

Production of ligninolytic enzymes by newly isolated bacteria from palm oil plantation soils

ABSTRACT

Three aerobic lignin-degrading bacterial strains were isolated from palm oil plantation soils. The bacterial isolates were screened using a selective nutrient medium of minimum salt media (MSM), with kraft lignin as lignin substrate and methylene blue as the ligninolytic dye indicator. The newly isolated bacterial strains SHC1, SHC2, and SHC3 were found to have the potential to tolerate high concentrations of kraft lignin and produced all three main ligninolytic enzymes (lignin peroxidase, manganese peroxidase, and laccase); these strains may therefore be useful in the degradation of lignin in oil palm empty fruit bunch biomass. The production of ligninolytic enzymes was carried out by means of submerged fermentation for 7 days using 2 mm of oil palm empty fruit bunch (OPEFB) fiber as a substrate. These bacterial isolates were characterized using biochemical tests from Biolog and identified using 16S rRNA gene sequencing analysis, which identified the strains SHC1, SHC2, and SHC3 as *Bacillus* sp., *Ochrobactrum* sp., and *Leucobacter* sp., respectively with 99% sequence similarity. *Bacillus* sp. SHC1 produced the highest manganese peroxidase (MnP) of 2313.4 U/L on the third day and the highest lignin peroxidase (LiP) of 209.30 U/L on the fifth day of fermentation. The optimum pH and temperature for the production of ligninolytic enzymes by *Bacillus* sp. SHC1 were pH 8 and 30°C.

Keyword: Lignin degrading bacteria; Ligninolytic enzymes; Oil palm empty fruit bunch (OPEFB); Palm oil plantation soils