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BIOGAS PRODUCTION FROM BIODEGRADABLE BIOPLASTICS

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Abstract

In this study, the potential for biogas production from biodegradable bioplastics was evaluated. Mater-Bi® (a family of maize-starch based flexible films) and PLA (PolyLactic Acid; a rigid, polylactide-based, polymer) bioplastics were digested in laboratory batch reactors, alone or in co-digestion with pig slurry or scotta (partially deproteinized cheese whey), at 35°C or 55°C. Methane (CH_4) and hydrogen (H_2) production were monitored during the incubation period. Maximum CH_4 (Mmax) or H_2 (Hmax) production per reactor, potential CH_4 (BMP) or H_2 (BHP) production g^{-1} volatile solids (VS), and residual VS in the digestates were determined. Methane was produced when bioplastics were digested alone or with pig slurry, whereas H_2 was produced only in co-digestion with scotta. Mmax, BMP, Hmax and BHP were on average higher at 55°C than at 35°C (+69%, +158%, +51% and +45%, respectively). At 35°C, in monodigestion, small amounts of CH_4 (33 mL g^{-1} VS) were produced with Mater-Bi® only. At 55°C, the BMP for Mater-Bi® and for PLA were equal to 113 mL and 282 mL CH_4 g^{-1} VS, respectively. Monodigestion of Mater-Bi® and PLA at 55°C reduced the initial VS content by 51%. When PLA was in co-digestion with pig slurry, Mmax was 12% higher than the theoretical one, with a synergistic effect. In co-digestion with scotta, a nearly significant 12% increase in H_2 production was observed for Mater-Bi® incubated at 35°C. The exploitation of bioplastic waste in anaerobic digestion for biogas production, together with or in alternative to conventional composting, appears a promising possibility for a successful waste management.

Key words: co-digestion, dark fermentation, deproteinized cheese whey, hydrogen, methane, pig slurry

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