CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME I

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CHAPTER 21

A BATCH PROCESS PRODUCTION OF COMPOST AND KINETIC ORDER OF REACTION STUDY BY ISOLATED FUNGAL STRAINS

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ABSTRACT

The rate at which solid wastes is generated across the globe is currently of great concern due to its social and institutional impacts on the environment and public health. Source separated wastes indicated pH range of 5.11 – 6.08, COD range of 1223 – 4366 mg/L COD, EC range of 0.37 – 6.04 dS/m, and BOD_5/COD range of 0.025 – 0.143 mg/L while comingled wastes indicated pH range of 3.83 – 4.17, COD range of 3431 – 96650 mg/L COD, EC range of 4.59 – 16.40 dS/m and BOD_5/COD range of 6.7×10^{-3} – 9.82×10^{-2} mg/L to indicate there contribution to the formation of primary leachate aside from the decrease in the economic value of the waste. The intercepted source separated food and yard trimmings wastes were composted using locally isolated fungal strains (*Phanerochaete chrysosporium*, *Lentinus tigrinus, Aspergilus niger* and *Penicillium Spp*) in two adopted experimental designs with open and close system. Results obtained at $P \leq 0.05$ after ten harvests indicated pH range of 5.45 – 6.03, DD range of 9.44 – 10.12% and the percentage decrease in C/N ratio range of 16.99 – 18.20% for the open systems of composting. The simplest zero and first order kinetic models described the microbial mineralization of C/N relatively (R^2 range of 0.87 - 0.99), but the second order model explained the observed kinetics of the SSB better with R^2 range of 0.87 – 0.98 and a positive decay coefficient. The decay coefficient (k) which indicates if all the components of the biomass decomposed at the same rate increases from -0.0584 to 2×10^{-4} for PC stream & -0.0578 to 2×10^{-4} for LT stream in the open system across the zero, first and second order.

Keywords: C/N ratio, decay ratio, compost, biomass, second order

INTRODUCTION

Malaysia's rapid economy and one of the most popular tourist destinations in the ASEAN region is not exempted in the challenges of MSW. In 2009, Malaysia generated about 7.7 million tons of solid wastes of which more than 68% of these wastes generated are organics (Saeed et al., 2009). This organic content is beneficial for composting projects and not favorable for combustion or thermal technology as presently practiced (World Bank, 2008). Meanwhile, 89% of the entire waste generated are disposed while only 1% are converted to compost despite the suitability of the country climate for commercial compost