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NATURAL RESERVE CHYNORIANSKY LUH FLOODPLAIN, ITS ECOLOGY AND BIOMETRY OF DOMINANT HERB SPECIES

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Abstract

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Fluvisols of the Nature Reserve (NR) Chynoriansky luh floodplain situated at the confluence of the rivers Bebrava and Nitra in W Slovakia have been formed from argillic, slightly carbonaceous alluvia deposed on gravel-sand terrace. In the neutral soils gleyed at depths of ≤ 50 cm, the ground water fluctuates in general from 0.5–2.5 m. The group of forest types *Ulmeto-Fraxinetum carpineum* is dominated by the species *Allium ursinum*, locally associated with *Hedera helix*, *Mercurialis perennis* and *Galeobdolon luteum* species in the 5 phytocoenoses. The mean parameter values of these species (folloving the same sequence) were: numbers of shoots per m^2 92 ± 42.7 s.d (standard deviation), 97 ± 103 s.d., 15 ± 10 s.d. and 27 ± 18 s.d., plant length 44.9 cm ± 7.3 s.d., 14.7 cm ± 2.9 s.d., 33.05 cm ± 7.4 s.d. and 31.0 cm ± 13.4 s.d., shoot weight 0.425 g ± 0.166 s.d., 0.240 g ± 0.092 s.d., 0.363 g ± 0.006 s.d. and 0.261 g ± 0.189 s.d., phytomass 42.2 $g.m^{-2}$ ± 25.7 s.d., 27.68 $g.m^{-2}$ ± 30.4 s.d., 6.3 $g.m^{-2}$ ± 5. 3 s.d. and 9.5 $g.m^{-2}$ ± 10.9 s.d., the energy content 17 742 $J.g^{-1}$ ± 527 s.d., 18 967 $J.g^{-1}$ ± 407 s.d., 16 871 $J.g^{-1}$ ± 322 s.d. and 17 167 $J.g^{-1}$ ± 102 s.d. The weight of the mean *Allium ursinum* shoot was 1.468 g, from which were aboveground organs 29%, bulbils 57% and roots 14%. The total primary production in *Allium ursinum* phytocoenoses was 145.4 $g.m^{-2}$, from which were aboveground organs 29%, bulbils 58% and roots 13%. The mean shoots lenght of *Allium ursinum*, *Mercurialis perennis* and *Galeobdolon luteum* species growing in the ecological conditions of 5th phytocoenoses differed on significance level $P < 0.0001$.

Key words: Chynoriansky luh floodplain, soil conditions, dominant herbs, phytoparameters

Introduction

One of the most precious natural treasures of Slovakia is the forest, covering practically the whole territory of the land in the past. The developing agriculture entailed its progressive reduction, primarily in the lowlands with climate and soil conditions favourable for growing plants with higher ecological demands. The Nature Reserve (NR) Chynoriansky luh floodplain represents the last remnant of the waterlogged, originally connected, floodplain forest of the Bebrava floodplain, preserved in spite of intensive anthropic activities, having in the Slovakian lowlands primarily agricultural character.

Ecological conditions in floodplain forests – an important ecotones between upland and aquatic ecosystems, were studied by numerous researchers (Hoagland et al., 1996; Décamps et al., 1988; Bonn, Roloff, 2001; Pišút, Uherčíková, 2000; Karpavičiené, 2003). Differences in frequency, intensity and duration of floods are considered being the most important factors determining differences in species composition and structure of floodplain forest vegetation (Lockaby et al., 1997; Burke et al., 2003; Maděra, 2001; Penka et al., 1985). The characteristic plant of the herb layer in floodplain forests, immediately reflecting every shift of habitat conditions, is *Allium ursinum.* The plant is sensitive both to water-logging and to drought and, consequently, indicates favourable environmental conditions of floodplains (Rychnovská, Bednář, 1998). Well-recognised is also relative sensitivity of this species to aluminium toxicity – a factor limiting its distribution (Andersson, 1993).

The aim of this paper is to evaluate the ecological conditions in the NR Chynoriansky luh floodplain as well as production and bioparameters of the dominant species occurring in the herb layer of the main phytocoenoses. This contribution follows up the previous research undertaken on this nature reserve (Kováčová et al., 2000; Kontriš, Kontrišová, 2002).

Study area

The Nature Reserve Chynoriansky luh floodplain is situated in the lower part of the Bebrava floodplain, NW from the Bebrava village, district Partizánske (48°37´15´´ N, 18°15´58´´ E), at an altitude of 175 m a.s.l. The territory is irregularly tetragonal-shaped, prolonged in N-S direction. The area of the territory is 46.2592 ha. The parent rock consists of young, argillic, slightly carbonaceous alluvia of the rivers Bebrava and Nitra, and it is deposed on more ancient gravel-sand terraces of the same water-flows. The territory belongs to warm, wet climate district with cold winters, in warm climatic region. The mean annual precipitation reaches 600–650 mm, the mean annual temperature is 9.2 °C.

Methods

Field investigations were conducted in 1997 in segments of 5 phytocoenoses most frequently occurring in the NR Chynoriansky luh floodplain. The dominant species are presented in Table 1. The soils were classified according to Collective (2000) and classification of the geobiocoenoses was done according to Zlatník (1959) and Hančinský (1972). The names to the plant taxa were given according to Dostál (1989).

In vicinity of the studied phytocoenoses, 10–20 shoots or individual plants (in case of *Allium ursinum*) of each herb species were sampled from populations with comparable vitality (according to Kubíček, 1977). As individual plants were considered: rosette of 1–2 leaves of *Allium ursinum* species, single shoot of *Mercurialis perennis* and *Galeobdolon luteum* and aboveground shoot with own sucking rootlets of *Hedera helix*.

We examined the following parameters: density, length and weight of shoots, aboveground phytomass and its energy content. The density of shoots was determined by summation of individuals occurring on representative mini-plots (1x1 m). The length of *Allium ursinum* individual was determined based on the longest leaf in the rosette.

The herbs were dried for 48 hours at a temperature of 85 °C, cooled and weighed with a precision of 0.002 grams. The energy value of the phytomass ($J.g^{-1}$) was determined using an adiabatic calorimeter IKA C-4000 (software C-402).

T a b l e 1. Species dominating in selected phytocoenoses.

<table>
<tr><td>Phytocoenosis</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td rowspan="4">Dominate species</td><td colspan="5">Allium ursinum</td></tr>
<tr><td></td><td colspan="4">Hedera helix</td></tr>
<tr><td></td><td></td><td colspan="2">Mercurialis perennis</td><td>Aegopodium podagraria</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">Galeobdolon luteum</td></tr>
</table>

The samples, each 0.7–1 g in weight, were homogenised with a planetary – micro mill (< 0.001mm), compressed into briquette form, dried up to a constant weight at a temperature of 100 °C and burnt in pure oxygen under a pressure of 3.04 MPa. The final value of combustion heat was adjusted with regard to the values of combustion heat of released sulphuric and nitric acids (DIN 51900). The differences in the length of the studied herb species were compared using non-parametric Kruskal-Wallis´ test and LSD multiple range analysis (Statgraphics, 1991; Chajdiak et al., 1994).

Results and discussion

Pedoecological conditions

The soils of the NR Chynoriansky luh floodplain have been formed from Holocene alluvial clay sediments deposed by the rivers Bebrava and Nitra. In a depth of about 2.5 m occurs a Pleistocene sandy-gravel terrace. The calcaric fluvisols at the site show certain signs of illimerization. They have the maximum content of physical clay in the middle part of the soil profile, whereas the maximum of coarse clay (< 0.01 mm) is already at a depth of 20–40 cm. The redox processes are visible only slightly, in the middle and lower parts of soil profiles (below 50 cm), and the over year fluctuation of ground water level is usually between 0.5–2.5 m below the soil surface. In terms of geobiocoenology such soils belong to the wetted edaphic-hydric order of geobiocoens.

The active soil reaction values (pH_{H_2O} 6.4–6.9) are in the neutral interval typical for the heminitrophilous interorder of geobiocoens (pH_{H_2O} 6.0–7.2 in 0–5 cm mineral topsoil layer according to Kukla, 1993). The carbonates are significantly accumulated already in a depth more than 50 cm; however, the mildly alkaline soil reaction only occurs in depths more than 80 cm. The humus contents in the soil profiles are very similar. The difference between the topsoil and subsoil is lower than 1%. The maximum of soil humus content was usually in a depth of 20–40 cm.

To the most important plant nutrients belong N, P and K. The surplus of nitrogen available for plants in soils of the NR is indicated already by dominance of heminitrophilous and nitrophilous species. The contents of available P and K are presented in Table 2. Supply of these nutrients in A-horizon is also very abundant, approximately 1–3 times higher than the limit for very good supply (26 mg $P.kg^{-1}$ and 154 mg $K.kg^{-1}$). In the lower soil horizons, the supply of K is still good (104 $mg.kg^{-1}$), while the supply of P is insufficient (< 13 $mg.kg^{-1}$).

T a b l e 2. Content of phosphorus and potassium available for plants.

Soil		Calcaric Fluvisol					
Parent rock		Clay alluvium					
Monitoring plot		1		2		3	
Available element		P	K	P	K	P	K
Horizon	[cm]	[mg.kg^{-1}]					
Al	1 – 6	75.6	195.0	54.5	192.0	61.0	240.0
Bv	20–40	15.0	138.0	12.5	157.0	9.0	132.0
Bg	50–70	8.5	157.0	7.5	145.0	6.5	142.0
Go	80–100	5.0	145.0	9.5	108.0	16.0	125.0
Go	100–120	11.5	145.0	8.0	92.0	11.5	100.0

Phytocoenology

The tree complex of the phytocoenoses in the NR Chynoriansky luh floodplain consists mostly of *Quercus robur* (160 years old), *Fraxinus angustifolia*, subsp. *danubialis*, *Fraxinus excelsior, Carpinus betulus* and *Acer campestre*. *Ulmus laevis, Quercus cerris, Acer platanoides, A. pseudoplatanus, Tilia cordata, Cerasus avium, Pyrus parater* are only rare. In the undergrowth usually occur *Prunus padus, Crataegus monogyna, Corylus avellana*, near the forest edge also *Prunus spinosa, Rosa canina, Ligustrum vulgare, Euonymus europaea, Rhamnus cathartica, Sambucus nigra, Svida sanguinea* and *Cornus mas*.

For the spring aspect of the phytocoenosis is typical the presence of *Allium ursinum* species with cover 4–5 up to the midst of summer. From the other heminitrophilous to nitrophilous species may be to various extent admixed *Galeobdolon luteum, Galeobdolon argentatum, Glechoma hederacea, Mercurialis perennis, Aegopodium podagraria, Hedera helix, Ajuga reptans, Alliaria petiolata, Arum alpinum, Galium aparine, Lamium maculatum, Pulmonaria obscura, Rubus caesius, Stachys sylvatica, Acquilegia vulgaris*. Significant is the rare occurrence of *Dryopteris dilatata* indicating wet conditions of the 4th forest vegetation tier. The layer of mosses (*Eurhynchium angustirette, E. bians* and *Fissidens adianthoides*) has been developed only in the wetted localities (Kontriš, Kontrišová, 2002). The total cover of herb layer in spring makes 90–100%. In summer, after drying of *Allium ursinum* leaves, is the total cover of herbs substantially lower, with insularly dominant *Galeobdolon luteum, Glechoma hederacea, Mercurialis perennis* and *Hedera helix*, sometimes also *Galium aparine*, *Geranium robertianum* and *Alliaria petiolata*.

From the geobiocoenological point of view, the phytocoenoses in the NR belong to the group of types of geobiocoens *Ulmeto–Fraxinetum carpineum* (according to Zlatník, 1959), the forest type garlic elm-ash forest with hornbeam – representing the driest communities of the wetted edaphic-hydric order of geobiocoens (according to Hančinský, 1972).

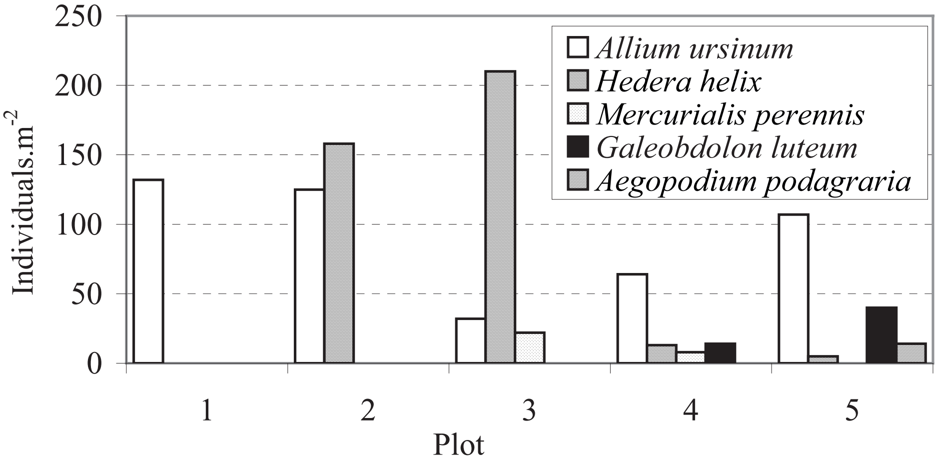

Fig. 1. Number of herb species individuals.

Phytoparameters of selected herb species

Number of shoots

The density values of shoots for the populations of the dominant species forming the five main phytocoenoses of the forest type (ft) *Ulmeto–Fraxinetum carpineum* are given in Fig.1. The shoot number of *Allium ursinum* per $1m^2$ moved between 32–132 (mean 92 ± 42.7 standard deviation – s.d.). In the case of *Hedera helix* species was the shoot number 5–210 (mean 97, s.d. ± 103), with the minimum value being only 2.4% from the maximum. Lower shoot densities were observed for the populations of the species *Mercurialis perennis* (8–22, mean 15 ± 10 s.d.) and *Galeobdolon luteum* (14–40, mean 27 ± 18 s.d.).

Rychnovská and Bednář (1998) found in well-balanced populations of *Allium ursinum* – association *Ficario-Ulmetum*, occurring in a floodplain forest in the region of Litovelské Pomoraví, up to 430–500 shoots per m^2. From this number were 50–70% seedlings. In comparison to the NR Chynoranský luh floodplain, it is about five times more.

Length of shoots

The values of shoot length of the studied herb species are summarised in Table 3. The length of *Allium ursinum* leaves ranged between 33.8–53.7 cm and the mean length in the NR was 44.9 cm ± 7.3 s.d. Gažová (1998) found somewhat shorter leaves (by 20–66%) in this species growing on a slope oriented to the Váh river in the forest park of the nearby town of Hlohovec. The length of *Hedera helix* shoots ranged between 11.0–17.7 cm with the mean value 14.7 cm ± 2.9 s.d. in the NR phytocoenoses. The shoot lengths of the species

T a b l e 3. Mean length of aboveground shoots of dominant herb species (significantly differing plots are in brackets).

Species in phytocoenosis		Phytocoenosis 1 [cm ± standard deviation]	2	3	4	5	d.f.	Significance level
1	*Allium ursinum*	44.0 ± 3.2 (3)	48.0 ± 3.7 (3)	33.8 ± 2.0	45.2 ± 5.6 (3)	53.7 ± 6.0 (1,2,3,4)	4;47	0.0000 *
2	*Hedera helix*		16.2 ± 6.0 (5)	13.8 ± 4.7	17.7 ± 2.4 (5)	11.0 ± 2.5	3;44	0.0359 n.s.
3	*Mercurialis perennis*			27.8 ± 4.6	38.3 ± 6.9 (3)		1;27	0.0000*
4	*Galeobdolon luteum*				21.4 ± 9.7	40.4 ± 14.4 (4)	1;15	0.0000*
5	*Aegopodium podagraria*					54.0 ± 7.4	–	–

* P < 0.0001, n.s. – non-significant difference, d.f. – degrees of freedom

Mercurialis perennis (33.05 cm ± 7.4 s.d.) and *Galeobdolon luteum* (31.0 cm ± 13.4 s.d.) were very similar. The minimum shoot length of *Mercurialis perennis* was almost 73% of the maximum length; in the case of *Galeobdolon luteum* it was only 53%, which could follow from non-equal ecological demands of the species.

The results of testing with the non-parametric Kruskal-Wallis´ test and LSD analysis allow us to conclude that the differences in the shoot length between the populations of *Allium ursinum*, *Mercurialis perennis* and *Galeobdolon luteum* growing in the NR phytocoenoses are significant (P < 0.0001). Not significant were only the differences in the mean values of shoot length between the populations of the species *Hedera helix*.

Weight of shoots

The amount of aboveground and belowground phytomass produced by plants of *Allium ursinum* is presented in Fig. 2. The aboveground biomass of this species ranged from 0.213 to 0.672 g (minimum value was only 32% of maximum), and the mean weight in the NR phytocoenosis was 0.425 g ± 0.166 s.d. The differences (8–18%) in the aboveground shoot phytomass between the phytocoenoses 1, 2 and 4 were not substantial.

The mean weight of *Allium ursinum* bulbils in the studied phytocoenoses was 0.434–1.454 g (minimum makes only 30% from maximum), in the frame of the whole NR it was 0.840 g ± 0.378 s.d. In the phytocoenoses 1, 2 and 4 were the differences in bulbil weight only small (15–18%). The mean weight of small roots ranged from 0.114 g (phytocoenosis 4) to 0.291 g (phytocoenosis 2), with the mean value in the frame of the NR being 0.203 g ±

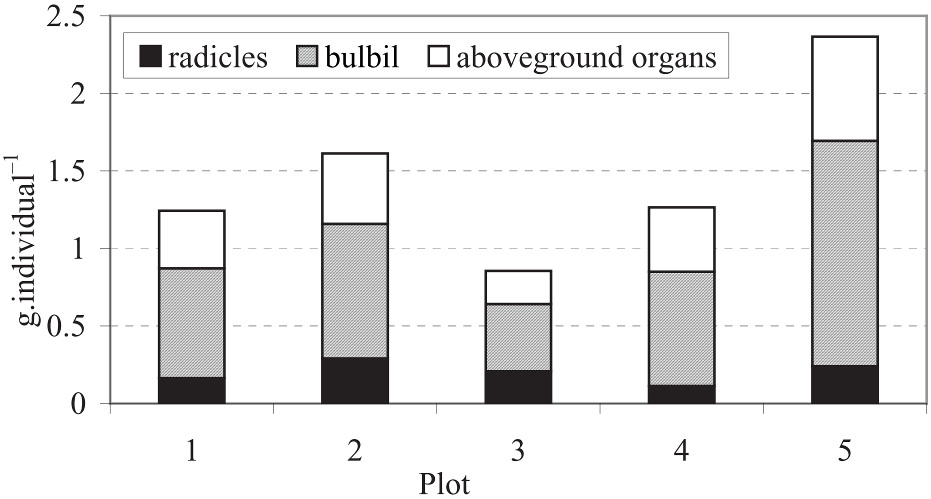

Fig. 2. Weight structure of mean *Allium ursinum* individual.

0.068 s.d. The total weigh of mean individual plant was 1.468 g, from which 29% was aboveground phytomass, 57% bulbils and 14% small roots.

From the other species (Fig. 4), the highest mean weight (0.904 g) was found for shoots of *Aegopodium podagraria* species (phytocoenosis 5). The mean weight of *Mercurialis perennis* species (0.363 g ± 0.006 s.d.) was practically the same in the all studied NR phytocoenoses (a difference of 2%). The *Hedera helix* species mean weight ranged from 0.170 g (phytocoenosis 5), to 0.373 g (phytocoenosis 2), with the mean value in NR 0.240 g ± 0.092 s.d., similar as *Galeobdolon luteum* species (0.261 g ± 0.189 s.d.).

Primary production

Production of aboveground and belowground phytomass of *Allium ursinum* is depicted in Fig. 3. The mean weight of the aboveground organs ranged from 6.82 g.m^{-2} (phytocoenosis 3), to 71.9 g.m^{-2} (phytocoenosis 5). Gažová (1998), studying the species in the forest park of the town of Hlohovec, found a two times higher aboveground production of *Allium ursinum* phytomass compared to our maximum. In the same phytocoenoses (3 and 5) were also found extreme values for bulbils – minimum of 13.9 g.m^{-2}, maximum of 155.6 g.m^{-2}. The minimum value was only 9% compared to the maximum. The production of roots ranged from 6.7 (phytocoenosis 3), to 36.4 g.m^{-2} (phytocoenosis 2), in the NR reaching a mean value of 19.53 g.m^{-2} ± 12.7 s.d. The mean production of aboveground organs of *Allium ursinum* populations in NR phytocoenoses was 42.2 g.m^{-2} ± 25.7 s.d., bulbils 83.7 g.m^{-2} ± 54.9 s.d. and small roots 19.5 g.m^{-2} ± 12.7 s.d. The total primary production in the NR

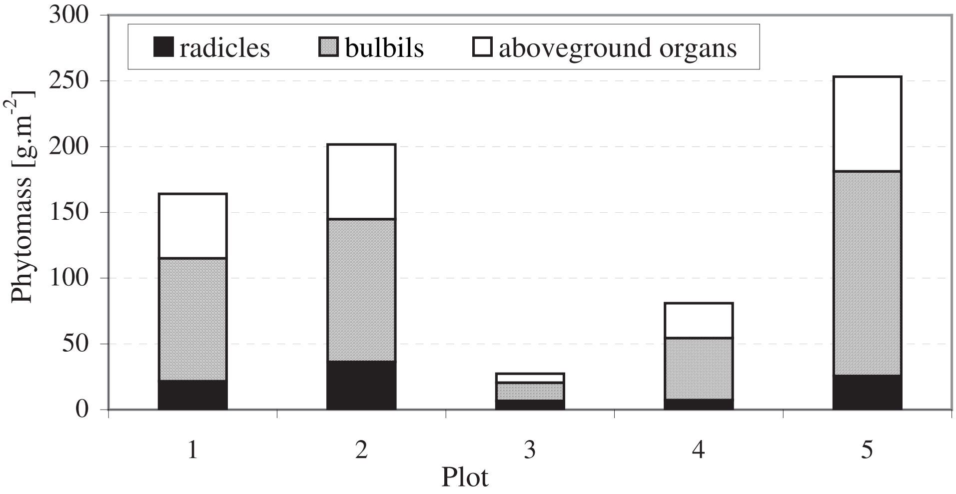

Fig. 3. Weight structure of *Allium ursinum* populations.

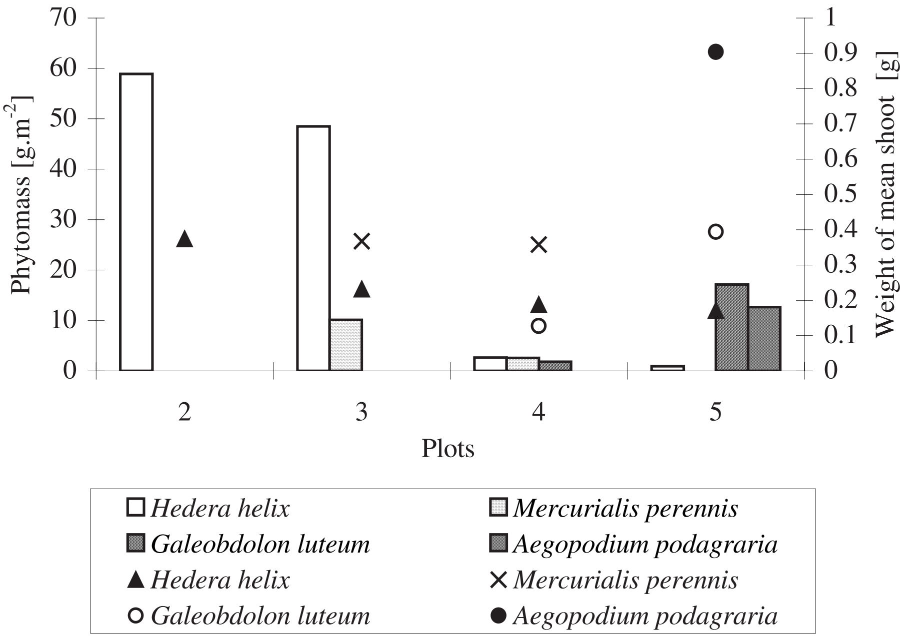

Fig. 4. Phytomass of dominate herb species (columns) and weight of mean shoots.

phytocoenoses was 145.4 g.m^{-2}, from which aboveground organs shared 29%, bulbils 58% and small roots 13%.

From the other species (Fig. 4), the highest mean production of aboveground organs in the NR phytocoenoses had *Hedera helix* (27.68 g.m^{-2} ± 30.4 s.d.), with a minimum of 0.9 g.m^{-2} in the phytocoenosis 5 and a maximum of 58.9 g.m^{-2} in the phytocoenosis 2. The minimum value was only 2% from the maximum. The mean production of aboveground organs in the species *Galeobdolon luteum* reached 9.5 g.m^{-2} ± 10.9 s.d. (minimum in phytocoenosis 4). The production of aboveground organs of this species in studied phytocoenoses was very variable, with the differences up to 90%. Somewhat lower was the mean production of aboveground organs in the species *Mercurialis perennis* (6.3 g.m^{-2} ± 5. 3 s.d.).

Energy content of shoots

The values of combustion heat of the studied species are given in Table 4. In the case of the aboveground biomass they ranged as follows: *Allium ursinum* 16 836 J.g^{-1} (phytocoenosis 5) to 18 208 J.g^{-1} (phytocoenosis 3), *Hedera helix* 18 367 J.g^{-1} (phytocoenosis 2) to 19 268 J.g^{-1} (phytocoenosis 5), *Mercurialis perennis* 16 643 J.g^{-1} (phytocoenosis 4) to 17 099 J.g^{-1} (phytocoenosis 3), *Galeobdolon luteum* 17 095 J.g^{-1} (phytocoenosis 5) to 17 239 J.g^{-1} (phytocoenosis 4).

The mean energy value of the *Allium ursinum* aboveground biomass in the NR phytocoenoses was 17 742 J.g^{-1} ± 527 s.d., for *Hedera helix* it was 18 967 J.g^{-1} ± 407 s.d, for *Mercurialis perennis* 16 871 J.g^{-1} ± 322 s.d., *Galeobdolon luteum* 17 167 J.g^{-1} ± 102 s.d. and for *Aegopodium podagraria* 15 493 J.g^{-1} ±17 s.d. The values of combustion heat for the *Allium ursinum* bulbils ranged from 17 264 J.g^{-1} (phytocoenosis 3) to 17 595 J.g^{-1} (phytocoenosis 2), with a mean value of 17 481 J.g^{-1} ± 129 s.d. The small roots had combustion heat ranging from 16 379 J.g^{-1} (phytocoenosis 5) to 17 635 J.g^{-1} (phytocoenosis1), with a mean of 17 012 J.g^{-1} ± 578 s.d.

T a b l e 4. Mean energy contents in dominant herb species.

Species	Herb organs	Phytocoenosis				
		1	2	3	4	5
		[J.g^{-1} ± standard deviation]				
Allium ursinum	Roots	17 635 ± 21	16 969 ± 59	17 560 ± 73	16 519 ± 2	16 379 ±160
	Bulbils	17 547 ± 55	17 595 ± 37	17 264 ± 4	17 522 ± 2	17 479 ± 60
	Shoots	17 965 ± 260	17 864 ± 16	18 208 ± 18	17 835 ± 17	16 836 ± 67
Hedera helix			18 367 ± 20	19 089 ± 34	19 142 ± 35	19 268 ± 103
Mercurialis perennis				17 099 ±53	16 643 ± 15	
Galeobdolon luteum					17 239 ± 29	17 095 ± 6
Aegopodium podagraria						15 493 ± 17

Penka et al. (1985) found in a group of forest types *Ulmeto-Fraxinetum carpineum* the energy values for most herb species ranging from 15 900 to 17 155 $J.g^{-1}$ of dry matter, i.e. the values were similar to the ours. The underground biomass had a wider range of energy values (from 12 573 to 18 284 $J.g^{-1}$ of dry matter) than the aboveground biomass.

Conclusion

The Nature Reserve Chynoriansky luh floodplain is exposed to a considerable anthropic load. One of necessary conditions for its preservation is thorough recognition of the actual status and development of the herb component of the phytocoenoses occurring at the site. The results of biometric and production analyses conducted on the dominant species of the herb undergrowth pointed out considerable differences in the parameter values between the populations of the examined taxa. These differences reflect the diversity of life conditions in the environment of the NR herb synusia.

Minimum and maximum values of the *Allium ursinum* phytoparameters (number and length of shoot, weight and phytomass production of aboveground and belowground organs) were observed in the same phytocoenoses (minimum in phytocoenosis 3, maximum in phytocoenosis 5). On the other hand, in phytocoenosis 5 were observed lower energy content in aboveground shoot and root phytomass of this species. The highest variability from the examined phytocoenoses was found in the density of *Hedera helix* (98% difference between the values) and in aboveground and belowground phytomas production of *Allium ursinum* and *Hedera helix* (90% differences in both species). The differences in the herb organ energy contents were very small (1–8%).

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Kuklová M., Kukla J.: **Prírodná rezervácia Chynoriansky luh, jej ekológia a biometria dominantných bylinných druhov.**

Fluvizeme Prírodnej rezervácie (PR) Chynoriansky luh nachádzajúcej sa pri sútoku riek Bebrava a Nitra na Z Slovensku sa vytvorili z ílových, slabo karbonátových naplavenín uložených na štrkopieskovej terase. V neutrálnych pôdach oglejených v hĺbke ≤ 50 cm kolíše podzemná voda obyčajne v rozpätí 0,5-2,5 m. V skupine lesných typov *Ulmeto-Fraxinetum carpineum* dominuje druh *Allium ursinum*, ktorý lokálne vytvára s druhmi *Hedera helix*, *Mercurialis perennis* a *Galeobdolon luteum* 5 fytocenóz. Priemerné hodnoty parametrov uvedených druhov (zoradených v rovnakom slede) boli: počet jedincov na 1m^2 92 ± 42,7 (smerodajná odchýlka), 97 ± 103, 15 ± 10 a 27 ± 18, dĺžka výhonku 44,9 cm ± 7,3, 14,7 cm ± 2,9, 33,05 cm ± 7,4 a 31,0 cm ± 13,4, hmotnosť výhonku 0,425 g ± 0,166, 0,240 g ± 0,092, 0,363 g ± 0,006 a 0,261 g ± 0,189, fytomasa 42,2 g.m^{-2} ± 25,7, 27,68 g.m^{-2} ± 30,4, 6,3 g.m^{-2} ± 5,3, 9,5 g.m^{-2} ± 10,9, obsah energie 17 742 J.g^{-1} ± 527, 18 967 J.g^{-1} ± 407, 16 871 J.g^{-1} ± 322 a 17 167 J.g^{-1} ± 102. Priemerný jedinec druhu *Allium ursinum* vážil 1,468 g, z toho nadzemné orgány 29%, cibuľka 57% a korienky 14%. Celková primárna produkcia druhu *Allium ursinum* činila 145,4 g.m^{-2}, z toho nadzemných orgánov 29%, cibuliek 58% a korienkov 13%. Priemerné dĺžky výhonkov druhov *Allium ursinum*, *Mercurialis perennis* a *Galeobdolon luteum* rastúcich v ekologických podmienkach 5 fytocenóz sa odlišovali na hladine významnosti $P < 0.0001$.