

TITLE: ENZYMATIC PRE-TREATMENT AND SACCHARIFICATION OF SUGARCANE BAGASSE

AUTHORS: MATEI, J. C.; SOARES, M.; MACIEL, G. M.

INSTITUTION: UNIVERSIDADE TECNOLÓGICA FEDERAL DO PARANÁ, CURITIBA, PR (RUA DEPUTADO HEITOR ALENCAR FURTADO, 5000, CEP 81280-340, CURITIBA – PR, BRAZIL)

ABSTRACT:

In Brazil, tons of agroindustrial wastes are generated annually, which can be used as biomass for second generation ethanol production, by hydrolysis of cellulose and fermentation. However, an efficient removal of the lignin barrier must be achieved in order to obtain high yields of sugars, without generating toxic components. For this reason, the biological routes are advantageous. The aim of this work was to evaluate the application of a biological pre-treatment in sugarcane bagasse, with subsequent saccharification, to use it in the production of cellulosic ethanol. An enzymatic extract produced by *Trametes* sp. was used for pre-treatment of the residue aiming the removal of lignin and the exposure of the cellulose layer. Laccase, manganese peroxidase and lignin peroxidase activities were evaluated spectrophotometrically in crude enzymatic extracts before application. In each assay, 96.9 U of laccase per gram of lignocellulosic material was used in the presence or absence of chemical mediators. An experimental design was performed to evaluate the effect of parameters that could influence the process. The following factors were studied: Hydroxybenzotriazole, Tween 80, Enzyme extract, Sodium acetate buffer (pH 5.0), Hydrogen peroxide, 2,6-Dimethoxyphenol and 4-Hydroxybenzoic acid. Modifications in lignin and cellulose were observed by Fourier transform infrared (FTIR) spectroscopy. Cellic® CTec2 enzymatic cocktail was used in the saccharification in order to obtain 50 FPU (filter paper units) of cellulases per gram of substrate. Before and after sugarcane bagasse saccharification, the phenolic composition and total mono and disaccharides quantity were investigated by Folin-Ciocalteu and 3,5-dinitrosalicylic acid methods, respectively. Laccase treatment containing all the factors resulted in 211.9 mg/L of sugars and 135.1 mg/L of total phenolics, corresponding approximately double the control. For this same sample, saccharification increased sugar concentration by 30-fold compared to control, resulting in 4500 mg/L of sugars. The results of the analyzes indicate the contribution of a pre-treatment with laccases on sugarcane bagasse in order to facilitate saccharification.

Keywords: Biodegradation, Bioethanol, Fungi, Laccase, Lignocellulosic residues.

Development Agency: CAPES