

Alkali pretreatment of rice straw to decrease the hemicellulosic hydrolysate inhibitors

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Rice straw is an abundant lignocellulosic residue that can be used as raw material for ethanol production due its high carbohydrate content. To obtain monomeric fermentable sugars in hemicellulosic fraction a hydrolysis step is required. However, various toxic compounds including furfural, hydroxymethylfurfural, acetic acid and lignin derivatives are also generated. Such compounds negatively affect the microbial fermentation. In order to eliminate or reduce the impact of these compounds on fermentative process, various pretreatments are been suggested. This work deals with an alkaline pretreatment of rice straw at mild conditions aiming to reduce some of the main fermentation inhibitors of the hemicellulosic hydrolysate. To alkali pretreatment were used 20g (dry weight basis) of rice straw with 200mL of 0.5% NaOH solution at 60°C for 60 minutes in 500mL Erlenmeyer flasks. The liquid fraction was collected through filtration and the solids were washed until pH 6.5 and oven-dried at 60°C for 24h. This pretreated material and the untreated rice straw were submitted to acid hydrolysis at following conditions: 1:10 solid/liquid ratio and 100 mg H₂SO₄/g dry matter, reaction time of 45 minutes at 121°C, carried out on 125mL Erlenmeyer flasks. Both hemicellulosic hydrolysates and the pretreatment liquid fraction were analyzed for its sugar and total phenolics contents. Based on the results obtained, was verified an increase of total sugars content (5,7%), and a reduction of acetic acid (73%) and total phenolics (36%) after the acid hydrolysis from alkaline pretreated rice straw. Therefore, this mild alkaline pretreatment should improve the subsequent fermentation of rice straw hemicellulosic hydrolysate, since the main inhibitors compounds have been greatly minimized without loss of xylose.

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