

Process Optimization for Shake Flask Bio-treatment of Disperse Yellow 9 Textile Dye with White-rot Fungi and their Enzymes

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ABSTRACT

Industries that release highly colored effluents are textiles, paper and pulp mills, dye-making industries, alcohol distilleries and leather industries. Effluents from these industries contain chromophoric compounds and can be mutagenic and inhibitory to aquatic biosystems. Bioremediation utilizes metabolic potential of microorganisms in order to clean up the environmental pollutants to less hazardous or non-hazardous forms. White-rot fungi and their lignin degrading enzymes; laccase, manganese peroxidase and lignin peroxidases are useful in the treatment of colored industrial effluents and other xenobiotics. This study was designed to investigate the oxidation (decolorization/degradation) of three selected synthetic dyes; Bromophenol Blue (BB), Acid Violet 7 (AV7) and DisperseYellow 9 (DY9), by white-rot fungus *Trametesversicolor*. The best decolorized dye DY9 was selected for subsequent optimization studies. After the step by step applications, the highest color removal yield was 93% in DY9 sample after 120 h of incubation at 35°C, pH 4.5 inkrik medium with added 1% starch and 0.01% ammonium sulphate as carbon and nitrogen source respectively. Ligninolytic enzyme activities were correlated to dye decolorization and maximum manganese peroxidase activity 416.33 U/ml was also noted in the maximally decolorized medium. The result indicated that *T. versicolor* was obviously able to breakdown synthetic dyes and manganese peroxidase was considered as a major lignin-degradation enzyme in this reaction. Manganese peroxidase enzyme play an important role in the bioremediation of these dyes and its activity is induced by dyes. The effects of dye concentration, fungal inoculum size as well as pH were studied. Samples were periodically collected for the measurement of color unit, laccase, manganese peroxidase and lignin peroxidase activity.

Keywords: Decolorization, white rot fungi, bioremediation, microbial enzyme system, culture condition, process optimization