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THE ASSOCIATION *STIPETO-CONVOLVULETUM COMPACTI* ASS. NOVA IN KOSOVO

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Abstract

Serpentine vegetation of Kosovo represents a diversity which has not been sufficiently explored, yet. Kosovo's serpentine is spread in different parts of Kosovo at the altitudes of 400-2100 m. Large complexes with serpentine are found in the north of Kosovo, but the southern part of Kosovo is also rich in serpentine rocks and in endemic species.

Using the principles and methods of the Zürich-Montpellier School we have explored the serpentine flora and vegetation of Gurana, an area in the south-east of Kosovo near the border with the Republic of Macedonia. This area has not been sufficiently researched because of the militarized border areas. During the research of these fields, we found species that were not present on the other serpentines of Kosovo.

The species *Convolvulus compactus* Boiss. (syn. *Convolvulus cochlearis*) and *Stipa mayeri* dominate this terrain and create stands that we have classified as the association *Stipeto-Convolvuletum compacti* ass. nova. This association was researched during 2007-2010. Based on the results obtained and comparing them with the results of other authors, we have arrived at the conclusion that we are dealing with a new association which we called *Stipeto-Convolvuletum compacti* ass. nova.

Key words: Vegetation of Kosova, Gurana, Serpentine terrains.

Izvleček

Vegetacija Kosova na serpentinitu je posebnost, ki do sedaj še ni bila zadovoljivo raziskana. Serpentinit je na Kosovu razširjen na različnih območjih na nadmorskih višini od 400 do 2100 metrov. Večje površine najdemo na severu Kosova, vendar je tudi južni del bogat s serpentinitom in endemičnimi vrstami.

Z züriško-montpelliersko metodo smo preučili floro in vegetacijo na serpentinitu pri vasi Gurana v jugovzhodnem delu Kosova ob meji z Republiko Makedonijo. To območje do sedaj ni bilo dobro raziskano zaradi vojaške navzočnosti na obmejnem območju. Na tem delu smo našli vrste, ki jih ne najdemo na drugih območjih s serpentinitom na Kosovu.

Vrsti *Convolvulus compactus* Boiss. (sin. *Convolvulus cochlearis*) in *Stipa mayeri* prevladujeta na teh območjih in gradita sestoje, ki smo jih uvrstili v asociacijo *Stipeto-Convolvuletum compacti* ass. nova. Raziskovali smo v letih od 2007 do 2010. Na podlagi dobljenih rezultatov in s primerjavo z drugimi avtorji smo prišli do zaključka, da lahko te sestoje uvrstimo v novo asociacijo, ki smo jo poimenovali *Stipeto-Convolvuletum compacti* ass. nova.

Ključne besede: vegetacija Kosova, Gurana, območja serpentinita.

1. INTRODUCTION

Serpentine is a rare bedrock on the surface of the earth (Kruckeberg 1985). In Kosovo territory there have been found serpentine rocks which are very rich, from the aspect of flora and vegetation (Rexhepi 1985, Krasniqi & Millaku 2007). The serpentine rocks in the Gurana area belong to the Jurassic age. These serpentines are poor in biogenic elements necessary for plant life; nevertheless, about 98 species are present in these terrains. Analyses made by Pavičević et al. (1974) have proved that the chemical composition of Gurana serpentines is very similar to other ser-

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pentines in the Balkans. In the Gurana area, about 70% of the serpentines present contain less than 3% CaO, where typical serpentine species dominate, and serpentines with CaO content exceeding 30%, where typical serpentine species are dominant, but also some species characteristic of carbonate rocks are present.

Flora and vegetation in serpentine terrains in Kosovo have been investigated by many researchers, such as: Blečić et al. (1969), Blečić & Krasniqi (1971), Krasniqi (1972, 1987), Hundozi (1987), Rexhepi (1978, 1979, 1982, 1997, 2000), Rexhepi & Millaku (1996), Krasniqi (2003, 2006), Krasniqi & Millaku (2004) and Millaku et al. (2007).

Figure 1: Map of the serpentine massifs spread on Kosovo (Ibër river valley (North Kosovo, near Mitrovica), Drini i Bardhë valley (Gubavc, near Peja), Brezovica massive, Kozniku massive and Guranë (on the foot of the Luboteni Mountain).

Slika 1: Zemljevid območij serpentinita na Kosovu (dolina reke Ibër (severni del Kosova, v bližini Mitrovice), dolina Drini i Bardhë (Gubavc, pri Pećiu), masivi Brezovica, Kozniku in Guranë (na vznožju gore Luboteni).

2. MATERIALS AND METHODS

2.1. Description of the researched area

The research area spreads on the eastside of the Luboten mountain, near the village of Gurana and near the area bordering Macedonia. In general, typical serpentine flora and vegetation is dominant, while around this area there are oak forests in which *Quercus pubescens* prevails. Sites of the association *Stipeto-Convolvuletum compacti* ass. nova in Gurana are serpentine pastures located at an altitude of 550–800 m above sea level (Figure 1). The land is degraded. Considering its chemical-physical features, serpentines in Gurana area are unfavourable biotopes for plant growth and development. The serpentine rocks in this area are easily crumbled, thus creating a dry rocky land. The soil color is black, therefore the soil can warm up quickly and plants are exposed to high temperatures during summertime and to high temperature amplitudes throughout all seasons. The serpentines are poor in some important bio-elements such as Ca, K, P, whilst on the other hand they contain some poisonous elements for the plants such as: Ni, Cr, Co etc. The serpentines contain a high content of magnesium (Mg), which is poisonous for many plant species when in high concentration (Rexhepi 1979, 1990). The climate is characterized by Sub-Mediterranean conditions which enter through the Lepenci river valley. During the summer the temperatures are high and rainfalls are rare. It is the area with less recorded rains in the Republic of Kosovo (under 500 mm per year) (Tahirsylaj & Asllani 2009).

The association is located next to the village Gurana (Hani i Elezit), where the pasture is well developed. Therefore the stands are rather degraded and species poor.

2.2. Methods

Phytocenological relevés in Gurana serpentines were made during 2007 and 2010. The phytocoenological research studies are made using the principles and methods of the Zürich-Montpellier School (Braun-Blanquet 1964).

Major activities in the field were identification and determination of homogeneous plots. This was achieved on the basis of field analyses, and floristic composition of each relevé on a singular site, together with other additional data, such as number of relevé, altitude, exposition of terrain, slope, geological composition and the size of each relevé (m^2). Species characteristic of higher syntaxa were assigned according to Rexhepi (1978, 1982), Mucina et al. (1993), Čarni et al. (2000) and Buzo (2005). The floristic composition of communities is presented as per the principles for characteristic species. The arrangement of all species into syntaxonomic categories is presented according to the degree of presence – constancy, beginning from grade V to I in phytocoenological table (Table 1).

Species were determined using the required literature such as: Tutin et al. (1964–1980), Jordanov (1963–1982), Josifović (1970–1977), Dakov (1984), Paparisto et al. (1988, 1992), Qosja et al. (1992), Polunin (1997), Vangjeli et al. (2000) and Matevski (2010).

New syntaxa were described according to rules of the International Code of Phytosociological Nomenclature (Weber et al. 2000).

3. RESULTS

3.2. Floristic composition of community

The floristic composition of the community is presented in the phytocoenological table (Table 1), which contains 10 relevés. In the table, there are 98 species present. Characteristic species of the association are *Convolvulus compactus, Stipa mayeri, Achillea coarctata,* and *Agropyron cristatum*.

***Convolvulus compactus* Boiss.** (Figure 2)

Syn: *C. boessieri* Steudel subsp. *compactus* (Boiss.) Stace in Bot. J. Linn. Soc. 64: 58 (1971); *C. boissieri* subsp. *parnassicus* (Boiss & Orph.) Kuzm. In Jordanov, Fl. Nar. Rep. Bulg., 8: 451 (1982), (Matevski 2010); *C. cochlearis* Gris. Spic. Flora SR Srbije 10: 164 (1986).

Dwarf, cushion-like, densely oppressed-pubescent perennial up to 10 cm; stems much-branched, woody. Leaves 4–10 mm long, 4–7 mm broadly linear to obovate. The plant is entirely covered with silver-silk hair and respectively colored. Peduncles are very short, terminal and axillary, 1-flowered. Corolla 20–22 mm, white to purple. Distributed in the Asiatic part of Turkey and the Balkan peninsula: Bulgaria, Albania, Macedonia and Kosovo (only in Guranë). In Macedonia

Figure 2: *Convolvulus compactus,* the characteristic species of the association *Stipeto-Convolvuletum compacti* (Photo: F. Millaku, Guranë, 2009).

Slika 2: *Convolvulus compactus,* značilna vrsta asociacije *Stipeto-Convolvuletum compacti* (Foto: F. Millaku, Guranë, 2009).

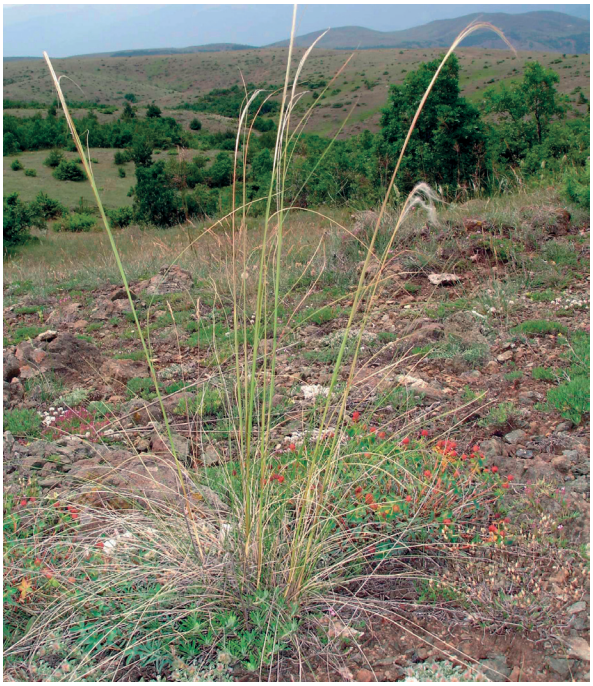

Figure 3: *Stipa mayeri,* the characteristic species of the association *Stipeto-Convolvuletum compacti* and endemic species of Kosovo (Photo: E. Krasniqi, Guranë, 2009).

Slika 3: *Stipa mayeri,* značilna vrsta asociacije *Stipeto-Convolvuletum compacti* in endemična vrsta Kosova. (Foto: E. Krasniqi, Guranë, 2009).

(Matevski 2010) and Kosovo (Rexhepi 2000) it is distributed only on the serpentines and is the main component of the phytocoenose.

***Stipa mayeri* Martinovsky** (Figure 3)

It is a perennial herbaceous plant, with the stem up to 50 cm length. It is an endemic species of Kosovo. It was discovered by the Czech botanist Jan Otokar Martinovsky in 1971 (Rexhepi 2000), from the herbarium material collected previously on serpentine territory of Kosovo by the Slovenian botanist E. Mayer, by whom it was named. In Kosovo it is spread in Mirushë, Koznik and Gurana. It is characteristic species of the association.

The association *Stipeto-Convolvuletum compacti* ass. nova is well differentiated in its floristic structure. The characteristic species of the association and some serpentinophyte species are usually present in this association. There exist differences in the aspect of flora and vegetation of Gurana, where the association *Stipeto-Convolvuletum compacti* is located, and other serpentines. This is a consequence of the climate conditions,

Figure 4: *Achillea coarctata*, the characteristic species of the association *Stipeto-Convolvuletum compacti* (Photo: E. Krasniqi, Guranë, 2008).

Slika 4: *Achillea coarctata*, značilna vrsta asociacije *Stipeto-Convolvuletum compacti.* Foto: E. Krasniqi, Guranë, 2008.

Figure 5: *Centaurea kosanini*, Balkan endemic species present only on the serpentines (Photo: F. Rexhepi Guranë 2009).

Slika 5: *Centaurea kosanini*, endemit Balkana, ki ga najdemo le na serpentinitu. (Foto: F. Rexhepi, Guranë, 2009).

geographic position and floristic structure. Thus, endemic species: *Genista hassertiana*, *Aster albanicus*, *Forsythia europaea*, *Tulipa scardica*, *Aristolochia merxmuelleri*, *Halacsya sendtneri, Linum elegans*, *Saponaria intermedia*, *Veronica andrazovszkyi*, that belong to the associations*: Polygalo-Genistetum hasertianae, Potentillo-Fumanetum bonapartei, Astero–Junipertum oxycedri, Sedo-Bornmullerietum dieckii* are not present in the association *Stipeto-Convolvuletum compacti*; whereas species *Convolvulus compactus*, *Achillea coarctata*, *Iris pallida* and *Colchicum hungaricum*, which are present in this association, are absent in the associations mentioned above. The association *Stipeto-Convolvuletum compacti* ass. nova belongs to the alliance *Centaureo-Bromion fibrosi* Bleč. et al. 1969, order *Halacsyetalia sendtneri* Rt. 1970 and in the class *Festuco-Brometea* Br. Bl. et R. Tx. 1943.

3.3. Community description

The association *Stipeto-Convolvuletum compacti* ass. nova (Figure 6) is spread in Gurana area, in the serpentine rocks, in the black soil crumbled up easily, thus creating a dry rocky land. The altitude of these terrains varies between 550–800 m. There are mostly South, West, South-East, South-West and East expositions, while the terrain inclination is 10–35 degrees. The soil is relatively degraded – typical rendzina on serpentine. The community is being developed in the form of open type because of the terrain configuration. In these terrains degradation of soils and vegetation is evident. The characteristic species of the association are: *Convolvulus compactus, Stipa mayeri, Achillea coarctata* and *Agropyron cristatum*.

The association *Stipeto-Convolvuletum compacti* Millaku et al. ass. nova belongs to the alliance *Centaureo-Bromion fibrosi* Bleč. et al. 1969, which is represented with a considerable number of species with constancy V and IV such as: *Thymus lykae, Alyssum markgrafii, Euphorbia glabriflora, Bromus fibrosus* [*B. erectus* subsp. *fibrosus*], *Galium lucidum* [*G. gerardi*] (Rexhepi 1978, 1982, 1994, 2007; Krasniqi & Millaku 2007). Also the order *Halacsyetalia sendtneri* Rt. 1970 (Rexhepi 1982, 2007; Krasniqi & Millaku 2007) is represented with an appreciable number of species with higher constancy, such as: *Astragalus onobry-*

Figure 6: Characteristic appearance of the association *Stipeto-Convolvuletum compacti* in Gurana serpentines (Photo: F. Millaku 2010).

Slika 6: Značilni videz sestojev asociacije *Stipeto-Convolvuletum compacti* na serpentinitu na območju Gurana. (Foto: F. Millaku, 2010).

chis, var. *multijugus, Plantago holosteum, Potentilla tommassiniana, Potentilla astracanica, Goniolimon collinum* and *Linum tauricum*.

The class *Festuco-Brometea* Br.-Bl. et R. Tx. 1943 (Rexhepi 1978, 1994, 2007, Krasniqi. & Millaku 2007), is represented with 48 species, of which 8 have the constancy V and IV, 20 species have the constancy III, whereas 16 species have the constancy II (Table 1).

The ecological characteristics of the association *Stipeto-Convolvuletum compacti* ass. nova were obtained on the basis of life forms analysis (Figure 7). The biological spectrum shows the following relationship given in percentage: H (71%), CH (12%), G (10%) T (4%) and P only 1%. Judging by the biological spectrum, we may conclude that in this case we are dealing with a hemicryptophytic community.

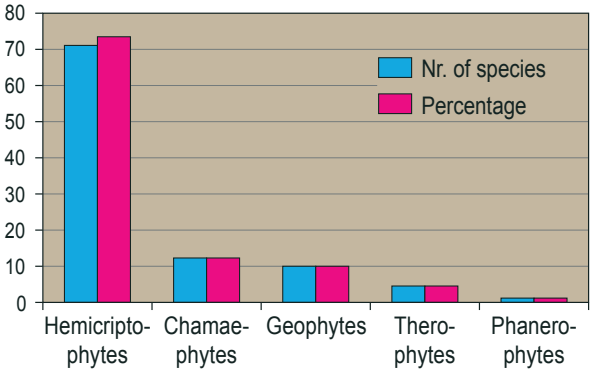

Figure 7: The biological spectrum of association *Stipeto-Convolvuletum compacti.*

Slika 7: Biološki spekter asociacije *Stipeto-Convolvuletum compacti.*

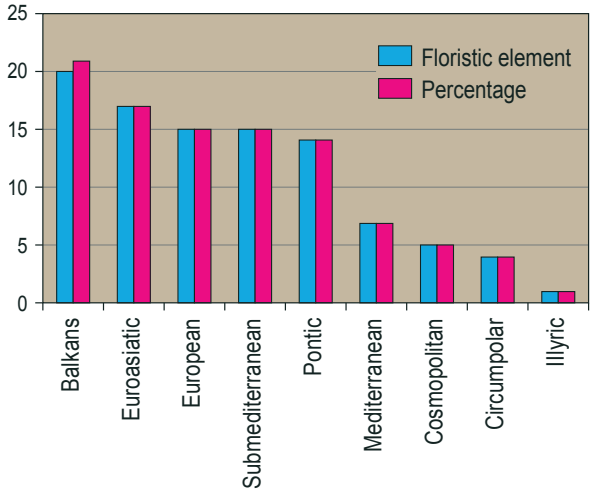

Figure 8: The areal spectrum of the association *Stipeto-Convolvuletum compacti.*

Slika 8: Spekter flornih elementov asociacije *Stipeto-Convolvuletum compacti.*

The geographical position of this community can be illustrated through the spectrum of species distribution (Figure 8). The distribution of floristic elements of the community is: Balkans (21%), European (15%), Euroasiatic (17%), Sub-Mediterranean (15%), Pontic (14%), Mediterranean (7%), Cosmopolitan (5%), Circumpolar (4%) and Illyric (1%), The southern thermophilous elements (Balkans, Mediterranean and Sub-Mediterranean) indicate the xerothermophilous character of the community. This community has no relevant economic importance, but it is important as a natural safeguard from erosion of the soil.

3.1. Syntaxonomical scheme

Festuco–Brometea Br.-Bl. et R. Tx. 1943
Halascyetalia sendtneri Rt. 1970
Centaureo–Bromion fibrosi Blečić et al. 1969
Stipeto–Convolvuletum compacti ass. nova hoc loco

Nomenclatural remark
Holotypus: Table 1/3 – *holotypus hoc loco*
Ecological circumstances: *Convolvolus compactus* dominated grasslands on serpentine bedrock.

4. CONCLUSIONS

Phytocenological research conducted in serpentine terrains on Gurana resulted in the establishment of a new association of serpentine pastures named *Stipeto-Convolvuletum compacti* as. nova. Its characteristic species include *Convolvulus compactus, Stipa mayeri, Achillea coarctata* and *Agropyron cristatum* and some endemic and serpentinophyte species such as: *Colchicum hungaricum, Iris pallida, Alyssum markgrafii* and *Bromus fibrosus* with high constancy.

The Species *Convolvulus compactus* in Kosovo is spread only in the Gurana area on this association.

Stipeto-Convolvuletum compacti is mostly similar with the association *Hyperico-Euphorbietum glabriflorae* Rexhepi 1978, but in the ass. *Hyperico-Euphorbietum glabriflorae* the following species

are absent: *Convolvulus compactus, Stipa mayeri, Achillea coarctata, Thymus lykae, Centaurea kosaniniі*, *Scabiosa fumaroides, Polygala doerfleri, Sedum serpentinii, Iris pallida, Goniolimon collinum, Linum tauricum, Silene paradoxa, Colchicum hungaricum, Teucrium polium* and *Centaurea napulifera*.

Association *Stipeto-Convolvuletum compacti* is different from the ass. *Potentillo-Fumanetum bonapartei* Rexhepi 1979*,* because in the association *Potentillo-Fumanetum bonapartei,* the following species are absent: *Convolvulus compactus, Achillea coarctata, Thymus lykae, Poa badensis, Centaurea kosaninii, Scabiosa fumaroides, Polygala doerflerii, Iris pallida, Colchicum hungaricum, Teucrium polium* and *Centaurea napulifera*.

Association *Stipeto-Convolvuletum compacti* have the largest differences in the floristic aspect compared with associations: *Cynancho-Saponarietum intermediate* Blečić et al 1969*, Onosmo-Scabiosetum fumaroides Rexhepi* 1978*, Sedo-Bornmuelleretum dieckii* Blečić et al. 1969 and *Polygalo-Genistetum hassertianae* Blečić et al. 1969.

5. APPENDIX

Species in only one relevé:
Allium flavum 2: *+, Centaurium erythraea* 2: +.1, *Chamaespartium saggitale* 3: +.2, *Clinopodium vulgare* 2: +, *Conyza canadensis* 6: +, *Crocus chrysanthus* 9: 1.1, *Fraxinus ornus* 2:+, *Helianthemum nummularium* 4: +.2, *Muscari racemosum* 10: +, *Potentilla detommasii* 2: +.1, *Quercus pubescens* 3: +, *Scilla autumnalis* 10: +.2, *Scilla bifolia* 9: +. *Tulipa sylvestris* 9: +.

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Table 1: Association *Stipeto-Convolvuletum compacti* ass. nova.
Tabela 1: Asociacija *Stipeto-Convolvuletum compacti* ass. nova.

	Nr. of relevé	1	2	3	4	5	6	7	8	9	10		
	Locality	Guranë											
	Altitude (m)	700	668	700	735	665	681	672	650	650	680		
	Exposition	W	W	SW	SW	S	S	SE	E	W	S		
	Slope	20	30	20	30	35	30	30	25	15	10		
Life form	Geological substratum	Serpentine										Constancy class	Floristic element
	Size of relevé (m^2)	25	25	25	25	25	25	25	25	25	25		
	Character species of association *Stipeto - Convolvuletum compacti*												
CH	*Convolvulus compactus*	3.4	4.4	3.4	4.4	4.5	4.5	4.5	5.5	3.3	2.3	V	Balk.
H	*Stipa mayeri*	3.3	2.2	1.2	2.2	2.2	2.3	1.2	+	+	+	V	Balk.
H	*Achillea coarctata*	2.2	1.2	+.2	+	1.1	+	1.1	1.1	1.1	+	V	Pont.
H	*Agropyron cristatum*	1.2	1.2	1.2	.	1.2	1.1	1.2	1.1	1.1	+	V	Eur.
	Character species of alliance *Centaureo - Bromion fibrosi* Bleč. et al. 1969												
CH	*Thymus lykae*	3.4	1.2	1.2	2.2	2.3	2.3	2.3	1.2	.	+	V	Balk.
CH	*Alyssum markgrafii*	1.2	1.2	2.2	2.2	1.2	1.2	1.1	+	.	1.1	V	Balk.
CH	*Euphorbia glabriflora*	1.2	1.2	.	1.2	1.2	1.1	1.2	1.1	+	+	V	Balk.
H	*Bromus fibrosus* [*B. erectus* subsp. *fibrosus*]	1.2	1.1	1.1	.	1.1	1.2	.	.	1.1	+	IV	Eur.
H	*Galium lucidum* [*G. gerardi*]	.	+.2	+	+	.	.	1.2	1.1	.	+	IV	Submed.
H	*Scorsonera austriaca*	1.1	1.1	+.2	.	.	.	.	.	1.1	1.1	III	Pont.
CH	*Fumana bonapartei*	+.2	+.2	+.2	.	.	.	.	.	+	+	III	Balk.
H	*Centaurea kosaninii*	+.2	.	.	+.2	+	1.1	.	.	.	.	III	Balk.
H	*Poa badensis*	.	.	+.2	+.2	.	.	.	.	+	+	III	Eur.
H	*Scabiosa fumaroides*	.	+.2	+.2	.	+	+	.	.	+	.	III	Balk.
H	*Hypericum barbatum*	.	+	+	+	.	.	.	.	1.1	+	III	Balk.
H	*Polygala doerflerii*	.	.	.	.	+	.	+	+	.	.	II	Balk.
H	*Potentilla australis*	.	.	.	+	.	.	.	.	+	+	II	Illyric
H	*Sedum serpentini*	.	.	.	.	+	+	.	+	.	.	II	Balk.
G	*Iris pallida*	.	.	.	.	.	.	.	.	1.2	1.1	I	Balk.
	Character species of order *Halacsyetalia sendtneri* Rt. 1970												
H	*Astragalus onobrychis* *var. multijugus*	1.3	1.2	+.2	+.2	1.2	2.2	.	.	1.2	+	V	Pont.
H	*Plantago holosteum*	1.2	.	+	.	2.2	2.2	1.2	2.2	1.1	1.1	V	Eur.
H	*Potentilla tommassiniana*	.	.	.	.	2.3	1.2	2.3	2.2	+	+	IV	Pont.
H	*Potentilla astracanica*	.	1.2	1.1	1.2	.	.	1.2	1.1	.	.	III	Pont.
CH	*Goniolimon collinum*	.	+.2	1.2	+.2	.	.	.	.	1.1	+	III	Submed.
H	*Linum tauricum*	.	1.2	+.2	.	.	.	.	.	+	+	III	Balk.
H	*Potentilla arenaria*	4.4	1.2	1.2	.	.	.	.	.	.	.	II	Pont.
H	*Silene paradoxa*	.	.	.	.	1.1	+	.	.	1.1	.	II	Eur.
CH	*Euphorbia barrelieri*	.	.	.	+.2	.	.	.	.	+	+	II	Balk.
H	*Vincetoxicum hirundinaria* [*Cynanchum athoum*]	.	.	.	.	.	.	.	1.1	+	+	II	Eur.
H	*Echium rubrum*	.	+	.	.	.	+	.	.	.	.	I	Pont.
	Character species of class *Festuco - Brometea* Br.-Bl. et R. Tx. 1943												
H	*Minuartia verna*	+.2	+.2	+.2	1.2	2.2	1.2	.	.	+	1.1	V	Circump.
H	*Centaurea stoebe*	1.2	1.2	+.2	.	1.2	1.1	1.1	1.1	.	.	IV	Euroas.
G	*Ornithogallum umbellatum*	1.1	+	.	+	1.2	1.1	.	.	1.2	1.2	IV	Eur.
H	*Anthyllis vulneraria*	.	.	1.1	.	+	1.2	+	+	+.1	1.2	IV	Submed.

	Nr. of relevé	1	2	3	4	5	6	7	8	9	10		
H	*Stachys scardica*	1.1	.	1.1	1.1	1.1	1.1	.	.	1.1	+	IV	Balk.
H	*Paronychia kapela*	1.2	+	+	.	+.1	.	.	+	+.1	1.2	IV	Eur.
H	*Chrysopogon gryllus*	.	.	+.2	+.2	2.3	1.1	1.1	1.2	.	.	IV	Pont.
H	*Sanguisorba minor*	1.1	.	+.2	+.2	1.2	1.1	.	.	.	1.1	IV	Euroas.
H	*Stachys recta*	1.2	+	.	.	.	+	.	1.2	+	2.2	IV	Pont.
H	*Leontodon crispus*	.	.	+	+	1.1	1.1	.	.	1.1	+	IV	Submed.
H	*Sedum acre*	.	.	.	.	+	+	+	+	+	+	IV	Euroas.
H	*Lotus corniculatus*	+	+	+	.	.	+	+	.	.	1.1	IV	Euroas.
H	*Koeleria gracilis*	.	.	.	.	1.1	1.1	2.2	1.2	.	+	III	Circump.
CH	*Dorycnium pentaphyllum*	.	+.2	.	+.2	.	.	.	+	1.2	+	III	Balk.
H	*Convolvulus cantabrica*	.	1.1	.	+	.	+	+	1.1	.	.	III	Submed.
T	*Euphrasia pectinata*	+	.	1.2	+	1.2	.	.	1.2	.	.	III	Eur.
H	*Trinia glauca*	+	1.1	.	.	.	.	+	1.1	+	.	III	Submed.
H	*Inula hirta*	+.1	+	.	.	.	.	+	+	.	1.1	III	Euroas.
H	*Euphorbia cyparissias*	.	.	+	+	1.1	.	+	.	+	.	III	Eur.
H	*Eryngium campestre*	+	+	+	+	.	.	.	.	+	.	III	Pont.
G	*Galium verum*	+	.	.	.	+	+	+	.	.	+	III	Euroas.
CH	*Teucrium montanum*	1.2	.	.	+.2	1.1	.	.	.	.	+	III	Eur.
H	*Veronica jacquini*	.	.	.	+	.	.	.	+.2	1.2	+.2	III	Pont.
CH	*Artemisia alba*	.	1.2	.	.	.	.	1.2	+.1	+	.	III	Submed.
H	*Potentilla argentea*	+.2	.	.	+	.	.	.	.	1.1	+	III	Pont.
H	*Centaurea splendens*	+	.	.	+	.	2.1	.	2.1	.	.	III	Submed.
H	*Hypericum perforatum*	.	.	.	.	.	1.1	+.1	+	+	.	III	Cosmop.
G	*Orchis morio*	.	.	1.2	.	+	.	.	+	+.1	.	III	Med.
H	*Thesium ramosum*	+	.	+.2	.	.	.	.	.	+	+	III	Euroas.
G	*Colchicum hungaricum*	.	.	.	.	+	+	.	.	+	+	III	Balk.
T	*Trifolium arvense*	+	.	.	.	+	+	.	.	+	.	III	Eur.
H	*Filipendula vulgaris*	+	+	.	.	+	+	.	.	.	.	III	Circump.
CH	*Teucrium polium*	+.2	.	.	+.2	.	1.2	.	.	.	.	II	Submed.
H	*Koeleria splendens*	.	.	.	.	1.2	1.2	.	.	.	1.1	II	Submed.
H	*Prunella laciniata*	.	1.2	.	+	.	.	.	+.2	.	.	II	Med.
H	*Hippocrepis comosa*	.	1.2	+.2	.	.	.	.	.	.	+	II	Submed.
G	*Iris reichenbachii*	.	.	.	.	+	.	.	.	1.1	1.2	II	Balk.
H	*Stipa pulcherrima*	.	.	.	.	1.1	1.1	.	.	.	+	II	Eur.
T	*Aethoinema saxatilis*	.	.	.	.	1.1	+	.	.	.	1.1	II	Submed.
P	*Juniperus oxycedrus*	.	+.2	.	.	.	.	.	.	+	+	II	Med.
H	*Anthoxanthum odoratum*	+.2	+	.	.	.	.	.	.	.	+	II	Circump.
H	*Hieracium bauchinii*	.	.	.	.	.	.	1.1	+	+	.	II	Eur.
H	*Sideritis montana*	.	+	.	.	.	+	1.1	.	.	.	II	Euroas.
T	*Filago arvensis*	.	.	.	.	.	.	.	+	+	+	II	Submed.
H	*Calamintha acinos*	+	.	.	+	.	.	.	.	+	.	II	Med.
H	*Orobanche gracilis*	.		.	.	.	+	+	+	.	.	II	Submed.
G	*Scilla autumnalis*	+	.	.	.	.	.	.	.	+	+	II	Med.
H	*Sedum ochroleucum*	.	+	+	.	.	.	.	.	+	.	II	Submed.
	Other species												
H	*Achillea millefolium*	+	.	1.1	.	1.1	.	+	1.1	+	.	III	Euroas.
H	*Eryssimum diffusum*	.	+.2	+	+	.	.	.	.	+	.	III	Pont.
H	*Verbascum phoeniceum*	.	.	+	+	.	.	.	+	+	.	III	Euroas.

	Nr. of relevé	1	2	3	4	5	6	7	8	9	10		
H	*Carex caryophyllea*	.	+	.	+	.	.	.	.	+	+	III	Euroas.
H	*Cichorium intybus*	.	.	.	.	+	+	+	+	.	.	III	Euroas.
H	*Podospermum laciniata*	.	.	.	+	1.1	.	.	.	.	1.1	II	Euroas.
H	*Poa bulbosa*	.	+.1	+	.	.	.	.	.	1.1	.	II	Eur.
H	*Taraxacum officinale*	.	.	.	1.1	+	.	.	.	.	+	II	Euroas.
CH	*Genista tinctoria*	.	.	.	.	.	.	.	+	1.2	+	II	Euroas.
G	*Allium cupani*	.	.	.	+	.	.	.	.	+	+	II	Med.
H	*Melica ciliata*	.	+	.	+	.	.	.	.	+	.	II	Euroas.
H	*Dianthus pinifolius*	.	+	.	.	.	.	.	+	+	.	II	Balk.
H	*Rumex acetosella*	+	+	+	.	.	.	.	.	.	.	II	Cosmop.
H	*Silene vulgaris*	.	.	+	+	.	.	.	.	+	.	II	Euroas.
H	*Plantago lanceolata*	+	.	.	+	.	.	.	.	+	.	II	Cosmop.
H	*Chondrilla juncea*	.	.	.	+	.	.	.	.	+	+	II	Cosmop.
G	*Jurinea mollis*	.	.	.	+	.	.	.	.	.	+	I	Pont.
G	*Iris graminea*	+	+	.	.	.	.	.	.	.	.	I	Med.
H	*Andropogon ischaemum*	.	.	+	+	.	.	.	.	.	.	I	Cosmop.
H	*Centaurea napulifera*	.	+	+	.	.	.	.	.	.	.	I	Balk.

Legend: Balk. = Balkans, Circump. = Circumpolar, Euroas. = Euroasiatic, Eur. = European, Cosmop. = Cosmopolitan, Med. = Mediterranean, Pont. = Pontic, Submed. = Submediterranean.