Studia Universitatis "Vasile Goldiş", Seria Ştiinţele Vieţii
Vol. 32, issue 2, 2022, pp. 50 - 59

FAGO-QUERCETUM PETRAEAE R. TÜXEN 1955 IN THE NORTHERN PART OF THE SEMENIC MOUNTAINS (SOUTHWESTERN ROMANIA)

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Abstract. In the present study, we conduct a floristic and phytosociological analysis of the *Fago-Quercetum petraeae* R. Tüxen 1955 association identified in the northern part of the Semenic Mountains in southwestern Romania. The aim of this research is to perform a floristic, phytosociological, ecological, conservative, and economic study of the oak (*Quercus petraea*) and beech (*Fagus sylvatica*) forests identified in the northern part of the Semenic Mountains. The phytocenoses of these forests have been analyzed in terms of physiognomy, floristic structure, life form spectrum, floristic elements, the synecology expressed mainly through main indexes (soil moisture, temperature, and soil reaction), as well as the polyploidy/diploidy ratio. A total of 19 relevées, described from various locations within the Silvicultural Districts of Reșița and Văliug, have been recorded and analyzed in the association table.

Keywords: *Fagus sylvatica, Quercus petraea*; association; phytocenosis; relevé; life forms; floristic elements; ecological indices; karyotype spectrum.

INTRODUCTION

Until now, the N part of the Semenic Mountains has been poorly researched, with only a few sporadic scientific communications and publications by specialized researchers who occasionally passed through the area.

In the period of August 20-25, 1941, Professor Alexandru Borza initiated the first floristic research of the Semenic Mountains, accompanied a year later, from June 20-22, 1942, by his assistant I. Todor, when the first phytosociological investigation was conducted. The observations made by the renowned botanist Alexandru Borza in the field were documented through the description of 11 plant associations, accompanied by 5 tables. This phytosociological research was continued by studies on the pastures of neighboring territories conducted by A. Buia (1963), followed by microstratigraphic research on peat bogs conducted by E. Pop and I. Ciobanu (1960), each contributing to their respective fields of expertise in understanding the most well-known mountain in Banat.

The reason we decided to initiate a detailed study on the flora and vegetation of the entire northern region of the Semenic massif is due to the fact that the majority of the territory has not been investigated from a floristic and phytosociological perspective.

The Semenic Mountains are located in the southwest of Romania, covering an area of 1,180 km^2, representing 0.4% of the national total area. They are situated in the Caraș-Severin County, which has a total area of 8,514 km^2. The researched geographic area covers 980 km^2 (Figure 1) and includes the territories of the silvicultural production units within the Reșița and Văliug Forest Districts. Geologically, these mountains are composed of crystalline metamorphic rocks, mainly schists and paragneisses. In the basins of the Secu and Râul Alb valleys, the foundation of the mountains consists of crystalline schists, overlain by Paleozoic and Mesozoic sedimentary deposits, with the oldest represented by conglomerates and sandstones. In depressions and along the main valleys, sedimentary formations such as marls, clays, and alluvium (gravel and sand) predominate.

The exposure is largely determined by the direction of the main watercourses (Bârzava, Secu, Râul Alb, Timiș, Stârnic, Groposu, Pietrosu, Bârzăvița). The majority of the studied territory falls within the temperate continental climate zone, with Mediterranean influences, where the thermal regime is quite constant. Annual precipitation throughout the year does not fall below 300 mm, with a peak in early summer. The number of favorable days for forest crops is 210-250 days per year.

The average annual temperature for the Semenic Mountains ranges from 8°C to 4°CThe highest average monthly temperature is in July, reaching 16°C, while the lowest average monthly temperature is in January, reaching -6°C. The average temperature during the vegetation season is around 7-8°C.

The atmospheric precipitation in the Semenic Mountains is abundant, and its distribution throughout the year is uneven, with a minimum in January and February and a maximum during the months of May and June.

Within the atmospheric precipitation, snowfall plays an important role, resulting in a significant snow cover with a long presence during the cold months of the year. The first day of snowfall usually occurs in early November, while the last day is towards the end of April.

The most important winds predominantly blow from the south, southwest, west (Austrian wind and Foehn), and the southeastern sector (Coșava).

MATERIALS AND METHODS

Our vegetation studies of the northern part of the Semenic Mountains (south-western Romania) were conducted between 2015 and 2022, aiming to establish the floristic inventory and analyze the ecological categories of life forms, phytogeographic elements, and ecological indices (soil moisture, temperature, soil reaction) related to the *Fago-Quercetum petraeae* R. Tüxen 1955 association (Figure 2). The phytosociological research methods developed by Braun-Blanquet (1964) were employed in the vegetation study.

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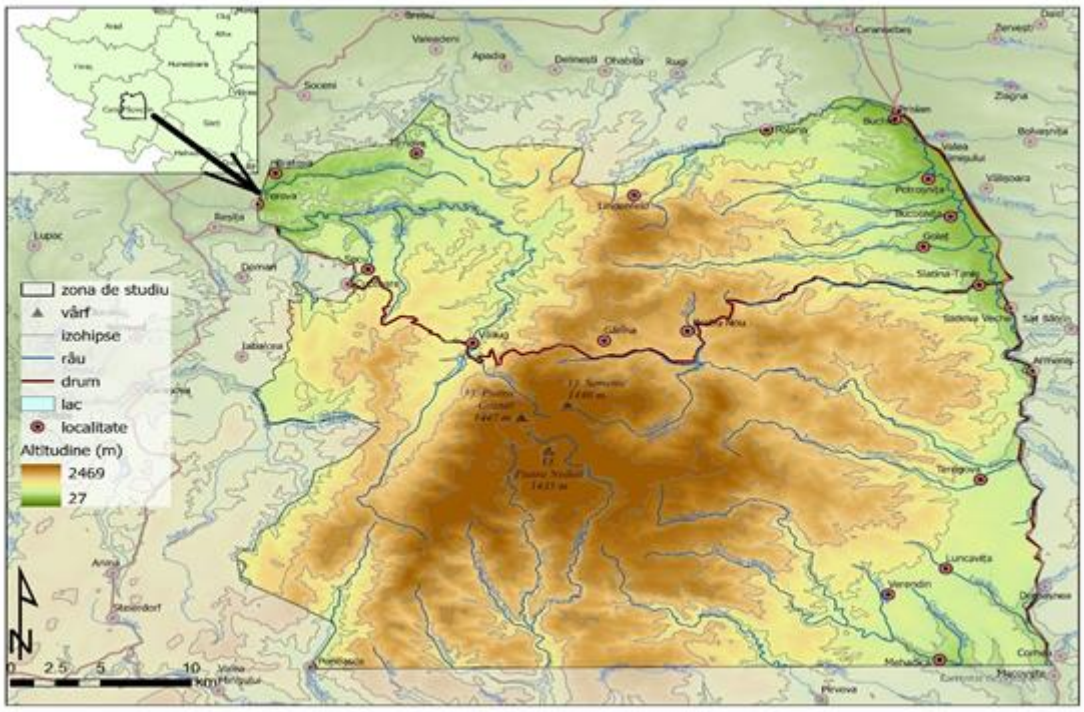

Fig. 1. Geographic Location and Delimitation of the Northern Part of Semenic Mountains.
(in Stereo 70 cartographic projection)

The sampling technique and notations (quantitative valuations) were carried out following the indications provided basically by Borza and Boșcaiu (1965). The association was identified using characteristic species, taking into account the differential and dominant species as well.

Fig. 2. *Fago-Quercetum petraeae* R. Tüxen 1955 facies with *Vaccinium myrtillus,* on Cozia Peak. (original)

To comprehensively identify the associated phytocenoses, a total of 19 phytosociological relevés were made, which were included in the synthetic table of the association (Table 1). Sample areas of 800 square meters (20 m x 40 m) were selected to achieve as much homogeneity as possible in terms of floristic structure and soil conditions while avoiding ecotonal zones.

Information regarding the site conditions in which the phytocenoses develop is recorded in the phytosociological records, including rock type, soil, altitude, exposure, slope, and vegetation cover. During the elaboration of the relevé descriptions, a quantitative assessment of the abundance and dominance of each species was conducted using the method proposed by Braun-Blanquet & Pavillard (1928). Additionally, overall vegetation cover information was completed using the methods developed by Tüxen (1955) and Ellenberg (1974).

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The phytosociological table of the association was structured according to the methodology developed by Braun-Blanquet (1964) and improved by Ellenberg (1974). In order to classify the association within higher cenotaxonomic units such as suballiance, alliance, order, and class, we considered both the traditional ecological-floristic systems developed by Tüxen (1955), Braun-Blanquet (1964), Borza et Boșcaiu (1965), Soó (1980), as well as the more recent works of researchers such as Mucina et al. (1993), Pott (1995), Borhidi (1996), Weber et al. (2000), Sanda (2002), Sanda *et al*. (2008). To place the *Fago-Quercetum petraeae* R. Tüxen 1955 association (analyzed in this study) within higher cenotaxonomic units, we took into account the studies conducted by Sanda *et al*. (2008).

The degree of fidelity of each species to the cenotic environment is reflected by the constancy degree (K) of the species, with their classes indicated by Roman numerals from I to V. To calculate the values of the synthetic phytocenological index, constancy (K), we used the methods proposed by Cristea et al. (2004).

The followed taxonomic nomenclature was the one established by Ciocârlan (2009), and the plant association was analyzed using the main ecological indices of the component species, life forms, and floristic elements. This data was presented graphically, in the form of spectra and diagrams.

RESULTS AND DISCUSSION

In the studied region, the phytocenoses of the *Fago-Quercetum petraeae* R. Tüxen 1955 association are widely distributed and have been identified within the territory of the Reșița and Văliug Forest Districts, along the Râul Alb stream meadow, in Poiana lui Vasile, along the Râul Alb valley, on the Pucioasa stream, and on the Cozia Ridge.

In Romania, the association has been mentioned in various regions: in Moldavia according to the citations in the work of Sârbu & Lupu from 1984, in Crișana according to the works of Burescu & Doniță from 2006 and Groza from 2008, in Muntenia according to the work of Sanda et al. from 2007, and in Maramureș according to the work of Resmeriță from 1975.

Habitat type: Dacian oak (*Quercus petraea*) and beech (*Fagus sylvatica*) forests, code: R4130 (Doniță et al., 2005).

Ecosystem type: Oak-beech forests with *Luzula luzuloides*, code: 4634 (Doniță et al., 2005).

The phytocenoses of the Dacian oak and beech forests grow on slopes with variable inclination (4 º - 20º), on moderately sloping, sun-exposed slopes with different orientations: western, southern, southwestern, southeastern, northwestern, and shaded areas. They are situated between 420-620 m altitude on wide valley bottoms. The characteristic rocks on which the phytocenosis develops are acidic, such as siliceous sandstones and marls. The present soils are eutricambosols, ranging from superficial to moderately deep, skeletal, acidic, optimally moist, and eutrophic.

In the tree layer with a total coverage of 71.69% ADm, *Quercus petraea* stands out with a general coverage of 47.89% ADm, accompanied by *Fagus sylvatica* with only 20.57% ADm coverage. Scattered throughout, some large-sized trees are also encountered, such as *Betula pendula*, *Quercus dalechampii*, *Quercus polycarpa*, *Fraxinus excelsior*, *Tilia tomentosa*, *Acer pseudoplatanus*, *Acer campestre*, *Carpinus betulus*, *Pinus sylvestris*, and *Acer platanoides*.

The density of these tree formations is lower in some phytocenoses (0.6-0.9), which results in increased light and heat at the ground level. This allows for the abundant development of some mesophilic herbaceous species, followed by xero-mesophilic ones, in certain areas. The tree dimensions vary, ranging from 36 to 64 cm in diameter and reaching heights between 18 and 30 m. These trees exhibit different production classes (Classes I, II, III, IV, according to Romanian silvicultural standards) based on specific environmental conditions.

The herbaceous layer has a considerable coverage (35-85%) and is dominated by acidophilic species such as *Deschampsia flexuosa*, *Hieracium umbellatum*, and *Luzula luzuloides*.

The subassociation *deschampsietosum flexuosae*, subas. nova (Table 1, rel. 4-15) encompasses acidophilic phytocenoses that develop in habitats with low humidity. It includes differential species such as *Deschampsia flexuosa* with a general coverage of 21.50% ADm and constancy (K=V), *Luzula luzuloides* with a general coverage of 17.71% ADm and constancy (K=V), and *Hieracium umbellatum* with a coverage of 2.26% ADm and constancy (K=V).

In the phytocenoses, characteristic species of the alliance ***Genisto germanicae-Quercion*** and the order ***Quercetalia roboris*** are notable, including *Agrostis capillaris*, *Calamagrostis arundinacea*, *Lathyrus vernus*, *Solidago virgaurea*, *Pteridium aquilinum*, *Trifolium medium*, *Quercus dalechampii*, *Betula pendula*, *Genista ovata*, *Hieracium maculatum*, *Rubus hirtus*, *Circaea lutetiana*, *Carex pilosa*, *Oxalis acetosella*, *Polystichum aculeatum*, *Galium odoratum*, *Carex sylvaticae*, *Euphorbia amygdaloides*, *Dryopteris filix-mas*, *Mercurialis perennis*, *Deschampsia flexuosa*, *Luzula luzuloides*, *Hieracium umbellatum*, *Caradamine bulbifera*, *Carpinus betulus*, *Anemone nemorosa*, and *Festuca drymeja*.

The floristic structure of this association also includes some xero-mesophilic and mesophilic species characteristic of the classes ***Quercetea pubescenti-Petraeae***, such as *Cytisus nigricans*, *Polygonatum odoratum*, *Fragaria viridis*, *Tilia tomentosa*, *Quercus polycarpa*, *Tamus communis*, *Cornus mas*, the class ***Vaccinio-Piceetea***: *Vaccinum myrtillus*, *Blechnum spicant*, *Sorbus aucuparia*, the class ***Epilobietea angustifolii***: *Sambucus nigra*, *Rubus idaeus*, *Galeopsis speciosa*, *Senecio nemorensis ssp. germanicus*, and the class ***Asplenietea trichomanis***: *Polypodium vulgare*, *Poa nemoralis*, *Sedum telephium ssp. maximum*.

These forests (*goruneto-făgete*, in Romanian)yield a significant amount of woody biomass, with the wood being used in carpentry, furniture manufacturing, and construction. There are also species present with forage value (*Poa nemoralis*, *Deschampsia flexuosa*, *Luzula luzuloides*, *Festuca drymeja*), medicinal value (*Polypodium vulgare*, *Dryopteris filix-mas*, *Hypericum perforatum*, *Rosa canina*, *Galium odoratum*, *Fragaria*

vesca, *Helleborus purpurascens*), and culinary use (*Corylus avellana*, *Rubus idaeus*, *Vaccinium myrtillus*, *Rosa canina*, *Sambucus nigra*, *Oxalis acetosella*, *Fragaria vesca*, *Allium ursinum*).

Since these tree formations are located on steep slopes with shallow soils, they also serve the function of soil protection.

Table 1.

Fago-Quercetum petraea R. Tüxen 1955 (original)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Life Forms	Fl. El.	U	T	R	G	Nr. Relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	K	ADm
						Altitude (m)	427	480	470	610	550	420	620	520	510	595	600	580	470	460	500	530	555	605	470		
						Exposure	E	SV	N	N	SV	N	N	V	N	N	N	SV	SV	N	N	N	SV	N	N		
						Slope (º)	-	8	10	4	-	12	10	4	14	4	20	18	8	10	8	14	-	20	18		
						Consistency	0,6	0,8	0,8	0,9	0,6	0,7	0,7	0,7	0,8	0,9	0,8	0,8	0,7	0,6	0,8	0,8	0,9	0,8	0,9		
						Tree height (m)	22	26	26	28	18	18	24	24	18	28	20	28	30	30	28	22	24	30	28		
						Tree diameter (cm)	46	58	54	58	40	36	52	58	36	58	38	60	64	62	60	42	46	62	60		
						Herbaceous layer coverage (%)	75	65	60	50	80	85	70	45	85	100	50	50	35	40	60	70	65	45	50		
						Area (mp)	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800		
MPh	E	2,5	3	0	D	As. *Quercus petraea*	3	2	1	1	2	1	+	4	4	2	2	2	1	2	2	4	2	1	+	V	20,58
MPh	E	3	3	0	D	As. *Fagus sylvatica*	4	3	3	4	4	4	4	2	3	4	3	4	3	4	4	1	4	3	3	V	47,89
						Genisto germanicae-Quercion, Quercetalia roboris																					
H	Cp-Bo	2,5	3	3	D	*Solidago virgaurea*	1	+	1	+	+	-	+	-	1	-	+	+	1	-	+	+	-	+	-	IV	1,29
H	Eua	2	3	0	P	*Calamagrostis arundinacea*	+	+	-	1	1	-	-	1	1	+	-	-	+	-	-	-	+	-	+	III	1,21
H	Eua	3	3	3	D	*Lathyrus vernus*	+	+	-	+	-	+	-	-	-	-	-	+	-	+	+	-	-	-	+	III	0,21
G	Cosm	3	3	0	P	*Pteridium aquilinum*	+	+	-	+	-	-	+	-	-	-	-	-	-	+	+	+	1	-	-	III	0,45
H	Eua	3	3	0	P	*Trifolium medium*	+	-	+	-	-	+	-	+	+	-	+	-	+	+	-	-	+	+	+	III	0,29
H	Cp-Bo	0	0	0	P	*Agrostis capillaris*	+	+	-	-	+	-	-	-	-	+	-	-	+	-	-	-	-	+	-	II	0,16
MPh	Eua	3	2	2	P	*Betula pendula*	-	-	-	-	-	+	-	-	+	-	-	-	-	-	+	-	+	+	-	II	0,13
nPh	Alp	2,5	3	3	N	*Genista ovata*	-	+	+	+	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	II	0,16
H	E	2	3	2	P	*Hieracium maculatum*	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	II	0,11
MPh	M	2,5	3	0	D	*Quercus dalechampii*	-	-	+	-	-	-	+	+	-	-	+	-	-	-	+	-	-	+	-	II	0,16
H	E	0	3	2	P	*Danthonia decumbens*	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	I	0,05
H	Ec	3	3	3	D,P	*Symphytum tuberosum ssp. nodosum*	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	+	-	I	0,08
						Fagetalia sylvaticae																					
G	Eua	3	3	3	P	*Galium odoratum*	+	+	-	+	+	+	+	+	+	+	+	+	-	-	+	-	-	+	-	IV	0,34
nPh	E	3	2,5	3	P	*Rubus hirtus*	-	+	-	-	+	+	-	2	+	+	2	-	+	-	+	3	+	+	+	IV	4,08
G	Eua	3,5	3	4	D	*Circaea lutetiana*	+	+	+	+	-	+	-	+	+	-	+	-	-	-	+	-	-	+	+	III	0,29
H	E	3,5	3	4	P	*Carex sylvatica*	1	+	+	-	+	-	-	-	+	+	-	-	-	-	+	+		+	+	III	0,50
H	Eua	2,5	3	3	P	*Carex pilosa*	1	+	+	-	1	+	+	+	1	-	-	+	-	-	-	-	-	+	-	III	0,97
H	E	3,5	3,5	3,5	P	*Polystichum aculeatum*	-	+	+	+	-	+	-	-	-	+	-	-	+	+	-	-	+	-	-	III	0,21
H	Eua	3	3	4	D	*Anthriscus sylvestris*	-	-	-	-	+	-	-	-	+	-	-	-	-	+	-	-	+	-	-	II	0,11
G	E	3,5	3	4	P	*Anemone ranunculoides*	-	-	+	-	+	-	-	+	-	+	-	-	-	+	-	+	-	-	-	II	0,16
G	Ec	3	3	0	D	*Corydalis cava*	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	+	-	II	0,11
H	Cosm	4	3	0	P	*Dryopteris filix-mas*	+	-	+	-	-	+	-	-	-	-	-	-	-	+	-	+	-	-	-	II	0,13
Ch	E	3	3,5	4	D	*Euphorbia amygdaloides*	+	-	+	-	-	-	+	-	-	-	-	-	+	+	-	-	-	-	+	II	0,16
H	Carp	2,5	3	4	P	*Helleborus purpurascens*	+	-	-	+	-	-	+	-	-	+	-	+	-	-	+	-	-	-	-	II	0,16
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
H	E	3,5	3	4	P	*Mercurialis perennis*	-	-	+	-	-	-	-	+	-	+	-	-	-	+	-	-	-	+	-	II	0,13
H	Cp-Bo	4	3	3	D,P	*Oxalis acetosella*	+	+	-	-	-	-	+	+	-	-	+	-	+	-	-	-	-	+	-	II	0,18

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
H	Cosm	4	2,5	0	P	*Athyrium filix-femina*	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	I	0,05
						Querco-Fagetea																					
G	Ec	3	3	4	P	*Cardamine bulbifera*	+	+	1	+	+	+	+	+	+	2	+	-	+	+	+	+	1	+	+	V	1,84
H	Cp	2	0	1	P	*Deschampsia flexuosa*	1	+	3	2	3	1	3	3	3	4	2	1	3	2	3	+	1	1	1	V	21,50
H	E	2,5	2,5	2	D	*Luzula luzuloides*	+	1	+	2	2	1	2	3	2	1	3	2	1	2	5	+	3	1	1	V	17,71
H	Cp-Bo	2,5	3	2,5	D,P	*Hieracium umbellatum*	+	1	+	+	+	+	+	1	2	+	1	+	1	-	+	-	+	+	-	V	2,26
G	E	3,5	4	0	P	*Anemone nemorosa*	+	+	+	-	+	-	+	+	+	-	+	1	-	+	+	-	2	-	+	IV	1,47
H	Eua	3	3	4	D,P	*Brachypodium sylvaticum*	+	+	-	+	+	+	+	-	-	-	+	-	+	+	-	-	+	-	+	III	0,29
MPh	E	3	3	3	P	*Carpinus betulus*	-	-	-	-	+	+	-	+	+	+	+	-	-	-	-	-	-	+	+	III	0,21
H	Eua	3	2	2	D,P	*Cruciata glabra*	-	+	-	+	1	-	-	+	+	-	+	-	-	+	+	-	+	-	+	III	0,50
G	Carp	4	2	3	D	*Festuca drymeja*	-	+	-	-	+	2	+	+	3	3	-	-	-	+	+	-	-	-	+	III	5,05
H	Ec	3	2,5	0	D	*Prenanthes purpurea*	-	+	-	-	+	+	-	+	-	-	+	+	+	-	-	-	+	-	-	III	0,21
H	E	3,5	3	3	D	*Pulmonaria officinalis*	+	-	-	+	-	-	-	+	+	+	+	-	-	-	+	-	+	-	-	III	0,21
H	Eua	3	3	0	D	*Stellaria holostea*	+	-	-	+	-	-	+	+	-	-	-	+	+	+	+	-	-	-	-	III	0,21
Ch	Eua	2	2	2	D,P	*Veronica officinalis*	-	+	-	+	-	-	+	+	-	-	+	+	-	+	+	+	-	+	+	III	0,29
G	Ec	3,5	3,5	4	P	*Arum maculatum*	+	-	-	+	-	-	-	-	-	+	-	-	+	-	-	+	-	-	+	II	0,16
MPh	Ec	3,5	3	3	P	*Acer pseudoplatanus*	-	+	-	-	-	-	-	+	-	-	-	+	+	-	-	-	-	+	+	II	0,16
G	Eua	2,5	3	4	D	*Cephalanthera longifolia*	-	-	-	-	+	-	-	-	+	-	-	-	+	-	-	+	-	-	-	II	0,11
mPh	E	3	3	3	D	*Corylus avellana*	-	+	-	-	-	+	-	+	+	-	+	+	-	-	-	-	-	-	+	II	0,18
H	Eua	3	3	0	D	*Campanula persicifolia*	-	+	+	-	-	-	-	-	-	-	+	-	+	+	-	-	-	+	+	II	0,18
H	E	3	3	3	P	*Carex digitata*	+	-	+	-	+	-	-	-	-	+	-	-	-	-	-	+	-	-	-	II	0,13
mPh	Eua	2,5	3	3	D	*Crataegus monogyna*	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	+	-	+	II	0,13
H	Eua	3	2,5	0	D	*Fragaria vesca*	-	-	+	-	-	-	+	+	-	-	-	-	-	-	+	-	+	+	+	II	0,18
G	Ec	2,5	3	3	P	*Galium schultesii*	-	+	-	+	-	-	+	-	-	-	-	+	+	-	-	+	+	-	-	II	0,18
Th	Cosm	3,5	3	3	P	*Geranium robertianum*	-	-	+	-	-	-	+	-	-	+	-	-	+	-	-	-	-	-	+	II	0,13
Ch	Mp	2,5	3	4	P	*Glechoma hirsuta*	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	+	-	+	-	II	0,11
H	E	2,5	3	4	D	*Melica uniflora*	+	-	-	+	-	-	-	-	-	-	+	-	-	+	+	-	-	1	-	II	0,39
H	E	3	3	0	D	*Mycelis muralis*	+	+	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	+	II	0,13
nPh	E	2	3	3	P	*Rosa canina*	-	-	-	-	-	-	+	-	-	+	+	-	+	-	-	-	+	+	-	II	0,16
H	Eua	3,5	3	0	P	*Scrophularia nodosa*	-	-	+	-	+	-	-	-	+	-	-	-	+	-	-	-	-	-	-	II	0,11
H	Eua	3	0	0	P	*Veronica chamaedrys*	+	-	+	-	-	-	-	-	-	-	-	+	-	+	-	-	-	+	+	II	0,16
H	Eua	3	3	3,5	P	*Viola reichenbachiana*	+	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	II	0,11
H	Eua	3	2,5	4	D,P	*Veronica urticifolia*	-	-	-	+	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	II	0,11
MPh	E	2,5	3	3	D	*Acer campestre*	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	+	-	-	I	0,08
G	E	3,5	3,5	4	D	*Allium ursinum*	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	I	0,05
MPh	Eua	3	3	3	D,P	*Acer platanoides*	+	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	I	0,08
TH	E	2	4	3	D,P	*Campanula rapunculoides*	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	I	0,05
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
MPh	E	3	3	4	D	*Fraxinus excelsior*	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-	I	0,08
H	Cp	3	3	4	D	*Hepatica nobilis*	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	I	0,03
H	Eua	3	3	0	D	*Hypericum perforatum*	-	+	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	I	0,08
H-Ch	Eua	3,5	3	4	D	*Lamium maculatum ssp. cupreum*	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	I	0,03
G	Eua	3,5	3	3	D	*Platanthera chlorantha*	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	+	-	I	0,08
						Quercetea pubescenti-Petraeae																					

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
nPh	Ec	2,5	3	0	P	*Cytisus nigricans*	+	1	+	2	+	+	+	1	+	+	1	+	+	+	+	-	-	+	-	V	2,03
G	Atl-M	3	3,5	4	N	*Tamus communis*	+	+	-	-	-	+	-	-	+	+	-	-	+	-	-	-	+	+	-	III	0,21
mPh	Ec	2	3,5	4	P	*Cornus mas*	+	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	II	0,11
H	E	2	4	3	D	*Fragaria viridis*	-	-	-	+	-	+	+	-	-	-	-	+	-	-	-	-	-	-	-	II	0,11
G	Eua	2	3	4	D	*Polygonatum odoratum*	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	+	-	II	0,11
MPh	Carp	2,5	2,5	0	D	*Quercus polycarpa*	+	+	+	-	-	-	+	-	-	-	+	-	+	-	-	-	-	-	+	II	0,18
MPh	Ppn	2,5	3,5	3	D	*Tilia tomentosa*	-	+	-	-	-	-	+	-	-	1	-	+	-	+	+	+	-	-	-	II	0,42
nPh	Ec	2	3,5	4	P	*Chamaecytisus hirsutus ssp. leucotrichus*	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I	0,05
G	Eua	3	3	3	D,P	*Epipactis helleborine*	-	-	-		-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	I	0,05
						Vaccinio-Piceetea																					
nPh	Cp-Bo	0	2	1	D	*Vaccinium myrtillus*	+	-	-	1	-	-	+	+	-	+	-	+	-	-	+	-	1	+	+	III	0,74
H	Cp-Bo	3,5	2	1,5	P	*Blechnum spicant*	-	-	-	-	+	-	-	-	+	-	-	-	+	-	-	-	-	+	-	II	0,11
MPh	Eua	0	0	0	D	*Pinus sylvestris*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	I	0,05
mPh	E	3	2,5	2	D	*Sorbus aucuparia*	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	I	0,05
						Epilobietea angustifolii																					
mPh	E	3	3	3	P	*Sambucus nigra*	+	-	-	+	+	+	-	+	-	+	-	+	-	+	+	1	-	+	+	IV	0,55
nPh	Cp-Bo	3	3	3	D,P	*Rubus idaeus*	-	+	+	-	-	+	-	-	-	-	+	-	-	-	-	-	-	+	+	II	0,16
Th	Eua	3	2	0	D	*Galeopsis speciosa*	-	-	+	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	I	0,08
H	Eua	3,5	3	3	P	*Senecio nemorensis ssp. germanicus*	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	I	0,03
						Asplenietea trichomanis																					
H	Eua	3	3	0	P	*Poa nemoralis*	+	+	-	+	-	+	+	+	-	+	+	+	+	+	-	+	+	-	+	IV	0,37
G	Cp-Bo	3,5	3	4	P	*Polypodium vulgare*	+	-	+	-	+	+	-	-	+	-	-	-	+	-	+	-	+	+	-	III	0,24
H	Cosm	3	0	4	P	*Asplenium trichomanes ssp. trichomanes*	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	I	0,05
H	Eua	2	3	0	P	*Sedum telephium ssp. maximum*	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	I	0,08
						Variae syntaxa																					
H	E	3,5	2,5	0	P	*Ajuga reptans*	+	-	-	-	-	-	+	-	-	-	+	-	-	-	+	-	-	-	-	II	0,11
H	Ec	1,5	4	4	D	*Melica ciliata*	-	-	-	+	+	-	-	-	-	-	-	-	-	+	-	-	+	-	-	II	0,11
Ch	Ec	3	3	3	D	*Galium rotundifolium*	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	I	0,05
H	Ec	4	2	4	P	*Gentiana asclepiadea*	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I	0,03
						Bryophyta																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
N	N	0	0	0	N	*Polytrichum commune*	1	-	-	2	1	+	+	+	-	-	3	2	-	-	-	+	4	-	-	III	7,74

Place and date of relevé implementation: 1 - O.S. Reșița UP V, ua 25 A, May 4, 2016; 2 - O.S. Reșița UP V, ua 25B, May 4, 2016; 3 - Râul Alb Stream Meadow, May 5, 2016; 4 - O.S. Reșița UP V, ua 12, May 3, 2016; 5 - O.S. Reșița UP V, ua 28 A, Râul Alb Brook Valley, May 6, 2016; 6 - O.S. Reșița UP V, ua 30 B, Râul Alb Brook, May 6, 2016; 7 - O.S. Reșița UP V, ua 30 B, Râul Alb Brook, May 6, 2016; 8 - O.S. Reșița UP V, ua 22 B, Râul Alb Brook, May 6, 2016; 9 - O.S. Reșița UP V, ua 28 A, May 6, 2016; 10 - O.S. Reșița UP V, ua 30 A, Râul Alb Brook, May 6, 2016; 11 - O.S. Reșița UP V, ua 53 A, May 6, 2016; 12 - O.S. Reșița UP V, ua 35 A, July 23, 2017; 13 - O.S. Reșița UP IV Stârnic, ua 26 A, July 23, 2017; 14 - O.S. Reșița UP IV Stârnic, ua 27 C, July 24, 2017; 15 - O.S. Reșița UP IV Stârnic, ua 28 A, July 23, 2017; 16 - O.S. Reșița UP IV Stârnic, ua 10 B, May 23, 2017; 17 - O.S. Reșița UP IV Stârnic, ua 15 B, May 28, 2017; 18 - O.S. Reșița UP IV Stârnic, ua 16 B, May 28, 2017; 19 - O.S. Reșița UP IV Stârnic, ua 11 C, May 28, 2017.
O.S. = Forest District
UA = Arrangement Units
UP = Production Units

The life form spectrum is dominated by hemicryptophytes (48.96%), followed by phanerophytes (25.00%, including mega phanerophytes 12.50%, mesophanerophytes 5.21%, nanophanerophytes 7.29%), followed by geophytes (17.71%), chamaephytes (4.17%), therophytes (3.13%) and bryophytes (1.04%), (Figure 3).

In the phytocoenoses of the association, in terms of floristic elements, Eurasian species (32.29%) and European species (28.13%) are notable, followed by Central European species (14.58%), circumpolar species (10.42%), cosmopolitan species (5.21%), Carpathian species (3.13%), Mediterranean species (1.04%), Mediterranean-Pontic species (1.04%), Ponto-Pannonian species (1.04%), Atlantic species (1.04%), alpine species (1.04%), and bryophytes (1.04%) (Figure 4).

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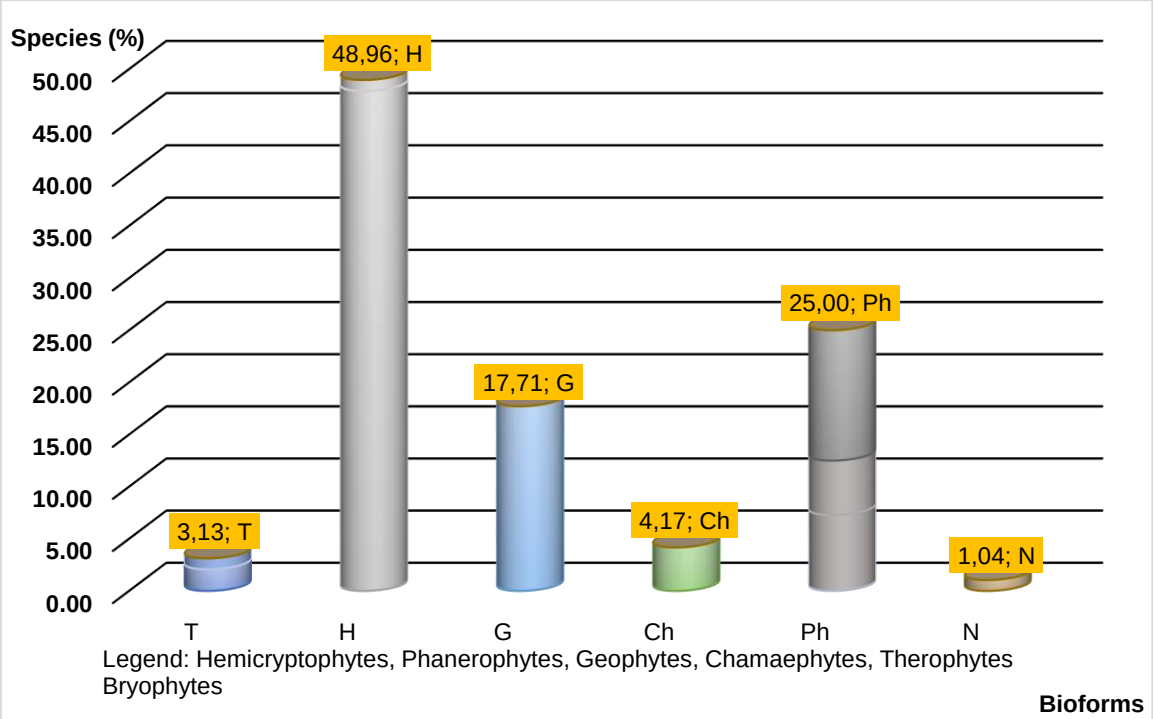

Fig. 3. The spectrum of life forms in the *Fago-Quercetum petraeae* R.Tüxen 1955 association.

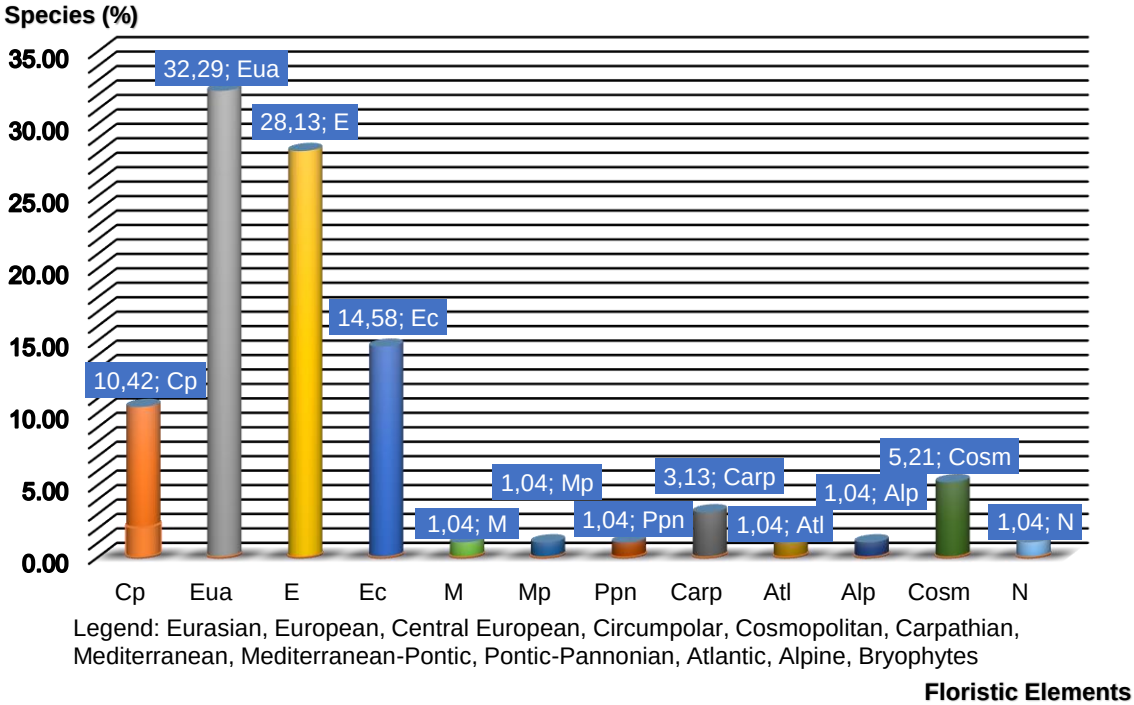

Fig. 4. The spectrum of floristic elements in the *Fago-Quercetum petraeae* R. Tüxen 1955 association.

The analysis of the behavior of ecological factors (Figure 5) in relation to moisture illustrates that the analyzed phytocoenoses predominantly exhibit a mesophilic character (59.38%), followed by xero-mesophytes (29.17%), meso-hygrophiles (5.21%), amphi-tolerants (euryhydric) (5.21%), and xerophytes (1.04%). Regarding temperature, the majority of species are micro-mesothermal (70.83%), followed by microthermal (17.71%), amphi-tolerants (eurythermal) (7.29%), and moderately thermophilic (4.17%). The chemical reaction highlights that the majority of species are acid-neutral (32.29%) and amphi-tolerant (eury-ionic) (28.13%), followed by a smaller percentage of weak acid-neutral species (28.13%), acidophiles (8.33%), and strongly acidophilic species (3.13%).

From a karyological perspective (Figure 6), within the association, species are represented in proportions of 44.79% polyploids, 40.63% diploids, followed by 11.46% diplo-polyploid species, and four species with unknown karyotypes (3.13%). The diploidy index has a value of 0.90.

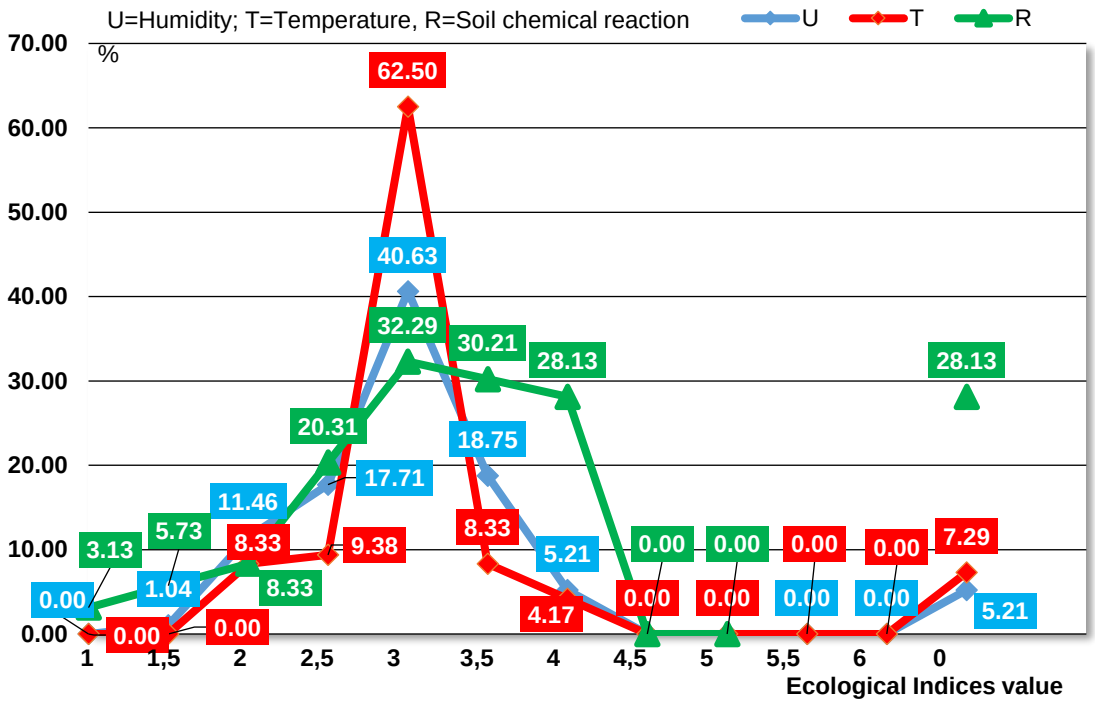

Fig. 5. Diagram of ecological indices for the association *Fago-Quercetum petraeae* R. Tüxen 1955.

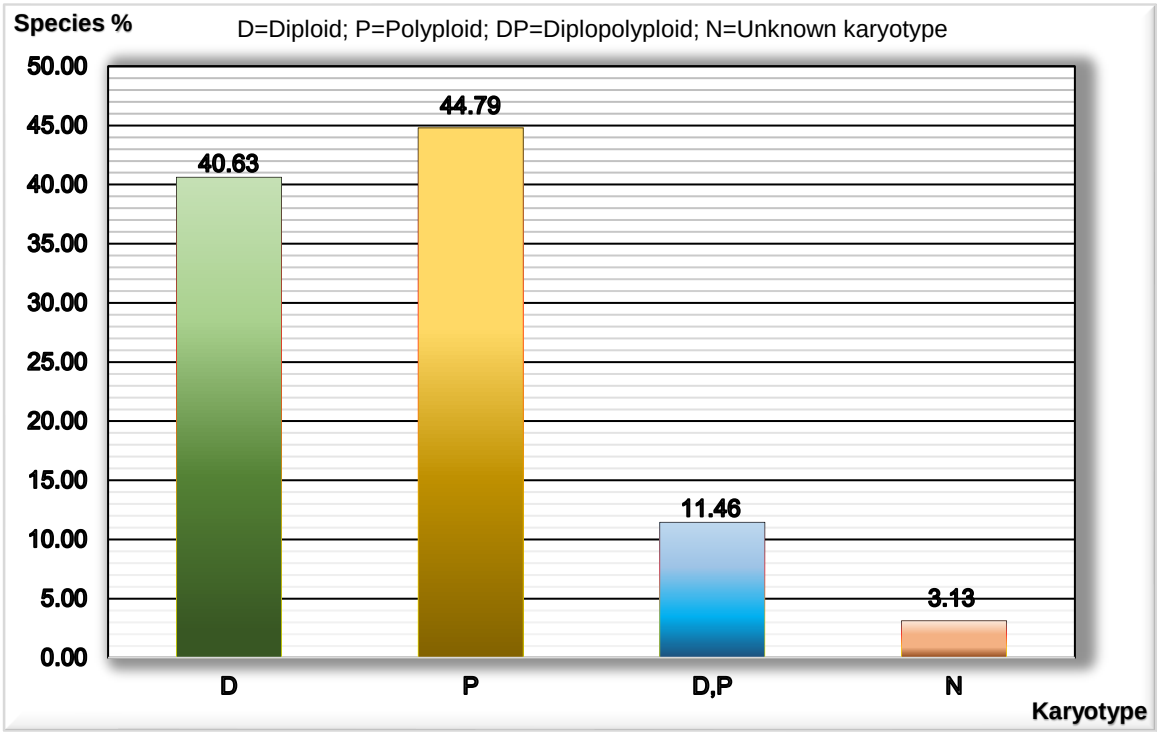

Fig. 6. The cariologic spectrum of the *Fago-Quercetum petraeae* R. Tüxen 1955 association.

CONCLUSIONS

The phytocenoses of the *Fago-Quercetum petraeae* R. Tüxen 1955 association develop in the northern part of the Semenic Mountains, with a rich floristic composition comprising 91 species, occupying the terrain with variable slopes (4-20º), on moderately inclined, sunny slopes with different exposures, including west, south, southwest, southeast, northwest, and shaded areas, on wide valley bottoms, situated at altitudes between 420-620 m. The rock types in this area are acidic, such as siliceous sandstones and marls, while the soils are eutricambosols, ranging from shallow to moderately deep, with a skeletal, acidic, well-drained, and eutrophic nature.

The analysis of bioforms highlights a high percentage of hemicryptophyte species (H = 48.96%) as the main components of the herbaceous layer in grassland carpets, some of which also penetrate forests. The high percentage of hemicryptophytes is a consequence of the studied geographical area belonging to the climate of a temperate and temperate-continental region. Phanerophytes (Ph = 25.00%) are the main components of forests and shrublands, occupying the largest areas in the territory, although their numerical

participation in the vegetation structure is smaller than that of hemicryptophyte species.

The spectrum of floristic elements reveals the predominance of Eurasian species (Eua = 32.29%), which have intersected with European (E = 28.13%) and Central European (Ec = 14.58%) elements in various phytohistorical stages.

The study conducted regarding the requirements of species with respect to the main ecological indicators highlights the following:

- In terms of moisture, mesophyte species (59.38%) predominate, indicating favorable moisture conditions in this territory. The presence of a relatively high percentage of xero-mesophytes (29.17%) indicates the existence of ecotopes with a relative moisture deficit, such as sunny slopes, more or less eroded, and dry grasslands.
- Under the aspect of plant behavior towards temperature, the most numerous are the micro-mesothermal species (70.83%), characteristic of mountain beech forests, hillside hornbeam and oak forests, as well as mountain and hillside grasslands. The narrow, shaded, and cool valleys determine the presence of microtherm species (17.71%) and cryophilic species (7.29%) in this territory.
- Regarding the reaction of the soil, it is favorable for the development of acid-neutral species (32.29%) and amphitolerant species (euionic) (28.13%).

The karyological analysis of the cormophyte gene pool in the surveyed territory illustrates the presence of a large number of polyploid species (44.79%), adapted to environmental conditions and with an increased capacity to colonize lands. They are followed by diploid species (40.63%), which store the necessary genetic potential for the evolution of the species composing the vegetation cover. A relatively small percentage of species are diplopolyploid (11.46%), with a role in adapting to environmental conditions and habitat colonization.

The influence of warm air masses that periodically penetrate south of the Danube from the Mediterranean Sea basin has favored the development of thermophilic Mediterranean, Mediterranean-Pontic, and Atlantic species, accounting for 3.12% of the total.

AUTHOR CONTRIBUTION

Conceptualization, I.B.R.; methodology, I.B.R.; data collection, I.B.R.; data validation, I.B.R; data processing, I.B.R; writing - original draft preparation I.B.R; writing - review and editing, I.B.R.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The author declares no conflict of interest.

REFERENCES

Borza, A., Boşcaiu, N., (1965): Introducere în studiul covorului vegetal. Academiei Române Publishing House, Bucharest, 342 p.

Borza, Al., (1946): Vegetaţia muntelui Semenic din Banat, Bul. Grăd. Bot. Muz. Bot. Cluj, 26, Cluj-Napoca, 1-2: 24-53 p.

Boşcaiu, N., (1971): Flora şi vegetaţia Munţilor Ţarcu, Godeanu şi Cernei, Edit. Acad., Bucureşti, 494p.

Borhidi, A., (1996): Critical revision of the Hungarian plants communities. Janus Pannonius University Press,Pécs, 43-94 p.

Braun-Blanquet, J., Pavillard, J., (1928): Vocabulairae de Sociologie Végétale. Troisieme edition. Imprimerie Lemair – Ardres, 15-18 p.

Braun-Blanquet, J., (1964): Pflanzensoziologie. Springer-Verlag, Wien - New York, 3, Aufl, 12-24 p.

Chifu, T., Mânzu, C., Zamfirescu, O., (2006): Flora & vegetaţia Moldovei (România). University ”Alexandru Ioan Cuza” Publishing House, Iaşi, 437-452 p.

Ciocârlan, V., (2009): Flora ilustrată a României. Pteridophyta & Spermatophyta. Ceres Publishing House, Bucharest, 1141 p.

Cristea, V., Gafta, D., Pedrotti, F., (2004): Fitosociologie. Presa Universitară Clujeană Publishing House, Cluj-Napoca, 394 p.

Dihoru, Gh., Negrean, G., (2009): Cartea roşie a plantelor vasculare din România. Academiei Române Publishing House, Bucharest, 630 p.

Doniţă, N., Popescu, A., Paucă-Comănescu, M., Mihăilescu, S., Biriş, I.A., (2005): Habitatele din România. Tehnică Silvică Publishing House, Bucharest, 207-208 p.

Ellenberg, H., (1974): Zeigerwerte der Gefässpflanzen Mitteleuropas - Scripta Geobotanica. Göttingen, 9: 1- 97 p.

Grigore Mihai (1981): Semenic, colecţia Munţii noştri, Editura sport-turism, Bucureşti, 196 p.

Mucina, L., Grabherr, G., Ellmaner, T., (1993): Die Pflanzengesellschaften Österreich, teil I. Anthropogene Vegetation, (Gustav Fischer) Verlag, Jena-Stuttgart New-York, 13: 149-169 p.

Oltean, M., Negrean, G., Popescu, A., Roman N., Dihoru., G., Sanda, V., (1994): Lista Roşie a plantelor superioare din România, Studii, sinteze, documentaţii de Ecologie, I, Bucureşti, 1-52 p.

Oprea, A., (2005): Lista critică a plantelor vasculare din România, University Al. I. Cuza Publishing House, Bucharest, 400 p.

Peia. P., (1978): Aspecte ale vegetaţiei din Cheile Minişului, Contrib. Bot Cluj-Napoca, 235-250, 15 p.

Pop, I., Cristea, V., Hodişan, I., (2002): Vegetaţia judeţului Cluj. Studiu fitocenologic, ecologic, bioeconomic şi ecoprotectiv. Contribuţii Botanice, 1999-2000, Cluj-Napoca, 35 (2): 40-43 p.

Pott, R., (1995): Die Pflanzengesellschaften Deutschlands. 2 Auflage, Verlag Eugen Ulmer, Stuttgard, 622 p.

Puumalainen, J., Kennedy, P., Folving, S., (2003): Monitoring forest biodiversity: a European perspective with reference to temperate and

boreal forest zone. Journal of environmental management, London, 67 (1): 5-14 p.
Rodwell, J.S., Schaminée, J. H. J., Mucina, L., Pignatti, S., Dring, J., Moss, D., (2002): The diversity of European vegetation - An overview of phytosociological alliances and their relationships to EUNIS habitats. National Centre for Agriculture, Nature Management and Fisheries, Wageningen, 168 p.
Sanda, V., (2002): Vademecum ceno-structural privind covorul vegetal din România. Vergiliu Publishing House, Bucharest, 331 p.
Sanda, V., Biţă-Nicolae, C., Barabaş, N., (2004): Flora cormofitelor spontane şi cultivate din România. Ion Borcea Publishing House, Bacău, 316 p.
Sanda, V., Barabaş, N., Biţă-Nicolae, C., (2005): Breviar privind parametrii structurali şi caracteristicile ecologice ale fitocenozelor din România. Partea I. ″Ion Borcea″ Publishing House, Bacău, 255 p.
Sanda, V., Kinga, Ö., Burescu, P., (2008): Fitocenozele din România, sintaxonomie, structură, dinamică şi evoluţie. Ars Docendi Press, Bucharest, 570p.
Soó, R., (1980): A magyar flóra és vegetáció rendszertani-növényföldrajzi kézikönyve VI. Akadémia Kiadó, Budapest, 556 p.
Tüxen, R., (1955): Das System der Nordwestdeutschen Pflanzengeselschaften, Mit Floristic-Sociologie Arbeitsgen, n. Folge, 5: 155-176 p.
Weber, H. E., Moravec, J., Theurillat, J.-P., (2000): International Code of Phytosociological Nomenclature. 3rd edition, Journal of vegetation Science Opulus Press, Uppsala, Sweden 11: 739–768 p.
(2012) *** Amenajamentul U.P. III GROPOSU – Ocolului Silvic Reşiţa, Regia Naţională a Pădurilor – Romsilva, Institutul de Cercetări şi Amenajări Silvice;
(2012) *** Amenajamentul U.P. IV STÂRNIC – Ocolului Silvic Reşiţa, Regia Naţională a Pădurilor – Romsilva, Institutul de Cercetări şi Amenajări Silvice;
(2012) *** Amenajamentul U.P. V RÂUL ALB – Ocolului Silvic Reşiţa, Regia Naţională a Pădurilor – Romsilva, Institutul de Cercetări şi Amenajări Silvice;
(2012) *** Amenajamentul U.P. VII CRAINIC-COZIA – Ocolului Silvic Văliug, Regia Naţională a Pădurilor – Romsilva, Institutul de Cercetări şi Amenajări Silvice;
(2012) *** Amenajamentul U.P. VIII BOGATU – Ocolului Silvic Văliug, Regia Naţională a Pădurilor – Romsilva, Institutul de Cercetări şi Amenajări Silvice Silvice.