

LIGNIN DEGRADING FUNGI

BY

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- Lignin is a class of complex organic polymers that form key structural materials in the support tissues of vascular plants and some algae
- Lignins are particularly important in the formation of cell walls, especially in wood and bark, because they lend rigidity and do not rot easily. Chemically, lignins are cross-linked phenolic polymers
- Lignin fills the spaces in the cell wall between cellulose, hemicellulose, and pectin components, especially in vascular and support tissues: xylem tracheids, vessel elements and sclereid cells
- It is covalently linked to hemicellulose and therefore cross-links different plant polysaccharides, conferring mechanical strength to the cell wall and by extension the plant as a whole

- It is particularly abundant in compression wood but scarce in tension wood, which are types of reaction wood
- Lignin plays a crucial part in conducting water in plant stems

Biodegradation

- Some ligninolytic enzymes include heme peroxidases such as lignin peroxidases, manganese peroxidases, versatile peroxidases, and dye-decolourizing peroxidases as well as copper-based laccases
- Lignin peroxidases oxidize non-phenolic lignin, whereas manganese peroxidases only oxidize the phenolic structures

- Dye-decolorizing peroxidases, or DyPs, exhibit catalytic activity on a wide range of lignin model compounds, but their *in vivo* substrate is unknown
- In general, laccases oxidize phenolic substrates but some fungal laccases have been shown to oxidize non-phenolic substrates in the presence of synthetic redox mediators.

Lignin degradation by fungi

- Some white rot fungican degrade the lignin in lignocellulose, but others lack this ability
- Most fungal lignin degradation involves secreted peroxidases
- Many fungal laccases are also secreted, which facilitate degradation of phenolic lignin-derived compounds, although several intracellular fungal laccases have also been described
- An important aspect of fungal lignin degradation is the activity of accessory enzymes to produce the H_2O_2 required for the function of lignin peroxidase and other heme peroxidases.

- Degradation of lignin occurs only in the presence of oxygen and glucose
- There is no anaerobic breakdown
- The break down is catalyzed by an enzyme system that used to be called ligninase
- These contain peroxidase ,it requires H_2O_2 for their function and catalyse the oxidative cleavage of β -o-4 ether bonds and c-c bonds in lignin

- Brown rot fungi first attack the intact wood it attack the cellulose and hemicellulose parts of wood directly thus lignin is liberated out
- White rot fungi degrade the lignin
- Degradation is an oxidative process
- White rot fungi producing oxidizing agents such as-
- Sulphur oxide anion
- Hydrogen peroxide
- Hydroxy radicals
- Singlet oxygen

- oxidizing agents breaks the bond between the sub units and bring about a gradual depolymerization of lignin results in a variety of phenols , aromatic acid and aromatic alcohols

THANK YOU