

Effect of Biological Detoxification of Sugarcane Bagasse Hydrolysate on Xylitol Production in Bioreactor

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Dilute-acid hydrolysis has been proven to be a fast and cheap method for producing sugars from lignocellulosic materials. The lignocellulosic hydrolysates are attractive feedstock for obtaining bioproducts, such as xylitol, a sugar alcohol that presents biomedical applications. Beside sugars, toxic compounds formation such as furans, aliphatic acids and phenolic compounds can be formed during dilute-acid hydrolysis. Several biological methods such as the use of lignolytic enzymes and micro-organisms, cell adaptation and over expressing genes encoding enzymes for resistance against specific inhibitors can reduce the inhibition problem. Microbial and enzymatic detoxifications of lignocellulosic hydrolysate are mild and more specific in their action. In this work, the acetic acid-detoxification and xylitol fermentation were carried out in two different stages using the yeast *Candida guilliermondii* FT120037. In both stages, the experiments were performed in bioreactor at 300rpm, 30°C and controlled pH at 5.5. In first stage (20% dissolved oxygen), detoxification was monitored by HPLC until 60% (BH₁) and 100% (BH₂) of the initial acetic acid concentration (5.0g/L) was reduced and the cells were removed by centrifugation. In second stage ($k_L a$ 10h⁻¹), the hydrolysates H₁ (without biological treatment), BH₁ and BH₂ were supplemented with nutrients and inoculated with high cell concentration previously grown under optimized xylitol production conditions. Comparing BH₁ to the control experiment (H₁), the volumetric xylitol productivity (0.754g_{xylitol}/h) and maximum specific xylitol production rate increased by 37.59 and 45.5%, respectively. The increases in glycerol formation as well as the decreases in maximum specific oxygen uptake rate were proportional to the acetic acid removal from the hydrolysate. Also, it was observed that total acetic acid removal from the medium did not improve the xylitol production. Acetic acid is a weak acid that strongly inhibits cell growth, but at low concentration in the medium improved xylitol volumetric productivity and maximum specific xylitol production rate.

Keywords: Biological detoxification, fermentation inhibitors, sugarcane bagasse, hemicellulosic hydrolysate, acetic acid-detoxification

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