

THE IMPACT OF APPLYING THE LIQUID ORGANIC FERTILIZER, OBTAINED FROM WORMS COMPOST, ON QUALITY OF THE MAIZE

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Abstract

A particular role in improving the situation of the environment and sustainable development of agriculture, the rests bioconversion technology the organic wastes through worm cultivation, in the result to which is obtained worms compost - valuable organic fertilizer.

The objective of the researches has included study on the impact of the liquid organic fertilizer on the quality of the maize. For this purpose the experiment was organized in field conditions, in which were included 3 lots, seeded with maize.

As fertilizer was used aqueous solution (liquid fertilizer) produced from worm's compost. Through biochemical analysis was evaluated the quality of maize in various stages of vegetation.

Maceration of maize seed in liquid fertilizer and its administration as supplementary food (three round), has improved the quality of maize increasing total nitrogen content respectively with 65.41% and 21.71%, in the plants on the experimental lot I and with 31.45% and 17.12% - in the plants collected from experimental lot II, also nitrate content decreased with 4.33% - 49.95% in maize samples (experimental lot I) and with 1.93 % -16.70% (experimental lot II), in comparison with the plants in the control lot.

So, the quality of maize cultivated using seed macerated in extract produced from raw worms compost and its administration as supplementary food, is higher than in the control lot.

Key words: bioconversion, liquid organic fertilizer, maceration, maize, worm compost, quality

INTRODUCTION

The technology of bioconversion of organic wastes by worm cultivation deserves a special attention with fundamental research, because to it belongs the solving of some important issues in the livestock sector and plant growing, thus improving the situation ambient, reanimating the degraded soils, enhancing soil fertility and improving the quality of agricultural production. Worm compost, the one of the final obtained products obtained by the use of bioconversion technology of organic wastes by worm cultivation is a valuable organic fertilizer. Its use is a real means of sustainable development of agriculture and warning against the environmental pollution. The estimation of the worm compost quality

has a paramount importance for improving the quality and increasing productivity of agricultural crops, including the forage, which then furthers in the obtaining of qualitative animal production [1].

Previously, were effectuated researches, the results of which found that the productivity and quality of agricultural crops fertilized with worm compost is superior to those grown with natural background. The fodder grown plants cultivated with worm compost fond, the nitrosocompounds content decreased and total nitrogen and crude protein content went the one in the control lot plants [2].

In the literary sources are presented information's, which support that from the worm compost is obtained a liquid organic fertilizer with high efficiency. The biochemical composition of liquid fertilizer includes all components of worm compost in more active state: hamates, fulvic acids,

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amino acids, natural plant hormones, micro and macro elements, spores of soil organisms, which are not offered by most mineral incentives. Liquid fertilizer has the bactericidal fungicide properties due to bacteriostatic protein content in it and antibiotics, eliminated by tissues worm culture in worm culture process. Due to these properties takes place the improving of plants resistance to environmental influence they are less prone to diseases and more resistant to unfavorable land climactic conditions. It was found that soaking seed agricultural crops into liquid fertilizer obtained from worm compost before sowing had a positive impact on the balance of plant phytohormone that regulates almost all the processes orthogenesis due to activation of plant genes. The using of liquid fertilizer positively influences the growth process, photosynthesis, increasing the productivity the quality of agricultural production [3].

This was the cause for what were effectuated the researches was in order to determine the role of the liquid organic fertilizer obtained from worm compost and water, concerning on the process of seed germination, physiological development and the quality of achieved production.

Therefore, the goal of the research included the study of the impact of the liquid organic fertilizer obtained from worm compost, on the quality of maize.

MATERIAL AND METHODS

In the base of the analysis of the obtained results in the experiment chamber, regarding the evaluation of the influence of organic fertilizer the liquid obtained from worm compost on the seed germination process, in the conditions of field of Technological and Experimental Station "Maximovca", it was organized an experiment to determine the quality of the agricultural crops. As research materials were used: M-450 variety of maize, raw and worm compost and aqueous extract (liquid organic fertilizer) obtained from it. For obtaining liquid organic fertilizer it was used worm compost crude and drinking water in the ratio 1: 100. In order to assess the role of liquid organic fertilizer on the process of emergence, physiological development and the quality of maize, according to the scheme of the experiment (table 1) in it were included in this three experimental lots having the area of 0.5 acres (one control and two experimental).

Table 1 Experimental scheme

No.	The variants of lots	The conditions of the experiment	The Investigations during of the experiment
1	Lot I (control)	Not macerated seeds and plants grown with natural background	They were determined a) the development of plants, various phenological phases; b) quality of the maize
2	Lot II (experimental I)	The seeds macerated and maize fertilized (in three half time) with the extract obtained from worms compost crude and water, in ratio of 1:100	
3	Lot III (experimental II)	The seeds macerated with the extract obtained from worms compost crude and water, in ratio of 1:100 and cultivated plants with natural background	

For lot I (control) were used not macerated seeds and natural background, lot II (experimental I) was sowed with macerated seeds and a liquid fertilizer and during the vegetation period it was performed the corn fertilization, and for the experimental lot II were used macerated seeds without being carried out the crop

fertilization during the experimental period. Initially, in order to determine the quality of worm compost and aqueous organic fertilizer obtained from it, biochemical analyzes were performed according to usual methods.

Before sowing the maize seeds were subjected to the process of macerate in liquid organic fertilizer prepared from the worm

compost for a period of 12 hours, then it was effectuated a sow according to the usual technology, for the mentioned crop. According to the technology the cultivation of maize after total emergence of plants at each meter, were left by 3 maize plants. During the growing season, in the dependence on phenological stages of maize, cultivated on lot II was effectuated a fertilization with liquid organic fertilizer (in consideration of 4t/ha) obtained from crude worm compost. During the vegetation period, the fertilization was performed in triplicate (the beginning half - 20.05.2014, when plants had 3 - 4 leaves, second half - 01.07.2014 before the ear emergence, the third inning - 15.07.2014, early emergence of cobs). Observations on the physiological development of maize were carried out over four phenological stages.

At the initial stage and during the phenological development were made the observations on the process of emergence and development of maize and also in dependence of the phenological stages it of was assessed its quality by determining the total nitrogen content, crude protein and nitrosocompounds. Corn samples were collected for research in four phenological phases: forming the ear, forming cobs in milk stage, in the phase of wax and final ripeness. In the first three phenological phases the analysis were carried in samples consisting of stems, leaves and cobs, but in the last stage – these were carried out separately, as in the plant, as in the cobs.

The duration of the experiment depended on maize vegetation period and constituted 4.5 months.

RESULTS AND DISCUSSIONS

The researches effectuated concerning to the evaluation of the influence of organic fertilizer influence fluid (aqueous extract) obtained from crude worm compost, concerning the process of emergence, physiological development and quality of

maize were carried out in three directions: determining the quality worm compost, the study of the process of emergence of corn and the determination of the obtained harvest. According to the result of the investigation in the purpose of determination of the quality of worm compost crude and aqueous extract obtained from it (in a ratio 1:100) it was found that the active acidity constituted respectively 7.2 and 7.24 units, and total nitrogen content – 3.14 % and 0.10%. Humus content, potassium, magnesium and phosphorus in worm compost crude constituted, respectively 22.8%, 1.90%, 0.85% and 1.83%.

In order to accelerate the germination of the seeds, for 12 hours, they were macerated in the fertilizer obtained from the warm compost in the ratio mentioned above.

After 12 hours the macerated seeds were incorporated into the soil.

In the result of examination effectuated on the plant emergence it was found that maize on experimental lot I and II have sprung, respectively 3 days and 5 days earlier, than the plants on control lot. In the result of counting plants of each row during the phase of heaving in sight were found the following (Table 2): the number of plants of maize emerged on experimental lots I and II after 16 days from sowing has exceeded that of the control lot, respectively 20.69% and 0.86%. After 19 days from sowing, the number of emerged plants has increased in all lots, but the ratio between the number of plants emerged on experimental lots I and II exceeded that of the control lot, respectively 28.96% and 20.22%. Changes were observed in the number of plants emerged after 25 days from sowing, but the difference as among the control lot and those experimental as and among experimental lots I and II, has decreased. However, in the experimental lots I and II the number of emergence of maize plants exceeded that of the plants in the control lot, respectively 18.70% and 16.83%.

Table 2 The evaluation of the process of the emergence of maize

No.	The variants of lots	Dates and number of emerged plants					
		16 days		19 days		25 days	
		The number of plants	%, relative to the control	The number of plants	%, relative to the control	The number of plants	%, relative to the
1	Control	11.6	100.00	18.3	100.00	35.66	100.00
2	Experimental I	14.0	120.69	23.6	128.96	42.33	118.70
3	Experimental II	11.7	100.86	22.0	120.22	41.66	116.83

Therefore, the results obtained regarding to the process of the emergence of plants, the seeds of which have been macerated in liquid fertilizer obtained from crude worm compost, demonstrates that its influence has been beneficial, accelerating the process plant emergence.

In the result of observations on the development phases of maize plants in the experiment it was found that in the first two phenological phases, the key differences between the physiological state of the cultivated plants on the control lot and those experimental were not found. The differences appeared in the third phenological phase of development of corn when it was found that in the experimental lot I, were kept several green plants than in the control lot and the experimental lot II (photo 1).

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This occurred under the influence of the liquid fertilizer action obtained from crude worm compost used in three innings for maize fertilization.

The fertilization maintained the soil moisture and prolonged the ripening of maize. In early September, during the harvest of maize (fourth phase of phenology) it was found that the experimental lot I the green plants constituted – 2.22%, the experimental lot II – 1.98%, while the control lot – 0.74%.

Therefore, from the effectuated results of research it was found that the liquid organic fertilizer used in corn fertilization, in triplicate, in the arid climatic conditions, retained the soil moisture, thus prolonging its ripe.

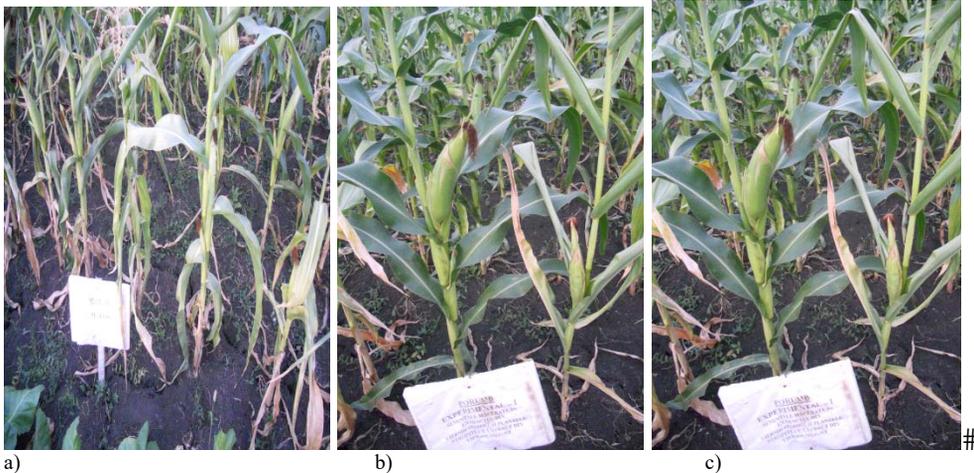


Photo 1. The physiological development of maize included in the experiment, in the third phenological phase: a) the control lot; b) the experimental lot I; c) the experimental lot II

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During the vegetation period, in dependence on phenological phases, taking into account the conditions of the experiment, the samples were taken in assessing the quality of maize in the purpose of estimation of its quality, by determining of some quality indicators: total nitrogen, crude protein, nitrites and nitrates (Table 3).

Table 3 The evaluation of the quality of the cultivated maize with the fond of liquid fertilizer

The phenological phases	The sample type	The quality indicators	The experimental variants		
			Control	Experimental I	Experimental II
I	The stems and leaves	Total nitrogen, %	1.59 ± 0.22	2.63 ± 0.22	2.09 ± 0.94
		Crude protein, %	9.94 ± 1.38	16.44 ± 1.38	13.06 ± 0.94
		Nitrates, mg / kg	420.80 ± 3.54	402.60 ± 3.54	412.68 ± 1.38
II	The stems and leaves	Total nitrogen, %	1.65 ± 0.11	2.63 ± 0.22	2.13 ± 0.08
		Crude protein, %	10.31 ± 0.72	16.44 ± 1.12	13.31 ± 0.50
		Nitrates, mg / kg	315.26 ± 0.39	210.48 ± 0.53	305.56 ± 0.42
III	The stems and leaves	Total nitrogen, %	1.71 ± 0.00	2.85 ± 0.16	2.13 ± 0.08
		Crude protein, %	10.68 ± 0.00	17.81 ± 1.11***	13.31 ± 0.50***
		Nitrates, mg / kg	157.40 ± 0.81	142.12 ± 0.50	147.46 ± 0.12
IV (a)	The stems and leaves	Total nitrogen, %	1.46 ± 0.00	1.85 ± 0.26	1.71 ± 0.00
		Crude protein, %	9.13 ± 0.00	11.59 ± 1.60	10.69 ± 0.00
		Nitrates, mg / kg	420.00 ± 0.88	210.20 ± 0.71	349.85 ± 1.06
IV (b)	The cobs	Total nitrogen, %	2.09 ± 0.15	2.97 ± 0.04***	2.50 ± 0.00
		Crude protein, %	13.06 ± 0.94	18.56 ± 0.27***	15.63 ± 0.00
		Nitrates, mg / kg	-	-	-

Note: Phenological stages: I - ear formation; II- cobs in the phase of milk; III- cobs in the phase of wax; IV- final ripening;

*** Authentic results

From the analysis of the recorded results it is noted the fact, that the values of total nitrogen crude protein from plants collected from the experimental lot I, in all phases, exceeded those of the control lot plants, respectively with 26.71% - 66.7%. The same regularity was manifested in comparison with their values in the plants of the experimental lot II, in which the content of total nitrogen and the content of crude protein exceeded the control lot, respectively with 17.12% - 31.45%. The value of these indexes in the maize seed collected in the period of final

ripeness of corn on the experimental lots I and II, has exceeded that of the control lot, respectively with 42.11% and 19.62%.

Differences were found in total nitrogen content and crude protein content and the ratio between experimental lots I and II.

Their value in the collected plants from the experimental lot II, in phenological phases I, II, III and IV decreased respectively by 20.53% and 20.56%; 19.01% and 19.04%; 25.23% and 25.27%; 7.53 and 7.57%, in comparison with those of plants of experimental lot I.

The values of these indicators, in maize seed collected during the final ripening of the crops from the experimental lots I and II, have exceeded those plant seeds in the control group, respectively 42.11% and 19.62%. The ratio between the experimental groups I and II, the seeds collected from the lot II, the content of total nitrogen and crude protein content decreased respectively with 15.82% -15.79%, in comparison to those in lot I.

In the result of researches concerning to the content of nitrosocompounds in the corn samples it was found that the amount of nitrites was insignificant as in the plants control lot as in those experimental. The amount of nitrates in the plants collected from experimental lot I decreased in all phenological phases, respectively with 4.33% -49.95%, but in those collected from the experimental lot II this reduction constituted collected from this reduction 1.93%-16.70%. In the corn seed samples collected in phenophase of final ripening the nitrogen compounds were not detected.

Thus, in result of the effectuated researches it was found the beneficial effect of liquid fertilizer obtained from was found liquid obtained from worm compost and drinking water in a ratio of 1:100, above the process of seed germination, plant development and the quality of achieved production.

CONCLUSIONS

In the result of researches it was found that soaking of maize seed in a liquid organic fertilizer obtained from crude worm compost and drinking water in the ratio 1:100 and its use as a fertilizer (in triplicate):

- contributed to the early emergence of corn and to its more intense physiological development;
- improved quality of maize, increasing the content of total nitrogen and crude protein content, and diminishing the nitrate content.

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