

# **Biosorption of cationic and anionic azo dye onto red macro alga: *Euchema Spinosum*. Determination of the optimal experimental variables using resolution V fractional factorial design**

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Abstract—

Naturally inspired biosorbent from macro alga species is 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 result indicated that the most significant variables that affect the biosorption process were initial concentration and dosage. Experimental screenings such as this is crucial in optimization studies. The successful capability of *E.Spinosum* as biosorbent for both dyes implies a great potential for local marine macro alga as an alternative resource for biosorption process.

*Keywords*— Biosorbent, *Euchema spinosum*, Acid Yellow 17, Methylene Blue, decolorization, Fractional Factorial Design