

RESEARCH ON BIODIVERSITY CONSERVATION AND MANAGEMENT IN THE VITICULTURAL AGROECOSYSTEM IN THE DEALUL BUJORULUI VINEYARD

CERCETĂRI PRIVIND CONSERVAREA ȘI GESTIONAREA BIODIVERSITĂȚII ÎN AGROECOSISTEMUL VITICOL DIN PODGORIA DEALUL BUJORULUI

TABARANU G.¹, ENACHE Viorica¹, DONICI Alina¹, BÎRLIGA N.¹
e-mail: gabitabaranu@yahoo.com

Abstract. The paper presents the research carried out at the Bujoru Viticulture and Wine Research and Development Station between 2015 and 2016. Research has focused on conservation and enhancement of functional and planned biodiversity through the implementation of all bio-resources of the greenhouse system and multifunctional protection areas, which are conducive to reducing the pathological risks and reducing external inputs (diesel, pesticides). Assessment of the state of conservation of biodiversity in the viticultural ecosystem of pogoria Dealul Bujorului. Biodiversity is a specific feature of our planet that ensures the optimal functioning of ecosystems, the existence and development of the biosphere in general. Lately, the issue of protecting biodiversity at ecosystems, species and populations has become increasingly vital to reducing the human impact on the biosphere. The viticultural ecosystem is defined as the functional unit of biosphere created and controlled by man in order to obtain high yields of grapes, of high quality and in more economical and socially advantageous conditions.

Key words: grapevine, biodiversity, ecosystems

Rezumat. Lucrarea prezintă cercetările efectuate la Stațiunea de Cercetare și Dezvoltare pentru Viticultură și Vinificație Bujoru în perioada 2015-2016. Cercetările au vizat studii privind conservarea și consolidarea biodiversității funcționale și planificate, prin implementarea tuturor bio-resurselor a sistemului de înverzire și a zonelor multifuncționale de protecție, favorabile reducerii riscurilor patologice și diminuării inputurilor externe (motorină, pesticide). Evaluarea stării de conservare a biodiversității în ecosistemul viticol din podgoria Dealul Bujorului. Biodiversitatea reprezintă o particularitate specifică a planetei noastre, care asigură funcționarea optimă a ecosistemelor, existența și dezvoltarea biosferei în general. În ultima perioadă, problema protejării biodiversității la nivel de ecosisteme, specii și populații a devenit tot mai vitală pentru reducerea impactului uman asupra biosferei. Ecosistemul viticol este definit ca fiind acea unitate funcțională a biosferei creată și controlată de către om, în vederea obținerii unor producții ridicate de struguri, de calitate superioară și în condiții economice și sociale tot mai avantajoase.

Cuvinte cheie: viță de vie, biodiversitate, ecosistem

¹ Research and Development Station for Viticulture and Winemaking Bujoru, Galati, Romania

INTRODUCTION

Sustainable growth of production and income in vineyard culture requires extensive measures to combat pathogens and pests. Beside the beneficial effect of the phytosanitary measures on the vine, these may have negative effects on the preservation of biodiversity in wine ecosystems.

At the same time, reducing damages caused by diseases, pests and herbage, must be achieved by reducing the dependence of culture on conventional resources (Ball *et al.*, 1986; Tălmăciu *et al.*, 1996).

MATERIAL AND METHOD

Research was conducted between 2015 and 2016 in the vineyard plantations of the Bujoru Viticulture and Wine-growing Research and Development Station.

In order to evaluate the positive impact of implementation of bio-resources, of greening systems and of multifunctional protection areas on functional biodiversity in vineyard ecosystems in vineyards were identified and installed six experimental variants located on terraces located on the level cubes with a width of about 20 m and a length of 600 m (tab. 1).

Table 1

Identification data of experimental lots - SCDVV Bujoru

Culture	Parcel	The variety	Soil maintenance system	Lat. N	Long. E	Altitude (m)
Vine	Variant 1	Rkatiteli	black field	45.50.01.59	27.55.25.06	40
	Variant 2	Rkatiteli	string mulch chopped	45.50.01.20	27.55.24.22	45
	Variant 3	Fetească albă	black field	45.50.00.46	27.55.22.22	49
	Variant 4	Fetească albă	string mulch chopped	45.50.00.29	27.55.21.18	53
	Variant 5	Babească gri	black field	45.49.58.94	27.55.15.60	66
	Variant 6	Babească gri	string mulch chopped	45.49.58.60	27.55.14.97	71

RESULTS AND DISCUSSIONS

In order to assess the conservation status of biodiversity in wine ecosystems two indicators were taken into account, namely the amount of semi-natural elements in the landscape of the vineyard holding and their quality.

The quantitative indicator represents the share of the total surface area of the component elements (artificial landscape and infrastructure in relation to the surface of the vineyard).

The case of the six experimental lots, the surface actually occupied by vine is 17.11 ha, and the agro-ecological infrastructure represented by grasshoppers, isolated trees and other crops occupy 9.01 ha. Under these circumstances the ratio between IAE and UAE is 53% and the artificialism rate is 47%.

The structure and morphology of the viticultural habitat in the Bujoru ecosystem: Total wine-growing = 26.12 ha of which:

Surface occupied by multifunctional protection areas = 9.01 ha:

- grasshoppers: $13500 \text{ m} \times 5 \text{ m} = 6.75 \text{ ha}$;
- isolated trees: $10 \text{ m} \times 10 \text{ m} = 0.01 \text{ ha}$;
- trenches: $2 \text{ m} \times 1250 \text{ m} = 0.25 \text{ ha}$;
- wetland specific vegetation = 0.50 ha;
- squid = 1,00 ha and alfalfa = 0.50 ha.

Total surface actually occupied by vineyard culture: 17.11 ha

17.11 ha \Rightarrow IAE/UAE = 53% Rate of artificialization = $100 - 53 = 47\%$

The qualitative indicator reflects the conservation status of the landscape elements. Quality is evaluated based on several indicators defined for each type of IAE. Indicators are divided into three categories: structure, composition and functions assimilated here to degradations. These indicators are being deducted for each type of IAE in rating grids and are then classified into three categories: good, medium, unfavorable, depending on their condition. Farm level, quality is assessed by aggregating all the conservation status obtained for all IAEs on the holding. This allows to obtain a radial pattern diagram showing the IAE share of good conservation, medium and unfavorable.

Barber soil traps, filled 2/3 with formalin solution (formaldehyde) 4%, 3/ each variant, have been installed on the vineyard rows in order to establish the quantitative and qualitative structure of entomofauna from the soil surface between May-August.

With Barber soil traps, entomological material (specimens of insects - juveniles, adults) was collected. Traps were disposed randomized in the experimental lot trying to cover as many ecological niches as possible (habitats). The entomological material collected and labeled was transported to the laboratory washed under water jet and then passed into a solution of ethyl alcohol 7%. The identification and counting of the entomofauna was done with the trinocular magnifier (KRÜSS) with two WF 10x20 magnifiers.

The relative numerical abundance (A.r.%) of a population is defined as the proportion represented by the number of individuals of a species or group compared to the total number of individuals belonging to all species in the sample.

In the observations on entomological material collected at ground level using Barber soil traps (May - August) we found the following (tab. 2):

Table 2

Structure of the species caught in the Bujoru agroecosystem

Systematic classification (species, family, order)	The percentage (%) main culture													Total catches
	Vine													
	V1		V2		V3		V4		V5		V6			
	Num ber of catch es	A %	Num ber of catch es	A %	Num ber of catch es	A %	Num ber of catch es	A %	Num ber of catch es	A %	Num ber of catch es	A %		
<i>Alopecosa pulverulenta</i> /fam. <i>Lycosidae</i> /	133	24.44	120	21.98	79	17.67	135	19.07	139	22.10	118	18.97	724	
<i>Formica rufa</i> /fam. Formicidae	139	25.55	120	21.98	158	35.35	255	36.01	158	25.12	177	28.46	1007	
<i>Epicometis hirta</i> Poda./fam. <i>Scarabeidae</i>	2	0.38	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	
<i>Apis</i> sp./fam. Apidae	18	3.31	38	6.96	20	4.74	24	3.39	10	1.59	16	2.57	126	
<i>Carabus</i> sp./fam. Carabidae	32	5.88	64	11.72	44	9.84	53	7.49	79	12.56	97	15.60	369	
<i>Euragaster Maura</i> , Subordinul <i>Geonidae</i>	2	0.37	2	0.37	0	0.00	0	0.00	1	0.16	0	0.00	5	
<i>Gryllus campestris</i> /fam. <i>Gryllidae</i>	1	0.18	0	0.00	0	0.00	6	0.85	3	0.48	0	0.00	10	
Fam. Vespidae	20	3.68	31	5.68	16	3.58	17	2.40	16	2.54	12	1.93	112	
<i>C. septempunctata</i> /fam. <i>Coccinellidae</i>	6	1.10	8	1.46	16	3.58	14	1.98	16	2.54	2	0.32	62	
<i>Cicada viridis</i> /fam. Cicadidae/	32	5.88	28	5.13	15	3.36	26	3.67	31	4.93	22	3.54	154	
Ord. Diptera	33	6.07	46	8.42	27	6.04	52	7.34	61	9.70	53	8.52	272	
<i>Myriapoda</i>	3	0.55	0	0.00	0	0.00	0	0.00	3	0.48	0	0.00	6	
<i>Tettigonia viridissima</i> /	6	1.10	10	1.83	4	0.90	21	2.97	7	1.11	5	0.80	53	
fam. Tettigonidae														
Lepidoptere	1	0.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	
<i>Forficula auricularia</i>	0	0.00	0	0.00	0	0.00	0	0.00	2	0.32	0	0.00	2	
Otherspecies	116	21.33	79	14.47	68	15.21	105	14.83	103	16.37	120	19.29	591	
TOTAL	544	100	546	100	447	100	708	100	629	100	622	100	3496	

Variant 1: 14 arthropod species or groups belonging to the *Myriapoda*, *Insecta* and *Arachnida* classes were identified, but most belong to the *Insectae* class. The highest relative abundance was recorded by the species of the *Formicidae* family (25.55%), followed by the *Lycosidae* (24.44%), *Carabidae* (5.88%), *Vespidae* (3.68%), *Diptera* 6.07%) and other species (21.33%). The *Coccinellidae* family recorded (1.10%).

Variant 2: Ground fauna consisted of 11 species or groups of arthropods belonging to the classes: *Insecta* and *Arachnida*. The largest population was represented by the *Formicidae* family and the *Lycosidae* family with (21.98%), *Carabidae* (11.77%), *Vespidae* (5.68%) and other species (14.47%). The *Coccinellidae* family recorded (1.47%).

Variant 3: Ground fauna consisted in 9 species or groups of arthropods belonging to the classes: *Insecta* and *Arachnida*. The most numerous population was the *Formicidae* family (35.35%), *Lycosidae* family (17.67%) and *Carabidae* family (9.84%). The *Coccinellidae* family recorded (3.58%).

Variant 4: The fauna at the ground level consisted in 10 species or arthropod groups belonging to the classes: *Insecta* and *Arachnida*. The largest population was represented by the *Formicide* family (36.01%), the *Lycosidae* family (19.07%), the *Carabidae* family (7.49%) and other species (14.83). The *Coccinellidae* family recorded (1.98%).

Variant 5: 13 arthropod species or groups belonging to the *Insecta* and *Arachnida* classes were identified, but most belong to the *Insecta* class. The highest relative abundance was recorded by the species of the *Formicidae* family (25.12%), followed by the *Lycosidae* family (22.10%), the *Carabidae* (12.56%), the *Diptera* Order (9.70%) and other species (16.37%). The *Coccinellidae* family recorded (2.58%).

Variant 6: 9 arthropod species or groups belonging to the classes of *Insecta* and *Arachnida* have been identified, but most of them belong to the *Insecta* class. The highest relative abundance was recorded by the species of the *Formicide* family (28.46%), followed by the *Lycosidae* (18.97%), the *Carabidae* (15.60%), the *Diptera* Order (8.53%) and other species (19.29%). The *Coccinellidae* family recorded (0.32%).

To manage biodiversity in order to protect and preserve it, it is necessary to measure it. In this respect, the following biodiversity characterization indices were used to quantify the biodiversity of the studied agroecosystem: the number of species (species richness), the Simpson index (D), the Shannon (H) diversity index, the Shannon-Weaver index H) and equity (E) (tab. 3).

Table 3

Simpson Diversity Index (D); Shannon-Weaver (H) and Equality (E) diversity index for the Bujoru viticultural agroecosystem

Agroeco system	Number individuals of a species	Number total catches in the perimeter analyzed	Proportion of representation	Simpson index (D)		Diversity Index (H)	Equity (E)
the species	ni	N	$\pi = ni/N$	$(\pi)^2$	$\ln \pi$	$-\pi \cdot \ln \pi$	$E = H / \ln(S)$
1	724	3496	0.2071	0.0429	-1.5746	0.3261	0.1176
2	1007	3496	0.2880	0.0830	-1.2446	0.3585	0.1293
3	2	3496	0.0006	0.0000	0.0000	0.0000	0.0000
4	126	3496	0.0360	0.0013	-3.3231	0.1198	0.0432
5	369	3496	0.1055	0.0111	-2.2486	0.2373	0.0856
6	5	3496	0.0014	0.0000	0.0000	0.0000	0.0000
7	10	3496	0.0029	0.0000	0.0000	0.0000	0.0000
8	112	3496	0.0320	0.0010	-3.4409	0.1102	0.0398
9	62	3496	0.0177	0.0003	-4.0322	0.0715	0.0258
10	154	3496	0.0441	0.0019	-3.1224	0.1375	0.0496
11	272	3496	0.0778	0.0061	-2.5536	0.1987	0.0717
12	6	3496	0.0017	0.0000	0.0000	0.0000	0.0000
13	53	3496	0.0152	0.0002	-4.1891	0.0635	0.0229
14	1	3496	0.0003	0.0000	0.0000	0.0000	0.0000
15	2	3496	0.0006	0.0000	0.0000	0.0000	0.0000
16	591	3496	0.1691	0.0286	-1.7776	0.3005	0.1084
Sum = 16	0.1765		1.9237	0.6938	0.1765		1.9237

CONCLUSIONS

The area actually occupied by vineyards is 17.11 hectares, and the agroecological infrastructure represented by grassy slopes, isolated trees and other crops, occupies 9.01 hectares. Under these circumstances, the ratio between the IAE and the UAE is 53% and the artificialism rate is 47%.

The most useful insect species were from *Formicidae* (28.80%) and *Lycosidae* (20.71%) family. The results show that in the vineyards there is a rich fauna, both as a number of species and as a number of individuals.

REFERENCES

1. Baal D., Tapp L., Gordon F., Potter D.A., 1986 - *Effects of pesticides on earworm populations* in Kentucky bluegrass Insecticide and Acaricide Tests, p. 395.
2. Tălmăciu M., Georgescu T., Mitrea I., Filipescu C., Bădeanu Marilena, Radu C., 1996 - *Contributions to the knowing of the carabid fauna of the vine plantation in Husi vineyard, Vaslui District*, Lucrări științifice, vol. 39, Seria Horticultură, USAMV Iasi, p. 267 – 271.