

TITLE: TOTAL PHENOLIC COMPOUNDS CONSUMPTION FROM SECONG GENERATION VINASSE IN ANAEROBIC SYSTEM

AUTHORS: SILVERIO, M. S.¹; CALEGARI, R. P.¹; LEITE, G. M. F. L.¹; MARTINS, B. C.¹, BAPTISTA, A. S.¹; GOMIG, A.²; PIOTROVSKI NETO, J.²; CUSATIS, M.²

INSTITUTION: ¹ESCOLA SUPERIOR DE AGRICULTURA “LUIZ DE QUEIROZ” - UNIVERSIDADE DE SÃO PAULO (ESALQ/USP); ²ENGIE BRASIL ENERGIA

ABSTRACT:

Biological treatments have become widely used by industry for organic residues, including those coming from food or bioproducts processes. Given the context, Brazilian Sucreoenergetic industry has also been showing interest in such technology. In ethanol production, alcohol distillation leads to the generation of vinasse, which is a vey rich residue in water content and organic matter, besides high salt concentration. Considering 2nd generation ethanol, the fermentation broth is composed by sugarcane juice and/or molasse, plus lignocellulosic hydrolysate. A fermentation broth of different composition is expected to result a vinasse of different composition as well. Lignocellulosic hydrolysates are supposed to have high concentration of phenolic compounds, since they are among the main components of lignin. After ethanol production, phenolic compounds might be found in vinasse. It is believed that microorganisms responsible for organic matter degradation in anaerobic systems are capable of efficiently removing a great sort of compounds. The efficiency of such systems is followed by organic acids concentration. Acetate, propionate and butyrate concentrations might increase in stress conditions. The aim of this study was to investigate the total phenolic compounds (TPC) consumption in an anaerobic digester. Second generation vinasse was used as affluent in a 83 days experiment. Samples were collected from 41st to 83rd days. Affluent composition in TPC was increasing, from 454.38 mg L⁻¹ to 1678.67 mg L⁻¹. Fed batch experiment was performed in 5 L reactor, with 4 L working volume. The bioprocess was monitored by TPC, acetate, propionate and butyrate concentrations. The maximum removal of TPC was 83.10%, which was achieved in the 56th day of experiment, when the affluent concentration of TPC was 1085.46 mg L⁻¹ and the removed concentration was 902.05 mg L⁻¹. When affluent TPC concentration reached 1678.67 mg L⁻¹ (69th day), the reactor showed higher concentration of organic acids, suggesting a stress situation. Acetate concentration raised from 1166.27 mg L⁻¹ (56th day) to 6132.42 gm L⁻¹ (69th day). Despite the increasing concentration of organic acids, microorganisms showed increasing TPC removal efficiency, with and average removal of 74.60%. Maximum concentration of removed TPC was 1341.59 mg L⁻¹ (79.92% removal efficiency). In conclusion, anaerobic digesters have potential for treating vinasses with high concentration of TPC.

Keywords: 2nd generation ethanol, vinasse, total phenolic compounds

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