OVER SEEDING AND FERTILIZATION, METHODS OF IMPROVING THE PRODUCTIVE POTENTIAL OF THE MOUNTAIN GRASSLANDS

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The mountain pasturelands' grass represents a source of nourishment and habitat for animals, contributes soil erosion's prevention by retaining the rainfall, improves the soils from the fertility's point of view, assures the biodiversity for the approximately 70% of the plant species, having also an esthetical and recreational function. During 2007-2009 there was organized, on a Agrostis capillaris + Festuca rubra grassland, an experiment in order to increase the productive potential, by over seeding with Phleum pratense, Dactylis glomerata and Trifolium pratense and fertilization with cattle manure and mineral fertilizers. There were obtained big productions for the fertilization with manure 20 t/ha + 100-200 kg/ha complex fertilizers (7.3-7.4 t/ha d.s.), and the grassland's floristic structure improved by the increase of the leguminous species' ratio with 10-15%.

***Key words**: grassland, mountain, fertilization, exploitation, over seeding*

Grasslands represent an important source for producing succulent and fiber full fodder for the domestic and wild animals' nutrition (1). The permanent grasslands' input into the fodder balance is smaller, compared to the forage plants' or the temporary grasslands' ones, because these grasslands' productions are small, being limited by some natural and social economical factors (2).

Among the actual problems of our country's mountain grasslands we considered the increase of the productive potential using soil surface works or radical works (3, 4).

This paper emphasizes the influence of fertilization and over seeding on production and on the floristic structure of a *Festuca rubra + Agrostis capillaris* mountain grassland in the Suhard Massif.

MATERIAL AND METHOD

The experiment, organized during 2007 – 2009 was set in randomized blocks, with two variable factors:

Factor A – fertilization with organic and mineral products, with the following variants:

a_1 – control;
a_2 – cattle manure 10 t/ha annually;
a_3 – cattle manure 20 t/ha annually;
a_4 – cattle manure 10 t/ha annually + 10 t/ha every second year;
a_5 – cattle manure 10 t/ha annually + 20 t/ha every second year;
a_6 – cattle manure 20 t/ha annually + 10 t/ha every second year;

a_7 – cattle manure 20 t/ha annually + 20 t/ha every second year;
a_8 – complex fertilizer 100 kg/ha annually;
a_9 – complex fertilizer 200 kg/ha annually;
a_{10} – cattle manure 10 t/ha + complex fertilizer 100 kg/ha annually;
a_{11} – cattle manure 10 t/ha + complex fertilizer 200 kg/ha annually;
a_{12} – cattle manure 20 t/ha + complex fertilizer 100 kg/ha annually;
a_{13} – cattle manure 20 t/ha + complex fertilizer 200 kg/ha annually.

The applied fertilizers were cattle manure (N_t = 0.685%; K_2O = 0.505%; P_2O_5 = 0.880%) and complex mineral fertilizer 22-22-0.

The seed mixture used for the over seeding contained the following species: *Phleum pratense* 40% - 6 kg/ha; *Dactylis glomerata* 30% - 10 kg/ha; *Trifolium pretense* 30% - 6 kg/ha.

The production was expressed in dry substance and the statistic calculus of the production results was made according to the variance analysis.

RESULTS AND DISCUSSIONS

Production. The organic and mineral fertilization and the over seeding procedure using the above seed mixture influenced the production level (table 1).

The fertilization with cattle manure determined productions increases of 25 – 69%; the biggest production yields were registered for the variants using 10 – 20 t/ha annually + 20 t/ha every second year (5.8 – 6.1 t/ha d.s.).

For the fertilization made only with complex fertilizers, the production increases were of 69 – 108%, obtaining 6.1 – 7.5 t/ha d.s., with 2.5 – 3.9 t/ha d.s. more compared to the control variant.

The combined fertilization, with manure and complex mineral fertilizer, offered production increases of 69 – 206%, better results being obtained for the variants using cattle manure 20 t/ha + complex fertilizer 100 - 200 kg/ha annually (7.3 – 7.4 t/ha d.s.), with 3.7 – 3.8 t/ha d.s. bigger than the control variant.

Floristic structure. The fertilization and over seeding of the *Festuca rubra + Agrostis capillaris* mountain grassland also influenced the floristic structure of the vegetal carpet (table 2). Thus, if in 2007 the graminee species had a percentage of 41 – 49%, the leguminous species of 35 – 43% and the diverse species of 14 – 21%, in 2009, the graminee species had a percentage of 37 – 46%, the leguminous species of 32 – 46% and the diverse species of 13 – 25%.

In 2009, we observed a decrease of the graminee species 'participation with 2 – 4% for the fertilization with cattle manure, with 4 – 12% for the fertilization with mineral compounds and with 2 – 7% for the combined fertilization; the leguminous species 'participation decreased with 2 – 5% for the fertilization with cattle manure, increase with 4 – 6% for the fertilization with mineral compounds and with 2 – 6% for the combined fertilization; the participation of the diverse species increased for all types of fertilization: with 4 – 7% for the fertilization with cattle manure, with 6% for the fertilization with 200 kg/ha mineral compounds and with 1 – 3% for the combined fertilization.

Table 1

The influence of fertilization and over seeding on production for the mountain grassland of *Festuca rubra + Agrostis capillaris* (2007 – 2009)

No crt	Fertilization	Production		Differences (t/ha d.s.)	Significance
		t/ha ds	%		
1	control	3.6	100	-	
2	manure 10 t/ha annually	4.5	125	0.9	xxx
3	manure 20 t/ha annually	4.8	133	1.2	xxx
4	manure 10 t/ha annually + 10 t/ha every 2nd year	5.2	144	1.6	xxx
5	manure 10 t/ha annually + 20 t/ha every 2nd year	5.8	161	2.2	xxx
6	manure 20 t/ha annually + 10 t/ha every 2nd year	5.5	153	1.9	xxx
7	manure 20 t/ha annually + 20 t/ha every 2nd year	6.1	169	2.5	xxx
8	complex fertilizer 100 kg/ha annually	6.1	169	2.5	xxx
9	complex fertilizer 200 kg/ha annually	7.5	208	3.9	xxx
10	manure 10 t/ha + complex fertilizer 100 kg/ha annually	6.1	169	2.5	xxx
11	manure 10 t/ha + complex fertilizer 200 kg/ha annually	6.7	186	3.1	xxx
12	manure 20 t/ha + complex fertilizer 100 kg/ha annually	7.3	203	3.7	xxx
13	manure 20 t/ha + complex fertilizer 200 kg/ha annually	7.4	206	3.8	xxx
LSD 5% = 0.5 t/ha; LSD 1% = 0.7 t/ha; LSD 0.1% = 0.9 t/ha.					

CONCLUSIONS

1. The permanent grasslands from the mountain area can provide, in general, the required succulent and fiber full fodder for the animals;

2. The increase of these grassland types' production can be obtained by fertilization with organic and mineral compounds and by over seeding with a mixture of grassland perennial graminee and leguminous species;

3. The fertilization of the over seeded mountain grasslands offer big production yields, of 4.5 – 6.1 t/ha d.s. for the variants treated with cattle manure, of 6.1 – 7.5 t/ha d.s. for the variants treated complex mineral fertilizers and of 6.1 – 7.4 t/ha d.s. for the variants treated with combined organic and mineral fertilizers;

4. The fertilization and the over seeding procedure also influenced the vegetal carpet's floristic structure; compared to year 2007, in 2009 we registered a decrease of the graminee species' participation with 2 – 7%, an increase of the leguminous species' participation with 2 – 6% for the variants using combined fertilization and an increase of the diverse species' participation with 1 – 7%.

Table 2

The influence of fertilization and over seeding on the floristic structure for the *Festuca rubra* + *Agrostis capillaris* grassland (%)

No crt	Fertilization	Graminee species		Leguminous species		Diverse species	
		2007	2009	2007	2009	2007	2009
1	control	46	42	37	32	17	26
2	manure 10 t/ha annually	44	44	35	35	21	21
3	manure 20 t/ha annually	48	46	38	34	14	20
4	manure 10 t/ha annually + 10 t/ha every 2nd year	46	44	38	36	16	20
5	manure 10 t/ha annually + 20 t/ha every 2nd year	46	42	37	33	17	25
6	manure 20 t/ha annually + 10 t/ha every 2nd year	45	41	39	36	16	23
7	manure 20 t/ha annually + 20 t/ha every 2nd year	41	38	46	42	13	20
8	complex fertilizer 100 kg/ha annually	45	41	40	44	15	15
9	complex fertilizer 200 kg/ha annually	49	37	40	46	11	17
10	manure 10 t/ha + complex fertilizer 100 kg/ha annually	45	40	42	44	13	16
11	manure 10 t/ha + complex fertilizer 200 kg/ha annually	48	41	40	46	12	13
12	manure 20 t/ha + complex fertilizer 100 kg/ha annually	46	41	42	45	12	14
13	manure 20 t/ha + complex fertilizer 200 kg/ha annually	44	42	43	43	13	15

BIBLIOGRAPHY

1. Barbulescu, C., Motca, Gh., 1983 – *Pajistile muntilor inalti*, Ed. Ceres, Bucuresti.
2. Dihoru, Alexandrine and coworkers, 1977 – *Efectul fertilizarii minerale si a frecventei de recoltare asupra calitatii fitomasei din pajistile permanente din etajul boreal*, Scientific papers, vol. XVIII, Brasov.
3. Iacob, T. and coworkers, 1996 – *Fertilizare si suprainsamantarea, masuri de imbunatatire a pajistilor din Podisul Central Moldovenesc*, Scientific papers, Agricultural series, vol. 39, USAMV Iasi.
4. Vîntu, V., Samuil, C., 1995 – *Influenta suprainsamantarii si fertilizarii asupra valorii nutritive si energetic a pajistilor de Festuca valesiaca*, Cercetari agronomice in Moldova, vol. 1 - 2.