(219)

Enrichment of Municipal Solid Waste Compost with Native Free-Living Diazotrophic Bacteria to Enhance the Plant Available Nitrogen

Manage, P.M.[1]*, Rathnapriya, R.H.K.G.[1], Wijerathna, P.A.K.C.[1, 2]

[1]Centre for Water Quality and Algae Research, Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[2]Faculty of Graduate Studies, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
**pathmalal@sjp.ac.lk*

Abstract

Composting is one of the sustainable solutions for Municipal Solid Waste (MSW) management. However, the applicability of MSW compost for agricultural purposes is limited due to the relatively lower availability of Nitrogen (N). N is considered one of the primary macronutrients required for plant growth. Thus, the present study focuses on the enrichment of MSW compost with native free-living diazotrophs isolated from open dump sites and soil from agricultural lands in the western province of Sri Lanka. Bacteria were isolated using nitrogen-free Ashby's mannitol medium and Winogradsky's medium, and their nitrogen fixation potential was evaluated using spectrophotometric methods. The isolates with the highest nitrogen fixation potential were selected for consortia preparation and identified through 16S rRNA molecular analysis. Moreover, their single and synergistic compatibility to enhance the plant available N in MSW compost was evaluated using a pot experiment with *Capsicum annuum* as the test plant. Based on the results, 12 morphologically different bacterial isolates were isolated as nitrogen-fixing bacteria, and out of those two potential bacterial strains (N2-*Bacillus altitudinis* and N3-*Lysinibacillus macroides*) were selected for consortia preparation to enhance the plant available N in MSW compost. The enriched compost with N2N3 consortia showed significantly higher ($p \leq 0.05$) levels of plant available Nitrogen in nitrate and ammonium concentrations compared to the control. Furthermore, the results of the pot experiment showed that the enriched compost with N2N3 consortia increased the plant growth parameters during the early growth of *Capsicum annuum* (root length (cm); 72±2%, shoot length (cm); 25±1%, Number of leaves per plant; 13±1%). Thus, this study provides a cost-effective, eco-friendly alternative to imported and expensive chemical fertilizers, providing valuable insights into sustainable agricultural practices and waste management strategies.

Keywords: *Biofertilizer, Bacterial consortia, Compost enrichment, Free-living diazotrophic bacteria, Municipal solid waste compost*