HYDROLYSIS OF SUGARCANE BAGASSE WITH CELLULASES FROM *Trichoderma reesei*, AND SIMULTANEOUS FERMENTATION WITH *Zymomonas mobilis* AND *Saccharomyces cerevisiae* IMMOBILIZED IN ALGINATE-CHITOSAN BEADS

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Despite the worldwide effort to generate ethanol from lignocellulose, there is still no an optimal process. More research is needed in order to optimize the bioethanol production from organic matter (OM) wastes. The aim of this research was to evaluate the ethanol production process from sugarcane bagasse integrating the chemical pretreatment of OM; the enzyme hydrolysis (saccharification) and fermentation simultaneously (FSS), using *Zymomonas mobilis* and *Saccharomyces cerevisiae* immobilized in chitosan-alginate beads.

Sugarcane bagasse was treated with NaOH (2 % w/v) at 121 °C and 1.1 kg/cm^2 at four different times (15, 30, 60, 120 and 240 min). After this chemical treatment, the bagasse solution was diluted with water (1:3, v/v) and cellulases (2.9 UI mL^{-1}) from *Trichoderma reesei* were added to the batch reactor (5L). Saccharification was performed at 50°C, pH 4.9 and at 110 rpm. At the highest reducing sugars concentration, the bioreactor was adjusted at 50°C and the immobilized microorganisms (50/50 w/w) were added to perform the fermentation-saccharification. The batch bioreactor was operated for 72 hours. Sodium alginate (2%) and chitosan (0.25%) were used to immobilize the microorganisms. The beads were maintained in $CaCl_2$ (1%) at 4°C until fermentation. The concentration of glucose, arabinose, xylose, glycerol, ethanol and sucrose were determined by HPLC. Cellulase activity, total reducing sugars and total proteins were also determined.

The production of reducing sugars was similar between the chemical treatments (6 gl^{-1}), with no statistical significance (P< 0.05). After 72 hours, 50% of the reducing sugars were removed, but the cellulose activity does not stop; 30% of the activity remains at the end of fermentation. Ethanol production was low probably due to the chitosan-alginate beads avoid microorganisms contact with sugars.

It is concluded that saccharification and fermentation could be performed simultaneously using microorganisms immobilized, but ethanol yields are low.

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