Co-digestion of domestic kitchen food waste and palm oil mill effluent for biohydrogen production

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ABSTRACT

Biohydrogen production from organic waste not only provides a sustainable way to produce biofuel but it also resolves the growing environmental concerns associated with agro-industrial waste. This research study investigated the biological hydrogen production potential in batch mode through co-digestion of domestic kitchen food waste (DKFW) and palm oil mill effluent (POME) under mesophilic conditions by immobilized Bacillus anthracis bacterial strain. The results showed that hydrogen production from co-digestion of DKFW and POME with an equal proportion of the combination is pH and temperature-dependent. Where, the elevated pH from 4.0 to 5.0 increases hydrogen production significantly; however, increasing the pH > 5.0 reduces productivity. Similarly, by raising the operating temperature from 25 °C to 35 °C the hydrogen production rate (HPR) increases up to 67 mL/h. Apart from hydrogen production, a reduction in chemical oxygen demand (COD) was observed by up to 72 % in this study. The improvement observed for HPR and a significant reduction in COD, suggests that the co-digestion of POME and DKFW is an ideal substrate for hydrogen production at operational temperatures and initial pH of 35 °C and 5.0, respectively. The strategy for utilizing the different organic waste together as a substrate provides a new avenue for the complex substrate for bioenergy production.

KEYWORDS

Bacillus anthracis; Biohydrogen; Co-digestion; Domestic kitchen food waste; Palm oil mill effluent wastewater

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