

Red sorghum flour protein extraction: influence of pH and temperature on yield, physicochemical and emulsion formation properties of the protein extracts

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This work aimed to obtain sorghum proteins by alkaline extraction and evaluate the physicochemical and functional properties of the concentrates. Protein extraction yield was evaluated in different pH conditions (8, 10, 12) and temperatures (20 °C and 40 °C). The sorghum protein concentrates (SGPC) were characterized for proximate composition, surface charge, solubility, surface hydrophobicity, SDS-PAGE and emulsifying activity (EAI) and emulsion stability (ESI) indexes. The extraction yields varied between 15.69 – 58.52 %, reaching maximum value in more alkaline medium and higher temperature. The protein content of the concentrates obtained in pH 8, 10 and 12 was 38.98, 44.59 and 43.02 % d.w., respectively. Zeta potential curve showed similar behavior for all extracts and the isoelectric point was around pH 3.7. The protein solubility in neutral condition for SGPC - 12 was significantly higher (64.49 %) than the other extracts (14.19 % and 17.50 %), which was related to reduction in protein surface hydrophobicity. SDS-PAGE revealed mainly kafirin bands in the SGPCs, in addition to globulin and glutelin fractions. Finally, the EAI were similar between the samples (average 117 m²/g) and the ESI was 14.76, 15.27 and 20.80 min for the SGPC - 8, 10 and 12, respectively. In extreme alkaline condition (SGPC - 12) an unfolding and refolding of the proteins probably resulted in a more flexible conformation, improving solubility and the emulsion stability, and reducing exposure of hydrophobic patches on the protein surface. The activity and stability indexes showed that the unpurified concentrates had the ability to form and stabilize oil-in-water emulsions with EAI and ESI comparable to other protein sources such as soy and pea. Alkaline extraction is adequate to produce protein products for food purposes without needing organic solvents. The results presented in our work point out that sorghum is an interesting source for the development of plant-based food ingredients.