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Effect of Food to Vegetable Waste Ratio on Acidogenesis and Methanogenesis During Two-Stage Integration

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Abstract

The mixing ratio of food waste (FW) to vegetable waste (VW) (2:3 FW:VW~152.51 g VS and 2:1 FW:VW~137.03 gVS) was optimized using two-stage (LBR-UASB) experimental process depending upon volatile solid (VS) load. The effect of FW to VW ratio was studied in leach bed reactor (LBR) towards leachate production. Results revealed that hydrolysis rate (73.11%), sCOD (3294.3 g/KgVS) and tVFA (2664 g/KgVS) yield was higher in 2:1 FW:VW ratio. Acetate, propionate, lactate and methane yield for 2:3 FW:VW (420 g/KgVS, 87 g/KgVS, 180 g/KgVS and 226.86 ml/gVS respectively) was different from 2:1 FW:VW (340 g/KgVS, 247 g/KgVS, 340 g/KgVS and 218.54 ml/gVS respectively). 2:3 FW:VW ratio depicted higher VS (53.96%) and COD (54.1%) removal than 2:1 FW:VW ratio 46.34% and 41.8% respectively. VW addition regulated pH, restricted propionate and lactate production with enhanced methanogenesis by improving acetate production in two-stage AD process which further boosted process stability and efficiency.

Keywords: Anaerobic digestion, Food waste, Vegetable waste, Lactic acid, Rate kinetics, Methanogenesis