PROCESSING AND UTILIZATION OF ORGANIC WASTES WITH HELP BIOOBJECTS

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The role of earthworms in the development of the physico-chemical and biological properties of soil and soil fertility is considerable and well-known. One of the important effects of earthworms is the production of large amounts of faeces or casts. Earthworm casts are the pool of concentrated nutrients. The content of total nitrogen, phosphorus, potassium and sodium are at a higher level in casts that in the surrounding soil. Vermitechnology (vermicomposting and vermiculture) is a biotechnical process in which earthworms are used to transform organic residues into more humified materials. Vermicomposting, the breakdown of organic wastes by earthworms, has become increasingly popular in recent years and there has been considerable commercialization of the process. In contrast with other traditional processes of utilization of organic wastes, vermicomposting takes advantages of the biological capabilities of earthworms and their activities to enhance the aerobic microbial decomposition of organic materials.

Vermitechnology (vermicomposting and vermiculture) is a biotechnical process in which earthworms are used to transform organic residues into more humified materials. Vermicomposting of agricultural and industrial wastes is not a traditional practice in Belarus.

The experimental design of our investigations is to work out different vermitechnologies of processing and utilization of organic wastes.

Almost any agricultural, urban or industrial organic wastes can be used for vermicomposting, but some may need form of preprocessing to make them acceptable to earthworms. Such preliminary treatments can involve washing, precomposting, macerating or mixing. Systems of vermicomposting include: outdoor or indoor windrows, wedge systems or indoor batch systems.

We use outdoor ground beds. The soil type, pH, organic matter content, soil moisture and any physical and chemical factors can act as limiting factors for earthworm survival. The processing of organic wastes be earthworms occurs most rapidly at temperatures between 15^0C and 25^0C and at moisture contents of 65-70%. The earthworms are also sensitive to certain conditions in the wastes. In particular, earthworms are very sensitive to ammonia (not more that 0.5 mg of ammonia per gram) and salts (not more than 0.5 %). In our investigation the content of ammonia was <0.5 mg/g and the content of salts was <0.5%. One of the most important characteristics of substrates supporting earthworm growth is the C/N ratio. The carbon to nitrogen (C:N) ration was 20 good bulking characteristics (because of high straw content). In our investigations we found that 70-75% moisture contents produced the best growth and reproductive response. Worms can survive in a pH range of 5 to 9 (Edwards, 1998). Our investigations showed that the range pH of

6.5-7.2 was optimum. E. foetida reproduced very quickly. Our population doubled every 50-60 days, but only under optimum conditions. The density of population was 1 kg/m^2. To our mind, it is optimum density for reproduction. E. foetida produced 8 cocoons per earthworm per week (25 young earthworms).

We used several types of wastes: agricultural, trade and municipal. They are: cattle manure, pig manure, horse manure, poultry manure, rabbit manure, plant residues, beer pellet, sewage sediments, paper, leaves, grass. No mortality of earthworms was observed in any substrates. Total earthworm biomass increased in all substrates. Maximal number of clitellated earthworms was observed between the second and third months in all substrates.

We use in the vermin technologies Eisenia foetida (Savigny, 1826) (the tiger or brandling worm). It is word-wide species of earthworms. It has very high reproductive potential, has wide range of temperature tolerance and is less sensitive to density pressure.

Our final product after vermicomposting had a fine particulate structure, good water-holding capacity, high microbial activity and contained nutrients in a form ready available for plant uptake. The chemical nutrient contents of biohumus depended on material from which it is processed. But it contains the necessary elements for plants. The chemical composition of initial substrates and obtained biohumus were determined. Nutrients in biohumus were much higher than either ordinary garden soil and ordinary compost. Biohumus had higher N, P, K, Ca, Mg values than compost. pH of biohumus was 7.1.

We worked out technology of getting new humic liquid fertilizer using biohumus. It includes a complex of biologically active components in addition to the humic substances. The preparation (tradename “Fiterra”) includes humates and fulvates Na and K, aminoacids, vitamins, phytohormones. The preparation improved seed germination; enhanced the growth of root systems: decreased the vegetative period by 2 -3 weeks and content of nitrates: increased the tolerance to diseases.

Flour from worms is a high quality of source of animal protein. Our investigations clearly indicated its efficiency in replacing fish flour and meat-bone flour in poultry, pig and fish feeds.