RESEARCH ON THE INFLUENCE OF FERTILIZATION ON PRODUCTIVITY OF SIMPLE MIXTURE BETWEEN PERRENIAL LEGUMINOUS AND GRASS UNDER THE CONDITIONS OF MOLDAVIAN SILVOSTEPPE

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Abstract

Research has followed the influence of fertilization on productivity of simple mixtures between perennial grass and leguminous under conditions of Moldavian silvostepe. In 2006, on mixtures studied the production increases achieved at fertilization dose N200P100 kg ha^{-1} were statistically ensured only in mixtures with 50% -70% Onobrychis viciifolia and on the 5 t ha^{-1} vinassa and 30 t ha^{-1} manure agrofunds the production increases were statistically ensured only on mixture with 70% Onobrychis viciifolia. In 2007, on fertilization rate of N200P100 kg ha^{-1} was registered a decrease of production of 0.86 t ha^{-1} DM, and production increases statistically ensured were achieved only on mixtures with 20-30% Onobrychis viciifolia. On fertilization with 5 t ha^{-1} vinassa the production increases were higher and statistically ensured on the mixtures with 20-50% Onobrychis viciifolia and on the fertilization with 30 t ha^{-1} manure the production increases were lower than those obtained on fertilization with 5 t ha^{-1} vinassa. In 2008, there were achieved very high productions for the conditions of the Plain of Moldavia on all agrofond, which are equal to the level of production made by some mixtures under irrigation. Fertilization brought production increases to all mixtures, the highest yields were achieved on fertilization with 30 t ha^{-1} manure on mixture with 70% Onobrychis viciifolia + 30% Bromus inermis.

Key words: simple mixtures, fertilization, production, vinassa, nitrogen

INTRODUCTION

Fertilization has a complex action on meadows and is reflected in supply with nutritive elements for each specie and whole vegetation of the meadow.

Relative high productions which are realised on temporary meadows determine also high consumptions of nutritive elements, so their fertilization with mineral and organic fertilizers to be necessary [6, 3, 4].

Starting with year 1990 it was a pass from the period in which high yields must be obtained with ay price to a new period in which the accent is on obtaining high yields but ecologic and unpolluted [2].

At mixtures of grasses and perennial legumes the needed doses of nitrogen fertilizers are low, because a part of this element is assured through a biological way by the symbiotic bacteria which lives of the roots of legumes, but also at these mixtures, in connection with other measures, fertilization plays an important role in obtaining high and qualitative yields [1, 5, 7].

MATERIAL AND METHODS

Research were carried out in period 2006-2008 in an experience with simple mixtures of perennial legumes and grasses placed on a chambic chernozem with 6.6 pH, humus content of 3.52 %, 27 ppm P_2O_5 and 225 ppm K_2O. The research aimed to observe the influence of fertilization with mineral and organic fertilizers on yield of simple mixtures.

Experience is bi-factorial placed under the method of sub-divided plots, in four repetitions.

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Factor A = fertilization, with 4 graduations: a_1 - control (unfertilized); a_2 – $N_{200}P_{100}$ kg ha^{-1}; a_3 - 5 t ha^{-1} vinassa; a_4 – 30 t ha^{-1} manure;
Factor B = mixture of perennial grasses and legumes with 6 graduations:
b_1 – *Onobrychis viciifolia 70 % + Bromus inermis 30%;* b_2 – *Onobrychis viciifolia 60% + Bromus inermis 40%;* b_3 – *Onobrychis viciifolia 50% + Bromus inermis 50%* b_4 – *Onobrychis viciifolia 40% + Bromus inermis 60%;* b_5 – *Onobrychis viciifolia 30% + Bromus inermis 70%;* b_6 - *Onobrychis viciifolia 20% + Bromus inermis 80%;*
In mixtures were used the following varieties: *Onobrychis viciifolia* (Splendid) and *Bromus inermis* (Doina).

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 in 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.

Results were statistically processed through the variance analysis and by concretion of limit differences.

RESULTS AND DISCUSSIONS

To enlightened the influence of fertilization on the yield of mixtures of perennial greases and legumes were compared the yields of dry matter at the variant without fertilization with the yields obtained when fertilization was administrated.

In 2006, at mixture 70% *Onobrychis viciifolia* +30% *Bromus inermis* fodder yield was of 3.55 t ha^{-1} DM at variant without fertilization, 4.31 t ha^{-1} DM (121%) at $N_{200}P_{100}$ kg ha^{-1}, 4.20 t ha^{-1} DM (118%) at 5 t ha^{-1} vinassa and of 3.86 t ha^{-1}DM (109%) at 30 t ha^{-1} manure (Table 1).

Table 1 The influence of fertilization on the yield in 2006

Variant	Unfertilized		$N_{200}P_{100}$ kg ha^{-1}				5 t ha^{-1} vinassa				30 t ha^{-1} manure			
	t ha^{-1}	%	t ha^{-1}	%	Dif.	Sign.	t ha^{-1}	%	Dif.	Sign.	t ha^{-1}	%	Dif.	Sign.
B1 - Ov. 70% + Bi. 30%	3.55	100	4.31	121	0.76	*	4.20	118	0.65	*	3.86	109	0.31	*
B2 - Ov. 60% + Bi. 40%	3.26	100	3.95	121	0.69	*	3.63	111	0.37	-	3.52	108	0.26	-
B3 - Ov. 50% + Bi. 50%	3.15	100	3.65	116	0.50	*	3.45	110	0.30	-	3.40	108	0.25	-
B4 - Ov. 40% + Bi. 60%	2.79	100	3.08	110	0.29	-	3.03	109	0.24	-	2.92	105	0.15	-
B5 - Ov. 30% + Bi. 70%	2.42	100	2.62	108	0.20	-	2.50	103	0.08	-	2.48	102	0.06	-
B6 - Ov. 20% + Bi. 80%	2.23	100	2.40	108	0.17	-	2.35	105	0.12	-	2.36	106	0.13	-

LSD 0.05%= 0.39 t ha^{-1}

At mixture with 50% *Onobrychis viciifolia* +50% *Bromus inermis* fodder yield was of 3.5 t ha^{-1} DM at variant without fertilization, 3.65 t ha^{-1} DM (116%) at $N_{200}P_{100}$ kg ha^{-1}, 3.45 t ha^{-1} DM (110%) at 5 t ha^{-1} vinassa and of 3.40 t ha^{-1} DM (108%) at 30 t ha^{-1} manure.

At mixture with 20% *Onobrychis viciifolia* + 80 % *Bromus inermis* production was of 2.23 t ha^{-1} DM at variant without fertilization, 2.40 t ha^{-1} DM (108%) at $N_{200}P_{100}$ kg ha^{-1}, 2.35 t ha^{-1} DM (105%) at 5 t ha^{-1} vinassa and of 2.36 t ha^{-1} DM (106%) at 30 t ha^{-1} manure (table 1).

From the studied mixtures the production increase realized for fertilization with $N_{200}P_{100}$ kg ha^{-1} were statistically assured only for the mixtures with 50-70% *Onobrychis viciifolia*, and for the agro-funds with 5 t ha^{-1} vinassa and with 30 t ha^{-1} manure the increasing of yield was statistically assured only for the mixture with 70 % *Onobrychis viciifolia*.

In 2007, year extremely drought, fertilization brings lower yield increases in comparison with 2006. At mixture with 70 % *Onobrychis viciifolia* +30% *Bromus inermis*

fodder production was of 9.33 t ha^{-1} DM at variant without fertilization, 9.99 t ha^{-1} DM (107%) at $N_{200}P_{100}$ kg ha^{-1}, 9.42 t ha^{-1} DM (101%) at 5 t ha^{-1} vinassa and of 9.36 t ha^{-1} DM (100%), at 30 t ha^{-1} manure.

At mixture with 50% *Onobrychis viciifolia* +50% *Bromus inermis* production was of 8.67 t ha^{-1} DM at variant without fertilization, 9.35 t ha^{-1} DM (108%) at $N_{200}P_{100}$ kg ha^{-1}, 8.92 t ha^{-1} DM (103%) at 5 t ha^{-1} vinassa and 8.58 t ha^{-1} DM (99%) at 30 t ha^{-1} manure, and at mixture with 20% *Onobrychis viciifolia* + 80 % *Bromus inermis* fodder yield was of 6.43 t ha^{-1} DM at variant without fertilization, 7.64 t ha^{-1} DM (119%) at $N_{200}P_{100}$ kg ha^{-1}, 7.42 t ha^{-1} DM (115%) at 5 t ha^{-1} vinassa and 7.28 t ha^{-1} DM (113%) at 30 t ha^{-1} manure (Table 2).

Table 2 The influence of fertilization on the yields in 2007

Variant	Unfertilized		$N_{200}P_{100}$ kg ha^{-1}				5 t ha^{-1} vinassa				30 t ha^{-1} manure			
	t ha^{-1}	%	t ha^{-1}	%	Dif.	Sign.	t ha^{-1}	%	Dif.	Sign.	t ha^{-1}	%	Dif.	Sign.
B1 - O.v. 70% + B.i 30%	9.33	100	9.99	107	0.66	*	9.42	101	0.09	-	9.36	100	0.03	-
B2 - O.v. 60% + B.i 40%	9.01	100	9.71	108	0.70	*	9.18	102	0.17	-	9.15	102	0.14	-
B3 - O.v. 50% + B.i 50%	8.67	100	9.35	108	0.68	*	8.92	103	0.25	-	8.58	99	-0.09	-
B4 - O.v. 40% + B.i 60%	7.71	100	8.55	111	0.84	*	8.12	105	0.41	*	8.04	104	0.33	-
B5 - O.v. 30% + B.i 70%	7.26	100	8.24	113	0.98	*	8.03	111	0.77	*	7.85	108	0.59	*
B6 - O.v. 20% + B.i 80%	6.43	100	7.64	119	1.21	*	7.42	115	0.99	*	7.28	113	0.85	*

LSD 0.0 5 %= 0.41 t ha^{-1}

At fertilization with $N_{200}P_{100}$ kg ha-1, at mixture with 70 % *Onobrychis viciifolia* +30% *Bromus inermis* was obtained an increase of yield production of 0.66 t ha^{-1} DM, at mixture with 50% *Onobrychis viciifolia* + 50 % *Bromus inermis* of 0.68 t ha^{-1} DM and at mixture with 20 % *Onobrychis viciifolia* + 80% *Bromus inermis* the production gain was of 1.21 t ha^{-1} DM production gains were statistically assured.

In 2008 were realised very high productions for the conditions from Plain of Moldavia, those ones being at the level of obtained yields recorder for some mixture in irrigated conditions. At mixture with 70 % *Onobrychis viciifolia* +30% *Bromus inermis* fodder yield was of 19.62 t ha^{-1} DM on the agro-fund without fertilization, 19.28 t ha^{-1} DM (98%) at $N_{200}P_{100}$ kg ha^{-1}, 20.00 t ha^{-1} DM (102%) at 5 t ha^{-1} vinassa and 20.23 t ha^{-1} DM (103%) at 30 t ha^{-1} manure. At mixture with 50% *Onobrychis viciifolia* +50% *Bromus inermis* production was of 18.49 t ha^{-1} DM at variant without fertilization, 18.72 t ha^{-1} DM (101%) at $N_{200}P_{100}$ kg ha^{-1}, 19.16 t ha^{-1} DM (104%) at 5 t ha^{-1} vinassa and of 18.94 t ha^{-1} DM (102%), at 30 t ha^{-1} manure. At mixture with 20% *Onobrychis viciifolia* +80% *Bromus inermis* fodder production was of 13.11 t ha^{-1} DM at variant without fertilization, 14.90 t ha^{-1} DM (108%) at $N_{200}P_{100}$ kg ha^{-1}, 15.33 t ha^{-1} DM (117%) at 5 t ha^{-1} vinassa and 15.24 t ha^{-1} DM (116%) at 30 t ha^{-1} manure.

Fertilization with $N_{200}P_{100}$ kg ha^{-1} realised a production minus of 0.86 t ha^{-1} DM and production increases statistically assured were realises only at the mixtures with 20 - 30 % *Onobrychis viciifolia* (Table 3).

At fertilization with 5 t ha^{-1} vinassa production gains were higher being statistically assured at mixtures with 20-50% *Onobrychis viciifolia* and at fertilization with 30 t ha^{-1} manure production gains were lower that at fertilization with 5 t ha^{-1} vinassa.

Table 3 The influence of fertilization on the yields in 2008

Variant	Unfertilized		$N_{200}P_{100}$ kg ha^{-1}				5 t ha^{-1} vinassa				30 t ha^{-1} manure			
	t ha^{-1}	%	t ha^{-1}	%	Dif.	Sign.	t ha^{-1}	%	Dif.	Sign.	t ha^{-1}	%	Dif.	Sign.
B1 - O.v. 70% + B.i 30%	19.62	100	19.28	98	-0.34	-	20.00	102	0.38	-	20.23	103	0.61	*
B2 - O.v. 60% + B.i 40%	19.72	100	18.86	96	-0.86	O	19.32	98	-0.40	-	20.71	105	0.99	*
B3 - O.v. 50% + B.i 50%	18.49	100	18.72	101	0.23	-	19.16	104	0.67	*	18.94	102	0.45	-
B4 - O.v. 40% + B.i 60%	17.54	100	17.91	102	0.37	-	18.18	104	0.64	*	18.09	103	0.55	-
B5 - O.v. 30% + B.i 70%	16.33	100	16.93	104	0.60	*	17.68	108	1.35	*	17.62	108	1.29	*
B6 - O.v. 20% + B.i 80%	13.11	100	14.12	108	1.01	*	15.33	117	2.22	*	15.24	116	2.13	*

LSD 0.0 5 %= 0.60 t ha^{-1}

CONCLUSIONS

In 2006, comparing the obtained yields on the agro-funds with fertilization with the unfertilized one, we observe that at fertilization with $N_{200}P_{100}$ kg ha^{-1} were statically assured only the mixtures with 50-70% *Onobrychis viciifolia* and on the agro-funds with 5 t ha-1 vinassa and with 30 t ha^{-1} manure production gains were statistically assured only at the mixture with 70% *Onobrychis viciifolia.*

In 2007, even if the year was a drought one, the realised productions were quite high. In this year fertilization with $N_{200}P_{100}$ kg ha^{-1} assured yield gains statistically assured at all the studied mixtures. At fertilization with 5 t ha^{-1} vinassa and 30 t ha^{-1} manure was realised production gains statistically assured at mixtures with 20 - 40% *Onobrychis viciifolia.*

In 2008 fertilization with $N_{200}P_{100}$ kg ha^{-1} assured production gains statistically assured at mixtures with 20 - 30 % *Onobrychis viciifolia.* Fertilization with 5 t ha^{-1} vinassa realised gains statistically assured at variants with 20 - 50% *Onobrychis viciifolia.*

On the agro-fund fertilized with 30 t ha^{-1} manure production gains weren't statistically assured at mixtures with 40% and 50 % *Onobrychis viciifolia.*

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