

Biochemical characteristics of acid-soluble collagen from food processing by-products of needlefish skin (*Tylosurus acus melanotus*)

ABSTRACT

The by-product of needlefish (*Tylosurus acus melanotus*) waste possesses important characteristics that could be used in food applications. Fish by-product collagen may be used in place of mammalian collagen due to ethical and religious considerations over environmental degradation. Different forms of acid-soluble collagen (ASC) were successfully extracted from needlefish skin. Based on dry weight, the collagen extracted using acetic acid (AAC), lactic acid (LAC), and citric acid (CAC) treatments was 3.13% with a significant difference ($p < 0.05$), followed by 0.56% and 1.03%, respectively. Based on proximate analysis, the needlefish skin composition was found to be significantly different ($p < 0.05$) between compositions, with the highest moisture content at 61.65%, followed by protein (27.39%), fat (8.59%), and ash (2.16%). According to the SDS-PAGE results, all extracted collagens were identified as a type 1 collagen. Additionally, ATR-FTIR revealed that all collagens had amide A, B, amide I, II, and III peaks. AAC significantly outperforms LAC and CAC in terms of yield following physicochemical characterisation, including pH determination, colour (L^* value), and hydroxyproline content. All collagens demonstrated strong heat resistance and structural stability with T_{max} above 38 °C. Collagen was most soluble at pH 5 for AAC, pH 3 for LAC, and pH 7 for CAC. The effect of collagen solubility on NaCl concentration was discovered to be significantly reduced to 50 g/L for all collagen samples. All collagens can be used as alternatives to terrestrial collagen in a diverse range of applications.