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INFLUENCE OF PASTURE ON THE SUCCESSION AND BIODIVERSITY IN THE NATIONAL PARK MALÁ FATRA

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Summary

The experimental pasture area Strungový príslop (110 ha) is situated on the territory of The National Park Malá Fatra on the altitude 1,150 m. The pasture vegetation was formed by the association *Agrosti-Festuceum rubrae* with up to 56 species. In the lower part the animals relaxed after the free grazing, and spent the nights on the area of 0.5 ha. After their long-lasting stay on the stand the soil was eutrophised and the above-ground biomass was badly ruderalised. The amounts of nitrogen and potassium were three times higher than the values of the control group. They varied from 2,680 to 4,928 mg.kg^{-1} in case of nitrogen and from 165 to 527 mg.kg^{-1} in case of potassium. Changes in the soil and destruction of turf by trampling of the cattle caused the gradual regressive succession of the original phytocoenosis. The group of ruderal weeds *Rumicetum obtusifolii* with the dominance of *Rumex obtusifolius* (27.2%) was formed on the area. There were from 12 to 27 species in the ground cover. The empty spaces comprised up to 29%. The replace of the young cattle by the flock of sheep (450 – 500) with at least 5 goats is proposed to affect by their grazing the top parts of *Rumex obtusifolius*. The areal application of the herbicide Roundup-Bioaktiv (3 l.ha^{-1}) and following reseeding of *Dactylis glomerata* and *Trifolium repens* is most advantageous to form the cover of vegetation and to draw the redundant nutrients from the soil. Other species will gradually appear in the cover and the richness of the plant species in the vegetation will rise.

Key words: National Park Malá Fatra, young cattle, grazing, euthrophisation, revitalization

Introduction

Ground cover belongs to the most rich European ecosystems as far as the number of species is concerned. They are the source of the plant species, natural resources of the country and their biodiversity is the highest on the agricultural land. Their ecological stability is relatively high. Their appearance and existence depends on the farming activity of people (mowing and grazing). If young cattle relax and spend the night, or stay for a longer time on one stand, the soil of the pasture ground cover is eutrophised and above-ground biomass ruderalised under the influence of excrements (Novák 1992).
Grass ground cover in the area of The National Park Malá Fatra belongs among the valuable biotops, and from the point of view of the occurrence of the species it belongs among the irreplaceable ecosystems. Except for the productive function the soil-protective, water-management, bio-homeostatic, landscape-engineering, recreational and medicare, esthetical and cultural functions are most important in these conditions. These functions stress the protection of soil against erosion, preservation of genofond of vegetation and animal communities and their species.

Material and methods

Experimental pasture area Strungový príslop (110 ha) is situated in The National Park Malá Fatra on the altitude 1,150 m, on the north-east incline, not far from Malý Rozsutec, in the cadastraly zone of the co-operative farm Párnica.
The purposes of the ecologically aimed pasture experiment (1999 – 2000) were to detect negative influences of the grazing of young cattle (175 heads) on the pasture turf, to evaluate the changes of the floristic composition of the grass, and on the base of the results to propose the way of revitalisation, keeping the rules of ecological farming. The cattle was situated on the night stand in the period from 15 May to 15 October during several years. Soil-forming substrate was formed by crystalline core with granitoid parent rock, upper layer is formed by medium heavy- heavy, podzolized-podzolic, brown forest and unproductive land. The samples of soil were taken in the autumn period from the depth of 100 – 200 mm to set the total nitrogen (N_t) by Kjeldahl, available P by Schachtschable, available K by Egner, humus by titration (Tjurin) and pH/KCl.
Floristic analyses were made in the spring and autumn periods by the method of projective dominance by Klapp (1965), using the exact squares (0.01m^2) in 4 repeatings. From the floristic records ecological characteristic was calculated - (medium number of nitrogen M.No.N), and value of quality (valuation of vegetation V_v) according to the forage value by Klapp et al. (1953).

Table 1 Chemical analysis of the soil

Stand	Place of taking samples	N_t mg.kg^{-1}	P mg.kg^{-1}	K mg.kg^{-1}	C_{ox} g.kg^{-1}	Humus g.kg^{-1}	pH/KCl	C : N
Strungový príslop	1	2,680.00	-	375.00	3.00	5.20	4.86	11.20
	2	2,492.00	10.00	417.00	2.50	4.30	4.45	10.03
	3	4,928.00	78.00	527.00	4.50	7.70	6.43	9.15
	4	2,632.00	-	165.00	2.90	4.90	4.34	11.02
	x	3,183.00	22.00	371.00	3.22	5.52	5.02	10.35
Control	5	1,200.00	-	102.00	1.85	3.20	4.20	15.42

Results and discussion

The vegetation cover of the original semi-natural ground cover on the stand Strungový príslop was created by association *Agrosti-Festuceum rubrae* (control) with the dominance of *Agrostis tenuis Sibht.* (19%) and side species *Festuca rubra L.* (8%). Floristic group of grasses constituted 41%, leguminoses 5%, other herbs 30%, and the rest 24%.
The animals except for trampling did not cause any visible damage. The trampled vegetation quickly regenerated. The cattle while moving to another side trampled narrow (200 – 250 mm) paths on the slopes with the direction of contour lines. On the steeper slopes the turf was during the grazing torn down by their hoofs to the height 50 – 70 mm.
On the lower part of the area near the shepherd's hut the soil was badly ruderalised because of the permanent movement of the cattle on the night stand during several years. The values of total nitrogen and potassium were three times lower comparing with the control, and they range from 2,680 to 4,928 mg.kg^{-1} of nitrogen, and from 165 to 527 mg.kg^{-1} of potassium (Tab. 1). The value 4.2 – 4.8 of the medium number of nitrogen (M.No.N) indicates detrimental content of available nutriments (overfertilised stand), except for the place of taking samples No.4, which is the farthest one from the shepherd's hut, and was not as badly eutrophised as the other sides. From the relation of C:N results, that the soil (except for the control) is richer in the organic bio-mass.
The changes in the soil and the damage of turf after the trampling of the cattle caused gradual regressive succession of the original phytocoenosis *Agrosti-Festucetum* and gradual ruderalisation of above-ground biomass. The association of ruderal weeds *Rumicetum obtusifolii* with the dominance of *Rumex obtusifolius L.* and side species *Urtica dioica L.* was formed on the site. Floristic group of grasses was represented only by 7 – 18%, *Poa trivialis L.* (5.2%) and *Agrostis tenuis Sibht.* (5.2%). Leguminoses were not found in the vegetation. From the floristic group of other herbs (share from 45 to 63%) *Rumex obtusifolius L.* (27,2%) dominated, the site species were *Ranunculus repens L.* (15.5%), *Urtica dioica L.* (8%) and *Anthriscus sylvestris L.* (1.5%). There were 12 – 27 species in the vegetation. The more nutrients there were in the soil, the less species there were in the vegetation cover. Empty spaces formed up to 29.5%. Compared with the control this association of herbs is very poor in the range of species. The quality of the vegetation (V_v = 1.66) was without any value, partially harmful and the cattle did not graze it.
The revitalization was necessary but as the stand is situated in The national Park, it should be done very cautiously. The protection of nature in national parks outranks all the other activities. It is necessary to follow the law of The Slovak National Council No.287/1994 of the Statute-book about the protection of nature and country § 14, par. 1. The replacement of the young cattle by the flock of sheep (45 – 500 heads) with at least 5 goats at least 5 goats is proposed to affect by their grazing the top parts of *Rumex obtusifolius*, and gradually avert its spreading. Radical solution by the application of the herbicide Roundup Bioaktiv (3 l.ha^{-1}) is the most advantageous (with the agreement of the superior authority in the field of the protection of environment). We agree with the authors Jiřište and Mládková (1998), who used the same herbicide for the similar vegetation cover, though with *Rumex alpinus L.* in the area of Krkonoše mountains, in the national park KRNAP. The reseeding of clover-grass mixture with the dominance of *Dactylis glomerata L.* and side species *Trifolium repens L.* supported the creation of the vegetation cover. With the spreading of the species of grasses, leguminoses and other herbs from the neighboring areas high reserve of nutrients, potassium mainly, will be within 10 years used up, biodiversity will grow, and the sustainable development of the country will be guaranteed.

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FLORISTIC CHANGES IN PRATOCENOSIS AFTER CESSATION OF FERTILIZING

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Summary

Field experiments were conducted to study the effect of fertilizing and its absence on floristic composition of semi-natural grasslands. Diversified grass community is changed during eight years of fertilization by gradated nitrogen rates into grassland with 71 to 84 % share of grasses. Phosphorus-potassium fertilization supports the development of dicotyledonous species and share of grasses is falling. After three-year cessation of fertilization unfertilized stand is typical by almost 50 % share of dicotyledonous species, grass species (*Festuca pratensis* Huds., *Festuca rubra* L.) are disappearing and moss (20 %) is spread in the stand. In the stand fertilized before cessation with PK-fertilizers the share of leguminous crops is significantly falling (by 24 %), and the representation of the other meadow herbs and grasses is increasing. Absence of fertilization affected minimally the stand with 240 kg N.ha^{-1}, though the stand was thinned due to a reduction in the representation of grasses (by 8 %) and the other herbs (by 2.5 %). Absence of fertilization affected negatively the development of floristic composition of grass pratocenosis. Minimum utilization of grassland starts as late as in the second year after cessation of the process of secondary succession.

***Key words*:** semi-natural grassland, floristic composition, cessation of fertilization

Introduction

Fertilization increases production capacity of seminatural grasslands, but on the other side its biodiversity is falling. One of the potential assumptions of regeneration of biodiversity is absence of mineral fertilization (Jeangros, Bertola, 1997) with minimising of the other anthropogenic factors, but with such a possibility of cultivation of grasslands which will preserve their species variability (Jančovič, 1996). In conditions of Slovakia an attention was paid to the problem of absence of mineral fertilization and effect of its composition on floristic structure and productivity at the end of the 1960s (Lichner, et al., 1966) at increase of the utilization of mineral fertilizers and recently when their application fell significantly (Olff, Bakker, 1991; Jančovič, Holúbek, 1993; Gáborčík et al., 1997).

Material and methods

Experimental field trials with fertilization of grasslands (1986 – 1993) and after its absence (1994 – 1996) were performed on seminatural grasslands in the region Stražov Hills (Central Slovakia, locality Chvojnica). The territory of the trial site is situated at an altitude of 600 m above sea level, with geographic altitude 48° 53' and 18° 34' of longitude. Slope character of the terrain ranges between 17° to 20°.
The site belongs to the slightly warm region, into subregion slightly arid with dominantly cold winter. According to long-term measurements average annual temperature reaches here 6.5 °C and 11.1 °C in the growing season. The long-term average of the whole-year sum of precipitation is 848 mm, while it is 431 mm during the growing season. Soil-forming substrate of the site is geest of Jurassic schists with inserts of marls, on which acid cambisol was formed. Semi-natural grassland has been identified as an association of *Lolio-Cynosuretum R. Tx* 1937 in view of phytocenology.
Original treatments of fertilization and rates of nitrogen are presented in Table 1. Phosphorus and potassium fertilization was constant and determinated at 30 kg P.ha^{-1} and 70 kg K.ha^{-1} annually.