

Aspects of the Flora and Vegetation of the “Izvorul Bigăr” Nature Reserve (South-Western Romania)

Alma L. NICOLIN¹⁾, Ilinca M. IMBREA¹⁾

¹⁾ Banat University of Agricultural Sciences and Veterinary Medicine Timișoara, Faculty of Agriculture,
Calea Aradului, 119, 300645 Timișoara, Romania; alma.nicolin@gmail.com

Abstract

The “Izvorul Bigăr” Nature Reserve is located in south-western Romania. The aim of the present paper is to describe some aspects of the flora and vegetation around Bigăr spring. The analysis of the vegetal association was carried out using the method of the Central-European phytocoenological school. The vegetation around the Bigăr spring and waterfall is dominated by compact beech forests with a frequently reduced grassy layer and soil rich in humus. On the banks of the watercourse and on the rocks around the spring there are species specific to flooding plains of the beech sub-stratum and also thermophilous and xerophilous species, many of them Balkan, Pontic or Mediterranean elements. The phytocoenoses we analysed belong to the Phyllitidi - Fagetum Vida (1959) 1963 association. The association is characteristic to shady and moist slopes with soils rich in humus and formed on a lime substratum sometimes with surface rocks. The species with high abundance-dominance values are: *Fagus sylvatica*, *Fraxinus ornus*, *Acer pseudoplatanus*, *Tilia cordata*, *Hedera helix*, *Asplenium scolopendrium*, *Arum orientale*, *Asarum europaeum*, *Cardamine bulbifera*, *Lunaria annua*, *Polypodium vulgare*. Such species as *Carpinus orientalis*, *Cotinus coggygria*, *Fraxinus ornus*, *Ruscus hypoglossum*, *Syringa vulgaris* point out the thermophilous character of the forests in southern Banat.

Keywords: beech forest, thermophilous character, rare species

Introduction

The “Izvorul Bigăr” Nature Reserve (176.6 ha) is located in south-western Romania (Caraș-Severin county). The water of this spring flows into the Miniș River that forms here one of the lime gorge sectors. The Bigăr waterfall is also known to tourists because the 45 parallel passes here.

The entire region is part of the “Cheile Nerei – Beușnița” National Park.

Materials and methods

The analysis of the vegetal association was carried out using the method of the Central-European phytocoenological school (J. Braun - Blanquet, 1928, 1932). For each sample we provide data about altitude, exposition, slope, total cover of the vegetation, and the height of the vegetation. For each species we supply the values of abundance-dominance and frequency, as well as their constancy within the samplings. The most relevant samples are grouped in Tab. 1. Species names are noted using Flora Europaea (<http://rbg-web2.rbge.org.uk/FE/fe.html>).

Results and discussions

The vegetation around the Bigăr spring and waterfall is dominated by compact beech forests with a frequently reduced grassy layer and soil rich in humus. On the banks of the watercourse and on the rocks around the spring there are species specific to flooding plains of the beech sub-stratum (*Alnus glutinosa*, *Anthriscus sylvestris*, *Circaea lutetiana*, *Valeriana officinalis*), and also thermophilous and xerophilous species such as *Fraxinus ornus*, *Syringa vulgaris*, *Cotinus coggygria*, *Carpinus orientalis*. Here and there one can see more or less mobile rocks, sometimes covered by small vegetation patches.

This territory was studied in the past (Peia, 1978), but there are few data concerning the reserve proper. There is a well preserved beech forest, compared to other beech forests in the Miniș Gorges, from where mature trees have almost entirely been eliminated (e.g., the “Gura Golâmbului” area).

In order to complete the data concerning the beech forest at “Izvorul Bigăr”, we grouped in Tab. 1 the most representative samplings. They belong to the Phyllitidi - Fagetum Vida (1959) 1963 association. The phytocoenoses of

Tab. 1. *Phyllitidi-Fagetum Vida (1959) 1963*

Altitude (m)	530	530	520	520	530	530	530	520	520	520	
Exposition	NE	NE	N	NV	V	V	N	N	NE	N	
Slope (°)	20	20	30	50	70	60	40	50	50	40	
Vegetation cover (%) - trees / bushes	95/5	100/5	95/10	80/10	90/10	90/30	95/10	90/10	80/30	90/5	
Vegetation cover (%) – grassy layer	50	20	30	30	5	50	10	30	20	30	
Vegetation height (m) - trees / bushes	30/3	35/1	40/2	40/2	20/3	40/2	40/2	40/3	30/2	30/2	
Vegetation height (cm) - grassy layer	30	40	30	40	30	20	50	40	50	30	
Number of relevee	1	2	3	4	5	6	7	8	9	10	K
<i>Fagus sylvatica</i> L.	4.5	4.5	5.5	4.5	2.4	3.5	4.5	5.5	3.4	5.5	V
<i>Asplenium scolopendrium</i> L.		+2	+4	+5	+3	1.4	+3	+2	+4	+4	V
<i>Cardamine bulbifera</i> (L.) Crantz	2.5	+2	+2	+2		+3	+4	+4	+1	+1	V
<i>Dryopteris filix-mas</i> (L.) Schott	+2	+2	+2	+1	+2	+1		+1	+2	+1	V
<i>Hedera helix</i> L.	+1	+1	+2	1.3	1.3	1.5	+2	1.3	1.3	1.4	V
<i>Tilia cordata</i> Mill.	+4	+3	+2		1.3	1.3	+2	+2	+3	+2	V
<i>Acer pseudoplatanus</i> L.	+4	1.4	+2		2.3	1.4	+1		+3		IV
<i>Fraxinus ornus</i> L.	+3	+4	+3			+3	+2	+2	2.3		IV
<i>Lunaria annua</i> L.		1.4	+1			+2	+4	1.2	1.3	+2	IV
<i>Polystichum aculeatum</i> (L.) Roth	+2		+3	+2	+	+1	+2	+2			IV
<i>Sambucus nigra</i> L.	+	+			+3	+5	+4	+2	+2	+2	IV
<i>Arum orientale</i> M.Bieb.	+2	+3	+			1.5	+1	+1			III
<i>Asarum europaeum</i> L.		+2	1.3	+2				+1	+3	1.3	III
<i>Acer platanoides</i> L.				+2		+2		1.2		+3	II
<i>Cardamine glanduligera</i> O.Schwarz				+1	+				+		II
<i>Oxalis acetosella</i> L.				+1					+1	+	II
<i>Polypodium vulgare</i> L.				1.5	+2	+1					II
<i>Acer campestre</i> L.									+1		I
<i>Anemone nemorosa</i> L.					+2	+2					I
<i>Anthriscus sylvestris</i> (L.) Hoffm.							+1	+			I
<i>Arum maculatum</i> L.							+	+1			I
<i>Asplenium ceterach</i> L.				+		+1					I
<i>Asplenium trichomanes</i> L.				+1		+1					I
<i>Brachypodium pinnatum</i> (L.) P.Beauv.			+						+2		I
<i>Campanula persicifolia</i> L.	+										I
<i>Carex pilosa</i> Scop.					+1						I
<i>Carpinus betulus</i> L.								+2	+3		I
<i>Carpinus orientalis</i> Mill.					+2						I
<i>Chrysosplenium alternifolium</i> L.					+1						I
<i>Circaea lutetiana</i> L.	+1									+	I
<i>Clematis vitalba</i> L.					+1						I
<i>Cornus mas</i> L.							+		+2		I
<i>Corylus avellana</i> L.				+1			+2				I
<i>Cotinus coggygria</i> Scop.					+2				+		I
<i>Dactylis glomerata</i> L. subsp. <i>aschersoniana</i> (Graebn.) Thell.							+	+1			I
<i>Epipactis belleborine</i> (L.) Crantz			+					+			I
<i>Erysimum odoratum</i> Ehrh.	+1										I
<i>Festuca drymeja</i> Mert. & W.D.J.Koch		+2						+1			I
<i>Festuca heterophylla</i> Lam.							+2		+1		I
<i>Fraxinus excelsior</i> L.			+2	+2							I
<i>Galium odoratum</i> (L.) Scop.	+4		+1								I
<i>Geranium robertianum</i> L.		+1						+			I

Tab. 1 *Phyllitidi–Fagetum Vida* (1959) 1963 (continuos)

<i>Geum urbanum</i> L.	+1				I
<i>Juglans regia</i> L.		+2			I
<i>Lathraea squamaria</i> L.	+				I
<i>Lathyrus vernus</i> (L.) Bernh.		+			I
<i>Ligustrum vulgare</i> L.			+1		+ I
<i>Milium effusum</i> L.			+2	+	I
<i>Moehringia muscosa</i> L.				+2	+ I
<i>Mycelis muralis</i> (L.) Dumort.				+	I
<i>Poa nemoralis</i> L.			+2	+	I
<i>Polygonatum multiflorum</i> (L.) All.				+	I
<i>Ranunculus ficaria</i> L.			+1		I
<i>Rubus idaeus</i> L.				+1	I
<i>Ruscus hypoglossum</i> L.	+		+1		I
<i>Scilla bifolia</i> L.				+	I
<i>Sedum telephium</i> L. subsp. <i>maximum</i> (L.) Krock.				+	I
<i>Syringa vulgaris</i> L.			+2		+2 I
<i>Thalictrum minus</i> L.					+ I
<i>Urtica dioica</i> L.			+2	+2	I
<i>Valeriana officinalis</i> L.				+	+1 I
<i>Vincetoxicum birundinaria</i> Medik.	+			+	I
<i>Viola reichenbachiana</i> Jord. ex Boreau	+				I

this association can be met in general on rocky, limy lands of the shady slopes of the Carpathians (Sanda *et al.*, 1998). In the Miniş Gorges the association also prefers shady lime rocks and places where air moisture stagnates for longer periods of time, on a typical rendzine very rich in humus and with a high content of calcium carbonate (Peia, 1978).

Many of the species identified are characteristic of the class *Quercus – Fagetea*, order *Fagetalia* and alliance *Symphito – Fagion*: *Arum maculatum*, *Asarum europaeum*, *Dryopteris filix-mas*, *Epipactis helleborine*, *Galium odoratum*, *Geranium robertianum*, *Milium effusum*, *Lathyrus vernus*, *Polygonatum multiflorum*, *Viola reichenbachiana*, *Lathraea squamaria*, *Festuca drymeja*. The *Phyllitidi – Fagetum* association is included in the *Moehringio muscosae – Acerenion* Boşcaiu *et al.* 1982 sub-alliance (Sanda *et al.*, 1998). The species characteristic of this sub-alliance and identified in the studied area are: *Lunaria rediviva*, *Moehringia muscosa*, *Asplenium scolopendrium*, *Polystichum aculeatum*, *Acer pseudoplatanus*.

The total number of species identified is 63. *Fagus sylvatica* covers in most samplings 80-100% of the land. Other species with high abundance-dominance are, among trees, *Fraxinus ornus*, *Acer pseudoplatanus*, *Tilia cordata*, together with *Hedera helix*. In the grassy layer, there are *Asplenium scolopendrium*, *Arum orientale*, *Asarum europaeum*, *Cardamine bulbifera*, *Lunaria annua* and *Polypodium vulgare* that cover up to 40% of the land. High constancy species are: V - *Fagus sylvatica*, *Asplenium scolopendrium*,

Cardamine bulbifera, *Dryopteris filix-mas*, *Hedera helix*, *Tilia cordata*; IV - *Acer pseudoplatanus*, *Fraxinus ornus*, *Lunaria annua*, *Polystichum aculeatum*, *Sambucus nigra*; III - *Arum orientale*, *Asarum europaeum*.

The grassy layer coverage is sometimes low, maximum 40-50% of the area. The species characteristic of beech forests and forests that prefer rocky shady slopes are: *Anemone nemorosa*, *Arum orientale*, *Asarum europaeum*, *Asplenium scolopendrium*, *Asplenium ceterach*, *Asplenium trichomanes*, *Circaea lutetiana*, *Cardamine bulbifera*, *Cardamine glanduligera*, *Dryopteris filix-mas*, *Epipactis helleborine*, *Galium odoratum*, *Lathyrus vernus*, *Lunaria annua*, *Moehringia muscosa*, *Polypodium vulgare*, *Polystichum aculeatum*.

Such species as *Carpinus orientalis*, *Cotinus coggygria*, *Fraxinus ornus*, *Ruscus hypoglossum*, *Syringa vulgaris* point out the thermophilous character of the forests in southern Banat. The thermophilous bushes on the rocky slopes delimiting lime gorges of the rivers in southern Banat form specific vegetation named “şibliac” (Imbrea *et al.*, 2005).

In the bioform spectrum (Fig. 1) the hemicryptophyta followed by geo-phyta and phanerophyta dominate. Among the geo-elements the most frequent are the Euro-Asian, the European, and the Central-European ones. Due to the location of these beech forests, there are also Balkan, Pontic, and Mediterranean species (Fig. 2).

From the point of view of soil moisture, mesophilous species are dominant, followed by xero-mesophilous ones. Most species of the floristic composition are mesothermal,

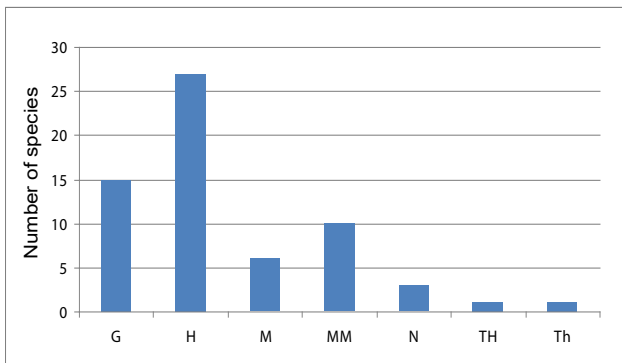


Fig. 1. Bio-forms spectrum

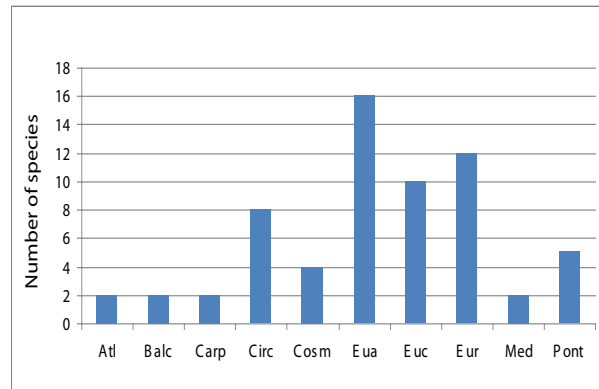


Fig. 2. Geo-elements spectrum

followed by moderate thermal ones. From the point of view of soil reaction, most species are poor acidic – neutrophilous and acidic – neutrophilous (Fig. 3).

The “Izvorul Bigăr” Nature Reserve, as well as the Miniş Gorges (Nicolin *et al.*, 2007), contain some endemic species (Nicolin and Imbrea, 2007) or species rare in the region: *Erysimum odoratum*, *Moebria muscosa*, *Lunaria annua*, *Carex pilosa*, *Cardamine glanduligera*, *Ruscus hypoglossum* (Flora Europaea, <http://rbg-web2.rbge.org.uk/FE/fe.html>; Ciocarlan, 2000).

The phytocoenoses of *Phyllitidi - Fagetum* Vida (1959) 1963 belong to the 91V0 - Dacian Beech forests (*Symphy-*

scolopendrium, *Arum orientale*, *Asarum europaeum*, *Cardamine bulbifera*, *Lunaria annua*, *Polypodium vulgare*, *Dryopteris filix-mas*, *Polystichum aculeatum*, *Sambucus nigra*.

Such species as *Carpinus orientalis*, *Cotinus coggygria*, *Fraxinus ornus*, *Ruscus hypoglossum*, *Syringa vulgaris* point out the thermophilous character of the forests in southern Banat.

The “Izvorul Bigăr” Nature Reserve and the Miniş Gorges are part of the “Cheile Nerei – Beuşniţa” National Park. Beside the beech forest with secular aspect and the thermophilous vegetation of the lime rocks, this area also preserves some endemic or rare species. The *Phyllitidi - Fagetum* Vida (1959) 1963 belong to the 91V0 - Dacian Beech forests (*Symphyto-Fagion*) - Natura 2000 habitat.

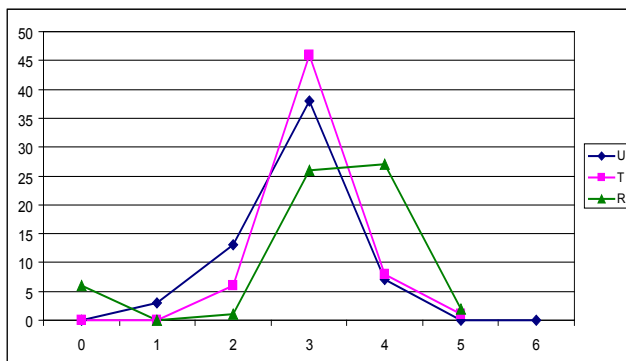


Fig. 3. Soil humidity, temperature, and soil reaction spectrum

to-Fagion) - Natura 2000 habitat (Gafta & Mountford, 2008).

Conclusions

The phyto-coenoses we analysed belong to the *Phyllitidi - Fagetum* Vida (1959) 1963 association. The association is characteristic to shady and moist slopes with soils rich in humus and formed on a lime substratum sometimes with surface rocks.

Species with high abundance-dominance values and high constancy are *Fagus sylvatica*, *Fraxinus ornus*, *Acer pseudoplatanus*, *Tilia cordata*, *Hedera helix*, *Asplenium*

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