Preparation of carboxymethyl sago pulp hydrogel from sago waste by electron beam irradiation and swelling behavior in water and various pH media.

ABSTRACT

Solutions of carboxymethyl sago pulp (CMSP) of various degree of substitution were irradiated with electron beam of various radiation doses. The gelation dose (Dg) and po/qo ratio (po is degradation density, qo is crosslinking density) is dependent on CMSP concentration and degree of substitution. In the range of concentrations of 10% to 80% (w/v) CMSP with degree of substitutions of 0.4, 0.6, and 0.8, the po/qo ratio decreases with increasing %CMSP showing that crosslinking processes are dominating and increasing the gel network of the CMSP hydrogel. The fourier transform infrared spectra of CMSP hydrogels of degree of substitutions of 0.4, 0.6, and 0.8 with percentage of gel fractions 25, 35, and ≥ 40 show differences in the intensity of the absorption bands at 1020–1100, 1326, and 1422 cm−1 with different degree of substitutions and percentage of gel fraction (%GF) that correspond to different extents of chain scission and crosslinking. The swelling behavior in water shows that CMSP hydrogels could absorb 3500–5300% of water by 1 g of CMSP hydrogel. The ability to absorb water increases with the decrease of degree of substitution and %GF of the CMSP hydrogels. It is also observed that the optimum pH for swelling CMSP hydrogel is at pH 7.

Keyword: CMSP hydrogel; Electron beam irradiation; Crosslinking; Sago pulp; FTIR.