TWO-PHASE ANAEROBIC DIGESTION OF MUNICIPAL ORGANIC SOLID WASTES

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Introduction: In Mexico, the total generation of municipal solid waste (MSW) has increased significantly, reaching 41 million tons in 2011, where 53% was organic[(1)]. Anaerobic digestion (AD) allows this degradation of organic fraction of municipal solid waste (OFMSW), transforming it into biogas, high in methane and susceptible therefore energy use and a stabilized final residue, qualifying to be used as soil improver[(2)]. Two-phase anaerobic digestion systems were developed to permit different bacterial enrichment in two different reactors by providing optimal growth conditions for initial acidogens and later methanogens[(3)]. In the acidogenic phase the high concentration of rapidly fermentable material produces volatile fatty acids (VFA) to pH <6. In a second phase (methanogenic) these VFA can be transformed into methane in an upflow anaerobic sludge bed (UASB) reactor. The objective of this study was to evaluate the hydrolysis and acidogenesis of the OFMSW in an anaerobic reactor and acetogenesis leaching and leaching generated in a UASB by methanogenesis

Methods. OFMSW samples were collected from the cafeteria at UAMI, crushed into a particle size of 6-10 mm and packed in a leaching reactor (RL) capacity of 7.2 Kg. The RL was fed 0.2 kg / d of OFMSW and digested residues were removed by the bottom of the reactor (50% of waste fed daily). The leachate was collected RL generated at the bottom outlet of the reactor and mixed with municipal wastewater methanogenic reactor feed. As inoculum was used RL fraction of the leach residue in a continuous reactor previously digested for 30 days. RL is recirculated daily to 200 mL UASB reactor effluent. The various parameters (pH, moisture, solids, ammonium, COD, etc.) were determined by standard methods (APHA, 2005). The biogas produced in both reactors was measured in a brine column by displacement volume and its composition was determined by gas chromatography.

Results. The average efficiency of the removal of volatile solids and COD reactor during operation of leaching was 57% and 50% respectively with a solids retention time (TRS) of 61 days (Figs. 1 and 2) the composition of biogas produced in the reactor was 100% CO2. In the UASB reactor the COD removal efficiencies were about 93% on average (Figure 3), with a biogas production of 10 L / d with a composition of 80% CH_4.

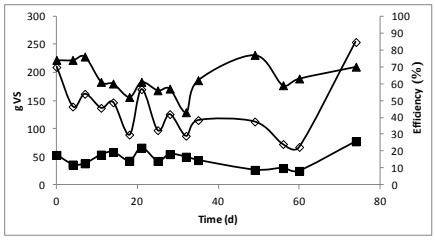

Fig. 1 VS ■ Outlet ◊ Inlet ▲ removal efficiency in RL

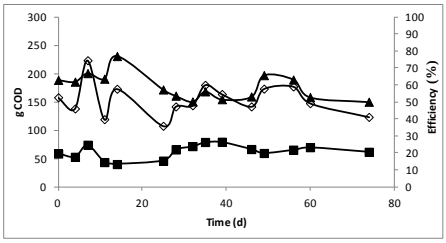

Fig. 2 COD ■ Outlet ◊ Inlet ▲ removal efficiency in RL.

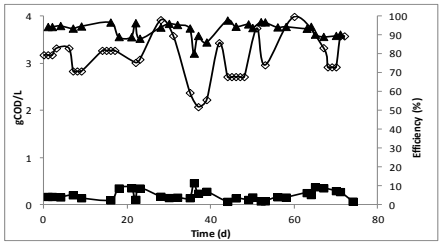

Fig.3 COD ■ Outlet ◊ Inlet ▲ removal efficiency in UASB.

Conclusions. By separating the phases of hydrolysis and acidogenesis of the MSW into a reactor and methanogenesis leaching leachate in a UASB reactor, are favored solids destruction efficiencies and a higher COD and composition of the biogas in CH_4 from the leachate diluted with wastewater.

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