

Periodic addition of anaerobic sludge enhanced the lignocellulosic degradation rate during co-composting of oil palm biomass

ABSTRACT

The main objective of this work was to investigate the effects of the controlled periodic addition of anaerobic sludge during composting to increase amount of microbial DNA, which appears to be correlated to soluble sugar content which may relate to rate of lignocellulosic degradation. In this study, the composting of pressed-shredded oil palm empty fruit bunch with the periodic addition of palm oil mill effluent anaerobic sludge for moisture control in a newly designed in-vessel type composter was carried out. A control experiment was also conducted over the same period but with the periodic addition of water for moisture control instead of the anaerobic sludge. The lignocellulosic composition and the reducing sugar content were determined via fibre analysis and the spectrophotometric method respectively. The bacterial profile throughout the composting process was quantified by using qPCR. The growth of bacteria reached its peak at 48°C and the degradation of lignocellulose was highest during the thermophilic stage. The highest content of reducing sugar coincided with the highest degradation rate of lignocellulose and the highest DNA copy number during the thermophilic stage. Under the controlled experimental condition of increasing the microbial community, the composting was accelerated to 2.07% OM degradation per day compared to the water addition control at 0.60% OM per day.

Keyword: Composting; Oil palm empty fruit bunch; Quantitative PCR; Lignocellulosic fraction; Anaerobic sludge