Evaluation of Novel Inoculation Strategies for Solid State Anaerobic Digestion of Yam Peelings in Low-Tech Digesters

The operation of household scale anaerobic digesters is typically based on diluted animal dung, requiring stabled livestock and adequate water availability. This excludes many rural households in low-income countries from the benefits of a domestic biogas digester. Solid state anaerobic digestion (SSAD) can be operated with low process water demands, but the technology involves operational challenges, as e.g., risk of process acidification or low degradation rates. This study aimed at developing simple methods to perform SSAD of yam peelings in low-tech applications by testing different inoculation strategies and evaluating the necessity of dung addition as a supportive biomass. In initial lab scale trials 143 \pm 4 mL CH_4/g VS (volatile solids) were obtained from a mixture of yam peelings and dung digested in a multi-layer-inoculated batch reactor. In a consecutive incubation cycle in which adapted inoculum was applied, bottom inoculated digesters loaded without dung reached a yield of 140 \pm 16 mL CH_4/g VS. This indicates that SSAD of yam peelings is possible with simple inoculation methods and dung addition is unnecessary after microbial adaptation. A comparison with a conventional fixed dome digester indicated that SSAD can reduce process water demand and the digester volume necessary to supply a given biogas demand.

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