Properties of a Complementary Food based on Grain Amaranth (*Amaranthus cruentus*)

Monica Wanjiku Mburu

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ABSTRACT

Amaranth grain (A*maranthus cruentus*) is a pseudo cereal consumed in various parts of the world with potential as a source of dietary nutrients. Although it can be used to alleviate malnutrition, its processing and nutritional characteristics are not well established. Development of new products from amaranth will expand utilization of this raw material as cereal-based foods which play an important role in the diets of many people in Kenya. Amaranth grain is a good source of protein and vitamins and therefore is used largely for feeding children and the elderly. The aim of this study was to determine the nutritional and functional properties of *Amaranthus cruentus* grain grown in Kenya for preparation of a ready-to-eat product that can be recommended for nutritional interventions as infant complementary food. The effect of processing on the physicochemical and nutritional properties of amaranth grain was analysed. The functional properties, acceptability and stability of amaranth grain product were also determined. The treatment structure involved ungelatinized (raw) amaranth grain flour used as the control and pregelatinized amaranth grain flour referred to as the product. The product was well accepted with 20 minutes steaming period considered as the average time required to acquire a ready to eat product. The colour of raw amaranth grain was cream with a lightness (L*) value of 79.4, which slightly reduced after processing to 74.1, giving a slightly dark cream product. A notably high fat, protein and ash content was demonstrated, both in raw and processed grain. The proximate analysis mean values for raw and processed grain were moisture 10.2% and 2.4%; protein 17.2 and 16.7%; fat 7.0%, 7.0% ash 2.7 and 2.6%; crude fiber 3.8 and 3.1%; carbohydrates 59.2 and 68.3%, respectively. Amaranth grain

contained good amount of unsaturated fatty acids 76.1%, with predominant ones being oleic 36.3% and linoleic 35.9%. The fatty acid profile associated with good amount of protein makes pregelatinized amaranth grain product a nutritionally balanced food appropriate for infant feeding. Amaranth grain product was rich in potassium, phosphorus, calcium and magnesium, which were not significantly ($P>0.05$) affected by the processing method. The tannins significantly ($P\leq0.05$) decreased during processing while phytates were not affected. The water soluble vitamins reduced during processing which affects the nutritional value of the product. However the product was rich in tocopherols which are essential for infant growth and development. The amino acids composition of processed amaranth grain were not significantly ($P\leq0.05$) affected by the processing method with essential ones identified as were histidine, threonine, valine, methionine, isoleucine, leucine, phenylalanine and lysine. Processing affected the functional properties of amaranth grain with water absorption capacity increasing from 343.9 g/100 g for the raw grain samples to 471.3 g/100 g for the product. However the protein water solubility decreased from 44. 1% to 27.4%. The dilution factor for the amaranth grain product was found to be 15 g/100ml with an acceptable viscosity for infant feeding. Due to moisture reduction in the product the bulk density reduced from 0.7 g/ml for the raw sample to 0.5 g/ml for the product.

This study achieved the objective of developing a complementary product of adequate nutritive value that can be prepared using locally available resources and technology. Steeping and steam pregelatinization of amaranth grain produced a ready nutritious product with improved solubility during reconstitution, suitable for infant feeding.