

TITLE: BIOAUGMENTATION EFFECTS ON THE TREATMENT OF RECYCLED PAPER MILL EFFLUENT

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ABSTRACT:

Paper recycling industry represents a relevant environmental concern due to the elevated demand of water in the process, consequently generating a significant volume of wastewater. High organic matter, toxic substances, strong coloration and inhibition of microbial activity, among others, can make this effluent difficult to treat. Characteristics related to the process itself, such as the compositional variation in the raw material used as well as different technologies employed, can also contribute to the difficulty in treatment. For those reasons, the need of new technologies to treat this effluent has expanded the interest in the efficiency and economic feasibility of new methods. This study evaluates the potential use of a compound known as Compound E (CE) which is used as a bioaugmentor in the recycled paper mill effluent biodegradation process. This compound is made of bovine manure that has been fermented in liquid and is then added to the reactors in sequential batches in a laboratory scale (6 L) in order to assess the aerobic and anaerobic conditions. Two reactors were used for each condition: one of them is bioaugmented and the other works as a control. CE was added to reactors working in two different conditions, aerobic and anaerobic. For the start-up, each of these bioaugmented reactors received 450g of unfermented bovine manure and 450g of sludge originated in the recycled paper mill effluent treatment. In each batch cycle, CE was added in the proportion of 5% (300 mL) of the total volume of the reactor. For comparison purposes, similar reactors received only the effluent and nothing else. The anaerobic batches were submitted to a 24-hour hydraulic retention time; whereas the aerobic batches were submitted to a 6-hour aeration period followed by 2 additional hours of sedimentation, totalizing an 8-hour cycle. The organic matter removal was evaluated by chemical oxygen demand (COD) removal efficiency. The statistical analysis of COD removal results using analysis of variance (ANOVA) and Tukey Test ($P < 0.01$) showed that: a) there is a significant difference in treatment efficiency when bioaugmentation is performed or not; b) there is no significant difference between anaerobic and aerobic bioaugmentation treatments, evidencing that both processes were benefited with the addition of microorganisms and nutrients.

Keywords: bioaugmentation; biological treatment; anaerobic digestion; aerobic treatment; recycled paper mill effluent; statistical analysis.