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A Feasibility Study of Waste (d) Potential: Synergistic Effect Evaluation by Co-digesting Organic Wastes and Kinetics of Biogas Production

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Abstract : A significant fraction of energy is wasted every year managing the biodegradable organic waste inadequately as development and sustainability are the inherent enemies. The management of these waste is indispensable to boost its optimum utilization by converting it to renewable energy resource (here biogas) through anaerobic digestion and to mitigate greenhouse gas emission. Food and yard wastes may prove to be appropriate and potential feedstocks for anaerobic co-digestion for biogas production. The present study has been performed to explore the synergistic effect of co-digesting food waste and yard trimmings from MNIT campus for enhanced biogas production in different ratios in batch tests (37±10C, 90 rpm, 45 days). The results were overwhelming and showed that blending two different organic waste in proper ratio improved the biogas generation considerably, with the highest biogas yield (2044±24 mLg-1VS) that was achieved at 75:25 of food waste to yard waste ratio on volatile solids (VS) basis. The yield was 1.7 and 2.2 folds higher than the mono-digestion of food or yard waste (1172±34, 1016±36mLg-1VS) respectively. The increase in biogas production may be credited to optimum C/N ratio resulting in higher yield. Also Adding TiO2 nanoparticles showed virtually no effect on biogas production as sometimes nanoparticles enhance biogas production. ICP-MS, FTIR analysis was carried out to gain an insight of feedstocks. Modified Gompertz and logistics models were applied for the kinetic study of biogas production where modified Gompertz model showed goodness-of-fit (R2=0.9978) with the experimental results.

Keywords : anaerobic co-digestion, biogas, kinetics, nanoparticle, organic waste
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