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Šefrová H.: **Invaze druhů podčeledi Lithocolletinae v Evropě – příčiny, způsoby, limity a ekologický vliv.**

Provedli jsme analýzu evropských invazí druhů *Phyllonorycter platani* (S t a u d i n g e r 1870), *P. leucographella* (Z e l l e r 1850), *P. issikii* (K u m a t a 1963), *P. medicaginella* (G e r a s i m o v 1930), *P. robiniella* (C l e m e n s 1859) a *Cameraria ohridella* D e s c h k a & D i m i ć 1986 vycházející z literárních údajů i vlastních víceletých výzkumů. Jsou diskutovány možné společné vlastnosti těchto druhů, jejich předpoklady k invazi, způsoby jejich šíření, faktory ovlivňující rychlost invaze a vlivy na hostitele. Je zhodnocen pozitivní i negativní význam těchto druhů, tj. vliv na zvyšování druhové diverzity i jejich možná škodlivost.

DEGRADATION OF SEMINATURAL PASTURES BY LOCAL OVERMANURING WITH CATTLE OR SHEEP EXCRETA

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Abstract

Novák J., Slamka P.: Degradation of seminatural pastures by local overmanuring with cattle or sheep excreta. Ekológia (Bratislava), Vol. 22, No. 2, 143–151, 2003.

The aim of the research was to investigate the effect of overmanuring by NPK nutrients on soil and sward degradation within the framework of 10 sites of pasture ecosystems during the years 1995-2000. The sites were situated in submountain and mountain areas of Slovakia (the Western Carpathians), where Walachian way of grazing still survives. Soil samples from strongly overmanured sites where animals stayed long while having regular rest from the overgrazed pastures (young cattle) and the areas folded by sheep were analysed. There were found the high contents of NPK nutrients in them. The contents of nutrients fluctuated within the following range: from 3912 to 8652 mg.kg^{-1} for total nitrogen (N_t), 131 to 216 mg.kg^{-1} for phosphorus (P) and 527 to 1880 mg.kg^{-1} for potassium (K). Content of humus on the investigated areas ranged from 5.3 to 13.6 %. Low ratio of C:N (6.9:1 to 9.9:1) resulting from C_{ox} and N_t values reflects good nutrient pool. However the concentration of K in soil exceeding 500 mg.kg^{-1} is considered to be negative in pasture ecosystem. There is no need to fertilise soils degraded in this way with K and P as has been recommanded in the older agricultural literature, because the content of K and P in these soils is high. The high concentrations of NPK in soil were tolerated mainly by ruderal weeds (*Rumex obtusifolius, Arctium lappa, Urtica dioica, Cirsium arvense, Aegopodium podagraria, Anthriscus sylvestris, Capsella bursa-pastoris, Chenopodium bonus-henricus, Anthemis arvensis, Stellaria media, Geranium pusillum, Geranium pratense, Glechoma hederacea*) an by some good quality forage grasses. During the years weed grassland communities by dominance of *Rumex obtusifolius* (6-43 %) has been established at the overmanured sites. There is a need for seeking methods suitable for soil and botanical degradation removing.

Key words: animal excreta, botanical degradation, livestock resting place, NPK nutrients, overmanuring, pasture ecosystem, soil degradation

Table 1. Abiotic factors of investigated sites

No.	Site	Region	Geographical region	Altitude [m]	Parent rock	Soil type	Soil kind	Inclination [°]	Exposition	Average sum of precipitation [mm]		Average temperature [°C]	
										growing season	year	growing season	year
1.	Chvojnica I. - Rajčula	Horná Nitra	Strážovské vrchy	600	cristalline rock	cambisol	sandy-loam	5	NE	500	800	13	8
2.	Chvojnica II. - Hluchá dolina	Horná Nitra	Strážovské vrchy	680	cristalline rock	cambisol	sandy-loam	6	E	500	800	13	8
3.	Párnica - Strungy	Orava	Malá Fatra	1150	cristalline rock	ranker	skeletal	12	E	800	1000	9	2
4.	Zázrivá - Pod Kýčerou	Orava	Malá Fatra	1007	cristalline rock	ranker	skeletal	6	N	800	1000	9	2
5.	Oravská Poruba - Jamy	Orava	Oravská vrchovina	600	flysch sediments	podzol	clay-loamy	8	E	500	800	12	7.5
6.	Zubrohlava - Pod dvorom	Orava	Západné Beskydy	670	flysch sediments	podzol	clay-loamy	3	SE	700	900	11	6
7.	Mýto pod Ďumbierom - Pri dvore	Horehronie	Nízke Tatry	580	cristalline rock	ranker	skeletal	4	SE	600	900	10.5	5
8.	Liptovský Ondrej - Jochy	Liptov	Vysoké Tatry	820	cristalline rock	podzol	skeletal	5	S	600	850	11	6
9.	Spišský Štvrtok - Čarna dolina	Spiš	Levočské vrchy	630	flysch sediments	podzol	sandy-loam	8	E	400	600	12	7
10.	Rokytov - Pod Plešom	Šariš	Východné Beskydy	370	flysch sediments	podzol	sandy-loam	7	N	450	700	12	7

Introduction

The oldest, traditional way of sheep and young cattle grazing, so called rough grazing controlled by herdman or shepherd in the mountain regions has survived up to now. Under this grazing style, the animals are during night and noon break closed in the enclosures, which are either removing regularly to the other place (folds) or stay for a long time (sometimes even several consecutive years) on the same place (resting places, staying cots). At the same time, folding is utilized for fertilising of the grassland and for that the folds have to be shifted everyday to a new place. If not, overfolding has strongly negative effects on the pasture as well as regular resting of animals on the same area for a longer time. Thus, overmanuring of the pasture and progressive soil degradation take place. Excessive input of NPK nutrients into soil and heavy sod trampling by grazing animals lead to development of vigorous and competitively strong ruderal weeds as *Rumex obtusifolius, Arctium lappa, Anthriscus sylvestris, Urtica dioica, Cirsium arvense, Stellaria media, Aegopodium podagraria, Anthemis arvensis, Geranium pusillum, Chenopodium bonus-henricus* and others (Klapp,1963; Lichner et al., 1983; Voigtländer, Jacob, 1987; Novák, 1992, 1997; Šúr, 1994).

At the higher altitudes of the Veľká Fatra Mts, at the sites overfolded by sheep the ruderal species *Rumex alpinus* has been described by Kliment (1989, 1991) and Jarolímek et al. (1997) on places, previously overfolded by sheep.

The aim of the research was to investigate the influence of overmanuring by NPK nutrients from animal excreta (young cattle and sheep) on the soil and botanical degradation of pasture in the submountain and mountain regions of Slovakia.

Material and methods

In 1995–2000, ten degraded pasture sites (370–1150 m a. s. l.) situated mainly on flysch sediments and weathered layers of cristalline rock (granite, paragneiss and others) were studied. The brief ecological characteristics of the analysed sites is shown in Table 1, brief characteristics of their utilisation is given below.

1. Chvojnica I. – Rajčula (overmanuring by young cattle excreta as a consequence of 5-year resting of animals on the same area)

2. Chvojnica II. – Hluchá dolina (overmanuring by young cattle excreta as a consequence of 6-year resting of animals on the same area)

3. Párnica – Strungy (overmanuring by young cattle excreta as a consequence of 5-year high stocking rate on the pasture)

4. Zázrivá – Pod Kýčerou (overmanuring by sheep excreta as a consequence of an inappropriate sheepfolding)

5. Oravská Poruba – Jamy (overmanuring by sheep excreta as a consequence of an inappropriate sheepfolding)

6. Zubrohlava – Pod dvorom (overmanuring by young cattle excreta as a consequence of 2-year resting of animals on the same area)

7. Mýto pod Ďumbierom – Pri dvore (overmanuring by young cattle excreta as a consequence of 4-year resting of animals on the same area)

8. Liptovský Ondrej – Jochy (overmanuring by young cattle excreta as a consequence of 3-year resting of animals on the same area)

9. Spišský Štvrtok – Čarna dolina (overmanuring by young cattle excreta as a consequence of 2-year resting of animals on the same area)

10. Rokytov – Pod Plešom (overmanuring by young cattle excreta as a consequence of 3-year resting of animals on the same area).

Eight of the investigated sites (1, 2, 3, 6, 7, 8, 9, 10) were overmanured by young cattle and in two cases by sheep (4, 5). Grassland overmanuring by sheep is quite common in Slovakia (for example covers of *Rumex alpinus* in higher mountain locations). However, this overmanuring is a consequence of sheep folding, but not sheep grazing or resting as it is with cattle. Resting of sheep, i. e. their long-term staying on the same place, is very seldom.

Soil samples in four replications were taken twice a year in spring and autumn (once during the period of investigation) from the depth of 0-0,2 m. In the samples following characteristics were determined: content of total nitrogen (N_t) according to Kjeldahl method, content of available phosphorus according to Egner method, content of potassium according to Schachtschabel method, content of humus and pH/KCl. Ratio of C:N was calculated on the basis of oxidizable carbon (C_{ox}) and total nitrogen (N_t). The values of PK nutrients in soil were compared with standard values according to Neuberg (1990). Botanical analysis was made according to the Klapp´s method (1965), based on projective dominance assessment of the species in the sward.

Results and discusion

After minimum two-years resting of animals on the same place (sites 1, 2, 6, 7, 8, 9, 10), overmanuring by high stocking rate of young cattle (site 3) or overmanuring by sheep fold-

Table 2. Agrochemical characteristics of the soil of overmanured sites in the depth of 0-200 mm (average of 4 replications)

No.	Investigated stands *	N_t [mg.kg^{-1}]	P [mg.kg^{-1}]	Exceeding of upper limit of P	K [mg.kg^{-1}]	Exceeding of upper limit of K	C_{ox} [%]	Humus [%]	$pH_{(KCl)}$	C:N
1.	Chvojnica I. - Rajčula	5810	190	4.2x	840	3.6x	4.4	7.6	6.7	7.6
2.	Chvojnica II. - Hluchá dolina	5627	216	4.3x	627	2.7x	3.9	6.7	6.1	6.9
3.	Párnica - Strungy	5928	102	2.3x	527	2.3x	5.5	9.5	6.4	9.2
4.	Zázrivá - Pod Kýčerou	8652	142	3.1x	1880	8.2x	7.9	13.6	7.2	9.1
5.	Oravská Poruba - Jamy	4752	150	3.3x	1531	6.6x	4.7	8.1	6.9	9.9
6.	Zubrohlava - Pod dvorom	5125	139	3.1x	742	3.2x	4.3	7.4	6.3	8.4
7.	Mýto pod Ďumbierom - Pri dvore	5197	195	4.3x	850	3.7x	4.9	8.4	5.3	9.4
8.	Liptovský Ondrej - Jochy	5420	163	3.6x	830	3.6x	4.5	7.7	5.5	8.3
	Investigated stands **									
9.	Spišský Štvrtok - Čarna dolina	4280	149	3.3x	705	3.1x	3.6	6.2	6.8	8.4
10.	Rokytov - Pod Plešom	3912	131	2.9x	650	2.8x	3.1	5.3	6.7	7.9

* this stand was overmanured by high stocking rate of cattle

**this stand was overmanured by inappropriate folding with sheep

ing (site 4, 5), the soil of analysed sites contained mature excrements mixed with soil particles which were decomposed by soil microorganisms to the homogeneous dark-soil biomass. In the soil there was the high content of total nitrogen (N_t) ranging from 3912 to still 5928 mg.kg^{-1} (Table 2). The content of N_t in soil depended on the time for which the sites were used for animal resting (2-6 years).

Content of phosphorus (P) is generally low in soils under the grasslands nevertheless on the studied sites it was over the low limit valid for high content in soils of grasslands. The values of phosphorus ranged from 131 to 216 mg.kg^{-1}. In the older agricultural literature we can meet an opinion that there is a need to fertilize folded areas with phosphorus and to remove its defficiency in this way (Regál, Krajčovič, 1963; Lichner et al., 1983). It is related to the normally folded areas on which the content of phosphorus and other nutrients is proportionally lower. In the analysed degraded soil (as a result of overmanuring) the content of P exceeded the bottom limit for high phosphorus content (45 mg.kg^{-1}) on the average 3.4 times. Consequently it can be concluded that strongly overmanured grassland do not require fertilization with P.

The content of potassium (K) in analysed soil was also high. It varied from 527 to 1531 mg.kg^{-1} and exeeded tho bottom limit for very high potasium content (180 mg.kg^{-1} for medium heavy soil, 230 mg.kg^{-1} for heavy soil) from 2.2 to 8.2 times. The lowest K content was found in the medium heavy soil of the Párnica - Strungy site which was grazed by high stocking rate of cattle and the highest in the soil of the Zázrivá – Pod Kýčerou site overfolded by sheep. During animal grazing relatively little potassium amount is getting into soil. However, under the conditions of long-term cattle resting on medium heavy soil grassland, content of K in soil increased 2.3–3.7 times and even 6.6–8.2 times under long-term sheep folding (Zázrivá – Pod Kýčerou a Oravská Poruba - Jamy) in comparison to permissible limit.

According to Čumakov (1994) the K content exceeding 300 mg.kg^{-1} has negative and K content over 500 mg.kg^{-1} very negative effect on the pasture ecosystem. Very high potassium content in soil causes its increased content in aboveground biomass as well. Physiological requirement of cattle for K is considerably lower than that needed for optimal grass phytomass growth. Long-time surplus of K in feeding rations can adversely affect fertility and physiological functions of animals. Exceeding K:(Ca+Mg) ratio over 2.2 (we found ratio 4.36 in experimental investigations) invokes symptoms of stagger disease (tetany). Excessive content of K in soil reduces uptake and content of Ca, Mg and Na in forage. For instance, in some experimental overmanured grassland sites K:Na ratio reached value of 247 although permissible limit value is only 2.6 (Novák, 1997).

The assumption that the high K content leads to soil acidification due to decalcifying effect was not proved in our case because the pH of overmanured soil was higher than those of not-overmanured sites. It was slightly acid to neutral which can be explained by increasing of organic matter content in soil after decomposition of animal excreta by soil microorganism. Thus, animal excreta are not only the source of nutrients but provide also the supply of organic matter in soil which enables humus formation resulting in buffering capacity increase and soil acidity decline.

Species	Number of stand									
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Grasses:										
Poa trivialis L.	11	7	3		3	12	10	5	6	4
Dactylis glomerata L.	4	7	+	11	+	5	4	6	5	6
Agrostis stolonifera Sibth.		1	2		9		5	5	3	7
Lolium perenne L.	1				4	5	2	2		+
Bromus erectus Huds.		2				8		2	5	
Festuca rubra L.				+	3			3		
Phleum pratense L.	1	2		+	3		1	2		+
Festuca pratensis Huds.		1	1	5						
Poa annua L.		1			1			3		
Cynosurus cristatus L.	+	1	1		3	+				
Deschampsia caespitosa (L.) P. Beauv.							2			
Elytrigia repens (L.) Desv.			+		+					
Alopecurus pratensis L.					+	1				
Trisetum flavescens (L.) P. Beauv.		1		+						
Total	17	23	7	18	26	31	19	28	19	17
Legumes:										
Trifolium repens L.	4	5		7	6		4	5	2	3
Trifolium pratense L.				1	2		1	1	1	1
Lathyrus pratensis L.					+				2	1
Vicia sepium L.				+	+				1	
Vicia cracca L.				+						
Medicago falcata L.								+		
Total	4	5		8	8		4	6	3	7
Herbs:										
Carum carvi L.	4			10	6	9	1	3	6	5
Ranunculus repens L.	6	3	11	5	3	7	2	3		4
Taraxacum officinale Web.	7	1	2	2	4	5	3	3	+	6
Plantago maior L.	2	1		1	2		4	2	1	5
Achillea millefolium L.		1	+	1		5	3	4	1	2
Veronica chamaedrys L.	2	1	+	2			2			
Alchemilla monticola Opiz		3	+	5						
Leontodon autumnalis L.		2	+							
Galium mollugo L.					3		2	2	3	2
Jacea pratensis Lam.		+			+			1		
Potentilla erecta (L.) Raeusch.					2			1		
Bellis perennis L.					1			2		
Heracleum sphondylium L.	+	+		+	1	1				+
Acetosa pratensis Mill.		+		1						
Fragaria vesca L.		1		1						
Luzula sylvatica (Huds.) Gaudin									2	
Hypericum maculatum Crantz	+								2	
Cerastium arvense L.	1	1		+						
Salvia pratensis L.			+							
Tithymalus cyparissias (L.) Scop.									1	
Ononis arvensis L.									1	

Species	Number of stand									
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Daucus carota L.					+			+		+
Agrimonia eupatoria L.					+				+	
Odontites vulgaris Moench					+					
Centaurium erythraea Rafn					+					
Colchicum autumnale L.									+	
Hypericum perforatum L.					+					
Juncus effusus L.					+					
Knautia arvensis L.					+					
Mentha longifolia Crantz					+					
Pimpinella saxifraga L.					+					
Plantago lanceolata L.					+					
Prunela vulgaris L.					+					
Ranunculus acris L.					+					
Silene latifolia Poir.							+			
Stellaria graminea L.					+					
Total	20	21	13	28	26	27	13	18	30	25
Weeds:										
Rumex obtusifolius L.	13	10	43	14	9	15	13	6	11	7
Geranium pratense L.		2					2	4	13	4
Urtica dioica L.	2	3	4	1	2	+	5	2		2
Anthriscus sylvestris L. Hoffm.	5	2		2	2		4	2		
Cirsium arvense (L.) Scop.		1	+	+	3	2	2	7	2	3
Aegopodium podagraria L.	1	+		2	2		3	1		3
Arctium tomentosum Mill.	2	2					3		1	3
Stellaria media (L.) Vill.	1	+	+				6	2		
Geranium pusillum Burm. F.	3				5	+		1		+
Capsella bursa-pastoris (L.) Med.	2	1	+	+	1	+	2	+	1	+
Anthemis arvensis L.			3		+	1	+	+	3	
Potentilla anserina L.						2		1	3	
Matricaria discoidea DC.	6									
Glechoma hederacea L.	2	2	+				2	2		
Cichorium intybus L.					1	2				
Arctium lappa L.			+					+		
Galeopsis tetrahit L.	+			3						
Chenopodium bonus-henricus L.	2					+				1
Polygonum aviculare L.					1					
Tanacetum vulgare L.		+		+	+	+	+	+	+	
Cardous acanthoides L.				+			+			
Symphytum officinale L.										
Equisetum palustre L.		+			+				+	
Lamium purpureum L.										
Rumex crispus L.)						+	+			
Total	39	23	50	22	24	20	38	28	29	30
Predominance in total:	80	72	70	76	84	78	74	80	81	79
Empty places and mosses:	20	28	30	24	16	22	26	20	19	21

The content of humus in soil of cattle resting places ranged from 5.3 to 9.5%, and on the site folded by sheep (Zázrivá - Pod Kýčerou) it was 13.6%. The C:N ratio calculated on the basis of C_{ox} and N_t values fluctuated from 6.9 to 9.9 and it reflects to a good nutrient pool which is very similar to that of the arable land (Table 2). The ratio over 12, which is typical for grassland, will be reached later after withdrawing the excessive supply of nutrients in soil (Novák, 1997).

In the sward of degraded pasture dominated *Rumex obtusifolius* and other weed species as *Arctium lappa, Anthriscus sylvestris, Urtica dioica, Cirsium arvense, Stellaria media, Aegopodium podagraria, Anthemis arvensis, Geranium pusillum, Geranium pratense, Glechoma hederacea, Capsella bursa-pastoris* and *Chenopodium bonus-henricus,* which tolerated the high N an K content in soil. Weeds were accompanied by some good quality forage grasses as *Dactylis glomerata* and *Poa trivialis*, by legumes as *Trifolium repens* and herbs like *Carum carvi* and *Taraxacum officinale* (Table 3). The most degraded site was Párnica - Strungy where *Rumex obtusifolius* formed 43% of area (Table 3, Fig. 1). The botanical degradation of analysed sites depended not only on content of nutrients in soil, but it was influenced also by other conditions decisive for the ruderal weeds propagation (formation and dissemination of seeds, seed pool in soil) and on site utilisation.

Conclusion

Excessive NPK input from animal excreta and heavy sod trampling resulted in soil and sward degradation of pastures. Typical meadow species were replaced by wide-leaves weeds mainly *Rumex obtusifolius*, which covered 6–43% of degraded grassland. The high NPK content in soil is very negative also from the environmental point of view because the nutrients can be leached to the water resources and polute them. There is a serious need to investigate some appropriate and effective methods to eliminate the negative consequences of overmanuring, mainly in the protected landscape areas and national parks.

The following recommendations can be drawn from this study:

on degrades sites

- to omit fertilisation by P and K till their contents in soil decrease. It is assumed that high supply of nutrients, especially K will be reduced during approximately 10 years. According to Novák (1997), it took approximately 10 years when omission of any fertilisation manifested in reduction of *Rumex obtusifolius* dominance in the cover from 30 to 6%
- to apply the total herbicide Roundup Bioactive (3 $l.ha^{-1}$) to eliminate *Rumex obtusifolius.* Similar procedure was used by Jiřiště, Mládková (1999) in Krkonoše national park (KRNAP) to eliminate covers of *Rumex alpinus*. However, this radical solution is conditioned by the permission of relevant environmental institution. After herbicide treatment it is favourable to resow the site by grass – clover mixture based on 15 $kg.ha^{-1}$ of *Dactilys glomerata* and 3 $kg.ha^{-1}$ of *Trifolium repens* and subsequently to cut or graze it regularly. Withdrawing of the nutrients from soil by *Dactylis glomerata* and regular removal of

Fig. 2. Localisation of sampled sites.

1. Chvojnica I. – Rajčula
2. Chvojnica II. – Hlucháa dolina
3. Párnica – Strungy
4. Zázrivá – Pod Kýčerou
5. Oravská Poruba – Jamy
6. Zubrohlava – Pod dvorom
7. Mýto pod Ďumbierom – Pri dvore
8. Liptovský Ondrej – Jochy
9. Spišský Štvrtok – Čarna dolina
10. Rokytov – Pod Plešom

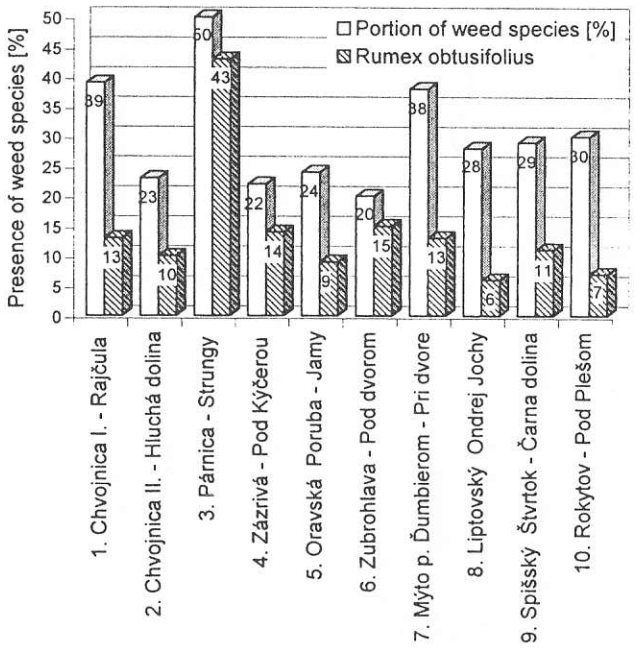

Fig. 1. Presence of weed species [%] in overmanured sites.

aboveground biomass would ensure return of soil to initial status and biodiversity of grassland will increase (Lichner et al., 1983; Novák, 1997)

- the another but rather work-consuming possibility is a removal of top layer of soil which contain animal excreta mixed with soil particles and subsequent mulching on the adjacent non-degraded pastures. Mulching with this material is very similar to grassland fertilisation with well matured farmyard manure (Novák, 1998)

on non-degraded sites

- to replace young cattle grazing in protected landscape areas and national parks by grazing of herd of sheep (450–500 pieces) including at least 5–10 goats. One-day folding by sheep is supposed to be strictly held. In addition it must be stressed that besides everyday shifting of the fold it is also inevitable to keep appropriate size of it.

Translated by P. Slamka

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Novák J., Slamka P.: **Degradácia poloprírodných pasienkov lokálnym prehnojením exkrementmi dobytka alebo oviec.**

Cieľom výskumu uskutočneného v rokoch 1995–2000 bolo sledovať vplyv nadmerného prísunu NPK-živín na degradáciu pôdy a porastu pasienkov v podhorských a horských oblastiach Slovenska (Západné Karpaty), kde ešte stále pretrváva valašský spôsob pasenia. Analyzovali sme pôdne vzorky stanovíšť, ktoré boli veľmi prehnojené v dôsledku dlhodobého stádlenia mladého dobytka, prekošarovania ovcami, prípadne nadmernej pastvy. V pôdach analyzovaných stanovíšť sme zistili vysoký až extrémne vysoký obsah NPK-živín. Obsah jednotlivých živín kolísal v rozsahu od 3912 do 8652 mg.kg^{-1} celkového dusíka (N_t), od 131 do 216 mg.kg^{-1} fosforu a od 527 do 1880 mg.kg^{-1} draslíka. Draslík bol vo veľkých množstvách prijímaný ruderálnymi druhmi (*Rumex obtusifolius* a iné) alebo niektorými krmovinársky hodnotnými trávami (*Dactylis glomerata, Poa trivialis*). Ak jeho koncentrácia v pôde prekračuje 500 mg.kg^{-1}, v pasienkovom ekosystéme sa považuje za nežiadúco vysokú. Takto degradované pôdy nevyžadujú hnojenie fosforom a draslíkom, pretože obsah týchto živín je v nich vysoký. Obsah humusu na skúmaných stanovištiach kolísal od 5,3 do 13,6 %. Nízky pomer C:N (6,9:1 až 9,9:1) vyplýva z hodnôt C_{ox} a N_t a odráža dobrú zásobu živín na stanovištiach. Vysokú koncentráciu NPK-živín v pôde tolerovali mnohé ruderálne buriny, napr. *Rumex obtusifolius, Arctium lappa, Urtica dioica, Cirsium arvense, Aegopodium podagraria, Anthriscus silvestris, Capsella bursa-pastoris, Chenopodium bonus-henricus, Anthemis arvensis, Stellaria media, Geranium pusillum, Geranium pratense, Glechoma hederacea*. Po niekoľkých rokoch sa na degradovaných stanovištiach, kde stádlil dobytok, vytvorili ruderálne typy trávnych porastov s dominanciou *Rumex obtusifolius* (6–43 %). V rámci štúdia tejto problematiky je nevyhnutné hľadať metódy vhodné na elimináciu degradácie pôdy a botanického zloženia.