ANNALS OF THE
UNIVERSITY OF CRAIOVA
Vol. XXII (LVIII) - 2017

Series: ✓ *Biology*
✓ *Horticulture*
✓ *Food produce processing technology*
✓ *Environmental engineering*

AQUATIC VERTEBRATE FAUNA OF THE CRAIOVIȚA ANTROPIC LAKE (CRAIOVA, DOLJ)

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Keywords: Craiovița Lake, aquatic vertebrates, diversity, protection

ABSTRACT

This paper analysis systematically, biologically and ecologically, the main aquatic vertebrates observed at the Craiovița Lake in Craiova city (Dolj). In the 2016-2017 period, we highlighted 2 species of fish, 2 species of amphibians, 3 species of reptiles, and 33 typical water bird species. In Annex 1 of the EC/2009 Birds Directive, there are species that have also been observed at the Craiovița Lake and which require special conservation measures: Aythia nyroca, Microcarbo pygmeus, Ixobrychus minutus, Nycticorax nycticorax, Ardeola ralloides, Egretta garzetta, Ardea alba, Circus aeruginosus, Chlidonias hybrida, Himantopus himantopus.

INTRODUCTION

Craiova city (Dolj County) is located in the south-west of Romania, on the left bank of the Jiu River. It is located in the plain of Oltenia; the climate is temperate - continental, with submediterranean influences.

Craiova has various aquatic habitats (the Jiu River, brooks: Şerca, Cornițoiu, ponds, lakes etc.), that have an appropriate intense biocenosis. The most important aquatic habitat of the city is the Craiovița Lake. It is situated in the northwest part of Craiova (Fig.1) on the European road E64 Craiova - Drobeta Turnu Severin, between the New Craiovița (North) and Old Craiovița (South) neighbourhoods.

It is an artificial lake created in the 1966-1974 period on the former pond, on the Cornițoiu stream. The purpose was to regulate the flows of water collected and transported by Cornițoiu stream and discharged into the Craiovița collector channel. Over the years, the lake has undergone several changes. During the 1981-1985 period the lake was divided by an isthmus, over which a pedestrian bridge was built, in two parts of different dimensions: the small lake (Fig. 2), the large lake (Fig. 3) surrounded by appropriate aquatic vegetation (rush, reed, and willow on certain sectors) and populated by small islands with reed. In many sectors of the lakes, there appear compact reed beds. Many species of trees and shrubs have been planted near the lake, thus forming the Craiovița Park. The entire lake-park improvement had 85 ha, of which the water was about 32 ha (Ciobotea et al. 1999). The Craiovița Park and Lake had a pontoon, boats, swimming pool etc., being a place of recreation for the citizens of Craiova on weekends. After 1990, the Craiovița Lake and Park underwent new transformations, resulting in the profound restriction of the habitat which was replaced

by different constructions (hotels, guest houses, hypermarkets, gas stations, etc.). Currently there are no official data on the surface of the land. From an administrative point of view, the lake is leased to a private person who has not properly exploited this habitat, being practically abandoned. However, the lake biocenosis has created conditions for a diverse range of invertebrates and vertebrates of which the aquatic birds are important components.

This paper aims to study the main aquatic vertebrates as well as their relations with the biotic and abiotic environment. Also the paper presents the most important threats to vertebrates as well as some measures to be taken in order to preserve the biodiversity of the Craiovița Lake.

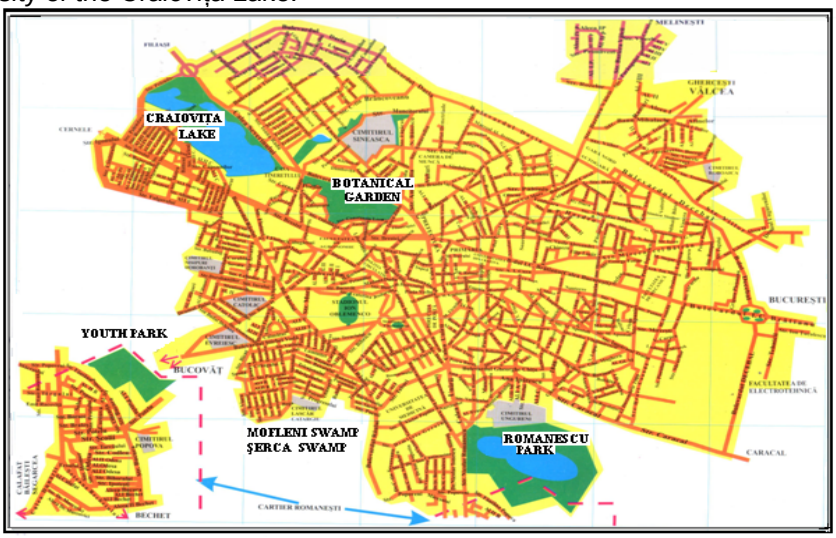

Figure 1. The map of the Craiovița Lake located in the city of Craiova (Ciobotea et al.1999)

MATERIAL AND METHODS

The study of aquatic vertebrates at the Craiovița Lake was carried out between February 2016 and September 2017. The used working methodology was based on classical methods and materials, some common ones, others specific for each group of vertebrates. The main used methods were: the method of transects, direct observations, photography, etc. The field trips took place monthly, mostly in the morning. Thus all the seasons of the year were covered: prevernal, vernal, aestival, serotinal, autumnal and hiemal. Photos were taken with the Cannon Sx50HS digital camera at every trip. There were filmed snapshots of the vertebrate life with the Panasonic SDR-H20 camera. The Bushnell binocular were used in the observation of birds, and the guides (Bruun et al.1999; Peterson et al.1989) for their determining.

The collected fish was made available to us by the amateur fishermen in the area. Amphibians captured (with hand, or with the landing net for those in the aquatic environment) were released after observations made on-site. The data obtained on the field were studied and analyzed from a biological, ecological and ethological point of view, based on the specialty literature (Bălescu 2004, 2007, 2013, 2016; Bănărescu 1964; Catuneanu et al. 1978; Cogălniceanu et al. 2000, 2016; Fuhn 1960, 1961; Iftime 2005; Mitruly 2002; Munteanu 2005, 2012; Onea 2002; Oțel 2007 etc.).

RESULTS AND DISCUSSIONS

During the study we have identified a diversity of aquatic vertebrates at the Craiovița Lake, among which multiple relationships (defense, trophic, etc.) are established.

The ichthyofauna of the lake is poor in fish species. Two species were identified from the Cypriniformes Order, Cyprinidae Family: *Carassius gibelio* and *Pseudorasbora parva*, but in very large numbers of specimens. This is due to the resistance of species to lake pollution and to their reproductive capacity. Both species are small in size. The Prussian carp varied between 10 and 22 cm, and the stone moroko ranged between 7 and 9 cm. The fishermen were not interested in the small species, releasing them into the water. They are benthic species, living on the sandy and muddy bottom of the lake. While the *Carassius gibelio* consumes both vegetal and animal food, being omnivorous, the *Pseudorasbora parva* is a zoophagus (Oțel, 2002), and consumes dwarfed aquatic invertebrates. The fish of the lake are important in the feeding of the ichthyophagous birds (cormorants) and of those with mixed zoophagous regime (herons, gulls, etc.).

The aquatic herpetofauna is represented by 2 species of amphibians and 3 species of reptiles. The amphibians belong to the Anura Order. *Pelophylax ridibundus* (the marsh frog) is very common, in large numbers of individuals. In the vicinity of the water there is also the species *Bufo viridis* (the European green toad) of the Bufonidae Family, which reproduces in the aquatic environment. It is rare compared to the marsh frog, which is in a variety of colours forms. The chromatic of *Pelophylax ridibundus* species is the ability of frogs to adapt to environmental factors, has the role of camouflage of enemies, a role of thermoregulation, a sexual attraction (Cârlig & Cârlig 2013). The species was observed from March to November. From the reptiles, *Emys orbicularis* (European pond turtle) of the Testudines Order, Emydidae Family is rare. The highlighted serpents belong to the Colubridae Family. The grass snake (*Natrix natrix*) predominates in comparison to the dice snake (*Natrix tessellata*), which is rare in the area. On the edge of the lake, but also in the holes on the shore, other reptile species such as *Lacerta viridis* and *Podarcis tauricus*, frequent species, common in the area that feed some birds (the grey heron), have been observed. Unlike previous studies (Bălescu, 2007), we did not observe the northern crested newt, but we noted the presence of the *Natrix tessellata* species in the area.

The systematic list of aquatic and semi-aquatic birds observed by us includes a number of 33 typical species (Table 1) of the total of 46 species (including wagtails species) highlighted in Craiova (Bălescu, 2013). They are distributed in 8 orders and 12 families. In this category we included the species of warblers, corn bunting and marsh harrier, which nest in the reed beds. From a phenological point of view, the migratory species dominate, not only by the number of individuals, but also by their biological and ecological importance (17 summer visitors, breeding and non breeding species, 9 species of passage, 4 winter visitors species). The sedentary species include 3 species. Many birds have double phenology; for example, the small cormorant, the grey heron, the gulls etc. were seen both in summer and winter. Out of the total of the inventories, 15 species are breeding. Most of them nest in the reed beds or on the edge of the reed from the lake: ducks, common coot, common moorhen, some herons (Bălescu, 2016). Chlidonias hybrida (Fig. 5) it uses the floating plants and the reed to fix its nest. Careful attention was paid to the nesting of the night heron (*Nycticorax nycticorax*) (Fig. 6), the little egret (*Egretta garzetta*) and the pygmy cormorant (*Microcarbo pygmeus*) in the willows of the middle of the large lake, in small colonies.

Table 1

The phenological category of aquatic birds and estimation of breeding pairs in the Craiovița Lake area (2016-2017). Threat category and status of protection of aquatic avifauna

No crt	Taxonomy	Phenology Craiova; Breeding	Phenology Craiovița Lake	Breeding (pairs)	Red Book of Vert. In Rom.	Bird Directive
1.Order Anseriformes Family Anseridae						
1	*Cygnus olor*	SV, WV, B	P	–		
2.	*Anas crecca*	WV, P	WV	–		
3.	*Anas platyrhynchos*	S, B	S	14 –17		
4.	*Spatula querquedula*	P	P	–		
5.	*Spatula (Anas) clypeata*	P, SV	P	–		
6.	*Aythya ferina*	SV, P, B	SV	+1		
7.	*Aythya nyroca*	SV, B	SV	4 – 5	VU	Annex 1
2.Order Podicipediformes Fam. Podicipedidae						
8.	*Tachybaptus ruficollis*	SV, WV, B	SV, WR	6 – 8		
9.	*Podiceps cristatus*	P, SV	P, rare	–		
3.Order Suliformes Fam. Phalacrocoraidae						
10.	*Phalacrocorax carbo*	P, WV	WV, P	–		
11.	*Microcarbo pygmeus*	SV, WV	SV, WV	+8	VU	Annex 1
4.Order Pelecaniformes Fam. Ardeidae						
12.	*Ixobrychus minutus*	SV, B	SV	+9		Annex 1
13.	*Nycticorax nycticorax*	SV, B	SV	9 – 10	VU	Annex 1
14.	*Ardeola ralloides*	P, SV, B	P	–	VU	Annex 1
15.	*Egretta garzetta*	SV, B	SV	2 – 4	EN	Annex 1
16.	*Ardea alba*	WV	WV-P	–	EN	Annex 1
17.	*Ardea cinerea*	SV, WV	SV, WV	–		
5.Order Accipitriformes Fam. Accipitridae						
18.	*Circus aeruginosus*	SV, PB	SV	–		Annex 1
6.Order Gruiformes Fam. Rallidae						
19.	*Gallinula chloropus*	S, B	S	12 – 14		
20.	*Fulica atra*	S, B	S	14 – 16		
7.Order Charadriiformes Fam. Recurvirostridae						
21.	*Himantopus himantopus*	SV, B	SV, P	–	EN	Annex 1
Family Charadriidae						
22.	*Vanellus vanellus*	SV, B	P	–		
23.	*Calidris minuta*	P	P	–		
24.	*Tringa ochropus*	SV, WV, PB	P	–		
Family Laridae						
25.	*Larus (Chroicocephalus) ridibundus*	SV,WV, PB	SV, WV	–		
26.	*Larus cachinnans*	SV,WV,PB	SV, WV	–		
27.	*Chlidonias hybrida*	SV, B	SV	3 – 4		Annex 1
8.Order Passeriformes Fam Acrocephalidae						
28.	*Acrocephalus schoenobaenus*	SV, B	SV	+2 (2017)		
39.	*Acrocephalus palustris*	SV, B	SV, P	+1 (2016)		
30.	*Acrocephalus scirpaceus*	SV, B	SV	+3		
31.	*Acrocephalus arundinaceus*	SV, B	SV	+5		
Family Locustellidae						
32	*Locustella luscinioides*	SV, P, PB	P	–		
Family Emberizidae						
33.	*Emberiza schoeniclus*	WV	WV	–		

Legend: Phenological status: SV-summer visitor, WV – winter visitor, P – passaje species, S – sedentary species, B – breeding, PB – possiblly breeding, Red book of Vert.in Rom – The Red Book of Vertebrates in Romania: VU – vulnerable, EN – endangered

We found that some species did not nest in both years of study. For example, the small cormorant was observed in the spring of 2017 at the nest. The marsh warbler did not nest in 2017, etc

Due to the changes made by this aquatic ecosystem in the last decades, besides the typical water birds, other species, called accessory, can be found at the Craiovița Lake. They have been able to integrate secondarly very well in the typical aquatic avifauna (Cătuneanu et al. 1987). The adaptation was done both in terms of feeding (with seeds of paludous plants, with different invertebrates,especially insects, insect larvae etc) and overnights rest (pheasants, Passeridae, Sturnidae, Paridae, Phylloscopidae, etc.) (Table 2).

Table. 2.

The list of some terrestrial accessory species observed at Craiovița Lake, by taxonomic units.

Order	**Family**	**Species**	**Phenology Breeding Craiova**	**Observation Craiovița Lake and Park**
1.Galliformes	1.Phasianidae	1.*Phasianus colchicus*	S,B	SV, WV, for rest and food; stay overnight in reeds
2.Accipitriformes	2.Accipitridae	2.*Buteo buteo*	SV,P	SV- P for food
3.Falconiformes	3. Falconidae	3.*Falco tinnunculus*	SV, B	
		4. *Falco subbuteo*	SV, B	
4.Cuculiformes	4.Cuculidae	5.*Cuculus canorus*	SV	lay eggs
5.Passeriformes	5.Laniidae	*6.Lanius collurio*	SV, B	SV, for rest and food
	6.Corvidae	7.*Corvus monedula*	S, B	S, B, common
		8.Corvus frugilegus	S,B	S,B, common
		9.Corvus cornix	S, B	S, B, common
		10.Pica pica	S, B	S, B, common
	7.Hirundinidae	11.*Hirundo rustica*	SV, B	OV,B,for food
		12.*Delichon urbicum*	SV, B	P, for food
	8.Phylloscopidae	*13. Phylloscopus collybita*	SV, PB	P, for rest and food; Insects on the edge of the lake;
		14.Phylloscopus trochillus	P	P; for rest; stay overnight
	9. Sylviidae	*15. Sylvia communis*	SV, B	P, for rest
	10.Paridae	*16.Parus major*	S	S,B, common
		17.*Cyanistes caeruleus*	S, B	WV, P, for rest and food
	11.Troglodytidae	18.*Troglodytes troglodytes*	WV	WV; for rest and food
	12.Sturnidae	*19.Sturnus vulgaris*	MP, B	MP, B, comnon, overnights
	13. Muscicapidae	*20.Erithacus rubecula*	WV	WV, for rest and food
		21.Saxicola rubetra	P	P; for rest and food; stay overnight
		22.Saxicola torquatus	P	
	14.Passeridae	23.*Passer domesticus*	S, B	S, B, common
		24.*Passer montanus*	S, B	
	15. Motacillidae	25. *Motacilla alba*	SV, B	SV, B,
		26.Motacilla flava	OV, B	P, rare
	16. Fringillidae	27.Carduelis carduelis	S, B	SV, WV for food, rest, shelter

A constant presence in the area is of the species *Cuculus canorus* (cuckoo), which prefers to lay eggs in the nest of warblers. They parasite the nests especially of the great reed warbler, which is the most common warbler in the area.

Both bird species, typical aquatic and terrestrial accessory, have been able to integrate well into the aquatic ecosystem with other animals in the area. Because the park was practically destroyed due to the construction of the area, in our opinion many terrestrial species (in passage, in winter or in summer) use reed beds as shelter, food, overnight and can be considered as accessories and atypical for the area under study.

The trophic regime of aquatic birds is very different and accesible to most species. Within the trophic chain, birds are consumers of a higher order. They consume invertebrates, both from water (snails) and from reed beds (Diptera, Lepidoptera) or from herbaceous vegetation (spiders, different larvae insects, or adults as locusts, coleoptera) etc.

From the vertebrates they feed on small fish, amphibians, tadpoles and small reptiles in the area. The mixed regimen species such as Anseriformes, Rallidae, etc, also consume appropriate aquatic vegetation. The trophic supply of birds is completed in winter with resources on the edge of the lake, and surroundings. It is no longer a secret that birds often consume household waste thrown on the edge of the lake. There was no competition for food between aquatic birds, as each specialized in capturing differently the prey from different places of the lake.

The aquatic birds in the area under study are the most diverse and numerous noted aquatic vertebrates. They remain important components of the lake biocenosis along with other living creatures.

Currently the Craiovița Lake and Park are under anthropogenic pressure, which influences the life of vertebrates in one way or another. In this area, human actions manifest themselves in different forms. The most obvious pollution is of the waste discarded by the neighborhood inhabitant, on the edge of the lake at different points (Fig. 4)

The constructions made after the 1990s have led to the reduction of the green space around the lake on the north, east, but also the drainage of a part of the water in the southeast, east. The current Auchan hypermarket (former Real) is located on a former marshy land with palustral vegetation where, before the 90's, *Anas platyrhynchos* was nesting.

Disposing of construction materials or their abandonment on the shore led to the destruction of the aquatic vegetation in the area, the destruction of the shore and, together with it, the destruction of some aquatic bird nests. The penetration of demolition materials or household rubbish into water has led to a change in the water's composition , clogging certain areas.

Cutting trees in the Craiovița Park to make a place for construction is another factor with negative effects on the birds in the area. In this case the birds were forced to find shelter in other places.

Cutting and burning of reed in unsuitable moments has negative effects on avifauna: - in the summer by reducing species or specimens (searching for other breeding places) –in the autumn, early in the day, by early bird leaving. The short, but repeated sound pollution (represented by machine horns, noise from construction works in the area, hard music, children's noise, etc.) has a disturbing effect both on amphibians and reptiles that make them escape in safe places and on bird biorhythm in the studied area.

Thus, birds had to change their diurnal and seasonal activities to adapt to the new conditions.The presence of domestic animals is added to the previous factors, whose actions disturb the activity of hatching birds.

We mention some measures for the conservation of the biodiversity in the studied area: periodic collection of waste in the area; maintaining the reed beds as a characteristic habitat and prohibiting its burning during bird breeding; a good management of the lake carried out by owner; reducing water pollution; to prevent the cutting of the shallows and other trees necessary for nesting and resting; removal of community dogs that destroy the nests; compliance with existing legislation; continue to monitor vertebrate species in the area; informing the public about the importance of this places biodiversity, etc.

CONCLUSIONS

The study regarding the diversity of aquatic vertebrate at Craiovița Lake, during the 2016 -2017 period, allowed us to identify 2 species of fish, 2 species of anuras, 3 species of reptiles, 33 typical aquatic species of the birds. These include the accessories species of the birds, which have been able to integrate well into the aquatic ecosystem. Multiple and complex relationships are established between aquatic vertebrates, as well as between them and environmental factors

With all the negative impact of man on the anthropic Craiovița lake, the vertebrates, especially the birds, adapted to the man-made disturbing factors.

We highlighted species at the Craiovița Lake that are listed on different European and national protected lists and which are subject to special protection measures. The 11 vertebrate species observed at the Craiovița Lake and Park are listed in the Romanian Red Book of Vertebrates with the following threatened status: near threatened species - *Bufo viridis*, *Podarcis tauricus, Natrix tessellata*; vulnerable species: *Emys orbicularis, Aythya nyroca, Microcarbo pygmeus, Nycticorax nycticorax, Ardeola ralloides*; endangered species: *Egretta garzetta, Ardea alba* (Fig. 7), *Himantopus himantopus*, also considered as Monuments of Nature.

Taking into account all this information, it is necessary to apply those measures that aim at maintaining a constant balance between the biotope and the biocenosis of the studied area.

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Figure 2. Craiovița Lake (the small lake)

Figure 3. Craiovița Lake (the large lake)

Figure 4. Wastes on the shores of the lake

Figure 5. *Chlidonias hybridus* (adult and chicken). 26.06.2016

Figure 6. *Nyctycorax nyctycorax* at nest. 18.05.2017

Figure 7. *Ardea alba* with fish in the beak. 5.11. 2016

ANNALS OF THE
UNIVERSITY OF CRAIOVA
Vol. XXII (LVIII) - 2017

Series: ✓ *Biology*
✓ *Horticulture*
✓ *Food produce processing technology*
✓ *Environmental engineering*

ECO-PHYSIOLOGICAL RESEARCH IN THE SANDY AREA FROM DABULENI, DOLJ COUNTY ROMANIA

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Key words*: sand, water stress, photosynthesis, transpiration*

ABSTRACT

In the protected area of Dabuleni, the presence of sandy alluviums and wind deflation determined the predominance of sandy soils in different degrees of evolution and of unstructured sands. The presence of sand gives rise to a dune relief well represented in the site's perimeter. Sandy soils, which do not retain water, give to this area a semiarid character marked by aridization and even desertification. As a result, vegetation has gained a strong xerophytic character. Annual species go into early vegetation, because in the middle of summer most of them end their vital cycle.

The woody species which are present in the site and adapted to the drought conditions are Robinia pseudacacia, Rhus typhina, Amorpha fruticosa. From a physiological point of view, they present a number of particularities that give them the ability to grow and have an individual evolution on a very low water content environment.

These particularities concern not only the water regime, but also the processes of absorbing mineral elements, photosynthesis and respiration. Amorpha fruticosa and Rhus typhina extend their habitat in the area, the main features which enable them to do so being the very low values of transpiration intensity, high suction force, and osmotic pressure of cellular juice.

INTRODUCTION

Sandy terrains, also known as light lands, include sands and sandy soils. They are characterized by a high percentage of large particles and a lower percentage of fine particles and humus that give them outstanding physiochemical and biological properties

Due to the mobility of the particles, the sand forms dunes with different heights and forms under the action of the wind. Near the Danube course, they are parallel to the shore, and on the inside they appear perpendicular to the river, being oriented on the wind direction of the Austru, NV-SE.

According to their age, there are recent dunes with a more compact profile and pronounced edges, old dunes, reinforced, with symmetrical profiles and prehistoric dunes.

The vast areas of mobile and fixed dunes are located in the Dăbuleni area, where we encounter a vegetation with a pronounced xerophytic character.

Due to its importance, the area was proposed for monitoring within the Natura 2000 network of protected areas.

The site is placed in the continental bio-geographical region, being located in the Danube Floodplain to the east of the confluence with the Jiu River, west to the Sarata locality, to the north of the former Potelu (currently agricultural area) and the Dăbuleni and Ianca localities to the east near Hotaru and in the south by the Danube. The coordinates of the site are: Latitude N 43 ° 43 '15', Longitude E 24 ° 9 '20' '(http://biodiversitate.mmediu.ro/rio/natura2000/static/pdf/rospa0135.pdf)

The climate is temperate-continental with Mediterranean influences. The dryness of the climate in this area is evidenced by the average annual temperature of about 11.2 ° C and precipitation below 500 mm (423 mm annually at Dabuleni). In July, the temperature reaches the value of 60 ° C at the surface of the sand.

From a physiological point of view, plants in this area have a number of peculiarities that give them the ability to grow and develop on a very poor water environment. These particularities concern not only the water regime, but also the processes of absorbing mineral elements, photosynthesis, respiration.

Research conducted by Farooq M. et al. (2008) highlighted the important role of potassium in the stoma closure mechanism, a mechanism that allows the possibility of limiting water loss.

Blum.A. (2005) considers that reducing the amount of water used, so a more efficient process, as well as increasing the osmotic cellular potential, are the main adaptations of xerophytic plants.

The ratio of the concentrations of growth stimulators and growth inhibitors ensure the survival of plants under stressful water conditions. Many researchers have found an increase in abscisic acid concentration in plants that were subject to water stress, this inhibitor being involved in the mechanism of stomata closure (Zhimi Zhu et al., 2007).

Wang. Z. et al. (2003) consider that abscisic acid accumulation in plants subject to water stress induces stomata closure and reduces water loss through sweating, but regulates osmotic shifts, maintaining cellular turgescence and reducing injury to membranes and assimilating cells.

MATERIALS AND METHODS

Research began in May of 2016; during this period field trips have been conducted to know the area and specific vegetation. In June, physiological determinations were performed.

For the physiological determinations, the woody species were chosen: *Robinia pseudacacia L, Amorpha fruticosa L., Rhus typhina L., Rosa canina L.*

In order to know the physiological particularities involved in plant drought resistance, the following aspects were determined: the intensity of photosynthesis, the intensity of respiration, the intensity of transpiration, the suction force of plant parenchyms, the concentration of cellular juice, the content of chlorophyll pigments, the total water content, free and bound water.

The intensity of photosynthesis and transpiration were determined with the portable Lci apparatus, in parallel, also determining the photosynthetic active radiation.

The intensity of respiration was determined by covering the assimilation chamber to prevent light penetration and the photosynthesis process realization.

The cell juice concentration was determined refractometrically using the Abbe refractometer, the results being expressed as a percentage of soluble dry substance (% s.u.s).

The osmotic pressure of the cell juice was determined by the plasmolytic method, this method being based on the knowledge of the plasma membrane detachment process due to cell output in the more concentrated external environment through the osmosis process.

RESULTS AND DISCUSSIONS

Photosynthesis intensity of ligneous species

Since the photosynthesis process is strongly influenced by light and temperature intensities, determinations were made at different times of the day, making diurnal variations graphs for each species.

As shown in these graphs, the studied species have low photosynthesis values at midday, the highest values being in the morning around 10^{00}-11^{00} hours. A slight intensification of the process is observed in the evening at *Amorpha fruticosa* (figure. 1) and *Rosa canina* (figure 2) but the values are not the same as those recorded in the morning.

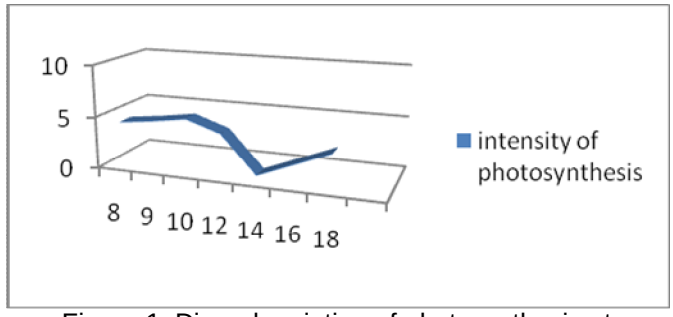


Figure 1. Diurnal variation of photosynthesis at *Amorpha fruticosa* (µmol / m^2 / h)

This diurnal variation of the process is an adaptation of plants to water stress conditions at high temperatures, intervening in the stomata closure mechanism, which minimizes water loss.

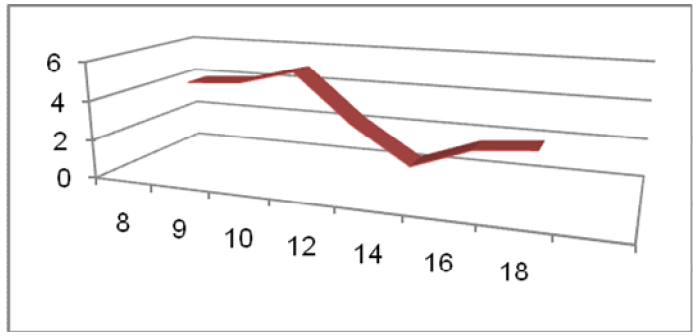


Figure 2. Diurnal variation of photosynthesis at *Rosa canina* (µmol / m2 / h)

The highest values of the photosynthesis intensity are recorded at *Rhus typhina* (Figure.3)

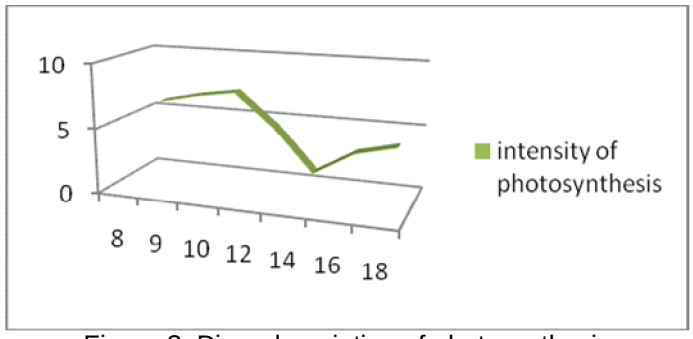


Figure 3. Diurnal variation of photosynthesis at *Rhus typhina* (µmol / m2 / h)

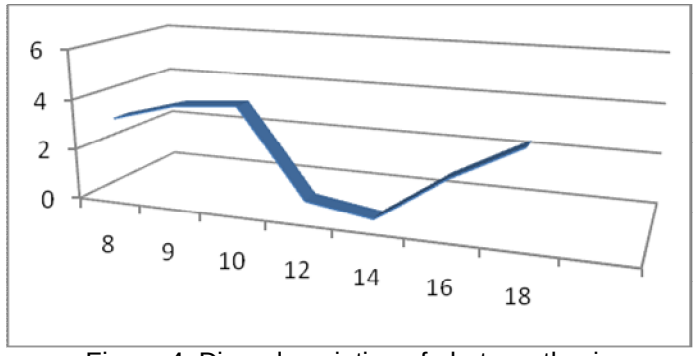


Figure 4. Diurnal variation of photosynthesis at *Robinia pseudacacia* (µmol / m2 / h)

The intensity of respiration

The intensity of leaf respiration was determined in all plants studied at different temperatures: 15, 20 and 30^0 C.

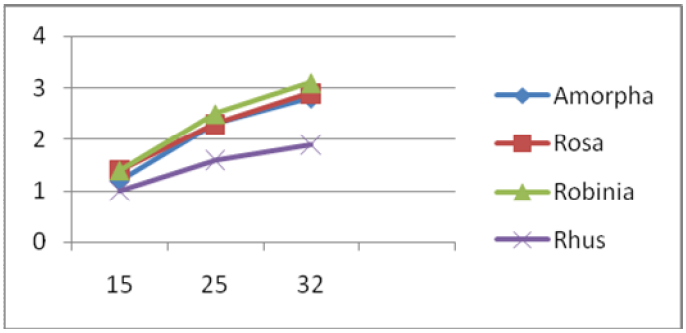
It is very important to know the temperature because the respiratory process in plants is strongly influenced by this factor.

Increasing the temperature suddenly intensifies breathing, and this process consumes much of the organic substance produced in photosynthesis, so that although true photosynthesis is maintained at high levels, apparent photosynthesis has very low values.

Thus, there is a proportional increase in respiration with the increase in temperature between the plants studied, the highest values of respiration being recorded in *Robinia pseudacacia*, and the lowest in *Rhus typhina* (figure 5).

The intensity of leaf transpiration

The process of sweating is one of the most important processes for xerophytic plants. The loss of water through this process is harmful, but it also assures the absorption and ascension of the raw sap, due to the suction force of the leaves.



Gr. 5. Influence of temperature on the respiration process (µmol / m2 / h)

Low transpiration values of *Rhus typhina* may be due to protective bristles present on the surface of the leaves, which prevent the removal of water vapors emitted by their stomata osteoles. They also reduce the temperature of vegetal tissue, preventing light radiation from penetrating. Thus, the plant is protected from overheating.

Robinia pseudacacia records the highest values of sweating intensity. Low values, close to those recorded at *Rhus typhina,* are also present at *Amorpha fruticosa*(6).

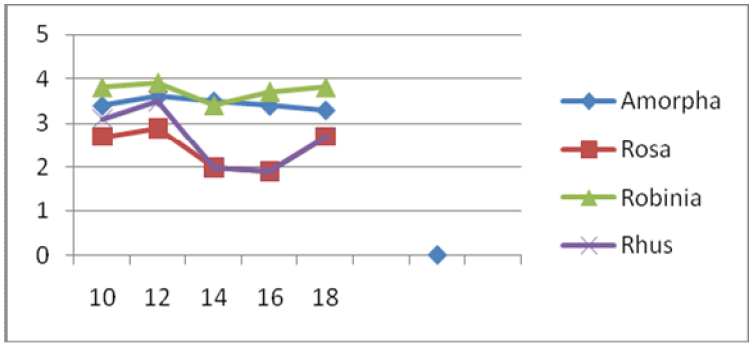


Figure 6. Diurnal variation of transpiration (mmol / m2 / h)

The chlorophyll content of leaves

Determining the amount of chlorophyll pigments with the portable Minolta chlorophyllometer revealed large variations without a correlation between the amount of chlorophyll and the intensity of the photosynthesis process. The smallest values were recorded in *Rhus typhina*, which shows the highest values of photosynthesis intensity, the highest values being recorded in Rosa canina leaves.

This is explained by the fact that in assimilating cells there are excessively assimilable pigments, their content becoming a limiting factor in cases of increased etiolation.

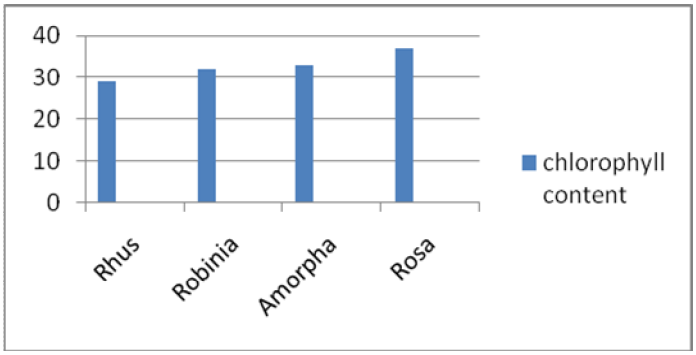


Figure 7 The content of chlorophyll pigments (SPAD units)

The concentration of cell juice

The cell juice is represented by the vacuolar juice, consisting of water, mineral and organic substances. A concentration of cell juice in xerophytic plants, determined by the accumulation of such substances is of particular importance because it causes the creation of an osmotic pressure sufficiently large to allow the water to penetrate through the external environment through osmosis. Thus, a significant correlation can be established between cell juice concentration and osmotic pressure.

The highest concentration of cell juice was recorded in the leaves of *Amorpha fruticosa*, the lowest values being recorded in *Robinia pseudacacia* (figure 8).

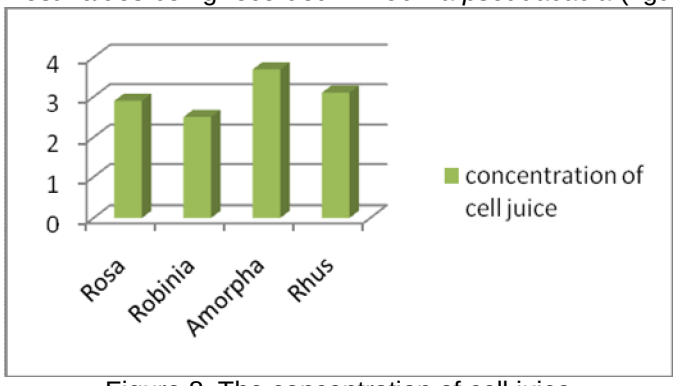


Figure 8. The concentration of cell juice
in xerophytic plants (% s.u.s.)

The suction force of vegetal parenchims

The suction force of the plant tissue is due to the osmotic pressure of the cell juice and the imbibition of the protoplasmic colloids. In the opposite direction, membrane pressure can sometimes act, causing the suction force value to decrease. Knowing the value of suction force is of particular importance, being one of the most important parameters that give indications of drought resistance of plants.

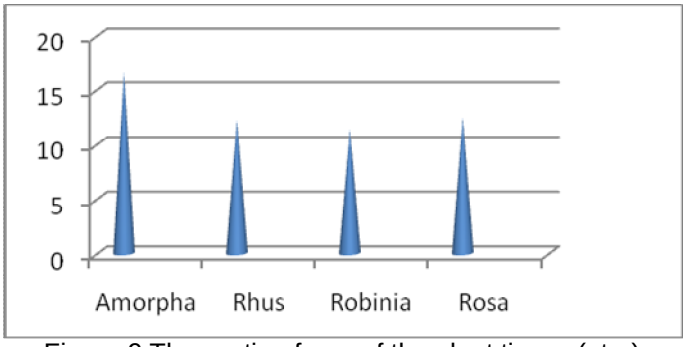


Figure 9 The suction force of the plant tissue (atm)

A high suction force of the tissues indicates a high concentration of cellular juice and allows the absorption of a large amount of water.

Of the plants studied, the highest value is found in *Amorpha fruticosa*, this value being of 16.54 atm (figure 9).

The quantity of leaf water

The amount of leaf water varies depending on species and climatic factors. Under the same conditions, the highest total water content is present in the leaves of *Rhus* and the lowest, in the leaves of *Amorpha* fruticosa (figure 10).

As for water forms, in all these plants, values of bound water have been found to be high, changing the ratio between free and bound water is an adaptation of plants to water stress conditions (figure 11-14).

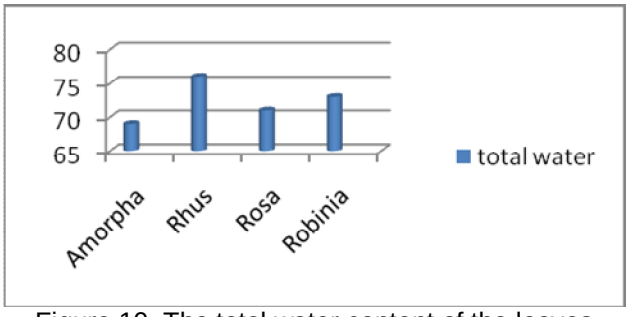


Figure 10. The total water content of the leaves

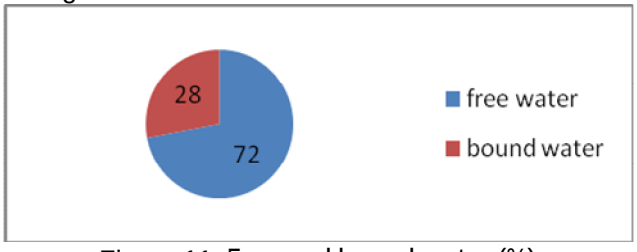
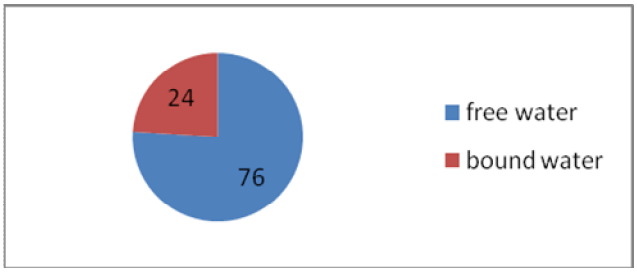
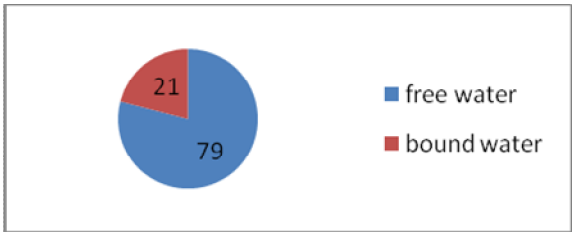


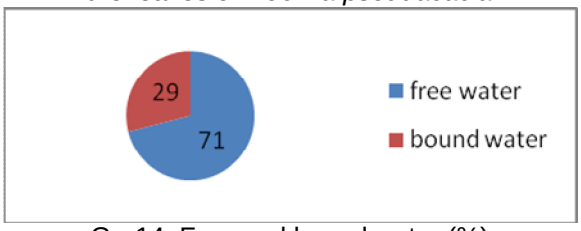
Figure 11. Free and bound water (%)
in the leaves of *Amorpha fruticosa*



Gr. 12. Free and bound water (%)
in the leaves of *Rosa canina*



Gr. 13. Free and bound water (%) in
the leaves of *Robinia pseudacacia*



Gr. 14. Free and bound water (%)
in the leaves of *Rhus typhina*

CONCLUSIONS

- Under the floral and phytocoenosis raport, there is a special world on the sands of Oltenia. Spontaneous plants that find optimal ecological conditions for growth and development are specific to continental sands. Over time, they have adapted to cope with water and nutrients scarcity.

Trees and shrubs adapted to live in this area have, besides the role of fixating the soil and reducing the temperature, a great importance for the bird species living here which find a place for nesting and rest.

The photosynthesis process records, at the ligneous species taken into study, a diurnal variation with a peak around 11 o'clock and a minimum at 14-16 o'clock due to stomata closure.

Amorpha fruticosa and *Rhus typhina* show very low values of sweating intensity, high suction force and high osmotic pressure

On warm summer days, sand heating intensifies the respiration process, and the apparent photosynthesis values decrease drastically

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RADIOACTIVTY IN DOLJ COUNTY

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Keywords: *groundwater and surface water, global beta radioactivity, environmental impact.*

ABSTRACT

This paper presents the radioactive pollution, respectively the artificial global beta radioactivity of the surface water and groundwater, as determined in the period 2006-2009 and in the monthly trend, being presented the significant values in comparison with the standard ones. There are presented the pollution sources of water, adjacent to Craiova municipality and their effects on the ecosystems.

INTRODUCTION

The natural regime of groundwater and surface water undergoes quantitative and qualitative changes over time due to polluting, natural and anthropogenic factors (Moldovan, 2006). Although in recent years the intensity of the anthropic impact has decreased (the reduction in the volume of industrial production and animal husbandry has reduced the quantity of pollutants discharged into natural receivers) and there have begun to implement measures for wastewater treatment, however, both surface water and groundwater have still remained poor quality due to the slow rhythm of their self-purification (Larry et al., 1980). A special issue on critical areas in terms of surface water and groundwater quality is their radioactivity (Horner, 1985). The existence of some sources such as the Thermal Power Plant Isalnita, which uses fuels such as lignite, resulting from the combustion process of ash and slag (545 Bq / kg), affects radioactively the surface water and groundwater. Also, the Sewer is a major pollution source (Cioşilă et al., 1994).

MATERIALS AND METHODS

In order to determine the global beta radioactivity there have been sampled water from the following points: Jiu-Isalnita sector, Jiu-Podari sector, Popoveni water drilling, Hanul Doctorului water drilling, Craiova drinking water. For immediate measurement of radioactivity, there were taken samples of 1 liter raw water, which was then evaporated to dryness and for the measurement delayed to 5 days, 2 liters of water were sampled and then evaporated to dryness in order to determine the spectrometric gamma (Oncescu, 1992).

RESULTS AND DISCUSSIONS

In 2006-2009, the Craiova drinking water was monitored in terms of specific global beta activity, noting according to the standards that the water is slightly

radioactive polluted. The higher values, both the average and the maximum values, are observed in 2007 (Fig. 1).

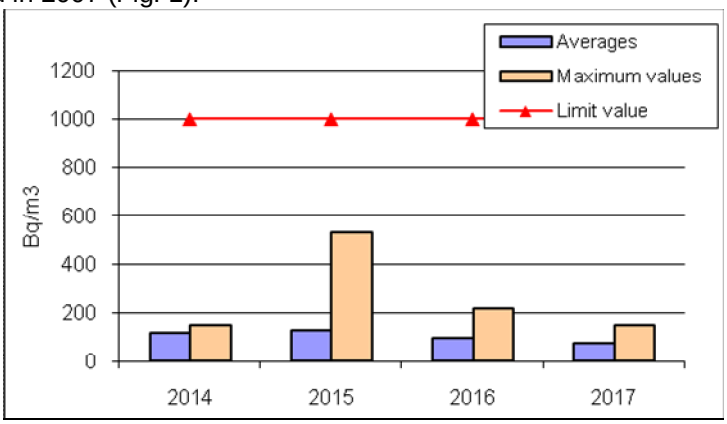

Figure 1. The drinking water – the specific global beta activity (immediate measurements)

In fig. 2, with the values determined after 5 days from the first sampling, we observe the lower concentrations of global beta radioactivity compared with the immediate values. The maximum value was recorded in 2007.

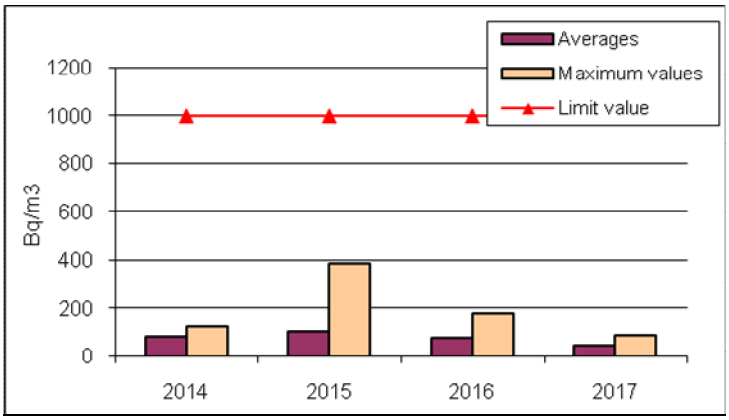

Figure 2. The drinking water – the specific global beta activity (delayed measurements)

In 2017, the artificial global beta radioactivity was monitored (immediate measurements), being observed that the surface water values were below the warning limit of 2000 Bq/m^3 established by the legislation in force(MAPM Ord. 338/2002). Thus, in fig. 3 there are observed:

- In the Jiu – Isalnita sector:
  - average values – 338 Bq/m^3
  - maximum values – 510 Bq/m^3
  - minimum values – 127 Bq/m^3
- In the Jiu – Podari sector:
  - average values – 230 Bq/m^3
  - maximum values – 300 Bq/m^3
  - minimum values – 106 Bq/m^3
- Popoveni groundwater:
  - average values – 45 Bq/m^3
  - maximum values – 58 Bq/m^3
  - minimum values – 31 Bq/m^3

- Hanul Doctorului groundwater:- average values – 112 Bq/m^3
  - maximum values – 168 Bq/m^3
  - minimum values – 76 Bq/m^3
- Craiova drinking water: - average values – 72 Bq/m^3
  - maximum values – 112 Bq/m^3
  - minimum values – 46 Bq/m^3

In the same year, the artificial global beta radioactivity was monitored (delayed measurements), being observed that the surface water values were below the warning limit of 2000 Bq/m3. Thus, in fig. 4 there are observed:

- In the Jiu – Isalnita sector: - average values – 229 Bq/m^3
  - maximum values – 381 Bq/m^3
  - minimum values – 72 Bq/m^3
- In the Jiu – Podari sector: - average values – 148 Bq/m^3
  - maximum values – 205 Bq/m^3
  - minimum values – 64 Bq/m^3
- Popoveni groundwater - average values – 34 Bq/m^3
  - maximum values – 44 Bq/m^3
  - minimum values – 18 Bq/m^3
- Hanul Doctorului groundwater:- average values – 83 Bq/m^3
  - maximum values – 102 Bq/m^3
  - minimum values – 61 Bq/m^3
- Craiova drinking water: - average values – 48 Bq/m^3
  - maximum values – 72 Bq/m^3
  - minimum values – 30 Bq/m^3

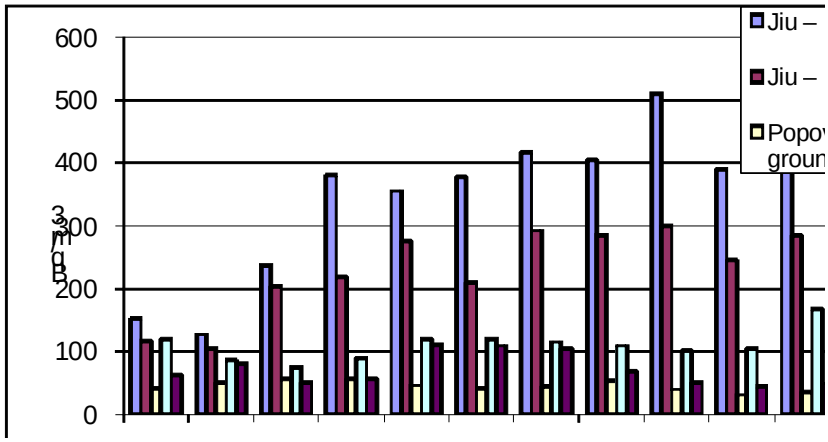

Figure 3. The artificial global beta radioactivity (immediate measurements) in surface and phreatic waters in 2017

The artificial global beta radioactivity has significant values in July, August and September, due to low water flows, and the intense period of drought.

In terms of radioactive pollution, the Jiu-Isalnita sector is the most polluted, followed by the Jiu – Podari sector. The Popova drilling water is the less radioactive polluted. The delayed measurements have lower values than the immediate measurement of radioactivity (Cothern & Lappenbuseh, 1985). The radioactivity of

surface water affects the aquatic organisms, especially the plants. The aquatic ecosystems of Jiu River have been affected only to a limited extent.

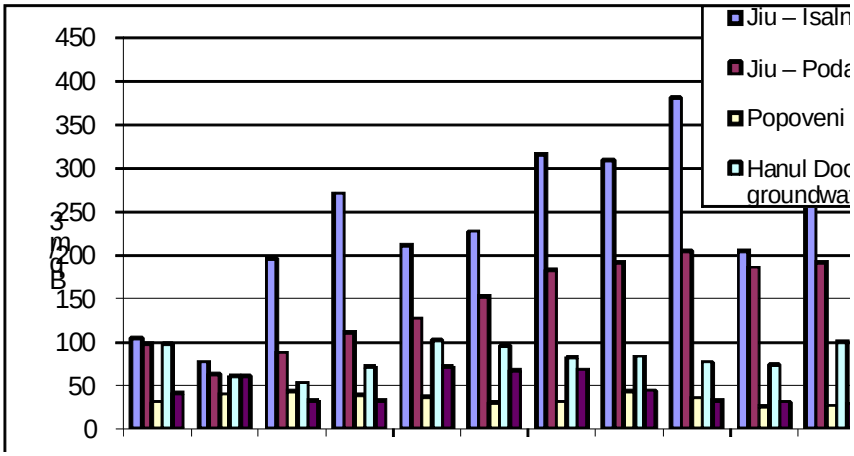

Figure 4. The artificial global beta radioactivity (delayed measurements) in surface and phreatic waters in 2017

CONCLUSIONS

The pollution of the phreatic water is often an irreversible phenomenon, with serious consequences for groundwater use in the drinking water supply. The artificial global beta radioactivity of surface sources does not have values over the maximum permissible limit. Regarding the groundwater levels, the recorded values are below the detection limits. The drinking water is not affected by radioactivity. The concentration in global beta radiation does not endanger the human health and ecosystems of the studied areas. The major sources of radioactive pollution are: Isalnita TPP, SNP Petrom, Doljchim Craiova Branch, and in the Jiu - Podari sector- the Sewer discharge (which collects all sewage and industrial water from the city and its surrounding areas).

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TERRARIUMS - MINIATURE LANDSCAPES

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Keywords*: terrariums, species, accesories, design*

ABSTRACT

Terrariums are beautiful, customizable and work with a variety of decor themes.They reproduce a part of the natural environment not just aesthetically, but also biologically, creating a veritable ecosystem that can be cared for and studied. For realizing terrariums can be used any plant that has a slow growth, of small size, reduced radicular system and that can evolve well within a reduced volume of substratum and supports cuts. The growing of this miniature gardens presupposes the appliance of the same design principles as the full-scale gardens. After one year since realizing the terrariums, the species used have behaved well without the necessity of being replaced, they only needed the minimum work of upkeep.

INTODUCTION

In 1829, dr. Nathaniel B. Ward buried a sphinx moth chrysalis in some soil – he called it “mould” – in a closed glass bottle. While he waited to observe the insect's metamorphosis, his attention shifted to something quite unintended and unexpected: a tiny fern and a few blades of grass emerged in the mould and continued to grow without the addition of more water to the bottle (Darby 2007). Dr Ward has repeated the experiment with other species of plants and observed that they can survive for years in the closed glass bottle if they have enough light and humidity. They soon became a Victorian fad with simple and inexpensive designs gracing the homes of the working class and elaborate palace-like constructions for the wealthy. (Hershey 1996). The discovery made almost two centuries ago by Dr Ward was extended and led to the creation of terrariums. From the early beginning this closed glass containers, known at the time as Wardian container, have been made in a variety of shape and sizes (Spector 1981).

Creating a terrarium can be a very interesting and educative project at the same time, because illustrates the way that an ecosystem is functioning and the processes that take place inside It (photosynthesis, respiration, water cycle). Such a closed environment can help us understand the effect that the living organisms and the environment that they enhabit have on one another.

Terrariums reproduce a part of the natural environment from both biological and aesthetic point of view. In realizing a terrarium type miniature landscape the same principle applies as in realizing a full-scaled one: ballance, shape, texture, colour, focal point, proportions (maintaining the proportion between the plants, container and the represented landscape) - but at a small scale (Stein 1990, Lerner 2007, Calvo 2013, Tricklein 2017). Depending on the destination, there are numerous themes that can be

approached (a corner of a forest with ferns, an exotic garden, a mini desert with cactus and succulents) and techniques for realizing them, depending on the materials available and the imagination of the specialist.

Terrariums can be open or closed. Closed type terrariums are usually sealed and require little to no watering because condensate forms to allow the terrarium to effectively "self-water". However, these terrariums do need to be opened at regular intervals (typically once a week) to remove excess moisture from the air and walls of the container. Open type terrariums are not sealed and require more watering because the moisture is lost (Zappia & Williams 2017). The containers used for realizing the terrariums are in general glass bottles. There are however numerous possibilities of using different recycled objects, with interesting shapes and sizes (glasses, candy glass jars, bowls etc). Also, terrariums within narrow necked bottles are more attractive for display (Ocampo 1975).

Terrariums have numerous advantages: realizing or purchasing the miniature landscapes is something eligible for whomever wishes to bring a corner of nature closer; limited space is not an issue, considering the diversity of containers and the vast number of plant species that can be used; long lifetime of terrariums (from several mounts to a few years even); depending on the species of plants used, terrariums are an alternative decoration for interior, exterior or in between the two spaces (open terrace or balconies) on a small surface; plants look mature even when they're young; the plants can be replaced from time to time; when properly planted, located and maintained, terrariums provide a means to grow many plants with minimal care (Gladbach 2014, Them et al. 2016).

Miniature landscapes, i.e. terrariums are a nowadays fashion all over the world, given the fact that they make the object of a real industry in full development. Therefore, this aim of this paper is to identify the ornamental species suitable for terrarium landscaping.

MATERIALS AND METHOD

The practical part of this study has taken place in the didactic field of the discipline of floriculture, in the interval 2016-2017.

For realizing the miniature landscapes – terrarium – there have been used grounded plants, that were planted with bale of soil for a sure that they will take root. Some species have been vegetatively propagated, most of them through cuttings. The biological material used for realizing the terrariums was represented by 38 species of flower growing plants, most of them were grown in protected spaces, and they belong to the following types:

- tropical decorative plants leaves: *Adianthum raddianum, Cordyline fruticosa Caruba black, Cianotis somaliensis, Cryptantus acaulis var. Rubra, Euonymus japonicus variegata, Ficus diversifolia Blume (syn F. deltoidea L.), Ficus triangularis, Fittonia argyroneura, Ficus benjamina, Fittonia verschaffeltii, Hemigraphis repanda, Peperomia puteolata, Ruellia makoyana*;
- succulents: *Aloe ciliaris, Crassula rupestris, C. lycopodioides, Echeveria secunda, Haworthia cymbiformis, Kalanchoe tomentosa, Graptopetalum paraguayense, Oscularia deltoides, Sedum dasyphyllum, Serpevivum montanum*
- exterior plants: *Alternanthera ficoidea, Asplenium trichomanes, Hydrangea hortensis, Ligustrum sinense, Luzula luzuloides;*

When choosing the containers the following agents were taken into consideration: appearance, scale, the height of the container that was supposed to allow the covering of the closed terrariums etc.

Terrariums necessitate a few mandatory elements: substratum, plants and some accessories that can complete the atmosphere of the landscape: alleys, rocks that can suggest the idea of a real size rock, or a mountain, tones or sand that can suggest the water and small rustic constructions (optional).

RESULTS AND DISCUSSIONS

Identifying some of the ornamental species that can be used for creating terrariums.

For realizing a terrarium is recommended any small sized plant (5-30 cm), of slow-growth, reduced radicular system, ability to evolve in a reduced volum of substratum, endurance to cuttings.

The first objective of the present paper was identifying, inside the didactic field of the floriculture discipline, some of the species that can be used to create terrariums, and require a minimum crop intervention. This assortment is presented at table 1 that contains data regarding the size, type/types of the suited plants for realizing a terrarium. Most of them are herbaceous species cultivated indoors, as for the woody plants like *Ficus, Murraya* etc will be suitable for bonsai.

Table 1

Ornamental species suitable for realizing different types of terrariums

Genus, species, cultivar	Family	Height (cm)	Terrarium type
Adiantum raddianum	*Polypodiaceae*	10 -20	clossed
Asparagus plumosus	*Asparagaceae*	20-30	clossed
Asplenium trichomanes	*Aspleniaceae*	5-10	clossed
Begonia conchifolia *Begonia boweri* 'Tiger'; *Begonia rex*	*Begoniaceae*	5-10 10 -20	open/clossed open
Callisia repens	*Commelinaceae*	10 -20	open
Campanula isophylla 'Alba'	*Campanulaceae*	20 -30	open
Ceropegia woodii	*Asclepiadaceae*	20 -30	open/clossed
Chamaedorea elegans	*Palmae*	20 -30	open
Cyanotis somaliensis	*Commelinaceae*	5-10	open
Crassula ovata 'Hobbit'; *C. ovata* 'Minima'; *C. capitella*; *C. perforata*; *C. muscosa*; *C. rupestris; C. rogersii; C. lycopodioides*	*Crassulaceae*	5-10	open
Cryptanthus acaulis; C. acaulis var. ruber	*Bromeliaceae*	5-10	open/clossed
Echeveria setosa var. deminuta; *E. lilacina; E. chihuahuensis; E. shaviana; Echeveria minima*; *Echeveria secunda*	*Crassulaceae*	5-10	open

Genus, species, cultivar	Family	Height (cm)	Terrarium type
Fittonia argyroneura; F.verschaffeltii	*Acanthaceae*	5-10	clossed
Ficus benjamina; F. retusa; F. diversifolia, F. triangularis, Ficus pumila	*Moraceae*	20 -30 10 -20	open/clossed
Guzmania lingulata var. minor	*Bromeliaceae*	20 -30	clossed
Haworthia fasciata	*Asphodeloideae*	5-10	open
Hedera helix 'Guyot'*; H. helix* 'Mein Herz'	*Araliaceae*	20 -30	open
Hemigraphis repanda	*Acanthaceae*	10 -20	open
Hypoestes sanguinolenta	*Acanthaceae*	20 -30	clossed
Kalanchoe tomentosa	*Crassulaceae*	5-10	open/clossed
Murraya paniculata	*Rutaceae*	10-20	open/clossed
Nephrolepis cordifolia 'Lemon Buttons'; *N. exaltata* 'Mini Ruffle'	*Nephrolepidaceae*	20 -30	open/clossed
Pachira aquatica	*Malvaceae*	20-30	clossed
Pellionia pulchra, P. daveauana	*Urticaceae*	10 -20	open/clossed
Peperomia caperata Rubra*; P. caperata* 'Little Fantasy'*; P. fenzlii; P. rotundifolia*	*Piperaceae*	5-10	open/clossed
Pilea spruceana	*Urticaceae*	10 -20	open/clossed
Plectranthus coleoides Variegatus	*Labiatae*	10 -20	open/clossed
Polyscia fruticosa	*Araliaceae*	20-30	clossed
Rhipsalis mesembryanthemum *Rhipsalis salicornioides*	*Cactaceae*	5-10	open/clossed
Saintpaulia ionantha	*Gesneriaceae*	5-10	open
Sansevieria trifasciata 'Golden Hahnii"	*Asparagaceae*	10-20	open
*Sedum spathulifolium '*Purpureum'*; S. spathulifolium* 'Cape Blanco'*; S. album; S. rubrotinctum* 'Nanum'*; S.adolphii*	*Crassulaceae*	5-10	open/clossed
Sempervivum tectorum	*Crassulaceae*	5-10	clossed
Soleirolia soleirolii	*Urticaceae*	5	open/clossed
Sphagnum moss	*Sphagnaceae*	5	clossed

Steps in realizing a miniature landscape – terrarium

- The first step in creating a terrarium has to begin with establishing the place or the destination of it (indoor, outdoor; shadow, half-light, light etc.) The terrarium can have only one front or it can be admired from all angles.

- Establishing the theme of the terrarium and making a sketch of landscaping (focal point, decorative construction).
- Choosing the container - shape and size of the container depend on the theme of the garden, personal taste, selected species. For the double-sided terrariums big bowls or even fish tanks can be used; for beginers are recomanded small containers (8-10 cm width and at least 8 cm depth), enough for growing a small bush/arbor alongside a few plants easy to mantain (graminaceae, ferns, succulents, mini-bromeliads).
- An important aspect is to secure the drainage, given the fact that for realizing terrariums are used glass containers that don't come with drainage vent;
- Choosing and finding/breeding plants.
- To determine the substrate of growth considering the plants requirements. It will be used a variety of substrates, but for the success of the compositions it is recommended the usage of the special substratum existent on the market (cactus and succulents substrate, bonsai substrate, decorative plant leaves substrate or universal substrate for gardens of unpretentious plants).
- To determine the materials and accessories that will be used (stones, sand, small decorative constructions) depending on the chosen theme.

Closed terrariums have to be watered once a month, but the scheduele of watering is diferent from one terrarum to another, and it depends on many agents, therefore it is recomanded that the substratum is checked in order to determine the amount and moment of watering. Open terrariums are watered between 3-6 weeks, depending on the species that have been used. In general for open terrariums resistant plants are used resistant plants that doesn't require frequent watering.

Proposals for realizing miniature landscapes

1. Clossed terrarium

Materials used for creating the terrarium:

o Species: *Sphagnum moss, Fittonia argyroneura "*Nana*", Cyanotis somaliensis, Ficus pumila, Pellionia daveauana.*

o Container - glass (diameter 1 cm, height 23 cm);

o Substrate - peat + perlite (3:1), vegetable coal, gravel for drainage; decorative stones.

2. Open terrarium

Materials used for creating the terrarium:

o Species: *Sphagnum moss, Iberis sempervirens, Ophiopogon japonicus, Adiantum raddianum, Juniperus chinensis "*Stricta*";*

o Container - glass (diameter 20 cm, height 25 cm);

o Substrate - peat + perlite (3:1), vegetable coal, gravel for drainage; decorative stones – placed in such manner that a mountain path is suggested.

3. Terrarium with oblique opening

Materials used for creating the terrarium:

o Species: *Anthurium scandens, Sphagnum moss;*

o Container - glass bowl with oblique opening (diameter 16cm, height 25cm);

o Substrate - peat + perlite (3:1), sand, vegetable coal, gravel for drainage; white decorative stones.

4. Open terrarium with succulents

Materials used for creating the terrarium:

o Species: *Crassula rupestris* ssp. Marnieriana, *C. orbicularis*, *C. orbicularis* var. rosularis, *Kalanchoe tomentosa*, *Aeonium haworthii*, *Sedum dasyphyllum*, *Rhipsalis salicornioides*;

o Container - glass (diameter 20 cm, height 15 cm);

o Substrate - Cactaceae potting soil, sand, vegetable coal, gravel for drainage; decorative stones.

5. Open terrarium with succulents

Materials used for creating the terrarium:

o Species:*Kalanchoe Tomentosa, Crassula orbicularis, Echeveria gibbiflora, Trandenscantia navicularis;*

o Container - cognac glass (diameter 10 cm);

o Substrate - Cactaceae potting soil, sand, vegetable coal, gravel for drainage; decorative stones.

CONCLUSIONS

The elements used in creating a terrarium are chosen in such manner that together will form a unified design. The terrarium can live from a few mounts up to a few years and represents a permanent decor option for indoor spaces and in-between spaces (terrace, balcony). Cactuses and succulents need a dryer environment therefore they will grow much better in an open terrarium, as for tropical plants a closed terrarium is recommended.

After one year of growing terrariums, the 26 species used have behaved very well without the necessity of replacing them, only minimum work of maintaining have been applied. The only specie that, after 12 weeks, has shown a decline in appearance was Sphagnum moss.

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ANNALS OF THE
UNIVERSITY OF CRAIOVA
Vol. XXII (LVIII) - 2017

Series: ✓ *Biology*
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CULTURE CULTIVATED IN GREENHOUSE

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Key words*: monitoring, attacks, harmful agents*

ABSTRACT

Tomatoes cultivated in greenhouse as other vegetable species growing under high humidity and high temperature conditions are affected by a series of pathogens and pests that evolve optimally in the same environmental parameters.

The attack of phytoparasites and animal pests without appropriate prevention and control measures can compromise culture. The severity of the attacks and the fact that they often overlap especially in greenhouse, which, of course, leads to a production decrease in terms of quantity and quality.

We have identified Phytophthora infestans AND Botrytis cinerea as The pathogen fungi with frequent attacks with economics effects were.

The overlapping interval of the phytoparasitic attack on tomato in greenhouse in the studied area is between the end of May and the end of the vegetation period with critical moments in the summer months.

Three particularly dangerous pests have been identified in the tomato greenhouse culture: Liriomyza trifolii, Tuta absoluta and Helicoverpa armigera.

The effect of the synergistic attack of pathogens and animal pests on tomato greenhouse culture leads to a diminution of production and the degradation of its quality because, in addition to the attack on the leaves, fruits are sometimes affected more seriously.

INTRODUCTION

Tomato culture is one of the world's most important food cultures (Willcox et al., 2003) and in our country (Sora and Iorga 2015).

Infortunately, tomatoes are being attacked by many phytoparasites and animal pests. As Iacob mentioned, in 2010, 35 parasitic diseases can be found in tomato crops, but some of them are considered to be key (Late blight produced by *Phytophthora infestans*, gray rot produced by *Botrytis cinerea*, early blight produced by *Alternaria solani* and leaf mold of the leaves produced by *Fulvia fulva*), which were also reported in the studied culture.

Data on the pathogenesis of these diseases were presented by numerous researchers both in the country (Oroian et al 2006, Pârvu 2007, Costache and Sovarel 2015, Mitrea 2006 etc.) and abroad (Agrios 2005, Elad et al., 2007, Lugtenberg 2015 etc.), and for animal pests (Borisade et al. 2017, Costache, M., and Roman, T., 1998, etc.)

MATERIAL AND METHOD

Monitoring the attack of some harmful agents from a tomato greenhouse culture was carried out during the growing season in 2016.

The main purpose of our research was to study pathogens and pests that affect tomato crops in protected areas in the Osica de Sus area, to allow for adequate prevention and control measures to reduce the biological reserve and damages produced following an attack that exceeds the economic damage threshold (PED).

The tomato culture in which the research was carried out was set on 20 March 2016, with seedlings obtained in a private household in the Osica de Sus area.

The biological material was represented by the cultivars: *Platus F1, Corvinus F1* and *Magnus F1.*

In order to determine the phytosanitary status of this crop, we focussed on the main harmful organisms: *Phytophthora infestans* (Mont.) By Bary; *Botrytis cinerea* Pers .; *Alternaria solani* (Ell., Mart.) Jones et Ground; *Fulvia fulva* (Cooke) Ciferri; *Liriomyza trifolii; Tuta absoluta; Helicoverpa armigera*

The estimation of the attack was made for the pest agents identified by: frequency (F%), intensity (I%), and degree of attack (GA%), determined parameters according to the methodologies used in forecasting and warning stations in within the framework of the National Phytosanitary Network (M.A.I.A. - Forecasting and Warning Methods, 1980).

RESULTS AND DISCUSSIONS

In tomato greenhouse culture, in the private household, in 2016, the occurrence and evolution of pathogens was differentiated as frequency, intensity and degree of attack, depending on microclimate conditions.

During 2016, the first symptoms have been observed on leaves since early May as a result of the pathogen attack of *Phytophthora infestans* and *Botrytis cinerea* (Table 1).

In the case of Botrytis cinerea attack on May 7 on the basal leaves appeared the first yellowish-green spots. Later on, we have recorded the presence of a gray fluff represented by conidiophores with conidia of the fungus. Finally, the attack led to the browning of parasited tissue as a result of its mortification (Figure 1).

Table 1

Recording the first symptoms of phytopathogenic agents in the solar tomato crop in 2016

Pathogen agent	**Data of the attack**	
	Attacked organ	
	Leaves	**Fruits**
Phytophthora infestans (Mont) de Bary	10.05	20.05
Botrytis cinerea Pers.	7.05	26.05
Alternaria solani (EPP. Et Mont)Jones et Ground	18.05	29.05
Fulvia fulva (Cooke) Ciferri	25.06	-

Attack of *Phytophthora infestans* fungus was also observed on May 10 on basal leaves. On the top of the foliales there were noticed "greenish" circular spots (fig. 2). Instead of these spots on the underside of the foliales appeared sporangiofors with sporangi, and finally the attacked area was necrotic.

Fig. 1. *Botrytis cinerea*

Fig. 2. *Phytophthora infestans* - attack on tomato leaves (original)

Around the 18th of May, the attack of the micromycote Alternaria solani has been noticed on the top of the foliales. On the foliage there were isolated brown spots, concentric zoning (Figure 3).

At the end of June (25.06) it was recorded a fulminant attack of Fulvia fluvo fungus. The attack was manifested by the appearance on the leaves of the lower floors of yellow spots, on the bottom of the leaves appeared the conidiophore with conidiums fluff, which in time had a brownish color (fig.

Fig. 3. *Alternaria solani*

Fig. 4. *Fulvia fulva* - attack on leaves (original)

Regarding the attack on fruit, as can be seen from the data of the same table 1, the first symptoms occurred at the end of the second decade of May and the third decade of the same month. The attack caused by the Phytophthora infestans pathogen was felt on (20.05) and then at six or nine days the attack of Botrytis cinerea (26.05) and Alternaria solani (29.05) respectively.

Attack of the fungus Phytophthora infestans was initiated at the insertion of the peduncle. There were large, burn-violet spots that became brown and soon took the fruit entirely. In addition to the spots, has been noticed the whitish fluff represented by sporangiophores with pathogen sporangiomas. Many of the fruits affected by the manna fell on the surface of the soil (fig.5).

The attack of the Botrytis cinerea fungus caused the appearance of the so-called phantom" spots on the fruit (represented by a central necrotic point bounded by a whitish border) (Figure 6).

The attack of the Alternaria solani fungus manifested on fruit with the appearance of circular, deep spots, disposed mostly around the peduncle. In time they became blackish, shiny, concentric zoning as seen from (Figure 7).

Fig. 5. *Phytophthora infestas*

Fig. 6. *Botrytis cinerea – attack* on fruits (original)

Fig. 7. *Alternaria solani* – attack on mature fruits (original)

. Analyzing the overlapping interval of pathogens attack, in the tomato culture from Osica de Sus area in 2016, critical moments for culture have been identified since mid-May, requiring the application of chemical control measures.

It was also found that the attack of the four pathogens overlaps during the vegetation period for a period of 105 days with synergistic effects in terms of diminishing production and quality.

It is not to be neglected that for each pathogen whose attack was identified there was a peak with a maximum attack rate, so for *Phytophthora infestans* the

highest value of the attack degree (3.1%) was registered in the last decade of June after which the attack was not reported. For the Botrytis cinerea pathogen, the highest value of the attack degree was found in the second decade of August (21.7%). In the case of the *Alternaria solani* and *Fulvia fulva* fungi, the highest value of the attack degree was (18.1%) and 7.9% respectively, and the latter attacked in the second decade of the month August.

The main pests of tomato in the greenhouse that caused lesions and which degraded fruit quality were: *Liriomyza trifolii, Tuta absoluta* and *Helicoverpa armigera (*Table 2).

Table 2

The main pests identified in greenhouse tomato culture in 2016

Pest	**Pest reporting period**	**Frequency (%)**
Liriomyza trifolii	5.05	8%
Tuta absoluta	20.05	15%
Helicoverpa armigera	15.06	30%

In the first decade of May (5.05) in the observed culture we found the presence of the *Liriomyza trifolii* pest. The attack is produced by the larva of the pest that develops between the folds of the foliage, where it produces sinuous galleries (Figure 8). At the surface of the leaves, the galleries are grayish.

On a single leaf can be found a large number of galleries. As a result of the attack, the leaves reduce the assimilation surface, the plants develop slowly, fruit production is reduced. The recorded attack frequency for this pest was 8%.

Another pest identified in the tomato culture was *Helicoverpa armigera*. At first the larvae attack the epidermis of the leaf, then attack the fruit penetrating inside them by consuming the pulp leaving their faeces in the fruit. Once the larvae have penetrated into the fruit it becomes hard to control. A single *Helicoverpa* armigera caterpillar can attack successively all the fruits in a tomato clove (Figure 9)

Fig. 8. *Liriomyza trifolii* Attack on leaves (original)

Fig. 9. *Helicoverpa armigera* Attack on fruite (original)

Once attacked, fruits lose their commercial value, become devoid of consistency and rot easily. For this pest, the frequency of the attack was 30%, making its presence in mid-June.

Starting with 20.05, we have identified Tuta absoluta species that can cause damage to all the underground organs of tomato plants in all phases of vegetation. The attack on the leaves consists of galleries inside the leaves, the larvae consume only the mesophyll of the leaf. The mines caused by larvae appear at first as small whitish spots. As larvae feed and grow, the spots on the leaves grow, become white - green, then yellowish. The galleries (mines) are of irregular shape, they can be separated or united depending on the density of the pest population, within the galleries there are black debris, excrement (fig.10).

The attack on the the fruit consists of galleries inside fruits, favoring the penetration of pathogens (bacteria, fungi) that cause damage to the fruit, making them improper for marketing and consumption (fig.11).

As a result of *Tuta absoluta* species attack, tomato production can record catastrophic losses.

Fig. 10. *Tuta absoluta* Attack on leaves (original)

Fig. 11. *Tuta absoluta* attack on fruit (original)

CONCLUSIONS

Tomatoes cultivated in greenhouse as other vegetable species growing under high humidity and temperature conditions are affected by a series of pathogens and pests that are optimally evolving into the same environmental parameters.

The attack of the phytoparasites without appropriate precautionary and control measures may lead to the emergence of diseases that in many cases may compromise culture.

Pathogenic fungus with frequent attack and economic effects on the tomato greenhouse culture from Osica de Sus area in 2016 were: *Phytophthora infestans* and *Botrytis cinerea*.

The overlapping interval of the phytoparasitic attack on tomato greenhouse culture from Osica de Sus area is between the end of May and the end of the vegetation period with critical moments in the summer months.

Also in the tomato greenhouse culture has been identified some dangerous pests as follows: *Liriomyza trifolii*, *Tuta absoluta* and *Helicoverpa armigera.*

The frequency attack of these pests ranged from 8% to *Liriomyza trifolii* and 30% to *Helicoverpa armigera.*

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ANNALS OF THE UNIVERSITY OF CRAIOVA

Vol. XXII (LVIII) - 2017

Series: ✓ *Biology*
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INFLUENCE OF SOME ENVIRONMENTAL FEATURES UPON THE FERMENTATIVE CAPACITY OF A *SACCHAROMYCES SPP.* STRAIN ISOLATED FROM THE SPONTANEOUS MICROFLORA

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Keywords*: yeasts, fermentation, factors, sugars metabolised*

ABSTRACT

The concept of directed fermentation does acquire nowadays some new meanings. There are several works which do sustain the fact that the Saccharomyces cerevisiae strains which have been isolated from the environment that does exist within vineyards do indeed own some technological assets which could be compared to the ones held by the yeast'strains which are selected for trading purposes. The technological potential offered by the indigenous yeast'strains is therefore brought to the general attention, due to the fact that their own and inner specific metabolic features do indeed lead towards the creation of some accurately distinctive and specific flavours which do constitute the local wines'respective typological patterns (Popa A., Popa D., Dragomir F., 2004).

INTRODUCTION

The existing competition between the indigenous yeasts and the selected ones is studied through the research programs. They point out as well the necessity of gathering some specialized collections which ought to be specific for each of the existing viticultural areas (Băducă Cîmpeanu C., 2003; Dragomir Tuţulescu F., 2010; Schuller D., Alves H., Dequin S., Casal M., 2005; Varela C., Borneman A. R., 2016).

The present work had as its chosen purpose the action of testing the fermentative capacity of a yeast'strain which has been isolated from the spontaneous microflora of the Drăgăşani vineyard, for various concentrations of sugars and under various temperature conditionings. Though, for a given environment, both the temperature and the sugars'concentration are to be considered among the physical features which do indeed influe upon the yeasts'activity, temperature is an external dimension while the sugars'concentration is an intrinsic feature for the environment where the concerned micro-organism does activate (Giugea N., Gheorghiţă M., 2005; Ţârdea C., Sârbu Ghe., Ţârdea A., 2010).

MATERIAL AND METHODS

The employed culture media have been: YMA (yeast extract, malt extract, agar), made use of in order to isolate and therefore to obtain a pure culture, the YM liquid environment (yeast'extract, malt extract) made use of in order to perform the morphological tests and the environment made of sterilized grapes'must endowed with various concentrations of sugars (190g/l, 250g/l and 350g/l) made use of in order to

test the resistance of the SDN1 yeast'strain when submitted to various osmotic pressures and to various temperature thresholds (12-15^{0}C, 25^{0}C and 35^{0}C).The fermentative capacity of the isolated strain has been tested through the daily recording of the respective amounts of unmetabolized sugars that have remained within the culture medium by the means of a portable refractometer of the Zeiss type.

RESULTS AND DISCUSSIONS

The fermentation graphs have been drawn upon the grounds of the performed readings. The indices that have been taken into consideration are: the rerspective amounts of metabolized sugars for a duration of 24 hours; the gathered amounts of respectively metabolized sugars till the current day but as well the dynamics of gathering for the respective amounts of unmetabolized sugars which have remained into the environment. The isolated yeast'strain has been the most active under the conditions created by the C2 concentration, case into which, in comparison with C1 that was ranked as the second, an amount of 17,3% more metbolized sugars has been recorded (fig.1).

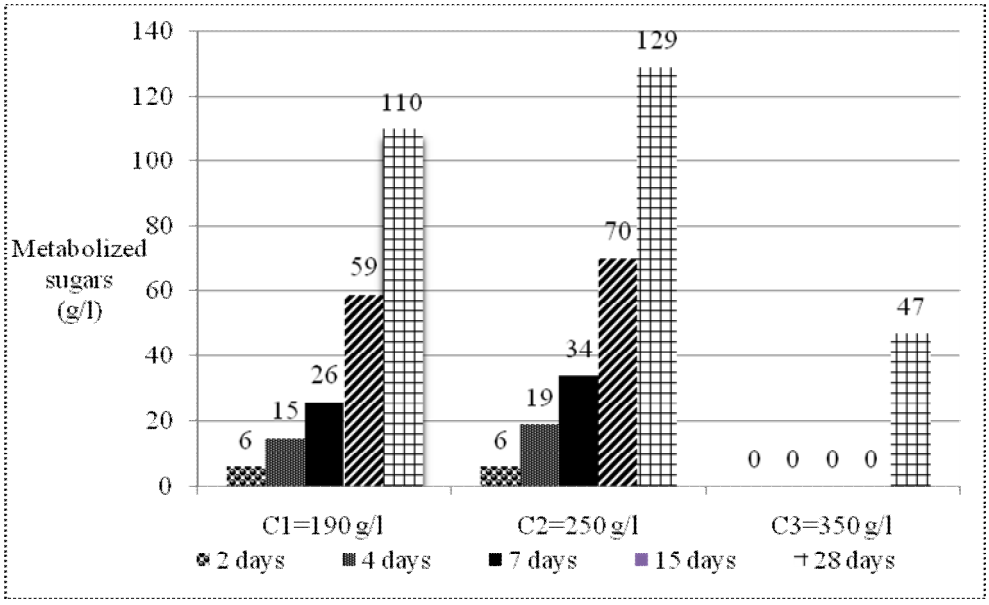

Fig.1. Metabolized sugars (g/l) after 2, 4, 7, 15, respectively 28 days at the temperature T1

When it could be achieved, the fermentation at some lower temperatures does indeed present a series of advantages: it does maintain the wines'aroma, it does retain into the wine an increased quantity of CO_2 (it does offer to the wines the respective touches of freshness and of fruitfulness), it does indeed lead to smaller losses of alcohol, it does indeed develop a reduced volatile acidity. In spite of the fact that the osmotic stress has been present under the conditions created by the C3 concentration, the temperature T2 has stimulated the activity of the studied yeast in comparison with C3 and T1, so that in the end 38,6% of the sugars'amount that were

present into the concerned environment have come to be metabolized, a figure to be compared with the one of only 13,4% of consumed sugars in the first case (fig.2).

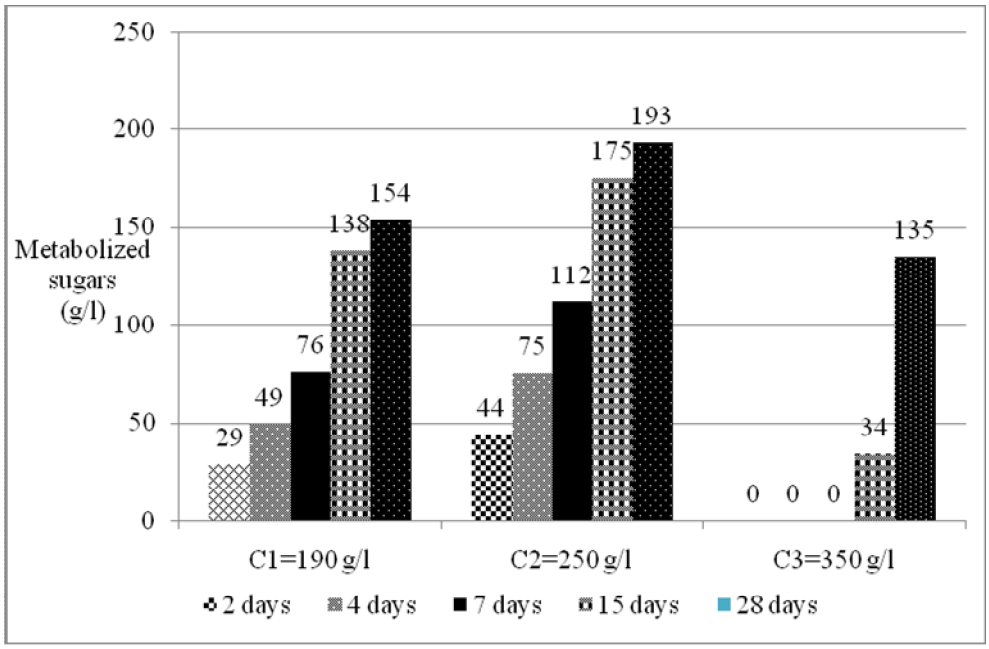

Fig.2. Metabolized sugars (g/l) after 2, 4, 7, 15, respectively 28 days at the temperature T2

During the four weeks the studied yeast has been able to stand against the osmotic stress only within the environments endowed with the C1 concentration. From the initial concentration of 190 g/l till the end of the research period, an averagely mean amount of 146 g/l in sugars has come to be successfully metabolized. We do as well have to mention the fact that C3-T1 A and C3-T1 B, the two values for which the average mean has been calculated, have been equal one to the other, that is to say bearing the value of 146 g/l (fig.3).

The key of success when it comes to the achievement of aromatic wines with a remaining amount of sugar is represented by the combination between a high concentration of sugars within the must and a temperature of fermentation situated around 15^0C. It is only under these circumstances that the intrinsic qualities which are owned by the kinds of Romanian Tămâioasă, Muscat Ottonel and Busuioacă from Bohotin could be adequately pointed out, but it is useful to remark the fact that due to these conditions the white kinds but as well the semi-aromatic ones could both develop at their best.

By simply following the graphs we have presented until this moment we are able to ascertain the fact that the studied yeast'strain is characterized by an appropriate ecological plasticity since it is able to metabolize the sugars it does meet in the environment in 8 among the 9 tested situations. In 4 among them the fermentative process has been initiated even since the former 24 hours while in other two situations

the fermentation's debut has been delayed with only a day. Another important indicating item is the duration held by the fermentative process.

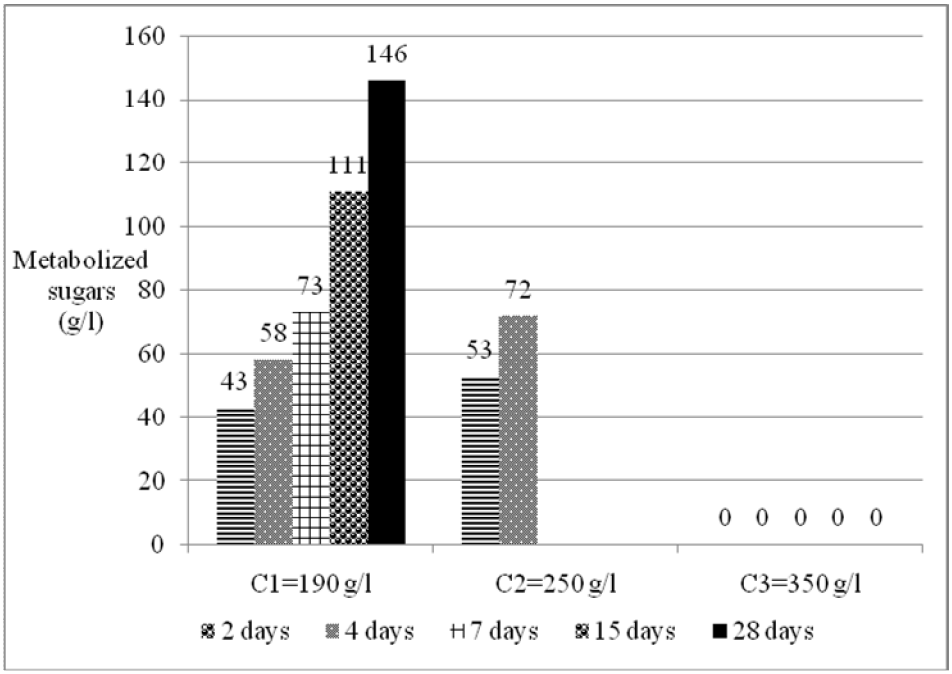

Fig.3. Metabolized sugars (g/l) after 2, 4, 7, 15, respectively 28 days at the temperature T3

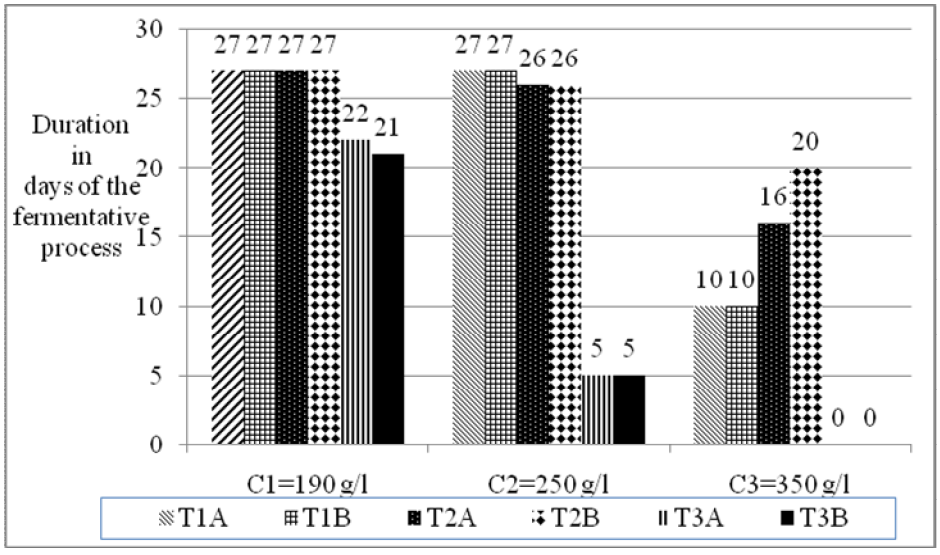

Fig.4. Duration of the fermentative process

It is directly related to the stress or either comfort degree to which the respective microorganism is submitted in its interaction with the environment. Lower temperatures have come in this context to be associated with some longer durations of the fermentative process (fig.4). The existence of some sugars which come to be metabolized during the former 24 hours does as well offer an accurate image of the comfort degree under which the studied micro-organism does find itself while being submitted to the environment's initial conditions. Under the circumstances offered by T1 the yeast strain's adaptation to the environment is delayed (fig.5).

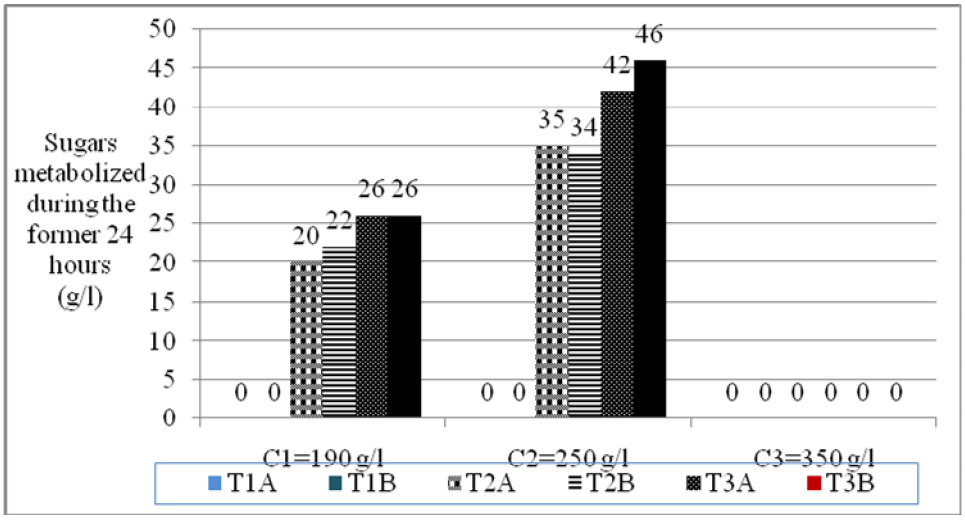

Fig.5. Sugars metabolized during the former 24 hours (g/l)

CONCLUSIONS

The influence of the environmental phenomena should be treated under a systemical perspective, since the whole of them is something else than its composing parts. Extracting temperature from its relationship with the osmotic pressure or in other words departing the sugars'concentration from the context of temperature could lead to some errors when it does come to the interpretation of results. The studied yeast strain is a part of the maesophile yeasts'group and had to act under the conditions offered by the temperature of 25^0C.

The best results have been obtained in what does concern the metabolized sugars, insofar quantity does matter but mostly from the perspective of the modality through which the fermentative process has been carried on. The fact has been ascertained that the SDN1 yeast does pretty well tolerate the low temperatures, to which it does manage to adapt after a certain delay. Due to the osmotic pressure the length of the time lapse which it does need in order to adapt does increase till 19 days in the case of the environment owning the highest density. In the respective cases of lower concentrations, that is to say till 250 g/l of sugars, the adaptative delay does decrease till one day only. For osmotic pressures within environments bearing sugars'concentrations lower than 250 g/l SDN1 is able to resist under temperatures of 35^0C. It does that the better insofar the concerned environment does present a lower sugars'concentration.

The stress induced to the SDN1 strain by the high temperatures is directly correlated with the growth of the osmotic pressure within the concerned environment. This is the reason why, in comparison with the high temperatures, low temperatures are easily endured. At normal osmotic pressures and concentrations of sugars in the environment of 250 g/l or lower, the low temperature does become the most restrictive though very influential item.

At high osmotic pressures and concentrations of sugars in the environment situated around 350 g/l , the most restrictive though very influential item is the osmotic pressure. At the highest temperature, the one of 35^0C, the fermentation period does become shorter insofar the osmotic stress does increase.

The metabolic activity of the SDN1 strain has been completely inhibited by the combintion between a high osmotic pressure and the temperature of 35^0C **.**

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ANNALS OF THE UNIVERSITY OF CRAIOVA
Vol. XXII (LVIII) - 2017

Series: ✓ *Biology*
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WAYS OF BEDDING PLANTS USE IN GREEN SPACES

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Key words*: vegetative propagation, carpet bedding, green spaces*

ABSTRACT

The bedding plants are the most important group of plants grown for their distinctive decorative qualities, such as flower and foliage colour, interesting forms or textures, being commonly used in public parks and gardens, in residential landscapes, in carpet beds and in other types of floral compositions, but also as plants in containers on patios, hanging baskets for the decoration of balconies. Plants with decorative leaves, typical for carpet bedding, were propagated vegetatively by shoot tip cuttings, for the production of planting material. The following parameters were evaluated: height of rooted cuttings, the number and length of roots, rooting percentage. Depending on the species, the best results regarding the rooting percentage of the cuttings and the quality of the plant root system were recorded in perlite and in the substrate composed of peat and perlite.

INTRODUCTION

Foliage bedding plants have multiple uses in various floral compositions, that can be changed annually, providing a long-lasting décor in urban green spaces. They are especially used in the decoration of carpet beds, but they are also found in arabesques, simple and mixed floral borders, flowerbeds, etc.

The art of carpet bedding was very popular in olden times and it used to be a common feature of any formal garden. The carpet bedding can be designed in different ways, depending on the plants available, the creativity and imagination of the designer and look better when is arranged in a slope or a slanting position (Randhawa & Mukhopadhyay, 1986).

True carpet bedding is an area covered of dwarf plants with coloured foliage into complex patterns. A variation of this type of arrangement, namely picture bedding, developed quite quickly in private grand gardens, then in city parks. Extensive carpet bedding schemes in the 19th century villa gardens were a symbol of wealth, the cost of materials and labour being high. In tourist towns, floral clocks, animals, birds, coats of arms or simple messages created with a range of dense, compact, herbaceous flowers and foliage plants with low-growing, can be admired in public parks (Hessayon, 1991, 2008). This type of bedding is done very often to commemorate a special event, but small scale planting schemes can also be carried out in private gardens (Fish, 2004).

The elegance, simplicity and unity of the design, the contrast or harmony of the flowers or foliage colours, determine the beauty of a carpet bed, which is placed on

lawns, in areas of maximum interest in green spaces, in front of important buildings or along the walkways.

In this type of floral composition there are used species with decorative leaves, typical for mosaiculture - *Alternanthera, Iresine, Cineraria, Santolina, Coleus, Gnaphalium*, succulent plants - *Echeveria, Sedum, Sempervivum*, and also small, well-branched and uniform cultivars of annual species such as *Ageratum houstonianum*, *Begonia semperflorens, Lobelia erinus, Lobularia maritima, Tagetes patula*, which are disposed in geometric or thematic pictures, giving a tapestry or carpet effect (Iliescu, 2003).

Foliage bedding plants are usually propagated vegetatively by shoot tip cuttings and sometimes by seeds (Zunete Beckmann et al, 2014; Carpenter, 1990).

For the full coverage of the soil, the plants must be well-branched, uniform and the planting distances very small, 5-10 cm. During the vegetation period, the trimming of the shoots is carried out, which requires a lot of experience and skill, in order to maintain an equal height of the plants, as well as the design within the carpet bed.

The paper presents the results of research on the vegetative propagation of some species highly appreciated for the decorative value of the leaves, in order to produce the planting material necessary for the arrangement of a small carpet bed.

MATERIAL AND METHODS

The biological material used to make the carpet bed was formed of plants obtained from rooted cuttings, from species with decorative leaves used in mosaiculture, as well as of seedlings of annual flower species purchased commercially, namely *Begonia semperflorens* and *Tagetes patula*.

In February, shoots from mature plants of *Alternanthera amoena, Alternanthera ficoidea, Cineraria maritima* and *Iresine herbstii* were harvested, from which shoot tip cuttings were made, that were treated with Radistim No.1, a biostimulator in the form of powder, indicated for rooting herbaceous cuttings. Three types of substrate were used: perlite, mixture of peat and perlite (1:1), sand. During the experimental period, the air and substrate temperature was 24^0C and the relative humidity was 60-70%.

The rooted cuttings were planted in small pots of 8-10 cm in diameter, in a substrate made of peat, manure and perlite mixture, and the pinch was made for a richer branching, until planting in the space of decoration.

The observations and biometric measurements were carried out in 2016 in the Floriculture discipline greenhouse of the Faculty of Horticulture of Craiova and focused on: the rooting percentage; the height of rooted cuttings, the number and length of roots, in the moment of planting in pots.

At the beginning of June, based on a project made in the Realtime Landscaping Architect software, a small carpet bed with a surface of 2.21 m^2, was arranged in the didactic and research field of the floriculture discipline.

RESULTS AND DISCUSSIONS

In order to produce the planting material necessary for the arrangement of a carpet bed, the species with decorative leaves have been propagated vegetatively by shoot tip cuttings, rooted in three types of substrate: perlite, sand, peat and perlite (1:1).

A good culture substrate has to provide material support for root development, water and nutrients, allow oxygen diffusion to the roots and gaseous exchange between roots and atmosphere (Argo, 1998).

The researches on the influence of the rooting substrate on the process of rhizogenesis revealed its important role in the success of cuttings rooting. The substrates used in the experiment influenced the rooting percentage of the cuttings, but also the quality of the formed root system.

The results show that in the *Alternanthera amoena* and *Cineraria maritima* species the highest rooting percentages were obtained both in peat and perlite mixture, as well as in perlite (100%). At *Alternanthera ficoidea*, the best results regarding the percentage of rooted cuttings were obtained in peat and perlite, and at *Iresine herbstii* in perlite, while the lowest values were recorded in the sand substrate in both species (85%) (figure 1).

Regarding the average height of the cuttings, the highest values were obtained at the cuttings of *Iresine herbstii* (15.8 cm) and *Alternanthera amoena* (9.7 cm), rooted in peat and perlite, respectively at the cuttings of *Cineraria maritima* (11.8 cm) and *Alternanthera ficoidea* (6.7 cm) in perlite, and the lowest values were recorded in the sand, in all species (figure 2).

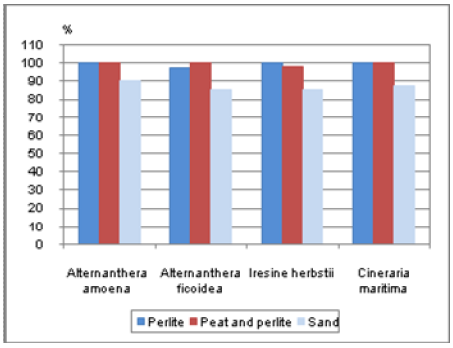

Figure 1 Percentage of rooting

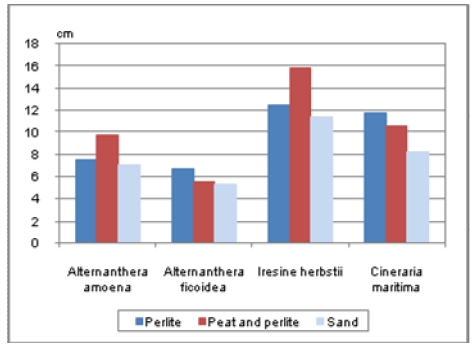

Figure. The average height of rooted cuttings

In figure 3 it is observed that in both species of the genus *Alternanthera*, the highest number of roots per cutting was recorded in peat and perlite (16.7-18.5). At *Iresine herbstii* and *Cineraria maritima*, the average number of roots was higher in perlite, in comparison with the other rooting substrates.

The best results for the root length were obtained in peat and perlite, with average values of 10.0 cm at *Alternanthera ficoidea* and 13.8 cm at *Alternanthera amoena*. At the other studied species, the root length recorded the highest values in perlite substrate, namely 10.4 cm at *Iresine herbstii* and 8.5 cm at *Cineraria maritima* (figure 4).

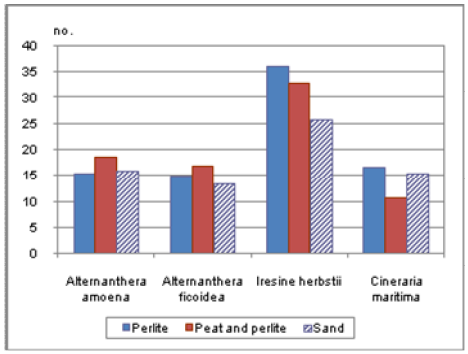

Figure 3. The average number of roots

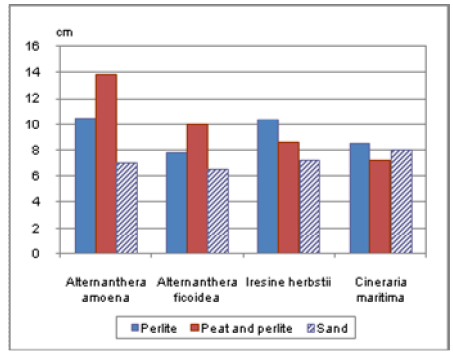

Figure 4. The average length of roots

The planting material obtained from the vegetative propagation was used to make a small carpet bed, after the model and its dimensions has been established first on paper, then in a professional landscape design software - Realtime Landscaping Architect (fig. 5).

The achievement of successful floral compositions is conditioned by the proper preparation of the land, which consisted in removing the previously existing vegetation layer (grass and weeds), the gathering of vegetal remains, digging (at a depth of 30-40 cm), fine crushing of superficial layer of soil, raking and levelling the soil. The next step was to apply the design on the ground by picketing, to mark the straight lines and drawing with sand of the desired shapes in the carpet bed.

Fig.5 The proposed pattern of carpet bedding

For planting purpose, the number of plants required has been established and the most compact and uniform plants have been chosen. The planting of the chosen species began from the centre of the carpet bed to the edge, respecting the appropriate distance between the plants and their position on the previously established drawing.

Very appreciated species for the shape and colour of the leaves, were used to make the carpet bed with a surface of 2.21 m^2: *Alternanthera amoena* (green-yellowish), *Alternanthera ficoidea* (green-olive), *Iresine herbstii* (dark red), *Cineraria maritima* (white-silver), as well as the annual species decorative by flowers - *Begonia semperflorens* and *Tagetes patula* (fig. 6).

During the vegetation period, current maintenance works were applied, such as watering, trimming, weeds removal by weeding, very important being the trimming of the shoots, which is carried out in order to keep the plants at the same height, considering the fact that in the plants used in arranging the carpet beds, the rapid growth in height is not an advantage.

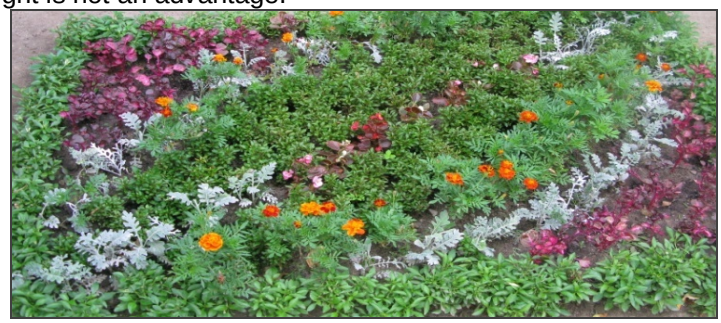

Fig. 6 The carpet bed after planting

Proposals of arranging a various floral compositions with foliage bedding plants in green spaces (fig. 7 - 9).

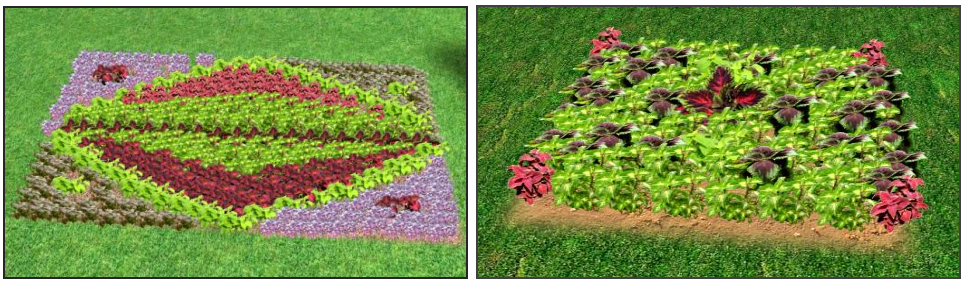

Fig. 7 Carpet bedding with foliage plants

Fig. 8 Flowerbed

Fig. 9 Foliage bedding plants in front garden

CONCLUSIONS

According to the experimental results, it was found that out of the three rooting substrates used, the best results regarding the rooting percentage of the cuttings were recorded both in perlite, and mixture of peat and perlite, and the lowest rooting percentage was obtained in sand substrate.

The rooting substrate also had a positive influence on the root system, the highest values in terms of the number of roots per cutting and the length of the roots, were recorded in the peat and perlite substrate in both *Alternanthera* species and in perlite for *Iresine herbstii* and *Cineraria maritima* species.

The studied and vegetative propagated species for the production of the planting material, due to the particular aspect of leaves, in different sizes, shapes and colours, can be used in green spaces in various floral compositions, such as carpet bedding, arabesques, flowerbeds, borders, alone or in combination with annual species decorative by flowers. During the vegetation period it is necessary to apply constantly the trimming of the shoots, in order to keep the plants at the same height, as well as the drawings within the carpet bedding.

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ANNALS OF THE UNIVERSITY OF CRAIOVA
Vol. XXII (LVIII) - 2017

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AIR QUALITY AS NATURAL CAPITAL FACTOR – AN OBJECTIVE REQUIREMENT FOR MAN AND SOCIETY

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Keywords*: natural capital, air micro-flora, environment indoor air, health*

ABSTRACT

Studying microorganisms in the air, which are of human or animal origin, are of particular interest from the point of view of health. Exposure to the presence of microorganisms suspended in the air of working and residential indoor environments is always associated with a wide range of adverse effects with major public health impacts. So, the quality of indoor air, as natural resources is one of the most significant factors affecting the well-being of people and of the society. The objective of this study was to perform a survey of air quality in some important points in the hospital environment and an identification of the present bacteria groups. The study was carried out in three stages of air sampling (June, November, February), which involved exposures of Petri plates with simple nutritional agar medium (usual culture medium) in the departments of a Hospital from Craiova (Romania), Pediatrics Section, namely: Patient Salon; Bandage room; Surgery room; Hallway of the section. The official information on micro-flora of indoor spaces is extremely rare and inconclusive, the approach of such study topics being mainly beneficial for the institutional management, avoiding the occurrence of such occupational diseases due to exposure to microbial agents. In all three months of exposure, a number of germs was found to be much higher than the guidelines. In the hospital air microflora prevails the germs of the genus Staphylococcus followed by the germs of the genus Streptococcus, while the bacilli are present in a higher percentage in the Patients salon. Airborne microbial load data should be used to implement an integrated management system at hospital level, reducing the risk of contracting infections and reducing maintenance costs.

INTRODUCTION

Natural capital – air, water, land - enable grow and development of humans and societies, through the variety of environmental functions and life-support mechanisms. At present time, is steel difficult to isolate and to analyse the contribution of natural capital components to man activity and to society, because of limited data and insufficient methodology. Natural capital stocks, including air and its environmental functions, provide a direct contribution to economic output and to the quality of services for human welfare. (Knight et al.,2013).

For a variety of purposes within the healthcare state, microbiologically controlled environments are used. Airborne microorganisms come mostly from the wild. To this is added microorganisms from humans or animals. Frequency and nature depend on where we are watching. Thus, in sparsely populated areas, microorganisms of nature will dominate, their maximum number being close to the soil, especially if it is rich in vegetation and lower in altitude, in desert areas or on large water areas, at a distance from shore. The structure and density of microbial flora in the air is changing in areas where there are organized human communities. In addition to the germs in nature, germs adapted to human and animal parasitism also appear, their density in the air increasing according to the population density in the area. Also, the relationship between microbial flora in nature and flora of human origin changes, the latter becoming changing in room conditions, especially when there is agglomeration or poor ventilation. ***The study of microorganisms in the air, which are of human or animal origin, are of particular interest from the point of view of health.*** Exposure to the presence of microorganisms suspended in the air of occupational and residential indoor environments is always associated with a wide range of adverse health effects with major public health impacts. So, the quality of indoor air is one of the most significant factors affecting the health and well being of people who inhale at least 10 m^3 of air every day, and spend between 80–95 % of their lives indoors. (Dacarro et al., 2003, Piotrowska et al., 2001). The assessment of environmental conditions in hospital units is an essential measure for assuring the quality of the medical act and the health of the population. The microbial flora may be present in the air, it may contaminate objects, devices, materials, their presence reflecting a poor quality of the medical services in the respective unit, implicitly non-observance of sanitary-sanitary norms. Most microorganisms survive well in hospital environments, such as in the air (bacteria below 10 μm may remain in the air for several hours or may be inhaled once with dust particles). It is mandatory to control the effectiveness of chemical disinfection applied by bacteriological methods regarding: aeromicroflora, surfaces, linen, machinery from food blocks, personnel hands. The total number of germs must not exceed the norms: 200 NTG/m^3 after cleaning/disinfection and 500 NTG/m^3 during work. A clean environment in hospital units plays an important role in the prevention of in-hospital infections, the transmission of which is influenced by many factors, such as air quality (Moleavin &Moraru., 2013). ***Applying adequate air management from hospital environments can reduce microbiological risk and also maintenance costs.*** We can consider the hospital buildings as dynamic environments; they can be affected by seasons, environmental factors, indoor ventilation systems, moisture, outdoor microbial load and number of occupants, visitors and human activities. The airborne microorganisms from hospitals buildings, such as bacteria, come from humans (patients, visitors, medical personnel) and also from various environmental sources, leading to bacterial air pollution (Viegas et al., 2015). That's why, regular monitoring measures of hospital environment is essential for microbial control by detecting the eventual irregular introduction of airborne particles. Now days, a multidisciplinary challenge for hospital managers and occupational health is to achieve a satisfactory microbial control in hospitals environment (Monteiro & Cabo Verde 2017). Although it is not possible to speak of an air micro-flora in the sense that there are no standards, the presence of microbial germs in the air in general and in the in-hospital environment in particular can give us indications of the degree of air contamination, which can translates to a higher or lower risk of infectious diseases and inter-contamination from healthy carriers to vulnerable persons (children, the elderly). Bacteriological air

analysis is not intended to detect a particular pathogen, but the extent to which air is loaded with micro-flora of human or animal origin. This is the case with some bacteriological air contamination indicators: total number of germs (TNG) in air that develop at 37°C (mesophilic flora in the air), colony-forming units (CFU), hemolytic streptococci (β-haemolytics) and (α-hemolytics), Staphylococci, coliform group.

MATERIAL AND METHODS

For this study, air samples were taken at a Hospital in Craiova, the Pediatric Section, namely: a salon with patients; a bandage room; an operating room; the lobby of the section. Samples were taken by sedimentation method (Koch method), using blood culture agar and nutrient agar as culture media. Exposure time of the open plates was 5 minutes. Their incubation temperature was 37°C. The determinations were based on the following parameters: determination of C.F.U., establishment of T.N.G/m^3; stabilization of the micro-organisms types that make up the air micro-flora at each sampling point for 5 minutes.

The ambient temperature was 19°C in the first three points and 2°C less in the lobby. Immediately after exposure, the plates were isolated and brought to the Microbiology Laboratory of the Faculty of Horticulture in Craiova, where they were incubated for 72 hours at 37°C, the first readings being made after 48 hours. There are no standard methods for air sampling. Available literature indicates that air-sampling methods could be highly variable, so that the same volume of air sample will produce similar rates of recovery (Ming-Ju Wu et al., 2011). We are dealing with limited available data concerning the accuracy, precision, sensitivity, and limits of detection and monitoring the air quality. The sedimentation method (Koch method) does not allow the actual number of microorganisms in the air, but only the sedimentary fraction in the time portion. Also, there is no unitary mode of expression of the result so far, the number of germs can be expressed in terms of time and surface.

For expression on air volume unit, Omeliansky's calculation formula can be used, which is based on the observation that over 10 minutes of deposition on an area of 100 cm^2 germs of 10 liters of air.

The calculation formula is: nr germs/ m^3 air = $\dfrac{nx\ 10000}{Sx\ \dfrac{T}{5}}$

Were: n = the number of colonies developed on the surface of the culture medium

S = surface of Petri box (in cm^2)

T = exposure time.

The formula is frequently applied in practice, although the results obtained have a certain error rate.

RESULTS AND DISCUSSIONS

The result of reading the plates exposed at the 4 points in summer period is shown in Table 1, concerning CFU (colony forming units), TNG (germ count/m^3) and on the presence of bacilli, streptococci and staphylococci.

Table 1.

Results concerning the air microflora obtained in summer exposure in the in-hospital environment

Sampling point/Parameter	**Patients salon**	**Bandage room**	**Operation room**	**Lobby**
CFU/m^3 air	9	8	6	4
TNG/m^3air	1146,5	1019	764	509
Bacilli (%)	17	25	33	25
Streptococci (%)	33	25	11	25
Staphylococci (%)	50	50	56	50

The largest number of colonies has been highlighted in the "Patient Salon", which can be interpreted as many healthy carriers release microbial germs that other patients are immune to or not. Colonies were highlighted in relatively large numbers, and at two other points, which should be virtually empty or have very few microbial germs in the air.This is the Bandage room and the Operation room.The presence in the air of microbial germs in these points indicate that ***the sterilization and aseptic conditions or the used antiseptics and disinfectants are not very effective, given that plaque exposure has occurred after prior disinfection.*** The smaller number of colonies that have developed in the Lobby may be explained by the fact that it is in the "open system", compared to the others 3 points where we can assume that the lack of proper ventilation and slightly higher temperature allow microbial germs to grow better. It should be noted that the standards for bacterial air content have not yet been established, but only indicative norms referring to TNG and on the basis of which the degree of air contamination can be assessed. Hospital guidelines recommend that, after cleansing with disinfectants, mesophilic microorganisms in the air do not exceed the following: operating rooms: 300/m^3, special rooms (dressing rooms, intensive care, infusion solutions, premature babies, birthplaces, dietetic kitchens, nipples): 500/m^3, salons of sick and other rooms: 600/m^3 (Sergiu Mănescu, 1989). Based on these guidelines, it can be established that the ***TNG in operating room is more than double, so we can say that the air is contaminated at this point and the risk of an infection is very high***. A similar situation occurs ***in the bandage room and in the patients salon, where the total number of germs is close to or higher than double the number indicated in the rules. The very big risk is in the bandage room where infected wound bandages can even infect the wound dressings, and this can lead to infections.*** For adjacent rooms such as the hospital lobby (hallway), no indicative rules have been established, but for the first exposure we considered it necessary to highlight the presence of germs at this point of work. Although the identification of the present germ species in the air has not been established, we have been able to microscopically examine the present germ groups. Thus, we have shown in Figure 1 the weight of these groups in the 4 working points.

From the graphical representation, it can be seen that the predominant are the *Staphylococcus* group, followed by the *Streptococcus* genus. The presence of the three germ groups that also include the germs of importance in microbiology can be explained by the fact that these germs are optionally anaerobic, so they find optimum conditions of life both in the human anaerobic and in the air where aerobic behaves.

They are virtually the most difficult to control and eradicate germs, because in addition to mesophilic energy metabolism, they can grow at temperatures between 10-45°C, with an optimum temperature of 30-40°C. Streptococci and bacilli are present

approximately in the same percentages at the 4 work points. ***In conclusion, we can say that at the first exposure that took place during the summer period, in the pediatric department, the number of microbial germs was far exceeded the indicative rules, so the risk of infections is very high.***

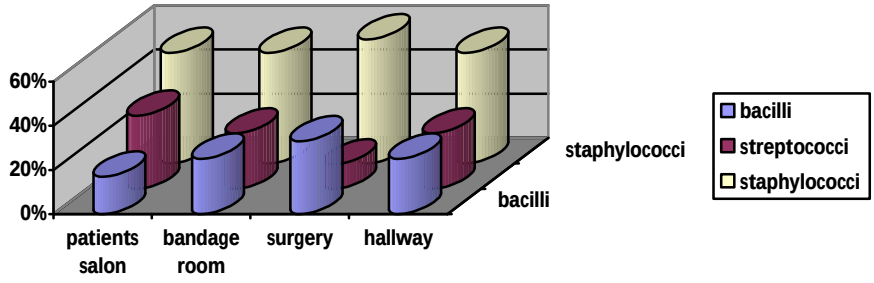

Figure 1. Breakdown by germ groups at work points

The second exposure was performed in November in the same hospital section, but only in two workplaces: the bandage room and the surgery room. There were no exposures in the patient room and in the hospital lobby due to the fact that no prior disinfection had taken place. The ambient temperature was 18°C. Incubation was also carried out at 37°C, the readings being carried out after 72 hours. The results obtained are plotted in Table 2 below.

Table 2.

Results concerning the air microflora obtained at second exposure – November – in the in-hospital environment

Sampling point/Parameter	**Bandage room**	**Operation room**
CFU/m^3 air	5	6
TNG/m^3air	636,94	764,33
Bacilli (%)	-	17
Streptococci (%)	40	33
Staphylococci (%)	60	50

It is noted that in the two workpoints, approximately the same results were obtained. Comparing with the indicative norms, it is found that in the surgery room, as in the first exposure, TNG is practically double, the risk of infection being as high as at the first determination. Compared to the first exposure, fewer microbial germs were found in the bandage room at the second exposure. This result can be attributed either to a more rigorous disinfection or to better ventilation or to a smaller number of patients who have passed through this room. The weaker presence of bacilli in both first and second exposures can be attributed to the fact that they are intestinal headquarters, unlike streptococci and staphylococci that are normally present in the room, especially in hospital settings, and are encountered in the normal human microflora. However, we can not fail to signal that their number is much higher than the normal one, and in addition, they can be harmful to the human organism (*Staphyloccocus aureus, Hemolytic streptococci).*

The third exposure was conducted in February and we aimed to make measurements on the microbial air load in the in-hospital environment before disinfection (Table 3).

Table 3

Results concerning the air microflora obtained at third exposure – February – in the in-hospital environment

Sampling point/Parameter	**Patients salon**	**Bandage room**	**Operation room**
CFU/m^3 air	14	12	34
TNG/m^3air	1783,4	1528, 66	433,21
Bacilli (%)	29	21	24
Streptococci (%)	36	43	44
Staphylococci (%)	35	36	32

The exposures were performed in the same section of the hospital, in three points: patient salon, bandage room, surgery room (for which microbiological norms were established). The ambient temperature was 19°C in the salon and 1 and 2°C lower respectively in the bandage room and the surgery room. The incubation was also carried aut at 37°C, the readings being carried aut after 72 hours.

It can be seen that disinfection is very important, although it does not have maximum efficiency. This can be seen from the large number of CFU developed in the three working points. Thus, there is a significant increase in the patient salon and bandage room, without doubling CFU, compared to the first two exposures. It is very important that in the surgery room, compared to the first two exposures CFU has grown approximately 6 times. Same results can be seen for TNG where it can be said that: in the Patients' Salon this indicator is approximately 3 times higher than the indicative rules; in the bandage room the TNG/m^3 was more than 4 times higher than the indicative rules. We believe that these figures could indicate the higher the risk of in-hospital and postoperative infections. As with the first exposures, Staphylococcus germs are predominant, followed by streptococci, while bacilli are less well represented, and they are more likely to be found in the patient's salon, perhaps because the personal hygiene of the patients is more difficult to achieve under hospital conditions. ***In conclusion, we can assert without the risk of mistaking that in the pediatric department the risk of infections and inter-contamination is very high.***

CONCLUSIONS

The official information on the indoor microbial air quality is extremely rare and inconclusive; so, the approach of such study themes is beneficial for the employed staff, avoiding by such periodic tests the occurrence of occupational diseases due to exposure to microbial agents and to suggest some control actions;

In order to reduce to disseminate the airborne biological particles, air-control measures are crucial;

Although it is not possible to speak of an air micro-flora in the sense that there are no standards, the presence of microbial germs in the air in general and in the in-hospital environment in particular can give us indications of the degree of air contamination, which can translates into a higher or lower risk of infectious diseases and inter-contamination from healthy bearers to vulnerable persons (children, the elderly);

In all three months of exposure, a number of germs was found to be much higher than indicated by the hospital and occupational guidelines;

Disinfection in the hospital is absolutely necessary: it should be done rigorously, daily, and using antiseptics and disinfectants with high microbicidal potential, the efficiency of this operation being highlighted by comparing the results of the three exposures (the first two exposures after disinfection and the last before disinfection).

In the micro-flora of the air in the hospital prevails the germs of the genus *Staphylococcus* followed by the germs of the genus *Streptococcus*, while the bacilli are present in a higher percentage in the Patients salon.

Microbiological survey data should be used to clearly define specific air quality guidelines for controlled environments in hospital settings.

RECOMMENDATIONS – with a view to maintain patients and staff's health:

- monitoring compliance with personal hygiene, hand hygiene, hand washing techniques, water, soap erasure;
- ensuring periodic, rhythmic ventilation of the rooms/spaces by opening the windows;
- thoroughly vacuuming carpets and, as far as possible, removing them;
- periodic cleaning of their mattresses and carpets, using washing and disinfection agents;
- compliance with the requirements for the use of clothing and footwear, distinct from clothing and street shoes;
- ensuring the regular maintenance of air conditioning, their regular replacement;
- performing repair works on the affected plasters (with dirt, mold, insalubres), periodic hygienic dyes

THE MOST IMPORTANT AND ELEMENTARY MEASURE absolutely necessary to be applied in each hospital section is: ***Restriction of permanent visits by family, friends of patients, strictly observing the visiting hours set by the hospital management and wearing protective equipment provided to each visitor by an employee or guard at the entrance to the hospital.***

ACKNOWLEDGMENT

The results of this paper were part of a research program for a Dissertation Paper for the Master's Program of Ecological Management of Natural Resources at the Faculty of Horticulture, University of Craiova.

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ANNALS OF THE
UNIVERSITY OF CRAIOVA
Vol. XXII (LVIII) - 2017

Series: ✓ *Biology*
✓ *Horticulture*
✓ *Food produce processing technology*
✓ *Environmental engineering*

THE STUDY OF THE AQUATIC AND PALUSTRAL HABITATS WITHIN THE CORIDORUL JIULUI PROTECTED AREA AND MEASURES FOR THEIR CONSERVATION

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Keywords*: conservation, habitats, Oltenia, Romania.*

ABSTRACT

The paper aims at presenting the current state of the aquatic and palustral habitats located on the lower part of the "Coridorul Jiului" protected area. The decreasing precipitation amounts fallen during recent years in the study area led to certain changes within the vegetation and the floristic composition of these habitats.

The research conducted by the authors with respect to the aquatic and palustral habitats of this protected area pointed out the existence of some rare taxa from the Romanian flora (e.g. Azolla filiculoides) or of taxa that are threatened at European level (e.g. Salvinia natans).

INTRODUCTION

The Jiu river represents the main watercourse that crosses the *Jiu Corridor* protected area. It is 339 km long (Ujvári, 1972).

Within the Jiu river alluvial plain, downstream of Craiova city, where this unit is best represented, there are located numerous pools; some of them have temporary character, whereas others are permanent and shelter a characteristic vegetation.

Certain speciality papers (Păun 1967, Păun & Popescu 1969, Roman 1974, Popescu 1996, Costache 2005, Răduțoiu 2006a, 2006b, 2008) comprise data concerning the aquatic and palustral flora in Oltenia.

In 1972, in the paper "The aquatic and palustral vegetation between the Jiu and the Desnățui" (original title in Romanian: "Vegetația acvatică şi palustră dintre Jiu şi Desnățui"), Cârțu D. mentions fifteen aquatic associations.

The research group coordinated by PhD Professor Popescu Gh. (2001) achieved an inventory of the aquatic vegetation and flora in Oltenia.

Data concerning the aquatic and palustral habitats within the protected areas located in Oltenia are scarce (Răduțoiu et al. 2015).

MATERIAL AND METHODS

Although this protected area partially overlaps the territory of three counties, the present research focused on the surface located downstream of Craiova city,

because this part of the area shelters one of the rarest and most representative relict samples of marginally affected European alluvial plain.

The study concerning “The aquatic and palustral habitats within the *Coridorul Jiului* protected area” was carried out with bimonthly rhythmicity and it led to the qualitative and quantitative interpretation of the results thus achieved, the underlying scientific basis being confirmed.

The applied work methods generally concerned:

- the scientific literature review;
- repeated field trips conducted in order to identify the species, the habitats and the main activities that impact the biodiversity;
- filling out the chorology of the aquatic and palustral habitats within the researched territory and underlining the local particular features.

The identification of these habitats was conducted by taking into account the characteristic vegetation, in accordance with the interpretation manual of Romanian habitats (Gafta & Mountford, 2008), while the book *Habitats of Romania* (original Romanian title *Habitatele din România*) (Doniță et al., 2005) was used as a comparison term.

The following materials and means were used for the inventory: Panasonic photo camera; Garmin *eTrex* 30 GPS; notebook where the authors filled in all species within the researched habitats, the characteristics of the station, as well as the corresponding coordinates; piolet, which was used to extract the plants necessary for an accurate field or laboratory identification; speciality field guide; plastic bags, in which the collected plants were put in order to be subsequently studied and included in herbarium of the University of Craiova (C.R.A.).

RESULTS AND DISCUSSION

According to the *Natura 2000 Standard Data Form*, five aquatic habitats are located within the researched territory:

3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoëto-NanoJuncetea*

3270 Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation

3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

The palustral habitats identified within the area belong to:

92A0 *Salix alba* and *Populus alba* galleries

91E0* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

6440 Alluvial meadows of river valleys of the *Cnidion dubii*

6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels.

The analysis of the data collected in the field and of the information in the speciality literature indicated that there are certain small differences.

3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoëto-NanoJuncetea*

This is the aquatic habitat with the best representation in the area. The surfaces edified by the species of the *Cyperus*, *Eleocharis* or *Juncus* genera relate to the category of emergent herbs, located on marshy soils or in areas that are waterlogged for a significant period.

Periodical flood phenomena and the human factor represent influence factors for these areas. The dry periods of the year substantially affect the floristic composition of these habitats located in the study area, the climatic factors implicitly marking their physiognomy.

The typical vegetation of this habitat belongs to *Cyperetum flavescentis* Koch ex Aichinger 1933.

Fig. 1. Physiognomy of the surfaces occupied by the vegetation of the habitat 3130 (original)

3270 Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation

This habitat was identified on small surfaces located on the fringe of the pools within the Jiu alluvial plain or on the muddy banks of the water canals in the site. A high percent of the species included in the floristic composition of this habitat belongs to the neophytes.

The identification of the surfaces occupied by vegetation belonging to the habitat 3270 is easier during the July – September interval, because this is the flowering period for the species that feature the physiognomy of these areas (*Bidens cernua, B. frondosa* or *B. tripartita*) (Fig. 2, 3). For the rest, the vegetation characteristic for these surfaces is nearly absent.

Fig. 2, 3. Stations edified by the species of *Bidens* genus (original)

A poor development of the vegetation of these areas was observed during years marked by drought. The typical vegetation of this habitat within the study area belongs to *Polygono lapathifolii - Bidentetum* Klika 1935.

3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

This habitat has a very poor representation in the area. Although the standard data form of the site mentions the value of 0.01% of the area, i.e. slightly more than seven ha, the reality in the field is different, the habitat being present only in a small number of pools that are characterised by very shallow waters during summer. The vegetation of this habitat belongs to *Charetum fragilis* Corillion 1957 (Fig. 4). *Eleocharis palustris*, *Schoenoplectus lacustris*, *Ceratophylum demersum* şi *Butomus umbellatus* are also encountered besides the species that gives the name of the association and that sometimes becomes exclusive.

Fig. 4. Detail with the alga that edifies the vegetation of this habitat (original)

3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation

Although the management plan of the site mentions a value of 0.01% of the total surface, the vegetation characteristic for this habitat displays a good representation in the area. The surfaces edified by *Lemna minor* are present in almost all pools and canals of the area. Moreover, the phytocoenoses belonging to the associations *Lemno-Salvinietum natantis* Miyavaki & J. Tx. 1960, *Potamogetonetum nodosi* (Soó 1960) Segal 1964, *Ceratophylletum demersii* Hild 1956, *Lemno-Azolletum filiculoidis* Br.-Bl. 1952 also display a good representation.

Most of them are pleustonic species with temporary character. They are better distinguished at the end of the summer, when the edifying species are in full vegetation.

Although the associations of this habitat are not remarkable through a high floristic diversity, they are important because of the scientific value of certain rare taxa in the Romanian flora (*Azolla filiculoides*) (Dihoru & Negrean, 2009), which have a good representation. On the surfaces where it is established, *Azolla filiculoides* becomes exclusive (Fig. 5, 6, 7).

Fig. 5, 6. Surfaces occupied by *Azolla filiculoides* in the *Coridorul Jiului* area (original)

Fig. 7. Detailed image of *Azolla filiculoides* (original)

From the sindynamic viewpoint, they frequently play a stabilizing part, encouraging the development of the successions of certain hydro-series by increasing the complexity of the submerged stratification.

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

In the area, the habitat 3260 is characterised by submerged or floating vegetation that is affected by the decreased water level during summer. It is encountered in permanent standing waters (lakes, pools, ponds with muddy bottom, compaction micro-depressions with stagnant water, small water bodies among the reed thickets), as well as in slowly flowing waters and in irrigation or drainage canals. On certain surfaces, the vegetation of this habitat undergoes changes because of fishing.

Within the researched territory, the vegetation characteristic for this habitat belongs to *Ranunculo trichophylli – Callitrichetum cophocarpae* (Soó 1927) Pócs 1958 (Syn. *Ranunculetum trichophylli* Soó 1927) (Fig. 8).

92A0 *Salix alba* and *Populus alba* galleries

Among all aquatic and palustral habitats within the researched area, the above-mentioned one has the best representation in the site. It is encountered on alluvial soils, with the water table near surface.

The typical vegetation of this habitat is widely spread at national level, as well as in the studied area. It belongs to *Salici-Populetum* (Tx. 1931) Meijer-Drees 1936.

Fig. 8. Sample image with the surfaces occupied by this habitat in the area (original)

91E0* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion*)

The black alder woodlands grouped in this alliance are located along rivers and along their main tributaries. The species vegetate on hygro-mesophillous, alluvial soils or on those rich in organic substances. *Alnus glutinosa*, *Ulmus glabra*, *Sambucus nígra*, *Equisetum telmateia*, *Impatiens noli-tangere*, *Stellaria nemorum*, *Geranium robertianum* etc. are among the species of recognition. It is to be mentioned the fact that this habitat is very poorly represented on the lower part of the *Coridorul Jiului* protected area. The analysis of the small identified surfaces shows that this habitat is in formation (Fig. 9).

Fig. 9. Sample image with surfaces in formation occupied by this habitat (original)

6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

At the level of the study area, the vegetation of this habitat is characteristic for the subtype 37.7 – Wet and nitrophilous tall herb edge communities, along water courses and woodland borders belonging to the *Glechometalia hederaceae* and *the Convolvuletalia sepium* orders (*Senecion fluviatilis, Aegopodion podagrariae, Convolvulion sepium, Filipendulion*).

The groupings within these cenotaxonomic units have a strong dynamogenetic capacity, encouraging the development of some successions. The vegetation of this habitat, which belongs to *Scirpetum sylvatici* Ralski 1931 em. Schwich 1944, covers representative surfaces in the area.

6440 Alluvial meadows of river valleys of the *Cnidion dubii*

The vegetation of this habitat encountered in *Coridorul Jiului* protected area belongs to *Caricetum vulpinae* Nowinski 1927. Under favourable conditions, this vegetation has a luxuriant development, whereas during dry years, these habitats serve as hayfields, although their floristic composition consists of species with low feed value. There was noticed that the dry vegetation is burned on small surfaces during spring.

Taking into account the entire study area, the authors have identified certain elements with negative impact upon the aquatic and palustral habitats: human activities, domesticated animals, water pollution, land use changes, vegetation burning, clearings in the woodland of the alluvial plain, expansion of some invasive species etc.

Certain domesticated animals, such as geese, ducks, cows (Fig. 10, 11), horses, pigs and goats, which are omnipresent in the aquatic ecosystems, represent a direct cause of the heavy water eutrophication.

Among the conservation measures required in the case of the researched habitats, we mention the following: to ban the drying out, the drainage and the regularization works; to maintain the current surfaces; to ban the waste dumping into water, as well as the activities that would ultimately lead to the degradation of these surfaces (e.g. burning dry vegetation); to ban the removal of riverside woodland vegetation (trees and shrubs) from the site, as well as riverbed excavations for ballast or gravel withdrawal.

Fig. 10, 11. Domestic animals in the aquatic habitats of the area (original)

CONCLUSIONS

The study of the aquatic and palustral habitats within the *Coridorul Jiului* protected area led to the conclusion that the conservation of the surfaces occupied by their vegetation is very important because they shelter a rich aquatic and palustral flora and fauna. In order to maintain the biodiversity within the areas that were not affected by the human factor, as well as to restore the ones that have been damaged, we propose the implementation of certain measures, such as: banning the drying out, the drainage and the regularization works; maintaining the current surfaces covered by

these habitats; banning any type of waste dumping into water bodies or on their borders, as well as banning vegetation burning during dormancy periods.

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*** Formularul standard Natura2000-Coridorul Jiului

ANNALS OF THE UNIVERSITY OF CRAIOVA

Vol. XXII (LVIII) - 2017

Series: ✓ *Biology*
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CONTROLLING THE ACTIVITY OF LACTIC BACTERIA PRESENT IN SEVERAL TYPES OF RED WINES

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Keywords*: lactic bacteria, malolactic fermentation*

ABSTRACT

Malolactic fermentation is a particularly complex combination of biochemical and microbiological processes that can be assessed from two distinct points of view: as a flaw in semi-sweet white wines and as an integral operation in the technology of elaboration of high quality red wines. Basically, malolactic fermentation is a process of wine biological deacidification which occurs in the presence of lactic bacteria and which consists in degradation of malic acid from wine to lactic acid and carbon dioxide.A particular importance for the normal course of malolactic fermentation is the initial bacterial density or the initial bacterial load of wine.

INTRODUCTION

Research has shown that spontaneous malolactic fermentation of wines is going well when bacterial density is greater than $5x10^4$ cells/ml. This factor is unimportant in the case of conducted malolactic fermentation (the use of selected lactic bacteria). For wines with low bacterial density ($1.5x10^4$ cells/ml) spontaneous malolactic fermentation is only finalized in the spring.

For wines with medium bacterial density ($5x10^4$ - $5x10^6$ cells/ml), half of the samples complete their malolactic fermentation in the autumn and the other half in the spring. For wines with high bacterial density (> $5x10^6$ cells/ml), 80% of the sample finalizes the malolactic fermentation in the autumn and 20% in the spring.The presence of malolactic bacteria on grapes is more limited than that of acetic bacteria or yeasts, reaching 10^2 cells/g. In the stum/must and at the beginning of the fermentation, 10^3-10^4 cells/ml are encountered.

At this stage Lactobacillus, Leuconostoc mesenteroides, Pediococcus damnosus is predominant and Oenococcus oeni and Lactobacilus brevis are less predominant (Popa A. et al., 2004).When grapes reach maturity under conditions with heat and low rainfall, malolactic bacteria are present even on fresh grapes, but are very rare on rain-washed grapes. The original flora, quite weak is supplemented by the bacteria coming from the technological equipments and machinery (Băducă Câmpeanu C., 2003, Ţârdea C., Sârbu Ghe., Ţârdea A., 2010, Dragomir Tuţulescu F., 2010).

As the yeasts ferment the musts/stum, the bacterial flora is reduced in number and variety; the selection operates in favor of strains with higher alcohol resistance and hydrogen ion concentration (pH) (Popa A. et al., 2004).

MATERIAL AND METHODS

Activity Control of Lactic Bacteria present in several varieties of red wines was to identify the types and species of lactic bacteria present in the black grape must/stum and the young wine (the end of the alcoholic fermentation, when lactic acid proliferation occurs) . The samples taken under study were: must Sâmbureşti Merlot variety; must Sâmbureşti Cabernet Sauvignon variety; must Drăgăşani; Novac variety; must Negru de Dragasani variety; must Vânju Mare Cabernet Sauvignon variety; must Segarcea Cabernet Sauvignon variety; must Segarcea Merlot variety. In order to determine the number of lactic bacteria in wine, the standard cultural method has been used.

RESULTS AND DISCUSSIONS

Lactic bacteria in wine are highlighted by inoculating the sample of wine or its decimal dilutions by the incorporation process into a selective nutrient medium. For this purpose, we have used the MRS agar medium. Incubation was performed at 35°C, the first observations being made after 24 hours from inoculation. Final reading was made 72 hours after inoculation.The results were expressed by the number of colony-forming units (CFU/ ml sample).

Table 1

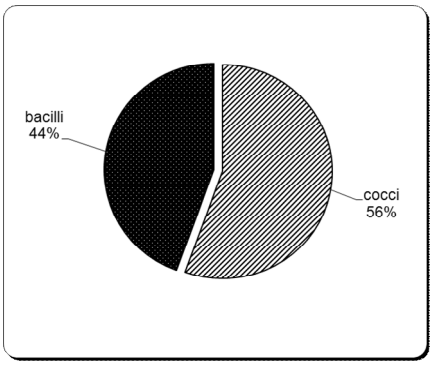
Lactic bacteria load of wine samples, before starting the malolactic fermentation

Sample wine	Dilution	UFC/ml	Number of lactic bacteria/ml wine
Merlot Sâmbureşti	1/100	90	9×10^3
Cabernet Sauvignon Sâmbureşti	1/10	108	1.08×10^3
Novac Drăgăşani	1/100	2	2×10^2
Negru Drăgăşani	1/10	26	2.6×10^2
Cabernet Sauvignon Vânju Mare	1/10	65	6.5×10^2
Cabernet Sauvignon Segarcea	1/10	127	1.27×10^3
Merlot Segarcea	1/10	78	7.8×10^2

From the data presented in the table it can be noticed that Cabernet Sauvignon variety has the highest values of UFC and lactic bacteria present in one ml of wine are recorded. It can also be noticed that wine produced with grapes from the same vine center is registering close/similar UFC values which demonstrate the importance of the climatic conditions in which grapes are matured. After determining the UFC number in each analyzed sample, microscopic preparations have been made from colonies having different morphological characteristics. Thus the proportion of the two morphological types of lactic bacteria present in grape must has been established. Figures 1-6 show graphically the proportion of the two morphological types of bacteria (cocci and bacilli).

Out of the six graphical representations (not the percentage distribution by morphological groups has not been presented in sample 2 because in this case the colonies were developed only by cocci) it can be noticed that in the grape must in process of alcoholic fermentation, before the beginning of the malolactic fermentation , the coci are higher number in comparison to bacilli. The determinations have been

resumed after 10 days when we assumed that malolactic fermentation had begun. Table 2 presents the results of the determinations made.



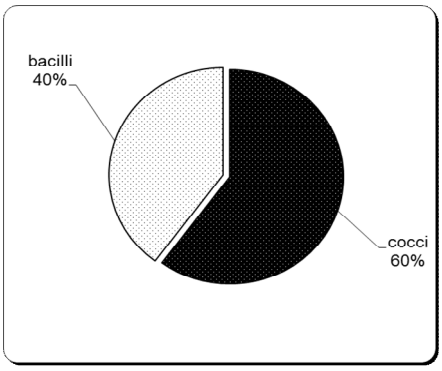
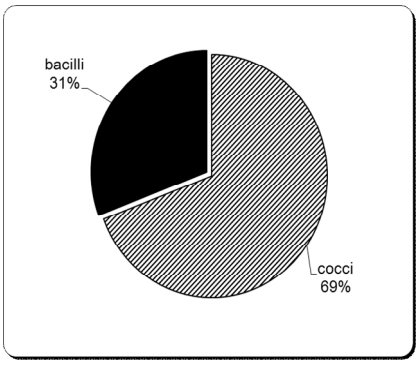


Fig.1 Percentage distribution of lactic bacteria present in must – Merlot Sâmbureşti

Fig.2 Percentage distribution of lactic bacteria present in must – Cabernet Sauvignon Sâmbureşti



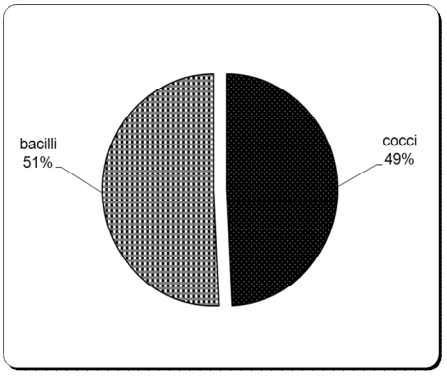
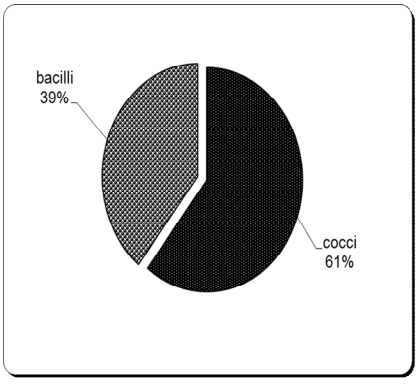


Fig.3.Percentage distribution of lactic bacteria present in must – Negru de Drăgăşani

Fig. 4. Percentage distribution of lactic bacteria present in must – Cabernet Sauvignon Vânju Mare



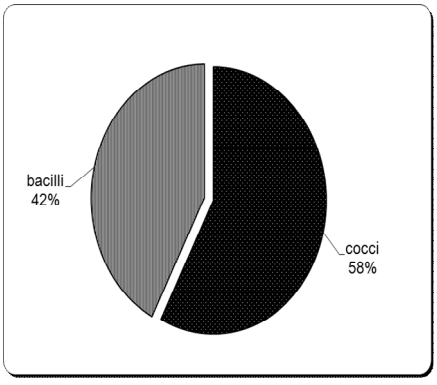


Fig. 5. Percentage distribution of lactic bacteria present in must – Cabernet Sauvignon Segarcea

Fig. 6. Percentage distribution of lactic bacteria present in must – Merlot Segarcea

Table 2

Lactic bacteria load of wine samples, during malolactic fermentation.

Sample wine	Dilution	UFC/ml	Number of lactic bacteria/ml wine
Merlot Sâmbureşti	1/100	135	1.35×10^4
Cabernet Sauvignon Sâmbureşti	1/100	274	2.74×10^4
Novac Drăgăşani	1/100	104	1.04×10^4
Negru Drăgăşani	1/100	73	7.3×10^3
Cabernet Sauvignon Vânju Mare	1/100	285	2.85×10^4
Cabernet Sauvignon Segarcea	1/100	348	3.42×10^4
Merlot Segarcea	1/100	184	1.84×10^4

Figures 7-13 represent the percentage distribution of the two morphological types of lactic bacteria present in wine. From these representations can be noticed that there is a good proliferation of cocci while the proportion of bacilli dropped a lot. Therefore, if initially the cocci were in average of 60%, after the malolactic fermentation, the proportion of these bacteria increases to 80% in some analyzed samples. This can be explained by the poor resistance of the bacilles to the action of alcohol produced by alcoholic fermentation.

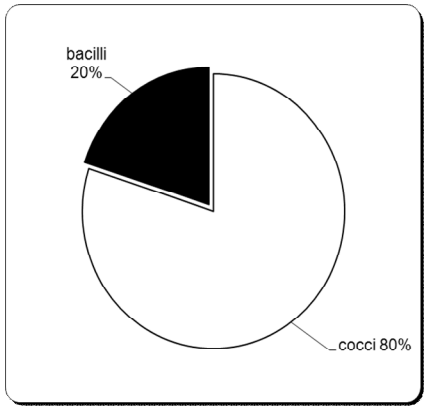


Fig. 7. Percentage distribution of lactic bacteria present in wine– Merlot Sâmbureşti

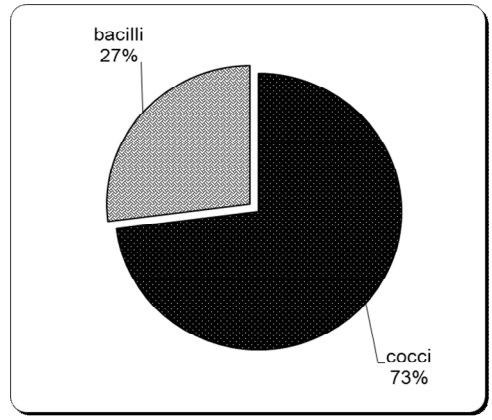


Fig. 8. Percentage distribution of lactic bacteria present in wine– Cabernet Sauvignon Sâmbureşti

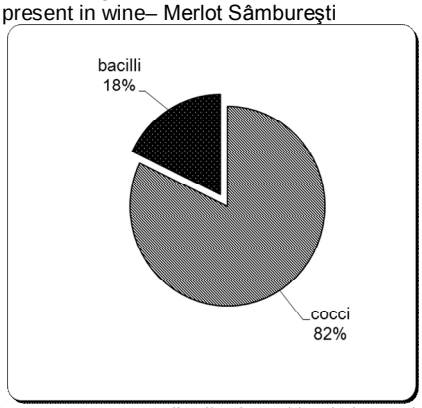


Fig. 9. Percentage distribution of lactic bacteria present in wine– Novac Drăgăşani

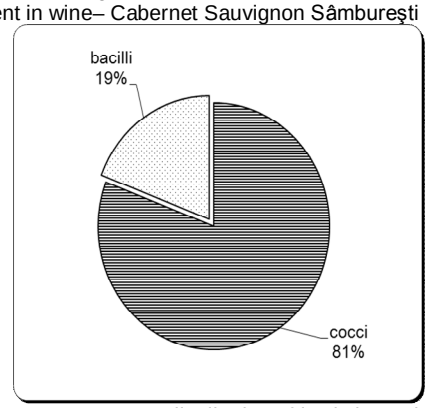


Fig. 10. Percentage distribution of lactic bacteria present in wine– Negru de Drăgăşani

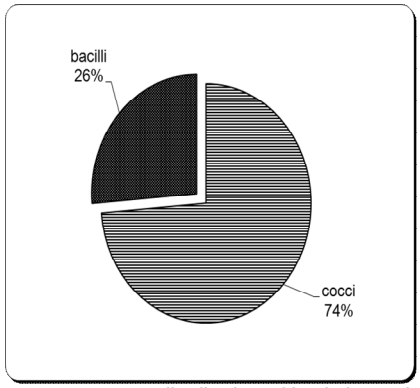


Fig. 11. Percentage distribution of lactic bacteria present in wine – Cabernet Sauvignon Vânju Mare

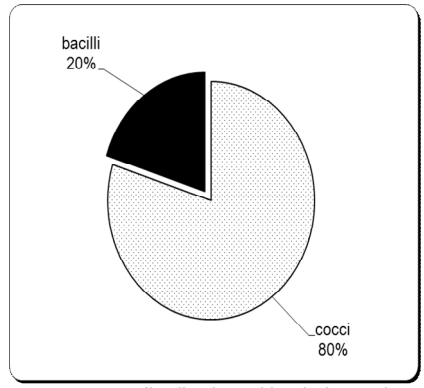


Fig. 12. Percentage distribution of lactic bacteria present in wine– Cabernet Sauvignon Segarcea

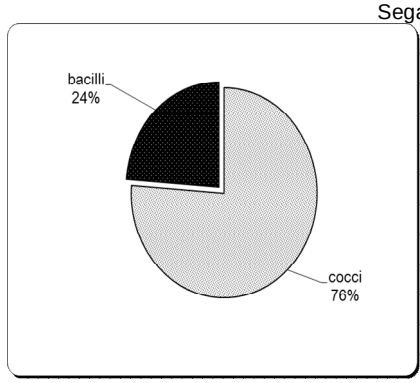


Fig. 13. Percentage distribution of lactic bacteria present in wine – Merlot Segarcea

Figure 14 shows the evolution of the CFU number for the 7 analyzed samples of must and wine. The best evolution found is in the sample of wine obtained from the Cabernet Sauvignon variety grown in Segarcea. In fact, all three samples of Cabernet Sauvignon show a good proliferation of lactic bacteria. A weaker proliferation of lactic bacteria is found in the Merlot and Negru de Dragasani varieties.

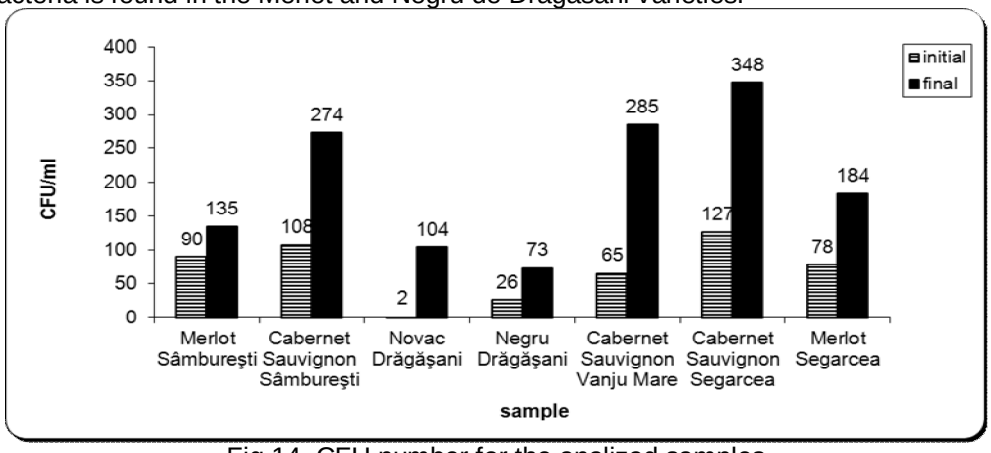


Fig.14. CFU number for the analized samples

CONCLUSIONS

Malolactic fermentation is absolutely necessary for red wines, especially for high quality wines of the type VS; DOC and DOCC. Malolactic fermentation in the primary vinification process must be carried out within a short time span, immediately after the wine is pulled from the yeast and the alcoholic fermentation is completed during the formation of the wine.Lactic bacteria, although present in small numbers on grapes and at the end of alcoholic fermentation, those resistant to the braking action of ethyl alcohol, sugars and pH may proliferate as much that during malolactic fermentation may reach up to 102 more numerous than in the initial phase of malolactic fermentation.

Among the samples of wine studied, it was found that the largest load in lactic bacteria was recorded in the Cabernet Sauvignon variety, while the wine resulting from the Negru de Dragasani variety had to be "helped" with selected strains of lactic bacteria so that they could complete malolactic fermentation in good conditions.A good evolution of lactic acid load we observed in Novac (Drăgăşani) where the proliferation reached from 2×10^2 to 1.04×10^3 cells / ml of wine.

The Merlot variety, due to the number of lactic bacteria recorded during malolactic fermentation, can not carry out this process in good conditions, so, as with Black Dragansani wine, it is required inoculation with selected lactic bacteria.

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