Physicochemical and Microstructural Analyses of Pepsin-Soluble Collagens Derived from Lizardfish (*Saurida tumbil* Bloch, 1795) Skin, Bone and Scales

ABSTRACT

Reducing food waste is critical for sustainability. In the case of fish processing, more than sixty percent of by-products are generated as waste. Lizardfish (Saurida tumbil Bloch, 1795) is an economically important species for surimi production. To address waste disposal and maximize income, an effective utilization of fish by-products is essential. This study aims to isolate and characterize pepsin-soluble collagens from the skin, bone and scales of lizardfish. Significant differences ($p < 0.05$) in the yields of collagen were noted with the highest yield recorded in pepsin-soluble skin collagen (PSSC) (3.50 ± 0.11%), followed by pepsin-soluble bone collagen (PSBC) (3.26 ± 0.10%) and pepsin-soluble scales collagen (PSCC) (0.60 ± 0.65%). Through SDS–polyacrylamide gel electrophoresis, the presence of two alpha chains were noted and classified as type I. From Fourier transform infrared spectroscopy (FTIR) analysis, the triple-helix structure of the collagen was maintained. The X-ray diffraction and UV visible spectra characteristics of the lizardfish collagens in this study are similar to the previously reported fish collagens. In terms of thermostability, PSSC (T_{max}= 43.89 ◦C) had higher thermostability in comparison to PSBC (T_{max} = 31.75 ◦C) and PSCC (T_{max} = 30.54 ◦C). All pepsin-soluble collagens were highly soluble (>70%) in acidic conditions (particularly at pH 4.0) and at low sodium chloride concentrations (0–30 g/L). Microstructural analysis depicted that all extracted collagens were multi-layered, irregular, dense, sheet-like films linked by random coiled filaments. Overall, pepsin-soluble collagens from lizardfish skin, bone and scales could serve as potential alternative sources of collagens.