Screening of lignocellulolytic fungi for hydrolyzation of lignocellulosic materials in paddy straw for bioethanol production

ABSTRACT

Aims: Paddy straw is known to have lignocellulosic materials such as cellulose and hemicellulose which can be readily converted into fermentable sugar for production of bioethanol via simultaneous saccharification and fermentation (SSF). In order to produce ethanol competently, the degradationof biomass by cellulase and highly ethanol-producing microorganism in fermentation process are necessarily needed. However, there is lacking in cellulose degrading organism in producing adequate amount of lignocellulosic enzyme. Therefore, the screening and selection for the best fungi to hydrolyze the lignocellulosic materials as well as forming consortium between two species of fungi has become the main focus. Methodology and results:Thirteen strains of fast-growing fungi were tested qualitatively forcellulase (congo red staining) and polyphenol oxidase (Bavendamm test). All tested strains displayed lignocellulolytic fungi characteristics. The selection was narrowed down by quantitative assay on endoglucanase, exoglucanase, β-glucosidase and xylanase and the highest cellulases enzyme producer were Trichoderma asperellumB1581 (3.93 U/mL endoglucanase; 2.37 U/mL exoglucanase; 3.00 IU/mL β-glucosidase; 54.87 U/mL xylanase), followed by Aspergillus nigerB2484 (5.60 U/mL endoglucanase; 1.08 U/mL exoglucanase; 1.57 IU/mL β-glucosidase; 56.85 U/mL xylanase). In compatibility test, both T. asperellumB1581 and A. nigerB2484 were inoculated on the same Petri dish for 4 days and the interaction showed by the two species was mutual intermingling.Conclusions, significance and impact of study:Both T.asperellumB1581 and A.nigerB2484 produced the highest cellulase enzyme. Since both strainscan co-exist and produce enzymes that complete each other, a fungal consortiumwas suggested to increase the yield of sugars in saccharification process.