



Functional Properties of Bambara Groundnut (*Vigna Subterranea* [L.] Verdc.) Starch-Soluble Dietary Fibre Nanocomposite

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Abstract

Bambara groundnut (BGN) is an underutilised orphan crop commonly grown in sub-Saharan Africa (Jideani & Mpotokwane, 2009). This legume is characterised by high dietary fibre (17.7-24.3%) and starch ($\pm 50\%$) making it a great source of the two polysaccharides. Bioactive compounds are absent in BGN starch (BGNS), therefore its conjugation with BGN soluble dietary fibre (BGN-SDF) would deliver the active compounds to food systems. Bambara groundnut starch-soluble dietary fibre nanocomposite (STASOL) was manufactured by grafting 11.5% BGN-SDF onto 88.5% BGNS using ascorbic acid (1% w/w) and hydrogen peroxide (16.5% w/w) as a redox initiator pair. The functional properties of STASOL, BGNS and BGN-SDF that were studied include pasting properties, chemical composition, hydration properties, oil binding capacity (OBC), emulsion activity index (EAI) and emulsion stability index (ESI). STASOL, BGNS and BGN-SDF were high in energy, with the least and highest being 1443.47 kJ (BGN-SDF) and 1525.78 kJ (BGNS), respectively, and showed significant ($p \leq 0.05$) differences in solubility with BGNS being insoluble in water. The water absorption capacities (WAC) of BGN-SDF and STASOL could not be determined because of their high solubility. The EAI of BGNS, BGN-SDF and STASOL were 23.25, 85.71 and 90.65%, respectively, and the ESI of BGNS, BGN-SDF and STASOL were 23.33, 87.13 and 87.49%, respectively. The significantly ($p \leq 0.05$) lower EAI and ESI of BGNS could be highly attributed to the insolubility and low WAC of native starch while the high ESI (90.65%) and EAI (87.49%) of STASOL suggested that the nanocomposite would be a suitable stabiliser in emulsions. The OBCs of BGNS, BGN-SDF and STASOL differed significantly ($p \leq 0.05$) and were 1.13, 3.78 and 1.61 g/g, respectively. Colour characteristics described all studied biopolymers as light (L^*), reddish ($+a^*$) and yellowish ($+b^*$). It was concluded that

STASOL is a natural and economic ingredient possessing desirable physicochemical properties, thus making it suitable for health-conscious consumers.

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