

CONTRIBUTIONS TO THE STUDY OF SAXICOLOUS VEGETATION FROM BICAZ GORGES (EASTERN CARPATHIANS)

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In this paper we present a number of 12 saxicolous vegetal associations identified on the "Cheile Bicazului-Lacu Rosu-Hasmasul Mare" National Park territory. Among them we propose 3 new vegetal associations having the following provisional names: *Valeriano (tripteris) – Polypodietum vulgare* ass. nova, *Galio (albi) – Teucrietum montani* ass. nova and *Melico (ciliatae) – Festucetum pallentis* ass. nova.

Key words: saxicolous vegetal association.

INTRODUCTION

The Bicaz Gorges are situated in Hășmaș Massif and traverse these mountains on 6 km length, developing relief energy of 320 m. In the south-eastern part there are the Șugău Gorges, together forming the Cheile Bicazului – Lacu Roșu – Hășmașul Mare National Park. The geological and geomorphological structure is very variate and causes the existence of great habitats diversity, involving a great flora and vegetation variability appearance. The triassic, jurassic and cretacic calcareous rocks and the presence of lithomorphic soils have favoured the installation of some pioneer plant communities which are colonizing these surfaces and constitute a very interesting saxicolous vegetation.

RESULTS AND DISCUSSION

In this paper, 12 saxicolous, chasmophytic and xeric grasslands on sunbathed calcareous rocks vegetal associations from the mountain vegetation unit are presented. These associations belong to *Asplenieta trichomanis* (Br.-Bl. 1934 in Meir et Br.-Bl. 1934) Oberd. 1977, *Thlaspieta rotundifolia* Br.-Bl. 1926 and *Festuco – Brometea* Br.-Bl. Et R. Tx. ex Klika et Hadač 1944 classes of vegetation. Also, we propose 3 new associations having the following provisional names: *Valeriano (tripteris) – Polypodietum vulgare* ass. nova, *Galio (albi) – Teucrietum montani* ass. nova and *Melico (ciliatae) – Festucetum pallentis* ass. nova.

Cls. *ASPENIETEA TRICHOMANIS* (Br.-Bl. 1934 in Meir et Br.-Bl. 1934) Oberd. 1977

Ord. *POTENTILLETALIA CAULESCENTIS* Br.-Bl. 1926

Al. *Gypsophilion petraeae* Borhidi et Pócs 1957

1. *Asplenio – Cystopteridetum fragilis* Oberd. 1926

2. *Thymo pulcherrimi* – *Poëtum rehmannii* Coldea (1986) 1990
 3. *Artemisio petrosae* – *Gypsophiletum petraeae* Pușcaru et al. 1956
 4. *Valeriano (tripteris)* – *Polypodietum vulgare* ass. nova
- Ord. ASPLENIETALIA RUTA-MURARIAE Oberd. et al. 1967
- Al. Cymbalario – *Asplenietum Segal* 1969
5. *Asplenietum ruta-murariae* – *trichomanis* Kuhn 1937
- Al. Cystopteridion (Nordh. 1936) J. L. Richard 1972
6. *Valeriano montani* – *Cortusetum matthioli* Boșcaiu et Täuber 1979
- Cls. THLASPIETEA ROTUNDIFOLII Br.-Bl. 1926
- Ord. THLASPIETALIA ROTUNDIFOLII Br.-Bl. 1926
- Al. Papavero – *Thymion pulcherrimi* I. Pop 1968
7. *Calamintho baumgarteni* – *Galietum anisophylli* Beldie 1967
 8. *Geranietum macrorrhizi* Boșcaiu et Täuber 1977
 9. *Cardaminopsidetum arenosae* Hodișan 1967
 10. *Galio albi* – *Teucrietum montani* ass. nova
- Cls. FESTUCO – BROMETEA Br.-Bl. et R. Tx. ex Klika et Hadač 1944
- Ord. STIPO PULCHERRIMAE – FESTUCETALIA PALLENTIS I. Pop 1968
- Al. Seslerio – *Festucion pallentis* Klika 1939
11. *Melico ciliatae* – *Festucetum pallentis* ass. nova
 12. *Thymo comosi* – *Festucetum rupicolae* (Csürös 1959) Pop et Hodișan 1985

1. *Asplenio* – *Cystopteridetum* Oberd. 1926 (Table 1, rel. 1–5). This association includes saxicolous plant communities situated in the inferior mountain zone, on relatively shady slopes, having sufficient humidity. The general covering degree varies between 55–70%, the principal role being fulfilled by the characteristic species to this association and to the superior coenotaxa. The floristic composition is relatively uniform, having some discontinuities due to saxicolous, without the soil layer substrata; most of them are xerophyte and mesoxerophyte species from *Asplenietea trichomanis* and *Elyno-Seslerietea* classes of vegetation.

2. *Thymo pulcherrimi* – *Poëtum rehmannii* Coldea (1986) 1990 (Table 1, rel. 6–8). Phytocoenosis of this association has been identified in Bicaz Gorges and Bicăjel Gorges at the base of steep slopes (30–40° inclination), the general covering degree being of 55–65%. The characteristic and dominant species, *Thymus pulcherrimus* and *Poa rehmannii*, are accompanied by *Potentilletalia caulescentis* and *Asplenietea trichomanis* characteristic species. The area occupied by this kind of plant communities is relatively small, specific to saxicolous associations (approximative 4 m²).

3. *Artemisio petraeae* – *Gypsophiletum petraeae* Pușcaru et al. 1967 (Table 1, rel. 9–11). This association appears on 5–8 m² area surfaces, on prevalent sunbathed slopes, having a 15–30° inclination degree. It had been met especially at the slopes base where, on 50–60 cm depth, bulk spare soil exists. In the Bicaz Gorges, this vegetal association has a 65–77° general covering degree realized by characteristic species to the association and to the superior coenotaxa. Sometimes, it can be remarked an important participation of other plant species having affinity to this type of stations.

Table 1

Ord. Potentilletalia Caulescentis Br.-Bl. 1926

No. of relevé	1	2	3	4	5	6	7	8	9	10	11
Altitude (m.s.m.)	990	1015	985	995	995	870	890	850	990	1010	1025
Exposure	NE	NE	NE	NV	N	SV	SE	NE	SE	SV	SV
Slope (degree)	40	30	45	50	25	40	35	30	25	35	30
Vegetation coverage (%)	60	70	65	65	55	60	55	65	65	75	65
Sample plot (m ²)	2	6	4	4	5	4	4	4	2	4	2
Ass. charact.											
<i>Asplenium ruta-muraria</i>	2	2	2	1	2	+	-	+	+	-	-
<i>Cystopteris fragilis</i>	2	3	2	3	2	+	-	-	+	+	-
<i>Poa rehmanni</i>	-	+	-	+		3	1	3	+	-	1
<i>Thymus pulcherrimus</i>	-	-	-	-	-	1	2	1	1	1	2
<i>Gypsophila petraea</i>	-	-	-	-	-	-	-	-	3	3	2
Potentilletalia											
caulescentis											
<i>Saxifraga paniculata</i>	1	+	-	+	-	-	-	-	-	-	+
<i>Asplenium viride</i>	-	-	-	-	-	-	+	+	-	-	+
<i>Sedum hispanicum</i>	-	+	-	-	+	+	1	+	+	+	-
<i>Silene nutans ssp. dubia</i>	+	-	1	+	+	+	-	-	1	+	+
<i>Moehringia muscosa</i>	-	-	-	-	-	-	-	-	-	-	+
<i>Kerneria saxatilis</i>	-	+	-	-	+	-	-	-	-	-	-
<i>Silene zawadzki</i>	+	-	-	-	-	-	-	-	+	+	+
<i>Bupleurum diversifolium</i>	-	-	-	-	-	-	-	-	-	+	+
<i>Cardaminopsis arenosa</i>	-	-	-	-	-	-	-	-	+	+	-
Asplenietea rupestris											
<i>Asplenium trichomanes</i>	+	-	+	+	+	+	+	-	+	+	-
<i>Campanula carpatica</i>	-	+	-	-	-	-	-	-	-	-	1
<i>Jovibarba sobolifera</i>	-	+	-	-	1	-	-	-	-	+	-
<i>Poa nemoralis</i>	1	-	1	-	1	-	-	-	-	-	-
<i>Polypodium vulgare</i>	1	-	-	+	-	-	-	-	-	-	+
<i>Thymus comosus</i>	-	-	-	-	+	-	-	-	-	+	+
<i>Cardaminopsis arenosa</i>	-	-	-	-	-	-	-	-	+	-	-
<i>Sedum telephium</i>	-	+	-	+	+	-	+	+	-	-	+
<i>ssp. maximum</i>											

<i>Elyno-Seslerietea</i>											
<i>Galium anisophyllum</i>	+	-	1	+	-	-	-	-	-	+	-
<i>Scabiosa lucida</i>	-	-	-	-	-	+	-	-	+	-	-
<i>Festuca versicolor</i>	-	-	-	-	+	-	-	-	-	-	-
<i>Sesleria rigida</i>	-	-	1	+	-	+	-	+	1	+	+
<i>Dianthus tenuifolius</i>	-	-	-	-	-	+	-	-	-	+	+
<i>Festuca pallens</i>	-	-	-	+	-	-	-	+	-	-	-
<i>Scrophularia heterophylla</i>	-	+	-	-	-	-	+	-	-	-	+
<i>ssp. laciniata</i>											
<i>Euphrasia salisburgensis</i>	-	-	-	-	-	-	-	-	-	-	+
<i>Sesleria heufleriana</i>	-	-	+	-	-	-	+	+	-	-	+
<i>Cerastium alpinum</i>	-	-	-	-	+	-	-	-	-	-	-
<i>Aliae</i>											
<i>Veronica urticifolia</i>	-	-	-	-	-	-	-	-	-	-	+
<i>Arenaria serpyllifolia</i>	-	+	-	-	-	-	+	+	-	+	-
<i>Geranium robertianum</i>	-	-	-	-	-	-	-	-	-	-	+
<i>Hieracium bifidum</i>	-	-	+	-	+	+	-	+	+	+	-
<i>Festuca rubra</i>	-	+	-	-	-	-	-	-	+	+	-
<i>Bupleurum falcatum</i>	-	+	-	-	-	+	-	-	-	+	-
<i>Epilobium collinum</i>	-	-	-	+	-	-	-	-	+	+	-
<i>Thymus pulegioides</i>	-	+	+	-	-	-	-	+	-	-	+
<i>Arabis hirsuta</i>	-	+	-	-	-	+	-	-	-	-	+
<i>Fragaria vesca</i>	-	-	+	-	-	-	-	-	+	-	-
<i>Lycopodium selago</i>	-	-	-	-	-	-	-	-	-	-	+

Place of the plots: Bicaz Gorges – 3, 4, 5, 7, 9, 10, 11; Bicăjel Gorges – 1, 2; Șugău Gorges – 6, 8.

Table 2

***Valeriano (tripteris) – Polypodietum vulgarae* ass. nova**

No. of relevé	1	2	3	4*	5	6	7	8	9	10
Altitude (m.s.m.)	1030	945	1020	970	1015	980	1005	935	990	1035
Exposure	NE	N	NE	NE	SE	N	N	NE	NE	NE
Slope (degree)	35	45	40	30	35	45	35	30	40	45

Vegetation coverage (%)	60	55	60	70	65	50	65	70	60	55
Sample plot (m ²)	4	3	4	8	6	4	6	6	5	2
<i>Ass. charact.</i>										
<i>Polypodium vulgare</i>	1	2	2	2	2	1	3	2	3	+
<i>Valeriana tripteris</i>	3	2	1	3	2	2	1	3	1	3
<i>Gypsophilion petraeae</i>										
<i>Silene zawadzkaei</i>	+	+	-	-	+	-	-	+	-	+
<i>Saxifraga luteo-viridis</i>	-	+	+	-	+	-	-	-	-	-
<i>Potentilletalia caulescens</i>										
<i>Asplenium ruta-muraria</i>	+	+	+	-	+	1	+	-	+	-
<i>Saxifraga paniculata</i>	-	-	+	-	-	-	-	+	-	-
<i>Kernera saxatilis</i>	+	-	-	-	+	-	-	-	-	-
<i>Moehringia muscosa</i>	-	+	-	-	-	+	-	+	-	-
<i>Asplenietea trichomanis</i>										
<i>Poa nemoralis</i>	+	1	2	+	1	1	-	-	+	1
<i>Asplenium trichomanes</i>	+	+	+	-	+	-	-	-	+	-
<i>Alyssum saxatile</i>	-	+	-	-	-	-	+	-	-	-
<i>Campanula carpatica</i>	+	1	1	+	+	1	-	-	+	1
<i>Cardaminopsis arenosa</i>	-	-	-	+	+	+	-	-	+	+
<i>Thymus comosus</i>	+	+	-	-	-	-	+	-	-	-
<i>Silene nutans ssp. dubia</i>	+	+	+	-	-	+	-	+	-	-
<i>Gymnocarpium robertianum</i>	+	-	+	-	-	-	-	+	+	-
<i>Sedum telephium ssp. maximum</i>	-	-	-	+	+	-	-	-	+	-
<i>Aliae</i>										
<i>Doronicum carpaticum</i>	+	-	+	-	-	-	+	-	+	-
<i>Alyssum repens</i>	-	-	+	-	+	-	+	+	-	-
<i>Oxalis acetosella</i>	+	+	-	+	-	1	-	+	+	-
<i>Hieracium bifidum</i>	-	+	+	-	+	+	-	-	+	-
<i>Veronica urticifolia</i>	+	-	+	+	+	-	+	+	+	1
<i>Lycopodium selago</i>	+	-	+	+	-	-	+	-	-	-
<i>Geranium robertianum</i>	-	-	+	+	-	+	+	-	+	-
<i>Fragaria vesca</i>	-	+	-	+	+	-	-	-	-	-
<i>Bupleurum falcatum</i>	-	-	-	+	+	-	-	-	-	-
<i>Stellaria nemorum</i>	-	-	-	+	+	+	-	+	-	-
<i>Trifolium repens</i>	-	-	-	+	-	+	-	-	-	-

<i>Galium album</i>	+	-	-	+	-	-	-	+	-
<i>Campanula persicifolia</i>	+	-	-	+	-	-	+	+	-
<i>Salvia glutinosa</i>	-	-	-	-	+	+	-	-	+
<i>Festuca rubra</i>	-	-	-	+	+	-	+	-	-
<i>Senecio ovatus</i>	-	-	-	-	+	+	-	+	+
<i>Cystopteris fragilis</i>	+	-	+	-	-	-	+	-	-
<i>Arabis hirsuta</i>	-	-	+	-	-	+	-	-	+
<i>Epilobium collinum</i>	+	-	+	-	-	+	-	-	-
<i>Sesleria rigida</i>	+	+	-	-	-	-	+	-	-
<i>Leucanthemum waldsteinii</i>	-	-	-	+	-	-	+	-	-
<i>Digitalis grandiflora</i>	-	-	-	-	+	-	-	-	-
<i>Chrysosplenium alternifolium</i>	-	+	-	+	+	+	+	+	-
<i>Cardamine impatiens</i>	-	+	-	-	+	+	-	-	+
<i>Calamagrostis arundinacea</i>	-	-	-	-	-	-	+	-	+

Place of the plots: Bicăjel Gorges – 1, 3, 7, 10; Bicaz Gorges – 2, 4, 5, 6, 8, 9.

Table 3

Ord. **ASPLENIETALIA RUTA-MURARIAE** Oberd. *et al.* 1967

No. of relevé	1	2	3	4	5	6	7	8	9
Altitude (m.s.m.)	900	980	880	865	985	995	990	845	995
Exposure	NV	NV	V	NE	N	N	NE	N	N
Slope (degree)	35	50	25	20	40	25	10	15	25
Vegetation coverage (%)	65	60	60	70	55	70	65	70	75
Sample plot (m ²)	2	2	4	2	2	4	4	5	4
Ass. charact.									
<i>Asplenium ruta-muraria</i>	1	2	1	3	1	-	+	-	-
<i>Valeriana montana</i>	-	-	-	-	-	2	3	3	3
<i>Cortusa matthioli</i>	-	-	-	-	-	2	1	2	2
<i>Cystopteris fragilis</i>	+	+	+	1	-	+	-	+	+
<i>Asplenium trichomanes</i>	2	1	3	+	2	-	-	-	-
Potentilletalia caulescentis									
<i>Saxifraga paniculata</i>	-	-	-	-	-	+	-	+	-

<i>Aliae</i>										
<i>Veronica urticifolia</i>	-	-	-	-	-	1	+	+	+	
<i>Arenaria serpyllifolia</i>	+	-	-	-	-	-	-	-	-	
<i>Geranium robertianum</i>	-	-	-	-	-	1	+	-	+	
<i>Hieracium bifidum</i>	+	+	-	-	-	-	-	+	-	
<i>Festuca rubra</i>	-	+	-	-	-	+	-	-	-	+
<i>Valeriana tripteris</i>	-	-	-	-	-	-	+	-	-	
<i>Bupleurum falcatum</i>	-	+	-	-	+	-	-	+	-	
<i>Epilobium collinum</i>	-	+	-	+	-	+	+	-	-	
<i>Teucrium montanum</i>	1	-	-	-	+	-	+	-	-	
<i>Thymus pulegioides</i>	+	-	+	-	-	+	1	+	-	
<i>Anthyllis vulneraria</i>	-	-	-	+	-	-	-	-	-	+
<i>Spiraea chamaedryfolia</i>	-	-	-	-	-	+	-	-	-	
<i>Saxifraga cuneifolia</i>	-	-	-	-	-	-	-	+	-	
<i>Chrysosplenium alternifolium</i>	-	-	-	-	-	+	-	-	-	
<i>Arabis hirsuta</i>	+	+	-	-	-	-	-	-	-	
<i>Lycopodium selago</i>	-	-	-	+	-	-	-	+	-	
<i>Fragaria vesca</i>	+	-	-	+	+	-	-	-	-	+

Place of the plots: Bicz Gorges – 1, 2, 6, 7, 9; Șugău Gorges – 3, 4, 8; Bicâjel Gorges – 5.

Table 4

Thlaspietea Rotundifolii Br.-Bl. 1926

No. of relevé	1	2	3	4	5	6	7	8	9	10
Altitude (m.s.m.)	950	1010	955	790	820	780	7955	940	965	950
Exposure	NV	SE	SV	NE	N	NV	V	SV	SV	SE
Slope (degree)	30	25	35	15	20	10	30	20	20	15
Vegetation coverage (%)	70	75	65	80	70	75	70	65	65	60
Sample plot (m ²)	6	4	6	10	10	8	10	12	8	8
<i>Ass. charact.</i>										
<i>Galium anysophyllum</i>	3	3	2	-	-	-	1	-	-	-
<i>Calamintha alpina ssp. alpina</i>	1	1	1	-	-	-	+	-	-	-
<i>Geranium macrorrhizum</i>	-	-	-	4	4	4	3	-	-	-
<i>Cardaminopsis arenosa</i>	-	-	-	-	-	-	-	3	3	3

Table 5

Galio (albi) – Teucrietum montani ass. nova

No. of relevé	1	2	3*	4	5	6	7	8	9	10
Altitude (m.s.m.)	760	745	780	820	850	1025	825	895	860	885
Exposure	NV	N	N	E	NV	NE	NE	N	N	V
Slope (degree)	20	25	15	10	15	10	30	20	35	15
Vegetation coverage (%)	70	75	70	80	85	85	70	75	65	75
Sample plot (m ²)	8	10	10	10	12	10	15	10	8	10
Ass. charact.										
<i>Galium album</i>	1	1	2	+	1	2	+	2	+	1
<i>Teucrium montanum</i>	3	4	3	4	4	3	3	3	3	3
<i>Thalictrum foetidum</i>	+	+	+	+	+	+	+	+	1	1
<i>Achnatherion calamagrostis</i>										
<i>Geranium macrorrhizum</i>	-	+	-	+	-	+	1	-	+	-
<i>Geranium robertianum</i>	-	-	+	-	-	-	-	+	-	-
<i>Melica ciliata</i>	+	+	+	1	-	+	1	+	1	-
<i>Origanum vulgare</i>	-	+	-	+	1	-	-	-	1	1
<i>Poa compressa</i>	+	-	+	-	-	-	-	-	+	-
<i>Vincetoxicum hirundinaria</i>	-	+	-	+	+	-	-	-	+	-
<i>Thlaspietalia rotundifolii</i>										
<i>Gymnocarpium robertianum</i>	+	-	+	-	-	-	+	-	+	-
<i>Cardaminopsis arenosa</i>	-	+	+	-	+	+	-	-	-	+
<i>Cerastium arvense ssp. calcicolum</i>	+	+	-	+	-	-	+	+	-	-
<i>Moehringia muscosa</i>	-	-	-	+	-	-	-	-	+	-
<i>Thlaspietea rotundifolii</i>										
<i>Alyssum repens</i>	+	-	-	+	-	-	+	-	+	+
<i>Thymus pulcherrimus</i>	+	-	-	+	-	+	-	+	-	+
<i>Galium anisophyllum</i>	-	+	-	-	+	+	-	+	+	-
<i>Calamintha alpina ssp. baumgarteniana</i>	-	+	+	-	-	-	+	-	-	-
<i>Cystopteris fragilis</i>	+	-	+	-	+	+	+	-	-	+
<i>Acinos arvensis</i>	+	-	+	-	-	+	+	-	-	-
<i>Thymus comosus</i>	-	-	-	+	-	-	-	-	-	-
<i>Helianthemum canum</i>	-	+	-	-	-	-	+	+	-	-

Aliae

<i>Salvia verticillata</i>	+	-	+	+	+	-	+	+	-	+
<i>Stachys recta</i>	+	+	-	-	+	-	-	-	-	-
<i>Valeriana officinalis</i>	-	+	-	-	+	+	-	-	+	-
<i>Silene vulgaris</i>	-	+	-	-	-	-	-	-	-	-
<i>Salvia glutinosa</i>	-	+	-	-	-	+	-	-	-	-
<i>Festuca rubra</i>	+	-	-	+	-	1	1	+	+	-
<i>Agrostis capillaris</i>	-	-	-	+	-	+	1	-	+	-
<i>Teucrium chamaedrys</i>	+	+	+	+	+	-	-	-	+	-
<i>Hieracium pilosella</i>	1	+	-	-	+	+	1	+	1	+
<i>Verbascum lychnitis</i>	-	+	-	-	+	-	-	-	-	-
<i>Fragaria vesca</i>	+	-	+	-	-	-	+	-	+	-
<i>Sedum telephium ssp. maximum</i>	-	+	-	-	-	+	+	-	-	-
<i>Lamium maculatum</i>	-	-	+	+	-	-	-	-	-	-
<i>Knautia arvensis</i>	+	-	-	+	-	+	-	+	-	-
<i>Koeleria macrantha</i>	+	-	-	+	-	-	+	-	+	-
<i>Veronica teucrium</i>	-	-	-	+	-	-	-	-	-	-
<i>Sedum hispanicum</i>	-	-	-	+	-	+	-	-	-	-
<i>Asplenium ruta-muraria</i>	-	-	-	+	-	-	-	+	-	-
<i>Asplenium trichomanes</i>	-	-	-	-	-	-	-	+	-	+
<i>Potentilla argentea</i>	-	+	-	-	+	-	-	-	+	+
<i>Centaurea biebersteinii</i>	+	-	-	-	+	+	-	-	-	+
<i>Astragalus onobrychis</i>	+	-	-	+	+	-	-	+	-	+
<i>Trifolium campestre</i>	-	-	-	+	+	-	-	-	+	-
<i>Arenaria serpyllifolia</i>	-	-	-	+	-	-	-	-	-	+
<i>Medicago falcata</i>	+	-	+	-	-	-	+	-	-	-
<i>Veronica austriaca</i>	-	-	-	-	-	-	+	-	+	-
<i>Jovibarba heuffelii</i>	-	-	-	+	-	-	+	-	-	-
<i>Phleum montanum</i>	+	-	+	-	-	-	-	+	+	-
<i>Anthyllis vulneraria</i>	-	+	-	-	+	+	-	-	-	-
<i>Dorycnium herbaceum</i>	+	+	-	+	+	-	+	-	+	-
<i>Potentilla arenaria</i>	-	-	+	-	-	-	+	-	-	-
<i>Carex humilis</i>	-	+	-	-	+	+	-	+	1	+
<i>Peucedanum oreoselinum</i>	-	-	+	-	-	-	-	-	-	-
<i>Galium verum</i>	+	+	-	+	+	-	+	+	+	-

<i>Thymus pannonicus</i>	+	-	-	-	-	+	-	+	-	-
<i>Silene nutans ssp. dubia</i>	-	-	-	+	-	-	-	-	-	+
<i>Carduus glaucinus</i>	-	-	-	+	-	-	-	-	-	-
<i>Bupleurum falcatum</i>	-	+	+	-	-	-	-	+	-	-
<i>Pimpinella saxifraga</i>	-	-	-	+	+	-	+	-	-	-

Place of the plots: Şugăul Gorges – 1, 2, 3, 4, 5, 7, 8, 9, 10; Bicaz Gorges – 6

Table 6

FESTUCO – BROMETEA Br.-Bl. et R.Tx. ex Klika et Hadač 1944

No. of relevé	1	2	3	4	5	6*	7	8	9	10	11	12	13	14	15
Altitude (m.s.m.)	790	640	775	795	1015	840	850	925	805	790	785	750	895	780	845
Exposure	V	SV	S	NV	S	SE	SV	NV	S	SV	SV	SV	SE	S	NV
Slope (degree)	30	30	20	35	20	10	35	35	25	15	15	25	20	25	35
Vegetation coverage (%)	70	75	75	80	85	75	75	70	75	75	80	85	80	80	75
Sample plot (m ²)	20	25	20	15	15	12	15	25	10	20	25	15	12	15	15
Ass. charact.															
<i>Festuca pallens</i>	2	3	3	3	4	3	4	2	3	3	-	-	+	-	+
<i>Melica ciliata</i>	2	2	1	2	1	2	+	2	2	1	-	-	+	-	-
<i>Festuca rupicola</i>	-	+	+	-	-	-	-	-	-	-	3	3	2	4	3
<i>Thymus comosus</i>	-	-	-	+	-	-	-	-	+	-	1	2	2	1	1
Seslerio-Festucetalia pallentis															
<i>Sedum hispanicum</i>	-	+	-	-	+	-	+	-	-	+	+	-	+	-	1
<i>Thalictrum foetidum</i>	+	-	+	+	-	+	-	-	1	-	+	+	-	+	+
<i>Jovibarba heuffelii</i>	-	-	-	-	-	-	+	-	-	-	-	+	-	-	+
<i>Helianthemum canum</i>	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Stipo pulcherrimae-Festucetalia pallentis															
<i>Erysimum odoratum</i>	+	-	+	+	+	-	+	-	-	-	-	+	+	-	+
<i>Peucedanum oreoselinum</i>	-	-	+	-	-	-	+	+	-	-	+	-	+	+	-
<i>Stachys recta</i>	-	+	-	-	-	-	+	-	+	+	+	-	+	-	-
<i>Veronica austriaca ssp. jacquinii</i>	+	-	+	+	-	-	-	-	-	-	+	+	1	-	-
<i>Potentilla cinerea</i>	-	+	-	-	-	-	-	+	-	-	-	+	-	+	-
<i>Anthyllis vulneraria</i>	-	+	+	-	+	-	-	+	+	-	+	1	-	+	+

4. *Valeriano (tripteris) – Polypodietum vulgare* ass. nova (Table 2). In the Bicaz and Bicăjel Gorges, on relative small areas (3–8 m²), we have identified some saxicolous vegetal communities situated on a rocky substratum covered by a very thin humus stratum. The exposition is prevalent northern, the slopes inclination degree varies between 30–45° and the phytocoenosis physiognomy is given by the two characteristic species having an alternative co-dominant role. Beside that, it can frequently meet other species characteristic for *Asplenietea trichomanis*, xero-mesophytic species, but also mesophytic species favoured by shady stations and by pronounced humidity of the inferior mountain region soils. The general covering degree varies between 55–70%. Beside the characteristic species, an important participation of *Campanula carpatica* and *Poa nemoralis* can be remarked. The floristic inventory includes 41 species, among that 17 species belong to *Asplenietea trichomanis* and subordinated coenotaxa and 24 are characteristic to other classes of vegetation.

5. *Asplenietum rutaemurariae-trichomanis* Kuhn 1937 (Table 3, rel. 1–5). The association is cited from Polițele Bradului, Fratele peak and also Bicăjel Gorges [5]. The same type of vegetal communities have been identified by us in Bicaz and Șugău Gorges. In these locations, it occupies small areas (2–4 m²), on rocky lands having an increased inclination degree and prevalent northern exposition. The general covering degree varies between 55–70%, realized predominant by the two characteristic species *Asplenium rutaemuraria* and *A. trichomanes* beside some other species from *Asplenietea trichomanis* and *Elyno – Seslerietaea* vegetation classes.

6. *Valeriano montani – Cortusetum matthioli* Boscaiu et Täuber 1979 (Table 3, rel. 6–9). Four of this type of plant communities have been identified in Bicaz and Șugău Gorges on rocky, shady slopes having a moderate degree inclination (10–20°), at 800–900 m altitude. The general covering degree has values between 65–75%, to this contributing the dominant *Valeriana ciliata* species and the co-dominant *Cortusa matthioli* species. Sometimes, in the floristic composition can be found species from the neighboring vegetal communities (*Veronica urticifolia*, *Hieracium bifidum*, etc.).

7. *Calamintho baumgarteni – Galietum anisophylli* Al. Beldie 1967 (Table 4, rel. 1–3). On spare soil situated on slopes having a 25–35° inclination degree and varied expositions, we have identified some plant communities similar to those which have been cited previously from the “Cheile Bicazului-Lacul Roșu-Hășmașul Mare” National Park territory [5]. The phytocoenoses are presented on small areas and are characterized by a floristic composition rich in saxicolous species from *Thlaspietea rotundifolii*, *Asplenietea trichomanis* and *Festuco – Brometea* classes.

8. *Geranietum macrorrhizi* Boscaiu et Tauber 1977 (Table 4, rel. 4–7). This association is frequently met in Șugău Gorges, on stabilized screes having spare

soil layer. It occupies 8–10 m² areas on north and northern-western slopes having a 10–30° inclination degree. The vegetation covering degree has values between 70–80% and the main component is represented by *Geranium macrorrhizum* characteristic species. On these fixed screes, at the slope base where a sufficient amount of humidity exists, these communities have a good stability.

9. *Cardaminopsidetum arenosae* Hodişan 1967 (Table 4, rel. 8–10). This association can frequently be met in the Romanian mountain zone, on semi-stabilized screes, having a significant amount of organic compounds. These are incipient phytocoenoses, having numerous pioneer species, which we have met in the Bicaz Gorges on sunbathed slopes having a middle coverage degree (15–20%). Beside the dominant species, also appear some other species constant to the superior coenotaxa of this association and also forestry plant species.

10. *Galio albi – Teucrietum montani* ass. nova (Table 5). This association is characteristic to calcareous screes from the mountain zone unit, being identified on moderate steeped slopes (up to 30–35°) having prevalent northern exposition, a 65–85% covering degree and 8–15 m² areas. On these calcareous screes, reduced quantities of organic materials are laid down forming a superficial spare soil. In this substratum are pushing the underground organs diverse species characteristic for *Thlaspietea rotundifolii* vegetation class, a major contribution to the phytocoenosis formation having *Teucrium montanum* and *Galium album* species (characteristic for the association). Also, numerous other species proceeded from the neighboring zones are inserted, species characteristic for *Molinio – Arrhenatheretea*, *Festuco – Brometea*, *Quercu – Fagetea* and *Artemisietea* classes of vegetation.

11. *Melico ciliatae – Festucetum pallentis* ass. nova (Table 6, rel. 1–10). This new association can be included in the mountain steppic associations category, installed on calcareous substratum on sunbathed slopes having an 10–35° inclination degree. On this substratum having a neutral or alkaline reaction was installed a xeromesophilous type of vegetation having an increased covering degree (75–85%) and dominated by *Festuca pallens* and *Melica ciliata* species (also representing the characteristic species for this association). In these phytocoenoses, a varied number of regional elements characteristic to the superior coenotaxa are present and also species from the neighboring meadows (*Elyno – Seslerietea*, *Molinio – Arrhenatheretea* etc.). This association had been identified by us in the Bicaz and Şugău Gorges, in inferior and middle mountain unit, at 740–1 015 m altitude.

12. *Thymo comosi – Festucetum rupicolae* (Csürös 1959) Pop et Hodişan 1985 (Table 6, rel. 11–15). The association has been met in the Carpathians submountain and mountain units, being identified by us in the Şugău Gorges and in the inferior part of the Bicaz Gorges on lithomorphic, rich in humus soils. These are calcicolous phytocoenoses containing on bigger areas numerous xerophilous and mesoxerophilous species. Among the two characteristic species to this association

and numerous other species characteristic to alliance and order, we have also frequently met other species characteristic for *Festuco-Brometea* class of vegetation. Some of these species have significant abundance-dominance quotients and an increased constancy.

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