Abstract No: 267 ***Earth and Environmental Sciences***

PHYTOREMEDIATION OF SYNTHETIC TEXTILE DYE (DIRECT BLUE 201) BY *Eichhornia crassipes* (MART.) SOLMS VIA BIO-SORPTION AND ENZYMATIC DEGRADATION

E.M.M.S. Ekanayake[1,2], D. Udayanga[3], I. Wijesekara[4] and P.M. Manage[1,2*]

[1]Centre for Water Quality and Algae Research, Department of Zoology, Facuty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[2]Faculty of Graduate Studies, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[3]Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Homagama, Sri Lanka
[4]Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[*]pathmalal@sjp.ac.lk

Synthetic dye containing textile wastewater effluents are highly toxic causing adverse impacts on the environment and human health. The present study is aimed to identify the dye decolorization potential and phytoremediation pathway of *Eichhornia crassipes* (Mart.) Solms (Water hyacinth) as a low cost and environmental friendly textile wastewater treatment method. Four plants of disinfected *E. crassipes* were introduced into 1 L of 50 mg L^{-1} of Direct Blue 201 (DB 201) textile dye containing tanks and dye removal percentages were analyzed at 12 h intervals using a standard spectrophotometric method. The controls were maintained without the involvement of plants. The potential dye decolorization pathways were studied via involvement of endophytes, bio-sorption activity, and effect of crude extracellular and intracellular enzymes extracted from *E. crassipes* on DB 201 dye. Activities of lignin peroxidase, manganeses peroxidase, laccase, tyrosinase, azoreductase in decolorized dye solution were assayed spectrophotometrically, following optimized protocols. Toxicity of the decolorized dye was evaluated by seed germination assay using *Oryza sativa* (L.) and *Vigna radiata* (L.). In the present study, *E. crassipes* showed 98% of DB 201 dye decolorization within 36 h of incubation while control showed less than 1% of dye decolorization. None of the isolated endophytic bacteria (12 isolates) or fungi (14 isolates) were found to be the potential candidates for removal of DB 201 dye. *E. crassipes* showed 17.7% of dye decolorization by means of bio-sorption on to the plant roots. The crude extract of the intracellular and extracellular source of the enzyme showed 46% and 10% of dye decolorization, respectively. Compared to the initial stage, the activity of lignin peroxidase, manganese peroxidase, laccase, tyrosinase, azoreductase enzymes were slightly increased at the end of dye decolorization process. The shifts of transmittance in FTIR spectrum confirmed the alteration of original dye structure after the treatment. The treated dyes showed significant seed germination, for both *O. sativa* and *V. radiate* seeds, compared to the seeds treated with textile dye ($p \leq 0.05$). Hence, the present study confirms the potential applicability of *E. crassipes* for enzyme based, low cost treatment method to treat textile wastewater in future.

Financial assistance from the University of Sri Jayewardenepura (*Grant No. ASP/01/RE/SCI/2016/10*) *is acknowledged.*

Keywords: Biosorption, Dye decolorization, *Eichhornia crassipes*, Enzymatic degradation, Phytoremediation