



REMOVAL OF COMMERCIAL TEXTILE DYES BY IMMOBILIZED PUTATIVE LACCASE ENZYME FROM *Talaromyces* sp.

Ekanayake E.M.M.S.^{1,2}, Wijesekara I.³ and Pathmalal M.M.^{1*}

¹Centre for Water Quality and Algae Research, Department of Zoology,
University of Sri Jayewardenepura, Sri Lanka

²Faculty of Graduate Studies, University of Sri Jayewardenepura,
Sri Lanka

³Department of Food Science and Technology,
University of Sri Jayewardenepura, Sri Lanka
pathmalal@sjp.ac.lk

Abstract

The removal of dyes from textile wastewater effluents grants a formidable challenge, as synthetic dyes are resistant for natural degradation processes. Laccases have high potential to degrade various aromatic compounds with less specificity. Therefore, potential applicability of laccase enzymes on textile dye decolorization processes was evaluated in the present study. The putative laccase enzymes were extracted from the fungi; *Talaromyces* sp. and partially purified by ammonium sulphate precipitation followed by dialysis. The putative laccase was immobilized on sodium alginate beads and 20 gL⁻¹ of beads were introduced into 50 mgL⁻¹ of three commonly used textile dyes; CI Direct Blue 201 (DB), Cibacron Blue FR (CB FR) and Moxilon Blue GRL (MB GRL) dyes, separately. Similarly, dye decolorization experiment was carried out using 8% (v/v) of putative laccase without immobilization. Controls were maintained without addition of enzyme. The extent of dye decolorization and the activity of laccase (ABTS oxidation, $\epsilon_{420} = 36000 \text{ M}^{-1} \text{ cm}^{-1}$) were determined by measuring the changes of the absorbance using UV-Vis spectrophotometer. The protein contents of the samples were determined using Bicinchoninic Acid Protein Assay kit. In the present study, specific enzyme activity of crude and partially purified putative laccase enzymes were recorded as 2.4 and 40 Umg⁻¹, respectively. When dyes incubated with immobilized laccase gel beads, 100% dye decolorization was observed for MB GRL within 16 hrs of incubation. DB 201 and CB FR showed 65% and 78% dye decolorization, respectively at 24 hrs of incubation and then descending dye decolorization patterns were observed. All dyes showed less than 50% of dye decolorization as a response to the liquid laccase without immobilization while controls were remained unchanged. Therefore, the immobilized putative laccase enzyme extracted from *Talaromyces* sp. can be used for the removal of textile dye contained wastewater in greener aspects. Further studies on the enzyme kinetics are yet to be carried out.

Keywords: Immobilization, *Talaromyces* sp., dye decolorization, laccase, enzym