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Effect of methanogenic inhibitors and temperature on biohydrogen production from simulated food waste

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The effect of methanogenic inhibitors (bromoethane sulfonate (BES) and autoclaving) and temperature (37, 60, and 70 °C) on hydrogen production in batch reactors was examined using simulated food waste and two different sources of biomass. Sludge A was obtained from a municipal wastewater treatment plant digester supplemented with fat. Sludge B was obtained from an upflow anaerobic granular sludge blanket reactor (UASB) treating brewery waste. Simulated food waste was composed of cabbage, fat, chicken, and potato flakes representing cellulose, lipids, protein, and carbohydrates, respectively. The results for sludge A at 37 and 60 °C showed that batch reactors containing BES produced more hydrogen with a shorter lag period than reactors in which the biomass was autoclaved. Very little to no hydrogen production was observed with either the addition of BES or autoclaved biomass for batch reactors at 70 °C. Similar results were observed for sludge B at 37 and 60 °C. However, in contrast to sludge A, significant hydrogen production was observed in granular sludge containing batch reactors at 70 °C. In addition, sludge B batch reactors containing BES produced more hydrogen when compared against reactors containing autoclaved granular sludge. These results show that methanogenic inhibition by BES yields more hydrogen production when compared against autoclaved biomass. In addition, granular biomass was less sensitive to the effects of temperature than suspended biomass.