

Preparation and optimization of water-soluble cationic sago starch with a high degree of substitution using response surface methodology

ABSTRACT

Modification and characterizations of cationic sago starch with 3-chloro-2-hydroxypropyl trimethylammonium chloride (CHPTAC) prepared via etherification reaction was reported in this study. The optimization of cationic sago starch modification was performed by utilizing the combination of response surface methodology and central composite design (RSM/CCD). The effect of each variable and the interaction between the three variables, the concentration of CHPTAC, concentration of the catalyst NaOH, and the reaction times on the degree of substitution (DS) of the product were investigated and modeled. Moderate conditions were employed and a water-soluble cationic sago starch with high DS value was obtained. Based on RSM, the highest DS = 1.195 was obtained at optimum conditions: 0.615 mol of CHPTAC concentration (CHPTAC/SS = 5), 30% w/v NaOH, and 5 h reaction time, at 60 °C reaction temperature. Furthermore, the cationic sago starch was characterized using Fourier transform infrared spectroscopy, FTIR, X-ray diffraction, XRD, and field emission scanning electron microscopy, FESEM.

Keyword: Cationic sago starch; Response surface methodology; High degree substitution; Water-soluble starch