

Aphinya Bunluesup 2008: Decolorization of Dyes in Textile Wastewater by Ligninolytic Enzymes Extracted from Mushroom Culture Waste. Master of Science (Environmental Technology and Management), Major Field: Environmental Technology and Management, Department of Environmental Science. Thesis Advisor: Miss.Prapaipid Chairattanamanokorn, Doc.Eng. 70 pages.

White rot fungi produce ligninolytic enzyme when nutrients starve. Utilization of mushroom spent culture that is residue after harvest is the one alternative to extract the enzymes for decolorization of dye in wastewater because this spent mushroom culture still contains the ligninolytic enzyme. This research studied ligninolytic enzyme extraction from spent mushroom cultured 5 types of fungi, *Pleurotus sajor-caju*, *Pleurotus ostreatus*, *Agrocybe cylindracea*, *Pleurotus cystidiosus* and *Ganoderma lucidum*. The extraction of the spent culture with 0.1 M phosphate buffer pH 7 that 15: 30 ratio (g/ml) for 3 hours produced maximum laccase (Lac) from the spent culture with *P. ostreatus* ( $367.04 \pm 1.26$  mU/g) and from that with *P. sajor-caju* ( $210.73 \pm 0.90$  mU/g). Reactive Black 5 (50 ppm) in 100 ml synthetic wastewater was decolorized with 750 mU Lac enzyme solution from the *P. ostreatus* extraction and from *P. sajor-caju* extraction at  $68.86 \pm 0.27$  % and  $48.48 \pm 0.39$  %, respectively, after 72 hours. Then decolorization of 50 ppm Reactive Red 198 and Reactive Yellow 176 was  $19.63 \pm 1.66$  and  $9.99 \pm 1.96$  %, respectively. Addition of 10 mM violuric acid as redox mediator with Lac enzyme solution promoted the decolorization efficiency of Reactive Black 5. The decolorizing efficiency was increased to  $74.61 \pm 0.93$ % compared with only Lac enzyme solution ( $6.05 \pm 0.35$  %) for 6 hours. NaCl inhibited Lac enzyme activity. One hundred mM NaCl with 750 mU laccase decreased decolorizing efficiency from  $57.09 \pm 0.74$ % (only laccase) to  $2.33 \pm 0.10$ % for 72 hours. Moreover, decolorization of 50 ppm Reactive Black 5 with immobilized Lac enzyme on supporting the media (pretreated coconut shell and cellulose bead) was conducted. The Reactive Black 5 was decolorized to 84.75% at 60 minutes and 89.98% at 90 minutes with immobilized laccase on the pretreated coconut shell and cellulose bead, respectively. This results shown the immobilized Lac enzyme had advantages in the term of shorter decolorizing time and consecutively repeated utilization for the decolorization. From the research , it is possible to apply the spent mushroom culture for the enzyme production and decolorization of wastewater in textile industries. However, the application of the enzyme for decolorization in industries is supposed to more studies involving characteristic of wastewater and immobilizing ligninolytic enzyme on the appropriate medium for better decolorizing efficiency.

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Thesis Advisor's signature

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