Salmon skin gelatin-corn zein composite films produced via crosslinking with glutaraldehyde: Optimization using response surface methodology and characterization

ABSTRACT

Composite films comprised of salmon (Salmo salar) skin gelatin and zein were prepared via crosslinking with glutaraldehyde. Response surface methodology (RSM) was used to optimize film composition to maximize tensile strength (TS) and elongation at break (EAB), and to minimize water solubility (WS) of the films. The significant ($P < 0.05$) variables affecting film properties were: glutaraldehyde for TS, and zein and glutaraldehyde for both EAB and WS. The optimum concentrations (g/mL) to maximize TS and EAB and to minimize WS were 3% zein and 0.02% glutaraldehyde, which yielded films having a TS of 3.11 ± 0.01 MPa, EAB of 22.43 ± 1.57%, and WS of 38.82 ± 1.71%. The infrared spectra and morphological analyses demonstrated that the gelatin-zein composite film was successfully crosslinked after the addition of glutaraldehyde, with the formation of crosslinked networks between proteins and a denser packed organization of proteins. Consequently, the resultant crosslinked composite film exhibited improvement on light transparency, water resistance and mechanical strength as a function of increasing humidity.