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## **Enzymatic Characterization of Heterologously Expressed Fungal $\beta$ -Glucosidase BGLII in *Escherichia coli***

Mohamad Farhan Mohamad Sobri<sup>1</sup>, Norhayati Ramli<sup>2\*</sup>, Suraini Abd-Aziz<sup>2</sup>,  
Farah Diba Abu Bakar<sup>3</sup>

<sup>1</sup> School of Bioprocess Engineering, Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia

<sup>2</sup> Faculty of Biotechnology and Biomolecular Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia

<sup>3</sup> School of Biosciences and Biotechnology, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia

\*Corresponding author's e-mail: [yatiramli@upm.edu.my](mailto:yatiramli@upm.edu.my)

**Abstract.** Saprophytic filamentous fungi such as *Trichoderma* sp. are capable of producing three categories of cellulase for cellulose degradation into glucose; endoglucanase, cellobiohydrolase and  $\beta$ -glucosidase. *Trichoderma reesei* in particular has an extensively studied cellulase enzyme system, establishing it as a model organism for enzymatic production. Studies on  $\beta$ -glucosidases produced by *Trichoderma* sp. have elucidated two variants, which have been classified into glycosyl hydrolase families 1 and 3, both including retaining enzymes capable of substrate hydrolysis via double-displacement method with retention of anomeric carbon. Extensive studies on BgII enzyme isolated has been compared and found to have sequence similarity to other known glycosyl hydrolase family 3  $\beta$ -glucosidases, an enzyme that is cell wall bound or expressed extracellularly, affects rate of reducing sugar formation from cellulase and involved in synthesis of soluble inducer of cellulolytic enzymes. Comparatively, enzyme characterization of the second  $\beta$ -glucosidase, BgIII, has been relatively recent. Nevertheless, it has been identified to be expressed intracellularly, has high affinity and catalyzes transglycosylation reactions on cellobiose. Of particular interest, BgIII has shown lower sensitivity to glucose inhibition, an appealing character for bioprocess development for efficient lignocellulosic biomass saccharification. As such, using local *Trichoderma* sp., this study has sought to characterize the BgIII gene isolated and following heterologous expression in *Escherichia coli*, characterize the recombinant enzyme for enzyme activity, glucose tolerance and product synthesis.

**Keywords:**  $\beta$ -glucosidase, glycosyl hydrolase family 1, glucose tolerance, heterologous expression