Improving Nutrient Supply of Grassland Soil

G. Füleky
Szent István University, Hungary

M. Orbán
LAM Alapítvány, Romania

Improving nutrient supply of grassland soil

G. Füleky[1] and M. Orbán[1,2]
[1]Szent István University, Department of Soil Science and Agricultural Chemistry, Gödöllő, Hungary, H-2103 Páter Károly u. 1, Email: Fuleky.Gyorgy@mkk.szie.hu., [2]LAM Alapítvány, Illyefalva, 4016 Romania

Keywords: fertilisers, grassland, nutrient uptake

Introduction In the Southern corner of the Eastern Carpathian Mountains is located the hilly region of Barcaság. The total agricultural area is 180 thousand ha of which 90 thousand ha is grassland. The maximum yield of natural grassland does not exceed 1.2 t ha^{-1} hay. The aim of this work is to find appropriate fertiliser and liming rates to increase the hay yield and improve the soil nutrient supply.

Methods A fertiliser and lime field trial was established with three replicates in a typical valley area of this region on Fluvisol in 2001 (Orbán *et al*., 2002). The average precipitation is 753 mm, the average temperature 7.3 ^{o}C. pH_{KCL} of the soil is 5.67, humus content 2.24 %, the texture clay-loam, and the soil has medium available P and very low K contents. The lime and fertiliser rates can be seen in Table 1. Ca and N, P, K were supplied as sugar beet factory lime, NH_4NO_3, superphosphate and KCl, respectively. A mixture of grasses and legumes was sown. The floristic composition of swards were determined twice. The dry matter yield and the chemical composition of the hay was also determined.

Results The floristic composition of plants was different in the two years. In the first year the ratio of grasses was about 25 % on the plots not fertilised with nitrogen (N). However, on the plots fertilised with N this ratio was about 50 %. The ratio of legumes was highest on the plots not fertilised with N. With increasing nutrient supply the ratio of legumes decreased to 30 %. In the second year, the ratio of grasses was *ca* 75-80 %, and that of legumes 10 %. The negative relationship between the ratio of legumes and the nutrient supply of soil was significant in the first year. Table 1 shows the cumulative yields and N, P and K uptake. As the results demonstrate, liming alone was not satisfactory to improve soil fertility and combining it with N, P, and K fertilisers significantly increased the hay yield. As the balance calculations show, the applied N_{50} and N_{100} rates were not enough to balance the N uptake of plants. By using 60 kg P for 3 years the P supply of soil did not decrease. It is surprising to see that the K rate of 240 kg for 3 years was not sufficient to maintain the K supply of soil.

Table 1 Dry matter yield and macro element uptake of grassland plants (sum of results from 2002 and 2003)

Treatment	Yield	N kg/ha		P kg/ha		K kg/ha	
N kg/ha per yr	t/ha	Uptake	Balance	Uptake	Balance	Uptake	Balance
P, K kg/ha per 3 yr							
Ca 2t/ha per 3 yr							
Control	9.0	197	-197	31	-31	248	-248
Ca	9.2	173	-173	29	-29	200	-200
CaN_{50}	11.0	213	-113	35	-35	277	-277
$CaN_{50}P_{60}$	11.9	256	-156	38	+22	306	-306
$CaN_{50}P_{60}K_{240}$	12.0	228	-118	34	+26	335	-195
CaN_{100}	12.9	266	-66	40	-40	339	-339
$CaN_{100}P_{60}$	12.6	260	-60	42	+18	351	-351
$CaN_{100}P_{60}N_{240}$	13.9	291	-91	43	+17	424	-184
LSD 5%	0.5	23		4		32	

Conclusions The limited hay production of poor soils could be increased with liming and fertilisers. The improved nutrient supply of soils was demonstrated with increased macro element uptake.

References

Orbán M., G. Füleky & I. Razec (2002). Correlation between soil and hay quality of natural grassland in Barcaság hilly region. *Innovation, science and practice of agriculture at the millennium* (In Hungarian), Debrecen 11-12 April 2002. p. 172-177.