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Characterization of The Nutritional Prope Sorghum Composite Flours Using Different Fo Fortification Approaches

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Abstract — **Intervention using blended composite flours can reduce malnutrition in sub Saharan Africa. Prevalence of protein-energy malnutrition among the vulnerable children has necessitated research on cost effective food product development like food to food fortification of common staples like sorghum. An investigation was carried out on the nutritional properties of selected sorghum composite flours for the production of porridge for both home and industrial applications. In this study, composite flours V1 to V4 were made from sorghum, maize, grain amaranth, baobab and butternut at different rations; V1-(42.5:22.5:5:15:15),V2-(22.5:42.5:5:15:15), V3-(32.5:32.5:5:15:15) and V4-(65:0:5:15:15) were compared against composite flours AV1 to AV4 made from sorghum, cassava, chickpea, orange fleshed sweet potatoes (OFSP) and baobab; AV1-(42.5:22.5:5:15:15) AV2-(22.5:42.5:5:15:15), AV3-(32.5:32.5:5:15:15) and AV4-(65:0:5:15:15). Standard methods were used in determining the chemical characteristics of the composite flours. Composite flour formulations were based on Concept4® creative software. Results on proximate composition indicated a significant ($p < 0.05$) difference in moisture content of the control composite (V5) and the other composite flours with the moisture content ranging from 9.1% to 12.1% in V5 and V3 respectively. Carbohydrates were the most abundant nutrient in the composite flours 66.0 to 72.7% in V1 and V5 respectively, followed by fat 5.5% (AV3) to 9.2% (AV1), protein 5.1 (AV2) to 8.6% (AV4), crude fibre 1.5 (V2) to 4.3% (V5), and ash 1.4 (AV1) to 2.8% (AV4). The total energy ranged between 359.25 kcal (V4) to 379.94 kcal (V1) however, these values were not significantly different ($p > 0.05$). Zinc, calcium and magnesium concentration were significantly different ($p < 0.05$) between the sorghum-maize-grain amaranth-baobab-butternut, on one hand and sorghum-cassava-chickpea-OFSP-baobab composite flours on the other. The concentrations of phosphorus and Iron were not significantly different ($p > 0.05$). Correlation analysis revealed significant negative correlation between crude protein and fibre (-0.512, $p < 0.001$)**

I. Introdu

Sorghum bicolor is a cereal tha as a food and feed, among oth important staple food of the poor However,despite its potential and sorghum has low nutritional valu properties compared to other pop and rice [3]. This inferiority is storage protein, kafirin, is very po lysine, as well as poor digestibility [2]. This has therefore, led to fo sorghum flours to improve on th bioavailability of micronutrients [

Most food-to-food fortificatio with legumes; which are rich in contains a relatively good c containing amino acids result compensation [5], [6]. Sorghum have been applied to reduce f insecurity in Kenyan households Africa [7] where it mostly co flatbreads. Flatbreads are widel Africa, for example the *kisra* in S be thin *(uji)* or stiff *(ugali)*. The *ugali* and *uji* relates to the amoun make the products. Less flour (ab make *uji* than *ugali* (about 30% w

Sorghum is more popular in ru the low income urban dwellers porridges are made from unblende