Degraded sites in the Low Tatras National Park

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Abstract: In the year 2004 was performed survey of sites influenced by folding of grassland, in locations Pod Keckou (1100 m) and Leniva (1400 m). Low soil fertility and low soil stability at folding site was affirmed. Soil conditions after end of folding vary, but at non folding site after notable withdrawal of potassium is presence of ruderal species still very high. Participation of synantropic species in stand with finished folding is comparatively high. Relation between ruderal species and form of maintenance, naked places and excessive nutrient content. Sites rank with weeds negatively affect adjoining areas by decreasing of species diversity, suppression of species restraining soil erosion, by degradation of feed value of stands and aesthetic value of the habitat. In term of its own being ruderal associations are rather stabil, but on the other side, in wider extensional and functional context of the ecosystem, they cause the unstability.

Keywords: 6520 Mountain hay meadows, Rumex sp., Urtica dioica, site degradation, folding

Introduction

Nowadays, there is a number of highly degraded sites of grasslands in the Low Tatras National Park located within nature protection zones of a second and third level. These sites function as seedbeds of dangerous weeds having spread as a consequence of deficiences in grassland management and its extensification. Consequently, weed infested areas induce the decrease in biodiversity, soil erosion, the decrease of feed value of surrounding swards, the expansion of weed species, and they can easily become a source for spreading diseases and pests. Keeping the site at self-restoration entails extend the threat of an environment to undeternined period with uncertain consequences. For purpose of the evaluation of biotopes affected by the farm exploitation, particularly folding, resting and walking livestock, was as the template for the future alternative of revitalization method of damaged stands, selected floristic, ecological and pedological survey.

Materials and methods

The research sites Pod Keckou (1150 m a.s.l) and Leniva (1450 m a.s.l.) were located in the Low Tatras National Park (Table 1). In the soil samples was specified: production of CO2 (the gas chromatography method), momentary content of NH4-N and NO3-N (spectrophotometric), intensity of the total mineralization of nitrogen (TMN), intension of nitrification (NIT), carbon content of total microbial biomass (rehydratation; Ruzek, 1992), Cox content (Tjurin), Nt (Kjeldahl), P, K, Ca, Mg (Mehlich III), pH (n KCl), the mould content, medium nitrogen number (Ellenberg, 1962) for assessment of the site nutritive treatment. Floristic composition (Klapp, 1965) was monitored at spring, summer and autumn – ratio of species was estimated in according to their dominance specificated by abundance at 10x10 dm^2 area. Evaluation of grassland quality was stated (Novak, 2004). The medium moisture number (Ellenberg, 1962) was stated in according to claims of plant for the site moisture treatment. The plant characteristic was named by method of Jurko (1990): oficinality (Of), toxicity (Tx), meliferousness, synantropy.

Table 1. Site characteristics

site	soil type	slope inclination.	exposure	soil skeleton	mean annual	total annual	site area (ha)	altitude (m)

					temperature	rainfall		
Pod Keckou	cambisol, rendzina on limestone	1°, 12-17°; 20-25°-and more	S; E; W	medium to strong, 25-50 %; >10%	6-7 °C	1000-1300 mm	1,6; eutrophic site 0,3	1153-1195
Leniva	cambisol, cambisol on podzol	0-1°, 9-12°; 1-20°	S; S-E; 0°	25-50%	5,6 °C	900-1200 mm	6,5; eutrophic site 2,4	1439-1482

Results and discussion

According to chemical and microbiological soil analysis the value of pH, N, P, Mg, Cox, mould and K decrease towards non-folded stands, except the site Pod Keckou/1, where was despite of the lowest volume of C_{ox} the most intensive production of CO2. At the stand Pod Keckou/1, which was exploited for resting and walking livestock at the time of survey, was content of Ntotal 6.0 $g.kg^{-1}$, at the next site without exploitation Pod Keckou/2 up to 6.2 $g.kg^{-1}$ and at Leniva/1, at least 1 year without folding 5.4 $g.kg^{-1}$. At eutrophic sites was measured very high content of K (331.3-727.3 $g.kg^{-1}$) and Mg (261.9-733.7 $g.kg^{-1}$). The microbial biomass content was the lowest at eutrophic areas (2075.1-3377.2 mg $C.kg^{-1}$). Values of nitrification and mineralization of nitrogen increase near the folder, in soil of control site they are considerably lower. Under the enhanced content of nitrogen effect was reduced C:N ratio (3.3-8.7 and 13.6). Difference at momentary content of NH4-N compared to control site (9.8 $mg.kg^{-1}$) was sizable in soil of stand Pod Keckou/1,2 (1,1-2,1 $mg.kg^{-1}$), when livestock rested. The content of NO3-N was 3 to 18 times higher compared to control sites.

The site Pod Keckou/2 is naturaly bounded typical degraded site, where dominate *Rumex obtusifolius* in leaf area and height. Grasses constituted 41% (of total 59%). Leguminoses were represented in trace amount. The cover of *Rumex obtusifolius* was 7%, herbs totaly 18%. The most frequented herbs was *Ranunculus repens, Urtica dioica, Acetosa pratensis, Veronica chamaedrys, Taraxacum officinale* and *Chaerophyllum hirsuthum.* Composition of floristic group of grasses was created mostly by *Poa pratensis* and *Agrostis stolonifera, Poa trivialis, Festuca pratensis*, less by *Elytrigia repens* and *Dactylis glomerata.* Following the evaluation of feed value the grassland is little valued to less valued (EGQ 36). In the phytocoenose was found 80% species which are typical for synantropic phytocoenoses, part of it are apophytes. Prevail species characteristic at folding areas, treaded places, forest and bushes boundaries, ruderal species. Most of them are allergens (grasses, *Urtica dioica, Rumex obtusifolius, Ranunculus repens* a.o.). Potentially toxical species constitute 17% of a cover. The medium nitrogen number 3,37 indicates suitability for intensive grazing. Mezophytes covered 56%, mezohygrophytes 33%. According to moisture claims indifferent species constitued 11%, xerophytes and mezoxerophytes in trace amounts.

The site Leniva/1 with visible representation of *Rumex alpinus* according to abundancy analysis was covered at 18%, the rest constitued blank spaces. Floristic groups of grasses and herbs equally covered 8%. The highest contribution created little valued *Deschampsia caespitosa* (4%) and high valued *Poa pratensis* (1%), *Rumex alpinus* (4%), *Stellaria graminea* (3%), *Acetosa pratensis* (1%). Feed value of the most of species is unvalued. Little valued (55%) and less valued (39%) species prevailed, high

valued created 6%. Following to evaluation of grassland quality, the phytocoenose is harmful. Species *Rumex alpinus* exceeded and *Stellaria graminea* achieved the treshold of viciousness. 50% of species was typical for synantropic phytocoenose, the part was apophytes. Potentially or partially harmful species constitued half of cover, similarly species causing allergy, only 9% of species was harmless. Toxic species was not recorded, harmful and soft toxic created minimal amount. According to provisionment of the moisture, the site is suitable for intensive grazing (*Figure 1*).

Table 1. Ecological and botanical analysis

site	medium nitrogen number	medium moisture number	E_{GQ}	grasses (%)	grass-like species (%)	leguminoses (%)	herbs (%)	bare patches (%)	number of species
Pod Keckou/2*	3,6	3,4	35,5	41	-	+	18	41	34
Pod K./control site	2,7		36	37	1	7	43	13	62
Leniva/1*	4,1	3,5	5,7	8	2	-	8	82	22
Leniva/2	2,7	3,1	33,7	59	1	-	22	18	30
Leniva/control site	1,4	1,9	23,5	71	3	-	11	15	25

(* eutrophic site)

Table 2a. Agrochemical and microbiological analysis of soil

site	N_T	P	K	Mg	pH/KCl	C:N	C_{ox}	microbial biomass
	g kg^{-1}	mg kg^{-1}	mg kg^{-1}	mg kg^{-1}	pH		g.kg^{-1}	mg C kg^{-1}
Pod Keckou/1*	6	119	46,0(?)	733,7	6,6	3,3	19,6	2 075,10
Pod Keckou/2*	6,2	54,6	727,3	447,9	5	7,6	47,1	2 249,80
Pod K./control site	5,1	8,9	136,4	344,9	4,5	8,7	44,3	2 825,10
Leniva/1*	5,4	53,5	331,3	261,9	3,8	13,6	73,4	3 377,20
Leniva/2	2,9	17,6	184,1	55,4	3,6	23,9	69,2	4 324,90
Leniva/control site	2,7	16,4	136,4	27,9	3,5	21,3	57,4	3 544,20

(* eutrophic site)

Table 2b. Agrochemical and microbiological analysis of soil

site	CO2 production after the 1st day of incubation	CO2 production after the 2nd day of incubation	NH_4-N	NO_3-N	nitrogen mineralisation	nitrification
	mg CO_2 kg^{-1} d^{-1}	mg CO_2 kg^{-1} d^{-1}	mg.kg^{-1}	mg.kg^{-1}	mg NH_4 - N kg^{-1} 14 d^{-1}	mg NO_3 -N kg^{-1} 14 d^{-1}
Pod Keckou/1*	518,2	523,8	2,1	43,5	45,4	47,2
Pod Keckou/2*	225,5	214,6	1,1	50,8	50,7	50,9
Pod K./control site	169,8	154	9,8	2,8	8,6	3
Leniva/1*	214,1	191,8	1,6	17,5	40,8	39,1
Leniva/2	201,6	193,4	1,4	9,5	42,2	41,8
Leniva/control site	155,9	147,9	1,5	5,9	20,3	19,4

(* eutrophic site)

Figure 1. The site Leniva (photo: J.Javorka)

Conclusions

Degradation of sites is caused by wrong evaluation, often subject to limited environmental possibilities – not by folding itself, which enrich a soil on quality mould, suitable nutrient content and accessing, content of microbial biomass. However, a long-term keeping of animals at same area hold excessive allowable nutrient content, decreases number of species and then a microbial biomass content at root zone, oxidation of ammonia nitrogen to nitrates and mineralization of N with habitat contamination menace rises. A deal of low feed value species with various degrees of toxicity involves a quality and productivity of next habitats fall. Soil conditions after end of folding, resting and walking change, but moreover markable nutrient decay is contribution of ruderal species and nutrient fund still very high, bare patches on account of vitality of dangerous weeds (*Rumex sp., Urtica sp.*) only slowly stuff by another species.

Adequate management reaction is to remove above-ground part of vegetation cover and sow autochtonne valued species. Leavings of unvalued species can be utilized as source of biomass for energy exploitation or composting.

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