

THE EFFECT OF THE COMPOST USED AS FERTILIZER UPON THE PRODUCTION OF SOME MAIZE HYBRIDS

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Abstract

In the climatic conditions of 2005-2007 years, with higher temperatures than the multi-annual average (0.4 – 1.4 °C) and precipitations with higher values in 2005 (with 157.7 mm) and smaller in 2006 and 2007 (with 139.1 respective 220.3 mm) compared with the multi-annual average, on a gleic faeoziom soil from Caraculău, Bacău district, it was organized a experience with three factors regarding increasing dozes of compost, compared with chemical fertilization and without fertilization, at three maize hybrids (Dana, Elan and Turda SU 210) and two sowing density (48000 and 60000 germinal seeds/ha), in order to practice biological agriculture.

After researches were accomplished it was observed that grain production (the average 2005-2007) had the higher value at the variant which was fertilized with 30 t/ ha compost, 6671 kg/ha, with a significant difference of 1883 kg/ha compared with the variant which was unfertilized and a difference of 939 kg/ha compared with the variant which was chemical fertilized (N₁₆₀P₈₀K₈₀).

Turda SU 210 hybrid realized the biggest production of 6671 kg/ha, with a very significant difference than the hybrids Dana and Elan, and density of 60000 germinal seeds/ha determined a significant difference of 317 kg/ha than the 48000 germinal seeds/ha.

The interaction between compost 30t/ha X Turda SU 210 X 60000 germinal seeds/ha realized the higher grain production, with an average on the three years, of 6847 kg/ha.

Key words: organic fertilization, maize hybrids, sowing density.

Organic agriculture could be defined as that way of producing which use most the internal resources and less the allogene resources (from outside), relying on a fertile and alive soil capable to sustain directly the plant productivity and indirectly the animal productivity through the physical, conscious and emotional participation of the human (Axinte, Stela și colab., 2004; Jităreanu, G., Samuil, C., 2003; Roman, Gh. V. și colab., 2006).

The main objective of the biological agriculture and the mechanism which is rely the animal and plant productivity from the future is the permanent increase of the soil fertility, the agricultural and wild high biodiversity and restoring the ecological balance for plant protection (Aubert, C., 1997; Ionescu, Gh., 2005; Lampkin, N., 1994; Toncea, I., 2002).

Although is perceived as a novelty, the concept of biological agriculture which combine the traditional practices with scientifically novelties, was scientific founded almost one century ago (1924) by Rudolf Steiner doctor, chemist and Austrian philosopher, founder of the adropostrophy which has the target the elaboration of one spiritual science “applicable to the all life domains” (Steiner R., 1991 – translation).

MATERIAL AND METHOD

Research whose results we present in this paper were organized during 2005 – 2007 years in the ecological conditions from The Tazlau-Casin kettle, on a gleic faeoziom in a experience with tree factors in four repetitions observing the influence of dome different compost doses comparing with the chemical fertilizers and unfertilized factor at three maize hybrids and two sowing density. There were made phenological observations and biometrical measurements, determination of the production quality and its values at the surface unity. Calculation of the results were made by the variance analysis method.

In the agricultural year 2004-2005 the mean recorded temperature was overcome the multiannual average 0.4 °C, in the year 2005-2006 with 0.35 °C and in the year 2006-2007 with 1.41 °C. The precipitation values had overcome the multiannual average with 157.7 mm in the year 2004-2005 and were under the multiannual average in the year 2005-2006 with a value of 131.1 mm and with 220,3 mm the year 2007-2007.

The compost which was used in the experience was made in the farm, making quality analisys every year.

The main proprieties of the compost in the three years are given in the *table 1*.

Table 1

Quality indicator	U.M.	2004		2005		2006	
		averages	Assessments	averages	Assessments	averages	Assessments
Ratio C/N	-	14.1/1	good	12.47	Very good	13.43	Very good
Content of the total N	%	0.71	good	0.86	Very good	0.73	Very good
Content of accesible P	%	0.46	Very good	0.51	Very good	0.48	Very good
Content of accesible K	%	0.61	good	0.57	Very good	0.69	Very good

Considering the nutrient content of the compost it results that at the 3 doses, in the soil was introduced:

- at the dose of 10 t/ha compost: $N_{63}P_{46}K_{61}$ (kg/ha);
- at the dose of 20 t/ha compost: $N_{126}P_{92}K_{122}$ (kg/ha);
- at the dose of 30 t/ha compost: $N_{189}P_{138}K_{183}$ (kg/ha).

RESULTS AND DISCUSSIONS

All the fertilizers averaged over the three years have brought very significant production spores than the unfertilized variant with values between 892 kg/ha (19.7%) at 10 t/ha compost and 1883 kg/ha (41.6%) t 30 t/ha compost. On the average of the three compost doses the spore production was of 1491 kg/ha (32.9%) and at the variant $N_{160}P_{80}K_{80}$ which was only mineral the spore production was of 20.8%. Between the doses of 20 and 30 t/ha compost the difference of ~ 5% is not significant.

Beside the control variant which was chemical fertilized with optimal doses, the dose of 10t/ha compost gave the same result, at the dose of 20 t/ha compost the spore production was of 13.7 % and at the dose of 30 t/ha compost the spore production was of 17.1% both variants being very significant. On average the three compost doses have brought a significant spore production of 574 kg/ha (10%) than the variant $N_{160}P_{80}K_{80}$.

The smaller spore production of 1 kg s.a. fertilizer was recorded at the chemical fertilization (2.95 kg) and the biggest spore production was recorded at the dose of 10 t/ha compost (5.01 kg).

The dose of 20 t/ha compost was well exploited with a production spore of 4.79 kg/1 kg s.a. (N+P+K) but at the dose of 30 t/ha compost the production spore decreased at 3.51 kg/ 1 kg s.a but not than the variant which was chemical fertilized.

Table 2

Type and fertilizer dose t(kg)/ha	Production average 2005-2007 (kg/ha)	Comparing with unfertilized (Mt. I)			Comparing to $N_{160}P_{80}K_{80}$ (Mt. II)			Spore (kg grains) on 1 kg s.a. (N+P+K)
		%	Difference (kg/ha)	significance	%	Difference (kg/ha)	significance	
a1 -unfertilized	4529	100.0	-		82.7	-944	000	-
a2 - $N_{160}P_{80}K_{80}$	5473	120.8	944	***	100.0	-		2.95
a3 - compost - 10 t/ha	5421	119.7	892	***	99.0	-52		5.01
a4 - compost - 20 t/ha	6226	137.5	1697	***	113.7	753	***	4.79
a5 - compost - 30 t/ha	6412	141.6	1883	***	117.1	939	***	3.51
Average of the compost doses	6020	132.9	1491	***	110.0	547	*	4.43
DL (kg/ha):	5% = 429.8		5% = 601.7		0.1% = 782.2			

The cultivated hybrid had significant influence but smaller than the fertilizers regarding the annual maize grain production variations and the mean production on the three years (table 3).

Although from very close precocity groups, the Dana and Elan hybrids had behaved different beside the climatic conditions of the year, Elan recording a bigger production variation than Dana but smaller than at the Turda –SU-210 hybrid. The average of the production from the three hybrids in the droughty year was with 1146 kg/ha smaller

than the one from the favorable year, more constant being the Dana hybrid.

The average from the three years, Dana which was considered the control had a production of 5197 kg/ha which was distinct significant smaller the average of the three hybrids. Elan exceeded Dana with 482 kg/ha (distinct significant) and the average of the experience (insignificant) having a production of 5679 kg/ha, a closer production than the one obtained by Turda-SU-210 and by Dana. The Turda-SU-210 hybrid had obtained the biggest production (5950

kg/ha), competing in the way very insignificant the Dana hybrid, significant Elan hybrid and the average of the three hybrids (with 279 kg/ha – 5.1% respectively 342 kg/ha – 6.1 %).

The production differences between the three hybrids are in all the cases smaller than the ones from the extreme years (at 1/3 or 1/3 from these) proving the greater influence of the climatic conditions of the year than of the

hybrid at least when the hybrids are from the precocity groups which are very close. The plant density also influenced significant the maize production but smaller than the hybrid, the fertilizers or the climatic condition of the year (*table 4*).

Table 3

Maize grain production depending on the cultivated hybrids, the climatic year and the average of three years (2005 - 2007)

Cultivated hybrid	Production (kg/ha) in the years			Difference between the extreme years (kg/ha)	The mean production (2005-2007) (kg/ha)	Reported at the Mt			Reported at the experience average		
	2005	2006	2007			%	Difference (kg/ha)	Significance	%	Difference (kg/ha)	Significance
b1 Dana - Mt	5829	5007	4757	1072	5197	100.0	-		92.7	-411	oo
b2 Elan	6410	5376	5251	1159	5679	109.3	482	**	101.3	71	
b3 Turda210	6671	5715	5464	1207	5950	114.5	753	***	106.1	342	*
Average of the hybrids and of the experience	6303	5366	5157	1146	5608	107.9	411	**	100.0	-	
DL (kg/ha):	5% = 273.8			5% = 383.3	0.1% = 513.6						

Table 4

The influence of the plants density on the maize production on climatic years and on the average in three years (2005-2007)

Plant density (plants/ha)	Production (kg/ha) in the years			Difference between the extreme years (kg/ha)	The mean roduction (2005-2007) kg/ha	% than Mt.	Difference than Mt. kg/ha	Significance
	2005	2006	2007					
c1 48000 Mt	6109	5218	5035	1074	5454	100.0	-	
c2 60000	6498	5515	-300	1198	5771	105.8	317	*
DL (kg/ha):	5% = 273.6			5% = 383.0	0.1% = 513.6			

The density of 48 thousands plants/ha (which was considered as control) has led to some productions of 6108 kg/ha in the favorable year than 5035 in the droughty year 2007, with a difference of 1074 kg/ha very significant, but smaller than the one which was recorded at the density of 60000 plants/ha because at this density in the most favorable years was recorded the biggest production of 6498 kg/ha and in the less favorable year a small production, the effect of increasing the plant density being the smaller in this year.

The growth of the plant density from 48 at 60000 plants/ha (density considered optimal for the group of the studied hybrids) have given a medium production spore on the three years of 317 kg/ha, significant (5.8%) which can be

considered small comparing with the obtained results from the other experiences which showed production spores of 8-13% (Singer J.W. ș.a. - USA).

The interaction from the fertilizer and the hybrid had a very significant effect upon the maize production, all the three hybrids giving very significant production spores than the unfertilized variant, but different production at different fertilizers and doses from one hybrid to another (*table 5*).

The Dana hybrid gave the smallest production without fertilization being competed from Elan with 7,9% and SU -210 with 11,5% (488 kg/ha significant spore production). At the chemical fertilization and at the dose of 10 t/ha compost he recorded some production spores as big as Elan but smaller than Turda –SU-210 with ~3%.

**The effect of the fertilizers at the interaction with the hybrid on the maize grain production
(the average of the years 2005 - 2007)**

Hybrid	b1 Dana				b2 Elan				b3 Turda-SU-210			
	Production (kg/ha)	% than the Mt.	Difference than Mt.	Significance	Production (kg/ha)	% than the Mt.	Difference than Mt.	Significance	Production (kg/ha)	% than the Mt.	Difference than Mt.	Significance
a1- unfertilized Mt	4247	100.0	-		4581	100.0	-		4735	100.0	-	
a2 - N ₁₆₀ P ₈₀ K ₈₀	5109	120.3	862	***	5475	119.5	894	***	5836	123.3	1101	***
a3 - 10 t/ha compost	5062	119.2	815	***	5404	118.0	823	***	5797	122.4	1062	***
a4 - 20 t/ha compost	5744	135.2	1497	***	6358	138.8	1777	***	6575	138.8	1840	***
a5 - 30 t/ha compost	5S8i	138.4	1633	***	6576	143.5	1995	***	6777	143.1	2042	***
DL (kg/ha):	5% = 402.8		5% = 563.9		0.1% = 755.6							

At the doses of 20 and 30 t/ha compost the production spores were 1497 respectively 1633 kg/ha (35.2 and 38.4%) almost double than the spore production obtained at the chemical fertilization and 10 t/ha compost, but smaller than the production spores made by the Elan hybrid to whom looked like only regarding the reaction at the chemical fertilization and 10 t/ha compost.

So, Elan reacted better than the Dana hybrid at the big dose of compost resembling more with the Turda - SU - 210 hybrid only in the relative spore production (38.8 and respectively 43% at the both hybrids at the doses of 20 and 30 t/ha compost). The Turda - SU- 210 hybrid gave not only bigger production than Elan at this doses but also gave absolute bigger production spores of 1 t/ha at the dose of 30 t/ha compost even if the dose was calculated beside its production when it is unfertilized with a bigger significance than the other hybrids. Compared to the Elan hybrid he reacted better at the chemical fertilization and at the dose of 10 t/ha compost the production spore being over 1 t/ha (22 - 23% than 18 - 19% at Elan).

The chemical fertilizers and the doses of 10 t/ha compost have given the same production spores and productions which were distinct significant bigger than at the unfertilized variant (15.7-14.65). The dose of 20 t /ha compost had increased the production with 30.4% doubling the production spore than the unfertilized variant comparing with the dose of 10t/ha compost, but the most capable was the dose of 30t/ha compost with a production spore of 42.8% (1892 kg/ha very significant).

CONCLUSIONS

In a mixed farm some quality composts can be obtained using as raw materials variable vegetable scraps in a ratio of 60% and animal manure in the ratio of 40%. From our research resulted a very good reaction of the maize at the compost fertilization no matter of the climatic condition of the year. The best maize hybrid is Turda SU 210, followed by Elan.

The best interaction was accomplished with the dose of 20 t/ha compost X Turda SU 210 X 60000 plants/ha.

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