

Combination of biological and hydrothermal pretreatment of mixed rice biomass for fermentable sugars production

Abstract

Rice biomass is one of the most staple agricultural by-products in Malaysia. In this study, mixed rice biomass (MRB) which combines rice husk and straw in certain ratio was used to produce the fermentable sugars. White-rot fungal strain, *P.chrysosporium* was used in biological pretreatment for 7 days (30°C). The pretreatment was proceeded by hydrothermal autohydrolysis for further removal of hemicellulose. The reducing sugar of soluble solid mixed rice biomass after autohydrolysis process was determined (0.225g sugar/g MRB). The characteristic of raw and insoluble solid pretreated MRB was observed by Scanning Electron Microscopy (SEM) and the functional groups changes were determined by Fourier Transformed Infrared (FTIR). The parameters of enzymatic saccharification were optimized using Central Composite Design for Response Surface Methodology by setting the concentration of commercial cellulase enzyme used, Celluclast 1.5L from 5 FPU/g to 15 FPU/g and incubation times from 24 to 72 hours. It was discovered that fermentable sugars production was increased from 0.098g sugar/g MRB (0.125 g/L) to 0.248g sugar/g MRB (0.319g/L) at optimized condition 82 hours incubation time and 10 FPU/g enzyme concentrations. Hence, the total reducing sugar produced was calculated as 0.473g sugar/g MRB and saccharification was determined as 66.31%.