SPECIMEN FORMAT FOR THESES OF MONTH

Faculty	:	School of Biosciences
Department	:	Zoology
Branch/ Area:	:	Zoology
Sub Subject Heading:	:	Environmental studies
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Title of the thesis	:	Studies on removal of brilliant green dye using marine brown macroalgal biomass *Sargassum wightii*

(i) In Roman Script
(ii) In roman Script

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Designation of Supervisor	:	Professor & Head
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Abstract within 300 words:

Abstract

In this study, the removal of brilliant green dye from aqueous solution using seaweed *Sargassum wightii* was carried out. The effects of different variables such as adsorbent dose, pH, initial dye concentrations and temperature were studied through batch experimental system. The adsorbent–adsorbate interaction was characterized by Fourier transform infrared spectroscopy and UV–Vis spectrophotometer and the surface structure of the sorbent was documented by scanning electron microscopy and chemical com- position was determined by energy dispersive X-ray spectroscopy. To assess the microbial toxicity of *S. wightii*-treated and untreated dye using various microorganisms and cytotoxicity effect on *Allium cepa* L. Further it aimed to evaluate the exposure of BG dye activity on haematological, plasma biochemical, enzymological activities and histopathology of Indian major carp, *Labeo rohita* as a biomarker. The results of the present study proved that the efficiency of marine brown macroalgal biomass *Sargassum wightii* in complete removal of the dye from the present study. Thus, worldwide awareness of dye removal from aqueous solution and its management could be provoked.

Keywords: Brilliant green dye, Marine alga, Batch study, Cytotoxicity, Microbial toxicity, Zootoxicty

i) Major objectives :

- To investigate the feasibility of *Sargassum wightii* for the removal of BG dye from aqueous solution.
- To determine the different environmental factors on decolourisation with varying dye concentrations, adsorbent dose and pH at different temperatures.
- To determine the variations in the functional groups using FT-IR spectroscopy, the surface characterization by SEM, the elimination of metals before and after biosorption using EDX.
- To determine the equilibrium uptake (q_{eq}) and adsorption yield of *S. wightii* as a function of initial pH, initial dye concentration and temperature for the removal of BG dye.
- To analyze the experimental adsorption data using Langmuir and Freundlich adsorption isotherms and determination of isotherm constants.

- To evaluate the kinetics of the adsorption process using pseudo first and second order rate equations.
- To state thermodynamics to explain the adsorption process.
- To analyse the physico-chemical parameters of dye before and after treatment by *S. wightii*.
- To check the feasibility of *S. wightii* for the removal of real textile effluents from aqueous solution.

ii) Hypothesis:

Water is one of the most valuable resources on planet earth. It is the lifeline for almost all living things on earth. Although the fact is widely recognized, pollution of water resources is a common occurrence. Water pollution is one of the major environmental problems that cause severe threat to living organisms. The waste water discharged from industries is either used for irrigation purposes or it runs off into natural sources of water. Thus waste water from textile industries creates a big pollution problem due to the dye content presence in it. Brilliant green dye (triphenyl methane) is a cationic dye used for decolourization study which was selected on the basis of its extensive use as a colouring agents (silk, wool) including soluble dyes and insoluble pigments, inks, paints and as indicators and reagents. It causes threats to human beings which include irritation in the respiratory tracts and gastrointestinal tracts that lead to damage in organs with symptoms of nausea, diarrhea and vomiting. Due to its toxicity to the environment, in this research, brown marine macroalgae which are popularly known as seaweed was used as the adsorbent to remove BG dye from aqueous solution. Seaweed was chosen as it is ubiquitous biological resource and is most predominant that contains alginate gel in their cell walls which offer a convenient basis for the production of biosorbent particles that are suitable for sorption processes and also the presence of abundant dye uptake functional groups. Keeping in view the significance of textile dyes and their environmental tribulations, the current study was undertaken to explore the biosorption potential of brown marine macroalgal biomass*Sargassum wightii* for the removal of brilliant green dye from aqueous solutions.

iii) Methodology :

Phase -I

- Selection, collection and identification of alga
- Selection of textile dye and preparation of dye solution

Phase -II

- Batch adsorption and desorption experiments

1. Determination of optimum biosorption conditions for decolourization
2. Dye desorption and regeneration study
3. Sorption Isotherm, kinetics and thermodynamics

Phase –III

- Physicochemical characterization of untreated and treated brilliant green dye
- Analytical studies
  1. UV- visible spectral analysis
  2. FTIR spectroscopic analysis
  3. SEM with EDX analysis

Phase -IV

- Commercial applications
  1. Phytotoxicity of untreated and *S.wightii* treated brilliant green dye
  2. Microbial toxicity of untreated and *S.wightii* treated brilliant green dye
  3. Cytotoxicity of untreated and *S.wightii* treated brilliant green dye
  4. Zootoxicity of untreated and *S.wightii* treated brilliant green dye

Phase –V

- Physicochemical characterization of untreated and *S.wightii*treated effluent
- *Sargassumwightii* efficiency in the removal of textile effluent- a batch experiment

iv) Findings:

The present study accomplished that the utilization of brown marine macroalga could be a good alternative and could drive the current expensive methods for the removal of dyes from aqueous solution and effluent. Bioremediation integrates the intensity of pollution and environmental effects, forms a major research outcome. By responding to the bioavailable concentration of a pollutant, they measure its impact on the environment more accurately. This is vital in assessing the environmental clean-up. *S. wightii* treated dye could have integrated with decolourization and revealed that it does not lead to detoxification of the dye whereas untreated dye reflected its extent of toxicity on plants, microbes and fishes. Thus the reduction in toxic effect of *S. wightii* treated dye decreases the environment damage.

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