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Bioethanol production from deacetylated biomass and oxalic acid pretreatment without detoxification

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Abstract

Lignocellulosic biomass which contains mainly cellulose, hemicellulose and lignin evaluated for production bioethanol and bio-based chemical. To produce bioethanol from yellow poplar (*Liriodendron tulipifera* L.), deacetylation was performed using sodium hydroxide (NaOH) solution and analyzed by a response surface methodology (RSM) with two parameters (time and NaOH concentration) to optimize the condition. The highest 7.06 g/L acetic acid was extracted through deacetylation by 0.8 % NaOH for 80 min and further used this condition to prepare deacetylated biomass. The pretreatment were carried out by oxalic acid at different temperatures for 30 min. After pretreatment, solids were separated from hydrolysate by filtration and used to simultaneous saccharification and fermentation (SSF). Acetic acid production significantly decreased in the oxalic acid pretreatment hydrolysate due to deacetylation. The xylan content decreased in the solid fraction after oxalic acid pretreatment with increasing the temperature. For the ethanol fermentation, hydrolysate directly used without detoxification and ethanol yields were 0.34 to 0.47 at different temperature. SSF was conducted by using *Pichia stipitis* CBS 6054 and cellulase (celluclast 1.5 L, 17.5 FPU/g of biomass) supplemented with β-glucosidase (12.5 CBU/g of biomass). The highest ethanol concentration was achieved 27.21 g/L at 170˚C, 50 mM oxalic acid by SSF. Overall 20.31 g of ethanol was obtained by hydrolysate fermentation and SSF from 100 g of deacetylated yellow poplar.