RESEARCH REGARDING THE INFLUENCE OF SIMPLE MIXTURES COMPOSED WITH PERENNIAL LEGUMES AND GRASSES ON NUTRITIONAL STATUS OF TEMPORARY MEADOWS

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Abstract

Research has sought to influence the proportion of legumes in mixtures simple participation on nutritional status of forest steppe grasslands temporary conditions in Moldova. In 2006, it appears that nutritional status nitrogen mixtures with *Medicago sativa* and *Dactylis glomerata* was better compared with mixtures with *Bromus inermis* and *Onobrychis viciifolia*. The mixture with 20% *Medicago sativa* + 80% *Dactylis glomerata* and at all mixtures with *Onobrychis viciifolia* nitrogen nutritional status on the four graduation was poor during the first year of vegetation. In 2007 nitrogen nutritional status was better than first year, the average index was between 96 – 108 INN at the mixtures with *Medicago sativa* + *Dactylis glomerata* and between 91-102 at the mixtures with *Onobrychis viciifolia* + *Bromus inermis*.
In 2008 nitrogen nutritional status was better than in previous years due to symbiotic activity of legumes from mixtures, the index was between 119-134 at the mixtures with *Medicago sativa* and *Dactylis glomerata* and between 114-128 at the mixtures with *Onobrychis viciifolia* and *Bromus inermis.*
From the mixtures used the highest value of 140 INN was obtained from the mixture with 70% *Medicago sativa* + 30% *Dactylis glomerata* at fertilization with N200P100 kg/ha. At the mixtures with *Onobrychis viciifolia* the highest value of the INN was 130, at the mixture with 70% *Onobrychis viciifolia* + 30% *Bromus inermis* at fertilization with N200P100 kg/ha.

Key words: temporary meadows, simple mixtures, nitrogen, leguminous, fertilization

In the conditions of continuous and sustained growth of Earth populations, the suficient providing with food products became a more acut problem, transformed from a national matter to a global one. Due to this fact, the demand for animal products keeps on growing, and the development of zootechnic industry forces an increase in quantity and quality of the forage.

Temporary grasslands, consisting of perennial grasses and legumes, is one of the main effective measures that contribute to the improvement of forage (Golinski P. 2008; Vintu V., 1996). The productivity of temporary meadows is influenced by the pedo-climatic conditions, of fertilization, especially the ones with nitrogen, as well as the mixtures of perennial herbs used at their establishment (Samuil C., 2010, Carlsson G., 2003).

In grassland ecosystems, they represent the main sources of nitrogen fixing biological nitrogen fertilizer applications and, to a lesser extent, deposits of inorganic combinations by precipitation (U. Thumm, 2008; Motca G., 1992, Samuil C., 1995; Vintu V., 2011).

To determine nutrient needs and to get a quality feed in environmental conditions, may cause nutritional indices (Lemaire I., Gast F, Solette J., 1989).

The nutrition status with nitrogen of grasslands is considered normal when INN has values between 80 and 100%. The lower values show that nitrogen is insufficient and the higher values indicate over-nutrition.

It is considered that the normal state corresponds to the nitrogen nutrition index values ranging from 80-120, while lower values indicate a 80 poor nutritional status, and values greater than 120, a state of nutritional excess (Brau-Nogue, Bassignon M., Bornard A., 1994; Lambert R. şi col. 1994).

MATERIAL AND METHOD

This research aimed to influence the mix of perennial grasses and legumes, and the influence of fertilization with mineral and organic fertilizers on the nutritional status of the soil.

Experience was done within Ezăreni Farm in spring 2005, on a cambium chernozem, with pH between 6.7 and 6.8 and humus content of 2.73 to 2.93%, 21-25 ppm P_{AL}, 226-232 ppm K_{AL} and 112-139 ppm CaO.

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The experience was the bi-factorial, located according to the method of subdivided parcels in four repetitions.

Factors studied were:

Factor A = fertilization, with 4 graduations:

A_1 - control (unfertilized);

A_2 - $N_{200}P_{100}$ kg/ha;

A_3 - 5 t/ha vinassa;

A_4 - 30 t/ha manure.

Factor B = mixture of perennial grasses and legumes with six graduations:

B_1– *Medicago sativa 70 % + Dactylis glomerata 30 %;*

B_2 – *Medicago sativa 50 % + Dactylis glomerata 50 %;*

B_3 – *Medicago sativa 30 % + Dactylis glomerata 70 %;*

B_4 – *Onobrychis viciifolia 70 % + Bromus inermis 30 %;*

B_5 – *Onobrychis viciifolia 50 % + Bromus inermis 50 %;*

B_6 - *Onobrychis viciifolia 30 % + Bromus inermis 70 %;*

Manure, vinassa and phosphorus fertilizers were used in autumn 2005, and nitrogen fertilizers were used in the spring before preparing the ground for sowing.

Vinassa is a by-product obtained after evaporation of waste water from factories that produce yeast. Vinassa has a complex chemical composition, being rich in total nitrogen (3.0 to 3.2%), very rich in potassium (5-7%) and low phosphorus (0.3 to 0.5%). At a rate of 1000 kg manure, the chemical composition was of 5 kg N, 3 kg P_2O_5 and 7 kg K_2O.

To determine the chemical composition of feed were used the following methods of analysis: dry matter content (DM) by drying in an oven at a temperature of 105° C for 5 hours, total nitrogen (Nt) by the Kjeldahl method;

The nutrition index with nitrogen was determined with the following relation, (after G. Lemaire et al., 1989):

- $INN = 100 \times N/4{,}8 \times (DM)^{-0{,}32}$, where:

N - nitrogen content in the plant (%),

DM - production of DM (t/ha).

RESULTS AND DISCUSSIONS

In 2006, at the mixture with 70% *Medicago sativa* + 30% *Dactylis glomerata*, the average index of nitrogen nutrition on the four graduation was 95, at the mixture with 50% *Medicago sativa* + 50% *Dactylis glomerata* INN dropped to 88, and at the mixture with 20% Medicago sativa + 80% *Dactylis glomerata* INN value was 73.

At the mixture 70% *Onobrychis viciifolia* + 30% *Bromus inermis* INN was 78, at the mixture with 50% *Onobrychis viciifolia* + 50% *Bromus inermis* was 71, and at the mixture 20% *Onobrychis viciifolia* was 57.

Table 1

The influence of fertilization on the index of nutrition with nitrogen (INN) in 2006

Experimental variant	Graduations	Nt % from DM	DM t/ha	INN	Average
B 1 M.s.70% + D.g. 30%	A1	2.71	3.46	84	95
	A2	2.86	5.38	102	
	A3	2.83	4.76	97	
	A4	2.82	4.52	95	
B 2 M.s.50 % + D.g. 50 %	A1	2.62	3.05	78	88
	A2	2.79	4.52	94	
	A3	2.75	4.20	91	
	A4	2.74	3.71	87	
B 3 M.s.20 % + D.g. 80 %	A1	2.44	2.31	66	73
	A2	2.61	3.08	78	
	A3	2.56	3.01	76	
	A4	2.54	2.73	73	
B 4 O.v.70 % + B.i. 30 %	A1	2.63	2.25	71	78
	A2	2.71	3.31	83	
	A3	2.68	3.20	81	
	A4	2.66	2.86	78	
B 5 O.v.50 %+ B.i. 50 %	A1	2.55	1.85	65	71
	A2	2.60	2.65	74	
	A3	2.58	2.45	72	
	A4	2.59	2.40	71	
B 6 O.v.20 %+ B.i. 80 %	A1	2.41	1.13	52	57
	A2	2.53	1.40	59	
	A3	2.52	1.35	58	
	A4	2.51	1.36	58	

INN value increased at mixture with 70% *Medicago sativa* + 30% *Dactylis glomerata* from 84 to variant unfertilized, at 102 to N200P100 kg/ha, 97 at 5 t/ha vinassa and 95 at 30 t/ha

manure. At the mixture with 20% *Medicago sativa* + 80% *Dactylis glomerata* INN value increased from 66 to variant without fertilization from 78 at N200P100 kg/ha, 76 at 5 t/ha vinassa and from 73 at 30 t/ha manure.

From the data presented the nitrogen nutritional status at the first two mixtures b_1 and b_2 was good, and at the mixture with 20% *Medicago sativa* + 80% *Dactylis glomerata* the INN value fell below the critical at all graduations. At the mixtures with *Onobrychis viciifolia* and *Bromus inermis* INN values were low, which is around the critical level of 80 (figure 1).

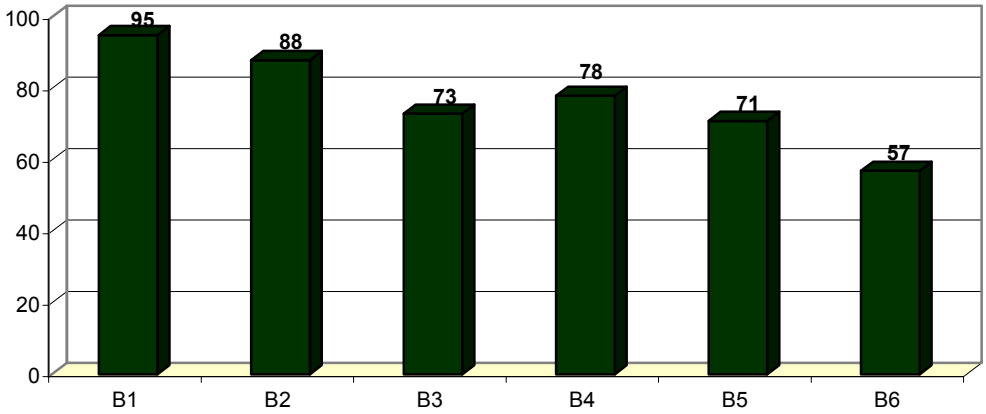

Figure 1 **The influence of mixture on the index of nutrition with nitrogen (INN) in 2006**

In 2007 nitrogen nutritional status was better than in 2006, explained by the symbiotic activity of mixtures of legumes and by additional fertilization with 100 kg nitrogen on A_2 and 50 kg nitrogen on A_3 and A_4 (table 2).

The INN values has increased on the graduation with fertilization depending on the nature and dosage of fertilizers.

The average value of INN on the four graduations decreased with decreasing percentage of participation of legumes in the mixture. Thus, the mixture with 70% *Medicago sativa* + 30% *Dactylis glomerata* INN average was 108, at the mixture with 50% *Medicago sativa* + 50% *Dactylis glomerata* was 103 and 93 at the mixture with 20% *Medicago sativa* + 80% *Dactylis glomerata*.

Table 2

The influence of fertilization on the index of nutrition with nitrogen (INN) in 2007

Experimental variant	Graduations	Nt % from DM	DM t/ha	INN	Average
B 1 M.s.70% + D.g. 30%	A1	2.46	8.24	101	108
	A2 x	2.67	9.51	114	
	A3 xx	2.64	8.75	110	
	A4 xx	2.60	8.76	108	
B 2 M.s.50 % + D.g. 50 %	A1	2.45	7.43	97	103
	A2 x	2.64	8.32	108	
	A3 xx	2.58	7.92	104	
	A4 xx	2.55	8.23	104	
B 3 M.s.20 % + D.g. 80 %	A1	2.38	6.83	92	96
	A2 x	2.49	7.28	98	
	A3 xx	2.47	7.11	96	
	A4 xx	2.43	7.58	97	
B 4 O.v.70 % + B.i. 30 %	A1	2.36	9.33	100	102
	A2 x	2.43	9.99	106	
	A3 xx	2.39	9.42	102	
	A4 xx	2.38	9.36	101	
B 5 O.v.50 %+ B.i. 50 %	A1	2.27	8.67	94	98
	A2 x	2.35	9.35	100	
	A3 xx	2.38	8.92	100	
	A4 xx	2.33	8.58	97	
B 6 O.v.20 %+ B.i. 80 %	A1	2.25	6.43	85	91
	A2 x	2.36	7.64	94	
	A3 xx	2.35	7.42	93	
	A4 xx	2.33	7.28	92	

x + $N_{100}P_{50}$ xx + $N_{50}P_{50}$

At the mixture with 70 % *Onobrychis viciifolia* + 30 % *Bromus inermis* average of INN was 102, at the mixture with 50% *Onobrychis viciifolia* + 50% *Bromus inermis* was 98, and at the mixture with 20% *Onobrychis viciifolia* + 80% *Bromus inermis* was 91.

The higher values of INN at mixtures with *Medicago sativa* and *Dactylis glomerata* is due that the symbiotic activity of the species *Medicago sativa* reaches a higher nutritional status better than mixtures with *Onobrychis viciifolia* and *Bromus inermis* (fig. 2).

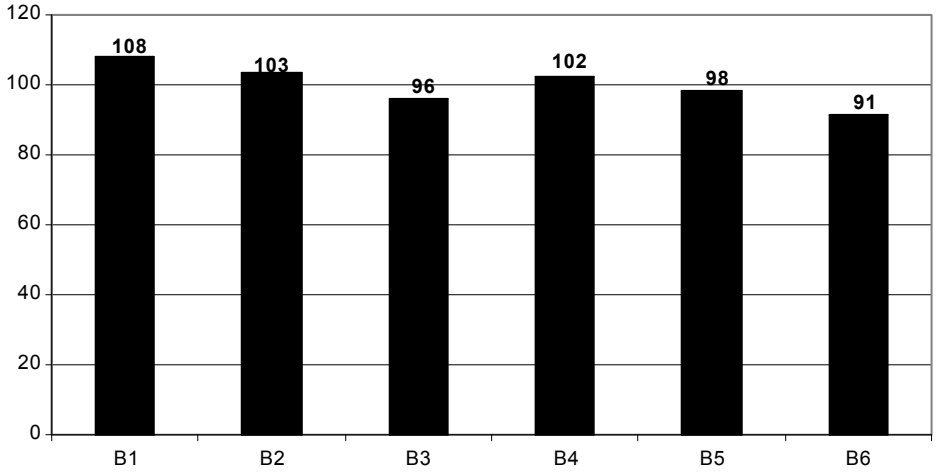

Figure 2 **The influence of mixture on the index of nutrition with nitrogen (INN) in 2007**

In 2008 (table 3) nitrogen nutritional status was better than in previous years, something explained both by symbiotic activity of mixtures of legumes and by additional fertilization with 100 kg nitrogen after base fertilisation with N200P100 kg/ha and 50 kg nitrogen on base fertilisation with 5 t/ha vinassa and 30 t/ha manure.

Of the four graduations the highest values were obtained from base fertilization with N200P100 kg/ha and annual fertilization with N100P50 kg/ha.

Table 3

The influence of fertilization on the index of nutrition with nitrogen (INN) in 2008

Experimental variant	Graduations	Nt % from DM	DM t/ha	INN	Average
B 1 M.s.70% + D.g. 30%	A1	2.38	18.09	125	134
	A2 x	2.57	20.09	140	
	A3 xx	2.44	21.06	135	
	A4 xx	2.48	20.35	136	
B 2 M.s.50 % + D.g. 50 %	A1	2.35	18.07	124	133
	A2 x	2.54	20.13	138	
	A3 xx	2.41	21.82	135	
	A4 xx	2.43	20.83	134	
B 3 M.s.20 % + D.g. 80 %	A1	2.14	17.31	111	119
	A2 x	2.38	19.45	128	
	A3 xx	2.16	20.84	119	
	A4 xx	2.12	20.84	117	
B 4 O.v.70 % + B.i. 30 %	A1	2.30	17.20	119	128
	A2 x	2.47	18.12	130	
	A3 xx	2.46	19.92	133	
	A4 xx	2.42	19.77	131	
B 5 O.v.50 %+ B.i. 50 %	A1	2.34	16.47	119	121
	A2 x	2.43	16.92	125	
	A3 xx	2.26	18.65	120	
	A4 xx	2.28	18.57	121	
B 6 O.v.20 %+ B.i. 80 %	A1	2.09	16.55	107	114
	A2 x	2.27	18.21	120	
	A3 xx	2.20	17.42	114	
	A4 xx	2.22	17.74	116	

^{x} + $N_{100}P_{50}$ ^{xx} + $N_{50}P_{50}$

The average INN of the four graduations decreased with decreasing percentage of participation of legumes in the mixture, both mixtures of *Medicago sativa* and *Dactylis gloemrata* and those with *Onobrychis viciifolia* and *Bromus inermis*.

Thus, at the mixture with 70 % *Medicago sativa* + 30% *Dactylis glomerata* the INN average was 134, at the mixture with 50% *Medicago sativa* + 50% *Dactylis glomerata* was 153 and at the mixture with 20% *Medicago sativa* + 80% *Dactylis glomerata* the INN value fell to 119. At the mixture with 70% *Onobrychis viciifolia* + 30% *Bromus inermis* the INN average was 128, at the mixture of 50% *Onobrychis viciifolia* + 50% *Bromus inermis* was 121, and at the mixture with 20% *Onobrychis viciifolia* + 80% *Bromus inermis* was 114.

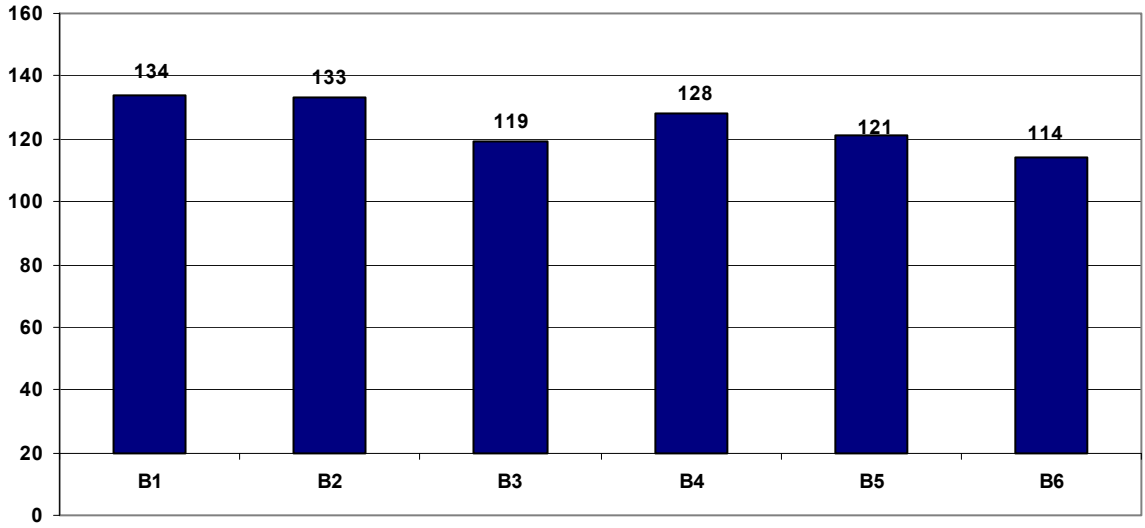

Figure 3 **The influence of mixture on the index of nutrition with nitrogen (INN) in 2008**

The mixtures with 70% *Medicago sativa* + 30% *Dactylis glomerata* and at mixture with *Medicago sativa* 50% nitrogen nutritional status was excess and at the mixture with 20% *Medicago sativa* + 80% *Dactylis glomerata* nitrogen nutritional status was normal (fig. 3). At mixtures with *Onobrychis viciifolia* +*Bromus inermis* nitrogen nutritional status has been in surplus only at the mixture with 70% *Onobrychis viciifolia*. At the mixtures with 50% *Onobrychis viciifolia* + 50 % *Bromus inermis* and 20% *Onobrychis viciifolia* + 80 % *Bromus inermis* nitrogen nutritional status was normal this year.

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CONCLUSIONS

In 2006, the nitrogen nutritional status at the mixtures with *Medicago sativa* was better than the mixtures with *Onobrychis viciifolia*, whose values were around the critical level of 80. Higher values of INN on the first mixtures is due the species *Medicago sativa* that the symbiotic activity reaches a higher nutritional status better than for mixtures with *Onobrychis viciifolia*.

In 2007 nitrogen nutritional status was better than in 2006, explained by the symbiotic activity of legumes and by additional fertilization with 100 kg/ha nitrogen on A_2 and 50 kg/ha nitrogen on A_3 and A_4.

In 2008 the index of nutition with nitrogen at the mixtures with *Medicago sativa* and *Dactylis glomerata* was better compared with mixtures with *Bromus inermis* and *Onobrychis viciifolia*. At the mixtures with 50% and 70% *Medicago sativa* and the mixtures with 50% and 70% *Onobrychis viciifolia* nutritional status has been in surplus, exceeding the value of 120. Regarding the influence of fertilization on nutritional status the INN value in all variants with fertilization were recorded higher values compared with control variant.

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