ENZYMATIC HYDROLYSIS OF HIDROTHERMALLY PRETREATED AGAVE BAGASSE

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Abstract

In the last decades, bioethanol has been widely studied as an eco-friendly alternative to reduce fossil fuels dependence, due to the decay in petroleum reserves, as well as the environmental problems that it entails. Bioethanol can be produced from lignocellulosic biomasses, such as agro-industrial and woody residues by three main steps: pretreatment, enzymatic hydrolysis, and fermentation. The agave bagasse is a lignocellulosic biomass with great potential in Mexico, and it is mainly composed by cellulose, hemicellulose, and lignin. Hydrothermal pretreatment is a promising pretreatment that allows to reduce the recalcitrance of lignocellulosic materials and increases cellulose accessibility for the subsequent cellulolytic enzymatic attack, which aims to depolymerize cellulose into glucose for its final fermentation into bioethanol. The objective of the present study was to evaluate different enzymatic hydrolysis solid loadings on hydrothermally pretreated agave bagasse to produce high concentrations of glucose. Pretreatments were carried out using a solid/liquid ratio of 1:10 (w/v) under isothermal regimen, with a temperature of 194°C and residence time of 30 min, conditions that produced a concentration of cellulose of 46.5% on dry basis. Thereafter, enzymatic hydrolysis assays were performed at solid loadings between 1-15% using commercial cellulase cocktail Cellic Ctec2 at 50°C and a pH of 4.8 for 72 h in shake flasks, obtaining glucose concentrations up to 75.4 g/L, corresponding to a glucose yield of 84.3%. Hydrothermal pretreatment resulted to be an effective method for the fractionation of agave bagasse into its principal components, providing a cellulose rich solid susceptible to enzymatic attack.