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MANAGEMENT OF ORGANIC WASTE IN CONTEXT ENVIRONMENT PROTECTION

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Abstract

Management of organic waste is a difficult, complex and intractable in Moldova, according to international standards. Acute problem of organic matter from livestock sector waste is generated by storing them in unauthorized areas. Organic waste management strategies require different methods. One of them is organic waste bio conversion technology by worm's cultivation. Wormculture is biological method converting the organic wastes with the help of worms (wormgrowing), which use organic wastes as food and vital environment. Before, organic wastes must be held to fermentation, in order to regulate the level of active acidity and of the content of azoth – ammoniac. The investigation performed bellow has the goal of showing how the ecological situation can be improved through wormculture, meaning the bioconversion of organic offal. This can be achieved by obtaining valuable organic fertilizers and ecological agricultural production by wormculture. Tecnology of wormculture included: the preparation of nutritional substratum; the production of worm's compost and wormculture; the utiluzation of worm's compost. The object of technology: the complexe bioconversion of wastes; obtaining organic enrichemnts with long-time action; the reanimation of damaged soils; the growth of the agricultural production; obtaining ecological production; the protection of the environment. In order to improve the ecological, sanitary-veterinary, epidemiological and epizootic situation, the bioconversion of organic wastes through wormculture method is strongly recommended.

Key words: *earth worm, nutrient substrate, organic wastes, wormculture, worm's compost.*

INTRODUCTION

Organic waste management includes all activities of collection, transport, treatment, and recovery of waste disposal. Principles of sustainable development and recycling of waste management is reflected by: prevention, and reversing the growth slow down provides waste generation the rate of, reuse and recycling means using waste as secondary raw materials or without Auxiliary (reuse) processing or with further processing (recycling) of waste recovery is to extract material values inclusive using combustible fraction of waste as alternative fuel, eliminating what is inhumation in landfills components that can not be recovered [3].

Effective planning of waste management is based on morphological composition including solid organic waste and the animal. Management system animal waste include: pastures and farms, where animal manure are left to decompose on land and are not collected, stored and used, scattering or dispersion which provides daily animal waste collection and subsequent scattering, regularly on the field; in solid form storage in animal droppings are collected and stored in solid form for a long time before being stored pens where manure formats are allowed to dry as periodically removed in the dry state and used by destination, liquid systems represented by artificial basins where manure in liquid form or suspension are stored over six months and more, is then applied on the land, anaerobic lagoons or ponds which are systems that use water for transporting livestock manure to lagoons/ponds, which are held by 30 to 200 days, and water can be recycled or used for irrigation and fertilization of agricultural land, storage and preservation in pits where liquid manure comes from growing pigs are kept for more than 30 days before the used [7].

Realization of adequate management of waste which have objective both for reduction volume of waste obtained and reuse as a maximum is

priority of environmental problems. The main objectives in managing organic waste is recovered and neutralization. Technology of wormculture is effective method of solving the main objectives in the management of organic waste.

The successful realization of waste management is necessary: public awareness about the danger to health from inadequate waste management, proactively in practice selective collection and stimulate economic activity and Waste Management [4].

The above demonstrates that organic waste processing is a current problem and perspective. Currently the world are developed methods and technologies for future bioconversion process of organic waste. One of these methods is the processing of organic waste by worm culture. Biological worm cultivation is the method processing of organic waste with rhyme (worm culture), using as food and living environment of livestock organic waste and plant growing. Previously, organic waste should be subject to fermentation, to regulate active acidity levels of nitrogen and ammonia.

It is known that worm cultivation technology plays an important role in solving the acute problems of the environment and organic farming.

Technology of bioconversion of organic waste by worm culture is based on biological capacity the rhyme of the solid fraction of organic waste used as substrate and source of nutrients. By using worm cultivation in a relatively short period of time is obtained valuable organic fertilizer (worm's compost), which contribute to increasing crop yields, has a high biological activity, are concentrated a large number of macro-and microelements , stimulating growth, vitamins and others [3, 5, 6].

Technology of bioconversion of organic waste by worm culture is method of perspective for sustainable development of agriculture can be practiced in households with divert property types (public, farmers and private). It involves the use of organic waste, animal waste, plant, which has undergone partial fermentation process [4].

MATERIAL AND METHOD

Study of organic waste management was made under the practical conditions of Technological-experimental station "Maximovca". For recovery and neutralization of organic waste was held territory for worm culture, which included five sections with dimensions 1 m x 50 m for worm cultivation. Each sector was divided into 25 sections with dimensions of 1m x 2m. Research materials were served cattle manure, and were under investigation by California red hybrid rhyme (Eisenia foetrida andrei), biotransformed of organic waste.

In sectors prepared for the recovery and disposal of organic waste, which was initially placed 5-7 cm layer of straw and then 125 tons of organic waste, in recital 25 tons or one ton at each sector. Organic waste used as a nutrient substrate in advance for six months, were subjected to fermentation. Nutrient substrate thickness for worm cultivation. Sector was 25-35 cm. In the course of a month in the sectors of food substrate were sprayed for a week-daily and then once a week. After the spraying, the substrate prepared for worm cultivation was tested for analysis performed by the purpose of determining the quality and nutritional value. Initially and during experimental both, nutrient nutrition substrate used for worm culture and in the final product (worm's compost) obtained as a result of organic waste of bioconversion were determined following indices: active acidity (pH), ammonia nitrogen content, total nitrogen, organic matter, potassium, calcium, magnesium, phosphorus and bacterial flora (Table 1).

Also for determining the quality of nutritional substrate was used the test "50 rhymes". According to test, a box of dimension 50 cm x 50 cm were placed 3 kg of nutrient substrate, and in it were placed 50 rhymes. If within 24 hours rhymes do not leave the substrate and they are active, then it is confirmed that nutritional substrate is beneficial for worm cultivation [7]. Initially, and during the experimental period, was made weighing of organic waste used for worm cultivation, and at the end of the experiment - obtained worm compost.

In prepared nutritive substrate was placed worm culture (rhymes), reasons 50 thousand mature individuals at a station. The experiment was six months. During experimental nutrient substrate was sprayed with water (to the extent necessary). Sectors for worm cultivation were covered with straw in order to reduce the evaporation.

After 30 days of the beginning of the experiment, then every 15 days sectors was carried additional nutrition of worm culture. During the experimental period to make an additional nutrition were used 50 kg of nutrient substrate. Adding additional food was held 12 times. So, in a section were added 600 kg of nutrient substrate addition, and in an area 15 tons. In general, the experimental period was used 200 tons of organic waste [1, 2].

Analysis of nutrient substrate quality and of worm's compost was performed according to the methods listed below: active acidity - with pH-meter, total nitrogen - using the Kjeldahl method, ammonium nitrate, calcium, phosphorus, and potassium - according E.Petuhova.

RESULTS AND DISCUSSIONS

Experiment on the organic waste management in practical conditions of Technological-Experimental Station "Maximovca" started in april and lasted six months. In the experiment for the recovery and neutralization of organic waste were used 200 tons of cattle manure. At the initial stage and during the experimental period were collected samples of nutrient substrate, where they underwent biochemical analysis to determine the quality of organic waste used for worm cultivation. From making multiple analyzes of nutrient substrate, it was found that all parameters are the same requirements set forth in bio conversion technology of organic waste by cultivation of worms. Results are presented in Table 1.

As a result of analyzes it was found that basic nutritional value and substrate parameters used in additional nutrition, prepared for worm cultivation corresponding the values admissible provided by worm cultivation technology, except for maximum the values of some parameters.

Analysis of the results on the quantity of organic waste recovered in the experiment has been found that during the six months were processed by worm cultivation 200 tons of organic waste. Originally used for worm cultivation five sectors were placed 125 tons of nutrient substrate and when making additional nutrition during the experiment were placed in sectors 75 tons of organic waste.

Table 1. Chemical composition of the nutrient substrate

No	Indices	Values admisibile M ± m	Values obtained in nutrient substrate, M ± m	
			minimum	maximum
1	Active acidity (pH), units	7.57 ± 0.08	6.80 ± 0.06	7.20 ± 0.08
2	Ammoniacal nitrogen, mg / kg	5.56 ± 0.57	4.30 ± 0.09	17.00±0.57
3	Total nitrogen, %	0.83 ± 0.63	0.81 ± 0.12	3.00 ± 0.63
4	Organic substanc, %	30.35±0.60	30.00±0.56	40.00±0.60
5	Magnesium, %	1.17 ± 0.52	0.50 ± 0.11	2.50 ± 0.52
6	Phosphorus (P_2O_5), %	0.65 ± 0.32	0.60 ± 0.08	2.50 ± 0.32
7	Potassium (K2O), %	0.68 ± 0.01	0.20 ± 0.01	1.50 ± 0.01
8	Calcium, %	0.55 ± 0.35	0.50 ± 0.09	4.00 ± 0.35

So, during the experiment on the farm Technological - Experimental Station "Maximovca" were recovered a considerable amount of organic waste.

As a result of bio conversion technology use by worm cultivation of waste was obtained valuable organic fertilizer - worm's compost. The quantity and quality depended on the quality of nutritional substrate. The literary sources mentioned that a tonne of organic substances are produced 400-600 kg of worm's compost [5]. The quantity of worm's compost obtained in the experiment was about 124 tons. Thus, the share of worm's compost obtained from a ton of organic waste in the experiment was 62%.

The worm's compost is one of the final products of bio conversion of organic waste by worm cultivation. It consists of small granules of dark brown color, no smell, is hygroscopic and can be stored in dry years without losing its qualities.

In Table 2 are exposed worm's compost quality indices of the result obtained by worm cultivation organic of waste management.

Comparing values of worm's compost with initially nutrient substrate found that active acidity, content of total nitrogen, calcium, magnesium, potassium and phosphorus in the

fraction 0.25 of worm's compost is obtained exceed that of the nutrient substrate, respectively 3.17%; 31.33%; 12.70% from 3.82 times to 2.11 times, and 1.0 mm fraction, respectively 6.74%, to 3.61 times, 6.90 times, 2.14 times, 3.67 times and 3.84 times.

Table 2. Quality indices of worm's compost obtained from cattle manure

No	Indices	Fractions and values of worm's compost, M ± m	
		Fraction, 0.25 mm	Fraction, 1.00 mm
1	Active acidity (pH), units	7.81 ± 0.03	8.08 ± 0.02
2	Organic substance, %	24.39± 0.45	27.41± 0.41
3	Total nitrogen, %	1.09 ± 0.01	3.00 ± 0.04
4	Potassium (K_2O), %	1.92 ± 0.02	2.50 ± 0.03
5	Magnesium, %	1.18 ± 0.03	2.50 ± 0.04
6	Phosphorus (P_2O_5), %	1.37 ± 0.08	2.50 ± 0.06
7	Calcium, %	0.62 ± 0.02	3.80 ± 0.05
8	Humus, %	29.66± 1.40	35.91± 1.90
9	Nonpathogenic bacterial flora, colonies	$2x10^{12}$	$2x10^{12}$

Organic matter content decreased in the fractions investigated, respectively 19.64% and 9.69%. The results of the investigations it was found that worm's compost contains 100 times more non-pathogenic microflora ($2x10^{12}$ colonies) than regular compost.

In the worm's compost is well-balanced content of macro-and microelements which allows the dose reduction by incorporation into the soil of 8-12 times compared with ordinary compost. Effectiveness of the action of worm's compost kept over a period of 3-4 years. In worm's compost are concentrated quantities of enzymes, vitamins and stimulating growth.

According to the results found that worm's compost is superior nutritional substrate. Organic matter during the bioconversion turned into humus.

The worm's compost can be used for cultivation of all agricultural plants, positive impact on their development needs at different stages of vegetation and harvest per unit of surface.

The incorporation into the soil of worm's compost is made considerable savings taking into account that the 6.3 tons per hectare using the worm's compost compared with 40-70 t / ha of traditional compost.

So, bioconversion technology of organic waste by worm cultivation resolves a number of problems that are present in agriculture: of organic waste recovery and neutralization, environmental protection, improving soil fertility, obtaining an ecological agricultural production.

CONCLUSIONS

In the results of the investigations it was found that:

- Bioconversion of organic waste by worm cultivation is one of effective methods in organic waste management.
- Bioconversion technology of organic waste by worm cultivation resolves a number of problems that are present in agriculture: recovery and neutralization of organic waste, environmental protection, improving soil fertility, obtaining an ecological agricultural production.
- In the worm's compost is well-balanced content of macro-and microelementswhich allows the dose reduction by incorporation into the soil of 8-12 times compared with ordinary compost.

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