Construction of efficient and cost-effective cellulase mixtures for lignocellulosic biomass saccharification

Pankajkumar Waghmare[1], Guodong Liu[1,2], Yinbo Qu[1,2]

[1] State Key Laboratory of Microbial Technology, Shandong University, Qingdao 266237, Shandong Province, China.
[2] National Glycoengineering Research Center, Shandong University, Qingdao 266237, Shandong Province, China.

Email address: wpankaj97@sdu.edu.cn; gdliu@sdu.edu.cn; quyinbo@sdu.edu.cn

Abstract

Lignocellulose is the most abundant renewable organic resource on Earth is a potential feedstock for biofuels. The natural resistance of the lignocellulose to enzymatic destruction, unfortunately, raised the cost in the production process, thus blocked the commercial application of biofuels. Cellulases are part of the system of biomass-degrading enzymes that are produced by a broad spectrum of microorganisms in nature, especially fungi, decompose cellulose to glucose by secreting an arsenal of extracellular cellulolytic enzymes that are classes of glycoside hydrolases (GHs). The fungal extracellular cellulase secretome comprises of cellobiohydrolase, endoglucanase, β-glucosidase, xylanase, accessory enzymes and oxidative enzymes (lytic polysaccharide monooxygenase) which provide the majority of the hydrolytic power required for the deconstruction of cellulose into basic sugar components. In this study, we have expressed previously reported highly efficient CBHIs (NcCBHI, PocCBHI, CtCBHI) gene candidates in filamentous fungi *Penicillium oxalicum*. We have compared the expressed lignocellulolytic proteins from different fungal sources for their enzyme activities and hydrolytic efficiencies. The expressed CBHIs can be further use for construction of improved cellulase mixtures which can efficiently hydrolyze lignocellulosic biomass to glucose for biofuel production.

Keywords: Lignocellulose; Glycoside hydrolase, Cellulase, Cellobiohydrolase, LPMO