

EFFECT OF PHYTATE AND IRON-BINDING PHENOLICS ON THE CONTENT AND AVAILABILITY OF IRON AND ZINC IN MICRONUTRIENTS FORTIFIED CEREAL FLOURS

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ABSTRACT

Iron deficiency anaemia is highly prevalent in Tanzania—affecting predominantly children and women. Fortification of cereal flour with micro-nutrients is being carried out as a strategy for combating micro-nutrient deficiencies. Four different cereal flours were fortified with micro-nutrients and evaluated for total and bioavailable iron and zinc, iron binding polyphenolics, phytate content and ascorbic acid. The extractable total phenolics ranged from 1.3 (maize) to 19.4 (redsorghum) mg catechin equivalent (CE) g⁻¹. Catechols ranged from 1.1 (maize) to 11.7 (red-sorghum) mg CE g⁻¹. Red sorghum was the only flour that contained a high amount of galloyls (4.0 mg tannic acid equivalent (TAE) g⁻¹). All samples contained high amounts of phytate (10.7 ± 1.0 $\mu\text{mol g}^{-1}$). The average total iron was 42.26 ± 10.26 mg kg⁻¹ in the unfortified and 52.67 ± 10.19 mg kg⁻¹ in the fortified cereal flours and the average *in vitro* available iron was 1.03 ± 0.30 mg kg⁻¹ and 1.65 ± 0.31 mg kg⁻¹ respectively. The average zinc content was 21.4 ± 3.10 mg kg⁻¹ and 25.9 ± 2.84 mg kg⁻¹ in the unfortified and fortified flours respectively and the average available zinc was 0.30 ± 0.12 mg kg⁻¹ and 0.53 ± 0.16 mg kg⁻¹ respectively. No ascorbic acid was detected in any of the unfortified flour, and a little amount was detected in the fortified red sorghum (4.5 mg kg⁻¹), compared to the white sorghum (11.1 mg kg⁻¹), finger millet (15.8 mg kg⁻¹) and maize (29.6 mg kg⁻¹). There was no significant increase of *in vitro* available iron (0.02 mg kg⁻¹) and zinc (0.06 mg kg⁻¹) availability in the red sorghum. The *in vitro* available iron increased by 3.8 % in finger millet, by 9.2 % in white sorghum, and by 10.1 % in maize four—compared to respective total iron content as a result of fortification. *In vitro* available zinc increased by 7.9 % in finger millet, by 4.8 % in white sorghum and by 5.9 % in maize flours, compared to respective total zinc content as a result of fortification. It was concluded that other dietary modification strategies that are being carried out for the improvement of native iron and zinc bioavailability (processing for decreasing inhibitory

factors, consumption of fruits and green leafy vegetables for enhancing absorption and nutrition education) should accompany fortification of flours with micro-nutrients. The red sorghum is not recommended as a good vehicle for food fortification with iron and zinc.

Key Words: Micronutrient, fortification, iron, zinc, polyphenols, phytate, cereal flour