STUDY THE EFFICIENCY OF SOME SELECTED COMPOSTING METHODS FOR LARGE SCALE COMPOSTING: A META ANALYSIS

By

A.M.T.M Adikari

Department of Biosystems Technology

Faculty of Technology

Eastern University, Sri Lanka

Chenkalady

2024

ABSTRACT

The circular economy is a concept that can significantly contribute to achieving a nation's sustainability goals. With the increasing urban population, cities generate more organic waste, but limited space constrains on-site waste management. Centralized composting is a viable solution to manage the waste efficiently, adding value by producing compost on a large scale. Several composting methods, including aerated static composting, biodigester composting, in-vessel composting, and vermicomposting, are currently used by industries. However, there is a need to determine the most suitable waste type for each method, a gap that remains in the literature. This study aims to identify the optimal waste type for each composting method by conducting a meta-analysis of the current literature on large-scale composting practices. A comprehensive review of 63 published research papers was conducted, followed by a meta-analysis. Key parameters such as temperature (mean 42.5°C), moisture content (mean 56.04%), pH (7.10), and composting duration (mean approximately 62 days) were analyzed as performance-controlling factors. Nitrogen (N), phosphorus (P), and potassium (K) content were used as performance indicators. The analysis revealed that temperature negatively correlates with the performance indicators, while moisture content shows a positive correlation. The biodigester method performed best, with mean values of N-2.52%, P-1.48%, and K-2.24%, followed by vermicomposting. The in-vessel and aerated static methods showed comparatively poor performance. Among waste types, food waste contributed the most, with mean values of N-2.28%, P-1.46%, and K-1.98%, while other waste types performed similarly but less effectively. The study concludes that the best combinations for large-scale composting are biodigesting with food waste and vermicomposting with municipal solid waste, offering the highest nutrient content in the produced compost.

Keywords: Composting method, large scale composting, waste management, Nutrition retention, Municipal Solid Waste

TABLE OF CONTENT