

## **Optimization on preparation condition of polyunsaturated fatty acids nanoliposome prepared by Mozafari method**

### **Abstract**

This study presents the application of the response surface methodology (design) to develop an optimal preparation condition (independent variables) namely shear rate (600–1000 rpm), mixing time (30–60 min), and sonication time (10–20 min) for polyunsaturated fatty acids (docosahexaenoic acid and eicosapentaenoic acid) nanoliposomes. Fifteen lipid mixtures were generated by the Box–Behnken design and nanoliposomes were prepared by the Mozafari (direct hydration and without using organic solvents) method. Nanoliposomes were characterized with respect to entrapment efficiency (EE) and vesicle size as Y1 and Y2 dependent variables, respectively. The results were then applied to estimate the coefficients of response surface model and to find the optimal preparation conditions with maximum EE and minimum vesicle size. The response surface analysis exhibited that the significant ( $p < 0.05$ ) second-order polynomial regression equations were successfully fitted for all dependent variables with no significant ( $p > 0.05$ ) lack of fit for the reduced models. The response optimization of experiments was the shear rate: 795 rpm; mixing time: 60 min; and sonication time: 10 min. The optimal nanoliposome had an average diameter of 81.4 nm and EE of 100%. The experimental results of optimal nanoliposomes characterization confirmed an accurate fitness of the predicted values by reduced response surface models.