

Effect of Extrusion Processing Parameters on Protein in Banana Flour Extrudates: Characterisation Using Fourier-Transform Infrared Spectroscopy

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Abstract : Extrusion processing is a high-temperature short time (HTST) treatment which can improve protein quality and digestibility together with retaining active nutrients. In-vitro protein digestibility of plant protein-based foods is generally enhanced by extrusion. The current study aimed to investigate the effect of extrusion cooking on in-vitro protein digestibility (IVPD) and conformational modification of protein in green banana flour extrudates. Green banana flour was extruded through a co-rotating twin-screw extruder varying the moisture content, barrel temperature, screw speed in the range of 10-20 %, 60-80 °C, 200-300 rpm, respectively, at constant feed rate. Response surface methodology was used to optimise the result for IVPD. Fourier-transform infrared spectroscopy (FTIR) analysis provided a convenient and powerful means to monitor interactions and changes in functional and conformational properties of extrudates. Results showed that protein digestibility was highest in extrudate produced at 80°C, 250 rpm and 15% feed moisture. FTIR analysis was done for the optimised sample having highest IVPD. FTIR analysis showed that there were no changes in primary structure of protein while the secondary protein structure changed. In order to explain this behaviour, infrared spectroscopy analysis was carried out, mainly in the amide I and II regions. Moreover, curve fitting analysis showed the conformational changes produced in the flour due to protein denaturation. The quantitative analysis of the changes in the amide I and II regions provided information about the modifications produced in banana flour extrudates.

Keywords : extrusion, FTIR, protein conformation, raw banana flour, SDS-PAGE method

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