

Microwave-alkali treatment of chicken feathers for protein hydrolysate production

ABSTRACT

Purpose: Conversion of chicken feathers into valuable products like protein and amino acids is very challenging due to the rigid structure of keratins extensively cross-linked by disulphide, hydrogen and hydrophobic bonds. An efficient treatment is necessary for reducing the disulphide bonds and increasing the feathers solubilisation. This study investigated the effects of microwave-alkali treatment on disulphide bond reduction and morphological changes of chicken feathers for protein hydrolysate production. **Methods:** Feathers were treated at different sodium hydroxide concentrations (0.1, 0.5, 1.0, 1.5, 2.0 M), various microwave power levels (100, 300, 450, 600, 800 W) and residence times (2, 4, 6, 8, 10 min). **Results:** The most efficient conditions for microwave-alkali treatment of feathers were (1) 10 min; (2) 0.5 M NaOH and (3) 800 W which produced 24.72 mM thiol and 26.74 mg/mL protein. In comparison to the autoclave-alkali and the conventional heating-alkali method, the microwave-alkali treatment denatured the feather keratins and reduced the disulphide bonds in feathers to a greater extent. Scanning electron microscope and fourier transform infrared analyses showed that the structure of the microwave-alkali treated feathers was highly disrupted and significantly changed from fibers into an amorphous structure. Based on the amino acid profile, the protein hydrolysate from the microwave-alkali treatment contained a significantly higher concentration of amino acids (69.4 mg/g of feathers) compared to the autoclave-alkali (19.0 mg/g of feathers) and the conventional heating-alkali (27.8 mg/g of feathers) treatments. **Conclusions:** Microwave-alkali treatment was more efficient than conventional treatments in breaking down the disulphide bonds, disrupting the feather structure and producing protein hydrolysate.

Keyword: Chicken feathers; Disulphide bonds; Microwave-alkali treatment; Morphological changes; Thiols