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Study the effect of clay, sawdust and half-composted garden waste as bulking agents in food waste composting at a controlled elevated temperature

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Bulking agents are generally employed to improve the efficiency and the quality of compost production. The use of bulking agents to accelerate the food waste composting process is an effective solution for the rising food waste management problem as landfill of food waste leads to serious environmental pollution. Bulking agents change the physical properties of composting feedstock and thereby enhance the biodegradation kinetics and composting performance. As the entire composting process relies on the indispensable role of the bulking agent, this study was focused to evaluate the effect of natural red clay, saw-dust, and half-composted garden waste as bulking agents for composting food waste derived from both cooked and raw food material, at a controlled high temperature (323.15 K). Three different composting feedstocks have been prepared with food waste, matured compost and selected bulking agents separately. Consecutive five-day studies were carried out to analyze the variation of pH, moisture content (MC) and organic matter content (OMC) in each sample. The surface morphology of the samples at the initial stage and after five days composting was analyzed using a Scanning Electron Microscope (SEM). A controlled elevated temperature (323.15 K) was used for rapid activation of thermophilic microorganism to enhance the biodegradation process. According to the literature, the activity of composting microbes is optimum under neutral to acidic pH and the ideal MC for composting is 50–60 %. This study showed that all three bulking agents are favorable for food waste composting. However, compared to the other two bulking agents, the employment of clay as a bulking agent, dropped the pH to acidic levels and also the recommended MC (50-60 %) for composting by thermophilic bacterial activity was achieved. Furthermore, the OMC was also highly reduced (~30%) by clay than the other two bulking agents, which gave evidence of a rapid composting process. Based on the SEM images, it was clear that the surface morphology after five days composting was more porous than the surface morphology of the initial sample, when clay was used as the bulking agent, when compared to the other two bulking agents. This study concluded that the clay has acted as the most effective bulking agent compared to saw dust and half-composted garden waste at this elevated temperature for composting food waste. Currently, further studies are being carried out to further optimize the percentage of clay for food waste composting process at elevated temperature.

Keywords: Food-waste composting, controlled elevated-temperature, bulking agent.

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