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Vegetation studies on the rocky grassland of the "Várhegy" at Sümeg

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Abstract: Samples have been taken in an open limestone rocky grassland from the SSE and NNW part of the "Várhegy" at Sümeg. The two each of the 20 samples groups have been examined and compared with each other according to their floral elements, species composition, ecological requirements, life-forms and cenological characters.

INTRODUCTION

The "Várhegy" at Sümeg is the western part of the Southern Bakony Mountains. The hill is approximately symmetrically conical, its height is 270 m. The diameter of the lower part of the hill is about 400 m, the angle of the slope is on the average about 30-40°. The underlying rock of the hill is Crinoidean limestone of the Middle Cretaceous period. On the top of the hill there are ruins of a mediaeval castle that used to be of military importance. The slopes had probably been covered with Cotino-Quercetum pubescentis association and the vegetation of the bottom of the hill was Orno-Quercetum. Originally the extension of the rocky grassland was smaller than nowadays. The changes in the vegetation were mostly induced by anthropogenic effects. Now the whole area of the hill is without trees, only in the western part can small bushes be seen. Open rocky grassland most similar to the original vegetation occurs in the upper third of the hill in SSE and NNW exposure. The heavily used places (because of heavy tourism) on the other part of the hill are covered by rocky slope steppe and ruderal associations. The goal of this study was a cenological examination of two samples of opposite exposure. However, the two parts of opposite exposure were markedly different from each other in view of microclimate and species composition, so it seemed useful to examine and analyse the vegetation of the two areas separately.

MATERIAL AND METHOD

The study is based on 40 cenologic samples. These samples of have been taken from a 2 x 2 m quadrat according to the Braun-Blanquet method (1964). Since our aim was to examine the relatively intact rocky grassland, we have tried to avoid marking out degraded areas (weedy, trodden place) in the samples. We have separated the samples into two groups according to their exposure. The samples taken on the SSE part from the first group, while the second group represents the samples of the NNW part. Both groups contain 20 samples. The species in the groups (soil pH, temperature, moisture and nitrogen requirements). These cenological parameters are expressed in a scale 0-5 (R, T, F, N values). Number 0 means indifference to the ecological parameter. The characteristic parameters of the species are taken from Soó's Synopsis (1964-80). The distribution of the characters in the two sample groups are represented in percentage pro rata (one species may belong to several categories with respect to floral element and ecological requirement, so the sum of the values may exceed 100 %).

The dates of the sampling: 16 July 1983, samples Nos 7-14, 21-25; 1 June 1984, samples Nos 1-6, 15-20, 26-29; 31 August 1984, samples Nos 30-40.
Table 1 contains the features of the samples (exposure, angle of slope, total cover value).

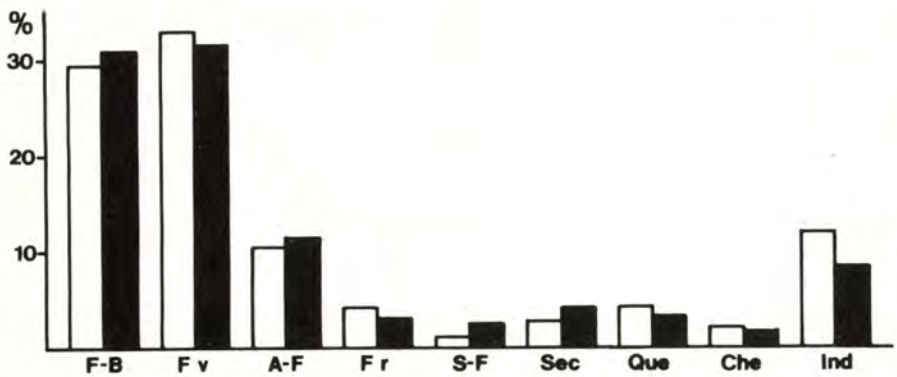
RESULTS

The two sample groups differ significantly from each other with respect to species composition. The total number of species is 79, out of this 47 have been found in both groups. The second group is considerably richer in species than the first one. The second group contains 70 species whilst the first one only 56. It is worth mentioning that the difference in species composition is caused first of all by the accessorial species. The constant and subconstant species are largely the same in both groups. The data of life-forms is shown in Table 4. The high value of the chamaephyton species is characteristic. The most important difference between the two sample groups is that the value of the therophyton species (SSE part) is higher in the first sample group than in the second group (NNW part). This occurence is in agreement with the differences in microclimate of the two slopes caused by the exposure. The therophyton life-form is adapted to tolerate the summer heat that is more effective in the southern part than on the northern slope. The other conclusion that can be drawn is with respect to the floral elements: the values of the Mediterranean and S-Eurasian elements are high in the SSE part of the hill compared with the opposite slope. There are several submediterranean, continental-like, Pontian and Balkan elements on both slopes (Table 5).

Fig. 1 shows the distribution of the sample groups with respect to cenological character. We can see that there is no great difference between the two sample groups. Both groups contained the same elements. The values show some percentile differences only. The Festuco-Bromea, Festuco-Brometea and Festucetalia valesiacae species have the highest values and the number of Asplenio-Festucion species is remarkable. The poorness in species of the first group, the number of the indifferent and ruderal species indicate the succes of the degradational effects. This processing is caused by the increased tourist traffic (trampled place, littering), as can be seen on the hill. The two sample groups are rather similar to each other as far as their ecological requirements are concerned (Table 6).

Essential differences are shown in the number of termophilous (T_4) species that is unambigously explained by the differences in exposure. The distributions according to soil pH, water and N requirements reflect the characteristic habitat features of the limestone mountains of medium height. The degradational effects are indicated by the presence of the indifferent species (marked with 0).

Figure 1. Cenological spectrum of the 1st and 2nd sample groups



Cenological characters: F-B = Festuco-Bromea and Festuco-Brometea, Fv = Festucetalia valesiacae, A-F = Asplenio-Festucion, Fr = Festucion rupicolae, S-F = Seslerio-Festucion pallentis, Sec = Secalietea, Que = Querco-Fagea and Quercetea, Che = Chenopodio-Scleranthea and Chenopodietea, Ind = Indifferent

Table 1. Exposure, angle of slope and total cover values of the samples

1st sample group

sample	exposure	angle of slope	total cover value
1	S	45	3
2	SE	45	3
3	SE	10	5
4	SE	45	3
5	SE	40	3
6	SE	50	2
7	SSE	45	3
8	S	50	3
9	S	5	5
10	S	45	3
11	S	50	5
12	S	60	4
13	SE	60	5
14	SE	60	4
15	S	60	4
16	S	60	4
17	S	60	3
18	S	70	3
19	S	50	4
20	S	60	4

2nd sample group

sample	exposure	angle of slope	total cover value
21	NW	50	4
22	W	45	5
23	NW	60	5
24	NW	50	5
25	NW	60	5
26	NW	45	4
27	NW	15	5
28	NW	60	3
29	NW	45	3
30	NW	80	3
31	NW	80	3
32	NW	80	3
33	N	50	4
34	N	60	4
35	N	60	3
36	N	70	5
37	NW	60	5
38	NW	40	4
39	NW	70	3
40	NW	60	3

Table 2. Cover values, A-D intervals and constancy values in the 1st sample group

Species	Cover values																			A-D	K
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Agropyron intermedium															+						+	I
Agropyron repens					1																1	I
Allium flavum	+	+	+				+	+	+	+	+	+	+		2		+		+		+-2	IV
Allium montanum				+	+											+		+		+	+	II
Alyssum alyssoides								+	+	1	1	1	+	+							+-1	II
Anchusa officinalis																				+	+	I
Anthyllis vulneraria																				+	+	I
Arenaria serpyllifolia				+												+	+	+	+		+	II
Arrhenatherum elatius														1							1	I
Artemisia austriaca	+	+	1	1	1	1		+	2	+	+	+	2	+	2				1	+	+-2	IV
Artemisia campestris		1		+			+	+	+	2	1	1					1				+-2	III
Asplenium ruta-muraria												+		+				+		+	+	I
Asplenium trichomanes														+							+	I
Berteroa incana							+														+	I
Bromus squarrosus														+							+	I
Carex praecox					+	+															+	I
Chondrilla juncea					+								+								+	I
Convolvulus arvensis						+															+	I
Echium vulgare	1		1	+	+		+		+												+-1	II
Eryngium campestre											+								+		+	I
Erysimum odoratum	+				+	+	+	+	+	+		+		+	+	+		+	+	+	+	IV
Euphorbia cyparissias	+	+	+	+	+		+	+	+	+	1	+	+	+	+	+	+	+	1	+	+-1	V
Festuca pallens	1	+															+				+-1	I
Festuca valesiaca	2	1	3	2	2	1	2	2	4	2	2	2	4	2	2	2	2	1	2	3	1-4	V
Galium austriacum								+													+	I
Geranium robertianum			+	+	1																+-1	I
Geranium rotundifolium															+	+	+	+	+		+	II
Hypericum perforatum							+	+		+											+	I
Linaria genistifolia										+											+	I
Malva neglecta							+														+	I
Marrubium vulgare			+							+											+	I
Medicago minima										+										+	+	I
Medicago prostrata	1	+	3	1	2	+	+	+	+			+			+	1	1	1	1	1	+-3	IV
Melica ciliata		+		1		1	1	1	+	2	2	2			1		1	1	1	2	+-2	IV
Minuartia setacea	+	1			+	1	1	1	+	+			+	+	1	+	1	+	1	+	+-1	IV
Orlaya grandiflora														+			+				+	I

Table 2. Continued

Species	Cover values																			A-D	K
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Orobanche alba											+			+							+	I
Phleum phleoides														+							+	I
Poa compressa				+																	+	I
Poa bulbosa		+				+										+		+	+	+	+	II
Potentilla arenaria	2	2	1	1	1	1	1	+	1	2	+	2	+	1	+	+	1	+	1	+	+-2	V
Sanguisorba minor	+	1	1		+		1	1	1	+	+	+		2	1	+	2	2	1	1	+-2	V
Sedum acre		+			+	1	+						+			+				+	+-1	II
Sedum album	1	1	+	1	+	1	1	+	+	+	2	+	+	+	+	2	1	1	+	1	+-2	V
Sedum sexangulare		+	+										1	+							+-1	I
Sempervivum hirtum	1	1	+	1	1	2	+	1	+	+	1	1	1		+	+	1	1	1	+	+-2	V
Sideritis montana			1	+			+				+	+		+	+	+	+	+	+	+	+-1	III
Stachys recta		1	+		+		+		+	+		1		+					+	+	+-1	III
Teucrium chamaedrys	2			+	2	1	+	2	+			2	1	2	1	1				+	+-2	IV
Thymus marschallianus				1							+			1	1			2	1		+-2	II
Thymus praecox	1	1	1		+	1	1	1	1	2	2	2	1			2	1		1	+	+-2	IV
Tunica prolifera		+		+	+	+		+	+				+	+							+	II
Tunica saxifraga										+	+	+									+	I
Verbascum phlomoides	+		+				+							+			1	+	+	+	+-1	II
Veronica teucrium									+												+	I
Xeranthemum annuum					+	+	+	+		+	+	+	+	+					+	+	+	III

Table 3. Cover values, A-D intervals and constancy values in the 2nd sample group

Species	Cover values																			A-D	K
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
Achillea pannonica		+		+																	+	I
Agropyron repens		+															+				+	I
Allium flavum										+	1	+	+	+	+	+				+	+-1	II
Allium montanum						+	+	+	+	+	2	1	+	+	+	1	+		+	+	+-2	IV
Alyssum alyssoides	+	1	2		+	2	+		+	+				+							+-2	III
Anchusa officinalis																		+	+	+	+	I
Anthericum liliago					+				+											+	+	I
Anthyllis vulneraria																					+	I
Arenaria serpyllifolia							+			1	+	1	1	1	1	+					+-1	II
Arrhenatherum elatius		+	+	1	1														I		+-1	II

Table 3. Continued

Species	Cover values																				A-D	K
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
Artemisia austriaca	+	+					+	+										1		1	+-1	II
Artemisia campestris						+					+		+				+				+	I
Asperula cynanchica										+	+	+	+	+						+	+	II
Asplenium ruta-muraria		+				+		1	+	+	+	+	1		+	+			+		+-1	III
Asplenium trichomanes				+		+		1		1	+	+	+	1	+	1			+	+	+-1	III
Berteroa incana	1																			+	+-1	I
Campanula rotundifolia											+		1	1		1				+	+-1	II
Cardaminopsis arenosa								+								+					+	I
Carex humilis																+					+	I
Centaurea micranthos		+	+	+		+		+					+				+				+	II
Centaurea sadlerana					1											1		+		+	+-1	I
Chondrilla juncea			+																		+	I
Convolvulus arvensis		+																			+	I
Dactylis glomerata				+																	+	I
Echium vulgare				+		1	1		+							+	+	+	+		+-1	II
Erysimum odoratum						+	+				+							+	+	+	+	II
Euphorbia cyparissias		1	2	1	1	1	1	+	+	+	+	+	+	+		+	+	1		1	+-2	V
Festuca pallens						1		+	1	2	2	2	1	1	2	1			+		+-2	III
Festuca valesiaca	2	2	3	3	3	3	3	1	1	2	+	2	2	2	1	2	2	3	2	2	+-3	V
Galium mollugo				2																	2	I
Galium verum								+	+												+	I
Geranium robertianum						+	1														+-1	I
Geranium rotundifolium						+															+	II
Helianthemum nummularium			+		+			+					+	1	+		1				+-1	II
Hypericum perforatum								+					+								+	I
Linaria genistifolia																				+	+	I
Linaria vulgaris								1	+												+-1	I
Marrubium vulgare		+																		+	+	I
Medicago minima							+		1									+		+	+-1	I
Medicago prostrata	+	+	2	+		2	3			+	1	+	+		+		2	2	1		+-3	IV
Melica ciliata		+					+		+		+			+	1	+			+		+-1	II
Minuartia setacea	+	+	+		+	+		+	+								+	1	+	+	+-1	III
Muscari racemosum		+	+	+	+	1	1	1	1							+	+	+		+	+-1	III
Orlaya grandiflora			+																	+	+	I
Orobanche alba		+																			+	I
Phleum phleoides		+	1																	+	+-1	I

Table 3. Continued

Species	Cover values																				A-D	K
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
Plantago media									+												+	I
Poa bulbosa						1	1										+			+	+-1	I
Potentilla arenaria	+				2	+	1	2	2	1	1	2	2	2	2		2	+	1	1	+-2	IV
Rosa canina																+					+	I
Sanguisorba minor	+		1	+	+	1		2		+			+		+	+	1	+	1		+-2	IV
Scabiosa ochroleuca	+	+	+					+	+	1			1			+					+-1	II
Sedum acre			2		1	1	+				+	+		+				+			+-2	II
Sedum album	2	2	+	1	+	2	1		+	1	1	3	+	1	+	1		+	+	1	+-3	V
Sedum sexangulare	1	+	+	1	2	1	1	+	1	1	1	1	1	+	1	+	+		+	+	+-2	V
Sempervivum hirtum	+	1	2	+	+	1	1	1	1	1	2	2	1	2	1	1	+	1	1	1	+-2	V
Seseli osseum					+																+	I
Sideritis montana	+																+	+	+		+	I
Silene otites	+																+		+		+	I
Stachys recta	+	+	+	+	+	+	+	+	1	+	+	+	+			+	+	+	+	+	+-1	V
Taraxacum officinale						+															+	I
Teucrium chamaedrys	+	+	1	2	2				1	1	+			+			+			1	+-2	III
Thalictrum minus		2								+					+	+					+-2	I
Thymus marschallianus	1	2	1	1	2	1		1	+	1		2	1	2	2	1					+-2	IV
Thymus praecox					+		1		1		2			+			2		1	1	+-2	II
Tragopogon dubius				+																	+	I
Tunica prolifera		+			+	+															+	I
Tunica saxifraga	+											+		+							+	I
Veronica prostrata			+			+	+				+										+	I
Veronica teucrium				+			+						+								+	I

Table 4. Distribution life-form in the 1st and 2nd sample groups

Life form	1st sample group	2nd sample group
Chamaephyta	25.2	25.6
Hemikryptophyta	41.8	46.2
Geophyta	7.0	8.8
Mikrophanerophyta	----	0.2
Hemitherophyta	4.0	4.4
Therophyta	22.0	14.8

Table 5. Phytogeographical spectrum of the 1st and 2nd sample groups

Floral element	1st sample group	2nd sample group
Circumpolar	1.0	4.3
Eurasian	27.6	31.3
South Eurasian	9.6	4.1
South-Central Eurasian	0.8	0.9
Eurosiberian	0.5	---
European	7.5	9.5
Central European	23.5	18.9
(Central-European)	9.3	7.2
South-East European	7.5	8.1
East-Central European	4.1	3.8
Mediterranean	11.6	5.9
(Mediterranean)	25.8	27.7
Submediterranean	20.2	18.7
(Submediterranean)	1.3	4.7
Pontian	9.6	7.9
(Pontian)	3.9	1.8
Balkan	9.0	7.0
Carpathian	4.9	4.5
East-Alpine	4.9	4.5
Pannonian	4.4	4.5
Continental	0.5	1.8
(Continental)	12.4	12.8
Cosmopolitan	0.5	2.9

Table 6. Distribution of the R, T, F, N values in the 1st and 2nd sample groups

		1st sample group	2nd sample group
R	1	0.3	2.7
	2	9.0	10.8
	3	27.4	20.5
	4	55.8	61.3
	5	17.1	16.9
	0	31.8	27.5
T	1	----	1.1
	2	6.7	10.1
	3	50.6	53.6
	4	41.6	33.8
	5	----	----
	0	9.0	17.8
F	1	47.5	49.8
	2	75.4	76.6

		1st sample group	2nd sample group
F	3	9.6	14.4
	4	----	----
	5	----	----
	0	----	0.5
N	1	54.5	55.6
	2	63.6	67.6
	3	9.6	10.6
	4	1.8	1.4
	5	----	----
	0	3.9	4.7

Ecological parameters: R = soil pH requirement, T = temperature requirement, F = water requirement, N = nitrogen requirement

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