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Biochemical Methane Potential of Korean Food Waste

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Structured Abstract

Background: Food waste, particularly from landfills, plays a crucial role in methane emissions. In Malaysia, where food waste is a significant portion of total waste, the rising trend of Korean cuisine adds to the challenge. Anaerobic digestion can help reduce methane emissions while producing renewable energy. This study focuses on analyzing Korean food waste, including its moisture content and organic composition, while assessing its Biochemical Methane Potential under anaerobic digestion. It aims to identify methane potential of Korean food waste and possibility as a good renewable energy.

Methods: For substrate preparation, Korean food waste samples were finely chopped and blended to maximize surface area, enhancing microbial access and digestion efficiency. Next, collected sludge was homogenized for uniform microbial distribution and stored anaerobically in sealed containers under inert gas until the BMP test for inoculum. Sample characteristics measured included moisture content, total solids (TS), volatile solids (VS), pH, and CHNS composition (carbon, hydrogen, nitrogen, and sulphur. A BMP test was conducted to assess methane production from substrates. Substrates were mixed with inoculum in a 3:1 ratio and prepared in triplicate for control, blank, and substrate groups. Bottles were incubated at 37°C for 30–40 days, with daily manual shaking. Methane production was monitored three times weekly using gas chromatography (GC-FID) analysis.

Results: The BMP curve for Korean food waste shows methane production over 40 days. During the lag phase (Days 1–8), methane slowly increases from 0.00 to 26.40 mL CH_4/gVS as microbes adapt. From Days 8 to 40, production rises sharply to 428.65 mL CH_4/gVS, driven by active microbial breakdown. The absence of a stationary phase suggests sustained microbial activity under optimal conditions. This highlights Korean food waste as a strong biogas source, with insights for optimizing anaerobic digestion and improving energy recovery.
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Conclusion: In conclusion, the BMP curve demonstrates the strong potential of Korean food waste for biogas production. The distinct lag and exponential phases highlight the microbial adaptation and rapid methane generation, while the sustained activity suggests efficient anaerobic digestion. These findings emphasize the importance of optimizing process conditions to maximize methane yield and enhance energy recovery from organic waste.

Keywords: Korean food waste, Anaerobic digestion, Methane, Biochemical methane potential

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