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Analysis of Biogas Production Potential from Anaerobic Digestion of Canteen Waste of University of Sri Jayewardenepura

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Abstract

Anaerobic digestion leads to the production of a renewable energy source in the form of methane through biogas production (biomethane). Recently, biodegradable organic waste has been subjected to anaerobic digestion as a sustainable waste management practice. Canteen waste is considered a good source of organic materials, such as food and paper waste. The most common conventional waste management methods regarding canteen waste are open dumping and landfilling. This suppresses the opportunity for energy recovery from the organic fractions of the canteen waste via integrating the anaerobic digestion technology into waste management, a sustainable approach. The feasibility and potential of filling this identified gap is addressed in this study. Accordingly, this study investigated biogas generation potential using the organic fraction of canteen waste, specifically focusing on food and paper waste. The biogas production potential was determined by conducting a series of biomethane potential assay experiments. According to the selected experimental design, the organic portions of canteen waste were subjected to anaerobic digestion for over 35 days in batch experiments under ambient temperature. A factorial experimental design was followed in the experiment to determine the effect on biomethane production of multiple factors with the least number of experimental runs. Numerous factors, such as microbiological, operational, environmental and substrate characteristics, influence this anaerobic digestion process. This study examined the effect of particle size, inoculum to substrate ratio and waste composition on biomethane production. Cow manure was used as the inoculum where necessary. The experimental results were analyzed by curve fitting using a modified Gompertz equation. The highest biogas generation potential was reported from the reactor which contained the feedstock composed of both food and paper waste. The biogas yields were higher in the reactors which contained ≤20mm sized particles than the reactors with smaller particle size. The results indicated the presence of individual and synergistic effects of selected independent variables on biogas yield and the overall study revealed that food and paper waste can be incorporated into anaerobic digestion via a co-digestion process rather than mono-digestion of food waste.

Keywords: *Anaerobic digestion, Biomethane, Canteen waste, Co-digestion*