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The Shelf Life and Riboflavin Content of Whole-grain Maize Meal

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Abstract

Maize is a staple food for over 4.5 billion people in 94 low to middle income countries. Maize crops occupy a substantial portion of farmland in Africa and is a staple food in sub-Saharan Africa. However, refined maize meal does not have a high nutrient density and therefore fortification is recommended to address micronutrient malnutrition. Replacing refined maize meal with wholegrain maize will further improve nutrient density, as the pericarp and germ fractions of the maize kernel, which are removed during the refining process, are rich sources of vitamins, minerals, essential fatty acids and dietary fibre. A problem, however, is that the shelf life of whole grain maize is limited by the oxidation of unsaturated fatty acids. Phytate in the pericarp also limits the bioaccessibility of minerals such as iron and zinc.

The objective of this study was to establish whether stored fortified whole-grain maize conforms to the technical specifications of the World Food Programme (WFP). This was done by conducting an accelerated shelf-life test at 40°C to estimate the shelf life of the maize meal at 25°C.

The fortified whole-grain maize meal did not conform to the WFP specification for fat acidity of 80 mg KOH/100 g. This standard was set for refined flour with a lower fat content and recalibration of this standard for whole grain flour is needed. With the exception of riboflavin, the vitamin and mineral content of the flour remained within the WFP specifications throughout the accelerated shelf-life test, up to 47 days at 40°C (4.5 months at 25°C).

Strategies to optimise the riboflavin content of the whole-grain maize meal over the required shelf-life period are required. When exposed to visible and UV light with wavelengths of 420-560 nm, riboflavin undergoes photodegradation to yield inactive products such as lumiflavin and lumichrome. Microencapsulation of riboflavin in fortificant premixes and the use of pigmented packaging material may protect riboflavin from photodegradation.