Holzforschung
47 (1993) 361–368

Decay of *Parkia oppositifolia* in Amazonia by *Pycnoporus sanguineus* and Potential Use for Effluent Decolorization

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Keywords
Amazonian wood
Lignin
Cellulose
Hemicellulose
Ligninases
Xylanase
Cellulase
Kraft effluent (Eucalyptus)
White-rot fungi
SEM-technique
Parkia oppositifolia
Pycnoporus sanguineus

Summary

Chemical characterization and scanning electron microscopy of decayed *Parkia oppositifolia* by *Pycnoporus sanguineus* demonstrated a first stage of non-selective wood decay followed by an increased rate of lignin degradation during the advanced stages. The inorganic contituents on *Parkia* with advanced decay exhibited 9 fold increase in ash content compared to sound wood. The ash had a black color, and was presumably manganese oxide. Ca-oxalate crystals were present in the parenchymal cells of decayed wood but not observed in cell of sound wood. The ligninase, Mn-peroxidase and beta-glucosidase activities present in *P. sanguineus* indicate a great potential for industrial use, specially in effluent treatment. In fact, this fungus was efficient in decolorization and decontamination of Kraft E_1 and C_1/E_1 effluents.

Introduction

Although many basidiomycetes exhibit different types of cell wall attack, these fungi are able to degrade all cell wall components, but large variations can be found in the types of decay which they produced. Cellulose, hemicellulose and lignin can be degraded at different rates, or a preferential attack on lignin and hemicellulose can occur (Blanchette *et al.* 1987).

A large number of white rot fungi were shown to selectively remove lignin from a variety of woods (Blanchette 1984; Blanchette and Reid 1986; Otjen and Blanchette 1986). Preferential lignin degradation can occur in localized areas of wood resulting in white-pocket rot or in larger, less restricted areas typical of decay with a mottle-rot appearance (Blanchette *et al.* 1985). Micromorphological studies of wood in advanced stages of delignification have demonstrated a loss of middle lamella from the cell walls and a defibration of the wood (Blanchette *et al.* 1985). Ultrastructural investigation of lignin loss from the cell walls of aspen and birch wood decayed by *Phlebia tremellosa* confirmed the extensive loss of lignin from the secondary wall as well as the compound middle lamella (Blanchette and Reid 1986). An intra- and extracellular localization of lignin peroxidase during the degradation of solid wood and wood components by *Phanerochaete chrysosporium* suggested the possibility of close substrate-enzyme association during wood cell degradation (Daniel *et al.* 1989). Lignin concentration was determined in cell wall, layers of sound and white-rotted birch and pine wood using energy dispersive X-ray analysis. In one type of decay (*Phellinus pini*) lignin was completely removed from all cell wall layers, but only in localized areas of wood blocks (Otjen and Blanchette 1988). In another decay (*Pholiota mutabilis* and *P. chrysosporium*), extensive amounts of lignin were uniformly removed from wood blocks, but the major attack occurred in the S_2 layer of fiber cell walls with no degradation of cell corners. *Phlebia subseriolis* removed lignin from wood blocks in a similar way as *P. pini* and *P. mutabilis*, but complete dissolution of all wall components occurred where lignin was degraded. There are many white-rot fungi that are not selective for lignin degradation and large losses of polysaccharides also are removed. *Trametes (Coriolus) versicolor* is an example of a white-rot fungus that causes simultaneous degradation of all cell wood components (Blanchette *et al.* 1988).

The ascomycete *Chrysonilia sitophila*, selectively de-

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This paper corresponds to Amazonian Lignocellulosic Materials II.