Response surface modeling of processing parameters for the preparation of phytosterol Nanodispersions using an emulsification-evaporation technique.

Abstract

The purpose of this study was to optimize the production parameters for water-soluble phytosterol nanodispersions. Response surface methodology (RSM) was employed to model and optimize three of the processing parameters: mixing time (t) by conventional homogenizer (1–20 min), mixing speed (v) by conventional homogenizer (1,000–9,000 rpm) and homogenization pressure (P) by high-pressure homogenizer (0.1–80 MPa). All responses [i.e., mean particle size (PS), polydispersity index (PDI) and phytosterols concentration (Phyto, mg/l)] fitted well to a reduced quadratic model by multiple regressions after manual elimination. For PS, PDI and Phyto, the coefficients of determination (R^2) were 0.9902, 0.9065 and 0.8878, respectively. The optimized processing parameters were 15.25 min mixing time, 7,000 rpm mixing speed and homogenization pressure 42.4 MPa. In the produced nanodispersions, the corresponding responses for the optimized preparation conditions were a PS of 52 nm, PDI of 0.3390 and a Phyto of 336 mg/l.

Keyword: Phytosterol; Nanodispersion; Response surface methodology; High-pressure.