

Novel bacterial consortium for the reduction of composting odor emission and enhancing compost maturation rate in the municipal solid waste

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Composting is a crucial part of global sustainable municipal solid waste management. However, the odorous emissions during composting are considered a major social and ecological concern. Most of the available physical-chemical methods to eliminate odor emission during composting are not successful and economically not viable. Thus, the present study focuses on the control of odorous emissions in composting while accelerating the compost maturity rate using novel microbial consortia as a greener approach. For the study, Bacteria were isolated from open dump sites, five different consortia were developed and their performance against malodor reduction was evaluated. The odorous emission in terms of Volatile Organic Compounds (VOC), CH₄, NH₃, and H₂S during composting was evaluated using an electronic nose and gas analyzer. According to the results, consortium No. 5 (C5) which contained *Bacillus haynesii*, *Bacillus amyloliquefaciens*, and *Bacillus safensis* performed an exceptional odor reduction compared to all other treatments. The C5 consortium eliminated the odor while recording VOC, CH₄, NH₃, and H₂S concentrations between 0.5-6.0 ppm, 0.5-0.8 ppm, 0.3-0.5 ppm, and 0.5-0.6 ppm, respectively, whereas the control sample detecting, 4.5-10.2 ppm, 0.5-5.5 ppm, 0.3-5.5 ppm, and 0.5-6.4 ppm concentrations for the same odor-causing gases, respectively. Furthermore, E-nose results confirmed a significant ($p < 0.05$) emission reduction of methane-aliphatic chemicals, sulfur and aromatic compounds, and alkane compounds in the C5 consortium inoculated treatment showing the potential applicability of novel prepared consortia for mitigation of composting odor.

Keywords: Bacterial consortia, composting, municipal solid waste, odor reduction

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