Green extraction and valorization of poultry skin: Collagen hydrolysates with improved functional attributes and bioactivity

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Innovative green technologies entailing fewer processing steps for extraction of hydrolysates have been developed to sustain environment-friendly processes with increased yield (Chemat et al., 2017). Among the clean, and green extraction technologies, ultrasonication has shown great potential for improving protein extraction efficiency, its functionality and bioactivity (Zou et al., 2017). The study primarily explored the impact of ultrasound probe (UP) and bath (UB) as pre-treatment during collagenase hydrolysis for preparing collagen hydrolysate (CH) from chicken skin. Hydrolysates prepared without ultrasound pre-treatment using collagenase was used as control.

Ultrasound pre-treatment significantly ($P<0.05$) increased the yield, and degree of hydrolysis (Fig. 1a) of CH and led to superior functional properties e.g., solubility, emulsifying properties, water holding, and oil holding capacity, foaming capacity, and foam stability, compared with control. FTIR spectra revealed that ultrasound pre-treatment impacted the secondary structure and functional groups of CH. Field emission scanning electron microscopy (FESEM) showed an uneven, disintegrated structure of control, while ultrasound-pretreated samples revealed more homogenous, porous, and orderly-arranged structure (Fig. 1b). Ultrasound-assisted extraction significantly ($P\leq 0.05$) enhanced the DPPH and ABTS radical scavenging and ferric reducing activities (FRAP) of CH (Fig. 2a, b) compared to control. The highest ABTS radical scavenging and reducing activities were recorded with ultrasonic probe mode, however, no significant differences ($P \geq 0.05$) in DPPH radical scavenging activity was found between ultrasound probe and bath system.

In conclusion, ultrasound pre-treatment followed by enzyme hydrolysis modified the collagen structure, which increased the enzyme accessibility of peptide bonds, thereby enhancing the release of antioxidant peptides and bioactivity of hydrolysates.

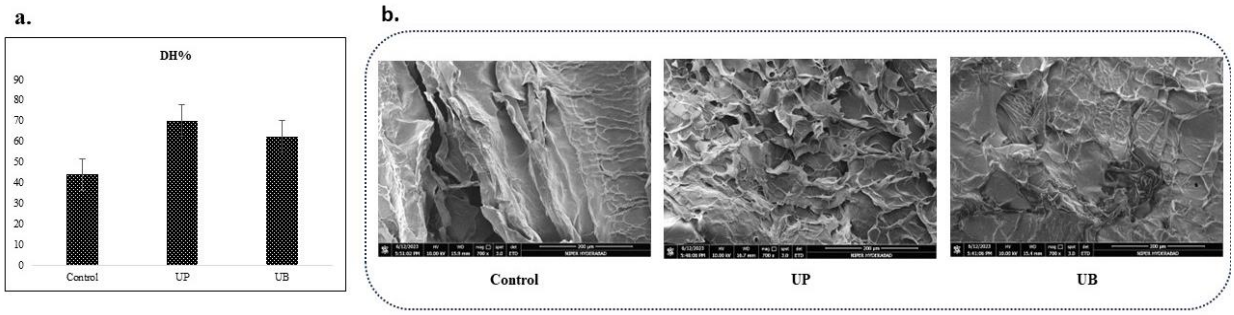

Fig. 1. a. Degree of hydrolysis and b. FESEM images (700X) of collagen hydrolysates

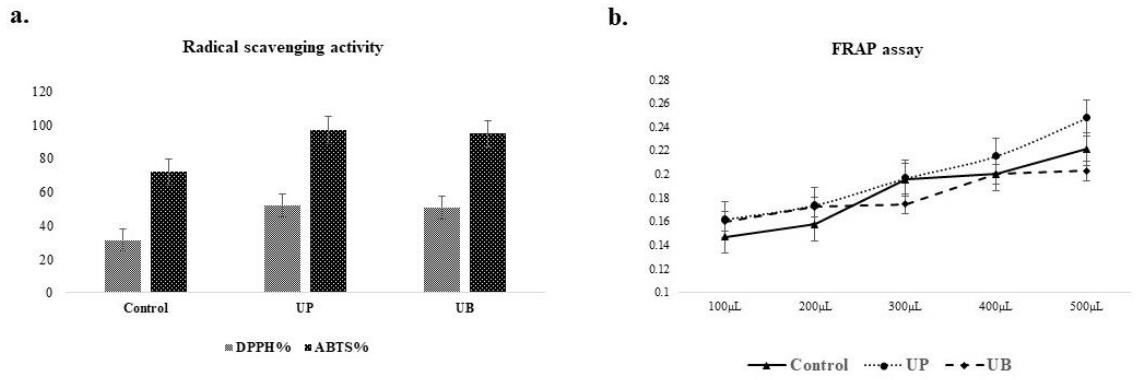

Fig. 2. a. Radical scavenging activity and b. ferric reducing activity of collagen hydrolysates

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