

ABSTRACT

Isolation and Physicochemical Properties of Starch and Protein from the Seeds of the Ackee (*Blighia sapida*) Fruit

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Ackee seeds contain hypoglycin toxins, and are a major agro-industrial waste. This research sought to develop optimum methods to isolate starch and proteins with negligible quantities of hypoglycin contaminants. The study investigated physiochemical and functional properties of the isolated starch and proteins. Ackee seeds (with and without shells) were dried, milled and defatted. Starch was isolated from defatted flours using sodium hydroxide (NaOH) steeping and sodium bisulphite (NaHSO₃) steeping, with varied combinations of concentrations, temperatures and times. Optimum steeping condition was selected based on starch recovery and objective colour difference. Protein was isolated from de-hulled seeds using four precipitation methods (isoelectric, acetone, ethanol and polyethylene glycol). Optimum precipitation was selected based on protein recovery, purity and hypoglycin content. Detoxification of the defatted flour was investigated. Physiochemical and functional properties of the starch, protein isolate and defatted flours were determined. Steeping of dehulled ackee seeds using NaOH (0.2%, 24°C, 72 h) was determined as the optimum starch isolation condition. When shells were removed, there were overall improvements ($p < 0.05$) in ackee starch colour difference (1.94 vs 4.58) and recovery (71.1% vs 69.2%) compared with seeds with shell. Hypoglycin toxins were not detected in the starch. Pasting properties revealed moderate peak viscosity, low breakdown but high setback. The starch was classified as high-amylose (41.5% db), small-granule, restricted-swelling and C-type diffraction pattern. Protein precipitation, using ethanol, produced optimum results in terms of protein recovery (39.4%), purity (70.8%) and hypoglycin content (106.4 ppm). The isolated protein, and detoxified defatted flour to a lesser extent, showed high solubility, and excellent foaming and emulsification properties particularly under acidic conditions. Ackee seed starch potential uses include thickener in soups and sauces, resistant starch, adhesives, dusting/face powders and bioplastics. The protein isolate may be used to fortify fruit juices, and as a foaming and emulsifying agent.

Keywords: Oneil Falloon; Ackee seeds; starch isolation; steeping; starch recovery; starch colour; protein isolation; detoxification; starch/protein properties.