

Phosphorus recovery from different composition of food waste using anaerobic digestion

ABSTRACT

Recent research has extensively focused on resource energy due to global concerns about non-renewable resources including phosphorus. As an alternative approach, waste has become a viable option as a new source of phosphorus to reduce the distress for phosphorus depletion. The recovered phosphorus can serve as a nutrient source for crops, therefore creating a new avenue for renewable non-ore of phosphorus resources. Previous studies have utilised different waste-based substrates and inoculum for anaerobic digestion to achieve phosphorus recovery. In this study, food waste was used as a substrate, which was segregated into different compositions, namely, fibre-rich food waste, protein-rich food waste and carbohydrate-rich food waste. The substrate used in anaerobic digestion is considered a potential phosphorus source and a feed to the inoculum. In turn, this contributes to an increased release of phosphorus, leading to phosphorus recovery. This study aimed to investigate phosphorus recovery through anaerobic digestion of different composition of food waste, using primary sludge as inoculum. It was found that the highest phosphorus concentration in the liquor after anaerobic digestion was 476.45 mg/L from fibre-rich food waste. When expressed using different unit, the total phosphorus recovered for each composition of food waste was 27.29 mg P/g VS, 82.84 mg P/g VS and 74.54 mg P/g VS, for fibre-rich food waste, protein-rich food waste and carbohydrate-rich food waste, respectively. This suggests that the highest phosphorus yield was obtained from protein-rich food waste. Overall, this study suggests that anaerobic digestion serves not only as a treatment method, but also as an alternative for recovering resources from waste, including phosphorus.