EFFECT OF DIFFERENTIATED FETILIZATION SYSTEMS ON MAIZE CROP ON NUTRIENT PRODUCTION AND ACCUMMULATION IN THE SOIL AND GRAINS

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Abstract: *Maize is considered to be a plant exhibiting significant nutient consumption, thus responding to the application of fetilization systems that make eadily available significant element amounts in the soil or applied by means divesified nutrient vaieties. It has been previously proven expeimentally that on a regula basis, the maize crop significantly responds to a multitude of fetilizing combinations, with an organic and mineral substatum, where esential nutritive elements reside, especially those with a high specific and global consumption in maize. The research undertaken in the field of differentiated fertilization in maize crop aim at rationalizing fertilizing mineral inputs and at their reduction by promoting alternatives and strategies for an efficient inclusion within differentiated fertilization systems of humiferous organic resources and plant residues. In order to achieve the aforementioned research objectives, field experiments were conducted in 2009 at SDE Cojocna of the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, on a cambic chernozem soil, on maize crop including different fertilizing sources, mineral- from complex NP fertilizers, organic- from semi-fermented stable manure and residual mushroom compost.The present paper presents analytical and experimental results obtained through the application of differentiated doses of fertilizers on maize crop, both mineral (from complex NP fertilizers) and organo-mineral (semi-fermented stable manure, residual mushroom compost and complex mineran NP fertilizers).The differentiated application of fertilizers reveals the importance of combinations such as the organo-mineral one with stable manure as an organic support, as well as that including residual compost, where the grain production significantly increases as compared to the control variant (unfertilized) and tne exclusively mineral fertilized one. In the same context, agrochemical soil indices and nutrient accumulations in maize grains are positively influenced in organo-mineral fertilizations. As far as the exclusively mineral fertilization is cocnerned, one can observe a slight acidification of the soil, as fertilizer doses are increased. The capitalization of production and analytical data in time, in the context of multiannual application of different fertilizer combinations will certainly lead to relevant, as well as impotant intepretations for agricultural pactice. These data support integated fertilization technologies for agicultural crops and determine decisions for the sustainable management of soil fertility. In addition, production quality modifications that are assessed on a periodical and an annual basis, as well as interpreted in connection with the multiannual changes of the relevant indices of soil fetility, may provide the foundation fo the safety of plant and food production. In this context, the drafting of agrochemical nomograms for differentiated fertilization systems are of the utmost scientific importance and may stir agricultural practice towards the differentiated application of fertilization.The paper was supported through the project: POSTDOCTORAL SCHOOL IN THE FIELD OF AGICULTURE AND VETERINARY MEDICINE Contract n.: POSDRU/89/1.5/S/62371.*

Key words**:** *productions, nutrients, fertilizers, maize grains*

INTRODUCTION

Organo-mineral fertilizations are in effect measures exerting complex effects in the soil-plant system, as they aim at high and stable productions, as well as having positive implications in maintaining and even enhancing soil fertility (M. RUSU, MARILENA

MĂRGHITAŞ, I. OROIAN, TANIA MIHĂIESCU, ADELINA DUMITRAŞ, 2005). There have been experimental and analytical proofs in the case of mineral fertilization, that effects on soil fertility are limited to certain increases of accessible element concentations (N, P, K). On the other hand, the same fetilizations on a multiannual basis bring a contribution to a decrease in the content of humified organic matter, through the oxidative degadation of these components, thus leading to a preponderance of mineralization in the soil, in the detriment of humification (BORLAN Z. et al., 1994).

The present paper presents the effects of differentiated fertilizations systems on maize crop and certain agrochemical traits of the soils.

MATERIAL AND METHODS

The reseach on the effect of complex and ogano-mineral fertilization in maize was conducted experimentally in the field, on a cambic chernozem in Cojocna and analytically in the laboratory, though soil and plant analyses.

Field experiments involved as studied factors complex mineral fertilizations with five graduations(N_0P_0; $N_{40}P_{40}$; $N_{80}P_{80}$; $N_{120}P_{120}$; $N_{160}P_{160}$), organo-mineral fertilizations where the organic support was provided though 20 t/ha stable manure and respectively 20 t/ha mushroom compost, agrofunds where the aforementioned 5 complex mineral graduations were applied

Soil-plant analyses were conducted accoding to the ICPA-recommended methodology for agrochemistry laboratories.

RESULTS AND DISCUSSIONS

Maize is a crop that efficiently responds to the differentiated application of fertilizers, as it exhibits a high specific average N, P, K consumption (BORLAN Z. et al., 1994).

Nivelul producţiilor de boabe obţinute ca urmare a aplicării fertilizării minerale complexe (N, P) şi a celei organo-minerale este determinat de valorificarea diferenţiată a nutrienţilor asiguraţi prin aceste măsuri. The level of grain productions obtained as a consequence of complex mineral fertilizer application (N, P), as well as the organo-mineral one is detemined by the differentiated capitalization of the nutrients provided by means of these measures (table1)

Table 1

Effect of complex mineral and organo-mineral differentiated fertilization on maize production

No.	Fertilization level N/P_2O_5 (kg a.s./ha) + manure (t/ha) + compost (t/ha)	Production		±Difference (tons/ha)	Significance
		(Tons/ha)	%		
1	0 + 0 + 0 (control)	6.386	100.0	0.00	Control
2	40/40	7.077	110.9	693.00	-
3	80/80	6.966	109.1	582.00	-
4	120/120	6.656	104.3	271.67	-
5	160/160	6.600	103.4	215.33	-
6	20 t/ha manure	6.633	103.9	249.00	-
7	40/40 + 20 t/ha manure	6.783	106.2	398.67	-
8	80/80 + 20 t/ha manure	7.485	117.2	1100.33	*
9	120/120+ 20 t/ha manure	7.408	116.0	1023.33	*
10	160/160+ 20 t/ha manure	7.200	112.8	815.33	-
11	20 t/ha compost	6.916	108.3	532.00	-
12	40/40 + 20 t/ha compost	7.536	118.0	1151.33	*
13	80/80 + 20 t/ha compost	6.991	109.5	607.00	-
14	120/120+20 t/ha compost	7.677	120.3	1293.00	**
15	160/160+20 t/ha compost	7.300	114.3	915.33	*
	DL (5%)			880.88	
	DL (1%)			1185.97	
	DL (0.1%)			1577.00	

It is thus obvious that there is a superior effect of organo-mineral fertilization, regardless of the nature of the organic component provided (stable manure or compost) on grain production, and the fertilizing superiority of this interaction is clear. By means of these organo-mineral fertilization systems, one can obtain production of 6.6-7.7 t/ha, which are sufficiently stable. Complex mineral fertilization (NP) provides productions of 6.6-7.7 t/ha maize grains.

The superiority of organo-mineral fertilization is determined, however, by certain positive and highly impotant effects for soil fertility (table 2).

Table 2

Influence of differentiated fertilization on agrochemical soil indices

No.	Fertilization level N/P_2O_5 (kg a.s./ha) + manure (t/ha) + compost (t/ha)	The principal agrochemical parameters of soil at depth 0- 20 cm			
		pH $_{H2O}$	Humus (%)	P-AL (ppm)	K –AL (ppm)
1.	0 + 0 + 0 (control)	5.73	3.52	52	230
2.	40/40	5.67	4.56	56	240
3.	80/80	5.80	4.52	64	270
4.	120/120	5.75	4.86	72	300
5.	160/160	5.66	4.70	84	300
6.	20 t/ha manure	6.50	4.30	48	270
7.	40/40 + 20 t/ha manure	5.67	5.10	56	280
8.	80/80 + 20 t/ha manure	5.60	5.66	84	300
9.	120/120+ 20 t/ha manure	5.82	5.82	160	390
10.	160/160+ 20 t/ha manure	5.93	5.64	172	560
11.	20 t/ha compost	6.20	4.31	32	210
12.	40/40 + 20 t/ha compost	5.57	5.36	68	330
13.	80/80 + 20 t/ha compost	5.72	5.48	72	350
14.	120/120+20 t/ha compost	5.82	5.22	92	410
15.	160/160+20 t/ha compost	6.09	5.38	140	430

The intervention of the organic support of organo-mineal fertilization positively and decisively influences the quantity of humifiable organic matter in the soil. It essentially modifies phosphorus and potassium reserves and can forcast a tendency for soil acidification as the NP input increases.

As fertilization formulas are differentiated quantitatively, as well as the variety, there is a substantial modification in the nutrient accummulation regime in maize grains, (tabelul 3).

Table 3

Nutrient accummulation in maize grains though differentiated fertilization

No.	Fertilization level N/P_2O_5 (kg a.s./ha) + manure (t/ha) + compost (t/ha)	N %	P_t %	K_t %	Ca %
1.	0 + 0 + 0 (control)	1.50	0.20	0.73	0.80
2.	40/40	1.80	0.35	0.92	1.05
3.	80/80	1.80	0.37	0.73	1.10
4.	120/120	1.80	0.45	0.73	1.20
5.	160/160	1.50	0.48	0.84	1.25
6.	20 t/ha manure	1.50	0.20	0.94	0.5
No.	Fertilization level N/P_2O_5 (kg a.s./ha) + manure (t/ha) + compost (t/ha)	N %	P_t %	K_t %	Ca %
7.	40/40 + 20 t/ha manure	1.65	0.28	1.30	0.8
8.	80/80 + 20 t/ha manure	2.10	0.30	0.98	0.9
9.	120/120+ 20 t/ha manure	1.80	0.33	0.94	1.1
10.	160/160+ 20 t/ha manure	1.95	0.35	1.05	1.3
11.	20 t/ha compost	1.95	0.26	0.94	1.1
12.	40/40 + 20 t/ha compost	1.80	0.38	0.96	1.2
13.	80/80 + 20 t/ha compost	2.70	0.40	0.96	1.3
14.	120/120+20 t/ha compost	2.85	0.43	0.96	1.4
15.	160/160+20 t/ha compost	2.85	0.45	0.96	1.4

The organic components of fertilizations, in interaction with an increase of NP doses, support a better translocation of nitrogen, as well as a better accummulation of phosphorus.

The nutrient accummulation domains in grains express the normal conditions of nutrient element concentation.

CONCLUSIONS

Maize is a crop that efficiently responds to the organo-mineral application of fertilizers and to complex mineral NP fertilization;

Fertilizing interventions through organic resources have positive effects not solely on grain production, but also on soil fertility;

As exclusive mineral fertilization increases the rate of humus minealization and soils tend towards reaching a minimum humic balance, it is highly important to include humiferous organic resources in fertilization systems.

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