

Ultrasound-assisted valorization of poultry processing waste for sustainable gelatin production

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Valorization of poultry processing waste reduces environmental concerns as well as provides an excellent opportunity to generate value-added products adhering to the principles of circular economy. The present study aimed to extract and characterize gelatin from chicken by-product blend (skin-head-feet) using 3% acetic acid and citric acid (1:1 w/v) and/alkali (0.5 N NaOH, 1: 10 w/v) pre-treatment and thermohydrolysis. A process intervention for ultrasound (200 W at 39 kHz \pm 1 kHz) assisted green extraction was attempted by reducing the processing time and eliminating the alkali hydrolysis process.

Ultrasound pre-treatment with acetic acid (UA) significantly ($P < 0.05$) increased gelatin yield, while regardless of acid treatment, ultrasound notably enhanced the gel clarity and hydroxyproline content of gelatin. Color attributes indicated a significant increase in ($P < 0.05$) lightness and yellowness but decreased redness with ultrasound treatment. Textural properties, including hardness, gumminess, chewiness, and cohesiveness, significantly ($P < 0.05$) improved with ultrasound. The storage modulus (G') of all gelatin was more prominent than their corresponding loss modulus (G'') over the studied temperature in the heating scan (Fig. 1). The higher G' value of gelatin extracted with acetic acid, as compared to citric acid, indicated its higher heat stability. Functional properties were significantly ($P < 0.05$) increased in UA gelatin compared to ultrasonic-citric acid-treated (UC) samples, whereas, ultrasound-pretreated gelatin showed higher foam stability over time. Ultrasound-assisted extraction increased ($P < 0.05$) protein solubility across pH values (pH 4-10) and enhanced gel strength and viscosity of gelatin. A comparison with commercial pork gelatin (PG), the SDS-PAGE profile of chicken skin-head-feet blend gelatin revealed two distinct α -chains (α_1 and α_2) with molecular weight ranging from 120 to 135 kDa, and β -chain ranging between 200 to 245 kDa. whereas, γ -chain was not observed.

In conclusion, this study highlighted that chicken skin-head-feet blend gelatin has a promising potential with diverse possible applications in the food industry.

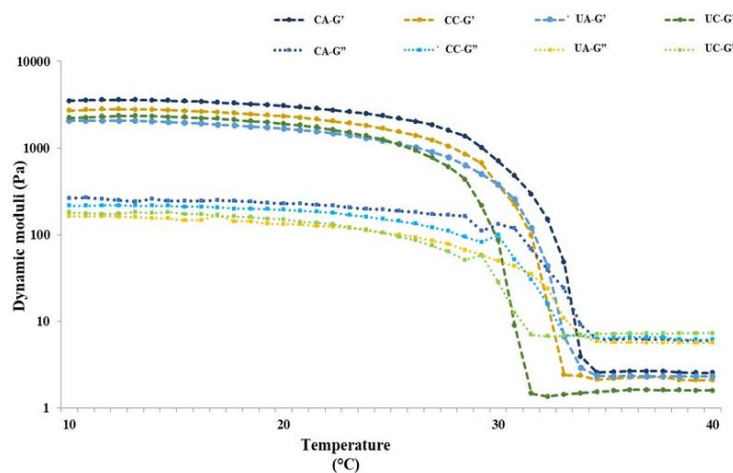


Fig. 1. Moduli of storage G' and loss G'' of chicken skin-head-feet gelatin in function of temperature sweep

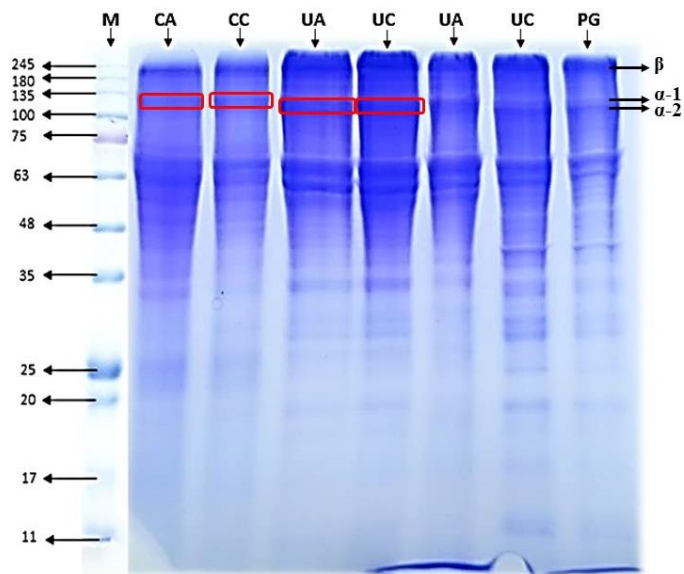


Fig. 2. SDS-PAGE pattern of gelatin extracted from chicken skin-head-feet blend

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