Modeling and Optimization of Algae Oil Extraction Using Response Surface Methodology

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Abstract : Aims: In this experiment, algae oil extraction with a combination of n-hexane and ethanol was investigated. The effects of extraction solvent concentration, extraction time and temperature on the yield and quality of oil were studied using Response Surface Methodology (RSM). Experimental Design: Optimization of algae oil extraction using Box-Behnken design was used to generate 17 experimental runs in a three-factor-three-level design where oil yield, specific gravity, acid value and saponification value were evaluated as the response. Result: In this result, a minimum oil yield of 17% and maximum of 44% was realized. The optimum values for yield, specific gravity, acid value and saponification value from the overlay plot were 40.79%, 0.8788, 0.5056 mg KOH/g and 180.78 mg KOH/g respectively with desirability of 0.801. The maximum point prediction was yield 40.79% at solvent concentration 66.68 n-hexane, temperature of 40.0°C and extraction time of 4 hrs. Analysis of Variance (ANOVA) results showed that the linear and quadratic coefficient were all significant at $p < 0.05$. The experiment was validated and results obtained were with the predicted values. Conclusion: Algae oil extraction was successfully optimized using RSM and its quality indicated it is suitable for many industrial uses.