

Assessment of potential biogas production from rice straw leachate in upflow anaerobic sludge blanket reactor

ABSTRACT

This study evaluates the potential of Rice Straw Leachate (RSL) to generate biogas and investigate its biodegradability by determining the differences between the theoretical yield and the actual one at its increasing organic loading rate. Seven litre working volume of Up-Flow Anaerobic Sludge Blanket (UASB) reactor is employed under mesophilic condition at temperature of 38 for approximately 17 consecutive weeks. The process performance was evaluated based on the efficiency of COD removal and Specific Methane Production (SMP) in relation to the other parameters such as pH, Organic Loading Rate (OLR), Total Ammonia Nitrogen (TAN) and alkalinity ratio. The OLR were varied at 0.43, 0.55, 0.9 and 1.55g COD/L/d with average COD removal of 79%, 81.2%, 76.1%, and 75.8% respectively. The stability of anaerobic digestion of RSL in UASB was found maintained at an increasing OLR with indicator of pH, TAN and IA/PA ratio that always maintain in the range of 6.5-6.8, below 200mg/L and 0.3 respectively. Meanwhile, the optimum average SMP and COD removal efficiency were 0.18L CH₄g-1CODrem and 81.2% respectively, at applied OLR of 0.55g COD/L/d. This study also revealed a relatively high deviation of SMP from its theoretical value, indicating its low degradability and the limitation of nutrient factors present in RSL.

Keyword: Anaerobic digestion; Chemical oxygen demand; Rice straw leachate; Specific methane production