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RESEARCH ON THE REMANENT EFFECT OF ORGANIC FERTILIZATION ON SILO MAIZE PRODUCTION

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Abstract

In the last decade, it has become imperative to implement a system of sustainable development meant to preserve and improve soil resources, protect biodiversity and reduce pollution, given the changes undergone in agricultural ecosystems and the raised prices of chemical fertilizers.

Under these circumstances, organic fertilization represents a viable alternative to increase soil fertility, humus supply in soil so as to obtain high and steady yields with maximized inputs and minimum impact on the environment and end consumers.

This paper aims to determine the remanent effect of stable manure on silo maize production.

In order to attain this objective in the period 2002-2005, in the pedoclimatic conditions in Belciugatele Didactic Station, a bifactorial experiment was carried out to assess the influence of the studied hybrid (Vultur, Milcov, Paltin) and the amount of the applied manure (40, 50, 60, 70 t/ha) on silo maize production.

Following the research there could be seen that the highest yields were obtained at rates of 70 t/ha, the most productive being the Paltin hybrid and least productive the Milcov hybrid. All the hybrids had very significant yield boosts when increasing the applied manure doses.

In the second and third year of organic fertilization, the recorded yields were smaller compared to the ones obtained in the first year of fertilization.

INTRODUCTION

Lately the tracts of land cultivated with maize decreased from 3227 thousand ha in 1996 to 2520 thousand ha in 2006 (2007 statistical yearbook), the selling prices remained the same and the prices of chemical fertilizers have substantially grown.

A major goal of sustainable development is to improve silo maize forage quality, taking into consideration the impact on environment and on the primary consumer (the animal). In order to monitor the remanent effect of organic fertilization on the production, on the forage quality and on soil properties, a bifactorial experiment was carried out, focusing on the hybrid influence and the manure dosis on biomass production.

MATERIAL AND METHODS

Research was carried out at Belciugatele Didactic Station, belonging to UASVM Bucharest.

To attain the goal set for the period 2002-2005 a bifactorial experiment was carried out where:

Factor A - Hybrid with three graduations	Factor B - Manure with 4 graduations
-a1-Vultur	-b1-40 t/ha
-a2-Paltin	-b2-50 t/ha
-a3-Milcov	-b3-60 t/ha
	-b4-70 t/ha

The surface of the experimental plot was of 20 m^2. The sowing density was of 70,000 plants/ha. The direct effect (year I) of manure was studied during 3 years: 2002, 2004, 2005. The remanent effect in the third year was studied in 2005.
The natural conditions where the experiment was carried out. The mean daily temperatures during the growing season did not exceed 25 ^{0}C. The rain fall pattern during the experimenting period shows that the year 2002 had high precipitations (838.5 mm), the year 2004 was dry (591.0 mm), the average of precipitations not exceeding the multiannual average on 10 years (609.7 mm) and the year 2005 had the highest precipitations, recording 1120.6 mm, which exceeded the known multiannual figures.

The soil is cambic chernozem (phaeozem) with loamy-clayey texture, humus content of 3% at the surface and 1% at the depth of 1 m, pH between 6.3-6.8.

RESULTS AND DISCUSION

Influence of the interaction between the hybrid and the manure doses on yield (whole plant), in the first year.

Influence of fertilization on production in the first year after applying manure

The amount of the silo maize yield in the first year after applying manure variest between 12 and 15 t/ha. When analyzing the influence of fertilization amount in Table 1 on mean yields for the three hybrids there can be seen that the increase in fertilization amount leads to statistically insured yield boosts. The boosts vary between 0.33 t/ha when fertilizing with 50 t/ha and 1.33 t/ha when fertilizing with 70 t/ha.

The influence of fertilization on production for each hybrid after applying manure

When analysing the data in Table 1, there can be seen that for all the studied hybrids the increase in fertilization amount leads to yield boosts, which are very significant for the fertilization with 60 t manure in comparison with the witness treatment b_1 fertilized with 40 t manure/ha.

Influence of hybrid on production in the first year after applying manure

Of all the studied hybrids the Milcov hybrid has the best reaction to increasing the fertilizer amount which leads to very significant yield boosts

Influence of the interaction between hybrid and manure doses on production (whole plant), in the second year.

Influence of fertilization on production in the second year after applying manure

When analyzing the data presented Table 2, there can be seen that in the second year after applying manure, the mean production level for the three hybrids was between 12.03 t/ha when fertilizing with 40 t/ha and 14.03 t/ha when fertilizing with 70 t/ha. The yield boosts obtained in comparison with the treatment fertilized with 40 t/ha are very significant and vary between 0.52 t/ha when fertilizing with 50 t/ha and 2 t/ha when fertilizing with 70 t/ha.

Influence of fertilization on production for each hybrid in the second year after applying manure

There can be seen that for all the studied hybrids the increase in fertilization amount leads to yield boosts, which are very significant when fertilizing with more than 60 t manure/ha compared with the control treatment b_1 fertilized with 40 t manure/ha. When fertilizing with 50 t manure/ha the obtained yield boosts are significant for the Milcov hybrid and distinctly significant for the other two hybrids. Of the three hybrids the Milcov hybrid had the best reaction to increasing fertilization amount.

Influence of hybrid on production in the second year after applying manure

When fertilizing with 40 t manure/ha, the yield level was between 11 and 13.09 t/ha and when fertilizing with 70 t manure/ha the yields were between 11.97 and 14.07 t/ha. When comparing the yield level for the three studied hybrids there can be seen that no matter the manure amount applied the highest yield was recorded in the Paltin hybrid.

Influence of the interaction between hybrid and manure doses on production (whole plant) in the third year.

Influence of fertilization on production in the third year after manure application

Analysing the data in Table 3, there can be seen that in the third year after applying manure, the mean production level for the three hybrids was of 11.31 t/ha when fertilizing with 40 t/ha and 13.01 t/ha when fertilizing with 70 t/ha. The yield boost obtained in comparison with the treatment fertilized with 40 t/ha are very significant and vary between 0.5 t/ha when fertilizing with 50 t/ha and 1.7 t/ha when fertilizing with 70 t/ha.

Table 1

Production of dry matter in the first year of manure application

Manure doses	Influence of hybrid on production												Influence of fertilization on production					
	b_1 40 t/ha			b_2 50 t/ha			b_3 60 t/ha			b_4 70 t/ha								
Hybrid	Prod	Dif. a_n-a_1	Signif	Prod	Dif. a_n-a_1	Signif	Prod	Dif. a_n-a_1	Signif	Prod	Dif. a_n-a_1	Signif	Dif. b_2-b_1	Signif	Dif. b_3-b_1	Signif	Dif. b_4-b_1	Signif
a_1 Vultur	13.0	-	Mt	13.0	-	Mt	14.0	-	Mt	14.0	-	Mt	0	-	1.0	***	1.0	***
a_2 Paltin	14.0	1.05	***	14.0	1.01	***	15.0	1.28	***	15.0	0.93	***	0	-	1.0	***	1.0	***
a_3Milcov	12.0	-0.13	-	13.0	-0.58	00	13.0	-0.44	0	14.0	-0.63	00	1.0	***	1.0	***	2.0	***
Average of	13.0			13.3			14.0			14.3			0.33	*	1.0	***	1.3	***

B Dl 5%=0.32 t dm/ha Dl 1%=0.58 t dm/ha Dl 0.1%=0.83 t dm/ha
AxB Dl 5%=0.34 t dm/ha Dl 1%=0.49 t dm/ha Dl 0.1%=0.76 t dm/ha
BxA Dl 5%=0.30 t dm/ha Dl 1%=0.42 t dm/ha Dl 0.1%=0.59 t dm/ha

Table 2

Production of dry matter in the second year after applying manure

Manure doses	Influence of hybrid on production												Influence of fertilization on production					
	b_1 40 t/ha			b_2 50 t/ha			b_3 60 t/ha			b_4 70 t/ha								
Hybrid	Prod	Dif. a_n-a_1	Signif	Prod	Dif. a_n-a_1	Signif	Prod	Dif. a_n-a_1	Signif	Prod	Dif. a_n-a_1	Signif	Dif. b_2-b_1	Signif	Dif. b_3-b_1	Signif	Dif. b_4-b_1	Signif
a_1 Vultur	12.0	Mt	Mt	12.51	Mt	Mt	13.16	Mt	Mt	13.48	Mt	Mt	0.51	**	1.16	***	1.48	***
a_2 Paltin	13.09	1.09	***	13.65	1.14	***	14.28	1.12	***	14.96	1.48	***	0.56	**	1.19	***	1.87	***
a_3Milcov	11.0	-1	ooo	11.49	-1.02	ooo	12.75	-0.41	o	13.66	0.18	-	0.49	*	1.75	***	2.66	***
Average of	12.03			12.55			13.40			14.03			0.52		1.37		2.00	

B Dl 5%=0.31 t dm/ha Dl 1%=0.50 t dm/ha Dl 0.1%=0.78 t dm/ha
AxB Dl 5%=0.34 t dmha Dl 1%=0.48 t dm/ha Dl 0.1%=0.83 t dm/ha
BxA Dl 5%=0.41 t dm/ha Dl 1%=0.66 t dm/ha Dl 0.1%=0.90t dm/ha

Table 3

Production of dry matter in the second year of manure application

Manure doses	Influence of hybrid on production (t/ha)												Influence of fertilization on production (t/ha)					
	b_1 40 t/ha			b_2 50 t/ha			b_3 60 t/ha			b_4 70 t/ha								
Hybrid	Prod	Dif. a_n-a_1	Signif	Prod	Dif. a_n-a_1	Signif	Prod	Dif. a_n-a_1	Signif	Prod	Dif. a_n-a_1	Signif	Dif. b_2-b_1	Signif	Dif. b_3-b_1	Signif	Dif. b_4-b_1	Signif
a_1 Vultur	11.37	Mt	Mt	11.89	Mt	Mt	12.32	Mt	Mt	12.98	Mt	Mt	0.52	***	0.95	***	1.61	***
a_2 Paltin	12.55	1.18	***	12.95	1.06	***	13.61	1.29	***	14.07	1.09	***	0.4	***	1.06	***	1.52	***
a_3Milcov	10.0	-1.37	ooo	10.6	-1.29	ooo	11.58	-0.74	ooo	11.97	-1.01	ooo	0.6	***	1.58	***	1.97	***
Average of	11.31			11.81			12.50			13.01			0.51		1.20	***	1.70	***

B Dl 5%=0.19 t dm/ha Dl 1%=0.30 t dm/ha Dl 0.1%=0.42 t dm/ha
AxB Dl 5%=0.17 t dm/ha Dl 1%=0.27 t dm/ha Dl 0.1%=0.40 t dm/ha
BxA Dl 5%=0.12 t dm/ha Dl 1%=0.16 t dm/ha Dl 0.1%=0.22 t dm/ha

Influence of fertilization on production for each hybrid in the third year after applying manure There can be seen that, for all the studied hybrids the increase in fertilization leads to yield boosts which are very significant when fertilizing with over 40 t manure per ha. The level of yield boosts is between 0.4 and 1.52 t/ha for Paltin hybrid and between 0.6 and 1.97 t/ha for Milcov hybrid. Of the three hybrids the Milcov hybrid best reacts to an increased fertilization.

Influence of hybrid on production in the second year after applying manure
When fertilizing with 40 t manure/ha, the yield level was between 10 and 11.37 t/ha, and when fertilizing with 70 t manure/ha the yield was between 11.97 and 14.07 t/ha. By comparing the level of the obtained yields for three hybrids with the same fertilizer amount, there can be seen that the Paltin hybrid had the highest yields.

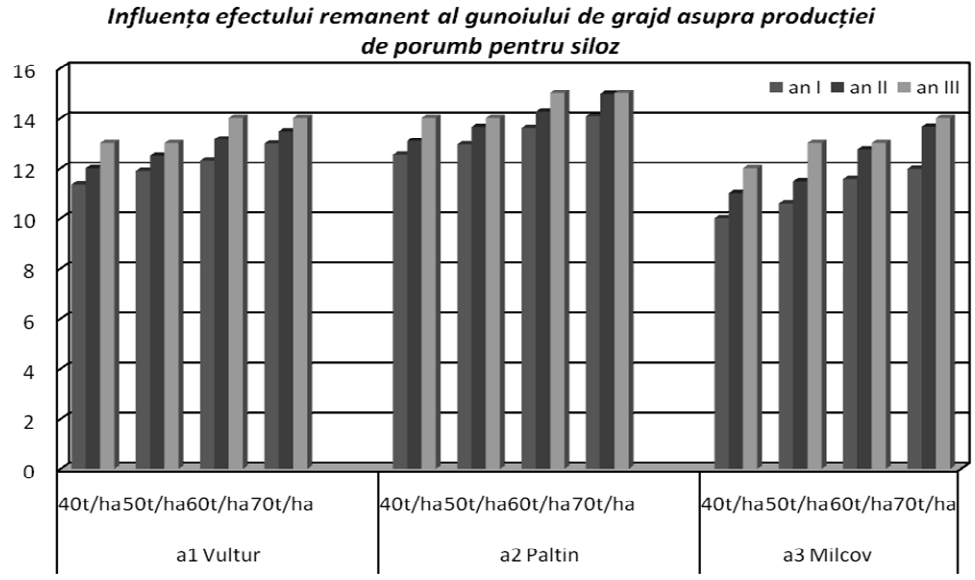

Fig. 1. Influence of the remanent effect of manure on silo maize production

The data presented in Figure 1 and Table 4 show that the remanent effect of manure is most active in the third year, when all the studied hybrids were at maximum levels.

The highest production level for the four fertilization graduations and the three years was recorded in the Paltin hybrid.

Table 4

Silo maize production mean values of dry matter for the three experimenting years (t/ha)

	a1 Vultur	**a2 Paltin**	**a3 Milcov**	***Average***
Year I	12.14	13.29	11.03	*12.16*
Year II	12.78	13.99	12.22	*13.00*
Year III	13.50	14.50	13.00	*13.67*
Average	*12.81*	*13.93*	*12.09*	

CONCLUSIONS

1. Organic fertilization had significant impact on silo maize production, the recorded yield boosts being very significant for all the studied hybrids and for all the fertilization treatments.
2. The highest yields were obtained at rates of 70 t/ha.
3. The hybrid with the best use of manure effect was the Paltin hybrid, a semilate hybrid.
4. The effect of manure was active both in the second and the third year from the application, but yields were 25% lower.

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