

TITLE: MICROBIAL CHARACTERIZATION (BACTERIA AND FUNGI) OF THE CO-DIGESTION OF COFFEE WASTES FOR THE PRODUCTION OF HYDROGEN, UNDER DIFFERENT CONDITIONS.

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ABSTRACT:

The present work screened the factors that affect H₂ production with coffee wastes pretreated in the hydrothermal reactor and bioaugmented with autochthonous microbial consortium, and the potential synthesis of intermediated products with commercial value. The characterization of bacterial and fungal populations was performed by PCR/DGGE, from samples of batch reactors submitted to different conditions. The parameters evaluated were pH (4.0, 5.5 and 7.0), temperature (30-50 °C), agitation velocity (without-180 rpm), headspace (50-70%), bioaugmentation (without -20%), coffee pulp and husk (2- 6 g/L), coffee processing wastewater (7-30 gCOD/L) and yeast extract concentration (without -2 g/L) using a Plackett-Burman design approach. The coefficient of similarity of the bacterial community ranged from 0.6% to 84%. Similarity of 0.6% was observed between populations of bacteria with higher (8 to 82 ml of H₂) and another with lower (maximum of 3 ml of H₂) hydrogen production. In relation the diversity index of Shannon was observed from 1.27 to 2.52. In the reactor with the highest diversity index (2.52), was related to higher H₂ production from coffee wastes, possibly due to the substrates complexity and necessity of a wide variety of populations for their biodegradation. In the fungi community the similarity coefficient observed was 30% to 97% and the Shannon diversity index from 1.25 to 2.58. The higher diversity indexes were related to the greater availability of lignocellulosic material (6 g/L pulp and husk) and lower dissolved material (7 gCOD/L of wastewater), which probably favored the fungi because they had the enzymes for the degradation of coffee pulp and husk, through of hydrolytic reactions. The highest H₂ production potential (82 ml H₂) was obtained under conditions of 30 °C, 180 rpm, headspace 50%, without bioaugmentation, pulp and husk coffee 2 g/L, coffee processing wastewater 30 gCOD/L and yeast extract 2 g/L. The major soluble metabolite products were acetic acid (1956 mg/L), lactic acid (7294 mg/L) and ethanol (1816 mg/L).

Keywords: Bacteria and Fungi, pulp and coffee husk, PCR/DGGE, hydrogen production

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