

Effects of substrate to inoculum ratio on Phosphorus Recovery from Different Composition of Food Waste using Anaerobic Batch Digestion

ABSTRACT

Anaerobic digestion is a process by which microorganisms break down biodegradable material in the absence of oxygen. The process involves hydrolysis, acidogenesis, acetogenesis and methanogenesis stages. Anaerobic digestion of food waste has been widely investigated for biogas recovery but limited study was performed on phosphorus recovery. Substrate to inoculum ratio is a very crucial parameter in anaerobic digestion in an attempt to recover phosphorus as it highly influences the production of organic acids during acidogenesis. Therefore, this study was carried out to investigate phosphorus recovery at different ratio of substrate to inoculum, where substrate was fixed to ratio 1.0 while inoculum ratio varied to 1.5, 2.0, 2.5, 3.0, 3.5 throughout the digestion process. The main substrate used in the anaerobic digestion was food waste which was segregated into different composition namely carbohydrates rich-food waste, fiber rich-food waste and protein rich-food waste. The phosphorus recovery was performed using anaerobic batch digester at mesophilic ($35\pm 1^{\circ}\text{C}$) condition and $\text{pH} = 6.0$ for 15 days. Semi treated palm oil mill effluent (POME) was used as the inoculum to boost up the anaerobic digestion. The results indicate that substrate to inoculum ratio (1.0 : 2.0) was the optimum ratio to recover phosphorus, where protein rich-food waste shows the phosphorus recovery was about 40.8%, followed by carbohydrate rich-food waste and fibre rich-food waste with 32.8% and 26.2%, respectively. This study is very important in resources recovery from wastes as it provides information on a new strategies for phosphorus recovery from food waste