

## ABSTRACT

Suboptimal management of household and agricultural organic waste can lead to environmental pollution and loss of potential organic material of agricultural value. Various composting methods have been developed, but still have limitations in process efficiency and the quality of compost produced. Therefore, this research developed COMPASS (Composting Process Automation System), an organic waste treatment system based on the Internet of Things (IoT) and engineered microbiome in smart bioreactors to improve the efficiency and quality of compost. This research aims to analyze the effectiveness of COMPASS in accelerating the decomposition process and producing quality compost according to the Indonesian National Standard (SNI 19-7030-2004). The results showed that the COMPASS system was able to maintain optimal conditions during the composting process with temperatures reaching the thermophilic phase (40-60°C), pH 7.0, humidity 44%, fresh soil odor, blackish brown color, and crumb structure. The use of EM4 as an inoculant accelerates the decomposition process by providing effective microorganisms. The IoT-based organic waste treatment system technology can be practically applied on a household and agricultural scale. The resulting compost can then be reused by farmers to fertilize their farmlands, reducing dependence on expensive and potentially environmentally damaging chemical fertilizers. In addition, the use of compost from their own organic waste can create a more sustainable and economical agricultural cycle.

Keywords: Compost, IoT, Microbiome, Bioreactor, Organic