THE BEECH FOREST VEGETATION OF THE CEROVÁ VRCHOVINA MTS. (SOUTHERN SLOVAKIA)

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Izvleček
Leta 2001 smo izvedli terenske fitosociološke raziskave sestojev, na gori vulkanskega izvora Cerová vrchovina v katerih dominira vrsta *Fagus sylvatica*. Uporabili smo standardno srednjeevropsko fitocenološko metodo. Za ločevanje posameznih združb smo naredili tabelarično sintezo s pomočjo numerične ločitvene klasifikacije (TWINSPAN) in indirektne gradientne analize (PCA). Znotraj zveze *Fagion* smo ločili štiri asociacije: *Carici pilosae-Fagetum*, *Dentario bulbiferae-Fagetum*, *Melico-Fagetum* in *Asperulo-Fagetum*. V zvezo *Tilio-Acerion* smo uvrstili štiri rastlinske sintaksone: *Roso pendulinae-Tilietum cordatae*, združba *Mercurialis perennis-Fagus sylvatica*, združba *Athyrium filix-femina-Fagus sylvatica* in združba *Dryopteris filix-mas-Fagus sylvatica*. Delno oligotrofne združbe smo uvrstili v asociacijo *Luzulo-Fagetum* in zvezo *Luzulo-Fagion*. Obravnavali smo vpliv številnih ekoloških faktorjev na vrstno sestavo. Relief, kamnitost in vsebnost humusa so med najpomembnejšimi.

Abstract
Field phytosociological research of the *Fagus sylvatica* dominated forests in the volcanic Cerová vrchovina Mts. was carried out in 2001. Standard methods of the Zürich-Montpellier approach were applied. Tabular synthesis with numerical divisive classification (TWINSPAN) and indirect gradient analysis (PCA) were used to differentiate particular communities. Within the *Fagion* alliance, four associations were recognized: *Carici pilosae-Fagetum*, *Dentario bulbiferae-Fagetum*, *Melico-Fagetum* and *Asperulo-Fagetum*. Four different plant communities of the *Tilio-Acerion* alliance were detected: *Roso pendulinae-Tilietum cordatae*, *Mercurialis perennis-Fagus sylvatica* community, *Athyrium filix-femina-Fagus sylvatica* community and *Dryopteris filix-mas-Fagus sylvatica* community. Semioligotrophic communities were classified as *Luzulo-Fagetum* within the *Luzulo-Fagion* alliance. Influences of several ecological factors on species composition are discussed. The type of relief, stoniness and humus content of topsoil seem to play the most important role.

Ključne besede: Slovaška, vegetacija, *Fagetalia,* klasifikacija, gradientna analiza
Key words: Slovakia, vegetation, *Fagetalia*, classification, gradient analysis

1. INTRODUCTION

The Cerová vrchovina Mts. forms a volcanic mountain range situated in the southern part of the Western Carpathians. Under the influence of a relatively warm and dry climate, communities with the dominance of *Fagus sylvatica* are restricted only on the northern slopes or shady valleys. On fully developed soils, communities of the *Fagion* alliance occur. On small patches of scree and boulder fields with a specific mesoclimate grow the communities of the *Tilio-Acerion* alliance.

The study area belongs to those regions of Slovakia which have been relatively well investigated

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from the point of view of floristics. The basic reviews about flora of vascular plants of the Cerová vrchovina Mts. and surroundings were published by Hendrych (1959, 1963, 1968) and Holub & Moravec (1965). On the other hand, only a few phytosociological papers discussing local forest vegetation exist. The occurrence of the associations *Carici acutiformis-Alnetum glutinosae* Scamoni 1935 and *Aegopodio-Alnetum glutinosae* Šomšák 1961 was presented by Balázs (1996). Csiky & al. (2001) described a new forest community of block forest – *Roso pendulinae-Tilietum cordatae* – from this area.

2. STUDY AREA

The Cerová vrchovina Mts. is situated at the southern edge of central Slovakia, on the border with Hungary. In the northwest, it is bordered by the Ipeľ river and in the northeast by the Rimava river. From the south, the studied area is delimited by the Hungarian state boundary (Fig. 1).

Figure 1: Location of studied area
Slika 1: Lokacija raziskovanega območja

The highest point of the Cerová vrchovina Mts. is Karanč (725 m a. s. l.). The lowest point of the Slovak part is near the Vlkyňa village at 155 m a. s. l.

Steep conic volcanic hills are characteristic for this region, rising from the smooth relief of sedimentary rock. Volcanic hills and mountain ridges are built mainly by Pliocene-Pleistocene basalt lava flows, agglomerates and lapilli tuffs. Other volcanic rocks, such as andesites (Karanč and Šiator hills) or rhyodacite tuffs and tuffites (situated on the western part) occur rarely as well. However, the largest part is covered by Miocene sediments, most frequently with disintegrating sandstones.

From the phytogeographical point of view this Carpathian region belongs to the *Matricum* district within the *Pannonicum* phytogeographical region (Futák 1966, cf. Molnár 1999).

The existence of *Fagus* dominated forests is enabled by the local mild mountain climate with average temperatures in July about 17 °C and average annual precipitation between 650–850 mm (cf. Tarábek 1980).

3. METHODS

Field research was carried out in June and July 2001. Thirty-two relevés were made following standard methods of the Zürich-Monpellier (Z-M) approach (Braun-Blanquet 1964) using the estimation abundance/dominance scale according to Barkman & al. (1964). Relevés were stored and processed by the TURBOVEG program package (Hennekens 1996a) and MEGATAB program (Hennekens 1996b). For the numerical classification, TWINSPAN (Hill 1979) program was used. For the indirect gradient analysis (Principal Components Analysis – PCA), CANOCO program (ter Braak & Šmilauer 1998) was used. Cover values of herb layer species were transformed into three levels: r, + = 1; 1, 2A, 2B = 2; 3, 4, 5 = 3. The same downweighting of cover values was used by the TWINSPAN program, to make ordination and numeric classification closer to the floristic approach of the Z-M school.

From each relevé plot, one soil sample of the top 10 cm of A horizon was taken. Soil reaction in H_2O and KCl was measured; humus content was calculated according to the total organic carbon content (Tyurin's method). Analyses were done in the laboratories of the Department of Forest Environment at the Technical University in Zvolen. Mean values for individual communities are presented in Fig. 2.

Syntaxonomical units used are mostly *sensu* Mucina & al. (1993) or Moravec & al. (2000). Full names of syntaxa (including authors and the year of description or validation) are presented in the "Survey of vegetation units" or at the first mention in the text. The nomenclature of plant taxa follows Marhold & Hindák (1998).

Determination of diagnostic species (cf. Whittaker 1962, Moravec 1994), dominants and prevailing species was based only on our relevé set presented in Table 1. We considered species with absolute cover of more than 25 % (3, 4, 5 degree of Braun-Blanquet scale) to be dominants and those

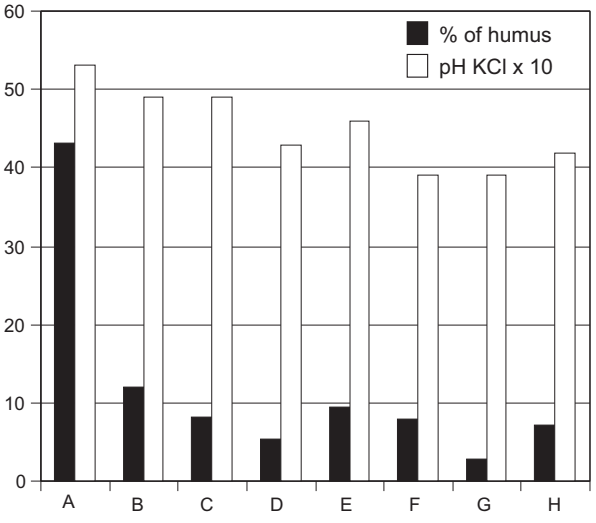

Figure 2: Mean values of soil reaction and humus content of topsoil (A – Roso pendulinae-Tilietum cordatae*, B* – Athyrium filix-femina-Fagus sylvatica *community, C* – Mercurialis perennis-Fagus sylvatica *community, D* – Melico-Fagetum*, E* – Asperulo-Fagetum*, F* – Dentario bulbiferae-Fagetum*, G* – Carici pilosae-Fagetum*, H* – Luzulo-Fagetum*)*

Slika 2: Srednje vrednosti pH in vsebnosti organske snovi v zgornji plasti tal (A – Roso pendulinae-Tilietum cordatae*, B* – *združba* Athyrium filix-femina-Fagus sylvatica*, C* – *združba* Mercurialis perennis-Fagus sylvatica*, D* – Melico-Fagetum*, E* – Asperulo-Fagetum*, F* – Dentario bulbiferae-Fagetum*, G* – Carici pilosae-Fagetum*, H* – Luzulo-Fagetum*)*

with more than 25 % of total herb layer cover to be prevailing species. Species that occur in more than 60 % of relevés of the current syntaxon were considered constant species.

Within the characteristics of particular communities, the following abbreviations were used: ass. – association, art. – article of the Code of phytosociological nomenclature (Weber & al. 2000), c – constant species, corr. – corexit, dom. – dominant and prevailing species, dif. – differential species, E_0 – moss layer, E_1 – herb layer, E_2 – shrub layer, E_3 – tree layer, em. – emendavid, lok. – local, rel(s) – relevé(s), s. lat. – sensu lato. In Table 1 cover values 2a and 2b are presented as A and B. In the first column of Table 1, the following abbreviations are used: ca – *Carpinion* Issler 1931, cf – *Cephalanthero-Fagenion* R.Tx. in Oberd. et R.Tx. 1958, fs – *Fagion sylvaticae*, Fs – *Fagetalia sylvaticae*, lf – *Luzulo-Fagion*, Pr – *Prunetalia* R.Tx. 1952, QF – *Querco-Fagetea*, Qp – *Quercetalia pubescentis* Klika 1933, QR – *Quercetea robori-petraeae* Br.-Bl. et R.Tx. ex Oberd. 1957, Qr – *Quercetalia roboris* R.Tx. 1931, ta – *Tilio-Acerion*.

4. RESULTS

4.1 Survey of vegetation units

Querco-Fagetea Br.-Bl. et Vlieger in Vlieger 1937
- *Fagetalia* Pawłowski in Pawłowski, Sokołowski et Wallisch 1928
  - *Tilio-Acerion* Klika 1955 em. Husová in Moravec et al. 1982
    - *Roso pendulinae-Tilietum cordatae* Csiky et al. 2001
    - *Athyrium filix-femina-Fagus sylvatica* community
    - *Mercurialis perennis-Fagus sylvatica* community
    - *Dryopteris filix-mas-Fagus sylvatica* community
  - *Fagion* Luquet 1926
    - *Eu-Fagenion* Oberd. 1957 em. R.Tx. in Oberd. et R.Tx. 1958
    - *Melico-Fagetum Seibert 1954*
    - *Asperulo-Fagetum* Souggnez et Thill 1959
    - *Dentario bulbiferae-Fagetum* Zlatník 1935
    - *Carici pilosae-Fagetum* Oberdorfer 1957
  - *Luzulo-Fagion* Lohmeyer et R.Tx. in R.Tx. 1954
    - *Luzulo-Fagetum* Meusel 1937

4.2 Characteristics of particular communities

According to our data set and its analyses (Table 1, Fig. 4) we could differentiate and characterise nine communities within three alliances of the *Fagetalia* order.

***Roso pendulinae-Tilietum cordatae* (Table 1, rels 1–2; community A)**

Diagnostic species: *Carpinus betulus* (E_3, c), *Dryopteris filix-mas* (c), *Euonymus verrucosus* (E_1, c, dif.), *Fagus sylvatica* (E_3, c, dom.), *Hypnum cupressiforme* (c, dom.), *Isothecium myurum* (dom.), *Tilia platyphyllos* (E_3, c, dom.; E_1, c, dif.).

This community was described recently just from the Cerová vrchovina Mts. (Csiky & al. 2001). Our relevés document this community from two other localities.

The community is well differentiated by species composition and habitat character. In the tree layer, coppices of *Tillia platyphyllos* dominate, in some places *Fagus sylvatica* prevails. *Tilia platyphyllos* frequently replaces *T. cordata* in stands of this com-

Table 1: Tabular differentiation of communities with *Fagus sylvatica* in the Cerová Vrchovina Mts. (A – *Roso pendulinae-Tilietum cordatae*, B – *Athyrium filix-femina-Fagus sylvatica* community, C – *Mercurialis perennis-Fagus sylvatica* community, D – *Melico-Fagetum*, E – *Asperulo-Fagetum*, F – *Dentario bulbiferae-Fagetum*, G – *Carici pilosae-Fagetum*, H – *Luzulo-Fagetum*)

Tabela 1: Tabelarični prikaz razlik združb z vrsto *Fagus sylvatica* v hribovju Cerová Vrchovina (A – *Roso pendulinae-Tilietum cordatae*, B – združba *Athyrium filix-femina-Fagus sylvatica*, C – združba *Mercurialis perennis-Fagus sylvatica*, D – *Melico-Fagetum*, E – *Asperulo-Fagetum*, F – *Dentario bulbiferae-Fagetum*, G – *Carici pilosae-Fagetum*, H – *Luzulo-Fagetum*)

	Relevé number:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Number of species in herb layer:	9	3	24	14	9	16	14	7	20	18	18	16	25	28	28	22	15	17	13	11	7	10	9	12	5	9	16	33	27	26	18
	Community:	A		B					C							D			E				F			G			H			
	Tree layer																															
fs	*Fagus sylvatica*	+	5	5	4	4	5	4	3	5	A	4	1	4	5	5	B	5	5	5	5	5	5	5	4	5	5	5	4	5	4	5
ta	*Tilia platyphyllos*	4	1	.	A	.	.	.	.	.	B	.	A	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ta	*Acer platanoides*	B	.	.	1	.	.	.	.	+	3	1	3	.	.	.	.	.	.	.	.	.	.	.	A	.	.	.	.	.	.	.
ta	*Ulmus glabra*	.	.	.	1	.	.	.	.	.	B	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ta	*Acer pseudoplatanus*	.	.	.	.	1	.	3	3	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ca	*Carpinus betulus*	+	1	.	.	.	.	.	+	.	1	B	1	1	.	.	3	A	.	.	.	+	+	+	+	.	.	.	+	.	.	+
	Quercus petraea agg.	.	.	.	.	.	.	.	1	.	.	+	1	1	.	.	3	+	.	.	.	.	1	1	.	.	.	.	r	.	.	.
ca	*Cerasus avium*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	.	.
QF	*Acer campestre*	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
ta	*Tilia cordata*	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
	Shrub layer																															
QF	*Corylus avellana*	A	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ta	*Tilia platyphyllos*	A	.	.	1	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
fs	*Fagus sylvatica*	.	+	+	1	.	.	.	.	.	+	.	+	.	+	+	.	+	1	A	.	.	1	.	+	+	+	+	+	.	+	+
ta	*Acer platanoides*	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Diagnostic species																															
Qp, Pr	*Euonymus verrucosus* (E_1)	r	+	.	.	.	.	.	.	r	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ta	*Tilia platyphyllos* (E_1)	r	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	+	.	.	.	.	.	.	.
	Stachys sylvatica	.	.	r	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
	Urtica dioica	.	.	.	1	+	r	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Athyrium filix-femina	.	.	A	A	1	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	1	.	.	.	.
	Circaea lutetiana	.	.	1	A	A	1	1	.	.	.	+	.	+	.	.	+	.	.	+	+	.	.	+	.	.	+	1	.	.	.	.
	Sambucus nigra	.	.	+	+	.	1	+	.	r	r	.	.	.	r	.	r	.	.	.	r	r	.	.	r	.	.	.	.	.	.	.
	Clematis vitalba	.	.	+	+	+	.	r	.	.	.	.	.	.	r	+	.	.	+	+	.	.	.	.	.	.	.	.	+	r	.	.
ta	*Chelidonium majus*	.	.	.	.	.	r	r	.	A	+	+	.	r	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
fs, Fs	*Mercurialis perennis*	.	.	.	.	.	.	.	3	B	3	3	3	B	4	1	.	.	+	.	.	1	.	.	.	.	.	.	.	.	.	+
fs, Fs	*Galeobdolon luteum*	.	.	.	.	.	.	.	.	.	A	+	1	.	A	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
fs, Fs	*Polygonatum multiflorum*	.	.	.	.	.	.	.	.	.	.	r	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
fs, Fs	*Isopyrum thalictroides*	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
fs, Fs	*Glechoma hirsuta*	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Fs	*Melica uniflora*	.	.	.	.	.	.	r	.	.	.	r	+	.	+	3	4	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
fs, Fs	*Dentaria bulbifera*	.	.	.	.	.	.	.	.	.	.	.	1	1	+	.	.	.	.	.	r	.	+	1	1	.	.	.	.	.	.	.
ca	*Carex pilosa*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1	B	4	3	1	.	.	.
lf, QR	*Veronica officinalis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	r	.	.
lf, QR	*Hieracium lachenalii*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	A	+	.	.
QF, Qp, cf	*Campanula persicifolia*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.
Qp, QF	*Hylotelephium maximum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	r	.
ca, Qr	*Hieracium sabaudum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+
	Veronica chamaedrys	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	r	+
ca	*Galium schultesii*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	r	A	1
QF	*Poa nemoralis*	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	3	B	A	+
lf, Qr	*Luzula luzuloides*	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	r	A
	Pohlia nutans	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	+
	Hieracium murorum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	B
fs, Fs	*Campanula trachelium*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+

	Relevé number:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Constant species																															
fs, Fs	*Dryopteris filix-mas*	1	1	A	A	1	+	+	.	1	+	+	B	r	+	.	.	+	1	.	+	r	.	r	r	+	.	+	.	r	+	+
fs	*Fagus sylvatica*	.	.	+	.	.	+	r	r	.	.	.	.	.	+	+	+	+	+	+	+	r	+	.	+	+	.	+	+	+	r	.
fs, Fs	*Mycelis muralis*	.	.	1	+	.	+	+	.	+	r	.	.	r	+	+	r	r	+	.	+	.	r	.	.	.	.	+	+	1	+	+
	Herb layer																															
fs, Fs	*Geranium robertianum*	r	.	+	+	1	.	+	.	.	+	.	r	1	+	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.
ta	*Acer pseudoplatanus*	.	.	r	.	+	.	+	+	.	.	1	r	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.
fs	*Actaea spicata*	.	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Fs	*Scrophularia nodosa*	.	.	r	.	.	.	r	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Asplenium trichomanes	r	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ta	*Acer platanoides*	+	.	.	+	.	.	.	.	+	+	1	.	r	1	+	.	.	.	+	.	.	r	+	1	.	.	.	.	+	.	r
QF	*Acer campestre*	.	.	r	.	.	+	.	+	.	.	r	.	.	.	+	1	.	.	1	.	.	r	.	r	.	+	+	+	.	.	.
fs, Fs	*Viola reichenbachiana*	.	.	1	+	.	+	.	1	.	.	+	.	+	+	+	B	+	+	A	1	+	.	.	.	.	+	1	1	.	.	.
fs, Fs	*Galium odoratum*	.	.	r	.	.	.	.	+	B	A	B	A	A	+	B	A	.	1	+	+	+	.	.	1	.	.	+	+	r	r	.
	Moehringia trinervia	.	.	r	.	.	.	.	.	+	+	.	.	r	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.
ta	*Alliaria petiolata*	.	.	r	.	.	.	r	+	.	.	1	1	1	+	+	+	.	.	r	.	.	.	.	.	.	.	.	r	r	.	.
	Galium aparine	.	.	.	.	.	r	.	.	r	.	+	+	.	1	+	+	+	.	.	r	.	.	.	.	.	.	.	+	+	r	+
	Fallopia convolvulus	.	.	.	.	.	.	.	.	r	.	.	.	+	+	1	+	.	.	.	+	.	.	.	.	.	.	.	+	+	+	.
	Lactuca serriola	.	.	.	.	.	.	.	.	+	r	.	.	+	r	r	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	+
fs, Fs	*Lathyrus vernus*	.	.	.	.	.	.	.	.	.	.	.	+	r	r	+	.	+	+	r	.	.	r	+	.	.	+	+	+	r	A	+
ca, cf (Qp)	*Melittis melissophyllum*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	r	.	r	.
ca, Qp	*Lathyrus niger*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ca	*Cerasus avium*	.	.	.	.	.	r	.	.	r	.	.	.	r	+	r	+	r	.	.	.	r	.	.	+	.	r	.	.	r	.	.
	Rosa canina agg.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	r	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Epilobium montanum	.	.	.	.	.	.	.	.	r	.	.	.	.	r	r	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.
ca	*Carpinus betulus*	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
fs, Fs	*Pulmonaria obscura*	.	.	.	+	.	.	.	.	.	.	.	.	r	+	+	+	.	r	+	.	.	.	.	.	.	r	.	.	.	.	.
fs, Fs	*Tithymalus amygdaloides*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	+	+	.	.	+	r	r	.	.	.	+	.	.	.
	Quercus petraea agg.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	r	r	.	.	+	.	.	r	r	.
fs, Fs	*Carex digitata*	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	+	.	+	.	+
	Campanula rapunculoides	+	.	.	.	.	.	.	.	+	r	.	.	.	.	A	.	.	r	.	.	.	.	.	.	.	.	.	A	.	1	1
	Cruciata glabra	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.
	Ajuga reptans	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	+	+	.	.
	Polypodium vulgare	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	+	.
	- species with occasional occurence																															
fs, Fs	*Neottia nidus-avis*	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Rubus hirtus s.lat.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	+	.	.	.	.
Qp	*Quercus cerris*	.	.	r	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
QF	*Hedera helix*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
	Robinia pseudoacacia	.	.	.	.	.	r	.	.	.	.	.	.	+	.	r	.	.	.	.	+	.	.	.	.	.	.	.	.	.	r	.
	Cardaminopsis arenosa	.	.	.	.	.	.	.	.	r	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
	Lapsana communis	.	.	.	.	.	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
ca	*Dactylis glomerata*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Fs	*Carex sylvatica*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
	Symphytum tuberosum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	r	.	.	.	.	.	.	.	.	.	.	r	.
	Moss layer																															
	Isothecium myurum	B	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Hypnum cupressiforme	3	A	.	A	.	.	.	.	.	.	.	A	.	+	.	+	.	+	.	.	.	+	+	.	.	+	.	+	.	.	.
	Paraleucobryum longifolium	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
	Schistidium apocarpum	.	+	.	+	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
	Brachythecium velutinum	.	+	.	.	.	A	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+	.	1	A	+	.
	Atrichum undulatum	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.
	Dicranella heteromalla	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.
	Plagiothecium cavifolium	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	B
	Pylaisia polyantha	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
	Dicranum scoparium	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+

munity (cf. Csiky & al. 2001). In the shrub layer, especially *Corylus avellana, Euonymus verrucosus* and *Tilia platyphyllos* occur. From the constant species presented by Csiky & al. (2001), we found only *Dryopteris filix-mas, Euonymus verrucosus, Geranium robertianum* and *Polypodium vulgare*. The herb layer features very low cover, which fully complies with the assertions of the above mentioned authors. On the other hand, the high cover features moss layer, with *Hypnum cupressiforme* as the most frequent and dominant species.

Roso pendulinae-Tilietum cordatae is a typical block forest community. Basalt boulders covered more than 60 % of the plots. Slopes were steep, exposed to the north. On the first relevé plot, soil reaction was acid, on the second it was neutral. The share of humus and total nitrogen was very high. These values are several times higher in comparison with other *Tilio-Acerion* communities in this region (see Fig. 2).

The following three communities are of transitional character between *Tilio-Acerion* and *Fagion* alliances. At the moment, they have been classified into the *Tilio-Acerion* alliance according to floristic composition and some ecological conditions.

***Athyrium filix-femina-Fagus sylvatica* community (Table 1, rels 3–7; B)**

Diagnostic species: *Acer pseudoplatanus* (E_3, dom.), *Athyrium filix-femina* (c, dif.), *Brachythecium velutinum* (dom.), *Circaea lutetiana* (c), *Clematis vitalba* (c), *Dryopteris filix-mas* (c), *Fagus sylvatica* (E_3, c, dom.), *Geranium robertianum* (c), *Hypnum cupressiforme* (dom.), *Mycelis muralis* (c), *Sambucus nigra* (c), *Stachys sylvatica* (dif.), *Urtica dioica* (c, dif.).

Fagus sylvatica is a dominant species of the tree layer in all relevés, *Acer pseudoplatanus, A. platanoides, Tilia platyphyllos* and *Ulmus glabra* make the admixture. The shrub layer is weakly developed in commercial forests. Apart from young trees, we recorded only *Corylus avellana* and *Sambucus nigra*. The herb layer is represented by 15 species per relevé on average, with the range of cover between (2) 8–25 %. It is characterised by a high cover of ferns. The species *Athyrium filix-femina* and *Circaea lutetiana* have their distinct ecological optimum in this community within beech-dominated forests in the Cerová vrchovina Mts. These two species along with *Dryopteris filix-mas* are the most dominant ones in the herb layer. The other species have only low cover values.

The community occurs on rocky, steep and shady endings (foots) of slopes above moist valleys, or directly in the side valley branches. Along valleys, it descends to low altitudes (the lowest occurrence at 335 m a. s. l.). The soils developed on various bedrock (andesite, sandstone, basalt) are slightly acid, rarely acid. They show relatively high values of humus content (Fig. 2) in comparison with the next communities. However, the most important ecological factor of these habitats seems to be a high aerial moisture, which is reflected in the increased dominance of ferns.

***Mercurialis perennis-Fagus sylvatica* community (Table 1, rels 8–14; C)**

Diagnostic species: *Acer platanoides* (E_3, dom.; E_1, c), *Acer pseudoplatanus* (E_3, dom.), *Alliaria petiolata* (c), *Carpinus betulus* (E_3, c, dom.), *Dryopteris filix-mas* (c), *Fagus sylvatica* (E_3, c, dom.), *Galeobdolon luteum* (c, dif.), *Galium odoratum* (c, dom.), *Glechoma hirsuta* (dif.), *Hypnum cupressiforme* (dom.), *Chelidonium majus* (c, dif.), *Isopyrum thalictroides* (dif.), *Isothecium myosuroides* (dom.), *Mercurialis perennis* (c, dif., dom.), *Polygonatum multiflorum* (dif.), *Tilia platyphyllos* (E_3, dom.), *Ulmus glabra* (E_3, dom.).

The tree layer of this heminitrophilous community is relatively species-rich. It is formed mainly by *Fagus sylvatica* with a variable admixture of nitrophilous tree species (*Acer platanoides, A. pseudoplatanus, Tilia platyphyllos, Ulmus glabra*) and *Carpinus betulus* (locally also *with Quercus petraea* agg.). The shrub layer was weakly developed under the closed canopy of trees. We found about 19 species of herb layer on the relevé plots. A strong dominant of the layer is *Mercurialis perennis*, frequently accompanied by *Galium odoratum* and locally also by *Galeobdolon luteum*. In some cases, more abundant were *Dryopteris filix-mas, Alliaria petiolata, Glechoma hirsuta, Dentaria bulbifera* and *Chelidonium majus*. The most frequently naturally regenerating tree species are *Acer platanoides* and *A. pseudoplatanus*. We recorded the cover of herb layer of (25–35) 50–80 %.

We found this community at relatively higher altitudes (470–700 m a. s. l.), mostly about 550 m. It grows from moderate to very steep slopes, exposed to the northeast, north and northwest. The soil reaction varies from acid to slightly acid. The average pH value is higher than in mesotrophic beech forests (Fig. 2).

The community is well distinguished from the syntaxa of mesotrophic beech forests by the occurrence of several nitrophilous species (*Chelidonium majus, Geranium robertianum*). Relevés No. 10 and 12 (Table 1) on the more bouldery soils with a higher occurrence of nitrophilous tree species

are close to the *Mercuriali-Fraxinetum* (Klika 1942) Husová in Moravec et al. 1982 association. Klika (1942) described this association as "*Acereto-Fagetum carpaticum*". The original name had to be rejected according to the Code of Phytosociological nomenclature (art. 34). Husová (2000) as well as Fajmonová (1984) consider this *Mercuriali-Fraxinetum* as a mountain forest community on rocky or bouldery screes. However, the communities with *Mercurialis perennis* in Cerová vrchovina in most cases (relevés Nr. 8, 9, 11, 13 in Table 1) were found on cambisols with a normally developed A horizon, with the surface stoniness below 25 %. Their typical feature is a high content of small soil skeleton in the topsoil.

Species composition is different as well. Unlike the *Mercuriali-Fraxinetum,* several diagnostic species (such as *Dentaria eneaphyllos, Hordelymus europaeus, Fraxinus excelsior*) are missing in our communities. Therefore, we named it the *Mercurialis perennis-Fagus sylvatica* community. According to the species composition, we ranked it into *Tilio-Acerion* alliance, however it has transitional character towards the *Fagion* alliance.

***Dryopteris filix-mas-Fagus sylvatica* community**

One specific community we recorded on andesites near the top of Karanč (725 m a. s. l.) on a steep rocky slope (about 50 % of soil skeleton in the topsoil).

Šiatorská Bukovinka, SE from the village, Karanč (725 m a. s. l.), about 250 m to the NW from the top of the hill; beech forest on a steep slightly concave slope close below the ridge; rocky (andesite) soil covered with thick litter layer; longitude: 19° 47,4639', latitude: 48° 9,61284'; age: 60–80 years; slope: 31°; aspect: 350°; relevé area: 400 m^2; total cover: 90 %; E_3: 90 %; E_1: 20 %; height of the tree layer: 21 m; 12.6.2001; B. Benčaťová, K. Ujházy; field number: 21/01, (relevé 32 in Figure 4).

E_3: *Fagus sylvatica* 5, *Tilia cordata* +.

E_1: *Dryopteris filix-mas* 2b, *Acer pseudoplatanus* +, *Chelidonium majus* +, *Robinia pseudoacacia* +, *Cerasus avium* r, *Fallopia convolvulus* r, *Geranium robertianum* r, *Moehringia trinervia* r, *Prenathes purpurea* r, *Urtica dioica* r.

It is a beech forest with the *Tilia cordata* admixture. The poorly developed herb layer has a heminitrophilous character with the prevalence of *Dryopteris filix-mas*. Mountain character is indicated by the occurrence of *Prenanthes purpurea*.

According to the occurrence of species such as *Chelidonium majus, Urtica dioica, Geranium robertianum,* we decided to rank this community to the *Tilio-Acerion* alliance. Similar communities were recorded in the Ostrôžky Mts. in the southeast part of the volcanic Slovenské stredohorie mountain region (Benčaťová, Hrivnák & Ujházy in litt.). A more exact classification will be possible after the comparison of a larger data set (from volcanic regions of southern Slovakia and northern Hungary).

***Melico-Fagetum* (Table 1, rels 15–17; D)**

Diagnostic species: *Alliaria petiolata* (c), *Carpinus betulus* (E_3, dom.; E_1, c), *Cerasus avium* (E_1, c), *Epilobium montanum* (c), *Fagus sylvatica* (E_3, c, dom.; E_2, E_1, c), *Fallopia convolvulus* (c), *Galium aparine* (c), *Galium odoratum* (c, dom.), *Lactuca serriola* (c), *Lathyrus vernus* (c), *Melica uniflora* (c, dif., dom.), *Mycelis muralis* (c), *Pulmonaria obscura* (c), *Quercus petraea* agg. (E_3, dom.), *Rosa canina* agg. (E_1, c), *Tithymalus amygdaloides* (c), *Viola reichenbachiana* (c).

Melico-Fagetum is a medium species-rich community (23 taxa per relevé on average). *Fagus sylvatica* dominates in the tree layer. At lower altitudes, it is accompanied by *Carpinus betulus* and *Quercus petraea* agg. Shrubs occur rarely or are missing. The herb layer has a high cover value (more than 50 %). Along with the general dominant species *Melica uniflora,* only two species (*Galium odoratum* and *Viola reichenbachiana*) have a high cover in some patches as well. Other species occur only with low cover values. Apart from the typical beech forest species, some species of *Carpinion* alliance (*Acer campestre, Crataegus* spec. div., *Melittis melisophyllum, Rosa canina* agg.) also grow here.

We detected the stands of *Melico-Fagetum* at altitudes between 400–500 m a. s. l. on even, slightly convex or concave slopes with an inclination of less than 15° without soil surface stoniness. Gravelly topsoil is strongly rooted. Soil reaction is slightly acid and acid, values of humus content are similar to those of the other *Eu-Fagenion* communities (Fig. 2).

The so-called "*Fagetum nudum*" communities are the most frequent types of beech forests in this region. Many of them are almost without herb layer. Types with a developed herb layer can be divided into the next two associations:

***Asperulo-Fagetum* (Table 1, rels 18–21; E)**

Diagnostic species: *Dryopteris filix-mas* (c), *Fagus sylvatica* (E_3, c, dom.; E_1, c), *Galium odoratum* (c), *Viola reichenbachiana* (c).

Fagus sylvatica is the absolute dominant of the tree layer. Only in the heminitrophilous variant with *Mercurialis perennis* (transition to the *Mercurialis perennis-Fagus sylvatica* community), did we record the admixture of *Carpinus betulus* and *Cerasus avium*. The shrub layer is formed by locally frequent beech. Apart from several mesotrophic species of the *Fagion* alliance or *Fagetalia* order, respectively (mostly *Viola reichenbachiana* and *Galium odoratum*), also some heminitrophilous species (such as *Circaea lutetiana, Mercurialis perennis*) with low cover values occur in the herb layer. The community has no differential species.

In contrast to the *Dentario bulbiferae-Fagetum,* we found *Asperulo-Fagetum* stands at higher altitudes (460–600 m a. s. l.). The *Carpinion* alliance species are missing on these habitats. The soils are cambisols with relatively higher humus content and higher pH values in the topsoil (Fig. 2).

We suppose that this community represents both qualitatively and quantitatively, the substantially impoverished variant of the low-herb flowery Carpathian beech forests on (possibly beyond) the southern border of their occurrence area. From the syntaxonomical point of view they are most close to the Central-European association *Asperulo-Fagetum* according to Wallnöfer & al. (1993). Quite similar communities were described by Moravec (1979) from the basalt Doupovské hory Mts. in northwest Bohemia as the *Violo reichenbachianae-Fagetum* Moravec 1979. The most important characteristic species of these communities – *Hordelymus europaeus* – is missing in the species-poor communities of the Cerová vrchovina Mts.

***Dentario bulbiferae-Fagetum* (Table 1, rels 22–24; F)**

Diagnostic species: *Acer campestre* (E_1, c), *A. platanoides* (E_1, c), *Carpinus betulus* (E_3, c), *Dentaria bulbifera* (c, dif.), *Dryopteris filix-mas* (c), *Fagus sylvatica* (E_3, c, dom.; E_2, E_1, c), *Lathyrus vernus* (c), *Quercus petraea* (E_3, E_1, c), *Tithymalus amygdaloides* (c).

We found this community at lower altitudes (370–430 m a. s. l.). From other studied forest communities of this territory, it is differentiated negatively (there are missing several diagnostic species of the *Fagion* alliance, or *Fagetalia* order, e. g. *Galium odoratum, Viola reichenbachiana, Mycelis muralis*). The only diagnostic (and also differential) species is *Dentaria bulbifera.*

In the beech-dominated tree layer, also *Quercus petraea* agg. with *Carpinus betulus* occur, rarely *Acer platanoides, Cerasus avium* and *Acer campestre.* In the weakly developed shrub layer of the commercial stands, only beech occurs. The herb layer is very poor. Only *Dentaria bulbifera* is more frequent in the vernal aspect. Other (mostly mesotrophic) species have cover below 1 % on the relevé area. On some places natural regeneration of tree species occurs.

The stands grow on even or slightly convex slopes without or with only a small stoniness on the soil surface. Normally developed soil exhibits acid reaction. The average values of humus content are similar to those in the *Mercurialis perennis-Fagus sylvatica* community and in *Luzulo-Fagetum* (Fig. 2).

***Carici pilosae-Fagetum* (Table 1, rels 25–27; G)**

Diagnostic species: *Acer campestre* (E_1, c), *Carex digitata* (c), *Carex pilosa* (c, dif., dom.), *Dryopteris filix-mas* (c), *Fagus sylvatica* (E_3, c, dom.; E_2, E_1, c), *Lathyrus vernus* (c), *Viola reichenbachiana* (c)

The tree layer of this community in the Cerová vrchovina Mts. was completely dominated by *Fagus sylvatica.* The shrub layer was weakly developed, formed of young individuals of beech, which is also most frequently regenerating. It is a species-poor community (with only 10 species per relevé on average) with the *Carex pilosa* dominance in the herb layer. Probably under the influence of the drier climate of the region, the herb layer has lower cover than communities in the *Carpaticum* floristic region.

The stands occur on moderate slopes. The soil is light grey brown, acid with higher sand content. Among other studied communities, this community has the lowest average values of soil reaction and humus content (Fig. 2).

***Luzulo-Fagetum* (Table 1, rels 28–31; H)**

Diagnostic species: *Brachythecium velutinum* (c), *Campanula persicifolia* (dif.), *C. rapunculoides* (c), *C. trachelium* (dif.), *Dryopteris filix-mas* (c), *Fagus sylvatica* (E_3, dom., c; E_2, E_1, c), *Fallopia convolvulus* (c), *Galium aparine* (c), *G. odoratum* (c), *G. schultesii* (c, dif., dom.), *Hieracium lachenalii* (dom., dif.), *H. murorum* (c, dif., dom.), *H. sabaudum* (dif.), *Hylotelephium maximum* (dif.), *Lathyrus vernus* (c, dom.), *Luzula luzuloides* (c, dif., dom.), *Moehringia trinervia* (c), *Mycelis muralis* (c), *Plagiothecium cavifolium* (dom.), *Poa nemoralis* (c, dif., dom.), *Pohlia nutans* (c, dif.), *Veronica chamaedrys* (c, dif.), *Veronica officinalis* (dif.).

Fagus sylvatica is the only dominant species of the tree layer. *Carpinus betulus* forms the admixture in some places. Only young individuals of *Fagus sylvatica,* or rarely other tree species, occur in the shrub layer. On the other hand, on average, 26 spe-

cies occur in the herb layer, and also the moss layer is relatively rich. Consequently, it is the most species rich community among other *Fagus* dominated communities of the region. The community is well differentiated through several oligotrophic species (*Luzula luzuloides, Veronica officinalis* or *Hieracium* spec. div.) and some mesotrophic *Carpinion* alliance diagnostic species (*Galium schultesii, Veronica chamaedrys*). However, also a lot of *Fagetalia* order or *Fagion* alliance diagnostic species exhibit a high constancy.

We recorded this community at altitudes about 600 m a. s. l. (570–630) on the northwest aspect. The communities are developed on steep convex slopes or side ridges. Soils are shallow, rocky and easily drying, with acid or less frequently with slightly acid reaction (Fig. 2).

Only the last relevé (Table 1, rel. 31) on rhyodacite (probably) tuffs has a distinctively oligotrophic character. This community can be classified as *Luzulo-Fagetum luzuletosum albidae* (Tüxen 1937) Hartmann 1953 em. Moravcová-Husová 1964.

The other three relevés (Table 1, rels 28–30) with *Poa nemoralis* dominance or subdominance contain many mesotrophic diagnostic species of *Fagion* alliance. Phytocoenoses of beech forest with *Poa nemoralis* dominance at lower altitudes were described by Moravcová-Husová (1964) as *Luzulo-Fagetum poetosum nemoralis* Moravcová-Husová 1964. Moravec (2000) later classified these communities within the *Luzulo-Fagetum luzuletosum albidae* subassociation.

5. DISCUSSION AND CONCLUSIONS

Tabular synthesis according to TWINSPAN analysis (Table 1) and indirect gradient analysis (PCA) yielded quite similar results, if the herb layer species cover values were transformed to the three levels (Fig. 4). Presence/absence data themselves were not sufficient for precise classification of these communities, however, floristic composition is the most important classification criterion of the Zürich-Montpellier approach.

By means of the above mentioned methods, we could specify nine plant communities with *Fagus sylvatica* ranked into three alliances in the Cerová vrchovina Mts.

Heminitrophilous and nitrophilous communities of the *Tilio-Acerion* alliance represent four units. They occur in side valley branches or on slopes with increased surface stoniness or high content of soil skeleton in the topsoil. These rocky soils are mostly slightly acid, less frequently acid and rarely neutral. Average pH values and percentages of humus content are higher than in beech forests of the *Fagion* or *Luzulo-Fagion* alliances (Fig. 2). In adition to beech, which is a common dominant (even in scree forests), also nitrophilous species of the genera *Tilia, Acer, Ulmus* and *Carpinus betulus* are frequent in the tree layer. However, some pure beech stands were classified within the *Tilio-Acerion* alliance according to herb layer diagnostic species. Cover of the herb layer varies according to stoniness. The moss layer is best developed on boulder fields. Here it reaches a higher cover than the herb layer and also the highest cover values of moss layer within all studied communities (Fig. 3).

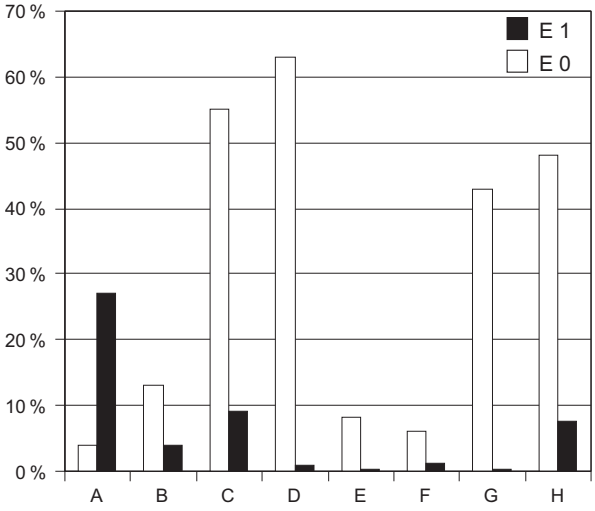

Figure 3: Mean cover values of herb and moss layer in individual communities (A – Roso pendulinae-Tilietum cordatae, B – Athyrium filix-femina-Fagus sylvatica community, C – Mercurialis perennis-Fagus sylvatica community, D – Melico-Fagetum, E – Asperulo-Fagetum, F – Dentario bulbiferae-Fagetum, G – Carici pilosae-Fagetum, H – Luzulo-Fagetum)

Slika 3: Srednja pokrovna vrednost zeliščne in mahovne plasti v posamezni združbi (A – Roso pendulinae-Tilietum cordatae, B – združba Athyrium filix-femina-Fagus sylvatica, C – združba Mercurialis perennis-Fagus sylvatica, D – Melico-Fagetum, E – Asperulo-Fagetum, F – Dentario bulbiferae-Fagetum, G – Carici pilosae-Fagetum, H – Luzulo-Fagetum)

Mesotrophic beech forests of the *Fagion* alliance represent five communities. They occupy most frequently even slopes and, unlike the *Tilio-Acerion* communities, they grow on habitats without (or with a small percentage of) surface stoniness. The single dominant of the tree layer is beech. At lower altitudes, it is accompanied by oaks and hornbeam. "Scree" species of the genera *Tilia, Acer* and *Ulmus*

are rare or completely missing. The cover of the herb layer is distinctively higher than the cover of the moss layer, which is frequently not developed.

A special position is held by hemioligotrophic beech forests of convex sites with shallow soils with lower humus content (Fig. 2). These relatively species-rich (both herbs and mosses) communities, classified as *Luzulo-Fagetum,* are well floristically differentiated from the others. It has a transitional character between the *Fagion* and *Luzulo-Fagion* alliance, because strictly acidophilous herb species are missing there.

Differentiating among of several communities was complicated because of the insufficient number of differential species, namely in the case of mesotrophic beech forests, which show a low species diversity and low cover values of herbs and mosses. Some of them could be differentiated only negatively. We also met some problems with ranking the particular communities into syntaxonomical units. This is discussed directly in the Results chapter. Generally, the communities shows floristical similarity with forest communities of the volcanic regions of the south of Central Slovakia, but they are significantly different (both in structure and species composition) from typical Carpathian communities, which were described from Slovakia. These syntaxonomical problems should be solved only by means of comparison of the larger data set from the volcanic regions of *Matricum* and *Carpathicum* regions and by cooperation between Slovak and Hungarian researchers.

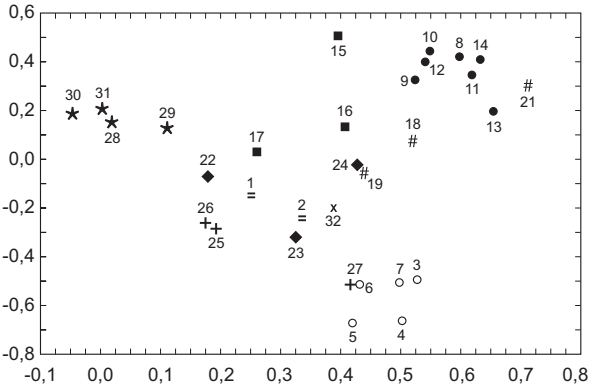

Figure 4: Ordination of relevés according to transformed herb layer species cover values using Principal Component Analysis. First ordination axis can be explained as nutrient/pH gradient (oligotrophic communities on the left side and heminitrophytic on the right). Relevés of individual communities are marked as: = – Roso pendulinae-Tilietum cordatae, ○ – Athyrium filix-femina-Fagus sylvatica *community,* ● – Mercurialis perennis-Fagus sylvatica *community,* x – Dryopteris filix-mas-Fagus sylvatica *community,* ■ – Melico-Fagetum, # – Asperulo-Fagetum, ◆ – Dentario bulbiferae-Fagetum, + – Carici pilosae-Fagetum, ★ – Luzulo-Fagetum

Slika 4: Ordinacija popisov z metodo glavnih komponent (PCoA). Pokrovne vrednosti zeliščne plasti so transformirane. Prva ordinacijska os predstavlja gradient hranil in pH, (oligotrofne združbe na levi in zmerno nitrofilne na desni strani). Popisi posameznih združb so označeni: = – Roso pendulinae-Tilietum cordatae, ○ – *združba* Athyrium filix-femina-Fagus sylvatica, ● – *združba* Mercurialis perennis-Fagus sylvatica, x – *združba* Dryopteris filix-mas-Fagus sylvatica, ■ – Melico-Fagetum, # – Asperulo-Fagetum, ◆ – Dentario bulbiferae-Fagetum, + – Carici pilosae-Fagetum, ★ – Luzulo-Fagetum

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APPENDIX

Species in one relevé only:

E_3: *Quercus cerris* 28 (relevé): 1.

E_2: *Acer campestre* 16: +, *Crataegus* sp. 16: +, *Euonymus verrucosus* 1: +, *Sambucus nigra* 3: +, *Tilia cordata* 4: 1.

E_1: *Brachypodium sylvaticum* 3: r, *Bromus benekenii* 15: +, *Calamagrostis arundinacea* 30: r, *Crataegus laevigata* 17: r, *C.* sp. 16: r, *Cystopteris fragilis* 11: +, *Equisetum sylvaticum* 27: +, *Festuca altissima* 11: +, *Gymnocarpium dryopteris* 4: +, *Hypericum perforatum* 28: r, *Lilium martagon* 13: +, *Melica nutans* 28: +, *Oxalis acetosella* 3: +, *Populus tremula* 23: +, *Pyrus communis* 17: r, *Ribes uva-crispa* 14: r, *Sambucus ebulus* 14: +, *Senecio nemorensis* agg. 31: +, *Solidago virgaurea* 30: r, *Stellaria holostea* 29: r, *S. media* 11: +, *Taraxacum* sp. 29: r, *Tithymalus cyparissias* 15: r, *Vincetoxicum hirundinaria* 15: +, *Viola hirsuta* 28: r, *V. mirabilis* 19: r, *V.* sp. 16: r.

E_0: *Anomodon attenuatus* 24: +, *Brachythecium populeum* 6: +, *B. rutabulum* 4: +, *B. salebrosum* 4: 1, *B. starkei* 6: +, *Bryoerythrophyllum recurvirostrum* 30: +, *Bryum capillare* 4: +, *B.* sp. 11: +, *Ceratodon purpureus* 30: +, *Cladonia* sp. 4: +, *Fissidens bryoides* 4: +, *Hedwigia ciliata* 1: 1, *Homalothecium sericeum* 4: +, *Isothecium myosuroides* 11: B, *Leucodon sciuroides* 1: +, *Metzgeria furcata* 11: +, *Mnium stellare* 11: +, *Plagiochila porelloides* 13: +, *Plagiomnium laetum* 13: +, *P. rostratum* 1: +.

Localities of relevés:

The header data of relevés are listed in the following order: town or village; locality and habitat;

longitude and latitude; age of forest (years); altitude (m); slope (°); aspect (°); relevé area (m^2); total cover (%); cover E_3 (%); cover E_2 (%); cover E_1 (%); cover E_0 (%); cover of bare rocks (%); average height of tree layer (m); date; author(s) of relevé (EB – Eva Belanová, BB – Blažena Benčaťová, RH – Richard Hrivnák, KU – Karol Ujházy; in alphabetical order); field number.

1. Hajnáčka village, NNE from the village; Steblová skala hill (468 m a. s. l.), SSW from the top of the hill, bouldery scree, steep slope under the top, copice forest; 19° 58,88257', 48° 14,78795'; 50–75; 440; 37; 300; 500; 95; 95; 15; 5; 35; 60; 25; 11.6.2001; EB, BB, RH, KU; 996.
2. Šurice village, S; Pohanský hrad, E from Soví vrch hill, Bouldery scree, slightly convex slope, coppice forest; 19° 55,34747', 48° 12,69303'; 80–100; 540; 20; 315; 525; 90; 90; 1; 3; 20; 85; 26–28; 11.6.2001; RH; 997.
3. Šiatorská Bukovinka village, 1,25 km to NE from the Karanč hill, commercial forest on steep path of northern slope of valley, 20 m above the Belina brook; 19° 48,08603', 48° 10,05386'; about 70; 370; 29; 335; 450; 100; 98; 1; 25; 0; 0; 28; 12.6.2001; BB, KU; 18/01
4. Hájnačka village, E; Ragač hill, E, stony-bouldery scree, even slope, fallen stems; -; 90–100; 430; 23; 20; 450; 80; 80; 10; 20; 15; 60; (15–18)23–25; 17.7.2001; RH; 1038.
5. Šiatorská Bukovinka village, SE; Karanč hill, SE, end of valley branch under the ridge, stony soil disturbed by mouflons, fallen stems and windfalls; 19° 47,70903', 48° 9,5993'; -; 590; 21; 350; 450; 70; 70; 0; 10; 0; 0; 23–25; 12.6.2001; RH; 1001.
6. Bulhary village, E; Malý Bučeň hill, S, narrow rocky valley, seed stand; 19° 52,36667', 48° 17,99283'; 80–100; 335; 15; 30; 375; 90; 90; 0; 8; 5; 55; 26–28; 17.7.2001; EB, RH; 1037.
7. Šiatorská Bukovinka village, about 400 m to NE from the Karanč hill, commercial forest on the path of northern rocky (andesite) slope just above the steep valley going to NE from the top of Karanč; 19° 47,73895', 48°9,63647'; 80–100; 550; 30; 350; 600; 95; 95 ;1; 2; 0; 90; -; 12.6.2001; BB, KU; 19/01
8. Šiatorská Bukovinka village, SE; Karanč hill, about 800 m NW along the ridge, 70 m from state border, slightly cocave even slope; 19° 47,14375', 48°9,87477'; (55–65)75–90; 565; 8; 360; 450; 90; 90; 0; 50; 0; 0; 18–20; 12.6.2001; BB, RH; 1003.
9. Obručná settlement, SE; Obručnianska baňa, 1,35 km to SE from the settlement, commercial beech forest on very steep slope just below sharp edge of plain, with small basalt boulders and stones spread on the soil surface; 19° 53,48152', 48° 11,08071'; -; 565; 35; 335; 450; 85; 80; 0; 35; 0,5; 10; 25; 26.6.2001; KU; 36/01
10. Obručná settlement, SE; Obručnianska baňa, SW from stone-pit, stony or locally bouldery scree under the ridge, numerous windfalls; 19°53,53438', 48°11,09723'; 60–80(90); 560; 47; 315; 375; 85; 85; 4; 55; 10; 25; 20–23; 26.6.2001; RH; 1029.
11. Šurice village, S; Pohanský hrad, under NW margin of plain, moderate slope, locally bouldery scree under the rock wall, coppice forest; -; -; 530; 3; 100; 300; 95; 95; 0; 73; 30 (indeterminate); 15; 20; 11.6.2001; BB; 174.
12. Šurice village, S; Pohanský hrad, under NW margin of plain, stony or locally bouldery scree under the rock walls, coppice forest; 19° 55,37868', 48° 12,37505'; -; 540; 30; 360; 450; 95; 90; 2; 65; 20; 25–30; 22–24; 11.6.2001; RH; 998.
13. Šiatorská Bukovinka village, SE; Karanč hill, NE from the top of the hill, even slope under the ridge; -; (40)60–95; 700; 25; 45; 450; 80; 80; 0; 25; 0; 0; 19; 12.6.2001; BB, RH, KU; 1002.
14. Bulhary village, E; Veľký Bučeň hill, NE, even slope under the top; 19° 52,56206', 48°18,45713'; (60)80–90; 475; 15; 360; 400; 85; 80; 1; 80; 1; 0; 23–24; 17.7.2001; EB, RH; 1033.
15. Bulhary village, E; Veľký Bučeň hill, NE, slightly convex slope under the top; 19° 52,30256', 48° 18,41844'; 70–85; 500; 10; 300; 375; 85; 85; 1; 60; 0; 0; 18–20; 17.7.2001; EB, RH; 1034.
16. Bulhary village, E; Veľký Bučeň hill, NE, near cottage, slightly convex even slope; 19° 52,97132', 48° 18,62863'; (30–50)60–80; 420; 2; 135; 400; 90; 90; 1; 80; 1; 0; (18)21–23; 17.7.2001; EB, RH; 1035.
17. Hájnačka village, Gortva settlement, E; under the saddle between Steblová skala hill and Veľká skala hill, shallow valley with transition to even slope; -; (30–45)70–90; 400; 15; 270; 480; 97; 97; 1; 50; 1; 0; 28; 11.6.2001; EB, BB, RH, KU; 995.
18. Večelkov village, W; Medvedia výšina hill, narrow and steep valley, gravelly-stony soil; 19° 53,39122', 48° 10,09827'; (60–75)80–100; 605; 22; 20; 400; 90; 90; 3; 10; 1; 0; 26–28; 26.6.2001; RH; 1027.

19. Večelkov village, W; Medvedia výšina hill, NW from the top of the hill, even slope; 19° 53,27297', 48° 10,34699'; (60–80)80–100; 595; 8; 45; 400; 85; 85; 10; 15; 0; 0; 23–26; 26.6.2001; RH; 1028.
20. Šiatorská Bukovinka village, SE; Karanč hill, Ku javoru; N from the top of the hill, even, slightly undulating slope; 19° 47,81398', 48° 10,23177'; 80–100; 460; 20; 360; 400; 98; 98; 0; 2; 0; 0; 30; 12.6.2001; BB, RH, KU; 1000.
21. Šiatorská Bukovinka village, about 700 m to NW from the Karanč hill, 70 m to the NE from the Hungarian boundary, commercial forest on the lower part of the even slope with frequent andesite stones on the soil surface; 19° 47,18646', 48° 9,85181'; about 75; 585; 25; 355; 400; 90; 90; 0; 7; 0; 15; 23; 12.6.2001; KU; 22/01
22. Hájnačka village, Gortva settlement, E; between Steblová skala hill and Črep hill, slightly convex soil, rarely stones on the surface; 19° 59,07076', 48° 15,12481'; 75–95; 455; 9; 290; 400; 93; 93; 2; 1; 1; 1; 25–27; 11.6.2001; BB, RH, KU; 994.
23. Hájnačka village, Gortva settlement, E; Steblová skala, NE from point of hill, under point 468 m a. s. l., even slope; 19° 59,03648', 48°14,86776'; 60–90; 430; 20; 60; 400; 95; 95; 0; 2; 1; 0; 25B27; EB, BB, RH, KU; 11.6.2001, 993.
24. Hajnáčka village, NNE; 680 m to the NNE from the Steblová skala hill, commercial forest on the concave slope on the very beginning of valley with basalt boulders spread on the soil surface; 19° 59,16404', 48° 15,20051'; -; 375; 25; 320; 450; 95; 90; 1; 15; 2; 5; 28; 11.6.2001; KU; 16/01
25. Nová Bašta, village, W; Dunivá hora hill, NW from point of hill, even slope; 19° 54,25343', 48° 10,75713'; 70–100; 435; 19; 10; 400; 95; 95; 2; 25; 0; 0; 30; RH, KU; 26.6.2001; 1031.
26. Bulhary village, E; Malý Bučeň hill, slightly convex steep slope above the bottom of valley; 19° 52,32978', 48° 17,59569'; 70–80; 330; 20; 250; 300; 90; 90; 1; 55; 1; 0; 24–25; EB, RH; 27.7.2001; 1036.
27. Šurice village, S; Pohanský hrad hill, N from point of hill, beside forest road, even convex slope; 19° 55,42239', 48° 12,76054'; -; 410; 10; 30; 400; 97; 97; 1; 50; 0; 0; 20; BB; 11.6.2001, 175.
28. Nová Bašta, village, W; 750 m to NNE from the top of the Medvedia výšina hill, stripe of forest between ridge and meadow, moderate convex slope with rocky surface; 19° 53,39805', 48E° 10,3892'; 40-70; 580; 10; 300; 400; 85; 70; 0,5; 60; 5; 30; 20; 26.6.2001; KU; 35/01
29. Šurice village, S; below side ridge of Pohanský hrad plain (about 800 m to the west from the top of the hill), about 900 m to the north from the Garát saddle, commercial forest on steep convex slope with shallow rocky red brown soil; 19° 54,73894', 48° 12,03533'; about 70; 565; 27; 315; 450; 95; 90; 0; 30; 10; 35; 20; 11.6.2001; EB, KU; 17/01
30. Nová Bašta, village, W; about 500 m to the E from the top of the Medvedia výšina hill, relatively sparse commercial forest on mild and convex top part of slope at the edge of ridge plain, shallow red brown soil; -; about 80; 625; 22; 355; 350; 80; 70; 0,5; 30; 5; 5; 20; 26.6.2001; KU; 34/01
31. Obručná settlement, SE; Obručnianska baňa, near the side of stone-pit, steep even slope under the ridge, coppice forest; 19° 53,63695', 48° 11,15338'; 50–70; 570; 42; 340; 300; 93; 93; 1; 30; 10; 0; 18; RH, KU; 26.6.2001; 1030.

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