

Effects of bacterial bio-augmentation on the methane potential from facultative digestion of palm oil mill effluent and empty fruit bunch

ABSTRACT

The methane productivity and biodegradability of facultative single- and co-digestion samples with palm oil mill wastes was evaluated on the effect of bacterial bio-augmentation. The single- and co-digestion substrates were bio-augmented with *Bacillus subtilis* and a methanogenic mixed culture of anaerobic microorganisms at different loading percentage. The highest methane production was recorded at 0.95 LCH₄ from co-digestion sample augmented with 10% (v/v) *B. subtilis* while the highest methane yield of 0.7 mLCH₄/g volatile solid, attained by single-digestion of palm oil mill effluent with addition of mixed methanogens at 5% (v/v). Cumulative methane production for single-digestion increased from 0.17 LCH₄ to 0.32 LCH₄ in response to the bio-augmentation treatment with 5% mixed methanogens. Conversely, additional mixed methanogens to co-digestion substrate resulted 75% reduction in methane production compared to non-augmented co-digestion substrate. Addition of *B. subtilis* into co-digestion was more beneficial than mixed methanogens due to the cellulolytic degradation ability of *B. subtilis* to digest the lignocellulolytic substances in empty fruit bunch.

Keyword: Facultative digestion; EFB; POME; Bio-augmentation; Methane