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Effects of volatile fatty acids in biohydrogen effluent on biohythane production from palm oil mill effluent under thermophilic condition

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Abstract

Background: Biohydrogen effluent contains high concentration of volatile fatty acid mainly as butyric, acetic, lactic and propionic acids and the presence of various VFAs (mixture VFAs) and their cooperative effects on two stage biohythane production need to be further studied. The effect of VFAs concentrations in biohydrogen effluent of palm oil mill effluent (POME) on methane yield in methane stage of biohythane production was investigated.

Results: The methane yield obtained in low VFA loading (0.9 and 1.8 g/L) was 15-20% times greater than that of high VFA loading (3.6 and 4.7 g/L). Butyric acid at high concentrations (8 g/L) has the individual significantly negative effect the methane production process ($P < 0.05$). Lactic, acetic and butyric acid mixed with propionic acid at a concentration higher 0.5 g/L has an interaction significantly negative effect on the methanogenesis process ($P < 0.05$). Inhibition condition had a negative effect on both bacteria and archaea with inhibited on *Geobacillus* sp., *Thermoanaerobacterium thermosaccharolyticum*, *Methanoculleus thermophilus* and *Methanothermobacter delphuvii* resulting in low methane yield.

Conclusion: Prevention the high concentration of butyric acid, and propionic acid in the hydrogenic effluent could enhance methane production in two-stage anaerobic digestion for biohythane production.

Keywords: Acid, Archae community analysis, Biohythane, Effluent, Hydrogen production, Methane, Methanogenesis, Microbial community analysis, microbial

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