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Grease trap waste to biogas: A kinetic study of methane yield optimization from anaerobic digestion utilizing acclimated inoculum

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Grease trap waste (GTW) is becoming one of the highly explored substrates to produce biogas, as previous studies have shown it lipid content has a high methane production potential. Despite its potential, the interest in GTW mono-digestion has grown making it an attractive option for biogas production. However, the challenge lies in managing the instability of the digestion process, as grease trap waste alone tends to create operational issues such as long-chain fatty acid (LCFAs) accumulation, which can inhibit microbial activities. There are several other methods that can be employed to address the challenges and one of the factors includes inoculum acclimatization, where the microbial community is gradually adapted to high-lipid substrates. Despite the technical advancements made in previous studies, there is limited understanding of how acclimatized inoculum influences reactor kinetics. This study aims to fill this gap by investigating the performance of acclimatized microbial communities in anaerobic reactors labelled as RAB, with a focus on methane production kinetics. Without lag phase, RAB reactor showed the highest methane production performance as compared to Rcontrol when methane composition recorded was 71% with 0.455 LCH₄/L.day of methane production rate and 0.22 LCH₄/gCODremoved of

methane yield at OLR of 2.2 gCOD/L.day. The experimental results were well fitted in Monod and Contois kinetic models. High relationship between experimental and simulated results were obtained with high correlation coefficients (R²) ranging from 0.96-0.98. Overall, the efficient strategies to enhance methane productions were evaluated when overall methane enhancement were 42%. Accordingly, the kinetic models used in the study can be used to foresee the performance of the reactor for anaerobic digestion system treating GTW.

Biography

Nazaitulshila, as a researcher has research interest in waste recovery technology, water quality assessment and monitoring and water and wastewater treatment technology. As an active researcher, she has 2 graduated students (1 PhD and 1 M. Sc) as main supervisor and currently also has 1 on-going PhD international student as co-researcher. She also supervised 28 undergraduate students for final year project. She has completed 3 research grants (1 grant as leader (FRGS) and 2 grants as co-researcher (Industry grant)) and currently has 2 on-going (1 Internal grant and 1 Industry grant with total amount of MYR292,740. She has published 19 indexed papers in international journals, 1 intellectual properties (Copyright) and attending 7 international conferences. In 2020, she went for post-doctoral attachment to improve knowledge in focused research, enhance her publication quality and interpersonal skills.