PRODUCTION OF COMPOST BY BIOCONVERSION OF AGRO-INDUSTRIAL WASTE WITH THE USE OF SELECTED BIOPREPARATIONS

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Abstract

Accumulation of agro-industrial waste represents problem of environmental pollution, considering that it increases the emission of greenhouse gases. Composting is an environmentally friendly waste management solution based on a circular economy strategy. The bioconversion of agro-industrial waste into the product with added value, such as compost, may reduce the amount of synthetic fertilizers utilized in agriculture. The bioconversion of lignocellulosic material itself is a complex process consisting of pretreatments such as mechanical, chemical or biological. The biodegradation of cellulose consists of the initial action of exo- and endoglucanase enzymes that break down the amorphous and crystalline structure of cellulose. Delignification of lignocellulosic biomass is carried out by extracellular oxidative enzymes, which are mainly produced by fungi that cause wood rot, as well as other types of bacteria. The inoculating lignocellulosic waste materials with specific microbial starters might accelerate the composting. This study developed technology for the production of compost from plant waste using selected organically certified biopreparations based on seaweed extracts, enzyme extracts of entomopathogenic fungi (Beauveria spp., Metarhizium spp., Verticillium spp. - 10%) and a mixture of Bacillus strains. The composting material used, was one of the most abundant agro-industrial wastes, lignocellulosic waste from wheat straw and alfalfa hay. To assess the maturity and quality of the compost, chemical and biological parameters (C/N ratio, pH, electrical conductivity, content of P_2O_5, K_2O, NH_4-N and NO_3-N and phytotoxicity) were monitored during the 40-day monitoring period. According to the results of C/N ratio and NH_4-N and NO_3-N content, the composting process was accelerated at the very beginning in the first 10 days in samples with biopreparations, compared to the control without treatment, which indicates increased microbial activity and accelerated decomposition of organic matter. The Germination index (GI) of the investigated white mustard seeds (Sinapis alba L.), after 40 days of the composting process, is higher by 30% compared to the control, in samples of compost from wheat straw and alfalfa hay with the treatments. The addition of organically certified biopreparations made it possible to reduce the time required for decomposition of plant waste, and the produced compost was acceptable and safe for further use in agriculture, according to all tested chemical and biological parameters and with an improved effect of biofertilization.

Keywords: *composting, wheat straw, alfalfa hay, seaweed extract, enzyme extracts of fungi, Bacillus sp.*

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