

Characterization of cellulases and xylanases from Thai isolated fungi and their potential use for bagasse hydrolysis

Benchaporn Buaban¹, Rath Pichyangkura², Lily Eurwilaichitr¹

¹National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), 113 Thailand Science Park, Paholyothin Rd., Klong 1, Klong Luang, Pathumthani 12120

²Department of Biochemistry, Faculty of Science, Chulalongkorn University

Abstract

Cellulases and xylanases have a wide array of potential application. They are preferable use for the conversion of lignocellulosic materials to sugars which could be use as a source of food, fuel and chemicals. Fungi are one of potential sources of these enzymes. In our preliminary experiments, we have identified fungi with cellulase and xylanase activities from approximately 814 isolates. We found that nine fungi isolated could produce high level of cellulase and xylanase activities in medium containing bagasse as a sole carbon source. We further tested their enzyme activities in bagasse hydrolysis. The results showed that crude enzyme from *Aspergillus* sp. BCC 7179 was the most efficient strain in bagasse saccharification. Its enzyme hydrolyzed bagasse within 200 h at 30 °C with a yield of reducing sugars close to 10 mg/ml in a presence of 3% wt/vol of bagasse. The characteristics of crude enzyme from *Aspergillus* sp. BCC 7179 was therefore investigated. Its cellulases exhibited optimal activity at pH 4.0 and 50 °C and remained highly active at pH 3-9. It was heat labile after 1 h at 60 °C. While its xylanases exhibited optimal activity at pH 5.0 and 60 °C and were stably maintained at pH 5-9. It was heat labile and totally inactivated after 1 h at 60 °C. In order to understand their physical properties and mechanism of enzymatic hydrolysis of bagasse, these enzymes have been purified and characterized. The enzyme kinetics, enzyme stabilities, substrate specificities, effect of inducers and inhibitors and optimal conditions for enzyme activity have also been examined.