INFLUENCE OF COMPOST FERTILIZATION WITH OR WITHOUT MINERAL FERTILIZER ON SOME CHEMICAL CHARACTERISTICS OF HAPLIC CHERNOZEMS

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Abstract
Compost made from cattle manure and used as amendment in a field experience on Haplic Chernozems is considered to fulfill all the conditions necessary for application to any type of soil. There were studied the changes of chemical characteristics of soil under the influence of organic fertilization with or without mineral fertilization. Organic fertilization resulted in significant decreases in soil reaction but mineral fertilization produced no significant changes. There has also been significant increases in organic carbon content in variants fertilised with composted manure, but mineral fertilization as well as in pH values, did not lead to significant changes. In terms of total nitrogen content were observed distinct significant changes after the application of compost and significant after mineral fertilization. The combination of the two fertilization systems has led to distinct increases achieving significant total nitrogen content. Ratio C/N declines distinct significantly through organic fertilization. The level of available phosphorus and potassium have been distinct significant increases both in each of the two types of fertilization.. The data obtained from the determination of the macroelements in soil samples suggest that composted cattle manure can be considered an important source of nitrogen, phosphorus and potassium.

Keywords: livestock, compost, mineral fertilization, nutrients

1. INTRODUCTION

Livestock production is growing in individual households and large production farms concentrated in traditional areas of farming. An important consequence is the accumulation of large quantities of waste organic material with solid, liquid and semi consistency. Normally, these residues considered as organic fertilizers are used in the fertilization of agricultural land surrounding. [1]. Livestock waste composting eliminates many of the shortcomings associated with use of fresh manure [2].

Compost amendment is considered a safe environment benefiting in terms of agronomic and relatively inexpensive that stimulates microbial activity in soil and crop development. Composting manure and its recovery as organic amendment is an optimal solution to decrease the quantity of waste deposited on land and to reduce the quantity of mineral fertilizers [3].

Composting manure cattle and its recovery as organic amendments is an optimal solution to decrease the quantity of waste deposited on land and mineral fertilizers.

2. MATERIALS AND METHODS

The experiments were organized on an experimental field at Caracal using subdivided parcels method, studying the two gradients:

A factor - organic fertilization with compost made from cattle manure, in 5 doses:

a_1 – unfertilized;

a_2 – fertilized with compost equivalent to 100 kg N/ha;

a_3 – fertilized with compost equivalent to 200 kg N/ha;

a_4 – fertilized with compost equivalent to 300 kg N/ha;

a_5 – fertilized with compost equivalent to 400 kg N/ha.

B Factor – mineral fertilization with nitrogen and phosphorus, in 3 doses:

b_1 – unfertilized;

b_2 – $N_{50}P_{50}$;

b_3 – $N_{100}P_{100}$.

The experiments were organized on a Haplic Chernozems with good supply in nutrients. The experiments were conducted under irrigation.

Processing of experimental data was performed using analysis of variance and Tukey test.

3. RESULTS AND DISCUSSIONS

There were studied the changes of chemical characteristics of a Haplic Chernozems from experimental field from Caracal under the influence of the two systems of fertilization.

The effect of organic and mineral fertilization on soil reaction are presented in *Table 1*. Considering mineral fertilization, the changes of pH values were not statistically significant. The strongest influence was observed in case of compost fertilization equivalent to a nitrogen rate of 400 kg N/ha associated with the mineral $N_{50}P_{50}$. Organic fertilization with the highest dose of compost resulted in statistically significant decreases compared with control variant of soil reaction.

Table 1. Effects of fertilization with composted cattle manure and mineral fertilization with nitrogen and phosphorus, on pH value of Haplic Chernozems

Mineral fertilization	Compost fertilization					Mean value mineral fertilization
	Unfertilized with compost	Compost fertilization equivalent to a nitrogen rate of				
		100 kg N / ha	200 kg N / ha	300 kg N / ha	400 kg N / ha	
Unfertilized	6.85	6.91	6.69	6.64	6.43	**6.70 A**[(1)]
N_{50} P_{50}	6.89	6.82	6.58	6.48	6.34	**6.62 A**
N_{100} P_{100}	6.84	6.64	6.74	6.62	6.36	**6.64 A**
Mean value compost fertilization	**6.86 W**[(2)]	**6.79 W**	**6.67 WX**	**6.58 WX**	**6.38 X**	

[(1)] or [(2)] - Values followed by the same letter (A, B, C or W, X, Z) are not significantly different at the p=0.05 level (Tukey's honestly significant procedure)

Table 2. Effects of fertilization with composted cattle manure and mineral fertilization with nitrogen and phosphorus, on soil organic carbon content

Mineral fertilization	Compost fertilization					Mean value mineral fertilization
	Unfertilized with compost	Compost fertilization equivalent to a nitrogen rate of:				
		100 kg N / ha	200 kg N / ha	300 kg N / ha	400 kg N / ha	
	---------- % ----------					
Unfertilized	1.39	1.67	1.62	1.53	1.61	**1.56 A**[(1)]
N_{50} P_{50}	1.41	1.62	1.64	1.59	1.66	**1.58 A**
N_{100} P_{100}	1.39	1.48	1.60	1.77	1.68	**1.58 A**
Mean value compost fertilization	**1.40 W**[(2)]	**1.59 X**	**1.62 X**	**1.63 X**	**1.65 X**	

[(1) or (2)] - Values followed by the same letter (A, B, C or W, X, Z) are not significantly different at the p=0.05 level (Tukey's honestly significant procedure)

Application of compost in doses that ranged from 100 kg N/ha to 400 kg N/ha, led to increases statistically significant compared with control variant of mean values of soil organic

carbon content, since the first dose of compost applied (*Table 2*).

Mineral fertilization in doses of $N_{100}P_{100}$ increased statistically significant the values of total nitrogen content in soil compared with control and with the doses of fertilizer $N_{50}P_{50}$ (*Table 3*) soil. Fertilization with compost equivalent to a nitrogen rate of 400 kg N/ha increased statistically significant the soil nitrogen content compared with control, and with variants where fertilized with compost doses equivalent to 100 kg N/ha, respectively 200 kg N/ha.

Considering the total nitrogen content, the strongest influence was obtained in case of mixed fertilization with high doses of mineral fertilizers ($N_{100}P_{100}$) and compost dose equivalent to 400 kg N/ha.

Table 3. Effects of fertilization with composted cattle manure and mineral fertilization with nitrogen and phosphorus on total nitrogen content in soil (Haplic Chernozems)

Mineral fertilization	Compost fertilization					Mean value mineral fertilization
	Unfertilized with compost	Compost fertilization equivalent to a nitrogen rate of:				
		100 kg N / ha	200 kg N / ha	300 kg N / ha	400 kg N / ha	
	%					
Unfertilized	0.174	0.188	0.186	0.193	0.174	**0.183 A**(1)
N_{50} P_{50}	0.161	0.177	0.190	0.184	0.205	**0.183 A**
N_{100} P_{100}	0.173	0.188	0.182	0.241	0.323	**0.221 B**
Mean value compost fertilization	**0.169 W**(2)	**0.184 W**	**0.186 W**	**0.206 WX**	**0.234 X**	

(1) or (2) - Values followed by the same letter (A, B, C or W, X, Z) are not significantly different at the p=0.05 level (Tukey's honestly significant procedure)

Table 4. Effects of fertilization with composted cattle manure and mineral fertilization with nitrogen and phosphorus on carbon : nitrogen ratio in soil (Haplic Chernozems)

Mineral fertilization	Compost fertilization					Mean value mineral fertilization
	Unfertilized with compost	Compost fertilization equivalent to a nitrogen rate of:				
		100 kg N / ha	200 kg N / ha	300 kg N / ha	400 kg N / ha	
Unfertilized	11	10	10	10	6	**9 A**(1)
N_{50} P_{50}	12	11	10	9	8	**10 A**
N_{100} P_{100}	11	10	11	7	9	**10 A**
Mean value compost fertilization	**11 W**(2)	**10 WX**	**10 WX**	**9 WX**	**8 X**	

(1) or (2) - Values followed by the same letter (A, B, C or W, X, Z) are not significantly different at the p=0.05 level (Tukey's honestly significant procedure)

Ratio C/N (*Table 4*) showed statistically significant decreases to control by applying the maximum dose of compost.

Increased intake of phosphorus by mineral fertilizers led to statistically significant increases of mobile phosphorus content in soil, since the first dose of mineral fertilizer ($N_{50}P_{50}$)

applied (*Table 5*). Variants that have applied high doses of organic fertilizers (compost at a dose equivalent to 300 kg N/ha and 400 kg N/ha) had showed statistical significant increases compared both with control and the variant where was applied the lowest dose of compost. The highest increase was observed in the variant with mixed fertilization in maximum doses (compost dose equivalent to 400 kg N/ha and $N_{100}P_{100}$).

Mobile potassium content in soil (*Table 6*) increased with increasing dose of mineral fertilizer the increases are statistically significant for both doses of mineral fertilizer. Additions of potassium by fertilization with composted cattle manure led to statistically significant increases since the first dose of compost applied. Fertilization with compost equivalent to a nitrogen rate of 300 kg N/ha and 400 kg N/ha resulted in statistically significant increased potassium levels compared with control and with variants who received lower doses of compost.

Table 5. Effects of fertilization with composted cattle manure and mineral fertilization with nitrogen and phosphorus on available phosphorus content in soil (Haplic Chernozems)

Mineral fertilization	Compost fertilization					Mean value mineral fertilization
	Unfertilized with compost	Compost fertilization equivalent to a nitrogen rate of:				
		100 kg N / ha	200 kg N / ha	300 kg N / ha	400 kg N / ha	
	mg/kg					
Unfertilized	38	39	44	37	39	**39 A**[(1)]
N_{50} P_{50}	36	43	45	47	50	**44 B**
N_{100} P_{100}	30	35	49	56	66	**47 B**
Mean value compost fertilization	**35 W**[(2)]	**39 WX**	**46 XY**	**47 Y**	**52 Y**	

[(1) or (2)] - Values followed by the same letter (A, B, C or W, X, Z) are not significantly different at the p=0.05 level (Tukey's honestly significant procedure)

Table 6. Effects of fertilization with composted cattle manure and mineral fertilization with nitrogen and phosphorus on available potassium content in soil (Haplic Chernozems)

Mineral fertilization	Compost fertilization					Mean value mineral fertilization
	Unfertilized with compost	Compost fertilization equivalent to a nitrogen rate of:				
		100 kg N / ha	200 kg N / ha	300 kg N / ha	400 kg N / ha	
	mg/kg					
Unfertilized	210	453	444	537	547	**438 A**[(1)]
N_{50} P_{50}	195	454	520	547	551	**453 B**
N_{100} P_{100}	263	506	499	510	549	**465 B**
Mean value compost fertilization	**223 W**[(2)]	**471 X**	**488 X**	**531 Y**	**549 Y**	

[(1) or (2)] - Values followed by the same letter (A, B, C or W, X, Z) are not significantly different at the p=0.05 level (Tukey's honestly significant procedure)

The results of experiment organized on a Haplic Chernozems from Caracal, suggest that compost made from cattle manure can be considered an important source of nitrogen, phosphorus and potassium.

4. CONCLUSIONS

Use of composted cattle manure as fertilizer in experimental field led to increases in nutrient contents in soil. The combination of organic fertilization with mineral fertilization with nitrogen and phosphorus led to significant increases, thus ensuring the necessary nutrients throughout the entire period of experimentation. Using compost in agriculture can create conditions for developing the capacity of fertilizer for livestock waste and increase soil fertility.

5. REFERENCES

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