COMBINED LACTIC ACID FERMENTATION AND VERMICOMPOSTING FOR FAST PROCESSING OF ORGANIC WASTE

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INTRODUCTION

Every day in Chisinău huge amounts of organic waste are produced, creating odor nuisance and numerous environmental problems. Data of Regia Autosalubritate (Gavrilita, 2006) indicate that approximately 67% of waste generated by households and business organizations is made up of fresh and dry organic waste. Processing of organic waste into useful soil amendments is usually done via aerobic composting. This type of composting requires a correct C/N ratio for an appropriate temperature increase for sanitization and decomposition by thermophilic bacteria. One of the problems with aerobic composting is that only approximately 50% of the carbon in the starting material is recycled, the rest being lost to the atmosphere as greenhouse gases, thus contributing to climate change effects. In order to have compost piles oxygenated it is important to turn them often and quite intensively. In addition, if aerobic composting is done outdoors, it can attract disease vectors such as flies and rodents.

Vermicomposting can be combined with lactic acid fermentation (so-called bokashi composting) as alternatives to aerobic composting, this practice could be applicable for many private and summer houses ("datcha"). Vermi-composting is a lengthy process of approximately 6 months; however additional pre-treatment by lactic acid fermentation can shorten the process to up to 2-4 months.

MATERIALS AND METHODS

The treated organic waste included faeces collected from urine diverting dry toilet, bio-waste (kitchen waste and fresh fruit waste), molasses and lactic acid bacteria inoculum obtained from sauerkraut juice. This mixture was lacto-fermented in an enclosed barrel for a period of 10 days at ambient temperature Vermi-composting was carried out outdoor, in a windrow of one meter wide by one meter long and 40 cm high, using *Eisenia foetida,* with an inoculation density of 5,000 worms per investigated windrow and the whole experimental period lasted 130 days. Since the lacto-fermented material was highly anaerobic and rich in organic acids (lactic and acetic acids), with a potential deleterious effect on earthworms, the lacto-fermented mix was kept for one week for aeration and volatilization of toxic compounds, before being offered to the earthworms. Wet shredded newspaper was used as bedding material. The germination index was calculated according to the methods described in Adreev et al.,

(2017). Sanitation indicator bacteria were assessed at the Laboratory of Sanitary Microbiology, National Centre of Public Health, Moldova (Andreev et al, 2017).

SUMMARY OF THE MAIN RESULTS

Pre-treatment of organic waste via lactic acid fermentation for a period of 10 days demonstrated that the composting earthworm *Eisenia foetida* is willingly to accept the substrate. Moreover, the worm body weight and hatchling rate was higher than that with untreated simple stored cattle manure (Andreev et al., 2016). Also the concentration of sanitation indicator bacteria, with the exception of coliforms in the obtained vermicast reached the safe level of < 3 CFU g^{-1} (Andreev et al., 2017). The aqueous extract of the vermicast after 4 months of vermicomposting had a beneficial effect on radish with a germination index of 84-100% after 72 hours. Growth of tomato in soil amended with vermicast contributed to higher plants and better fruit performance than the control (Andreev et al., 2017). According to the biological effects on plant germination and growth, the vermicast was mature; however, it is important to assess additional parameters for compost maturity, e.g. C/N ratio, respiration rate, the level of elemental and functional composition of organic matter and the humification level with the use of chromatography-mass spectrometry or UV-spectroscopy (Bernal *et al.*, 2009). In addition, the hygienization level shall be assessed when such organic waste as human excreta or animal manure is used as feedstock material.

References

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