

Biogas production from solid wastes removed from fish farm effluents



An experimental small scale partial recirculating system for rainbow trout was assembled. The system components were two 1.3-m³ fish tanks with sloping bottoms, each connected to a sedimentation column and containing 50 kg rainbow trout biomass, an anaerobic up-flow digester (total volume 0.424 m³, available volume 0.382 m³) connected to the funnel shaped bottom of the sedimentation column by means of a peristaltic pump, an aerobic submerged plug-flow filter (total volume 1 m³; filled with 0.83 m³ plastic rings with a specific surface of 194 m²·m⁻³) and a submerged pump. Aeration was provided through porous stones. The anaerobic digester was filled with 35 mm cubes of expanded polyurethane foam (25 pores·cm⁻², specific surface 1.375 m²·m⁻³, filtering volume 0.291 m³) and kept at a temperature of 24–25 °C using an electric heater. The gas chamber at the top of the anaerobic digester was connected to a gas meter and to an infrared continuous gas analyser. Measures on system performance with a recirculation rate of 60 % were done following three feeding levels (1, 1.5 and 2 % live weight). At the highest feeding rate, 2.8 L of faecal

sludge collected from the trout tanks were pumped every four hours in the anaerobic digester. Slurry characteristic were: total N 0.197 g·L⁻¹, TAN 0.014 g·L⁻¹, volatile solids (VS) 16.91 g·L⁻¹, suspended solids (SS) 21.39 g·L⁻¹ and pH 6.9. Biogas production was 144 L·d⁻¹ (mean value) with a methane content higher than 80 %. Methane volumetric production was 0.3 m³·m⁻³·d⁻¹ and methane daily yield was 0.4 and 0.32 m³·kg⁻¹ VS and SS respectively. After passing through the anaerobic digester, effluents were characterized by a total N content of 0.243 g·L⁻¹, TAN 0.222 g·L⁻¹, VS 1.1 g·L⁻¹, SS 1.32 g·L⁻¹ and pH 6.8. The anaerobic digester was able to significantly reduce VS and SS content of wastewater and the zeolite ion-exchange column significantly improved water quality of effluent produced by the digester. The aerobic biofilter significantly reduced the ammonia content of the water leaving the fish tanks.

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