Sub-Sahara African Academic Research Publications
June, 2023 Editions

JAAS
Journal of African Advancement & Sus. Studies
Vol.28, No.2, ISSN: 3125-5521

ACCEPTABILITY OF BREAKFAST CEREALS PRODUCED FROM CASSAVA-AFRICAN YAM BEAN FLOUR BLEND

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Abstract
This study is to assess the acceptability of cassava-african yam bean flour blend to produce breakfast cereals, different samples of breakfast cereals is to produce from blend of Maize-African yam bean. Four smaples will be selected randomly, and determine their proximate compositions and sensory attributes.

Keywords: Acceptability, Breakfast, Cereals, Produced, Cassava-African Yam.

Introduction
Breakfast is the nutritional foundation or the first meal of the day (Kowtaluk, 2001). Nutritional experts have referred to breakfast as the most important meal of the day, citing studies that found people who skip breakfast to be disproportionately likely to have problems with concentration, metabolism, and weight (Mayo Clinic, 2009). Breakfast meals vary widely in different cultures around the world. It often includes a carbohydrate source such as cereals, fruit and or vegetable, protein, sometimes dairy, and beverage. In developing countries, particularly sub-Saharan Africa, breakfast meals for both adults and infants are based on local staple diet made from cereals, legumes, and cassava and potatoes tubers. However, the most widely eaten breakfast foods are cereals (Kent, 1983).
Breakfast cereals are legally defined as foods obtained by swelling, grinding, rolling or flaking of any cereal (Sharma and Caralli, 2004). They can be categorized into traditional (hot) cereals that require further cooking or heating before consumption and ready-to-eat (cold) cereals that can be consumed from

the box or with the addition of milk (Fast 1990; Tribelhorn, 1991). Ready to eat breakfast cereals are increasingly gaining acceptance in most developing countries, and gradually displacing most traditional diets that serve as breakfast due to convenience, nutritional values, improved income, and status symbol and job demands especially among urban dwellers. According to Jones (2003), instantized and ready-to-eat (RTE) cereals facilitate independence because of their ease of preparation which means that children and adolescents can be responsible for their own breakfast or snacks. Such foods may need to be reconstituted, pre-heated in a vessel or allowed to thaw if frozen before consumption, or they may be eaten directly without further treatment (Okaka, 2005). The common cereal products in Nigeria include NASCO Cornflakes, Good morning corn flakes, Kellogg‟s cornflakes, NABISCO flakes, Weetabix, Quaker Oats, Rice crisps, among others. A study has clearly shown that 42% of 10-year-olds and 35% of young adults consumed cereal at non-breakfast occasions (Haines *et al.*, 1996). This may be consumed dry as snack food, with or without cold or hot milk, based on their location, availability of resources and habits.

Statement of problem

African yam bean has been recognized to have vast genetic and economic potentials, especially in reducing malnutrition among Africans; however the crop has not received adequate research attention, thereby limiting its contribution to food security and preventing potential food crisis. Increasing the use of underutilized crops is one of the better ways to reduce nutritional, environmental and financial vulnerability in times of change (Jaenicke and Pasiecznik, 2009). Over time, some conditions have negatively influenced the productivity and acceptability of African yam bean among cultivators, consumers, and research scientists. These include, characteristic hardness of the seed coat (Oshodi *et al.,* 1995) which increases the cost and time of cooking, presence of anti-nutritional factors (ANF) or secondary metabolites (Machuka and Okeola, 2000) and the tendency to cause flatulence in humans (Rockland and Nishi, 1979). Therefore, it is of interest to process African yam bean seeds into acceptable, ready-to-eat and safe products together with other locally available materials including malted maize.

Justification of the study

African yam bean has been reported to have equal or higher lysine content than that of Soybean while most of other essential amino acids correspond to the

WHO/FAO recommendation (Yetunde *et al.,* 2009). In addition to this, it is reported to be important in the management of chronic diabetes, hypertension and cardiovascular diseases because of its low glycemic index and high dietary fiber content (Enwere, 1998). This research, therefore, has the potential to address the twin problems of energy malnutrition as well as food security. It will stimulate establishment of food industries for the production of breakfast cereals and create other marketing and employment opportunities.

Materials and Methods

Samples preparation

Maize grains and African yam bean seeds was properly cleaned and sorted to remove stones, dirt, chaff and other extraneous matters, before they were used for further processing.

Processing of Maize flour

The method used is a modification of the method described by Iheoronye and Ngoddy (1985) and Okaka (2005). 5kg of maize will be cleaned and sorted after which it will milled into flour.

Processing of African yam bean

The procedure as described by Enwere (1998) will be used. 5kg of cleaned/sorted brown African yam bean seeds will be weighed and washed thoroughly with clean tap water after which they will be soaked for 12 hours and boiled for 30 minutes. The beans will be dried in a hot air oven (60oC for 10hours), dehulled and milled using an attrition mill. The flour obtained will be sieved using 0.5mm mesh sieve and packaged in polyethylene bags for further analysis.

Formulation of the Blend

Composite flour was formulated by mixing AYB and maize flour. Six samples of complementary food will be generated by mixing the composite flour (made of AYB: Maize flours) (100:0, 90:10, 80:20, 70:30, 60:40, 50:50), sugar, salt, sorghum malt extract and water, and roasted at 280°C with continuous stirring till dried products was obtained.

Proximate Analysis

The sample was analyzed for proximate composition such as carbohydrates, crude fat content, crude fiber, crude protein, ash content and moisture content using the method of (AOAC 2010).

Sensory Evaluation

The sensory evaluation of the products was carried out using a 9 point hedonic scale ranking 1-9, where 1 = extremely dislike, 2=dislike moderately 3=dislike slightly 4=dislike very much 5= neither like or dislike 6= like very much 7= like slightly 8= like moderately and 9 = like extremely with 12 panelist which comprises of Staff and students of Nutrition and dietetics in Federal Polytechnic Bida who will assess the product for flavor, fluffiness, color, taste and overall acceptability.

Proximate composition of breakfast cereal blend was shown in Table 1 The moisture content was found to be statistically lower in sample D as the concentration of Africa yam increased. The results suggested that variationin moisture content was associated with processing. The findings of this study indicated that the breakfast cereal products had low moisture content that could extend its shelf life. Harper and Jansen (1985) reported that moisture content between 6% and 10%aids in prolonging the shelf life of dry food products; and above this range, the shelf life stability of the products could be hindered by both chemical and microbiological agents. Similarly, protein content was observed to be statistically higher among samples. This increase could be attributed to addition of Africa yam bean composition. Anouye *et al.* (2012) showed that fortification of unripe banana with Pigeon pea for the acceptability of complementary food products in increment of protein content from 15.23% to 24.23% due to concentration of pigeon pea. Similarly, the fat content was observed to be statistically higher in sample B (5.01±0.02%) and lower in sample A (2.50±0.08%). Low fat content observed in sample B could be linked to processing since most legumes such as pigeon pea contain less than of fat. The reduction of fat content observed in this study was in agreement with the findings of Anuonye *et al.,* (2012) where significant reduction in fat content was reported when soybean was blended with acha. Dietary fats are beneficial in the body because of their function as carriers of fat soluble vitamins in the diet and as mediators of some physiological processes associated with growth and development, inflammation and brain function (Gbenyi *et al*., 2016). Fibre play important role in maintaining good health with increased risk of coronary heart disease could occur to individuals who consume low levels of fibre over time (Singh *et al.,* 2007). It promotes beneficial effects associated with lowering of cholesterol (Singh *et al.,* 2007). The crude fiber content was found to be statistically higher in sample D (4.48±0.02%) compare to (2.96±0.07%). The significant ($p<0.05$) increase observed in sample D could be due to the increase

in the concentration of African yam bean composition. The result of ash content observed that sample C (1.47±0.02%) was statistically higher compare to sample A (1.07±0.10%). In this study, the significant ($p<0.05$) differences in ash content is associated with higher processing. El-Samahy *et al.,* (2007) showed that blending of rice with cactus pear resulted in significant ($p<0.05$) differences in ash content.

The carbohydrate content showed that sample A (68.34±0.01%) was statistically higher and lower in sample B (64.58±0.02%). This increase in sample A could be attributed to high feed blend composition. Higher value observed in carbohydrates could be linked to the raw material that was not affected by processing. Energy store of food products is generally indicated by its carbohydrate content. Similarly, variation in legumes affected the overall carbohydrate content of the blendas observed by Anouye *et al.,* (2012). Similarly, the differences in calorific values of the developed Maize-African yam bean would promote its wider application and utilization in food industry; especially in formulation of ready- to-eat foods (Jisha *et al.,* 2010).

Proximate Composition (g/100g) of breakfast cereals from Maize-Africa yam bean blend

Parameters	Sample A	Sample B	Sample C	Sample D
Moisture	7.08 ± 0.06^{d}	5.32 ± 0.08^{c}	4.15 ± 0.09^{b}	3.68 ± 0.10^{a}
Protein	17.49 ± 0.07^{a}	20.79 ± 0.04^{c}	22.10 ± 0.01^{d}	20.24 ± 0.05^{b}
Fat	2.50 ± 0.08^{a}	5.01 ± 0.02^{d}	3.28 ± 0.07^{b}	3.53 ± 0.04^{c}
Ash	1.07 ± 0.10^{a}	1.34 ± 0.04^{b}	1.47 ± 0.02^{c}	1.35 ± 0.03^{b}
Crude Fibre	3.52 ± 0.06^{b}	2.96 ± 0.07^{a}	4.05 ± 0.03^{c}	4.48 ± 0.02^{d}
Carbohydrate	68.34 ± 0.01^{d}	64.58 ± 0.03^{a}	65.24 ± 0.05^{b}	65.56 ± 0.04^{c}
Energy (Kcal)	365.82 ± 0.01^{c}	386.57 ± 0.03^{d}	378.88 ± 0.04^{b}	357.32 ± 0.06^{a}

Values are mean± Standard Deviation. Values with different superscripts on the same row are statistically different at $p<0.05$.

The results of sensory properties of breakfast cereal produced from Maize-African yam bean flour blend indicated that sample C were statistically higher in taste (8.34±0.09), texture (8.09±0.01) and flavour (7.98±0.02) which could be attributed to processing and high moisture content (Table 2). This result is in agreement with report of Iwe (2001) who observed the increase in texture when cereal was blended with legumes. He also suggested that taste and flavor are physiologically and physically connected with one another depending on the

respondents. Similarly, results from this work indicated that taste and flavor of the products were enhanced during processing. Furthermore, Iwe (2001) explained that slight variation of values observed in taste and flavor could be due to processing. In addition to color rating (8.55±0.01) and general acceptability (7.68±0.06) of the products, sample C were statistically higher when there is increase in the concentration of legumes. These results were in agreement with Rampersad *et al.*(2003) who reported the degree of likeness in all the sensory attributes.

Table 2: Sensory Evaluation of breakfast cereals produced from Maize-African yam bean flour Blend

Parameters	Sample A	Sample B	Sample C	Sample D
Taste	7.09±0.06^{a}	7.10±0.07 ^{a}	8.34±0.09^{b}	7.21±0.05^{b}
Texture	6.98±0.04 ^{a}	6.92±0.03 ^{a}	8.09±0.01^{c}	7.00±0.02^{b}
Flavor	7.53±0.03 ^{a}	7.91±0.02^{c}	7.98±0.01^{c}	7.65±0.04^{b}
Color	8.12±0.07^{a}	8.22±0.05^{b}	8.55±0.01^{c}	8.51±0.03^{c}
Acceptability	7.38±0.05 ^{a}	7.63±0.04^{b}	7.68±0.06^{b}	7.66±0.02^{b}

Values are mean± Standard Deviation. Values with different superscripts on the same row are statistically different at $p<0.05$.

Conclusion

In this work, different samples of breakfast cereals were produced from blend of Maize-African yam bean. Out of the four samples prepared, sample C was enhanced in terms of proximate composition and sensory attributes. In conclusion therefore, breakfast cereals could be produced from Maize-African yam bean for growth and development.

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