Sargassum wightii, a marine alga is the source for the production of algal oil, bio-oil, and application in the dye wastewater treatment

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ABSTRACT

The utilization of algal biomass is a field that is fast reaching the lime light as their overflowing potentials are just being realized. The marine macroalga, Sargassum wightii, known for its photosynthetically efficient nature, has been considered as the main source of biomass. In this research, the algal biomass has been utilized for three different purposes (i) production of algal oil, (ii) production of bio-oil, and (iii) the oil-free algal biomass was used as a biosorbent in the treatment of dye wastewater. Optimal conditions of the influencing parameters such as the solvent systems, pre-treatment methods, optimum temperature, and time of exposure for the production of algal oil and bio-oil were studied. Once the oil extraction was completed, the remaining algal biomass acts as a solid waste. This waste was utilized as an effective biosorbent for the removal of methylene blue (MB) dye from the aqueous solution. The effect of operating parameters such as solution pH, biosorbent dose, initial dye concentration, time, and temperature on the removal of MB dye from the aqueous solution has been investigated. Biosorption kinetics, mechanism, isotherm, and thermodynamics of dye removal by the algal biomass were studied. Freundlich and pseudo-second-order models provide the best fit to the biosorption equilibrium and kinetic data, respectively. Biosorption of dye molecules onto the biomass was controlled by both particle and film diffusion. The thermodynamic study showed that the biosorption process was found to be an exothermic and spontaneous in nature.

Keywords: Algal oil; Biosorption; Bio-oil; Methylene blue dye; Sargassum wightii

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