Lignin biodegradation and ligninolytic enzyme studies during biopulping of Acacia mangium wood chips by tropical white rot fungi

Abstract

White rot fungi are good lignin degraders and have the potential to be used in industry. In the present work, Phellinus sp., Daedalea sp., Trametes versicolor and Pycnoporus coccineus were selected due to their relatively high ligninolytic enzyme activity, and grown on Acacia mangium wood chips under solid state fermentation. Results obtained showed that manganese peroxidase produced is far more compared to lignin peroxidase, suggesting that MnP might be the predominating enzymes causing lignin degradation in Acacia mangium wood chips. Cellulase enzyme assays showed that no significant cellulase activity was detected in the enzyme preparation of T. versicolor and Phellinus sp. This low cellulolytic activity further suggests that these two white rot strains are of more interest in lignin degradation. The results on lignin losses showed 20-30% of lignin breakdown at 60 days of biodegradation. The highest lignin loss was found in Acacia mangium biotreated with T. versicolor after 60 days and recorded 26.9%, corresponding to the percentage of their wood weight loss recorded followed by P. coccineus. In general, lignin degradation was only significant from 20 days onwards. The overall percentage of lignin weight loss was within the range of 1.02-26.90% over the biodegradation periods. Microscopic observations conducted using scanning electron microscope showed that T. versicolor, P. coccineus, Daedalea sp. and Phellinus sp. had caused lignin degradation in Acacia mangium wood chips.