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Functional, Pasting, and Microstructural Properties of Sorghum-Cowpea Gluten-Free Flours

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Abstract

Sorghum (Sorghum bicolor L. Moench) and cowpea (Vigna unguiculata L. Walp) are climate-smart crops that are underutilised despite providing vital nutrients and phytochemicals used in flours for a range of applications, including baking. The sorghum and cowpea composite flours were composited in the ratios 90:10; 80:20; 70:30. The functional, pasting, and microstructural properties of sorghum and cowpea gluten-free flours were determined using approved methods. The loose and packed bulk densities, water absorption, and oil absorption capacities ranged from 0.49 - 0.63 mg/ml, 0.71 - 0.80 mg/ml, 0.16 - 0.80 g/g, and 0.16 - 0.20 g/g, respectively. The pasting properties such as final viscosity, peak, trough, breakdown, setback and peak time ranged from 1958.00 - 3046.67, 1492.67 - 2813.33, 1295.67 - 2168.00, 197.00 - 645, and 1958.00 - 3046.67 respectively. Water absorption capacity was shown to differ significantly in functional attributes analyses. Functional properties such as loose bulk, packed bulk densities, and water absorption capacity increased after addition of cowpeas into sorghum flour. All pasting attributes decreased significantly ($P < 0.05$) with the addition of cowpea flours, except for the pasting temperature, which increased compared to the control. Addition of white and red cowpea flours in sorghum flour showed changes in starch granules sizes, shape, and surface smoothness. The starch granules were spherical in shape, not close together and were embedded in the protein matrix. The results in this study implies that the composite flours may have a substantial impact on their functioning and usability in food systems.