Influence of astaxanthin, emulsifier and organic phase concentration on physicochemical properties of astaxanthin nanodispersions.

ABSTRACT

Background; The emulsification-evaporation method was used to prepare astaxanthin nanodispersions using a three-component emulsifier system composed of Tween 20, sodium caseinate and gum Arabic. Using Response-surface methodology (RSM), we studied the main and interaction effects of the major emulsion components, namely, astaxanthin concentration (0.02–0.38 wt %, x1), emulsifier concentration (0.2–3.8 wt %, x2) and organic phase (dichloromethane) concentration (2–38 wt %, x3) on nanodispersion characteristics. The physicochemical properties considered as response variables were: average particle size (Y1), PDI (Y2) and astaxanthin loss (Y3). Results; The results indicated that the response-surface models were significantly ($p < 0.05$) fitted for all studied response variables. The fitted polynomial regression models for the prediction of variations in the response variables showed high coefficients of determination ($R^2 > 0.930$) for all responses. The overall optimum region resulted in a desirable astaxanthin nanodispersions obtained with the concentrations of 0.08 wt % astaxanthin, 2.5 wt % emulsifier and 11.5 wt % organic phase. Conclusion; No significant differences were found between the experimental and predicted values, thus certifying the adequacy of the Response-surface models developed for describing the changes in physicochemical properties as a function of main emulsion component concentrations.

Keyword: Astaxanthin; Emulsification-evaporation; Nanodispersion; Emulsion component.