

Suspended growth kinetic analysis on biogas generation from newly isolated anaerobic bacterial communities for palm oil mill effluent at mesophilic temperature

Abstract

The anaerobic degradation of palm oil mill effluent (POME) was carried out under mesophilic temperature in an anaerobic suspended growth closed bioreactor (ASGCB). Monod model was applied to describe the kinetic analysis of POME at different organic loading rates (OLR) in the range of 2.75-8.2 g TCOD per L per day. The hydraulic retention time (HRT) ranged between 8 and 24 days. The TCOD removal efficiency achieved was between 89.66% and 79.83%. The evaluated kinetic coefficients were: growth yield, YG (0.357 g VSS per g TCOD), specific biomass decay rate, b (0.07 per day), maximum specific biomass growth rate, μ_{max} (0.27 per day), saturation constant for substrate, Ks (25.03 g TCOD per L), critical retention time, Θ_C (3.72 day) and methane yield, Y CH₄ (0.34 L CH₄ per TCOD_{removed}). Besides, new fermentative anaerobic bacteria isolated from POME were identified as *Escherichia fergusonii*, *Enterobacter asburiae*, *Enterobacter cloacae*, *Desulfovibrio aerotolerans*, *Desulfobulbus propionicus*, *Fusobacterium nucleatum*, *Paenibacillus pabuli*, *Bacillus subtilis*, *Methanobacterium* sp., *Methanosaeta concilii*, *Methanofollis tationis*, *Methanosarcina mazei* and *Methanosarcina acetivorans* using 16S rDNA.

Keywords

Bacteria; Bacteriology; Decay (organic); Ecology; Effluents; Kinetics; Methane; Oil shale; Palm oil; Anaerobic degradation; *Enterobacter cloacae*; Hydraulic retention time; Mesophilic temperature; *Methanosarcina acetivorans*; Organic loading rates; Palm oil mill effluents; Removal efficiencies

