

The assessment of the pretreatment of Barley straw on cellulose production in solid state

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Background: Barley straw has shown to be promising agriculture by product in the bioconversion of biomass to value-added products. Hydrolysis of cellulose, a main constituent of lignocellulosic biomass, is a requirement for fermentable sugar production and its subsequent bioconversion to biofuels such as biobutanol. The high cost of commercial enzymes is a major impediment to the industrial application of cellulases. *Aspergillus niger* strains are potential CMCase and β -glucosidase producers. Some researches have been reported on cellulase production by *A. niger* and the subsequent use of the whole set of cellulase components including exoglucanase, endoglucanase and β -glucanase at a considerable concentration is required. An effective pretreatment could be of central significance in the bioconversion of biomass to biofuels. In this study *Aspergillus niger* PTCC 5012 was cultivated on PDA and also the efficacy of different concentrations of NaOH, substrate and cellulase on the production of glucose and barley straw pretreated using NaOH and untreated barley straw as substrates for enzyme production under solid-state cultivation was investigated. Barley straw pretreated using various concentrations of NaOH was subjected to enzymatic hydrolysis. The saccharification of barley straw pretreated with 2% (w/v) NaOH using crude cellulase *A. niger* resulted in the production of 27.8g/l reducing sugar and the yield of hydrolysis was 51.04%. The result of the x-ray diffractogram analysis showed an increase in relative crystallinity of cellulose in alkali-pretreated barley straw (60.4%) compared to 51.04% in untreated barley straw. However the crystalline structure of cellulose was partially disrupted after alkali pretreatment, resulting in a decrease in absolute crystallinity of cellulose. The structural changes of barley straw before and after alkali pretreatment were compared by using Scanning Electron Microscopy. Fungal mycelial growth was also observed for both untreated and alkali pretreated substrates. The result of this study indicated

that the use of NaOH as an alkali reagent for pretreatment of barley straw could be effective.

Keywords : *Aspergillus niger* ,cellulase ,solid-state fermentation .

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