

THE JUNIPER VEGETATION OF BIHOR MOUNTAINS, THE CĂPĂȚÂNA WETLAND COMPLEX. PHYTOCENOSES OF THE ASSOCIATION PINO MUGO-SPHAGNETUM

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Abstract

*The phytocenoses edified by *Pinus mugo* are well represented in the wetland complex from Căpățâna (springs of Someșul Rece river), with a percentage of 33.5% ADm and maximum constancy ($K = V$). The analysis of bioforms highlights that the highest share of plant species is made of chamaephytes (45.45%) specific to subalpine regions with frosty, snowy winters, followed by phanerophytes (27.27%), hemicryptophytes (18.18%) and therophytes (9.09%).*

The spectrum of floristic elements shows the dominance of circumpolar species (63.63%), followed by alpine ones (18.18%) which include Central European-Alpine and Arctic-Alpine species, Eurasian, and European species on an equal footing (i.e. 9.09%).

The review of ecological indices indicates that in terms of humidity, the euryhydric species are dominant (45.45%), followed by mesophilic (27.27%), hygrophilic (18.18%) and meso-hygrophilic (9.09%) species. Regarding the temperature, the eurythermal (63.63%) and microthermal (36.36%) species are dominant. The chemical reaction of the soil favours the strongly acidophilic (63.63%), euryionic (27.27%) and acidophilic (9.09%) plant species.

The analysis of the genetic karyotype highlights the dominance of diploid plant species (81.81%) at a great distance from polyploid species (18.18%). The diploid index has a high value of 4.5.

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

INTRODUCTION

This association is very rare in Romania and gathers mountain shrubs of *Pinus mugo* that grow in the peatlands of Căpățâna in the form of islands on the mountain plateau, being bordered by spruces, at altitudes ranging from 1,597 m to 1,608 m, on deep peat histosols (1.5-4 m), of high acidity (pH = 3.5 - 5), permanently moist with small, drier reed bushes.

The well-represented specimens of *Pinus mugo*, developed in the form of clusters, reach heights ranging from 1 to 3 m, rarely reaching 4 m and

trunk diameters of 10-18 cm, and deciduous shrubs (*Vaccinium uliginosum ssp. uliginosum*) grows under the juniper bushes.

The phytocenoses of this association have been described only for Gutâi Mountains (Coldea et Plămadă, 1970) and Bihor Mountains (Pop et al., 1987; Coldea et Plămadă, 1989; Togor, 2016).

MATERIAL AND METHOD

The material subjected to research consists of the very rare natural ecosystems edified by the *Pinus mugo* bushes in the Bihor Mountains, the wetland complex of Căpățâna (springs of Someșul Rece river). We carried out a total of 5 phytosociological surveys on the most representative phytocenoses. In the Association Table (see Table 1), we recorded all plant species found with the assessment of abundance and dominance (AD) index for each species according to (Braun-Blanquet et Pavillard, 1928) scale. The association of subalpine shrubs *Pinus mugo* and *Sphagnum* was reviewed and characterized ecologically, phyto-sociologically, cytogenetically based both on the Association Table and the histograms with reference to the distribution of bioforms, floristic elements, ecological indices and genetic karyotypes.

Finding and description of the association were carried out 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 ones established by the Code of Phytosociological Nomenclature developed by (Weber et al., 2000). The classification of the species in the corresponding cenotaxonomic units (i.e. suballiances, alliances, orders, classes) was made according to the ecological-floristic systems elaborated by (Tüxen, 1955), (Braun-Blanquet, 1964) and on the basis of more recent works of (Coldea et al., 1997) and (Sanda et al., 2003, 2008).

The ecological and phytosociological characterization of the species from the surveyed territory was made in accordance with the works of (Sanda et al., 2003), (Ciocârlan, 2009), and (Sârbu et al., 2013).

The information regarding the value of ecological indices, bioforms, floristic elements, number of chromosomes are presented after the synthesis works made by (Pop, 1977, 1982), (Sanda et al., 2003, 2008), (Cristea et al. 2004), (Ciocârlan, 2009), (Burescu et Toma, 2005), and (Doniță et al., 2005).

The review of phytocenoses in terms of the influence of ecological factors such as moisture (M), temperature (T) and chemical reaction of the soil (R) were carried out according to the works of (Sanda et al., 2003) that adapted the values of ecological indices for plants in Central Europe on a

scale ranging from 1 to 9 after (Ellenberg, 1974), to the pedoclimatic conditions specific to Romania, using a scale ranging between 1 and 6. The classification of the species in the corresponding cenotaxa was done according to the works of the authors (Borza et Boşcaiu, 1965).

Cytogenetic analysis of species by karyotype was carried out according to the works of (Sanda et al., 2003).

RESULTS AND DISCUSSION

The composition of the plant association includes a small number of species, but with a very high conservation value (HCV) comprising 11 cormophyte species and three bryophyte species (see Table 1). The characteristic species of the alliance *Pinion mugii*, the order JUNIPERO-PINETALIA MUGI, and the class VACCINIO-PICEETEA are *Vaccinium myrtillus*, *Picea abies*, *Vaccinium vitis-idaea*, *Melampyrum sylvaticum*, *Deschampsia flexuosa*, *Sphagnum recurvum*, *Sphagnum recurvum*, *Sphagnum* while the other relict species (i.e. *Eriophorum vaginatum*, *Andromeda polifolia*, *Vaccinium uliginosum* ssp. *Uliginosum*, *Empetrum nigrum*, *Vaccinium microcarpum*) are included in the class **OXYCOCCO-SPHAGNETEA**.

In terms of floristic composition, following the analysis of the Association Table (see Table 1) and histograms, in comparison with the work of (Togor, 2016), we notice that we found in this association 11 species as against 13 found by of (Togor, 2016), of which five belong to the alliance, order and class which is the same number of species found by of (Togor, 2016).

From the comparison of the spectrum of bioforms, in our survey chamaephytes predominate with a percentage of 45.45% while in of (Togor, 2016), hemicryptophytes are dominant with 46.16%. Phytogeographic elements are represented by circumpolar species 63.63% (69.23% in of Togor, 2016). The chart of ecological indices shows that euryhydric species predominate with 45.45% while in of (Togor, 2016) hygrophilous and mesophilic species are dominant with 30.78% each; in our survey eurythermal are dominant with 63.63% and while in of (Togor, 2016) microthermal are dominant with 53.85%. The strong acidophilic species are dominant both in our case study i.e. 63.63% and in (Togor's, 2016) i.e. 61.54%. The karyological analysis shows that diploid species reach the highest percentage in our study i.e. 81.81%, while in of (Togor, 2016), they reach only a share of 53.85%.

From the analysis above it results that the results are far from being similar because the surveyed areas do not have the same pedoclimatic conditions.

Analysis of bioforms (see Fig.1 below) shows us that the highest chamaephytes have the highest share (45.45%) which is a specificity of to the subalpine regions with frosty, snowy winters, rich in snow, followed by phanerophytes (27.27%), hemicryptophytes (18.18 %) and therophytes (9.09%).

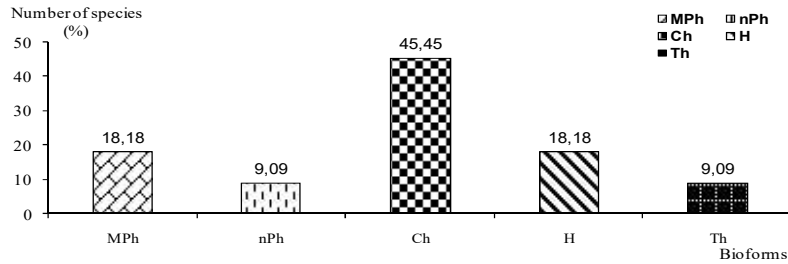


Fig. 1 Spectrum of bioforms in the *Pino mugo-Sphagnetum* association
 Legend: MPh = Megaphanerophytes; nPh = Nanophanerophyte; Ch = Chamaephytes; H = Hemicryptophytes; Th = Annual therophytes.

The spectrum of floristic elements (see Fig. 2 below) highlights the dominance of circumpolar species (63.63%), followed by Alpine ones (18.18%) which include Central European-Alpine and Arctic-Alpine species, and Eurasian and European species in equal shares (9.09%).

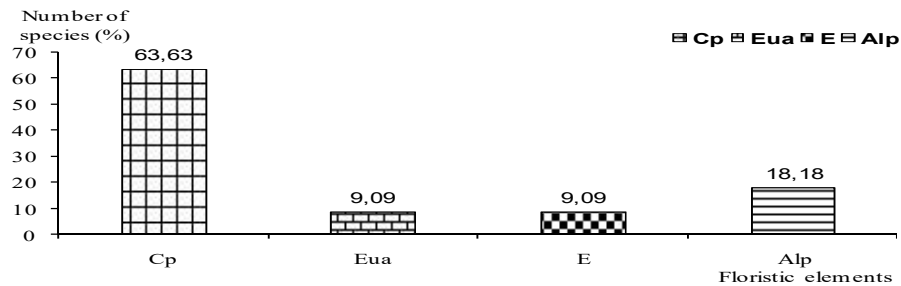


Fig. 2. The spectrum of floristic elements in the association *Pino mugo-Sphagnetum*
 Legend: Cp = Circumpolar; Eua = Eurasian; E = European; Alp = Alpine

The chart of the ecological indices (see Fig. 3 below) indicates that in terms of humidity the dominant species are the euryhydric species (45.45%), followed by mesophiles (27.27%), hygrophiles (18.18%) and meso-hygrophiles (9.09%). In terms of temperature, the species eurythermal (63.63%) and microthermal (36.36%) species are predominant.

As far as chemical reaction is concerned, the soil favours the strongly acidophilic (63.63%), euryionic (27.27%) and acidophilic (9.09%) species.

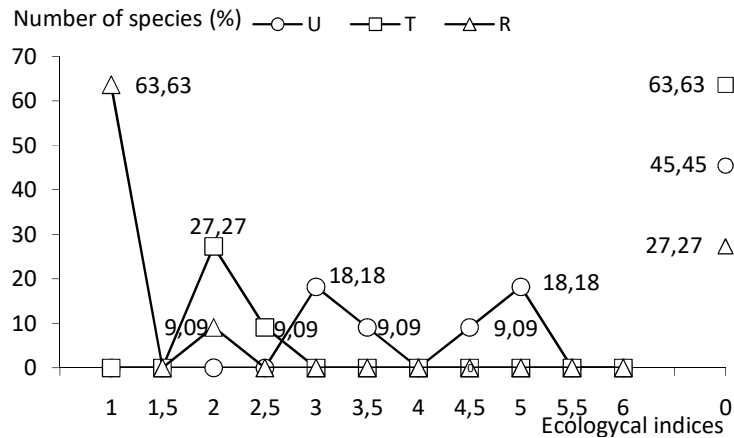


Fig. 3. Chart of ecological indices of the association *Pino mugo-Sphagnetum*

The analysis of the genetic karyotype (see Fig. 4) highlights the dominance of diploid species (81.81%) at a great distance from polyploid ones (18.18%). The diploid index has a high value of 4.5.

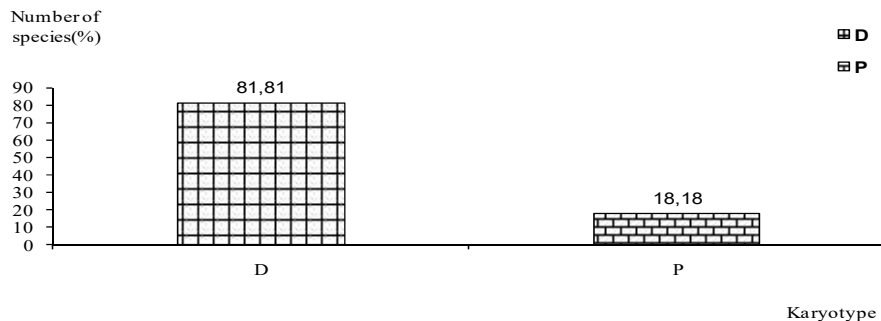


Fig. 4. The karyological spectrum for the association *Pino mugo-Sphagnetum*
Legend: D = Diploid; P = Polyploid

These high value junipers are included in the habitat type: R3105 Southeast Carpathian dwarf pine bushes (*Pinus mugo*) in oligotrophic Sphagnum wetlands. Correspondence: NATURA 2000: 91D0* Bog woodland.; PAL.HAB: 31.562 Sphagnetum mountain pine scrub. These are rare, high conservation value habitats (HCVs) including relict species, part of the list of natural habitats of community interest which conservation

Table 1

Pino mugo-Sphagnetum Kästner et Flössner 1933

Biof.	Fl. cl	M	T	R	G	Survey no.	1	2	3	4	5	K	ADm
						Altitude (mamsl)	1608	1607	1597	1602	1607		
						Herbaceous layer coverage (%)	80	90	40	90	90		
						Moss layer coverage(%)	90	80	85	60	85		
						Surface (sq.m.)	400	400	400	400	400		
MPh	Ec-Alp	0	2	0	D	<i>As. Pinus mugo</i>	3	3	3	2	3	V	33,5
						<i>As. Sphagnum recurvum</i>	5	4	4	3	4	V	62,5
						<i>As. Sphagnum magellanicum</i>	+	+	+	+	+	V	0,5
						<i>As. Sphagnum fallax</i>	.	.	+	+	+	III	0,3
Pinion mugi, Junipero-Pinetalia mugi, Vaccinio-Piceetea													
Ch-nPh	Cp	0	2	1	D	<i>Vaccinium myrtillus</i>	3	3	+	4	3	V	35,1
MPh	E	0	0	0	D	<i>Picea abies</i>	+	+	1	+	.	IV	1,3
Ch-nPh	Cp	3	2	1	D	<i>Vaccinium vitis-idaea</i>	+	+	+	.	+	IV	0,4
Th	Eua	3	0	1,5	D	<i>Melampyrum sylvaticum</i>	+	+	.	+	.	III	0,3
H	Cp	2	0	1	P	<i>Deschampsia flexuosa</i>	.	+	.	.	.	I	0,1
Oxycocco-Sphagnetea													
H	Cp	4,5	0	1,5	D	<i>Eriophorum vaginatum</i>	1	+	1	1	1	V	4,1
Ch-nPh	Cp-Bo	5	2,5	1	P	<i>Andromeda polifolia</i>	+	+	+	.	+	IV	0,4
Ch-nPh	Cp-Bo	0	0	1	D	<i>Vaccinium uliginosum ssp. uliginosum</i>	+	2	+	.	+	IV	3,8
nPh-Ch	Cp-Arct	3,5	0	0	D	<i>Empetrum nigrum</i>	+	+	1	.	1	IV	2,2
Ch	Arct-Alp	5	0	2	D	<i>Vaccinium microcarpum</i>	.	+	+	+	1	IV	1,3

Place and date of surveying: 1-5 Căpățâna wetlands, 21.07.2019 GPS 462811, 230544.7; 28.07.2019 GPS 462817.3, 230601.4; 462820.6, 230615.5; 462828.4; 230559.9; 462825.8, 230554.

CONCLUSIONS

1. The association is of very high scientific importance because it includes five rare, vulnerable species, glacial relicts, included in the Red Lists such as: *Eriophorum vaginatum*, *Andromeda polifolia*, *Vaccinium uliginosum ssp. Uliginosum*, *Empetrum nigrum*, *Vaccinium microcarpum*.

2. The phytocenoses of the association Pino mugi-Sphagnetum are dominated by chamaephytes (45.45%) specific to subalpine regions with frosty, snowy winters, followed by phanerophytes (27.27%), hemicryptophytes (18.18%) and therophytes (9.09%).

3. In terms of the geographical area of the association *Pino mugo-Sphagnetum*, circumpolar species are dominant (63.63%), followed by alpine species (18.18%).

4. Ecological indices show that, in terms of soil moisture, the euryhydric species are predominant (45.45%), while in relation to temperature, the eurythermal are dominant (63.63%) while as far as chemical reaction of the soil is concerned, the strongly acidophilic species dominate (63.63%).

5. In the genetic structure of the phytocenoses of the association *Pino mugo-Sphagnetum*, diploid species predominate (81.81%), which makes the genetic reserve for their evolution, at a great distance from polyploid species (18.18%). The diploid index has a high value of 4.5.

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