Application of solar assisted bioreactor for biogas production from palm oil mill effluent co-digested with cattle manure

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ABSTRACT

The key objective of this research was to investigate the potential of the co-digestion of palm oil mill effluent (POME) with cattle manure (CM) in a solar-assisted bioreactor (SABr) to produce enhanced biogas. The solar panel first converted solar radiation into electricity, which then warmed up the POME and CM mixture to maintain the required reactor temperature. The operation was conducted semi-continuously at mesophilic temperature (35°C). The produced energy was analyzed at 0:100, 25:75, 50:50, 75:25, and 100:0 mixing ratios of POME and CM. The mixture with equal proportions of POME and CM produced the maximum amount of biogas, i.e., 1567.00 mL, while the methane content present was 64.13%. The results revealed that this mixing ratio of POME and CM at mesophilic temperature (35°C) was the best arrangement of anaerobic co-digestion for storing solar energy during biogas production. The economic impact of constructing a biogas plant has been successfully analyzed and predicted as well. The proposed biogas plant seems to be economically feasible because an approximately five-year payback period on investment may be achieved if this technology is used on a large scale. Finally, the present work demonstrated that a complete solution to the application of solar-assisted bioreactor (SABr) is to integrate different features to enhance biogas production.

KEYWORDS

Solar-assisted bioreactor; Anaerobic co-digestion; Palm oil mill effluent; Cattle manure; Biogas production

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