table 5

Differences of the content in soluble dry substance (%) at different cultivars in the same maturation phase

Comparison between cultivars	Difference (%) and the signification	Comparison between cultivars	Difference (%) and the signification
a_1b_2-a_1b_1	0.47^{++}	a_2b_2- a_1b_1	0.50^{++}
a_1b_3-a_1b_1	$- 1.55^{ooo}$	a_2b_3- a_2b_1	$- 0.58^{oo}$
a_1b_3-a_1b_2	$- 2.02^{ooo}$	a_2b_3- a_2b_2	$- 1.08^{ooo}$
a_1b_4-a_1b_1	$- 0.80^{oo}$	a_2b_4- a_2b_1	0.00
a_1b_4-a_1b_2	-1.27^{ooo}	a_2b_4- a_2b_2	$- 0.50^{oo}$
a_1b_4-a_1b_3	0.75^{++}	a_2b_4- a_2b_3	0.58^{++}

LSD 5%= 0.47 % LSD 1% = 0.64 % LSD 0.1% = 0.87 %

a_1= 43 days after full bloom; a_2= 56 days after full bloom;

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

From table 6 it can be seen that in the interval of 43-56 days after full bloom, all the cultivars have registered differences very significant positive at soluble dry substance content.

Table 6

Differences of the content in soluble dry substance (%) at the same cultivar in different maturation phases

Comparison between maturation phases	Difference (%) and significance
a_2b_1- a_1b_1	2.45^{+++}
a_2b_2- a_1b_2	2.48^{+++}
a_2b_3- a_1b_3	3.42^{+++}
a_2b_4- a_1b_4	3.25^{+++}

DL 5%= 0.05 % DL 1% = 0.60 % DL 0.1% = 0.86 %

a_1= 43 days after full bloom; a_2= 56 days after full bloom

b_1= Bucium; b_2= Ştefan; b_3= Iaşirom; b_4= Radu

CONCLUSIONS

1. 'Ştefan' and 'Radu' have got noticed by the fruit's growing size (mm), weight (g) and content in soluble dry substance (%) in the second maturation phase, the differences being very significant positive.

2. Due to high fruit's quality, the two cultivars can be harvested (earlier) at 43 days after full bloom for fresh consumption.

3. ‘Iaşirom’ and ‘Bucium’ have the quality conditions in the third maturation phase and they can be harvested at 56 days after full bloom.

4. The dynamics of the physical and chemical parameters study can set up a criteria for establishement of optimal harvesting period.

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EVALUATION OF ORNAMENTAL FEATURES AT SOME SPECIES FROM SPONTANEOUS FLORA OF DOBROGEA

EVALUAREA CARACTERELOR ORNAMENTALE ALE UNOR SPECII DIN FLORA SPONTANĂ A DOBROGEI

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Abstract. *In the paper are presented some species with ornamental value identified in the spontaneous flora of Dobrogea, more precisely in Tulcea County. Were studied and gathered more species from which in the paper are presented 5 species: Achillea coarctata Poiret., Campanula romanica Săvul., Dianthus nardiformis Janka., Globularia punctata Lapeyr., Thymus zygioides Griseb. Identification and sampling activities of spontaneous species with ornamental potential took place during vegetation period. From these species the gathered biologic material was represented by seeds or whole plants with who was settled down the experimental field for their study in crop conditions. The choose of multiplication methods and recommendations regarding the usage methods are based on biologic particularities and on imposed ecologic demands by natural habitats of those species. Taxonomic nomenclature used is the one adopted by V. Ciocârlan and Flora Europaea.*

Key words: spontaneous flora, ornamental potential, biodiversity, Dobrogea.

Rezumat. *În această lucrare sunt prezentate câteva specii cu valoare ornamentală identificate în flora spontană din Dobrogea şi anume în judeţul Tulcea. Au fost studiate şi colectate mai multe specii dintre care în această lucrare sunt prezentate 5 specii: Achillea coarctata Poiret., Campanula romanica Săvul., Dianthus nardiformis Janka., Globularia punctata Lapeyr., Thymus zygioides Griseb. Activităţile de identificare şi colectare a speciilor spontane cu potenţial ornamental au avut loc în timpul perioadei de vegetaţie. De la aceste specii materialul biologic recoltat a fost reprezentat de seminţe sau plante întregi cu care a fost înfiinţat câmpul experimental pentru studierea în condiţii de cultură. Alegerea metodelor de înmulţire şi recomandările cu privire la modalităţile de utilizare se bazează pe particularităţile biologice şi cerinţele ecologice impuse de habitatele naturale a acestor specii. Nomenclatura taxonomică utilizată este cea adoptată de către V. Ciocârlan şi Flora Europaea.*

Cuvinte cheie: flora spontană, caractere ornamentale, biodiversitate, Dobrogea.

INTRODUCTION

Introduction in culture of new species with ornamental potential from spontaneous flora are in according with the demands of the development of suitable agriculture.

Spontaneous flora is an important source of plants with ornamental features, which could be cultivated in different landscape designs, in according with ecologic demands.

The literature enlighten the preoccupation of the researchers in finding ways and methods through which the biodiversity of spontaneous flora to be preserved but also to be used as a source of new plants for horticulture, inclusively in ornamental sector (Halevy A.H., 2003; Heywood V., 2003; Moreno de las Heras M., Nicolau J.M., Espigares F., 2008; Buta Erzsebet, Cantor Maria, Zaharia A., Joung Hyang-Young, Choe H.R., Park S.K., 2009; Manda Manuela, Nicu Carmen, Doina Anton, 2009).

In the paper are presented, in the context of their ornamental importance, species of plants identified in Tulcea County, the studies having as goal the improvement of knowledge regarding utilisation of spontaneous flora as a enrichment source for ornamental plants.

MATERIAL AND METHOD

Studied area for the present paper is represented by Tulcea County, and gathered of biologic materials was realised in three locations as follows: Greci, Turcoaia, Babadag.

The relief of Tulcea County include Măcinului Mountains at west and Danube Delta at east. The climate has a continental temperate character, with large thermo amplitudes, reduced rainfalls, and high atmospheric humidity. Summers are very hot and droughty, autumns are long and dry and winters are frosty and with reduced rainfalls. Is characterized by annual average temperatures of around 10 – 11 ^{0}C and with average quantities of rainfalls which not pass over 500 mm. The most frequent soils in the area are chambic chernozem, redzinas, brown eumezobasic soils, brown clay-loam soils and very rare the grey ones.

Identification, recording and gathering activities of plants species from spontaneous flora, with ornamental potential, took place during vegetation period. Were studied and collected five species: *Achilea coarctata* (whole plants and seeds); *Campanula romanica* (seeds); *Dianthus nardiformis* (seeds); *Globularia punctata* (seeds); *Thymus zygioides* (whole plants).

The biologic material gathered for establishment of experimental field was different (seeds and whole plants), function of plants' biologic particularities (duration of life cycle, phenophase) or sozologic category in which are placed some taxons. Also, at some species, at which were identified populations in different areas, was gathered biologic material from each population, having in view to compare the morphologic characters and multiplication and adaptation capacity (*Campanula romanica, Thymus zygioides*).

The studying method consists in observations regarding the main morphologic and ecologic features of the species, marking the spread areas from Romania (Oprea A., 2005).

Taxonomic nomenclature used is the one adopted by V. Ciocârlan and Flora Europaea (Tutin T.G. et al, (eds.) (1964 – 1980 & 1993).

RESULTS AND DISCUSSIONS

Studies regarding cultivation potential for ornamental purpose of some spontaneous species from Romanian flora were made in the south and south-east part of the country, respectively Tulcea County.

In Tulcea County were studied, recorded and collected from different locations, some interest species, from which in the paper are presented 5 species.

Location - Greci: *Dianthus nardiformis* (seeds); *Campanula romanica* (seeds); *Thymus zygioides* (whole plants).

Location – Turcoaia: *Achilea coarctata* (whole plants and seeds); *Thymus zygioides* (seeds); *Campanula romanica* (seeds).

Location – Babadag Forest: *Globularia punctata* (seeds).

Are presented the studied species, with their main biologic, morphologic, ecologic features, spread area, the place were the material was collected and the ornamental features.

***Achillea coarctata* Poiret., Asteraceae family**, (figure 1), is a hemicryptophyte perennial plant, origin from Pontic-Balkan area, in Romania could be found sporadic from steppe area to sessile floor, in barren grasslands and massive, on fields with sunny exposure. The specie blossoms in summer (June – July) flowers are yellow, small, grouped in corimbe. The biologic material represented by seeds and whole plants was gathered from Turcoaia area.

The decorative part is represented by flowers and port, and the specie could be recommended for usage as a cut flower and in rocky design.

***Campanula romanica* Săvul., Campanulaceae family**, (figure 2), is a perennial specie hemicryptophyte. In Romania is rarely presented, being an endemic specie, in Dobrogea. Decorate through small and blue flowers. The specie blossoms in summer (June – August).

Was recorded and collected from two locations: Greci and Turcoaia, biologic material being represented by seeds.

Plant present ornamental interest due to flowers, with the possibility of their usage in rocky design, ornamental pots.

***Dianthus nardiformis* Janka., Caryophyllaceae** family, (figure 3), specie is perennial with short height 5 - 15 cm, with small pink – violet flowers. It could be found in the rocky areas of Dobrogea, and it is rare specie.

It was recorded in Greci. The gathered biologic material was represented by seeds.

The decorative part is formed by flowers at which could be put the plants' port, respectively the compact bush. It could be used at borders, rocky designs, ornamental pots and groups or massive.

Globularia punctata **Lapeyr. (syn. *Globularia bisnagarica* L.), Globulariaceae family**, (figure 4), it is a hemicryptophyte perennial plant, which is very rarely found from steppe area to the beech floor, in grassy places, dry and rocky, in Muntenia, Dobrogea, Transilvania and Banat. Specie has a central – sub Mediterranean European origin. Plants have simple leaves, alterns and in rosette, flowers have a blue colour, having a globular shape.

Biologic material was represented by seeds. It was collected from Babadag location.

It could be used at borders, rocky designs, ornamental pots, and groups or massive.

Thymus zygioides **Griseb., Lamiaceae family**, (figure 5), is a camefit perennial specie of Balkan origin. In Romania it is considered rare specie and it is spreading in steppe area and silvo-steppe on grassy rocks. Specie capitalized well the droughty plots. Plant grows as a bush with a lower height, (3 – 10 cm). It blossom in summer from (May – July).

Biologic material is represented by seeds and whole plants and was recorded from Greci and Turcoaia

Present ornamental interest due to flowers and bush shape and could be recommended for usage in landscape designs such as borders, ornamental pots, rocks.

Fig. 1. *Achillea coarctata*

Fig. 2. *Campanula romanica*

Fig. 3. *Dianthus nardiformis*

Fig. 4. *Globularia punctata*

Fig. 5. *Thymus zygioides*

CONCLUSIONS

1. The studies realized in Dobrogea area, Tulcea County, allowed the identification of some species (*Achillea coarctata* Poiret., *Campanula romanica* Săvul., *Dianthus nardiformis* Janka., *Globularia punctata* Lapeyr., *Thymus zygioides* Griseb.), which could be recommended for cultivation as ornamental plants.

2. Specific biologic and ecologic particularities are very important in establishing the crop technologies and the usage modalities in decorative assembly.

3. Depend on the above mentioned ornamental features; capitalization could be done both in different types of landscape designs and also as cut flowers.

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STUDIES ON THE INFLUENCE OF MACERATION TECHNIQUES ON TĂMÂIOASĂ ROMÂNEASCĂ WINE'S FREE TERPENIC COMPOUNDS

STUDII ASUPRA COMPUŞILOR TERPENICI ÎN VINURILE OBŢINUTE DIN SOIUL TĂMÂIOASĂ ROMÂNEASCĂ PRIN DIFERITE PROCEDEE DE MACERARE

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Abstract: *The volatile compounds in local origin Romanian wines represent an insufficiently researched domain. This study wants to identify aroma substances in Tămâioasă românească wines from Cotnari vineyard, in the north-east of Romania. During 2008 harvest, different maceration technologies were applied to Tamâioasă românească grapes like: classical maceration, cryo-maceration, ultrasound maceration and microwave maceration. A SPE extraction prior to gas-chromatography mass-spectrometry was used to determine individual aroma compounds. As expected, Tamâioasă românească has terpenic compounds that vary in number in quantity according to the used maceration method.*

Key words: terpenes, *Tamâioasă românească, gaschromatography, SPE extraction*

Rezumat: *Studiul propus se referă la testarea unor noi tehnologii de producţie şi impactul lor asupra unor compuşi de aroma din vinuri. Au fost folosite vinuri obţinute din Tămâioasă românească din podgoria Cotnari. Strugurii s-au recoltat la maturare tehnologică, în 2008. Strugurii au fost procesaţi urmând fluxul tehnologic general pentru obţinerea de vinuri aromate, dar accentul a fost pus pe faza de macerare, efectuată atat pe cale clasică, prin macerare pe boştină cât şi aplicând metodele moderne, gen macerare enzimatica, macerare cu microunde, macerare cu ultrasunete, criomacerare. Extractul obţinut prin separare SPE a fost gaz-cromatografiat şi analizat prin spectrometrie de masă. In vinurile de Tămâioasă românească au fost identificate terpene, ce variaza in numar si cantitate in functie de metoda de macerare folosita.*

Cuvinte cheie: terpene, *Tămâioasă românească, gazcromatografie, extractie SPE*

INTRODUCTION

Wine aroma is one of the most important parameters that determine wine character and quality, and it depends on the variety, grape maturity, prefermentative and vinification procedures, yeast activity, and wine aging.

Several authors (Pomohaci et al., 2000, Nechita et al, 2007, Ribérau-Gayon et al., 2000) underline that terpenic compounds play a significant role in varietal wine aroma because of their characteristic fruity-flowery odour. The main

representatives of terpenes in grapes and wine are monoterpene alcohols linalool, geraniol, nerol, citronellol and α-terpineol (Ebeler S.E, 2001**)**. Since the majority of monoterpenes is contained in berry skin (Schreier P., 1979), type and duration of maceration can significantly influence their concentration in must and wine (Radeka S., 2008). In winemaking practice, the most frequently applied are maceration treatments at temperatures from 20 to 25°C, and cold soak maceration with skin contact at 5–8°C. Skin contact at temperatures from 20 to 25°C leads to increased extraction of the phenolic compounds that increase wine astringency and bitterness, and with time oxidize, creating undesirable odours that suppress varietal aroma, as well as browning of must and wine (Cotea V.D., 1985).

On the contrary, a cold soak maceration leads to an increased extraction of aromatic compounds (Radeka S., 2005) from berry skin cells, while the additional undesirable extraction of phenolic fraction is reduced to the highest possible degree. Namely, cold soak low temperatures favour must and wine enrichment with terpenic compounds (Marais J., 1983).

This study wants to identify the terpenic compounds found in Tămâioasă românească wines from Cotnari vineyard, in the north-east of Romania and to underline the effect the type of applied maceration has on the extraction of these volatile compounds.

Three types of categories of monoterpenes exist in grapes with some interrelationships between the categories (Rapp A., 1986).

On the top of the complex are the free aroma compounds, commonly dominated by linalool, geraniol, and nerol, together with the pyran and furan forms of the linalool oxides. However, depending on how the juice has been treated and on factors, which may include climate, many additional monoterpenes can be found in this group, i.e. citronellol, α-terpineol, hotrienol, nerol oxide, myrcenol, the ocimenols plus several other oxides, aldehydes and hydrocarbons. In wines, several monoterpene ethyl ethers and acetate esters have also been found among the free aroma compounds.

Second, there are the polyhydroxylated forms of the monoterpenes, or free odourless polyols. A most significant feature of the polyols is that, although these compounds make no direct contribution to the aroma, some of them are reactive and can break down with great ease to give pleasant and potent volatiles, i.e. diendiol (3,7-dimethylocta-1,5-diene-3,7-diol) can give hotrienol and nerol oxide.

Third, there are the glycosidically conjugated forms of the monoterpenes which also make no direct contribution to the aroma of the grape. Glycosides are, in most cases, more abundant than the unglycosilated forms of individual monoterpenes and polyols (Teisseire P. J., 1991).

MATERIAL AND METHOD

The experimental part of my paper is based on the study and comparison of different maceration techniques of Tămâioasă românească grapes. The obtained wines will be analysed by gas-chromatography and the differentiated identification of terpenic compounds, according to the maceration method applied, will be developed.

Romanian variety Tămâioasă românească from Cotnari vineyard has been used, harvest of 2008. The experimental 100 litres of Tămâioasă românească marc was divided into equal parts to which several maceration techniques were applied: ultrasound maceration, microwave maceration, cryo-maceration and simple skin maceration.

For the ultrasound maceration, marc was ultrasoned for 15 minutes, at 35kHz (2000W, 30 L volume).

Microwave maceration was done at 650 W for 10 minutes. It was observed that the color compounds migrated into the pulp, therefore the grape berry changed color and became less translucid, even opaque. The skin of the grape berry tore, as the internal pressure was too high. Water evaporated and the volume reduced. Microwave maceration was applied to whole grape berries and grape marc.

For cryo-maceration, the grapes were first frozen at -20 ^{o}C, then destemmed, crushed and pressed while still frozen.

Classical maceration was done by allowing must to remain in contact with the berry skins for 12 hours, adding no enyzmes.

The control sample was obtained by pressing the Tămâioasă românească grapes immediately.

Saccharomyces cerevisiae yeast strains were used in order to induce fermentation, which lasted for 2 weeks, at low temperatures of 15 ^{o}C. Enovit, a fermentation activator, was added in the beginning of the second week, to make sure that there was not sugar remaining in the wine, which would lead to a second fermentation. The wine samples were filtered and bottled, not before sulphiting.

SPE extraction gas chromatography method:

50 mL wine were passed through a LiChrolut RP-18 (40-63 µm) 200 mg cartridge and LiChrolut EN (40-120 µm) 100 mg, 6 mL cartridge. The bed was first conditioned by washing it with 10 mL dichloromethane, 10 mL methanol and 10 mL ethanol 13 % v/V solution. After being force dried for 20 minutes, the sample was passed through. The aroma compounds were recuperated by washing the bed with 1,5 mL dichloromethane. 1000 µL extract, splitless mode are injected into the GC. Carrier gas flow (He) 1mL/min; temperature rising from 35^{o}C to 250^{o}C, 5^{o}C/min, 250^{o}C for 27 minutes. Injector temperature 220^{o}C, detector temperature 250^{o}C. Terpenic compounds were identified by comparison of their fragmentation patterns with those of reference compounds in spectrum libraries NIST08, Wiley08 and SZTERP.

RESULTS AND DISCUSSIONS

A Shimadzu GC-2010 gas chromatograph, coupled with a GCMS – QP 2010 Plus mass-spectrometer was used. The identified terpenes and their peak areas are registered in table 1.

Table 1

Terpenic compounds and their peak areas identified in Tămâioasă românească wines obtained through different maceration technologies

TR 2008 control	
Area	Terpenic compound
1729324	Limonene
4027946	Linalool
1136176	Hotrienol
1208369	Linalyl propionate

1635130	3,7-Octadiene-2,6-diol, 2,6-dimethyl-
564206	7-Octene-2,6-diol, 2,6-dimethyl-
1048242	2,7-Octadiene-1,6-diol, 2,6-dimethyl-
TR microwave marc maceration 650 W 2008	
Area	Terpenic compound
3133287	Linalool
767731	Hotrienol
588680	Nerol
1971865	3,7-dimethyl-1,5-octadien-3,7-diol
798632	7-Octene-2,6-diol, 2,6-dimethyl-
TR microwave grape berries maceration 650 W 2008	
Area	Terpenic compound
613285	Linalool oxide
3967532	Linalool
2083529	Hotrienol
639931	trans-Geraniol
814692	3,7-Octadiene-2,6-diol, 2,6-dimethyl-
885509	3,7-Dimethyloct-1-en-3,7-diol
TR simple maceration 12 h 2008	
Area	Terpenic compound
695191	Linalool oxide trans
6260691	Linalool
1246652	Hotrienol
1939399	Linalyl propionate
850190	Citronellol
259104	Trans-Geraniol
1138281	Nerol
3490192	3,7-Octadiene-2,6-diol, 2,6-dimethyl-
1707419	3,7-Dimethyloct-1-en-3,7-diol
651282	Dihydromyrcenol
3087955	2,7-Octadiene-1,6-diol, 2,6-dimethyl-
1132496	Geranic acid
TR cryomaceration 2008	
Area	Terpenic compound
613285	Linalool oxide

3967532	Linalool
2083529	Hotrienol
639931	trans-Geraniol
814692	3,7-Octadiene-2,6-diol, 2,6-dimethyl-
885509	3,7-Dimethyloct-1-en-3,7-diol
TR ultrasounds 15 minutes 2008	
Area	Terpenic compound
3254403	Linalool
821104	Hotrienol
567746	Nerol
2455109	3,7-Octadiene-2,6-diol-2,6-dimethyl-
1175077	3,7-Dimethyloct-1-en-3,7-diol
1429564	2,7-Octadiene-1,6-diol, 2,6-dimethyl-

Tămâioasă românească's analysis confirms its profound aromatic character, by identifying compounds with high aromatic qualities: linalool, linalool oxide cis and trans, limonene, hotrienol, nerol, trans-geraniol, citronellol, dihydromyrcenol, linalool derivates, all terpenic compounds that are specific to aromatic grape varieties, like Tamâioasă românească.

As it can be observed from the above tables, simple maceration for 12 hours extracted the most aroma compounds, even if α – terpineol was not identified in this wine sample. α – terpineol was found in the wine samples obtained by cryomaceration, ultrasounds maceration and grape berries microwave maceration.

Linalool, compound specific for Muscat obtained wines, was, on the other hand, found in all of the six wine samples, as was hotrienol, although in smaller quantities. It was best extracted by simple maceration for 12 hours. The second highest levels were found in the control sample, cryomaceration and grape marc microwave maceration. The lowest extraction levels are in the wine saples obtained by ultrasound maceration and marc microwave maceration.

Hotrienol, another aromatic compound, was also found in all six wine samples, in smaller quantities that linalool. Hotrienol was best extracted by cryomaceration and grape berries microwave maceration, on the second place being found in the wine obtained by simple maceration for 12 hours. Third and fourth place are occupied by the control sample and the wine made through ultrasound maceration and marc microwave maceration.

Other monoterpenes that contribute to the wine's aroma were found in the wine sample obtained by simple maceration for 12 hours: citronellol, dyhidromyrcenol, geranic acid. Limonene appeared in the control wine sample, demonstrating thus that this compound appears in the pulp of the grape as well.

Trans-geraniol, an isomer of nerol, appears in the wines obtained by grape berry microwave maceration, cryomaceration and simple maceration for 12 hours,

having the highest level in the first two samples. Nerol, on the other hand, has been found in the wines made by ultrasounds maceration, simple maceration and marc microwave maceration.

CONCLUSIONS

SPE extraction and GC MS analysis of wines proves to be satisfactory concerning identification of volatile compounds, as known from literature (Ţârdea, 2007). In ulterior studies, the reasearch will comprise quantitative results obtained by using internal standard.

Terpenic compounds proved to be better influenced by simple maceration extraction, for short periods of time.

Although, in literature, Tămâioasă românească's specific terpenic compound is shown to be α – terpineol, this study proved that linalool is found in all of the obtained wine samples.

Considering the fact that the used maceration techniques (ultrasounds, cryomaceration) are new in the wine-making process they do have a certain efficiency in the process of aromatic compounds extraction.

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PHYSICAL-CHEMICAL CHARACTERISTCS OF BĂBEASCĂ NEAGRĂ ROSE WINES FROM IAŞI, DEALU BUJORULUI AND ODOBEŞTI VINEYARDS

CARACTERISTICI FIZICO-CHIMICE ALE VINURILOR ROZE DE BĂBEASCĂ NEAGRĂ DIN PODGORIILE IAŞI, DEALU BUJORULUI ŞI ODOBEŞTI

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Abstract. *This study aims at diversifying the wine assortment by using the oenological potential of Băbească neagră grape variety for rose wine production. Grapes of Băbească neagră, harvest of 2009, from Iaşi, Dealu Bujorului and Odobeşti have been processed. In order to obtain rose wines, a short maceration was applied, so that only part of the anthocyans diffuse in the must. The rest of the technological process was the same with the one for white wine production. The physical-chemical parameters of obtained wines prove that Băbească neagră can be used in rose wine production.*

Key words: Băbească neagră, rose wine, maceration

Rezumat. *Lucrarea urmăreşte posibilitatea diversificării sortimentului de vinuri prin valorificarea potenţialul oenologic al soiului Băbească neagră în direcţia elaborării vinurilor roze. În acest scop s-au realizat vinuri din struguri ai soiului Băbească neagră din recolta 2009 din podgoriile Iaşi, Dealu Bujorului şi Odobeşti. Pentru obţinerea vinurilor roze s-a aplicat macerarea de scurtă durată, pentru ca doar o parte din pigmenţii antocianici din pieliţe să difuzeze în must, etapă continuată conform schemei tehnologice de obţinere a vinurilor albe. Parametrii fizico-chimici a vinurilor obţinute evidenţiază pretabilitatea soiului Băbească neagră la obţinerea vinurilor roze.*

Cuvinte cheie: Băbească neagră, vin roze, macerare

INTRODUCTION

The local grape varieties (Fetească neagră, Băbească neagră) out of which competitive and typically world-class wines can be obtained, are a desired reach in the wine-making bussiness.

Optimising the rose wine technology (Munteanu Camelia, 1997) from Băbească neagră grape variety is a necessary aim, as these wines are very much appreciated by consumers, being often light and not too full-bodied, as red wines.

The maceration-fermentation technology has been applied so as the polyphenolic compounds content is low and the wine's color remain rose (Cotea D.V., 2009).

MATERIAL AND METHOD

Băbească neagră grapes (Cotea, Victoria, 1996) were harvested in 2009 from Iaşi, Dealu Bujorului and Odobeşti vineyards (Cotea D.V. ş.a., 2000). The grapes were manually harvested and transported to Iaşi Pilot Research Station where they were processed. Table 1 shows the compositional characteristics of grapes at harvest.

Table 1

Compositional characteristics of grapes at harvest

No.	Vineyard	Harvest date	Reductive sugars (g/L)	Total acidity (g/L) C4H6O6
1.	Dealu-Bujorului	19.09.2009	239,83	6,85
2.	Iaşi	23.09.2009	246,21	7,12
3.	Odobeşti	19.09.2009	218,67	7,36

As a working method was used the technology for rosé wine production by short maceration (Cotea V.V., Cotea D.V., 2006). For obtaining rosé wines, the following processes are effectuated: the grapes are destemmed and crushed, marc homogenization is realized, selected yeasts of the Saccharomyces cerevisiae sort were added (25 g/100 kg), a short maceration takes place for 8 hours, at 12°C, in order to achieve a short maceration. After the short maceration (Macici M. ş.a., 1998), the marc was pressed by a hydraulic press. The obtained must has been kept in stainless steel tanks for finishing its alcoholic fermentation (Ţârdea C, ş.a., 2000). After finishing its alcoholic fermentation, the wine was racked and conditioned. Bottling was done after filtering.

RESULTS AND DISCUSSIONS

Physical - chemical analyses were done according to international standards.

Alcoholic strength, reductive sugars, relative density, total acidity, volatile acidity, pH, non - reductive extract and total dry extract were registered.

Table 2

Compositional characteristics of rosé wines from Băbească neagră grapes

VINEYARD	Relative density at 20ºC	Reductive sugars (g/L)	Volatile acidity g/L $C_2H_4O_2$	SO_2 free (mg/L)	SO_2 total (mg/L)
Dealu-Bujorului	0,9921	5,86	0,36	22,37	78,27
Iaşi	0,9922	2,56	0,42	18,56	69,31
Odobeşti	0,9917	1,23	0,38	19,81	62,45

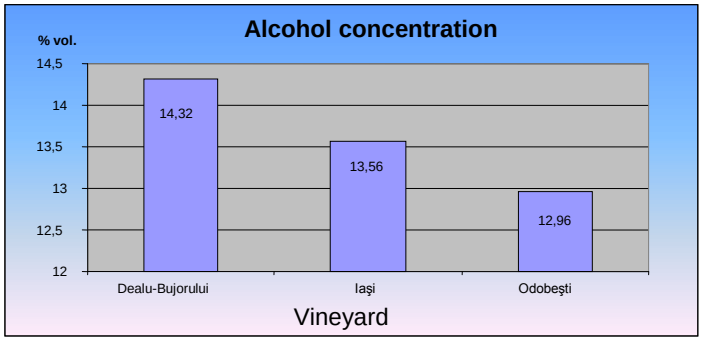

Fig. 1. Alcoholic concentration of Băbească neagră rosé wines

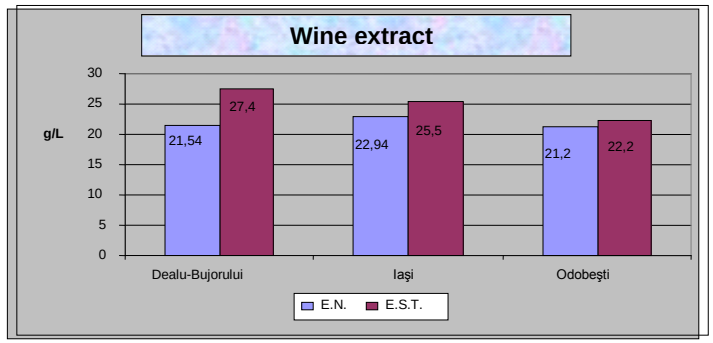

Fig. 2. Non-reductive extract and total dry extract of Băbească neagră rosé wines

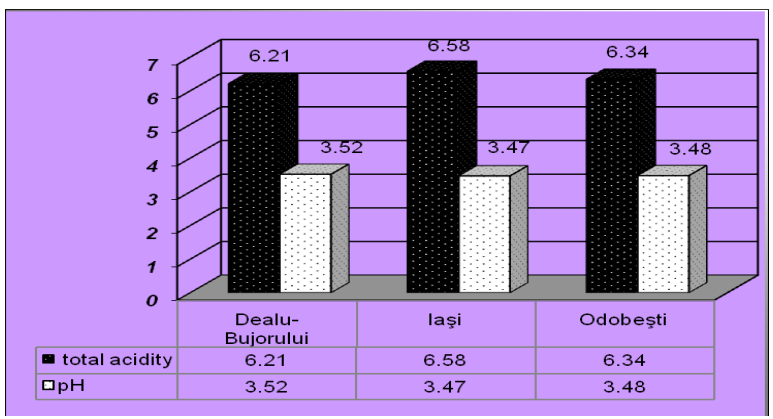

Fig. 3. Total acidity and pH of Băbească neagră rosé wines

The alcoholic concentration (fig. 1) varies from 14,32 % vol.in Dealu Bujorului vineyard up to 12,96 % vol. in

Regarding the values of reductive sugars (tab. 2) of studied wines it can be concluded, that the obtained wines are dry, with a content of maximum 4g/L, for example rosé wine of grape sort- Iaşi vineyard 2,56 g/L reductive sugars, and the roze wine from Odobeşti vineyard. Rosé wine Băbească neagră exception is from Dealu-Bujorului vineyard, where was obtained semi-dry wine (5,86 g/L).

The rose wines have relatively high total acidity values that, together with the pH values lead to the conclusions that the wines did not undergo malo-lacticic fermentation (fig.3), thus keeping their freshness and fruitiness.

Analyzing the obtained wines in terms of non - reductive extract one can observe that the values varies from 21,2 g/L - Odobeşti vineyard up to 22,94 g/L Iaşi vineyard. (fig. 2). This values show that by working in compliance with technology and the quality of raw material led to the obtaining of full bodied and extractive wines.

CONCLUSIONS

The compositional characteristics of Băbească neagră wines obtained through black grapes' maceration over a short period of time can improve the wines' assortment from the Moldovian Hills' region.

All the wines obtained in 2009 from the black grapes of Băbească neagră harvested from Iaşi, Dealu Bujorului and Odobeşti vineyards are registered in the quality category of D.O.C.-C.T.

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STUDY REGARDING THE INFLUENCE OF SOME OENOLOGICAL PRODUCTS USAGE ON WINE'S CHROMATIC PARAMETERS

STUDIU PRIVIND INFLUENŢA UNOR PREPARATE OENOLOGICE ASUPRA PARAMETRILOR CROMATICI LA VINURILE DE COTNARI

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Abstract. *In the present study, the influence exerted by utilizing certain oenological products on white Frâncuşă, Fetească albă, Grasă de Cotnari and Tămâioasă românească wines from The Cotnari vineyard during the 2009 harvest has been observed. The oenological products considered for this study were selected yeasts, nutrients, clearing enzymes and extraction enzymes. The obtained experimental variants were subjected to a spectrophotometric analysis method – Cie-lab 76 colour space in visible spectrum. The analysed chromatic parameters were:* ***L*** *(for luminosity or psychometric clarity),* ***a*** *and* ***b*** *for the color-opponent dimensions (red-green and yellow-blue) and* ***C*** *(chromaticity or colour saturation), based on non-linearly compressed CIE XYZ colour space coordinates. One noticed that the chromatic parameters varied with the different oenological product used.*

Key words: Cotnari, selected yeasts, enzymes, nutrients.

Rezumat. *În studiul de faţă s-a urmărit influenţa pe care o exercită utilizarea unor preparate oenologice asupra parametrilor de culoare la vinurile albe obţinute din soiurile Frâncuşă, Fetească albă, Grasă de Cotnari şi Tămâioasă românească din podgoria Cotnari, recolta 2009. Preparatele oenologice luate în studiu au fost: levuri selecţionate, nutrienţi, enzime de limpezire şi enzime de extracţie. La variantele obţinute s-au analizat spectrele de absorbanţă în domeniul vizibil pe baza cărora s-au calculat componentele culorii prin metoda Cie-Lab 76. Parametrii cromatici analizaţi au fost:* ***L*** *(luminozitatea sau claritatea psihometrică),* ***a*** *(coordonata culorilor complementare roşu-verde);* ***b*** *(coordonata culorilor complementare galben-albastru);* ***C*** *(cromaticitatea sau saturaţia culorii). S-a constatat că parametrii cromatici s-au comportat în mod diferit în urma administrării produselor oenologice.*

Cuvinte cheie: Cotnari, levuri selecţionate, enzime, nutrienţi.

INTRODUCTION

Colour is a very important quality trait, being the first choice criteria in consumer wine choice. The main role in defining grape and wine colour is achieved by anthocyans, tannins and flavons (Cotea V. D., Zănoagă C. V., Cotea V.V., 2009). When it comes to colour there are two types of wine: white and red, depending on the original grapes. There is also an intermediary category, rose wines, that have a lower phenolic content compared to red wines. The white wines colour is due to the presence of flavons (yellow pigments) and

hidroxycynamic phenolic acids that are being accumulated in the grapes. The colour hues differ: white, green-white, yellow-/white, yellow, green-yellow, golden yellow and correspond to the absorbed radiations from the visible light spectrum with wavelength between 400-480 nm (Ţârdea C., 2007).

The present study follows the way that certain oenological products (selected yeasts. Enzymes or nutrients) influence the chromatic parameters for white wines obtained from Frâncuşă, Fetească albă, Grasă de Cotnari and Tămâioasă românească grape varieties from Cotnari vineyard, 2009 harvest.

MATERIAL AND METHOD

Grape harvest took place in September 2009. The main grape compositional characteristics are presented in table 1.

Table 1

Main grape compositional characteristics

No.	Grape variety	Sugars g/L	Total acidity g/L $C_4H_6O_6$
1	Frâncuşă	195	9,15
2	Fetească albă	197	8,54
3	Grasă de Cotnari	208	8,20
4	Tămâioasă românească	202	8,75

The wines were obtained by using white dry wine processing technology (Cotea V., 1985), with the specification Grasă de Cotnari and Tămâioasă românească grape carieties were subjected to an 8-10 hours maceration process with the Vulcazym arome extraction enzyme (2 g/hL), with the exception of the control sample.

The studied variants for Frâncuşă were the following:

M – spontaneous fermentation (control sample) ;

V_1 – selected yeasts were added to the must (IOC Expression) - 15 g/hL;

V_2 - selected yeasts were added to the must (IOC Expression) - 15 g/hL and nutrient (Fermoplus integrateur) - 35 g/hL;

V_3 - selected yeasts were added to the must (IOC Expression) - 15 g/hL, and nutrient (Fermoplus integrateur) - 35 g/hL. Also clearing enzymes (Pecvine V) were added to grapes 3 g/100 kg;

V_4 - selected yeasts were added to the must (Zymaflore X 5) - 20 g/hL, nutrient (Fermoplus integrateur) - 35 g/hL. Also clearing enzymes (Pecvine V) were added to grapes 3 g/100 kg;

The studied variants for Fetească albă were the following:

M - spontaneous fermentation (control sample);

V_1 - selected yeasts were added to the must (Zymaflore X 16) - 20 g/hL;

V_2 - selected yeasts were added to the must (Zymaflore X 16) - 20 g/hL and nutrient (Fermoplus integrateur) - 35 g/hL;

V_3 - selected yeasts were added to the must (Zymaflore X 16) - 20 g/hL, nutrient (Fermoplus integrateur) - 35 g/hL. Also clearing enzymes (Pecvine V) were added to grapes - 3 g/100 kg;

V_4 - selected yeasts were added to the must (IOC Expression) - 15 g/hL, nutrient (Fermoplus integrateur) - 35 g/hL. Also clearing enzymes (Pecvine V) were added to grapes - 3 g/100 kg.

The studied variants for Grasă de Cotnari were the following:

M - spontaneous fermentation, without using extraction enzymes, but with a 8-12 hours maceration process (control sample);

V_1 - selected yeasts were added to the must (Cross Evolution) - 20 g/hL;

V_2 - selected yeasts were added to the must (Cross Evolution) - 20 g/hL and nutrient (Fermoplus integrateur) în doză de 35 g/hL;

V_3 - selected yeasts were added to the must (Cross Evolution) - 20 g/hL, nutrient (Fermoplus integrateur) - 35 g/hL and clearing enzymes (Zymoclaire CG) - 1,5 g/hL;

V_4 - selected yeasts were added to the must(Zymaflore X 16) - 20 g/hL, nutrient (Fermoplus integrateur) - 35 g/hL and clearing enzymes (Zymoclaire CG) - 1,5 g/hL.

The studied variants for Tămâioasă românească were the following:

M - spontaneous fermentation, without using extraction enzymes, but with a 8-12 hours maceration process (control sample);

V_1 - selected yeasts were added to the must (Fermol aromatic) - 25 g/hL;

V - selected yeasts were added to the must (Fermol aromatic) - 25 g/hL and nutrient (Fermoplus integrateur) - g/hL;

V_3 - selected yeasts were added to the must (Fermol aromatic) - 25 g/hL, nutrient (Fermoplus integrateur) - 35 g/hL and clearing enzymes (Zymoclaire CG) - 1,5 g/hL;

V_4 - selected yeasts were added to the must (Zymaflore X 5) - 20 g/hL, nutrient (Fermoplus integrateur) - 35 g/hL and clearing enzymes (Zymoclaire CG) - 1,5 g/hL.

After the alcoholic fermentation, the wines were separated from the lees deposited, filtrated, sulphitated and bottled.

The colour components were calculated based on the absorbency spectrum recorded in the visible domain (VIS) with an Analytik Jena S-200 spectrophotometer attacged to a computer, by using o glass vat with 1 cm optical length; The retention time was 0,1 s, while $\Delta\lambda$ = 1 nm. The absorbance spectrae were numbered and quantified using an "VINCOLOR" programme, upgraded by the research team in order to obtain L, a, b and C chromatic parameters according toCIE Lab 76 analysis method.

The chromatic parameters analysis was conducted in January-February 2010 in the Oenology Laboratory of the University of Agricultural Sciences and Veterinary Medicine „Ion Ionescu de la Brad" Iaşi.

RESULTS AND DISCUSSIONS

From the data presented in table 2, one can extract the influence of certain oenological products on the chromatic parameters of the obtained wines.

It was noticed that the used oenological products (selected yeasts, enzymes and nutrients) lead to a decrease of the **L** (luminosity) parameter, in comparison to the control sample for all the studied variants. It was also noticed that the selected yeasts increased the **a** (red green complementary colour coordinate) parameter for the variants obtained from Fetească albă grape variety and lead to a decrease for the other varieties, fact due to the specificity of the grape sort. In the case of **b** (yellow blue complementary colour coordinate) and **C** (chromaticity or colour saturation) parameters, higher values were recorded compared to the control sample in all of the experimental variables.

Due to nutrient addition (Fermoplus integrateur) **a** parameter registered an increase in the studied samples, except the one obtained from Fetească albă; **b** and cromaticity (**C**) parameters increased in the variants of Fetească albă and Tămâioasă românească and decreased in the samples made from Frâncuşă and Grasă de Cotnari grape varieties.

The clearing enzymes lead to a decrease of the **a** parameter for the Grasă de Cotnari grape variety, (for the other ones one noticed an increase) and an increase of **b** and **C** parameter values for all the values of the four grape sorts.

Table 2

Influence of certain oenological products on the chromatical parameters of Cotnari wines

No	Grape variety	Sample	Clarity L	Colour coordinates		Saturation C
				a red-green-	b yellow-blue-	
1	Frâncuşă	M	99,4	-0,28	2,07	2,09
2		V_1	99,2	-0,33	2,79	2,81
3		V_2	99,1	-0,36	3,29	3,31
4		V_3	99,1	-0,36	3,32	3,34
5		V_4	99,2	-0,51	3,4	3,44
6	Fetească albă	M	100	-0,49	2,02	2,08
7		V_1	99,7	-0,39	2,72	2,75
8		V_2	99,7	-0,45	2,89	2,9
9		V_3	99,4	-0,37	3,4	3,42
10		V_4	99,3	-0,28	3,5	3,51
11	Grasă de Cotnari	M	99	-0,41	3,58	3,6
12		V_1	98,7	-0,47	4,77	4,79
13		V_2	98,7	-0,43	3,03	3,07
14		V_3	98,9	-0,64	4,13	4,18
15		V_4	98,8	-0,41	3,99	4,01
16	Tămâioasă românească	M	99,5	-0,5	3,39	3,43
17		V_1	99,2	-0,62	4,22	4,26
18		V_2	99,3	-0,55	3,76	3,8
19		V_3	99	-0,46	4	4,03
20		V_4	99,3	-0,55	3,61	3,65

CONCLUSIONS

1. The selected yeasts highlight the oenological potential for the processed grapes.

2. The nutrients add to the differentiation of the wines' sensory profiles in relation to the initial musts, technological conditions and olfactory-gustatory characteristics that must be found in the obtained wines.

3. Enzymes allow an enrichment of the colour of wines, extraction and superior varietal aromas.

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REDOX ASPECTS ON CERTAIN ANTISEPTIC SUBSTANCES OF OENOLOGIC USE

ASPECTE REDOX ASUPRA UNOR ANTISEPTICI DE UZ OENOLOGIC

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Abstract. *The rH values modulated by SO_2 substantiates, by the small values, the anti-oxidizing effect at high concentrations, and by the high values, the bacteria-static effect at small concentrations. The potassium metabisulphite modulates only rH values with effects that tempt the bacteriastasis, as well as the potassium sorbate. But, at the contact of substance with the bios, the rH used as a marker shows that SO_2 is highly labil, and the stability grows in the SO_2–potassium metabisulphite–potassium sorbate series, the latter seeming to be the most proper for the long-term preservation of wine qualities, with no subsequent corrections.*

Key words: SO_2, potassium metabisulphite, potassium sorbate, redox potential

Rezumat. *Valorile rH modulate de către SO_2 exercită, prin valorile mici, un efect antioxidant la concentraţii mari, iar prin valorile ridicate, un efect bacteriostatic la concentraţii mici. Metabisulfitul de potasiu modulează numai valori rH cu efecte ce tentează bacteriostazia, ca şi sorbatul de potasiu. Dar, la contactul substanţelor cu viul, valorile rH, utilizate ca marker, arată că SO_2 este foarte labil, iar stabilitatea creşte în ordinea SO_2–metabisulfit de potasiu–sorbat de potasiu, ultimul părând a fi cel mai potrivit pentru conservarea calităţilor vinului, fără corecţii ulterioare.*

Cuvinte cheie: SO_2, metabisulfit de potasiu, sorbat de potasiu, potential redox

INTRODUCTION

Wine making uses a series substances as preservatives – namely bacteriostatic, sometimes bactericide –, in order to ensure on a longer term the qualities of wine, the product of a technology that entwines with art. Such substances are also used, as additives in the ever more industrialized food that we consume more often and in larger quantities than wine. While in wine making, the use of such substances is strictly regulated, even enacted/institutionalized, tradition also braking/slowing their introduction, use, and ultimately, extension, in the food industry, which lacks a tradition taht gave birth for wine making to that international forum namend "Office international de la vigne et du vin" (notice that in its documents the subject is not only the wine but also anything related to it), the use of such substances often escapes control/surveillance.

That's why we propose/bring in a study, original in terms of procedure, on these substances, in order to find out or at least assume the side effects on the

consumer but also, with direct reference to oenology, on becoming of grapes into wine.

MATERIAL AND METHOD

We chose, subjective, of course, three such substances: SO_2 (E 220), its solid (/potential) form of potassium methabisulphite (E 224), that is, two forms of adding the same active substance (SO_2), respectivelly the sorbic acid (as potassium salt – an esential form for wine, as it brings off a unity between it and the added substance, by means of K^+ ion, but also form reasons as pragmatic as possible, related to the superior/better solvability of sorbate) (E 202), a substance that seems to act on a different way, as it does not liberate SO_2, even more, as it is considered absolutely harmless, metabolizing like any other organic acid (though man does not usually consume sorbic acid, which can be found almost exclusively in the fruits of *Sorbus*, a forest shrub). And we chose, as a new way, but also relying on an ever more enriched data base, to treat the subject as being o redox modulated one. The procedure details are presented in (Duca G.et al., 2001; Zănoagă C. V. et al., 2010).

RESULTS AND DISCUSSIONS

The prototype of this substance class, even in historical terms, is SO_2, also a substance naturally known to wine: during fermentation SO_2 appears as a result of sulphates reduction. It is a substance, as simple in structural terms, as it is physiologically complex: it is bacteriostatic – even bactericide –, but also an antioxidant, that is, mandatory, a reducer. But it also is, in its stable form in water, implicitly accesible to vegetal (in grapes), microbial (yeasts, bacteria) cells, H_2SO_3, that is an acid. This fact is also shown in figure 1 which which, compared to the same order data in (Zănoagă C. V. et al., 2010), suggests a unity in acids manifestation: the ambivalence of a reducing behaviour at high concentrations, respectivelly an oxidizing one at low concentrations.

This fact explains both the antioxidant effect as, even from concentration as low as 1/1,000 (fig. 1 – lg C = –3), SO_2 modulates net reducing rH values (approx. 23), and the inhibitive effect, at least for certain forms of microorganisms, such as molds (compare the rH value of about 23, modulated at 1/1,000 concentration, to the optimum value for *Penicillium*, of about 19 (Duca G.et al., 2001). A light sulphitation helps yeasts in their competition with bacteria (be they acetic), which preffer reducing rH-s: a rH of about 25, ensured by the SO_2 concentration of 1/20,000 (lg C = –3.3) inhibits bacteria, but represents the optimum for yeasts.

The "solid" form of SO_2, the potassium methabisulphite, chosen because the grapes, implicitly the wine, is rich in / compatible with this cation, but meant, in contact with wine acidity, to develop the same SO_2, known as an active antimicrobial, is a substance with reducing (redox) effect: in the studied concentrations (Fig. 2: 1/100 (lg C = –2)…1/1,000,000 (lg C = –6)), the substance develops only the lower level of rH = f(C) dependence.

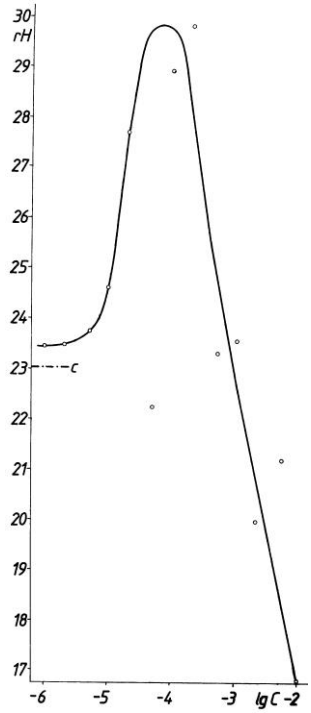

Fig. 1. Dependence rH = f(C) of SO_2

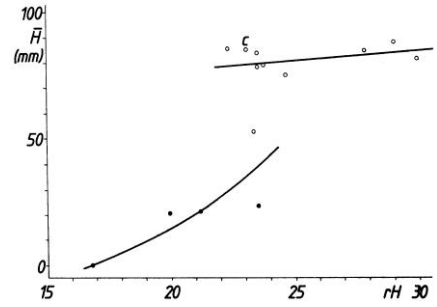

Fig. 4. Dependence of plantlets's average height on rH of SO_2 solutions

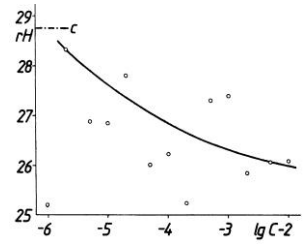

Fig. 2. Dependence rH = f(C) of potassium methabisulphite

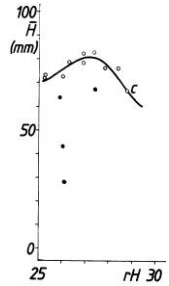

Fig. 5. Dependence of plantlets's average height on rH of potassium methabisulphite solutions

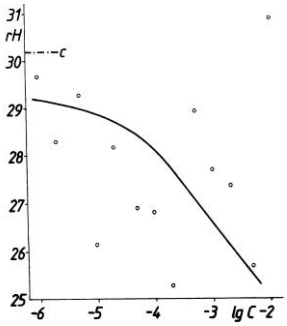

Fig. 3. Dependence rH = f(C) of sorbic acid

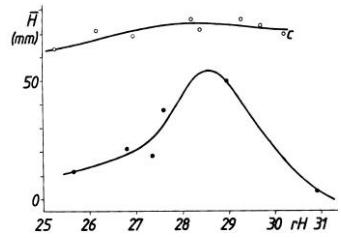

Fig. 6. Dependence of plantlets's average height on rH of sorbic acid solutions

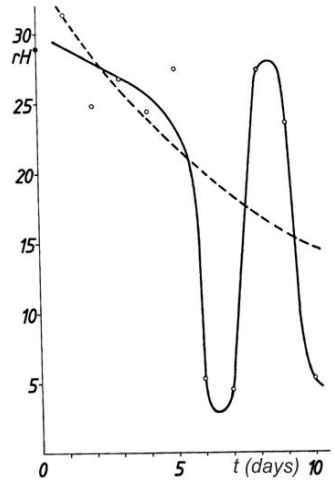

Fig. 7. Dynamics of substrate's rH in SO_2 case

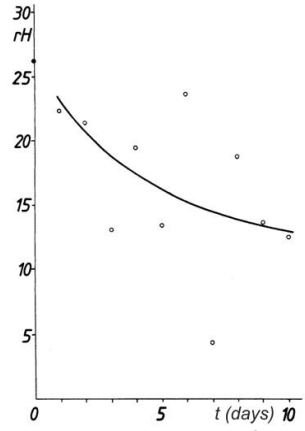

Fig. 8. Dynamics of substrate's rH in potassium methabisulphite case

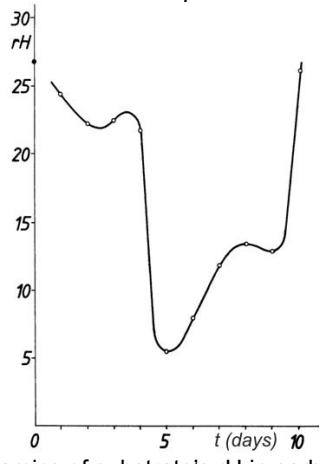

Fig. 9. Dynamics of substrate's rH in sorbic acid case

The effect of this substance is questionable/controversial even if, by means of a chemical becoming,it would develop that SO_2 which could materialize the mechanism described before.

The sorbate (potassium, from the same reasons) (fig. 3) seams to be more "intelligent": at high concentrations (approx. 1/100 – lg C = –2), it modulates optimum for yeasts but absolutely awkward for bacteria rH values, but at lower concentrations induces rH values which are awkward to any heterotroph; so it results an obvious preservative action.

The effect of redox modulation is felt differently at the level of a test plant – wheat – but in conditions that promote heterotrophy. That is, at high concentrations (up to 1/2,000) (fig. 4 – the full dots), SO_2 induces a semi-Gaussian shape/allure of the biological effect (seedlings height, $\overline{H}$), proving the redox modulation. For lower concentrations (the empty dots), no clear dependence is seen, but only a slight tendency of stimulation at oxidizing values of rH (otherwise, a normal behaviour for plants). In other words, at such concentratios, the SO_2 effect is of a different nature than the redox one. This fact can be attributed to the presence of SO_2 in a free form, the H_2SO_3 compound it could form being unstable. As it is more stable, the potassium methabisulphite (fig. 5) shows an obvious redox dependence (a Gaussian shape), from which are excepted only the high concentrations (up to 1/1,000) which can be accused of osmotic or simply toxicological mediated effects. The potassium sorbate proves to be even more redox modulating. Analyzing figure 6 only a disjunction between the high concentrations (up to 1/5,000 – the full dots) and the low ones it can be seen, in both cases being seen tipical, Gaussian, dependencies, a more obvious one at high concentrations and a more discreet one at low concentrations.

As regards the stability of substances depending on the environment (the experimental details are identical with those mentioned in (Zănoagă C. V. et al., 2010), SO_2 proves to be, one more time, the most sensitive, "personality"-lacked, substance, as proven by figure 7: after a period of relative stability, the appear large oscillations of rH (the full line), and only the average (the dashed line) shows a progresive reduction, accordingly to the effect of seedlings living in contact with the SO_2 solution, a sign of losing in time the redox effect specific to the substance.

It is something normal, as long as the more stable form of SO_2, that is the potassium methabisulphite, shows the same becoming of the substance (fig. 8). The most obvious/apparent redox modulator, that is potassium sorbate, also shows the best resistance to the action on test-organism – wheat –, able to counteract the presence of the redox modulating substance redox effect (fig. 9): after a quite long time of rH constancy, that is of "personality", there follows a loss of it in the favour of the contact organism effect, so that at the end of the experiment, when the test-organism becomes allelopathic inhibited, the substance "personality" enforces again, by the means of rH returning to the previous value.

CONCLUSIONS

The potassium sorbate has the most obvious preservative effect on a long term scale, it also being the substance which, through a redox mechanism, controls – no matter the scale of concentration – the becoming of the existing organisms in wine. In other words, the potassium sorbate can be applied/introduced as result of an appropriate study, valid forever, while SO_2 or the potassium methabisulphite needs a continuous watch and corrections in order to maintain the preservative effect.

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SUPERIOR VALORIFICATION OF THE SEA BUCKTHORN FRUITS STORED BY FREEZING

VALORIFICAREA SUPERIOARĂ A FRUCTELOR DE CĂTINĂ ALBĂ DEPOZITATE ŞI PĂSTRATE PRIN CONGELARE

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Abstract. *One of the most valuable products processed from the sea buckthorn fruits (Hippophae rhamnoides L.) is the fresh pressed juice. The main problem is the possibility of extending the period of storage of the sea buckthorn fruits in order to obtain the fresh juice when the derivate products are processed. The purpose of this study is to investigate the storage possibilities of the sea buckthorn fruits for a period that covers a ripping cycle. Studying the variation of the organoleptic properties in different storage periods by freezing process, it has been discovered that the sea buckthorn fruits can be stored for a period of 360 days without being affected the quality of the final products.*

Key words: sea buckthorn, storage, freezing

Rezumat. *Unul dintre cele mai valoroase produse din fructe de cătină albă (Hippophae rhamnoides L.) este sucul proaspăt presat. Principala problemă este posibilitatea de prelungire a duratei de depozitare a fructelor de cătină în vederea obţinerii sucului proaspăt în momentul producerii preparatelor derivate. Scopul acestui studiu este de a investiga posibilităţile de depozitare a fructelor de cătină pe o perioadă care să acopere un ciclu de fructificare. Studiind variaţia proprietăţilor organoleptice pentru durate diferite de depozitare prin congelare, s-a constatat că fructele de cătină pot fi păstrate pentru o durată de 360 de zile fără a se afecta calitatea produselor obtinute.*

Cuvinte cheie: cătină albă, păstrare, congelare.

INTRODUCTION

The sale of the sea buckthorn *(Hippophae rhamnoides* L.*)* fruits in fresh is burdened by the fact that these fruits are not consumed as they are, but after they have been prepared or as derived products (Bernath and Foldesi, 1992). Due to its degree of very quick degradation and small storage period of the sea buckthorn fruits, in order to obtain a superior quality of the products the whole year, it is necessary to store them for a longer period (Artyomova, 2001). A modern method to extend the storage period is freezing them, the quality of the sea buckthorn juice obtained by processing the frozen fruits will remain the same (Radu, 1973). The low temperature, created with support of the artificial frost can prolong the storage period of the sea buckthorn fruits. The artificial frost is used for storing the fruits for a short (days) and longer (months) period (Beveridge et all. 1999).

In order to store the fruits for a short period it is used the *refrozen* procedure, a method through the fruits are stored at temperature more close to the freezing point (0^0 to 5^0C), without being completely frozen. Regarding the storage

of the fruits for a longer period, it is used the *congealment* procedure. The fruits are congealed at very low temperatures (until -20^{0}C), as the most part of the water contained in the fruits transform in fine ice crystals.

MATERIAL AND METHOD

The types of Şerpeni, Sf. Gheorghe and Şerbăneşti sea buckthorn have been used for this study, cultivated in a plantation in Roşia village, Sibiu county, belonging to a commercial society NP PROD. L.T.D. The fruits were mixed from all the cultivated types in equal proportions, the crop being made in August, September and October 2008.

In this paper, it has been studied the storage by freezing the sea buckthorn fruits and the variation of components and acidity of the juice in relation with the freezing temperature and the storage time.

First, there have been applied several treatments as: sorting, cleaning and freezing at temperatures between 0^0 and 6^0 C. Also, it had been taken into consideration the employment of a high quality of the sea buckthorn fruits, fresh and healthy.

The cleaning consists in removing the foreign bodies, leaves and branches. The selection was made by removing the non healthy fruits, injured or that do not have the specific color of the specie. The packaging was made in plastic bags in equal quantities, and after that preserved in refrigeration rooms (0-6 °C) by the moment of freezing. The fruits freezing was made in 2-3 days from harvesting, any extension of preserving time leading to a deterioration of product's quality. The main objectives of the study that we have proposed are the pursuit of the optimal freezing temperature and the storage period admitted, but also the fruit behavior at freezing, the organoleptical and physical or chemical modifications and acidity that took place during the frozen and storage process.

In order to freeze sea buckthorn fruits, it has been used a temperature between -15 to -20 degrees Celsius for different storage periods, starting from three hours to 360 days. It also have been established the fruits behavior and there have been made periodic organoleptic determinations of the fresh fruits stored for 90, 120, 270 and 360 days. The proportional factors are as follows: taste -4, consistence -2, smell -2, color -1 and shape -1. For determining the organoleptic properties (consistency, color, taste, flavor and form) were used the indicators and conditions from table 1.

Table 1

The indicators and conditions for determining the organoleptic properties

Organoleptic quality classes	Note (*o.m.*)	Qualification
95-100	10	Excellent
85-95	9	Very good
75-85	8	Good
65-75	7	Good enough
55-95	6	Satisfactory
45-55	5	Average satisfactory
35-45	4	Slight defective
25-35	3	Defective
15-25	2	Bad
5-15	1	Very bad
0-5	0	Discomposed

The general organoleptic figure (*Go*) is taken from the relation:

$$Go = o.m. \times Pf / 10.$$

To each organoleptic characteristic is given a mark (*o.m.*) from 1 to 10. This mark is multiplied with a proportional factor (*Pf*) that indicates the importance of the characteristic for a certain characteristic of the analysed product. The total of the proportional factors (*Pf*) must be 10.

Beside the organoleptical examination were made a long series of determinations regarding the acidity of juice obtained from frozen sea buckthorn fruits. The determination of seabucktorn juice acidity were performed by titration of a NaOH solution 0.1N, factor =1.0201, in the presence of phenolphthalein (the filtered juice was used).

RESULTS AND DISCUSSIONS

Using the organoleptic examination (consistency, colour, taste, smell and shape) and calculating a general organoleptic mark (*Go*), there were obtained quality qualifications connected to the storage period of the frozen sea buckthorn fruits.

The allowed preserving period was established when, after a storage period, the frozen product gets a quality qualification of at least good, respective the mark 7.

From this point of view the sea buckthorn fruits received the ranking "good to very good". This makes us to establish the preserving allowed period for the frozen sea buckthorn fruits of at least 360 days.

In figure 1 there is described a graph with the organoleptic modifications (general mark) for different storage periods.

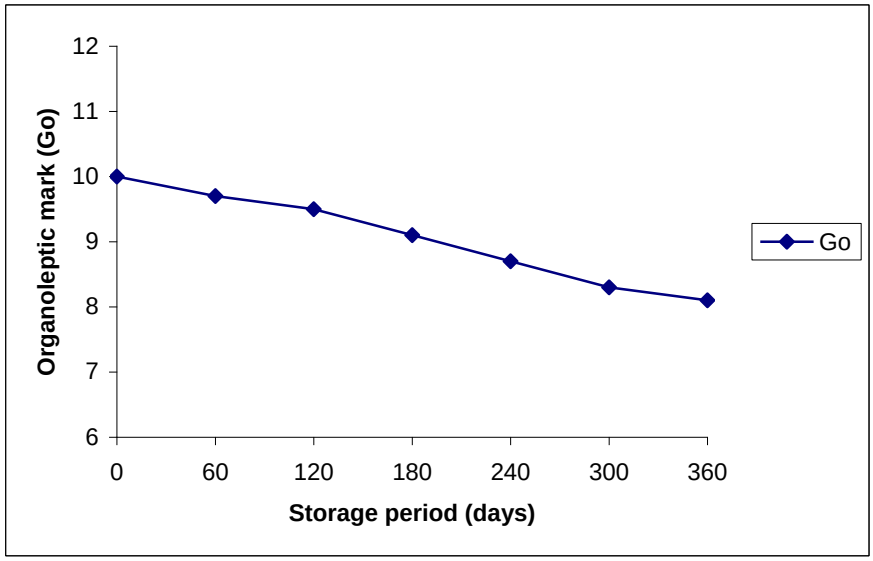

Fig. 1. The organoleptic modifications of the frozen sea buckthorne fruits

The acidity of juice obtained from white sea buckthorn frozen fruits and preserved a period of 360 days decreases compared to the acidity of juice obtained from fresh fruits with 20,5 %, having a slight increase by the middle of storage period (figure 2).

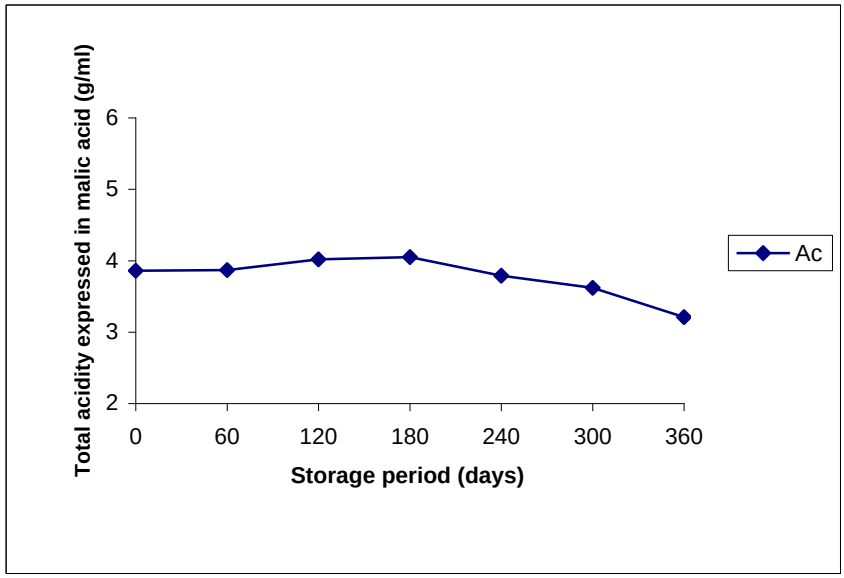

Fig. 2. Variation of total acidity expressed in malic acid (g/100ml) depending on the storage period

The obtained results confirm that the sea buckthorn fruits can be well frozen.

CONCLUSIONS

1. The preliminary treatments applied during the freezing process (cleaning, selection of fruits, packaging in equal amounts in plastic bags, as well as the preserving of these in refrigeration rooms with temperatures between 0 °C and 6 °C) guaranteed the proper conditions for the freezing operation.

2. In order to obtain high quality products from sea buckthorn, is recommended that the seabucktorn fruits be stored to the freezing temperature of – 20 °C and a preserving allowed period of 360 days.

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THE AGROBIOLOGICAL AND TECHNOLOGICAL VALUE OF THE VINE CLONES OBTAINED IN THE RESEARCH DEVELOPMENT STATION FOR VITICULTURE AND WINE PRODUCTION OF IAŞI

VALOAREA AGROBIOLOGICĂ ŞI TEHNOLOGICĂ A CLONELOR DE VIŢĂ DE VIE OBŢINUTE LA STAŢIUNEA DE CERCETARE DEZVOLTARE PENTRU VITICULTURĂ ŞI VINIFICAŢIE IAŞI

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Abstract. *Maintaining and improving the biological potential of old and valuable vine varieties that are the basis of the traditional varieties of famous vineyards, by using the clonal selection as a fast and efficient means of quantitative and qualitative growth of the grape production, is a major concern of the scientific research in the field of vine improvement and breeding. In this regard, by applying the clonal selection method in the Research Development Station for Viticulture and Wine Production of Iaşi, five vine clones were obtained for white wines, one for aromatic rosé wines, one clone for red wines and two cones for the table grapes. The nine homologated clones stand out through vigorously uniform stocks, through their increased productivity, achieving harvest increments between 16 and 94%, having higher quality and genetic stability characteristics, in comparison to the control samples. All these outcomes recommended them for priority breeding and production spread.*

Key words: vine, clones, the traditional variety

Rezumat. *Menţinerea şi îmbunătăţirea potenţialului biologic al soiurilor vechi, valoroase de viţă de vie ce stau la baza sortimentelor tradiţionale ale unor podgorii renumite, prin utilizarea selecţiei clonale ca mijloc rapid şi eficient de creştere cantitativă şi calitativă a producţiei de struguri, constituie o preocupare majoră a cercetării ştiinţifice din domeniul ameliorării şi înmulţirii viţei de vie. În acest sens, prin aplicarea selecţiei clonale la SCDVV Iaşi, au fost obţinute cinci clone de viţă de vie pentru vinuri albe, una pentru vinuri roze aromate, o clonă pentru vinuri roşii şi două clone pentru struguri de masă. Cele nouă clone omologate se remarcă prin butuci uniformi ca vigoare, sunt mai productive, realizează sporuri de recoltă cuprinse între 16 şi 94% şi prezintă însuşiri superioare de calitate şi stabilitate genetică, comparativ cu martorii. Toate aceste rezultate le-au recomandat pentru înmulţire cu prioritate şi răspândirea lor în producţie.*

Cuvinte cheie: viţă de vie, clone,ameliorare, sortiment tradiţional

INTRODUCTION

During time, the improvement of grape wine had a long evolution, and as a result, the valuable improved varieties completed the local varieties, less valuable. A part of these varieties, under the influence of the ecologic factors and genetic erosion depreciated their productive and qualitative biological potential.

The structural improvement of the national wine varieties is supported by the activity of creation of new varieties, more valuable than the old existing ones and the increase of their biological value by using the clonal selection, so that, in time, the clonal selection should replace the populations they result from. By the selection works performed in our country, we intended to maintain in culture the valuable varieties of the traditional variety, with good results, as long as possible (Gh. Calistru et al., 1988; Gh. Calistru et al., 1987; Gh. Calistru et al., 1980; Damian Doina et al., 2006; Damian Doina et al., 1998; D. Dănulescu et al., 1986).

This work refers to a number of nine clones of grape vine, obtained at the Station for Research and Development for Viticulture and Vinification of Iaşi, which are the basis of the varieties cultivated in the vineyards of Cotnari or Huşi.

MATERIAL AND METHOD

The cloned plantations where the researches were made are placed on a cambic cernosium -type soil, using planting distances of 2.2/1.2 m in the system of semi-high culture semi-protected during winter. The culture technologies used were those recommended by the viticulture agrotechnics for this area. In order to know the biological potential of production and quality of these clones, the researches focused on observations and determinations concerning the vegetation, fertility phenophases and the productivity, quality and quality of the crop, in direct relation with the ecologic factors. The climatic factors of the studied period corresponded to a few years with different conditions. From the climatic point of view, the global thermal result, active and useful of the vegetation period had values in 2009 compared to 2008, the same for the monthly average temperature of 18.5°C (2009) compared to 17.3°C (2008). The average temperatures of July, August and September, period when there occurred the main physiological and biochemical processes which condition the ripening and ripeness of berries, were normal, with higher values in 2009, they contributing to the completion of these processes. The absolute minimum temperatures during winter were below the frost limit of grape vine. Summers were hot, sometimes canicular, with absolute maximum temperatures up to 38°C. From the hydrical point of view, the year 2008 is considered a year with abundant precipitations (532.5 mm), and 2009, a very draughty year, in the vegetation period being accumulated only 214 mm. The values of the eco-climatic synthetic indicators, which also indicate a restrictive character for the culture of grape vine in certain areas, give a clear image on the climatic conditions of the studied period.

RESULTS AND DISCUSSIONS

Due to the climatic conditions presented previously, the clones studied gone through all the phenophases specific to the period of active vegetation (table 1), starting with debudding that occurred in the period April 14^{th}- 26^{th}, followed by blossoming in the interval June 12^{th}-13^{th} and the grapes dough between July 22^{nd}- August 7^{th}. The technological or consume ripeness of grapes, in the conditions of the viticultural ecosystem of Copou Iaşi, occurred in the majority of the clones studied during the month of September, the moment of the harvest being conditioned by the climatic values of the crop year and the manner of organizing the Vinification campaign. The cycle of the active vegetation period was composed of 182-183 days, finalizing through the normal ending of the

metabolic processes, in the interval 16th- 28th October.

Table 1

The phenologic specter of the grape vine clones (2008 – 2009)

Clone	Debudding	Blossoming	Grapes' dough	Grapes ripening	Fall of leaves
Aligoté 5 Iş	16 – 23 IV	3 – 10 VI	5 VIII	9 - 15 IX	16 – 28 X
Aligoté 31 Iş	16 – 23 IV	3 – 10 VI	5 VIII	9 - 15 IX	16 – 28 X
Busuioacă de Bohotin 5 Iş	16 – 24 IV	5 – 12 VI	22 – 29 VII	9 IX – 1 X	16 – 28 X
Cabernet Sauvignon 4 Iş	15 – 24 IV	3 – 12 VI	5 – 7 VIII	1 - 10 X	16 – 28 X
Chasselas doré 20 Iş	17 – 23 IV	3 – 11 VI	30 VII – 2 VIII	16 - 22 IX	16 – 28 X
Chasselas rose 17 Iş	16 – 22 IV	2 – 10 VI	31 VII – 6 VIII	16 - 22 IX	16 – 28 X
Fetească albă 8 Iş	14 – 22 IV	7 – 12 VI	31 VII – 3 VIII	7 - 22 IX	16 – 28 X
Frâncuşă 14 Iş	14 – 24 IV	6 – 12 VI	5 – 7 VIII	11 - 23 IX	16 – 28 X
Muscadelle 1 Iş	18 – 26 IV	6 – 13 VI	5 – 7 VIII	9 - 15 IX	16 – 28 X

The values of the elements defining the fertility and productivity of cloned reveal the fact that all have favorably capitalized the environment conditions of the ecosystem in which they were studied (table 2).

Table 2

The fertility and productivity of the grape vine clones

Clone	Fertile sprouts, %	Fertility coefficient		Productivity index	
		absolute	relative	absolute	relative
Aligoté 5 Iş	79,7	1,64	1,33	188,1	144,4
Aligoté 31 Iş	74,2	1,40	1,08	148,1	112,2
Busuioacă de Bohotin 5 Iş	82,5	1,44	1,48	263,4	219,3
Cabernet Sauvignon 4 Iş	68,1	1,15	0,87	101,5	77,3
Chasselas doré 20 Iş	80,1	1,59	1,22	259,2	206,5
Chasselas rose 17 Iş	78,7	1,45	1,11	229,2	179,1
Fetească albă 8 Iş	90,2	1,5	1,33	161,5	143,0
Frâncuşă 14 Iş	88,6	1,73	1,50	320,5	276,5
Muscadelle 1 Iş	82,2	1,26	1,21	229,6	198,3

The percentage of fertile sprouts has had average values that oscillated from 68,1% in the Cabernet Sauvignon 4 Is up to 90,2% at Fetească albă 8 Is, and intermediary values for the other clones. The absolute fertility coefficients were super unitary in all the clones, distinguishing themselves through a superior value Frâncuşă 14 Is (1,73), and the relative ones varied between 0,87 and 1,50. The productivity indices achieved have had values comprised between 101.5 and 320,5 (the absolute ones) and between 77,3 and 276,5 according to the size of grapes. During the period when the researches were carried out, the production of the studied clones was influenced by the action of the climatic factors specific in that period, in correlation with the genetic specific of each (table 3). In the same ecosystem and technology ecosystem, the average production of grapes was variable from one clone to the other, the most productive being Muscadelle 1 Is with 5,25 kg/vine (real production) respectively 19,88 t/ha (calculated production) followed by Aligoté 31 Is, with 5,15 kg/ vine, Aligoté 5 Is, with 4,28 kg/vine, Chasselas doré 20 Is with 4,17 kg/vine, Frâncuşă 14 Is with 4,12 kg/vine and Busuioacă de Bohotin with 3,71 kg/vine.

Table 3

The quantitative and qualitative production of the studied (2008 – 2009)

Clone	Production		Average mass of a grape, g	Average mass of 100 beans, g	Sugars, g/L	Acidity, g/L H_2SO_4
	Real kg/grape vine	Calculate t/ha				
Aligoté 5 Iş	4,28	16,20	117	177	182	5,2
Aligoté 31 Iş	5,15	19,50	108	174	182	4,7
Busuioacă de Bohotin 5 Iş	3,71	14,10	187	252	224	4,8
Cabernet Sauvignon 4 Iş	2,32	8,80	89	124	201	5,7
Chasselas doré 20 Iş	4,17	15,79	165	242	180	3,2
Chasselas rose 17 Iş	3,41	12,91	159	286	173	3,3
Fetească albă 8 Iş	3,24	12,25	107	151	207	3,8
Frâncuşă 14 Iş	4,12	15,60	184	240	186	5,6
Muscadelle 1 Iş	5,25	19,88	182	199	183	4,3

The quality of the crop, appreciated through the average mass of the grape, the content in sugars and the stum acidity certify the hereditary character of these traits, and their modification under the influence of the unfavorable climatic factors. The average mass of the grape and bean has had variable values from one clone to the other, distinguishing itself through the large grapes the clones Busuioacă de Bohotin 5 Is (187 g/ grape), Frâncuşă 14 Is (184 g/grape), Muscadelle 1 Is (182 g/grape), followed by the table ones, Chasselas doré 20 Is (165 g/grape) and Chasselas rose 17 Is (159 g/grape), where the beans were large, with an average mass between 2.72-2.86 g/bean.

The qualitative indices of the production, appreciated through the content in sugars and the total acidity of the stum, emphasize different accumulations from one clone to the other. The clones of Busuioacă de Bohotin 5 Is (224 g/L), Fetească albă 8 Is (207 g/L) and Cabernet Sauvignon 4 Is (201 g/L) manifested a larger potential of sugars accumulation, values belonging in the group of varieties destined to obtaining quality wines. The other clones registered also accumulations of over 180 g/L sugars, with the exception of those for the table mass. The total acidity of the stum was situated in the normal limits, comprised between 4,3 and 5,7 g/L H_2SO_4, with the exception of Fetească albă 8 Is (3,8 g/L H_2SO_4) clone and those for the table grapes.

The main composition characteristics of the wines obtained from the clones studied certify the fact that a part of them has all the conditions of the types of wine with name of controlled origin (table 4). Thus, the wines resulting from the clone of Busuioacă de Bohotin 5 Is, are characterized through an alcohol concentration of 12,6-14,6 % alcohol volume, the total acidity of 3,5 – 4 g/L H_2SO_4 , which together with an appropriate non-reductive extract, a high content in total polyphenols, anthocyans and glycerols, ensure a general balance for them. These characteristics are completed by the pleasant colour, nuanced in pink – purple and the aroma specific to the variety. The same composition characteristics were found in the wines resulted from the Cabernet Sauvignon 4 Is clone, with the mention that they had a higher content in total polyphenols and anthocyans and a higher content in total polyphenols and anthocyans and a higher colored intensity.

Table 4

The main composition characteristics of the wines achieved by the studied clones

Clone	Years	Alcohol, % vol.	Total acidity, g/L H_2SO_4	Volatile acidity, g/L CH_3COOH	Sugars, g/L	Non-reducing extract g/L	Ash g/L	Total polyphenols, g/L	I.C. 420 nm	Anthocyans mg/L	pH	Glycerol, g/L
Aligoté 5 Iş	2008	9,9	3,8	0,23	0,4	16,0	0,96	0,21	0,10		3,14	7,36
	2009	13,1	4,7	0,80	15,0	18,0	1,64	0,51	0,20		3,16	4,80
Aligoté 31 Iş	2008	10,4	3,5	0,26	0,2	16,0	0,98	0,20	0,09		2,20	5,98
	2009	11,9	3,7	0,50	-	15,4	1,33	0,21	0,07		3,19	4,10
Busuioacă de Bohotin 5 Iş	2008	14,6	3,5	0,83	15,0	21,2	1,88	0,69	0,04	33,2	3,85	15,64
	2009	12,6	4,0	0,44	-	20,0	1,79	0,61	0,15	36,0	3,63	6,40
Cabernet Sauvignon 4 Iş	2008	11,8	3,1	0,34	0,8	20,1	1,91	0,53	1,24	-	3,53	6,90
	2009	12,2	3,3	0,41	-	20,3	1,91	1,14	0,41	440	3,70	6,50
Fetească albă 8 Iş	2008	10,3	3,4	0,17	-	18,3	1,71	0,33	0,06		3,30	6,40
	2009	12,2	5,4	0,70	29,0	21,0	2,08	0,26	0,08		3,30	5,40
Frâncuşă 14 Iş	2008	11,0	5,3	0,29	0,7	19,0	1,18	0,24	0,15		3,04	5,29
	2009	10,8	4,1	0,54	-	16,0	1,43	0,22	0,09		3,30	4,20
Muscadelle 1 Iş	2008	10,1	2,7	0,35	0,4	16,0	0,97	0,18	0,20		3,38	5,75
	2009	12,5	3,8	0,49	-	16,7	1,57	0,24	0,08		3,30	5,40

The wines obtained from the other clones reunited the necessary parameters for being considered of quality. We should notice the fact that 2009 can be qualified as a quality year.

CONCLUSIONS

1. The climatic factors from the studied period, allowed for all the clones to go through the entire phenologic specter, benefiting from an average number of 182 days of active vegetation;

2. The fertility and productivity of clones were high, the values of the absolute fertility coefficients being superunitary, and of the relative ones, with the exception of the Cabernet Sauvignon 4 Is clone (0.87) over 1 as well.

3. The productions of grapes achieved were differentiated according to clones, the most productive ones being Muscadelle 1 Is with 5.25 kg/vine effective production, Aligoté 31 Is, with 5.15 kg/vine and the clones of Aligoté 5 Is, Chasselas doré 20 Is and Frâncuşă 14 Is with over 4.0 kg/ vine;

4. The accumulation potential of sugars in the stum were superior in the clones of Busuioacă de Bohotin 5 Is (224 g/L), Fetească albă 8 Is (207 g/L) and Cabernet Sauvignon 4 Is (201 g/L), and the total acidity was situated in the normal limits, specific to the population of the varieties they originate from;

5. The wines obtained from the clones created and studied in the Station of Research Development for Viticulture and Vinification Iaşi, are characterized by all the conditions of the DOC wine types (Busuioacă de Bohotin 5 Is, Cabernet Sauvignon 4 Is, Fetească albă 8 Is) and of quality wines.

Acknowledgments.

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CONTRIBUTIONS TO THE KNOWLEDGE REGARDING AGROBIOLOGICAL AND TECHNOLOGICAL CHARACTERISTICS OF GENETIC RESOURCES EXISTENT AT THE RESEARCH DEVELOPMENT STATION FOR VITICULTURE AND WINE PRODUCTION OF IAŞI

CONTRIBUŢII LA CUNOAŞTEREA UNOR ÎNSUŞIRI AGROBIOLOGICE ŞI TEHNOLOGICE ALE RESURSELOR GENETICE EXISTENTE LA STAŢIUNEA DE CERCETARE DEZVOLTARE PENTRU VITICULTURĂ ŞI VINIFICAŢIE IAŞI

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Abstract. *The researches carried out in 2009 on the existing genetic fund of SCDVV Iaşi focused on aspects regarding the development of vegetation phenophases, the grape production and its quality. The outcomes of the studies regarding the knowledge referring to the agrobiological and technological characteristics of the varieties existing in the ampelographic collection reveal the fact that very many of these are valuable and can keep constituting the study object with the purpose of promoting them in production.*
Key words: genotypes, the agrobiological and technological characteristics

Rezumat. *Cercetările efectuate în anul 2009 asupra fondului genetic existent la SCDVV Iaşi au vizat aspecte privind desfăşurarea fenofazelor de vegetaţie, producţia de struguri şi calitatea acesteia. Rezultatele obţinute în urma studiilor efectuate cu privire la cunoaşterea principalelor însuşiri agrobiologice şi tehnologice ale soiurilor existente în colecţia ampelografică, relevă faptul că, foarte multe dintre acestea sunt valoroase şi pot constitui în continuare obiect de studiu în scopul promovării lor în producţie.*
Cuvinte cheie: genotipuri, însuşiri agrobiologice şi tehnologice

INTRODUCTION

The ecologic plasticity of the grape vine has given birth to thousands of varieties/cultivar, spread today on all the continents of the globe, which present a very impressive phenotypic variety leading most of the times to uncertainties and confusions regarding the identity of the native varieties. The desire to know the best varieties, by comparison with those existent previously and the need of conserving the ancestral varieties have aroused the interest of wine growers, especially of the ampelographic specialists and ameliorators (G. Alleweldt et al., 1986; G. Alleweldt et al., 1987).

The local, native varieties, which along time were subject to a long selection process present a good adaptation to the culture conditions in which they were formed, but they were depreciated under the aspect of productivity and quality due to the action of genetic erosion, of some inadequate crop measures but

also due to the lack of applying a scientific, systematic selection which leads to maintaining and increasing their genetic potential (Gh. Calistru et al., 1997; Damian Doina et al., 1992; Vişan Luminiţa, 2001). By studying the species and varieties used in the crop, we are aiming at knowing their origin and evolution in the interdependency with the ecological factors, in view of establishing their variability as morphogenesis element reflected on the productivity and quality characteristics. Knowing the varieties of grape vine under the relation of agro-biological and technological characteristics, is a problem which is solved starting from the genetic resources from the gene bank (ampelographic collection) and which constitutes the subject of the present paper.

MATERIAL AND METHOD

The study collections that make up the gene bank where the researches took place are placed on a cernosium soil, with slight bent and southern exposal. The semi-protected crop system is used during the year, with direction forms on the stems and bilateral cords, with cuts in fruit stems and little cords of 4-6 eyes and safety stems at the basis of the grape vine. The variety cultivation taken in the study comprises 590 genotypes. The varieties cultivated come from the old autochthonous varieties, new varieties and clones, belonging to the species *Vitis vinifera* L., created (430), varieties with increased resistance and parent stock varieties (160). Given the very pronounced variability of the varieties within each production direction, for facilitating the researches, they were divided on groups of variations according to the determined elements. The level of climatic factors from the viticultural center Copou Iaşi, in 2009, can be appreciated as being favorable for the crop of grape vine, the vegetation period that the studied varieties have gone through being characterized by normal average temperatures (18,5^{o}C), those from July, august and September of 23,1°C, 21,2°C and 17,6°C ensured a good ripening of grapes and appropriate quality. In exchange, the precipitations were reduced, during the vegetation period registering only 214 mm. The sum of insolation hours was of 1521.7 hours.

RESULTS AND DISCUSSIONS

Based on a favorable climatic regime, all the studied genotypes have gone through the entire phonological specter, the triggering of vegetation occurring through debudding, and the ending through the yellowing and fall of leaves. Groups in variation classes for the debudding phenophases and the dough of grapes (table 1) within each production direction we ascertained that in 2009 debudding occurred during the period 20 April – 5 May with a duration of 6 days in the genotypes with apyrexia, 9 days in the resistant ones (April 25th – May 4th), 11 days in the varieties for the table grapes (April 22nd –May 3rd) and 12 days in those for white wines, rose (April 20th – May 3rd) and red (April 24th –May 5th). A pronounced variability for this characteristic is encountered in all the varieties taken in the study, 53% of those for table grapes, 49% for the white and rose wines and 57% for the red wines, debudding in the interval April 25th – May 1st, while the apyrenus genotypes were in the period April 24th – 30th. The flowering in the climatic conditions of 2009 was advanced with approximately 10 days and was produced in all the genotypes studied in the interval May 31st – June 9th with an average duration of 4 up to 10 days.

Table 1

The phenologic specter of the studied genotypes in the ampelographic collection SCDVV - 2009

Specification	Duration of the phenopahse	Total genotypes	Variation class % (calendar dates)			
THE DEBUDDING						
Genotypes for table grapes	11	193	22 – 26.04 30	27 – 30.04 53	01 – 03.05 17	
Genotypes with apyrenus characteristics	6	13	24 – 30.04 100			
Genotypes for white and rose wines	12	151	20 – 24.04 17	25 – 28.04 49	29.04 – 03.05 44	
Genotypes for red wines	12	54	24 – 27.04 37	28.04 – 01.05 57	02 – 05.05 6	
Genotypes with increased biological resistance	9	82	25 – 28.04 40	29.04 – 01.05 30	02 – 04.05 30	
THE FLOWERING						
Genotypes for table grapes	8	193				
Genotypes with apyrenus characteristics	4	13				
Genotypes for white and rose wines	8	151				
Genotypes for red wines	6	54				
Genotypes with increased biological resistance	10	82				
THE VERAISON						
Genotypes for table grapes	22	193	16 – 20.07 6	21 – 26.07 14	27.07 – 01.08 15	02 – 08.08 65
Genotypes with apyrenus characteristics	15	13		22 – 26.07 23	27.07 – 01.08 23	02 – 06.08 44
Genotypes for white and rose wines	23	151	16 – 21.07 2	22 – 26.07 2	27.07 – 02.08 15	03 – 09.08 81
Genotypes for red wines	12	54			28.07 – 02.08 7	03 – 09.08 93
Genotypes with increased biological resistance	17	82		22 – 26.07 6	27.07 – 02.08 11	03 – 08.08 83

The veraison, as the other phenophases was strongly influenced by the great values of the temperatures and the lack of precipitations which rushed the beginning of the veraison for the varieties, this occurring in the period July 16th – August 9th. For all the directions, we emphasized only the fact that between 2 and 6% of the varieties began their veraison early (July 16th–July 21st) most of them (44-93%) belonging to the first variation class (August 2nd- August 9th). They were emphasized through an early and semi-early veraison of grapes, the varieties: Ozana, Otilia, Paula, Gelu, Transilvania (table varieties); Aromat de Iaşi, Donaris, Fetească albă, Fetească regală, Busuioacă de Bohotin, Lampara, Armărie, Albuţ, Coada oilor (for the white and rose wines), while the genotypes destined for obtaining the red wines had the veraison almost simultaneously in around 12 days, and among these 90% in the interval August 3rd-9th.

The ripeness of grapes began with the white genotypes for the table in the interval August 6th – September 4th being followed by the black ones (September 2nd – September 22nd) while those destined to obtaining white, rose or red whines, the technological ripeness of grapes coincided with the harvesting period in the interval September 14th –October 1st.

The production of grapes was variable from one group of varieties to the other but also within the cultivars of the same production direction. For this technological characteristic there was a pronounced variability, so that only 24% of the genotypes for the table grapes produced over 3.1 kg grapes/ vine, 16% of the apyrenus ones, 42-47% varieties for the white and red wines and 27% of the varieties with increased biological resistance (table 2).

Table 2

Production of grapes - 2009

Specification	Total genotypes, no.	Production classes, 0%		
		0,5-1,5 kg/ vine	0,5-1,5 kg/ vine	0,5-1,5 kg/ vine
Genotypes for table grapes	193	31	45	24
Genotypes with apyrenus characteristics	13	46	38	16
Genotypes for white and rose wines	143	18	40	42
Genotypes for red wines	52	8	46	46
Genotypes with increased biological resistance (interspecifici)	77	21	52	27

The following varieties manifested a higher production potential: Gelu, Milcov, Paula, Muscat timpuriu de Bucureşti, Transilvania, Coarnă neagră, Românie (table varieties); Golia, Crâmpoşie selected, Negru de Drăgăşani, Arcaş, Fetească albă, Fetească regală, Frâncuşă, Zghihară de Huşi, Busuioacă de Bohotin, Creaţă, Băşicată de Drăgăşani, Băbească neagră and Negru românesc (varieties for the white, rose and red wines) and Brumăriu, Valeria, Moldova, Frumoasă albă (varieties with characteristics of increased biological resistance)

The researches made regarding the quality of the studied genotypes production emphasize a great variability within each production direction and from one variety to the other (table 3). Thus, the size of grapes, appreciated in the average mass, character with genetic variety marks, but variably under the action

of the environment factors, was specific to each variety. The results obtained emphasize the fact that over 30% of the varieties for table achieve larger grapes of 350 g, existing a distribution for each variation class.

Table 3

The quality of grape production

Specification	No.	Variation classes, %					
Average mass of grapes, g		**<150**	**151-200**	**201-250**	**251-300**	**301-350**	**>350**
Genotypes for table grapes	193	10	16	21	14	8	31
Genotypes with apyrenus characteristics	13	23	15	31	8	8	15
Bean mass, g.		**<2**	**2,1-3,5**	**3,6-5**	**>5**		
Genotypes for table grapes	193	8	51	32	9	-	
Genotypes with apyrenus characteristics	13	23	62	15	-	-	
Sugars, g/L		**<145**	**146-170**	**171-195**	**196 -220**	**>220**	
Genotypes for table grapes	193	10	27	33	15	15	
Genotypes with apyrenus characteristics	13	-	15	37	23	15	
Genotypes for white and rose wines	143	1	5	27	26	41	
Genotypes for red wines	52	-	6	19	23	52	
Genotypes with increased biological resistance	77	3	18	44	19	16	
Acidity, g/L H_2SO_4		**2,4-4,0**	**4,1-5,5**	**5,6-7,0**	**7,1-8,5**	**>8,6**	
Genotypes for table grapes	193	35	39	21	4	1	
Genotypes with apyrenus characteristics	13	31	23	38	7	-	
Genotypes for white and rose wines	143	22	52	22	4	-	
Genotypes for red wines	52	13	46	40	-	-	
Genotypes with increased biological resistance	7	30	44	13	13	-	

As regards the size of the bean we ascertained that in most varieties for the table grapes (51%) and with characteristics of apyrenus (62 %) produce grapes with the average mass of the bean comprised between 2,1 and 3,5 g/bean, only 9 % having the beans larger than 5 g.

The results obtained emphasize new or foreign varieties, autochthonous or local varieties with grapes and large beans that deserve to be taken into consideration: Victoria, Italia, Ceauş alb, Deac Ferencz, Greaca, Afuz Ali, Xenia, Gelu and the apyrenus varieties Kiş Miş moldovenesc and Călina.

Under the aspect of the potential of accumulation of sugars in the stum, there was also a higher variability both from one group to the other and within the sale direction of production. Grouped in variation classes, from a smaller content of 145 g/L to a bigger one of 220 g/L we ascertained that most varieties for the table grapes (27-33%) and apyrenus (15-37%) belong to the classes 146-170 g/L, respectively 171-195 g/L, while those destined for obtaining white, rose and red wines had a superior potential, the majority belonging to the variation classes of 196-220 g/L (23-26%), respectively larger than 220 g/L (41-52%). The genotypes with increases resistance belonged to the highest extent in the first variation classes, knowing their lower potential of accumulating the sugars in the stum.

The total acidity of the stum in the climatic conditions of 2009 oscillated in very large limits, between the five groups of varieties for the table grapes and

with apyrenus characteristics presented a total variety of 2,4-5,5 g/L H_2SO_4, character specific to the varieties for consume in fresh state (77 – 87%) an acidity of 4,1 - 7,0 g/L H_2SO_4.

The following varieties distinguished themselves through a superior potential of sugars accumulation in the stum accompanied by a corresponding acidity: Gelu, Paula, Napoca, Muscat timpuriu de Bucureşti, Coarnă neagră, Ţâţa caprei, Razachie (table varities); Călina, Kiş Miş negru, Otilia (apyrenus varities); Selena, Cristina, Donaris, Golia, Busuioacă de Bohotin, Fetească albă, Fetască regală, Grasă de Cotnari, Tămâioasă românească, Lampara, Galbenă verde, Cioinic, Albar (varieties for rose and white wines) and Arcaş, Negru de Drăgăşani, Fetească neagră, Băbească neagră, Merlot, Oporto, Negru românesc (varieties for red wines)

CONCLUSIONS

1. The genotypes studied went through the entire phenologic specter in the interval April 20th –October 28th, after 182- 188 days of active vegetation.

2. The productions of grapes achieved were, generally, under the biologic potential of the majority of varieties studied, most of them achieving between 1.5 and 3,0 kg/vine, distinguishing through productions of over 3,1 kg/vine a significant number of genotypes from each production direction.

3. The size of grapes and beans has had large variation limits, from grapes smaller than 150 g up to over 350 g/grape, respectively from the beans situated under 1,4 g/bean at over 5 g/bean.

4. The accumulation potential of sugars in the stum was high, all the varieties according to the production direction, manifesting a pronounced variability, larger quantities of sugars accumulating the varieties for the white, rose and red wines.

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THE AGROBIOLOGICAL AND TECHNOLOGICAL VALUE FOR GELU TABLE GRAPEVINE VARIETY IN VINEYARD AREA OF IASI

VALOAREA AGROBIOLOGICĂ ŞI TEHNOLOGICĂ A SOIULUI PENTRU STRUGURI DE MASĂ GELU, ÎN CONDIŢIILE PODGORIEI IAŞI

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Abstract. *In the zone of the North-East of Romania, characterizes by the restrictive climatic conditions (the winters cold and be torrid for it and drynesses), the type of vines for the grapes of table have the less favorability, being cultivates especially the Chasselas type of vine gilds. For at the time the units of research wine in Romania centered their research of improvement of vine for obtain new genotypes which have the best adaptability with the these restrictive factors and the shorter growing period. The table grape variety Gelu, constitute one of the most valuable Romanian creation. It was obtain at SCDVV Iasi by Gh. Calistru and Doina Damian (1998) in follow Coarnă neagră seeds radiated with X rays. In this paper, the authors present the behaviour of table grape Gelu in area ecoclimatic condition of Copou vineyard, where it constitute one of most valuable variety, which allows obtain greats and best quality productions in NE of Moldavia area.*

Key words: Gelu, grapevine variety, Iaşi, fertility, productivity.

Rezumat. *Zona de nord est a României este caracterizată prin condiţii climatice restrictive (ierni geroase, veri călduroase şi secetoase) pentru cultura soiurilor de viţă de vie pentru struguri de masă, de aceea aici se cultivă mai ales soiurile de tipul Chasselas. Tocmai de aceea, unităţile de cercetare viti-vinicolă din România şi-au îndreptata atenţia către obţinerea de noi genotipuri care să fie mult mai bine adaptate la aceste condiţii restrictive si care să prezinte perioadă scurtă de vegetaţie. Soiul de viţă de vie Gelu este una din aceste acreaţii. el a fost obţinut la SCDVV Iasi de către Gh. Calistru şi Doina Damian (1998) din seminţe de Coarnă neagră iradiate cu raze X. În această lucrare sunt prezentate valoarea agrbiologică şi tehnologică a soiului Gelu, care asigură obţinerea unei producţii de struguri pentru struguri de masă de calitate foarte bună în condiţiile zonei de NE a Moldovei.*

Cuvinte cheie: Gelu, struguri de masă, Iaşi, fertilitate, productivitate.

INTRODUCTION

The variety of Gelu consumption grapes is one of the most valuable Romanian creations. It was obtained at SCDVV Iaşi following Coarnă neagră seeds radiated with X rays. It has widely spread in other vineyards, where it proved its special quality (Damian D. and al., 2006).

In Romania this variety has been recently introduced in most vineyards whose production objective is to obtain varieties of consumption grapes. This

paper is meant to outline the behavior of the Gelu grape variety in the ecoclimatic conditions of the Copou Iasi Viticultural Center, one of the most valuable varieties, which enables the obtaining of extensive and high quality productions in the North-Eastern zone of Moldavia, the area of the Copou viticultural center, together with other important creations obtained at SCDVV Iasi, such as the Aromat de Iaşi and Paula varieties (Rotaru L. and al., 2002).

MATERIAL AND METHOD

The study was performed in the Copou viticultural center, at ampelographic colection of University of Agricultural Sciences and Veterinary Medicine of Iaşi, in a experimental plantation with the Gelu variety, grafted on the mother plant Berlandieri *x* Riparia Selection Oppenheim-4. On the plantation, the vines are directed on semitall stems, bilateral cord, with cutting in crop chains (taps 2 eyes + cord 5-6 eyes), with the attribution of a cutting load of 40-45 eyes per vine.

The observations and calculi were performed in the period 2007-2009 and focused on: the resistance of the variety to frost, the development of the vegetation phenophases, grape fertility and productivity, resistance to diseases and damages, quantity and quality of the grapes production.

RESULTS AND DISCUSSIONS

The Iasi vineyard meets many of the habitat conditions for vine, in relation to the support factors (litho-morpho-pedologic), as well as to the external ones (bioclimatic). The main climatic indexes: the duration of the vegetation period 170-180 days, the annual average temperature, 11.3 degrees Celsius in 2007, 11,5 degrees Celsius in 2008 and 11.7 degrees Celsius in 2009, the global thermal situation 3700-3800^{0}C, the active thermal situation 3200-3350^{0}C, the useful thermal situation 1400-1500^{0}C, the real insolation 1400-1500 hours, the sum of annual rains 500-550 mm; in 2007 - 2009 the vegetation periods were of only 296-312 mm. In the study years, the absolute minimum value –25.1 C, was registered in the month of December of 2007, and the maximum value reached 42.3°C in August 2009 .

Consequently, in this vineyard one can grow vine varieties with a medium vegetation period, with moderate requests in relation to temperature and humidity, good resistance to frost, except for the years with climatic accidents (Cotea D:V. and al., 2000).

Gelu grapevine variety is resulting from seeds resulted from free pollination from the type of vine Coarnă neagră irradiated with x-rays. Obtained with the SCDVV Iaşi, Gh. Calistru and Doina Damian authors, approved in 1998. Type of vine of II-e epoch (1 -15 August), which presents the large adult sheet (17-18 cm), glabrous, pentalobe, of color dark green to the slightly corrugated limb, completed. The side sines are U-shaped with the slightly superimposed lobes, and the petiolar sine in the shape of quadrant. The grapes of intermediate size, cylindro-conical, uniaxial, bi or are triailés, semi-compact. The grain of intermediate size towards large, elliptic, with the film of color blue-purple, is

covered with bloom. Pulp is without color, semi-crunching with frank savour, agreeably harmonious (Rotaru L. and al., 2008).

The losses of buds during the winter. In the years with a normal thermal regime the Gelu variety (figure 1) registers losses of the main buds, the losses of buds exceed 24.9% and the application of compensation cutting is necessary in order to obtain a normal production of grapes.

In the years when the minimum absolute temperatures decrease under the resistance limit of the variety (2007), the losses of buds exceed 24.9%, thus requiring compensation cutting in order to obtain a normal production of grapes.

The development of the vegetation phenophases (table 1). Function of the climatic conditions of the year, it has been noticed that the Gelu variety enters in vegetation in the second half of April, being protected from the danger of late spring frost (15 April), and the blossoming occurs in the first decade of the month of June. The ripening of the grapes takes place at the end of July, when the grapes reach maturity, in the second decade of the month of August, according to the second epoch.

Fig. 1. Gelu grapevine variety

The vegetation period ends with the ripeness of the twigs and the fall of the leaves, phenophases that are strongly conditioned by the climatic regime of the area of the Iasi vineyard; for the Gelu variety, these phases take place after October 15, with the appearance of the first autumn frost.

Table 1

The development of the vegetation phenophases at Gelu grapevine variety in the Iaşi vineyard (years 2007-2009)

Years	Budding	Flowering	Ripeness of the grapes	Maturation of the grapes	Falls of the sheets
2007	24.04	5.06	31.07	18.08	20.10
2008	22.04	4.06	28.07	17.08	23.10
2009	20.04	1.06	26.07	15.08	25.10

The fertility and productivity of the grapevine variety (table 2). The Gelu variety is characterised by medium fertility and increased productivity, due to the size of the grapes.

The percentage of fertile twigs varies between 60% and 70%. The values of the fertility quotas were: c.f.a 1,00-1,05, c.f.r. 0,64-0,69, which indicates the fact that a single inflorescence forms on a twig, in average, and consequently, the application of the green rate setting operation is not necessary.

The productivity of this variety is very high, due to the weight of the grapes, which is of approximately 400 g. The values of the productivity indexes were: i.p.a. 427,45-513,45, i.p.r. 282,20-312,96.

Table 2

The fertility and productivity of the Gelu grapevine variety in the Iaşi vineyard (years 2007-2009)

Years	The percentage of fertile twigs	C.f.a.	C.f.r.	The average weight of the grape (g)	I.p.a.	I.p.r
2007	60	1,05	0,64	400	513,45	312,96
2008	63	1,04	0,65	388	403,52	252,20
2009	65	1,03	0,68	415	427,45	282,20
Average	*62,5*	*1,04*	*0,67*	*401*	*448,24*	*282,45*

Resistance to diseases and damages (table 3). The appreciation of the level of resistance was performed according to the O.I.V. norms, with the help of descriptors. We analyzed the behavior of the variety in relation to biotic and abiotic factors. It was observed that the Gelu variety presents a good level of resistance to the grey rot of the grapes, medium tolerance to manna and mildew. Under the aspect of tolerance to damages, the Gelu variety has medium tolerance to the attack of grape moths and sensitivity to spiders, especially to the red spider. It has medium resistance to drought and is a little more sensitive to frost.

Table 3

Resistance to diseases at the Gelu grapevine variety in the Iaşi vineyard (years 2007-2009)

Years	Resistance of manna		Resistance of mildew		Resistance of grey rot	
	levels	grapes	levels	grapes	levels	grapes
2006	5	4	5	6	3	4
2007	6	5	5	5	3	4
2009	4	5	4	6	2	3

Quantity and quality of grapes production (table 4). The Gelu variety has a very increased productivity capacity, of over 20t/ha, and with a percentage of 83% of merchandise production; the quantity of traded grapes was of about 16-17t/ha.

Table 4

Quantity and quality of grapes production at the Gelu grapevine variety in the Iaşi vineyard (years 2007-2009)

Years	The average weight of the grape (g)	Weight of a 100 berries (g)	Production		Percent of the merchandise production	Sugar accumulations (g/l)	Total acidity (g/l H_2SO_4)	Glucoacidimetric index
			kg/stock	t/ha				
2007	400	385	5,1	19,3	84	170	4,0	42,50
2008	388	368	6,2	23,0	82	160	4,8	33,33
2009	415	400	5,0	18,8	86	165	4,5	36,66
Average	*401*	*384,3*	*5,4*	*20,3*	*84*	*165*	*4,4*	*37,49*

From the analysis of the table it results that the Victoria grape has very big grapes, this feature being less influenced by the climatic conditions of the year and by the agrotechnical level applied at the plantation.

From a qualitative perspective, the Victoria variety has sugar accumulations within the specific limits of consumption grapes 165-170 g/l, with total acidity of the must, balanced with 4,3 g/l H_2SO_4, so that the value of the glucoacidimetric index approaches the optimum value of 37,49.

CONCLUSIONS

1. In the ecoclimatic conditions of the Iasi vineyard, the Gelu variety can be cultivated with good results, since it reacts very well under the temporal aspect, and registers large and high quality productions.

2. The introduction of the Gelu variety in the category of consumption grapes of the Iasi vineyard brings diversity to the grapes variety and enables the consumption of these varieties for a longer period of time.

3. Due to medium resistance to frost and drought, when setting up new plantations one must give special attention to the growing surface and exclude those lands with high frequency of climatic accidents or with long periods of drought during the summer.

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THE BEHAVIOUR OF SOME GRAPEVINE VARIETIES FOR WINE AT LOW TEMPERATURES ON 2009/2010 WINTER IN VINEYARD AREA OF IASI

COMPORTAREA UNOR SOIURI DE VIŢĂ DE VIE PENTRU STRUGURI DE VIN LA TEMPERATURILE SCĂZUTE DIN IARNA 2009/2010 ÎN PODGORIA IASI

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Abstract. *The absolute minimum temperatures recorded during the 2009/2010 winter destroyed the winter buds and injured the ligneous elements of the vines. Because of these damages at some sensible grapevine varieties its necessary to restore the permanent vine structure with the canes from the base of the trunk, that were protected of frost by ridging. In this paper is presented the frost resistance of some wine varieties during the 2009/2010 winter, in the Jassy vineyard conditions.*
Key words: frost, winter buds, grapevine varieties, vineyard, Jassy.

Rezumat. *Temperaturile minime absolute înregistrate în iarna anului 2009/2010 au distrus mugurii de rod la soiurile de viţă de vie, afectând chiar şi elementele multiuanuale ale butucului. De aceea la unele soiuri este necesar refacerea elementelor de schelet, din coardele rezultate din cepii de siguranţă de la baza butucului. Lucrarea prezintă comportarea unor soiuri de vită de vie pentru struguri de vin admise în cultură pentru arealul podgoriei Iasi, la gerurile înregistrate în iarna anului 2009/2010.*
Cuvinte cheie: ger, mugure de rod, soi de viţă de vie, podgorie, Iaşi.

INTRODUCTION

The high- and semi high trunk trellising forms, introduced in the last decades in the vine plantations, require for each wine-growing centre and vineyard, to establish some new technologies and to select the varieties that shown enough resistance to frost.

In the last time the grapevines from north-eastern part of Moldavia were frequently affected by the frosts. The most damaging was the frost from 1996 - 1997 winter, when the trunk and others ligneous elements of the vines were totally destroyed, having as result the loss of the yield in 90-100 % (Ţârdea C. and al., 1997).

As a ligneous perennial plant, grapevine has a weak frost resistance: the table varieties resist up to $-16^{\circ}C$ . . . $-18^{\circ}C$, and vine varieties to $-20^{0}C$ . . . $-22^{0}C$. The buds has a lower frost resistance, the minimum limit begin to $-8^{0}C$ (Cotea V. and al., 1996).

MATERIAL AND METHOD

During the 2009-2010 winter, the minimum negative temperatures, harmful for grapevine were registered in the second and the third decade of December, and in the final part of January. The lowest temperature in the air was –25.3^{0}C and temperature at the soil level of -32.4^{0}C. For establishing the destructive frosts effects, we have done the observations on the buds. The samples of canes were taken from 2% of the vines from the parcel for each variety. The vines were representative for the entire surface being dispose on the diagonal of the parcels. To appear the color differences between the viable and the destroyed tissues of the buds, the canes were maintained 48 hours with their base in the water at 20… 24^{0}C. The viability of the buds were determined with a magnifying glass, used for observations on the longitudinal buds sections. The observations regarded also the ligneous diaphragm of the cane' knobs.

The biologic material was represented by the grapevine varieties from the Jassy vineyard. The climatic data were provided by the Jassy weather station.

RESULTS AND DISCUSSIONS

The temperature as a climatic factor influence the grapevine by its level and its amount. The temperature level can be optimum, minimum and maximum for each vegetation phase. The harmful level depends on: specie, variety, the organ of the vine, the stark reserves accumulated during the vegetation and the technology (Ilie E. and al., 2002).

Climatic conditions and especially the air temperature influence direct on the bud viability. The minimum harmful temperature for the principal burgeon of the bud registered this year in December and January (tables 1 and 2).

Table 1

Absolute minimum temperatures of the air, for 2009/2010 winter, in Jassy vineyard

Month	Dec.	Sum and number of days with temperatures of:				Absolute minimum
		-15... -20^{0}C	-20...-25^{0}C	-25... -30^{0}C	> -30^{0}C	value/data
December	I	-	-	-	-	+4.0/ 10.12. 09
	II	-33.3/2				-17.0/19.12.09
	III	-16.5/1	-	-	-	-16.5/21.12.09
January	I	-	-	-	-	-7.4/05.01.10
	II	-	-	-	-	-10.4/19.01.10
	III	-37.7/2	-68.1/3	-25.3/1	-	-25.3/25.01.10
February	I	-	-	-	-	-13.0/08.02.10
	II	-	-	-	-	-4.5/16.02.10
	III	-	-	-	-	-2.3/22.02.10

The first thermal shock registered in the second decade of December, when the temperature descend to -17.0 $^\circ$C, after a period with positive temperatures in the air (the absolute minimum temperature in the first period was +4.0^{0}C. The second frost period affected grapevine in the last decade of January, when six successive days the air temperature was extremely low, the sum of negative temperatures being -131.1°C. At the soil level the temperature were most harmful because eight successive days the absolute minimum was under -15°C with a sum

of negative temperatures by -175.6 °C. As a consequence, the bud was affected in very different ways (figure 1 and 2).

Table 2

Absolute minimum temperatures at the soil level, for 2009/2010 winter, in Jassy vineyard

Month	Decade	Sum and number of days with temperatures of:				Absolute minimum
		-15... -20°C	-20...-25°C	-25... -30°C	> -30°C	value/data
December	I	-	-	-	-	-1,0/05.02.09
	II	-19,6/1	-49,2/2	-	-	-24,8/20.12.09
	III	-34,6/2	-	-29,0/1	-	-29,0/21.12.09
January	I	-	-	-	-	-2,7/06.01.10
	II	-	-	-	-	-9,5/19.01.10
	III	-48,2/3	-43,0/2	-52,0/2	-32,4/1	-32,4/26.01.10
February	I	-62,9/4	-	-	-	-16,0/10.02.10
	II	-	-	-	-	-8,0/15.02.10
	III	-	-	-	-	-3,8/22.02.10

The research effectuated in France by Oliver B., Barka A. and Ledet O. (1997), established that harmful effect is a result of ice crystals appearance in the bud (Rotaru L, 2008). The low temperatures action very different because of the biological heterogeneity of the tissues that constitute the winter bud, some parts of it freezing quicker than others: the first, at -10 °C . . . -12 °C, when ice crystals begin to affect the cells on the base of the principal bourgeon of the winter bud; the second, at –15 °C . . . -20 °C, when the phenomenon extends progressive along the axe of the principal bourgeon, while the secondary and tertiary bourgeons remain untouched; the third, between -25°C ... -30°C, when the ice crystals affect the entire principal bourgeon in the winter bud, that is finally destroyed. The base of the bud is also affected and destroyed. These minimum negative temperatures affect the diaphragms from the knob levels and also the secondary wood tissues of the bark. The result is the harm of the canes and of the ligneous skeleton of the vine.

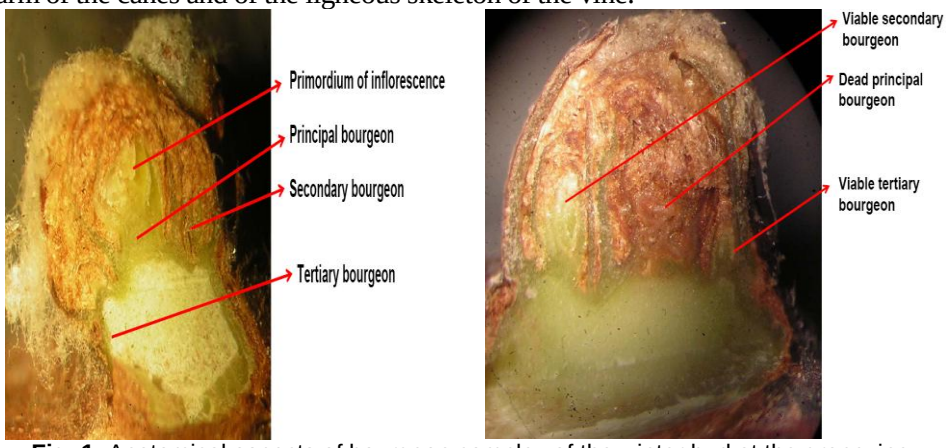

Fig. 1. Anatomical aspects of bourgeon complex of the winter bud at the grapevine

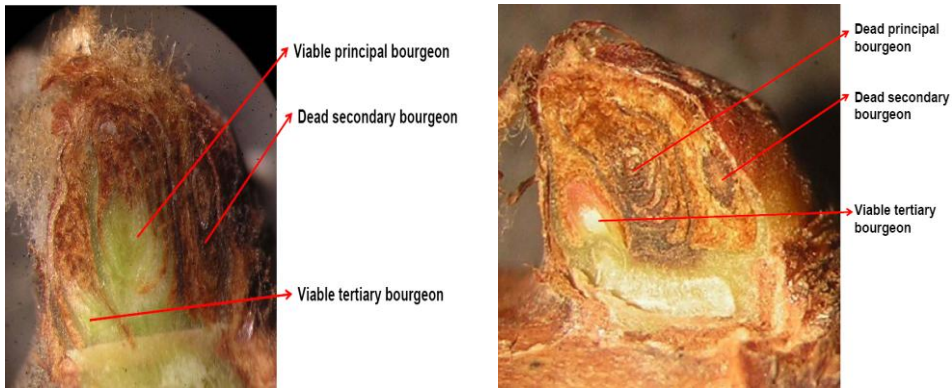

Fig. 2. Different harmful levels of the bourgeon complex of the winter bud at the grapevine

Table 3

The viability and the fertility of vine varieties, from Jassy vineyard in 2009/2010 winter

Variety	Number of examinated buds	Viable buds %	Viable principal bourgeon %	Fertile bourgeons %
Aligoté	384	61	51	37
Aromat de Iaşi	335	17	12	2
Chardonnay	218	51	40	21
Fetească albă	421	49	43	29
Fetească regală	444	30	23	15
Muscat Ottonel	408	53	45	39
Pinot gris	327	66	56	37
Riesling italian	314	45	37	18
Sauvignon	390	77	70	42
Cabernet Sauvignon	259	39	29	16
Fetească neagră	326	42	35	10
Merlot	247	28	18	7

The values from table 3 show that bud lost registered in 2009/2010 winter are significant. So the percent of viable buds is between 17% at Aromat de Iaşi variety and 77% at Sauvignon.

The red wine varieties were also brutally affected, the percent of viable buds being of 39% at Cabernet Sauvignon with only 29% principal bourgeon viability; at Fetească neagră variety the viable buds were %, with only 35% principal buds viability. The most affected in this grapevine varieties group was Merlot; the viability of the buds at this variety was 28% with 18% principal bourgeon viability.

The reduced potential fertility of these varieties will affect significantly the grapes yield of 2010. The lowest fertility has Merlot with 7%; Fetească neagra variety has 28% viable buds with only 10% of inflorescence primordiums because of reduced genetical fertility of this variety. At Cabernet Sauvignon the yield will be only 16% from the normal one, according to the potential fertility of the bourgeons.

At the white wine varieties the viability of the buds is different, being influenced by the high resistance at frost of these varieties. So the best resistance at frost revealed Sauvignon that has 77% viable buds, with 70% viable principal bourgeons; the potential fertility is also high, many of 42% bourgeons presenting inflorescence primordiums. The most resistant white grapevine varieties at 2009/2010 winter frosts were: Pinot gris and Aligoté with more than 50% viable buds; Chardonnay, Fetească albă and Muscat Ottonel with more than 40 % viable buds (figure 3). The lowest viability of the winter buds (17%) registered Aromat de Iaşi variety; this variety has also the lowest potential fertility, by 2%.

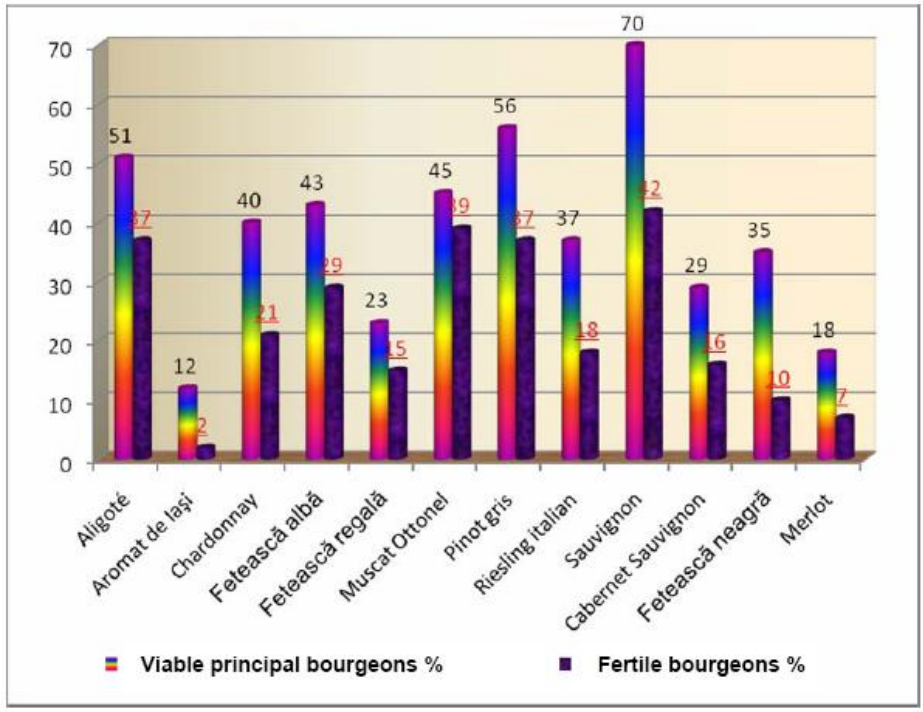

Fig. 3. The viability and potential fertility of principal buds at the grapevine varieties from Jassy vineyard, in 2009/2010 winter

CONCLUSIONS

1. The absolute minimum temperatures registered in Jassy vineyard during the 2009/2010 winter affected grapevines by their cumulative effect, that determined important loss of winter buds viability.

2. Between the white wine varieties the most resistant are Sauvignon, Pinot gris and Aligoté; the lowest resistance at frost are Aromat de Iaşi, Fetească regală and Riesling Italian that suffered major damages of the winter buds.

3. At red wine varieties the destructive effect of the frost affected especially Merlot variety, that has only 18% viable principal bourgeons.

4. The fertility of the bourgeons, influenced by genetically nature of the varieties and by the efficiency of the technology reveal the perspective of obtaining reduced yields, by only 2% to 39% comparing with the ones obtained in climatically normal years in Jassy vineyard.

ACKNOWLEDGEMENTS

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THE INFLUENCE OF CLIMATIC CHANGES ON THE DYNAMICS OF THE VEGETATION PHENOPHASES IN THE VINE VARIETIES CULTIVATED IN COPOU VINE GROWING CENTER OF IAŞI

INFLUENŢA SCHIMBĂRILOR CLIMATICE ASUPRA DINAMICII FENOFAZELOR DE VEGETAŢIE LA SOIURILE DE VIŢĂ DE VIE CULTIVATE ÎN CENTRUL VITICOL COPOU IAŞI

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Abstract. *During the past years, we observed unfavourable tendencies in the evolution of the climatic factors (temperatures, precipitations etc.), with a direct impact on the vegetative and productive potential of vine plantations. The determinations carried out between 1993 and 2009 regarding the physiological succession and completion of the vegetation phenophases, in relation to the ecologic factors specific to Copou vine growing ecosystem of Iaşi, reveal that these were conditioned by the level and cumulative action of the climatic factors and by the hereditary specific of the varieties. Major climatic changes were observed, both for the entire year, and for February, March and April, decisive months for the vegetation beginning of the vine varieties. The increase in the temperature generated the rush of the time of the sprouting, blooming and the shortening of their periods. A forced maturation tendency of the grapes was also noticed, which has unwanted repercussions on the quantitative and qualitative production of grapes.*
Key words: clima, phenologie, vine

Rezumat. *În ultimii ani s-au constat tendinţe nefavorabile în evoluţia factorilor climatici (temperatură, precipitaţii etc), cu impact direct asupra potenţialului vegetativ şi productiv al plantaţiilor viticole. Observaţiile efectuate în perioada 1993 - 2009 cu privire la succesiunea şi desăvârşirea fiziologică a fenofazelor de vegetaţie, în relaţie cu factorii ecologici specifici ecosistemului viticol Copou - Iaşi, evidenţiază faptul că acestea au fost condiţionate de nivelul şi acţiunea cumulativă a factorilor climatici şi de specificul ereditar al soiurilor. S-au evidenţiat schimbări climatice majore, atât la nivelul întregului an, cât şi pentru lunile februarie, martie şi aprilie, luni hotărâtoare pentru pornirea în vegetaţie a soiurilor de viţă de vie. Creşterea valori temperaturilor a determinat devansarea momentului declanşării dezmuguritului, înfloritului şi scurtarea duratei perioadei acestora. De asemenea, s-a constatat şi o tendinţă de maturare forţată a strugurilor, fapt ce are repercusiuni nedorite asupra producţiei cantitative şi calitative de struguri.*
Cuvinte cheie: climă, fenologie, viţă de vie

INTRODUCTION

The vineyards in the Northeast of Moldavia, being at the northern limit of the wine cultivation in Europe are more and more affected by the climatic

changes from the last decades. In this context, the existence of some climatic data bases, as well as using the phenological observations, both in relation with the climatic changes and with different fields (sylviculture, agriculture, wine growing) acquired a special importance (Sparks et al., 2000; Scheifinger et al., 2002).

The long term study of the vegetation phenostages dynamics closely correlated with the environment conditions are one of the best methods to quantify the climatic changes, aspect also supported by the increasing number of publications in the specialized literature from abroad, especially in the last decade. (Snyder, R. L et al., 2001). This research represents an important stage in the optimization of the vine division into zones as well as a basis for making possible scenarios in the context of the global climatic changes.

MATERIAL AND METHOD

For analysis of climatic factors were used the climatic data registered at the meteorological station of the Station for Research and Development for Viticulture and Vinification of Iaşi and at the Regional Meteorological Centre of Moldova Iaşi. Observations and determinations were made during 1993 - 2009 the main grape varieties recommended and approved the Copou wine centre, Iasi vineyard (Aligoté, Fetească albă, Fetească regală, Sauvignon blanc, Chardonnaz, Muscat Ottonel, Cabernet Sauvignon and Chasselas doré) followed the dynamics the vegetation phenostages (debudding, blossoming, veraison and maturation).

RESULTS AND DISCUSSIONS

In order to study the impact of the global climatic changes over the wine ecosystem of the Iasi wine-growing region – the Copou wine centre, there have been analysed the climatic data obtained was done over 17 years (1993-2009), so that they could establish the tendency/periodicity of the climatic elements and their influence over the vegetation phenostages of the vine.

During the last years a slight increase of the annual thermal values reaching an average temperature of 11,5°C in 2007, which shows a thermal increase of + 1,9 °C comparing the multiannual average value (9,6°C). The values of the global thermal balance from the vegetation period), comprised between 2968,6 – 3493,3°C show that generally in the Copou wine centre of Iasi there are insured grapes maturation conditions till the 5^{th} age and less chances for grapes maturation in the 6^{th} and 7^{th} age. The amounts of the active and net temperatures in the vegetation period are between 2841,0 – 3342,2°C, namely 1273,4 - 1692,2°C. A slight tendency of the increasing of these values is noticed (Vasile Ancuţa et al., 2008).

In the temperate climate of our country, the level and frequency of absolute minimal temperature have a great importance for the vine cultivation. Thus, in the Copou Iasi wine centre, in the analysed period, the absolute minimal temperatures during winter were comprised between - 16,0 and - 27,2 ºC in the air and between - 17,2 and - 30,6 ºC on the ground. The average temperature in the first and second decade of June had as its highest value 22,8°C in 1999 and 2007 and a minimal temperature of 16,8°C in 1994. The average temperature from the hottest

month (July) was 21,9°C (average value in the period 1993 – 2003) with a tendency to increase in the last years. The average number of days with maximal temperature higher than 30°C was 25 days, with a peak of 60 days in 2007.

The values of the synthetic parameters in the Copou Iasi wine centre show a favourable habitat to grapevine cultivation, balanced, very favourable for the cultivation of quality white wines. The analysis of the specific eco-climatic conditions of the Copou wine-making center during 1993 – 2009 (in comparison with the multi-annual values) show an increase of the thermal and insulation regime and a decrease of the hydric regime.

The observations regarding the physiologic succession and completion of the vegetation phenostages covered by the main varieties in the range, in relation with the ecologic factors specific to the Copou Iasi wine ecosystem point out that they have been conditioned in a complex way by the level and cumulative action of the climatic factors and the hereditary features of the varieties

The starting of the vegetation of the studied varieties began with the debudding which in the period 1993 – 2007 took place between April 12 for the Fetească albă variety and May 9 for Muscat Ottonel (figure 1). Debudding starts at temperatures of over 10°C (biologic zero) and intensifies to the extent of reaching 20-25°C (considered the optimal level). At lower temperatures, the starting and the duration of the phenostage extend. The variety cultivated determines, in the same environmental conditions, differentiations in the starting of the debudding, which can be of 10-12 days. In the last years, as a result of the increase of the temperatures values both in the air and at the ground level, we noticed a tendency to bring forward the moment of starting the debudding and to shorten the period of its carrying out. Thus, in 2007 and 2008, the debudding took place between April 12-20, with little differences among varieties, comparing to 1993, 1996, 1997 when it took place between May 2-9.

The multiannual phenologic observations of the studied varieties prove that the beginning of the blossom period took place between June 1 (1994, 1996) and June 19 (2005), with an annual variation of 18 days (figura 2). The influence of the climatic factors change makes more and more difficult an exact forecast of the moment when this phenostage starts. The increase of the amount of the net average temperatures, a tendency registered during the last years, shortened the period of blossom, accelerating also its beginning (for example in 2007, 2008 and 2009 when the blossom started on June 2).

The veraison grape place in the interval July 23 – August 28 and lasted between 5 to 18 days, depending on the year and variety, starting with the varieties Fetească albă, Chasselas dore and Muscat Ottonel (figure 3). In the case of this phenostage as well it is noticed a tendency of outstripping because of the high temperatures in the air, of the great number of days with maximal temperatures higher than 30°C in August (for exemple: 60 days in 2007) and of the high water deficit.

The maturity of the studied varieties, which concurred with the harvesting date, took place in a period of approximately 38 days, beginning with the first decade of September till October, with the varieties Fetească albă, Fetească regală and finishing with the varieties Aligoté and Cabernet Sauvignon (figure 4).

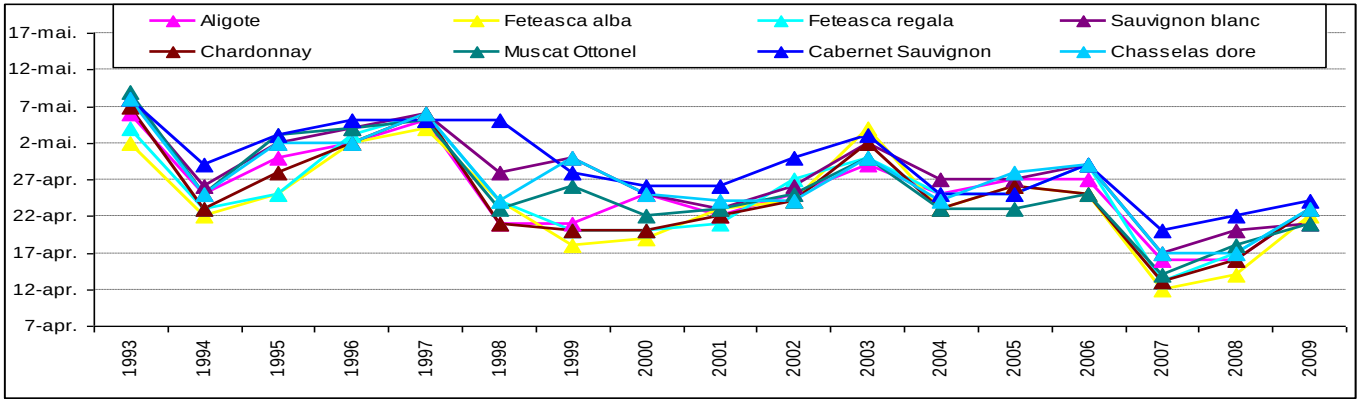

Fig. 1. The dynamics of debudding of the main grape varieties during 1993 – 2009

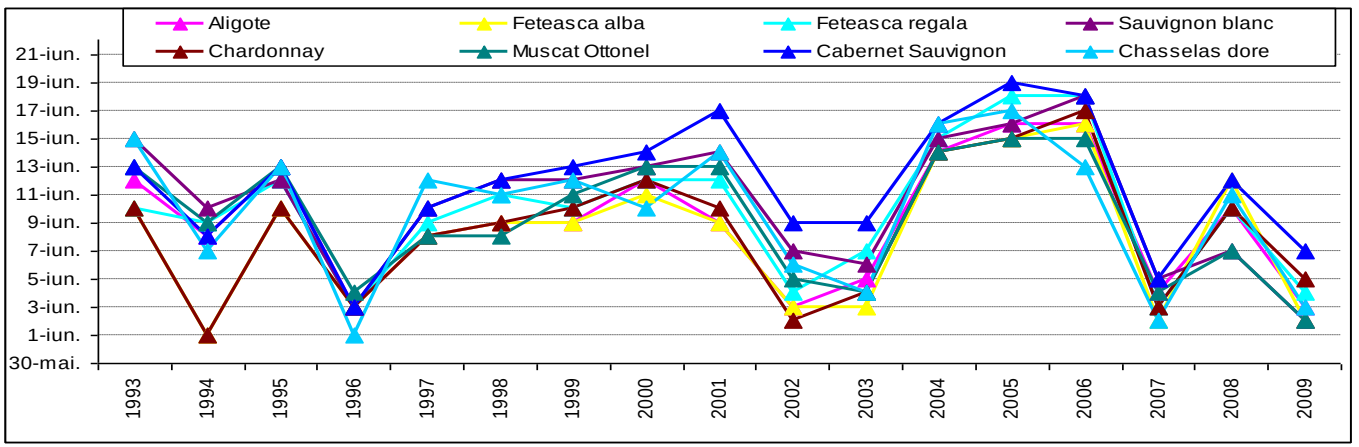

Fig. 2. The dynamics of blossoming of the main grape varieties during 1993 – 2009

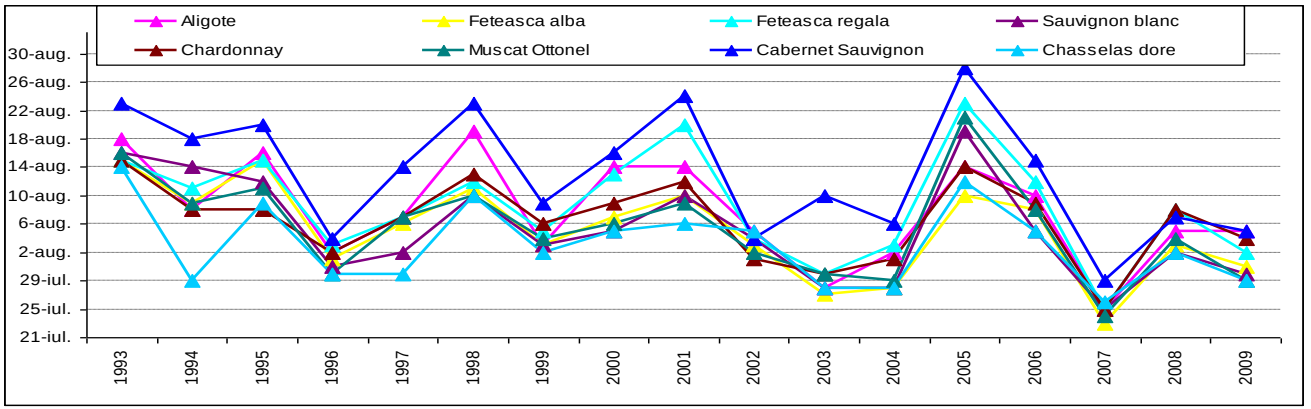

Fig. 3. The dynamics of veraison of the main grape varieties during 1993 – 2009

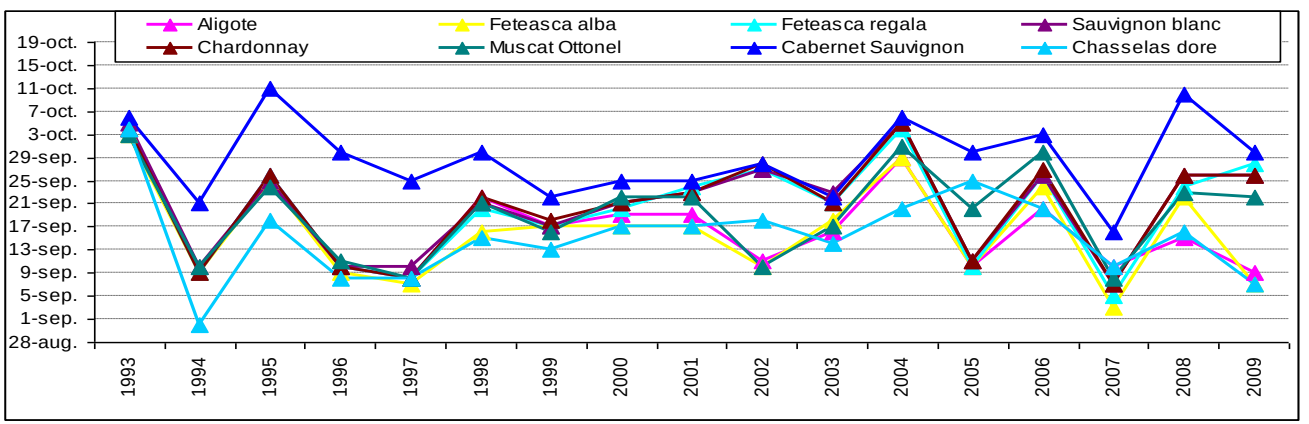

Fig. 4. The dynamics of maturation of the main grape varieties during 1993 – 2009

The high temperatures in the summer of 1994 and 2007 together with the water deficit in the soil led to the accentuation of the atmospheric and pedologic drought with negative effects on the quantitative production of grapes. In this situation, the technological maturation took place with approximately three weeks earlier, which is in the interval August 8 – September 8.

The influence of the climatic factors directly reflected in the grapes productions of the studied varieties, which were fluctuating from one year to another. Thus, the studied varieties made average productions, a lot below their biologic potential in 1994, 1997, 2005 and 2007. The smallest productions were obtained in 1994 and 2005, when for all the varieties the production was under 1000 kg/ha.

CONCLUSIONS

1. The dynamic analysis of the vegetation phenostages, in a close correlation with the eco-climatic conditions specific to the wine growing region of Iassy during 1993 – 2009 represent one of the best ways of quantification of the climatic changes.

2. The observations made concerning the physiologic sequence and completion of the vegetation phenostages, covered by the main varieties from the range in the wine growing region of Iassy point out that they were conditioned by the level and the cumulative action of the climatic factors and by the hereditary features of the varieties.

3. The influence of the climatic factors directly reflected in the grape productions obtained from the studied varieties, which fluctuated from one year to another.

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CLIMATIC ACCIDENTS DURING THE PHYSIOLOGICAL REPOSE OF VINE, REGISTERED IN COPOU VINE-GROWING CENTER OF IAŞI

ACCIDENTE CLIMATICE DIN TIMPUL REPAUSULUI FIZIOLOGIC AL VIŢEI DE VIE, ÎNREGISTRATE ÎN CENTRUL VITICOL COPOU IAŞI

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Abstract. *One of the limitative factors of the vine culture under the conditions in our country is the thermal regime registered during the physiological repose period. In the temperate climate, a very important issue is the frequency of absolute minimum temperatures, which are harmful for the vine, lower than -22 ... -20o C, which affect both the buds and the annual and multi-annual wood. The study analyses the absolute minimum temperatures during a period of 50 years, and establishes the average number of days with negative temperatures and the frequency of years in which climatic accidents may occur, as well as their periodicity.*

Key words: absolute minimum temperatures, vine

Rezumat. *Unul din factorii limitativi ai culturii viţei de vie în condiţiile ţării noaste îl constituie regimul termic înregistrat în perioada de repaus fiziologic. În condiţiile climatului temperat o importanţă deosebită o are frecvenţa temperaturilor minime absolute, nocive pentru viţa de vie, mai mici de -22 ...-20°C, temperaturi care afectează atât mugurii de rod cât şi lemnul anual şi multianual. În lucrare sunt analizate temperaturile minime absolute pe o perioadă de 50 ani, stabilindu-se numărul mediu de zile cu temperaturi negative, frecvenţa anilor în care pot apărea accidente climatice precum şi periodicitatea acestora.*

Cuvinte cheie: temperaturi minime absolute, viţă de vie

INTRODUCTION

In the continental temperate climate of Romania, characterized by cold winters, the harmful minimum temperatures are very important in the culture of grape vine.

The specialized literature shows that the resistance limit of wine - growing plantations to frost is of -15°C ....-18°C for fruit - developing burgeons for the table varieties, -18°C....-21°C for the wine varieties, the annual tendrils are affected at temperatures of -20°C ....-21°C, and the multiannual wood at -22°C ....-24°C (T. Martin, 1972; M. Oşlobeanu et al., 1991).

The degree of resistance depends on a series of factors such as: frost intensity and duration, the period when they appear in relation with the degree of preparation of the vines (hardening), the degree of vine aging, alternation of low and high temperatures, volume of the grape production and culture technologies

used in the previous year (M.Oşlobeanu et al., 1980). In January this year, in the viticulture centre of Copou Iaşi, there were registered absolute minimum temperatures under the limit of resistance of the grape vine, between -20.0°C and -27.0°C in the air, and on ground surface between -18,0°C and -35,0°C.

MATERIAL AND METHOD

To perform the researches there were used the climatic data registered at the meteorological station of the Station for Research and Development for Viticulture and Vinification of Iasi and at the Regional Meteorological Centre of Moldova Iaşi. There were used the absolute minimum temperatures registered during the rest period, for a period of 50 years (1961 – 2010), establishing the number of days with negative temperatures below or equal to -15°C, -20°C and -25°C, which may be considered as the character of climatic accident for the grape vine, the frequency of the years when these temperatures appear, as well as their periodicity (P. Piţuc et al., 1982).

RESULTS AND DISCUSSIONS

From the analysis of the absolute minimum temperatures registered during the months of winter (December, January, February), for a period of 50 years (1961 – 2010), we noticed that the lowest air temperature was of -27,2°C on 28 December 1996, and the absolute minimum on the ground was registered on 26 January 2010 and was of -35,0°C (table 1). We also noticed that the average of the absolute minimum air temperatures, during the analyzed period, was of -18.4°C, and on the ground surface of -24,2°C. These values of the temperatures confirm once again the fact that the viticulture centre of Copou Iaşi is in the area of semi-protected culture of grape vine.

To point out the levels where the decreases of temperature are possible and to appreciate the degree where they destructively influence the organs of the grape vine, we analyzed the lowest values of the absolute temperatures registered during the months of December, January and February. Thus, in the air, the temperatures considered dangerous for the grape vine (≤ - 15°C), those at which the fruitful burgeons are affected were registered during the analyzed period in 54% of the years, in January, 45% of the years, in February and only 29% of the years, in December (table 2). The very dangerous temperatures (≤ - 20°C), those affecting burgeons and annual wood, were recorded in 20% of the years in January, in 8.2 % of the years in February and 4.1% of the years, in December. The periodicity of the years with temperatures of ≤ - 20°C was of 5 years in January, 12.3 years in February and 24.5 years in December.

The temperatures considered extremely dangerous for grape vine (≤ - 25°C), which affect all organs, were recorded with a frequency of 8% of the years in January and 1% of the years in December. In February, during the analyzed period, there weren't registered any temperatures ≤ -25°C. The periodicity of the years with temperatures ≤ -25°C was of 12.5 years in January and 49 years in December.

On the ground surface, the frequency of temperatures ≤ - 15°C was of 78% of the years, of those ≤ - 20°C of 60% of the years, and of those ≤ - 25°C of 24% of the years, all of them in January (table 3).

Table 1

Absolute minimum temperatures registered in the viticulture centre of Copou Iaşi (1961 -2010)

Years	in the air			the ground surface		
	month	day	t ºC	month	day	t ºC
1961	I	27	-20,6	I	28	-22,1
1962	XII	29	-17,0	XII	29	-22,4
1963	I	20	-25,2	I	23	-32,5
1964	I	11	-21,0	I	11	-24,6
1965	II	6	-17,1	II	10	-19,2
1966	II	5	-18,5	II	5	-20,4
1967	I	31	-20,3	II	1	-24,7
1968	I	10	-16,8	I	10	-25,5
1969	I	28	-19,0	II	13	-27,3
1970	I	31	-16,1	I	1	-18,9
1971	I	9	-14,8	I	8	-25,5
1972	I	14	-24,0	I	15	-28,2
1973	I	26	-15,0	I	25	-26,1
1974	I	15	-16,8	I	16	-22,1
1975	II	17	-10,0	II	18	-12,0
1976	II	8	-22,0	II	9	-31,6
1977	XII	14	-15,0	I	6	-21,6
1978	XII	8	-17,0	XII	8	-23,5
1979	I	3	-15,6	I	8	-20,5
1980	I	7	-18,2	I	18	-28,0
1981	I	8	-14,6	I	8	-24,6
1982	II	22	-14,3	II	11	-23,0
1983	XII	15	-14,0	II	24	-17,0
1984	II	18	-16,0	II	18	-23,0
1985	I	14 and 16	-25,5	I	14	-30,4
1986	XII	28	-18,8	II	28	-29,0
1987	I	9	-25,0	I	9	-33,4
1988	II	2	-17,4	II	2	-28,1
1989	XII	11	-13,0	XII	11	-16,0
1990	I	5	-14,0	I	6	-20,6
1991	II	1	-19,2	I	31	-17,8
1992	I	22	-15,2	I	22	-22,4
1993	I	3	-18,2	I	4	-24,0
1994	II	13	-20,8	II	14	-17,2
1995	XII	30	-16,0	XII	31	-21,2
1996	XII	28	-27,2	XII	28	-33,5
1997	XII	17	-19,2	I	7	-22,0
1998	XII	3	-19,0	XII	24	- 24,0
1999	XII	24	- 13,0	II	20	-19,3
2000	I	25	- 15,9	I	26	- 22,2
2001	XII	18	- 20,4	XII	18	- 24,5
2002	XII	26	- 19,8	XII	26	- 21,0
2003	I	13	- 21,6	I	13	-30,6
2004	I	31	-17,0	I	31	-19,0
2005	II	8	- 19,4	II	6	-27,6
2006	I	23	- 25,1	I	25	- 29,0
2007	II	24	-19,6	II	24	- 25,0
2008	I	5	-19,5	I	5	-24,2
2009	XII	19	-17,0	XII	21	-29,0
2010	I	26	-27,0	I	26	-35,0
		average	**-18,4**		**average**	**-24,2**

Table 2

Frequency of negative temperatures registered in the air, in the Viticulture Centre of Copou Iaşi, between 1961 -2010

Analyzed elements	Grouping the negative temperatures		
	≤ - 15°C	≤ - 20°C	≤ - 25°C
January			
Number of days	80	31	5
Number of years	27	10	4
Years frequency	54,0	20,0	8,0
Years periodicity	1,85	5,0	12,5
February			
Number of days	64	7	-
Number of years	22	4	-
Years frequency	44,9	8,2	-
Years periodicity	2,2	12,3	-
December			
Number of days	29	3	2
Number of years	14	2	1
Years frequency	28,6	4,1	2,0
Years periodicity	3,5	24,5	49,0

We noticed a much greater frequency of the ground surface temperatures, compared to those of the air. The periodicity of appearance of the temperatures ≤ - 20°C was of 1.7 years in January, of 2.7 years in February and of 3.1 years in December. The temperatures ≤ - 25°C were registered every 4.2 years in January, every 4,9 years in February and every 16.3 years in December.

Table 3

The frequency of negative temperatures registered on ground surface, in the viticulture centre of Copou Iaşi, between 1961 -2010

Analyzed elements	Grouping the negative temperatures		
	≤ - 15°C	≤ - 20°C	≤ - 25°C
January			
Number of days	179	79	41
Number of years	39	30	12
Years frequency	78,0	60	24,0
Years periodicity	1,3	1,7	4,2
February			
Number of days	103	52	16
Number of years	32	18	10
Years frequency	65,3	36,7	20,4
Years periodicity	1,5	2,7	4,9
December			
Number of days	96	36	6
Number of years	33	16	3
Years frequency	67,3	32,6	6,1
Years periodicity	1,5	3,1	16,3

The years when there were very low temperatures, between -25°C and -27°C in the air and between -30,4° and -35°C on the ground surface, were: 1963, 1985, 1987, 1996, 2006 and 2010. These temperatures lead to the registration of great losses of main eyes, affecting the annual and multiannual wood and implicitly to productions much below the average of the normal years from the thermal point of view (table 4).

Table 4

Viability of bud in the years with climatic accidents

Variety and place	Percentage of viable eyes									
	1985		1987		1997		2007		2010	
	main	total	main	total	main	total	main	total	main	total
Fetească albă – slope leg	8	19	0	11	0	0	0	0	0	7
Fetească albă – middle part	13	40	0	36	0	6	0	2	0	27
Fetească albă – plateau	44	69	11	37	0	14	3	9	2	61
Fetească regală – slope leg	3	43	0	5	0	0	0	0	7	49
Fetească regală – middle part	13	45	0	8	0	13	2	4	8	84
Fetească regală – plateau	25	44	3	27	3	5	7	31	11	71
Aligoté – slope leg	3	13	0	8	0	10	0	11	1	32
Aligoté – middle part	34	40	4	4	0	12	13	45	16	85
Aligoté – plateau	44	53	3	30	0	13	15	57	30	76
Muscat Ottonel – slope leg	2	22	0	11	0	23	6	8	6	65
Muscat Ottonel – middle part	45	65	4	8	1	23	64	82	12	90
Muscat Ottonel – plateau	47	68	13	25	12	41	80	87	23	63
Chasselas doré– slope leg	28	44	0	25	0	6	2	23	-	-
Chasselas doré– middle part	32	44	3	36	-	-	11	39	-	-
Chasselas doré– plateau	49	67	19	63	6	18	24	64	7	90
Chabernet Sauvignon - middle	10	26	0	0	0	4	3	4	5	74
Sauvignon blanc – plateau	70	77	4	38	0	0	92	91	50	78
Sauvignon blanc – middle part	-	-	-	-	-	-	55	86	25	77
Chardonnay- plateau	75	78	-	-	40	43	31	46	17	85
Pinot gris	69	72	-	-	14	36	94	100	23	67
Aromat de Iaşi - plateau	27	70	0	11	7	8	2	18	20	98
Fetească regală 3 m – middle	-	-	-	-	-	-	39	62	2	69
Gelu	-	-	-	-	12	36	3	21	12	85
Paula	-	-	-	-	2	9	3	18	1	66
Golia	62	98	70	96	24	66	45	55	86	100
Perlă de Csaba	-	-	-	-	-	-	0	20	5	88
Victoria	-	-	-	-	-	-	1	7	7	95

We notice that in these years there were registered losses up to 100% for the varieties of white Fetească, royal Fetească, losses up to 96 – 100% for Aligoté and 20 – 88% for Muscat Ottonel. The varieties Sauvignon blanc and Chardonnay manifested a better resistance to frost. Of the autochthonous varieties, newly created at the Station for Research and Development for Viticulture and Vinification of Iaşi, the Golia variety reconfirmed its good resistance to frost, it recording between 55 – 98 % of viable bourgeons.

CONCLUSIONS

1. In the viticulture centre of Copou Iaşi, during the period 1961 – 2010 the lowest air temperature was of -27,2°C, registered on 28 December 1996, and the absolute minimum on the ground was registered in 2010 and was of -35°C on 26 January;

2. The analysis of the lowest temperatures registered in the months of January, February and December shows that in all years the lowest temperatures with character of climatic accident were in January;

3. The periodicity of the years with temperatures ≤ - 20°C, in the air, was of 5 years in January, 12.3 years in February and 24.5 years in December, and the periodicity of the years with temperatures ≤ - 25°C was of 12.5 years in January and 49 years in December. On ground surface the values of the absolute negative minimum temperatures registered a much higher frequency;

4. During the period 1961 – 2010 there were registered very low temperatures between -25° and -27°C in the air and between -30,4° and -35°C on ground surface in 1963, 1985, 1987, 1996, 2006 and 2010. These temperatures lead to the great losses of main eyes, to affecting annual and multiannual wood and implicitly to obtaining productions much below the average of normal years from the thermal point of view.

5. Of the varieties cultivated at the Station for Research and Development for Viticulture and Vinification of Iaşi, the varieties Sauvignon blanc, Chardonnay and Muscat Ottonel manifested a better resistance to frost. In addition, of the varieties created at SCDVV Iaşi, the Golia variety reconfirmed its good resistance to frost.

Acknowledgments

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PHYSICAL-CHEMICAL CHARACTERISATION OF SOME RED WINES OBTAINED THROUGH CLASSICAL TECHNOLOGY FROM IASI VINEYARD

CARACTERIZAREA FIZICO-CHIMICĂ A UNOR VINURI ROŞII OBŢINUTE PRIN TEHNOLOGIA CLASICĂ DIN SOIURILE ROMÂNEŞTI DIN PODGORIA IAŞI

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Abstract: *The present study analyses the evolution of some parameters when producing red wines from Romanian grape varieties of Iasi vineyard, through the classical fermentation technology, with no enzymes and selected yeasts addition. The wines have been characterised through their physical-chemical basic analyses: alcoholic concentration, total acidity, volatile acidity, volumic mass, reductive sugars, non reductive extract and phenolic compounds. Following analysis of red wines a correlation was shown to exist between the quantity of phenolic acids and anthocyans, expressed in galic acid.*

Key words: physical-chemical parameters, Romanian grape varieties, colour, anthocyans profile, phenolic acids, galic acids.

Rezumat: *În studiul de faţă s-a urmărit evoluţia unor parametri ai unor vinuri roşii provenite din soiuri româneşti de struguri din podgoria IAŞI, obţinute prin tehnologia clasică de fermentare, fără însămânţare cu levuri şi enzime. Vinurile au fost caracterizate prin efectuarea analizelor fizico-chimice de bază: concentraţia alcoolică, aciditatea totală, aciditatea volatilă, masa volumică, zaharurile reducătoare, extract nereducător, compuşi fenolici. În urma analizei datelor obţinute privind vinurile roşii s-a evidenţiat existenţa unei corelaţii între cantitatea de acizi fenolici şi cea de antociani, exprimată prin proporţia de acid galic.*

Cuvinte cheie: parametri fizico-chimici, soiuri autohtone, culoare, profil antociani, acizi fenolici, acid galic

INTRODUCTION

Maceration-fermentation is a very important step in red wines production (Cotea D.V. ş.a., 2009). The present study aims at characterising through physical-chemical analyses the red wines from Iasi vineyard obtained by a classical fermentation process without adding yeasts and enzymes.

MATERIAL AND METHOD

In this study red grapes from local grape varieties was (Rotaru Liliana, 2009) were used, 2009 harvest, from the Ampelographic Collection of UŞAMV Iaşi.

Table 1

Compositional characteristics of grapes at harvest

No.	Vineyard	Reductive sugars (g/L)	Total acidity (g/L) $C_4H_6O_6$
1	Amurg	170	7.66
2	Arcaş	215	6.32
3	Balada	193	7.26
4	Băbească neagră	168	6.91
5	Bătută neagră	138	7.05
6	Busuioacă de Bohotin	198	7.68
7	Codană	143	6.98
8	Fetească neagră	193	6.51
9	Negru aromat	227	7.49
10	Negru de Căuşani	193	7.79
11	Negru de Drăgăşani	182	7.56
12	Negru vârtos	138	6.91
13	Negru moale	170	8.04
14	Novac	198	7.11
15	Vulpe	221	7.53

Harvesting was done manually, in wooden crates. The grapes were processed at the Pilot Research Station of the Horticulture Faculty Iasi. The obtained must was homogenised and processed as the classical maceration –fermentation technology foresees, (Cotea D.V. 1985) in stainless steel tanks (KEG), for 120 hours with cap washing 4 times/day. After the maceration-fermentation was over, the marc was pressed with a hydraulic pump, the must passing into glass vessels, where it finished its alcoholic and malolactic fermentation. Bottling was done after a sterile filtering with SA 795 (40x40) paper filtering disks – for normal filtering – and SA 995 (40x40) – for sterile filtering. The physical-chemical analyses were done according to methods of national and international standards and specific literature. The chromatic parameters of the wine samples were calculated according to CIE Lab 76 method, according to the registered absorption spectrum of each sample. In order to minimise errors, adequate vials were used for each wine sample, concerning the liniar domain of the method, of 0,1 – 1,2 absorbency units. The content in phenolic compounds is measured through its characteristic indices: IFC, IPT (D_{280}) and I_{Mn}. The Folin - Ciocâlteu index (IFC) is specific only to phenolic compounds with reductive qualities. The total polyphenolic index (IPT or D_{280}) registers the content of total phenolic compounds (phenolic acids, tannins and colour compounds) in wines. These parameters were determined by the UV-VIS AnalytikJena Specord 200 spectrophotometer, as the specific literature (Compendium of International Methods of Analysis of Wine and Musts, 2009 - O.I.V., Paris) confirms.

RESULTS AND DISCUSSIONS

The main compositional characteristics of the wines obtained from local grape varieties of Iasi vineyard are shown in table 2. The alcoholic concentration has values between 8,67% vol. at Codană wine and 13,78% vol. in Fetească neagră wine (fig.1). The maximal values of the non-reductive extract (fig.2) was obtained in the Negru moale wine (30,9 g/L), while the minimal was found to be

in Busuioacă de Bohotin wine (19,1 g/L), showing that the obtained wines can be classified as controlled origin denomination wines. The remnant sugar quantity was low, the wines obtained were dry, the highest value being found in Novac wine (3,29 g/L). An exception is the wine sample obtained from Busuioacă de Bohotin grapes, with a sugar content of 17,04 g/L. Total acidity values vary from 5,62 g/L tartaric acid in Arcaş wine, up to 7,39 g/L tartaric acid in Negru moale.

Table 2

Compositional characteristics of red wines obtained from local grapes varieties from IASI vineyard

No.	Grape variety	Free SO_2	Volatile acidity g/L $C_2H_4O_2$	Total acidity g/L $C_4H_6O_6$	Density	Alcohol	Non-reductive extract
1	Amurg	74.54	0.20	6.96	0.9938	10.51	20.3
2	Arcaş	52.75	0.07	5.62	0.9918	12.84	22.2
3	Balada	57.48	0.14	6.66	0.9918	12.49	21.4
4	Băbească neagră	59.69	0.26	6.21	0.9950	10.95	24.8
5	Bătută neagră	88.75	0.30	6.35	0.9936	9.32	19.2
6	Busuioacă de Bohotin	90.65	0.96	7.05	0.9998	11.85	19.1
7	Codană	43.59	0.42	6.18	0.9938	8.67	20.0
8	Fetească neagră	80.54	0.20	5.71	0.9924	13.78	26.6
9	Negru aromat	112.12	0.21	6.79	0.9929	14.65	30.5
10	Negru de Căuşani	32.53	0.66	6.79	0.9905	12.18	19.7
11	Negru de Drăgăşani	41.06	0.18	6.96	0.9925	10.96	21.1
12	Negru vârtos	26.21	0.71	6.22	0.9957	9.01	19.5
13	Negru moale	33.48	0.61	7.39	0.9995	10.07	30.9
14	Novac	57.80	0.57	6.44	0.9931	12.65	23.3
15	Vulpe	124.44	0.21	6.83	0.9932	13.34	24.4

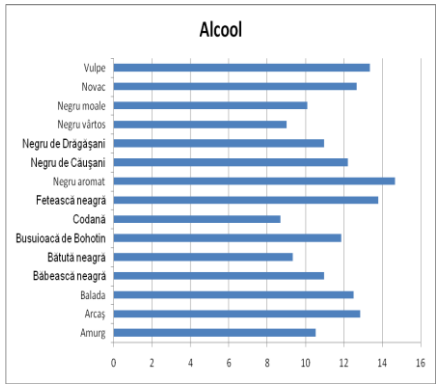

Fig. 1. Alcohol

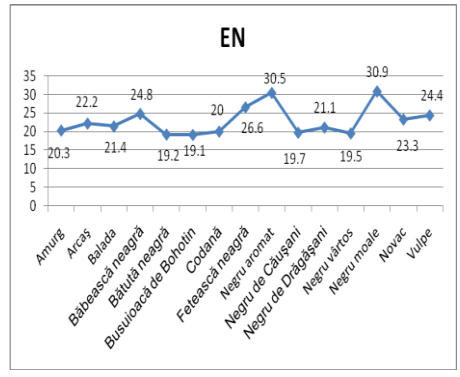

Fig. 2. Non-reductive extract

Table 3

Chromatic parameters values of wines obtained from Romanian grape varieties from IASI vineyard

No.	Grape variety	Clarity L 0(opaque) – 100(transparency)	Color coordinates a red(+) green(-)	Color coordinates b yellow(+) blue(-)
1	Amurg	44,7	59,35	35,69
2	Arcaş	27,3	48,52	46,97
3	Băbească neagră	87,8	15,73	14,47
4	Balada	22,5	48,43	38,61
5	Bătută neagră	59,3	50,82	26,25
6	Busuioacă de Bohotin	60,6	40,26	18,19
7	Codană	86,9	24,54	7,39
8	Fetească neagră	24,3	54,48	35,06
9	Negru aromat	29,0	58,67	49,83
10	Negru de Căuşani	19,1	51,56	32,69
11	Negru de Dragaşani	14,5	43,93	24,85
12	Negru moale	61,0	47,14	20,75
13	Negru vârtos	68,0	41,98	11,86
14	Novac	30,5	61,57	52,47
15	Vulpe	6,3	35,58	10,75

Of the entire colour components measured using the CIE Lab76 method, the most important are clarity L and the values of the changes *a* and *b* parameters undergo. Clarity L characterises the visual aspect more or less shiny of the wine and can have values between 0 (zero) for a black – opaque sample and 100 (one hundred) for colourless, transparent samples. Clarity L (Tab. 2) varies from 87,8 in Băbească neagră to 6,3 in Vulpe wines. The „a“ red-green component of the colour represents the coordinate of the red-green complementary colours. This parameter frequently has negative values for white wines where green tones are preponderant to red ones and positive values in red wines, with values between 15,73 in Băbească neagră and 61,57 in Novac. The „b“ yellow-blue component of colour represents the coordinate of the yellow-blue complementary colours. The values of this parameter are usually positive, the yellow nuances being preponderant towards the blue ones, the minimal value being registered in Codană (7,39).

Classifying the analysed wines according to the computerised analysis of colour parameters is as follows: the highest vales are found in Vulpe wine, then Balada, Novac, Negru de Drăgăşani, Fetească neagră, Arcaş, Negru aromat, Negru de Căusani, Negru vârtos, Bătută neagră, Băbească neagră, Negru moale, Amurg, Codană and Busuioacă de Bohotin wines.

One could notice that the order established by the values of the content of total phenolic compounds in studied wines is the same with the hierarchy drawn based on the anthocyans content with the ones established on the absorption spectrums specific to each wines and with the one configured by the digital

simulation of wines' colour, as previous research have shown. At the same time, one must know that the harvest time of the grape varieties from the Ampelographic Collection of UASMV Iaşi, has been the same for all grapes (24.09.2009), not all having reached their full maturity, being varieties with a longer vegetation period, meant for the South of Romania.

The phenolic compounds contribute to the savour and body of the wine, bringing astringency when in too much quantity, influencing their colour and appearing in must or wine changes (oxidative processes, aging processes) and in conditioning treatments, pushing back the oxidation of other components in the wine.

Following the analyses of data obtained from the red wines processed from local grape varieties of IASI vineyard, a correlation between the quantity of phenolic acids (IFC galic acid equivalent) and that of anthocyans, one can see that the values close to 1 show an equilibrium between phenolic compounds, sub-unitary values demonstrate the preponderance of compounds with antioxidant properties, while values higher than 1 – preponderance of anti-reductive compounds.

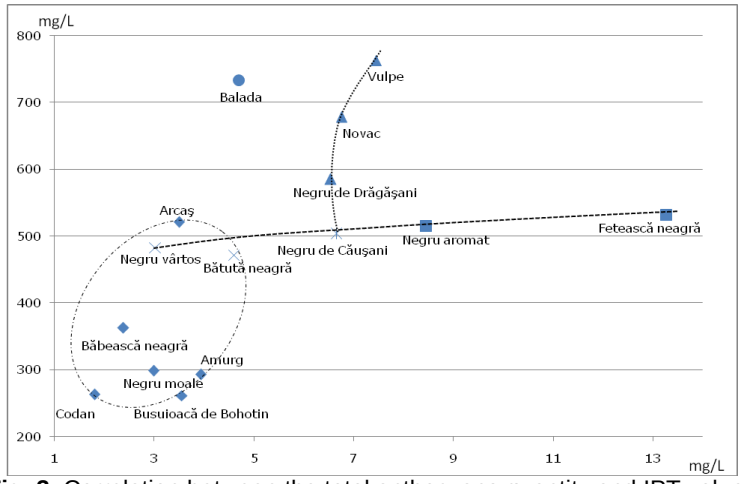

Fig. 3. Correlation between the total anthocyans quantity and IPT values

Figure 3 represents the correlation of the total quantity of anthocyans and the IPT values (mg/L galic acid), three levels being visible, suggesting the existence of some common characteristics: the grape varieties Arcaş, Negru vârtos, Bătută neagră, Băbească neagră, Negru moale, Amurg, Codană and Busuioacă de Bohotin in one field, Vulpe, Novac, Negru de Drăgăşani and Negru de Căuşani on a axis with a growing tendency while Negru vârtos, Bătută neagră, Negru de Cauşani, Negru aromat and Fetească neagră, on a slightly growing median axes.

Regarding the correlation between the total anthocyans quantity and IFC values (mg/L galic acid) (fig. 4), the grouping of the values is slightly different than the previous case, in the same field being Băbească neagră, Negru moale, Amurg, Codană and Busuioacă de Bohotin, while, at the same time, two

ascending areas, approximately parallel, are formed by the Codană, Băbească neagră, Negru vârtos, Arcaş and Balada, respectively by Busuioacă de Bohotin, Amurg, Bătută neagră, Negru de Drăgăşani, Novac and Vulpe, the common aspect being represented by the group on the median axes of the same grape varieties (Bătută neagră – Fetească neagră).

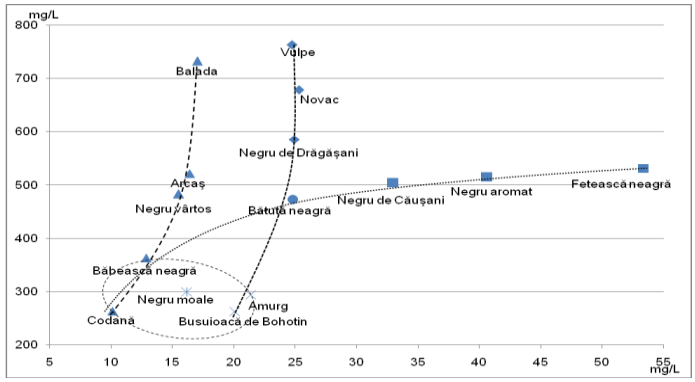

Fig. 4. Correlation between the total anthocyans quantity and IFC values

CONCLUSIONS

1. The main compositional characteristics of red wines obtained from local grape varieties in Iasi vineyard allow their registry in the quality category of controlled origin denomination.

2. Classification according to computerised determination of colour parameters in wines obtained from local grape varieties through classical maceration fermentation methods clearly underlines the extended possibility of producing a large palette of red wines according to their colour intensity.

3. The values of the phenolic compounds are data proof of the savour and body of the obtained wines, thus influencing their colour and their antioxidant properties.

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FLAVOUR LARGE VARIETY OF WHITE WINES PRODUCED AT DEALU BUJORULUI VINEYARD

ASPECTE PRIVIND SPECTRUL AROMATIC AL VINURILOR ALBE ELABORATE ÎN PODGORIA DEALU BUJORULUI

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Abstract. *The flavour of wines results from a harmonious blend of several chemical substances of different origin and structure. We can distinguish the primary or varietal flavours that come from grapes, the secondary flavours or for fermentation and tertiary flavours that are acquired during the evolution of wine. Varietal flavours are typical for variety wines, because they originate from a particular variety grapes as free or combined flavours. These are mainly terpenoids substances which are capable that hydrolysis to release volatile smelling (terpenes), which are well represented in Muscat Ottonel aromatic variety. In case of semi-flavoured Sarbien variety the most abundant odorant substance was given by alcohol 3-methyl 2-butanol, also present at Muscat Ottonel variety. During fermentation process, occur esterification reactions of alcohol with acids, resulting esters with varied flavours.*

Key words: flavour, white wines, fermentation, vineyard

Rezumat. *Aroma vinurilor rezultă dintr-un amestec armonios de mai multe substanţe chimice de origine şi structură diferită. Se disting aromele primare sau varietale, care provin din struguri, aromele secundare sau de fermentare şi aromele terţiare care se dobândesc în timpul evoluţiei vinului. Aromele varietale sunt tipice pentru vinurile de soi pentru că ele provin din strugurii unui anumit soi, ca arome libere sau legate. Este vorba în principal de substanţele terpenoide care sunt capabile ca prin hidroliză să elibereze substanţe volatile mirositoare (terpenele), care sunt bine reprezentate la soiul aromat Muscat Ottonel. In cazul soiului semiaromat Sarba, cantitatea cea mai mare de substanţă odorantă a fost reprezentată de alcoolul superior 3-metil 2-butanol, prezent dealtfel si la soiul Muscat Ottonel. In timpull fermentaţiei au loc procese de esterificare; prin reactia alcoolului cu acizii rezultă esteri cu nuanţe aromatice diversificate.*

Cuvinte cheie: arome, vinuri albe, fermentaţie, podgorie

INTRODUCTION

The quality of wine is also influenced by its aromatic character that involves a number of odorant chemical compounds, known as generic name of flavours.

About aromatic spectrum of Romanian wines has held a series of Romanian researchers in different geographical areas: I. Buia (2001) in vineyard Târnave and Heroiu Elena in vineyard Ştefăneşti-Arge (1998).

On international plan, about the aromatic character of the grapes and wine are related a number of researches that predominantly pertaining of Guerin-Schneider R. (2001), Rapp A., Versini G. (1995). Were determined for the first time some compounds of flavours from wines of Dealu Bujorului wineyard.

MATERIAL AND METHOD

Samples investigated to determine the volatile compounds with GC-FID (Gas-Chromatography - Flame Ionization Detector) are from Bujoru vineyard and include varieties of white wines unflavored white Fetească and royal Feteasca and varieties of flavored wines Sauvignon, Sarba, Muscat Ottonel.

The method used to analyze volatile compounds in samples of wines is liquid-liquid extraction, followed by gas chromatography with flame ionization detection (LLE / GC-FID).

For extraction of samples was used dichloromethane as solvent, 10 mL for firstly extraction and then 5 mL for secondary, for 50 mL sample. The drying of the organic phase was carried out with anhydrous sodium sulfate and its evaporation took place into the rotary evaporator (Laborata 4010, Heidolph, Germany) connected to a vacuum pump to a volume of 2-3 mL, then under pure nitrogen flow until 1,0 mL.

The instrument used in the analyze of the investigated compounds - separation, identification, quantification - GC-FID, Agilent Technologies 7890 GC type.

The identification of analyzed compounds – on the base of retention times - was done with the assistance reference-standards Sigma-Aldrich or Merck.

The sensitivity of the method depends on the efficiency of extraction and the response of detector for each compound.

The quantification of identified compounds was done through the method of external calibration (regression curve) with the assistance of internal reference - standard (3-octanol, 422 μg/L. concentration), by interpolating the relative areas of compounds to internal reference-standard area.

RESULTS AND DISCUSSIONS

From primary and secondary free flavours detected in white wines, α terpineol is well represented, especially at the varieties with genetic potential aroma. The α-terpineol is the unsaturated monocyclic terpene alcohol with one double link. It is formed in grapes by cyclization of the nerol and linalol, giving to the wine the "lilac" floral flavour (fig.1).

Analyzing the wines in terms of content in this aromatic ingredient, is found a higher percentage at less flavours varieties, compared with the neutral aroma, but the variety Muscat Ottonel was recorded with the highest content in flavours (0.2919 mg/L).

The secondary flavours, formed during alcoholic fermentation by yeast and lactic bacteria metabolism, are very large, being distinguished the superior alcohols, neutral fermentation esters, lactones etc.

Among superior alcohols, 1-hexanol has a vegetal flavour which is less desired, but is quantitatively underrepresented; likewise 1 - decanol and 1-phenyl ethanol are underrepresented. Are well represented among superior alcohols, 3-methyl 3 – butanol, in all varieties studied, especially to the Muscat Ottonel, with

the highest amount, 16.5 mg/L. 2-phenyl ethanol with floral aromas of rose shows the largest amount of superior alcohols in wines from Fetească regală, Fetească albă and Muscat Ottonel grape variety (fig. 2).

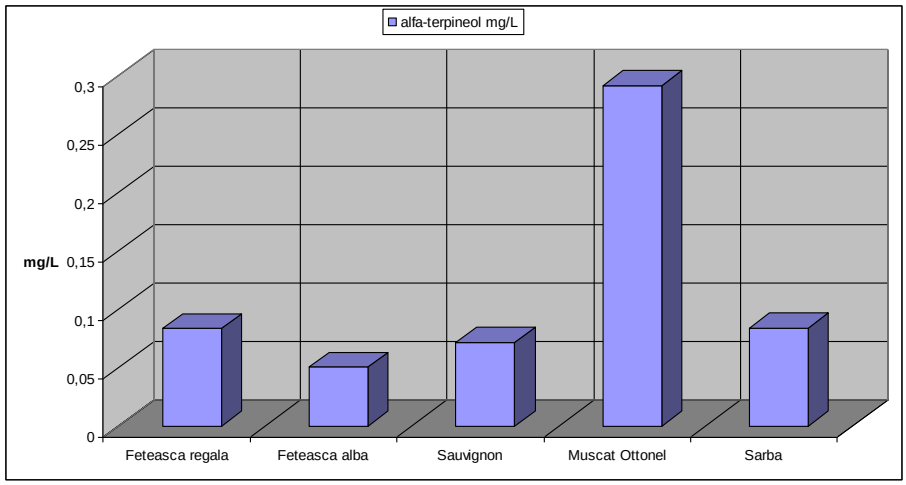

Fig. 1. α terpineolul in wines

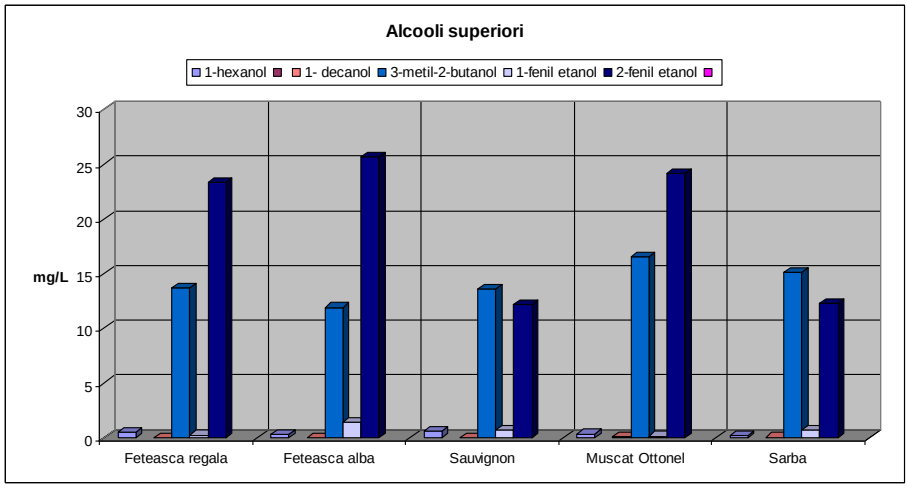

Fig. 2. Superior alcohols in wines

During fermentation there are formed inferiors short-chain and medium-chain fatty acids and their esters with ethylic alcohol. Ethyl esters of fatty acids with ethylic alcohol are promoters of fermentation aroma that give character of "*winy*".

Leading alcoholic fermentation of white wines from the Dealu Bujorului vineyard is: isobutyl acetate (pear flavor) isoamyl acetate (banana flavor).

The superior fatty acid esters and floral aromas are represented by ethyl hexanoat, ethyl octanoat, ethyl decanoat, having a relatively low concentration in

white wines ranging from 0.01 mg/L isoamyl acetate in the case of neutral wines as Fetească Regală, and maximum 0.30 to 0.35 mg/L ethyl octanoat in flavoured wines as Sauvignon Blanc and Muscat Ottonel. These esters are better represented in Muscat Ottonel wine, which is essentially a flavoured variety (Ffg.3).

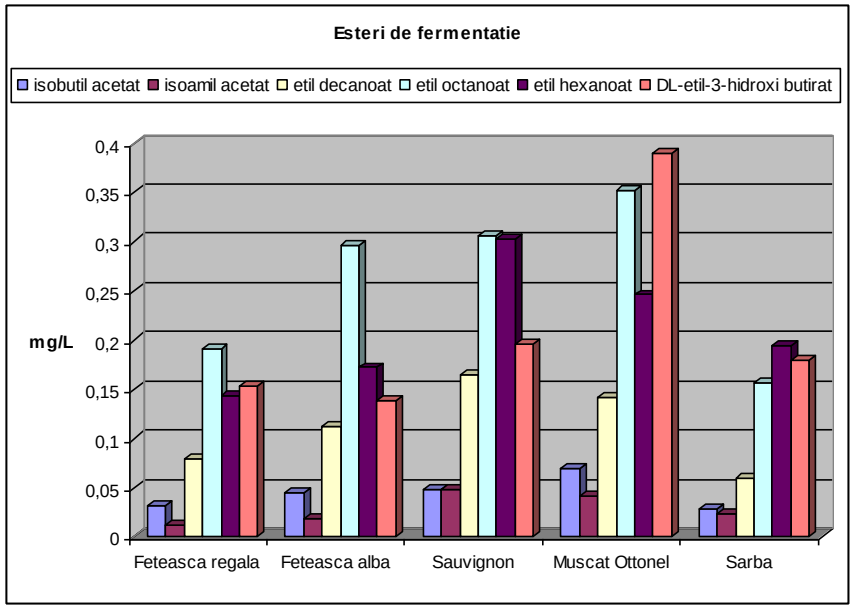

Fig. 3. Fermentation esters in wines

In small quantities also is formed superior fatty acids which presents pleasant floral aromas as the octanoic acid, showing high values in Sarba and Muscat Ottonel wines (36.5 mg/L) and values of 7-8 mg/L for wines with neutral character. (fig. 4).

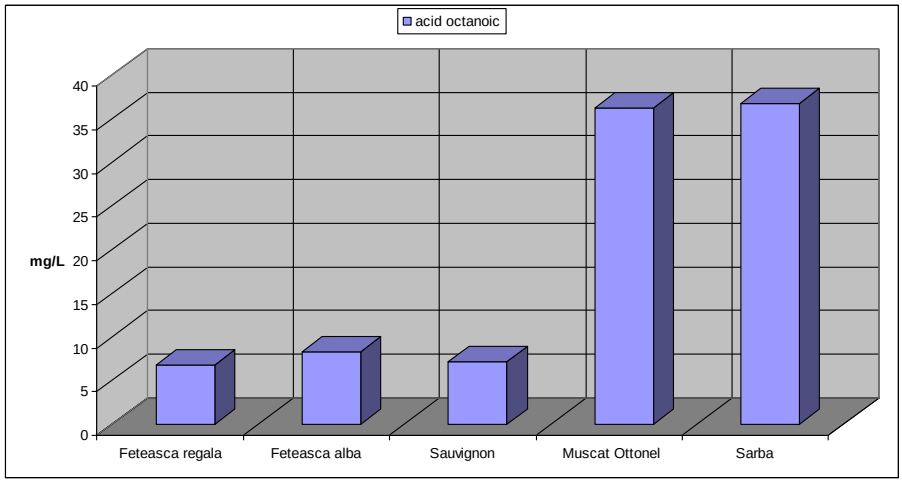

Fig. 4. Octanoic acid in wines

The lactones, represented by γ - octanoic lactone are present in the Feteasca white wine variety in higher proportion (18.6 mg/L) and insignificant in proportion to other varieties, without any significance on wine flavour (fig. 5).

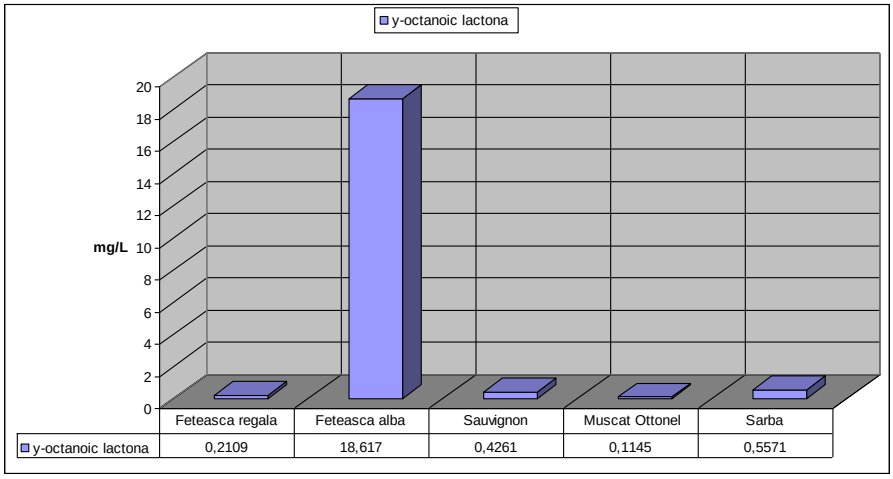

Fig. 5. γ – octanoic lactona in wines

During wine aging, evolutionary processes occurring, contribute to the formation of these flavour bouquet with the taste being perceived olfactory, constituting tertiary aromas. Part of this class are also the diethyl succinate and monoethyl succinate, which are neutral esters and ethyl lactate is formed during malolactic fermentation. Among the esters of aging, the best is in the case of monoethyl succinate in Muscat Ottonel variety wine (156.8 mg/L) and diethyl succinate of the same variety (45.8 mg/L) (fig. 6).

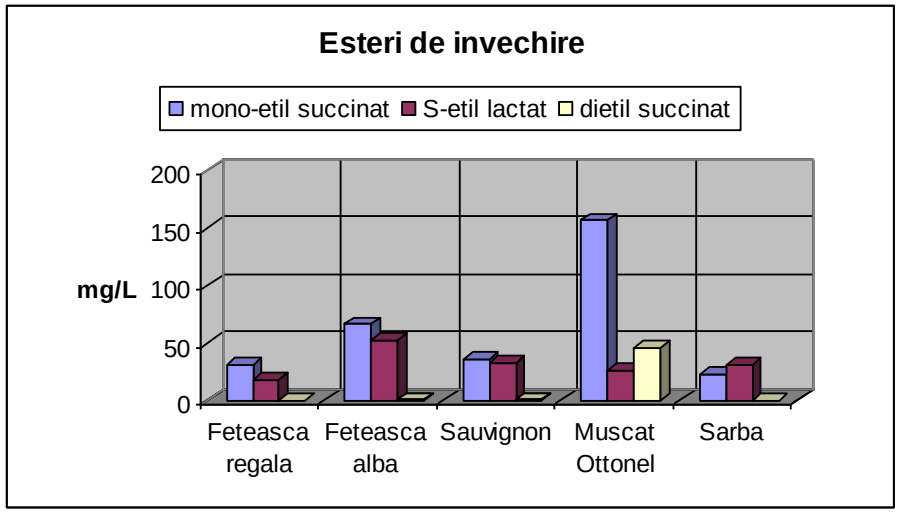

Fig. 6. Esters of aging in wines

CONCLUSIONS

1. The α terpineol is very well represented, especially in wines from Muscat Ottonel variety, variety with aromatic genetic potential.

2. Among superior alcohols well represented is 3-methyl 3 – butanol, in all varieties studied, with relevance to the Muscat Ottonel, which has the biggest amount, 16 5 mg/L; 2 phenyl ethanol, shows the largest amount of superior alcohols in wines from Fetească regală, Fetească albă and Muscat Ottonel varieties.

3. The alcoholic fermentation esters of white wines are isobutyl acetate (pear flavour), isoamyl acetate (banana flavour). The esters of superior fatty acids present floral flavours and are represented by ethyl hexanoat, ethyl octanoat, ethyl decanoat, that have a relatively low concentration in white wines, the isoamyl acetate in the case of neutral wines royal Fetească as the ethyl octanoat from flavored wines variety Sauvignon blanc and Muscat Ottonel. These esters are better represented in the Muscat Ottonel wine variety.

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COMPARATIVE STUDY OF RED BĂBEASCĂ NEAGRĂ WINES FROM NICOREŞTI VINEYARD OBTAINED THROUGH CLASSICAL TECHNOLOGY OF MACERATION FERMENTATION AND THROUGH INNOVATIVE MACERATION TECHNOLOGIES

STUDIU COMPARATIV AL VINURILOR ROŞII DE BĂBEASCĂ NEAGRĂ DIN PODGORIA NICOREŞTI OBŢINUTE PRIN TEHNOLOGIA CLASICĂ DE MACERARE-FERMENTARE ŞI PRIN TEHNOLOGII NECONVENŢIONALE DE MACERARE

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Abstract *This study presents comparative results of Băbească neagră wines obtained through the classical maceration-fermentation process and those obtained through innovative maceration technologies – microwave and ultrasounds maceration. The analyses' results differ, proving that the maceration-fermentation technology and contact time between must and grape skins greatly influence the physical-chemical characteristics of obtained wines.*
Keywords: Băbească neagră, red wine, maceration-fermentation, color.

Rezumat*: În acest studiu se prezintă rezultate comparative între vinurile roşii de Băbească neagră obţinute prin procedeul clasic de macerare-fermentare şi cele obţinute prin tehnologiile neconvenţionale de macerare: macerare cu microunde şi macerare cu ultrasunete. Rezultatele analizelor efectuate evidenţiază, prin diferenţele care apar la vinuri, că tehnologia de macerare-fermentare şi durata de menţinere a mustului pe boştină influenţează în mare măsură caracteristicile fizico-chimice ale vinurilor obţinute.*
Cuvinte cheie: Băbească neagră, vin roşu, macerare-fermentare, culoare.

INTRODUCERE

Maceration-fermentation is a particularly important technological step in the production of red wines. The two processes, maceration and fermentation, influence each other and their mechanism is influenced by many factors, among which the period of the extraction process of phenolic compounds (Cotea D.V., 2009) and the technological variant of maceration-fermentation. This study presents comparative results of Băbească neagră wines obtained through different technologies. By applying different technologies for obtaining Băbească neagră wines, by studying and comparison of samples obtained by these technologies, you can recommend the most appropriate variant of wine-making.

MATERIAL AND METHOD

Băbească neagră (Rotaru Liliana, 2009) local grapes variety were harvested in 2009 from Nicoreşti vineyard (Cotea D.V., 2000), Nicoreşti center.

The grapes were manually harvested, in wooden crates and transported to Iaşi Pilot Research Station where they were processed by different technologies (Cotea V.V., Cotea D.V., 2006).

Compositional characteristics of grapes at harvest are presented below (table 1).

Table 1

Compositional characteristics of grapes at harvest

No.	Vineyard	Harvest date	Reductive sugars (g/L)	Total acidity (g/L) $C_4H_6O_6$
1.	Nicoreşti	19.09.2009	206,14	7,83

The grapes were processed by different technologies: classical maceration-fermentation (control sample = M), and through innovative maceration technologies – microwave and ultrasounds maceration. The grapes were de-stemmed and crushed, marc homogenization is realized and then the grapes were processed by different technologies:

In the case of classical maceration (Cotea D.V. 1985), selected yeasts of the Saccharomyces cerevisiae sort were added (30 g/100 kg), as well as pectolytic enzymes (1,5 g/100 kg). Maceration - fermentation was performed in stainless steel tanks, for 120 hours, with pumping over four times daily. At the end of the maceration process, the marc was pressed by a hydraulic press, the working pressure being no more than 2 bar. The obtained must has been kept in stainless steel tanks for finishing its alcoholic and malo - lactic fermentation (Ţârdea C. ş.a., 2000). After finishing its malo - lactic fermentation, the wine was racked and conditioned (Pomohaci ş.a., 2001). Bottling was done after filtering.

In the case of ultrasounds maceration, the process took place at 2000 W in an ultrasonic cavity, with a frequency of 35 kHz at different times for 15 minutes and then for 22 minutes. After this treatment the marc undertook the same technological operations as in classical maceration-fermentation procedures.

In the case of microwave maceration the marc was irradiated at 750 W at different times: 15 minutes and then after 30 minutes. After this, the marc was cooled at 20˚C, with a third of its unheated volume and Saccharomyces cerevisiae (30 g/100 kg) and pectolytic enzymes (1,5 g/100 kg) were added.

Physical - chemical analyses were done according to international standards (Compendium of International Methods of Analysis of Wine and Musts, 2009 - O.I.V., Paris).

Chromatic parameters of wine samples were calculated according to CIE Lab 76 method, also taking into consideration the absorption spectrum registered for each wine sample. SPECORD S200 spectrophotometer was used. Automatic quantification and registration of the absorption spectrum was done. To minimize analysis errors, absorbance determination was done by using vials with adequate optic characteristics for each wine sample.

RESULTS AND DISCUSSIONS

Alcoholic strength, reductive sugars, relative density, total acidity, volatile acidity, pH, non - reductive extract, total dry and variation of chromatic parameters extract were registered.

The main compositional characteristics of Băbească neagră wines obtained through different maceration-fermentation technologies are presented in table 2.

The following abbreviations were used in this study: M = classical maceration (control sample); V1 = ultrasounds maceration 15 minutes; V2 = ultrasounds maceration 22 minutes; V3 = microwave maceration 750 W – 15 minutes; V4 = microwave maceration 750 W – 30 minutes.

The alcoholic concentration varies from 11,57 % vol. in the control sample (M) -classical maceration- up to 12,26 la V4 (fig. 1.).

The values presented in graphic 2 shows that the obtained wines are dry, with a content of maximum 4g/L reductive sugars, with a maximum value at V2 (3,24g/L).

The values of total acidity (tab. 2), which varies from 5,84 g/L tartaric acid in the control sample (M) up to 6,47 g/L tartaric acid at V3 together with those of the pH underline the fact that the malo-lactic fermentation of the wines did not occur.

Regarding the non reductive extract content of studied wines (tab. 2), one can observe that he has a minimum value of 20, 92 g/L at V1 ultrasounds maceration 15 minutes and a maximum of 21,89 g/L at V4 microwaves maceration 750 W 30 minutes. One can remark that, the influence of the technological variants on this parameter is very clearly observed; also, the data shows the influence of the maceration-fermentation techniques on the wine's color, especially the influence of exposure time to marc for extraction of color compounds in the same technology.

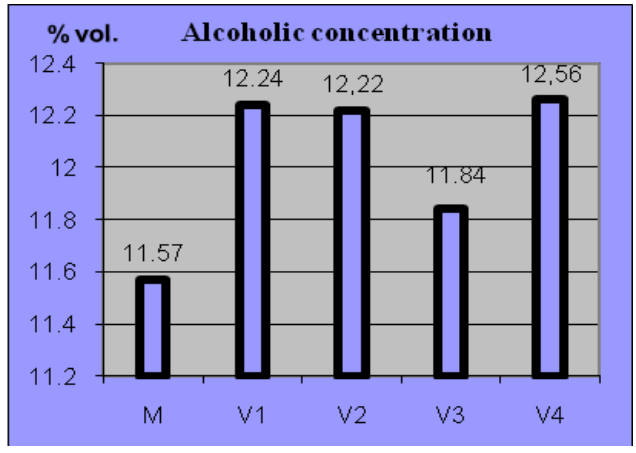

Fig. 1. Alcoholic concentration of Băbească neagră wines

Table 2

Compositional characteristics of red wines from Băbească neagră grapes harvested from Nicoreşti vineyard

No.	Technological variant	Relative density at 20ºC	Total acidity g/L $C_4H_6O_6$	Volatile acidity g/L $C_2H_4O_2$	pH	SO_2 free (mg/L)	SO_2 total (mg/L)	Non reductive extract(g/L)	Total dry extract (g/L)
1	M	0,9932	5,84	0,43	3,61	20,18	74,55	21,04	22,2
2	V1	0,9931	6,28	0,38	3,67	15,33	58,19	20,92	24,00
3	V2	0,9932	6,14	0,36	3,64	12,92	48,87	21,26	24,50
4	V3	0,9934	6,47	0,32	3,63	18,51	61,42	21,06	23,50
5	V4	0,9934	6,34	0,32	3,63	16,74	54,76	21,89	24,8

Table 3

Chromatic parameters of wines obtained from Băbească neagră grape variety from Nicoreşti vineyard

No.	Technological variant	Clarity L	Color coordinates		Saturation C	Tonality H	Luminosity	Hue	Δ E	Δ H
			a red(+) - green(-)	b yellow(+) - blue(-)						
1	M	64,5475	43,9773	20,5060	48,5232	24,9990	1,6944	0,7131		
2	V1	48,9912	58,6284	13,7052	60,2090	13,1574	2,5708	0,5783	22,4255	11,1512
3	V2	58,2106	49,8458	12,2043	51,3182	13,7577	1,9010	0,6498	11,9797	9,7748
4	V3	39,9875	59,1963	19,5428	62,3388	18,2699	3,4035	0,5951	28,9091	6,4556
5	V4	28,6080	58,1903	27,1049	64,1934	24,9759	4,9739	0,6002	39,2072	0,0224

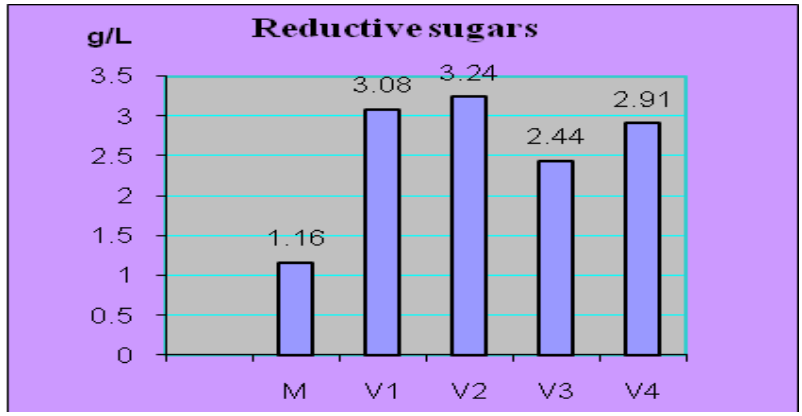

Fig. 2. Reductive sugars content of Băbească neagră wines

In table 3, the chromatic parameter values for the different wines obtained are presented.

Clarity „L" characterizes the more or less „bright" visual aspect of the wine's color and can have values between zero for an opaque black sample to 100 for transparent colorless samples. Therefore, the values of clarity „L" varies between 58,21 in V2 to 28,6 in V4 compared with the control sample(M) 64,5. These values prove the efficacy of microwave maceration, that leads to a better extraction and diffusion of anthocyanic pigments and other compounds found in the skin, avoiding unwanted changes in the taste and odor that can appear in the case of excessive heating specific to thermo-maceration.

The <<a>> component red-green (Tab. 3) of color represents the coordinate of complimentary colors red-green. This parameter frequently has negative values in white wines where green tonalities prevail on red hues and positive values in red wines; it varies from 49,84 in V2 to 59,19 in V3, compared with the control sample(M) 43,97.

The <<b>> component yellow-blue of color represents the coordinate of complimentary colors yellow – blue. This parameter frequently has positives values, with minimum value at V2 12,20.

CONCLUSIONS

The obtained wine samples can be qualified as D O C - CMD, execpt the ROTO-tank maceration sample.

The V4 maceration method (750 W for 30 minutes) has the best chromatic parameters and physical-chemical compositional characteristics in the conditions of 2009 harvest.

The use of a certain maceration-fermentation technology greatly influence the wines'color.

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ASPECTS REGARDING THE INFLUENCE OF CERTAIN OENOLOGICAL PRODUCTS ON THE PHYSICO-CHEMICAL PARAMETERS OF SOME COTNARI WINES

ASPECTE PRIVIND INFLUENŢA UNOR PRODUSE OENOLOGICE ASUPRA PARAMETRILOR FIZICO-CHIMICI LA UNELE VINURI DE COTNARI

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Abstract. *The oenological products used in wine-making allow its potential qualities to be emphasised. Depending on the goal, one can distinguish oenological products specific to certain technological development stages (enzymatic products, selected yeasts and malolactic bacterial starter cultures), maturation, clarification, stabilization and filtration of wines. This study aims to present the influence of some oenological products (selected yeasts, enzyme preparations and nutrients) on the physical-chemical parameters of Fetească albă and Tămâioasă românească white wines obtained in the Cotnari vineyard in 2009.It was noticed that the best results were obtained in the case of selected yeasts, nutrients, clearing and extraction enzymes usage.*

Key words: Cotnari, Fetească albă, Tămâioasă românească

Rezumat. *Produsele oenologice utilizate în elaborarea vinurilor permit punerea în evidenţă a calităţilor lor potenţiale.În funcţie de scopul urmărit, se pot distinge produse oenologice specifice etapelor tehnologice de elaborare (preparate enzimatice,levuri selecţionate şi bacterii malolactice selecţionate), limpezire, stabilizare, filtrare şi maturare a vinurilor. În acest studiu s-a urmărit influenţa pe care o exercită unele produse oenologice (levuri selecţionate, preparate enzimatice şi nutrienţi) asupra parametrilor fizico-chimici ai vinurilor albe obţinute din soiurile Fetească albă şi Tămâioasă românească din podgoria Cotnari,recolta 2009. S-a constatat că cele mai bune rezultate s-au obţinut la varianta la care s-au utilizat levuri selecţionate, nutrient, enzime de limpezire, respectiv enzime de extracţie.*

Cuvinte cheie: Cotnari, Fetească albă, Tămâioasă românească

INTRODUCTION

If in the past, the obtained wines had high sensory qualities only in climatically favourable years, today the same does not apply. The wine-maker possesses different practices and oenological products that lead to producing high-quality wines, capable to highlight the varietal characteristics of the grape variety (Croitoru C., 2009).

The present study follows the influence exerted by some oenological products (selected years, enzymes and nutrients) on the physical-chemical characteristics of white wines obtained from Fetească albă and Tămâioasă românească grape varieties in Cotnari vineyard, 2009 harvest.

The selected yeasts ensure a better transformation of must sugars in ethical alcohol and also a better underlining of different grape varieties oenological potential.

The oenological enzymes products ensure the accelerations of must clearing processes, colour extraction and stabilisation, varietal aroma potential and quickening the filtering processes (Croitoru C., 2009).

The nutrients are products that activate the alcoholic fermentation by enhancing a high sterols quantity and other indispensable cellular growth factors for the yeasts (non saturated fatty acids, pantomimic acids and other vitamins, microelemets). These products allow the wines' sensory profiles to be differentiated, in regards to the initial musts, to technological conditions used and the winemakers' choice towards wine class to be obtained (Croitoru C., 2006).

MATERIAL AND METHOD

Grape harvest took place in September 2009 when the grape sugars reached 197g/L reducing sugars and 8,54 g/L $C_4H_6O_6$ total acidity for Fetească albă and 202 g/L reducing sugars and de 8,75 g/L $C_4H_6O_6$ total acidity in Tămâioasă românească.

The wines were obtained by following white dry wine prodicing technology (Cotea V., 1985) with the specification that the grapes from Tămâioasă românească variety were subjected to a 8-12 hours maceration process in order to extract aromas and the Vulcazym aroma extraction enzymes (2 g/hL), except the control sample.

The variants taken into consideration for the Fetească albă grape sort were the following:

- M - spontaneous fermentation (control sample);
- V_1 _ selected yeasts added to musts (Zymaflore X 16), 20 g/hL;
- V_2 - selected yeasts (Zymaflore X 16), 20 g/hL and nutrient (Fermoplus integrateur), 35 g/hL were added to the must;
- V_3 - selected yeasts (Zymaflore X 16), 20 g/hL and nutrient (Fermoplus integrateur), 35 g/hL; clearing enzymes (Pecvine V) were added to grapes 3 g/100 kg;
- V_4 - selected yeasts (IOC Expresion), 15 g/hL and nutrient (Fermoplus integrateur), 35 g/hL; clearing enzymes (Pecvine V) were added to grapes 3 g/100 kg;

The variants taken into consideration for the Tămâioasă românească grapes were the following:

- M - spontaneous fermentation (control sample) without using extraction enzymes;
- V_1 - selected yeasts added to musts (Fermol aromatic), 25 g/hL;
- V_2 - selected yeasts added to musts(Fermol aromatic), 25 g/hL and nutrient (Fermoplus integrateur) , 35 g/hL;
- V_3 - selected yeasts added to musts (Fermol aromatic), 25 g/hL and nutrient (Fermoplus integrateur), 35 g/hL, clearing enzymes (Zymoclaire CG), 1,5 g/hL;
- V_4 - selected yeasts added to musts (Zymaflore X 5), 20 g/hL, nutrient (Fermoplus integrateur), 35 g/hL and clearing enzymes (Zymoclaire CG), 1,5 g/hL.

At the end of the alcoholic fermentation, wines and less were separated; after filtration and sulphitation, they were bottled.

For the obtained samples, the main physical-chemical characteristics were analysed (on the base of international and national standards indicated methods and by the specific literature): alcoholic concentration, reducing sugars content, total acidity, pH, relative density, total dry extract, non-reducing extract, free and total sulphur dioxide.

The physical chemical parameters for the above mentioned samples were analysed in January-February 2010 in the Oenological Laboratory within the University of Agricultural Sciences and Veterinary Medicine „Ion Ionescu de la Brad" Iaşi.

RESULTS AND DISCUSSIONS

The obtained results following the analyses are presented in tables 1 and 2.

For the obtained wines, Fetească albă and Tămâioasă românească, the best results were registered in the third variant in which selected yeasts, enzymes and nutrients were used.

For the Fetească albă wines, the used oenological products (selected yeasts, clearing enzymes and nutrients) lead to a high alcoholic concentration (11,65 % alcohol for the third variant) in comparison to the control sample that had 11,35 % alcohol.

Table 1

Main physical-chemical parameters for Fetească albă obtained wines

Sample	Alcohol content %	Reducing sugars g/L	Total acidity $C_4H_6O_6$ g/L	pH	Relative density	TDE g/L	NRE g/L	SO_2 mg/L	
								free	total
M	11,35	2,40	6,70	3,39	0,9940	23,50	21,10	35	115
V_1	11,63	2,65	7,80	3,17	0,9939	23,70	21,30	30	107
V_2	11,50	2,90	7,57	3,10	0,9939	24,00	21,10	32	114
V_3	11,65	2,65	7,85	3,10	0,9940	24,50	21,85	37	126
V_4	11,60	2,85	7,12	3,27	0,9939	24,00	21,15	35	110

Also, for the Tămâioasă românească wine samples, the same situation is presented: the sample treated with selected yeasts (Fermol aromatic), nutrients (Fermoplus integrateur), clearing enzymes (Zymoclaire CG) and extraction enzymes (Vulcazym arome), the alcoholic concentration reached a peak of (11,80 % alcohol, but the minimum value was obtained at the control sample (11,65 % alcohol). The obtained wines are dry (under4 g/L sugars).

For the control samples, the total acidity registered minimum values (6,70 g/L $C_4H_6O_6$) for Fetească albă and 6,95 g/L $C_4H_6O_6$ for Tămâioasă românească. By using selected yeasts, nutrients and enzymes, the third variant reached maximum values (7,85g/L $C_4H_6O_6$ for Fetească albă and 7,60 g/L $C_4H_6O_6$ for Tămâioasă românească).

Table 2

Main physical-chemical parameters for Tămâioasă românească wines

Sample	Alcohol content %	Reducing sugars. g/L	Total acidity $C_4H_6O_6$ g/L	pH	Relative density	TDE g/L	NRE g/L	SO_2 mg/L	
								free	total
M	11,65	3,00	6,95	3,49	0,9939	24,2	21,20	38	118
V_1	11,72	2,48	7,16	3,55	0,9938	24,2	21,72	30	97
V_2	11,75	2,35	7,35	3,31	0,9937	24,0	21,65	35	123
V_3	11,80	2,12	7,60	3,27	0,9936	23,70	21,58	32	90
V_4	11,78	2,30	7,52	3,15	0,9936	23,70	21,40	27	80

The pH values are normal, varying between 3,1, and 3,5, fact that strongly influences the sensory characteristics if wines, limpidity, colour, proteic and tartaric stability (Târdea C., 2007).

The extract is highly important in defining wine quality, by enhancing their corpulence, amplitude, body and personality (Macici M., 2008) by analysing the extract one can emphasise some illegal practices like adding water to wine, adding alcohol, glicerol, mineral acids etc. (Târdea C., 2007).

For the Fetească albă wines, the non-reducing extract registers values between 21,10 g/L (control sample) and 21,85 g/L for the third variant.

In the case of Tămâioasă românească wine, the minimum non-reducing extract value was registered at the control sample (21,20 g/L), while the maximum one in the first variant due to the addition of selected yeasts.

CONCLUSIONS

The best results, in regard to compositional characteristics were obtained at the variant where selected yeasts, nutrients, clearing enzymes and extraction enzymes were used.

In order to achieve successful wine-making process, the use of oenological products is necessary in order to enhance the oenological potential of a certain grape variety.

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COMPARATIVE STUDY ON THE INFLUENCE OF MACERATION TECHNOLOGIES ON THE FETEASCĂ NEAGRĂ WINES COLOUR

STUDIU COMPARATIV PRIVIND INFLUENŢA TEHNOLOGIILOR DE MACERAŢIE ASUPRA CULORII VINULUI OBŢINUT DIN SOIUL FETEASCĂ NEAGRĂ

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Abstract. *The study presents aspects concerning the influence of various types of maceration on the Feteasca Neagră wines colors, color extraction is one of the main concerns of winemakers. Experimental material used was taken from the "V. Adamachi" farm and was applied specific technology for obtaining quality red wines. Then were used different variants of maceration: ultrasonic maceration, microwave maceration compared with classical and thermo maceration. Were obtained five technologic variants and the obtained wine were determined physico-chemical parameters, parameters of color, phenolic compounds: the anthocyans, the phenolic acids, Folin Ciocâlteau and* D_{280} *index. The analyses obtained have found variations of the phenolic compounds and color parameters depending on the type of maceration.*

Key words: Feteasca neagră, phenolic compounds, color parameters, microwave, ultrasounds

Rezumat. *În lucrarea de faţă s-au urmărit aspecte privind influenţa diferitelor tipuri de maceraţie asupra culorii vinurilor obţinute din soiul Fetească neagră, extragerea culorii fiind una din principalele preocupări ale tehnologilor. Materialul experimental utilizat a fost preluat din ferma „V. Adamachi" Iaşi şi s-a prelucrat conform tehnologiei specifice de obţinere a vinurilor roşii de calitate. Ulterior, s-a apelat la diferite variante de maceraţie: maceraţia cu ultrasunete, maceraţia prin intermediul microundelor comparativ cu maceraţia clasică şi termomaceraţia. S-au obţinut cinci variante tehnologice, iar la vinul obţinut s-au determinat analizele fizico-chimice, parametrii de culoare, compuşii fenolici: antocianii, acizii fenolici, indicele Folin Ciocâlteau şi* D_{280}*. În urma analizelor obţinute s-au constatat variaţii ale conţinutului de compuşi fenolici, ale parametrilor cromatici în funcţie de tipul de maceraţie folosit.*

Cuvinte cheie: Fetească neagră, compuşi fenolici, parametri cromatici, microunde, ultrasunete

INTRODUCTION

Colour is the one of the main issue for obtaining red wine. To extract the color of red wine are used different maceration technologies, like: classical maceration, thermo, microwaves and ultrasound maceration . The main compounds of red wines are phenolic substances. The anthocyanins extraction

during the maceration depends on the oenological potential of grapes. The grapes content in phenolic substances depending on variety and year of the harvest . The main processes determining the anthocyans extraction are diffusion and dissolution (Cotea D.V., 1985, Cotea V.V. et al., 2005). The formation of red wine color involves the phenolic compounds: anthocyanins, tannins and phenolic acids. They are responsible for red wine color, the astringecy and smoothness (Petronela- Cristina Mogîrzan et al., 2009; J. Ribereau-Gayon et al., 1972). The most important specific pigments of red and rosé wines are anthocyanins. The quantities are 200-500 mg/L in red wine and it is reducing by half during the first year of storage and after the content stabilizes of 200 mg/L. The mechanisms which reducing the quantity of anthocyans is the enzymatic hydrolysis with formation of unstable antocianidine and condensation reactions (Pomohaci N. et al. 2000; Ţârdea C et al., 2000).

MATERIAL AND METHOD

The researches on the influence of microwave, ultrasound compared with conventional maceration, termomaceration, which influence the wine color were made in November 2009 - January 2010, in the Oenology Laboratory of University of Agricultural Sciences and Veterinary Medicine Iaşi and were on obtained dry red wine samples of Fetească neagră grapes, from the wine center Copou harvest in 2009.

The wines were obtained under specific technology for obtaining high quality red wines.

The experiment was carried in three stages: preparation of mark for the 5 variants: 2 variants of irradiation, irradiation at 350 W on 10 and 17 minutes, 1 variant with ultrasound maceration, a variant with termomaceration (90°C) and classical maceration, then inoculation with enzymes Zymoclaire G (Sodinal, 2 g/hl mark) for a high degree of extraction and clarification of musts and selected yeast *Saccharomyces bayanus* Fermactive Rouge (Sodinal; mustuială 20 g/100 kg mark), followed by soaking at 20°C for one day. He followed the pressure mark in a hydraulic press followed by alcoholic fermentation, malo-lactic fermentation, sterile filtration, addition of 30 mg/L SO2 and bottling in dark bottles of 0.75 L. After three months (after which the visual appearance of tartaric precipitation was analysed) the physico-chemical analyses were made. The physico-chemical analyses were made under international and state standards and specific literature (Ţârdea C., 2007; Recueil des méthodes internationales d'analyse des vins et de moûts 2008).

The chemical determination were: alcoholic concentration, reductive sugars, total acidity, volatile acidity, wine density, dry extract, non reductive extract. The other determinations was anthocyans determination by pH variation method, the total content of phenolic compounds determination by Folin Ciocalteau Index, D_{280} Index, phenoloc acids determination by high performance liquid chromatography (HPLC) and determination of the the color parameters.

RESULTS AND DISCUSSIONS

The main physico-chemical characteristics of the Fetească neagră wines, obtained by different techniques of maceration are presented in table 1.

Regarding the phenolic compounds content, it is remarkable the variation depending on the type of used maceration, the highest quantity, 349,95 mg/L (fig. 1) it is at the microwave maceration samples, at 350 W power, 17 minutes, where the phenolic compounds extraction is highest, due the power and more time maceration, compared with microwave maceration variant for 10 minutes at the same power, where the anthocyans quantity is 309,56 mg/L.

The termomaceration variant, classical variant have lower values than the variants mentioned below and the ultrasound variant, the anthocyans quantity is the lowest, 278,24 mg/L.

The total polyphenols index values at the 5 samples analysed have a minimum of 25, 09 (fig. 2) at ultrasound maceration. The variation of parameters color in wines (varies by maceration technologies used and phenolic maturity of grapes in the moment of harvesting.

The brightness or L parameter values were from 60,13 on ultrasound variant and to 33,41 at the wine produced by microwave treatment for 17 minutes, reverse varying with the intensity color wine. In the case of a parameter (fig. 3) is noted that the wines are red color component, with the values between 34,31 at ultrasound maceration and 59,07 for the variant where was used microwave maceration, 17 minutes. The b parameter indicates the existence of the yellow color component, with a maximum of 31.65 in the microwave variant, 17 minutes and a minimum of 21,08 for the ultrasound variant.

Table 1

Physico-chemical characteristics of wine

No.	Alcohol % vol.	Reductive sugar g/L	Total acidity, g/L $C_4H_6O_6$	Volatile acidity, g/L $C_2H_4O_2$	Relative density g/mL	R.E g/L	N.R.E g/L
1	12,50	3,44	5,18	0,73	0.9920	21,90	18,46
2	11,56	3,96	4,75	0,59	0.9924	20,10	16,14
3	12,27	2,94	5,44	0,54	0 .9922	21,60	18,66
4	11,51	3,96	6,10	0,59	0.9922	19,30	15,34
5	11,38	2,26	5,96	0,54	0.9941	24,00	21,74

R.E-reductive extract; N.R.E - non reductive extract;
1 Fetească neagră-ultrasound maceration 37 KHz 10 ', 2 Fetească neagră -microwave maceration 750 W 10 ', 3 Fetească neagră - microwave maceration 750 W 17', 4 Fetească neagră - termomaceration, 5 Fetească neagră - classical maceration;

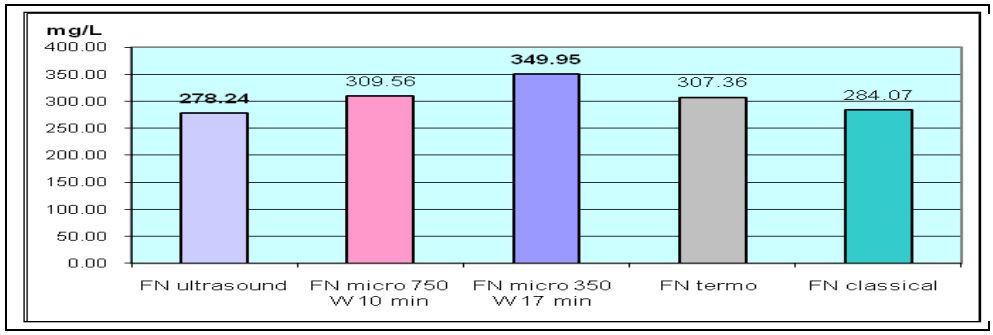

Fig. 1. The total quantity of anthocyanins present in wines

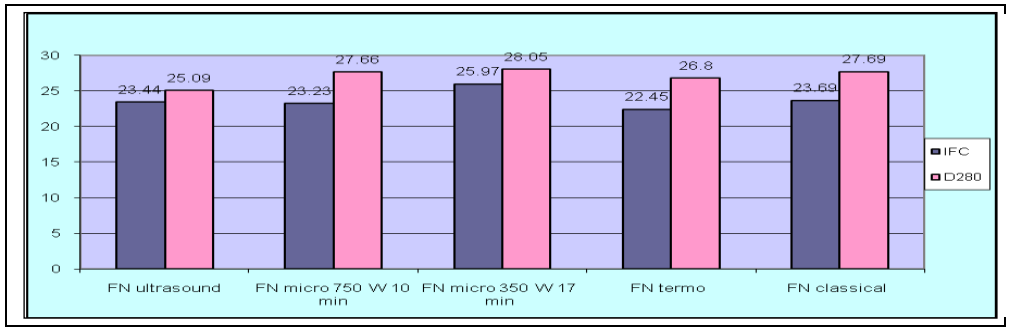

Fig. 2. Folin-Ciocâlteau and D280 index

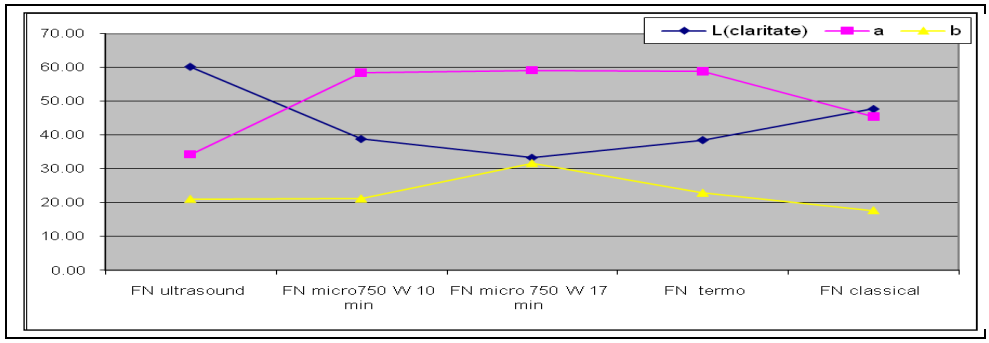

Fig. 3. Chromatic parameters CIE Lab 76

The anthocyans profile varies by used maceration technology, finding the highest values on the microwaves variants where were used a higher power and a long time maceration, respectively termomaceration, which can be observed in table 2. The phenolic acids (table 3) were relatively small variations depending on maceration used; the oscillations are not constant depending on the type of phenolic acids.

Table 2

Percentage values (% of amount) of the 9 anthocyanins in wines

No.	Dp	Cy	Pt	Po	Mv	Po-a	Mv-a	Po-cm	Mv-cm	ΣAnt.-acet.+Ant.-cum.	ΣAnt.-acet./ΣAnt.-cum.	Mv/ΣMv-COOR	ΣAnt./ΣAnt.-COOR
1	3,91	0,34	10,08	3,50	76,75	0,42	3,40	0,10	1,51	5,42	2,38	15,64	17,44
2	3,42	0,55	8,72	3,58	76,69	0,45	4,58	0,12	1,90	7,05	2,50	11,83	13,18
3	3,48	0,67	9,03	3,23	73,82	1,00	4,43	0,49	3,86	9,78	1,25	8,90	9,23
4	3,37	0,01	8,44	3,45	76,08	0,80	4,34	0,35	3,16	8,65	1,46	10,14	10,56
5	3,28	0,30	9,11	3,01	77,23	0,38	2,96	0,36	3,38	7,08	0,89	12,18	13,12

1- Fetească neagră microwave maceration 750 W 17', 2- Fetească neagră microwave maceration 750 W 10', 3- Fetească neagră termomaceration , 4 - Fetească neagră classical maceration, 5 - Fetească neagră ultrasound maceration 37 KHz 15';
Dp - delphinidin ; Cy – cianidin; Pt – petunidin; Po – poenidin; Mv – malvidin; Mv-a, malvidin-acetylated; Po-cm, poedinidin cumarilated; ΣAnt.-acet.+Ant.-cum., the amount of the anthocyans acetylate and cumarilated, ΣAnt.-acet./ΣAnt.-cum, report of the acetylated and cumarilated anthocyans, Mv/ΣMv-COOR, report of the monoglucozid malvidin and the amount of esterified malvidin, ΣAnt./ΣAnt.-COOR-report of the amount of simple and esterified anthocyans.

Table 3

Quantitative value of phenolic acids in wine (mg/L)

No.	gallic acid	protocatechic acid	p - hydroxybenzoic acid	gentisic acid	vanillic acid	caffeic acid	clorogenic acid	syringic acid	p-cumaric acid	ferulic acid
1	8,063	0,593	0,012	13.0387	20,616	4,065	1,514	4,647	3,767	0.3886
2	5,007	0,899	0,008	12,038	19,441	3,267	1,034	4,571	3,002	0,494
3	12,508	0,803	0,032	6.9221	13,810	0,496	0,919	6,213	0,374	0,413
4	9,010	0,779	0,016	8,068	10,092	0,492	1,180	5,409	0,392	0,353
5	3,983	0,704	0,026	3,020	22,808	3,265	1,329	3,590	3,168	0,205

1- Fetească neagră microwave maceration 750 W 17', 2- Fetească neagră microwave maceration 750 W 10', 3- Fetească neagră termomaceration, 4 - Fetească neagră classical maceration, 5 - Fetească neagră ultrasound maceration 37 KHz 15'

CONCLUSIONS

The study demonstrates that microwave treatment favors the color components extraction, the total quantity of anthocyanins increased in microwave the sample,750 W 17 minutes.

The color parameters varies by used maceration technology, the brightness increased on the ultrasonic maceration variant varying inversely with intensity. The a and b parameters showed a maximum value on the microwave variant, power of 750 W, 17 minutes, which shows that microwaves have influence on the tannins and anthocyans extraction.

The monoglucosid anthocyans is higher on the microwave maceration at 750 W 17 minutes and the amount of acetylated and cumarilated anthocyans has the highest value for the microwave treatment at a lower intensity and for the ultrasound variant.

The phenolic acids quantity varies depending on the used treatment, the microwave and the ultrasound treatment favors phenolic acids extraction.

The classical variant and the other new type of variants are not large differences, but we may say that the color varies quite high comparative with the conventional maceration and termomaceration, so can be obtained a new type of wine.

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THE EFFECT OF THE TARTARIC ACID AND SULPHUR DIOXIDE ADDITION ON THE ENZYMATIC BROWNING OF THE GRAPES, MUSTS AND WINES

INFLUENŢA ADAOSULUI DE ACID TARTRIC ŞI DIOXID DE SULF ASUPRA IMBRUNĂRII ENZIMATICE A STRUGURILOR, MUSTURILOR ŞI VINURILOR

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Abstract. *Together with the sulphur dioxide, bentonite and polyacrylamides, the tartaric acid addition inhibits the activity of the oxidative enzymes,. The aim of this study was to analyse the enzymatic brwning1in the grapes, must and wine after which the experimental variants were made by combining different doses of sulphur dioxide and tartaric acid. Tyrosinase activity during alcoholic fermentation registered a decrease of 54,5-83,3% in the case of tartaric acid addition while for the sulphur dioxide addition the tyrosinase activity was total inhibited. During the alcoholic fermentation, enzymatic activity of peroxidase and laccase were reduced by 9,4-94,4% correlated with the dose of sulphur dioxide and tartaric acid used. After the alcoholic fermentation of grape must in the case of variants with sulphur dioxide and tartaric acid tyrosinase and laccase activity was total inhibited. In the case of variants where used similar doses of sulphur dioxide and tartaric acid, a reduction of peroxidase activity of 10,9- 57% was observed.*

Key words: tartaric acid, enzymes, sulphur dioxide, alcoholic fermentation

Rezumat. *Acidul tartric inhibă activitatea enzimelor oxidative, alături de dioxidul de sulf, bentonită şi poliacrilamide. Scopul acestui studiu a fost de a analiza activitatea oxidazică din struguri, must şi vin după care s-au realizat variantele experimentale cu diferite doze de dioxid de sulf şi acid tartric. Activitatea tirozinazei în timpul fermentaţiei alcoolice a înregistrat o scădere cu 54,5-83,3% în cazul adaosului de acid tartric, în timp ce la adaosul de dioxid de sulf activitatea tirozinazei a fost total inhibată. În timpul fermentaţiei alcoolice activitatea enzimatică a peroxidazei şi lacazei scade cu aproximativ 9,4-94,4 %, proporţional cu doza de dioxid de sulf şi acid tartric folosită. După finalizarea fermentaţiei alcoolice, în cazul variantelor cu dioxid de sulf şi cu acid tartric, activitatea tirozinazei şi lacazei a fost inhibată total. În cazul variantelor la care s-au folosit doze similare de dioxid de sulf şi acid tartric s-a observat o reducere a activităţii peroxidazei cu 10,9-57%.*

Cuvinte cheie: acid tartric, enzime, dioxid de sulf, fermentaţiealcoolică

INTRODUCTION

The tartaric acid appears in grapes in a dextrorotatory form and only in very small quantities in racemic form. In the must it can be found in quantities of 2-7 g/l. Only 0.6 – 0.8 g/l of the tartaric acid found in grapes is found unbound whereas the

rest is combined with tartrates (Pomohaci et al., 2000). Starting from the must and up to the wine to be bottled, the content of tartaric acid decrease gradually. Thus, during the alcoholic fermentation, as the alcohol is formed, approximately 50% of the tartaric acid which existed in the must, settles as potassium bitartrate (Ţârdea et al., 2000).

The tartaric acid participates with a share of approximately 50% to the total acidity, confering the wines their specific characteristics, especially their vinosity, but is important to mention that in bigger quantities it grants them a rougher/more astringent taste. The tartaric acid inhibits the activity of the oxidative enzymes (peroxidase and tyrosinase). In a study conducted by Mujdaba et al., 1985, on the activity of the peroxidase in comparison with the tyrosinase in the *Fetească albă* and *Italian Riesling* grape varieties, originating in the *Murfatlar* vineyard, the moment when tartaric acid had been added (1.5 g/l at the most) an inhibition effect on the oxidative enzymatic activity was obtained. Many researches have been dedicated to the reduction of the tyrosinase activity the by sulphitation (Macheix et al., 1991). The decrease of the total activity is directly correlated with the concentration of the SO_2 used, the enzyme being completely inhibited by a concentration of 50 mg/l (Rapine, 2005). The laccase activity is little affected by the presence of the sulphur dioxide while the peroxidase, being a stable enzyme, is partially inactivated by using of high doses of SO_2. The decrese of the laccase and peroxidase activities is directly correlated with the SO_2 concentration which has been used.

The purpose of this study was to analyse the oxidative activity in the grapes, must and wine and, afterwards, the enzymes inactivation with different doses of sulphur dioxide and tartaric acid was done.

MATERIAL AND METHOD

The research has been conducted at the "Bujoru' Research and Development Station for Viticulture and Vinification, Romania, in 2008 – 2009. The healthy and mouldy (20%) *Italian Riesling* grapes were collected during their technological ripeness stage. After the crushing – destemming and pressing, the *Italian Riesling* wine musts, from healthy and mouldy grapes, were treated with different SO_2 and tartaric acid doses according to the variants:

V_{01} - healthy grapes ; V_{02} - mouldy grapes;
V_1- addition of 0,5g/l tartaric acid; V_6 - addition of 0,5g/l tartaric acid;
V_2 - addition of 1 g/l tartaric acid; V_7 - addition of 1 g/l tartaric acid;
V_3 - addition of 1.5 g/l tartaric acid; V_8 - addition of 1.5 g/l tartaric acid;
V_4 - addition of 100 mg/l SO_2 ; V_9 - addition of 100 mg/l SO_2 ;
V_5 - addition of 150 mg/l SO_2. V_{10} - addition of 150 mg/l SO_2.

The alcoholic fermentation has taken place at 17- 21°C. During this period daily samples were collected for physico-chemical and enzymatic determinations. The dynamics of the oxidative enzymatic activity was quantified in the must, fermented must and young wine. The activity of the tyrosinase and laccase was measured by using the method described by Dubernet et al., (1974). The activity of the peroxidase was evaluated by using the method described by Ciopraga et al., 1978. At the same time, the polyphenoloxidase index (IPFO) and the browning index (IB) were calculated according to the method described by Leglise et al., (1969), and Mantis (1980) and cited by Ioniţă et al., (1998). The musts and wines obtained were analysed for the content of total polyphenols by means of the reaction with the Folin –Ciocâlteau

reagent and was expressed as g/l gallic acid. In order to analyse the musts and wines there were used official methods (OIV). All determinations were performed in duplicate and the standard deviations were less than ±1%.

RESULTS AND DISCUSSIONS

The oxidative enzymatic activity and the physico-chemical characteristics of the wine must

The physico-chemical characteristics of the grapes during their harvesting period were as follows: the reducing sugar content of the grapes 194-199 g/l, total acidity3,4- 4,9 g/l H_2SO_4 and the content of total polyphenols 0,136-0,175 g/l gallic acid. By determining the activity of the oxidative enzymes in the healthy grapes (V_{01} – control sample) and in the mouldy ones (V_{02} – control sample), several specific features were noticed. The activity of the oxidative enzymes decresed in the fresh wine must obtained from healthy grapes by 25% for the tyrosinase, by 66.6% for the laccase and by 29.4% for the peroxidase by using an addition of 1.5 g/l tartaric acid. When fresh must from healthy grapes was sulphitated with doses of 100 mg/l SO_2 and 150 mg/l SO_2 , respectively, the activity of the laccase, decreased by 44.4 and 66.6% respectively. The peroxidase activity decresed by 30.5 and 47% respectively. When sulphitation on the fresh must from healthy grapes was done with a dose of 150 mg/l SO_2 the activity of the tyrosinase was completely inhibited.

The activity of the oxidative enzymes decreased in the fresh wine must obtained from mouldy grapes by approximately 28.5 - 57.1% for the tyrosinase, 10.7 – 35.7% for the laccase and by 6.4 – 13.9% for the peroxidase at the same time with the increase of the doses of tartaric acid. When for the fresh must from mouldy grapes doses of 100 mg/l SO_2 and 150 mg/l SO_2 were used, a decrease of the oxidative enzymatic activity by 71.4 and 85.7%, respectively, in the case of the tyrosinase, by 78.5 up to 85.7% for the laccase and by 25.8 and 30.1%, respectively, for the peroxidase. The polyphenoloxidase and browning indices varied between 1 - 25.9 and 2 - 12.81 for the wine must of healthy grapes. In the wine must obtained from mouldy grapes the polyphenoloxidase index varied between 15.8 - 32.7 and the browning index between 3 - 14.53.

The activity of the oxidative enzymes from the grape must during the alcoholic fermentation

The oxidative enzymatic activity was evaluated for the healthy and mouldy grape must during the alcoholic fermentation (after 24, 48, 72 and 96 hours). During the alcoholic fermentation, in the healthy grape must, a decrease by 14.2 -25% for the tyrosinase, by 50-66.6% for the laccase and by 24.6 – 34.7% for the peroxidase when adding a dose of 1.5 g/l tartaric acid (V_3) was observed (figures 1, 3, 5).

The activity of the oxidative enzymes decresed during the alcoholic fermentation, in the mouldy grape must too.These decrease was by 54.5 - 83.3% for the tyrosinase, by 32.2 - 55.5% for the laccase and by 9.4 - 15% for the peroxidase when adding a dose of 1.5 g/l tartaric acid (V_8) (figures 2,4,6).

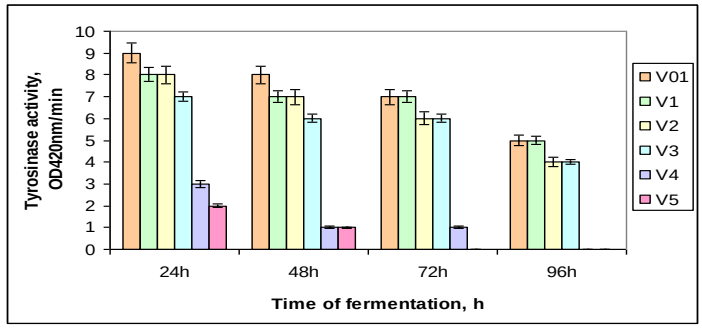

Fig.1. The activity of the tyrosinase during the alcoholic fermentation of the healthy grape must

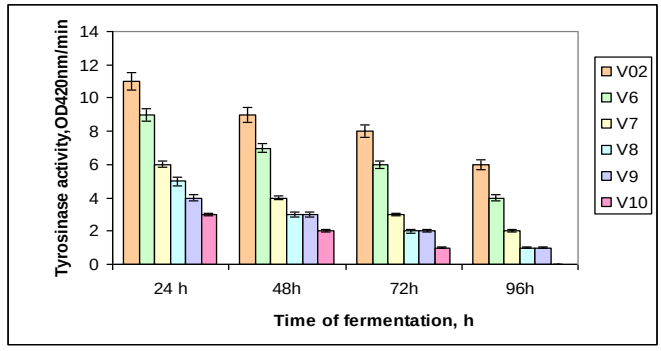

Fig. 2. The activity of the tyrosinase during the alcoholic fermentation of the mould-contaminated grape must

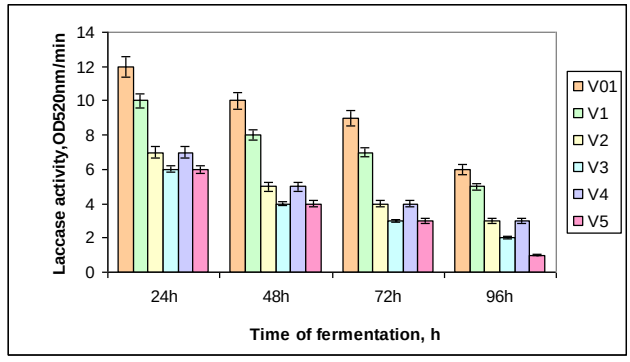

Fig.3. The activity of the laccase during the alcoholic fermentation of the healthy grape must

The tyrosinase activity was not detected in in the case of the sulphitated variants of the healthy and mouldy grape musts during the alcoholic fermentation (V_4, V_5, V_9, V_{10}). During the alcoholic fermentation of the healthy grape must and sulphitated with 150 mg/l SO_2 a decrease of the laccase activity by 50 - 83.3% and, respectively, that of the peroxidase activity by 45.2 - 48.6% (V_5) in comparison to the control sample (V_{01}) (figures 3 and 5) was observed.

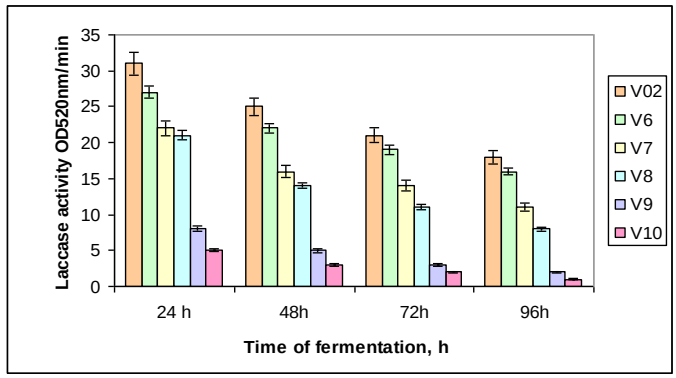

Fig. 4. The activity of the laccase during the alcoholic fermentation of the mouldy grape must

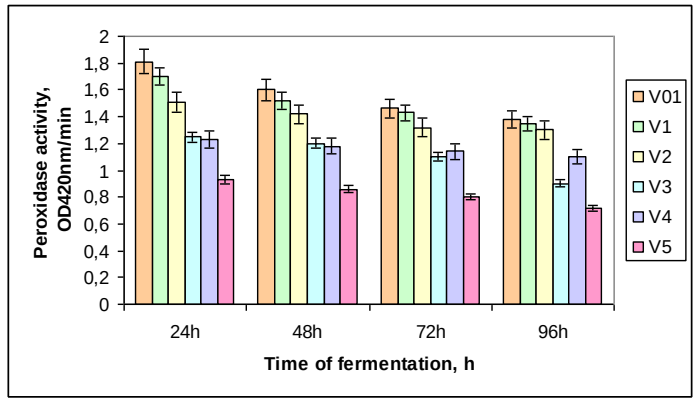

Fig.5 The activity of the peroxidase during the alcoholic fermentation of the healthy grape must

During the alcoholic fermentation of the mouldy grape must sulphitated with a dose of 150 mg/l SO_2 there was noticed a diminishing of the activity of the laccase by 83.8 - 94.4% and that of the peroxidase by 28.2 - 30.7% (V_{10}) in comparison to the control sample (V_{02}) (figures 4,6).

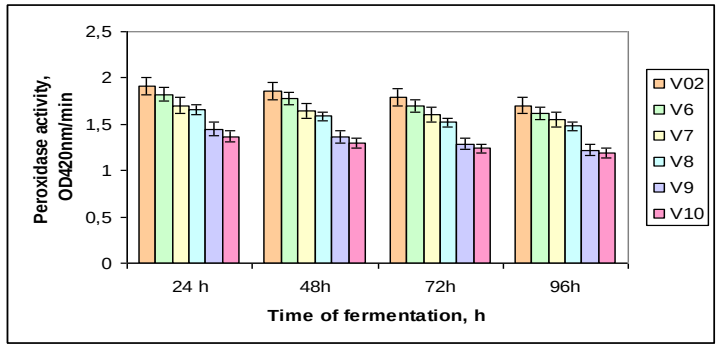

Fig. 6 The activity of the peroxidase during the alcoholic fermentation of the mouldy grape must

The oxidizing enzymatic activity of the young wine

The activity of the oxidative enzymes in the young wine, obtained by processing healthy grapes decresed by 25 - 75% for the laccase and, respectively, by 16 - 39% for the peroxidase activity in parallel with the increase of the tartaric acid doses. The activity of the oxidative enzymes in the young wine, obtained by processing of mouldy grapes, decreased by 33.3 - 66.6% for the laccase and, respectively, by 10.9 - 17.8% for the peroxidase with the increase of the tartaric acid doses.

CONCLUSIONS

1. The activity of the oxidative enzymes (tyrosinase, laccase and peroxidase) decreased during the alcoholic fermentation by 9.4 - 94.4% with the increasing of tartaric acid and SO_2 doses. In the young wine for the V_3 variant (when adding a dose of 1.5 g/l tartaric acid) the tyrosinase activity was completly inactivated.

2. In the young wine, obtained by processing of healthy and mouldy grapes, when doses of 100 mg/l SO_2 and 150 mg/l SO_2 were added, the tyrosinase and laccase activities were inactivated.

3. The activity of the peroxidase in the young wine decreased by 10.9 - 57% when different doses of tartaric acid and sulphur dioxide were added.

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STUDY OF PHENOLIC COMPOUNDS IN CABERNET SAUVIGNON RED WINES OBTAINED IN IAŞI VINEYARD BY SIX DIFFERENT MACERATION-FERMENTATION TECHNIQUES

STUDIUL COMPUŞILOR FENOLICI DIN VINURILE ROŞII CABERNET SAUVIGNON OBŢINUTE ÎN PODGORIA IAŞI PRIN DIFERITE TEHNICI DE MACERARE FERMENTARE

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Abstract. *Black grapes contain a significant quantity of phenolic compounds responsible for color, which are transmitted into wines during the maceration-fermentation processes. The present paper's objectives are to monitor the extraction level, concentration evolution and analysis of these phenolic compounds in conjuncture with six different maceration-fermentation procedures used – classical maceration, ROTO-tank maceration, cryomaceration, microwave maceration, thermomaceration and ultrasound maceration. By approaching modern analytical methods, the correlation of studied phenolic compounds concentration variation with the maceration-fermentation technique will be facilitated. In order to underline this correlation, grapes from Cabernet sauvignon variety were used, harvested at technological maturity from Iaşi-Copou vineyard; the grapes were processed into wine and the obtained products were physical and chemical analyzed for the different phenolic compounds responsible for color. The results reflect the extraction degrees for the analyzed compounds from the obtained wines. This study represents a continuance of a previous one, which aims to describe the various proficiency levels in grape phenolic extraction methods applied to black grapes.*

Key words: maceration, polyphenol, extraction

Rezumat. *Strugurii negri conţin o cantitate însemnată de compuşi fenolici responsabili de culoare, care se transferă în vinuri în timpul procesului de macerare-fermentare. Obiectivele prezentei lucrări sunt de a monitoriza gradele de extracţie, evoluţia concentraţiei şi analiza acestor compuşi fenolici în condiţiile a şase metode de macerare-fermentare utilizate – maceraţie clasică, maceraţie în tancuri ROTO, criomaceraţie, termomaceraţie şi maceraţie cu ultrasunete. Prin utilizarea metodelor moderne de analiză, se va realiza corelaţia dintre concentraţiile compuşilor fenolici analizaţi cu variantele tehnologice de macerare-fermentare utilizate. Pentru a evidenţia această corelaţie, au fost utilizaţi struguri din soiul Cabernet Sauvignon, culeşi la maturitate tehnologică din podgoria Iaşi-Copou; strugurii au fost vinificaţi şi vinurile astfel obţinute au fost analizate din punct de vedere a compuşilor fenolici responsabili de culoare. Rezultatele reflectă gradele de extracţie ale compuşilor fenolici din vinurile analizate.Acest studiu reprezintă o continuare au unui anterior, ce are ca scop să descrie diferitele randamente de extracţie ale variantelor tehnologice utilizate.*

Cuvinte cheie: macerare, polifenoli, extracţie

INTRODUCTION

Red wines contain relatively high quantities of phenolic compounds (anthocyans, tannins, flavones and phenolic acids), thus differing from white ones. When compared to white aromatic wines, whose odor and taste are defined by many terpenic compounds, the red ones have a varietal aroma that is given by different compounds (like pyrazines in the case of Cabernet sauvignon) (Cotea V.D., Sauciuc J.H., 1998).

In order to obtain high quality red wines, highly colored and with good organoleptic traits, an optimum extraction method must be applied. The extraction of colored compounds and aromas from grape skins, its main deposit, is done in the pre-fermentative and even in the fermentation stages, though maceration (Cotea V.D., 1985; Pomohaci N. et al., 2000).

The results presented in this paper highlight the technological conditions that favor the phenolic compounds extraction from black Cabernet sauvignon grapes, in order to optimize the winemaking techniques. In addition, this study is just a part of a bigger research project that aims to analyze the degrees in which phenolic compounds from different sorts of black grapes are extracted into wines by using different maceration-fermentation methods. The results obtained in the previous stages of the project have also been published.

MATERIAL AND METHOD

Research concerning the influence of different maceration-fermentation technological processes on the extraction degree for phenolic compounds from black grapes has been conducted in the Oenology Laboratory of the University of Agricultural Studies and Veterinary Medicine Iasi. Therefore, Cabernet sauvignon grape variety has been harvested from Copou vineyard, which was processed by using various maceration fermentation techniques: classical maceration, ROTO-tanks maceration, thermo-maceration, microwave maceration, ultrasound maceration and cryo-maceration.

The characteristics of each maceration-fermentation technique used are:

– Classical maceration: selected yeasts were added to the must, which was in contact with the skins for 3 days at 20°C; when the alcoholic concentration reached 9%, the must was separated from the skins and the fermentation process continued until all sugars were depleted (Cotea V.V., Cotea V.D., 2006);

– ROTO-tank maceration: selected yeasts were added to approximate 40 L of marc, which was maintained in rotating tanks for three days, and the phases separation was conducted when the alcoholic separation reached 9%; the fermentation process ended in glass containers until all sugars were depleted (Cotea V.D., 1985; Ribéreau-Gayon P., 2006).

– Microwave maceration: 5 kg marc underwent microwave irradiation for 10 minutes at 650 W power; the marc was then pressed; the fermentation process was conducted as stated above (Niculaua M. et al., 2008).

– Thermo-maceration: the marc was subjected to thermal treatment at 60-75 °C, for 30 minutes. A device for thermal treatment in must was used, with the following technical characteristics: tank capacity 20-40 kg, maximum temperature 80°C, maximum productivity 40 kg/hour, power 10 kW. The minimal threshold for marc thermal treatment is 50°C. After the thermal treatment, the fermentation process took place as in the above cases.

– Cryo-maceration: fresh grapes have been slowly frozen at -30°C and then a fast destemming and crushing process took place; selected yeasts were added to the warmed must at 12°C. The fermentation process took place as in the above cases.

– Ultrasound maceration: represents the easiest way to destroy the cellular wall and obtain the extract. Ultrasound cavitation builds powerful forces that mechanically destroy the cellular wall and improve the transfer. As the compound that must be solved is surrounded by an insoluble structure, in order to extract it, the cellular wall needs to be destroyed. Therefore, the destemmed grapes were subjected to this treatment for 15 minutes. This process is not widely used in black grape processing technology but it is successful in obtaining aromatic white wines.

Many technological operations used were common to all variants: crushing and total destemming, SO_2 treatment of the marc, (doses of 0,05 g/L) in order to insure antioxidant and antiseptic protection, proteolytic enzymes addition in order to increase fluid extraction, adding the same yeast to the must, *Saccahromyces oviformis* (S.C.D.V.V. Iasi collection) – characterized by a high alcoholigenous capacity, SO_2 resistance and non-foaming effect –, marc pressing using a low-capacity pneumatic press, alcoholic and malo-lactic fermentation (using endogenous lactic bacteria), oenological gelatin treatment (doses of 0,1 g/L), racking, filtration with a sterile filter and bottling (Ţârdea C., 2007).

The obtained wines were analyzed: density, total acidity, volatile acidity, free and total SO_2 content, reducing sugar content, alcoholic concentration, and non-reducing dry extract. In addition, the phenolic compounds were analysed: total anthocyans content, total polyphenolic index, Folin-Ciocâlteu index. An UV-VIS Analytik Jena Specord 200 spectrophotometer was used (Compendium of International Methods of Wine and Must Analysis, 2008).

RESULTS AND DISCUSSIONS

The main compositional characteristics of the obtained wines (samples 1-6) are shown in table 1, while the analyses results regarding polyphenolic compounds are stated in table 2.

From the first data series one can observe that if the same conditions were generated and same treatments applied to each of the samples, aside from the various maceration technique used, the physico-chemical parameters vary in a very small degree (alcohol concentration, SO_2 concentration, total acidity, remnant sugars and so on).

The obtained values (total polyphenolic index and anthocyans concentration) from all the samples state that the highest concentration was achieved in the cases of thermomaceration and ROTO-tank maceration. Cryomaceration and ultrasound maceration produced the lowest values. The Folin-Ciocalteu index values reflect that the microwave maceration technique is better in obtaining wines with a higher degree of extraction levels concerning reductive polyphenols, other than anthocyans.

Table 1

Physical-chemical characteristics of wines obtained from Cabernet sauvignon grape variety through different maceration-fermentation procedures

Sample	Alcohol (%)	T.A. (g/L)	V.A. (g/L)	Free SO_2 (mg/L)	Total SO_2 (mg/L)	Sugars (g/L)	Density (g/L)	T.D.E. (g/L)	N.R.E. (g/L)	pH
Classical maceration	13.6	6.11	0.61	28	71	4.12	0.9912	27.6	23.48	3.8
Thermo-maceration	13.6	6.41	0.57	31	75	2.35	0.9912	27.6	25.25	3.9
Ultrasound maceration	13.3	6.24	0.63	27	68	1.75	0.9904	24.8	23.05	3.8
Microwave maceration	13.34	6.06	0.57	33	79	1.81	0.9905	25	23.19	3.7
Cryo-maceration	13.4	7.32	0.61	29	89	3.15	0.9927	30.2	27.05	3.6
ROTO-tank maceration	13.4	6.15	0.51	32	65	3.45	0.9901	24.9	21.45	3.6

Table 2

Phenolic indexes, Folin-Ciocalteu indexes and total anthocyans quantities

Sample	Total phenolic index	Total phenolic quantity (mg/L galic acid)	Folin-Ciocalteu Index	Total anthocyans (mg/L)
Classical maceration	31,25	2073,65	37,67	358,11
Thermo-maceration	35,97	2386,85	44,17	454,85
Ultrasound maceration	27,08	1796,94	41,1	302,17
Microwave maceration	21,34	1416,05	52,22	251,73
Cryo-maceration	28,2	1871,26	35,65	344,19
ROTO-tank maceration	31,71	2104,17	39,11	372,64

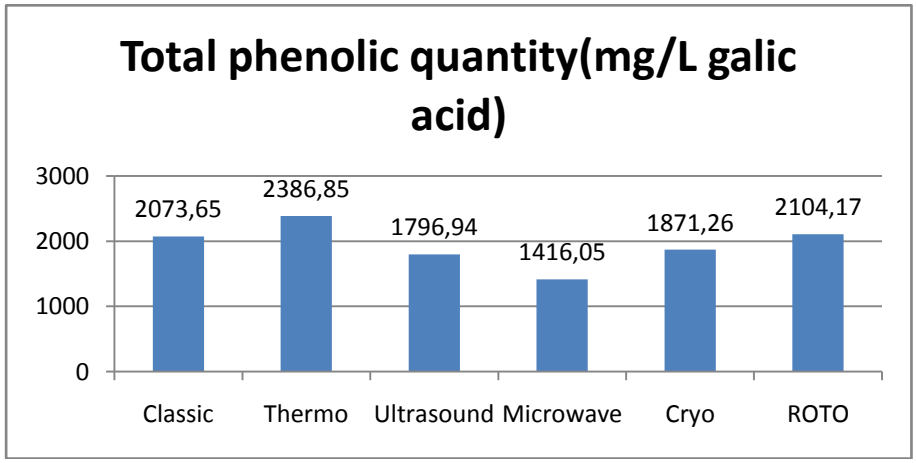

Fig. 1. Total phenolic quantity

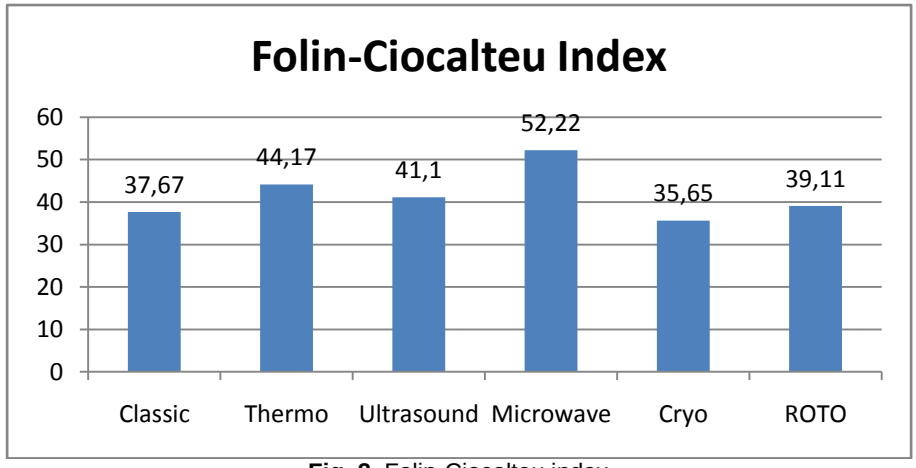

Fig. 2. Folin-Ciocalteu index

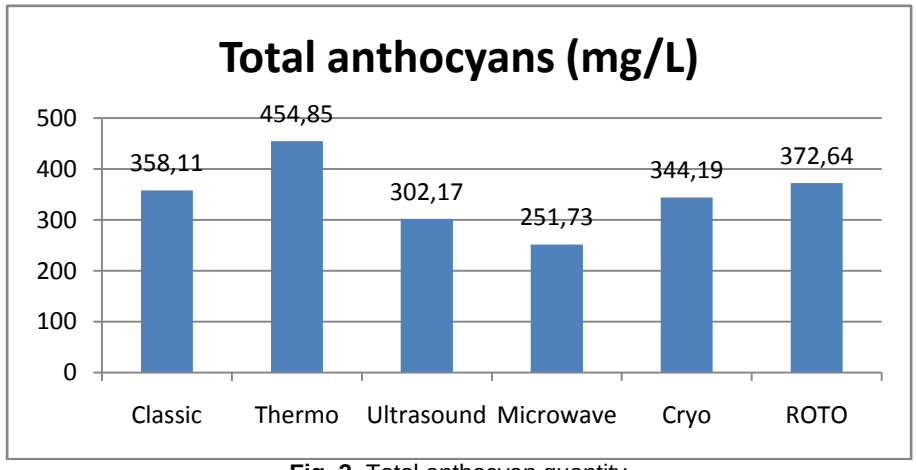

Fig. 3. Total anthocyan quantity

CONCLUSIONS

By analyzing the overall results, one can state that the highest values were obtained when the marc was subjected to a heating process (thermomaceration or microwave maceration). Although these maceration techniques are very proficient in extracting phenolic compounds, they are not recommended all the time because the obtained wine has inferior organoleptic traits (because of the Maillard reactions that take place, giving the wine a "boiled" taste); this procedure is strongly recommended in the case of inferior grapes.

The ROTO-tank maceration proved to be an adequate technique, producing wines with superior phenolic characteristics, thus this procedure is recommended most of the time.

The two other methods (cryo-maceration and ultrasound maceration) produced inferior values concerning polyphenolic concentrations, compared to the others, but nonetheless the wines obtained are considered superior products.

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THE INFLUENCE OF NEW YEAST STRAINS FROM THE INDIGENOUS FLORA OF IAŞI VINEYARD ON THE ALCOHOLIC FERMENTATION PROCESS

INFLUENŢA UNOR NOI SUŞE DE LEVURI IZOLATE DIN FLORA INDIGENĂ A PODGORIEI IAŞI ASUPRA PROCESULUI DE FERMENTAŢIE ALCOOLICĂ

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Abstract. *The variability, the degree of adaptation as well as the wide spread of yeasts in different biotypes enable the isolation of new yeast strains with properties that can influence the fermentative processes, for this reason, the activity of isolating and selecting yeasts strains from the vintage microbiota of Iaşi vineyard imposed as a necessity in the research and production activity. With the purpose of being used in the current biotechnological practice, the Saccharomyces ellipsoideus F1 (200), Saccharomyces ellipsoideus S3(150) and Saccharomyces ellipsoideus C4(100) yeast strains, isolated from the indigenous flora, were tested at industrial level. The monitoring of the alcoholic fermentation involved the registration of the commencement time and the duration of the fermentation stages, as well as the dynamical evolution of the temperature, of the sugar concentration, the alcohol content and the total acidity. The new yeast strains were assessed as valuable biological material, recommendable in vine-growing practice, as they contribute to obtaining high quality wines that reflect the personality and potential of the varieties specific to Iaşi vineyard.*

Key words: yeasts strains, the alcoholic fermentation

Rezumat. *Variabilitatea, gradul de adaptare precum şi larga răspândire a levurilor în diferite biotopuri permit izolarea de noi suşe de levuri cu proprietăţi ce pot influenţa procesele fermentative. Din acest considerent activitatea de izolare şi selecţie a levurilor din microbiota vinicolă a podgoriei Iaşi s-a impus ca o necesitate în activitatea de cercetare şi producţie. În vederea utilizării în practica biotehnologică curentă, suşele Saccharomyces ellipsoideus F1(200), Saccharomyces ellipsoideus S3(150) şi Saccharomyces ellipsoideus C4(100) izolate din flora indigenă au fost testate la nivel industrial. Monitorizarea fermentaţiei alcoolice a presupus înregistrarea momentului declanşării şi durata etapelor de fermentare, precum şi evoluţia în dinamică a temperaturii, a concentraţiei în zaharuri, conţinutul în alcool şi aciditatea totală. Noile suşe de levuri testate au fost apreciate ca fiind un material biologic valoros, recomandabil în practica vinicolă, acestea contribuind la obţinerea unor vinuri de calitate ce reflectă personalitatea şi potenţialul soiurilor specifice podgoriei Iaşi.*

Cuvinte cheie: suşe de levuri, fermentatie alcoolică

INTRODUCTION

In the technology of wines production, the yeast used in the fermentation process contribute to the formation or, on the contrary, to the decrease of the wine

quality and structure characteristics. At present, because of the necessity to increase the wines quality, the selection of some yeasts that should insure, through a controlled fermentation, the obtaining of wines typical to the vine-growing region, with a more marked character of naturalness, unique as variety and personality (A. Popa et al., 2006).

The alcoholic fermentation of the mash is a complex process to which a great number of types and species of yeasts contribute (Christine Le Jeaune, et. al., 2006). The possible structure or organoleptic faults because of the fermentation in improper conditions is very difficult to correct, if ever, during the subsequent stages of evolution, negatively influencing the quality and the stability of the final wine (C.B. Câmpeanu, 2003).

MATERIAL AND METHOD

In order to optimize the alcoholic fermentation process by using some of yeast strains selected from the indigenous flora, the *Saccharomyces ellipsoideus* F1(200), *Saccharomyces ellipsoideus* S3(150) and *Saccharomyces ellipsoideus* C4(100) yeast strains have been tested at an industrial level.

The mash fermentation was made in 1000 litres tanks and the following basic conditions have been provided so that the alcoholic fermentation should take place properly: the used mash was cleared, clarified and sulphated in order to eliminate the spontaneous microbiota from the mash; the selected yeasts have been introduced in tanks in quantities that should guarantee from the beginning the optimal density of yeast cells/mL, necessary for the process of fermentation and the fermentation took place at 17 - 18°C.

When monitoring the fermentation process, there were registered the moment of starting and the duration (hours/days) of the fermentation stages, the tumultuous fermentation, the calm fermentation as well as in the dynamics of the main parameters: temperature (t°C), sugar concentration (g/L), alcohol content (% vol.) and total acidity (g/L $C_4H_6O_6$). At the end of the process, the conditioned wines were analysed from a physicochemical and organoleptic point of view

RESULTS AND DISCUSSIONS

The *Saccharomyces ellipsoideus* F1(200), *Saccharomyces ellipsoideus* S3(150) and *Saccharomyces ellipsoideus* C4(100) yeast strains, considered to be successful in the production of quality white wines (Ancuţa Vasile, 2009), have been verified on the musts obtained from the varieties Fetească albă, Sauvignon blanc and Chardonnay whose physical - chemical characteristics are presented in table 1.

Table 1

The physical-chemical characteristics of the musts used for experiments

The musts used	Sugars, g/L	Total acidity, $C_4H_6O_6$ g/L.	pH
Must of grape variety Fetească albă	197	7,7	3,38
Must of grape variety Sauvignon blanc	203	8,7	3,36
Must of grape variety Chardonnay	211	8,5	3,36

We have to mention that for every must lot, a witness was provided for which we used as fermentation agent a commercial compound usually used in the technology of white wine production.

The data obtained when monitoring the fermentation processes carried out with the three yeast strains are graphically presented in figures 1, 2 and 3.

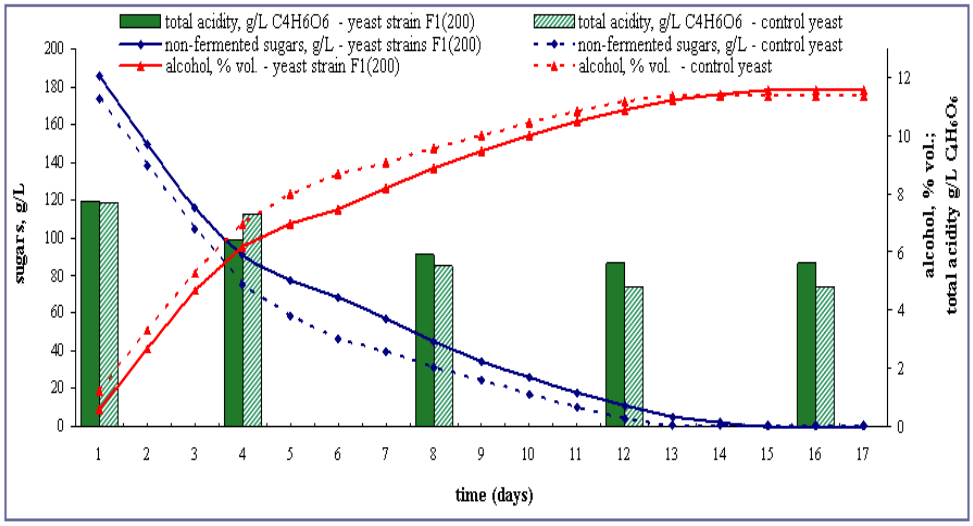

Fig 1. The dynamic of the physical-chemical parameters during the alcoholic fermentation process made by the *Saccharomyces ellipsoideus* F1(200) yeast strain in comparison with the control yeast.

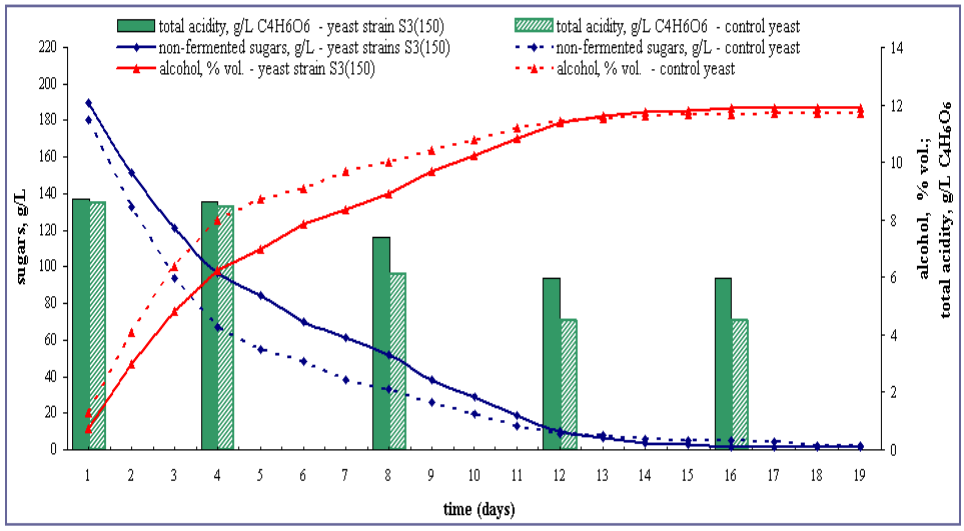

Fig 2. The dynamic of the physical-chemical parameters during the alcoholic fermentation process made by the Saccharomyces ellipsoideus S3(150) yeast strain in comparison with the control yeast.

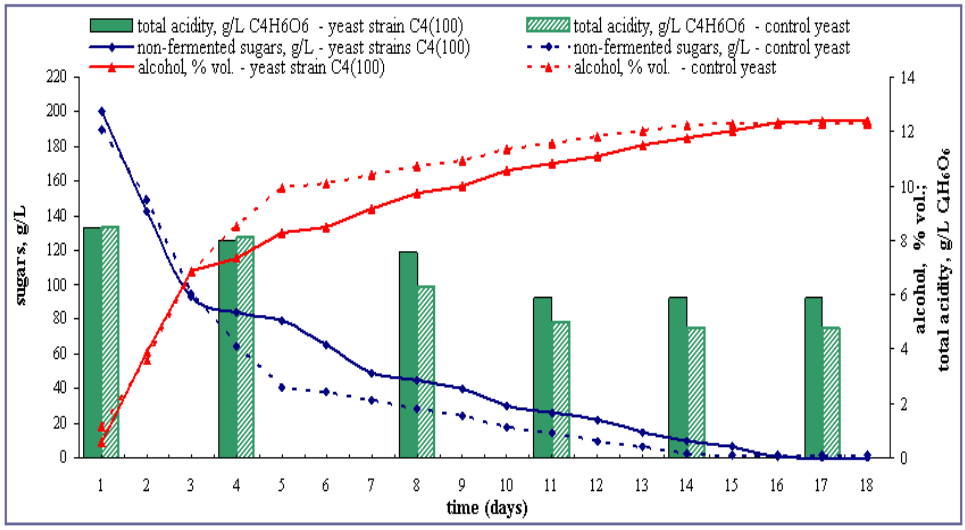

Fig 3. The dynamic of the physical-chemical parameters during the alcoholic fermentation process made by the *Saccharomyces ellipsoideus* C4(100) yeast strain in comparison with the control yeast.

After testing the oenological value at an industrial level of the new selected yeast strains *Saccharomyces ellipsoideus* F1(200), *Saccharomyces ellipsoideus* S3(150), *Saccharomyces ellipsoideus* C4(100), we established that they may be appreciated as biologic material useful for the wine-making practice in the production of quality dry white wines technology.

The data obtained when monitoring of the fermentation processes point out the following aspects:

- the yeast strains *Saccharomyces ellipsoideus* F1(200) and *Saccharomyces ellipsoideus* S3(150) fitted in category of yeasts with a minimal degree of foaming in the first 24 hours from the beginning of the pre-fermentation stage (after this interval, the fermentation advances without foaming) and the yeast strain C4 (200) fitted in the category of non-foaming yeasts. From the perspective of this characteristic, the tested yeast strains are valuable because they offer the possibility to use the fermentation space in full capacity.
- the new selected yeast strains started the alcoholic fermentation after 18-20 hours from the introduction of the leavens in the must. In this stage the musts grew turbid, and at the microscope we can notice a great number of yeasts in an intense process of burgeoning, and the must temperature grew slowly with approximately 1°C. The relative small duration of the pre-fermentation period is an advantage of the alcoholic fermentation process, always being preferred the yeast strains that show this characteristic. In dynamic, the evolution of the alcoholic concentration curve emphasizes a more intense activity of sugar metabolisation in the tanks considered as witness, where a commercial compound was used as

a fermentation agent. For example, after 48 hours, the yeast strain *Saccharomyces ellipsoideus* S3(150) accomplished 3,1 % vol. alcohol and the witness yeasts 4,1 % vol. alcohol (figure 2);

- the tumultuous fermentation stage started after 48 hours and continued for 8-10 days, when the must temperature increased gradually, because of the increase of the metabolic activity concomitantly with the increase of the yeasts number. In this stage, the temperature was verified in the fermentation devices twice a day, intervening to maintain it between 16 - 18°C. In the case of the three tested yeast strains, we noticed an average metabolisation of sugars, which led to eventually obtaining some wines with special sensory characteristics;
- in the tanks with the new selected yeast strains, the clarifying process started quickly at the end of the tumultuous stage, obtaining after 10 days relatively clear or lightly opalescent wines and the yeast deposit formed after the first racking was compact, hardly removable.

At the end of fermentation, dry wines were obtained, with an alcoholic strength between 11,6 and 12,4 % vol. alcohol (table 2), depending on the initial concentration of sugars from the substratum, which proves that the new tested yeast strains are alcoligene, being capable to metabolise almost completely the sugars from the fermentation medium.

Another important oenological characteristic is the capacity of the tested yeast strains to ferment the musts sulphated with different concentrations of sulphur dioxide, of even 200 mg/L SO_2 (Vasile Ancuţa et al, 2009).

As a result of determining the main structure characteristics, it follows that the wines made by the new selected yeast strains from the indigenous flora of the Iassy vine-growing region show balanced concentration of the physicochemical characteristics (table 2).

Table 2

The main composition characteristics of the wines obtained by using new yeast strain testing in comparison with the control yeast

Physical parameters - chemical and organoleptic	Fetească albă		Sauvignon blanc		Chardonnay	
	control yeast	F1(200)	control yeast	S3(150)	control yeast	C4(100)
Alcohol, % vol.	11,0	11,6	11,7	11,9	12,3	12,4
Non-fermented sugars, g/L	3,4	0,2	1,7	0,9	1,8	-
Glycerol, g/L	5,1	7,4	5,0	7,4	5,1	7,3
Non-reducer extract, g/L	17,2	21, 4	17,8	22, 4	17,8	22, 6
Total acidity, g/L $C_4H_6O_6$	4,8	5,6	4,8	5,95	4,5	5,9
Volatile acidity, g/L CH_3COOH	0,71	0,28	0,8	0,20	0,78	0,29
Tartaric acid, g/L	2,0	2,1	2,1	2,1	2,1	2,1
Citric acid, g/L	0,31	0,34	0,30	0,31	0,34	0,38
Malic acid, g/L	5,8	6,0	6,0	5,5	5,9	6,1
Polyphenols, g/L	0,41	0,43	0,40	0,42	0,40	0,44
Organoleptic assessment, 0 - 20	17,8	19,8	17,9	19,7	18,0	20,0

The tested yeast strains are considered valuable for obtaining quality dry white wines, these ones satisfy more conditions, which are: superior alcohol level, low volatile acidity, superior sugars-alcohol efficiency etc.

The organoleptic appreciation of the analysed wines emphasized their very good quality, materialized in marks from 19.7 to 20. All the wines presented a discreet, fine, specific flavour, being fruitfully well harmonized with the other components.

All these data offer a complete image of the oenologic value of the new yeast strains, as well as their practical importance in the dry white wines production technology.

Taking into account the results, we recommend the carrying on of the research in order to go deeply into the aspects concerning the importance of the yeast strains origin, into defining the characteristics regarding the wines authenticity and specificity.

CONCLUSIONS

1. The verification at the industrial level, because of the fermentation and technological characteristics, allowed the appreciation of the new selected yeasts strains *Saccharomyces ellipsoideus* F1(200), *Saccharomyces ellipsoideus* S3(150) and *Saccharomyces ellipsoideus* C4(100) as valuable biologic material, recommendable for the vine-growing practice.

2. Using the new selected yeasts strains in the alcoholic fermentation process al the industrial level has the following advantages: increased efficiency of the process by using at full capacity the fermentation spaces, total transformation of sugars, rapid conditioning (clearing, separation from the deposit) and increasing the specificity degree of the Iassy vine-growing region wines, contributing to their fame on the domestic and external market.

3. The oenologic value of the new selected yeasts strains allows their recommendation in the white dry wines production technology in Iassy vine-growing region, these ones contributing to obtaining quality wines which reflect the personality and the potentiality of the varieties specific to the region.

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STUDIES CONCERNING THE VISCOSITY COEFFICIENT OF SOME VEGETABLE OILS OBTAINED FROM DIFFERENT WALNUT BIOTYPES AND GRAPE SEEDS

STUDII PRIVIND COEFICIENTUL DE VÂSCOZITATE AL UNOR ULEIURI VEGETALE OBTINUTE DIN DIFERITE BIOTIPURI DE NUCI ŞI SEMINŢE DE STRUGURI

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Abstract. *This paper analyses the viscosity coefficient variation of vegetable oils obtained from grape seeds and some walnuts biotypes coming from different geographic regions of Moldavia (Romania). This study proposes a mathematical model, an algorithm for calculating the variation of the viscosity coefficient with the temperature used for determination. Measuring the viscosity coefficient is the first step in a larger study, which considers the investigation of various properties of these horticultural oils, such as: the degree of turbidity, the degree of siccativity, the forces of molecular cohesion. Finally these parameters will be used to achieve a classification system in terms of quality of the grape seed oil and walnut oil.*

Key words*:* viscosity, grapeseed oil, walnut oil

Rezumat. *În lucrarea de faţă s-a determinat modul de variaţie a coeficientului de vâscozitate la uleiurile vegetale obţinute din seminţe de struguri şi din nucă aparţinînd unor biotipuri provenite din diferite regiuni geografice din zona Moldovei (România). Studiul de faţă propune un model matematic, un algoritm de calcul al variaţiei coeficientului de vâscozitate cu temperatura la care acesta a fost determinat. Măsurarea coeficientului de vâscozitate este prima etapă dintr-un studiu mai larg ce are în vedere investigarea diverselor proprietăţi ale acestor uleiuri horticole, precum: gradul de turbiditate, gradul de sicativitate, forţele de coeziune moleculară. În final aceşti parametri vor fi utilizaţi pentru realizarea unui sistem de clasificare din punct de vedere calitativ a uleiurilor din seminţe de struguri şi de nucă.*

Cuvinte cheie*:* vâscozitate, ulei din seminţe de struguri, ulei de nucă

INTRODUCTION

The edible vegetable oils are characterized by physical and chemical properties that give their favorable quality note. Among these properties the viscosity coefficient is a very important fact that may have a manifestation at macrofizic level. By its nature, the viscosity coefficient provides information about molecular structure and the type of cohesion forces between atoms / molecules of the analyte (Hristov A., 1990). Also, the coefficient of viscosity is an

important indicator of the stability of the test material, indicating whether or not it retains its optimal proprieties in time, to be consumed.

Any degradation of the chemical properties and structure will be directly reflected in the coefficient of viscosity, also. The solid suspensions (inclusions) and/or other foreign substances which the oils may be blended with, will lead directly to change the coefficient η (Manahan Stanley E., 2001) so that by its determination, respectivley finding of any value far from an optimal value we may conclude if or not the oil fits to certain rules.

Of the frequent changes occurring in the chemical structure of the edible oils we mention oxidation and microparticle matter load. Any of the substance and its quality, temperature is vitally important physical parameter affecting the value of the coefficient of viscosity, so that a temperature drop is correlated with an increase in the coefficient of viscosity and vice versa.

In the present study aimed to identify a mathematical algorithm of variation value of the parameter η according to the temperature measurement that was made.

Non-polar molecular structure gives oil characteristics (Luca E., 1993) the interest being that they do not wet the walls of the vessels where are being stored. This shows that between non-polar ends of the constituent molecules and the main glass wall surface interaction forces due to friction between the peripheral layer of liquid and the inner surface of the vessel wall extreme (Luca E., 1993).

The viscosity of the fatty acids and the derived triglycerides is determined by the structure of the fatty acid composition, specially of the composition, length of the chain and the degree of unsaturation.

Viscosity increases proportional to molecular weight of the fatty acids and decreases with the increasing of the unsaturation degree of the same length of chain and it is therefore a linear function for the increasing of the iodine value.

MATERIAL AND METHOD

The oils we studied were obtained from a total of 10 samples of grape seed and walnut, from different localities of E and NE Romania, as follows: Aligote, Iassy; Fetească regală, Iassy; Mustoasă de Măderat, Iassy; Mioriţa, Odobeşti; Merlot, Iassy; Fetească albă, Iassy; Băbească gri, Odobeşti (for grape seeds) and Darabani, Botoţani; Ţibăneşti, Iassy; Vânători, Neamţ (for walnuts).

The grape seed oil was obtained by extraction, by immersing the crushed seeds into the solvent, followed by recovery of the solvent and obtaining of the crude oil. The walnut oil was obtained by pressing, using a mini lab press.

The dinamic viscosity was determined by the laminar flow of fluids using an Ostwald viscosimeter. Experimental data needed to determine the coefficient of viscosity are: time of flowing through the capillary, the temperature of the sample and the density of each oil sample.

To determine the coefficient of viscosity of the control (sunflower oil) we used the Stokes method for each temperature at which were determined the parameters by Ostwald method.

The viscosity coefficient determined by Stokes method is used as control for calculating the viscosity (η) by Ostwald method – where may be used only small quantities of oil.

RESULTS AND DISCUSSIONS

After we effectuated the determinations we obtained the curve of dependency of viscosity coefficient by temperature. We may see a linear dependence of the coefficient η in the same time with the increasing of the temperature (table 1). The deviations from linearity are most likely errors caused accidentally.

Table 1

The coefficient of viscosity of the sunflower oil (control), grapeseed oil (Băbească gri, Odobeşti) and walnut oil (Vânători, Neamţ)

T(°C)	η (T) sunflowwer oil (control)	η(T) grape seed oil	η(T) walnut oil
25	77,1	38,98652	61,8132
30	75,85	38,82564	58,29039
35	69,21	38,0278	56,87887
40	67,92	35,12709	58,15809
45	61,79	33,54313	52,56525
50	54,65	34,02568	47,17029
55	53,86	33,8945	47,62364
60	49,65	28,40704	45,37075

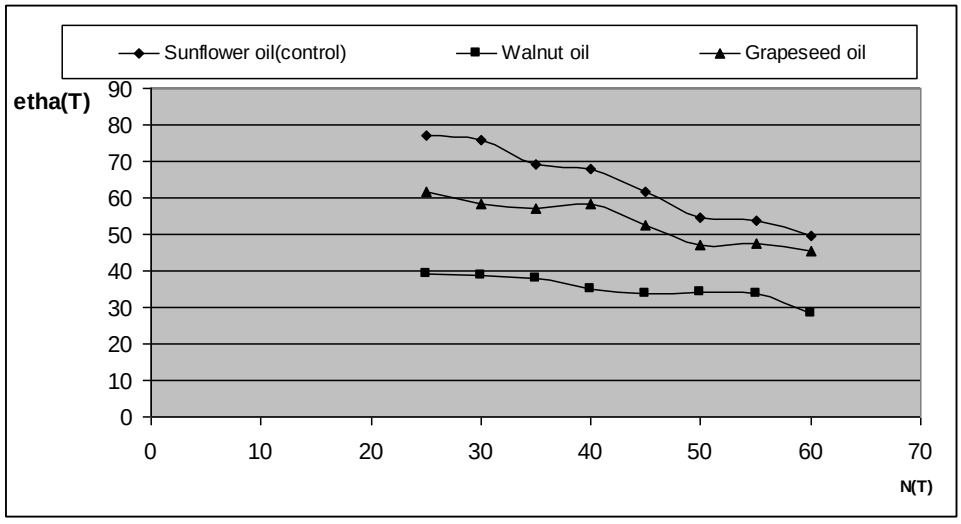

Fig. 1. The variation of the viscosity coefficient with temperature

Linear variation of coefficient η depending on temperature can be modeled by knowing a specific constant of the analysed fluid (table 2). With this constant we may easily model the punctual changes of the viscosity.

The mathematical model proposed is applicable in this case also for the used temperature range (fig. 1).

Due to this type of variation, for each of the three determinations (sunflower oil, grape seed oil, walnut oil), we could implement the following algorithm:

$$\eta=\eta_0 - N \times \upsilon,$$

where :

η: coefficient of viscosity;

η_0: initial value of the coefficient of viscosity;

N: variation index of the temperature parameter;

υ: linearity coefficient

Using the linear equation we could show the changes in viscosity for the entire spectre of temperatures in the range considered (fig. 2).

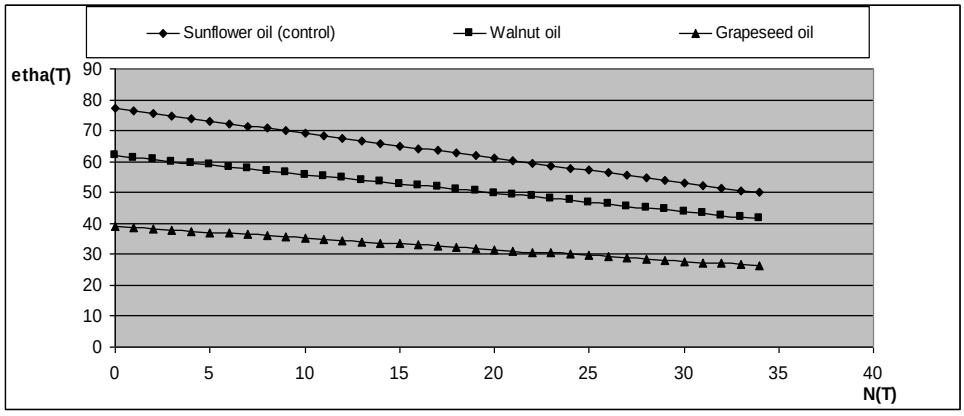

Fig. 2. The liniar variation of viscosity coefficient with temperature

Table 2

Variation with temperature of the viscosity coefficient determined punctual, depending on the sunflower oil (control)

The index of the temperature variation (N)	The sunflower oil (control) coefficient of viscosity (daP)	The walnut oil (control) coefficient of viscosity (daP)	The grape seed oil (control) coefficient of viscosity (daP)
0	77,1	61,8132	38,98652
1	76,3	61,2132	38,61152
2	75,5	60,6132	38,23652
3	74,7	60,0132	37,86152
4	73,9	59,4132	37,48652
5	73,1	58,8132	37,11152
6	72,3	58,2132	36,73652
7	71,5	57,6132	36,36152
8	70,7	57,0132	35,98652
9	69,9	56,4132	35,61152
10	69,1	55,8132	35,23652
11	68,3	55,2132	34,86152
12	67,5	54,6132	34,48652

13	66,7	54,0132	34,11152
14	65,9	53,4132	33,73652
15	65,1	52,8132	33,36152
16	64,3	52,2132	32,98652
17	63,5	51,6132	32,61152
18	62,7	51,0132	32,23652
19	61,9	50,4132	31,86152
20	61,1	49,8132	31,48652
21	60,3	49,2132	31,11152
22	59,5	48,6132	30,73652
23	58,7	48,0132	30,36152
24	57,9	47,4132	29,98652
25	57,1	46,8132	29,61152
26	56,3	46,2132	29,23652
27	55,5	45,6132	28,86152
28	54,7	45,0132	28,48652
29	53,9	44,4132	28,11152
30	53,1	43,8132	27,73652
31	52,3	43,2132	27,36152
32	51,5	42,6132	26,98652
33	50,7	42,0132	26,61152
34	49,9	41,4132	26,23652

For the oils obtained from the following sources: Aligote, Iassy; Fetească regală, Iassy; Mustoasă de Măderat, Iassy; Mioriţa, Odobeşti; Merlot, Iassy; Fetească albă, Iassy; (for the grape seeds) and Darabani, Botoşani; Ţibăneşti, Iassy (for walnuts) we determined the viscosity coefficient at two points of temperature in the range studied: 25°C, respectively 55°C (table 3)**.**

Tabel 3

Variation with temperature of the viscosity coefficient determined for 25°C, respectively 55°C

Oil sample- sources	η(T)		N(T)
	η(25°C)	η(55°C)	
Darabani, Bt	75,29266	70,38991	0,162602
Ţibăneşti, Is	76,59937	71,15116	0,156
Aligote, Is	79,54025	75,55388	0,121615
Fetească regală, Is	71,52895	66,31569	0,153
Mustoasă de Măderat, Is	89,65773	69,15627	0,576667
Mioriţa, Odobeşti	68,01586	59,44067	0,24667
Merlot, Is	98,05117	67,98822	0,88
Fetească albă, Is	85,39492	67,12439	0,5191

The tangent determined from the slope that represent the variation of viscosity coefficient with temperature is the coefficient who provides information about dependence of the physical property in each point of temperature according to linear equation (fig. 3).

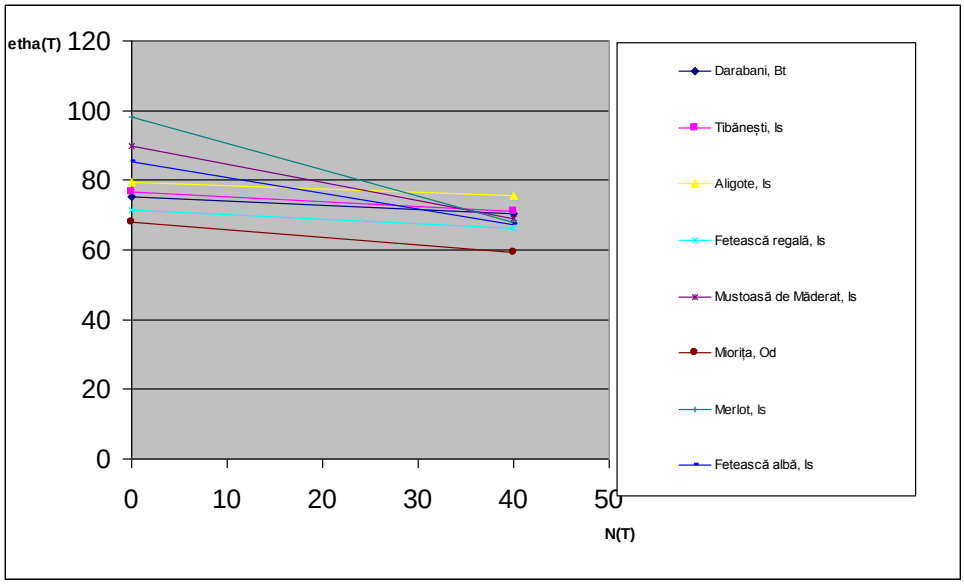

Fig. 3. The variation of the viscosity coefficient with temperature determined point by point using the linear equation for 25-60ºC temperature interval.

CONCLUSIONS

1. The mathematical modeling of the variation of the viscosity coefficient helps to comparing the experimental results with the modeled point results and therefore help for a good correlation of data.

2. For the temperature range between 25-60°C, the variation of the viscosity coefficient for the analyzed oils decreases linearly in the same time with the increasing of temperature.

3. The constant determined from the slope of the graphic implies a variation in the percentage of the fatty acids composition in the analysed oils.

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EXPERIMENTAL RESEARCH ON THE DETERMINATION OF APPLES IMPACT FORCE, ON A HARD SURFACE

CERCETĂRI EXPERIMENTALE PRIVIN DETERMINAREA FORŢEI DE IMPACT A MERELOR PE O SUPRAFAŢĂ DURĂ

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Abstract. *The researches made have highlighted the determination of mode variation of impact forces appeared in the case of apples collision on a hard steel surface. Test results in'Golden Delicious' and 'Jonathan' apples, showed that at the impact, plastic properties of fruit, conferred by their viscoelastic behavior, do not have time to manifest, because of extremely short time of impact occurance, and the fruit behave as a rigid body. The impact energy which generate pulp deformation is not dissipated in the pulp's mass fruit and the result is that the pulp is crushed in the contact point. Analyzing the graphics, impact force - time, there was a rapid growth of the force within moments of impact, in most cases in 0.001s reaching the maximum value. The results obtained have allowed verification of theoretical calculating formulas of the parameters, which characterizing the impact, with the practical results of experiments, to determine by analytical method, the impact parameters.*

Key words: apples; impact force; hard surface

Rezumat. *Cercetarile efectuate au urmărit determinarea modului de variaţie a forţelor de impact apărute in cazul ciocnirii merelor de o suprafaţă dură din oţel. Rezultatele experienţelor efectuate la soiurile 'Golden Delicious' şi 'Jonathan' au aratat că la impact, proprietăţile plastice ale fructului, conferite de comportarea vâscoelastică a acestora, nu au timp să se manifeste, datorită timpului extrem de scurt în care se produce impactul, fructul comportându-se ca un corp rigid. Energia de impact care generează deformarea pulpei nu se disipează în masa pulpei fructului şi pulpa se striveşte în punctul de contact. Din analiza graficelor forţa de ciocnire – timp, s-a observat o creştere rapidă a forţei în primele momente ale impactului, în majoritatea cazurilor după 0,001s atingându-se valoarea maximă. Rezultatele obţinute au permis verificarea formulelor de calcul teoretice a parametrilor care caracterizează impactul, cu rezultatele practice ale experimentelor, în scopul determinării pe cale analitică a parametrilor de impact.*

Cuvinte cheie: mere; forţă de impact; suprafaţă dură

INTRODUCTION

The impact is a dynamic application, characterized by a high speed implementation of the load, an application of the load, in a very short time (usually impact time being milliseconds), when there are produced and sent "waves " of tension and strain which are acting on the structure of the fruit, "waves" that are atenuated as the removal of impact location.

Through collision, takes place a rapid conversion of kinetic energy of the bodies, which are colliding, partly in potential energy of deformation and, also in absorbed energy for remanent strain, heating and transmission of waves.

One current theory based either on the collision of elastic bodies theory of Hertz or various impacts of viscoelastic bodies, is developed and applied, also in the case of fruit, by analogy, from case to case, depending on specific problem. This is underlined by mechanical properties of bodies which collide.

Mechanical injuries of fruit (Căsăndroiu T., Segărceanu M., Oprița N., 1993) are influenced by maturity stage of fruit, variety, sorting technology - packing and handling , the complexity of installation, its working arrangements and by the type machines that are part of installation.

Key assumptions in the theory of collisions developed by Hertz, for vegetal nature material, particularly fruits, have been adapted by Kosma and Cuningam (Mohsenin N., 1986) and consists of: materials in contact are uniform; static application is applied; Hooke's law is respected; rays surfaces in contact are much greater than the radius in which take place the contact between surfaces; the contact surface is uniform so that tangential forces can be eliminate

These sizes can be calculated, theoretically, using the following relationships:

$$p_{max} = 0{,}2515 \cdot \left[\frac{\pi^4 \cdot m \cdot V_i^2}{A^4 \cdot R^3} \right]^{\frac{1}{5}} \quad (1) \qquad F_{max} = \frac{2}{3} \cdot \pi \cdot a^2 \cdot p_{max} \quad (2)$$

$$\delta = \left[\frac{15}{16} \cdot \frac{A \cdot m \cdot V_i^2}{\sqrt{R}} \right]^{\frac{2}{5}} \quad (3) \qquad t = 4{,}53 \cdot \left[\frac{A \cdot m}{\pi \cdot \sqrt{R \cdot V_i}} \right]^{\frac{2}{5}} \quad (4)$$

$$\text{in which: } A = \frac{1 - \mu^2}{E} \quad (5)$$

and, the significance of variables used is: **m** - fruit mass [kg], **V** - velocity at early collision [m/s], **R** - ray of sphere surface of the fruit at the point of collision [m], **μ** - Poisson coefficient of transverse contraction of the fruit (for apple μ = 0.33); **E** - modulus of elasticity in compression of the fruit [N/m^2] (for apple is E = 2.86 x 106 N/m^2).

As is shown in (Chen P., Sun Z. 1994; Mc Glone V.A., Jordan R.B., Schaare P.N., 1997), the above relations can be applied successfully in the case of collision fruit, particularly apples, among themselves and / or with hard flat surfaces, if collisions are not strong, when it can approximate that collisions are elastics.

MATERIAL AND METHOD

Apples used in experiments were kept for six months in cells freezer, at 2 ÷ 6^0C temperature, being removed with 24 hours before the experiments. Experimental plots were covered by 24 'Golden Delicious' and 'Jonathan' varietes fruits, noted starting from G1 ÷ G24, respectivelly J1- J24. The height of fruit fall was 100, 150, 200, 250, 300 and 400 mm, corresponding to the speeds at early collision of 1.40, 1.7, 1.98, 2.21, 2.24 and 2.80 m/s.

All fruits used in the experiments were analyzed as follows: a visual inspection; the weight of each fruit was determined with an electronic balance-type KERN 440-33; fruit radius was measured in the impact zone with electronic gauge; before and after the collision was scanned fruit surface in the collision area, and also were scanned the tissues bruises that occurred following the collision, after keeping fruit for five days at a temperature of 20^0C.

To determine the impact force of fruit with a hard surface, it was used the assembly shown schematically in fig. 1 (M Vintila, 2002). The device includes a holder provided with an adjustment through sliding on vertical post, a distance of a releasing fruit; catch and release system of fruit, steel base plate, with a mass of 5 kg aproximately; HOTTINGER - C9B type with force sensor, resistive (Fmax = 50 kN); DC measuring amplifier type HOTTINGER - ME10 (± 10V voltage range and the frequency of measured signal reception is10 kHz). All this system is controlled by an desk- top computer, that provides data acquisition and storage.

The device used (fig. 2) is equipped with an attachment and detachment system of the fruit, allowing the orientation of the fruit after clipping the center of mass, catching this between the two rods with rounded ends that go into the stem and calcium cavity, allowing rotation of the fruit until after the center of mass orientation.

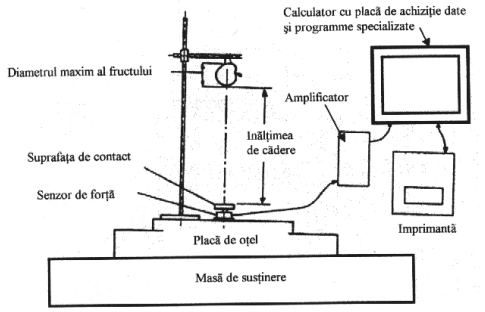

Fig. 1. The Scheme of Measuring Device

Fig. 2. The Assembly of Basis Plate

RESULTS AND DISCUSSIONS

Using this assembly, diagrams were obtained in force coordinates, time for the experimental variants which was considered. Thus, in Golden Delicious variety were obtained graphs of the same shape, for drop height (H) of 100, 150, 200 mm, in fig. 3, and drop height of 300 and 400 mm., carring out a stability of a curve shape, as shown in fig. 4.

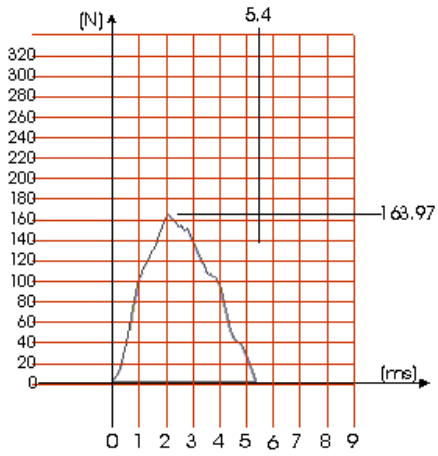

Fig. 3. G11 Variance (H=150 mm)

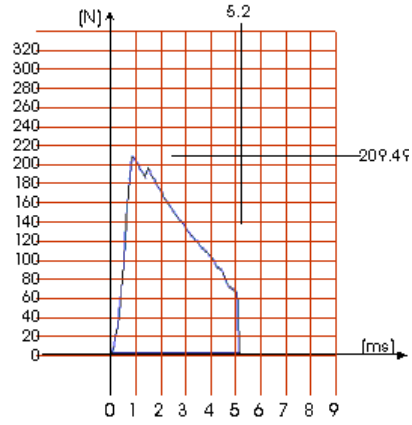

Fig. 4. G19 Variance (H=300 mm)

The variety Jonathan, curve shape becomes stable from drop height of 200 mm (fig. 5 and fig. 6).

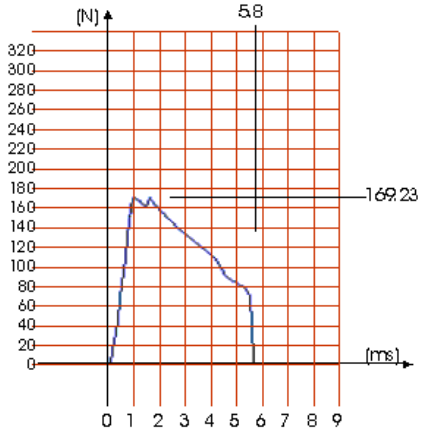

Fig. 5. J9 Variance (H=200 mm)

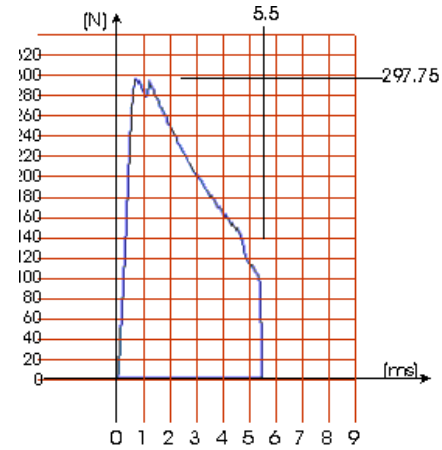

Fig. 6. J23 Variance (H=400 mm)

For all considered variants, were made graphs which illustrate the variation mode of maximum impact force and impact time, according to the initial acceleration of fruit at considered drop height, being also established the equation of regression functions (fig. 7 and fig. 8).

Measured forces have close values of the calculated forces, fits within the limits of 2%, which allows us to say that the formulas used in calculating the impact parameters are validated by experiments.

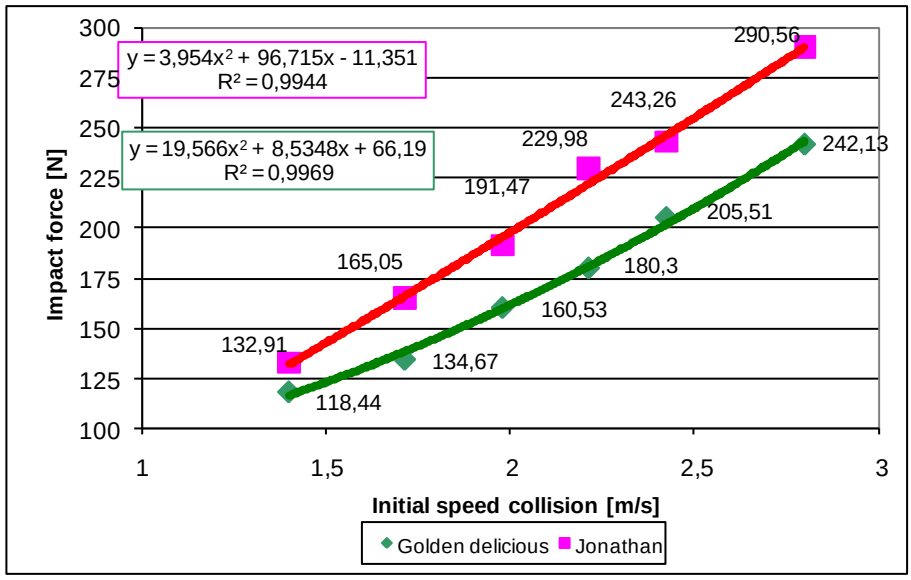

Fig. 7. Variation of impact force based on the initial speed collision

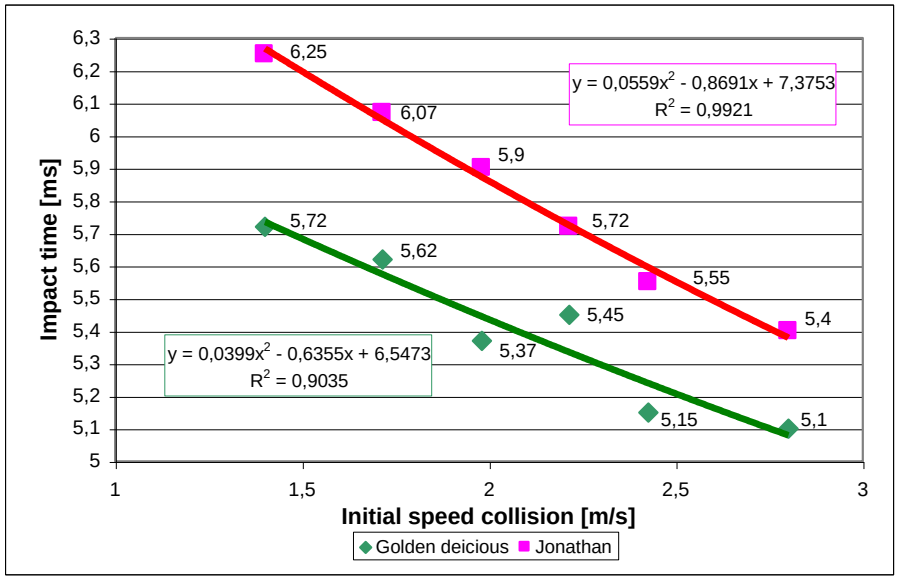

Fig. 8. Variation of impact time based on the initial speed collision

- *Note - the average value it was calculated according to the corresponding variations of each initial acceleration of collision.*

CONCLUSIONS

1. Maximum impact force depends on the fruit mass, by the drop height and variety, at appropriate values of masses and at the same drop height (identical acceleration of collision) the forces values are smaller in Golden Delicious variety and higher in Jonathan variety, all this due to the structure of apple variety, of the maturity degree of each variety and different viscoelastic behavior of studied biological material.

2. Regression analysis, show that all values of "R" trend concentration towards 1 value, which allows to conclude that the regression equations can be used to predict the maximum impact force collision, when it drop from one height used in experiments, according to the mass fruit.

3. Collision time decreases when the drop height increase. This downward trend of collision time is due to the increasing of initial impact acceleration.

4. Value R = 1 for time collision, occurred in variants J1 J4 for a polynomial regression of 2 degree function and at G21- G24, J21 G24 respectively, for a polynomial regression function of 3 degree, and the minimum value R = 0.7247 (R2 = 0.5253) was recorded at G13- JG16 variants.

5. On impact, plastic properties of the fruit, conferred by their viscoelastic behavior, do not have enought time to manifest, because of a shortly time in which the collision is produced, and the fruit behave as a rigid body. In this case, the shock energy which generate the flesh deformation, is not dissipated in the mass flesh and the flesh is crushed in contact point, the fruit is bruising, and for this reason is reduced the period of storage.

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FERTILIZER WITH PROTEIN STRUCTURE - AGROCHEMICAL TESTING

FERTILIZANŢI CU STRUCTURI PROTEICE – TESTE AGROCHIMICE

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Abstract. *Fertilizers containing organic matter of animal or vegetable nature are a sustainable alternative to the traditional fertilizing system. Foliar fertilization and applied fertilizers using this technology represent another less studied domain. Therefore, in this work are presented results from new treatments of fertilizers organic natural substances, chelates with possible use in conventional agriculture but also ecological. Carried research aimed to realize and test agrochemically some fertilizers that contain proteic hydrolysate with chelated properties for microelements present in extraradicular fertilizers. Also there are presented the agrochemical testing carried out in the House of vegetation o a sunflower crop.*
Key words: fertilizers, hydrolysate, collagen, biostimulator, chelates

Rezumat. *Fertilizantii continand substante organica de natura animala sau vegetala reprezinta o alternative sustenabila fata de sistemul de ingrasaminte clasice. Fertilizarea foliara si fertilizantii aplicati folosind aceasta tehnologie, reprezinta un domeniu inca putin studiat. Din acest motiv, in aceasta lucrare, sunt prezentate rezultatele obtinute la teatarea unor noi fertilizanti cu subtante organice naturale, chelatante cu posibilitatea utilizarii in agricultura clasica dar si cea ecologica. Cercetarile efectuate au urmarit realizarea si testarea agrochimica a unor fertilizanti ce contin hidrolizate proteice cu proprietati chelatante pentru microelementele prezente frecvent in ingrasamintele cu aplicare extraradiulara. Sunt prezenta testarile agrochimice efectuate in Casa de vegetatie pe o cultura de floarea soarelui.*
Cuvinte cheie: fertilizanţi, hidrolizate, colagen, biostimulator, chelaţi.

INTRODUCTION

The rapid evolution of fertilization methods and technologies using the liquid extraradicular fertilizers was possible due to application possibilities of them controlled by the phases of vegetation, culture, agro fond and nutritional deficiencies and increase efficiency indicators regarding cost fertilization - economic results and sustainable agriculture promotion. Using proteic substances that contain proteins, protides and free amino acids in a complex matrix with macro and microelements chelates leads to the obtaining of stabile fertilizers from physical and chemical point of view. Close to the chelates role, proteic hydrolysate has another role such as protector coloid which helps to the maintenance of fertilizers stability, and through all components with molecular mass of around 14000 - 15000 Da forms crusts on the vegetal tissue surface.

These crusts have the ability to cease gradually in time of chelates microelements of collagen polypeptides, acting both as hydrophil protector to environment factors and as fitostimulator (Carmen Sirbu et al., 2008, 2009).

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MATERIAL AND METHOD

Worldwide it's being remarked the tendency to produce fertilizers that contain natural substances (primar products or secondary resulted in different technological processes) or synthethysys (accepted or not through international regulations) from biostimulator category, such as: heteroauxine, betaindoilacetic acid, triiodbenzoic acid, giberelina and derivatives, aminoacids (glycine, alanine, phenylalanine, proline, oxiprolina, asparagines, glutamine, arginine, histidine, lysine, serine, threonine, valine), vitamins, peptides, ureides, phosphoproteins, hydrolyzed protein, seaweed extracts and fulvic acids and / or humic. Hydrolyzed of collagen used to obtain experimental fertilizers it has been characterized through a high level of purity, proteic substance of 99.75%, majoritary formed by polypeptides with molecular average weight between 14000 – 15000 Da, 16.10 – 17.75% content of total nitrogen, 0.7 - 0.85% fat substances and under 0.3% mineral substances (T. Cioroianu et al., 2009).

Polypeptides from hydrolysate of collagen form chelates complexes and chelates with metallic ions, especially Fe, Ca, Mg,Cu, Zn by carboxylic reactive groups, hydroxyl and azotophore of NH-pirolidinic type and of -CO-NH- peptides connection (Trandafir Viorica et al, 2003, 2007). Chelates formed are stable if the molecular weight average of hydrolysate is smaller or the metallic ions concentration is reduced. In order to transport chelated microelements it has been chosen a neutral collagen hydrolysate, which is being used as chelates support for microelements used in animals food, having a biostimulator reaction (Carmen Sirbu et al., 2008, 2009). Extraradicular fertilizers formulas, selected and obtained experimentally concerning the agrochemical testing, were the following type:

- NPK with chelates organic substance and microelements from material matrix ("Fert 1");
- NK with chelates organic substance and microelements introduced in the in the obtaining process (two variants "Fert 2" and "Fert 3");
- N with organic chelates substance and microelements introduced in the obtaining process ("Fert 4").

Experimental fertilizers were comparatively tested with an witness unfertilized foliar(M0), 2 witnesses fertilized certified "ECO" (ECO 1 and ECO 2) and a witness represented by an extraradicular fertilizers classic of NPK type with a report of N:P2O5:K2O de 1:1:1. Agrochemically experiments were carried out in the House of Vegetation of I.N.C.D.P.A.P.M. – ICPA Bucharest, using Mitscherlich pots with 20 kg of soil. Agrochemical experiments were carried out on sunflower, Justin type with a vermouth chernozems soil. There were created 14 variants (seven on agrofond without fertilization of the seven on agrofond with basic fertilization) with three repetitions. Experimental fertilizers were applied as 0.5% concentration solution in quantities of 30 ml / pot, in number of three treatments at intervals of 10 to 15 days. The first application was made when plants had a height of 35 - 40 cm. At the end of the vegetation were performed assessments of the parameters of production from the average samples of seed of the three repetitions remained in vegetation were carried out analyses of elements and oil.

RESULTS AND DISCUSSIONS

The results of agrochemically testing of fertilizers on sunflower culture, in the House of Vegetation, are presented in the figures 1 and 2. Experiments showed that in the case of calatidiu mass this has rised up when applied experimental fertilizers no matter the agrofond (fig. 1). It has to be remarked the fact that the report between calatidiu mass for experiments carried out on basic fertilized agrofond and on the unfertilized it has been maintained in range 1.02 (witness M0) – 1,27 (Fert 1), obtained report seeds production had higher values between 2.61 (Fert 4) respectively 3.90 (Eco 1), with values of 2.8 - 3.2 for experimental fertilizers. Seeds production raised up toward the M0 and ECO witnesses through experimental fertilizers application, in case of experiments carried out on basic fertilized agrofond, this being around three times higher (fig. 2).

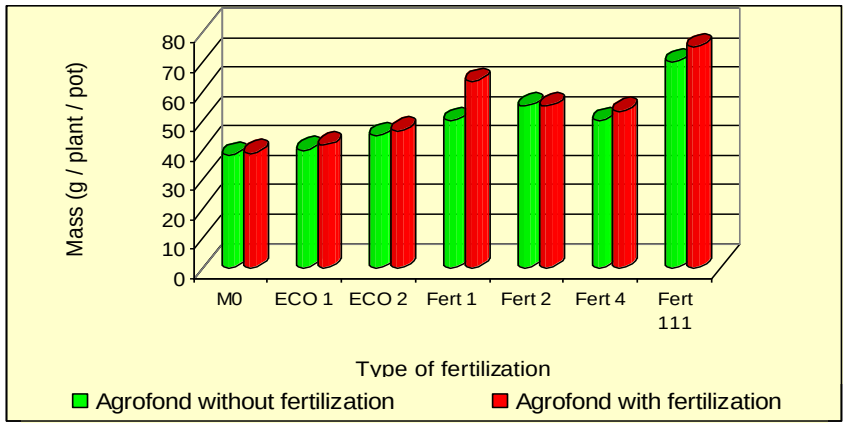

Fig. 1. Calatidium mass evolution concerning extraradicular fertilizing applied to sunflower culture, Justin Type

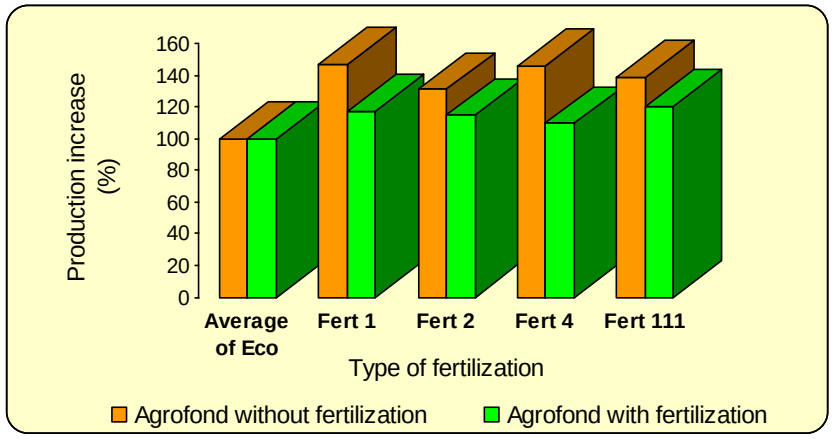

Fig. 2. Production and average values obtained for ECO witnesses

Table 1

Evolution of seed production by treatment foliar applied, unfertilized agro fond

Fertilizer type	Product plant / pot, g	Difference compared to control, g	Signif.	Difference compared to control, g	Signif.	Difference compared to control, g	Signif.	Difference compared to control, g	Signif.
		MO		ECO 1		ECO 2		Fert 111	
M0	6,98	0,0	-	-3,3	oo	-1,2	ns	-6,6	ooo
ECO 2	10,27	3,3	*	0,0	-	2,1	ns	-3,3	o
ECO 1	8,18	1,2	ns	-2,1	ns	0,0	-	-5,4	ooo
Fert 111	13,58	6,6	***	3,3	*	5,4	***	0,0	-
Fert 1	12,10	5,1	***	1,8	ns	3,9	**	-1,5	ns
Fert 2	13,45	6,5	***	3,2	*	5,3	***	-0,1	ns
Fert 4	12,80	5,8	***	2,5	*	4,6	**	-0,8	ns
DL 5%	2,53		DL 1%	3,51		DL 0.1%	4,88		

Table 2

Evolution of seed production by treatment foliar applied, basic fertilized agro fond

Fertilizer type	Product plant / pot, g	Difference compared to control, g	Signif.	Difference compared to control, g	Signif.	Difference compared to control, g	Signif.	Difference compared to control, g	Signif.
		MO		ECO 1		ECO 2		Fert 111	
M0	20,80	0,0	-	-11,3	ooo	-11,1	ooo	-16,7	ooo
ECO 2	32,10	11,3	***	0,0	-	0,2	ns	-5,4	o
ECO 1	31,90	11,1	***	-0,2	ns	0,0	-	-5,6	o
Fert 111	37,53	16,7	***	5,4	*	5,6	*	0,0	-
Fert 1	36,70	15,9	***	4,6	*	4,8	*	-0,8	ns
Fert 2	35,05	14,3	***	3,0	ns	3,2	ns	-2,5	ns
Fert 4	38,64	17,8	***	6,5	**	6,7	**	1,1	ns
DL 5%	4,44		DL 1%	6,15		DL 0.1%	8,55		

Production increased for applied variants to sunflower on and agrofond without basic fertilization were 17% (ECO 1) up to 92% (Fert 1 and Fert 4) higher than the extraradicular unfertilized witness (M0) and trend upward in the following order ECO 1, ECO 2, Fert 2, Fert 111, Fert 4, Fert 1 respectively. When experiments carried out on a agrofond with basic fertilization, increases production of the witness before M0 was higher by 53% (ECO 1, ECO 2) and up to 85% (Fert 111) and have evolved increased in order ECO 1, ECO 2, Fert 4, Fert 2, Fert 1, respectively Fert 111.

Compared to the average production obtained by applying the ECO witnesses, production had an upward trend and was 31% (Fert 2) up to 47% (Fert 1) higher than the witnesses in the case of the a without fertilization agrofond and 10% (Fert 4) to 21% (Fert 111) in case of experiments carried out on a fertilized agrofond (figure 2). Statistical data analyses obtained after carried out experiments on a basic unfertilized agrofond have indicated significant productions of seed in case of experimental fertilizers Fert 1 ÷ 4 and Fert 111 compared with unfertilized variant (M0) and with the product certified as "ECO1" (tab 1).

If tests carried out on a agrofond with fertilization, the statistical analysis of data showed a very significant production of seed for experimental fertilizers Fert 1 ÷ 4 and Fert 111 compared to the unfertilized witness (M0). In case of variants Fert 1, Fert 4 and Fert 111 were obtained significant production compared with certified products "ECO" (table 2). Fertilizers compared to the classic Fert 111, obtained productions with experimental fertilizers were insignificant, no matter the agrofond.

CONCLUSIONS

1. Have been obtained and characterized physico-chemical three fertilizers with extrardicular application that is being characterized by a complex matrix composition due to association type NPK, NK, or N with microelements Fe, Cu, Zn, Mn, Mg and some organic substances such as protein hydrolysates with chelated role but also fitostimulator.

2. There were obtained very significant productions towards the extraradicular unfertilized witness (M0) and significant towards "ECO" witnesses.

3. Tor the basic unfertilized variants, it's being noted a ascending evolution for production in the following order ECO 1 (17.3%), ECO 2, Fert 2, Fert 111, Fert 4, respectively Fert 1 (94.7%), and in case of experimental variants on a basic fertilized agrofond the production was maximum of 34 – 35% were obtained with extraradicular fertilizers Fert 111 and Fert 4 cu 80 – 85% %, followed by Fert 2 with 76.4%, Fert 4 with 68.5% and respectively ECO 2 and ECO 1 with 53 – 54%.

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ORGANO-MINERAL FERTILIZER USE IN AGRICULTURE SUSTAINABLE

FERTILIZANŢI ORGANO-MINERALI CU UTILIZARE ÎN AGRICULTURA DURABILĂ

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Abstract. *Carried out research aimed to test agrochemically and realize some organo-mineral fertilizers with humic substances, fulvic and microelements that can be used both in organic and conventional agriculture. Fertilizers can be applied both extraradicular and through irrigation (watering or drip). Testing and evaluation of these fertilizers has been carried out comparatively with witnesses represented by certificated fertilizers. Present paperwork shows the results of agrochemically tests carried out in the House of vegetation on a tomato culture using new variants of organo-mineral fertilizers with possibilities to be used both in conventional and ecological agriculture.*

Key words: fertilizer, humic acids, fulvic acids, organo-mineral, foliar

Rezumat. *Cercetarile efectuate au urmarit realizarea si testarea agrochimica a unor fertilizanti organo-minerali cu substante humice, fulvice si microelemente utilizabili atat in agricultura clasica cat si cea ecologica. Fertilizantii se pot aplica atat extraradicular cat si prin irigare sau udare cu picatura. Testarea si evaluarea acestor fertilizanti s-a facut comparativ cu martori reprezentati de ingrasaminte certificate. Lucrarea prezentate rezultatele testarii agrochimice efectuate in Casa de vegetatie pe cultura de tomate utilizand noi variante compozitionale de fertilizanti organo-minerali cu posibilitati de utilizare atat in agricultura clasica cat si ecologica.*

Cuvinte cheie: fertilizant, acid humic, acizi fulvici, organo-meineral, foliar

INTRODUCTION

Globally there is a remarkable series of solutions containing fertilized Humic substances, fulvice, proteic substances in single component or structures with macro and micronutrients, used as fertilizers both in high culture and in the intensive from greenhouses and solariums (T. Cioroianu si col., 2009, Manuel Mata Brenuy, 2006, Oleg Andreevich Gladkov, 2007).

It is well known that the use of compounds that belong to class of humic and fulvic substances due to chelate properties from such elements as iron, copper, zinc, calcium, magnesium and manganese that ensures a more easily absorption both by plant and animal organisms. It also mentions their use in combination with NP or NPK structures to increase agricultural production by

increasing nutrient absorption and photosynthesis processes (Carmen Sirbu et al. 2008, 2009).

Within the testing laboratory and quality control of fertilizers in the INCDPAPM - ICPA - Bucharest experiments have been conducted leading to many variants of processes and formulas of fertilizers with possible uses in agriculture classical system, but also organic, the fertilizer-applied agrochemical extraradicular being tested in the House of vegetation and solar (Carmen Sirbu et al., 2009).

The principles that were applied to define the technological processes for obtaining these fertilizers were specific to organic agriculture standards also classic according to EC Regulation 834/2007 regarding organic production and labeling of organic products, Regulation (EC) 889/2008 laying rules for implementing Regulation (EC) no. 834/2007 on organic production and labeling of organic products and Regulation (EC) 2003/2003 on chemical fertilizers.

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MATERIAL AND METHOD

Using some extracts of natural substances from vegetal origin, represented by salts of humice and fulvice acids into a complex matrix with chelates macro and microelements , leads to stabile fertilizers from physical and chemical point of view. Fertilizers can be applied both extraradicular and drop wetting.

There were obtained from laboratory phase three variants of extraradicular fertilizers with organic substances composition with simulating role, obtained by extraction and separation and fulvice and humic acids from coal mass. Experimental fertilizers have been tested experimentally, by extraradicular application in the House of vegetation on tomato culture.

Experiments performed to obtain fertilizers extraradicular targeted:

-to define the structure and composition of fertilizer materials setting;
-to set the laboratory experimental schemes and operating parameters;
-to establish control on the phase of the process and final;
-to check technologies at the laboratory stage;
-to create samples for physico-chemical characterization and realize agrochemical testing.

Extraradicular fertilizers experimentally obtained to realize the agrochemical testing were:

- NPK type with salts from fulvice acids and chelates microelements, variant „OMI 1";
- NPK type with salts from humic acids and chelates microelements – variant „OMI 2"
- NK-type with salts from humic and fulvice and microelements – variant „OMI 3"

Experimental fertilizers were tested comparatively with unfertilized witness (M0), two foliar fertilized and certified „ECO" (ECO 1 and ECO 2) and a traditional extraradicular fertilizer „Fert 111".

Agrochemical experiments were carried out in the House of Vegetation from I.N.C.D.P.A.P.M. – ICPA Bucharest, using Mitscherlich pots with 20 kg soil.

Testing were carried out on a cultures created on unfertilized agrofond, and also on fertilized agrofond with complex fertilizer type 15.15.15, in doses of 50 mg for each nutrient / kg soil.

Agrochemical experiments were realised on tomato culture, type Dacia – Pontica, on a vermic chernozem soil There were created fourteen variants (seven on agrofond without fertilization and seven on an agrofond with fertilization), with three repetitions of three plants.

Experimental fertilizers were applied as 0.5% concentration solution in quantities of 30 ml / pot, in number of three treatments at intervals of 10 to 15 days.

At the end of the vegetation were performed assessments of the parameters of production and analysis of the value of nutrients in the fruit samples.

RESULTS AND DISCUSSIONS

In case of experiments carried out on tomato culture, Dacia Pontica type, cultivated in vegetation pots, when the end of vegetation there were made physical and chemical analyses from fruits, after the assessments of production parameters, from the average sample of the three repetitions.

The agrochemical activity results of the fertilizers on tomato culture, in House of Vegetation, are presented in table 1 - 2 and figure 1 - 3.

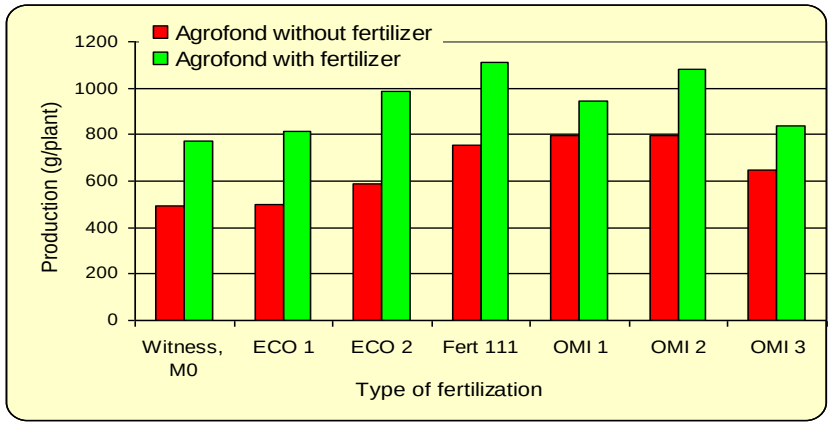

Fig. 1. The evolution of production depending on extraradicular fertilization applied to tomatoes, variety Dacia - Pontica (without fertilization and with basic fertilization)

The growth of production for experimental variants cultivated on unfertilized agrofond were 100.7 – 119.3% (ECO witnesses) until 161.5 – 161.7 (fertilizers OMI 1 and OMI 2) compared to extraradicular unfertilized witness (M0) and increased gradually in the following order: M0, ECO 1, ECO 2, OMI 4, Fert 111, OMI 1 and OMI 2.

In the case of carried out experiments on basic fertilized agrofond, growth of productions compared to M0 witness were bigger with 5 to 28% (in case of ECO witness) and till 40 – 43.8 % (fertilizer OMI 2, respectively Fert 111) with a evolution in the following order: M0, ECO 1, OMI 4, OMI 1, ECO 2, OMI 2 and classic fertilizer Fert 111.

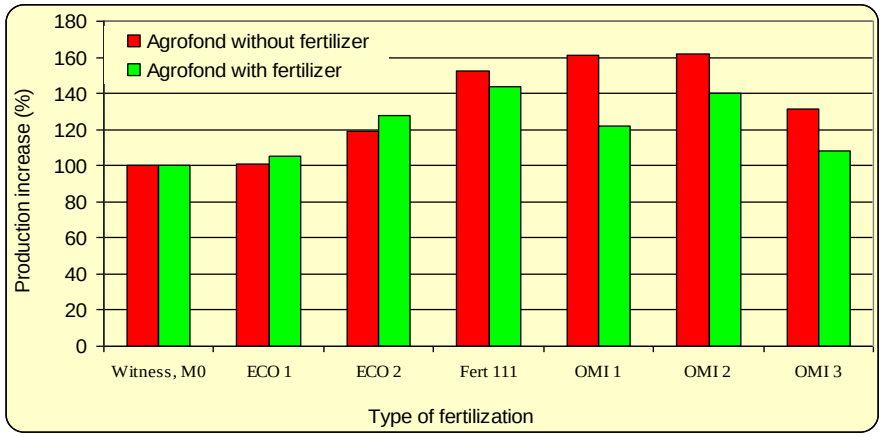

Fig. 2. The evolution of production over the M0 witness according to the extraradicular fertilization, applied on tomatoes, variety Dacia - Pontica (without basic fertilization and with basic fertilization)

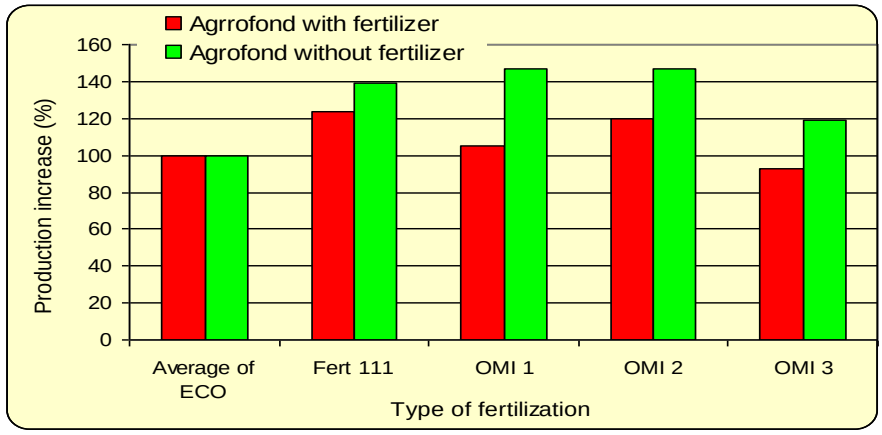

Fig. 3 - Distribution of production increase over the average of witness ECO depending on extraradicular fertilization applied an tomato variety Dacia - Pontica (without basic fertilization and with basic fertilization)

Statistical data analyses obtained after the agrochemical experiments carried out on and agrofond without basic fertilization indicated the obtaining of a different significant production in case of experimental fertilizers OMI 1 and OMI 2 both compared to the variant without foliar fertilization (M0) and with the product certified „ECO 1" and average yields obtained (table 1).

In case of carried out tests on a basic fertilized agrofond the statistical analyses data indicated a significant production in case of experimental fertilizers Fert 111 and OMI 2, both against the variant without foliar fertilization (M0) and against the fertilizer certified "ECO 1". Compared to the traditional fertilizer Fert 111 obtained productions were insignificant (table 2).

Table 1

The evolution of tomato production by foliar treatment applied, basic unfertilized agrofond

Fertilizer type	Product plant / plot g	Difference compared to MO, g	Signif.	Difference compared to ECO 1, g	Signif.	Difference compared to ECO 2, g	Signif.	Difference compared to Fert 111, g	Signif.
		MO		ECO 1		ECO 2		Fert 111	
M0	493,3	0,0	-	-3,3	ns	-95,0	ns	-260,0	o
ECO 1	496,7	3,3	ns	0,0	-	-91,7	ns	-256,7	o
ECO 2	588,3	95,0	ns	91,7	ns	0,0	-	-165,0	ns
F 111	753,3	260,0	*	256,7	**	165,0	ns	0,0	-
OMI 1	796,7	303,3	**	300,0	**	208,3	*	43,3	ns
OMI 2	798,7	305,3	**	302,0	***	210,3	*	45,3	ns
OMI 3	646,7	153,3	ns	150,0	*	58,3	ns	-106,7	ns

DL 5% 201,44 DL 1% 287,38 DL 0.1% 410,28

Table 2

The evolution of tomato fruit production by foliar treatment applied, basic fertilized agrofond

Fertilizer type	Product plant / plot	Difference compared to control, g	Signif.	Difference compared to control, g	Signif.	Difference compared to control, g	Signif.	Difference compared to control, g	Signif.
	g	MO		ECO 1		ECO 2		F 111	
M0	771,7	0,0	-	-40,0	ns	-216,0	ns	-338,3	o
ECO 1	811,7	40,0	ns	0,0	-	-176,0	ns	-298,3	o
ECO 2	987,7	216,0	ns	176,0	ns	0,0	-	-122,3	ns
F 111	1110,0	338,3	*	298,3	*	122,3	ns	0,0	-
OMI 1	943,3	171,7	ns	131,7	ns	-44,3	ns	-166,7	ns
OMI 2	1080,0	308,3	*	268,3	*	92,3	ns	-30,0	ns
OMI 3	835,0	63,3	ns	23,3	ns	-152,7	ns	-275,0	o

DL 5% 268,78 DL 1% 383,45 DL 0.1% 547,43

CONCLUSIONS

1. Were experimentally obtained and characterized physico-chemical 3 fertilizers to be applied to extraradicular fertilization. These fertilizers are distinguished by a complex composition by associating a type matrix NPK or NK, with micronutrients Fe, Cu, Zn, Mn and Mg of humic and fulvic acids, natural substances chelated and biostimulator role.

2. With agrofond a basic fertilization in the House of Vegetation on tomato, Dacia Pontica variety, it has been remarked a ascending evolution of the productions gains compared to M0 witness, in the following order: 5.2% for ECO 1, 8.2% for OMI 3, 22.2% for OMI 1 and 28% for OMI 3, respectively 40% for OMI 2 and 43.8% in the case of traditional fertilizer Fert 111, production differences being significant for Fert 111 and OMI 2.

3. Regardless the agrofond the higher production were obtained through the extraradicular application of experimental fertilizers OMI 1 and OMI 2 containing humic and fulvic compounds as well in the case of the fertilizer Fert 111.

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THE SOILS EVALUATION FOR THE PEAR AND CHERRY (SOUR CHERRY) PLANTATIONS IN THE SÂRCA FRUIT-GROWING BASIN

BONITAREA SOLURILOR DIN BAZINUL POMICOL SÂRCA PENTRU PLANTAŢIILE DE PĂR ŞI CIREŞ (VIŞIN)

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Abstract. *The soil evaluation is a method and a system determining the favorability of the soils for a certain use or type of culture, expressed as an evaluation grade. This grade is a synthetic expression in a (quasi)quantitative manner of the relative production potential of the terrain, according to the ecological conditions and the way the soil is capitalized by the plants. The expression of the soils favorability for the pear and cherry plantations was done by calculating the average evaluation notes, depending on their values, establishing 10 favorability classes.*

Key words: bonitarea solurilor, note de bonitare, clase de favorabilitate, bazin pomicol

Rezumat. *Bonitarea solurilor este o metodă şi un sistem de stabilire şi de exprimare a favorabilităţii solurilor pentru o anumită folosinţă sau cultură, redată prin nota de bonitare. Această notă exprimă sintetic, într-o formă (cvasi) cantitativă, potenţialul relativ de producţie a solului corespunzător specificului său ecologic şi modului de valorificare a acestuia de către plante. Exprimarea favorabilităţii solurilor din bazinul pomicol Sârca pentru plantaţiile de păr şi cireş (vişin) s-a realizat prin calcularea notelor medii de bonitare, în funcţie de valorile acestora, stabilindu-se 10 clase de favorabilitate.*

Cuvinte cheie: soils evaluation, evaluation notes, favorability classes, fruit-growing basin

INTRODUCTION

The evaluation of agricultural terrains represents a complex operation of deep knowledge of the growing and fruit-bearing conditions of plants and of determining the favorability degree of this conditions for each use and culture (because a land can be unfavourable for certain uses and cultures, but favourable for others) by a system of values and evaluation notes (Teaci et al, 1985).

Establishing soil favorability for the fruit-growing plantations (pear and cherry trees) requires not only good knowledge of the multiple functions of the soil, but also the existent interaction between agricultural activities and soils. Evaluation of the soils for the pear and cherry plantations in the Sârca fruit-growing basin was done to establish whether the soils in this fruit-growing basin (especially soils in the western part) enable to be set up the orchards of pear and cherry tree.

MATERIAL AND METHOD

The soil evaluation was done according to methodology elaborated by ICPA, 1987, the data regarding physical and chemical characteristics of the soils representing the result of interpreting data acquired through complex pedological studies performed by OJSPA - Iaşi (1995, 1999), on a 1:10.000 scale.

For the evaluation notes calculation for the pear and cherry plantations, in the natural conditions in the Sârca fruit-growing basin, some indicators were used, respectively evaluation indicators. Thus, only the environmental conditions considered the most important, easier and more accurately measurable were chosen, namely: mean annual temperature (corrected values); mean annual precipitations (corrected values); gleyzation; salinisation and alkalization; texture in the ploughing horizon (the first 20 cm); soil pollution; slope; landslides; depth oh the phreatic water; flooding; total porosity; total content of calcium carbonate in depth until 50 cm; reaction (pH) in the ploughing horizon (the first 20 cm); degree of base saturation in the first 20 cm; soil edaphical volume; reserve of humus in the 0 – 20 cm layer; surface waterlogging. To the land evaluation, in the natural conditions of the studied area, each of the indicators above, except "degree of base saturation" indicator, which intervenes indirectly, participated in the establishment of the evaluation mark by a evaluation coefficient, which varied between 0 and 1. The evaluation marks were obtained by multiplying by 100 of the coefficient product of the 17 indicators, which participated directly in their establishment. Depending on their values, 10 classes of favorability were established: the 1st class – 100 – 91 points; the 2nd class – 90 – 81 points; the 3rd class – 80 – 71 points; the 4th class – 70 – 61 points; the 5th class – 60 – 51 points; the 6th class – 50 – 41 points; the 7th class – 40 – 31 points; the 8th class – 30 – 21 points; the 9th – 20 – 11 points; the 10th class – 10 – 0.1 points.

RESULTS AND DISCUSSIONS

The soils, that assure a very good favorability for the pear plantations, included in the 1st class of favorability with 100 evaluation points, are the typical and cambic chernozems (inclusively those affected by low sheet erosion), in conditions in which the phreatic water is approximately 5 m depth – fig.1; therefore 31.25% of total area of the terrains are very favourable for the pear plantations (fig. 2). The cambic chernozems, the typical chernozems with moderate sheet erosion and the cambic hortic anthrosol are very good for the growing and the fruit-bearing of the pear species, being included in the 2nd class of favorability (81 – 90 evaluation points), which represents 25.87% of entire area of the fruit-growing basin (fig.2). For the cambic chernozems and the cambic hortic anthrosol, the limiting factor, with minor implications, is represented by the phreatic water depth (over 5m depth), while the typical chernozems with moderate sheet erosion are penalized by higher slopes (approximately 10%).

The steep slopes (above 10%) and the high depth of the phreatic water include the cambic and typical chernozems with moderate sheet erosion in the 3rd class of favorability (71 – 80 evaluation points). These soils, that presents a good favorability for the pear tree, occupy 15.27% of the entire fruit-growing basin (fig.2). The hortic anthrosol with moderate sheet erosion, as a result of the steep slopes and of the phreatic water depth above 7 m, is included for the pear plantations in the 4th class of favorability (61 – 70 evaluation points). The mollic

aluviosol and the mollic colluvic aluviosol with low salinisation are included in the same class of favorability (the 4th class). The evaluation notes of these soils are penalized by the waterlogging, the low alkaline reaction, the texture, respectively the low salinisotion. The soils in this class of favorability, which ensure a good favorability for pear tree, occupy 2.08% of the total area of the fruit-growing basin.

The soils with medium favorability for pear tree, included in the 5th class of favorability (51 – 60 evaluation points) and the 6th class of favorability (41 – 50 evaluation points), occupy more than 1% of entire surface of the fruit-growing basin (fig.2) and are represented by the typical chernozem with moderate sheet erosion (clay texture), the calcaric erodosol (with slopes of 10,1 – 15%), the cambic phaeozem with strong sheet erosion (fig.1). For the typical chernozem with moderate sheet erosion, the limiting factors are related to the slope, the high depth of the phreatic water and the fine texture. The cambic phaeozem presents restrictive factors as slope, high depth of the phreatic water, low-alkaline reaction, low humus content. As the phaeozem, the calcaric erodosol have the same limiting factors plus high carbonate content.

With a low favorability for the pear plantations, the typical chernozem with strong sheet erosion and the mollic colluvic aluvisols strongly gleyed are included in the 7th class of favorability (31 – 40 points) – fig.1, which represents 0.78% of the fruit-growing basin area (fig.2). The penalties of the evaluation marks are very high. The limiting factors of the typical chernozem with strong sheet erosion are the steep slopes, the phreatic water depth, the high carbonate content, the low – alkeline reaction and the low humus content. The sternly restrictive factor for the colluvic aluviosols strongly gleyed is the phreatic water depth (coefficient of evaluation value is 0.5); the gleyzation and the waterlogging are also the limiting factors for the pear tree. The gleyic hortic anthrosols and the low alkalized and gleyed aluviosols, with a low favorability are included in the 8th class of favorability (21 – 30 evaluation points), which 2.89% of the total area of the fruit-growing basin (fig.2).

The calcaric erodosols, with very high slopes, high carbonate content (the penalties are very high for this indicator, the coefficient value being 0.3), low reserve of humus, which have developed on terrains with phreatic water depth over 7 m, are included in the 9th class of favorability. These soils, improper for pear tree development, are complemented by some complex soils, owning 3.87% of entire fruit-growing basin area.

The improper soils for the pear plantations are the gleyic aluviosols, the gleyic chernozems, the salinized cernic gleyosol, a part of the soil complexes are included in the 10th class of favorability, which occupy 16.63% of entire studied area (fig.2).

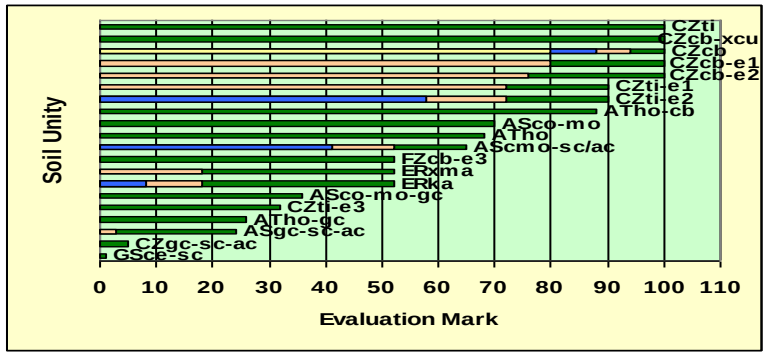

Fig. 1. The favorability of the main soil types in the Sârca fruit-growing basin for the pear plantations

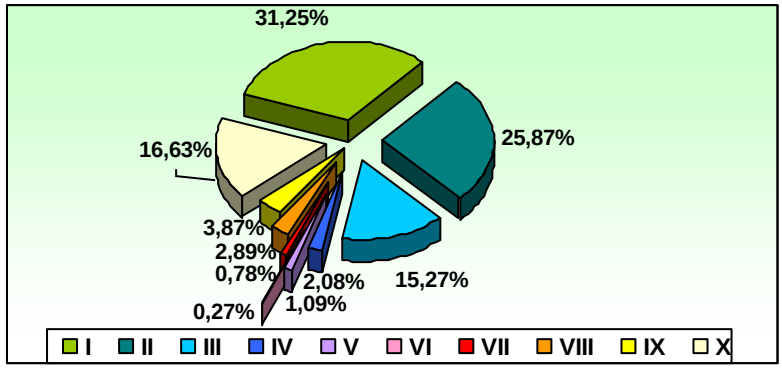

Fig. 2. The distribution of the classes of favorability of the soils in the Sârca fruit-growing basin for the pear plantations

The typical chernozems (including those with low sheet erosion, which present a medium texture) are included, in a 1.65% proportion, in the 1st class of favorability with 100 evaluation points (fig. 3, 4), presenting a very high favorability for cherry plantations. The minor restrictions related to fine texture classify the typical chernozems (even those affected by low sheet erosion) and the cumulic cambic chernozem in the 2nd class of favorability, with 90 evaluation points (fig. 3). With 81 evaluation points, the typical chernozems with moderate sheet erosion are included also in the same class of favorability (the 2nd class of favorability) – fig. 3, the minor penalties being represented by the slope, which exceeds 10%, and the fine texture. Although these terrains with very favourable soils for the cherry plantations occupy 31.59% of the fruit-growing basin area, currently all these terrains are used as arable lands.

The fine texture and the phreatic water depth over 7 m are the factors which classify the cambic and typical chernozems (including those with moderate sheet erosion) and the cambic hortic anthrosol in the 3rd class of favorability (71 – 80 evaluation points) – fig. 3. These soils with high favorability for the cherry plantations occupy 36.81% of entire studied area (fig. 4). The 4th class of favorability (61 – 70 evaluation points) contains the typical and cambic

chernozems, the hortic anthrosol; these soils are affected by moderate sheet erosion and occupy 4.02.% of entire fruit-growing basin. The limiting factors for these soils are the fine texture, the slopes over 10%, the high depth of the phreatic water (over 7m).

With restrictions imposed by slope (10 – 15%), phreatic water depth, high content of calcium carbonate, low-alkaline pH, low reserve of humus, the calcaric erodosols are included in the 5th class of favorability (51 – 60 evaluation points) – fig. 3. The mollic aluviosols, the low alkalized mollic colluvic aluviosols are included in the same class of favorability, the restrictions being the fine texture, the low-alkaline reaction, waterlogging; the low alkalization is added for some colluvic aluviosols. The terrains occupied with these soils own 1.31% of total studied area (fig. 4). Because of the slopes (over 15%), the phreatic water depth (over 7 m), the high content of calcium carbonate, the low-alkaline reaction and the low reserve of humus, the typical chernozems with strong sheet erosion and the calcaric erodosols are grouped in the 6th class of favorability (41-50 evaluation points) – fig. 3, occupying 1.47% of pomicol basin area (fig. 4).

The 7th class of favorability (31 – 40 evaluation points) contains the calcaric and marnic erodosols (fig. 3), owning 0.54% of total fruit-growing basin area (fig. 4). These soils present a low favorability for the cherry plantations, because of the slopes over 20%, the phreatic water depth above 7 m, the high content of calcium carbonate, the low-alkaline reaction and the low reserve of humus. The strongly gleyed mollic-colluvic aluviosols have a very low favorability for the cherry trees because of the very small depth of phreatic water, the strong gleyzation and the waterlogging. The terrains with these soils occupy 1.19% of fruit-growing basin (fig. 4) and are included in the 8th class of favorability (21 – 30 evaluation points) – fig. 3. The gleyic hortic anthrosol, the alkalized salinized gleyed aluviosols, the gleyic chernozem, the salinized cernic gleyosol are included in the 9th and 10th classes of favorability (1 – 10, respectively 11 - 20 evalaution points) – fig.3, which occupy 21.41% of studied area. Restrictions are related to strong degree of gleyization, alkalization and salinisation processes, low-alkaline reaction, waterlogging.

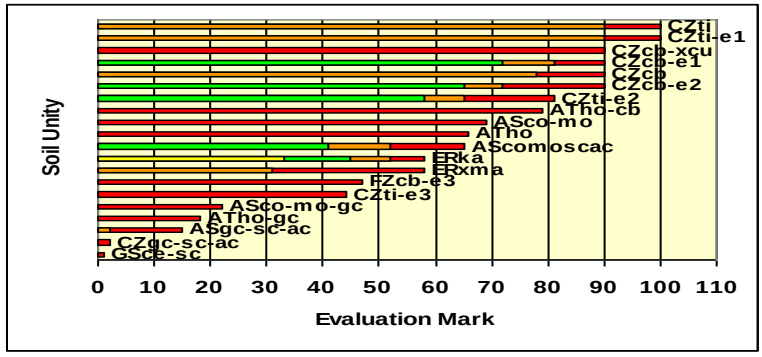

Fig. 3. The favorability of the main soil types in the Sârca fruit-growing basin for the cherry (sour cherry) plantations

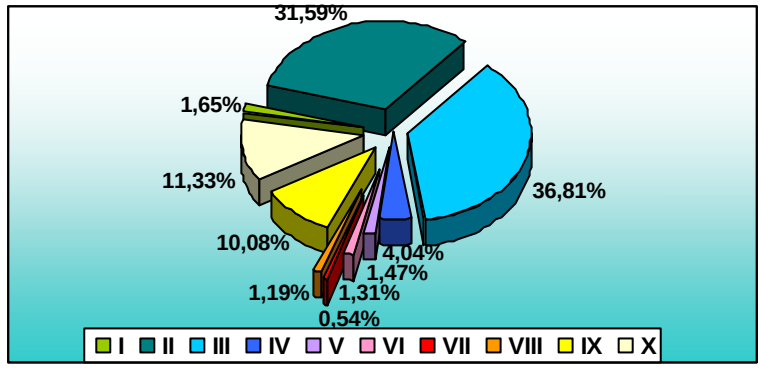

Fig. 4. The distribution of the classes of favorability of the soils in the Sârca fruit-growing basin for the cherry (sour cherry) plantations

CONCLUSIONS

From among studied species (pear and cherry tree), the pear tree is the most tolerant species to environmetal conditions in the Sârca fruit-growing.

The fine texture of the soils in the fruit-growing basin is the main limiting factor for the cherry (sour cherry) plantations.

Within the whole study area where the soils have been charted (4195,5 ha), in the pear orchards the soils included in the 1st class of favorability are prevalent (31,25%), while in the cherry (sour cherry) plantations, the soils belong mostly to the IIIrd class of favorability (36,81%).

The soils which assure a special favorability to pear and cherry (sour cherry), are the typical and cambic chernozems (cernisol class), as well as the cambic anthrosols.

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LIMITING FACTORS FOR FRUIT-GROWING PLANTATIONS IMPOSED BY PEDOLOGICAL CONDITIONS IN THE SÂRCA FRUIT-GROWING BASIN

FACTORII LIMITATIVI PENTRU PLANTAŢIILE POMICOLE IMPUŞI DE CONDIŢIILE PEDOLOGICE DIN BAZINUL POMICOL SÂRCA

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Abstract. *Soil properties (texture, mineralogical- geochemical composition, humus content, reaction, volume of soil, gleyzation, salinization) exert a determinative influence in the mechanical support, the mineral nutrition, the water supply and the ensurance the unfolding place of the processes physiological at the interface of the root/soil elementary particles (by ion exchange, respiration etc.), and the tree, in turn, through the processes of life, produces changes in soil. Soil properties manifest interdependent with other conditions and ecological factors, that may potentiate or inhibit the favourable or unfavourable action of these qualities. To establish the pedological factors that restrict the fruit-growing use, agri-environmental assessment was done of the main soil types (calculation of the evaluation notes) for the main fruit-growing species: apple, pear, plum, cherry, apricot, peach. Thus, it was found that the soil restrictions are related to texture, the $CaCO_3$ content, the reserve of humus, pH, the gleyzation and the salinization.*

Key words: limiting factors, pedological conditions, fruit-growing plantations

Rezumat. *Însuşirile solului (textura, alcătuirea mineralogică - geochimică, conţinutul de humus, reacţia, volumul de sol, starea de gleizare, de sărăturare – alcalizare) exercită o influenţă determinantă în susţinerea mecanică, nutriţia minerală, aprovizionarea cu apă şi asigurarea locului de desfăşurare a proceselor fiziologice la interfaţa perişorilor radiculari/particule elementare de sol (prin schimbul de ioni, respiraţie etc.), iar pomul, la rândul lui, prin procesele de viaţă, produce modificări în sol. Însuşirile solului se manifestă interdependent cu celelalte condiţii şi factori ecologici, care pot potenţa sau inhiba acţiunea favorabilă sau defavorabilă a acestor însuşiri. Pentru stabilirea factorilor pedologici ce impun restricţii utilizării pomicole, s-a realizat evaluarea agroecologică a principalelor tipuri de sol din bazinul pomicol Sârca (calculul notelor bonitative) pentru principalele specii pomicole: măr, păr, prun, cireş, cais şi piersic. Astfel, s-a constat că restricţiile solurilor sunt legate de textură, conţinutul de $CaCO_3$, rezerva de humus, pH, starea de gleizare şi cea de sărăturare – alcalizare.*

Cuvinte cheie: factori limitartivi, condiţii pedologice, plantaţii pomicole

INTRODUCTION

The relations established between soil and tree is a complex reciprocity. The systemic analysis of the ecometric function of each soil properties, in relation to specific physiological requirements of different fruit-growing species, defines

the manner in which the soils should be selected and improved for fruit-growing plantations to succeed and give high and steady yields (Teaci, 1985).

Through the analysis of the soil characteristics and the relations between them and the trees in the Sârca fruit-growing basin, it aims the manner in which each fruit-growing species should be placed in territory, considering this fruit-growing basin may extend to west, near the Târgu – Frumos town.

MATERIAL AND METHOD

The study is based on the analysis of the fruit-growing species requirements towards the pedological conditions. To establish the pedological factors that restrict the fruit-growing use, an agro-ecological assessment of the main soil types has beesn performed (calculation of the evaluation marks) for the main fruit-growing species: apple tree, pear tree, plum tree, cherry tree, apricot tree and peach tree. The agro-ecological assessment soils in the Sârca fruit-growing basin for the fruit-growing plantations represents the result of interpreting data assumed from the complex pedological studies performed by OJSPA - Iaşi (1995, 1999), on a 1:10000 scale, for the Bălţaţi şi Târgu-Frumos communees.

RESULTS AND DISCUSSIONS

The restrictions imposed by soils in the Sârca fruit-growing basin are related to texture, calcium carbonate content, the humus reserve, reaction (pH), the gleyzation and salinization – alkalization state.

The soil texture determines the manner of root of the trees, this process having consequence on the whole vigor of the trees, as well as the fruit production. In the Sârca fruit-growing basin, 87.78% (3045.56 ha) of soils have fine texture (clay loam) in the first 20 cm, which is a limiting factor for the planting of cherry tree, apricot tree and peach tree, because of clay content over the optimal, determining a reduced value of the free space of soils and a tendency to compaction. The 2497.32 ha of these soils are included in cernisols class, representing 81.16% of soils characterized by fine texture (fig. 1).

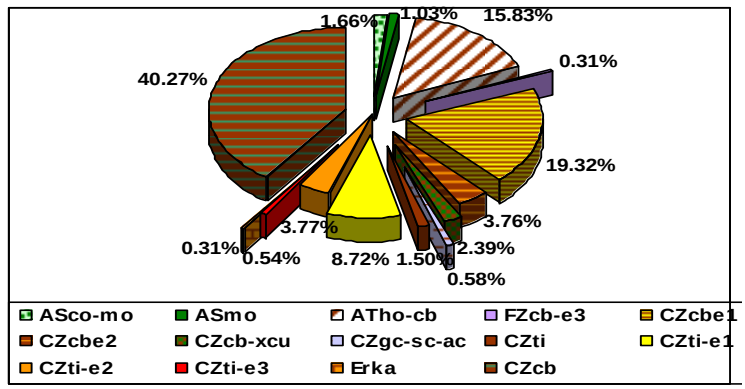

Fig. 1. The distribution of the soils with fine texture in the Sârca fruit-growing basin

Because of the high content of clay, the radicular system has the tendency to move towards the superficial horizons of the soil; the superficial radicular system (determined by soil properties) is affected by the climatic stress and the trauma caused by the annual works of the soil in the orchard. The climatic stress is brought about the high thermal and hydric variations, which are felt to a depth of 20 – 30 cm.

Aproximately 94% of soils present the same texture on entire thickness of the profile, the fine texture owning the highest part (86.90%). The texture contrasts appear in the soils formed on textural unhomogeneous materials consisting of layers with defferent textures, such as the parental materials of alluvial origin which the gleyosols and most alluviosols have developed; the 6.35% of soils present textural contrasts.

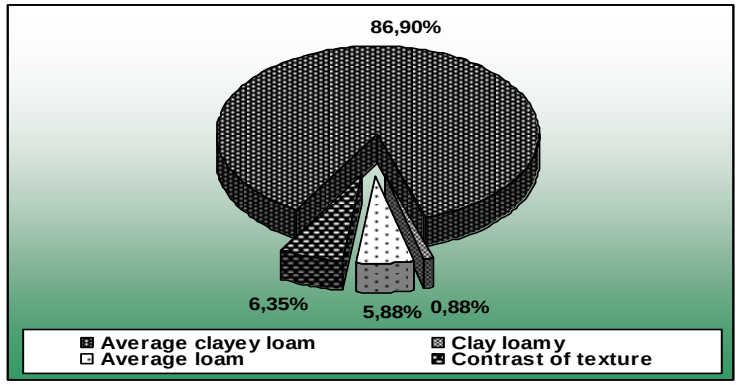

Fig. 2. The distribution of the soils in the Sârca fruit-growing basin depending on texture

The content of calcium carbonate of the soils plays an important role in the trees growth. In the Sârca fruit-growing, the soils, that do not present carbonates on profile, occupy an area of 2509.83 ha, representing 59.78% of pedological charted area; these soils are represented by the cambic chernozems and the cambic hortic anthrosol.

For an average content of calcium carbonate between 2% and 8%, no penalties aplly to any fruit-growing species, while a content of 9 to 12% (moderate), the penalties appear for apple and peach trees, the values of the evaluation coefficients being 0.9 in both cases. The soils with moderate content of carbonates occupy an area of 922.73 ha (9.53 ha of this area have a calcium content between 9% and 12%), respectively 21.98% of entire pedological charted area. These soils are represented by typical chernozems, the typical chernozems with low and moderate sheet erosion, the gleyic chernozems, as well as the hortic and gleyic hortic anthrosols. All soils from protisols class have an average content of calcium carbonate.

The increase of the calcium carbonate content penalizes all fruit-growing species. The soils with high content of carbonates (13 to 25%) own only 1.72% (72.13 ha of entire pedological charted area). These soils are represented by the

calcaric and marling erodosol and the typical chernozems with strong sheet erosion.

The cherry tree, the apricot tree and the plum tree are the most tolerant fruit-growing species to calcium carbonate content, while the apple tree, the peach tree and, especially, the pear tree are less tolerant (fig.3).

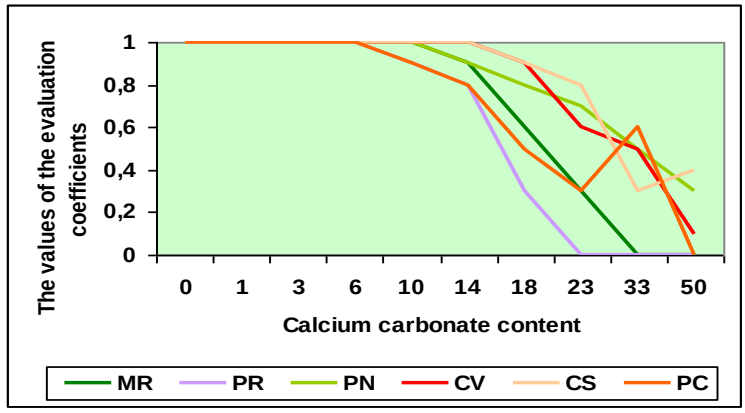

Fig. 3. The correlation between carbonate the calcium content and the values of the evaluation coefficients for the main fruit-growing species in the Sârca fruit-growing basin

One of the important properties of the soil, with a large influence on the growth trees, is the soil reaction, which expresses largely the real condition of unfolding of the phenomena of plant nutrition. The values of pH are included in the low acid – neutral domain in the Sârca fruit-growing; this reaction is the most favourable for the growth and development of the fruit-growing plantations.

The soils characterized by low – alkaline reaction, which penalizes all fruit-growing species, excepting apricots, are spread on an area of 341.04 ha. The apple tree has the least resistance to low – alkaline reaction, the evaluation coefficient being of 0.8.

A considerable influence about the growth and production trees is exerted by the reserve of humus. The soils with very low reserve of humus (31 to 60 t/ha) occupy an area of 146.42 ha, being represented by the typical chernozem with strong sheet erosion (CZti-e_3), the cambic phaeozem with strong sheet erosion (FZcb-e_3), the calcaric erodosol (ERka), the marling erodosol (ERxma) and the salinic – cernic gleyosol (GSce-sc). The sodic – salinic – gleyic aluviosol (ASgc-sc-ac) presents a low reserve of humus (61 – 120 t/ha), occupying 95.25 ha, representing 2.26% of entire pedological charted area and 49.87% of protisols class. The penalties for these soils, following the evaluation operation, are not big (table 1).

Table 1

The penalties (the values of the evaluation coefficients) imposed by „reserve of humus" indicator for the main fruit-growing species in the Sârca fruit-growing basin

Soil type	Surf. (ha)	Ind. Name	Ind. Cod	Framing limits (t/ha)	Evaluation coefficients					
					AP	PR	PM	CR	CT	PC
CZti-e_3	23.06	Humus reserve (0 -50 cm)	045	31–60	0,8	0,8	0,8	0,8	0,8	0,8
FZcb-e_3	9.5									
ERka	38.25									
ERxma	20.34									
GSce-sc	55.26									
ASgc-sc-ac	95.25	Humus reserve (0 -50 cm)	090	61 –120	0,9	0,9	0,9	0,9	0,9	0,9

Because of the low depth of the phreatic water (in the first 200 cm), the formed soils present in their profile horizons affected by the gleyzation process. The gleyzation state determines definitely the favorability of the soil for all fruit-growing species. Generally, for the trees, the gleyzation is one of the most restrictive factors. All six studied species grow normally in conditions of soils without gleyzation. Among fruit-growing species, the pear tree extends the optimum in the gleyzation domain , but low gleyzation, and the apricot tree is the most sensitive to this process. When the gleyzation is increased, the penalties are higher for all fruit-growing species (table 2).

Table 2

The penalties (the values of the evaluation coefficients) imposed by „gleyzation" indicator for the main fruit-growing species in the Sârca fruit-growing basin

Soil type	Indicator name	Ind cod	Framing Limits	Evaluation coefficients					
				AP	PR	PM	CR	AT	PC
ATho-gc	Gleyzation	3	Moderate gleyic	0.9	0.9	0.9	0.9	0.9	0.9
CZgc-sc_2-ac_1	Gleyzation	4	Strong gleyic	0.7	0.8	0.7	0.7	0.7	0.7
GSce-sc	Gleyzation	6	Excessive gleyic	0.4	0.4	0.4	0.4	0.3	0.4

In the Sârca fruit-growing basin, the gleyzation occupies an area of 238.53 ha, being distributed in Bahluieţ field (the gleyic chernozems, the gleyic aluviosols), on the route of the beginning valleys that cut off the river terraces of Bahluieţ (the hortic gleyic anthrosols, the colluvic aluviosols), at contact of the field with the slopes, where there is springs (the cernic gleyosols). The process

intensity is very strong for 23.17% of soils affected by this process (1.32% of entire pedologic charted area, without soil complexes), strong for 41.81% (2.38 of charted area), moderate for 35.03% (1.99% of entire area). The areas affected by very strong gleyzation are occupied by gleyiosols.

The fruit-growing species have a high sensibility at salinization and alkalization processes; practically, the trees grow only on terrains without salinization and alkalization. Even if the terrains are low salinized or low alkalized, the fruit-growing use is excluded. Among fruit-growing species, only the pech tree and pear tree present a certain tolerance to salinization and alkalization. These processes are often encountered in the soils of Bahluieţ and Valea Oilor fields (aluviosols, colluvic aluviosols, soil complexes), occupying an area of 302.63 ha of entire fruit-growing basin.

CONCLUSIONS

The pedological conditions in the Sârca fruit-growing basin are generally favourable for all pomicol species.

The pear tree is the most tolerant fruit-growing species to the pedological conditions in the Sârca fruit-growing basin.

The clay-loam texture of the soils represents the main limiting factor for the cherry (sour cherry), apricot and peach species (87.78% of Sârca fruit-growing basin area), the high content of clay determining a reduced value of the free space of soils and a tendency to compaction of these.

The gleyzation and salinization/alklization processes that impose severe restrictions to all fruit-growing species, occupy 12.89% of Sârca fruit/growing area and are often encountered in the soils of Bahluieţ and Valea Oilor fields (aluviosols, colluvic aluviosols).

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GIS DATABASE ON SOIL EROSION BASED ON DIGITAL PHOTOGRAMMETRY

OBȚINEREA BAZELOR DE DATE SIG PRIVIND EROZIUNEA SOLULUI PRIN METODA FOTOGRAMMETRIEI DIGITALE

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Abstract. *Irresponsible use of soils in agriculture may cause the start soil damaging processes. Among the forms of soil damage, erosion has concentrated most of researchers' efforts for mapping and rehabilitation. The erosion forms have to be located and studied, in order to apply the most adequate technologies for ecological rehabilitation. The objective of the study is to develop a mapping technique for erosion forms, within the specific conditions of Suceava Plateau. The target area of the study was identified based on the analysis of orthorectified and georeferenced digital images. These aerial images represent the material used for identifying and characterizing the erosion forms present within the target area. The instrument for the actual delineation of erosion formations is the photointerpretation key, obtained by comparing ground data to corresponding images. The final result of the study is represented by a GIS database containing necessary information for ecological rehabilitation of affected areas.*

Key words: land degradation, Suceava Plateau, GIS Database

Rezumat. *Utilizarea nerațională a resurselor de sol în agricultură poate cauza inițierea procesului de degradare a solului. Dintre formele de degradare, eroziunea a concentrat în cea mai mare măsură eforturile de cartare şi combatere. Pentru a propune cele mai bune soluții de reabilitare ecologică, formele erozionale trebuie să fie localizate şi analizate. Obiectivul studiului este dezvoltarea unei tehnologii de cartare a formelor de eroziune în condițiile specifice din Podişul Sucevei. Zona de studiu a fost identificată în baza analizei imaginilor digitale ortorectificate şi georeferențiate. Aceste imagini aeriene reprezintă materialul utilizat pentru identificarea şi caracterizarea formelor de eroziune prezente în zona de studiu. Instrumentul folosit pentru delimitare este reprezentat de cheile de fotointerpretare interactivă, obținute prin compararea situațiilor din teren cu imaginile corespondente. Rezultatul final este reprezentat de o bază de date SIG care conține informații necesare reabilitării ecologice a zonelor afectate.*

Cuvinte cheie: degradarea terenurilor, Podisul Sucevei, baza de date GIS

INTRODUCTION

The rational use of soil is one of the important requirements of the sustainable management of the renewable resources, because of its role as a main nutrient source within the substances circuit in nature. The unreasonable usage of these resources may lead to the occurrence of the soil's degradation forms, which

influence both the productivity of those terrains and the hydrologic and gravitational equilibrium of the zones in which they produce.

From the soils degradation processes, *the erosion* has concentrated the most part of the researchers efforts to develop some specific study methods, that should lead to ecological reconstruction technologies adapted to the conditions specific to the areas in where these phenomena take place (Băloiu, 1967, Rusu et al., 1981, Boş et al., 1986, Untaru et al., 1981, Perlado, 1998, Maftei, 2007).

The objective of the study is to substantiate a method for creating a georeferenced database into the specific GIS format regarding the land degradation by sheet and gully erosion, in Suceava Plateau soil conditions.

MATERIAL AND METHOD

The researches comprised the largest part of the Suceava Plateau, namely the part that lies between Romania's North border, Suceava and Moldova rivers and Obcinele Bucovinei (fig. 1).

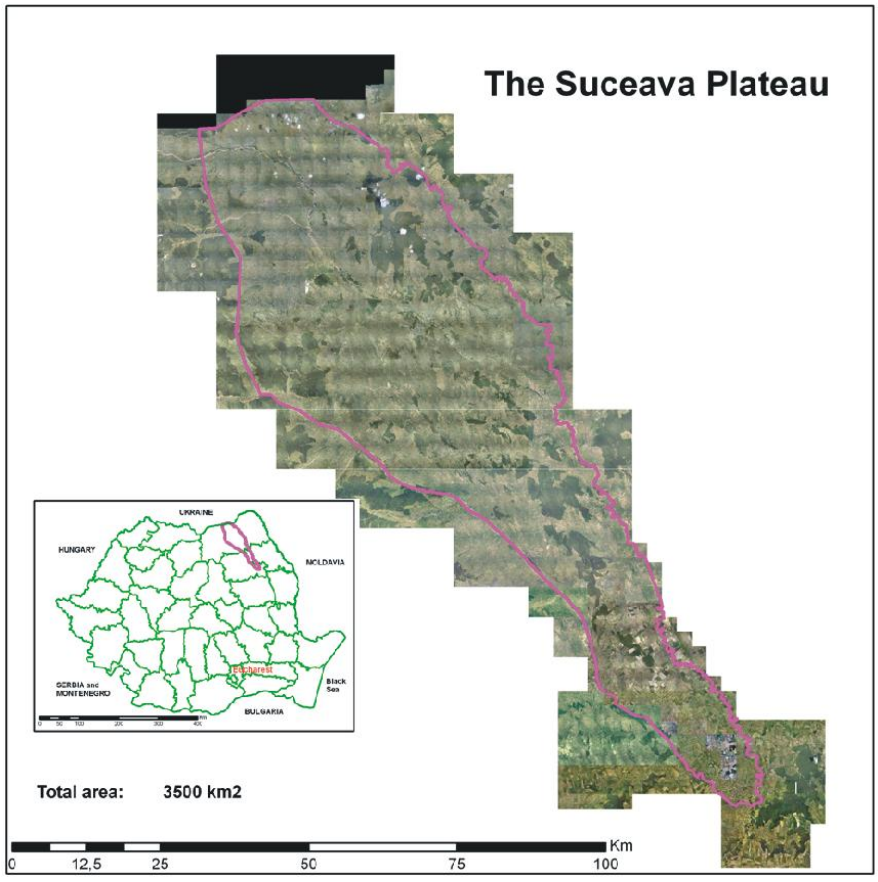


Fig. 1. Research location (Suceava Plateau)

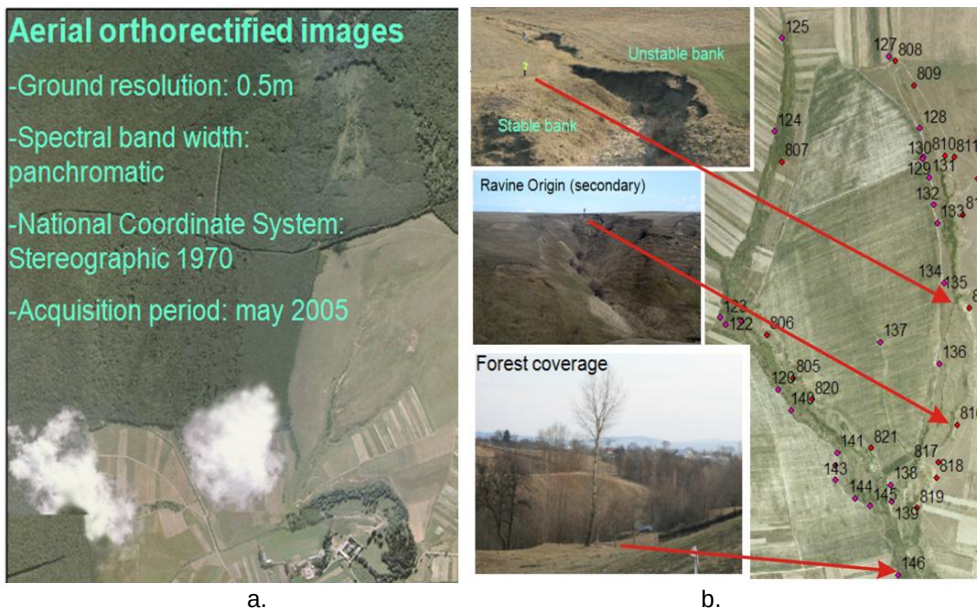
The *materials used* were the *digital orthophotos* taken in 2004 – 2005 within the LPIS programme (Land Parcel Identification System), *topographic plans (*1:5000 scale), *geological and pedologic maps* (1:200.000 scale) (fig. 2). All the imagistic materials have been acquired in digital format, or brought to this format by scanning and georeferencing in Stereo 70. There have also been used the GPS *Garmin GPSMAP 76CSx* and *Topcon GMS 2* receivers. The software platforms used were *ArcGIS 9.3* and *ERDAS Imagine 2009*.

Research method. The main research methods were *observation and the comparison.* Basically, the substantiation of the mapping method consisted in comparing the field observations with the corresponding image fragments. The correspondence was done by means of the GPS points taken in the field in the points in which the observations regarding the land degradation phenomena were done (fig. 2.b).

The intermediary result obtained is represented by both the erosion forms (gullies, ravines, surface erosion) *interactive photointerpretation keys* and the elementary units from the complex degradation forms.

The actual *mapping* of the degradation forms and of the elementary units (expected to take the same ecological reconstructions measures) was done within some representative target areas, which totals 10 % of the surface of the study area. The mapping was checked by analyzing the disparity, in other areas then the ones used in making the photointerpretation keys.

The mapping model was extended at the level of the whole study area, and the vectorial files resulted were overlapped on the pedologic and geological maps of the study area. The way of the vectorial information integration is represented by the geodatabase format, characteristic to the 9.2 and 9.3 *ArcGIS* versions.



a. b.

Fig. 2. Digital orthophotos used in mapping the soil erosion (a) and the correspondence between the field descriptions and the characteristic image fragments (b)

RESULTS AND DISCUSSIONS

The results from the mapping and spatial data integration implementation are represented by national coordinate system georeferenced database, which contain many important information for the ecological reconstruction process of the areas affected by sever forms of surface and depth erosion.

A mapping example of the elementary units is the one of Salcea–Plopeni area ravines, which are extended on many kilometres and show tendencies of lateral and at the origins area evolution.

The proportions between the elementary units which are found within the study area have been determined depending on the area of each polygon resulted by vectorization, as follows: confluence – 11; forest vegetation areas – 9; origins – 16; relatively stable shores – 22; unstable shores – 32; talweg – 4; sheet erosion (e_3-e_4) – 6.

The mapping precision analysis reveals insignificant differences between the outline points terrestrial determined (by GPS) and by photointerpretation on aerial images based on the photointerpretation keys. The maximum of these errors is ±1-2 m, given by the orthophotos georeferencing and orthorectifying errors and to the evolution of the phenomena after the image taking. The erosional phenomena evolution errors appear in the areas which are vulnerable to these phenomena, mainly in the origin and unstable shores areas.

The integration of the spatial data which came from the other cartographic resources has been done with a high precision, after the projection systems harmonization, projections which are attached to each raster file used, by ArcGIS transcalcultation. The organizatory structure of the SIG database allows the complex spatial information extraction by intersecting the thematic layers and processing that data.

The analysis of the mapping and inventory model highlights the positive aspects of this approach: the used materials (high resolution aerial images, efficient soil control equipments) assures a high identification and mapping precision of the land degradation forms, the acquiring period of the aerial images (2004-2005) assuring an up to date inventory of the soil erosion.

The aerial orthophotos usage in (LPIS programme) parcel identification assures a national coverage with such images, which can have additional usages. In this respect, the presented researches may stand for a possible beginning of a national inventory of the land degradation forms.

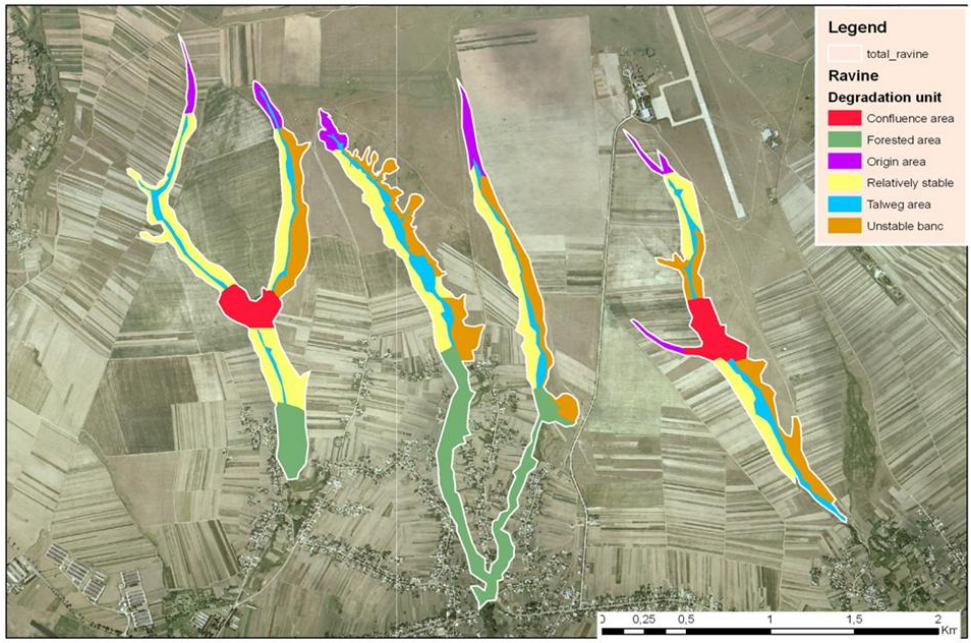


Fig. 3. Plopeni – Salcea ravine mapping example

A possible shortcoming of the method is the forest covered terrains exclusion from the mapping activity because of the lack of visualisation under the tree canopy coverage. On the other hand, it is known that the vegetation has a protective role for the soil against erosion, fact which causes a low probability of high, dangerous intensity erosion in a forest fund.

Regarding the surface erosion in early stages, the lack of sensitivity of the aerial images from the visible channel might be compensated by acquiring multispectral satellite images, which can be used in the automatic classification depending the soil erosion degrees, according to the prior researches (Iacobescu et al. 2006).

CONCLUSIONS

1. The use of the digital aerial images photointerpretation in mapping the soil erosion presents a satisfactory precision and efficiency in widely analysing the phenomena.

2. The method allows the separation of elementary soil erosion units, which claim different ecological reconstruction measures.

3. A SIG database of the soil erosion in which geology, topographic, and pedologic information are integrated too, can give the most of the cadastral needed information in projecting the ecological reconstruction of the lands degraded by this phenomena.

Acknowledgments

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USING IKONOS SATELLITE IMAGES IN CHARACTERIZING BIODIVERSITY IN CONIFEROUS STANDS

UTILIZAREA IMAGINILOR SATELITARE IKONOS ÎN CARACTERIZAREA BIODIVERSITĂȚII ARBORETELOR DE RĂŞINOASE

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Abstract. *Biodiversity, defined as the variability of the life forms within an ecosystem, represents one of the most important characteristics of natural and artificial ecosystems. Conserving a high level of diversity has become one of the requirements of environment preservation, as stated in the conclusions of the Rio de Janeiro Conference (1992). This requirement is also considered a criterion for the certification of forests and wood custody chains. The researches analyze the possibilities of using IKONOS satellite images in characterizing specific and structural diversity of the tree layer in coniferous stands found in the Vanatori Neamt Natural Park. The work routine is based on quantifying spectral diversity and the correlation with the biodiversity indicators computed on the ground inventory basis.*
Key words: structural diversity, IKONOS, pixel values

Rezumat. *Biodiversitatea, definită ca variabilitatea formelor de viață dintr-un ecosistem, reprezintă una dintre caracteristicile cele mai importante ale ecosistemelor naturale şi antropizate. Conservarea unui nivel ridicat al diversității reprezintă una dintre cerințele protecției mediului, după cum menționează concluziile conferinței de la Rio de Janeiro (1992). Această cerință este introdusă şi în criteriile de certificare a pădurilor şi lanțurilor de custodie a lemnului. Cercetările efectuate au scopul identificării posibilităților de utilizare a imaginilor satelitare de înaltă rezoluție IKONOS în caracterizarea biodiversității specifice şi structurale a etajului arborilor din arborete de răşinoase, în cadrul Parcului Natural Vânători Neamț. Modul general de lucru se bazează pe cuantificarea diversității spectrale şi analiza corelației dintre aceasta şi indicatorii diversității specifice şi structurale calculați în baza inventarierilor terestre.*
Cuvinte cheie: diversitate structurală, IKONOS, valori ale pixelilor

INTRODUCTION

The concept of biodiversity holds many levels of analysis, levels that can be addressed differentiated, depending on the scale of the researches. The remote sensing methods have been used in analyzing the biodiversity at the complexes of ecosystems (or landscape) level, by means of land cover types maps derived from the classified satellite or aerial images. More recent studies (Ivits, 2004; Koch, Ivits, 2004; Ivits et al., 2005) applied methods characteristic to the spectral diversity as related to the terrestrial determined biological diversity indices.

The present researches aim at finding some statistic relations between the specific and structural diversity at the level of tree storey from the studied stands and certain elements that can be extracted from the satellite images.

MATERIAL AND METHOD

The main *methods* used are *the comparison* and *correlation analysis.* There are compared values of the diversity indices computed terrestrial or on satellite images, directly, or by some intermediary indices.

The *materials* that were used are represented by four *IKONOS* 4 m resolution multispectral images (blue, red, green and near infrared) and a corresponding panchromatic channel *satellite* images (1 m resolution).

The collection of the data was done simultaneously by specific forest inventory, in circular sample plots. Inventory parameters were *specie*, *diameter at breast height*, *height*). The interpretation of the data from the terrestrial inventory was done in BIODIV programme (Palaghianu, 2009), the result being represented by the values of a suite of specific and structural biodiversity indices: *Simpson* value (D), *Simpson* value(1-D), *Shannon value*, *equity*, *Berger – Parker* value, *McIntosh* value, *Margalef* value, *Menhinick* value, *Glisson* coefficient.

The interpretation of the satellite images presumed the realization of a multilayer image, resulted by overlapping the images taken by IKONOS 2 (blue, green, red, near infrared and panchromatic), image on which there were overlapped the exterior borders of the sample plots on one hand and of the inventoried stand on the other hand. Thus, there have been taken the values of the pixels from each spectral channel in the form of mean, minimum, maximum and standard deviation values, separately for each sample plot.

Aside from these operations, within some statistically inventoried stands (by circular sample plots) have been randomized generated, known coordinate points within a thematic file *point* type. The values of the pixels which correspond to the points from each stand have been grouped to classes and processed then as *Biodiv* experimental distributions. (Palaghianu, 2009).

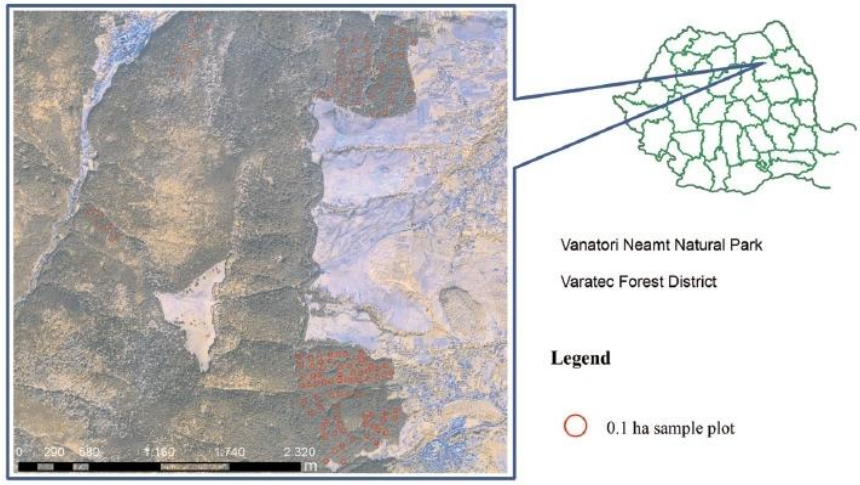

Fig. 1. Research location (Vânători Neamț Natural Park)

The comparative analysis of the terrestrial and satellite data has been done by means of direct comparison (in the case of the calculated diversity indices for both

situations) and by applying the direct correlation between the indices values and the parameters of the images corresponding to each studied stand.

RESULTS AND DISCUSSIONS

In the case of 73 circular sample plots, 1000 m^2 each (parcels 17A, 19A, 20A, 22A) the terrestrial structural diversity was quantified by applying the mentioned biodiversity indices on classes and by processing the frequency values in *Biodiv 1.0*. Given the low specific diversity of the tree storey (stands formed of silver fir and spruce), the experimental distributions of the diameter at breast height, total height, tree volume, and percentage of fir in the structure were preferred for the analysis of structural diversity. The values were analyzed comparatively, for each index (tab.1).

Table 1

The values of the biodiversity indices presented comparatively for the terrestrial and the IKONOS satellite images determinations (calculated using the *Biodiv 1.0* application – Palaghianu, 2009)

Biodiveristy indices	Indices determined from the field data			Indices resulted from measuring the value of the channel pixels				
	Diameter (cm)	(m)	Volume at 1000m^2 (m^3)	Blue	Green	Near infrared	Panchromatic	Red
Simpson Index	0,061	0,173	0,058	0,257	0,186	0,051	0,084	0,206
Shannon –Weaver Index	2,977	1,962	2,951	1,474	1,774	3,160	2,594	1,730
Equity	0,837	0,765	0,955	0,916	0,912	0,938	0,936	0,832
Berger – Parker Index	0,093	0,254	0,099	0,387	0,274	0,097	0,129	0,290
McIntosh Index	0,770	0,638	0,861	0,565	0,651	0,887	0,814	0,626
Margalef Index	4,455	2,421	4,926	0,969	1,454	6,784	3,634	1,696
Menhinick Index	0,771	1,091	2,611	0,635	0,889	3,683	2,032	1,016
Glisson Coefficient	3,088	1,678	3,415	0,672	1,008	4,703	2,519	1,176

In the case of field measurement, it can be noticed that the highest values of the diversity indices are recorded in the case of the basal diameter and tree volume, the two characteristics being thus highly correlated. The values of the structural diversity are comparable with the values of the same indices in the case of the available IKONOS imagery corresponding pixels. Thus, the highest diversity is recorded within the images taken in near infrared and panchromatic channels, fact that can be noticed on the pixels values histograms from these images (data not shown). The values within the near infrared are comparable with the ones resulting in the case of the base diameter and the stand volume.

The diversity of measured heights is comparable to the diversity of the spectral response in the green channel; values comparable can result in the case of the fir percentage in the composition and the spectral response in the blue channel.

Taking into account the fact that the diameters diversity is considered representative enough for the mixed stands (on one hand) and the calculated indices values comparability for this characteristic with the ones resulted for the near infrared pixel value (on the other hand), there have been continued the researches towards the dimensional diversity from the base diameter point of view. An index of spectral signature diversity is the standard deviation of spectral response corresponding to a certain active surface. This index is easy to determine (automatically calculated in *Signature Editor* from *ERDAS IMAGINE 2009*, as well as in *Spatial Analyst* from *ArcGIS 9.3*), but less stable, being influenced by the extreme values which can be met on the fragments of image taken into account. Since we talk about forest vegetation, the extreme values are represented on one hand by the minimum registered for the shadows cast on the trees and on the other hand by other active surfaces which are not representative for the forest environment – surfaces occupied by rocks, streams, and tractor roads etc.

The standard deviation of the near infrared pixel value has been compared, by means of the correlation analysis, with the specific biodiversity indices of the trees and of the structural diversity of the diameters at breast height from the ten inventoried stands.

The bidimensional variation tendencies of the parameters mentioned before proves relative intense correlations, even if the number of observations is relatively low. In the case of specific diversity of the tree layer there were very intense linear correlations between diversity indices values and the standard deviation of pixel values in the near infrared image, with a maximum correlation coefficient in the case of Shannon diversity index (R^2 = 0,825***) (fig. 2.a,b,c).

In the case of structural diversity, the correlation coefficients characterizing the relation between structural diversity indices values and the standard deviations of pixel values have lower values (fig. 2.d,e). The highest values of this coefficient are observed in the case of Shannon (0,433***) and Simpson diversity index 1/D (0,651***).

The use of diversity index computed in parallel on the image and on the terrestrial data gives poorer results then in the case of the standard deviation correlated with the diversity indices.

Thus, after the processing of the pixels values corresponding to the randomized generated points within the inventoried stands, have been obtained comparable results as a size order just in the case of the near infrared images usage (fig. 2.f).

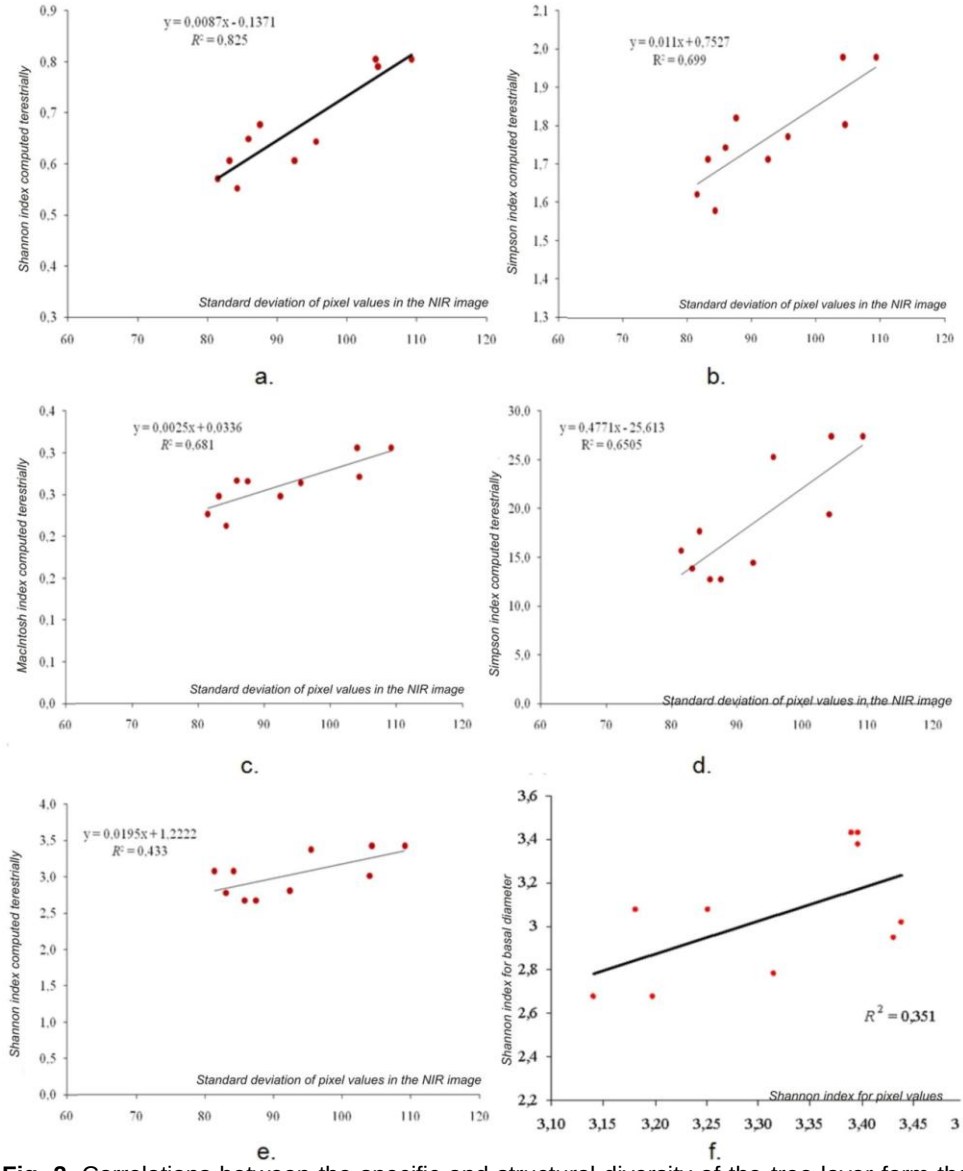

Fig. 2. Correlations between the specific and structural diversity of the tree layer form the inventoried stands and the standard deviation of the corresponding spectral response: a,b,c,d,e – specific (Shannon, Simpson and Macintosh) and structural (Simpson, Shannon) diversity indices correlations of the stand layer and the standard deviation of the spectral response in near infrared; f. correlation between the Shannon index values for the structural diversity of the base diameters and the calculated values on the near infrared images

After successively comparing the terrestrial and on the multispectral image determined values, a maximum of the determination coefficient (R^2 = 0,351) results when comparing the Shannon diversity index which was calculated

depending on the base diameter with the one calculated on the infrared image, by correspondence to the generated points. But in this case too, it can be noticed a lower variation interval at the indices calculated on the images, namely, 3,10 – 3,50, against 2,2 – 3,6 in the case of base diameters.

CONCLUSIONS

1. The values of the base diameters structural biodiversity calculated in the circular sample plots are similar to the values resulted by applying the same indices on the near infrared spectral channel.

2. At a per stand analysis, applied to ten statistically inventoried stands, there can be noticed strong correlations between the Shannon, Simpson and Macintosh indices (computed for the specific diversity of the trees layer) and the standard deviation of the pixels value in the near infrared channel. In the case of the structural diversity, average intensity correlations can be noticed when taking into account the Simpson and Shannon indices.

3. In studying the simulation of randomly generated points in the inventoried stands, there can be noticed an average intensity correlation between the Shannon index terrestrial values for the structural diversity of the diameters and the values computed on the near infrared image.

Acknowledgments

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RESEARCH CONCERNING CENTER-PIVOT SPRINKLER IRIGATION SYSTEM WITHIN SUD-SOLONET IRRIGATION SYSTEM

CERCETĂRI PRIVIND IRIGAŢIA PRIN ASPERSIUNE CU INSTALAŢII AUTODEPLASABILE TIP PIVOT CENTRAL, ÎN CONDIŢIILE SISTEMULUI DE IRIGAŢIE SUD-SOLONEŢ, JUDEŢUL IAŞI

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Abstract: *This research refers to center-pivot irrigation systems of the latest generation with lengths of 300 m and 400 m, respectively, which are equipped with both a set of wobbler sprinklers along the pipeline and a gun sprinkler in the downstream end. It includes measurements made in the field of watering pattern and uniformity of water applications, analysis of droplet diameter, evaporation losses and water application efficiency, the risk of runoff following applications on specific land slopes, and soils and agricultural conditions within Sud-Solonet system.*

Key words: center-pivot irrigation, application uniformity, application efficiency, risk of run-off.

Rezumat: *Cercetările se referă la irigarea cu instalaţii tip pivot central, de ultimă generaţie, având lungimi de 300, respectiv 400 m, echipate cu un set de microaspersoare oscilante şi cu aspersor de mare presiune în capătul aval.Au fost efectuate masuratori in teren ale pluviometriei si uniformitatii,analize privind finetea ploii,randamentul udarilor ,riscul excesului de apa si scurgerilor la suprafata solului,ca si al formarii crustei in urma udarilor*

Cuvinte cheie: instalaţie de irigaţie tip pivot, uniformitatea udărilor, randamentul udărilor, risc de scurgere la suprafaţă.

INTRODUCTION

Recently, many irrigation systems in our country are increasingly using center-pivot machines. The use of this type of machinery is ubiquitous with large irrigated farms, especially with crops of high yield and profitability. Although the necessary investments for these systems are large, they are effective due to several advantages: high productivity, high quality applications, and flexible irrigation with light and frequent applications that correspond to various water needs during the growing season. However, the disadvantage of water application with center-pivot systems is that the average application rate increases from pivot point to the extremity, where the rate may be so high that runoff problems at soil surface may occur. This may happen specifically when irrigation is done in conditions of clay soils or sloped lands. In addition, the end-gun sprinkler irrigation is problematic during windy conditions and its application profile is sensitive to the wet sector angle.

These types of systems are used in several arrangements such as South-Solonet, Albita-Falciu, and the Big Island of Braila. The latest generation systems exhibit low pressure sprinklers, positioned at equal distance along the lateral length, with a gun impact sprinkler at the downstream end of the lateral pipeline. The irrigated surface has a circular shape with a radius equal to the operative length of the equipment. Since these machines are replacing the older sprinkler laterals in actual irrigation plots with tertiary conduits at 600 m or 800 m, the best operation length of the center pivot equipment is 300 m and 400 m, respectively.

The center pivot machines have automated systems to maintain alignment of the lateral pipeline during travel and adjust the rotation speed to ensure various water application amounts. The investment cost for this equipment is proportional with its length and the irrigated area increases with the square of the operation length. Thus, the specific investment per irrigated area (lei/ha) is lower as the center pivot length is greater. However, with increased lateral pipe length, the pressure at the head at pivot point has to increase and so does the operation (consumed energy) cost. The state of minimal total costs (initial investment, energy, operation, maintenance, etc) for irrigation results in an optimal length for the center-pivot equipments of 400 m.

The research herein refers to some aspects that define the irrigation performance of center- pivot systems in South-Solonet arrangement conditions in Iasi County.

MATERIAL AND METHOD

The studies were conducted during the summer of 2009 and they refer to center-pivot systems with 300m and 400m length. The water application uniformity was determined using collector cans positioned on the soil surface (on a field route strip) 5 m apart in a radial pattern, from pivot point out to the edge of the wetted circle of the 400m lateral length system. In addition, the stationary wetting pattern was measured at several rotating-spray sprinklers. The subsequent analysis refers to the droplet diameters, the sprinkler jets evaporation losses, the water application efficiency, and the application intensity at various distances away from the pivot point.

RESULTS AND DISCUSSIONS

The center-pivot system with the 300 m lateral length is composed of five spans, while its inside diameter is 136.22 mm. Its flow rate is 120 cubic meters per hour and the operational pressure measured at the supply point is 2.5 bars. A booster pump is positioned at the downstream end of the lateral pipe to raise the pressure and help perform the irrigation function of the end gun sprinkler with a 15 mm nozzle diameter and a throw angle of 24°. The operational pressure inside the lateral pipe at the downstream end is 1,59 bars ahead of the booster pump and 3,71 bar passes the pump. Rotating –spray sprinklers distribute the water on the basic circular area out to the end gun sprinkler. These are spaced at nearly equal distances using flexible hose reaching 1-1,3 m above the soil surface. The nozzle size of the rotating–spray sprinklers gradually increases from pivot point to the end of the lateral pipe. A pressure regulator is positioned at each drop. The end

gun sprinkler provides irrigation of a circular belt and it reaches a main circular irrigated area to 33,3 ha (that corresponds to an effective radius of 326m).

The second researched equipment has a lateral pipe length of 400 meters and is composed of seven spans and the end gun sprinkler with the same characteristics as the previous one. The inside diameter of lateral pipe is 160mm and the flow rate is 200 cubic meters per hour. The effective radius of the circular wetted area including end gun sprinkler is about 425m and the wetted area of a complete rotation is 56.7 ha. The water distribution is performed with the same type of rotating–spray sprinklers, having a set of nozzle diameters larger than previous equipment due to the increased length of the lateral pipe. If the systems are supplied throughout the season by the same hydrant, the specific application rate is 3,58 m³/ha/hour. The water application amount is regulated by adjusting the rotation time, according to the following relationship:

$$m = \frac{T \cdot Q}{10 \cdot S_u} \qquad \text{(mm)}$$

where : T is rotation time (hours); Q-flow rate of equipment; S-circular irrigated area (ha).

Water application uniformity

One of the main irrigation parameters is the application uniformity. The center pivot machines have uniform water distribution throughout the area irrigated with spray sprinklers; this condition is ensured by the specific design of the nozzle such as the size and the spacing of the sprinklers and an appropriate application pattern of each spray sprinkler. In addition, the pressure regulators ensure constant working pressure at each spray sprinkler, regardless of its position on lateral length and the land slope, along the lateral pipe. In windy conditions, the disturbances to uniformity may occur, but the influence of wind is reduced by the low positioning of the sprinklers above ground surface. The end gun impact sprinkler has a long and high throw and these features cause a high sensitivity to wind influence, which may adversely affect the application uniformity.

The radial application uniformity was established for the 400m length equipment by measuring of water amounts collected at different distances from pivot point. The radial coefficient of uniformity was computed with Hermann and Hein formula (Dukes, Perry, 2006):

$$C_u = 100\left[1 - \frac{\sum_{i=1}^{n} D_i \left| h_i - \overline{h} \right|}{\sum_{i=1}^{n} D_i * h_i}\right] \quad (\%)$$

where:

D*i* - radial distance to collector "i"; h_i - depth of catch at Di (mm); h - average depth of catch.

Analysis was performed within all wetted radius of equipment and it was separated by the radius of the irrigated area with spray sprinklers and with the gun

sprinkler. The result of the entire application uniformity is expressed by Cu= 80% value, and for circular area wetted by spray sprinklers of Cu =92 %. Gun sprinkler application uniformity was moderately affected by wind influence. Relying upon these results, the irrigation is suitable for vegetables and crops with deeper root system (e.g. alfalfa, corn, sugar beet).

Drop size distribution

Small size droplets increase drift and evaporation losses and intensify the disruptive effects of the wind, with regard to the application uniformity. Conversely, droplets too large impact on the soil surface by dissolving soil clods or sealing over the soil and crop. In both events, the irrigation efficiency is significantly lowered.

Average droplets diameter d_{50} depends on the ratio of nozzle diameter and water pressure at sprinkler outlet. Moreover, with rotating spray sprinkler, the droplet size is a function of the deflector profile, the number and form of its grooves (Kinkaid et al., 1996). The average droplet diameter of rotating spray sprinklers with nine grooves of water throw, such as those with these facilities, is between 0.8 to 0.9 mm. Thus, we can assume that the water application is done with medium droplets and low kinetic energy.

Regarding the gun sprinkler, its droplets have an average diameter d_{50} of about 1.4 mm .The index of rain quality established with $K_p = \frac{d}{H}$ (d – nozzle diameter, mm; H – working pressure head, m) is 0.4 value, which corresponds to an average size droplet rain, recommended for field crops and grasses and for sandy and loamy soils.

Water applications efficiency

Evaporation losses from jet trajectory were assessed with Frost and Schwalen diagram **(**Cismaru, Gabor, 2004), using average wind speed conditions (approx. 2 m/s), relative humidity 40%, an atmospheric temperature of 30°C, and a working pressure and nozzle diameter that correspond to both categories of sprinklers (rotating spray sprinklers and impact gun sprinkler). For spray sprinklers, evaporation losses amount to approx. 5% of distributed water, with added water intercepted by vegetal cover, which is about the same size (5%). This shows that the water applications efficiency is about 90%. For gun sprinkler water application zone, the evaporation losses are 10%, resulting in an irrigation efficiency about 85%.

The risk of water excess at soil surface and run-off, during and after irrigation

The water application rate to be received at a point of the surface wetted by spray sprinklers is variable in time (histogram) according to the distance away from the pivot, the width of the stationary application pattern of spray sprinklers and the linear rotation speed of the lateral arm. The watering time near the pivot point is longer and the average application rate is lower, unlike the spray sprinkler located at the end of the lateral arm where lower watering time and higher average

application rate apply. Peak application rate at any watering point is $4/\pi$ times the average application rate at the same point.

To assess the peak and average application rate we considered the following elements of center pivot equipment: all rotating spray sprinklers have constant work pressure with 103 kPa values, the nozzle diameter suitable to position of spray sprinkler from pivot point and the width of application pattern from technical book of equipment [6].

The average water application rate, tacking into account an elliptical profile, was calculated with following formula:

$$i_j = \frac{m_{br} \cdot R_e \cdot O_e}{T_j} = \frac{\pi \cdot T_j \cdot i_{xj}}{4 \cdot T_j} = \frac{\pi}{4} i_{xj}$$

where: i_j – average application rate required at radial distance r_j, mm/hr; i_{xj} – peak application rate at radial distance r_j, mm/hr; m_{br} – gross depth of water required per irrigation, mm; R_e – effective portion of water discharged from sprinklers, most of wich reaches the irrigated soil-plant surface, decimal; O_e – ratio of water effectively discharged through sprinklers to total system discharge, decimal; T_j – application time at radial distance r_j, hours.

The evaluation was done for 100 m, 200 m, 300 m, and 400m from pivot point (for the 400 m length equipment (table 1).

Table 1

Average and peak local application rates at some distances from pivot point (refer to 400 m length equipment)

Lateral lenght (m)	**300**			**400**			
Application time (hr), considering m=30mm	2.0	1.06	0.74	2.0	1.06	0.74	0.54
Average application rate (mm/hr)	14.94	28.28	40.18	14.94	28.28	40.18	55.7
Maximum application rate (mm/hr)	19.03	36.00	51.2	19.03	36.00	51.2	70.95
Nozzle diameter (mm)	5.16	7.14	8.73	5.16	7.14	8.73	9.53
Radial distance (m)	100	200	300	100	200	300	400
Radius of wetted sprinkler area (m)	7.55	7.97	8.1	7.55	7.97	8.1	8.1
Sprinkler flow (m^3/ora)	1.022	1.965	2.789	1.022	1.965	2.789	3.724

This work proves that the maximum local application rate does not depend on the application amount and has the maximum values of 71 mm/hour at the lateral pipe end. The local watering time directly depends on the application

amount, which means that the usage of high water applications increases the risk of excess water and run-off on soil surface. To forestall these situations, some measures must be taken such as lower water applications (about 25-35 mm amounts, correlated with land slope size and intake capacity of soils), and measures for storage of temporary excess water, etc.

CONCLUSIONS

1. The applications uniformity of center pivot equipments with a set of rotating spray sprinklers and end gun impact sprinkler is good, even in low – moderate wind conditions, except for the area watered by gun sprinkler where this item is influenced by speed and wind direction.

2. The droplets size of rotating spray sprinklers is medium with low kinetic energy.

3. The water applications efficiency is about 90 % for spray sprinklers irrigated area and 85 % for gun sprinkler irrigated area.

4. The peak application rate has large values towards the end of lateral arms. If the land slope is in the range of 2-10 % and clay loams soils are irrigated, it is required to adopt measures to reduce the risk of excess water and run-off during and after applications, especially during the months of July and August.

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STUDIES CONCERNING THE POTENTIAL OF REDUCING SALT LOAD OF ALBITA-FĂLCIU ARRANGEMENT SOILS TACKING INTO ACCOUNT THE MODERNIZATION OF LAND IMPROVEMENT WORKS

STUDII PRIVIND POTENŢIALUL DE SPĂLARE A SĂRURILOR DIN SOL, ÎN CONDIŢIILE MODERNIZĂRII AMENAJĂRILOR HIDROAMELIORATIVE DIN INCINTA ALBIŢA-FĂLCIU

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Abstract. *This paper is presented some impacts of hydro complex spatial arrangements Falciu Albita performed on mineralization of groundwater in the area. It highlights the effect of irrigation and drainage systems on groundwater level differences on the three sub-areas: strip near river, meadow and preterrasic. Tacking into account to minimize the phenomenon of secondary salinization of soils, it is looking to increase efficiency by the action of integrated irrigation and drainage systems by simulating water and salt regime of soils under the action of scarified soil and leaching in conditions of drainage systems upgraded.*
Key words: land improvement works, drainage system, soil salinity

Rezumat. *In această lucrare se prezintă unele efecte ale lucrărilor hidroameliorative executate în amenajarea complexă Albiţa Fălciu asupra regimului şi mineralizării apelor freatice din zonă. Se evidenţiază efectul irigaţiei asupra nivelului freatic diferenţiat pe cele trei subzone: de grind, luncă şi preterasic. Având în vedere minimizarea fenomenului de salinizare secundară a solurilor, se analizează posibilităţile de reducere a salinităţii prin acţiunea integrată a lucrărilor de irigaţii şi desecare drenaj. S-a simulat regimul hidric şi salin al solurilor sub acţiunea lucrărilor de scarificare şi spălari în condiţiile unor sisteme de drenaj modernizate.*
Cuvinte cheie: lucrări de îmbunătăţiri funciare, sistem de drenaj, salinitate sol

INTRODUCTION

The land reclamation developments in Prut River flooding area between Albita and Falciu consist of a series of dikes on the side of the river, an 18,655 ha drainage system, and an irrigation system with open main canals and water distribution networks for sprinkler irrigation on 16,795 ha. In addition, there are 560 ha of land with subsurface horizontal drainage on saline and alkaline soils which is situated on a strip adjacent to the terrace area. The dikes, the surface drainage system, the works for control of torrential water courses originating on the terrace area and the works for soil protection on the sloped lands of the terrace were finished in the 1966-1970 period. The irrigation infrastructure was carried out in the 1977-1980 period. Beginning with 1984, modernization works for both

the irrigation system (on 1,726 ha) and the drainage system were performed. Furthermore, 1995 was the year when modernization works of all main pumping plants situated near Prut River started. The main rationale of these complex measures is to minimize the salinization and water logging and to diminish the damage to agricultural crops.

Investigations into the operation performance of reclamation works confirmed that the salinization of soils in correlation with groundwater conditions (regarding the depth and the salinity of the groundwater) has intensified following the area being impounded and drawn out from natural flood of Prut River. Other factors contributing to this phenomenon are the low permeability of the soil layers, the deficiency of internal drainage, the inefficient irrigation practices and canal seepage (Cismaru et al., 2004). These features are observed on the strip situated near terrace foot and within the central strip of the floodplain, where internal natural drainage of soils is very slow. It is evident that during a 16 year period from 1974 to 1989, the use of irrigation water with a salinity of 0.4-0.5 g/l generated a low to moderate phenomenon of secondary soil salinization which attenuated in time. This dynamic has changed since 1990 when the social-economical conditions lead to a lesser utilization of the irrigation systems and the under-maintenance of the irrigation and drainage works. Finally, the salt leaching process due to surplus irrigation and the influence of surface drainage collectors were significantly diminished.

The aim of this study is to analyze the actual conditions for the operation and maintenance of the land improvement works, the contributing factors to soil salinity, and the alternatives to improve the current condition.

MATERIAL AND METHOD

The soil water balance in our investigation area is determined by rainfall rate, irrigation, evapo-transpiration, and the upflux from the shallow aquifer. The dissolved salts in the groundwater upward flow are the main contributor to soil salinity balance. Their contribution varies in time mainly due to various groundwater conditions such as depths and salt concentration. The local groundwater within the study area has an ascending character due to the supply of groundwater from higher lands. Prut River has a supply action of floodplain groundwater during high levels and a drainage action during opposite conditions.

The salt balance components of the root soil zone were analyzed for the 1995-2007 time period. Monthly precipitation data is obtained from Vaslui meteorological stations. The water level regime of Prut River was analyzed based on the recordings of the Prut River Water Administration at Dranceni and Falciu hydrostations. These stations are located immediately upstream and downstream from study area, respectively. The dynamics of apparent depth of water table (which was measured by observation wells) and groundwater salinity concentration were provided by the hydrological Service of Water Administration Prut, referring to observation wells situated on four alignments: Risesti, Lunca Banului, Vetrisoaia, and Falciu.

The simulation of soil salinization process was carried out using UPFLOW-v.2.2 model of Catholic University Leuven-Belgium (Raes, De Proost, 2003), where the main output is upflux from groundwater. Several input elements were considered, such as the stratigraphy and hydro-physical properties of soil profile (the depth of soil root

zone is 0,5 m), monthly real depth of water table (this is an apparent depth, modified by the coefficient developed by dr. ing. Tomita O. (Tomita O., 1999). the salt concentration of groundwater, the evapotranspiration rate (calculated with Penman-Monteith formula), and the soil water content for a well irrigated soil.

The significance of the input factors shows a net difference in transversal direction upon the Prut River direction depending on the soil profile and its physical properties, the water pressure of groundwater, and the real depth of water table. In the floodplain land strip situated near high terrace, there are aluvial soils with very low permeability and slow drainage porosity (2,5-6,2 %), from the land surface down to 4-5 m depth. The real depth of groundwater table varied from about 2 m over wet periods up to about 5 m over dry periods, while the salt concentration of groundwater in observation wells varied between 2 and 3 g/l (Atanasie, 2008).

In the floodplain's central zone, stratigraphy is about the same as in near foot terrace zone. The drainage porosity has medium values of 0-1 m depth, but downward it fast diminishes and stabilizes at about 3% (from 1,4 m depth to water table). Real depth of water table ranged from 2,5m to 4m and the salt concentration of groundwater in observation wells varied between 1g/l and 2,5 g/l.

In the strip zone near Prut River, there is a great influence of river water level variations on the groundwater table depths. Real depths of groundwater are in the range of 3-5 m. Salt concentration of groundwater is in range of 1-2 g/l in observation wells, but overpasses 2,5 g/l in dry years. The soil stratigraphy from surface to groundwater is composed mainly by loam, sandy clay, clay, sand, and clay loam layers, all of which generally have a good permeability, with the exception of the clay layer which is about 1m in depth.

RESULTS AND DISCUSSIONS

Salt amount rising from groundwater in soil root zone

Simulations of salt build-up were carried out using the previously demonstrated model for each of the three zones of floodplain between Albita and Falciu. An observation well was chosen as the representative data point for conditions influencing the salt move-up.

On average, annual salt inflow to the active soil layer supplied from groundwater are different between near foot terrace zone, central part of floodplain and in the zone near Prut River, respectively. These differences are due to various amounts of upward flow and salt concentration of groundwater. The largest salt amount builds into the soil root zone during the dry years, with water deficit during cool season, especially when we observe a gradual increase of groundwater salinity.

Soil salt evolution and leaching efficiency with increased rainfall rates

During the study period we observed reduced salt leaching by natural rains which occurred only during cool periods of the year while the soil water regime is in excess and only in the proximity of the drainage canals. In other circumstances, the salinization process is intensified. In the conditions of successive years with limited precipitation and the cool period of the year, it is possible to reach elevated values of soil salt concentration that can generate low yielding crops.

To ensure a leaching process of soil salts, it is necessary to rehabilitate the subsurface drainage system by promoting reduced drain spacing and to extend the

area provided with horizontal subsurface drainage on the central and the near foot terrace strip of the floodplain.

The soil water balance simulation was carried out for the condition of a horizontal drainage system with drains 12.5 m apart and 1.2 m depth and with a filtering layer situated above the drains with a 50 cm height. The simulations reported on two alternatives: scarified and non-scarified soils. It was considered that the subsurface drainage system helps evacuate 30% of exceeding water in non-scarified soils and 70% in the scarified soils conditions (research of dr. ing. O. Tomita - Tomita O., 1999). Salt leaching efficiency was measured during experiments for condition of predominant soil texture in study area, silty clay respectively, and for 0,5 m depth of soil (table 1).

Table 1

Salt leaching efficiency

Depth of applied water (mm)	**250**	**125**	**62,5**	**30**	**15**
Leaching efficiency (remaining salinity/ initial salinity)	0,55	0,7	0,85	0,92	0,97
Salinity reduction (%)	45	30	15	8	3

The simulations of salt leaching process under the action of soil water surplus, especially in the cool period of the year were carried out with monthly values within the 1996 – 2007 year period. In tables 2 and 3 there are presented the simulations results for the land strip of floodplain situated near high terrace zone.

It is evident that the best results of leaching soil salts were obtained for the scarified soil alternative during the years with water surplus in the cool season. However, if this water surplus is low, as was the case during the last years, the soil salinity will increase or remain at the same level. In the case of non-scarified soils, the drainage efficiency is lower. For these reasons, the reduction of soil salinity is more probable during the years with significant water surplus during the cool period; during other years, soil salinity is stationary or it may rise during dry years. These features reveal the importance of taking actions of scarifying the soil with a repetition every 2-3 years, for a successive period of dry years. However, for a period of years with water surplus in cool season, the operation of scarifying soil is sufficient if repeated at intervals of 3-5 years. With these measures, soil salinity can be favorably influenced and maintained at reduced levels for a longer period. During irrigation season, it is necessary to use a water regime that can maintain the soil solution concentration at a level demanded by agricultural crops in order to obtain the planned yields. The soil salinity management could be done by leaching irrigation with water from the Prut River. Nevertheless, this alternative demands the use of an actual sprinkler irrigation system, which in turn requires higher costs for water pumping and distribution on the fields.

Table 2

Soil saline balance under natural salt leaching in following situation: subsurface horizontal drainage and scarified soil

Year	Water surplus in the cool year period	Percent of leached salt	Salt input from groundwater		Initial soil salinity (mg/100g of soil)	Final soil salinity (mg/100g of soil)
			(mg/100g of soil)	t/ha.year		
1995			5,95	0,387	734	577,42
1996	92,26	22,14	5,72	0,372	577,42	473,04
1997	79,45	19,06	6,25	0,407	473,04	364,53
1998	101,08	24,25	11,2	0,731	364,53	300,89
1999	85,54	20,52	19,2	1,25	300,89	293,01
2000	34,65	9,01	22,3	1,45	293,01	293,44
2001	27,51	7,46	8,4	0,54	293,44	296,78
2002	8,61	1,72	10,1	0,66	296,78	249,69
2003	80,29	19,26	8,2	0,53	249,69	234,36
2004	36,61	9,42	0,74	0,05	234,36	195,97
2005	69,58	16,69	2,27	0,15	195,97	166,93
2006	66,57	15,97	2,5	0,17	166,93	163,26
2007	17,08	3,69	8,13	0,53	163,26	171,39

Table 3

Soil saline balance under natural salt leaching for subsurface horizontal drainage and non-scarified soil (same area)

Year	Water surplus in the cool year period	Percent of leached salt	Salt input from groundwater		Initial soil salinity (mg/100g of soil)	Final soil salinity (mg/100g of soil)
			(mg/100g of soil)	t/ha. year		
1996	39,54	10,05	5,72	0,372	666,15	612,76
1997	34,05	8,87	6,25	0,407	612,76	552,41
1998	43,32	10,86	11,2	0,731	552,41	511,49
1999	36,66	9,43	19,2	1,25	511,49	515,61
2000	14,85	2,95	22,3	1,45	515,61	525,75
2001	11,79	2,35	8,4	0,54	525,75	530,27
2002	3,69	0,73	10,1	0,66	530,27	492,91
2003	34,41	8,94	8,2	0,53	492,91	485,19
2004	15,69	3,23	0,74	0,05	485,19	447,30
2005	29,82	7,96	2,27	0,15	447,30	415,20
2006	28,53	7,68	2,5	0,17	415,20	411,62
2007	7,32	1,46	8,13	0,53	411,62	419,75

CONCLUSIONS

1. The soil salinization process of the Prut River floodplain from Albita at Falciu is more severe in land strips near the high terrace and in the central zone. This is justified mainly by lythological and hydrological conditions.

2. The prevention of increasing soil salinity in actual conditions requires the rehabilitation of the surface drainage system, especially by reducing drain spacing and extending the area with subsurface horizontal drainage (the latter is in correlation with soil salinity evolution and the degree of irrigation usage).

3. Wherever these undertakings are successful, they could achieve a proper management of the soil salinity. Soil desalinization efficiency using water surplus in the cool season depends on the drainage system efficiency as well as the salt leaching efficiency, both being very strongly influenced by the soil scarifying activity.

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REMOTE SENSING METHODS FOR THE SPATIAL ANALYSIS OF LAND DEGRADATION UNITS

METODE ALE TELEDETECŢIEI UTILIZATE ÎN ANALIZA SPAŢIALĂ A DEGRADĂRII TERENURILOR

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Abstract. *Romania's transition process increased the human pressure on natural resources (soils, forests, and water bodies) and the probability of natural hazards occurrence (floods, landslides, lake plugging). The objective of the study is to analyze the spatial distribution of the degradation forms, within the specific conditions of Suceava Plateau in North Eastern Romania. The instrument for the actual delineation of degradation formations was represented by aerial orthorectified images, obtained by comparing ground data to corresponding images. The results of the study show a good comparability between the ground and aerial photo mapping for the degradation forms present in these areas. Spatial variability of land degradation forms was analyzed through geo-statistical methods, within ArcGIS 9.3.*
Key words: land degradation, spatial variability

Rezumat. *Procesul de tranziţie din România a intensificat presiunea antropică asupra resurselor naturale (soluri, păduri, cursuri de apă) şi probabilitatea producerii de hazarde naturale (inundaţii, alunecări de teren, desecări). Obiectivul studiului este acela de a analiza distribuţia spaţială a formelor de degradare, în condiţiile specifice din Nord Estul ţării. Formele de degradare luate în calcul sunt eroziunea în adâncime, de suprafaţă, deplasări de teren, zone mlăştinoase, zone afectate de procese antropice de degradare. Materialul utilizat pentru delimitarea formelor de degradare este reprezentat de imagini aeriene ortorectificate şi georeferenţiate. Rezultatele studiului arată o bună comparabilitate dintre hărţile de distribuţie ale formelor de degradare obţinute terestru şi pe imagini aeriene. Variabilitatea spaţială a formelor de degradare este analizată prin metode ale geo-statisticii aplicate în ArcGIS 9.3.*
Cuvinte cheie: terenuri degradate, variabilitate spaţială

INTRODUCTION

The occurrence and development of the land degradation forms is linked to diverse geological, geomorphologic and vegetation conditions of the areas in which take place. An important aspect in the terrains vulnerability at the degradation phenomena is represented by the way of managing of the existing soil resources and the vegetation in those areas. Between the general land degradation forms, an important percentage is occupied by the erosion land sliding phenomena (Agurgo, 1996, Iacobescu et al., 2006, Nael et al., 2004). These phenomena are generally linked by torrential events and take place in areas that present high erosion susceptibility, areas differentially distributed in Suceava Plateau.

The researches objective is represented by the orthophotos usage opportunities analysis in the study of the spatial distribution of the Suceava Plateau degraded surfaces.

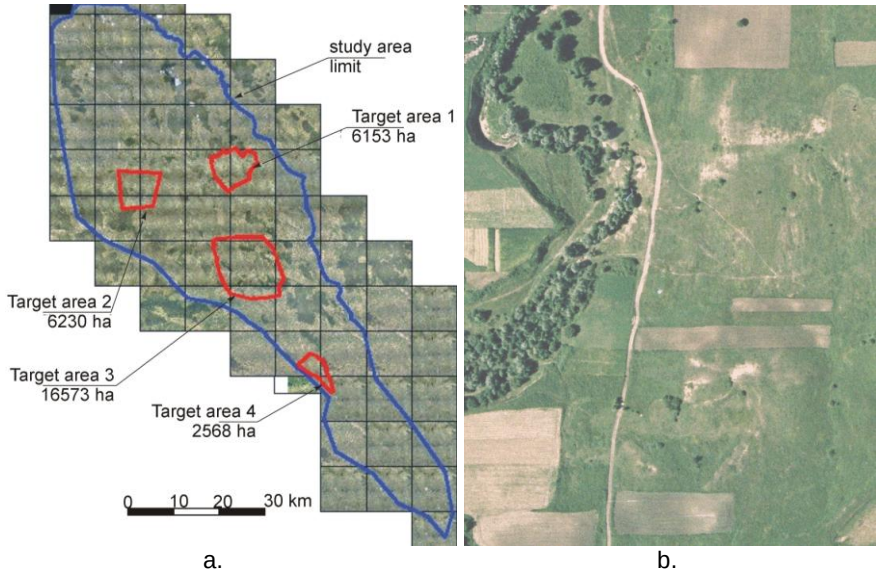
MATERIAL AND METHOD

The researches are located in Suceava Plateau (part which lies between Romania's North border, Moldova and Siret river, and Obcinile Bucovinei). The working model has been tested in four target areas, representative from the land degradation point of view, areas which sum up to 10 % of the total study area surface (fig.1.a): Suceava - Salcea (6153 ha), Ciprian Porumbescu (6230 ha), Preuteşti Buneşti (16573 ha) and Cristeşti (2568 ha).

The used *materials* are represented by *digital orthophotos* taken in 2004 – 2005 within the LPIS Programme (***L**and **P**arcel **I**dentification **S**ystem*). The images processing parameters are: 0,5 m spatial resolution, multispectral character, the spectral sensitivity domain – visible (fig. 1.b). The correspondence between the points in which the field observations were done and the images was accomplished by means of GPS technology, using Topcon GMS 2 GPS receiver.

The research methods are *observation* and *comparison*, applied in the field and at the office. Using these methods interactive photointerpretation keys were constituted, that were used afterwards in visual identification and mapping of land degradation affected terrains. The mapping was performed within *ArcGIS 9.3* software platform and verified in four target areas mentioned above (fig. 1.a).

The elementary units used in the mapping of degraded lands were differentiated based on the degradation forms that they occur in: *gullies, ravines* (coposed of origin, stable banks, relatively stable banks, talweg, forested areas), *landslides*, with breakage area, slide mass with marshes, *human induced degradations* (home and industrial waste heaps).



a. b.

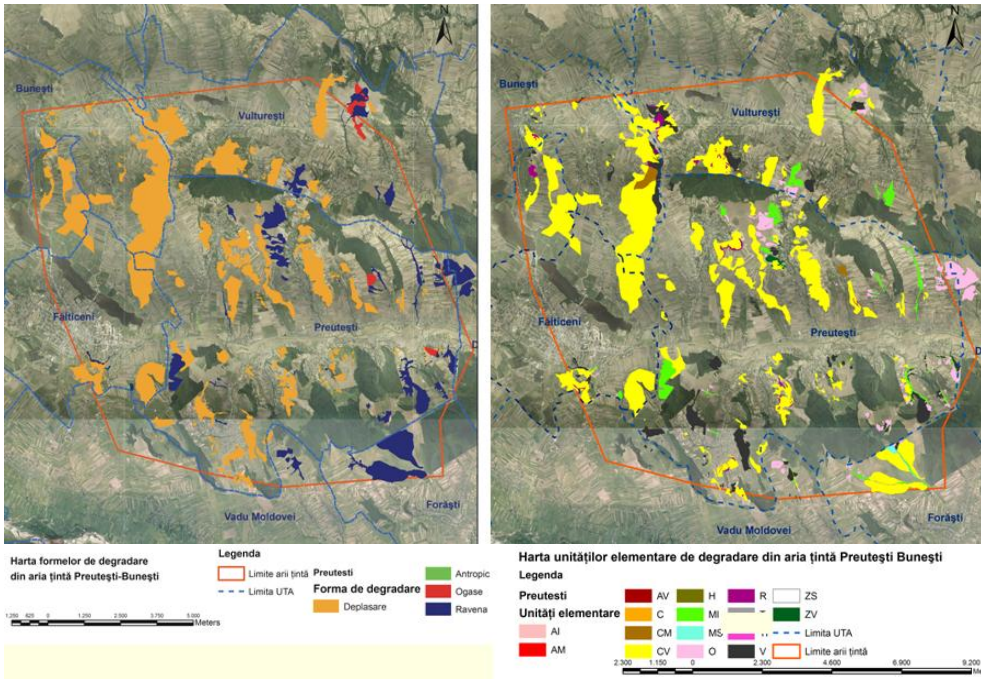
Fig. 1. a. Location of target areas for methodology calibration, b. fragment of *digital orthophoto*

The polygons resulted from digitization were overlapped on the administrative units limits (UTA). By interrogating the database, synthetic situations regarding the distribution of the degradation forms on the target area were obtained.

RESULTS AND DISCUSSIONS

The mappings from the target areas have been assembled in degraded lands distribution maps, lands identified on images, both by the type of land degradation (fig.2.a), and on the maps which contained the elementary units of the identified degradation forms (fig. 2.b). The predominant degradation types met in these areas are the gully erosion and the land slides, often in combined forms, which can be separated in erosion elementary units, to be dealt with separately in ecological reconstruction design (tab. 1). The highest percentages were obtained in Preuteşti Buneşti target area (17%) and Ciprian Porumbescu (15%).

By analyzing the distribution of degradation forms on the whole study area (fig. 3 and 4), one can notice a differentiation in the density of degradation areas (as a percent from non forested area) and in the location of the main degradation types. The highest land degradation percents occur in the central part of the Suceava Plateau, the land displacement areas having a high proportion.



a. b

Fig. 2. Land degradation type maps in Preuteşti - Buneşti area (a); with elementary degradation units identified (b)

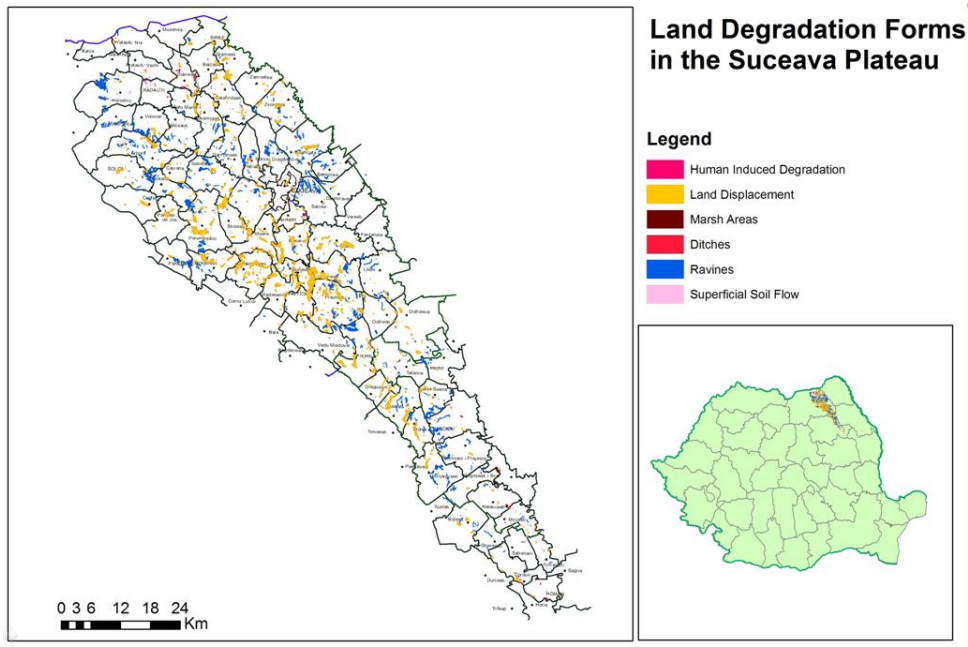


Fig. 3. Land degradation forms distribution in Suceava Plateau, mapped on digital orthophotos

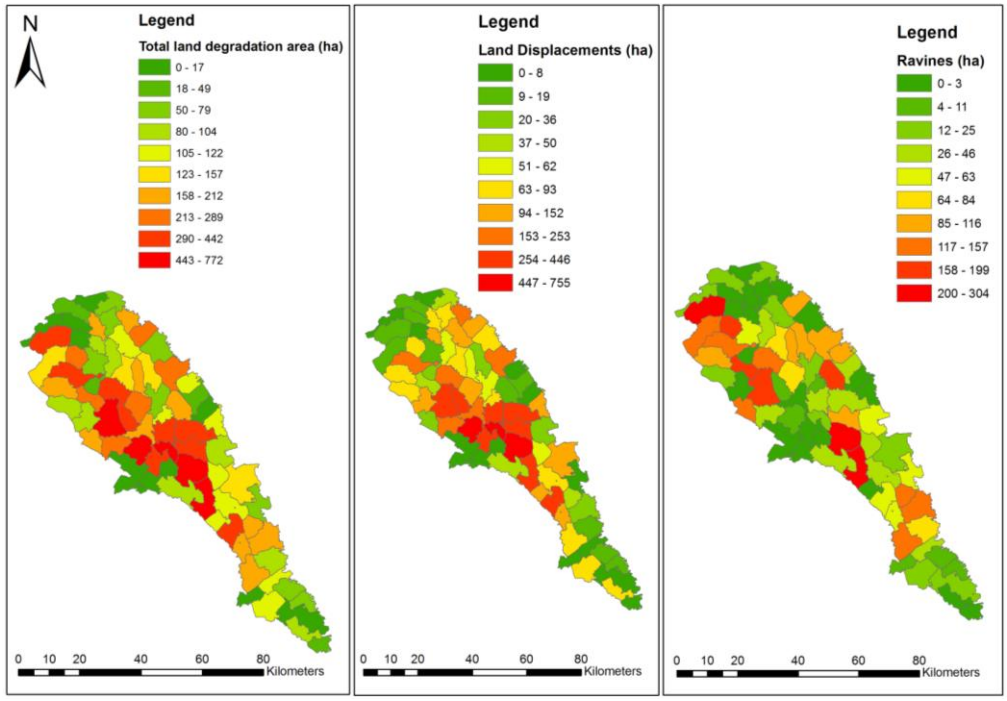


Fig. 4. Land degradation forms distribution in Suceava Plateau

Table 1

Area distribution on degradation types

Degradation type	Degraded areas in area … (ha)			
	Preuteşti Buneşti	Suceava	Ciprian Porumbescu	Cristesti
Human induced	67.49	20.14	4.43	0.90
Gullies	14.34		0.89	1.13
Ravines	1102.19	250.84	359.59	302.56
Land displacement	1654.85	40.95	544.92	72.49
Total	2838.87	311.94	909.82	377.08

The gully erosion forms are more uniformly distributed, occurring from North to South in all the study area.

The land degradation maps represent an important auxiliary in the decision system regarding the application of ecological reconstruction of affected areas. Aside the practical applicability, the maps have a special importance in the study of these phenomena, taking into account the high spatial resolution of the materials used and the digitization accuracy of the degradation forms.

CONCLUSIONS

1. The mapping of the land degradation on digital aerial images represents an alternative of analyzing this phenomenon on a broad scale, within an inventory repeatable on a five years basis.

2. The mapping method based on visual photointerpretation keys offers a satisfactory accuracy for the analysis of land degradation spatial distribution.

3. By separating elementary degradation units homogenous areas are separated, claiming similar ecological reconstruction methods.

4. Land degradation areas are differently distributed in the study area. The land displacement areas are concentrated in the central portion of the Suceava Plateau.

5. The integration of other elements regarding geological and geomorphologic conditions in analyzing the distribution of degradation forms on a broad scale can constitute a decision system regarding the management of ecological reconstruction works.

***Acknowledgments**:*

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REHABILITATION" research project, within the PNCDI II research program, Partnerships in Priority Domains.

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STABLE RIVER REACHES IDENTIFICATION ON AERIAL IMAGE SERIES – A TOOL FOR RIVER REGULATION

IDENTIFICAREA BIEFURILOR STABILE DE RÂU PE BAZA SERIILOR DE IMAGINI AERIENE – INSTRUMENT ÎN REGULARIZAREA RÂURILOR

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Abstract. *Natural river reaches, which show some stability in time, are used in river regulation as models for other unstable reaches. In this context, it is very helpful to find, for this stable reaches, some relationships between riverbed characteristics. These reaches can be considered to be in regime; it means that the parameters which characterize the bed and the flow keep relatively well defined ratio and can be considered to be regime-equation type: parameter = AxQ^n, where A is a coefficient and Q is considered to be the bank full discharge. Starting from this idea we combined field observations with the information available from aerial images taken in 1956, 1971, 1979, 2004 and 2008 and we succeeded to identify such stable reaches on gravel-bed rivers from North Moldavia (Romania). For these reaches we found same regime equation*.
Key words: aerial image series, stable reaches, river regulation

Rezumat. *Porţiunile din râurile naturale relativ stabile în timp sunt folosite ca modele în regularizarea altor biefuri instabile. În acest context, este util de identificat pentru aceste biefuri, relaţii între caracteristicile geometrice ale albiei. Aceste biefuri pot fi considerate în regim; aceasta înseamnă că între parametrii care caracterizează albia şi scurgerea există relaţii bine definite, ce se pot considera de tip regim: parametru = AxQ^n, unde A este un coeficient, iar Q este considerat debitul transportat la albie plină. Pornind de la această idee, în lucrare au fost integrate determinările din teren cu informaţiile provenite din serii de imagini aeriene (1956, 1971, 1979, 2004 şi 2008) pentru identificarea unor porţiuni de râu stabile, cu albia dezvoltată în pietrişuri, situate în nordul Moldovei. Pentru aceste biefuri s-au determinat ecuaţii de tip regim*.
Cuvinte cheie: serii de imagini aeriene, biefuri stabile, regularizare

INTRODUCTION

An essential characteristic of all the forms which directed the flow is that, more than any factor, these generate a continuous modeling of ground surface.

This study is based on the idea that identifying stable channel reaches on natural (or quasi – natural) gravel-bed rivers may be an adequate approach to study the structure of the elements mentioned above.

In this context, an important aspect in river bed morphology approach should be related to a time scale which is fitted on the interdependence between the main variables of the river bed system. This derives from the fact that any adjustments are typical for determining time periods, which are representatives for both the phenomena produced on river bed level and for its characteristic

length, as shown in fig. 1. An adequate time-scale approach is also important in establishing the type of variable (dependent or independent).

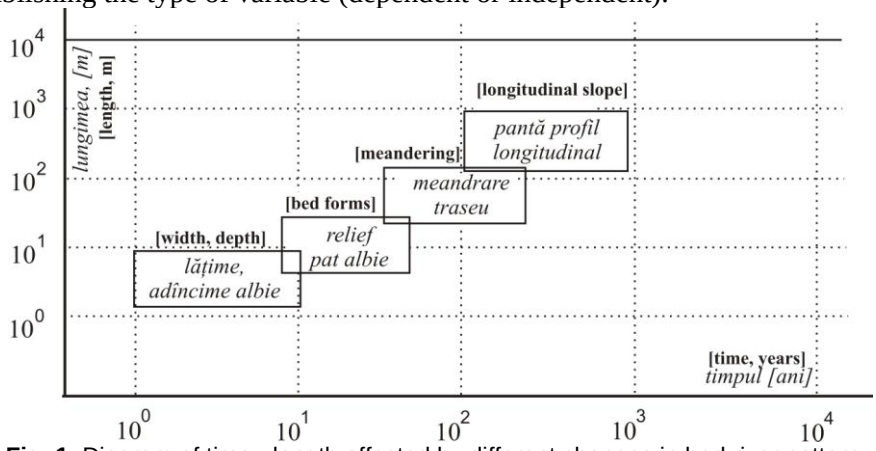


Fig. 1. Diagram of time - length affected by different changes in bed river pattern - dimensions considered for an average hydrographic basin (after Knighton, 1993)

River bed stability approaches were accomplished using empirical regime equations for stable gravel-bed rivers. An important simplification is due to the acceptance of a *dominant* (*characteristic*) *discharge* (Bray, 1982, Inglis, 1947, quoted by Knighton 1993), which is responsible for the major changes of the variables and which is most frequently considered to be the bankfull discharge (Ichim et al,1989).

MATERIAL AND METHOD

Being at aim to identify stable reaches on gravel-bed rivers, we used a series of aerial analogical photographs taken in 1956, 1971, 1979 and digital georeferenced orthophotos (2008). The area taken into account is located in Suceava district, NE of Romania, as shown in fig 2.

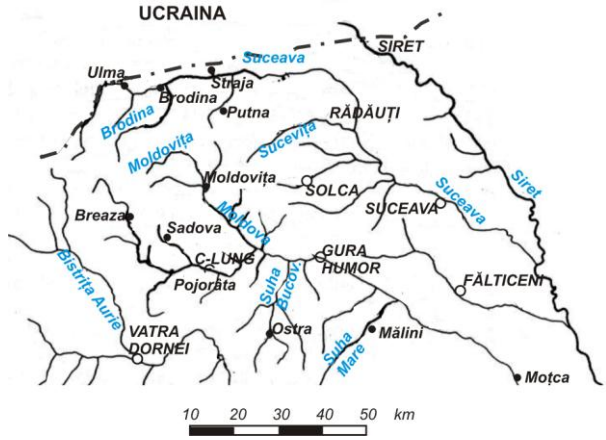


Fig. 2. Hydrographical map of mountain area of Suceava district

In a first step we have identified *natural reaches* river bed, although there are only a few reaches without human interferences. We have direct those reaches

without bank protection works, channel reconstruction or flood protection schemes, following river bed stability in time, i.e if the unique thread and some characteristic bedforms (channel bars detectable on aerial images) are maintained. These observations, corroborated with those taken *in situ* shows that in stables transverse and diagonal bars are gathered particularly boulders, increasing the local resistance of channel bed and dissipated hydraulic energy.

Because we founded reaches relatively stable for over 50 years, we assumed that for these a regime state is valid.

Speaking about reaches stability, the author use a new concept called *evolution*, *ev*, defined like the ratio between river length measured along channel axis and the length of the valley, measured along its axis (Iacobescu, 2001):

$$ev = \frac{l_{râu}}{l_{vale}} \left(= \frac{l_{river}}{l_{valley}}\right) \quad [1]$$

Keeping the idea that the river may flow *only* in the available space of the valley, one can also use *evolution coefficient*, c_{ev}, defined bellow:

$$c_{ev} = \frac{l_{râu} - l_{vale}}{l_{vale}} \left(= \frac{l_{river} - l_{valley}}{l_{valley}}\right) \quad [2]$$

The delimitation of the valley was done on the stereoscopic model, obtained from stereo images pairs, arranged under the MS27 stereoscope, eyepiece 3X, connected to stereo pantograph TRA2 Sokkia (fig. 3). Valley characteristics were considered independent variables; every reach slope proved to be continuous and thereby the horizontal projection was considered to be an affine transformation. Valley limits are conspicuous, because in the stereoscopic model heights are about 12 times exaggerated. Further, we supposed that the regime slope was achieved for these reaches. The achievement of equilibrium (regime) state was gradual in time, starting with cross section and planform parameters.

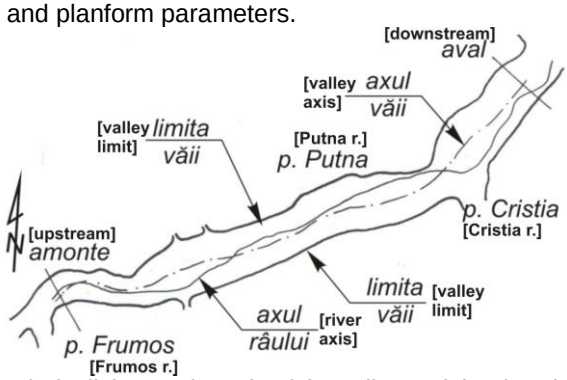


Fig. 3. Example for lining up the axis of the valley and the river (Putna River)

In the study area we found *21 reaches* considered to be stable (table 1). For each reach the author determinates:

- the average scale of the aerial image, using the existing plans 1:5,000,
- valley altitude upstream (z_{am}) and downstream (z_{av}) in the prior mentioned plans,
- the length of valley (l_{valley}) and river (l_{river}) axis, with an electronic curbimeter, adjusted on the scale of the aerial image,
- the slope corresponding to the regime, i_{reg}

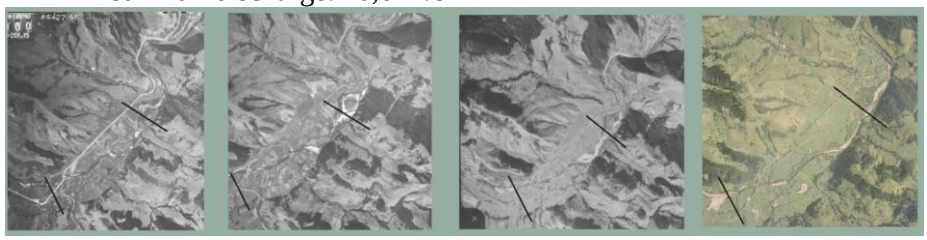
$$i_{reg} = \frac{z_{am} - z_{av}}{l_{river}} \quad [3]$$

- river evolution and coefficient of evolution, using [1] and [2],
- cross section area and the local slope of the free surface, by terrestrial measurements done by means of total station,
- bankfull discharge, using Manning relation, with the channel roughness taken from technical books (Kiselev, 1988).

RESULTS AND DISCUSSIONS

For each reach we did outlines and sketches, e.g. for Putna River (fig. 4):

- Pojorâta village, between confluence with Frumos and Modova river,
- pairs of stereo images: 30765 and 30764 / 1956,
- average scale in river bed area: 1:20.980,
- description: single bed, stable banks (wood vegetation),
- valley altitude: upstream = 742 mdMN, downstream = 710 mdMN,
- length of valley axis: 2,47km, length of river axis: 2,53km,
- regime slope = $i_{reg} = l_{râu}/(Z_{am} - Z_{av})$,
- bankfull discharge: 20,0m^3/s



1956 1971 1978 2008

Fig. 4. The same stable river reaches on aerial images series

Table 1 contains the summarized data for all the reaches. Data processing was done in order to obtain the regime slope equation:

$$i_{reg} = 0{,}0501 \cdot Q^{-0.441} \qquad [4]$$

Relation [4] shows the variation trend for regime slope. The correlation coefficient is significant for 99% probability (fig. 5).

The table reveals that river length is longer than the valley axis. This means that the river extended his plan form towards valley axis in order to attain the regime slope, i.e. for the valley slope is greater than the regime slope.

$$l_{river} \geq l_{ax} \;;\; i_{valley} \geq i_{reg} \qquad [5]$$

It results that for a stable reach relation [6] is valid:

$$\frac{l_{river}}{l_{valley}} = \frac{i_{valley}}{i_{reg}} \qquad [6]$$

and, for a given location, the regime slope depends on river evolution:

$$i_{reg} = i_{valley} \frac{l_{valley}}{l_{river}} = i_{valley} \Big/ ev \qquad [7]$$

Relation [7] indicate both the slope for a stable reach, and the adequate river length to attain this slope, for a given valley slope, considered an independent variable. The evolution coefficients show low values, meaning that mountains river would rather

make deposits in river bed (diagonal or transverse bars) than have a spectacular evolution. Depending on river evolution value, it is possible to predict river behavior in a given period of time.

Tabelul 1

Hydrometric data for stable reaches

	Reach river or brook	Z_{am} [m]	Z_{av} [m]	l_{valey} [km]	l_{river} [km]	i_{reg} (%)	Q_{bf} m^3/s	ev	c_{ev}
1	Moldoviţa (confl. Deia-confl Puşca)	567,0	555,0	2,94	3,20	0,37	171,4	0,09	1,09
2	Moldoviţa (up confl Dragoşa)	617,5	596,0	2,38	3,01	00,72	149,6	0,26	1,26
3	p. Dragoşa (up. confl Moldoviţa)	635,0	599,0	2,93	3,41	1,05	19,2	0,16	1,16
4	p.Sălătruc (up confl Moldova)	564,0	524,0	2,61	2,80	1,43	8,6	0,07	1,07
5	r Moldova (up Prisaca Dornei)	599,0	587,5	2,82	2,93	0,39	130,5	0,04	1,04
6	r Moldova (up C-lung Mold)	701,0	675,0	3,14	3,20	0,81	97,0	0,02	1,02
7	P Dobra (Vama, up confl Moldova	555,0	538,0	1,62	1,94	0,89	11,2	0,20	1,20
8	p. Frumoasa (up confl Moldoviţa)	682,5	595,0	3,85	4,24	2,06	18,5	0,11	1,11
9	p Hurghiş (up confl Moldova)	667,0	600,0	1,53	1,8	3,72	4,1	0,18	1,18
10	r Moldova (up Fundu Moldovei)	727,0	710,0	2,68	2,74	0,63	70,3	0,02	1,02
11	P Sadova (up confl cu Moldova)	701,0	671,0	1,87	1,88	1,58	34,0	0,01	1,01
12	p. Sadova (up Sadova village)	824,0	745,0	4,06	4,86	1,62	27,0	0,20	1,20
13	r. Moldova (up Botuş village)	859,0	790,0	5,07	7,02	0,99	68,2	0,38	1,38
14	r. Moldova (Colacu village)	801,0	770,0	3,17	3,43	0,90	75,5	0,08	1,08
15	Moldova (Breaza – confl r Negru)	831,0	800,0	2,05	2,40	1,30	51,6	0,17	1,17
16	r. Moldova (up. Breaza village)	878,0	835,0	3,78	4,68	0,92	28,1	0,24	1,24
17	r. Moldova (up confl Porcescu r.)	911,0	880,0	2,50	2,65	1,16	9,0	0,06	1,06
18	r. Moldova (down confl Timoi r.)	763,0	735,0	2,80	3,02	0,92	82,8	0,08	1,08
19	r. Moldova (up. confl Putna r.)	709,0	700,0	1,76	1,76	0,52	8,81	0,0	1,0
20	r Putna (up confl Moldova r.)	742,0	710,0	2,47	2,53	1,27	20,0	0,02	1,02
21	r Timoi (up confl Moldova r.)	820,0	740,0	1,93	1,95	4,10	6,2	0,01	1,01

Technical papers in river training quote examples of regime equation, mostly between bankfull discharge and cross section parameters. Bankfull discharge is best related to river bed width and bankfull cross section, which is in agreement with the diagram presented in fig. 1 (Hey, 1982).

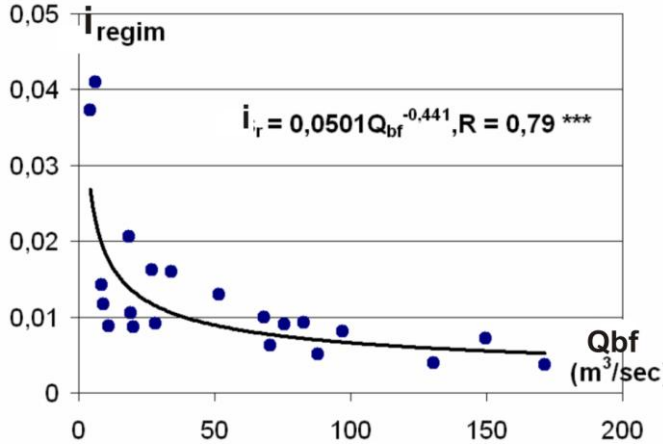


Fig. 5. Correlation between regime slope (i_r) and bankfull discharge (Qbf)

CONCLUSIONS

1. Aerial image series are useful to show channel river behavior in time.

2. The transition from valley slope to regime slope (equilibrium slope) can be made through river evolution, defined like a ratio between river length measured on channel axis and valley ax is.

3. The correlation coefficient *R* is significant (fig. 5), but the number of regime pairs slope – bankful discharge is rather small. For more pairs of data, R can decrease, but maintaining the trend described by [4].

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THE DETERMINATION OF TROPOSPHERIC REFRACTION CORRECTIONS FOR GPS MEASUREMENTS, PERFORMED ON THE AREA OF IAŞI COUNTY

DETERMINAREA CORECŢIILOR DATORATE REFRACŢIEI TROPOSFERICE LA MĂSURĂTORILE GPS EFECTUATE PE TERITORIUL JUDEŢULUI IAŞI

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Abstract. *This paper analyses the tropospheric effects on GPS signals and how tropospheric refraction varies depending on the atmospheric parameters, season and elevation angle. There will be presented the main mathematical formulas for the tropospheric refraction and will be determined how the elevation angle of the observations influences the measurements. There were determined also, as a case study, the corrections to be applied to GPS measurements, performed on the area of Iasi County, for different cadastre works.*
Key words: GPS, satellite, Geodesy, troposphere, ionoposhere, refraction

Rezumat. *Lucrarea de faţă analizeaza efectul troposferei asupra semnalului GPS, modul de variaţie a refracţiei troposferice în funcţie de regiunea geografică, de sezon, precum şi în funcţie de unghiul de oblicitate. Sunt prezentate expresiile pentru corecţiile ce trebuie aplicate observaţiilor GPS, astfel încât sa fie eliminate erorile datorate fenomenului de refracţie troposferică la măsurarea pseudodistanţelor. În ultima parte sunt determinate, pe un caz concret, corecţiile ce trebuie aplicate măsurătorilor GPS, efectuate pe teritoriul judeţului Iaşi, în cadrul lucrărilor de cadastru general.*
Cuvinte cheie: GPS, sateliţi, geodezie, troposferă, ionosferă, refracţie.

INTRODUCTION

The propagation of radio waves through the troposphere, is subject to the laws of physics. The signal path bents from the straight geometrical connection between the observer and the satellite, and as a result of tropospheric refraction, the optical distance measured is longer than the direct geometrical range.

The troposphere represents the lowest, gaseous part of the atmosphere situated between the surface of the Earth to about 40-50km. The propagation delay of the GPS signals through the troposphere depends on the water vapor content and on temperature. Hence, tropospheric refraction varies with geographic location and season.

MATERIAL AND METHOD

The troposphere can be defined as the gaseous part of the lower atmosphere where the weather takes place. Given the fact that charged particles are virtually

absent and the uncharged atoms and molecules are well mixed, the troposphere can practically be considered a neutral gas. Within the troposphere the temperature decreases with height by *6.5 °C/km* and varies horizontally with only a few *degrees/km*. Furthermore, because nearly 90% of the atmospheric mass is below 16 km altitude and nearly 99% below 30km (Lutgens, Tarbuck 1998), the index of refraction, which is slightly greater than 1 to begin with, decreases with increasing height and becomes nearly 1 at the upper limit of the troposphere, corresponding to the continuously decreasing density of the medium.

The index of refraction does not depend on the frequency of the signal; it depends on air pressure, temperature and water vapor pressure of the atmosphere. Because these three parameters vary so much and are so dynamic within the troposphere, it is very difficult to predict and/or model the index of refraction.

A direct measurement of the refractivity along the signal propagation path is then not feasible. Therefore various models for a description of the height-dependent behavior of the refractivity have been developed. Best results were obtained by Hopfield (1969), who has done the basic research in the field. Input parameters are mostly the meteorological surface data near the observation site.

According with the Helen Hopfield, the impact of the state of the troposphere on the propagation of waves $[\partial d_t]$, can be characterized by the following algorithm:

$$\partial dt = \partial d_d + \partial d_w = \frac{k_d}{\sin\sqrt{\left(E^2 + 6.25\right)}} + \frac{k_w}{\sin\sqrt{\left(E^2 + 6.25\right)}},$$

where $[k_d]$ and $[k_w]$ describe the total effect of the tropospheric refraction in the direction to the zenith, corresponding to the dry term and to the wet term, respectively, and [E] represents the elevation angle of the satellite the way it is seen by the observer, as illustrated in Fig.1.

The dry and the wet items, $[\partial d_d]$ and $[\partial d_w]$, are determined separately because their parameters are formulated as distinct functions of height:

$$k_d = 155.2 \cdot 10^{-7} \frac{P}{T} H_d; k_w = 155.2 \cdot 10^{-7} \frac{4810e}{T} H_w,$$

with [P], the air pressure in Hectopascal [HPa], [e], the partial pressure of the water vapor [HPa], and [T] representing the temperature in Kelvin. $[H_d]$ and $[H_w]$ are the effective altitudes of the dry and the wet terms respectively.

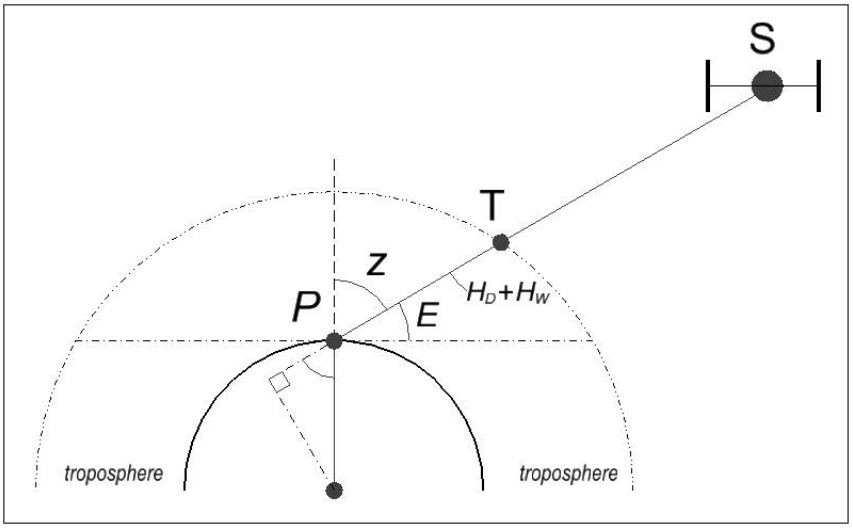

Fig.1. The tropospheric model

Generally, for $[H_w]$ a mean value is accepted $[H_w = 11000m]$, but the parameter $[H_d]$ was determined by Helen Hopfield empirically from globally distributed balloon data:

$$H_d = 40136 + 148.72(T - 273.16).$$

For elevations [E > 30°], Harold Black (1978) proposes the simple correction formulas:

$$\partial d_{trop} = (2.31 \cdot P + Q_w)\cos ecE,$$

where [P] is the air pressure in atmospheres [1atm = 1013.25HPa], and $[Q_w]$ is a regional empirical constant with values ranging for Romania from 0.06 during the winter to 0.28 for summer, as showed in Table 1.

The two expressions depending of [P] and $[Q_w]$, to which equation (4) could expand, correspond to the two layers of the troposphere, dry and wet, respectively:

$$\partial d_{trop} = 2.31 \cdot P \cos ecE + Q_w \cos ecE.$$

The global variation by region and season of the regional empiric constant that integrates the atmospheric conditions $[Q_w]$, determined according with the simplified Harold Black model, is presented in Table 1.

Table 1

The global variation of the regional empiric constant for Harold Black model

Region and Season	$[Q_w]$
Summer in tropical areas or mean latitudes	0.28
Spring or autumn in mean latitudes	0.20
Winter in maritime latitudes	0.12
Winter in continental mean latitudes	0.06
Polar regions	0.05

RESULTS AND DISCUSSIONS

Based on the models presented above, there were determined the values of the errors due to the tropospheric refraction, associated with a set of GPS observations made in the summer of 2008 and in the winter of 2009 for a series of cadastre works carried out in Iasi County area.

The atmospheric conditions corresponding to the two sessions of observations were recorded in table 2.

Table 2

The atmospheric parameters associated with the two observation sessions

Atmospheric parameters	Summer	Winter
Temperature [T]	25°C	-12ºC
Atmospheric pressure [P]	1002.25 HPa	1023.38 HPa
Partial water vapor pressure [e]	33.25 HPa	5.22 HPa

In table 3 there were also presented the actual dry altitudes, along with the dry and the wet parameters $[k_d]$ and $[k_w]$ that characterize the total effect of the tropospheric refraction in the direction to the zenith, determined with the equations (2) and (3), for both sessions of the GPS measurements.

Table 3

The dry altitude of the troposphere and the total tropospheric refraction influence to the zenith calculated based on the Hopfield model

Determined parameters		Summer	Winter
Dry altitude (H_d)		43854.0 m	38351.4 m
The total tropospheric refraction effect to the zenith	Dry term (k_d)	2.2891 m	2.3338 m
	Wet term (k_w)	0.3075 m	0.0629 m

The errors due to the tropospheric refraction, associated with the GPS observations made in the summer of 2008 and in the winter of 2009 in Iasi County

area, for the given atmospheric conditions, determined with the Hopfield algorithm were tabulated in Table 4.

Table 4

The errors due to the tropospheric refraction at GPS measurements in Iaşi County area [Hopfield model]

[E]		90°	60°	45°	30°	15°	10°	5°
$[\partial d_d]$ [m]	Summer	2.29	2.64	3.23	4.56	8.73	12.79	23.50
	Winter	2.33	2.69	3.30	4.65	8.90	13.04	23.96
$[\partial d_w]$ [m]	Summer	0.31	0.35	0.43	0.61	1.18	1.75	3.38
	Winter	0.06	0.07	0.09	0.13	0.24	0.36	0.69
$[\partial d_t]$ [m]	Summer	2.60	3.00	3.67	5.18	9.91	14.54	26.88
	Winter	2.40	2.77	3.39	4.78	9.14	13.40	24.65

The errors due to the tropospheric refraction, associated with the GPS observations made in the summer of 2008 and in the winter of 2009 in Iasi County area, determined with the simplified Black algorithm were tabulated in table 5.

Table 5

The errors due to the tropospheric refraction at GPS measurements in Iaşi County area [Black model]

[E]		90°	60°	45°	30°	15°	10°	5°
$[\partial d_d]$ [m]	Summer	2.29	2.64	3.24	4.58	8.84	13.18	26.26
	Winter	2.33	2.69	3.30	4.67	9.02	13.44	26.78
$[\partial d_w]$ [m]	Summer	0.28	0.32	0.40	0.56	1.08	1.61	3.21
	Winter	0.06	0.07	0.08	0.12	0.23	0.35	0.69
$[\partial d_t]$ [m]	Summer	2.57	2.97	3.63	5.14	9.93	14.79	29.48
	Winter	2.39	2.76	3.39	4.79	9.25	13.79	27.47

From the analysis of the values from tables 4 and 5, one can observe that the effect of tropospheric refraction increases with increasing zenith angle [Z] or, in other words, with decreasing the elevation angle [E]. For elevations [E < 5°] the errors at GPS observations due to the tropospheric refraction and hence the corrections that need to be applied to the measured ranges, easily exceed 20 m.

On the other hand, the portion of the wet term, which depends on the distribution of water vapor in the atmosphere and is therefore harder to model, reaches only around 10% of the total influence.

Moreover, the values in tables 4 and 5, show that the differences from summer to winter conditions between the total errors due to the tropospheric refraction in determining the pseudo-range at GPS signal propagation are also within 8-10% from one another. Same thing, when station distances are smaller

[<50km] and when the height differences are small (in non mountainous regions, as those in the Iaşi county area), the atmospheric conditions are sufficiently correlated with one another which means that the water vapor content of the air is almost identical horizontally.

CONCLUSIONS

The resulting range error, for GPS signals, because of the tropospheric refraction can vary from less than 3 m to more than 26 m.

The effect of tropospheric refraction increases severely for GPS observations at low elevation angles. It is hence advisable not to make observations for the satellites that are seen by the observer under 10-15° above the horizon. The differences from summer to winter conditions between the total errors due to the tropospheric refraction in determining the pseudo-range at GPS signal propagation are limited in size.

For a small network it is not advisable to introduce the observed meteorological data into the adjustment of the determinations separately for each station. If the stations are close together, the tropospheric residual error disappears almost completely by differencing in the relative observation mode.

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THE IMPACT OF U-650 AND VALTRA T-190 ROLLING SYSTEM ON SOIL

IMPACTUL SISTEMULUI DE RULARE ASUPRA SOLULUI PENTRU TRACTOARELE U-650 ŞI VALTRA T-190

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Abstract. *The paper establishes, based on the concepts and researches regarding the subject, the impact of agricultural tractors rolling system on soil compaction. Using these concepts, the tire-soil contact patch and the specific pressure are determined at the tire-ground interface level for the U-650 and the Valtra T-190 tractors. The present research aims to evaluate the influences of the tire type, tire pressure, soil type and agricultural soil characteristics.*
Key words: tractor tire, patch area, pressure on soil.

Rezumat. *În cadrul lucrării se determină, pe baza conceptelor dezvoltate în acest sens, impactul sistemului de rulare, din componenţa unor tractoare, asupra solului. Pe baza acestor concepte se determină mărimea petei de contact şi presiunea specifică, care se dezvoltă la nivelul zonei de interferenţă dintre sol şi anvelopele cu care sunt echipate tractoarele U-650 şi Valtra T-190. Cercetările efectuate au în vedere determinarea influenţei tipului de anvelopă, presiunii din anvelopă, categoriei de sol şi stării solului.*
Cuvinte cheie*:* roţi de tractor, suprafaţă de contact, presiunea pe sol.

INTRODUCTION

One of the most important characteristics of tractors is the pressure on the soil for each tire, which must not exceed 100 kPa. In order to evaluate the average tire pressure on the ground it is necessary to know the force (weight) acting on the tire-soil interface and the contact surface with the ground.

MATERIAL AND METHOD

Different mathematical models were used in this paper, established by different authors (researchers) in order to determine the tire contact patch area with the ground, for front and rear wheels of tractor U-650 and Valtra T-190 (table 1). The mathematical models presented by different authors to calculate the wheel - ground contact surface, are empirical, semi-empirical and theoretical. Theoretical models use different equations to calculate the geometric surface of the tire-soil contact patch, for example the known equations for determining the area of the circle, ellipse, square or rectangle. For empirical equation models, researchers use different empirical constants, obtained from a large number of experiments. Then, for each variant of the contact patch area equation, the average pressure exerted by the wheel with tire to the ground was evaluated, dividing the corresponding wheel weight (force) to the contact area.

Table1

Equations used to calculate the contact surface of wheel with soil

Equation no	Equation determined by:	Significance of formulas:
1	Komandi [6] $A = \frac{c \cdot W^{0,7} \cdot \sqrt{\frac{b}{d}}}{p_i^{0,45}}$, (m^2)	A - tire contact patch area with the ground , m^2 ; W - weight (force) of the wheel on the ground, kN; b - tire wheel width, m; d - exterior tire diameter, m; p_i - tire air pressure chamber, kPa; c - constant, depending on soil texture (0.30 ... 0.44, 0.31 was used); δ- the amount by which the radius decreases wheel tire, due to its weight (force), (m) ; r - unloaded wheel radius, which is down on the ground with a force equal to zero (m) ; r_1 - loaded wheel radius, being ground down by its own weight (force) (m) ; c_1 - a constant, depending on tire and soil characteristics (0.175 ... 0.270, 0.270 was used) ; h - the tire height section, m; G - indicate the pressure of the wheel ·on the floor, kPa; $h = 0,77 \cdot b^{0,89}$, $\delta = r - r_1$; b_c - width of the wheel contact patch with the ground, m; Lc - length of the wheel contact patch with soil, m ; z - wheel sinking into the ground or wheel traces depth, m ; r_b - transverse radius of the tire,m ; b_w - lugged tire tread width, m; k - empirical constant, depending on the characteristics of the tire (18 ... 33, used 33), k - empirical constant depending on the characteristics of the tire (0.40
2	Silversides and Sundberg [10] $A = \frac{0,90 \cdot W}{p_i}$, (m^2)	
3	Grecenko [4] $A = \pi \cdot \delta \cdot \sqrt{d \cdot b}$, (m^2), in which $\delta = r - r_1$	
4	Grecenko [4]: $A = c_1 \cdot d \cdot b$, (m^2)	
5	Krik [7] $A = 8 \cdot \delta \cdot h$, (m^2), in which $h = 0,77 \cdot b^{0,89}$, (m) established by Lyasko [8]	
6	Krik [7]: $A = 5,3 \cdot h^2 \cdot \delta \cdot \left(\frac{p_i}{W} \cdot d \cdot b \right)^{0,8}$, (m^2)	
7	Pillai and Fielding [9]; $A = 1,85 \cdot \delta^{\frac{2}{3}} \cdot b \cdot r^{\frac{1}{3}}$, (m^2)	
8	Godbole [3] $A = \pi \cdot \delta \cdot \sqrt{d \cdot h}$, (m^2), in which h = b, and $\delta = h \cdot 0,67 \cdot \left(\frac{p_i \cdot d \cdot b}{W} \right)^{-0,8}$, (m)	
9	Dwyer [1] $A = \frac{W}{G}$, (m^2), in which $G = \frac{W}{b \cdot d} \cdot \sqrt{\frac{h}{\delta}} \cdot \left(1 + \frac{b}{2 \cdot d} \right)$, (kPa),and $h=0,77.b^{0,89}$	
10	Ziani and Biarez [12] $A = \frac{\pi}{4} \cdot b_c \cdot l_c$, (m^2), in which $b_c = 2 \cdot \sqrt{z \cdot (2 \cdot r_b - z)}$, (m) $l_c = 2 \cdot \sqrt{z \cdot (2 \cdot r - z)}$,(m);z = 0,147r, and $r_b = \frac{b}{2}$	

11	Febo [2] $A = \frac{\pi}{4} \cdot b_c \cdot l_c$, ($m^2$), in which $b_c = b_w \cdot (1 - \exp^{-k \cdot \delta})$ (m); $l_c = 2 \cdot \sqrt{d} \cdot \delta^j$ (m); $\delta = r - r_1$, (m)	... 0.44, 0.41 was used).
12	Sohne [11] $A = 2 \cdot b \cdot \sqrt{d \cdot z}$, ($m^2$)	

RESULTS AND DISCUSSIONS

In order to calculate the wheel-soil contact surface and the average pressure exerted by it on the ground, the U-650 and Valtra T-190 tractors front and rear wheels features were used, as presented in table 2.

Table 2

Front and rear wheels features of tractor U-650 and Valtra T-190

Wheels features	U-650 Tractor		Tractor ValtraT-190	
	front wheel	***rear wheel***	***front wheel***	***rear wheel***
Exterior tire diameter , d (m)	0,850	1,600	1,400	1,800
Tire wheel width, b (m)	0,1651	0,3556	0,4293	0,5283
Unloaded wheel radius, r (m)	0,425	0,800	0,700	0,900
Loaded wheel radius, r_1 (m)	0,385	0,720	0,665	0,875
Lugged tire tread width, b_w (m)	0,145	0,320	0,410	0,500
Wheel weight, G (kN)	6,227	11,500	17,210	17,063
Tire air pressure chamber, p_i (kPa)	216	89	160	160

In each of the four categories of tire wheel (front wheel and rear wheel of Valtra T190 and U-650 tractors) the wheel-ground contact area and the average pressure exerted on the ground was calculated, for all 12 variants of the surface equation. The results are presented in tables 3 and 4.

The U-650 tractor front wheel

The wheel - ground contact surface varied depending upon the version of equation used for calculating from 0,0181 m^2 (variant 6) to 0,0761 m^2 (variant 12). For the variant 12, the contact surface is with 320.4% bigger than the variant 6 value (it is 4,2 times higher). It is estimated that the difference between the two extreme options (6 and 12) is too great.

The average pressure exerted by the wheel on the soil varied, depending on the version of the equation used to calculate the wheel contact area with the ground, between 81,835 kPa (variant 12) to 344,745 kPa (variant 6). For variant 6, the average ground pressure is with 321.3% bigger than the one in variant 12 (it is 4,21 times higher).

Table 3

Wheel contact surface with soil (m^2)

Equation number	U-650 Tractor		Valtra T-190 Tractor	
	front wheel	***rear wheel***	***front wheel***	***rear wheel***
1	0,0438	0,107	0,128	0,124
2	0,0259	0,116	0,096	0,096
3	0,0471	0,189	0,085	0,076
4	0,0379	0,153	0,162	0,256
5	0,0496	0,196	0,101	0,087
6	0,0181	0,13	0,096	0,145
7	0,0269	0,113	0,075	0,08
8	0,0367	0,172	0,176	0,188
9	0,065	0,261	0,161	0,198
10	0,0558	0,219	0,21	0,337
11	0,0411	0,209	0,132	0,13
12	0,0761	0,308	0,325	0,515
average	**0,043**	**0,181**	**0,145**	**0,186**

The average value of the 12 variants is 165,929 kPa. We believe that the difference between the two extreme options (12 and 6) is high. Regarding media variants, it exceeds with 65,929 kPa the 100 kPa maximum permissible pressure value of agro requirements.

Table 4

The wheel average pressure exerted on the ground [kPa]

Equation number	U-650 Tractor		Valtra T-190 Tractor	
	front wheel	***rear wheel***	***front wheel***	***rear wheel***
1	142,318	107,313	134,248	136,868
2	240	98,888	177,777	177,777
3	132,344	60,692	201,994	222,899
4	164,342	74,86	106,054	66,456
5	125,557	58,569	169,424	195,51
6	344,745	88,027	177,974	117,478
7	231,278	101,245	227,552	210,965
8	169,752	66,712	97,353	90,629
9	95,825	43,98	106,324	85,966
10	111,656	52,431	81,86	50,542
11	151,507	54,887	130,41	130,869
12	81,835	37,277	52,81	33,092
average	**165,929**	**70,406**	**138,648**	**126,587**

The U-650 tractor rear wheel

The contact surface of the wheel with the ground varied from 0.1070 m^2 (variant 1) to 0.3080 m^2 (variant 12). In version 12, the contact surface is with 188% bigger than the one of variant 1 (it is 2.88 times higher). It can be said that the difference between the two extreme options (1 and 12) is quite large.

The wheel average pressure exerted on the ground has different values, ranging from 37,277 kPa (variant 12) to 107,313 kPa (variant 1). For variant 1, the average ground pressure is with 187,9% bigger than the pressure of variant 12 (is 2,879 times greater). The average of all 12 variants is 70,406 kPa. It appears that the difference between the two extreme options (12 and 1) is quite large. It should be pointed out that the average of the 12 variants is less than the maximum admissible of 100 kPa. Comparing the average values, leads to the conclusion that the rear wheels of the tractor U-650 average ground pressure is much lower than the front wheels value (70,406 kPa to 165,929 kPa).

Front wheel of Valtra T-190 tractor

Contact surface of the wheel with the ground ranged from 0,0750 m^2 (variant 7) to 0,3250 m^2 (variant 12). The contact surface for variant 12 is with 333.3% bigger than the variant 7 one (it is 4.33 times higher). The difference between those two extreme options (7 and12) is significant. The average pressure exerted by the wheel on the ground varied from 52,810 kPa (version 12) to 227,552 kPa (variant 7). For variant 7, the average ground pressure is with 330,9 % bigger than the pressure of variant 12 (is 4,309 times greater). The average of the 12 variants is 138,648 kPa. It is estimated that the difference between the two extreme options (12 and 7) is high. It should be noted that the average of 12 variants exceeds the maximum admissible (100 kPa) with 38,648 kPa. It is worth mentioning that the average ground pressure Valtra T-190 tractor front wheels, is lower than the one recorded for the U-650 tractor (the variants average is 138,648 kPa compared with 165,929 kPa).

Rear wheel of the Valtra T-190 tractor

Tire-soil contact patch ranged from 0,0760 m^2 (variant 3) to 0,515 m^2 (variant 12). In variant 12, the contact surface is with 577,6 % bigger than the one of variant 3 (it is 6,776 times higher). We believe that the difference between the two extreme options (3 and 12) is very high. The average pressure exerted by the wheel on soil had different values ranging from 33,092 kPa (variant 12) to 222,899 kPa (variant 3). For variant 3 the average ground pressure is with 573,6 % bigger than the pressure of variant 12 (is 6,736 times greater). The average value of the 12 variants is 126,587 kPa. It can be said that the average ground pressure difference between the two extreme options (3 and 12) is very high. Regarding the 12 variants average, it exceeds the maximum admissible (100 kPa) with 26 587 kPa Comparing the variants average, it is noted that the rear wheels of the Valtra T-190 tractor average ground pressure is lower than the front wheels (rear = 126,587 kPa and front =138,648 kPa). The comparison of the average values of the variants reveals that the rear wheels average ground pressure is much higher for Valtra T-190 tractor than for U-650 tractor (126,587 kPa, respectively 70,406 kPa).

CONCLUSIONS

It was found that, both the contact patch wheel - ground surface and the average pressure of the wheel on the ground, have remarkable differences between extreme variants: differences large enough for U-650 tractor rear wheels, great differences for front wheels of the two types of tractors and very large differences for rear wheels of the

Valtra T-190 tractor. This is the reason why for the interpretation of results it were taken into account the average values of the variants.

The best results in terms of average pressure of the wheel on the ground were obtained for the rear wheels of U-650 tractor, where the average of 12 variants (70,406 kPa) is less than the imposed limit of 100 kPa.

Regarding the rear wheels of the Valtra T-190 tractor, the average wheel ground pressure was 126,587 kPa, exceeding the imposed limit by agro-technical requirements.

For the front wheels of the Valtra T-190 tractor, average wheel ground pressure is 138.648 kPa (variants average value), exceeding the 100 kPa limit imposed even more.

For the front wheels of the tractor U-650 the average wheel ground pressure is higher, 165.929 kPa (mean variants). In this case, it exceeds the maximum limit imposed by 66 kPa.

Therefore the average pressure on the ground must be reduced, primarily for the front wheels of the U-650 tractor, but also for front and rear wheels of the tractor Valtra T-190, in order not to exceed the maximum limit of 100 kPa. One solution is to decrease the tractor's front wheels axle or rear wheel axle weights. Another solution, easier to apply, is to increase the diameter of the wheels. We believe that the most easily applied solution can be the increasing of tire wheel width.

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RESEARCH ABOUT PRODUCTION QUALITY AT MAIZE FODDER IN TWO DIFFERENT LOVE-STOCK FARMS NEARLY IASI AREA

STUDII ASUPRA CALITĂŢII PRODUCŢIEI DE PORUMB FURAJER ÎN DOUĂ LOCAŢII AGRO-ZOOTEHNICE DIFERITE DIN ZONA LIMITROFĂ IAŞULUI

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Abstract *The food necessity of animals is realized through fodders plants, wich from this point of wiew are considerd defining. The nutritive value of fodder is given of many and various factors, especially by conditions of obtain and cultivation, the vegetation level at maturity, hybrid, specieses, preserve conditions, and so on. Paper presents the variation of some quality fodder characteristics, in two live-stock farms near Iasi, knowing that the agricultural technology used during vegetation, are determined in a considerable way, theier chemical composition.*
Key words: product quality, nutritional value

Abstract *Satisfacerea cerintelor nutritive a animalelor se realizeaza prin furaje, care din acest punct de vedere sunt considerate definitorii. Valoarea nutritiva a furajelor este influentata de numerosi si variati factori, respectiv de condiţiile de obtinere – cultivare, stadiul de vegetatie la recoltare, hibridul, soiul, conditiile de conservare etc. Lucrarea prezinta variatia unor indici de calitate* a f*urajelor, in doua unitati de crestere a animalelor din judetul Iasi, stiut fiind faptul ca tehnologiile de cultură utilizate în perioada de vegetaţie, influenţează într-o manieră semnificativă compoziţia chimică a acestora.*
Cuvinte cheie: calitatea productiei , valoare nutritiva

INTRODUCTION

A normal animal nutrition can be ensured by addressing nutritional requirements, respectively using balanced rations, adapted to the peculiarities of digestive and as economically as possible. In this direction using a set of rules allowed for providing the nutritional requirements for maintenance and production.

Satisfying the nutritional requirements of animal feed is done, which in this view are considered definitive. The nutritional value of feed is influenced by many and varied factors, including conditions for obtaining – cultivation, state of vegetation at harvest, hybrid, variety, storage conditions. From this perspective, food standards and requirements are relative and chemical composition and nutritive value of fodder varies, depending on their nature and by the species or category of animals that use them.

Nutrients as fodder quality factors, provides information to assess their nutritional value, the research being undertaken in a large study conducted over two years, in two different locations, which concerned an entire trophic chain soil-plant-animal.

MATERIAL AND METHOD

From perimeter of Research and Development Station for Cattle-Dancu-Iasi and one in the SC Daniela LLC Raducaneni-Iasi, both units specialize in livestock feed in their bases, during the years 2007 and 2008 after methodologies in force,(Davidescu,1972) were identified and were harvested from field samples that average whole plant corn silage, properly defined and analytical units as standard methodologies. Also, from the feeds used in animal nutrition medium samples were harvested corn silage and corn grain.

Samples collected for analysis were prepared and subjected to further stages of analysis, being recorded in a first phase, degree of contamination, moisture and weight.

Analyses were performed:

- Determination of dry matter (SU,%)
- Determination of ash (%) by dry digestion
- Determination of total nitrogen (Nt,%), Kjeldahl method
- Determination of crude protein (PB,%)
- Determination of nitrate nitrogen (NO3-N, ppm) colorimetric method with acid fenoldisulfonic
- Determination of total phosphorus (Pt,%) colorimetric method with ammonium molibdad
- Determination of crude fiber (CB,%), method-Kürschner Schasser
- Determination of calcium (Ca,%), flame photometry method

RESULTS AND DISCUSSIONS

Plant material analysis results for the two locations are presented in tables 1 and 2.

Table 1

Results analysis of plant material - Farm Dancu

Nr crt	Proba furaj	SU %	ash %	Nt %	PB %	$N\text{-}NO_3$ ppm	CB %	P %	Ca %
1	green corn silage I	16,6	1,2	2,00	12,50	1732,5	16,29	0,030	0,065
2	green corn silage II	17,5	1,5	2,27	14,18	1017,5	17,32	0,020	0,046
3	corn silage prepared	26,9	1,7	1,29	8,06	1100,0	23,00	0,050	0,200
4	maize	85,0	1,2	8,50	53,12	990	1,95	0,383	2,03

Table 2

Results analysis of plant material - Farm Raducaneni

Nr crt	Proba furaj	SU %	ash %	Nt %	PB %	$N\text{-}NO_3$ ppm	CB %	P %	Ca %
1	green corn silage I	15,5	1,8	2,32	14,50	770	22,01	0,031	0,042
2	green corn silage II	16,4	1,1	2,00	12,25	495	24,28	0,034	0,053
3	green corn silage 2008	24,5	1,5	1,57	9,81	1100	18,66	0,05	0,12

Compared to these data, the values recorded in samples of corn silage Green I and II - Dancu - are 1.2% and 1.5% ash, 12.50 and 14.18% PB and 16.29, respectively 17.32% CB and for the green corn silage I and II Raducaneni values of 1,8% and 1,1% ash, 14,50% , respectively 14,37% for PB and 22,01% and 21, 28% CB, with quotes in some normal limits for ash and below the reference to PB and CB

Total N content in corn varies in the same samples, recording approximately equal values for both locations of 2.00 and 2.27% samples Dancu I and Dancu II, wich the fraction of nitrate is 1732.5 and 1017.5 respectively ppm N-NO3 and 2,32 and 2,00% total N, samples Raducaneni I and Raducaneni II, wich nitrate nitrogen is 770 ppm, respectively 495 ppm N-NO3. Total nitrogen content for both locations are included in the normal range (2-4% total nitrogen)(Davidescu,1999) and for nitrate registering a content medium.

Total phosphate content was 0.030% and 0.020% for samples of corn silage Green I and II - Dancu, and 0.031% and 0.034% and 0.031% and 0.034% for corn silage samples Raducaneni Green I and II, slightly below normal insurance quoted in the literature (0.04% Pt), while the total calcium content posted under normal values (0.086% Ca) for both locations, 0.065% and 0.046% respectively in samples of corn Dancu I and Dancu II , and 0.042% and 0.053% as the evidence Raducaneni I and Raducaneni II.

Maize sample of registered working point values Dancu ash content of 1.2%, slightly lower than the values quoted in the literature (1.8%). In PB and CB content was 53.12% and 1.95%. Maize grains analysis showed a total nitrogen content of 8.50%, the nitrate content was 999 ppm and containing a total phosphorus 0,383% and calcium 2.03%.

For both locations, the samples prepared corn silage Dancu and corn silage 2008 Raducaneni, values were recorded in ash of 1.7% respectively 1,5%, considered slightly suboptimal (optimal 1,8-1,9%)(Davidescu,1999). PB indicators and CB rates were 8.06% and 23.0% for Dancu and 9.81% and 18.66% for Raducaneni, values considered normal for PB to Dancu and under optimum limit to Raducaneni (best quote of the literature, 22-23%). Values

for total nitrogen were 1.29% for Dancu, in which nitrates were 1100 ppm and 1.57% for Raducaneni, wich nitrates 1100 ppm. For total phosphorus and calcium indicators, for location Dancu values were determined of 0,005%, respectively 0,200% while for Raducaneni, for phosphorus was recorded value of 0.05% P and 0.12% for calcium

CONCLUSIONS

1. Following the evolution of quality productions from plants, feed implicitly allows differential routing of fertilizers, in order to obtain higher yields quantitative and qualitative.

2. It appreciates the need for optimal nutrition and fertilization with macro and micronutrients, to eliminate states of insufficient or excess, by favoring the normal dynamics of nutrient accumulation and dry.

3. For both sites , Dancu and Raducaneni farm, feed samples taken, have been normal, insignificant up or down for most determine indicators , properly accepted limits for the species studied.

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RESEARCH ABOUT SOME QUALITATIVE CHARACTERISTICS OF FODDER PRODUCTION WITH SIGNIFICANCE, IN TWO LIVE-STOCK FARMS FROM IASI REGION

CERCETĂRI ASUPRA UNOR INDICI CALITATIVI AI PRODUCŢIEI FURAJERE CU IMPORTANŢĂ ÎN NUTRIŢIA ANIMALIERĂ, ÎN DOUĂ UNITĂŢI DE PROFIL ZOOTEHNIC DIN JUDEŢUL IAŞI

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Abstract. *Paper makes the subject of study somes qualitative and reference indicatories for many fodder plants , the quality of thees plants beeng certainty and striking changed by fertilizers, by the trataments against plant's illness and insects ans in same way by the fertility of soils. Study was drown up in two some live-stock farms in Iasi area, wich are produceiung fodder base by their own forces.*

Key words: nutrition, foliar diagnosis, quality indices

Rezumat. *Lucrarea face obiectul studiului unor indici calitativi de referinta pentru o serie de specii furajere , calitatea furajelor fiind in mod cert si pregnant influentata de ingrasamintele utilizate , de tratamentele fitosanitare aplicate dar si de starea de fertilitate a solurilor . Studiul a fost intocmit in doua unitati de profil agro-zootehnic din judetul Iasi, care isi produc prin forte proprii baza furajera .*

Cuvinte cheie: nutritie, diagnostic foliar, indici de calitate

INTRODUCTION

Alfalfa, bean family plant, has a high resistance to drought, has the ability to grow in symbiosis with nitrogen-binding bacteria and is characterized by high nutritional value. Compared with grass, contains more protein, more Ca, Mg and S and less Mn and Zn, representing an important source of vitamins E, K, C, B - and xanthophylls pigments.

Lucerne is the most productive plant protein, the highest proportion of protein being recorded before bud, being the most widely used legume, both fresh and as a fan, in all types of animal feed. Generally, alfalfa hay is used in the calves, providing up to 40% of the energy requirements and over 50% of the herbivorous animal protein.

In the alfalfa fodder nutrient content is high and varies widely, depending on stage of vegetation

MATERIAL AND METHOD

Chemical analysis of plant serves to monitor different fertilization practices and to establish recommendations for fertilization, in conjunction with the analysis of soil

samples from the same location prelevete, with climatic conditions, plant health and culture targeting information, directly with technology applied.

The research took place over two years, 2007 and 2008, the Research and Development Station for Cattle-Dancu-Iasi and S.C.Daniela S.R.L Raducaneni-Iasi, both units specialize in breeding, with their forage base. After methodologies in force, have been identified and samples collected from the field average of entire plants, respectively that green alfalfa, alfalfa and sew a 3, alfalfa hay and from the fodder samples were taken from alfalfa hay bales.

Samples collected for analysis were prepared and subjected to further stages of analysis, being recorded in a first phase, the degree of contamination, their moisture and weight.

Analyses were performed:

- Determination of ash (%) by dry digestion by
- Determination of total nitrogen (N t,%), Kjeldahl method
- Determination of crude protein (PB,%)
- Determination of crude fiber (CB,%), method-Kürschner Schasser

RESULTS AND DISCUSSIONS

Plant material analysis results for the two locations are presented in figures 1,2,3 and 4

For location Dancu, green alfalfa simples 1-st and 3-rd scyte, the values of ash were determined by 1.9%, respectively 2.6% (fig. 1), 0.4% below the normal range and 0,3 % above normal values (2.3% ash).

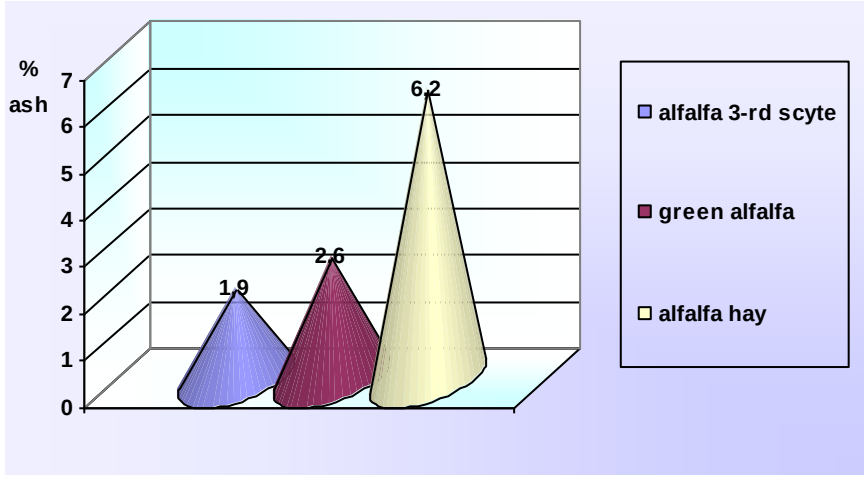

Fig. 1. Ash content (%) of samples of feed - farm Dancu

For the same samples Dancu, crude protein and crude fiber (PB and CB) had levels of 12.87%, respectively 13,21 % for alfalfa scythe 3-rd and 19,93 %, respectively 10,80 % for green alfalfa (fig. 2), content values are close to normal PB cited in the literature (16,5%) (Volf,2008)and under optimal for CB (18.0 to 20.0%).

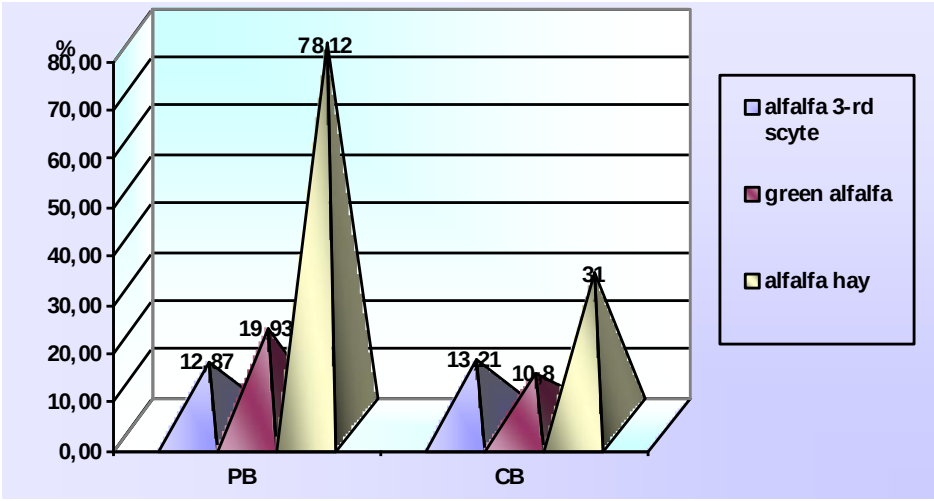

Fig. 2. PB and CB content in the samples of feed - farm Dancu

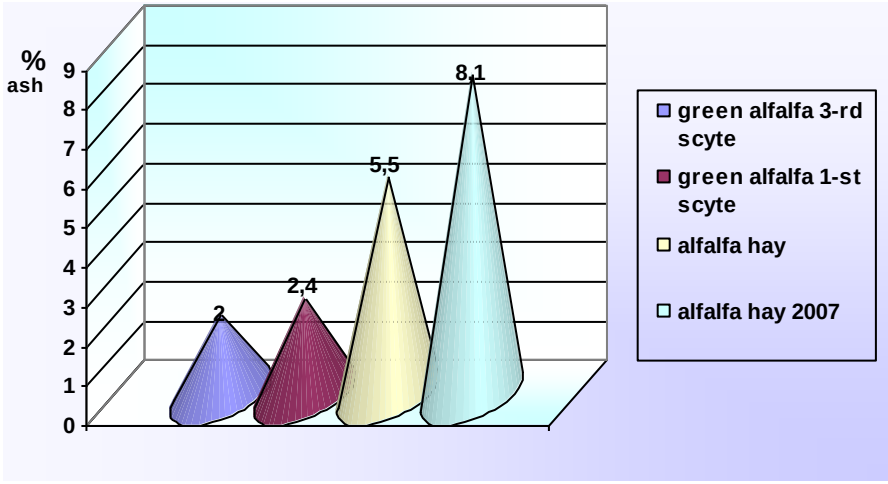

Fig. 3 Ash content of feed samples - farm Raducaneni

In samples of green alfalfa, first and third scythe Raducaneni, ash content had values of 2.4% and 2.0% (fig. 2), considered optimal levels (Bilteanu,1979), while crude protein and crude fiber values recorded 17.68%, respectively 14,4 % for first scyte,and normal values for PB and below normal for CB for third scyte (fig. 4)

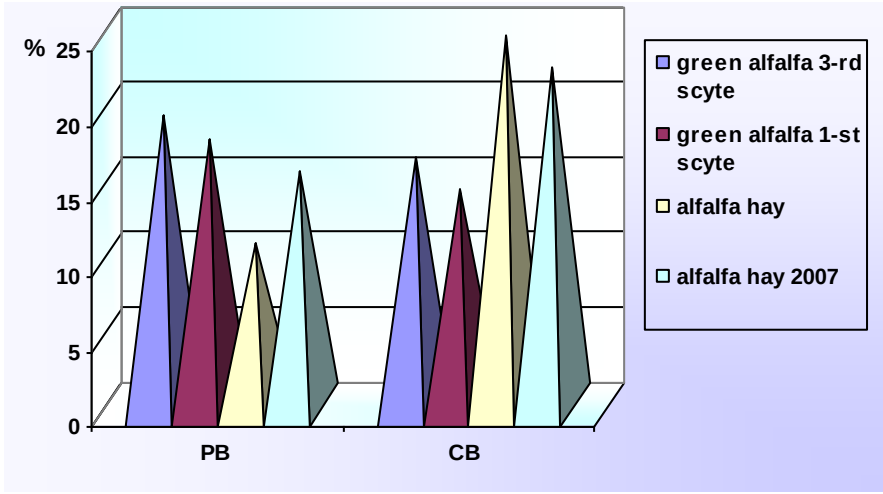

Fig. 4. PB and CB content in the samples of feed - farm Raducaneni

Alfalfa hay samples from farm Dancu and Raducaneni, register values to ashes of 9,3 (fig. 1), 5,5 and 8,1 % (fig. 3). For the same samples the content in PB and CB was within limits of 43,12% PB and 30,50 CB (fig. 2) respectevly 10,8% and 15,56% for PB and 22,53, respectively 22,40 for CB (fig. 4), values considered normal in specialized literatura, respectively easy under optimal

CONCLUSIONS

1. Forecast likely changes in nutritional status negatively (deficiencies, excesses, imbalances), by diagnosis foliar, allows the review and adaptation of system integrated nutrient in time and on fenofaze, for proper management of fodder in the soil-plant system

2. High soil fertility status associated with fertilization, especially those with nitrogen and potassium, a fund of phosphorus, significant effect on quality of production, namely the amount of protein per unit area.

3. The two indicators of quality of forage production, crude protein and cellulose, is positively correlated and have for both locations taken into study, optimum, suboptimal and easy above optimum values, possible mainly due to mild metabolic dysfunction, the quality feed remaining same **.**

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PEDO-BIOLOGICAL STUDIES ON SOIL QUALITY

STUDII PEDO-BIOLOGICE ASUPRA CALITĂŢII RESURSELOR DE SOL

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Abstract. *The researches were conducted on three subtypes of preluvosols (Luvisols Class), under four flower associations from Dobrovăţ forestry ecosystem. We analyzed the biotic physiological (soil respiration and cellulosoliysae), enzymatic potentials (catalase, invertase, urease and total phosphatase) and, also, the biological and synthetically indicators of soil fertility and quality (Indicator of Vital Activity Potential-IVAP%, Indicator of Enzymatic Activity Potential-IEAP% and Biological Synthetic Indicator-BSI %). The soil samples were collected on 0-40 cm and 20-40 cm depth. The analyze of the pedo-biological indicators pointed out low values on 0-40 cm, because the biological activity is stressed and restricted by the ecological factors and determinants of the zonal and regional specific, like the fine texture, hard sooil consistency in the summer season, the low level of the aerohidric regime, especially in the summer season excesively droughty. The level of the biological potential, biotic and enzymatic is until 50% lower on the 20-40 cm depth.*

Key words: ecological specific, forestry ecosystem, pedo-biological indicators, soil fertility, soil quality

Rezumat. *Cercetările s-au desfăşurat în ecosistemul forestier Dobrovăţ în 4 asociaţii floristice dezvoltate pe 3 subtipuri de preluvosol (clasa Luvisoluri). S-au analizat potenţialele fiziologice vitale (respiraţia şi celulozoliza) şi enzimatice (catalazic, zaharazic, ureazic şi fosfatazic total) precum şi indicatorii biologici sintetici de fertilitate şi calitate a solului (Indicatorul Potenţialului Vital, Indicatorul Potenţialului Enzimatic şi Indicatorul Sintetic Biologic). Analiza indicatorilor pedobiologici pe adâcimea 0-40 cm evidenţiază valori scăzute întrucât activitatea biologică este stresată şi limitată, mai ales în sezonul estival excesiv de secetos, de factorii şi determinanţii ecologici de specific zonal şi local, cum ar fi textura fină, consistenţa estivală dură, porozitatea de aeraţie scăzută. Pe adâncimea 20-40 cm, nivelul potenţialului biologic vital şi enzimatic înregistrează valori cu până la 50% mai scăzute.*

Cuvinte cheie: specific ecologic, ecosistem forestier, fertilitate, indicatori pedobiologici, calitatea solului

In the existing conditions, the soil represents an important and strategic resource for the survival of humanity. After Cârstea (2003), Mausbach and Seybold (1998), Montanarella (2006), Marmo (2006), the attention referring to protection, improvement of soil quality and the rehabilitation of degraded lands must be an essential importance in the environmental politics, at regional, national and global scale. The soil, the crucial element in the functioning of the biosphere (Rubio, 2008) is an essential constituent of terrestrial

ecosystems, but not only this one, as is any vegetation, climate, or other environmental factor considered separately, represents the factor which may be assigned ecosystem capacity to produce biomass, only the whole complex of factors and environmental conditions, in the reciprocal interaction of whole components of the environment (Moise *et al*., 2006; Bireescu *et al.*, 2008). Biological potential of soil resources characterizes the fertility condition of them and reflects the ecological vocation of soil microflora, highlighting the impact of local environmental factors, and various pollutants and stressed anthropogenic factors or others (Ştefanic *et al*., 2006; Bireescu *et al.*, 2007, 2008; Januszek, 1999). The ecological interpretation of the soil defines, from the quantitative and qualitative point of view, two important and realistic characteristics of its: trofic potential and ecological specific where the soil can completely or restricting, seasonal and local manifest (Chiriţă, 1974; Bireescu *et al.*, 2009).

MATERIAL AND METHOD

Ecopedological researches were conducted during vegetative growth phase in the summer season of 2009 year, on soil resources, both, field stationary method and laboratory, on soil samples collected from representative profiles belonging to the forestry ecosystem Dobrovăţ, Iaşi. The four studied floristic stationary are: floristic association *Polygonatum multiflorum*; floristic association *Polygonatum latifolia*; floristic association *Poygonatum officinale* and floristic association *Allium ursium*. Genetic soil types corresponding the four studied floristic stationary, belong to Luvisols class (SRTS, 2003; WRB 2006) and they are: Stagnic Luvisol in the floristic association *Polygonatum multiflorum*; Haplic Luvisol in the floristic associations *Poygonatum latifolia* and *Allium ursium* and Vertic Luvisol in the floristic association *Polygonatum officinale*.

They were analyzed the main characteristics of biotope, in the ecological specific, regional and local, by the study of soil profiles, of genetic horizons, both, field and laboratory, and the ecological specificity file of the forestry ecosystem Dobrovăţ, Iaşi. Referring to the characterization of the efective trophicity of soil resources from studied research stationaries of forestry ecosystem Dobrovăţ Iaşi, we analyzed the main 10 pedo-bio-ecological factors and determinants and we we appreciated their value depending on absolute values determined by the field and laboratory analyses. In this way we gave the Sinthetic Indicator of the Eco-Pedological Diagnosis of Efective Trophicity of Soil Resources (EPDETSR).

The main 10 studied pedo-bio-ecological factors and determinants are: 3 physico-mechanical determinants (soil texture-Tx, air porosity-AP and hard soil consistency in the summer season-Con); 1 pedo-biological determinant (Biological Sinthetic Indicator-BSI); 3 ecological growth factors (total nitrogen content-Nt; available phosphorus content-P_{AL} and exchangeable potassium content-K_{AL}); 3 eco-pedo-chemical determinants (soil reaction-pH_{H2O}; soil organic matter content-SOM and base saturation-BS). These were assigned in 6 ecological size classes marked with grades from 0 ... 10 points.

The Eco-Pedological Diagnosis of Efective Trophicity of Soil Resources (EPDETSR-points), like general ecologic and synthetic indicator of the background of soil quality, is obtained by sum of the score of each of 10 quality analyzed indicators:

$$\text{EPDT} = \sum_{1}^{10}(Tx + AP + Con + BSI + pH + SOM + BS + Nt + P_{AL} + K_{AL})$$

the 10 main pedo-ecological factors and determinants that compose this formula being above-mentioned.

With a view to comparing of the resulted values we gave an assessment scale, with 5 levels: less than 20 points – low effective trophicity, oligo-trophic soil; 21-40 points – than medium effective trophicity, oligo-mezotrophic soil; 41-60 points – medium effective trophicity, mezotrophic soil; 61-80 points – good effective trophicity, eutrophic soil; 81-100 points – very good effective trophicity, mega-trophic soil.

RESULTS AND DISCUSSIONS

Many scientists (Larson *et al*., 1994; Karlen *et al*. 1996, 1997) considers the soil quality just soil capacity to function. Cârstea (2001) formulates a more comprehensive definition for soil quality. According to this definition, the soil quality represents the combination of the soil properties which enabling it to preserve, long-term, whole its natural functions, considering this property the result of soil structural multifunctionality. Also, the author consider that, the definition of soil quality should be linked to the use of current, effective and any potential future use. Although the term of soil quality is relatively new, for the assessment of soil quality, from the quantitative point of view, required the characterization of physical, chemical and biological soil properties, corroborated to the regional and local elements of ecological specific (Carter, 2002; Grand, 2002; Barrios *et al*., 2006). Thus, in the synthesis of the eco-pedological and pedo-biological researches, we pointed out the matrix of eco-pedological diagnose of the effective trophicity for the soil resources from the forestry ecosystem Dobrovăţ, Iaşi, within four floristic stationary studied during the summer season 2009 (table 1 and figure 1).

The analysis of the quantitative values of the 10 main ecological factors and determinants (soil texture, hard soil consistency in the summer season, soil reaction, base saturation, soil organic matter content, nutrient content, air porosity and Biological Synthetic Indicator) highlights the qualities, lacks and excesses of soil resources, which can be used of biocoenosis installed within the forestry ecosystem Dobrovăţ Iaşi, according to the ecological specific. Thus, the value of eco-pedological diagnosis of effective trophicity for the soil resources (EPDETSR) resulted by the sum of the scores of quantitative levels of the 10 analyzed ecological factors and determinants (table 1). The values of this synthetic and integrator indicator of the trophicity and fertility of the biotope have light variations depending on the floristic analized stationary, during the summer season 2009. In the case of stagnic luvisol within floristic association *Polygonatum multiflorum*, the value of score for eco-pedological diagnose of the effective trophicity for the soil resources is 58 points, characterizing a mezotrophic background with a medium value of assessment for herbaceous vegetation (figure 1). In the case of haplic luvisol within floristic association *Polygonatum latifolia*, the value of score for eco-pedological diagnose of the effective trophicity for the soil resources is 64 points, characterizing an eutrophic background with a good value of assessment for herbaceous vegetation.

This value represents the best score in case of the forestry ecosystem Dobrovăţ, during summer season 2009. In the case of vertic luvisol within floristic association *Polygonatum officinale*, the value of score for eco-pedological diagnose of the effective trophicity for the soil resources is 62 points, characterizing an eutrophic background with a good value of assessment for herbaceous vegetation. In the case of haplic luvisol within floristic association *Allium ursium*, the value of score for eco-pedological diagnose of the effective trophicity for the soil resources is 56 points, characterizing a mezotrophic background with a medium value of assessment for herbaceous vegetation.

Table 1

The matrix of the eco-pedological diagnosis of effective trophicity of the soil, Dobrovăţ, Iaşi, 2009

Indicators	Grades	Dobrovăţ forestry ecosystem			
		Polygonatum multiflorum	***Polygonatum latifolia***	***Polygonatum officinale***	***Allium ursium***
Soil texture	value	32,8	33,3	34,5	33,7
	class	V	V	IV	IV
	score	8	8	6	6
Hard soil consistency	value	moderately cohesive	moderately cohesive	moderately cohesive	moderately cohesive
	class	V	V	V	V
	score	8	8	8	8
Soil reaction (pH_{H2O})	value	5,58	6,23	6,51	5,38
	class	IV	V	V	IV
	score	6	8	8	6
Base saturation (%)	value	85	81	80	88
	class	V	V	V	V
	score	8	8	8	8
Soil organic matter (%)	value	3,041	3,342	3,164	2,943
	class	III	IV	IV	III
	score	4	6	6	4
Total nitrogen content (%)	value	0,148	0,162	0,155	0,141
	class	III	IV	IV	III
	score	4	6	6	4
Available phosphorus (ppm)	value	20	28	24	25
	class	IV	IV	IV	IV
	score	6	6	6	6
Exchangeable potassium (ppm)	value	142	158	170	161
	class	IV	IV	IV	IV
	score	6	6	6	6
Air porosity (%)	value	13	14	11	10
	class	III	III	III	III
	score	4	4	4	4
Biological Sinthetic Indicator(BSI%)	value	16,73	15,10	14,89	12,28
	class	III	III	III	III
	score	4	4	4	4
Genetic type of soil		stagnic luvisol	haplic luvisol	vertic luvisol	haplic luvisol
EcoPedological Diagnosis of Efective Trophicity of Soil Resources (EPDETSR points)	score	58	64	62	56
	estimate	mezotrophic medium	eutrophic good	eutrophic good	mezotrophic medium

Knowing the pedo-ecological background of the area can help us to understand local ecosystem functioning and enable to consider the best possible way to implement sustainable land use and soil resource conservation (Reintam *et al.* 2001; Kõlli *et al.* 2008; Bireescu *et al.* 2009). Thus, both in case of haplic luvisol within floristic association *Allium ursium* and for stagnic luvisol within floristic association *Polygonatum multiflorum* we can conclude that, although the natural soil resources have some favorable chemical properties (weak acid to moderate acid soil reaction, middle content of soil organic matter, nutrients and base), however the

main physico-mechanical properties of the soil are restrictive and limitative for effective trophicity, having direct negative effects on the structure and functionality of these biocenosis.

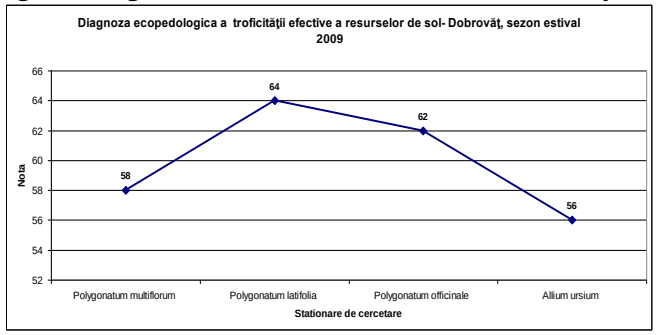

Fig. 1. Eco-pedological diagnosis of soil resources, Dobrovăţ, Iaşi, summer season, 2009

Also, the restrictive and limitative conditions, caused mainly by the local and regional ecological context (summer season excessive droughty during a long time, fine texture, low level of air porosity) cannot allow the development of normal activities of the edaphic microflora. This characteristic is point out by the low values of the sinthetic pedo-biological indicators of soil resources, the biological activity being correlated with the physical and chemical properties of the soil, soil organic matter content and the mechanism of action of enzymes (Winding *et al.,* 2005). In this way, the analysis of these pedo-biological indicators of soil quality and fertility (Indicator of Vital Activity Potential-IVAP%, Indicator of Enzimatic Activity Potential-IEAP% and Biological Synthetic Indicator-BSI%) highlights the medium quality of the trophic background of soil resources just in the first 20 cm in case of forestry ecosystem Dobrovăţ Iaşi, during the summer season 2009.

CONCLUSIONS

1 The most pedo-ecological factors and determinants are included into the middle ecological size classes and ecological favorability, from the quantitative and qualitative point of view, according to ecological specificity file. We pointed out some ecological climatic, edaphic and physico-mechanical factors and determinants, like stressed and limitative, by lack or excess: excessive and prolonged summer drought, fine soil texture, hard soil consistency in the summer season excessive droughty and the low level of air porosity.

2. Although the natural soil resources have some chemical favourable properties (weak acid to moderate acid soil reaction, middle content of soil organic matter, nutrients and base) however the main physico-mechanical properties of the soil are restrictive and limitative for effective trophicity, having direct negative effects on the structure and functionality of these biocenosis.

3. The analysis of some pedo-biological indicators of soil quality and fertility (IVAP%, IEAP% and BSI%) highlights the medium quality of the trophic background of soil resources just in the first 20 cm. The analysis of Biological Synthetic Indicator (BSI%) by the sum of the scores for quantitative values from 10 eco-pedological factors and determinants pointed out a medium to good effective trophicity, depending on the floristic analized stationary, during the summer season 2009.

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GLEY STAGNIC CHERNOZEMS – GENESIS, PROPERTIES AND AGRICULTURAL SUITABILITY

CERNOZIOMURILE STAGNICE GLEICE – GENEZA, PROPRIETĂŢILE ŞI PRETABILITATEA AGRICOLĂ

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Abstract. *Research carried out in Central part of Moldova. Gley stagnic chernozems are distribute on the draining surfaces of wide watershed of spaces, on the plane surface of contemporary watershed, which in Pliocene period was a part of extensive alluvial plain. These soils differ essentially from environmental area in the soil profile structure. By distinctive character of their structure - the presence in its bottom part, under humus layer, a strong carbonated gley horizon formed without participation of ground waters. The chernozems stagnic have favorable physical and chemical properties for growth and development of plants and have increased potential of fertility, but per damp years in their structure increase the anaerobic condition and there is an essential decrease the crop of agricultural cultures. The chernozems stagnic came into being a combination of contemporary and relict processes of soils' formation.*

Key words: chernozem, stagnogleic, genesis, Pliocene

Rezumat. *Cercetările au fost efectuate în partea Centrală a Moldovei. Cernoziomurile stagnice gleice sunt răspândite pe suprafeţele uniforme (orizontale) sau slab neuniforme ale culmilor intrafluviale, substratul litologic fiind reprezentat de argile. Se deosebesc de cele tipice zonale prin prezenţa unui orizont gleic în partea inferioară a stratului bioacumulativ, textură argiloasă, capacitate de schimb cationic mare, conţinut de humus ridicat. Gleizarea în profil se evidenţiază la adâncimea 50-100 cm de la suprafaţă. Procesele de gleizare se produc ca urmare a excesului de umiditate provenit din apele pluviale şi conduc la acumularea compuşilor liberi de fier în orizontul gleic. Cernoziomurile stagnogleice au proprietăţi fizice şi chimice favorabile pentru creşterea şi dezvoltarea plantelor. În anii cu umiditate sporită creşte potenţialul de fertilitate a solurilor stagnice, dar se intensifică condiţiile anaerobe, care conduc la scăderea esenţială a productivităţii culturilor. Cernoziomurile stagnogleice sunt rezultatul combinării procesului contemporan şi relict de geneză a solurilor.*

Cuvinte cheie: cernoziom, stagnogleic, geneza, Pliocen

INTRODUCTION

Stagnation of water in soil is a continuing phenomenon in soil or ground surface has an excess of water from precipitation, now above a waterproof layer that is usually a soil horizon. In Moldova, special research to assess genesis, nomenclature and classification stagnate chernozems gley in depth were not made. The horizontal well-drained soils occupy areas on local and draining

surfaces of wide watershed*;* their gley presents a paradox often-incomprehensible depth research. As a result, stagnic chernozems outlined in the existing system of classification and soil rating, their genetic and production are not studied. On previous maps, stagnic chernozems areas had incorrectly placed in areas within the zonal soils. Simultaneously the soil rating had performed incorrectly and their suitability for different agricultural issues have not appreciates. Non-evidence be explained by these chernozems that the classification of Russian naturalist, used in the country, soils are presented stagnate. A gley deep layer of soil and subsoil are relicts and is determinate by geological processes as soon as soil. Soils with gley properties are separate at the stagnosoil type as the class of Hydrosoils in the Romanian system of soil taxonomy. Of those exposed is a clear need to study processes in stagnogleic soils of Moldova.

MATERIAL AND METHOD

The object of research is chernozems stagnogleic in deep from Central Moldova (Răut river basin) located at altitudes of 250-290 m. The analogue soils meet in other parts of the Moldova, but the most common spread of stagnic chernozems that is characteristic for the territory. The purpose of the paper is studying the genetic particularities, characteristics, classification at lower level, soil rating, and assessment, recommendation system of sustainable use of gley stagnic chernozems.

RESULTS AND DISCUSSIONS

The relief is primary areas denudation that the outcome alpine lifts the occupied territories today absolute altitude 250-290 m. Pedogenesis chernozems stagnic in large part are determined by the texture of the rock parental clay. Clay on plateaus differs from high clay appearing on the slopes. Origin of clay is possible lack of salinization or alluvial lake. Information on the geological structure of territory within the catchment of basin Răut, where soil samples collected for research is very limited. According to geological research at the end of Pliocene territory of central and southern Moldova continental climate regime is established, alluvial plain is formed, the sedimentary deposits which have been preserved today only on the highest areas altimetry relief. Sediment surface smoothing is particularly of clay-altered deposits of lakes and lagoons with low water. The composition of clays mainly dominated montmorillonit. Most are dense clay and rock composition *chlorito-montmorillonito-hydromicaceous* (Geomorfologia Moldavii, 1978). Training is performing on the contemporary relief plains of Pliocene-lake, which served as the original surface. In Moldova, alluvial-delta plain middle Pliocene is marine deposits of Sarmatia. The composition of deposits indicated in a few fragmented landscapes. Morphogenesis of middle Pliocene and Pleistocene is characterizing by periodic changes of cold and warm climate cycles. Also, be initiated formation of a river delta with high-flow high and wide meadows associated lakes, state. The Pleistocene tectonic movements are amplified, they form small mountains with

altitudes of Codri, incurred the hydrographic contemporary (Geomorfologia Moldavii, 1978; Bilinchis G. M., 2004). Meanwhile Nistrean Plateau formation occurs, the ramifications of which are watershed areas, which placed soil profiles studied. The profiles of stagnogleic chernozems showed in fig. 1.

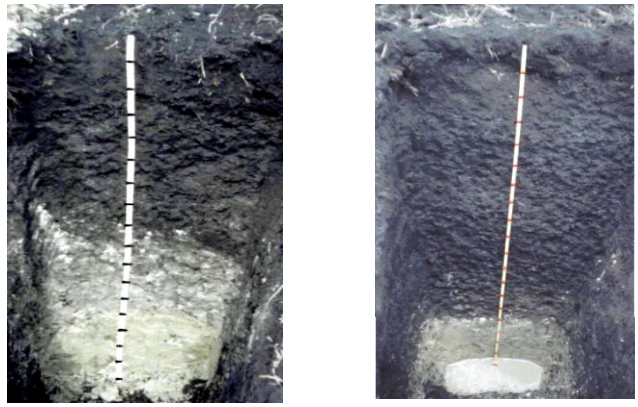

Fig. 1. Chernozems stagnogleic with thick and very thick humus horizons

Pedogenesis of chernozems stagnogleys is due to clay texture of parental rock. The data confirm that natural clay content in soils investigated range from 70% to 80% and clay - from 48% to 57%. The fine texture is characteristic of the parental rock. Physical clay content in the underlying horizons of this profile is 76-79% and clay - 53-57%. Increased percentage of clay in the parent material is a special phenomenon that can only be formed when underwater rock alteration in the climate warm. The size composition of parent material that are formed chernozems stagnate confirmed alluvial origin from late Pliocene, established Prospecting (Pokatilov B.P. 1983; Bilinchis G. M., 2004) The following is required warned in an attribute of the clays, observed in the field in the cutting of profiles. When are removed from the wet land area, under the action of strong sunlight clay rocks are covered with a dense network of cracks and crumble into small aggregates. In years with normal hydrothermal system in early spring glomerular structure with small aggregates and fluffy status of arable layer of stagnate chernozems ensure the possibility of soil material to auto crumb contrasting temperature conditions and wetting. In literature (Atlas Moldavscoi SSR, 1978; Krupenicov I. A., 1990; Cerbari V. V., 2007) often, indicate that soils with high clay soils are compaction. Case studies show that not all processes can be assesses by compacted with high clay content in soil. Chernozems typical survey, located on the same lot as chernozems stagnate, characterized by clay texture. As a result of frost and thaw arable layer is structured, giving the opportunity to accumulate large reserves of water in the soil and create a favorable germinate bed crops in spring. However, these soils are resistant to drought spring, common in Moldova. In the ending of summer and dry autumn, because of the structure into blocks, clay stagnate chernozems working very hard, plowing on these soils is very

rough, creating a favorable germinate bed is impossible both for winter and spring crops. In years with rainfall when soils have a high water field capacity, the soils dries hard and slowly reach a state of physical maturity. As a result, the agricultural tillage is impossible with adverse consequences for crop yields.

Average statistical data confirms that chernozems stagnogleys, characterized by high levels of hygroscopicity coefficient within 7-12%. Therefore, in the soil water reserves are also inaccessible for plants. Statistical values of the average density of soil material ranges from 2,62-2,65 in humus horizons up to 2.70 to 2.75 in the underlying gley layers. A full index of physical quality of soil condition is the apparent density. The values of this indicator for soil profiles investigated range from 1,20-1,30 g / cm ³ in the arable layer of chernozems stagnate until 1,50-1,60 g / cm ³ of parental gley rock. Total porosity, while it is great for arable layer of these soils and underlying gley stratum is very small. Bulk density values for arable layer within 1,1-1,3 g / cm ³ to calculate optimal. So but the arable layer chernozems stagnogleic is characterized by physical attributes than positive and underlying gley layers - with adverse physical proprieties.

Generally, in terms of texture and physical characteristics, chernozems stagnogleic is a difficulties object for use in arable both in dry years and in years with abundant rainfall. In the normal hydrothermal regime of arable layer in early spring chernozems stagnate in some extent can be found as too loose and then, after sowing requires an easy roller. In the autumn drought is difficult to work with these soils and arable layer grinding to create a favorable germinate bed. In years when rainfall during the growing danger in the soil formation of a weak aerobic system. Long-term preservation of the status favorable physical quality of chernozems stagnogleic is possible through measures that would help to ensure continuous flow of organic matter in arable layer thereof to form a valuable agronomic structure.

The soils studied characterized by neutral reaction from the surface horizons (pH 6.9-7.3) and low alkali underlying horizons (pH 7.8 to 8.3). For gley horizons, there is a tendency to react slightly more alkaline than adjacent horizons. Horizons of the area are stagnate chernozems non-carbonated or weak carbonate. A maximum content of carbonates is characteristic for horizons material altered the limestone rocks, shown in clay. Investigated soils are poor in phosphorus. Total phosphorus content of their profile in the arable layer range from 0,10-0,11 to 0,05-0,06% in rock parent. Humus content (statistical average) in chernozems stagnogleic is 4,5-4,6%. Humus profiles ends rather abruptly, but below the horizon, almost non-humificate, meet black humifer languages, formats the result of mechanical flow of material humifer on cracks in horizons above. Humifer profile is black, area aggregates humifer profile is characterize by a characteristic gloss anthracite color. Report C:N in the humus layer and underlying arable is 10-13.The observed increase in the value ratio C:N in the underlying horizon, indicating the carbonated substance underlying organic horizons of these soils. Investigated soils are rich in mobile potassium (30-40

mg/100 g soil) and poor in mobile phosphorus and consist 2,0-2,5 mg/100 g soil (table 1).

Table 1

Chemical properties of Gley Stagnic Chernozems on arable

Horizon and depth, cm	pH	$CaCO_3$	Humus	N total	C : N	Ca^{++}	Mg^{++}
		%				me/100 g soil	
Ahp 0-30	7,0	0	4,56	0,265	10,0	38,6	4,6
Ahk 30-52	7,5	4,7	3,78	0,202	10,8	35,6	5,0
ABh 52-74	7,8	7,6	2,94	-	-	32,1	5,5
Bhgk 74-96	8,0	13,5	1,67	-	-	25,4	6,0
Gk 96-106	8,2	22,0	0,76	-	-	22,7	6,6
Cg k 106-180	8,0	7,4	0,33	-	-	18,0	6,0
CRkg 180-200	7,8	32,2	0,07	-	-	14,2	6,5

The chemical proprieties characterize stagnic chernozems favorable for plant growth. Chernozems typical parallel researched, located on the same plot, are moderately humous (humus content in arable layer varies within 3.0-3.5%) and characterized by less cation exchange capacity. However, because have more favorable texture, these soils are more easily to tillage, together by creating arrangements for crop plant growth and more favorable as a result; yields on these soils are higher than on stagnogleic chernozems.

Productivity level of stagnic chernozem in the drought conditions of 2007 was determined by the method of knock-sample on the surface of 1m ² plots with winter wheat and 10 hectares for maize. In parallel, the same methods used to determine harvest chernozems typical spatial spread on the same sole. This made it possible to compare the productivity of agricultural crops both chernozems typical and stagnate of area with agricultural technique analogous conditions.

Peculiarities of agriculture were dry autumn (2006), warm winter deficient rainfall, dry spring, dry summer. Soils were showing fall, but winter drought has given way to work and to prepare quality the soil and germinate favorable crops, particularly on land with chernozems stagnate clay, which for autumn became arable layer structure blocks. The results of measurements in five repetitions on plots with area 1 meters was established that the winter wheat harvest is 27.4 q / ha for stagnic chernozems and for the same typical chernozems sola - 32 q / ha, with 14 - 15 to percent higher.

CONCLUSIONS

1. Pedogenesis of chernozems stagnic determined by texture of clay alluvial deposits - lake formed in the late Pliocene, which were currently stored only on the highest areas altitude relief (200-290 m). The diagnostic horizons in profile of

chernozems stagnogleic is formed in the bioaccumulative layer in an environment where soil conditions much of the year is saturated and stagnant water accumulated from precipitation. Stagnogleic horizon is pronounced and characterized by a massive accumulation of carbonates as bieloglasca, greenish-yellow in the Pliocene clay horizon is weaker gley and situated on limestone rocks eluvia compact.

2. In the analysis of morphometric indices and profiles investigated was established that humus horizon thickness of these soils vary within very large 40-60 cm to 90-150 cm and differ by a characteristic bright black anthracite given faces aggregates.

3. Chernozems stagnogleic have a fertility potential, but not always give adequate results due to faulty aerohydro regime in years because of rainfall or problem with their work in autumn dry years (arable layer structure in blocks). The tillage recommended to chernozems stagnic out only to soil moisture adequate of physical maturity.

4. In years when these soils are dry in spring, and have a high water field capacity, is drought tolerant, but if drought is prolonged and summer, spring crop harvest may be lost. In terms of risk chernozems stagnic are suitable: first, the ***perennial herbs, apple and plum orchards*** if gley horizon is located deeper than 70-80 cm, secondly - for ***winter cereals***, in the third - ***hoeing crops***. In years when the hydrothermal regime is, normal harvest on such land at least is different from the zonal soil and is only 10-15 per cent or less. Note average creditworthiness (soil rating) of chernozems stagnogleic, their level of productivity as determined by the method sheaves - sample is about 85 points.

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POLLUTION OF ERODED SOIL BY EXCESS AND DEFICIENCY OF COPPER

POLUAREA SOLURILOR ERODATE PRIN EXCES ŞI CARENŢĂ DE CUPRU

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Abstract. *In the paper are presented the data concerning to plant pollution by copper excess and deficiency on the Grey Forest eroded soils and diluvial soils with different agricultural utilization. The pollution by copper excess takes place in the vineyards on the eroded soils. Pollution by copper deficiency has founded to alfalfa and grass vegetation on the diluvial soils. The report Fe:Cu is useful as a diagnostically factor in the determination the copper level pollution of soils and plants on the eroded soils.*
Key words: copper, excess, deficiency, plants, soils, erosion

Rezumat. *In lucrare sunt prezentate datele referitoare la poluarea plantelor prin exces şi carenţă de cupru, pe solurile cenuşii de pădure erodate şi deluviale, cu diferită utilizare agricolă. Poluarea produsă de cupru prin exces are loc în solurile erodate plantate cu viţă de vie. Poluarea de cupru prin carenţă s-a depistat la lucernă şi vegetaţia ierboasă pe solurile deluviale. Raportul Fe:Cu poate fi folosit ca indice diagnostic in determinarea nivelul poluării cu cupru a plantelor pe solurile erodate.*
Cuvinte cheie: cupru, exces, carenţă, plante, sol, eroziune

INTRODUCTION

The soil contains a large amounts elements received by agricultural chemicals' of various types and levels of toxicity. Because of erosion, these substances easily put in motion in that case are very difficult to determine and to implement effective economic measures to combat soil erosion. The problem is distribution of chemicals between soil components, chemical forms that migrate in the erosion processes and pollution degree of plant and soil eroded and accumulated. Thus, erosion is represented not only a process of soil degradation, but also as a type of pollution through excess or deficiencies of nutrients. Macro- and microelements fulfill different functions in plant metabolism, lack or excess of one of these elements cause symptoms of "illness" deficiency of the type greensickness physiological function (Kabata-Pendias A., Pendias X., 1989).

MATERIAL AND METHOD

Research objects were Grey Forest soils of the southeast part of Forest reservation "Codri" from Republic of Moldova. The territory has undergone an erosion relief and landslides. Despite these, intensive agriculture developed the prevalence of

viticulture. The pollution of copper carry out on the three different agricultural uses (chains): arable, vineyard - 27 years, fallow land (used under grape vine 6-7 years, then left unprocessed for 20 years caused of erosion, this time covered with natural vegetation). All three chains are representing in the exhibition southwest slope, the inclination of 2-10º, length of 800 - 1000 m. The soil cover is represented by none eroded, weakly eroded, moderately eroded, strongly eroded soils, cumulative soil (at the foot of slopes and meadows). The content of copper was investigates in vines: (leaves, rods (osier), clusters, and grains), growing natural grass, winter barley and alfalfa (whole plant). The soil content of copper was determined by the classical method disaggregate with hydrofluoric acid in combination with sulfuric acid. The plant content of copper in has resulted in hydrochloride solution obtained after dissolution of ash from the incineration plant at 450ºC for 4 hours. Determination was performs by atomic absorption spectra-photometer method.

RESULTS AND DISCUSSIONS

The concentration of copper in plants correlated with the soil mostly in the toxic content. These concentrations is maintained during the first 16 cm of soil, not harmful to the vine root system developed mostly less than 40 cm. Movement of copper in different parts of the vine plants plays an important role in its use. The largest amount of copper accumulated by leaves; in them is contained 3016 mg Cu/kg on the soil with whole profile (non eroded) up to 1560 mg Cu/kg in the strongly eroded soil (table 1).

Table 1

Content of total Cu in plants ash of Grey Forest soils, mg / kg

Chains	Plants	None eroded	Weakly eroded	Moderately eroded	Strongly eroded	Diluvial
Vine-yard	leaf	3016	2750	2200	1560	-
	rod	117	200	233	275	-
	clusters	127	109	107	97	-
	grain	34	50	50	67	
	Alfalfa	-	-	-	-	20
Fallow	Grass	44	34	26	17	20
	Alfalfa	-	-	-	-	34
Arable	Barley	21	17	13	10	-
	Alfalfa	-	-	-	-	14

Rods and clusters containing, respectively: 117-275 and 127-97 mg Cu/kg. The small amount of copper has found in grapes: from 34 mg/kg on none eroded soil to 67 mg/kg on highly eroded soil. The concentration of copper in grapes increases with degree of erosion, exceeding the maximum allowable fruit - 10 mg/kg [Leah Tamara, 1995] of 3,7 times. Copper has a lower immobility in plants, in comparison with other elements. Therefore, a large part of the plant to remain with their dying, and only small concentrations can move to the young parts of the plant. The most important practical application of the data above

relates to the problem of excess and deficiency microelements in agricultural crops. The copper insufficiency influence physiological processes, on plant productivity (Răuţă C., Cârstea S., 1983). Although the phenomenon of copper deficiency is widespread and known, his diagnosis and correction methods require further research. For different plant species, the concentration of copper deficiency that is determined is very different. However, generalized data show that a concentration below 2 mg Cu/kg is unfavorable for most plants (Leah Tamara, 2005).

Copper concentrations in eroded soils have a lasting effect. Even 20 years after application of preparations containing copper in concentrations of grass vegetation on the fallow chain are quite large, from 44 mg/kg on whole soil profile to 17 mg/kg on highly eroded soil. The concentration in barley plants is almost 2 times lower than in natural grass vegetation. Stability of high concentrations (excess) of Cu in plants and their ability to accumulate the maximum levels can lead to some undesirable phenomena, damaging the environment. The high concentration of copper in leaves has caused by absorption that takes place during watering the vine plants with copper sulphate solution. Long-fallow eroded soils has stimulated the process of soil genesis, improved some physical-chemical properties, and increased the amount of humus by 2 times compared with eroded soils of neighboring chains.

To provide insufficiency and excess has calculated with the ratio of Fe and Cu in the plants on eroded and diluvial soils (table 2).

Table 2

The ratio of Fe and Cu in plants on the Grey Forest soils

Chains	Plants	None eroded	Weakly eroded	Moderately eroded	Strongly eroded	Diluvial
Vine-yard	leaf	0,25	0,24	0,28	0,36	-
	rod	1,16	1,38	1,51	1,92	-
	clusters	3,33	1,44	0,97	0,73	-
	grain	2,79	2,40	2,22	2,09	-
	Alfalfa	-	-	-	-	95,0
Fallow	Grass	5,0	8,3	16,9	3,2	87,5
	Alfalfa	-	-	-	-	38,2
Arable	Barley	10,5	13,5	19,0	27,5	-
	Alfalfa	-	-	-	-	78,6

Research has shown that the plants on eroded soils ratio of Fe and Cu is lower than in plants on diluvial soil. The lowest values were obtained in vines leaves (0,25-0,36), where he is in high enough concentrations. In a rods, clusters, grapes this ratio varies between 3,33-0,73. The highest values of this report has obtained for alfalfa (95) on diluvial soil, here has found in low concentrations. The grass and barley vegetation ratio is increased (5,0-3,2) while increasing erosion. This report Fe:Cu in the plants on eroded soils is changing and depending

on the degree of erosion. In light of this report has made up gradation of copper excess and deficiencies in the plants (table 3).

Table 3

Gradation of copper excess and deficiency for plant as the ratio of Fe and Cu

Gradation	Level	Fe : Cu	Copper accumulation in plants
Excess	strong	0,1-1,0	Leaves (all eroded soils) Clusters (moderately and strongly eroded soils)
	moderate	1-5	Rods and grapes (all eroded soils)
	low	5-10	Grass (none eroded, weakly eroded soils)
Deficiency	low	10-20	Grass (moderately eroded soils) Barley (none eroded, weakly, moderately eroded soils)
	moderate	20-30	Barley (highly eroded soils)
	strong	>30	Lucerne and grass vegetation (diluvial soils)

According to the graduations, excess or toxicity of copper is strong on all eroded soils with vines (0,1-1,0) and strong deficiency of copper - on diluvial soil (>30) in alfalfa and grass vegetation. Absoluteness set of indices ratio of Fe and Cu in plants on eroded and accumulated soils quite clearly manifested. This report and the reports of micronutrients content in plants on the eroded soils can serve as a diagnostic factor for assessing ecological conditions of plant development.

CONCLUSIONS

1. The excess of copper occurs in the vines (leaves, clusters) on eroded soils; the copper deficiency in the alfalfa and grass vegetation on diluvial soils, on weakly and non-eroded, not detected excess or deficiency of copper in plants.

2. The perspective index provides diagnostic failure and copper toxicity to plants on eroded soils is the ratio of Fe: Cu. Plant pollution by copper excess and deficiency on Grey Forest soils occurs depending on the degree of soil erosion and agricultural uses.

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EFFECT OF TYPE OF POTATOES PLANTING MACHINE OVER THE QUALITY INDICES, WITH REFERENCE TO THE DISTANCE BETWEEN TUBERS ALONG THE ROW

INFLUENŢA TIPULUI DE MAŞINĂ DE PLANTAT CARTOFI ASUPRA INDICILOR DE CALITATE PRIVIND DISTANŢA DINTRE TUBERCULI PE RÂND

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Abstract. *In this experiment three types of potatoes planting machines were tested: the six rows type 6 SAD-75 potatoes planting machine, using a vertical disc with flaps as a distribution apparatus; the four rows Cramer Marathon Jumbo potatoes planting machine, using a conveyer chain with cups on two rows as a distribution apparatus; the two rows 2 MPC potatoes planting machine, equipped with a conveyer belt with cups on two rows as distribution apparatus. The following quality indices were evaluated for the free machines taken into account: percent of good distances between tubers along the row; percent of normal distances between tubers along the row; percent of distances equal to the average distance between tubers; percent of double and triple planting; percent of single gaps; percent of double and triple gaps. It was concluded that the best results were achieved by the Cramer Marathon Jumbo potatoes planting machine.*
Key words: quality, potatoes planting, planting machines

Rezumat. *În cadrul experienţei efectuate s-au încercat trei tipuri de maşini de plantat cartofi: maşina de plantat cartofi 6 SAD-75, pe 6 rânduri, cu aparate de distribuţie a tuberculilor de tip disc vertical cu clapete de prindere; maşina de plantat cartofi Cramer Marathon Jumbo, pe 4 rânduri, cu aparate de distribuţie a tuberculilor de tip lanţ transportor cu două rânduri de cupe; maşina de plantat cartofi 2 MPC, pe 2 rânduri, cu aparate de distribuţie a tuberculilor de tip bandă transportoare cu două rânduri de cupe. La cele trei maşini s-au determinat următorii indici de lucru calitativi: procentul de distanţe bune între tuberculi pe rând; procentul de distanţe normale între tuberculi pe rând; procentul de distanţe între tuberculi pe rând egale cu distanţa medie; procentul plantărilor duble şi triple; procentul golurilor simple; procentul golurilor duble şi triple. S-a stabilit că cele mai bune rezultate le-a obţinut maşina de plantat cartofi Cramer Marathon Jumbo.*
Cuvinte cheie: calitate, plantat cartofi, masina de plantat

INTRODUCTION

In potato growth, the farmers have access to highly productive varieties and modern machinery; this is why the achievement of a rich and high quality harvest is necessary.

Potato planting is a very important operation and its quality is directly affecting the production level and the quality of the harvested tubers (Toma Dr., Sin Gh., 1987). This is the reason why the paper is referring to the testing of some types of potatoes planting machines, in order to establish whether these achieve the imposed agro technical requirements relative to the quality indices of the potato planting operation.

MATERIAL AND METHOD

Three types of potatoes planting machines were tested: the six rows type 6SAD-75 potatoes planting machine, using a vertical disc with flaps as a distribution apparatus; the four rows Cramer Marathon Jumbo potatoes planting machine, using a conveyer chain with cups on two rows as a distribution apparatus; the two rows 2MPC potatoes planting machine, equipped with a conveyer belt with cups on two rows as distribution apparatus. The U-650 tractor was used as a power source, and the real working speed was 5.57 – 5.7 km/h.

The experiments took place on a cambic chernozem type of soil, with loam texture, with a clay content of 30.2%. The terrain slope was 2...3 degrees. The soil had a good compaction state, with a bulk density of 1.25...1.37 g/cm^3, and 16 daN/cm^2 penetrability. Soil humidity was normal according to its texture, with a value of 14...15%.

RESULTS AND DISCUSSIONS

During the experiments, the effect of the type of potatoes planting machine over the quality indices (with reference to the distance between the tubers along the row) was studied. The quality indices taken into account were: percent of distances between tubers along the row equaling the average distance or being close to it; percent of good distances between tubers; percent of normal distances between tubers; percent of double and triple planting; percent of single gaps; percent of double and triple gaps (Popescu et al., 1984).

The experimental results are presented in table 1 and figure 1.

Percent of distances between tubers along the row equaling the average distance d_r or being close to it (P_{dr}). The lowest value of this index was achieved by the 6 SAD-75 (51.2%); for the 2MPC planting machine the index is significantly increasing (53.6%), and for the Cramer Marathon Jumbo machine, there is a slight increase in comparison with the value registered for the 2MPC machine (54.5%).

It can be concluded that the Cramer Marathon Jumbo machine attained the best results, but the 2MPC machine also achieved good results.

The agro technical standards require that the percent of distances between tubers along the row equaling the average distance or being close to it should be at least 50% (Bria N. et al., 1965). Considering the experimental results, it is obvious that all the tested machines have fulfilled the standards' requirement.

Percent of good distances between tubers along the row, P_{db}. The highest value of this index was recorded for the Cramer Marathon Jumbo

machine, but the 2MPC planting machine also attained good results. The 6 SAD-75 machine achieved a lower percentage of good distances between the tubers.

Agro technical standards impose that the percent of good distances between tubers along the row should be at least 80% (Popescu N. et al., 1995). Taking into account this limit and the experimental results, it can be concluded that all the tested machines achieved adequate values for this index.

Table 1

Effect of the type of potatoes planting machine over the quality indices referring to the distance between the tubers along the row

Quality indices	Values of the indices (%) for different types of potatoes planting machines		
	6 SAD-75	**2MPC**	**Cramer Marathon Jumbo**
Percent of distances between tubers along the row equaling the average distance d_r or being close to it (P_{dr})	51,2	53,6	54,5
Percent of good distances between tubers along the row, P_{db} Good distance $d_b = (0,8 \dots 1,2)d_r$	81,1	82,9	83,8
Percent of normal distances between tubers along the row (P_{dn}) Normal distance $d_n = (0,5 \dots 1,5)d_r$	93,2	94,8	95,4
Percent of double and triple planting (P_{pd}) Low distance $d_m < 0,5\ d_r$	2,7	2,5	2,4
Percent of simple gaps (P_{gs}) High distance $d_M = (1,5 \dots 2,5)d_r$	4,0	2,8	2,6
Percent of double and triple gaps (P_{gd}) Very high distance $d_{fM} > 2,5\ d_r$	0,1	-	-

Percent of normal distances between tubers along the row, P_{dn}. The lowest value of this index was achieved by the 6 SAD-75 (93.2%). For the 2MPC machine, the registered percent of normal distances between tubers along the row was 94.8%, while the highest value was recorded for the Cramer Marathon Jumbo, 95.4%.

The agro technical standards require that the percent of normal distances between tubers should be al least 90% (Popescu N. et al., 1995). It is concluded that all the planting machines meet this criterion.

Percent of double and triple planting, P_{pd}. The highest value of this index was achieved by the 6 SAD-75 (2.7%). In the case of the 2MPC machine the percent of double and triple planting drops down to 2.5%, while the Cramer Marathon Jumbo the index drops further to 2.4%.

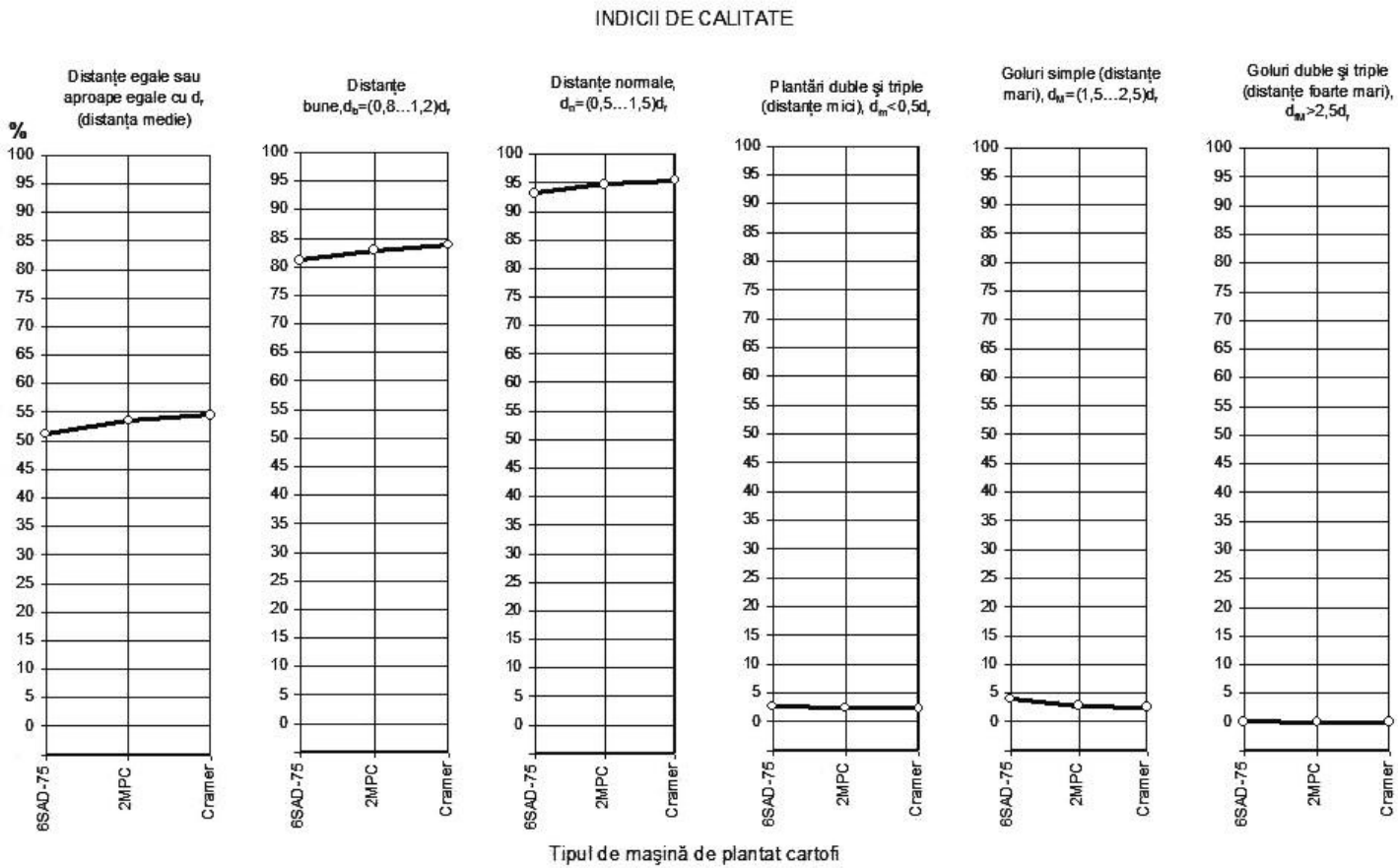

Fig.1. Effect of the type of potatoes planting machine over the distance between the tubers along the row

Agro technical requirements regarding this criterion impose an upper limit of 3% (Caras M., 1995), which is not exceeded by either of the tested machines.

Percent of simple gaps, P_{gs}. The highest value was recorded for the 6 SAD-75 planting machine (4.0%). For the 2MPC machine, the index decreased to 2.8%, and for the Cramer Marathon Jumbo machine, the percent of simple gaps decreased further, to 2.6%.

The agro technical standards require that the percent of simple gaps should not exceed 4% (Toma Dr., Sin Gh, 1987) and all the tested machines complied with this requirement.

Percent of double and triple gaps, P_{gd}. The maximum value of the index was attained by the 6 SAD-75 planting machine (0.1%). For all the other machines, the percent of double and triple gaps was zero. Taking into account the upper limit of 0.1% imposed by standards (Bria et al., 1965), it is concluded that all the tested machines have fulfilled the requirements of the standards.

CONCLUSIONS

Considering the experimental results, it was concluded that all the tested potatoes planting machines (6 SAD-75, 2MPC and Cramer Marathon Jumbo) achieved adequate values of the quality indices

The best results were recorded by the Cramer Marathon Jumbo machine, closely followed by the 2 MPC planting machine. The 6 SAD-75 machine was ranked the third, with somewhat less favorable results.

We consider that the Cramer Marathon Jumbo and 2MPC planting machines achieved better results due to the chain conveyer or belt conveyer type of distribution apparatus, which achieve a higher evenness of the distance between tubers along the row.

Taking into account the experimental results, we recommend the use of the Cramer Marathon Jumbo potatoes planting machine, which also achieved very good results for the coefficient of variation of the distance between tubers, the planting depth and the potatoes injury degree, while attaining a high productivity.

The 2MPC potatoes planting machine, which also recorded good results referring to the quality indices, may be taken into account. However, this machine has a lower productivity, due to the lower working width. As a result, the 2MPC machine shall be used only when the field conditions do not allow the use of the Cramer Marathon Jumbo machine (high terrain slope, small lost, narrow or short etc.)

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EFFECT OF TYPE OF POTATOES HARVESTING MACHINE OVER THE QUALITY INDICES OF TESTED MACHINES

INFLUENŢA TIPULUI DE MAŞINĂ DE RECOLTAT CARTOFI ASUPRA VALORII INDICILOR CALITATIVI DE LUCRU REALIZAŢI DE MAŞINILE ÎNCERCATE

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Abstract. *In this experiment three types of potatoes harvesting machines were tested: the E-684 potatoes harvesting machine; the Dewulf RDT 1700 potatoes harvesting combine; the CRC-2 potatoes harvesting combine. The experiments were developed in average conditions regarding the working depth of the dislocation coulter, the soil clay content, humidity and penetration resistance. The working speed was 3.43 km/h. Several quality indices were evaluated during the experiments: loss of tubers in and on the soil; tubers injury index; amount of impurities in the mass of harvested potatoes. Based on the experimental results it was concluded that all the three tested potatoes harvesting machines achieved adequate values of the quality indices, the Dewulf RDT 1700 potatoes harvesting machine being ranked first.*

Key words: quality, potatoes harvesting, harvesting machines.

Rezumat. *În experienţa întreprinsă s-au folosit trei tipuri de maşini de recoltat cartofi: maşina de recoltat şi încărcat cartofi E-684; combina de recoltat cartofi CRC-2; combina de recoltat cartofi Dewulf RDT 1700. Experimentările au fost efectuate în condiţii medii privind adâncimea de pătrundere în sol a brăzdarelor de dislocare, conţinutul de argilă al solului, rezistenţa acestuia la penetrare şi umiditatea lui. Viteza de deplasare a agregatelor a fost de 3,43 km/h. La încercările efectuate cu cele trei tipuri de maşini de recoltat cartofi s-au determinat mai mulţi indici de calitate ai lucrării executate: pierderile de tuberculi în sol şi pe sol; gradul de vătămare a tuberculilor; impurităţile rămase în masa de cartofi recoltaţi. Pe baza rezultatelor obţinute în cadrul experimentărilor s-a stabilit că toţi indicii de calitate ai lucrării de recoltat cartofi sunt corespunzători pentru toate cele trei tipuri de maşini încercate, pe primul loc situându-se combina Dewulf RDT 1700.*

Cuvinte cheie: calitate, recoltat cartofi, maşini de recoltat.

INTRODUCTION

Potato is an important alimentary plant, used for producing fodder or for industrialization. After corn, maize and rice, potato is the most important plant for the populations of many regions on earth.

Potato harvesting and conditioning is the most expensive technological

sequence, requiring the highest work and energy consumption. Important production losses occur during harvesting.

The production level quality are highly dependent upon the harvesting quality. This is the reason why the paper is referring to the testing of some types of potatoes harvesting machines, in order to establish whether these achieve the imposed agro technical requirements relative to the quality indices of the potato harvesting operation

MATERIAL AND METHOD

Three types of potatoes harvesting machines were tested: the E-684 potatoes harvesting and loading machine; the Dewulf RDT 1700 potatoes harvesting combine; the CRC-2 potatoes harvesting combine. The U-650 tractor was used as a power source.

The experiments were developed on a cambic chernozem type of soil, with the following features: clay content - 31.5%; penetration resistance - 19 daN/cm^2; humidity - 15%. The stalk quantity was 0.108 kg/m^2 and the weeds quantity was 0.182 kg/m^2. The potatoes were from the Sante variety. The real working speed was 3.43 km/h.

RESULTS AND DISCUSSIONS

The experimental test were aimed to evaluate the effect of the type of potato harvesting machine over the harvesting quality indices: loss of tubers in and on the soil; tubers' injury index; amount of impurities in the mass of harvested potatoes.

The experimental results are shown in table 1 and figure 1.

Table 1

Effect of the harvesting machine type over the harvesting quality indices

Potatoes harvesting quality indices	Type of potatoes harvesting machine:		
	E-684 potatoes harvesting and loading machine	CRC-2 potatoes harvesting combine	Dewulf RDT 1700 potatoes harvesting combine
Loss of tubers in and on the soil, P_t (%)	2,1	3,3	2,6
Tubers' injury index, G_v (%)	7,2	4,0	3,6
Amount of impurities in the mass of harvested potatoes, I_C (%)	18,1	11,5	13,3

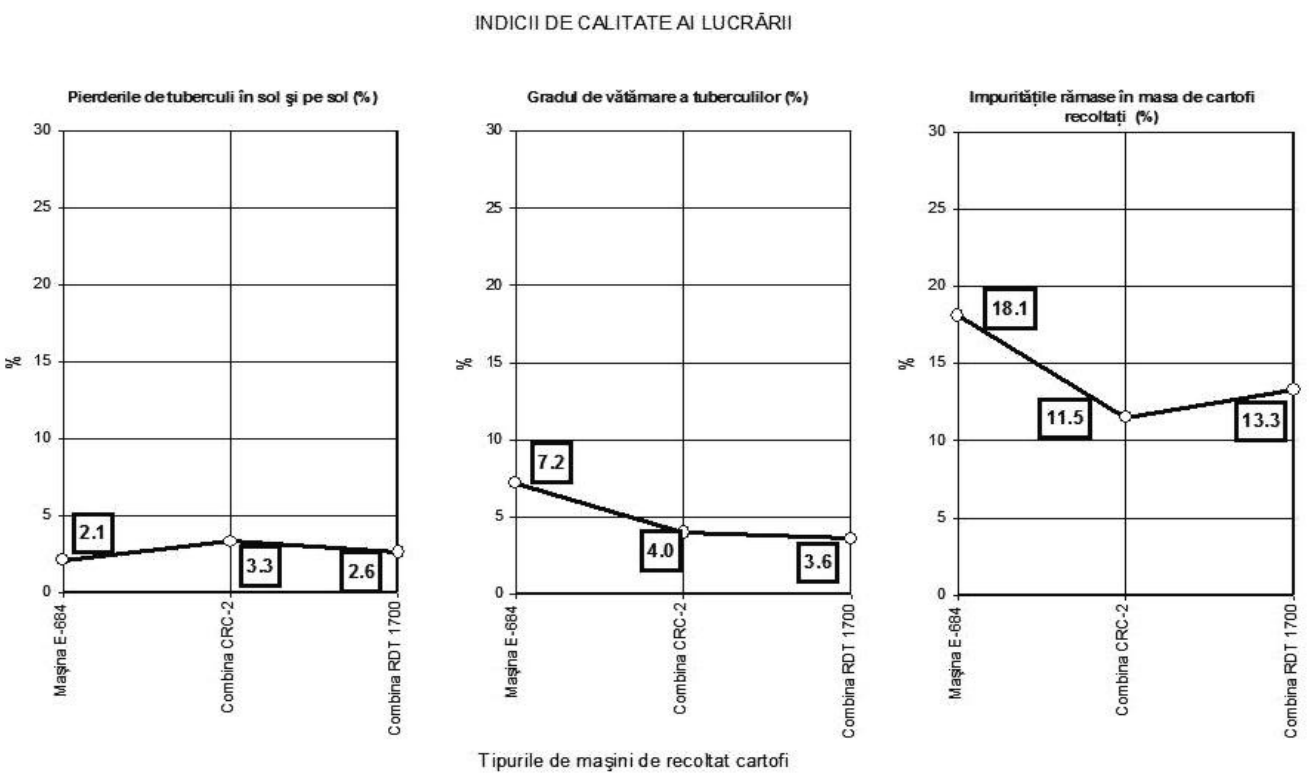

Fig.1. Effect of the harvesting machine type over the harvesting quality indices

Loss of tubers in and on the soil, P_t. Based on the experimental results it was established that the loss of tubers was comprised between 2.1% and 3.3%.

When analyzing the effect of the harvesting machine type, one can see that the E-684 harvesting machine recorded the lowest values (2.1%). The Dewulf RDT 1700 was ranked next, with 2.6% loss. The highest losses (3.3%) were recorded for the CRC harvesting combine.

Agro technical standards require that the loss of tubers when using either the harvesting and loading machine or the harvesting combines should not exceed 4% (Morărescu E. et al., 1974).

The experimental results show that all the tested machines have achieved the requirements of the standards when referring to this quality index.

Tubers' injury index, G_v. The analysis of the experimental results referring to the tubers' injury index led to the conclusion that, for the tested machines, the values of this index were comprised between 3.6 and 7.2%.

The lowest value of this index was achieved by the Dewulf RDT 1700 machine (3.6%).

The CRC-2 combine, with a slightly higher value (4.0%), occupied the second position. The highest tuber' injury index was recorded by the E-684 potatoes harvesting and loading machine (7.2%), a value which is nearly the double of the one achieved by the Dewulf RDT 1700 combine. The high tuber' injury index achieved by the E-684 machine should be remembered.

Agro technical standards require that the tuber's injury index should not exceed 8%, when harvesting combines or harvesting and loading machines are used (Toma Dr. et al., 1969).

When considering the experimental results, it is obvious that none of the tested machines did not surpass the above mentioned limit, but some remarks should be made: while the two combines achieved lower values of the tubers' injury index, the E-684 machine was very close to the upper limit of the considered criterion.

Amount of impurities in the mass of harvested potatoes, I_c. The experimental results show that the amount of impurities into the mass of potatoes that were harvested and loaded into the transporting vehicle was comprised between 11.5% and 18.1%.

The lowest amount of impurities was achieved in the case of the CRC-2 combine (11.5%). The Dewulf RDT 1700 was placed the second, with 13.3% impurities in the mass of harvested potatoes. The larger amount of impurities (18.1%) was recorded by the E-684 potatoes harvesting and loading machine, a value that is 4.8% higher than the one recorded by the Dewulf RDT 1700 combine; The amount of impurities for the Dewulf RDT 1700 combine is only 1.8% higher than the value obtained for the CRC-2 combine.

We consider that the large percentage of impurities obtained for the E-684 machine is due to the fact that impurities separation is achieved only by mechanical means, while the combines are provided with places for 4 or 6 workers, who manually separate the impurities. In the meantime, the use of 6 workers on the CRC-2 combine instead of only 4, on the Dewulf RDT 1700, explains the lower amount of impurities achieved by CRC-2. Moreover, compared to the Dewulf combine, the CRC-2 combine is equipped with two supplementary separation devices (besides the rolling grates, used on both combines mainly for soil separation): an elevator with a rubber carpet and flexible fingers, used for separating clods and stones; a separation device provided with two rubber discs, aiming to separate clods and small stones.

Agro technical requirements impose a maximum percent of impurities of 20% (Neagu Tr. et al., 1984). All the tested machines fulfilled these requirements.

CONCLUSIONS

Based on the analysis of the experimental results, aimed to evaluate the effect of potatoes harvesting machine over the harvesting quality indices, we concluded that all the tested machines fulfilled the agro technical requirements.

The Dewulf RDT 1700 combine, being ranked second, first and respectively second (at neither of the quality indices was it ranked the third), achieved the best results. The CRC-2 potatoes harvesting combine, which was ranked third, second and respectively first, took the second place (third place when considering tubers losses). The E-684 harvesting and loading machine achieved the worst quality indices, being ranked first, third and respectively third (third place when considering the tubers' injury index and amount of impurities).

Taking into account the above-mentioned specifications, we recommend the use of the Dewulf RDT 1700 potatoes harvesting combine. The CRC-2 combine could be also considered, if technical sollutions are applied to reduce the losses of tubers.

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ECOLOGICAL CONTROL METHODS AGAINST COLORADO BEETLE OF POTATO CROPS ACCORDING TO ENVIRONMENTAL REQUIREMENTS

METODE DE COMBATERE ECOLOGICĂ A GÂNDACULUI DIN COLORADO DIN CULTURA DE CARTOF, ÎN CONTEXTUL ARMONIZĂRII CU MEDIUL ÎNCONJURĂTOR

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Abstract. *The potato pests and diseases form an important set of species, which produce great damages. The main pest of potato crops is Colorado beetle (Leptinotarsa decemlineata). In order to efficiently control this pest there is not a safe technology with spectacular results. The extent of biological crop system by partial or complete renouncing at chemically pest control ensuring has imposed to find new alternative fighting methods, which should be non-pollutant methods. The efforts made to reduce the traditional chemical pesticides due to their negative impact upon the environment have led to the elaboration of ecological managing systems for L. decemlineata populations, mainly based on the utilization of physical methods and plant biological protecting means. The paper presents the results of certain researches related to possibilities to protect the potato crop by using the natural enemies of Colorado beetle (entomopathogens, predators) and at the same time an equipment for ecological control.*

Key words: Colorado beetle, *Beauveria bassiana*, ecological control.

Rezumat. *Dăunătorii şi bolile cartofului formează un complex bogat de specii care produc pagube importante. Principalul dăunător al culturilor de cartof este gândacul din Colorado (Leptinotarsa decemlineata). Pentru controlul eficient al acestui dăunător nu există o tehnologie sigură cu rezultate spectaculoase. Extinderea sistemelor de culturi biologice, cu renunţarea parţiala sau integrală la combaterea chimică, a impus gasirea de metode alternative de combatere, nepoluante. Eforturile de a reduce pesticidele chimice convenţionale datorită impactului lor negativ asupra mediului înconjurator au condus la elaborarea unor sisteme ecologice de management al populatiilor de L. decemlineata, bazate, în principal, pe utilizarea metodelor fizice şi a mijloacelor biologice de protecţie a plantelor. In lucrare prezentăm rezultatele unor cercetari privind posibilităţile de protecţie a culturii de cartof prin utilizarea duşmanilor naturali ai gândacului din Colorado (entomopatogeni, prădători) şi a unui echipament de combatere ecologică.*

Cuvinte cheie: gandacul din Colorado, *Beauveria bassiana*, combatere ecologica.

INTRODUCTION

The methods of ecological protection are more and more promoted within the current context of environmental-friendly policy. Colorado beetle is one of the most convincing example of insect endowed with genetic and biochemical characteristics for rapidly developing resistance at chemical substances currently used for its control. The concern for human health has led to potato crops extension, as "organic" system**,** therefore the use of chemical insecticides is completely forbidden. The ecological protection is performed by using alternative methods (biological and physical).

We present the results of some researches regarding the ecological protection of potatoes culture by using a control equipment and biological insecticides based om entomopathogenic microorganisms.

MATERIAL AND METHOD

1. The physical fight against Colorado beetle of potato crops has been tested by means of a specialized equipment. For conceiving and manufacturing this equipment we have taken into consideration the insect physical and behaviour characteristics which have to be controlled, the resistance at air currents of plants to be protected, the air currents orientation, the air rate flow and speed.

Within the speciality literature (Misener G. C., Boiteau G., 1993) it is mentioned that Colorado beetles better grip on interior side of leaves or on their edges. An adult Colorado beetle can maintain its adherence on the plant, in spite of the application of forces equivalent to up to 20 times its weight. So, its ultimate speed is of approx. 12,5 m s^{-1} (Khelifi M., Laguë C., Lacasse B., 2001). The larva's reach terminal velocities of : 9,4 m s^{-1} for L_4; 7,3 m s^{-1} for L_3 ; 5,9 m s^{-1} for L_2, where L_2, L_3, L_4 represents the developing stages of Colorado beetle larva's. The adults and larvas of ultimate stages can be more easily detached out of the plant than those in incipient stages. The potato plants containing less than 12 leaves and a medium height under 40 cm could be exposed to air speed up to 27,5 m s^{-1} (at leafage level), without suffering a visible damage. (Khelifi M., 1996)

The ecological control equipment against Colorado beetle ECG-0 is aimed at pneumatically fighting against Colorado beetle in potato crops, by gathering the grubs and grown-up insects. The usage domain: include all the potato species in Romania, on different vegetation stages.

The frontal supporting frame is set on the tractor's chassis, in shape of deformable parallelogram, which is driven by a single effect hydraulic cylinder and ensures the equipment mobility in vertical plane. The frame of each section is designed at setting and supporting the active parts of the machine. Each frame is endowed with separated adjustments devices for every lateral sections. These settings are performed in relation with the distance between the rows of plants and their width. The gathering sections comprise the same constructive elements, with an appropriate arrangement of direction and acting sense on plants rows. The main elements of such a section are: the centrifugal fan, the pressure tubing and the pests collecting system. The air pressure tubing are manufactured as two rigid segments between which is found intercalary a linkage flexible element, allowing to adjust of the air pressing nozzle in comparison with the plants row. Each sections collecting part is placed in front of pressing nozzle of next section. The three centrifugal fans are individually driven by means of hydraulic engines. The oil comes from an own

hydraulic group, mounted by means of a rear supporting frame on the tractor's hydraulic elevator and driven from its PTO's.

The operating sytem of this equipment is based on the effect of grubs detachment out of Colorado beetle, on the potato plants by means of an air current produced by a centrifugal blower.

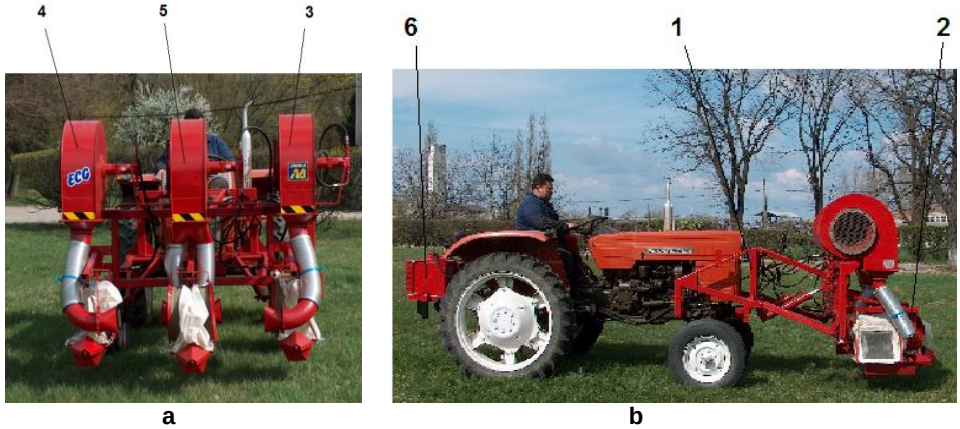

Fig. 1. Ecological control equipment against Colorado beetle ECG-0.
(a-frontal view si b –lateral view): 1- front supporting frame; 2- section frame; 3, 4 si 5-work sections; 6- hydraulic actuating installation.

The collecting sections enframe each plants row (left-right). The air jets. produced by the three centrifugal fans and evacuated through air nozzles "washes" the potato stems, causing the leaves shaking and the pests detachment (the beetles and their grubs) out of vegetal matter. At the same time the air currents also perform the pests transport towards the equipment special collecting division, from where they are subsequent taken out and destroyed. The air current speed is adjusted by modifying the fans flowing rate, as a result of their rotational speed frequency and this adjustment is performed in terms of plant vegetal and crop characteristics and crop infecting degree. The front supporting frame with mechanism of deformable parallelogram type ensure the adjusting of working height in comparison with the running surface and allows the optimum position of active parts as against the respective plants.

Main technical and functional characteristics of equipment ECG-0

- Equipment Type…….....carried
- Power source…….....L-445 tractor
- Operating system…….....hydraulic engine
- Number of rows processd at a single passing……...2
  - Distance between sections, m…….....max. 0.75
  - Type of fans…….....centrifugal
- Fans' rotating frequency, min^{-1}…….....2700
- Fans' flow, $m^3 h^{-1}$ …….....1886
- Working height, measured from the ridges' top min. mm……100
- Work speed, Km h^{-1}…….....2…4
- Air current speed:
  - at nozzle's output, m s^{-1}……25…46
  - at collector's input, m s^{-1} ……....10…13

2. It was tested the biological activity of an experimental fungal bioinsecticide formulated as concentrated conidian suspension ($2x10^8$ conidia/ml) whose active

ingredient was entomopathogenic fungus *Beauveria bassiana* (Bals.) Vuill. The experiment was organized in a potato crop in plots of 25 sq. m. The biological insecticide was applied in the post bloom potato culture infested with *L. decemlineata* larvae ($L_1 – L_4$). The fungal bioinsecicide was applied on leaf at a dose of 0.6 l / ha in 300-400 L solution / ha, resulting in a quantity of active ingredient per hectare of 1.2 $x10^{11}$ conidia. There are made observations on the number of live larvae before the treatment and the number of dead larvae at 3, 5, 10 and 15 days after treatment. There were used CALYPSO 480 SC (0.08 l / ha) and Decis 2.5 EC (0.3 l / ha) as chemical standards. Biological efficacy of the product was calculated using the Haenderson-Tilton formula.

RESULTS AND DISCUSSIONS

By testing the equipment of Colorado beetle ecological control ECG-0 we have been able to verify its design and operating principle.Following the performed determinations we have found out that the air current speed coming out of nozzles at potato plants level was of max. 25 m s^{-1} – speed which does not hurt the plants (according to the previous statements). The air current speed has been appropiate for Colorado beetle grown-ups and grubs transport. The tests results synthesis is shown in table 1. In terms of a medium displacement speed v_m=2.4 Km h^{-1} and a coefficient of using the shift working time K_{07}=0.7, at a single passage, the effective output was of W_{ef}=0.336 ha/h, and the productivity of working shift time was of W_{shf}=1.88 ha/shf.

Tabel 1

Working qualitative de lucru

Den. no.	Working qualitative indices	Symbol	M.U	Value			
				Grubs L_1-L_2	Grubs L_3-L_4	Adults	Total
1.	Detachment grade	G_d	%	53,96	65,12	77,89	65,69
2.	Collecting grade	G_a	%	40,62	51,27	60,51	50,80
3.	Alive pests falling down (soil)	i_v	%	13,34	13,95	17,38	14,89
4.	Pests crushed by the tractor's wheels	i_s	%	5,63	8,16	3,67	5,82
5.	Control degree for Colorado beetle	G_c	%	46,25	59,43	64,18	56,62
6.	Plants' damaging stage by the equipment	G_v	%				3,36
7.	Plants' damaging stage by the tractor passage	G_{vt}	%				6,47

The analysis of results, taking into account the values obtained for the main qualitative indice, control degree for Colorado beetle, G_c=56.62% comprising the collecting degree and the percentage of insects crushed by tractor's wheel during the working process, is promising, although these performances do not reach the level of other foreign machines. The pests remained in the crops after a passage are numerous enough (approx 40% grubs and approx. 20% grown-ups) so that for efficiently destroy them several passages are necessary.

The results of the test performed in different experimental plots (P-1, P-2) are presented in tables 2 and 3. In both experimental plots the fungal bioinsecticides induced larval mortality from the 3-rd day of treatment, first and second instar larvae showing more sensitivity to the entomopathogenic action, compared with 3th and 4th instar larvae. In the P-1 plot is found progressive increase in the larval mortality, begining with the 5th day after bioinsecticide application. After 10 days of treatment the efficacy of the biological insecticide was superior to chemical standard (DECIS 2.5 EC), ranging between 97-100% (table 2).

In the experimental variants in P-2 plot, the biological insecticide had good efficacy in *L. decemlineta* larvae control, the larval mortality ranging between 92,5-100% for 1st and 2th larval instar, respectively 80.5 to 92.5% for 3th and 4th larval instar. Compared with chemical standard the experimental bioinsecticide recorded during the 15 days of observation, a lower biological effectiveness (table 3).

Table 2

***Beauveria bassiana* biological activity in *Leptinotarsa decemlineata* control (experimental plot P-1)**

Variant	Dose	Number of live larvae before of the treatment		(%)larvar mortality, after treatment							
				3 days		5 days		10 days		15 days	
		L_{1-2}	L_{3-4}	L_{1-2}	L_{3-4}	L_{1-2}	L_{3-4}	L_{1-2}	L_{3-4}	L_{1-2}	L_{3-4}
Fungal bioinsecticid	*$1,2x10^{11}$ conidia/ha*	*443*	*335*	*97,7*	*74,0*	*98,2*	*80,3*	*100*	*96,4*	*100*	*96,7*
DECIS2,5EC	*0,3 l/ha*	*489*	*411*	*94,7*	*87,8*	*95,3*	*92,2*	*90,3*	*89,3*	*87,3*	*85,2*
Fungal bioinsecticid	*-*	*473*	*382*	*470*	*394*	*400*	*400*	*381*	*376*	*399*	*387*

Table 3

***Beauveria bassiana* biological activity in *Leptinotarsa decemlineata* control (experimental plot P-2)**

Variant	Dose	Number of live larvae before of the treatment		(%)larvar mortality, after treatment							
				3 days		5 days		10 days		15 days	
		L_{1-2}	L_{3-4}	L_{1-2}	L_{3-4}	L_{1-2}	L_{3-4}	L_{1-2}	L_{3-4}	L_{1-2}	L_{3-4}
Fungal bioinsecticid	*$1,2x10^{11}$ conidii/ha*	*151*	*138*	*92,5*	*80,5*	*95,0*	*82,5*	*100*	*92,5*	*100*	*90,0*
CALYPSO 480 SC	*0,3 l/ha*	*609*	*503*	*100*	*97,2*	*100*	*99,4*	*100*	*99,4*	*100*	*99,4*
Fungal bioinsecticid		*408*	*452*	*400*	*470*	*391*	*485*	*345*	*490*	*320*	*499*

The diagnosis of the mycosis induced by the biological treatment was done by the "wet room" method; for estimating the biological effectiveness it was taken into account only the larvae that had specific signs of *B. bassiana* mycosis (fig. 2).

Fig.2. Micosed *Leptinotarsa decemlineata* larva (L_2 –L_4) from experimental plots with *Beauveria bassiana* treatments

As shown in fig. 2, the *B. bassiana* saprophytic development, proves a considerable advantage in terms of biological control as the fungal sporulation on insects bodies ensures the pathogen horizontal transmission from an infected host to another, without the need for a new phytosanitary intervention.

CONCLUSIONS

The results obtained during the tests of the ecological control equipment for Colorado beetle in potato crop, in real working conditions and as a result of a rich expertise represent important arguments for manufacturing of performant and harmonized with the environment equipment.

The test of biological insecticide based on *B. bassiana* has proved a very good efficacity in *L. decemlineta* control, which demonstrates its possible use in orgnic protection progrmas of potato crops.

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TECHNOLOGY AND INSTALLATION FOR FRUIT STONE REMOVAL

TEHNOLOGIE ŞI INSTALAŢIE PENTRU SCOATEREA SÂMBURILOR DIN FRUCTE

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Abstract: *The paper presents a machine of extracting the fruits kernels, manufactured by INMA –Bucharest. It is an independent installation aimed at obtaining certain by products, which are subsequently used at processing other food product (jam, plum jam, natural juices). There are also presented the results of tests performed with this machine, as well as, the advantage of using it within the technological process of fruit, industrially processing. The installation has been designed and tested in order to separate the kernel from the small stone fruits (sweet cherries, sour cherries and plums) and big stone fruits (apricots, peaches and nectarines), obtaining this way a process of 95-99% of stones taken out of fruits.*

Key words: stone fruits, stone, pulp.

Rezumat: *În lucrare se prezintă o maşină de scos sâmburi din fructe realizată de INMA Bucureşti ca o instalaţie independentă pentru obţinerea unor subproduse utilizate ulterior la fabricarea altor sortimente alimentare (gem, magiun, sucuri naturale). Sunt prezentate rezultatele încercărilor efectuate cu acestă maşină, precum şi avantajele utilizării acestei maşini în procesul tehnologic de prelucrare industrială a fructelor. Instalaţia a fost proiectată şi testată pentru a separa sâmburii de la fructe mici (cireşe, vişine şi prune) şi mari (caise, piersici şi nectarine), obţinând în acest fel 95-99% sâmburi scoşi din fructe.*

Cuvinte cheie: fructe sâmburoase, sâmbure, pulpă

INTRODUCTION

The efficiency of an activity of production, in case of horticultural products is finally determined by the capitalizattion manner and its forms. At the prezent moment , the most difficult problem encountered by the small producers of fruits is how to render them profitable, especially those which are perisahable. A solution to this problem is represented by the smiindustrialization process of fruits by means of small and medium capacity equipment and installations.

In general, in order to process the stone fruits for obtaining natural juices, gams and different pasty products are necessary the instalations (machines) that take the stones out of fruits (Ioancea L., 1986).

The operating principle of the above machines is based on several procedures, namely:

a) taking out the stones by pressing, under the action of mechanical elements;

b) cutting the fruit in two pieces and then removing the stones from the two halves;

c) cutting the fruits till the stone and removing the whole stone.

When the fruits are industrially processed for obtaining products such as jams, marmelades, juices, nectars etc., the aspect of fruit (pulp) is less important and that is why the installation should not ensure the integrity of processed products.

MATERIAL AND METHOD

Within INMA Bucharest has been conceived and manufactored an installation of stnes removing (fig. 1), where the working process consist in cutting the fruits till their stones and then, removing them as a whole. This installation above, by small adjustments and interchangeable components can ensure the necessary conditions for taking the stones out of fruits, inrespective of their size (sweet cherries, sour cherries, plums, apricots, peaches etc.)

The installation for fruit stone removal can be a part of a technological process for capitalizing the stone fruits or an independent installation for obtaining by products ,subsequently used at other food products fabrication (jam, marmelade, natural juices).

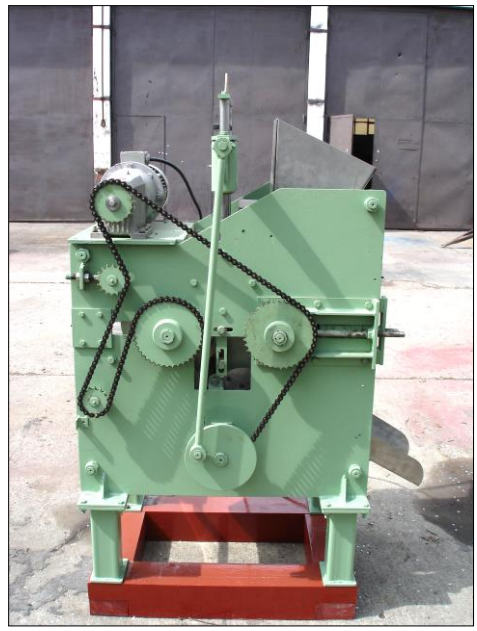

Fig. 1. Installation for fruit stone removal

Description and operating system of installation

The installation, which is schematically presented in figure 2, compuises a gearmotor (1) mounted on a metallic frame (2), which drives a disc rotor (3) and a cylindrical drum on which a food rubber layer has been cured (3), chain transmission (11)

The installation is endowed with a cutting knife-type device (5) driven from two mechanisms of rod-handle type (6) for facilitating the fruit penetration between the two drums.

At the installation upper part a feeder hopper (7) is mounted aimed at stone fruits removal.

The fruits collecting is performed in three troughs, such as:

-trough for stones (8)

-trough for pulp (9)

-trough for juice (10)

All the components of installation coming into contact with processed fruits are made of austenitic steel.

The installations operating system is based on cutting the fruit till its kernel after which the stones are completely removed by means of a rubber drum, afterwards the fruits without their stones are collected and their juce is recovered.

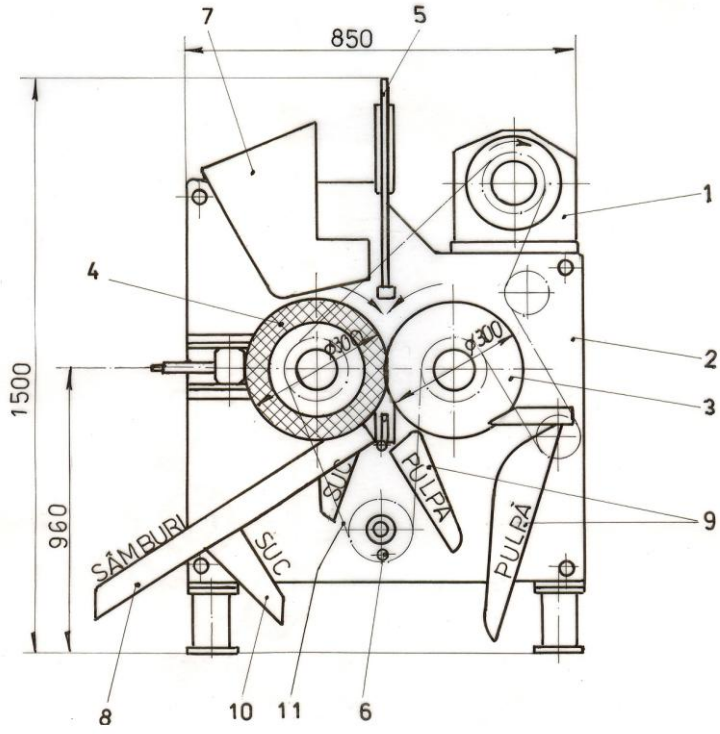

Fig.2. Operating scheme of installation for fruit stones removal:
1-gearmotor; 2-frame; 3-drum with discs; 4-rubbered drum; 5-cutting knife; 6-rod system; 7-feeder hopper; 8-trough for fruit stones; 9-trough for pulp10-trough for juice; 11-chain 10B-1

Before being processed the fruits stalks are removed and they are washed for eliminating the dust particles or other adherent impurities on fruits external part.

The fuits are manually (or mechanically) introduced through the feeder hopper (7) and theyfall between the two drums (3 and 4).

The soft part of the fruit (pulp) enters between the disc of drums (3) and the stones continue to be rolled between the two drums (3 and 4), the pulp reaching

also the stone separator, which guides the stones into the collecting trough (8) and the juice is carried forward to be gathered into the trough (10).

The pulp falls into the pulp collecting trough (9) and remains between discs are scraped out by rabble and sent into the same collecting trough.

Technical and functional characteristics:

- Working capacity, kg/h 300-400
- Degree of the stone removal, % 95 - 99
- Electric engine power, kW 1,5
- Electric engine rotative speed, rot/min 1420
- Rotativ speed of drums, small fruits/big fruits/, rot/min 41/31
- Number of double lifts of cuttingknife, small fruits/big fruits, cd/min 70/52

RESULTS AND DISCUSSIONS

The installation for fruit stone removal has been tested in the following conditions:

- processed product sour cherries and plums
- ripening degree mature fruits
- impurities (after washing and drying), % 1,2
- quantity of products per sample, kg 8,00
- test performed for fixing the installation 3 for sour cherries
  3 for plums

The installation s adjustment has been made for the following parameters:

-rotative speed of disc drum, rot/min 41
-rotativ speed of rubber drum, rot/min 41
-perpheral speed of drums, m/min 38,6
-frequency of cutting knif lift, cd/mim 70
-distance between drums, mm 3
-distance from cutting knife to drums, mm 3
-distance from separator to rubbered drum, mm 2
-time of feeding on a test, min 1

The experimental results are presented in table 1.

Table 1

Experimental results

PARAMETER	MU	Sour cherries	Plums
Quantity of processed product	kg	8,0	8,00
Quantity of stones removed	kg	1,130	0,333
Quantity of resulted pulp and juice	kg	6,838	7,612
Quantity of residual products in the installation	kg	0,032	0,055
Quantity of existing stones in pulp having been separated	kg	0,048	0.01

Following the researches, the percentge of stones remained unseparated for sour cherries was of 1,4% and for plums was 1%.The percentage of residual pulp per sour cherry stones was of 4.5% and for plums was 1,1 %.

In fig. 3 there are shown aspects during the experiments and the processed samples are shown in fig. 4 and fig. 5 .

Fig.3- Aspects during the experiments

Fig.4. Sample of sour cherries

Fig.5. Sample of plums

Socio-economic effects:

- shortening the removing time in comparison with the manual operation;
- reducing the physical effort;
- improved reliability;
- increased work quality and reduced exploiting costs;
- ecological (non polluant) processing technology;
- creating new jobs at producer level and in rural area;
- diminishing the imports of similar installations.

CONCLUSIONS

1. This installation fulfils all the requirements for fruit industrial processing.

2. The performed degree of stones removing out of fruit is: for sour chrries 95,9% and for plums 99%.

3. The installation can be adjusted in order to separate small or big stones.

4. The installation is able to operate independently or integrated in an industrial processing line.

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ASPECTS EN CONCERNANT L`APPARITION ET L`ÉVOLUTION DES AGENTS PATHOGÈNES SPÉCIFIQUES (DES VIROSES, DES BACTERIOSES, DES JAUNISSEMENTS MYCOTIQUES) AUX PIMENT DOUX, DANS LES CONDITIONS CLIMATIQUES DE LA PLAINE DU BARAGAN (LA ZONE BRAILA)

ASPECTE PRIVID APARIŢIA ŞI EVOLUŢIA UNOR AGENŢI PATOGENI SPECIFICI (VIROZE, BACTERIOZE, INGALBENIRI MICOTICE) LA ARDEI ÎN CONDIŢIILE CLIMATICE ALE CÂMPIEI BĂRĂGANULUI (ZONA BRĂILA)

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Abstract. *Pepper crops (green pepper, bell pepper and long pepper) are attacked by a series of dangerous pathogens which can produce great damages. During cold and rainy years the pepper wilt (Phytophthora capsici) produces great damages. During draughty years great damages are produced by the virosis and mycotic wilts caused by fungus such as Fusarium and Verticillium, as it happened in 2009. For this purpose, there has been studied the dynamics of appearance and evolution of the pathogens at 11 species and hybrids of green pepper, long pepper and bell pepper of Romanian and foreign origin. There have been recorded data of great importance for the farmers who grow different types of pepper (green pepper, bell pepper and long pepper).*
Key words: green peper, *Phytophthora, Fusarium Verticillium*

Rezumat. *Culturile de ardei (gras, gogoşar şi lung) sunt atacate de o serie de agenţi patogeni periculoşi, care pot produce mari pierderi. În anii ploioşi, răcoroşi, pagube mari produce mana ardeiului (Phytophthora capsici) şi uneori bacteriozele . În anii secetoşi pagube mari produc în special virozele şi ofilirile micotice cauzate de ciupercile din genurile Fusarium şi Verticillium, aşa cum s-a întâmplat în anul 2009. Pentru aceasta, a fost studiată dimaica apariţiei şi evoluţiei agenţilor patogeni la 11 soiuri şi hibrizi de ardei gras, ardei lung şi ardei gogoşar de provenienţă românească şi străină. Au fost obţinute date care prezintă importanţă pentru fermierii care cultivă diferite varietăţi de ardei (gras, lung şi gogoşar).*
Cuvinte cheie: ardei gras, *Phytophthora, Fusarium, Verticillium*

INTRODUCTION

Le poivron est attaqué pendant les années de sécheresse des agents pathogènes comme: de viroses e des jaunissements mycosiques provoqé surtout des champignons de la varitété *Fusarium* et *Verticillium.* Aussi, pendat le temps pluvieux tant que le frais, les poivrons peuvent être attaqués par des bactérioses, particulièrement provoquées par la bactérie *Xanthomonas vesicatoria*. Les viroses plus importantes qui peuvent affecter le poivron peuvent être provoquées par:

Tobacco mosaic virus in pepper, le rabourgi et l`augmentation du poivron produits par *Cucumber mosaic virus in pepper*, le mosaique jaune di poivron, provoqé par *Alfalfa mosaic virusin pepper*.

Les chapignons de la variété *Fusarium* et *Verticillium* produissent au poivron des jaunissements, plus rapides ou plus lentes. La variété *Fusarium* produit, d` habitude, des jaunissements parfois apoplectiques. Dans ces cas – ci, les plantes peuvent maintenir après le jaunissemnt la couleur verte. Le genre *Verticillium* produit, des jaunisssements plus lents, qui peuvent durer parfois jusqu`aux 3 semaines

La bactérie *Xanthomonas vesicatoria* produit des taches sur les feuilles et des cloques sur les fruits du poivron. Particulièrement à cette maladie – ci, c`est l`apparition sur les feuilles des taches nécrotiques petites au début (1 mm le diamètre) qui ensuite elles grandissent jusqu`aux 3 – 5 mm. Plus tard, les feuilles attaquées peuvent dessécher et ensuite elles tombent. Les fruits attaqués se déprécient qualitatif.

MATÉRIEL ET MÉTHODE

Les experiences ont été fait aupprès de Brăila. L`étude de l`évolution de l`attaque des agents pathogènes mentionnés a été effectué sur 13 variétés et hybrides des poivrons sur 13 variétés et hybrides des poivrons (piments doux, piments – tomates, poivrons longs). Les 11 variétés et hybrides ont été emplacer les uns à côté des autres, d`après le modèl des lots démonstratifs, par des rangs équidistants (70 cm) et 10 m longueur. Chaque variété ou hybride a constitué une parcelle expérimentale. Chaque parcelle a eu une surface de 7 m^2 et elle a eu dans sa structure 40 plants de piments.

Pour l`evaluation de l`attaque des pathgènes mentionés, on a été utilisé le système de notation qui exige le calcul des suivantes valeurs: F% (fréquence de l`attaque), I% (l`intensité de l`attaque) et G.A.% ( le degré de l`attaque) Le degré de l`attaque est donné par la formule: F x I/100. Pour le calcul des valeurs mentionnées dans le cas de la bactériose ont été analyses 6 feuilles par plante. Á chaque parcelle ont été analysées 10 plantes. Pour noter l`intensité de l`attaque (I%), chaque feuille attaquée par la bactériose a reçu des notes de 1 à 6, en fonction de la surface attaquée.

Dans le cas des viroses et des chamignons de la sorte *Verticllium* et *Fusarium* on a considéré la fréquence (F%) des plantes attaquées vis – à – vis de celles – ci non – attaquées. Pour noter l`intensité de l`attque (I%), chaque plante attaquée par de viroses, *Verticillium* et *Fusarium* a reçu aussi des notes en commencant de 1 à 6. Le nombre de plantes analysées à chaque parcelle a été aussi 10.

Dans le cas de l`attaque de viroses, *Verticilium* et *Fusarium,* pour noter l`intensité de l`attaque (I%) on a prit en considération le procentage de la plante attaquée.

Les observations en concernant l`apparition et l`évolution de l`attaque des agents pathogènes ont été executées aux tous les 11 variétés et hybrides ainsi: le 15 mois de juillet, le 31 mois de juillet et de 26 mois d`août.

Pour la collection et l`interprétation des dates météorologiques on a utilisé le système ,,Argroexpert,, de l`Unité Phytosanitaire Braila.

RÉSULTATS ET DISCUTIONS

Observations effectuées en 2009 le 15 mois de juillet. Le mois de juillet les plus évidentes ont été les symptômes de viroses. Ceux symptômes – ci ont manifesté surtout aux variétés de piment doux Jaune Supérieur (G.A. 40 %) et Arôme (G.A. 24 %). On suivit par l`ordre décroissant la variété de piment doux Bârsan (G.A. 15,5%) la variété de piment – tomate Cornel (G.A. 15,5%), les hybrides de poivron long: Rosano F_1 (G.A 14,5%), Red Imperator F_1 (G.A. 8%) et Nordal F_1 (G.A.5,5 %). Les hybrides de poivron long: Orea F_1, Golden Horn F_1, Mansur F_1 et le hybride de piment – tomate Tomaten Paprika F_1 n`ont présenté aucun symptôme de viroses à celle date – la.

En concernant les prèmiers symptôme de bactériose les plus évidents ont été aux variétés de piment – doux Jaune Supérieur (G.A. 9,2 %), Arome (G.A. 8,1%) et au variété de piment - tomate Cornel (G.A. 1,4 %). Les hybrides de poivrons longs et le hybride de pement – tomate Paprika F_1 ont présente des symptômes faibles ou nuls. Le jaunissements mycotiques n`ont été manifester aucune variété ou hybride(tab,1).

Table1

Le comportament de l`attaque des viroses, de la bactériose et des jaunissements mycosiques et des variétés et des hybrides de poivron (piment doux, poivron long et piment – tomate), le 15 mois de juillet 2009.

G.A% / La variété /le hybride	Viroses	Bactériose (*Xanthomonas vesicatoria*)	Fusarium étiolement (*Fusariumsp.*)	Verticillium étiolement (*Verticillium* sp.)
Jaune Suoérieur*`	40,0	9,2	0	0
Bârsan*	15,5	4,6	0	0
Arome*	24,5	8,1	0	0
Nordal F_1**	5,5	0,6	0	0
Rosano F_1**	14,5	0,3	0	0
Red Imperator F_1**	8	0	0	0
Orea F_1**	0	0	0	0
Golden Horn F_1**	0	0	0	0
Mansur F_1**	0	0	0	0
Tomaten Paprika F_1***	0	0	0	0
Cornel***	15,5	1,4	0	0

*- piment doux **- poivron long; ***- piment - tomate

Observations effectuées en 2009 le 31 mois de juillet. Le 31 mois de juillet, la plus affectèe de viroses a été aussi la variété de piment doux Jaune Superieur (G.A- 53,0%)suivit par: Bârsan (G.A. 36,5%) et Arome (G.A. 31,0%). Au hybrides de poivron long, la manifestation de viroses a été la suivante: Rosano F_1 (G.A 14%), Orea F_1 (G.A. 10,0%), Mansur F_1 (G.A. 6,5%), Red Imperator F_1

(G.A. 4 %) et Golden Horn F_1 (G.A. 3,5 %). Au piment - tomate, le hybridee Tomaten Paprika F_1(G.A.11,5 %) a eu un comportament meilleur à l`ataque de viroses que la variété Cornel (G.A 31,5 %). Le degré de l`attaque des bactérioses a eu un évolution lent vis – à – vis le 15 mois de juillet; par exemple, aux variétés de piment doux: Arôme – G.A. 10,9% Jaune Supérior -G.A. 9,3%, Bârsan – 2,5%. Les hybrides de poivrons longs ont manifesté des symptômes légèrs de bactérioses, (G.A. 0,25 – 1,1%). Toutes les 2 cultures (Tomaten Paprika F_1 et Cornel) de piment – tomate ont eu aussi des symptômes légèrs de bactériose (G.A. 1,0 – 1,1%). En concernant les jaunissemnts mycotiques ont présenté des symptômes typiques produits par *Fusarium* sp. la variété de piment – doux Bârsan (G.A 20%) le hybride de poivron long Rosano F_1 (G.A.10%) et la variété de piment – tomate Cornel. La variété de piment doux Arôme F_1 a présenté des symptômes typiques produits par *Verticillium* sp.(ta.2)

Table 2

Le comportament de l`attaque des viroses, de la bactériose et des jaunissements mycotiques et des variétés et des hybrides de poivron (piment doux, poivron long et piment – tomate), le 31 mois de juillet 2009.

G.A% La variété /le hybride	Viroses	Bactériose (*Xanthomonas vesicatoria*)	Fusarium étiolement (*Fusarium sp.*)	Verticillium étiolement (*Verticillium* sp.)
Jaune Suoérieur *	53,0	9,3	0	0
Bârsan*	36,5	2,5	20	0
Arôme*	31,0	10,9	0	10
Nordal F_1**	9,0	1,1	0	0
Rosano F_1**	14,0	0,4	10	0
Red Imperator F_1**	4,0	0,25	0	0
Orea F_1**	10,0	0,5	0	0
Golden Horn F_1**	3,5	0,6	0	0
Mansur F_1**	6,5	0,8	0	0
Tomaten Paprika F_1***	11,5	1,0	0	0
Cornel***	31,5	1,1	10	0

*- piment doux **- poivron long; ***- piment – tomate

**Observation effectuées en 2009 le 26 mois d`août.** A la date du 26 mois d`août on a été enregistré un recul légèr, vis – à – vis du 31 mois de juillet ,des symptôme produits par des bactérioses aux toutes les cultures de poivrons. Par exemple, les variétés de piments doux Jaune Supérieur et Arôme ont présénté un G.A. moindre 7,5 et respectivement 8,8% vis – à – s de 31 mois de juillet. Les symptômes produits par des viroses ont eu le plus semnificatif accroissement, vis – à – vis le 31 mois de juillet . Les plus affectées ont été les piments doux: Jaune Supérieur (G.A 65%), Arôme (G.A. 52%), Bârsan (G.A. 48%), la variété de piments – tomates Cornel (G.A 48%) et le hybride de poivrons longs Rosano F_1 (G.A. 44%). Un comportament meilleur à l`attaque des viroses ont eu les hybrides: Orea F_1(G.A. 33,8%), Nordal F_1(G.A 24%), Red Imperator F_1 (G.A.24,5%), Golden Horn F_1 (G.A. 21,0%), Mansur F_1 (G.A. 21,0%) et la hybride de piment tomate Tomaten Paprika F_1 (G.A. 24 %). Les jaunissements mycotiques ont affecté

les variétés: Bârsan (G.A. 30% -*Fusarium* sp); Galben Superior (G.A. 20% *Fusarium* sp), Arôma (G.A. *Fusarium* sp.10 % şi G:A *Verticillium* sp. 10%). Des symptômes produits par les jaunissements mycotiques (*Fusarium*) on présenté aussi le hybrides des poivrons longs: Nordal (G.A. 10%), Rosano F_1 (G.A. 10%), Red Imperator F_1 (G.A. 10%). La variété de piments – tomates Cornel des simptômes de *Fusarium* (G.A. 10%) et *Verticillium* (G.A. 10%)(tab.3)

Table 3

Le comportament de l`attaque des viroses, de la bactériose et des jaunissements mycotiques et des variétés et des hybrides de poivron (piment doux, poivron long et piment – tomate), le 26 mois de aoûit 2009.

G.A% La variété /le hybride	Viroses	Bactériose (*Xanthomonas vesicatoria*)	Fusarium étiolement (*Fusarium sp.*)	Verticillium étiolement (*Verticillium* sp.)
Jaune Superieure*	65,0	7,5	20	0
Bârsan*	48,5	2,2	30	0
Arôme*	52,0	8,8	10	10
Nordal F_1**	24,0	2,6	10	0
Rosano F1**	44,0	0,4	10	0
Red Imperator F_1**	24,5	0,25	10	0
Orea F_1**	33,8	0,5	0	0
Golden Horn F_1**	21,0	2,4	0	0
Mansur F_1**	21,0	1,7	0	0
Tomaten Paprika F_1***	24,0	2,1	0	0
Cornel***	48,0	4,1	10	10

*- piment doux **- poivron long; ***- piment – tomate

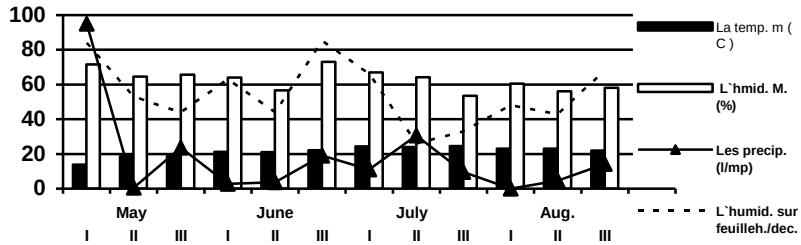

Fig. 1. L`evolution des facteurs climatiques pendant 2009 (la température moyenne, l`humidité relative moyenne de l`air% les precipitations l/$m^2$ l` humidité sur les feuilles h/dec.)

Fig. 2. Les conidies du type *Fusarium* isollées des plantes de poivrons, étiolées apoplectiques (original).

CONCLUSIONS

1. Pendant 2009, les viroses ont été les agents pathogènes qui ont affecté la plupart des cultures de poivrons, en département Braila.

2. D`habitude, les premiers symptômes de viroses apparaissent de la deuxième moitié du mois de juillet. Ceux – ci progressent rapidement, sourtout pendant les annés de sécheresse et chaudsi.

3. La seule possibilité efficace pour prévenir les attaques des viroses c`est de cultiver des variétés et des hybrides qui ont prouvé etrê résistants.

4. D`entre les hybrides de poivrons longs testés, le meilleur comportament à l`attaque des viroses ont eu les hybrides: Mansur, Golden Horn F_1, Red Imperator F_1, Nordal F_1. Plus sensibles à l `attaque des viroses ont prouvé être les hybrides de poivrons longs: Orea F_1 et Rosano F_1.

5. Le hybride de piment-tomate Tomaten Paprika F_1 a eu un comportament meilleur à l`attaque des viroses que la variété Cornel.

6. Les variétés de piments doux Jaune Superieur Arôme et Bârsan ont prouvé être sensibles à l`attaque des viroses.

7. L`attaque des bactérioses a prouvé être assez réduit en 2009, mais les variétés de piments doux Jaune Superieur et Arôme ont prouvé être plus sensibles que la variété Bârsan. Les hybrides de poivrons longs et toutes depoivrons longs et toutes les 2 cultures de piments – tomates testées ont eu un comportoment assez bon à l`attaque des bactérioses.

8. Les jaunissements mycotiques produits par les champignons des genres *Fusarium* et *Verticillium* ont manifesté moins que les viroses. Les variétés de piments – doux ont eu plus affectées; Jaune Supérieur, Bârsan et Aroma .

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LA DYNAMIQUE DE L`APPARITION ET DE L `ÉVOLUTION DE L`ATTAQUE DES AGENTS PATHOGÈNES SPECIFIQUES AUX MELONS DANS LES CONDITIONS CLIMATIQUES DES ANNÉS 2008 ET 2009 (LA ZONE BRAILA)

DINAMICA APARIŢIEI ŞI EVOLUŢIEI ATACULUI UNOR AGENŢI PATOGENI SPECFICI PEPENILOR GALBENI ÎN CONDIŢIILE CLIMATICE ALE ANILOR 2008 ŞI 2009 (ZONA BRĂILA)

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Abstract. *Years 2008 and 2009 proved to be extremely draughty and warmly. Under these conditions, the crops of yellow melons were attacked by a series of pathogenic organisms proper to these climacteric conditions, such as the Verticillium wilt - Verticillium, Fusarium wilt – Fusarium,sp., virosis. For this purpose, there has been studied the evolution of the meteorological factors: temperature, medium humidity of air, precipitations and humidity on leaves, as well as appearance and evolution of the symptoms of the pathogenous organisms mentioned before. For collecting and processing the data, there has been used the "Agroexpert" system within the Phytosanitary Unit – Braila. During the above mentioned years, there has not been noticed any downy mildew caused by Pseudoperonospora cubensi; these years being the first years after 13 years of research when the appearance of the attack of this pathogenic organism to the yellow melons has not been recorded.*

Key words: *Verticillium, Fusarium,,* virosis

Rezumat. *Anii 2008 şi 2009 s-au dovedit a fi deosebit de secetoşi şi călduroşi. În aceste condiţii, culturile de pepeni galbeni, au fost atacate de o serie de agenţi patogeni specifici acestor condiţii climatice, cum ar fi: verticilioza – Verticillium sp. ,fuzariază – Fusarium sp., viroze. În acest scop, a fost studiată evoluţia factorilor meteorologici: temperatura, umiditatea medie a aerului, precipitaţiile şi umiditatea pe frunze, precum şi apariţia şi evoluţia simptomelor, agenţilor patogeni menţionaţi. La culegerea şi prelucrarea datelor, a fost utilizat sistemul ,,Agroexpert,, din cadrul Unităţii Fitosanitare – Brăila. În anii menţionaţi nu a fost semnalat atac de mană Pseudoperonospora cubensis, fiind primii ani, după 13 ani de observaţii, când nu se observă apariţia atacul acestui agent patogen la pepenii galbeni*

Cuvinte cheie: *Verticillium, Fusarium* ,viroze

INTRODUCTION

Les melons sont attaqués aussi de viroses, surtout celles – ci qui se transmettent facilement par les vecteurs. Ici on remarque partculièrement le virus du mosaique des concombres (*Cucumber mosaic virus*). Au – dessus des feuilles

jeunes de plantes apparassent des taches petites, jaunâtres – verdâtre, qui alternent avec les zones colorées normalement (le symptom typique du mosaique).

Dernièrement on constate un accroissement de la fréquence de l`attaque des champignons qui produit des étiolement vasculaires (*Verticillium dahliae et Fusarium* sp.). L`attaque des champignions se remarque par l`apparitions des symtômes d`étiolement, qui peuvent – être plus fort, dans le cas de la varété *Fusarium* ou plus lent, dans le cas du champignon *Verticillium dahliae.*

Pendant les années 2008 et 2009, à cause des conditions climatiques (des températures plus hautes, de la sécheresse, l` humidité plus diminuéeé de l`air, on ne voit aucun symptôme du mildiou aux melons .C`est pour la première fois pendant 14 ans d`observations aux melons, quand l`attaque du mildiou est absent pendant l`année, 2 ans consécutifs.

MATERIEL ET METHODE

Les expériences ont été fait auprès de Brăila. Ces expériences – ci ont été exécutés avec la restriction stricte de la technologie de culture spécifique au melon.

L`apparition et l`évolution de l`attaque des viroses et des champignons des variétés *Verticillium* et *Fusarium* ont été observées pendant 2008 aux 3 hybrides de melons (Ananas F_1, HP 03710 F_1, 198/03 F_1) et pendant 2009 aux 3 hybrides (Ananas F_1, HP 03710 F_1, UG 1405 F_1) et un variété (Fondant).

Pendant 2008, l`expérience a été faite en carré latin (3 variantes placées en 3 répétitions). Pendant 2009, l` expérience on été faite en blocus randomisés (4 varientes placées en 3 répétitions).

Pour l`évaluation de l`attaque des pathogènes mentionés, on a été utilisé le système de notation qui exige le calcul des suivantes valeurs: F% (fréquence de l`attaque), I% (l`intensité de l`attaque) et G.A. (le degré de l`attaque). Le degré de l`attaque est donné par formule: F x I/100. Pour le calcul des valeurs signalées dans les cas des viroses ont été analisées par 20 feuilles à la chaque parcelle expérimentée. Pour noter l`intensité de l` attaque (I%), chaque feuille avec des symptômes des viroses a reçu des notes en commencant de 1 à 6, en fonction de la surface attaquée.

Dans le cas des champignons de la sorte *Fusarium* et *Verticillium* on a considéré la fréquence (F%) des plantes attaques vis-à-vis de celle-ci non attaquées. Pour noter l`intensité de l`attaque (I%), chaque plante attaquée par *Verticillium* et *Fusarium* a reçu aussi des notes en commencant de 1 à 6. .Le nombre de plantes à chaque parcelle a été 10.

Dans le cas de l`attaque de *Verticillium* et *Fusarium,* pour noter l`intesité de l`attaque (I%) on a prit en considération le procentage de la plante attaquée.

Par le plantes étiolées apoplectiques des melons ont été isolées des condies du type *Fusarium*.

RÉSULTATS ET DISCUTIONS

Observatios en 2008. Au mois de 11 juillet les premiers symptômes signales ont été les viroses. Aux 3 hybrides étudiés le degré de l`attaque (G.A.%) des viroses a été au mois de juillet: 6,3% au hybride 198/03 F_1, 8,5% au hybride Ananas F_1, et 8,9% au hybride HP 037190 Les jaunissement mycotiques

(*Fusarium , Verticillium*) n`ont produit aucun symptôme à date de 11 mois de juillet.

Á la date de 6 mois d`août a été observé un renforcement léger des symptômes des viroses, aux tous les hybrides, vis – a – vis à la date de 11 mois de juillet (Ananas $F_1$- G.A. – 11,1%, HP 03710 $F_1$ – 13,6% et 198/03 $F_1$ – 9%). Á la date de 6 mois d`août a été observé aussi des symptômes de jaunissements mycosiques aux tous les 3 hybrides, ainsi: Ananas F_1 G.A. 10% *Fusarium* şi G.A. 8%, *Verticillium*, HP 03710 F_1 G.A. *Fusarium* 0% et 4,5% *Verticillium*, 198/03 F_1 *Fusarium* 0% et 4,9% *Verticillium*.

Á la date de 27 mois d`août, les symptomes de viroses (G.A.%) aux tous les 3 hybrides étudiés ont été: 17,3%, au Ananas F_1, 19,5% au HP03710, et 14,8% au 198/03 F_1. Le symptômes produits par les jaunissements mycotiques sont manifestés aux tous les 3 hybrides ainsi: Ananas F_1 G.A. 15% *Fusarium* et G.A. 26,7%, *Verticillium*, HP 03710 F_1 G.A. *Fusarium* 0% et 13,7% *Verticillium*, 198/03 F_1 *Fusarium* 0% et 15,8% *Verticillium*.

Table 1

Le comportament de l`attaque des viroses et des jaunissements mycotiques des hybrides aux dates du 11 mois de juillet, 6 mois d`août et 27 mois d`août 2008.

G.A% La variété Le hybride	Viroses	Fusarium étiolement (*Fusarium sp.*)	Verticillium etiolement (*Verticillium* sp.)
11 juillet			
Ananas F_1	8,5	0	0
HP 03710 F_1	8,9	0	0
198/03 F_1	6,3	0	0
6 août			
Ananas F_1	11,1	10,0	8,0
HP 03710 F_1	13,6	0	4,5
198/03 F1	9,0	0	4,9
27 août			
Ananas F_1	17,3	15,0	26,7
HP 03710 F_1	19,5	0	13,7
198/03 F_1	14,8	0	15,8

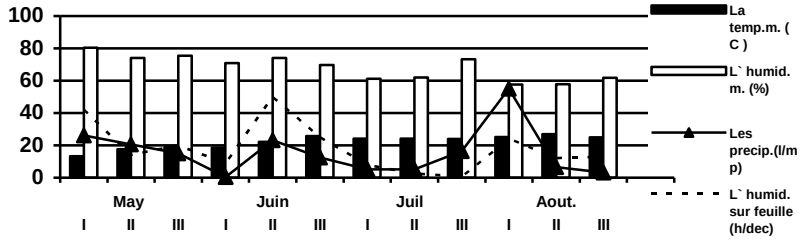

Fig. 1. L`évolution des facteurs climatiques pendant 2008 (la température moyenne($^{o}$C), l`humidité rélative moyennne de l`air (%), des précipitations (l/mp), l`humidité sur les feuilles h/dec).

Observations en 2009. Á la date de 14 mois de juillet les premiers symptômes remaqués ont été comme l`année antérieure aussi les viroses. Au début , l`lattaque des viroses a été: 9,7% au P 03710 F_1, 8,5% au UG 1405 F_1, 7,4% au Fondant , 4,8% au Ananas F_1. Les jaunissement mycotiques (*Fusarium, Verticillium*) n`ont produit aucun symptôme à la date de 14 mois de juillet.

Á la date de 31 mois de juillet, on a observé un renforcemement léger comme l`année antérieure, des symptômes de viroses vis – à – vis la date de 14 mois de juillet .(HP 03710 F_1 G.A- 11,3%, UG 1405 F_1 -G.A. 9,1%, Fondant G.A - 12 ,8%, et Ananas F_1 - G.A 6,7%). Á la date – ci ont été observés aussi des symptômes de jaunissements mycotiques, provoqués par *Verticillium* aux toutes 3 cultures ainsi: Ananas F_1 G.A. 19,3%, Fondant G.A.- 17,3%, UG 1405 F_1 G.A.- 15,8%, HP 03710 F_1- G.A. 15,1 %. Á la date de 31 mois de juillet, aucune parmi les cultures étudiées n`est présenté des symptômes de jaunissement provoqués par *Fusarium* .

Á la date de 21 mois d`août les symptomes de virose (G.A.) aux toutes le 4 culturs étudiées ont été: HP 03710 F_1 - 27,1%, Fondant -16,7%, UG 1405 F_1 - 11,6%, et Ananas F_1 - 8,3%. Le symptômes produits par le jaunssements mycotiques aux toutes les 4 cultures étudiés ainsi: Ananas F_1 G.A -*Fusarium* 10 % et G.A. *Verticillium* - 43,8%, Fondant G.A-*Fusarium* 10% et G.A. *Verticillium* -32,1%, UG 1405 F_1 G.A -*Fusarium* 0% et G.A. *Verticillium* -34,3%, et HP 03710 F_1 *Fusarium*- 0% et G.A *Verticillium* -30,3%.

Table 2

Le comportament de l`attaque des viroses et des jaunissements mycotiques des hybrides aux dates du 14 mois de juillet, 31 mois de juillet et 21 mois d`aôut 2009.

G.A% / La variété / Le hybride	Viroses	Fusarium étiolement (*Fusarium sp.*)	Verticillium etiolement (*Verticillium* sp.)
14 juillet			
UG 1405 F_1	8,5	0	0
Ananas F_1	4,8	0	0

HP 03710 F_1	9,7	0	0
Fondant	7,4	0	0
31 juillet			
UG 1405 F_1	9,1	0	15,8
Ananas F_1	6,7	0	19,3
HP 03710 F_1	11,3	0	15,1
Fondant	12,8	0	17,4
21 auôt			
UG 1405 F_1	11,6		34,3
Ananas F_1	8,3	10	43,8
HP 03710 F_1	27,1		30,0
Fondant	16,7	10	32,1

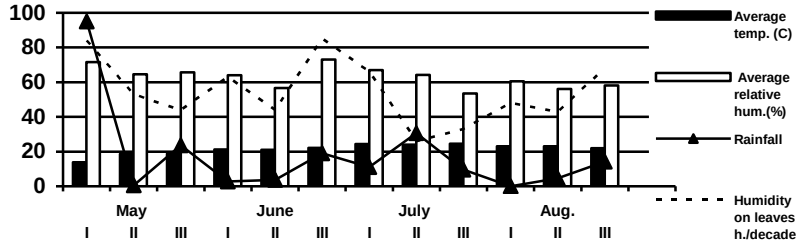

Fig. 1. L`évolution des facteurs climatiques pendant 2009 (la température moyenne($^0$C), l`humidité rélative moyennne de l`air (%), des précipitations (l/mp), l`humidité sur les feuilles h/dec).

Fig. 2. Les conidies du type *Fusarium* isolées des plantes de melons (Ananas F_1) etiolées brusquement apoplectique (original).

CONCLUSIONS

1. Pendant 2008 et 2009 les viroses ont été les agents pathogènes qui ont affecté dans une mesure rélativement réduite les cultures de melons, en départemen Braila.

2. D`habitude, les premiers symptômes de viroses on observe aux melons, du début de la deuxième décade du mois de juillet.

3. Actuellement, la seule possibilité de prévention de l`attaque de viroses on constitue la culture des variétés, hybrides qui sont résistants ou tolérants. Les hybrides et les variétés cultives actuellement assez bon à l`attaque de viroses. Plus sensibles à l`attaque de viroses sont les variétés plus anciennes comme Turkestan Meillleure d`Hongrie, Hales Best, Cantaloupe-Charantaise, Olive d'Hiver, etc.

4. D`entre les variétés et les hybrides de melons testés un comportament meilleur ont eu les hybrides:Ananas F_1, (G.A. 17,35 en 2008 et 8,3% en 2009), 198/03 F_1(G.A 14,8% en 2008) et UG 1405 F_1(G.A. 11,6% en 2009).

5. Aux melons, pendant 2008 et 2009 les jaunissements mycotique ont affecté les variétés et les hybrides testés dans une plus grande mesure que les viroses. D`entre les variétés et les hybrides étudiés, assez sensibles aux jaunissements mycotiques ont été: le hybride Ananas F_1 (G.A. *Fusarium*- 15% et G.A. *Verticillium* -26,7% en 2008 et respectivement 10% et 43,8% en 2009) et la variété Fondant (G.A. *Fusarium*- 10% et G.A. *Verticillium* -32,1% en 2009).

6. Le mildiou des cucurbitacées *Pseudoperonospora cubensis* ne s`est manifesté pas de tout pendant 2008 et 2009. C`est pour la prèmiere fois pendant 14 ans d`observations aux melons, quand l`attaque de mildiou est absent pendant l`année, dans ce cas – ci 2 ans consécitifs. Le fait est grâce aux températures moyennes élevées, l`absence aigue des précipitations et de l`humidité très baissé de l`air, enregistrées pendant 2008 et 2009.

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ASPECTS REGARDING THE LUMBICIDAE FAUNA FROM THE PROTECTED AREAS, UNDER THE CONDITIONS OF THE COUNTY OF NEAMT

ASPECTE PRIVIND FAUNA DE LUMBRICIDE (OLIGOCHAETA- LUMBRICIDAE) DIN SPAŢIILE PROTEJATE, ÎN CONDIŢIILE DIN JUDEŢUL NEAMŢ

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Abstract. *The Lumbricidae fauna represents a component of paramount importance for each type of soil. The presence of Lumbricidae, the number of species, the number of specimens, the biological, physiological and ecological characteristics of each species, represent important clues regarding the characteristics of the soils they were sampled from, details on structure, texture, fertility, humidity or exposal to floods, as well as the degree of pollution with chemical substances, especially pesticides. All these clues are evident from the changes in morphological parameters in the specimens, in comparison to the characteristics of each species. This paper concentrates on the diversity of the Lumbricidae species from four enclosed spaces (greenhouses) in the county of Neamt, as well as on the morphological characteristics of the specimens of each species.*

Key words: environment, fauna, lumbricidae, pollution, greenhouses.

Rezumat .*Fauna de lumbricide reprezintă o componentă deosebit de importantă a oricarui tip de sol. Prezenţa lumbricidelor , numărul de specii, numărul de indivizi, particularităţile biologice, fiziologice şi ecologice ale fiecărei specii în parte, reprezintă indicii preţioase cu privire la particularităţile solurilor din care au fost prelevate, atât în ce priveşte structura, textura, fertilitatea, gradul de umiditate, sau expunerea la inundaţii cât şi în ce priveşte gradul de poluare cu substanţe chimice, mai ales cu pesticide, indicii date de modificarea parametrilor morfologici ai indivizilor , faţă de parametrii caracteristici ai fiecărei specii în parte. Lucrarea de faţă abordează diversitatea speciilor de lumbricide din 3 locaţii acoperite (sere) din judeţul Neamţ, precum şi particularităţile morfologice ale indivizilor din fiecare specie.*

Cuvinte cheie: mediu, faună, lumbricide, poluare, sere.

MATERIAL AND METHOD

The observations and soil samples were during a period of two months, in 3 parts of the county of Neamt, under greenhouse conditions.

The three locations were: Vânători- Neamt (flower greenhouse), Sihăstria Monastery–Neamţ (flower greenhouse) and Sihla Monastery-Neamt (open greenhouse, soil cultivated with vegetables) .

There were collected samples of Lumbricidae from the three locations which were then transported to Iasi in 10% ethylic alcohol. In the laboratory, the material was analyzed and determined, then the data was registered and interpreted, the obtained

results were compared to the data related to the characteristics of the soils from that locations and to the data related to the agro-technical techniques employed, as well as the exploitation methods applied on those lands. The determinations and the measurements of the biological material were undertaken using binocular magnifying glasses.

RESULTS AND DISCUSSIONS

The first location to make observations and take biological samples was the greenhouse from Vânători Neamt. It is a private property used to produce flower seeds and pot flowers. The samples were taken from the soil layer of 1-40cm. Even though there were undertaken several soil samples, there were collected only three specimens.

At the moment of the sampling, the greenhouse soil was not cultivated and relatively tamped. Although we could collect only a reduced number of specimens, we noticed the presence of numerous Lumbricidae galleries. The specimens collected from that soil are part of *Dendrobaena octaedra typica* species.

After the analysis of the obtained parametres we could notice the following:

- the length of the body varies between 30-50 mm, in an average of 32,5 mm;
- the diametre is 2 mm, (100%);
- the clitellum is positioned on segments 29-33 in 2 specimens (66,6%), on segments 28-33 in 1 specimen (33,3%)
- the minimum number of body segments is 30 and the maximum is 35.

The obtained data rank the collected specimens in the normal limits of the species. Also, the presence of *Dendrobaena octaedra typica* species in that soil proves the exposal of the land to repeated floods, a fact confirmed by the owner.

The second location to take biological samples was the flower greenhouse from Sihăstria Monastery-Neamţ, an unexploited greenhouse, used only to keep the pot flowers for the winter period. The sampling was done also from the soil layer between 1-40 cm depth. There were collected 9 specimens from *Octolasium lissaense* species.

After the analysis of the morphological characteristics we could notice the following:

- the length of the body varies between 80-100 mm in 6 specimens, between 101- 150 mm in 3 specimens, with an average of 91,5 mm.;
- the minimum diametre is 4 mm, (1 specimen - 11,1%), the maximum of 6 mm (6 specimens - 66,6%) and the average is 5,5 %.
- the clitellum is positioned on segments 29-37 in 7 specimens (77,7%), on segments 28-36 in 3 specimens (22,2%)
- the minimum number of body segments is 118, the maximum number is 150.

The obtained data rank the collected specimens in the normal limits of the species.

The third location dedicated to research was the greenhouse opened at Sihla Monastery-Neamţ. The samples were taken from a depth of 1-50cm. There was noticed the presence of 6 species, as there was collected a number of 39 specimens. The species sampled from this location are the following: *Eisenia submontana*-11 specimens; *Lumbricus rubellus*- 4 specimens; *Eiseniella tetraedra typica*- 11 specimens; *Lumbricus terestris*- 2 specimens; *Eisenia foetida*- 4 specimens; *Octolasium lissaense*-7specimens.

For *Eisenia submontana* species there were found 11 specimens and their morphological characteristics proved the following traits:

- the length of the body varied between 130-149 mm in 5 specimens (45,45%), between 150-180mm in 6 specimens (55,55%), the average length being 160mm;

- the minimum diametre was 5mm in 1 specimen (33,3 %), maximum of 6 mm in 2 specimens (66,6 %); average of 5,25 mm.

- the clitellum was positioned on segments 24-32 in 9 specimens (81,81%), on segments 24-31in 1 specimen (9,09 %), on segments 27-33 in 1 specimen (9,09%)

- the minimum number of body segments was 115, the maximum number 130.

For *Lumbricus rubellus* species there were collected 4 specimens. In all, the length varied between 130-150 mm. The minimum measured diametre was 5mm, in 2 specimens, respectively 50% of them, and the maximum diametre was 6 mm, recorded for the other 2 specimens. The clitellum was positioned on segments 26-32 in 25% of the specimens (1 specimen), on segments 26-33 in 50% of them and on segments 27-33 in 25%. The minimum number of body segments was 134 and the maximum was 145.

Eiseniella tetraedra typica species was represented by 11 specimens. The length of the body varied, thus in 54,54% of the specimens (6) it varied from 50 to 80 mm, in 45,45% (5) it varied between 80-100 mm. The diametre ranged as well between 2 mm (63,6%) and 4 mm (18,18%). The clitellum was found on segments 23-27 in 81,81% of the specimens, and on segments 23-36 in 9,09%. The number of body segments varied from a minimum of 70 to a maximum of 90.

Out of *Octolasium lissaense* species there were collected 7 specimens. The recorded variations in length was from 50-99 mm - 42,8% of the specimens to 100-170-57,2% of them. The minimum diametre was 3 mm and the maximum one was 7 mm. The position of the clitellum was noticed on segments 30-35 in 3 specimens (42,8%), on segments 31-36 in 4 specimens (57,2%). The total number of body segments was a minimum of 97 and a maximum of 170.

There were collected 4 specimens from *Eisenia foetida* species. The variations in length were recorded from 40-90 mm- 25 % of the specimens to 100-130mm- 75% of them. The minimum diametre was 3 mm and the maximum one was 4 mm. The position of the clitellum was noticed on segments 24-31 in 25 %, on segments 25-31 in 50% and on segments 26-33 in 25% of the specimens. The total number of body segments was at least 87 and maximum 120.

Out of *Lumbricus terestris* species there were collected 2 specimens. The recorded variations in length were 90-300 mm.

The recorded diametre was 10 mm. The position of the clitellum was noticed on segments 32-37. The total number of body segments was 180.

CONCLUSIONS

1. Although placed at relatively small distances from one another, the locations proved to host different species of Lumbricidae, the number of collected specimens being also variable from one location to the other;

2. The greatest variety of species but also the greatest number of specimens was found in the greenhouse belonging to Sihla Monastery, where the forest soil and high degree of humidity favors the development of Lumbricidae.

3. In the non-cultivated greenhouses from Vânători Neamţ and Sihăstria Monastery, the number of collected specimens was very small, due to the tamped soil, as well as the relatively low fertility index;

4. The structure of the Lumbricidae species, as well as the abundance of the specimens highly influenced by the degree of humidity, the soil fertility but also the macro and micro-flora present on those soils;

5. Lumbricidae species are good indicators for the fertility degree, but also the pollution with pesticides, even more, the species of soil worms which populate the soils have a special impact in the agricultural eco-systems and a positive role in the improvement of the quality of the degraded soils.

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THE USE OF GEOGRAPHIC INFORMATIONAL SYSTEMS FOR THE MANAGEMENT OF NATURAL PROTECTED ELEMETS

UTILIZAREA SISTEMELOR INFORMAŢIONALE GEOGRAFICE PENTRU MANAGEMENTUL ELEMENTALOR NATURALE PROTEJATE

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Abstract. *The present paper work refers to the opportunity of GIS use in relation with the management of natural protected areas along with their wild vegetation and fauna elements within the counties of Botoşani, Iaşi, Vaslui, Galaţi. Special attention is given to the Iaşi county. The use of ArcGIS 9.3 and the integrated spatial data prove important tools for environmental decision making by gathering and extracting spatial information for natural protected areas and endangered species or insuring a more precise expertise and more efficient response for large amounts of collected data. In brief, the environmental decision toward the management of biodiversity becomes more efficient with the help of spatial modelling techniques.*

Key words: natural protected areas, GIS, biodiversity, endangered plants, management.

Rezumat. *În cadrul lucării de faţă atenţia noastră se îndreaptă spre utilizarea tehnicilor S.I.G. pentru managementul ariilor naturale protejate şi a elementelor protejate de vegetaţie şi faună sălbatică din cadrul judeţelor Botoşani, Iaşi, Vaslui, Galaţi, cu privire specială asupra judeţului Iaşi. Utilizarea soft-ului ArcGIS 9.3 şi a datelor spaţiale integrate, permite coroborarea şi extragerea informaţiei spaţiale în vederea luării deciziilor de mediu, cu referire strictă la rezervaţiile naturale şi speciile periclitate sau, asigurând o expertiză mai precisă, un răspuns efectiv mai prompt şi o gestionare corespunzătoare a unei cantităţi mari de informaţie la nivelul intregii arii de acoperire. În linii mari decizia de mediu, în ceea ce priveşte biodiversitatea poate fi eficientizată cu ajutorul tehnicilor mai sus amintite.*

Cuvinte cheie: arii naturale protejate, SIG, biodiversitate, management, plante vulnerabile

INTRODUCTION

The use of GIS techniques in the field of Earth Sciences became more important since 1950, when their efficiency was emphasized by the first relevant models applied on the cereals production in relation with weather conditions. These models were introduced, initially, by Von Neumaann from U.S. Army (Charles L., 2001). Henceforth, the application of GIS modelling spread between related fields of study, comprising environmental protection, land-use planning, agriculture, demography and so on. In nowadays Romania spatial modelling is wide known and

largely applied in a variety of studies (soil science, environmental protection, geomorphology, climatology, plant ecology, land-use etc.)

Our paper aims to emphasize the opportunity of spatial modelling use in environmental decision making and the role of these methods in managing detailed and large information quantities pertaining to natural frame and human induced conditions in order to sustain efficient coordination measures toward biodiversity protection. For concrete exemplification we bring into attention a certain rare plant from the Romanian Flora Red List and try to study it in a complex manner, combining the botanical systematic studies with spatial modelling.

MATERIAL AND METHOD

The GIS database, constructed within a PHARE CBC project, implemented by the Local Environmental Agency in Iaşi, comprises:

1) the ESRI support spatial dBase for the counties of Botoşani, Iaşi, Vaslui, Galaţi, in Stereographic projection.

This infrastructure network includes the spatial data present on the 1: 100 000 topographic maps and contains rivers and lakes, settlements polygons, roads, railways, administrative boundaries at the level of counties and communes, all in a vector format.

2) the LEPA spatial database which includes: prior documented information, GPS Trimble Geo XM collected data, tabular data with associated information for the natural reserves, vectorial and tabular data for the Natura 2000 sites (Figure 1), detailed ortho-rectified raster images and metadata for the description of natural protected areas.

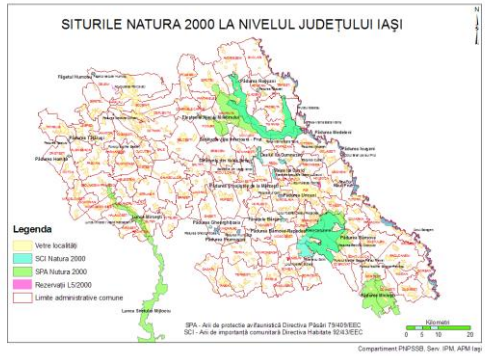

Fig. 1. Natura 2000 Sites and Natural Reserves of Iaşi County

The general utility of the above mentioned spatial database resides in decision making for the various investment projects in relation with environmental law enforcement and focuses, mainly, on natural protected areas. The practical outcome of the database maintaining and updating with terrain collected information serves for better and faster environmental decision groundwork. Within this general frame one distinctive feature refers to rare plant conservative measures through an interdisciplinary approach pertaining to systematic botanics and GIS.

The rare plant monitoring programme tackles the study of the Turkish dock - *Stemmacantha serratuloides* (Georgi) M. Dittrich *(Leuzea altaica, L. salina, Rhaponticum serratuloides* (Georgi) Bobr.) (fig. 2.).

The specific ecologic conditions of the studied taxon are encountered in humid spots of river meadows on alluvial soils with weakly acid to neutral pH values and low saline content. The bioecology of this plant describes it as a Ponto – Balcanic hemicryptophyte with meso-hydrophilic and moderate thermophilic requirements. *Stemmacantha serratuloides* is classified as a critically endangered species in the Republic of Moldavia (Negru A., Sabanov G., Cantemir V., Ganju Gh., Balcanov V., 2002) and endangered for Romania (Oprea A., Davideanu A., Davideanu G., Popescu I. E., Iordache I., Gache C., 2008) and described as enlightner of Sarmatic saline meadows habitats or (Ponto-sarmatic salt steppes and marshes) in the EUNIS database of EEA (Devillers, P., Devillers-Terschuren, J., and Vander Linden, C., 1999, Royal Belgian Institute of Natural Sciences).

Fig. 2. *Stemmacantha serratuloides* in the Bahlui River meadow (D. Stoica)

As specified in the recent dedicated literature, the vegetation studies ought to start from the basic level of taxonomic knowledge and systematic botanics and, further, proceed to the systematization of spatial distribution, through populational observations and complex information processing for synthetic interpretation (Cristea V., Gafta D., Pedrotti F., 2004).

Consequently, a proper management of endangered plants through interdisciplinary evaluation requires connected approaches in the Natural Sciences domain including spatial relations modelling and statistics in order to obtain proper results to lead to viable protection measures.

The main goal of our study is to collect filed data for a detailed taxon evaluation within the Iaşi county and our attempt is meant to continue the results of the *Mutual Management – Romania - Republic of Moldavia for the Conservation of Biodiversity in the Border Region 2004* – project, implemented by the Local Environmental Protection Agency in Iaşi which ended up with the publication of the *Wild Flora and Fauna Species Red List in the Border Region*.

The targeted result is the documentation of increased anthropic pressure and the conservation status of *Stemmacantha serratuloides* in the Bahlui hydrographic basin in order to propose viable protection measures.

The Bahlui River flows in the hilly region of North-Eastern Romania and occupies the central and north-eastern part of the Moldavian Plateau at the intersection of 47°13’ parallel with the 27°15’ meridian, running into the Middle Prut River via its emissary, Jijia River, in a joint meadow pertaining to the three mentioned rivers. The Bahlui River hydrographic basin covers 1639 sq. kilometres.

The geology of this region has Quaternary, recent features with alluvial deposits placed only meters above the present river beds and consisting of various petrographic types going from sands to loessoid loams (figure 4).

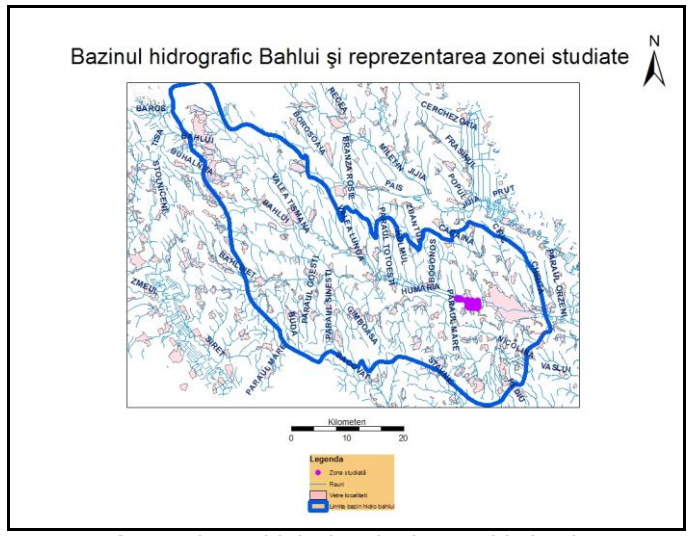

Fig. 4. The Bahlui River hydrographic basin

The accumulative relief is well represented, especially along the water channels with wide meadows (0,2-2,5 m), annual average temperatures of 9,6 ^{o}C (Podu Iloaiei) and annual average precipitations of 525 mm (Podu Iloaiei). The soil cover consists in hydrosols and presents different ecologic conditions compared with the less humid neighbouring tracts through a higher specific heat. This results in a different thermic regime less prone to heating processes compared with the neighbouring areas where humidity is lower.

As far as the plant's phylogeny is concerned, the Bahlui hydrographic basin belongs to two important genetic regions: the Euro-Siberian Region (comprising the European East-Carpathian and the Balcano – Moesic regions) and the Irano – Turanic Region (comprising the Ponto – Sarmatic Region) (Borza, Boşcariu, 1965).

Specific objectives:

- accumulation of a very detailed information material to enhance elaborated investigation of *Stemmacantha serratuloides*;
- release of spatial distribution maps with GPS collected data and ArcGIS techniques to enhance populational evaluation;
- biotope spatial modelling and emphasis of anthropic negative impact;
- correlation of the obtained results with the geomorphologic, climatic hydrologic and pedologic factors;

These steps are meant to achieve a better understanding of the studied taxon ecology and the particular phytosociological features in the Bahlui River basin, for conservative purposes.

RESULTS AND DISCUSSIONS

Our study is meant, first, to bring into attention evaluation of this particular taxon and the interdisciplinary approach that results in a better understanding of present conservative efficiency upon endangered plants. The field stage brought the first results contributing to spatial distribution maps in relation to human activities and infrastructure. The plant ecological conditions are obscured by the intense activity in this area (passing through, grazing, soil intake, unauthorised plant ingathering, surplus water evacuation canals, agricultural and zootechnical activities, unsafe waste deposits etc.).

Filed expertise emphasis the distribution of pure populations in remote places, displaying circular shapes with tens and even hundreds individuals, and scattered individuals in association with common, nitrophil or steppe taxons. Healthy, well grown populations appear in spots where access is difficult (canals bordered areas, long distances from settlements, along railways). This shows that ecological conditions are prone to *Stemmacantha serratuloides* flourish but intense human and human induced activities force its retreat in secluded places. Places with intense human and cattle activity display few, scattered and less grown exemplars.

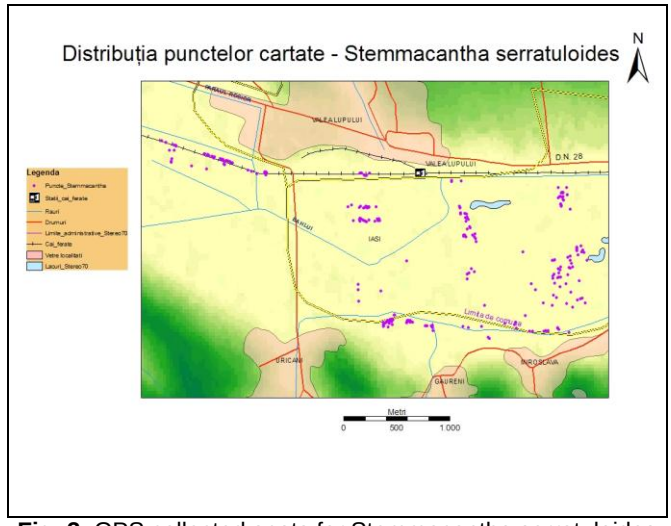

Fig. 3. GPS collected spots for Stemmacantha serratuloides

The initial study stage covers a 9 sq. km tract and includes 264 GPS collected points representing, in average, 15-20 individuals. A total number of 4000 individuals can be estimated for the 9 sq. km which can lead to the conclusion that the above mentioned taxon is abundant. On the other hand if we consider that the biotope of this plant is strictly restricted to few square kilometres in the river's meadow, where almost all human activities are present, then we can withdraw the idea that *Stemmacantha serratuloides*, the *Sheep's tongue*, as popularly called is an endangered plant in this region.

CONCLUSIONS

1. The Geographic Information Systems enhance efficient management of natural elements and supports short time cover of vast areas in decision making;

2. As stated in the recent, dedicated literature, vegetation studies should start from the taxonomic approach and the systematic botanics and, further, achieve systematic territorial distribution patterns and populational observations and, finally, become integrated in spatial distribution models that depict biotope and anthropogenic factors as controlling parameters;

3. The present paper work starts from the general context, of GIS use in the field of biodiversity protection and depicts a concrete, endangered taxon – *Stemmacantha serratuloides* – and manages to demonstrate the interdisciplinary side of our attempt and the vulnerability of the target taxon even if there is much to be done in this sense;

4. Vectorial analysis show that the Bahlui's meadow covers less than 20% (227,8 km^2) percent of the total basin area (1639 km^2). GPS collected data account for less than 15 % of *Stemmacantha serratuloides* population's presence in the meadow area which means that proper flourish conditions are within no more than 34 km^2, representing no more than 2,07 % of the total basin surface.

5. Further, approaches foresee the enlargement of evaluation area in the Bahlui hydrographic basin, more detailed description and processing of spatial information. On the way, the study aims to integrate the aspects of biotope factors at local level and better spatial patterns for the studied taxon.

Acknowledgements

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STUDIES REGARDING THE RESISTANCE OF SOME BACTERIAL STRAINS FROM SOIL TO CHEMICAL FACTORS

CERCETĂRI ASUPRA REZISTENŢEI UNOR TULPINI BACTERIENE IZOLATE DIN SOL, LA ACŢIUNEA UNOR FACTORI CHIMICI

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Abstract. *The use of different chemical substances for preventing or treating the plant diseases involved a special attention for their remanence in soil and plants. Because the soil microbiota is a very important factor for normal biochemical processes at this level, the chemical treatments should not influence in negative way the physiological activities of microorganisms. The aim of this paper was the established sensibility or resistance of soil bacteria against some chemical substances, frequently used in plant therapy (in bacterial or fungal diseases). The difusimetric method was use. The bacterial strains presented various degree of sensibility. The majority of them was sensible to streptomycin, resistant to copper sulphate (tested concentrations) and sensible to Mancozeb.*

Key words*:* microbiota, streptomycin, mancozeb

Rezumat. *Utilizarea diferitelor substanţe chimice în scopul prevenirii sau combaterii bolilor plantelor de cultură determină o atenţie deosebită pentru remanenţa acestor substanţe în sol şi în plante. Deoarece microbiota din sol este un factor esenţial pentru desfăşurarea normală a proceselor biochimice care au loc la acest nivel, tratamentele chimice aplicate nu trebuie să influenţeze negativ activitatea fiziologică a acesteia. Scopul acestei lucrări a fost evidenţierea gradului de rezistenţă sau sensibilitate a microorganismelor izolate din sol la acţiunea unor substanţe chimice care se utilizează frecvent în terapia bolilor bacteriene şi micotice la plante. Pentru determinarea sensibilităţii a fost folosită metoda difuzimetrică. Tulpinile bacteriene din sol au prezentat grade variate de sensibilitate. Majoritatea au fost sensibile la streptomicină, au prezentat rezistenţă faţă de concentraţiile testate de sulfat de cupru şi sensibilitate faţă de mancozeb.*

Cuvinte cheie: microbiotă, streptomicină, mancozeb

INTRODUCTION

The soil microbiota is important for normal course of biochemical processes at this level. The applied chemical treatments for different plant cultures had to protect plants against pathogens, without adverse effects on microorganisms from soil microbiota.

In time, the phytopathogenic bacteria from soil, which are constantly in contact with different chemical substances, may develop resistance against these, and the treatments may become ineffective at a time.

The bacteria are most numerous and most active microorganism from soil, and Gram negative bacteria are more frequent than Gram positive bacteria. (Mihăescu, 2000). There are various category of bacteria in soil, from bacteria implicated in carbon, nitrogen, phosphorus, sulphur or iron cycle, with crucial role for plant nutrition and ensure soil fertility, to pathogenic bacteria (some of them pathogenic for plant, the other pathogenic for animals and humans).

The microorganisms influence plants through changes of soil structure and through decomposition of different toxic substances, accumulation in the soil which could lead to plants death (Zarnea, 1970).

The chemical treatments that are used for phytopathogenic bacteria control, involves the application of organic, inorganic or antibiotic solution. These solutions accede on plants and on soil, too.

The aim of this study was the established the sensibility or resistance level for some bacteria, isolated from soil, against some chemical substances (organic, inorganic or antibiotic, with varied concentrations), frequently used in plant treatments (in bacterial or fungal diseases).

MATERIALS AND METHODS

In this paper were used 100 bacterial strains isolated from nine samples of soil (marked from P1 to P9), removed of vineyard plantation.

The soil samples were obtained from the rizosfera of vine plants at 10cm depth and were further processed in laboratory by making a suspension in sterile saline solution. Decimal dilutions of obtained suspensions (10^{-6}, 10^{-7}, 10^{-8}) were inoculated by incorporation in nutrient agar. Isolated bacterial colonies were obtained after five days at 22ºC. These colonies were used for bacterial strains selection.

Each bacterial strain was isolated in pure culture on the slant of nutrient agar.

The difusimetric method was use for testing bacterial sensitivity or resistance against three substances frequently used in plant treatments (bacterial and fungal diseases) - figure 1.

Those three substances were: streptomycin (antibiotic for human, animal and plant use), copper sulphate (inorganic copper substance, used as a Bordeaux mixture) and Dithane 45 (organic substance for plant protection, with 80% mancozeb, efficiency against some fungal pathogens in vineyards).

Fig. 1. Difusimetric method (original)

The antibiotics used in treatments of plant diseases acting systemically and remain in plants more than in animal organisms. The antibiotic dissemination in plant is not uniform (D. Pramer, 1954). In some countries the antibiotic treatments for plants are widely used. These have quite small efficiency, relatively high toxicity and large costs (P. McManus, 2002). Sometimes the effects obtained through antibiotic treatments against plants, like streptomycin, are similar to effects of very low temperatures (R. Yoshida et al., 1998), or treatments stain the fruits in green. Restricting use of antibiotics in plant treatments is possible through cultivation of resistant plants varieties or through biological control of plant pathogens. Depending on crops and the objective of treatment, recommended concentrations of streptomycin varies between 50 - 200µg/ml.

Streptomycin resistance was detected for almost all susceptible pathogen, especially *Erwinia amylovora*, *Erwinia carotovora*, *Pseudomonas lachrymans*, *Xanthomonas campestris*, (McManus et al, 2002).

The copper sulphate was selected from inorganic substances. This is the most common form to use copper for control plant diseases, the concentrations varies between 0,5 - 1%, (especially neutralized mixtures). The copper compounds begin to be used from 1882, when Professor A. Millardet (Bordeaux University) discovered the first efficient compound against grapevine downy mildew, the mixture of copper sulphate and hydrated lime (Bordeaux mixture, fr. *bouillie bordelaise*). Inextricably linked molecules of copper sulphate determined proteins coagulation, lock of fermentative breathing systems and inhibition of carbohydrate metabolism, but also phytoalexin formation in plants.

The organic plant protection products present high toxicity against plant pathogen and relatively low risk to humans and animals. The most popular antibacterial substance from organic group is mancozeb, a mixture to maneb and zineb, old fungicide and bactericide, with widely spectrum of antibacterial activity, but without phytotoxicity; it can correct deficiencies of manganese and zinc at treated plants, too. In Romania are approved these products: Dithane M-45 (mancozeb 80%, used in this paper), Mancozeb 800 (mancozeb 80%), Dacmancoz 80 WP (mancozeb 80%), Dithane 75 WG (mancozeb 75%).

We used in our experiments various concentrations: streptomycin 10µg (standard micro disks for antibiogram); aqueous solution of copper sulphate 0,25%, 0,5% and 1% (usual for treatment 0,5%); 0,1%, 0,2% and 0,4% aqueous solution of Dithane 45 (usual for treatment 0,2%), corresponding to dilutions 0,08%, 0,16%, 0,32% mancozeb.

Were used, for copper sulphate and mancozeb, sterile filter paper disks impregnated in corresponding solutions. These disks were placed on solid media (nutrient agar) in Petri dishes after uniform inoculation of bacterial suspension. The results were obtained after incubation at 37ºC for 24 hours.

Interpretation of the results consisted of classification in three degrees of sensitivity, depending on diameter of bacterial growth inhibition zone, determined by those three substances: sensitive strains (S), strains with intermediate sensitivity (SI), resistant strains (R).

- Streptomycin conc. 10µg/disk (S):
  - S: 21 – 50 mm
  - SI: 7 – 20 mm
  - R: 0 – 6 mm

- Copper sulphate (S_1, $S_{0,5}$ and $S_{0,25}$):
  - S_1 - conc. 1%:
    - S: 11 – 20 mm
    - SI: 7 – 10 mm
    - R: 0 – 6 mm
  - $S_{0,5}$ – conc. 0,5%:
    - S: 11 – 20 mm
    - SI: 7 – 10 mm
    - R: 0 – 6 mm
  - $S_{0,25}$ – conc. 0,25%):
    - S: 11 – 20 mm
    - SI: 7 – 10 mm
    - R: 0 – 6 mm
- Mancozeb (Dithane 45) (D_1, D_2 and D_4):
  - D_1 - conc. 0,08%:
    - S: 11 – 30 mm
    - SI: 7 – 10 mm
    - R: 0 – 6 mm
  - D_2 - conc.0,16%:
    - S: 11 – 30 mm
    - SI: 7 – 10 mm
    - R: 0 – 6 mm
  - D_4 – conc. 0,32%):
    - S: 11 – 30 mm
    - SI: 7 – 10 mm
    - R: 0 – 6 mm

RESULTS AND DISCUSSIONS

The sensitivity, intermediate sensitivity and resistance of tested bacterial strains against streptomycin, can be observed in Figure 2. The most tested bacterial strains were sensitive or had intermediate sensitivity against streptomycin. Just two of soil samples presented a number of resistant bacterial strains against streptomycin at used concentration; for these, the diameter of the growth inhibition zone was maximum 6mm.

This antibiotic isn't used in Romania for treatment of grapevine bacterial diseases, so the soil bacteria not require resistance genes against streptomycin, which to be able to transmit to next generation and in bacterial population.

Regarding the action of copper sulphate, the tested bacterial strains were resistant against small concentrations, but the sensitivity and intermediate sensitivity increased with the growing concentration (Figure 3). Since 94% from tested bacterial strains were resistant at concentration of copper sulphate twice smaller than therapeutic dose, just 32% from all strains were resistant at concentration twice larger than therapeutic dose. In this case the majority of tested strains had intermediate sensitivity.

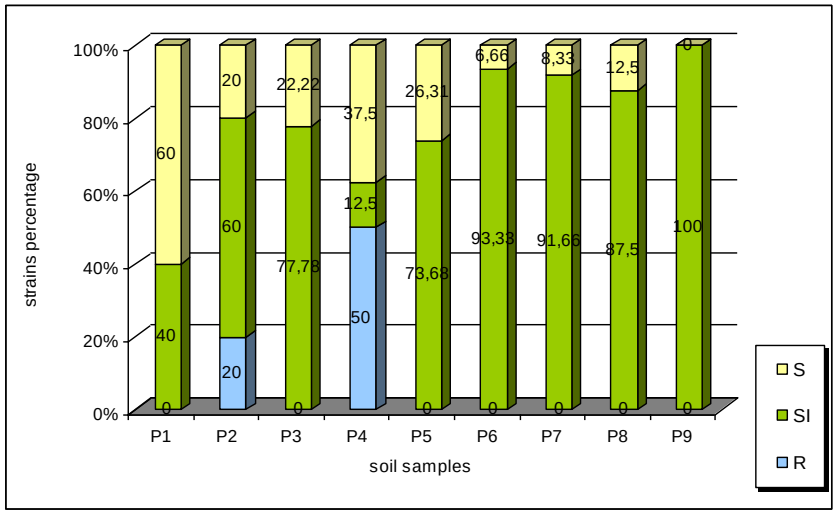

Fig. 2. The sensitivity spectrum of studied strains against streptomycin

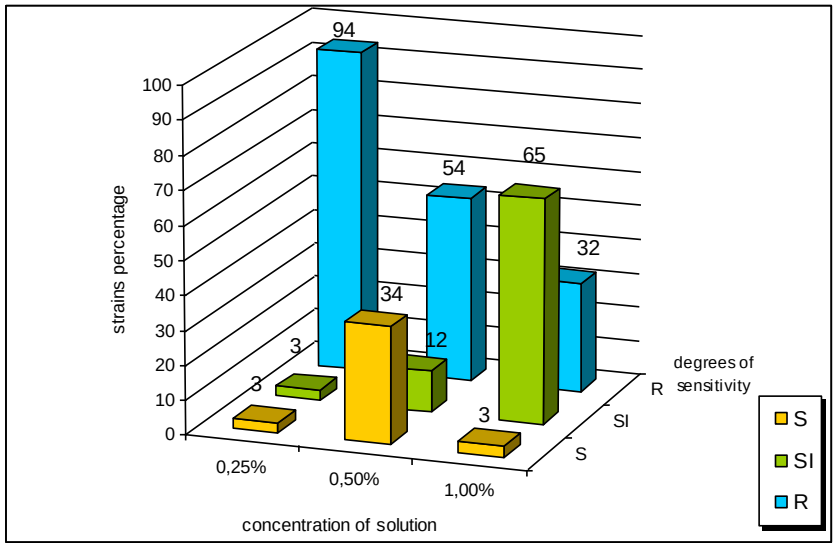

Fig. 3. The sensitivity spectrum of studied strains against copper sulphate

The bacterial strains tested against mancozeb had similar sensitivity with sensitivity against copper sulphate, the sensitivity and intermediate one increased with the growing concentration (figure 4). The percentage of resistant strains decreases from 53% against mancozeb with concentration 0,08% to 14% against mancozeb with concentration 0,32%.

The sensitivity and the intermediate sensitivity seems to be more obviously against mancozeb than copper sulphate, so a cautious approach in widely using the substance is required, because the tested bacterial strains were not pathogenic by all means.

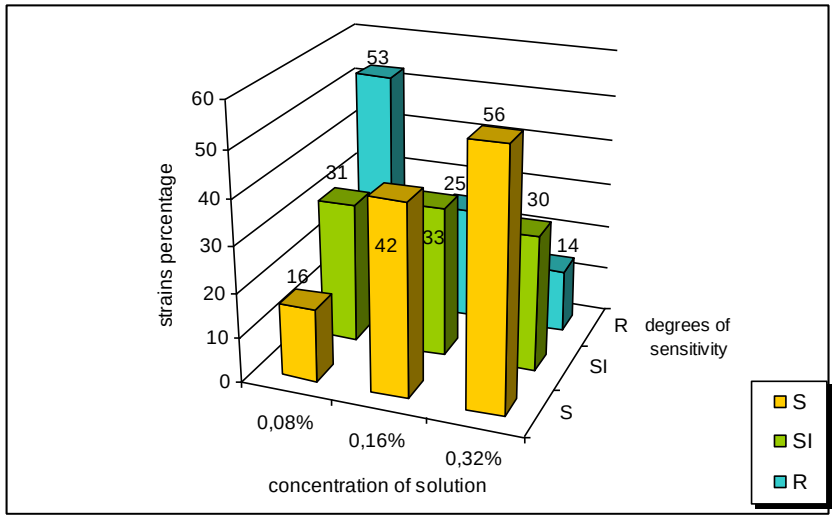

Fig. 4. The sensitivity spectrum of studied strains against mancozeb

CONCLUSIONS

1. The bacterial strains isolated from soil samples presented various degrees of sensibility against substances frequently used in plant treatments (bacterial and fungal diseases).

2. The resistance against low concentration of streptomycin was observed for small percentage of bacterial strains, which means the absence of resistance genes against this antibiotic on soil bacteria and the absence of risk to transmit the resistance to pathogenic bacteria for animals and humans.

3. The copper sulphate, with well known effects against fungal plant diseases, don't influence in negative way the bacterial microbiota from soil, consist especially of saprophytic bacteria; almost 54% from tested strains against usually concentration of copper sulphate are resistant and smaller concentrations determined higher resistance.

4. The mancozeb action against soil bacteria is more pronounced than streptomycin or copper sulphate action, which means the mancozeb could have a bad influence on the sensitive microbiota from soil.

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STUDY REGARDING THE EVALUATION OF THE ATTACK DEGREE OF THE PLUM POX VIRUS (PPV) AT SOME PLUM CULTIVARS (*PRUNUS DOMESTICA* L.)

STUDIU PRIVIND EVALUAREA GRADULUI DE ATAC AL VIRUSULUI PLUM POX (PPV) LA UNELE SOIURI DE PRUN (*PRUNUS DOMESTICA* L.)

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Abstract. *Between the years 2008 and 2009, at Fruit Growing Research & Extension Valcea, were evaluated twenty plum cultivars regarding the attack degree of the Plum pox virus. Performing the serologic test Double Antibody Sandwich-Enzyme Linked Immunosorbent Assay was established that only six were not infected with this virus: Tuleu timpuriu, Diana, Flora, Minerva and Vangerka jubilejnija. On leaves, the different values of the frequency of the attack oscillated between 12% and 94,5%, and of the intensity between 21,2% and 61,5%. The limits between the attack degee oscillated were 2,5% and 55,4%. Regarding the virus attack on fruits, only five cultivars were affected: Renclod hramova, Kisinevskaja rana, Valor, Balada and Edda.*

Key words: frecquency, intensity, concentration of the viral protein, ELISA.

Rezumat. *În perioada 2008-2009, la Staţiunea de Cercetare-Dezvoltare pentru Pomicultură Vâlcea, au fost evaluate douăzeci de soiuri de prun privind gradul de atac al virusului Plum pox. În urma efectuării testului serologic Double Antibody Sandwich-Enzyme Linked Immunosorbent Assay s-a stabilit că doar şase sunt libere de virus, respectiv: Tita, Tuleu timpuriu, Diana, Flora, Minerva şi Vangerka jubilejnija. Pe frunze, frecvenţa atacului s-a manifestat diferit, valorile oscilând între 12% şi 94,5%, intensitatea atacului a oscilat între 21,2% şi 61,5%, iar pentru gradul de atac s-au înregistrat valori cuprinse 2,5% şi 55,4%. Pe fructe, atacul virusului a fost înregistrat doar la 5 soiuri: Renclod hramova, Kisinevskaja rana, Valor, Balada şi Edda.*

Cuvinte cheie: frecvenţă, intensitate, concentraţia proteinei virale, ELISA.

INTRODUCTION

Plum pox virus (PPV) is a Potyvirus that infects many *Prunus* ssp. The virus causes a disease called Sharka which is one of the most devasting diseases of stone fruit industry in Europe and the Mediterranean (Roy and Smith,1994). The disease is detrimental primarly for apricot, peach, and plum trees, reducing quality

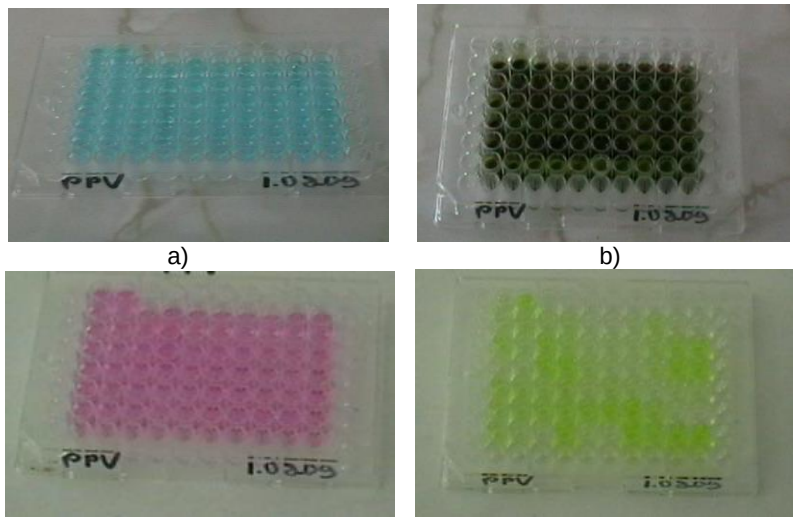
and causing premature dropping of fruits (Dunez and Sutic, 1988). The severity of symptoms is influenced by host species and cultivar and, to a lesser degree, by climate, nutrition and growth of the trees, their age, the viral strain etc. (Desvignes,1999).

The aims of present study were: the identification of the virus in the sap of several stone fruit samples and to determine the attack degree on leaves and fruits in case of the cultivars infected.

MATERIAL AND METHOD

The biological material was represented by twenty plum cultivars (*Prunus domestica L.)*: Tita, Stanley, Renclod hramova, Tuleu timpuriu, Anna Spath, Kisinevskaja rana, Large sugar prune, Diana, Robé de Sergent, Verzişoare de Olteanca, Imperial California, Čačanska rodna, Flora, Edda, Tuleu gras de Sineşti, Vangerka jubilejnija, Minerva, Valor, Balada and Tegera.

The concentration of the viral protein in leaves was determined through the serologic method Double Antibody Sandwich-Enzyme Linked Immunosorbent Assay (DAS-ELISA) (Clark&Adams,1977). The PPV reagents were purchased from the firm Bioreba (Switzerland) and the work protocol was done according to the technical information received in the kits brochure (Figure 1).



a) b)

c) d)

Fig. 1. ELISA Mycroplates: - **a.** The distribution of a specific antibody; **b.** The distribution of the plant extract; **c.** The distribution of the conjugate; **d.** The distribution of the substrate with pNPP: color reaction indicates infected sample.

The attack degree (AD%) was calculated according to the formula: AD% =(F% × I%) ⁄ 100 (Cociu, 1989) and it represents the expression of the suffering infected plants for the years in questions.

The frequency of the attack was calculated using the formula: F%=(n×N)/100, in which ″n″ means the number of the affected plant organs reffered to the total number of analysed plant organs ″N″.

The intensity of the attack was determined appling the formula: I%=∑(i × f)/b, in which ″i″ means the cover percentage of the attack on the plant organs, ″f″ means the number of plant organs framed in a certain percentage and ″b″ represents the total numer of affected plants.

RESULTS AND DISCUSSIONS

By appling the serologic test DAS-ELISA (Table 1) we observed that only six of twenty cultivars were not infected with Plum pox virus: Tita (0,443), Tuleu Timpuriu (0,441), Diana (0,505), Flora (0,443), Vangerka jubilejnija (0,556) and Minerva (0,562). Values for the concentration of the viral protein in leaves smaller than 1,000 indicated the negative response of the tested plants to the viral infection.

Table 1

The evidency of the Plum pox virus at plum cultivars through the serologic method

No. Crt.	The cultivar	DAS-ELISA	
		Values recorded at one hour	Sample reaction
1	Tita	0,443	-
2	Stanley	>3,000	+
3	Renclod hramova	1,479	+
4	Tuleu timpuriu	0,441	-
5	Anna Spath	1,882	+
6	Kisinevskaja rana	3,258	+
7	Large sugar prune	3,258	+
8	Diana	0,505	-
9	Robé de Sergent	>3,000	+
10	Verzişoare de Olteanca	2,697	+
11	Imperial California	>3,000	+
12	Čačanska rodna	2,125	+
13	Flora	0,443	-
14	Edda	2,220	+
15	Tuleu gras de Sineşti	1,893	+
16	Vangerka jubilejnija	0,556	-
17	Minerva	0,562	-
18	Valor	1,126	+
19	Balada	3,257	+
20	Tegera	>3,000	+
Possitive whitness		>3,000	+
Negative whitness		0,455-0,464	-

Note: - = healthy; + = infected

The frequency of the attack on leaves (figure 2) was very variable, the values oscillated between 12% and 94,5%. Low values were recorded at Renclod hramova, Kisinevskaja rana cultivars (12%) and very high fin case of four cultivars: Tegera (94,5%), Čačanska rodna, Stanley (90%) and Large sugar prune (89%) and Edda (84,5%).

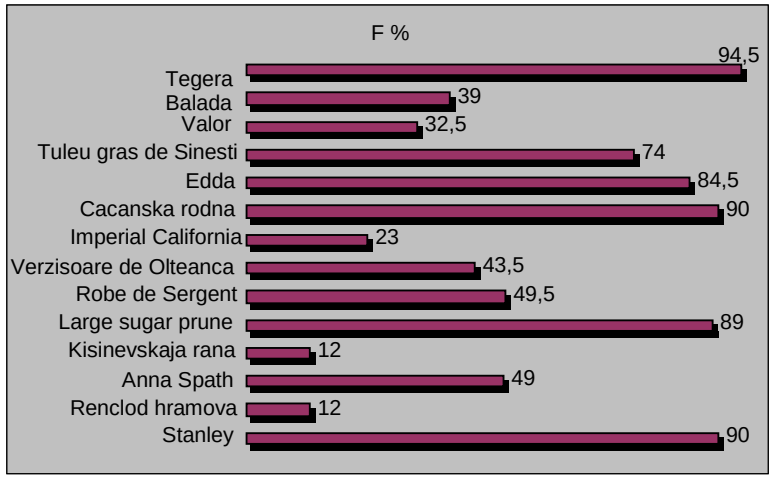


Fig. 2. The frequency of the attack (%) of PPV on leaves

The limits between the values of the intensity attack oscillated were 21,2% (Kisinevskaja rana) and 61,5% (Čačanska rodna) (figure 3).

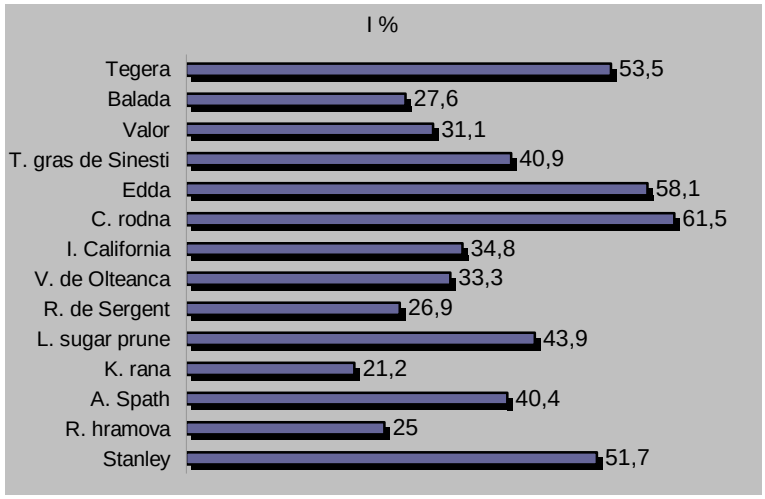


Fig. 3. The intensity of the attack (%) of PPV on leaves

According the interpretation scale for the values of the attack degree: AD % = 1-10 % week attack; AD % = 10-20 % medium attack; AD % = 20-30 % powerful attack; AD % > 30 % very powerful attack, we observed a week attack in case of three cultivars: Renclod hramova (3%), Kisinevskaja rana (2,5%), Imperial California (8%), a medium attack on the leaves of the cultivars Valor (10,1%), Balada (10,7%), Robé de Sergent (13,3%), Verzişoare de Olteanca (14,5%), Anna Spath (19,8%) and a very powerful attack in case of the cultivars

Tuleu gras de Sinești (30,2%)), Large sugar prune (39,1%), Edda (49,1%), Tegera (50,6), Stanley (51,7%) and Čačanska rodna (55,4%) (figure 4).

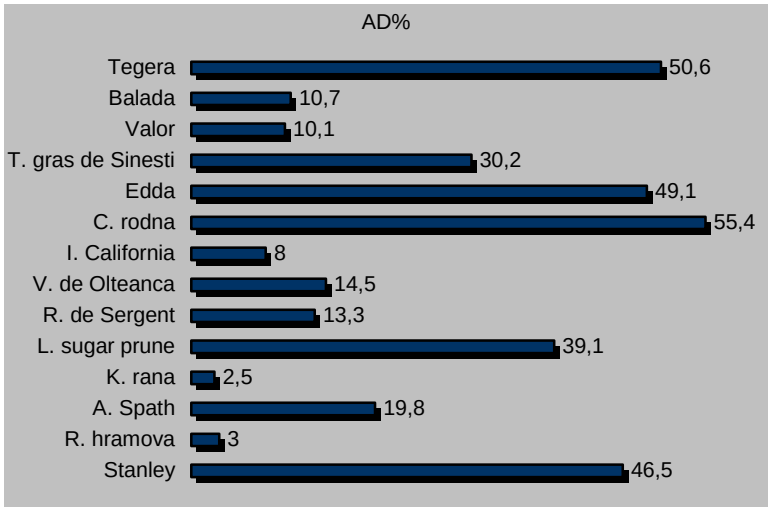


Fig. 4. The attack degree (%) of PPV on leaves

On fruits the attack degree of Plum pox virus was very small (values of the AD% were between 0,1% and 6,7%). Thus, of the five plum cultivars with characteristic symptoms on fruits, Edda was the most affected (6,7%) (figure 5).

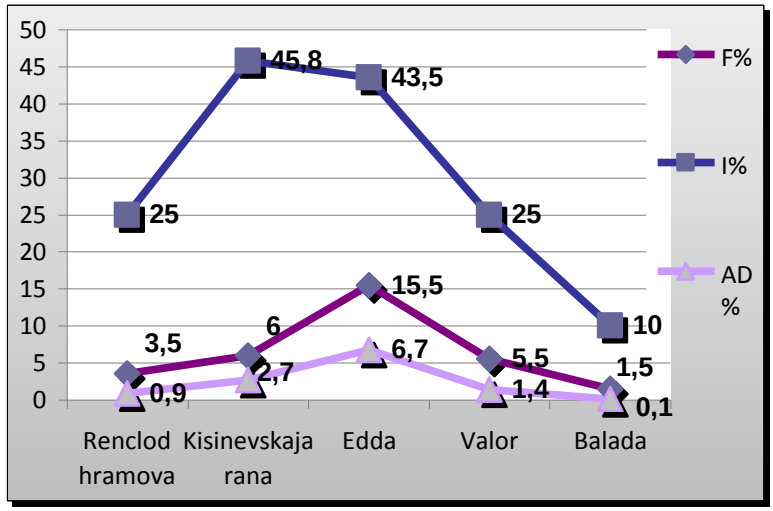


Fig. 5. The frequency, intensity and the attack degree of PPV on fruits

CONCLUSIONS

1. The plum cultivars Tita, Tuleu timpuriu, Diana, Flora, Minerva and Vangerka jubilejnija proved not to be infected with Plum pox virus.

2. The attack degree of the virus on leaves was proved to be very powerful for six plum cultivars: Tuleu gras de Sineşti, Large sugar prune, Edda, Stanley, Tegera and Čačanska rodna (the AD% values were higher than 30%).

3. The plum cultivars Renclod hramova, Kisinevskaja rana, Valor, Balada and Edda presented symptoms on fruits too, but the attack degree was less important (the AD% values were under 10%) by comparing him with the attack on leaves.

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CONSIDERATIONS REGARDING THE LUMBRICIDAE FAUNA (*OLIGOCHAETA- LUMBRICIDAE*) FROM THE REGION OF SACUTA FOREST RANGE, THE COUNTY OF SUCEAVA

CONSIDERAŢII PRIVIND FAUNA DE LUMBRICIDE (*OLIGOCHAETA- LUMBRICIDAE*) DIN REGIUNEA CANTON SILVIC SĂCUŢA, JUDEŢUL SUCEAVA

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Abstract. *Sacuta forest range, in the county of Suceava is responsible for the maintenance, conservation and exploitation of some important areas of land cultivated with deciduous trees, as well as coniferous trees. It is known that the soil macro-fauna is determined by the structure of the vegetation which grows on it. This paper focuses on the structure and biodiversity of the Lumbricidae fauna sampled from the merging area between the deciduous and coniferous wood, being part of a process of analysis of the structure Lumbricidae species which are presently found on the territories of the counties in Moldavia.*

Key words: environment, fauna, lumbricidae, pollution, greenhouses.

Rezumat. *Cantonul silvic Săcuţa, judeţul Suceava, este responsabil cu întreţinerea, conservarea dar şi exploatarea unor suprafeţe importante, cultivate cu specii de arbori de foioase dar şi de răşinoase. Se cunoaşte faptul ca macrofauna de sol este determinată şi de structura vegetaţiei care creşte pe solul respectiv. Lucrarea de faţă, urmareşte stabilirea structurii biodiversităţii speciilor de lumbricide colectate la locul de întalnire dintre pădurea de foioase şi cea de răşinoase, înscriindu-se într-un proces de analiză a structurii speciilor de lumbricide existente la ora actuală pe teritoriul judeţelor din Moldova.*

Cuvinte cheie: mediu, faună, lumbricide,poluare,sere.

MATERIAL AND METHOD

The biological material was collected by classical methods (digging and soil sieving) from the area of Sacuta forest range, county of Suceava. The digging area is a young nursery of coniferous trees, in the neighbourhood of the decideous wood. We also mention that there is an artificial pond at approximately 50 m.

The material once collected, it was washed, deposited and transported to the laboratory, in 10% ethyl alcohol. In the laboratory, the collected Lubricidae were analysed in order to be identified and they were measured so as to establish the ecological parametres of each group.

For identification there were taken into consideration the following data: length and diametre of the specimens, shape of the head, the total number of

segments which form the body, the position and shape of the clitellus. All these data were recorded and compared in order to establish the characteristic limits of each species.

RESULTS AND DISCUSSIONS

The collection was undertaken from a soil layer of 1-50 cm depth. There were taken biological samples belonging to 6 species of Lumbricidae.

Collected species: *Eisenia foetida*; *Eisenia submontana*; *Lumbricus castaneus f. Typica*; *Lumbricus rubellus*; *Dendrobaena rubida*; *Eiseniella tetraedra typica*.

Eisenia foetida is a pigmented species, especially on the back, with red-purple stripes and it prefers fat soils, as it is often present in the decaying garbage; its ecological parametres are the following:

- **Variations in length -** between 80-100 mm-6 specimens (1oo), between 101- 150 mm- 3 specimens.
- **Diametre** – minimum-4mm (1 specimen-11,1%), maximum- 6mm (6 specimens- 66,6%) .
- **Position of the clitellus**: on segments 29-36– 7 specimens (77,7%), on segments 28-36-3 specimens (22,2%)**.**
- **Total number of body segments:** minimum-118, maximum-150.

Eisenia submontana is a pigmented species, the colour of the body is uneven, it has red-purple stripes on the back and sides. It is characterized by the following ecological traits:

- **Variations in length -** between 80- 180 mm-2 specimens (100%).
- **Diametre** – minimum-4mm (1 specimen-50 %), maximum - 6mm (1 specimen - 50%) average - 5%
- **Position of the clitellus**: on segments 26-33– 1 specimen (50 %), on segments 27-34-1 specimen (50 %)
- **Total number of body segments:** minimum-135, maximum-137

Lumbricus castaneus f. typica is a pigmented species, with red-purple stripes on the back and it prefers wet, swampy soils.

It presents the following morphological characteristics:

- **Variations in length -** between 30- 45 mm-1 specimen (16,6%),45-85 -3 specimens (50%), more than 85 mm-2 specimens (33,3%).Average length: 70 mm.
- **Diametre** – minimum -3mm (1 specimen-16,6 %), maximum - 5 mm (1 specimen - 16,6 %) average - 4 mm.
- **Position of the clitellus**: on segments 28-33– 1 specimen (100 %).

- **Total number of segments / body:** minimum-45, maximum-120.

Lumbricus rubellus species is brown – purple, bright, frequently found under logs or fallen trunks. The specimens from this species have the following morphological characteristics:

- **Variations in length –** between 50- 100 mm-2 specimens (50 %),100-150 -2 specimens (50%). Average length: 113,7
- **Diametre** – minimum -4mm (1 specimen-25 %), maximum- 6 mm (2 specimens- 50 %) average - 4 mm.
- **Position of the clitellus**: on segments 26-32– 1 specimen (25%).26-33 (2 specimens-50 %), 27-33 (1 specimen - 25%)
- **Total number of segments / body:** minimum-95, maximum-140. Average number: 125,75.

Dendrobaena rubida species is red-purple on the back, it is frequently present under logs or fallen trunks. The specimens of this species have the following morphological traits:

- **Variations in length -** between 40- 80 mm-2 specimens (100 %). Average length: 80 mm.
- **Diametre** – 4 mm-100%.
- **Position of the clitellus**: on segments 26-32– 2 specimens (100 %).
- **Total number of segments / body:** minimum-87, maximum-90. Average number: 88,5.

Eiseniella tetraedra f. typica species is red-brown and it is an amphibious. The specimens of this species present the following morphological characteristics:

- **Variations in length -** between 30- 60 mm-7 specimens(63,63 %),60-100 -4 specimens (36,36b%). Average length: 59,5
- **Diametre** – min-2mm (8 specimens-72,72 %), maximum- 3 mm (3 specimens- 27,27 %) average- 2,27 mm.
- **Position of the clitellus**: on segments 22-26– 8 specimens (72,72 %).22-27 (1 specimen-9,09 %), 23-27 (2 specimens- 18,18 %)
- **Total number of body segments:** minimum-71, maximum-90. Average number: 78.

CONCLUSIONS

As human technology develops, it is more and more important to study the influence it has on the environment; on the soil, water, air, flora and fauna.

From the above mentioned area there were collected 6 species of Lumbricidae, mostly species of purple pigment, epigeic, specific to fertile lands, excessively wet.

The ecological parametres which were determined rank within the characteristic limits of the species.

The collected species belong to the categories which have a significant ecological impact on the soils of decideous forests, as they are the ones which process the organic matter and improve the quality of the soil.

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OBSERVATIONS ON HARMFUL SPECIES OF APPLE ORCHARDS AND PREVENTION AND CONTROL MEASURES APPLIED IN THE SA LOTURI SERVICE SRL VASLUI, VASLUI COUNTY

OBSERVAŢII PRIVIND SPECIILE DĂUNĂTOARE DIN PLANTAŢIILE POMICOLE DE MĂR ŞI MĂSURILE DE PREVENIRE ŞI COMBATERE APLICATE ÎN CADRUL S.A. LOTURI SERVICE S.R.L. VASLUI, JUD. VASLUI

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Abstract*:Observations were made on the farm orchards belonging SA Loturi Service SRL Vaslui, Vaslui county, in the period October 2008 - September 2009. For this was made regular observations directly on the ground, at the same time were harvested and samples were we analyzed in the laboratory .Species indicated that harmful observation period was: San Jose Scale (Quadraspidiotus permiciosus Comst.), worm apples (Laspeyresia pomonella L.), Wodlly apple aphid (Eriosoma lanigerum Hsm.), Cherry bark tortrix moth (Enarmonia formosana Scop.), saw wasp with the apples(Haplocampa testidinea Klug.), Phalaena cunea (Hyphantria cunea Drury.)*

Key words: *worm apples, bark tortrix moth, apple orchards*

Rezumat:*Observaţiile au fost efectuate în cadrul fermei pomicole aparţinând S.A. Loturi Service S.R.L. Vaslui, jud. Vaslui, în perioada octombrie 2008- septembrie 2009. Pentru aceasta au fost efectuate periodic observaţii direct pe teren, totodată recoltându-se şi probe care au fost apoi analizate în laborator. Speciile semnalizate ca dăunătoare în perioada de observaţie au fost: paduchele ţestos din San José (Quadraspidiotus permiciosus Comst.), viermele merelor (Laspeyresia pomonella L.), păduchele lânos al mărului (Eriosoma lanigerum Hsm.), molia scoarţei pomilor (Enarmonia formosana Scop.), viespea fructelor (Haplocampa testidinea Klug.), omida păroasa a dudului (Hyphantria cunea Drury.) etc.*

Cuvinte cheie: viermele merelor, molia scoarţei pomilor, plantaţii de măr

INTRODUCTION

Apple culture is the best known and widespread in temperate climates, and apples tops both in terms of production volume, the quality - and request their food outlets. Apple important fruit species worldwide, has an extremely large number of plant and animal organisms effects, which cause harm. Percher (Way, 1988 cit. Talmaciu M., 2006) has compiled a list of 80 diseases caused by viruses, mycoplasma, bacteria, fungi, plus 64 species of insects and mites, eight species of nematodes and at least two species of rodents (Chatened du Gaetan, 1990; Panin I., 1951; Reitter E., 1908; Rogojanu V., Perju T., 1979). Therefore, knowledge of pests

and pathogens that attack apple and prevention and control measures are of particular importance for obtaining high yields and good quality.

MATERIAL AND METHOD

Observations were made in 2009 in a plantation belonging apple fruit growing, SC Loturi Service, SRL Vaslui. Pests were identified that occurred in apple plantations by direct observations made on trees during rest and vegetation (Talmaciu M., 2006). There have also been reported treatments were applied against pathogens and pests, depending on phenological stage, the economic threshold of pest, and weather factors.

RESULTS AND DISCUSSIONS

In 2009, the apple orchards of the Company taken as observations were identified as most important following harmful species (table 1) tested San Jose Scale (*Quadraspidiotus perniciosus* Comst., Woolly Scale (*Eriosoma lanigerum*), weewil buds (*Sciaphobus squalidus* Gyll.), apple aphid (*Aphis pomi*), apple worm (*Cydia pomonella* L.) trees of red mite (*Panonychus ulmi*), saw wasp with apples (*Hoplocampa testudinea*) etc.

Table 1

Structure pest of apple plantations belonging to SC Lots Service Ltd. in 2009

No.	Scientific name of species	Common name	Order / Family	Time attack event	Observations
1	*Quadraspidiotus perniciosus*	San jose scale	Homoptera/ Diaspididae	From May to September	Occasionally plantations. Treatment was performed at the end of rest
2	*Eriosoma lanigerum*	Wooly apple aphid	Homoptera/ Eriosomatidae	From April to October	With greater frequency during the summer. Treatment was performed at the end of rest
3	*Sciaphobus squalidus*	Weewil buds	Coleoptera/ Curculionidae	Mid-March, the first decade of April	Varieties that have disbuding later, the attack was more powerful treatment is performed
4	*Aphis pomi*	Apple aphid	Homoptera/ Aphididae	Late April-mid September	The attack was quite frequently influence the quantity and quality production
5	*Anthonomus pomorum*	Apple Blossom Weevil	Coleoptera/ Curculionidae	Late April-early May	The attack was sporadic and did not require application of any treatment
6	*Hoplocampa testudinea*	European apple sawfly	Hymenoptera/ Tenthredinidae	The first half of May	Sporadic attack not necessary to apply a special treatment.
7	*Panonychus ulmi*	Red spider mite	Acari/ Tetranychidae	From May to	Attack particularly intense in July and

				September	August
7.	*Lithocolletis blancardella*	Apple blotch leafminer	Lepidoptera/ Tortricidae	From May to September	Sporadic attack, treatments performed to control other pests have taken this species
8.	*Adoxophyes reticulana*	Apple peel tortricid	Lepidoptera/ Tortricidae	From May to September	Occasionally attack 1-2% fruit contested
9	*Cydia pomonella*	Codling moth	Lepidoptera/ Tortricidae	From June until Octomber, a strong attack inJuly-August	The attack was stronger in the second generation. Treatments performed in 10% reduced attack contested fruit
10	*Hyphantria cunea*	Fall Webworm (larva)	Lepidoptera/ Arctiidae	From July to September	Special treatment was made in late August
11	*Euproctis chrysorrhoea, Aporia crataegi, Hyponomeuta malinella,*	Brown-tail, Black Veined White, Apple Ermine Moth,	Lepidoptera	From May to September	Defoliator attack these species has been kept under control by carrying out treatment against other pests.

With regard to chemical treatments applied against pathogens and pests in the Company in 2009, apple plantations have been a number of 10 treatments (table 2). Pests that were considered when carrying out these treatments were tested San Jose Scale (*Quadraspidiotus perniciosus* Comst.) weewil buds (*Sciaphobus squlidus* Gyll.) Scale of apple green (trees Aphis), apple blossom weewil (*Anthonomus pomorum*), saw wasp with apples (*Hoplocampa testudinea*), (*Cydia pomonella*) apple worm, flea nectareous of apple (*Psylla mali*), mites, species mined, defoliator species.

Table 2

Chemical treatments applied against pathogens and pests in 2009, the Company Loturi Service Ltd. Deleşti

No.	Performing during treatment.	Pest / pathogen	The product used	Dose and concentration used	Quantity of solution/ha
1	3.04 5.04	*Quadraspidiotus perniciosus, Sciaphobus squalidus, Aphis pomi*	Confidor	13,5 l/ha	900 l
2	13.04-16.04	*Sciaphobus squqlidus, Aphis pomi, Venturia inequalis, Podosphaera leucotricha*	Karate Zeon, Funguran Sulfomat	0,25 l 3 Kg 4 Kg	900l
3	23.04-25.04	*Anthonomus pomorum, Aphis pomi, Quadraspidiotus perniciosus, Podosphaera leucotricha, Venturia inequales*	Karate Zeon Chorus Topsin	0,25 l 0,3 Kg 0,7 Kg	900 l
4	29.04-30.04	*Hoplocampa testudinea,* Mined, Afids, *Larve Adoxophyes, Epicometis hirta, Apple scrab,Powdery mildew .*	Coragen Funguran Chorus	0,6 Kg 9 Kg 0,9 Kg	1500 l
5	8.05-10.05	*Anthonomus pomorum, Aphis pomi, Quadraspidiotus perniciosus*	Fastac Chorus Dithane M-	0,9 Kg 0,9 Kg 10 Kg	1500 l

		Venturia inequales,Podosphaera lecotricha	45		
6	15.05-17.05	*Cidya pomonella,* Afids, *Psylla, Minatoare, Apple scrab,*Powdery mildew .	Calypso Decis Strobi	0,9 l 0,6 0,6	1500 l
7	24.05-26.05	*Cidya pomonella,* Afids, *Apple scrab, Powdery mildew .*	Lufox Aloha Decis	5 l 1,5 l 0,6 l	1500 l
8	9.06-11.06	*Quadraspidiotus perniciosus,* afids, *Eriosoma, Adoxophyes, Erwinia amilovora*	Decis Zato Topsin	0,15 l 0,2 l 5 Kg	1500 l
9	22.06-24.06	*Cidya pomonella,* Mites, *Apple scrab,Powdery mildew, Monillinia* sp., Mined	Zato/Impact Shavit	0,45 l 9 Kg	1500 l
10	15.07-16.07	*Cidya pomonella,* Apple scrab, Powdery mildew, Afids, Mined.	Supersect	0,9 l	1500 l

CONCLUSIONS

1. In the farm-Vaslui Deleşti belonging Loturi Service Company Ltd., have been identified as major pests in 2009, the following species: *Quadraspidiotus perniciosu*s Comst, *Sciaphobus squalidus* Gyll, *Aphis pomi*

2. For chemical control of pests and pathogens were made in 2009, a total of 10 treatments. These treatments, in most of them were complex, and combat while at the same time both pests and pathogens, to overcome the PED.

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THE SPECTRUM OF THE ARTHROPODS FROM THE ROSE CROPS

SPECTRUL FAUNEI DE ARTHROPODE DIN CULTURILE DE TRANDAFIR

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Abstract. *Within an agricultural biocoenosys there are usually only a few species of pests that have a large economic impact. These species that are found each year, which are called key species, and therefore require continuous treatment without which can not be achieved a high quality yield. Establishing the key species, is one of the basic premises of the success of integrated control. Research on entomofauna rose were conducted at the Botanical Garden "Alexandru Buia" of Craiova in a collection of rose varieties and focused primarily on identifying pest species as well as beneficial species. Following our researches we have establish that the harmful entomofauna it is classified systematically into four orders: Homoptera, Thysanoptera, Hymenoptera and Coleoptera, while the useful entomofauna belongs to Heteroptera and Coleoptera orders.*

Key words: rose, entomofauna, Botanical Garden „Al. Buia", Craiova

Rezumat. *În cadrul unei agrobiocenoze sunt de obicei numai câteva specii de dăunători care au o influenţă economică mare. Acestea sunt speciile care se întâlnesc an de an, care se numesc specii cheie, şi de aceea necesită tratamente permanente fără de care nu se poate realiza o producţie susţinută şi de calitate superioară. Stabilirea judicioasă a speciilor cheie, constituie una din premisele de bază a asigurării succesului combaterii integrate. Cercetările cu privire la entomofauna trandafirului au fost efectuate la Grădina Botanică „Alexandru Buia" din Craiova într-o colecţie de soiuri de trandafir şi s-au axat în primul rând pe identificarea speciilor dăunătoare dar şi a speciilor folositoare. În urma cercătorilor efectuate am putut stabili că entomofauna dăunătoare este încadrată din punct de vedere sistematic în patru ordine: Homoptera, Thysanoptera, Hymenoptera şi Coleoptera, în timp ce entomofauna folositoare aparţine ordinelor Hetroptera şi Coleoptera.*

Cuvinte cheie: trandafir, entomofauna, Gr. Botanică „Al. Buia", Craiova

INTRODUCTION

Within an agricultural biocoenosys there are usually only a few species of pests that have a large economic impact. These species that are found each year, which are called key species, and therefore require continuous treatment without which can not be achieved a high quality yield.

Classification given in this regard by Smith, R. and van der Bosch (1967) includes besides the key species, the following pests: secondary pests or occasional pests, potential pests that do not cause significant damage of economic, migratory species from other cultures and are very dangerous, indifferent species, useful species.

Regarding the rose pests in Romania after Bernardis, R. et al. (2003), the main pests are classified systematically in Insecta class, orders: Homoptera, Hymenoptera, Coleoptera, Thysanoptera.

The research was conducted at the Botanical Garden "Alexandru Buia" of Craiova, in a collection of rose varieties and focused primarily on identifying pest species but also beneficial species.

MATERIAL AND METHOD

During 2008-2009 there were made observations on the collection and identification of the rose entomofauna, in a collection of rose varieties at the Botanical Garden „Al. Buia" from Craiova.

The collection includes 65 varieties of roses in an area of 500 m^2. Be noted that whilst investigations were not applied pesticide treatments. Measurements consisted of: collected with tweezers, or directly by hand, brushing using a soft brush, collected using entomological fillet, colored traps.

The entomological material was collected in Petri dishes then analyzed using an binocular magnifier, for a correct identification of the species. The collections of the entomological material were made from April until the end of the vegetation period. Colored traps were weekly read and cleaned.

The species collected were analyzed and identified according to the determinators published in the Fauna României (Panin L. 1951) and the European Fauna (Chinery M.1998).

RESULTS AND DISCUSSIONS

The entomofauna collected from a rose culture throughout the vegetation period was represented by 21 species: eight damaging species, three beneficial species and 10 indifferent species.

Analyzing the harmful entomofauna, we find that is framed from the systematically point of view in four orders: Homoptera (two species), Thysanoptera (one species), Hymenoptera (three species) and Coleoptera (two species).

Weight was represented by the species from the order Homoptera, *Aulacaspis rosae* Bouche. with 92 individuals and *Macrosiphum rosae* L. with 121 individuals.

Regarding the beneficial entomofauna belong to the orders Hetroptera (one species) and Coleoptera (two species).

Table 1

The harmful entomofauna from the rose collection of the Botanical Garden „Alexandru Buia", Craiova

Species	Order	Family	Nr. individuals, adults + larvae
Aulacaspis rosae Bouché.	*Homoptera*	*Diaspididae*	92
Macrosiphum rosae L.	*Homoptera*	*Aphididae*	121
Thrips fuscipennis Hall.	*Thysanoptera*	*Thripidae*	75
Arge rosae Berland.	*Hymenoptera*	*Tenthredinidae*	56
Blennocampa pusilla Klug.	*Hymenoptera*	*Tenthredinidae*	43
Cladius pectinicornis Geoffr.	*Hymenoptera*	*Tenthredinidae*	33
Oxythyrea funesta Poda.	*Coleoptera*	*Scarabeidae*	21
Epicometis hirta Poda.	*Coleoptera*	*Scarabeidae*	18

Table 2

The beneficial entomofauna from the rose collection of the Botanical Garden „Alexandru Buia", Craiova

Species	Order	Family	Nr. individuals, adults + larvae
Orius insidiosus Say.	*Heteroptera*	*Anthocoridae*	10
Coccinella 7-punctata L.	*Coleoptera*	*Chrysomelidae*	37
Adalia bipunctata L.	*Coleoptera*	*Chrysomelidae*	40

As expected, the most numerous species were indifferent species, systematically framed in four orders: Dermaptera (1 species), Hetroptera (1 species), Lepidoptera (five species) and Hymenoptera (three species).

Table 3

The indifferent entomofauna from the rose collection of the Botanical Garden „Alexandru Buia", Craiova

Species	Order	Family	Nr. individuals, adults + larvae
Forficula auricularia L.	*Dermaptera*	*Forficulidae*	13
Pyrrhocoris apterus L.	*Heteroptera*	*Pyrrhocoridae*	22
Vanessa atalanta L.	*Lepidoptera*	*Nymphalidae*	17
Vanessa cardui L.	*Lepidoptera*	*Nymphalidae*	10
Inachis io L.	*Lepidoptera*	*Nymphalidae*	25
Iphiclides podalirius L.	*Lepidoptera*	*Papilionidae*	27
Papilio machaon L.	*Lepidoptera*	*Papilionidae*	31
Bombus terrestris L.	*Hymenoptera*	*Apoidae*	43
Apis mellifica L.	*Hymenoptera*	*Apoidae*	28
Formica rufa L.	*Hymenoptera*	*Formicidae*	81

CONCLUSIONS

1. The entomofauna collected from a rose culture throughout the vegetation period was represented by 21 species: eight damaging species, three beneficial species and 10 indifferent species.

2. The harmful entomofauna, we find that is framed from the systematically point of view in four orders: Homoptera (two species), Thysanoptera (one species), Hymenoptera (three species) and Coleoptera (two species).

3. Regarding the beneficial entomofauna belong to the orders Hetroptera (one species) and Coleoptera (two species).

4. The indifferent entomofauna it is systematically framed in four orders: Dermaptera (1 species), Hetroptera (1 species), Lepidoptera (five species) and Hymenoptera (three species).

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COMPARATIVE STUDIES ON THE ACTIVITY OF CATALASE IN WHITE ROT FUNGUS *PHANEROCHAETE CHRYSOSPORIUM* GROWN ON MEDIA CONTAINING CONIFEROUS AND DECIDUOUS SAWDUST

STUDII COMPARATIVE ASUPRA ACTIVITĂŢII CATALAZEI LA CIUPERCA LIGNOCELULOZOLITICĂ *PHANEROCHAETE CHRYSOSPORIUM* CULTIVATĂ PE MEDII CONŢINÂND RUMEGUŞURI DE CONIFERE ŞI FOIOASE

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Abstract *In the present study we presented the comparative studies in catalase activity in the white rot fungus Phanerochaete chrysosporium grown on media containing various amounts of sawdust: spruce, beech, fir and poplar. In order to conduct these studies was replaced glucose from Sabouraud medium with different amounts of sawdust of 4 species of trees resulting in the final 3 work variants for each species: V1-20 g /l, V2-30 g /l; V3-40 g /l. Catalase activity was determined at 7 and 14 days from inoculation using fungus mycelium and culture fluid. Analyzing the data obtained revealed that this enzyme activity was influenced by type of sawdust, amount of sawdust and the fungus age.*

Key words: *Phanerochaete chrysosporium*, catalase, sawdust, coniferous, decidous

Rezumat *În lucrarea de faţă se prezintă studiul comparativ asupra activităţii catalazei la ciuperca Phanerochaete chrysosporium cultivată pe medii conţinând cantităţi variate de rumeguş de molid, fag, brad şi plop. În vederea efectuării acestor studii s-a înlocuit glucoza din mediul Sabouraud cu diferite cantităţi de rumeguş de la 4 specii de arbori (molid, fag, brad şi plop) rezultând în final 3 variante de lucru pentru fiecare specie: V1-20 g rumeguş /l; V2 -30 g rumeguş /l; V3-40 g rumeguş /l. Activitatea catalazei s-a determinat la 7 şi 14 zile de la însămânţare din miceliul ciupercii şi din lichidul de cultură. Din analiza datelor obţinute s-a evidenţiat faptul că activitatea acestei enzime a fost influenţată de tipul de rumeguş, cantitatea de rumeguş şi de vârsta ciupercii.*

Cuvinte cheie: *Phanerochaete chrysosporium*, catalază, rumeguş, conifere, foioase.

INTRODUCTION

Phanerochaete chrysosporium is a fungus that degrades woody cell wall components including lignin and uses hydrogen peroxide as a substrate in its ligninolytic phase (Sun-Il Kwon and Anne J. Anderson, 2001).

In the Microbiology Laboratory from Biological Research Institute Iaşi the biology of cellulolytic fungi represented the center of research for more than 15 years. The most important studies were those regarding Krebs cycle's dehydrogenases activity in cellulolytic species *Alternaria alternata* grown on media containing deciduous and coniferous sawdust (Manoliu et al., 2002), the evolution of cellulase complex in *Alternaria alternata* grown on media containing forestry industry wastes - deciduous and coniferous sawdust (Manoliu et al., 2005), the influence of magnetic and electromagnetic field on peroxidase activity in *Chaetomium globosum* and *Trichoderma viride* grown on media containing deciduous and coniferous sawdust (Manoliu et al., 2008), the influence of different amount of spruce sawdust on catalase and peroxidase activity in species *Phanerochaete chrysosporium* (Manoliu et al., 2009).

Catalase (H_2O_2: H_2O_2 – oxidoreductase, EC 1.11.1.6) is an antioxidant enzyme, grown in aerobic organisms. Along with peroxidase and glutathione peroxidase, catalase is involved in detoxification of hydrogen peroxide, a reactive oxygen species (ROS), produced by fungi during metabolic activity. Fungi increase their production due to stress factors as lack of food, light, mechanical degradation, and interaction with other organisms. Setting levels of reactive oxygen species is very important during development fungus (Gessler et al., 2007).

MATERIAL AND METHOD

The study was performing on lignolytic fungus *Phanerochaete chrysosporium* (HEM no. 5772) acquared by the Biological Research Institute Iasi from the Institute of Santé Publique Scientifique, Belgium. In order to determine catalase activity, the fungus was grown on Sabouraud medium with following composition: peptone – 10 g, glucose – 35 g, distillated water - 1000 ml (Constantinescu, 1974), in which the carbon source (glucose) was replaced with different amounts of sawdust from 4 trees species and the final result 3 variants for each species: V1-20 g sawdust /l; V2-30 g sawdust /l; V3-40 g sawdust /l. Incubation took place at 28^{o}C and determination of catalase activity was realised at 7 days and 14 days after sowing in fungus mycelium and culture liquid by spectrophotometric method Sinha. Enzyme activity was reported to the amount of soluble protein determinated by Bradford method (Artenie et al., 2008).

RESULTS AND DISCUSSIONS

The results regarding the influence of various concentrations of coniferous and deciduous sawdust on catalase activity are presented in figures 1-6. Thus, figure 1 present the comparative results of catalase activity in mycelium of *Phanerochaete chrysosporium* in variant V1 containing 20g sawdust/l, from which observed that at 7 days after sowing, the increased activity was recorded on medium containing spruce sawdust (139.287 ± 4.872 UC/g/mg protein), and the lowest on medium containing beech sawdust (47.498 ± 6.724 UC/g/mg protein). At 14 days after sowing the highest activity was detected in the variant with the fir sawdust (243.584± 32.506 UC/g/mg protein), while in the variant with the beech sawdust was present the lowest value (128.547 ± 4.408 UC/g/mg protein).

Following the dynamics activity of catalase, we established that enzyme actvity increased to 14 days after sowing compared with values recorded in 7 days from sowing in all four species of trees, the most significant differences between the two periods of growth occured in the variants with fir and beech sawdust.

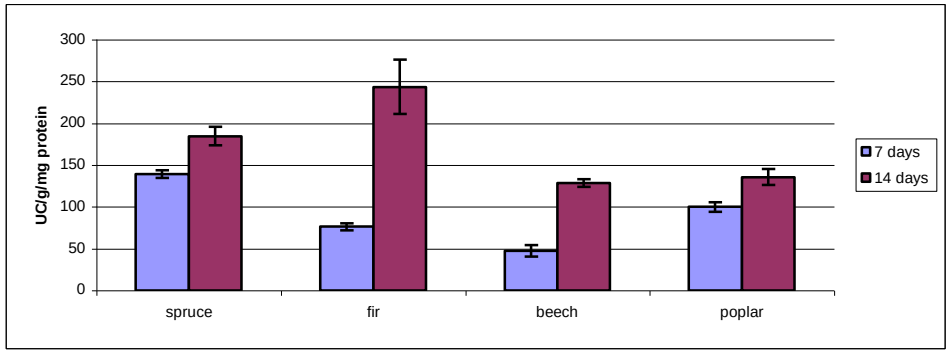

Fig. 1. Catalase activity in *Phanerochaete chrysosporium* - V1-20 g sawdust/l (mycelium)

The data regarding catalase activity in fungus mycelium at variant V2 with 30 g sawdust/l are shown in figure 2, in which it appears that most of enzyme activity at 7 days after sowing was determined on medium containing spruce sawdust (145.034 ± 12.099 UC/g/mg protein) and the lowest activity was recorded in the variant with the beech sawdust (42.936 ± 2.151 UC/g/mg protein). At 14 days after sowing, catalase activity was stimulated in the variant containing fir sawdust (192.796 ± 13.535 UC/g/mg protein), while in the variant with the beech sawdust was highlighted lowest enzyme activity (114.632 ± 15.643 UC/g/mg protein).

Comparing the dynamics of catalase activity in connection with the type of sawdust used as substrate and fungus age, it is noted that there was an intensification of this enzyme in all four trees species in second period of growth especially at medium containing fir and beech.

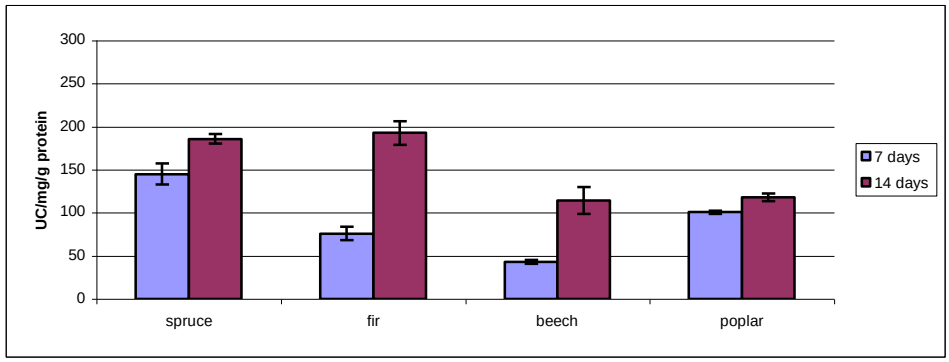

Fig. 2. Catalase activity in *Phanerochaete chrysosporium* – V2-30 g sawdust/l (mycelium)

Maximum values of catalase activity in the fungus mycelium at variant V3 with 30 g sawdust/l (figure 3) were recorded on culture medium containing spruce sawdust at 7 and 14 days after sowing (156.184 ± 12.435 UC/g/mg protein respectively 176.570 ± 8.048 UC/g/mg protein). The lowest values in those two periods of growth were observed in variant with beech sawdust (46.24085 ± 0.900371 UC/g/mg respectively 97.57118 ± 7.026108 UC/g/mg protein).

The dynamics of catalase activity in connection with the culture age showed that at 14 days after sowing compared with results obtained at 7 days increased the activity of this enzyme in all four sawdust types used as substrate.

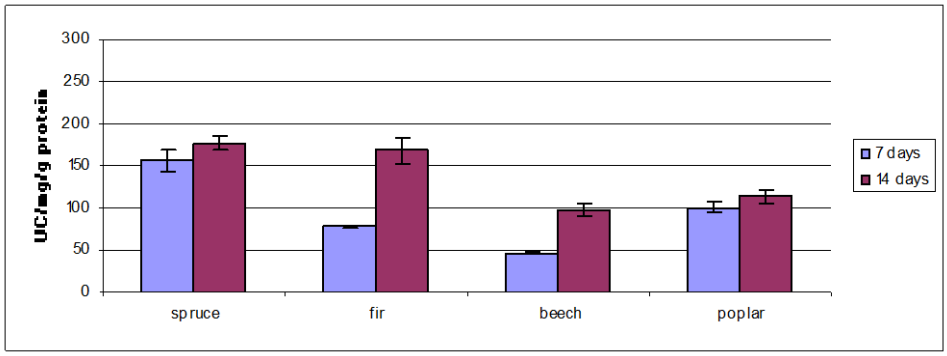

Fig. 3. Catalase activity in *Phanerochaete chrysosporium* – V3-40 g sawdust/l (mycelium)

The catalase activity in liquid culture at the variant V1 is presented in figure 4, wich shows that at 7 days after sowing, the increased value was determined on medium containing poplar sawdust (69.807 ± 5.533 UC/ml/mg protein) and the lowest value occured in variant with beech sawdust (20.650 ± 3.205 UC/ml/mg protein). At 14 days after sowing the maximum activity was detected in the variant with spruce sawdust (113.067 ± 17.702 UC/ml/mg protein), also, and the minimum value is in the variant with poplar sawdust (44.097 ± 14.768 UC/ml/mg protein). At this time it might show that there has been a stimulating catalase activity only at three types of sawdust (spruce, fir, beech), while the poplar has been decreased in activity of this enzyme.

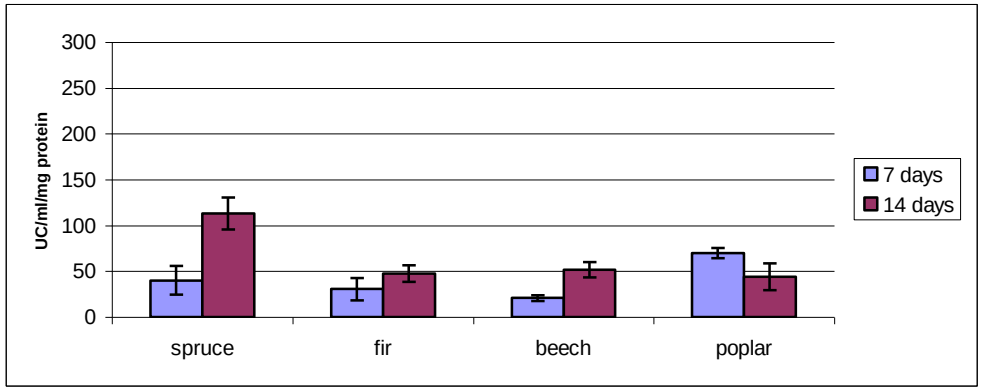

Fig. 4 Catalase activity in *Phanerochaete chrysosporium* –- V1-20 g sawdust/l (liquid culture)

In the variant V2 with 3 g sawdust/l (figure 5), the catalase activity was higher in the poplar sawdust (97.036 ± 30.421 UC/ml/mg protein) and the lowest activity was observed in the spruce sawdust (14.934 ± 1.549 UC/ml/mg protein) at 7 days after sowing. In the next period (14 days after sowing), the highest value was recorded in the variant with fir sawdust (99.590± 5.315 UC/ml/mg protein) and the lowest in the variant with poplar sawdust (61.857 ± 4.404 UC/ml/mg protein).

Folowing the dynamics of this enzyme activity depending on culture age can show that at 14 days after sowing was registred an increased activity in the variants with spruce, fir and beech sawdust, while the variant with poplar sawdust was observed weaking in.

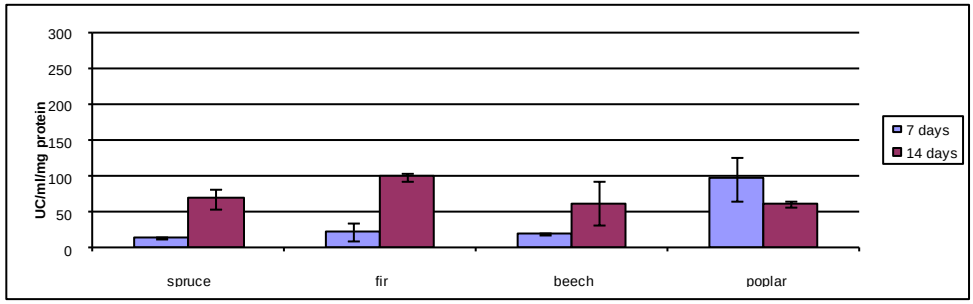

Fig. 5. Catalase activity in *Phanerochaete chrysosporium* – V2-30 g sawdust/l (liquid culture)

The results of catalase activity in liquid culture medium in variant V3 (40 g sawdust/l) are shown in figure 6, from which established that at 7 days from sowing, the increased enzyme activity was recorded in the variant with poplar sawdust (103.020 ± 8.241 UC/ml/mg protein) and the lowest in the variant with beech sawdust (17.891 ± 3.688 UC/ml/mg protein). At 14 days the most intense activity was observed in the variant with beech sawdust (105.056 ± 15.137 UC/ml/mg protein) and the lowest activity in the variant with pine sawdust (38.707 ± 12.835 UC/ml/mg protein).

The dinamics of the catalase activity in culture liquid at 14 days after sowing compared with age of 7 days , shows an increase in enzyme activity only in media containing spruce and beech sawdust, comparatively with the variants with pine and poplar sawdust which decreased.

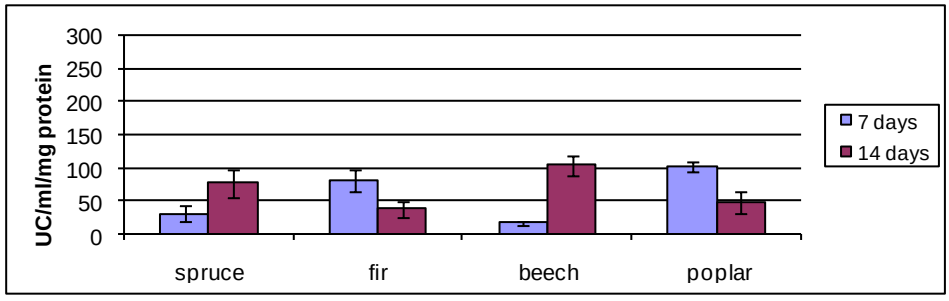

Fig. 6. Catalase activity in *Phanerochaete chrysosporium* V3 - 40 g sawdust/l (liquid culture)

CONCLUSIONS

1. In the fungus mycelium, the catalase activity, in all variants has been stimulated to 7 days from sowing in the samples with spruce and poplar sawdust compared with those containing fir and beech sawdust. At 14 days after sowing the activity of catalase was stimulated at all sawdust types compared with values determined at 7 days, the most significant values was recorded in the variants with coniferous sawdust.

2. In the liquid culture, at 7 days after sowing, the catalase activity was stimulated in all variants which contained poplar sawdust and at 14 days after sowing the catalase activity was stimulated in the variant V1 containing spruce sawdust , variant V2 containing fir sawdust and the variant V3 with the beech sawdust.

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POSSIBLE EFFECTS OF DISCHARGE OF WASTE WATER USED BY SOME ECONOMIC AGENTS FROM ROMAN MUNICIPALITY AND NEAMT COUNTY

EFECTE POSIBILE ALE DEVERSĂRII APELOR UZATE DE CĂTRE UNII AGENŢI ECONOMICI DIN MUNICIPIUL ROMAN, JUDEŢUL NEAMŢ

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Abstract*. The studies of environmental impact are focused on the physico-chemical parameters of environmental quality, moving in a secondary place the analysis of the potential or manifested changes on biological systems. Considering that reactions in living organisms are the ablest to describe the effects of pollutants discharge into the environment, this paper proposes you to describe the ecotoxicological effects of sewage produced by some economic agents from the Roman city. The Daphnia magna high toxicity test was used. In parallel, some indicators of wastewater quality have been determined and we intended to observe the influence on the seed germination and the growth of the Medicago sativa plantlets. The results obtained show an acute toxicity effect on daphnia and of delayed seed germination / plantlets growth in the test species.*

Key words: industrial effluents, acute toxicity testing, water quality indicators, physiological indicators.

Rezumat. *Studiile de evaluare a impactului asupra mediului acordă mare atenţie parametrilor fizico-chimici de calitate ai mediului, trecând în plan secundar analiza modificărilor potenţiale sau manifestate asupra sistemelor biologice. Pornind de la considerentul că reacţiile organismelor vii sunt cele mai în măsură să descrie efectele deversării poluanţilor în mediu, lucrarea de faţă îţi propune să identifice şi să analizeze efectele ecotoxicologice exercitate de apele uzate provenite de la unii agenţi economici din oraşul Roman. S-a utilizat testul de toxicitate acută cu Daphnia magna. În paralel, s-au determinat unii indicatori de calitate ai apelor uzate şi s-a urmărit influenţa asupra germinaţiei seminţelor şi creşterii plantulelor de Medicago sativa. Rezultatele obţinute evidenţiază un efect de toxicitate acută asupra dafniilor şi de întârziere a germinaţiei seminţelor/ creşterii plantulelor la specia test.*

Cuvinte cheie: efluenţi industriali, test de toxicitate acută, indicatori de calitate a apei, indicatori fiziologici.

INTRODUCTION

The ecotoxicity of chemicals to aquatic and terrestrial ecosystems is estimated based on standardized bioassays with standard organisms, representative of the most important trophic levels. Using bioassays to assess the toxicity of industrial waste is a necessity legislatively regulated by the Directive 91/689 EEC, and heavily recommended for the direct and integrated estimation of the environmental toxicity (WFD, 2000). The ecotoxicology laboratory tests are

applied in different countries of Western Europe / Romania in order to demonstrate the adverse effects of various chemicals on the biological systems (Costică Naela and collab., 2006; Neamţu Mariana and collab., 2009). These tests, together with other complementary tools available in ecotoxicology are and continue to be useful to quantify the correlation exposure - effect of the toxic substances under defined, controlled and reproducible conditions.

On the line of these developments, the ecotoxicological determinations made with the *Daphnia magna* species on the wastewater issued by Arcelor Mittal Tubular Products Roman SA and Agrana Romania SA, the Roman branch are included. Note the fact that the two industrial units have pre-purifying sewage stations

Experimental data show that *Medicago sativa,* by its root system is able to absorb heavy metal ions from aqueous solutions (Gardea – Torresdey - J.L., and colab.,1995,1998) and to remove from the environment the organic compounds such as polycyclic aromatic hydrocarbons (Flocco C.G., and collab., 2002). Also, this species is considered to have a potential for the phytoremediation of soils contaminated with heavy metals. (Hernandez Pinero J.L., and collab., 2002).

Based on these considerations, we selected *Medicago sativa* as a test species to study the influence of wastewater coming from the metallurgical industry-specific processes/ the sugar-beet processing industry on certain physiological processes.

MATERIAL AND METHOD

The biological material that tests were made on was the culture of *Daphnia magna* provided by *MicroBioTests* Inc., Belgium. The cultures were propagated and maintained in laboratory conditions, at the Faculty of Biology - Iaşi, and the tests were conducted according to the standard protocol (OECD, 2004; XXXX, 2000). In order to realize the test, the daphnids were exposed for a period of 48 hours at a temperature of 20 ° C and in the dark. After this exposure, the inhibition of mobility of the young adults can be noticed and is reported at 24 hours and 48 hours; they must be old 24 hours and be at least at the third generation. The water for the dilution environment is distilled or deionized water with a pH of 7.8 and dissolved oxygen over 80%. The total volume of tested solutions is at least 2 ml per daphnid, and the minimum number of individuals is 20, divided into four lines. The results of the ecotoxicity tests with *Daphnia magna* were analyzed and expressed with the parameter EC50. It expresses the concentration that produces a toxic effect in 50% of individuals (immobilization, mortality) compared with the control. The results were expressed as the number of immobilized *Daphnia* individuals after their exposure to dilute wastewater solutions, in a standard environment, at 24 and 48 hours. The statistical interpretation of data obtained was performed using the EPA Probit program.

In parallel, qualitative / quantitative measurements were performed regarding the following indicators of water quality: smell, appearance, pH, conductivity, phosphates, sulfates, nitrates, nitrites. In order to determine the pH and conductivity, a Consort C532 type multiparameter was used, while for the other indicators specific methods of analysis were used (Mănescu, S., and collab.,1978). We studied the influence of wastewater on the *Medicago sativa* seed germination and growth during the early ontogenetic stages. The germinated seeds were made in laboratory

conditions in Petri dishes on filter paper soaked with distilled water (control variant) / wastewater (sewage from P1-Mittal Tubular Products; P2, waste water from Agrana). For each experimental variant 250 seeds were used (200 seeds to study the effect on the germination and 50 to study the influence on the growth of plantlets). We calculated the percentage of germination and the measurements were made on germinated seeds regarding the rootlet length (two days from the mounting of the experiment) and the plantlets and in order to determine the water and dry substance content (gravimetric method) (at 30 days). The results obtained for the rootlet length were statistically processed by applying the ANOVA Kruskal-Wallis nonparametric unifactorial test.

RESULTS AND DISCUSSIONS

In a comparative analysis of the results obtained for the two types of water, differences in the chemical composition and their effect on daphnids and seed germination and growth in early ontogenetic stages (at *Medicago sativa*) are highlighted.

The pH plays an important role in vital activity of the vegetal, animal and human organisms and in the technological processes. The water pH is neutral to the P1 variant and acid to the P2 version (5.95). In the second case the average value does not fall within the acceptable limits (6.5 to 9.5) for wastewater. The conductivity is determined by the presence of solutes in water. For water analysis, the conductivity has values between 532-535 μS/cm. They showed materials in suspension, phosphates, sulfates, nitrates (in both types of water) and aromatic hydrocarbon (wastewater from Arcelor Mittal) (table 1).

Table 1

Water quality indicators

No. crt.	Varianta experimentală	Quality indicators							
		Smell	Aspect	pH	Conductivity (μS/cm)	Sulphates i	Phosphates	Nitrates	Nitrites
1	M	odorless	clear						
2	P1	hydrocarbon	opalescent	7.03	535	+	+	-	+
3	P2	penetrating	opalescent	5.95	532	+	+	-	+

The wastewater from the two economic agents has an acute toxic effect on the daphnids. The calculated value of the concentration that produces an immobilization effect on 50% of *Daphnia* individuals (EC 50) is different (in 24 hours) in the case of the two categories of water (figure 1).There is a higher toxicity when comparing the case of Agrana to that of the Arcelor Mittal, toxicity which is due to the acid pH of the water. However, at 48 hours the EC 50 values are significantly closer (figure 2).

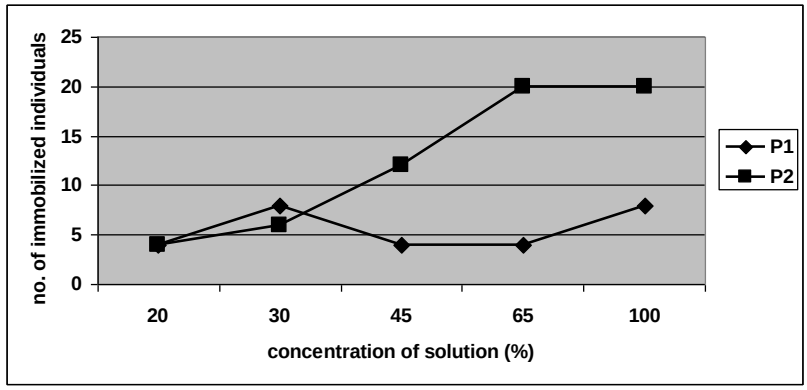

Fig.1. The results of the ecotoxicity tests with *Daphnia magna* after 24 h of exposure – P1, P2 variants

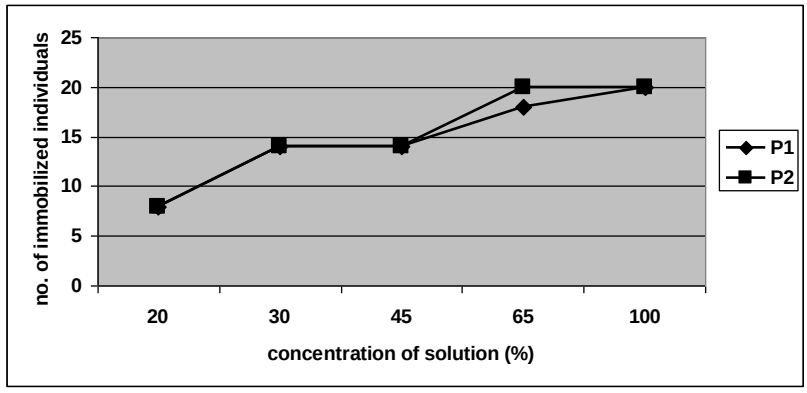

Fig.2. The results of the ecotoxicity tests with *Daphnia magna* after 48 h of exposure – P1, P2 variants

The two specific types of wastewater affect the seed germination at *Medicago sativa*. Compared with the control, the wastewater from Agrana delays the seed germination with 22%. The rootlet length has average values between 7.88 mm (control) and 4.77 to 5.76 mm at the treatment variants (table 2). The differences regarding the rootlet length between the control and treatment variants are statistically significant ($P < 0.05$).

Given that the enzymatic activity takes place at a neutral pH, we appreciate that the seeds germination delay in the case of the P2 variant is due to the acid pH of the water.

Table 2

Analyzed physiological / morphometric indicators at *Medicago sativa*

Nr. crt.	Experimental variant	The percentage of germinated seeds (%)	Average length of the rootlet (mm)	The plantlet average length (mm)	Water content (g %)	Dry matter content (g%)
1	M	75	7.88	58.87	94.03	5.97
2	P1	74	5.76	44.38	93.74	6.26
3	P2	58.5	4.77	45.2	93.52	6.48

Regarding the influence on growth we found out that the at the treatment variants the average length of the plantlet has values inferior to the control. The hydration degree of the plantlets is high (93.52 g% - 94.03 g%) and the dry matter content records low value variations between the control and treatment variants (table 2).

CONCLUSIONS

1. The wastewater from certain specific technological processes specific to the two economical agents have an acute toxicity effect on the daphnids. The most obvious toxic effect in 24 hours of exposure of the water from Agrana is due to their acid pH.

2. The substances present (partially shown by us) in the two types of wastewater analyzed have an unfavorable effect on the plantlet germination and growth during the early stages of the studied test species *(Medicago sativa)*.

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MONITORING OF NITROGEN COMPOUNDS CONTAMINATION OF PHEATIC WATERS IN THE WEST SIDE OF ROMANIA

MONITORIZAREA CONTAMINĂRII CU COMPUŞI CU AZOT A APELOR FREATICE DIN PARTEA DE VEST A ROMÂNIEI

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Abstract. *The problem of depth and surface water contamination in the Banat region, is a topical issue, these days. During 1999-2007 the team of Agro-technique Discipline from Faculty of Horticulture and Forestry, USAMVB Timisoara, conducted detailed studies on nitrogen contamination (nitrates, nitrites and ammonium) of surface and deep groundwater in western Romania,. The test results of water samples taken from wells over 60 m depth, indicates the quality of drinking water located in deep groundwater. Instead surface groundwater in the Banat countryside, is leading a high content of nitrate, nitrite and ammonium.*

Key words: nitrates, nitrites, ammonium, groundwater.

Rezumat. *Problema contaminării apei de adâncime şi de suprafaţă cu contaminanţi în zona Banatului, prezintă o temă de actualitate în momentul de faţă. În perioada 1999-2007 colectivul Disciplinei de Agrotehică din cadrul Facultăţii de Horticultură şi Silvicultură, USAMVB Timişoara, a realizat studii aprofundate privind contaminarea cu compusi cu azot (nitrati, nitriti si amoniu) a apei freatice de suprafata si adancime din vestul României. Rezultatele analizelor probelor de apă prelevate din fântâni de peste 60 m adâncime, semnalează calitatea apei potabile din apa freatică situată la adâncime. În schimb apa freatică de suprafaţă, din spaţiul rural bănăţean, se remarcă printr-un nivel ridicat privind conţinutul de nitraţi, nitrţi şi amoniu.*

Cuvinte cheie: nitraţi, nitriţi, amoniu, ape freatice

INTRODUCTION

Worldwide previous research concluded that in many places over the world the underground water resources are severely polluted with chemicals that include nitrogen compounds (nitrates, nitrites, ammonium ion). Spill residue is abundant in highly populated areas (in urban areas), which presents a high risk with negative direct effect on most drinking water consumers. Among these sources, one in a continuous growing is the residue infiltration in agricultural land, which is mainly found where intensive agriculture is practiced. The waters are contaminated by agricultural activity, excessive and often inappropriate use of pesticides, and nitrates and phosphates fertilizers. Water pollution also comes from intensive farming practiced.

Nitrate pollution comes mainly from agriculture. Nitrogen is an essential element for life and in water undergoes many chemical and biochemical processes. Appears mainly as nitrate, nitrite, ammonia, nitrogen gas and fixed in organic compounds, groups that have continued processing or transit, forming "nitrogen cycle". Excess leads to eutrophication, contamination of aquifers, possible damage to human health: methemoglobinemia to children, gastric cancer etc. World Health Organization sets for a number of substances a limited range within different countries can adopt their own rules, expressed as maximum allowable concentrations. The technical quality of surface water and maximum limits for different chemical indicators are stipulated in STAS 4706/1988, and also, in section regulation which is gradually replacing the provisions of this standard. Chemical parameters of water quality are listed in Law 458/2002. European Directives considered as an acceptable maximum concentration of ***50 mg/L for nitrate, 0.5 mg/L for nitrite and 0.5 mg/L for ammonia.***

MATERIAL AND METHOD

For the risk factors evaluation on water pollution were taken samples from:

- 9 private wells located in agricultural area of Sag-Part municipal waste deposition and adjacent area of deposition. Samples were collected quarterly in the period January 2004 - November 2006 (Cozma Antoanela, 2007)

- 5-10 m deep wells, from the flood area of Timis County, Foeni, Cruceni, Uivar, Ionel, Otelec. Samples were taken quarterly in the period January 2005 - November 2007 (Vlaescu D., 2008)

- private and public wells placed in Becicherecul Mic, Giarmata Vii and Gataia, localities representative regarding the accumulation of nitrogen compounds, pollution sources given by: intensive agriculture and livestock complex (Becicherecul Mic), amendments deposits (Gataia), salt ammonium usage to defrosting the runway-landing of Timisoara International Airport (Giarmata Vii). Sampling was done within May 1999 - May 2002 (Cuc, Liana, Lazureanu, A., 2001). Water sampling was done in accordance with SR ISO 5667-10, ISO SR 2852. Identification and determination of nitrogen compounds was done by Merck Spectrophotometer method.

RESULTS AND DISCUSSIONS

The experimental results on nitric content of water samples from municipal waste deposition area are given in figures 1-3.

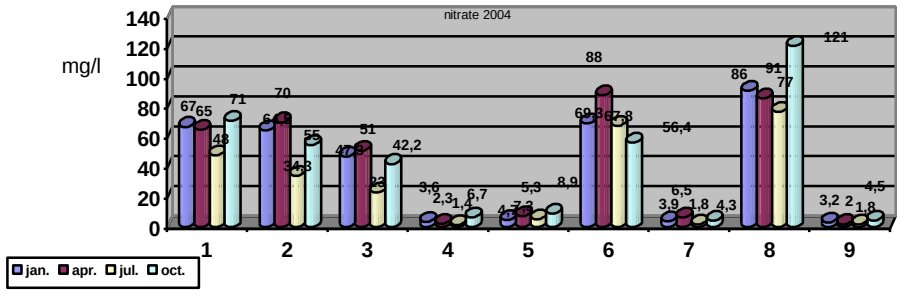

Fig. 1. Nitrate content in water samples taken deposition area in 2004

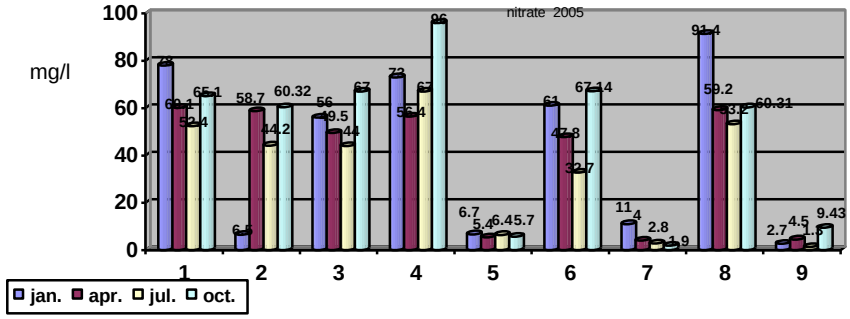

Fig. 2. Nitrate content in water samples taken deposition area in 2005

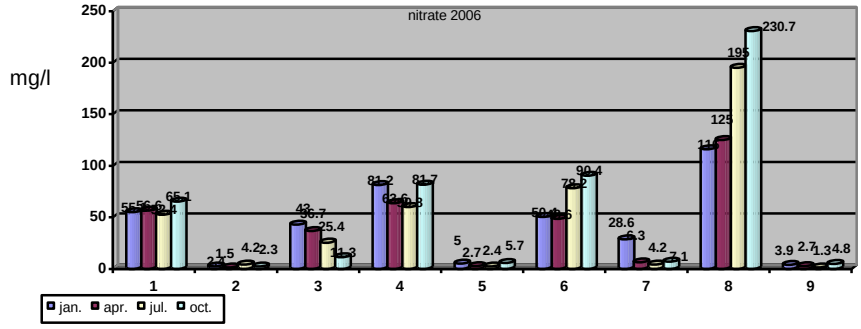

Fig. 3. Nitrate content in water samples taken deposition area in 2006

The experimental results indicated that maximum admitted limit of 50 mg/l nitrate was exceed, in 41.66% of the analyzed samples in 2004, 44.22% to 41.66% in 2005 respectively in 2006, these excesses registering for wells near land agricultural cultivation (sites 1-3 and 8) or in rural households in which livestock is develop. Water samples taken from wells deep drilled more than 20 m or from the public water supply network, did not exceed the maximum admitted levels. Explanation regarding high levels of nitrate content in low depth drilled wells villages is given by non-compliance of water sources protection norms namely: the prohibition of animal waste dropped on land and cultivated field on which is applying fertilizer near and are water sources (Cuc, Liana, Lazureanu, A., 2001). Also, excessive use of nitrogen fertilizers and non-compliance nitrogen demands of plant uptake leads to a low assimilation of these compounds in plants protein genesis and shift the excess nitrates in groundwater.

Evolution of the nitrate content according to the seasons show a decrease of nitrate content in summer, and then during the autumn-winter period nitrate content in water sample registered an upward trend. This sinusoidal evolution related to months of the year is explained by the growing stage of crops (Cozma Antoanela şi colab., 2006). Ammonium content exceeds the maximum admitted limit only to one well (Location 6). Nitrite content does not exceed the maximum allowable limit which according with STAS is 0.5 mg/L in no one of the analyzed samples. Nitrite is formed because of nitrate decomposition processes. Water samples taken from the public distribution of drinking water network are within normal limits.

In water samples taken from surface water from the flooded area of Timis County (table 1) was found following:

- In **2005** in the localities Cruceni and Otelec where sampling depth was low, 5 and 6 m, the nitrates concentration in February, April, June and September was very high varying between 160.0 mg/L and 201.6 mg/L, exceeding 3-4 times the maximum admitted limit.
- In **2006** in Cruceni (6 m) and Otelec (5 m) following the nitrate analysis made the values decreased compared to 2005, registering exceeded values over limit of 3 times in these areas. In Otelec nitrate concentration decreased from 201.6 mg/L (value found in September 2005) to 159.6 mg/L (September 2006), representing the place with highest nitrates level.

Table 1

Results of nitrates (NO_3^-) content analysis in the flooded area in Timis county

Sample/locality/depth	**2005 Month, mg/l**			
	february	**april**	**june**	**september**
Blank variant	0,00	0,00	0,00	0,00
1- Foeni - 10 m	17,0	20,1	27,6	23,2
2- Cruceni - 6 m	160,0	170,9	196,3	191,0
3 - Uivar – 9 m	13,2	21,1	29,9	28,8
4 - Ionel - 10 m	27,6	28,1	28,9	29,6
3 - Otelec - 5 m	170,0	173,0	194,4	201,6
Sample/locality/depth	2006 Month, mg/l			
	february	april	june	september
Blank variant	0,00	0,00	0,00	0,00
1 - Foeni - 10 m	19,7	24,2	24,9	25,6
2 - Cruceni - 6 m	196,4	191,5	199,7	193,0
3 - Uivar – 9 m	24,1	26,6	30,7	30,9
4 - Ionel - 10 m	28,5	33,0	38,1	34,7
3 - Otelec - 5 m	149,9	157,7	150,5	159,6
Sample/locality/depth	2007 Month, mg/l			
	february	april	june	september
Blank variant	0,00	0,00	0,00	0,00
1 - Foeni - 10 m	23,40	27,10	23,60	26,70
2 - Cruceni - 6 m	205,40	187,90	195,40	201,20
3 - Uivar – 9 m	35,70	32,10	41,15	36,30
4 - Ionel - 10 m	32,10	29,70	36,80	39,70
3 - Otelec - 5 m	156,70	171,60	167,80	169,70

- In **2007**, as in previous years, in areas Foeni (10 m) Uivar (9 m) and Ionel (10 m) nitrates values did not exceeded the maximum limit, the highest value was recorded in June – 41.15 mg/L. In localities Cruceni and Otelec recorded values for nitrate content in surface water exceeds the maximum allowable of 50 mg/L. The samples of Otelec area (5 m) are the highest values in April - 171.60 mg/L and September - 169.70 mg/L, exceeding, also, in this year, the admitted concentration more than 3 times. To Cruceni, nitrates values increased from the previous year, exceeding more than 4 times the maximum allowed limit in February - 205.40 mg/L and in September 201.20 mg/L and in another period of

year, nitrate concentration is slightly lower as follows: 187.90 mg/L in April and 195.40 mg/L in June. In all three years of research, were discovered large nitrate amounts (3-4 times overruns maximum admitted limit) in areas Cruceni and Uivar (Vlaescu D., 2008).

The experimental results regarding nitrate content in water samples taken from rural areas coming from Becicherecul Mic and Giarmata Vii during 1999-2002 and their correlation with rainfall levels are shown in figure 4-5.

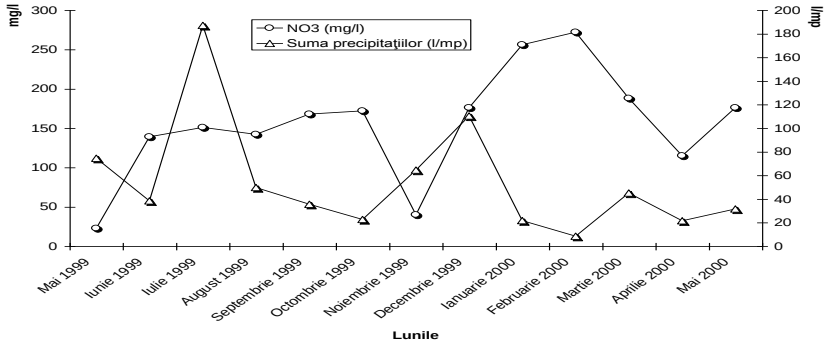

Fig. 4. Correlation between nitrate levels and rainfall in Giaramata Vii

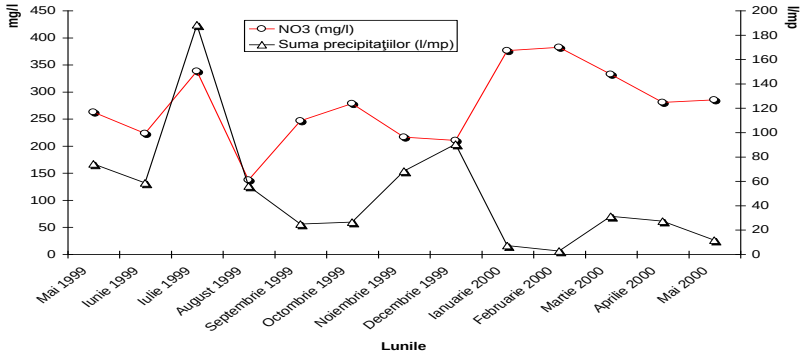

Fig.5. Correlation between nitrate levels and rainfall in Becicherecul Mic

The experimental results indicate high nitrates content in surface groundwater (the well depth of 5 m) from Giarmata Vii during the hole analyzed period. In Giarmata Vii is remarkable increase of nitrate content in groundwater due to intensive agriculture practice. Another source of high nitrate content in Giarmata Vii area groundwater is the town position close to aircraft landing strips of Timisoara International Airport. For thawing the runway in the cold season, have been used for over 20 years nitrogen fertilizers, the maximum nitrate content was recorded in winter (January, February 2001, 270 respectively 385 mg/L).

An increased nitrate level in surface groundwater taken from Becicherec village area is due to intensive agriculture practiced in this area. Thus, fountain position in the town, near a cornfield fertilized with high amounts of nitrogen led to nitrate infiltration

in groundwater and its contamination. Another cause of water contamination by nitrates is the livestock farms that existed in Becicherecul Mic and Dudestii Noi. Currently only the Dudestii Noi farm works with smaller animal effectives. Nitrate concentration in surface groundwater in and volume depends on rainfall volume. Rainfall is an important factor in increasing the leaching process. Risk of nitrate loss from soil due to rainfall was found in months with high rainfall volume and the plants have poor growth and low nitrogen consumption. Experimental results performed on the drilled deep well (75m), in the Giarmata area does not indicate a nitrogen contamination of deep groundwater, demonstrating that Romania has in layers deeper located valuable potential ground waters, which may be exploited further.

CONCLUSIONS

1. The nitrate content of surface groundwater in rural area is high and is due on the one hand, to large pigs shelters, to which is missing animal manure removal system, improper use and storage of chemical fertilizers and intensive improper agriculture practice.

2. Groundwater nitrate concentration in surface groundwater depends on the amount of rainfall, soil characteristics and the nature and duration of existing vegetation growth. Can be expected that a rainfall increase can cause, in a short time, a nitrates accumulation in ground water and the abundant vegetation decreases nitrate content.

3. Nitrogen content in groundwater (NH_4^+, NO_3^-, NO_2^-) decreased significantly during 2002-2008. This decrease, in our opinion is due mainly to the action of two influence factors:

a) diminish nitrogen fertilizers quantities used in agricultural production in Romania after 1990;

b) reducing of livestock, particularly cows and pigs.

4. Research regarding deep groundwater confirms a high quality ground water in large depths, so in deep layers there is a valuable source of groundwater, which can drill a use for human consumption.

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REHABILITATION OF BUZAU MARGHILOMAN PARK

REABILITAREA PARCULUI MARGHILOMAN DIN BUZĂU

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Abstract. *The park, having a surface area of 10.17 ha along with Albatross Villa and other building facilities of the time, make up a monumental complex that is on the Historical Monument List under the code Bz-II-a-B-02347. The rehabilitation proposes the English garden restoration by reinforcing and completing the arboreal mass, placing valuable groups or species of trees and shrubs, remaking the round walks and floral borders, the rose garden being well known for its rarities, works of vertical systemizing in the area of restored constructions, retracing some alleys and total restoration of its carpet, modernizing the illumination system, endowment with specific urban furniture in "fin de siècle" style. A peculiar attention is given to the former horse training track and the lake. At the same time, it is considered the park securing by restoring the surrounding wall of the estate. The intervention works should give back to the spiritual life of the area a valuable architectural and landscaping ensemble, comprising some elements with primary status at national level.*

Key words: rehabilitation, historical park, cultural center.

Rezumat: *Parcul, în suprafaţă de 10,17 ha, împreună cu Vila "Albatros", şi alte construcţii din aceaşi epocă, formează un ansambu monumental, încadrat în Lista Monumentelor Istorice sub codul Bz–II–a–B–02347. Reabilitarea propune refacerea parcului englezesc prin consolidarea şi completarea masivelor arboricole, amplasarea de grupuri sau exemplare valoroase de arbori şi arbuşti, refacerea rondurilor şi platbandelor florale, rozariu fiind vestit pentru raritățile sale, lucrări de sistematizare verticală în zona construcţiilor restaurate, retrasarea unor alei şi refacerea integrală a îmbrăcăminţii acestora, modernizarea sistemului de iluminat, dotarea cu mobilier urban specific, în stil "fin de siecle". O atenţie deosebită esta acordată fostei piste de antrenament hipic şi lacului, cu problemele lagate de consolidarea malurilor, a plantaţiilor şi aleilor perimetrale, refuncţionalizarea ecluzei. Lucrările de intervenţie vor reda vieţii spirituale din zonă un ansamblu arhitectural şi peisager valoros, conţinînd unele elemente cu statut prioritar la nivel naţional.*

Cuvinte cheie: reabilitare, parc istoric, centru cultural.

INTRODUCTION

This ensemble was as early as 1892 one of the most flourishing and modern estates in the country. While Alexandru Marghiloman was the owner, the estate included Albatross Villa (BZ-II-m-B 2347.01 additional buildings), the stables and the gust house (BZ-II-m- B 2347.02), other constructions, some of them still

existing however not on the M.I. list, such as the horse jockey and horse riding coach house, and later, after 1913, an hippodrome that was later demolished.

Our project aim is to finalize the restoration works of Villa and to be used as Alexandru Marghiloman Cultural Center as well as to set up the rehabilitation works for the site of this monument, the park and the lake.

MATERIAL AND METHOD

The aim of the project is to rehabilitate this park in order to bring it back to the present using standards, in the context of arranging in this place the monumental complex of the Alexandru Marghiloman Cultural Center, important components of cultural and leisure endowments of Buzau municipality.

We are not planning to make modifications regarding functional partition, on the contrary, but preserving and emphasizing the original composition, including the return of the original layouts of some alleys modified in time.

RESULTS AND DISCUSSIONS

1. Brief history

Iancu Marghiloman, characterized as one of the greatest farmers of the country, Mayor of Buzau city, deputy and senator, won at cards, between 1870 and 1890, The Iazul Morilor estate, placed not far away of Buzau city, including a pond and land with a surface area of 20 ha that belonged to Constantin Musceleanu. On the property Iazul Morilor, Iancu Marghiloman erected in 1884 – 1890, The Albatross Villa. Previously the son of Iancu Marghiloman, perpetuating his father interest for pedigreed and race horses, organizes a bloodstock hose stud on Marghiloman property as well as the famous stables existing even nowadays (Penes N., 2007).

In 1890 Alexandru Marghiloman married to Princess Eliza Stirbey and set its residence in his country side residence on the estate Iazul Morilor. Since this time the park organization and lake lay-out started.

Between 1892 and 1906, the estate and the house traverse a flourishing period. Now the famous English gardens is arranged, the lake gained its approximate present contour changed compared to its initial profile in order to develop the park and to erect a performing small size horse track following the model of Baneasa Hippodrome horse track. He built a hippodrome in the vicinity of Villa, with tracks, paddocks, administrative house and watchman house, power plant, water supply system and drainage system for the entire complex.

By its functions and dimensions, the way of arrangement, the estate became unique in this country highly appreciated by King Carol I, the Queen Mary and later on by King Ferdinand, as well by politicians and men of culture that were among the guests of Alexandru Marghiloman. (Penes N., 2007)

The lay outs are kept at the same high level of organizing and refinement till 1925 when Alexandru Marghiloman died and the usufruct of his estate came to Maria Petrescu – his second wife. After this date, the bloodstock stud is sold, the stables and hippodrome decayed, the park fell into ruin and the house, a

depository of a rich documentary material, furniture, valuable books, paintings entailed with mortgage and lawsuits, inhabited by administrators faced a severe degradation.

In 1935 the hippodrome – one of the most modern in the country was however on the way of demolition. When Maria Marghiloman died, the estate and the facilities, the houses came to the successors Mihai Butculescu and Alexandru Pherekide, sisterly nephews of Alexandru Marghiloman. The estate was estimated and the expertise contains an accurate description of houses and estate. Due to the property state (entailed with debts), it is sold to the Ministry of Air and Marine, and the stud farm is also liquidated (sold to Solomon Goldman).

By his political career and as a chairman of the Conservative Party, between 1918-1925, A. Marghiloman attracted to Albatros Villa, important personalities: King Carol I, Queen Maria, King Ferdinand, Titu Maiorescu, Dimitrie Sturdza, P.P. Carp, A. Lahovari, Tache Ionescu, A. Vaida Voievod., I.C. Bratianu, N. Iorga. Alongside of his political concern, A. Marghiloman is considered one of the great lawyers of the country, being recognized for his oratorical skill and one of the pioneers of Romanian horse racing. In this respect, the Marghiloman estate of Buzau is representative. The hippodrome built by him in Buzau and demolished in 1938 had a surface of 42 ha, and the organization of stables, the paddocks of training tracks were at international at that time. He contributed in making the horse racing grounds of Baneasa and founded the Romanian Jockey Club. (Penes N., 2007)

Between 1939-1948, the Albatros Villa, the park, the lands, the houses of the estate passed from one owner to another and started to decay. In 1948, Albatros Villa passed to the ownership of the state, belonging to Buzau Popular Counsil, and the park with a surface of 11.91 ha became a public garden. The park is modified regarding the layout of the alleys, the plantations are re-arranged as well as the enclosures and the access way.

In 1980, Villa, other houses of the former estate and the park were administrated by the Industrial Production Company for Railroad Construction of Buzau. This company made repairs at Albatros Villa and re-arranged the park.

Starting from 1987, the Albatros Villa, the guesthouse and other buildings of the estate are declared as unused and are abandoned.

In 1992, DMI (DMASI) presently DCCPCN, represented by ONMI, takes over in administration the Marghiloman Complex estate and finances the restoration of Albatros Villa, work executed between 1992 and 1998 by S.C. Rom Construct Istrita S.R.L. company till the consolidation phase, framework rehabilitation, execution 90%, covering works. The works are stopped in 1998 due to short of funds. After 2000, the guard of the estate can not be provided and the construction is looted and is continuously degrading together with the park and the outside layouts.

2. Present state

In 1890, Alexandru Marghiloman and his wife Eliza Stirbey arranged around the Albatros Villa a romantic park with exotic trees, Japanese pagoda tree, cypress and local species (poplars, elms, chestnut trees), renowned species of roses. The author of the park arrangement probably was Eliza Stirbey whose contributions are well known for other famous gardens such as Cismigiu gardens.

Queen Mary, frequently a guest on this estate, noted down "… Eliza Marghiloman helped him to make a splendid garden. We enjoy much to work the Albatros Villa. It just brings back to our minds a life style like other foreign countries. We enjoyed the horses and highly appreciated the strawberries as well as the beautiful roses which made their house a particular one…" Likewise, at the time, it was famous for its chestnut alley, as well as for the horse racing training track, a copy of the Baneasa one. The shape of the lake was changed in order to allow the construction of the track. After 1938, the park and the estate decayed. After 1947, the park was taken by the Romanian state and becomes a public park, named Dorobanti Park (Ciobanasu C., 2009).

This park is rearranged by changing the alleys, restructuring the plantations and the enclosure modification as well as the accesses, the layout of the furniture pieces without considering the specific ambience and disconsidering the original style.

In 1982, many modifications took place, sacrificing certain plantations due to sewage works crossing the park from east to west. The surface of the park is diminished by making the level crossroad of Horticolei Street, in this part, the wall enclosures were demolished.

From 1990, the park has fallen into ruin regarding alley routes, water surface, lighting system, plantations, furniture items, enclosure.

The first founding is alteration of romantic park feature, due to frequently contradicting successive uninspired interventions. The arrangement of the main functional areas largely remains as the initial one but correlated also with retracing of some alleys, and suppression of others, and, mostly, their present physical state contributes to the aspect of destructuring.

The composition is defined by the two major axes, the longitudinal one, on NE-SW, between Al. Marghiloman and Luceafarului streets, laid out in front of Albatros Villa, making the connection with the lake, and the perpendicular one on NW-SE, on the right side the proper park, with the arranged lake, and on the left side the main access way, frontally oriented to the mansion, as well as the façade garden and what remained of the park after the arranging works of the level crossroad from the SW corner of the estate (Ciobanasu C., 2009).

The area in the proximity of the Villa, on each side, is out of use as a consequence of construction works needed for restoring works. On the site, there are waste and earth deposits and remains of construction materials.

Beyond the transversal alley, to the NE, there is the rose garden with a diameter of about 75 m, with two concentric alleys and three radial ones.

North to the main, longitudinal alley, an ample area of the park expands, unfortunately, in a mediocre state of preservation with degraded lawns, trees and shrubberies, alignments or isolated, in disorganized compositions.

In extension to this alley, before reaching the lake, on a descending platform succession, a rest area is organized, with alveolas supported by decorative walls, provided with heavy benches and pergolas made of painted rolled steel sections that stand aloof from park ambience. The alley extension passes over a decorative footbridge connecting the two banks of the lake, terminating in the protection area located at the north-east border of the property.

The two main alleys, as composition generators, like the access alley to the Villa, have a rectangular layout, the rest of the alleys developing a sinuous course, suitable to a development with a dominant romantic character. Either asphalted or with prefabricated slabs, their state is precarious with uneven portions, cracks and settlings, in tune with the general image of the park.

Neither other furniture parts are in a better state, the wood benches, the masonry pillars of pergolas, the component parts of the children playing ground, some portions of the enclosing wall present important damages and, stylistically, have nothing in common with the park.

The banks of the water surface are degraded, with eroded portions, without a suitable plantation. Because of this, the perimetric alley is out of use, not presenting security of pedestrians. Furthermore, the decorative, metal footbridge crossing the lake has an advanced degree of wear, as well as the water gate that regulates the level of the accumulations in the set up basins.

3. Proposed situation

The aim of the project is to rehabilitate this park in order to bring it back to the present using standards, in the context of arranging in this place the monumental complex of the Alexandru Marghiloman Cultural Center, important components of cultural and leisure endowments of Buzau municipality.

We are not planning to make modifications regarding functional partition, on the contrary, but preserving and emphasizing the original composition, including the return of the original layouts of some alleys modified in time.

In the area conterminous to the Villa, works of vertical systematization should be carried out on a surface of 3.265,0 sq. m., so that the rain water to fall off the construction. New grassed lawns should be arranged on a surface of about 1.400 sq. m., rounds and flat strips with flowers, rest benches should be placed, two water basins, decorative statues, and information signs. Foot ways were provided of about 600,0 sq. m. with the wear layer made up of Margaritar type gravel and decorative kerb stones. The mansion's footway should be remade with stone slabs on a sand bed cu connecting elements to grassed surfaces and to the building base. Two parking areas should be arranged, one parking area with 18 places for cars, at NE to the building, the other on the SW side of the Villa, with a capacity of 56 places, directly connected to the rehabilitated driveways; also in this area, a household platform should be arranged provided with ecological containers (Ciobanasu C., 2009).

In the rest of the park, on a surface of about 96.000,0 sq. m., ample works of rehabilitation are provided for the alley network, some portions returning to their original routes, earthworks in the areas affected by previous construction works, recovery of degraded lawns.

It is suggested to remake the horse racing track, the horse running circuit, reinforcing the lake banks, including the planting of suitable species, Salix Alba, Salix Babilobica, restoration of the metallic, decorative footbridge and of the water gate.

At the same time with restoration of enclosing wall, the original access gates should be reopened, laying out in their vicinity two new parking areas with 100 places each.

Regarding the vegetal material, completions of trees and shrubs should be carried out in shrubberies of alignments, as well as isolated species with an emphasizing role. It is considered the sustaining of the composition axes, outlining favorable perspectives to the mansion, lake or rose garden. The rounds, flat strips, mosaics and flower borders made of annual, biennial or perennial flowers should be stylistically framed to the "fin de siècle" ambience (Ciobanasu C., 2009).

The urban furniture made of benches in eclectic style, pergolas of stone and wood walls, eliminating the morally and physically used metal elements, decorative wells, lighting units of suitable style having a functional but also a decorative role, in completion to the proposed endowments.

CONCLUSIONS

The ensemble of this works, together with the restoration of Albatros Villa, should occasion the organization of the Alexandru Marghiloman Cultural Center, at his place, in a place full of history, where one of the most important political men of Romania of the 20th century initiated some outstanding events at that time and not only.

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LANDSCAPE SUSTAINABLE SOLUTIONS FOR RESIDENTIAL PEDESTRIAN TRAFFIC REGENERATION

SOLUŢII PEISAGERE DURABILE DE REGENERARE A CIRCULAŢIILOR PIETONALE REZIDENŢIALE

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Abstract. *The pedestrian circulation is on top between urban spaces that are being accelerated degraded. In the modern city, public spaces, both ancient and modern, were gradually degraded, sometimes entirely subordinated to the needs of traffic, losing real contact with its inhabitants. A first measure outlined in the West since the 70s was the rehabilitation of pedestrian circulation in residential areas. Some residential roads trails, which become high traffic and polluted, were "returned" to pedestrian use. Experiences have been successful worldwide and many other countries began to experiment locally. The cost to create such residential pedestrian in Romania and locally can be quite high, but the magnetism created by zonal regeneration will bring double-quick maximum profit with far-reaching time.*

Key words: landscape regeneration, urban traffic, residential pedestrian streets.

Rezumat. *Pe primele locuri între spaţiile urbane care sunt în curs de degradare accelerată se află pietonalele. In orasul modern, atât spaţiile publice vechi, cât şi cele moderne, au fost treptat degradate, fiind uneori în întregime subordonate nevoilor de trafic, pierzând contactul real cu locuitorii săi. O primă măsură care s-a conturat în occident încă din anii 70 a fost cea a reabilitării circulaţiei pietonale în zonele rezidenţiale. Anumite trasee carosabile rezidenţiale, care deveniseră intens circulate auto şi poluate, au fost «restituite» pietonilor. Experienţele s-au bucurat de succes mondial şi numeroase alte ţări au început să experimenteze local. Costul pentru a crea astfel de pietonale rezidenţiale experimente în România şi pe plan local poate fi destul de ridicat, dar magnetismul creat de regenerarea zonală va aduce foarte rapid un profit maxim, cu bătaie lungă în timp.*

Cuvinte cheie: regenerare peisagistică, trafic urban, circulaţii pietonale rezidenţiale.

INTRODUCTION

Since its introduction, in the XIX century, movement roadway car slowly started to choke the city. Man became a pedestrian with the advent of the car. Increasing number of cars lead to conflictual situations in urban areas and the pedestrian was in exile, from squares and streets, on sidewalks surrounding the building framework (Dascalu Doina Mira, 2006). Gradual degradation of the condition and pedestrian needs warned the researchers. Despite the warnings, the needs of pedestrians was not taken into account. Pedestrian circulation problem remained unsolved until now.

MATERIAL AND METHOD

To counter the disastrous effects, the mental and physical urban pollution, created especially by pedestrian traffic and urban public spaces degeneration and degradation, a first step that was outlined to be feasible was the rehabilitation of pedestrian traffic in residential areas.

Top initiatives successfully tested were taken from years ‘70 in Holland and Germany. Some residential roads, which became high traffic and polluted were "returned" pedestrian. Experiences enjoyed worldwide success and interest. Many other countries have begun to experience the invigorating effect, on all levels, especially the socio-economic interest specifically to offset these costs.

This paper studied some application ways through local experiments, for regeneration of degraded and polluted residential areas. The study aims as final result to stimulate attractive areas creation-healthy, clean and streamlined on multiple levels.

RESULTS AND DISCUSSIONS

“Woonerf” experiments

Terms under which they are known urban experiences "restitutio" or residential pedestrian regeneration are those originally used in early experiments in the Netherlands and Germany: the Dutch “woonerf “and German “verkehrberuhigung”. Literally, these words would mean “streets with a new life” or “space for all”.

How they proceeded?

Attempted revival lively charm that it had in the past these residential areas.

In a woonerf people on bicycles and on foot have full access to the street, not only on sidewalks. Moreover, the street functions are primarily those of a public "living-room", where adults, children and elderly, people with special needs and normal gather, socialize, relax in safety, because vehicle/cars speed is minimized (FHA University, 1999**).**

There are a few basic criteria for a woonerf (Donald Appleyard, 1981): 1. gateways that are controlled and announced into the woonerf; 2. curved to slow traffic vehicles; 3. recreational equipment and vegetation with dual purpose- forcing vehicles to slow; 4. remove borders; 5. intermittent parking for dwellers so that cars do not create a wall between the street and houses; 6. various landscape elements are often used to slow traffic, but also to improve the spatial experience pedestrians, giving them relaxation areas. Cars can pass only on selected locations and woonerf signalize. The speed limit is usually cca.16 Km / h. Nowadays there are woonerf areas in many big cities of the world (fig. 1 and 2)

Fig. 1. Woonerf in Tokyo

Fig. 2. Woonerf in Holland

Proposals for implementing locally

In the context principle to enhance comfort and quality of life, urban pedestrian spaces should become a value in itself, turning into community streets, residential streets, co-designed landscaping in the interest of serving several functions: recreation, education, contacts, information, etc. Thus it would create such pedestrian area which includes customizing. The desire to preserve the good virtues of our cities, to make them favorable for better social life, pedestrian problem area is required not only considered, but directed towards some practical solutions (fig. 3).

Fig. 3. Woonerf means community streets

The study has outlined several ideas presented below.

A. For local application of these experiments, we should start with an interactive morphological study documented residential tissues that allow us a check. From this study we obtain some criteria to make proposals outlining rehabilitation and urban interventions required landscaping. Environmental rehabilitation of selected areas primarily involves the creation of adequate urban

functions, not formal/abstract, to regenerate urban life and create a personalized atmosphere locally. Using the right tools for urban and landscape rehabilitation, we can turn residential streets into multifunctional spaces – fit for public, cultural, commercial and social activities.

B. Through a real contact with nature will be possible to regenerate respect for the "essential joys". The virtues of sustainable use of landscape morphological elements - earth , water, vegetation and adequate equipment - will provide contact and interference between movement and space for relaxation. The tack of this new pedestrian streets, with the presence of urban art objects, will give real visual therapy, stimulating local leisure. Small areas arrangements for various creative activities-outside classes will encourage more people to communicate in these areas. Such spaces will stimulate also users with special needs to attend these areas, to enjoy and socialize with other people.

C. For pedestrian safety, selected areas will be protected from traffic by creating a very low car traffic-movement will be limited to pedestrian walk - under 16 km/h. Through design and judicious location-using urban art, furniture, vegetation, special luminous signs, special decorative tiles - we can manage daily traffic and maintain very low vehicle speed to create safe pedestrian movement including children and elderly, but also for guests with special needs. Presence and proper location of public traffic lights at night will further improve safety area rehabilitated (fig. 4).

Fig. 4. Daily traffic is managed using furniture, vegetation, special signs

D. Also as a safety measure, special signs, visible identification of these areas, should be placed at each entrance to these places. Also, special attention should be paid to these areas to ensure easy access for fire trucks, sanitation vehicles, minibus transport to school, special parking places for vehicles and small cars riverside residents will be severely restricted and controlled, with

exactly given space. Pedestrians coming from outside will park outside. Magnetism of landscape composition of parking area and these regulations will encourage pedestrian movement.

Fig. 5. Special signs, visible identification of these areas

E. Since the street will be transformed into a common space, we will create conditions for pedestrians to use all areas of the public street. Road users - pedestrians and drivers - should not disturb each other. For the safety of pedestrians with special needs, proposals for design will provide a subtle distribution management footpath. To avoid obstacles or dangerous areas for people with reduced mobility are proposed area with a regular and homogeneous structure of the pavement (fig. 6). To support the mobility of blind or visually impaired will propose areas of tactile materials, tapes or specific relief. As a result, urban space will acquire magnetism and will generate direct social contact, an escape from anonymity and isolation.

Fig. 6. For people with reduced mobility - area with homogeneous pavement

F. This concept will strengthen in our city the social role of urban residential streets, old and new. The purpose of applying this new concept is to

create for visitors an escape from routine pollution in the reclaimed areas. Materialization of these proposals will end urban isolation. Mixing population with and without special needs, mixing ages, will bring back our direct inter-city communication, tolerance, peace, harmony, is a mean of restoring dignity and identity of all citizens. These places will be reanimated to educate new generations capable in feelings of self-esteem and their responsibility to the city and its needs. (Dascalu Doina Mira, 2006)

CONCLUSIONS

"Woonerf" experiences successfully implemented worldwide constitute very important lesson to be disseminated not only among specialists but also to the inhabitants. Because these experiments have already created attractive areas, healthy, clean and streamlined on multiple levels, implementation of such spaces is currently desired by majority of municipalities around the world. Concrete application of these experiments in Romania and locally, could be hampered from start of economic arguments. (Dascalu Doina Mira, 2006). The cost to create such residential pedestrian can be quite high, but the magnetism created by zonal regeneration will bring maximum profit, while far-reaching. Capital depreciation will be very fast due to the influx of people from other parts of the city and outside, which will encourage local development of new activities with new jobs and overall profit.

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HEALTH BENEFITS OF HOSPITALS LANDSCAPE DESIGN

BENEFICII ADUSE SĂNĂTĂȚII PRIN AMENAJAREA SPAȚIILOR VERZI AFERENTE SPITALELOR

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Abstract. *Proper use of landscaping related medical institutions may lead to reduced costs for treatment patients, while improving workplace in which medical staff operate. While the green spaces of hospitals in the world are designed and implemented as vibrant landscapes, representing the "life", most Romanian hospitals are facing a decline in the landscape, with a negative effect on quality of life of people (patients, visitors and medical staff). This paper presents a concept of designing a green space for a medical institution taking as a case study Institute of Oncology "Prof. Dr. I. Chiricuta "Cluj-Napoca.*
Key words: landscape, hospitals, health, solutions, concept

Rezumat. *Valorificarea corespunzătoare a spațiilor verzi aferente instituțiilor medicale pot duce la o reducere a costurilor pentru tratamentele bolnavilor, îmbunătățind în acelaşi timp locul de muncă în care personalul medical îşi desfăşoară activitatea. În timp ce spațiile verzi ale unor spitale din lume sunt proiectate şi amenajate ca peisaje vibrante, reprezentând „viață", majoritatea spitalelor româneşti se confruntă cu un declin al peisajelor, cu efect negativ asupra calității vieții oamenilor (pacienți, vizitatori, personal medical). Lucrarea de față prezintă un concept de proiectare al unui spațiu verde aferent unei instituții medicale, luând ca studiu de caz Institutul Oncologic „Prof. dr. I. Chiricuță" din Cluj-Napoca.*
Cuvinte cheie: peisaj, spitale, sănătate, soluții, concept

INTRODUCTION

In recent years, the medical worlds there is concerned for the creation of functional areas, with beneficial effects on reducing patient stress and improve their health, leading to give greater attention and importance of green spaces planning in medical centers.

For a patient, visitor or employee time spent in hospital can be a stressful experience.

Opportunity to spend part of their time in middle of a landscape or a garden, can improve people's ability to cope with stress and at the same time, improve the physical health.

Based on existing research and results in foreign literature (Ulrich, RS and R. Parsons, 1992) regarding the influence of vegetation and environment on health, this paper presents a concept for designing a green space for a medical institution.

MATERIAL AND METHOD

Development of this project started by analyzing the effects of green space on health, taking as a case study Oncology Institute „Prof. dr. Ion Chiricuță" Cluj-Napoca. The design of such green space aims to positively influence quality of life for patients, medical staff and others whose work is related to that institution.

For a large number of patients treated ambulatory, only temporary waiting spaces are lounges, offices, hospital lobbies. Therefore becomes imperative solving these spaces landscape through designing projects that meet patients' needs.

The approach of this project is based on documentary analysis and several observations made in the hospital. Green space of the medical institution is sufficient, but is designed so that people which have to come into this place to feel excluded, to feel that the only space that is allowed to use it inside the hospital.

In dealing with landscaping of the proposed project, in accordance with objective, to achieve an effective proposals were studied following: analyzing Oncology Institute neighbourhoods, the existing accesses, analyzing the relationship between built area and area of green space, spaces between buildings located, existing vegetation, topography, analysis of pedestrian walkways, parking, decorative accessories, fences, utility system, lighting system, roofs of buildings (fig. 1A, fig.1B and fig.2).

Fig. 1A. Existing situation

Fig. 1B. Surface analysis (a. buildings; b. paving, c. Green spaces)

For a better approach and treatment of concept was studied shading, and for proper integration into the urban landscape were studied climate, noise and exhaust pollution.

Analysis and design was done using 2D and 3D Architecture and Landscape Software (Archicad, Realtime Landscaping Architect, SketchUp, CorelDraw, Google Earth) by photo simulation, either by the total reconstruction of studied areas (fig. 2, fig.3).

For understanding and playing more special details or some proposed arrangement was made a 1:20 scale model (ex. thematic garden for children) (fig. 4).

Fig. 2. Shading study

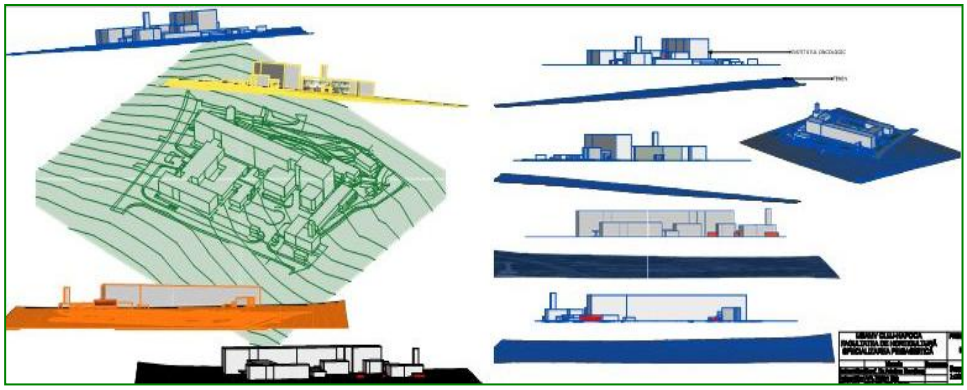

Fig. 3. Land survey

Fig. 4 - Model, thematic garden
Scale 1:20

RESULTS AND DISCUSSIONS

Hospitals related green spaces should be designed to give the landscape the following attributes: reducing stress and balancing the body, creating a natural environment for practicing physical therapy and horticultural therapy, providing an optimal environment for relaxation (Cooper-Marcus, C. and M. Barnes, 1995). In addition to these medical attributes, the proposed project aims at a better exploitation of existing green space and landscape aesthetic effect of urban area to which it belongs (fig. 5).

Fig. 5. Proposal

After analyzing the situation, taking into account the different location of green areas inside the hospital, was proposed a subdivision of these areas, allowing a clearer approach and understanding of the proposed concept.

Thus, were designed and developed the following areas: waiting areas, relaxation areas, decorative water areas, spaces between buildings, themed gardens for children (landscape architecture witch style an idea or theme - in this case a scene from a fairy tale).

To increase and diversify the areas of green spaces were designed roof gardens (on terraces and roofs of buildings) and vertical gardens (by coating the walls with vegetation).

Rest and relaxation areas: arrangement of these spaces is proposed to in the main courtyard of the hospital. By creating uneven ground these areas will become real "vegetable compartments" which will have the following roles: to provide protection against environmental conditions in this strong anthropic environment, to reduce noise (these areas being located near thoroughfares or are surrounded by parking) (fig. 6). Added interest will be made by designing decorative water - ornamental ponds (fig. 7).

Design the main entrance: to highlight the main entrance of the institute has developed a stylized model of medical symbol, who will be done by associating species of shrubs, with decorative foliage, that are suitable for trimming (*Buxus sempervirens* and *Berberis thunbergii*) perennial flower species and ornamental grasses.

Fig. 6 - Field gradient around the areas of relaxation

Fig. 7. Ornamental pool water

Area of buildings: is proposed location of a garden theme (garden style an idea, in this case a characteristic element of fairy tale), (fig.8).

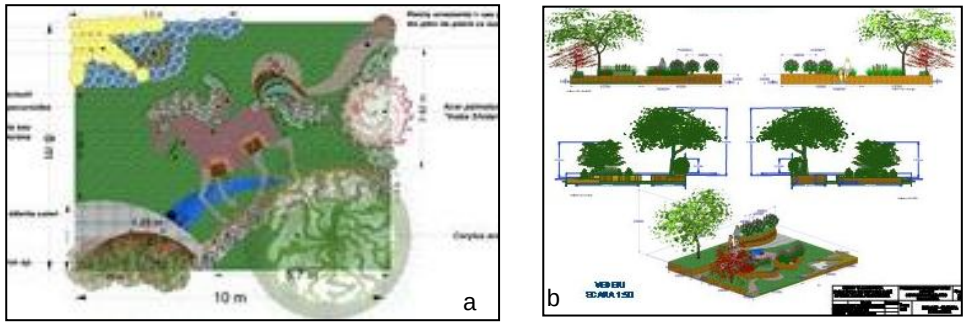

Fig. 8. Theme garden: (a) detail, (b) views

Gardens on roofs and vertical gardens: is proposed coating part of the the walls of vegetation using systems for vertical gardens and roofs of buildings will be designed using two types of system - intensive and extensive (fig.9).

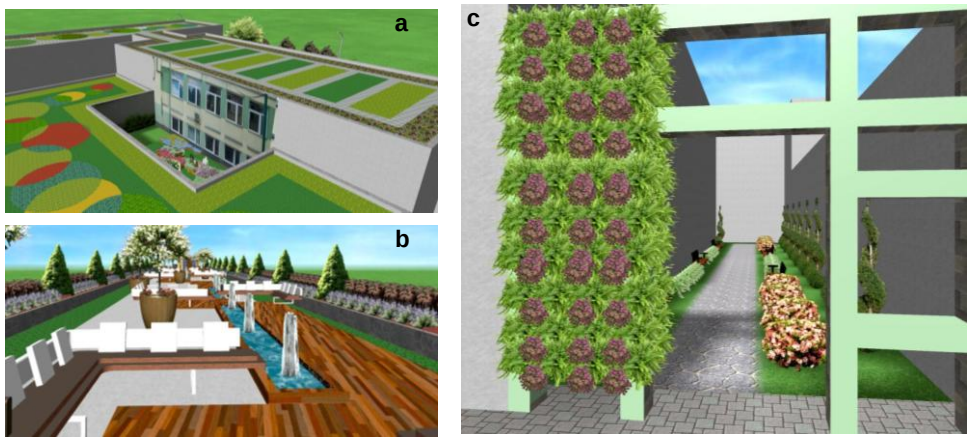

Fig. 9. (a) extensive green roof; (b) intensive green roof;
(c) Vertical garden

Increased green spaces surface area *with 32,87%* (currently the total area corresponding Cancer Institute totals 20332.797 m^2, with 6684.51 m^2 occupied by buildings, 5317.219 m^2 are occupied by pavement and 8331.068 m^2 is the area occupied by vegetation). 32,87% increase of surface area is accomplished by arranging green roof and vertical gardens (Singureanu V. et al., 2008).

Vegetation is the main constituent of the proposed development, being represented both ornamental woody species, species flower and grass surfaces (Dumitras Adelina et al., 2008).

CONCLUSIONS

Considering the psychological links between green spaces of cities and people, proposal defines an atmosphere atmosphere that a user can feel natural and clear.

Proposal application will remove the anonymity of areas located between buildings, in particular, which are now in a state more or less damaged, roofs extending over a considerable area and green spaces that were designed only to be seen and not used. Redevelopment area for the Oncology Institute will bring improvements in terms of aesthetic, social, environmental quality, education.

Benefits of applying and implementing the concept detailed in this paper are: *under medical issue*: significant effects on health, improve attention, facilitate recovery, and improve state of mind and general welfare; *ecologically viewpoint:* reduce pollution by promoting and applying the principles of sustainable development.

The project attempt to establish one of the possible answers the question: "What are the qualities which must meet a mental health and physical rehabilitation landscape?" proposing new approaches and aesthetic values of the Institute of Oncology green space and not least for the urban landscape of Cluj-Napoca.

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BIORETENTION - INTEGRATION OF RAINWATER MANAGEMENT IN LANDSCAPE DESIGN

BIORETENȚIA - INTEGRAREA GESTIONĂRII APELOR PLUVIALE ÎN DESIGN-UL PEISAJULUI

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Abstract. *This paper is a case study of an area with problems caused by stagnant rainwater; this study was completed by designing a bioretention cell. This type of planning is an approach with little impact on the environment. Bioretention cell is one of the techniques that can solve studied land problems; existing vacant land can be transformed into a green space with multiple uses. For designing an effective solution has made a thorough review of the site, the results of this analysis leading to the creation of a bioretention cell model correctly sized, the choice of appropriate plant material and ultimately to prepare a detailed plan of the proposed landscaped for the studied site.*

Key words: landscape, rain, bioretention, polluted water

Rezumat. *Această lucrarea reprezintă un studiu de caz, al unei zone cu probleme cauzate de stagnarea apei pluviale, studiu finalizat prin proiectarea unei celule de bioretenție. O astfel de amenajare reprezintă o abordare cu impact scăzut asupra mediului înconjurător. Celula de bioretenție este una din tehnicile care poate rezolva problemele terenului studiat, terenul viran existent putând fi transformat într-un spațiu verde cu întrebuințări multiple. În proiectarea unei soluții eficiente s-a făcut o analiză amănunțită a sitului, rezultatele acestei analize conducând realizarea unui model de celulă de bioretenție, corect dimensionat, la alegerea materialului vegetal adecvat şi în final la elaborarea unui plan detaliat al propunerii de amenajare peisagistică pentru amplasamentului studiat.*

Cuvinte cheie: peisaj, ploaie, bioretenție, apă poluată

INTRODUCTION

Along with rapid urbanization, the world's urban population has nearly quadrupled in the past 50 years, from 732 million in 1950 to more than 3.2 billion in 2006 (Worldwatch Institute, 2007). Cities are not able to accept these rising populations without increasing in size, typically leading to urban sprawl, land use changes, and environmental degradation. Increases in the density and size of urban areas have thus resulted in an increased amount of impervious surfaces and a corresponding decrease in forests, wetlands, prairies, and other areas that naturally infiltrate and purify water (Brabec et al., 2002).

Roads, buildings, driveways, and cultivated lawns change the partitioning of water between runoff and infiltration and increase high flows of storm water.

This imbalance can cause flooding of urban areas, as well as increase flows to streams and lakes. Further complicating the cycling of rain water is the installation of drainage networks in urban areas to contend with the water flowing off of impervious surfaces (Lerner 2002). Storm water, considered to be nonpoint source pollution, has been identified by the Environmental Protection Agency (EPA) as the leading cause of water quality problems, as it transports a variety of pollutants directly into waterways. Sewage control systems involve complicated and expensive systems that are designed to manage and purify water from rainfall before its discharge into the rivers. Have been developed alternative approaches with low impact on the environment (LID) to control the harmful effect of polluted water, one of the approaches being the bioretention cell (rain garden). The goal of systems with low environmental impact is to mimic natural techniques for capture, retention, infiltration and evaporation of storm water runoff (Prince George's County, 1999).

Purpose of this paper was to develop a complete draft for a bioretention cell based on a study of land with drainage problems.

MATERIAL AND METHOD

This paper is a case study of an area with problems caused by stagnant rainwater that will be completed by designing a bioretention cells.

In the area known as Bodon in the centre of Boteni, Cluj County there is a vacant land, representing plot no. 159, with area of 2173 m^2 (fig. 1).

Fig. 1. Studied area

„Bioretention cell" is one of the techniques that can solve the studied land problems, which could subsequently be turned from a vacant land into a green space with multiple uses: playground, sitting area, area aesthetics.

Bioretention is based on natural principles and soil qualities and uses a certain area designed to capture and filter out rainwater runoff, through a soil mixture and

allowing water absorption while its use by existing vegetation (Prince George's County, 2002).

From an environmental perspective, a "Rain Garden" is a practical solution for storm water retention, while having an aesthetic appearance (fig. 2).

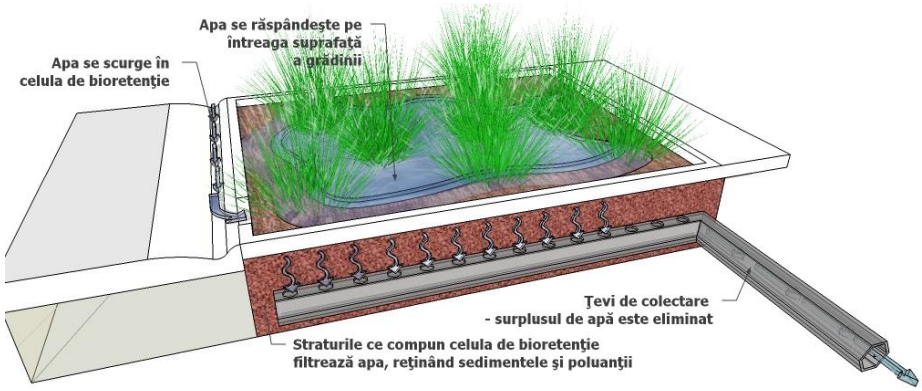

Fig. 2. „Rain garden" operation mode

To implement Bioretention cells in the landscape design to manage the pollution and negative effects of rain water, was analyzing the current situation of an area located in the Boteni centre, area during rainy periods is impractical hampering daily activities and negatively affecting locality aesthetics and environment. Installing a bioretention cells can be effective in reducing moisture in low areas where water temporarily stagnates.

There have been studies on climate, landscape, geological studies, photo analysis, and site behaviour in rainy periods; results were interpreted by the graphics.

From these studies it appears that drainage problems of this locations could be improved by installing several rain gardens. A preliminary design was carried out with proper sizing.

In sizing the rain garden was used a simplified version of Darcy law. Darcy's law was established experimentally in 1856 and applies to uni-dimensional flow of incompressible homogeneous fluids, both under saturated and unsaturated regime.. Darcy experimentally observed relationship between flow across a porous material (sand) and the corresponding load flow. Darcy's law expresses the fact that the specific flow q [L / T], is directly proportional to load hydraulic gradient: q = (-K) H / L = (-K) dh / dl (1) where: K [L / T] is hydraulic conductivity, dh / dl [L / L] the hydraulic gradient. Since rain gardens function is based on the flow of water leaking through the ground, a version of Darcy's law can be used in the calibration process. A simplified version of Darcy's law is:

$$SA = \frac{0{,}04 \cdot c \cdot DA \cdot depth}{(i) \cdot (depth + h\ edges)}$$

In this equation, the rain garden area (SA) is a function of flow coefficient (c) measuring the flow of rain on a surface, the total drainage area (DA), mixture planting depth (depth), the edge height planting area (edges), native soil infiltration rate (i).

Other additional data needed to build an effective model of bioretention cell are design parameters of the rain gardens, soil water retention capacity, infiltration rate, laboratory analysis, results in the field, the calculation of permeability coefficient, research on mixing plant use and implications for bioretention cells design, biological and social aspects of rain gardens, the main hydrological parameters for mixtures of soil

, typical values of permeability for unconsolidated sediments, typical values of porosity for unconsolidated sediments, laboratory measurements for permeability and determination of d10 values (defined as the inactivation dose) on samples from the field, suspended sediment, water quality, filtration efficiency.

RESULTS AND DISCUSSIONS

The site analysis has determined that the land is characterized by geomorphological, geological and hydrogeological conditions this: water poor drainage of surface leads to a very wet perimeter, moorland. In the south - west a well was dug for animals and water level in this well is at ground level.

Excessive moisture of this area due, also, to slope leakage witch form a small stream under the form of a gutter, which discharge into the creek that crosses the village. From the relief study result the Boteni area is located geographically in the north-west of the Transylvanian Plateau, the geographical unit is characterized by a succession of gentle ridges separated by wide valleys, the low plains, the average altitude hills being 400 m. Lithological columns for the site are as follows (table 1).

Table 1

Lithography Columns for the studied site, Boteni

Location	0,00– 0,20 m	0,20 – 0,5 m	0,50 – 1,40 m	1,40–3,00 m	Observations
Boteni	Very wet brown clay with soft texture	Very wet brown clay with soft texture	Very wet brown clay with soft texture	Brown sandy clay - yellow with viscous texture	Water infiltration were found in depth of 1.5 m

In designing an effective solution for problems of this area have been respected rules on bioretention cells dimensioning, installation, maintenance and type of plant material used, developing a complete landscape plan (fig. 3).

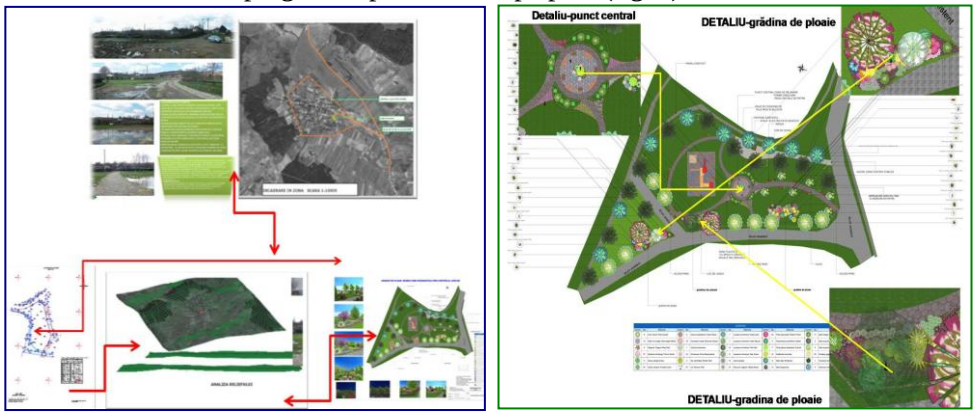

Fig. 3. Site analysis and development proposal

Given the structure of the soil in the area where is proposed the bioretention cell is recommended that the thickness of the stone to be between 12-15 cm. To install the plant layer is required additional excavation. Fertile layer can be mixed inside or outside the garden, before bedding and 50% of the content may be the first layer of soil obtained from the excavation and the remaining 50% will be added to compost, soil rich in organic matter.

The sizes of bioretention cell proposed for this site will be between 100-50 m^2, areas that will provide drainage for areas with stagnant water from rainfall and slopes runoff. They will be located at least 30.5 m of existing well and 15 m from the foundations of buildings.

Topography of the site poses no additional problems for installing bioretention cells, ground level showing insignificant differences. Proposed depth is 3000 mm edges slope 4:1, soil depth treatment 1200 mm, is indicated using a soil infiltration rate of 13 mm / hr.

Plant selection. There are a variety of species suitable for planting in a bioretention system. They will be chosen from a list that includes large trees, small trees, perennial flower species, shrubs, ornamental grasses (table 2, table 3).

The plant material chosen has the following qualities: it is able to tolerate excessive moisture conditions during rainy periods and, various pollutants resulting from the surrounding roads and slopes pastures washing. The prolonged drought periods is recommended supplementary irrigation

Table 2

Trees and shrubs

Large trees	Small trees	Shrubs
Acer rubrum	*Aesculus pavia*	*Aronia arbutifolia*
Betula nigra	*Carpinus caroliniana*	*Callicarpa americana*
Fraxinus pennsylvanica	*Cercis canadensis*	*Calycanthus floridus*
Nyssa sylvatica	*Chionanthus virginicus*	*Cephalanthus occidentalis*
Quercus phellos	*Crataegus phaenopyrum*	*Clethra alnifolia*
Quercus nuttalii	*Magnolia tripetala*	*Euonymous americanus*
Magnolia grandiflora	*Asimina triloba*	*Lindera benzion,*
Quercus laurifolia	*Alnus serrulata*	*Viburnum nudum*
Betula lenta	*Amelanchier arborea*	*Corylus americana*
Salix species	*Cornus alternifolia*	*Physocarpus opulifolius*
Taxodium distichum	*Hamamelis virginiana*	*Sambucus canadensis*
Platanus occidentalis	*Cornus sp.*	*Spiraea latifolia*
Aesculus octandra		*Spiraea tomentosa*
Nyssa sylvatica		*Spiraea alba*
Prunus serotina		*Rhododendron viscosum*
Tilia heterophylla		*Rosa palustris*
Acer negundo		*Vaccinium ashei*

Table 3

Ornamental grasses and flower species recommended for bioretention cell planning

Ornamental grasses	Perennial flower species	
Carex sp.	*Aster caroliniana*	*Pontederia cordata*
Rhynchospora latifolia	*Coreopsis auriculata*	*Rudbeckia sp.*
Scirpus cyperinus	*Coreopsis lanceolata*	*Solidago rugosa*
Juncus effusus	*Coreopsis rosea*	*Liatris spicata*
Chasmanthium latifolium	*Helianthus angustifolius*	*Lobelia cardinalis*
Muhlenbergia capillaris	*Iris versicolor*	*Phlox paniculata*
Panicum virgatum	*Iris virginica*	*Phlox subulata*

CONCLUSIONS

In the process of analysis and design were obtained data and detailed plans that allow installation of a system composed of three bioretention cells in Boteni, Cluj county, landscaped method that will provide a way to use and optimize every drop of rainfall, and will improve drainage conditions of this site.

Benefits of the bioretention cells placed in this area are varied: increasing the amount of water that infiltrates in soil, solving the problems caused by poor drainage, reduce pollution caused by rainwater, improved aesthetic appearance of the locality without interfere with the natural ecosystem, will provide a favourable habitat for fauna and biodiversity, contributing to the promotion and implementation of a type of landscape architecture which respects the principles of sustainable development.

In Romania we are not aware of such bioretention systems, although their presence is needed and would represent a step forward for greening several areas, noting that this design would be implemented on a large scale to be effective.

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THE FRAMING OF THE MEANS OF CONVEYANCE INTO THE ENVIRONMENT LANDSCAPE

ÎNCADRAREA MIJLOACELOR DE TRANSPORT PUBLIC ÎN PEISAGISTICA MEDIULUI ÎNCONJURĂTOR

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Abstract. *The urban development specific to the Romanian big cities , but not only, has gradually led to the elimination of the environment's various component elements, this imposing the* ***necessity for the rearrangement*** *of the ambient by planting trees and transforming many destroyed surfaces into parks. The authorities' efforts can be sustained by the producers' and also the designers' in order to offer to certain objects or vehicles of public use a friendlier aspect, easier to be used, adapted to the environment in which they are exposed. This paper presents the designer's implication in conceiving some transportation means which can correspond from aesthetic, technological and functional point of view not only to the needs of the citizens but also to the need of the environment. Thus, two case studies were chosen (tram concept, train wagon concept) as main urban and interurban transportation means; transportation means which are present in the currently constant landscape.*

Key words: train, tram, design

Rezumat. *Dezvoltarea urbană specifică marilor oraşe din România şi nu numai, a condus treptat la eliminarea unor elemente componente ale mediului înconjurător, impunând* ***necesitatea reamenajării*** *ambientului prin plantarea de pomi şi transformarea în parcuri a numeroaselor suprafeţe distruse. Eforturile autorităţilor pot fi susţinute de cele ale producătorilor şi totodată ale designer-ilor pentru a oferi unor obiecte sau vehicule de uz public un aspect mai prietenos, mai uşor de folosit, adaptat mediului în care acestea sunt expuse. Lucrarea de faţă prezintă implicarea designer-ului în conceperea unor mijloace de transport care sa corespundă din punct de vedere estetic, tehnologic şi funcţional atât nevoilor cetăţenilor cât şi mediului înconjurător. Astfel s-a optat pentru două studii de caz (concept tramvai, concept vagon de tren), ca principale mijloace de transport în plan urban sau interurban, mijloace de transport prezente in peisajul veşnic actual.*

Cuvinte cheie: tren, tramvai, design

INTRODUCTION

The visual and psychological urban pollution generated by the unaesthetic and degraded aspect of the Romanian transportation means, represents the basis for launching new concepts for products which respect the principles of eco-design (Pralea Jeni, 2009).

MATERIAL AND METHOD

The public transportation means represent a point of interest for the passengers, producers, environment and designers. The designer's involvement in the transportation means' design is a real challenge, due to the responsibility imposed

by the complexity of the project as well as to its impact on the society. The work method used in designing public transportation means which are compatible with the needs of the modern society is based on respecting the designing rules specific to the design activity (Pralea Jeni, 2009). In order to realize the concepts presented in this paper, the research phase presumed the use of: the interview method (producers, transportation means drivers and passengers were interviewed), the Internet, normative and specialized books. When making the idea and the project sketches modern virtual work methods were used, like: 2D and 3D programs, graphic charts.

RESULTS AND DISCUSSIONS

Based on the market studies and on a detailed research of the transportation domain the "Sitra" concept appeared. (The author: Silviu Teodor- Stanciu, fig. 1-5) (http://tramclub.org). **Sitra** represents a high capacity tram, having low positioned floor, using the latest technology, bold exterior design, adaptable to urban environments (fig.1). The integration of the public transportation means in the environment's landscape, as well as the incorporation of certain technical elements that correspond to the various needs of the passengers represents a permanent challenge and preoccupation for the designers of all times.

Fig. 1. Integration of the Sitra concept in the urban environment's landscape

The Sitra concept, 25 meters long, having 6 motors, with: 5 doors (4 for the passengers and one for the driver) (fig. 2), 38 seats, a total capacity of 195 passengers, air conditioning (cold - hot), informative announcements regarding the next station during travel, wagons with smoke and heat detectors which transfer the information to the driver, is designed to be produced from fireproof and non-combustible materials (aspect which completes the safety concept of the vehicle). The driver's cabin, ergonomically designed, is spacious and has air-conditioning. The main commands are integrated in the driver's seat for easy

accessibility in handling the vehicle (http://tramclub.org). The tram is equipped with two spaces, in the central part, destined for wheel chairs. Two foldable ramps, manually driven, are available in order to compensate the height difference between the floor of the vehicle and the platform (adaptation to the environment and to the passengers' needs: elderly persons, baby carriages, bicycles and people with disabilities) (fig. 3). The equipments of this concept are according the European standards ("StrabVO 1999") (http://tramclub.org). The back side of the interior (fig. 3) has a metal stand designed to hold two bicycles (for people who prefer ecological means of transportation). Due to the compensated secondary suspension system (allows the driver to adjust the ground level), the use of the tram is possible even in the case of heavy snowfall (adapted to the weather conditions from Europe). Having motors on each wheel (fig. 4) allows the passengers to enter the vehicle at a height of only 20 cm and the absence of steps in the interior provides a fast and secure flow. The tram can enlarge its transport capacity by adding an articulated trailer wagon. The basic model, made from three modules, has also options with two and four modules (fig. 5).

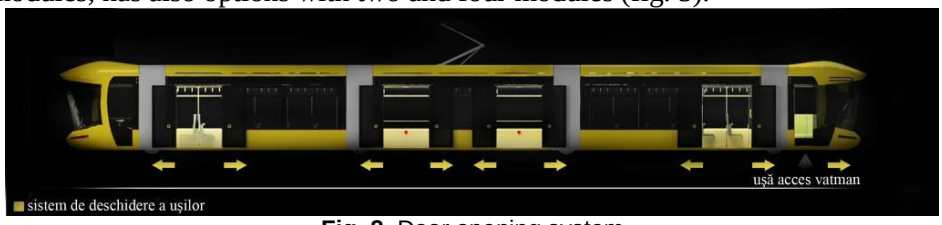


Fig. 2. Door opening system

Fig. 3. Special space for people with disabilities/ Bicycle stand.

Fig. **4.** Vertical placement of the motors / Coupling system / Pantograph/ Dashboard.

Aesthetically, the vehicle has a compact, refined aspect, in fully concordance with the elements of the classic architecture, through the round shape specific to the 1900, and also the elements of the contemporary architecture, through edges or aggressive and dynamic oblique lines, and last but not least in harmony with the environment. The body's round form, as well as the big

windows gives the impression of being part of the nature, Sitra becoming a friendly vehicle not only from functional point of view, but also aesthetically. In the front part, the tram has a wide wind screen, oblique from exterior to the upper edge, aspect which offers massiveness and also a certain dynamism. The spherical calotte which limits the superior part of the wind screen emphasizes the fluid character of the Sitra concept. The general line of the front part is interrupted by the oblique disposal of the linear headlights, this underlining an aggressive and dynamic aspect. The interior, designed not only to be refined, but also useful, has seats covers made by hemp fabric, a fluorescent illuminating system hidden in panels placed in the lateral sides of the ceiling, which offers the same fluid aspect as on the exterior. For a better systematization of the interior, on both sides of the access doors glass panels framed in metal bars were placed and for the orientation of the passengers, visual and auditory indicators were placed, as well as boxes for advertisements and trash bins at each door, all of these items maintaining the identity of the vehicle intact. From a chromatic point of view, Sitra comes in a variety of colors (borrowed from nature: yellow, cream, green, turquoise and others), in harmony with the ones used for the interior.

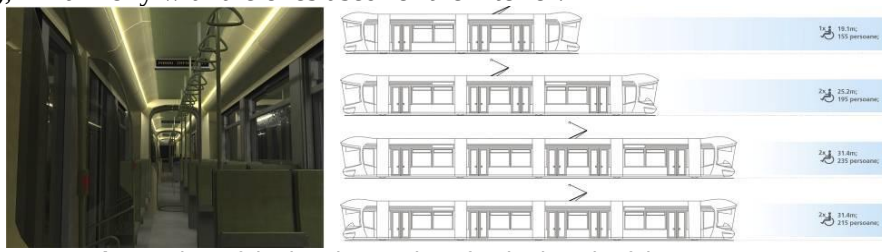


Fig. **5**. View of the interior; Options for the length of the tram

Public mean of transportation, the train, through its esthetics and functionality must integrate in the environment it was designed for. In the case study presented (fig.6) a wagon produced in the `80 was analyzed. (Two leveled wagon, serial number 26-26) for which the designer (Author: Nedelcu Viorel, fig. 6-11) proposed the modernization by improving the functional and esthetic characteristics. The studies which were made imposed the designer's intervention over the exterior by improving the window area (silicon fitting and increasing the dimensions through optical illusion). The designer proposed the realization of horizontal lines located on the length of the wagon in order to cover its large monochromic areas. At the window area, the gray line chromatically unites the windows between one another, giving the illusion of big and continuous windows (fig.6). An important role in the evolution of trains had the electric frame (www.alstom.com). In order to aesthetically frame the concept of an electric frame in the environment, the designer, after a number of computer analysis (computer programs 2D and 3D), proposed the concept illustrated in fig.7. The front part by the proposed graphics reproduces the train's characteristics: aggressiveness, quietness, calmness, and the pleasure of traveling (fig.7). The graphic used, defines the shape, accentuates areas and covers large surfaces. The graphic elements used are shapes of geometrical forms. In fig.8.b,c. is presented the situation before the

color intervention and fig.8.a,d. the train after the designer's intervention is illustrated (www.alstom.com). The quality leap justifies the growth of the esthetic value of the train and its integration in the environment, and also the importance of the software that allows these interventions and studies. The use of continuous gray stripes from the window area gives the illusion of length, transparency and speed. The door area can be highlighted through colors (red, white, yellow) assuring a faster passenger embarkation, eliminating the confusion and panic that can emerge in a crowded train station. From an esthetical point of view, especially the exterior shapes of the trains, give the impression of complexity, the graphic being a simple way to create the harmony of the shapes. Usually, the railway companies order the trains in their specific colors, thus leading to a great chromatic variety.

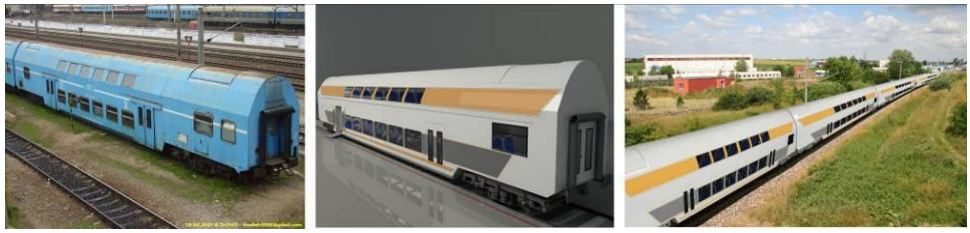


Fig. 6. Graphic proposal of the wagon (Stylistic proposal, daily landscape framing)

Fig. 7. Frontal part of the train (before and after the graphic intervention)

a. b. c. d.

Fig. 8. Graphics a. frontal area after and b. before the graphic intervention; c. the side area before and d. after the graphic intervention

Fig. 9. Graphic proposals for the front's and doors' area

After the theoretical and practical researches that were performed, a new model of chairs is recommended for the train, which will correspond to the new ambient requirements of the wagons fig.10. The concept presents updates which will assure the physical and psychological comfort of the passengers (foldable tables, auxiliary

light consoles, recycle bins, sockets). The redesigned space can be executed from modern and ecological materials and presents new facilities (fig.8).

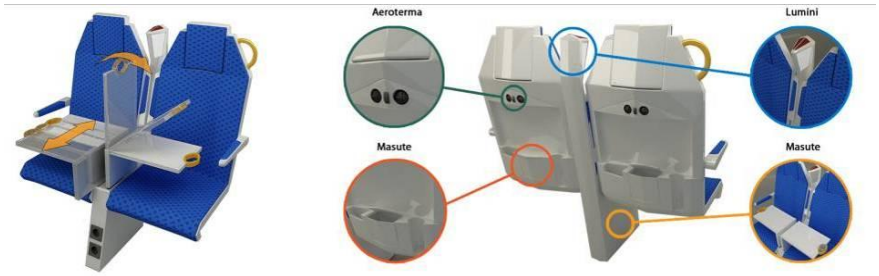
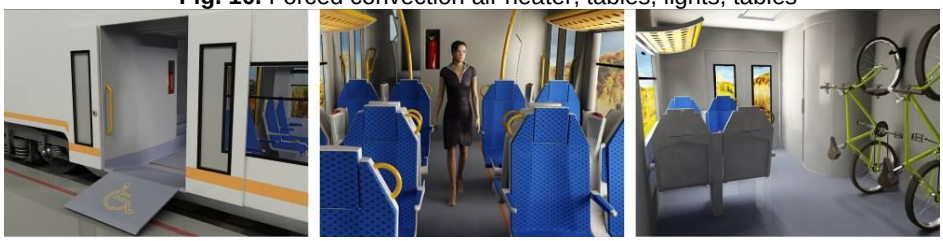


Fig. 10. Forced convection air heater, tables, lights, tables



a. b. c.

Fig. 11. Modernized wagon concept: a. Access ramp for people with disabilities; b. Interior; c. Bicycle supports

CONCLUSIONS

Taking into account the complexity of the design activity, the product's impact on the environment must be studied, on the short term as well as on the long term. The product must fully correspond from functional and aesthetic point of view, to contribute to the elimination of the sound pollution, answering the needs of the public as a component of the natural ambient. Unlike the graphic used on various objects like cars, buses, trolley buses and trams (having aesthetic and also advertising purposes) for the trains the graphic is used to define the shape, the functional items and details, also to avoid big flat surfaces. The dimension of the trains, as well as the preoccupation for beautiful, enforces their graphical framing in the scenery.

The use of 2D and 3D programs create the base for arguments in the evaluation of a project. This work was supported by CNCSIS –UEFISCSU, project number PNII – IDEI code1226/2007.

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PROXEMIC DESIGN OF URBAN RELAXATION FURNITURE

PROXEMICA ÎN DESIGN-UL MOBILIERULUI URBAN DE ODIHNĂ

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Abstract. *This paper analyses the dynamic evolution of furniture elements for parks and gardens in stylistic and also functional, useful, constructive and ergonomic terms. Having an important role from aesthetic and functional point of view, this type of furniture throughout its evolution must correspond to the current requirements related to the physical and psychological comfort of people, but also from the point of view of the environment's "comfort". The care to create environmentally friendly furniture will be a decision factor for the designer in its choosing strategy of the interference rules between the furniture items and the green spaces.*

Key words: green spaces, benches, gardens, eco-friendly.

Rezumat. *Lucrarea trateaza evolutia dinamica a elementelor de mobilier urban destinat odihnei atat din punct de vedere stilistic, cat si din punct de vedere functional, util, constructiv, ergonomic. Avand un important rol din punct de vedere estetic si functional, acest tip de mobilier in evolutia sa trebuie sa corespunda cerintelor actuale legate de confortul fizic si psihic al omului, dar si din punct de vedere al "confortului" mediului inconjurator. Grija de a crea un mobilier adecvat mediului inconjurator va fi un factor de decizie pentru proiectant in strategia modului de abordare a regulilor de interferenta intre elementele de mobilier si spatiile verzi.*

Cuvinte cheie: spatii verzi, banci, gradini, ecologic.

INTRODUCTION

Urban furniture represents a contemporary term that includes all objects installed in the public spaces of a city which answer to all the necessity of their users, changing the image of the city. This category includes: resting furniture (benches, backless benches, chairs, tables), objects that contributes to keeping the city clean (dumpsters), equipments of street illumination, communication and information (municipal or cultural information billboards, placards with the name of the streets, orientation (information) tables, playgrounds, objects used for traffic (delimitation poles, barriers, bicycle parking supports, horologes, traffic lights), flowerpots, lattices and protections, trees, station covers destined for the users of the city's transport system (http://www.tc.ro/arhiva/228-18.07.2003/?cat=tehnologii; http://www.berra.ro/advanced_search.php?categ[]=40&subcateg[]=179).

Starting with the 19th century the furniture used in the public spaces was designed to be in harmony with the urban architecture, inspired by nature, using metal and wood, but without being used the term "urban furniture". The term "urban furniture" starts to appear in 1970 (fig.1), in the same time with the "birth"

of the urban furniture line and its design, a period when also the first rules appear concerning the urban furniture and the concession of its maintenance. The arrangement of a public space is a relatively complex process which needs to satisfy all the participants of the urban life. The authority's decisions are not always compatible with the users' necessities and requirements. The work of the architects, landscape artists and designers tends to develop together with the municipality and the global projects, taking into account the functionality of the objects, the materials used in their composition, their dimensions, ergonomics and resistance. In order to answer the users' necessities the urban arrangement tends to develop socialization, restoring for the public spaces the dignity and the quality lost in time, attributing an essential role to the meeting and relaxation spaces. (Mitrea V., 2000).

MATERIAL AND METHOD

Starting with two reference studies, important in the use of the exterior space's domain, the paper evaluates the way today's necessities for urban comfort are satisfied by the evolution and contemporary design concepts of the urban furniture destined for resting and socializing. The studies, presentations and evaluations made by environmentally friendly methods, namely virtual 2D and 3D, create the premises of some analyses without material consumption (toner, paper, ink, etc).

RESULTS AND DISCUSSIONS

Proxemics studies the use of space by man. According to anthropologist Hall (1959), the personal space is in the shape of a sphere and the individual has ownership feelings for this mobile sphere which he is included in. Most of us are more familiarized with the term "personal space". The personal space is between 46cm and 360cm, the distance we are reported to other people (parks, parties, social events). An important factor in dimensioning the "personal space" represents the person's culture (differences appear amongst countries, location: urban/rural, etc.) Hall identified four types of distances that characterize the interactions of the individuals: **intimate distance** (characterizes the interactions between lovers, married couples, parents and their children, etc); **personal distance** which generally represents the length of an arm and constitutes the usual distance of the daily interactions amongst friends and acquaintances without having physical contacts; **social distance** (used in the interactions that we have with persons we superficially know and also in formal interactions); **public distance** (characterizes the formal interactions), assuming a physical distance of 3 to 8 meters.

A study of Knowels (1973) highlighted that groups, as individuals, have personal spaces. Knowels placed groups of two and four people in the center of an airport's waiting room and noted that "invaders" which moved to one group to another rarely existed; most of them avoided the group (fig.2 and fig.3). The bigger the group was, it was less likely that its space was violated. By connecting Hall's and Knowels' studies with the historical evolution of the urban furniture used for relaxation, it can be observed that it started with objects destined for

intimate and singularized external relaxation, presently having proposals for objects destined to collective and semi-collective relaxation. This is due to the human being's growing necessity for contact and socialization.

Fig. 1. Gaudi – Guell Park, Barcelona
(http://www.berra.ro/advanced_search.php?categ[]=40&subcateg[]=179)

A main element of furniture, the park benches, started to exist in the same time as the first green areas destined for relaxation and resting. In the culture of the great civilizations like Ancient Greece, the Roman and the Persian Empires, the benches from the gardens were built from marble or other rocks. The end of the 18th century is characterized by building the park benches from lighter materials (wood with metallic legs or structure), starting the idea of the bench with wooden slats placed on metallic structure (Raizman D., 2003).This type of benches, are relatively fragile, being vulnerable to the weather and/ or acts of vandalism, the wood being periodically replaced.

Fig.2. Modular furniture pieces for socialization
(http://www.berra.ro/advanced_search.php?categ[]=40&subcateg[]=179)

Fig.3. Modular furniture piece for socialization

Fig. 4. Furniture element involved in the urban landscape

(http://www.berra.ro/advanced_search.php?categ[]=40&subcateg[]=179)

Making the benches from other materials started in the 20th century, by replacing the classic wood and rock benches. Aside the benches other types of objects were created, to be possible their use for collective relaxation, like: backless benches, steps, margins of the green spaces, etc. (fig.4). Presently it is considered that the urban development is associated with the development of the urban furniture and its components. The urban furniture represents a comfort element of the public spaces, an element of strict necessity, essential to all urban or rural places (http://www.solutiiurbane.ro/).

Fig. 5. Relating the furniture with the urban landscape (http://www.tc.ro/arhiva/228-18.07.2003/?cat=tehnologii)

The designer's role is defining in the design and placement of the urban furniture by making the space optimal and more beautiful (fig. 5). The furniture's design answers to the citizens' and the city tourists' need for comfort, simplifying the modern urban life (fig. 6 and fig. 7).

Fig. 6. Solution for the maintenance of the urban furniture (http://www.berra.ro/advanced_search.php?categ[]=40&subcateg[]=179)

The basic complex elements of the furniture's design (aspect and functionality) are important in the general tendency of creating furniture in conformity with the architectural elements or with anthropomorphous forms. The design varies from simple to complex, according to the purpose of the furniture, the period of the construction, material, technology, purpose, placement, price, etc. The same type of furniture (fig.8 and fig. 9) can be made from different materials (plastic, wood, concrete, mosaic, steel, crude iron, etc.), according to the elements mentioned before.

The multiple functions of the product (fig.7, fig.8, fig.9 and fig.10) offer different possibilities of: relaxation, socialization, having different activities, aside from its capacity (due to its modular concept) to adapt, according to space and placement area, to the socializing desire.

Fig.7. Modular furniture destined for urban spaces
(http://www.berra.ro/advanced_search.php?categ[]=40&subcateg[]=179)

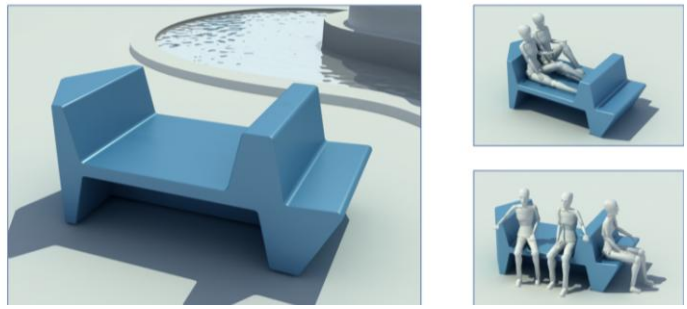

Fig. 8. Modular bench (concept by Caraman Stela)

These characteristics determine the favorable appreciation of the concept, concerning its placement in the modern urban. By its placement in the ergonomic and aesthetic requirements, the presented concept (fig.8 and fig.9) becomes performance generator, managing to get attention, to determine socialization and dialogue.

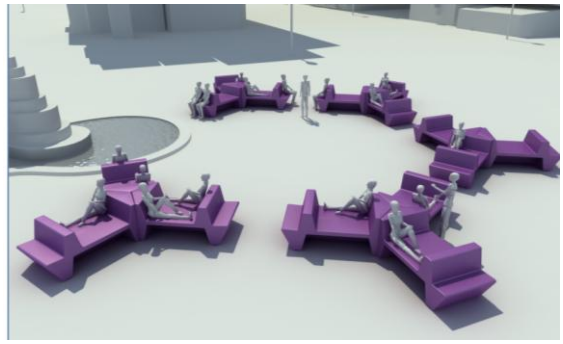

Fig. 9. Arrangement models for collective relaxation (concept by Caraman Stela)

In order to answer the eco-design requirements concerning the care towards the environment, the concept presented in fig. 10 presents a bench without additional assembling elements. The multifunctional concept, made by natural

material (wood), respects the current trend of care towards the environment, nature, user but also the manufacturer.

Fig. 10. Concept of ecological, traditional, multifunctional bench without additional assembling elements (Concept by Balan Ilarion)

CONCLUSIONS

The presented concepts, based on an extensive research concerning the proxemic and history of urban furniture, are benches which answer to the requirements concerning comfort, urban aesthetic aspect, eco-design, placing the products in the eco-design concept. Multifunctional, modular, with the possibility of making them from different materials, without assembling elements, easy to maintain and adaptable to different spaces, the urban furniture represents a challenge for the citizen, municipal administration, designer, architect and landscape artist. It must be considered in the urban plan, in the eco-design rules and in the ergonomic rules with respect for environment and society.

Acknowledgments

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DETERMINIG THE OPTIMAL METHODES OF DETECTING COUNTERFEIT WINES BY ADDING SUGAR AND SYNTHESIS SWEETENERS

STABILIREA METODELOR OPTIME DE DEPISTARE A VINURILOR FALSIFICATE PRIN ADAOS DE ZAHAR ŞI ÎNDULCITORI SINTETICI

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Abstract. *Experiments were made on witness wines, representative for each vineyard Murfatlar and Iaşi and wines purchased from the internal market for the detection of counterfeits (the addition of sugar in grape must and the addition of synthetic sweeteners). For the detection of added sugar beyond the limits permitted by law were used several processes: establishment of the alcohol /nonreduced extract report, establishment of the glycerol /alcohol, determining the polarimetric deviation, detection of natural sweeteners by chromatographic methods and detection of chaptalisation by isotopic analysis. Oenological reports alcohol /extract and glycerol /alcohol can indicate if the wine was made from must with added sugar or wine was fortified. The thin-layer chromatography method detects the natural sweeteners used, but it is difficult to assess the quantity and their origin. The $^{13}C/^{12}C$ isotope ratio gives useful indications for tracing the origin of ethanol in wine depending on the type and amount of sugar that has undergone fermentation. The thin-layer chromatography can detect exactly if the wine was treated with synthetic sweeteners.*

Key words: chaptalisation, synthetic sweeteners, chromatography

Rezumat. *Experimentele au fost făcute pe vinuri martor reprezentative pentru podgoriile Murfatlar şi Iaşi şi vinuri achiziționate de pe piața internă pentru depistarea falsurilor (adaos de zahăr în must şi adaosul de îndulcitori sintetici). Pentru depistarea adaosului de zahăr în must s-au folosit mai multe procedee: stabilirea raportului alcool/extract nereducător, stabilirea raportului glicerol/alcool, determinarea deviației polarimetrice, depistarea îndulcitorilor naturali prin metode cromatografice şi detectarea şaptalizării prin analize izotopice. Rapoartele oenologice alcool/extract şi glicerol/alcool ne pot indica dacă vinul a fost obținut din must cu adaos de zahăr sau vinul a fost alcoolizat. Metoda cromatografică în strat subțire depistează îndulcitorii naturali utilizați, dar este dificil de apreciat cantitatea şi originea acestora. Raportul izotopic $^{13}C/^{12}C$ dă indicații utile pentru depistarea originii etanolului din vin în funcție de tipul şi cantitatea de zahăr care a fost supusă fermentării. Prin cromatografia în strat subțire se poate detecta cu exactitate dacă vinul a fost tratat cu îndulcitori sintetici.*

Cuvinte cheie: şaptalizare, îndulcitori sintetici, cromatografie

INTRODUCTION

Wine is a beverage resulting exclusively from complete or partial alcoholic fermentation of fresh grapes or of grape must. The main attributes of quality wines are

their naturalness and authenticity. The addition of sugar to grape must is to increase the alcoholic concentration of wine operation known as chaptalisation. According to the regulations of Vine and Wine Law, by sugar addition in must aim to raise the alcoholic degree of wines equivalent of more than 2% alcohol. Authentic wines are characterized by a harmony of their chemical composition, naturally, any intervention which would alter the natural intrinsic composition of the wine is not allowed.

MATERIAL AND METHOD

Experiments were made on witness wines, representative for Murfatlar and Iasi vineyards and existing wines on the internal market for the detection of counterfeits (the addition of sugar in grape must and the addition of synthetic sweeteners. Wines were analyzed in terms of physico-chemical and organoleptic, using international analytical methods (OIV) and the existing STAS. For detection of added sugar in the must were used several processes: establishment of the alcohol /nonreduced extract report, establishment of the glycerol /alcohol, determining the polarimetric deviation. The detection of natural sweeteners was made by chromatographic methods and the detection of chaptalisation by isotopic analysis. The $^{13}C/^{12}C$ isotope ratio was determined at the National Institute of Research and Development for Cryogenics and Isotopic Technologies Ramnicu-Valcea.

RESULTS AND DISCUSSIONS

Witness wines have a normal composition, representative for each vineyard it comes from. Samples purchased in commerce, are table wines bottled in PET of 2 litres, bulk and DOC wines, bottled in 0.75 litre bottles. Samples of witness wine and those purchased from the market were analyzed in terms of physico-chemical and sensory, analytical results are presented in tables 1 and 2. The analyses showed that wines of DOC category fit into the physico-chemical characteristics of natural wines. Samples of bulk or bottled table wine, despite having the chemical parameters characteristic to natural wines, were disqualified at tasting receiving weak notations because mostly were thin, oxidized, stained and with odour defect, without typical.

The influence of chaptalisation on wine composition is manifested in particular by raising the alcoholic degree, slight decrease of total acidity, a slight increase of glycerol and of non-reduced extract. For the control of added sugar in the grape must were used the following methods:

Determination the report of total alcohol / non-reduced extract

The addition of sugar before fermentation produces an increase of this report, which is never proportional to the increase in alcoholic strength. Sugar gives with alcohol glycerol, succinic acid and other extractive materials that come to increase the wine extract. The report total alcohol/nonreduced extract increases even at the addition of alcohol in wine. Values of this report for the white wine purchased from the internal market ranges between 4,64 (white table wine, semidry, bottle 1,5 l) and 5,99 (table wine, semidry, PET 2 l). The average value of this report, subject to an alcohol concentration between 8,5-15% volume for natural wines is 4,3 for white wines and 3,6 for red wines**,** with the upper limit 6,5, 4,6 respectively. Maximum values or higher of these limits indicate the addition of sugar or alcohol in wine.

Table 1

Compositional characteristics of witness wines and those existing on the internal market - SCDVV MURFATLAR

Wine type	Alcohol vol. %	Total alcohol vol. %	Total acidity g/L H_2SO_4	Volatile acidity g/L H_2SO_4	Fix acidity g/L H_2SO_4	Density g/ml	Nonreduced extract g/L	Reduced sugar g/L	Ash g/L	Glycerol g/L	SO_2 total mg/L	SO_2 free mg/L	Tasting mark	Alcohol/ EN	Glycerol/EN
Pinot gris DOC-witness	12,4	12,54	3,84	0,39	3,45	0,9921	23,1	2,4	2,02	7,6	29,2	156,0	Very good	4,30	7,63
Table wine semidry white PET 2 L,	12,1	12,73	3,33	0,60	2,73	0,9931	17,0	10,8	1,69	7,1	98,4	24,6	Good	5,99	7,33
Table wine semisweet white, PET 2L	9,1	9,82	2,56	0,69	1,87	0,9971	16,2	12,3	1,48	6,3	113,6	31,9	Mediocre	4,84	8,65
Table wine semidry white, PET 2L	10,5	12,06	3,53	0,56	2,97	1,0014	17,3	26,6	1,60	7,9	93,4	22,1	Stained, mediocre	5,57	9,40
Table wine semidry white aromatic, PET 2L	9,8	10,97	3,33	0,82	2,51	1,0005	19,3	19,9	1,64	5,7	132,8	29,5	Stained, no aroma, mediocre	4,54	7,22
Table wine semisweet, red PET 2L	10,6	11,67	3,79	0,80	2,99	1,0028	22,8	18,3	1,79	7,1	120,5	39,3	Poor, colored, mediocre	4,09	8,37
Table wine semidry white	11,5	12,14	3,74	0,39	3,35	0,9947	18,7	11,0	1,71	7,8	125,4	24,6	Acceptable	5,19	8,47
Table wine semidry white, 1,5 L bottle	11,3	11,9	3,87	0,56	3,31	0,9953	20,5	10,2	1,9	6,7	119,2	17,2	Satisfactory	4,64	7,41

Table 2

Composition characteristics of wines purchased from the market SCDVV IAŞI

Wine type	Alcohol vol. %	Total acidity g/L H_2SO_4	Volatile acidity g/L H_2SO_4	Nonreduced extract g/L	Sugar g/L	SO_2 free mg/L	SO_2 total, mg/L	Glycerol, g/L	Ash g/L	Politeness, g/L	Dry matters, g/L	Colour	Density	Tasting mark
White wine DOC-CMD- Fetească albă semisweet 11,0 % vol.	12,6	3,6	0,44	23,2	21,0	20	160	11,0	1,56	0,117	43,0	0,099	1,0073	Very good
White wine DOC-CMD- Muscat Ottonel semisweet11,5 % vol.	11,4	4,2	0,45	23,9	11,8	22	128	8,3	2,18	0,237	34,4	0,191	0,9975	Very good
White wine DOC-CMD- Muscat Ottonel semisweet 12,0 % vol.	12,0	3,8	0,48	24,6	31,5	16	130	7,47	2,11	0,165	54,9	0,107	1,0041	Good
White wine DOC-CMD- Grasă de Cotnari 12,0 % vol.	11,3	3,5	0,54	21,8	40,0	14	146	7,70	1,92	0,277	59,8	0,203	1,0073	Very good
White wine, bulk, semisweet	9,5	3,4	0,71	22,8	31,3	-	56	7,36	1,92	0,177	49,2	0,108	1,0062	Mediocre
White wine, bulk, semisweet	9,4	3,4	0,42	19,6	9,8	27	129	5,75	1,70	0,449	25,1	0,228	0,9910	Good
Red wine, bulk, semisweet	11,1	3,2	0,72	22,2	19,4	7	46	6,44	2,11	0,834	38,44	1,350	0,994	Mediocre
White wine semisweet 9,0 vol.	9,0	2,4	0,57	20,8	9,8	30	76	7,13	1,63	0,086	30,34	0,053	0,9982	Acceptable

Analyzing the report of total alcohol / nonreduced extract at the studied samples we note that their values exceed the permissible average. The distinction between added sugar and fortification is generally difficult to establish with this report especially if the wine contains no sugar. To determine if there is added sugar no alcohol we determined and the ratio glycerol / alcohol.

Establishment the report of glycerol / alcohol

Between glycerol content and alcoholic degree of wines there is a linear correlation: glycerol content increases with increasing alcohol. The report of glycerol / alcohol for wines which have suffered the addition of sugar is always higher than 7. Ratio values for the studied wines are between 7,22-9,40, these values indicate a presumption of sugar addition in the grape must and ratio values around the figure 6 shows the addition of alcohol in wine. The influence of chaptalisation is easily found when the chemical composition of wine is known and difficult for an unknown wine, because sometimes the values of the chemical constants of falsified wine are very close to those of natural wine.

Determination of wines polarimetric deviation

Natural wine, with no added sugar, always presents a negative value of polarimetric deviation due to fructose. Use of this report is based on the fact that in the grape must, the glucose and fructose content is almost equal (G / F approximately 1), which corresponds to a P / α, of -5,1 at 20 ° C. During alcoholic fermentation yeast consumes priority sugar and therefore at the end of fermentation P / α report will be smaller. The addition of sugar during fermentation does not change too much the value of the report and can not be detected by calculating of this report when the wine is dry. Analyzing the data in table no. 3 we note that there are not very large deviations of the P / α report thereof we are unable to draw a clear conclusion on the intervention of sugar to obtain these wines. The report of P/α can be considered as an aid in determining a wine naturalness with other determinations but can not be regarded as an absolutely safe way to detect an unsupported intervention with sugar.

Table 3

The report of P/α at studied wines

No	Type of wine	Report of P/α
1	Pinot gris DOC-witness	-1,70
2	Table wine, white, semidry alb , PET 2 L,	-2,14
3	Table wine, white ,semisweet, PET 2L	-2,28
4	Table wine, white ,semisweet , PET 2L	-2,72
5	Table wine, white ,semisweet, flavoured, PET 2L	-2,67
6	Table wine, red ,semisweet, PET 2L	-2,81
7	Table wine, white ,semidry	-3,05
8	Table wine, white ,semidry, bottle1,5 L	-3,81

Detection of chaptalised wine through isotopic analyses

Deuterium atoms contained in the sugar from the grape must, will be redistributed after the alcoholic fermentation, in the alcohol molecules of wine. By the addition of exogenous sugar in the grape must, the deuterium content increases, which affect the redistribution of deuterium in the alcohol molecules which are formed in wine. Based on the deuterium content and the isotope ratio D/H we can determine the

nature of alcohol in wine. Sugar addition in the grape must leads to a displacement of the value $^{13}C/^{12}C$ of the isotopic report of ethanol resulted by his fermentation. Degree of differentiation depends on the amount of added sugar, but also the source of sugar used. Parallel use of ratio D/H of ethanol allows a more reliable identification of chaptalisation. Both D and ^{18}O are measured by mass spectrometric method from the water remaining after the distillation of wine. ^{13}C is measured from the ethanol obtained by distilling the wine after it is subjected to the process of combustion in excess of oxygen to get CO_2, on which is determinate the ^{13}C by mass spectrometry compared to a standard report. In the process of photosynthesis, the CO_2 assimilation by plants occurs through two metabolic processes: metabolism C_3 (Calvin cycle) and C_4 metabolism (Hatch and Slach cycle). These two types of metabolism produce different carbon isotopic fractionations of the CO_2 used by plants in the process of photosynthesis. Products resulting from the metabolism of C_4, such as sugars and alcohol derived from fermentation, have higher concentrations of ^{13}C than similar products resulting from plants with C_3 metabolism. Data obtained from the ^{13}C measurement of ethanol in wine permit to detect the addition of sugar diverged from C_3 plants (sugar beet).

Table 4

Values of isotopic ratios in the witness wine and purchased from the market

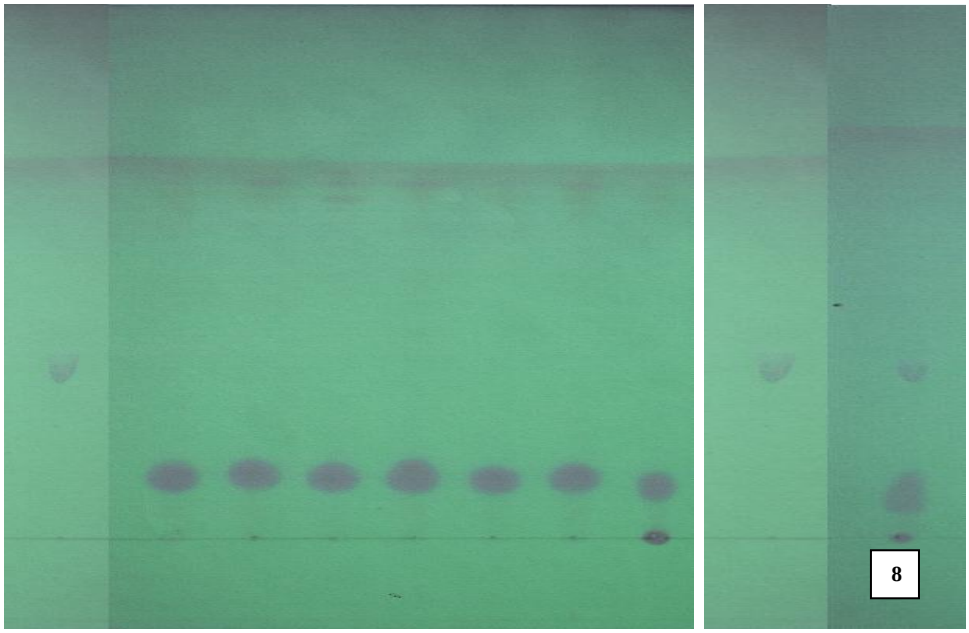
No.	Name of the sample	Concentration (D/H) of water extracted from wine (PPm)	$\delta^{18}O/^{16}O$ vs. SMOW of water extracted from wine (‰)	$\delta^{13}C/^{12}C$ vs. PDB of alcohol extracted from wine (‰)
1.	White wine DOC witness	154	1,05	- 23,52
2.	White wine PET 2 L	146	- 8,67	-24,36
3.	Water	141	- 9,98	-
4.	Absolute ethanol	-	-	- 24

Where, the standard used for both $^{13}O/^{12}O$ and $^{2}H/^{1}H$ is V-SMOW (Vienna - Standard Ocean Water), is provided by AIEA Vienna and characterized by isotope ratio of $^{2}H/^{1}H$ = 155,76 x10-6, respectively $^{18}O/^{16}O$ =2005,2 x 10^{-6}. The international standard for $^{13}C/^{12}C$ was defined by PDB ($^{13}C/^{12}C$ =11237,2 x 10^{-6}), a calcium carbonate from the Pee Dee Belmnite area (South Carolina, USA). Isotopic analysis of this sample confirms that the addition of sugar to the grape must led to a shift of the isotope ratio value $^{13}C/^{12}C$ of the ethanol resulted through its fermentation.

Detection of synthetic sweeteners

Synthetic sweeteners are food additives with a high sweetening power. These substances are used for fraudulent imitation of sweet wines and to mask a high acidity. In both cases, the action is a **forgery** and the identification of these substances is necessary. The Vine and Wine Law does not admit any such synthetic sweetener in wine. In most cases, when the synthetic sweetening substances are present in a relatively large proportion can be identified by tasting. Most used synthetic sweeteners are saccharin and sodium cyclamate. Chromatogram shows that the benzene extracts of the first 7 samples of wine in table no. 2 does not contain saccharin (fig. 1, a), sample no 8 show the synthetic sweetener saccharin (fig. 2, b). To achieve the goal of obtaining a semisweet wine, the forger probably used a dry wine to which added solution of

fructose and saccharin. In most cases the samples studied contained no synthetic sweeteners. With thin layer chromatography method can be accurately identified saccharine.



a. etalon **1** **2** **3** **4** **5** **6** **7** **b. etalon** **8**

Fig. 1. a) The Chromatogram of benzene extracts obtained from samples of wine 1 - 7 compared with the saccharine etalon; **b)** The Chromatogram of benzene extracts obtained from sample of wine no 8 compared with the saccharine etalon

CONCLUSIONS

Oenological reports alcohol / extract and glycerol / alcohol can indicate if the wine was produced from must grape containing added sugar or the wine has been fortified.

The thin layer chromatography method detects natural sweeteners, but is difficult to assess the quantity and origin.

The $^{13}C/^{12}C$ isotope ratio gives useful information for tracing the origin of ethanol in wine depending on the type and quantity of sugar that has undergone fermentation.

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