

RESIDUE CHARACTERIZATION OF ALCOHOL PRODUCTION BY ANAEROBIC MIXED CULTURE FED WITH VINASSE

Messetti, M. A. ¹, Santos, G. M. ², Silva, A. J. ², Angelis, D. F. ¹

¹UNESP - São Paulo State University (Avenida 24 A,1515, 13506-900 Rio Claro, São Paulo, Brazil),

²UNICAMP - State University of Campinas, FEAGRI - Faculty of Agricultural Engineering (Av. Cândido Rondon, 501, Barão Geraldo, 13083-875, Campinas, São Paulo, Brazil).

The ethanol fermentation generate vinasse or stillage, which is a dark liquid effluent rich in organic and inorganic matter, about one hundred times more polluting than domestic sewage. In Brazil, the disposal of vinasse in rivers was prohibited by environmental agencies. Thus, it began to be used as fertilizer in agricultural fields, in a process called fertirrigation. Due to the polluting characteristics of vinasse CETESB regulated its application in the soil, trying to preserve it, and the groundwater. Brazilian ethanol production in 2015/2016 is estimated in 29 billion liters. Consequently, about 290 billion liters of vinasse will be generated. Currently, there is great interest in clean energy sources and the reuse of agro-industrial waste. Vinasse contains fermentable sugars and is produced in abundance. Recent studies have evaluated the use of mixed cultures for its anaerobic fermentation, with the purpose of its reuse for ethanol and butanol production. In this context, this study aimed to analyze the products of this fermentation, and to characterize the final residue to give it correct destination decreasing environmental impact. Fermentation experiments were conducted under strictly anaerobic conditions, in sucrose medium supplemented with vinasse, using inoculum from an anaerobic sludge of cattle waste pilot treatment. The inoculum was subjected to two conditions: thermic-acid-shock and heat shock. The vinasse was previously centrifuged at 8000 rpm for 5 minutes. Alcohols were quantified by high performance liquid chromatography (HPLC) using Aminex HPX-87H (300 mm x 7.8 mm; BioRad) column at 43° C; 0.01 N H₂SO₄ solution as eluent and flow rate of 0.5 mL min⁻¹. There was a significant ethanol production. The microbiological analyzes showed absence of fungi and yeasts and presence of anaerobic and facultative aerobic bacteria around 10⁸ CFU/mL. After microbial biomass separation by centrifugation, the fermentation broth was heated at 80°C for 15 minutes for alcohols and volatile acids evaporation. The final residue was characterized by physical-chemical analysis and compared to vinasse initially used. There was a decrease of about 95.7% of BOD and 45.3% of COD. Test with *Daphnia similis* showed acute toxicity, with EC(50) ranging from 8.11% to 10.08%. Although the BOD and COD values have shown organic matter biodegradation, residue remains toxic requiring treatment for disposal.

Keywords: anaerobic fermentation; vinasse; stillage; toxicity.

Acknowledgements: CNPq, FAPESP and CAPES.