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Hydrolysis of Food Waste with Immobilized Biofilm as a Pretreatment Method for the Enhancement of Biogas Production

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Abstract

The present study shows the opportunity of using biofilm in the hydrolysis step of food waste (FW) to increase biogas production. Therefore, screened biofilm-producing microorganisms were adopted to facilitate the biodegradation of organic compounds (OCs) and enhance the volume of biogas production. The biofilm-producing microorganisms were first immobilized on a granular activated carbon (GAC) surface, and the optimum values of immobilization time, mass of the GAC surface, and size of the microbial inoculums were found using the statistical methods of one-factor-at-a-time (OFAT) and the response surface methodology (RSM) using a face-centered central composite design (FCCCD). Based on the results, 48 h of incubation, 8 g of GAC, and 1 mL of inoculum were the optimum conditions when shaken at 37 °C and 150 rpm. Different biofilm amounts (328 mg, 492 mg, 656 mg, 820 mg, and 984 mg) were used in hydrolysis flasks operated in batch mode to increase the degradation of the OCs. The optimal level of the hydrolysis degradation was on day 3 and at 328 mg of biofilm; the total solid (TS) content was decreased from 115 gL⁻¹ to 79 gL⁻¹ (31%), and the TCOD was decreased from 85.33 gL⁻¹ to 54.50 gL⁻¹ (36%). © 2023 by the authors.

Author Keywords

biofilm; biogas production; food waste; hydrolysis; treatment

Index Keywords

activated carbon, biodegradation, biofilm, biogas, food waste, hydrolysis

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