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ANAEROBIC TREATMENT OF MEZCAL VINASSES IN FLUIDIZED BED BIOREACTORS

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Abstract

Mezcal distilleries are one of the most polluting industries in Mexico generating large volumes of a very aggressive wastewater called mezcal vinasse (MV). Anaerobic digestion has been one of the most employed systems for vinasses treatment because of low operational costs, aeration savings, low sludge production and the generation of by-products as methane gas. In the present work the anaerobic digestion of mezcal vinasse in fluidized bed bioreactors was evaluated.

Mesophilic lab scale fluidized bed bioreactors (AFBBR) were used. MV (pH adjusted to 7.0) was fed to the AFBBR with five steady states with decreasing hydraulic retention times (or increasing organic loads, i.e., 1.96, 2.73, 5.70, 10.70 and 30.40 gCOD/L_{FB}*d). Wastewater analyses were performed according to Standard Methods (APHA, 1998); total aromatics compounds (TAC) and total phenolic content were determined according to literature.

Organic matter removal was in the range 62-85%. As expected, it decreased with increasing loading rates. At an organic load of 10.70 gCOD/L_{LF}*d the methanogenic regime in the AFBBR began to deteriorate (decrease in COD removal efficiency (60-70%) and increase in the parameter alpha (from 0.4 to 0.6-0.7). Also, methane content in biogas diminished to 48.9 from 82.9%. Removal efficiencies of total aromatics compounds and phenols were within the ranges 67.8% and 76.3% respectively.

The anaerobic digestion achieved moderate-to-high contaminant removal efficiencies of COD as well as recalcitrant and toxic substances reductions such as TAC and phenols. However, it still remained a fraction of undigested compounds, since the COD removals should be compared to 85% degradability of raw mezcal vinasses. Microorganisms sometimes lack the enzymes necessary for complete biodegradation of recalcitrant compounds in conventional biological treatment. High values of alpha parameter correlated well with poor performance of the AFBBR at the highest loading rates; the alpha parameter could be a valuable warning tool of process (methanogenic) deterioration.

Key words: anaerobic digestion, fluidized bed reactor, mezcal vinasses
