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WOODY VEGETATION OF *MYRICARIA GERMANICA* WITH *SALIX PURPUREA* ALONG THE LEUCA VALLEY

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Abstract

The phytocenoses of the association Salici purpureae-Myricarietum develop as clumps, on periodically flooded gravel, from the upper course of the Leuca Valley (Arad County).

The floristic inventory of the association gathers 63 species in the 5 phytosociological surveys carried out, see Table 1. The species characteristic of the association and edifying the phytocenosis are Myricaria germanica with an average coverage of 47%, maximum constancy (K = V), and Salix purpurea with an average coverage of 25.5%, maximum constancy (K = V), both in codominance. The phytocenoses of the association are completed by species belonging to the alliance Salicion elaeagno-Daphnoides, the order Salicetalia purpurea and the class Salicetea purpurea, as well as other transgressive species belonging to the classes Molinio-Arrhenatheretea, Querco Fagetea, Artemisietea vulgaris, and Betulo-Sesenietea.

The study of this association found in the surveyed territory, together with the review of bioforms, floristic elements, ecological indices, together with the economic analysis and interpretation of cytogenetic characters, provides important information on habitat conditions, economic importance, and ecological and scientific relevance of the phytotaxa encoutered .

Key words: phytocenoses, bioforms, floristic elements, ecological indices, karyotype

INTRODUCTION

The research of and knowledge building on the vegetation of the Biharia Massif are a challenge that responds to current scientific and practical needs.

While carrying out the exploring endeavour of the Biharia Massif area, we conducted a phytosociological, ecological and bioeconomic study of its vegetation. On the occasion of the vegetation research carried out in 2019 along the Leuca Valley from Lazuri village, Vârfurile Commune, Arad County, we found the association *Salici purpureae- Myricarietum*, Moor 1958, part of the class *Salicetea purpureae*, Moor 1958.

MATERIAL AND METHOD

The material subjected to research consists of the woody vegetation of the mountain valleys, especially Leuca Valley (Arad County, Romania). Five studies (phytosociological surveys) were performed on the most representative phytocenoses. In the Association Table (see Table 1) there

are recorded all the plant species we found, included in the corresponding cenotaxa units (i.e. subaliance, alliance, order, classes), depending on the constancy (K), according to the indications of the renowned scholars (Borza et Boşcaiu, 1965), (Cristea et al., 2004), with the criteria of the ecological-floristic systems elaborated by (Tüxen, 1955), (Braun- Blanquet, 1964), and on the basis of the information of some more recent works belonging to the authors (Borhidi, 2003), (Sanda et al., 2008), (Chifu et al., 2014). The quantitative criterion followed in the research of phytocenoses is the abundance and dominance index, according to the system elaborated by (Braun-Blanquet et Pavillard, 1928), with the establishment of constancy classes (K = I-V). Phytocenosis of the association *Salici purpureae-Myricarietum*, was surveyed and characterized ecologically, phyto-sociologically, cytogenetically based both on the Association Table (see Table 1), and histograms with reference to the distribution of bioforms, floristic elements, ecological indices and genetic karyotypes.

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

Information on the value of ecological indices, bioforms and phytogeographical elements is presented according to the following authors: (Sanda et al., 2003), (Cristea et al., 2004), (Burescu et Toma, 2005). We made use of data on species karyotype from (Majovsky et Murin, 1987), (Sanda et al., 2003), (Ciocârlan, 2009), (Moare, 2009).

To assess the economic importance of plants we used information from the "Flora of Romania" (1952-1976) as well as information from (Ciocârlan, 2009), to which we added our observations and findings on the use of plants by locals of the area.

To establish the status of rare, vulnerable, endangered, endemic species we used the so-called "Red Lists" prepared by (Boșcaiu et al., 1994), (Dihoru et Negrean, 2009), and the "European Red List and the IUCN Endangered Species List" (Bilz et al., 2011).

RESULTS AND DISCUSSION

Within the surveyed territory we found the association subject to research in the Leuca Valley, Lazuri Village, Vârfurile Commune, Arad County. The phytocenoses of this association develop along mountain valleys as clumps, on gravel subject to periodic flooding.

The floristic inventory of the association contains 63 species in the five phytosociological surveys performed, see Table 1. The species characteristic of the association and which edifies the phytocenosis are

Myricaria germanica with an average coverage of 47%, maximum constancy (K = V), and *Salix purpurea* with average coverage of 25.5%, maximum constancy (K = V), found in codominance. The phytocenoses of the association are supplemented by species of the alliance ***Salicion elaeagno - Daphnoides***, order ***Salicetalia purpurea*** and class ***Salicetea purpurea***: *Salix elaeagnos, Calamagrostis pseudophragmites, Calystegia sepium,* as well as other transgressive species belonging to the classes ***Molinio - Arrhenatheretea*** (*Mentha longifolia, Equisetum arvense, Leontodon hispidus, Prunella vulgaris, Carex hirta, Epilobium parviflorum, Hypericum perforatum*), ***Querco Fagetea*** (*Salvia glutinosa, Tanacetum corymbosum* ssp. *corymbosum, Brachypodium sylvaticum, Carex pendula, Mycelis muralis, Telekia speciosa*), ***Artemisietea vulgaris*** (*Verbascum phlomoides, Erigeron annuus, Anchuza officinalis, Melilotus alba*), ***Betulo - Adenostyletea*** (*Angelica archangelica, Digitalis grandiflora, Campanula abietina*) and ***Seslerietea mediae*** (*Oxalis stricta, Erigeron canadensis, Sonchus arvensis*).

In the spectrum of bioforms (see Fig. 1 below) hemicryptophytes are dominant (61.90%), followed at a great distance by therophytes (17.45%) and geophytes (11.11%).

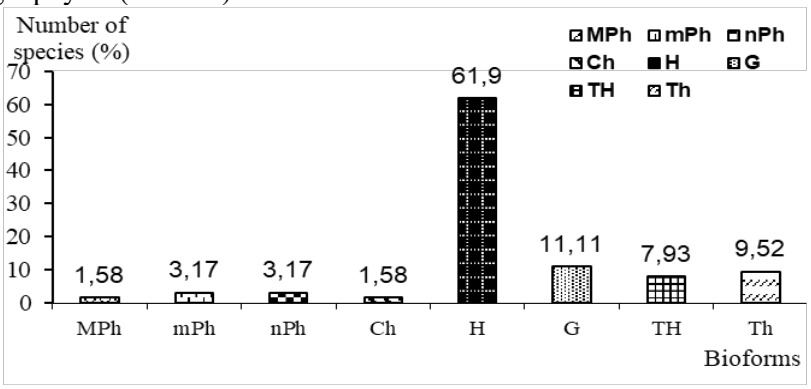

Fig. 1 Spectrum of bioforms of the association *Salici purpureae – Myricarietum*
Legend: MPh = Megaphanerophytes; mPh = Mesophanerophytes; nPh = Nanophanerophyte; Ch = Chamaephyte; H = Hemicryptophytes; G = Geophytes; TH = Annual Therophytes; Th = Biannual Therophytes.

The spectrum of floristic elements (see Fig. 2 below) shows an increased dispersion in terms of the origin of the plants belonging to this association, the majority being Eurasian (53.96%), followed at a great distance by European (11.11%), Central European (7.93%), circumpolar (7.93%), cosmopolitan (6.34%), adventitious (4.76%), Carpathian-Balkan (3.17%), endemite-Carpathian (1.58%), Atlantic (1.58%), and Balkan & Pontic (1.58%) species.

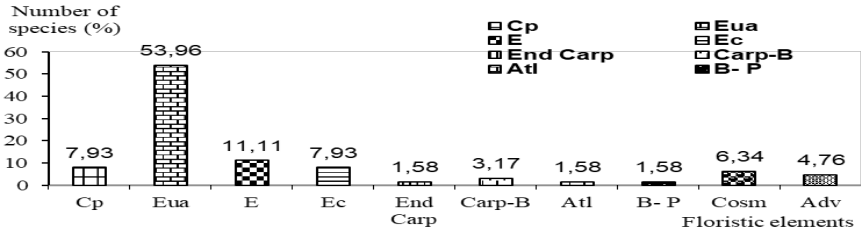

Fig. 2 The spectrum of floristic elements from the association *Salici purpureae – Myricarietum*

Legend: Cp = Circumpolar; Eua = Eurasian; E = European; Ec = Central European; End Carp = Endemite-Carpathian; Carp-B = Carpathian-Balkan; Atl = Atlantic; B-P = Balkan & Pontic; Cosm = Cosmopolitan; ADV = adventitious.

From the humidity point of view (see Fig. 3), the most numerous plant species are the mesophiles (41.6%), followed by the mesohygrophiles (22.21%), xeromesophiles (17.45%) and hygrophiles (12.96%). Depending on their behaviour towards temperature, more than half are micro-mesotherms (55.54%), followed by eurytherms (20.63%), microtherms (17.45%) and moderate thermophiles (4.76%). The chemical reaction of the soil favours the development of euryionic species (36.50%), succeeded by weak neutrophilic (28.57%), acid-neutrophilic (26.98%), acidophilic (6.34%) and strongly acidophilic (1.58%) species.

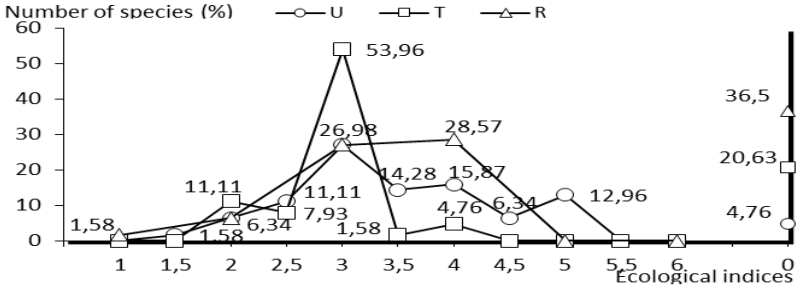

Fig. 3 Chart of ecological indices for the association *Salici purpureae – Myricarietum*

Analysis of chromosomal karyotypes (see Fig. 4 below), highlights the dominance of polyploid (52.38%), compared to diploid (38.09%) and diplo-polyploid (9.52%) species. The diploid index has a value of 0.72.

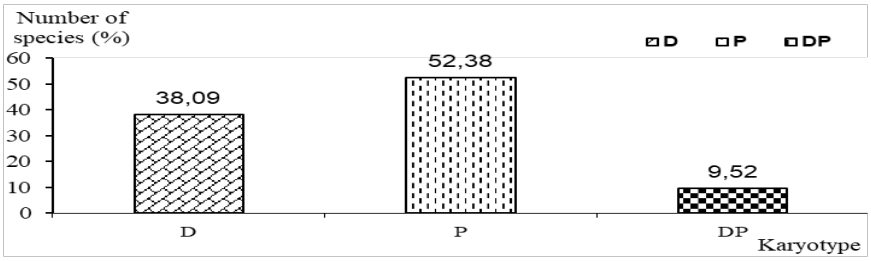

Fig. 4 Cariological spectrum of the association *Salici purpureae – Myricarietum*
Legend: D = Diploid; P = Polypoid; DP = Diplo-polyploid species

Importance: In the phytocenoses of the association there is an endemic species i.e. *Leuchantemum walsteinii*, a vulnerable species i.e. *Angelica archangelica*, and the species characteristic for the association i.e. *Myricaria germanica* has tinctorial properties, from its bark being extracted a black paint that can be used local household industries without endangering the cenoses of the association. At the same time, medicinal plants are found in this phytocenosis.

Table 1

Salici purpureae – Myricarietum, Moor 1958

Bio-form	Fl. el.	U	T	R	G							K	ADm
						Survey no.	1	2	3	4	5		
						Altitude (mamsl)	460	458	473	457	450		
						Exposition	-	-	-	-	-		
						Slope (º)	-	-	-	-	-		
						Vegetation cover (%)	80	50	80	70	70		
						Surface (sq.m.)	10	200	400	100	60		
mPh	Eua	5	3	4,5	D	*As. Salix purpurea*	2	1	4	3	1	V	25.5
nPh	Eua	0	0	4	P	*As. Myricaria germanica*	4	3	2	1	4	V	47.0
						Salicion elaeagno- Daphnoides, Salicetalia purpurea et Salicetea purpurea							
mPh	Ec	4	3	4,5	D	*Salix elaeagnos*	+	+	+	.	+	IV	0.4
H	Ec	5	0	2	P	*Epilobium dodonei*	+	+	+	.	+	IV	0.4
H	Eua	3	3	0	D	*Saponaria officinalis*	+	+	.	.	+	III	0.3
G	Eua	2	3	0	P	*Calamagrostis pseudophragmites*	.	+	.	.	.	I	0.1
G-H	Eua	5	3	4	D	*Calystegia sepium*	.	.	.	.	+	I	0.1
						Molinio- Arrhenatheretea							
H	Eua	4.5	3	4	P	*Mentha longifolia*	+	+	+	+	+	V	0.5
G	Cosm	3	3	0	P	*Equisetum arvense*	+	.	+	+	.	III	0.3
H	Eua	2.5	0	0	D	*Leontodon hispidus*	.	.	+	+	.	II	0.2
H	Cosm	3	3	0	P	*Prunella vulgaris*	.	.	+	+	.	II	0.2
G	Cp	0	3	0	P	*Carex hirta*	.	.	+	+	.	II	0.2
Biof.	Fl. el.	U	T	R	G	Survey no.	1	2	3	4	5	K	ADm
H	Eua	5	3	4.5	P	*Epilobium parviflorum*	+	.	+	.	.	II	0.2
H	Eua	3	3	0	P	*Hypericum perforatum*	.	+	.	+	.	II	0.2

Table 1 (continuation)

Ch	E	4	3	3	P	*Lysimachia nummularia*	+	.	.	.	.	I	0.1
H	Eua	3.5	0	0	D	*Ranunculus acris*	+	.	.	.	.	I	0.1
H	Cp	5	0	2	P	*Epilobium palustre*	+	.	.	.	.	I	0.1
H-TH	Eua	3	0	0	D	*Trifolium pratense*	.	+	.	.	.	I	0.1
H	Eua	3	0	0	P	*Lotus corniculatus*	.	.	+	.	.	I	0.1
H	Cosm	3,5	3	0	D	*Verbena officinalis*	.	.	+	.	.	I	0.1
H	Eua	3	0	4	P	*Dactylis glomerata*	.	.	+	.	.	I	0.1
H	Cosm	4,5	3	3	P	*Juncus effusus*	.	.	+	.	.	I	0.1
H	Eua	3,5	4	4	P	*Potentilla reptans*	.	.	+	.	.	I	0.1
H	Eua	4	3	0	P	*Rumex crispus*	.	.	+	.	.	I	0.1
H	Eua	3	2,5	3	D	*Galium molugo*	.	.	.	+	.	I	0.1
H	Cp	3	2	0	P	*Juncus articulatus*	.	.	.	+	.	I	0.1
Th	Ec	3	3	2	P	*Centaurium erythraea ssp.erythraea*	.	.	.	+	.	I	0.1
H-HH	Eua	5	2	0	DP	*Lysimachia vulgaris*	.	.	.	+	.	I	0.1
H-HH	Eua	4	3	3	P	*Epilobium hirsutum*	.	.	.	+	.	I	0.1
H	Eua	3	0	3	D	*Cichorium intybus*	.	.	.	.	+	I	0.1
						Querco- Fagetea							
H	Eua	3,5	3	4	D	*Salvia glutinosa*	+	+	.	.	+	III	0.3
H	Eua	2,5	2,5	3	P	*Tanacetum corymbosum ssp.corymbosum*	.	+	.	+	+	III	0.3
H	Eua-M	3	3	4	DP	*Brachypodium sylvaticum*	+	+	.	.	.	II	0.2
H	Atl-M	4	2	3	P	*Carex pendula*	.	+	+	.	.	II	0.2
H	E	3	3	3	D	*Mycelis muralis*	.	+	.	+	.	II	0.2
H	Carp-E	4	2	0	D	*Telekia speciosa*	.	.	+	+	.	II	0.2
H	Cp	3,5	3	3	DP	*Milium effusum*	.	+	.	.	.	I	0.1
MPh	Eua	3,5	3	3	DP	*Populus alba*	.	.	+	.	.	I	0.1
H	End	4	2	3	D	*Leucanthemum waldsteinii*	.	.	+	.	.	I	0.1
TH-H	B-P	1.5	4	1.5	P	*Digitalis lanata*	.	.	+	.	.	I	0.1
H	E	3.5	3	3	P	*Stellaria nemorum*	.	.	.	+	.	I	0.1
Th	E	3	3	0	D	*Galeopsis tetrahit*	.	.	.	+	.	I	0.1
H	Ec	4.5	2.5	4.5	P	*Carduus personata ssp.personata*	.	.	.	+	.	I	0.1
H	Eua	2	3	3	P	*Origanum vulgare*	.	.	.	.	+	I	0.1
nPh	E	3	2.5	3	P	*Rubus hirtus*	+	.	.	.	.	I	0.1
						Artemisietea vulgaris							
TH	E	2.5	3.5	4	P	*Verbascum phlomoides*	+	.	.	+	+	III	0.3
Th-TH	Adv	4	0	4	P	*Erigeron annuus*	+	+	.	.	+	III	0.3
TH-H	E-M	2	3	0	D	*Anchusa officinalis*	.	+	.	+	.	II	0.2
Biof.	Fl.el.	U	T	R	G	Survey no.	1	2	3	4	5	K	ADm
Th-TH	Eua	2.5	3	0	D	*Melilotus alba*	.	+	+	.	.	II	0.2
						Betulo- Adenostyletea							
TH-Th	Eua-Bc	4.5	2.5	0	D	*Angelica archangelica*	.	+	.	+	.	II	0.2
H	Ec	2.5	3	3	P	*Digitalis grandiflora*	.	.	+	+	.	II	0.2
H	Carp-E	3.5	2	2	P	*Campanula abietina*	.	.	.	+	.	I	0.1
						Stellarietea mediae							

Table 1 (continuation)

H	Adv	3.5	0	0	D	*Oxalis stricta*	.	+	+	+	.	III	0.3
Th	Adv	2.5	0	0	D	*Erigeron canadensis*	.	+	.	.	+	II	0.2
G	Eua	3	0	0	P	*Sonchus arvensis*	.	+	.	.	.	I	0.1
						Variae Syntaxa							
H	Eua	4	3	3	D	*Eupatorium cannabinum*	+	+	+	+	+	V	0.5
G	Eua	0	3	4	P	*Tusilago farfara*	1	1	+	1	.	IV	3.1
H-HH	Eua	5	3	0	D	*Lycopus europaeus*	+	+	.	+	.	III	0.3
G-HH	Eua	5	4	4	P	*Carex riparia*	+	.	.	+	.	II	0.2
H-G	Eua	3	2	4	DP	*Euphorbia cyparissias*	.	.	.	+	+	II	0.2
Th	Cp	5	3	4	D	*Polygonum hydropiper*	.	.	.	+	.	I	0.1
TH	Eua	2	3	4	DP	*Echium vulgare*	.	.	.	.	+	I	0.1
H	Eua	4	3	3	D	*Hypericum maculatum*	.	.	.	.	+	I	0.1

Place and date of surveying: 1-5. Leuca Valley, 08.08.2019, GPS 462338.1, 223619.1, 462339.1, 223617.8, 462340.3, 223616.3, 462340.3, 223613.9, 462345.2, 223607.5.

CONCLUSIONS

1. The phytocenoses of Dacian deciduous shrubs with small sea buckthorn (*Myricaria germanica*) have a high conservative value, making a natural habitat of community interest which conservation requires the declaration of Special Areas of Conservation (SACs).

2. In the spectrum of bioforms, hemicryotophytes predominate (61.90%), followed at a great distance by therophytes (17.45%) and geophytes (11.11%).

3. In terms of geographical area, the Eurasian species are dominant (53.96%), followed at a great distance by the European (11.11%) species.

4. Regarding the ecological indices and in relation with humidity, the most numerous plant species are the mesophilic (41.6%), compared to the micro-mesothermal species (55.54%), while the euryionic are dominant species (36.50%) in terms of the chemical reaction of soil.

5. The analysis of chromosomal karyotypes highlights the dominance of polyploid (52.38%), compared to diploid (38.09%) and diplopolyploid (9.52%) species.

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