THE FONTINAL VEGETATION IN THE RÂIOSU AND BUDA MOUNTAINS

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The paper presents the fontinal community growing near the streams in the Râiosu and Buda mountains, Făgăraş Massif. The hygrophile, microtherm, acid-neutrophile coenoses are characteristic of the mountain level and subalpine level, from 850 m altitude up to 2 100 m altitude. The coenoses are short, with grassy upper layer and mossy inferior layer, and a small surface ($4m^2$–$16\ m^2$).

Key words: fontinal vegetation, coenosis, floristic composition.

INTRODUCTION

The studies were made based on field observations. The main method of study was the Braun-Blanquet method.

Syntaxonomical system of investigated plant associations:

MONTIO-CARDAMINETEA Br.-Bl. et Tx. 1943 ex Klika et Hadač 1944 em Zechmeister 1993

Montio-Cardaminetalia Pawl. 1928 em. Zechmeister 1993

Caricion remotae Kästner 1941

Cardamino - Chrysosplenietum alternifolii Mass 1959

Cardamino - Montion Br.-Bl. 1926

Chrysosplenio alpini - Saxifragetum stellaris Pawl. et Walas 1949

Cratoneurion commutati W. Koch. 1928

Doronico carpatici - Saxifragetum aizoidis Coldea (1986) 1990

RESULTS AND DISCUSSION

MONTIO-CARDAMINETEA Br.-Bl. et Tx. 1943

Fontinal phytocoenoses, which are grouping in the class *Montio-Cardaminetea* Br.-Bl. et Tx. 1943, vegetated near the cold streams from the mountain, subalpine and alpine levels. The floristic composition, which is stabilized by a real ecological homeostasy, is insured both by the uninterrupted flow and the relatively constant temperature of the water on the whole vegetation period.

The most representative species for recognizing are: *Cardamine amara, Epilobium alsinifolium, Pinguicula vulgaris, Saxifraga aizoides, Silene pusilla, Epilobium nutans.*

MONTIO-CARDAMINETALIA Pawl. 1928

In the South-Eastern Carpathians, fontinal coenosis belongs to this single order. Its associations are determined by the calcareous or siliceous substratum on which they develop. The most representative species for recognizing the order are the same as of the class.

Carricion remotae Kästner 194121

The alliance contains shady fontinal groups, sometimes situated in the forest ecotone zone. The species for recognizing are: *Cardamine amara, Chrysosplenium alternifolium, Caltha palustris, Chaerophyllum hirsutum, Carex remota.*

Cardamino-Chrysosplenietum alternifolii Maas 1959

The sciophilous coenoses dominated by *Cardamine amara* and *Chrysosplenium alternifolium* are frequently around the streams which are situated in the beech forest and the spruce forest in the upper zone of the Buda Valley. The characteristic species of association is *Chrysosplenium alternifolium* (Table 1).

In the floristic composition the species number is small. Phytocoenoses from the inferior mountain level are dominated by *Impatiens noli-tangere*, and those from the superior mountain level are dominated by *Chaerophyllum hirsutum.* Simultaneously with the altitude increase, the composition of these coenoses is dominated more and more by the elements of the *Adenostyletalia* order.

There are meso-hygrophile (54%), microtherm (31%), acid-neutrophile (38%) coenoses (Fig. 1). In bioforms spectrum the hemicryptophytes are predominant (92%) (Fig. 2).

The spectrum of geoelements shows that eurasiatics species (38%) prevail, succeeded by the circumboreale ones (23%). The central European and European species are in the same proportion (15.3%) (Fig. 3).

The karyologic spectrum shows that the polyploid species prevail (62%), succeeded by the diploid ones (28%) (Fig. 4). The diploid index is 0.5.

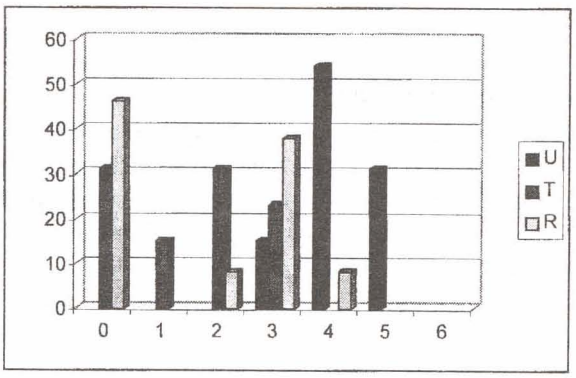


Fig. 1 – Spectrum of ecological inex of ass. *Cardamino-Chrysosplenietum alternifolii.*

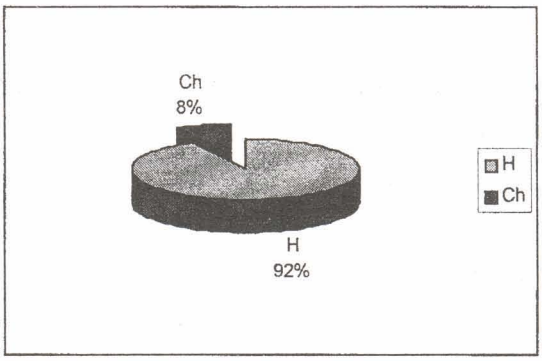


Fig. 2 – Spectrum of bioforms of ass. *Cardamino-Chrysosplenietum alternifolii.*

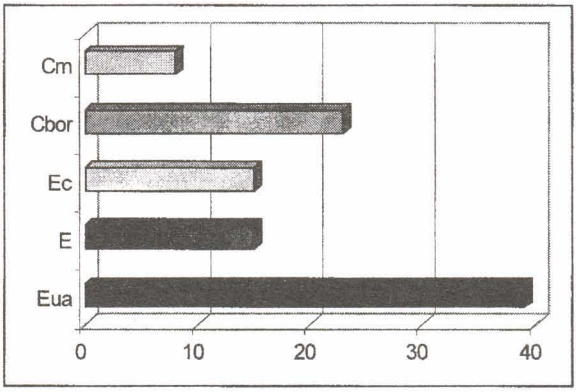


Fig. 3 – Spectrum of geoelements of ass. *Cardamino-Chrysosplenietum alternifolii.*

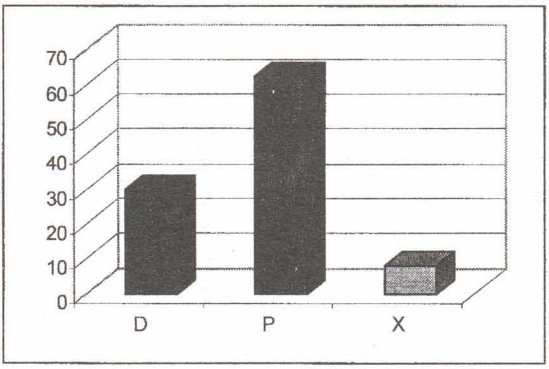


Fig. 4 – Karyologic spectrum of ass. *Cardamino-Chrysosplenietum alternifolii.*

Table 1

Cardamino-Chrysosplenietum alternifolii Maas 1959

Bioforms	Geoelements	Number of survey	1	2	3	4	5	6	7	8	K
		Altitude (m.s.m)	800	800	850	800	900	900	900	800	
		Exposure	S	S	S-E	S	W	S-W	S	S	
		Slope (degrees)	15°	15°	30°	15°	30°	30°	45°	30°	
		Covering (%)	40	50	45	40	40	45	30	25	
		Recording area (m^2)	4	4	4	4	16	4	4	4	
1	2	3	4	5	6	7	8	9	10	11	12
		Caricion remotae									
H	Cbor	*Chrysosplenium alternifolium*	3	+	1	2	3	1	+	2	V
H	Eua(Med)	*Cardamine amara*	+	3	3	1	+	3	2	+	V
Brch	Cbor	*Phylonotis seriata*	+	1	+	1	+	+	1	.	V
H	Cbor	*Carex remota*	+	.	.	+	.	.	+	.	II
		Cardamino-Montion et Montio-Cardaminetea									
H	Cbor	*Caltha palustris*	+	1	+	.	+	+	.	1	IV
H	E-Alp	*Epilobium nutans*	+	.	.	+	.	+	.	.	II
Ch-H	Eua(Arct-alp)	*Saxifraga stellaris*	.	+	.	1	+	+	.	+	IV
		Adenostyletalia									
H	Ec(mont)	*Chaerophyllum hirsutum*	+	.	+	.	+	.	+	.	III
H	E	*Stellaria nemorum*	.	+	.	.	+	+	.	.	II
H	Ec(mont)	*Doronicum austriacum*	+	.	+	+	.	.	+	+	IV
		Variae Syntaxa									
H	Eua(med)	*Ranunculus repens*	.	+	+	+	.	+	+	.	IV
H	Eua	*Myosotis scorpioides*	+	.	+	1	+	.	1	+	IV
H	Eua	*Poa trivialis*	+	.	.	+	.	+	.	.	II
H	Cm	*Juncus efusus*	.	+	+	.	+	.	+	.	III
H	Cbor(Arct-alp)	*Cerastium cerastoides*	.	.	+	.	+	+	.	+	III
Th	Eua	*Impatiens noli-tangere*	.	+	.	+	.	.	.	+	II

The place and date of surveys: 1, 2, 3, 4, 5, Buda Valley – 18.08.1999; 6,7,8, Buda Valley – 4.07.2000

Cardamino-Montion Br.-Bl. 1926

The alliance contains the vegetation of the streams from the acid till neutral substratum (pH = 4–6.8). In Buda mountain there are a few species that characterized that alliance.

Chrysosplenio alpini-Saxifragetum stellaris Pawl. et Walas 1949

(Syn.: *Phylonotido-Saxifragetum stellaris* auct. roman., *Epilobio anagallidifolii-Saxifragetum alpigeni* Rejmanek et Rejmankova 1979)

The coenoses characterized the stream vegetation at the subalpine level. The characteristic species are the east-carpathic endemit *Chrysosplenium alpinum* and the alpine element *Saxifraga stellaris* which realised an average covering by 35–50%. The species exigency from the humidity factor offers a hydro-hygrophile character to the association (Table 2).

There are mesophile (55%) to meso-hygrophile (32%) coenoses, in which microtherm (41%) and euritherm (31%) species are predominant. The neutrophile species are frequent (23%), but the great percentage belongs to euriionic species (31%) (Fig. 5). In the bioforms spectrum, the hemicryptophytes are predominant (72%), succeeded by the chamephyte (14%) and yearly therophyte (9%) (Fig. 6).

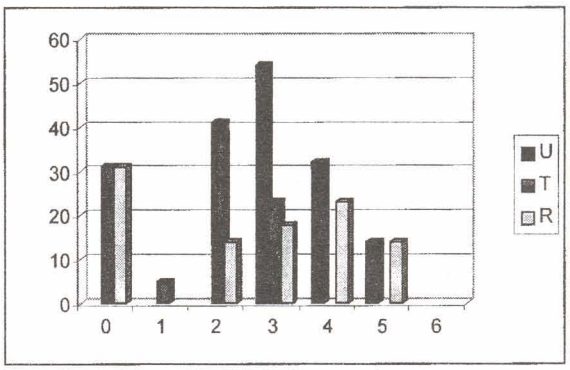
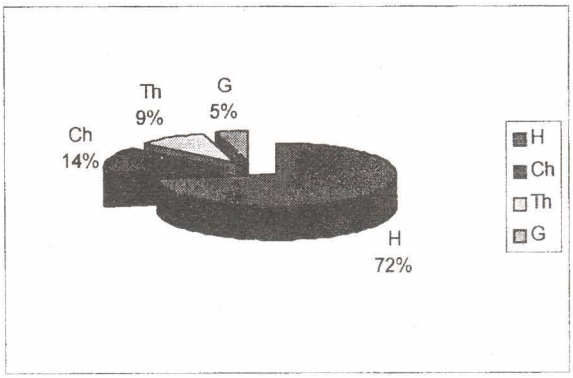


Fig. 5 – Spectrum of ecological index of ass. *Chrysosplenio alpini-Saxifragetum stellaris.*



F ig. 6 – Spectrum of bioforms of ass. *Chrysosplenio alpini-Saxifragetum stellaris.*

Table 2

Chrysosplenio alpini-Saxifragetum stellaris Pawl. et Walas 1949

Bioforms	Geoelements	Number of survey	1	2	3	4	5	6	7	8	9	K
		Altitude (m.s.m.)	700	700	850	850	850	900	900	900	700	
		Exposure		W	E	E	E	W	S-E	E	E	W
		Slope (degrees)	45°	45°	45°	30°	45°	30°	45°	50°	50°	
		Covering (%)		65	40	50	75	75	75	50	50	45
		Recording area (m^2)		4	4	1	4	4	4	4	4	1
1	2	3	4	5	6	7	8	9	10	11	12	13
		Opt. ass.										
H	Carp(end)	*Chrysosplenium alpinum*	1	2	+	1	+	1	+	+	3	V
Ch(H)	Eua(Arct-alp)	*Saxifraga stellaris*	3	1	3	4	3	4	+	1	+	V
		Phylonotis seriata	.	1	1	.	+	+	1	+	+	IV
		Cratoneurion commutati										
Ch	E(alp)	*Silene pusilla*	2	1	1	.	.	1	+	.	.	III
		Cardamino-Montion et Montio-Cardaminetalia										
H	Eua(Med)	*Cardamine amara*	.	+	.	1	3	.	3	+	1	III
H	Cbor	*Caltha palustris*	+	+	.	.	.	1	+	+	+	IV
		Adenostyletalia										
H	Cbor	*Viola biflora*	.	.	+	+	.	.	+	.	+	III
H	E	*Stellaria nemorum*	+	+	+	.	+	.	+	.	.	III
		Variae Syntaxa										
H-HH	Eua	*Myosotis scorpioides*	+	1	+	+	.	.	+	3	+	IV
H	Ec(mont)	*Valeriana tripteris*	.	+	+	.	+	.	+	+	.	III
H	Eua(Med)	*Epilobium montanum*	.	.	.	+	+	.	+	.	+	III
H	Cm	*Deschampsia caespitosa*	+	.	.	.	.	+	+	+	.	III

Species only in a survey: *Alchemilla xanthochlora* (1), *Leucanthemum waldsteinii* (1), *Rumex aryfolius* (2), *Hypericum maculatum* (3), *Cardamine flexuosa* (3), *Petasites albus* (4), *Chaerophyllum hirsutum* (4), *Saxifraga heucherifolia* (5), *Carduus personata* (5), *Aconitum tauricum* (6).

The place and data of surveys: 1–4, Buda Mountain – 25.07.1997; 5–9, Buda Mountain – 3.07.1999.

In the spectrum of geoelements, the first place is occupied by the Eurasiatic species (43%), then by central European species (18%) (Fig. 7). The karyologic spectrum shows that the polyploid species prevail 50% (45% (Fig. 8). The diploid index is 0.9.

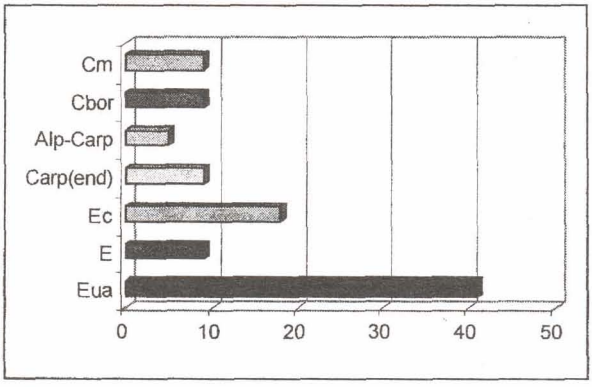


Fig. 7 – Spectrum of geoelements of ass. *Chrysosplenio alpini-Saxifragetum stellaris.*

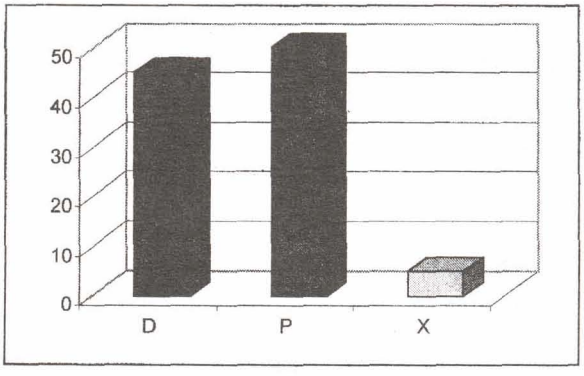


Fig. 8 – Karyologic spectrum of ass. *Chrysosplenio alpini-Saxifragetum stellaris.*

Cratoneurion commutati W. Koch 1928

The alliance contains the fontinal phytocoenoses consisting of basophile components which developed close by the streams and springs from the calcareous substrate.

The species for recognizing are: *Silene pusilla, Saxifraga aizoides, Doronicum carpaticum.*

Doronico carpatici-Saxifragetum aizoidis Coldea (1986) 1990

These coenoses were met on the edge of the Buda stream which is flowing among the calcareous or siliceous rocks, sunbathed, situated on the Buda mountain`s southern slope and on the edge of the Râiosu stream situated on the Râiosu mountain`s western slope. The characteristic species, which realised a great covering, are *Doronicum carpaticum* and *Saxifraga aizoides* (Table 3).

Table 3

Doronico carpatici-Saxifragetum aizoidis Coldea (1986) 1990

Bioforms	Geoelements	Number of survey	1	2	3	4	5	6	7	
		Altitude (m.s.m.)	2000	2000	2200	2200	2200	2100	2200	K
		Exposure	S	S	W	W	W	S	W	
		Slope (degrees)	30°	45°	45°	30°	45°	45°	45°	
		Covering (%)	45	30	40	50	30	30	55	
		Recording area (m^2)	4	4	4	16	4	16	4	
1	2	3	4	5	6	7	8	9	10	11
		Cratoneurion								
H	Carp-Balc	*Doronicum carpaticum*	3	2	2	3	2	1	3	V
Ch	E(alp)	*Silene pusilla*	+	.	1	.	.	+	.	III
Ch	Eua(Arct-alp)	*Saxifraga aizoides*	1	+	1	+	1	2	+	V
		Cardamino-Montion et Montio-Cardaminetalia								
H	Cbor	*Caltha palustris*	+	1	+	1	.	+	.	IV
Ch	Carp-Balc	*Saxifraga rotundifolia*								
		ssp. heucherifolia	+	.	.	.	+	1		IV
Ch(H)	Eua(Arct-alp)	*Saxifraga stellaris*	+	.	.	1	+	+	.	III
Brch	Cm	*Philonotis seriata*	.	1	+	.	+	+	+	IV
		Adenostyletalia s.l.								
H	Cbor	*Viola biflora*	+	+	1	+	1	+	.	V
H	Alp-Carp	*Aconitum tauricum*	.	+	+	+	.	.	2	III
G	Eua	*Veratrum album*	.	.	+	+	.	.	.	II
		Variae Syntaxa								
H	Cbor(Arct-alp)	*Luzula alpinopilosa*	.	.	+	+	+	.	.	II
H	Carp-Balc-Anat	*Plantago gentianoides*	.	.	+	+	+	.	.	II
H	Alp-Carp	*Cardamine resedifolia*	.	.	+	+	.	.	.	II
H	Ec	*Alchemilla xanthochlora*	+	+	1	.	.	+	+	IV
H	Cbor	*Chrysosplenium alternifolium.*		.	+	.	.	+	+	II

Species only in a survey: *Aconitum napelus* (1), *Fontinalis antipyretica* (1), *Athyrium distentifolium* (3), *Poa violacea* (3).

The place and date of surveys: 1–5, Buda Mountains, longways of the Buda stream – 3.07.1999; 6,7, Râiosu Mountain – 10.08.2000.

The spectrum of ecological index shows that mesophile species prevail (47%), followed by the meso-hygrophile species (29%), and from the viewpoint of the temperature microtherm species prevail (59%), this association being situated especially in the subalpine and alpine level of the massif. From the viewpoint of the soil reaction, we remark that weakly acid-neutrophile, neutrophile and amphitolerant species have the same proportions (23%) (Fig. 9). The spectrum of bioforms shows that hemicryptophytes prevail (70%), followed by the chamephytes (24%), the other categories being less representative in those phytocoenoses (Fig. 10).

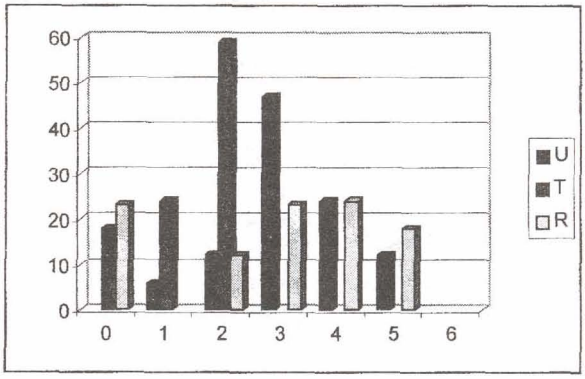


Fig. 9 – Spectrum of ecological index of ass. *Doronico carpatici-Saxifragetum aizoidis.*

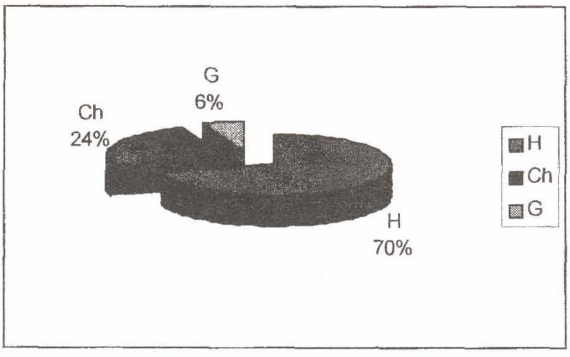


Fig. 10 – Spectrum of bioforms of ass. *Doronico carpatici-Saxifragetum aizoidis.*

In the floristic composition the largest weight belongs to the circumboreal species (26%), the eurasiatic and the carpathian-balcanic one having the same proportion (24%). The alpine-carpathian species have a great frequency (12%) which proved closely bundled with Alp`s flora (Fig. 11). The karyologic spectrum shows that diploid species are in the same proportion with polyploid ones (47%) (Fig. 12). The diploid index is 1.

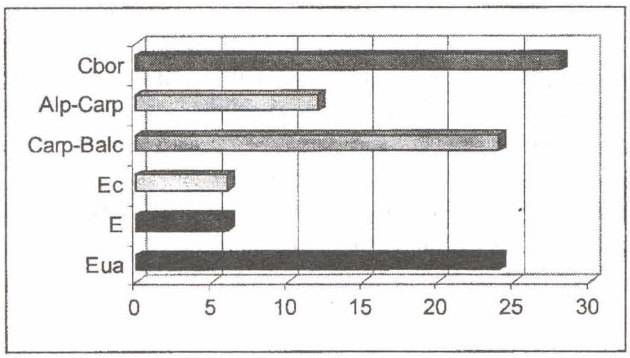


Fig. 11 – Spectrum of geoelements of ass. *Doronico carpatici-Saxifragetum aizoidis.*

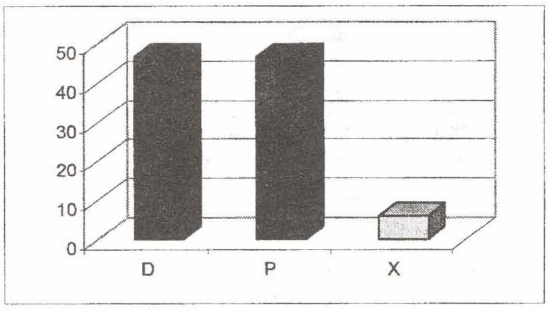


Fig. 12 – Karyologic spectrum of ass. *Doronico carpatici-Saxifragetum aizoidis.*

CONCLUSION

According to the rise of the altitude, we remark an increase of the microtherm species. Following the spectrum of bioforms, we notice an increase of the chamephytes near the hemicryptophytes, and an increase of the circumboreal species, which indicate a cool climate, with moderate anthropic influences.

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