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Removal of Tryphenylmethane Dyes by the Microalgae *Chlorella* sp.

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Abstract

Removal of organic dyes from industrial wastewater is a costly process. Activated charcoal and polymeric material are widely used to adsorb such material. Biomass provides alternative low-cost adsorbents to remove organic substances in wastewater. Dry biomass is only capable of adsorption, whereas live biomass is capable of adsorption as well as degradation of molecules to less toxic substances. Bioremediation with microalgae (phycoremediation) is a practically useful approach due to the ease of handling and environmental adaptability of microalgae. This study was aimed to use phycoremediation to remove tryphenylmethane dyes; crystal violet, methyl violet, malachite green, and fuchsin from aqueous solutions using microalgae *Chlorella* sp. The microalgae samples were extracted from polluted water bodies in Kandy urban area. To determine the factors affecting the dye removal, the percentage decolorization was determined at different salt concentrations by measuring UV-visible absorption at appropriate wavelengths. NaCl was used as the representative inorganic salt. *Chlorella* sp. showed tolerance up to 2,000 ppm salt concentrations and was able to decolorize dye solutions above 60% within five days. Three replicates were done under each salt concentration. Further, the effect of dye concentration on the decolorization rate was investigated for five different salt concentrations from 0 ppm to 500 ppm. *Chlorella* sp. showed a decolorization percentage above 65% in the presence of 100 ppm dye concentrations. The phycoremediation potential of *Chlorella* sp. was determined by investigating the change in pH, chemical oxygen demand (COD), and phosphate content after the treatment using simulated wastewater. The microalgae were able to maintain the pH levels within the discharge limits. The chemical oxygen demand was decreased from a value around 600 mgL⁻¹ to a value less than 250 mgL⁻¹ which was within the discharge limits. Phosphate content was also decreased within 10 days. According to the above study, it can be concluded that the isolated *Chlorella* sp. can be used to treat and improve the quality of wastewater contaminated with tryphenylmethane dyes.

Keywords: *Chlorella* sp., Tryphenylmethane dyes, Decolorization, Phycoremediation