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Screening and Optimization of Pretreatments for Rice Straw and Their Utilization for Bioethanol Production Using Developed Yeast Strain

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Abstract : Rice straw is one of the most abundant lignocellulosic waste materials and its annual production is about 731 Mt in the world. This study treats the subject of effective utilization of this waste biomass for biofuels production. We have showed a comparative assessment of numerous pretreatment strategies for rice straw, comprising of major physical, chemical and physicochemical methods. Among the different methods employed for pretreatment alkaline pretreatment in combination with sodium chlorite/acetic acid delignification found efficient pretreatment with significant improvement in the enzymatic digestibility of rice straw. A cellulase dose of 20 filter paper units (FPU) released a maximum 63.21 g/L of reducing sugar with 94.45% hydrolysis yield and 64.64% glucose yield from rice straw, respectively. The effects of different pretreatment methods on biomass structure and complexity were investigated by FTIR, XRD and SEM analytical techniques. Finally the enzymatic hydrolysate of rice straw was used for ethanol production using developed Saccharomyces cerevisiae SR8. The developed yeast strain enabled efficient fermentation of xylose and glucose and produced higher ethanol production. Thus development of bioethanol production from lignocellulosic waste biomass is generic, applicable methodology and have great implication for using ‘green raw materials’ and producing ‘green products’ much needed today.

Keywords : rice straw, pretreatment, enzymatic hydrolysis, FPU, Saccharomyces cerevisiae SR8, ethanol fermentation
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