Enzymes of *Phanerochaete chrysosporium* Burds. and *Irpex lacteus* (Fr.)Fr.: Decolorization of Dyes and Effluents

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White-rot Basidiomycetes (WRB) play a central role in global carbon cycles as a result of their innate ability to mineralize the lignin, which has a complex polymeric structure. Shallow stationary cultures of *Phanerochaete chrysosporium,* grown on low-nitrogen mineral medium, produced manganese peroxidase (MnP) and lignin peroxidase (LP). Sulphonphthalein (SP) dyes were decolorized by MnP activity. Decolorization of SP dyes occurred optimally at pH 4.0. An increase in the halogenation (bromine group) of the SP dyes decreases its substrate specificity for MnP. The presence of additional auxochromes (position, type, and number) on the SP dye chromophore influence the suitability of SP dyes as an MnP substrate.

The methyl group in the *ortho* position (in the case of *o*-cresol red) is favored over that in *meta* position (in the case of *m*-cresol purple). Oxygen scavenger (sodium metabisulfite) and hydroxyl radical scavengers (thiourea and mannitol) did not have any influence on MnP decolorization activity. EDTA, a metal chelator, inhibited MnP-catalyzed decolorization reaction. The results highlight the SP dyes as substrates of MnP and provide another class of chromogen for the detection and estimation of ligninolytic peroxidases. Also, the results emphasize as a model for the bioremediation program of the structurally similar xenobionts and recalcitrant compounds stressing over enzyme(s) of white rot basidiomycete *P. chrysosporium* as a potent biochemical tool.

In another study, white-rot basidiomycete *Irpex lacteus* decolorized the textile dyes on solid medium. Decolorization on solid medium was of older mycelium. Extracellular enzyme extract prepared from *I. lacteus*-infested wheat straw possessed ligninolytic enzymes manganese peroxidase (MnP), manganese-independent peroxidase (MIP), and lignin peroxidase (LP). Decolorization of triphenyl methane dyes is attributed to MnP activities.

The same color dyes (red, orange, and blue) were decolorized variably on the solid medium as well as by the ligninolytic enzymes of *I. lacteus*. The presence of a halogenated compound, cyanuric chloride, in the structure of reactive orange 13 makes it a suitable substrate for MIP, whereas MnP decolorizes reactive orange 16 that has a naphthalene ring with an hydroxyl group, presenting the dye as a simpler phenolic moiety. Decolorization of triphenyl methane dyes methyl blue (MB) and fast green (FG) was attributed to MnP activities. Brilliant green (BG) resisted decolorization by ligninolytic activities. The presence of two 3-[2-(ethyl amino) ethyl] benzene sulfonate groups in FG and three 4-amino benzene sulfonate groups in MB favor the decolorization, whereas the presence of two *N,N*-diethyl amine groups in BG resist the decolorization by ligninolytic activities. Enzymatic decolorization of effluents led to the complete loss of the peak in the UV-region. Ligninolytic activities associated to decolorization of effluents showed no influence of pH and decolorized the effluent over the pH range of 3–5. The results highlight the efficacies of the ligninolytic system in designing a modest bioremediation program and also provide the means to distinguish among the peroxidases generated as a part of the ligninolytic system.