**Title:** Structural properties and solubility of okara protein isolates

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**Abstract**

Okara is a by-product of soymilk production process which contains around 37% (w/w) proteins, rendering it a suitable feedstock for protein isolate production. Soybean protein isolates can have several industrial applications due to an array of functional properties that can affect protein behaviour in food systems. The aim of this research was to identify routes for okara valorisation, through the optimisation of protein extraction. Hence, okara protein extraction was evaluated using 0.1 M phosphate buffer at different pH (9, 10, 11 & 12) and the conformational and solubility properties of the isolates obtained were characterised. This characterisation is very important since the conformational structure of proteins is one of the factors that influence their solubility, their functional properties and their potential application in food products. FTIR was used to analyse the secondary structure of the protein isolates. Amide 1 band, which is the most sensitive spectral region of protein secondary structure, was deconvoluted to obtain Fourier self deconvoluted (FSD) spectra. The FSD spectra was further analysed to quantify the different secondary structural (β-sheet, α-helix, random coil and turn) contents of the isolates. The results of amide 1 peak analysis showed that there was no shift in the bands for α-helix, random coil and turn, for all the isolates and the original sample (defatted okara flour), but there was a shift in the band for β-sheet of isolate extracted with pH 12 phosphate buffer, . The relative amounts of different secondary structures, α-helix, random coil and turn for all the isolates showed no significant difference; the amount of β-sheet of pH 12 isolates was 38.8 %, 32.6 % for pH 11, 31.2 % for pH 10 and 32.7 % for pH 9. These differences in the β-sheet of the isolates might reflect upon the protein solubility. Indeed, protein isolates extracted at pH 12 exhibited the highest solubility among tested samples. Additionally, zeta potential results revealed that at pH close to 4, all okara protein isolates were insoluble. The result of the amino acid composition showed that isolates from pH 9 and pH 10 contained higher levels of lysine and histidine compared to the isolates from pH 11 and pH 12. The isolate from pH 12 had the highest amount of phenylalanine compared to the isolates from pH 9, 10, and 11. Glutamic acid was the predominant amino acid in all the isolates followed by aspartic acid; both these amino acids prevailed in the composition of the protein isolate from pH 12. All these attributes seem to influence the solubility properties of the isolates, which is one of the major functional properties for food applications.