SAXICOLOUS VEGETATION FROM THE VÂRTOP MASSIF - THE MOUNTAINS OF BIHOR. PHYTOCENOSIS OF THE ASPLENIETUM VIRIDAE. AS. NOVA. ASSOCIATION

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Abstract

The Asplenietum viridae association gathers the phytocenoses of the subalpine saxicolous vegetation of the Biharia Massif, Bihor county. The relief on which the phytocenoses of the association develops is one consisting of massive rockland, located on the northern slopes, with limestone rocks, at altitudes ranging between 1140-1160 m. In the surveyed territory, the phytocenoses of the association are located on some small areas (1-4 m^2), on the shady rockland , with strips and cracks on the Vârtop Massif and the Seaca Valley. The specific and dominant species are Asplenium viridae and Ctenidium moluscum. In addition to the two aforementioned we encounter in the floristic structure different elements of the association Cistopteridion (Asplenium scolopendrium, Cystopteris fragilis), of the order Tortullo-Cybarietalia (Geranium robertianum, Polypodium asgara) and class Asplenietea trichomanis (Doronicum columnae, Moehringia muscosa, Veronica urticifolia), bringing together a small number of taxa (see Table 1), The floristic index of the association summates 13 species of which hemicryptophytes (75%), followed by geophytes (16.6%) and therophytes (8.33%), circumpolar (33.33%), followed by cosmopolitan species (25%). With regard to ecological indices moisture (M), temperature (T) and soil chemical reaction (R), mesophilic (66.66%), micro-mesothermal (58.33%) and acid-neutrophilic species (41.66%) are dominant. The cariologic analysis highlights diploid species (50%), which forms the genetic reserve for evolution purposes.

Key words: saxicolous vegetation, phytocenosis, floristic elements, bioforms, karyotype, ecological indices

INTRODUCTION

The saxicolous vegetation dominated by *Asplenium viridae and Ctenidium moluscum* grows on massive, steep slope (60° - 90°), calcareous rockland, located on the northern slopes, at an altitude ranging between 1140 m and 1160 m in the Bihor Mountains. At lower altitudes this vegetation decreases in terms of consistency or even disappears.

Research on the saxicolous vegetation was carried out in the basin of the Arieș River Valley by Ursu, 2013, on the *Asplenietum septentrionali - adianti - nigri* coenosis from which *Asplenium viridae* is missing, and by Togor, 2016, on the Padiș Plateau rockland, which describes the *Asplenio*

trichomani- Poëtum nemoralis association; the species *Asplenium viridae* is also missing from this coenosis.

MATERIAL AND METHOD

The surveyed material consists of the subalpine rockland populated with the species *Asplenium viridae* and *Ctenidium moluscum* from the Biharia Massif, Bihor county, located especially at the Vârtop Massif and Băița Plai village. A total of five surveys (phytocenological relevés) were carried out on the most representative phytocenoses. In the Association table (see Table 1 below) all the species we found are listed and classified according to the corresponding cenotaxonomic units (sub-alliance, alliance, order, class) by constancy (K), while observing the criteria of the works of Borza et Boşcaiu, 1965, the requirements of the eco-floristic systems developed by Tüxen, 1955, Braun-Blanquet, 1964, and based on the information provided in the most recent papers of Coldea et al., 1997 and Sanda et al., 2008, with an assessment of abundance and dominance (AD) of each species according to the Braun-Blanquet and Pavillard scale, 1928. Phytocenosis of rock vegetation consisting of *Asplenium viridae* and *Ctenidium moluscum* was analyzed, and characterized ecologically, phytocenologically and cytogenetically based on the Association table and histograms with regard to the distribution of bioforms, floristic elements, ecological indices and genetic categories.

Classification and description of the associations were made on the basis of the floristic criterion, with the help of characteristic, dominant and differential species. The name of the association is given in accordance with the provisions established by the International Code of Phytosociological Nomenclature developed by Weber et al. (2000)

The ecological and phytocenological characterization of the species within the surveyed area was done according to Sanda et al., 2003, Ciocârlan, 2009, and Sârbu et al., 2013.

The information on the level of ecological indices, bioforms, floristic elements, number of chromosomes, are presented according to the synthesis works developed by Ellenberg, 1979, Pop, 1977, 1982, Sanda et al., 1983, 2003, 2008, Cristea et al., 2004, Ciocârlan (2009), Burescu and Toma, 2005, and Doniţă et al.., 2005

We analysed the phytocenoses in terms of categories of ecoforms, moisture (M), temperature (T) and chemical reaction of the soil (R) according to the works of Sanda et al., 1983, 2003, who adapted the ecological index values for the plants in Central Europe classified on a scale ranging from 1 to 9 according to Ellenberg, 1979, to the specific pedoclimatic conditions of Romania using, this time, a scale ranging

between 1 and 6. Cytogenetic analysis of the species by karyotype was done according to the works of Sanda et al., (2003.

RESULTS AND DISCUSSION

It is about a casmophlyic plants association that grows in the cracks and on the belts of shady limestone rockland, covered by a thin layer of loose soil.

The dominant, specific species of the association i.e. *Asplenium viridae* (ADm=19%) and the bryophyte *Ctenidium moluscum* (ADm = 51%) have an overall coverage range of 70%.

The floristic inventory of the association *Asplenietum viridae* adds up to 13 species. Nine species belong to the basic coenotaxa of the association, of which two species are enclosed into the *Cistopteridion alliance (Cistopteris fragilis, Asplenium scolopendrium)*, two species are included in the order *Tortullo-Cybarietalia* (*Geranium robertianum, Polypodium vulgare*), three species are part of the *Asplenietea- Trichomanis* class (*Doronicum columnae, Moehringia muscosa, Veronica urticifolia*). Four species belong to the *Querco - Fagetea* transgressive class (*Dryopteris filix - mas, Mycelis muralis, Oxalis acetosella, Polystihum aculeatum*), which are species that are characteristic for the vegetation of that area' forests.

The holotype of the association is the survey no 1 (see Table 1).

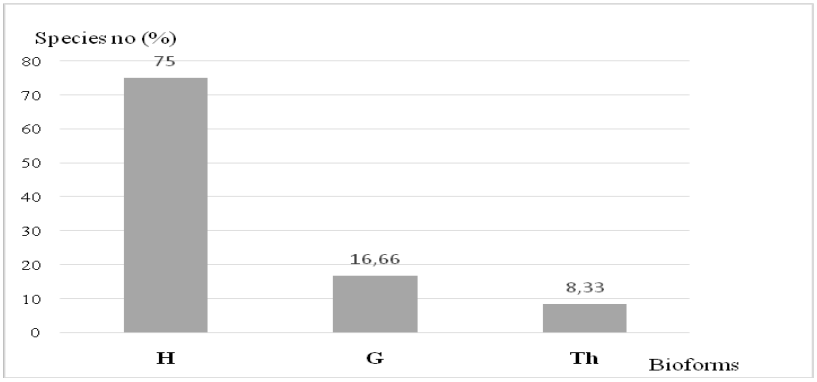

Fig. 1. The bioforms spectrum of the *Asplenietum viridae* association
Caption: H = Hemicryptophytes, G = Geophytes, Th = Therophytes

The bioforms of the *Asplenietum viridae* association (See Chart no 1 above) are dominated by hemicryptophytes (75%), followed by geophytes (16.6%), and to a smaller extent by the therophytes (8.33%).

Table 1

Asplenietum viridae As. nova.

Bioform	**Floristic elem.**	**M**	**T**	**R**	**K**	**Survey no**	**1**	**2**	**3**	**4**	**5**	**K**	**ADm**
						Altitude (m)	1160	1154	1152	1140	1145		
						Exposition	N	N	N	N	N		
						Slope (°)	70	90	80	60	70		
						Vegetation coverage (%)	80	80	80	70	80		
						Surveyed area (m^2)	4	4	1	1	2		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
H	Cp	4	2	4	D	As. *Asplenium viridae*	2	3	2	1	2	V	19.0
						As. *Ctenidium moluscum*	4	4	4	1	4	V	51.0
						Cistopteridion							
G	Cp	3.5	3	5	D	*Asplenium scolopendrium*	+	+	+	1	+	IV	0.6
H	Cosm	3.5	0	0	P	*Cistopteris fragilis*	.	+	.	.	.	I	0.01
						Tortullo- Cybarietalia							
Th-TH	Cosm	3.5	3	3	D	*Geranium robertianum*	+	+	+	+	+	V	0.05
G	Cp	3.5	3	4	P	*Polypodium vulgare*	1	.	.	.	.	I	1.0
						Asplenietea- Trichomanis							
H	Alp-Carp-B	3.5	2	3.5	CN	*Doronicum columnae*	+	+	.	.	.	II	0.2
H	Ec	4	2	4	P	*Moehringia muscosa*	+	.	.	.	.	I	0.1
H	Ec	3	2.5	4	D	*Veronica urticifolia*	+	.	.	.	.	I	0.1
						Querco- Fagetea							
H	Cosm	4	3	0	P	*Dryopteris filix- mas*	+	.	.	.	+	II	0.2
H	E	3	3	3	D	*Mycelis muralis*	+	.	.	.	.	I	0.1
H	Cp	4	3	3	D	*Oxalis acetosella*	.	.	+	.	.	I	0.1
H	E	3.5	3.5	3.5	P	*Polystichum aculeatum*	.	.	.	.	+	I	0.1

Place and date of surveys: 1-3 Vârtop Massif; 4-5 Seaca Valley - Băița Plai village, 16.09.2018.

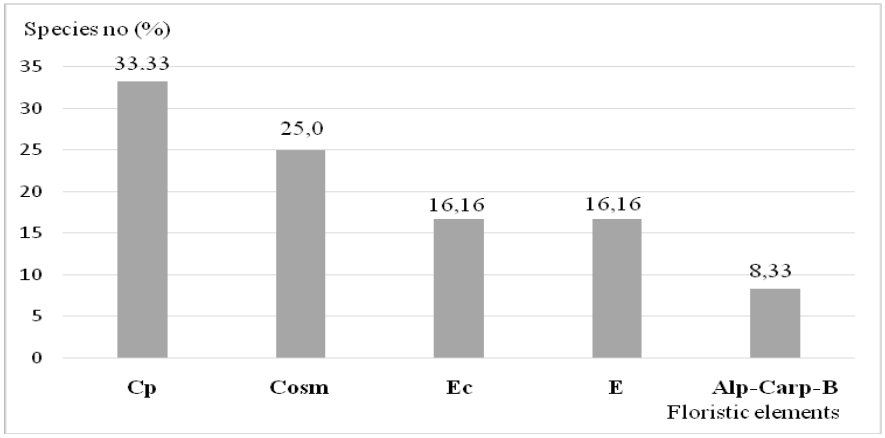

Fig. 2. Floristic elements spectrum of the *Asplenietum viridae* association
Caption: Cp = Circumpolar, Cosm = Cosmopolitan, Ec = Central European, E = European, Alp-Carp-B = Alpine - Carpathian – Balkan

With respect to the geographical area and the current distribution of species (see Chart no 2 above) in the case of phytocenoses of the *Asplenietum viridae* association, circumpolar species (33.33%) are dominant, followed by cosmopolitan ones (25%), and the European and Central European species each with an equal share of 16.16%. The Alpine - Carpathian - Balkan species are present in small share (i.e. 8.33%).

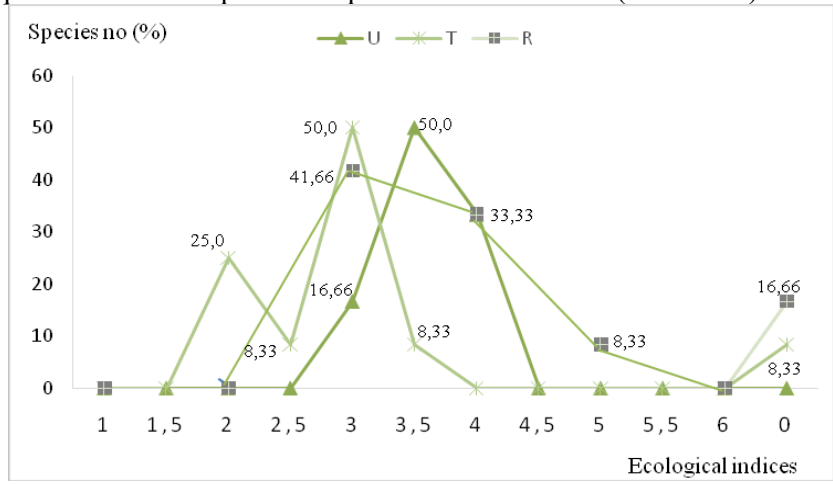

Fig. 3. Diagram of ecological indices for the *Asplenietum viridae* association

The analysis of ecoforms (see Chart no 3 above) shows that mesophilic species (66.66%) are dominant in relation to soil moisture, followed by mesohygrophilic species (33.33%). Regarding the temperature factor, the micro-mesothermal species (58.33%) are dominant, followed by

microthermal ones (33.33%) and eurithermal species (8.33%). By the soil chemical reaction, the acid-neutrophilic species (41.66%) are dominant, followed by weak acid-neutrophilic (33.33%), euryionic (16.66%) and neutrophilic species (8.33%).

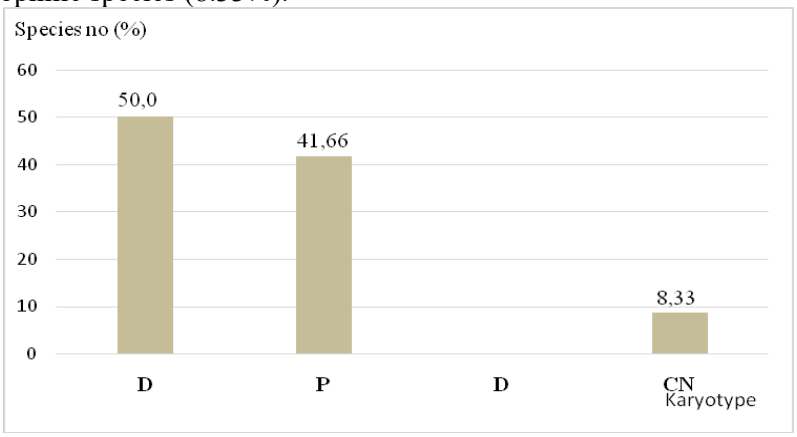

Fig. 4. *Asplenietum viridae*
Caption: D = Diploid, P = Polyploid, DP = Diplo-Polyploid, UK = Unknown karyotype

The karyological spectrum of the *Asplenietum viridae* association shows that diploid species (50%) are dominant and form the genetic reserve to secure the evolution thereof, followed by polyploid species (41.66%), which provides adaptation to habitat conditions and by unknown karyotype species (8.33%).

Phytocenoses of saxicolous vegetation populated with *Asplenium viridae* have not been surveyed and analyzed phytocenologically so far. It turns out that no comparisons can be made with other research works of foreign or domestic authors.

Therefore we present for the first time the floristic, ecological, phytocenological description and analysis of a coenosis dominated by *Asplenium viridae* that we subordinated to the association *Asplienietum viridae* as. nova. Holotypus hoc loco: see Table no 1.

CONCLUSIONS

1. The phytocenoses of the *Asplenietum viridae* association go through the adverse season of vegetation, i.e. the cold season, as hemicryptophytes (75%), followed by the geophytes (16.6%) and therophytes (8.33%), thus benefiting from better adaptation possibilities to the temperate-continental region climate.

2. As regards the geographical area of the association *Asplenietum viridae*, the circumpolar plant species (33.33%) are dominant, followed by the cosmopolitan ones (25%).
3. As far as the ecological factors are concerned, in terms of soil moisture the mesophiles (66.66%) are dominant, the micro-mesotherms are dominant (58.33%) in terms of temperature, and the acidic-neutrophils are dominant (41.66%) with regard the chemical reaction of the soil.
4. The genetic structure by karyotype of the association phytocenoses is dominated by the diploid (50%) followed by the polyploid species (41.66%).
5. The described saxicolous coenosis is of scientific importance and is described for the first time.

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