

Biosorption of anionic and cationic azo dye onto red macro alga: Determination of the significant variables using resolution V fractional factorial design

Abstract

Naturally inspired biosorbent from macro algae species are favored because of its excellent biosorptive capability and low cost. The present investigation reports the potential of red macro-alga, *E. spinosum* as a biosorbent to remove both anionic and cationic azo dyes, namely Acid Yellow 17 (AY17) and Methylene Blue (MB) from aqueous solution. A resolution V fractional factorial design (2_v^{5-1}) analysis was employed to study the main effects and interaction of variables on the biosorption process. Factorial matrix with five variables; pH (2–12), dosage (0.4–2 g/L), initial concentration (50–200 mg/L), contact time (5–120 min) and temperature (30–50 °C) at two levels were conducted in batch study. Pareto charts and ANOVA (within 95% confidence level) were applied to examine the relationship and significance between independent variables and their interactions. A regression model with $R^2_{AY17} = 0.9998$ and $R^2_{MB} = 0.9995$ was implemented to fit the experimental data. The results obtained indicated that the most significant variables that affected biosorption process were initial concentration and the dosage of the dyes. Experimental screenings are crucial in optimization studies. The remarkable performance of *E. spinosum* as biosorbent to absorb both dyes shows a great potential to be implemented for local marine macro alga as an alternative. Resource for biosorption process.

Keywords

Acid yellow 17; Biosorbent; Decolorization; *Euchema spinosum*; Fractional factorial design; Macro algae; Methylene blue