

Cellulase production from treated oil palm empty fruit bunch degradation by locally isolated *Thermobifida fusca*.

Abstract

The aim of this research was to evaluate the production of cellulases from locally isolated bacteria, *Thermobifida fusca*, using thermal and chemical treated oil palm empty fruit bunch (OPEFB) as substrate in liquid-state fermentation (LSF). *T. fusca* was successfully isolated and was a dominant cellulase producer in OPEFB composting at the thermophilic stage. Analysis of the surface morphology of OPEFB samples using Scanning Electron Microscopy (SEM) showed that the most significant changes after the combination of thermal and chemical pretreatment was the removal of silica bodies, and this observation was supported by X-ray Diffraction analysis (XRD), Fourier Transform Infrared (FTIR), and Thermogravimetric analysis (TG) showing changes on the hemicelluloses, cellulose, and lignin structures throughout the pretreatment process. As a result of the pretreatment, higher cellulase production by *T. fusca* was obtained. The highest activity for CMCase, FPase, and β -glucosidase using optimally treated OPEFB were 0.24 U/mL, 0.34 U/mL, and 0.04 U/mL, respectively. Therefore, it can be suggested that the combination of chemical and thermal pretreatments enhances the degradation of OPEFB for subsequent use as fermentation substrate, contributing to a higher cellulases yield by *T. fusca*.

Keyword: Cellulases; *Thermobifida fusca*; Physicochemical characteristics; Oil palm empty fruit bunch