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Enhancement of cellulolytic enzyme production of lignocellulose during pretreatment of wheat bran by consortium Bacillus bacteria

Vi Vu, Csilla Farkas, Vijai Kumar Gupta, Quang D. Nguyen
Institution of Food Science and Technology / Hungarian University of Agriculture and Life Sciences

Effective microbial degradation of lignocellulose is one of the key points in the process of utilizing biomass resources. Microbial consortia, which are more stable and able to perform complicated tasks than monocultures, present a potential frontier for effective bioconversion of lignocellulose biomass. Bacillus strains could produce starting materials for further downstream processes. In this study, eight Bacillus species and their consortia were used to evaluate wheat bran degradation in the submerged medium. The mass balance of residual weight after 7 days of pretreatment indicated Bacillus subtilis, B. coagulans, B. cereus species as highly efficient degraders. Simple model microbial communities (in the combinations of 2 species, 3 species) comprised of B. subtilis B.01162, B. coagulans B.01123, B. cereus B.00076, and two B. licheniformis strains were constructed to elucidate their roles and behaviors. The consortia were structurally stable with the co-existence of different members, providing an improvement in cellulase productivity in the comparison with monoculture. A strong correlation between reducing sugars and cellulase enzyme was only observed. The interaction between species in 2-member communities contributed to the increase of cellulase yield, including total cellulase, endo-glucanase, and xylanase enzyme activities. More strains presented in the consortium lead to the severe loss of sugars due to their complex interaction and metabolite. Our results are very promising to develop the consortia of Bacillus strains for degradation of lignocellulosic biomass.