

BIOREMOVAL OF FIVE LABORATORY DYES IN AQUEOUS SOLUTIONS USING GREEN ALGAE, *CHLOROCOCCUM AQUATICUM*

M.H.K.T. Rupasinghe¹, A.D.S.N.P. Athukorala^{2*} and K.B. Jayasundara³

¹Department of Environmental and Industrial sciences, University of Peradeniya, Peradeniya, Sri Lanka

²Department of Botany, University of Peradeniya, Peradeniya, Sri Lanka

³Department of Chemistry, University of Ruhuna, Matara, Sri Lanka

*sarangiathu@sci.pdn.ac.lk

Dyes are one of the frequent contaminants in science laboratory wastewater which are highly water soluble, potentially toxic and carcinogenic. Their negative impact on aquatic and soil ecosystems urges treating laboratory effluents before discharge. Conventional removal of laboratory dyes from wastewater is a costly process. As an alternative, the current study investigated the potential use of phytoremediation to decolourize and detoxify five laboratory dyes: rose bengal, safranin, congo red, bromothymol blue and methylene blue using microalgal species *Chlorococcum aquaticum*. The percentage decolourization was determined using UV visible spectrometry with 400 nm – 800 nm for 14 days. The experiment was repeated twice. The microalgal species demonstrated a decolourization percentage above 50% for all dyes, except for safranin, with the highest colour reduction of 90% with methylene blue within 14 days. The percentage of live cells of *C. aquaticum* monitored using light microscopy indicated that a tolerance of over 85% was observed for all dyes except safranin after the investigation period. The reduction in toxicity of the dyes by *C. aquaticum* determined using a seed germination assay showed that there was no significant difference among percentage seed germination ($p=0.11 - 0.95$ for 5 dyes) in seeds treated with dye solutions with and without *C. aquaticum* at day 0. However, a significant increase in the percentage of seed germination ($p<0.0001$) was observed in seeds treated with dye solutions incubated with *C. aquaticum* from day 0 to day 14 for all dyes, while no significant change ($p=0.22 - 1.00$ for 5 dyes) was observed between day 0 to day 14 with the dye solutions without the algae added. This study revealed that *C. aquaticum* has the potential to decolourize and detoxify the five laboratory dyes tested, and therefore the method developed can be extended as a dye remover/detoxifier from laboratory wastewater.

Financial assistance from the Department of Botany and Department of Environmental and Industrial Sciences undergraduate research allocations, University of Peradeniya, are acknowledged.

Keywords: *Chlorococcum aquaticum*, Detoxification, Laboratory dyes, Phytoremediation