RETASTE Conference Abstracts
Vol. 3 RETASTE-ANA-375-Oral
Athens, Greece, 27-29 September, 2023

rethink food resources, losses, and waste 2023 retaste

Valorization of Kitchen Waste for Gas Production Using Anaerobic Digestion

Chihhao Fan and Yi-Chun Chung

National Taiwan University, New Taipei, Taiwan

Abstract

Over the years, the world population increases, and the quantity of kitchen residue over the years. With the diversity in dieting habits and culinary cultures around the world, kitchen waste can be complex in composition, and may not be treated properly by conventional methods such as landfill and incineration. Although kitchen waste has been used as the feeding forage for pigs due to its organic-rich characteristic, the concern for the spread of pig diseases by kitchen waste often limits such an application. A proper mechanism for kitchen waste treatment seems urgently required. In this study, the anaerobic digestion of synthetic kitchen waste was evaluated for its gas generation under various scenarios. The sludge from a domestic wastewater treatment plant was used as the inoculum to mix with synthetic kitchen waste, and the gas (i.e., methane and carbon dioxide) production by anaerobic degradation was evaluated. The synthetic kitchen waste used in the study included Chinese cabbage, beef, and fish which were used as the feed individually, subject to the culinary treatment of cooking with salt, oil, or both. The mixtures of three individual raw kitchen wastes were also digested anaerobically as well and the observed results were compared. In addition, the experiments using sludges with different ages (i.e., 0, 6, and 18 months after collection) were conducted for comparison. For the individual raw feeds investigated, fish showed the least gas production both for methane and carbon dioxide. Cooking helps to increase the production of both gases from fish anaerobic digestion. Among all the tests of individual feeds (i.e., Chinese cabbage, fish, and beef), cooking with oil showed an apparent inhibition of gas production. This is because the tested kitchen waste was coated with oil, which makes it difficult for bacteria to facilitate the digestion process. For the experiments of mixed kitchen waste, the mixture of vegetables and beef demonstrated the highest efficiencies in producing methane and carbon dioxide. Generally, the anaerobic treatment for well-cooked or uncooked residues also exhibited different gas production efficiency. The gas quantity generated 16% more by the mixture of sludge and well-cooked residue, while methane generated 24% more. The elder sludge and well-cooked kitchen residue could produce more methane. The total gas production using the younger sludge produced 33% less than the elder one, with 46% less methane and 66% less carbon dioxide. The results from the present study can be a useful reference for the design of anaerobic digestion for kitchen waste.

Keywords: Waste Valorization, Kitchen waste, Methanogens, Anaerobic fermentation

Acknowledgments: This work is supported by the National Science and Technology Council, Taiwan under the grant number of NSTC 110-2621-M-002-015-MY3.