

Ethanol production from lignocellulose by mold and yeast

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ABSTRACT

Trichoderma reesei (*T. reesei*) has a complete cellulase system, but extracellular β -glucosidase activity is extremely low. However, it has showed more efficient saccharification of cellulose with *Aspergillus niger* (*A. niger*). *Saccharomyces cerevisiae* (*S. cerevisiae*) has good fermentation capacity. Pulp of kraft pulp has higher purity of cellulose, which lignin is largely removed. The objective of the present study was to investigate effect of single strain and mix strains, which 0.02 g/mL pulp from dried pulp was as substrate in saccharification during 6-days culture. Activity of cellulase was measured by DNS (3,5-dinitrosalicylic acid) method. There were also assayed glucose and ethanol concentration. There showed the best cellulase activity in 1st day of culture by *T. reesei*. The activity of exoglucanase (avicelase), endoglucanase (CMCase) and filterase were 0.45 IU/mL, 0.59 IU/mL and 0.21 IU/mL, respectively. However, *T. reesei* secreted low amount of extracellular β -glucosidase, the activity of β -glucosidase was almost zero. While increasing culture days, glucose content decreased gradually. Glucose concentration was 4.86 mg/mL and ethanol concentration was 0.85 mg/mL in the sixth day culture. Culture broth of *S. cerevisiae* had little activity of cellulase. Exoglucanase got higher activity (0.15 IU/mL), but activity of β -glucosidase and filterase were near zero in six-days culture. Glucose contents in culture broth was not detectable. Ethanol concentration decreased gradually from the highest 4.53 g/L at day 0 to 3.44 g/L at day 6. Mix cultures of *T. reesei* and *A. niger* got the highest endoglucanase activity 1.69 IU/mL at day 1. The maximum activity of the exoglucanase, β -glucosidase and filterase were found that 1.50 IU/mL (day 0), 1.66 IU/mL (day 1) and 0.35 IU/mL (day3), respectively. Glucose concentration of two strains mixing cultures was also decreasing gradually from 4.26 to 1.47 mg/mL, while ethanol concentration increased to 1.11 g/L at day 6. In mixing cultures of *T. reesei*, *A. niger* and *S. cerevisiae* during six days culture, activity of endoglucanase showed the highest (1 IU/mL) at day 5. The maximum activities of the exoglucanase, β -glucosidase and filterase were assayed, respectively - 0.32 IU/mL for exoglucanase (day 5), 0.33 IU/mL for β -glucosidase (day 1) and 0.26 IU/mL for filterase (day 2). Glucose concentration was 1.93 mg/mL (day 0) - the highest, but ethanol concentration increased 3.55 g/L at day 4.

Keywords : ethanol、endoglucanase、exoglucanase、 β -glucosidase、lignocellulose

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