



Methane Production from Acidic Effluent Obtained from Hydrogen Fermentation Process of Food Waste Using Continuous Stirred Tank Reactor

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ABSTRACT

This study investigated the effect of hydraulic retention time (HRT) on methane production from the acidic effluent of a hydrogen fermentation process of food waste using a continuous stirred tank reactor (CSTR). The CSTR was operated at $35 \pm 3^\circ\text{C}$ with HRTs of 12, 10, 8 and 6 days (d). The hydrogen content, methane yield (MY) and methane production rate (MPR) were increased with a decrease in HRT from 12 to 10 d. At the HRT of 10 d, the maximum methane content of 71.3%, MY of 155 mL $\text{CH}_4/\text{g-COD}$ and MPR of 4629.1 mL $\text{CH}_4/\text{L d}$ were achieved. However, a further decrease in HRT from 10 to 8 and 6 d resulted in a decrease of methane content, MY and MPR. The main soluble metabolite products obtained at the HRT of 10 d were butyric and acetic acids. The maximum energy production rate obtained at the optimum HRT of 10 d was 185.31 kJ/L d.

Keywords: biogas production, continuous stirred tank reactor (CSTR), methane

1. INTRODUCTION

Anaerobic digestion (AD) has gained popularity because of its efficiency in the conversion of organic waste, such as food waste, sewage sludge, animal waste and livestock waste, into an energy carrier. The organic waste is converted to methane by a series of biological reactions that include hydrolysis, acidogenesis, acetogenesis and

methanogenesis [1]. The advantages of AD include reduction of chemical oxygen demand (COD) of organic waste, pathogens and organic waste odors. Importantly, this process produces hydrogen and methane as energy carrier in which methane is a popular energy carrier that accounting for 2-3 % of the total primary energy