

Thesis Title	Enhancing Methane Production of Fruit and Vegetable Waste Using Dry Anaerobic Digestion with Leachate Recirculation.
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Abstract

In this study, investigation of solid waste degradation behavior and comparison of methane production efficiency from high solid anaerobic digestion with and without leachate recycle was performed. Two 125 liters with 100 cm height of lab-scale anaerobic reactors with and without leachate recycle system were constructed. The reactor body was made from a PVC pipe with 16 inches diameter and 10.3 mm thickness.

Batch anaerobic digestion was operated for 200 days. Initial conditions, such as quantities and compositions of solid waste as well as of anaerobic sludge seeded, were kept the same for both reactors. There were three different recycle ratio of 10, 25, and 50 percent applied in this study. Input solid waste consisted of vegetable and fruit wastes from large delivery markets. The solid wastes were cut to the size of 5-10 cm and was mixed with anaerobic sludge from Huay Kwang Wastewater Treatment plant prior to addition into the reactors. Initial amount of waste was 45 kg with the density of 450 kg/m^3 , total solids of 58.94 percent, and total volatile solids of 89.28 percent.

The COD removal efficiency in the reactor without leachate recycle was 72.04 percent. The methane yield of 0.044 L/g.COD and biogas production of 149.60 liters was observed. The highest methane content was 40.48 percent. For the leachate recycle reactor, efficiency for COD removal was 94.34 percent, whereas 0.183 L/g.COD of methane yield and 338.58 liters of biogas production with the highest methane content of 57.55 percent was found.

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Increasing the recycle ratios from 10, 25, and 50 percent resulted in rising biogas production of 25.74, 156.2, and 129.14 liters, respectively. And percent methane content in off-gas to 40.88, 48.61, and 52.45 percent, respectively. Therefore, a leachate recycle system was found beneficial and enhanced a more complete conversion of organic waste to methane than a system with no recycle of leachate.

Physical properties of solid waste were observed to change after the reactors were opened for examination at the end of experiment. Solid waste from the recycle reactor was black in color and possessed smell of anaerobic sludge. Solid waste from the reactor with no recycle was not as dark as the other and possessed a vinegar-like smell. Moisture content of waste from the recycle system was higher. Efficiencies of solids and volatile solids removal for the recycle reactor were 69.18 and 67.80 percent, respectively. Whereas efficiencies of solids and volatile solids removal for the non-recycle reactor were 56.98 and 55.86 percent, respectively.