

Characterization of gelatin from bovine skin extracted using ultrasound subsequent to bromelain pretreatment

ABSTRACT

Bovine skin was pretreated with bromelain enzyme and ultrasound (53 kHz and 500 W) was used to extract gelatin for the time durations of 2, 4 and 6 h at 60 °C (samples were referred as UB2, UB4 and UB6, respectively). Control (UBC) gelatin was extracted using ultrasound for 6 h at 60 °C without enzymatic pretreatment. Gelatin yield increased significantly ($P < 0.05$) as the time duration of ultrasound treatment increased with UB6 giving the highest yield of 19.71% followed by UBC (18.67%). Gel strength and viscosity of UBC were 603.24 g and 16.33 mPa s, respectively. The corresponding values for UB6 were 595.51 g and 16.37 mPa s, respectively. The amino acids content increased with longer duration of ultrasonic treatment and UBC exhibited the highest content of the glycine (27.06%) and hydroxyproline (17.21%) compared to other samples. Protein pattern of the gelatin samples showed the progressive degradation of polypeptide chains as the time duration of ultrasound extraction increased. As demonstrated by Fourier transform infrared (FTIR) spectroscopy, amide I band of gelatins extracted by ultrasound treatment exhibited higher wavenumbers than the commercial gelatin (CG) suggesting greater loss of molecular order in these samples. Longer duration of ultrasonic treatment resulted in denser, irregular, disorganized and more interconnected structure with increased porosity as revealed by scanning electron microscopy (SEM) but structural integrity was retained in UBC indicating degradation effect of bromelain enzyme in other samples. Finally, it was concluded that the ultrasound assisted gelatin extraction using bromelain enzyme produced high yield with good quality gelatin.