

Effects of chemical and thermal pretreatments on the enzymatic saccharification of rice straw for sugars production

ABSTRACT

The effects of alkaline pretreatment with NaOH, KOH, Ca(OH)₂, and NaOCl at varying temperatures and concentrations on the production of sugars, changes in the morphological structure, and the chemical composition of rice straw were evaluated. Enzymatic saccharification of 2% (w/v) KOH-treated rice straw with autoclaving at 121 °C, 15 psi, 20 min, gave a maximum yield of 59.90 g/L of reducing sugars, which was slightly higher than that of NaOH (55.48 g/L) with the same conditions. Chemical composition analysis of the rice straw showed that the cellulose content was increased to 71% and 66% after pretreatments with NaOH and KOH, respectively. Fourier Transform Infrared (FTIR) spectroscopy revealed that solubilization and removal of the lignin component also took place. The scanning electron microscope (SEM) analysis showed a marked change in the morphological structure of the treated rice straw compared to the untreated rice straw. These results suggested that pretreatment of rice straw with either 2% (w/v) NaOH or KOH at high temperature could be a promising pretreatment method for sugars production.

Keyword: Lignocellulosic biomass; Rice straw; Alkaline pretreatment