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Comparative Evaluation of Nutrient Composition of Bread Fruit Flour (*Artocarpus altilis*)

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ABSTRACT

The underutilization of local food commodities such as breadfruit in our economy can never be overemphasized. The object of this study was to determine some of the nutritional content of breadfruit flour. The bread fruit was processed into flour following standard laboratory procedures by AOAC (2005). A summary of the physicochemical screening of breadfruit flour showed a rich nutrient content in the following order; carbohydrate (65.29 ±0.02) crude fibre (1.45 ±0.001), crude protein (2.86 ±0.01), Fat (1.87 ±0.01), Vitamin A (321.46 ±0.01), Vitamin B12 (0.45 ±0.01), Vitamin C (137.23 ±0.01). A comparative analysis showed that nutrients content such as Vitamins, Calcium and Amino acids were much richer in the breadfruit flour than in the Wheat flour (control). It could therefore be concluded that breadfruit flour has a rich nutrient source similar to that of wheat flour and can serve as an alternative staple meal to those placed under therapeutic diet and can also be of benefit for its rich source of nutrient especially to people living in developing countries with special reference to Nigeria and in particular people living in Akwa Ibom State.

Keywords: Breadfruit, Nutrient composition, Breadfruit Flour; underutilized local food.

1.0 Introduction

Right from the medieval times before the civilization of human race, indigenous food crops were cultivated around the nearby environments and accepted as staple foods by different cultures of the world in time and space. Locally sourced food commodities did not only serve as food for household meals but also as medicine and for entertainment as they were displayed during cultural festivals, religious functions and as exchange for gifts. Breadfruit was among the local food commodities that had found their places in an average Akwa Ibom state indigenous kitchen in the ancient times, although is now given little or no preference in today's family food menu.

Today, most of our indigenous foods crops in Nigeria are often perceived as inferior especially in the cities where civilization has brought about a shift of interest in the food habit of many people, from the most common traditional foods to packaged fast food. Those who still patronize these local food commodities are often classified among the peasant groups. Many of these abandoned indigenous crops such as cocoyam, Ariel yam, three-leaved yam, bread fruit etc., are nutritionally rich and acceptable as staple food. This could be attributed to their low agriculture manipulative input such as genetic mutation, application of inorganic manure and pesticides etc.

According to the reports of Singh (2018), the recent statistics of susceptibility to diseases and sicknesses such as diabetes mellitus, cancer, high blood pressure and other human health abnormalities, have some strong evidences linking to the long term consumption of food products with increased chances of specific cancer condition in the various parts of the human body organ. It was further revealed that while some of the everyday fast food and drinks (processed meat, hydrogenated oils, diet foods, refined sugar/soda genetically modified organisms used as meat) which are labelled as carcinogenic contains some natural toxins, adulterants, artificial color ant, additives, preservatives, and residues of insecticides or many unwanted/unavoided chemical ingredients; most indigenous staple food which have very little or no agriculture manipulative input such as whole grain and flours, fresh and dry fruits and nuts, tubers, vegetables, dairy milk etc. tends to possesses safe and healthy nutrient composition in the right amount.

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According to Iyotsna & Kateeira (2016), some indigenous foods crops have the potency of helping to control some metabolic errors such as diabetes mellitus by reducing the blood sugar levels due to their high fibre contents (Adepeju *et al*., 2011). Earlier reports from the findings of Lehmann & Robin, (2007) also revealed that breadfruit can also help in lowering the cholesterol levels in the body, a condition which could leads to blockages of blood vessel and narrowing of the respiratory tubes (Atherosclerosis).

The Local food commodities used as a sample for this study is the seedless breadfruit (*Artocarpus altilis*). Breadfruit are highly perishable due to their high moisture contents making them susceptible to spoilage and unavailable round the year, therefore processing it into flour will not only enhance food availability but would also ensure food security, diversity in nutrients and availability all year round by extended shelf life, hence the need for the present study. The main objective of the study was to evaluate the nutrient composition of the breadfruit flour.

2.0 Materials and Methods

2.1 The Biology of Breadfruit (*Artocarpus altilis)*

Artocarpus altilis is a seedless species of breadfruit (Engiberger, 2003). Like every other tropical plants, breadfruit requires humid and warm climate as well as sufficient rainfall for proper growth and development (Ragone and Manner, 2006). Bread fruit (*Artocarpus altilis*) trees produce two main crops throughout the year and the pulp which is usually eaten surrounds the heart or core and is yellowish or milky white in colour on maturity (Jones et al., 2011). Bread fruit (*Artocarpus altilis*) has the capacity of deteriorating in approximately three (3) to five (5) days after harvest (Worrell 2002). Unless the shelf life is extended using controlled atmospheric storages which could be maintained at 16^0C with 5% oxygen and 5% carbon-dioxide (Singh, 2009), this is often done to control and help scale up breadfruit production and export.

2.2 Processing of Raw Breadfruit (*A. altilis*)

Breadfruit (*A. altilis*) is subject to spoilage soon after harvest, it takes a period of 2-4 days to decay, hence preservation is necessary to enhance the shelf life. The processing method employed in the study was adopted from AOAC (2005). Freshly harvested Breadfruits were washed in clean water to remove adhering latex and dirt and subsequently peeled, sliced into pieces of about 5mm for blanching. Blanching was done by soaking the sliced specimen into 0.02% concentration of $KHSO_3$ at a temperature of 50^0C for 5minutes after which the specimen was oven-dried at the temperature of 50^0C for 12hrs. This method was adopted by AOAC (2005).

2.3 Breadfruit Flour Production

After the specimen was well dried it was subjected to milling and passed through sieving with a mesh size of 55µm to obtain a fine powder flour which was then packaged in an air-tight cellophane bag and stored in an air-tight plastic container at 37^0C (room temperature). This serves as a cheap and safe storage method since there will be no addition of chemicals preservatives.

2.4 Proximate Analysis of Breadfruit Flour

The laboratory analysis of the proximate composition of the breadfruit flour sample was determined in bi-replicates using standard analytical techniques. The breadfruit flour sample was analyzed for, crude fibre, crude protein, crude fat and carbohydrate, vitamins and minerals and the result obtained were tabulated into tables.

2.5 Statistical Analysis

The results of laboratory result subjected to statistical analysis using IBM SPSS version 20 software. The mean and standard error results of the statistical analysis were presented tables.

3.0 RESULTS

Nutrient Composition of breadfruit and wheat flour

The result of the study shows a significant difference between all the proximate compositions of breadfruit flour when compared to those of wheat flour. High and low crude protein values of (13.23 ±0.01) and (2.86 ±0.01) were observed for wheat flour and breadfruit flour respectively. Higher and lower carbohydrate values of (65.29 ±0.02) and (62.22 ±0.02) were also observed for wheat flour and breadfruit flour, respectively (Table 1).

Table 1: Proximate Composition of breadfruit and wheat Flour

Proximate composition	Bread Fruit Flour	Wheat Flour
Crude Protein	18.64 ±0.02	13.23 ±0.01
Fat	1.87 ±0.01	2.53 ±0.01
Crude Fibre	1.45 ±0.00	1.51 ±0.01
Ash	3.58 ±0.00	2.67 ±0.00
Moisture	10.2 ±0.00	9.88 ±0.00
Carbohydrate	65.30 ±0.03	62.22 ±0.02

The mineral content of breadfruit flour when compared to those of wheat flour showed high chlorine valueswith significant difference at $p<0.05$ (Table 2).

Table 2: Nutrient Composition of breadfruit and wheat Flours

Nutrient profile	Bread Fruit Flour	Wheat flour
Cl	40.68 ±0.01	31.66 ±0.01
Fe	6.26 ±0.00	6.86 ±0.01
Mg	67.7 ±0.02	75.65 ±0.01
K	265.39 ±0.01	267.34 ±0.02
Mn	41.54 ±0.01	38.76 ±0.01
Ca	168.67 ±0.02	154.40 ±0.02
I	5.22 ±0.01	4.03 ±0.01

The amino acid profile ofbreadfruit flour and wheat flour shows a high and low significant difference value at $p<0.05$ of 4.63 ±0.001 and 0.82 ±0.001 for Threonine; 3.84 ±0.001 and 0.42 ±0.01 Methionine respectively (Table 3).

Table 3: Amino Acid Content of breadfruit and wheat Flours

Amino Acid profile	BF flour	Wheat flour
Lysine	1.66 ±0.01	0.38 ±0.01
Threonine	4.63 ±0.00	0.82 ±0.00
Cysteine	5.22 ±0.00	1.28 ±0.01
Valine	3.84 ±0.01	0.89 ±0.01
Methionine	3.84 ±0.00	0.42 ±0.01
Isoleusine	5.84 ±0.01	0.81 ±0.00
Leusine	3.96 ±0.00	0.63 ±0.01
Tyrosine	1.63 ±0.01	0.22 ±0.01
Phenyalamine	7.22 ±0.01	0.95 ±0.01
Histidine	5.38 ±0.01	0.86 ±0.01
Arginine	6.02 ±0.00	0.81 ±0.00
Aspartic Acid	4.68 ±0.01	1.48 ±0.01
Serine	2.85 ±0.01	0.32 ±0.01
Glutamine Acid	3.42 ±0.00	1.51 ±0.01
Proline	3.79 ±0.01	0.42 ±0.01
Glycine	3.68 ±0.01	0.55 ±0.01
Tryptophan	3.63 ±0.00	1.16 ±0.01
Alanine	4.18 ±0.00	0.58 ±0.0.2

In the vitamins profile, breadfruit flour had a higher vitamin D content value of 0.72 ±0.01 as compared to a lower value of 0.17 ±0.02 observed for the wheat flour (Table 4).

Table 4:Vitaminsprofile of breadfruit and wheat Flours

Vitamins Profile	Bread Fruit flour	Wheat flour
Vit_A (µg per/100g)	171.46 ±149.99	261.96 ±0.01
Vit_B1 (mg per/100g)	0.64 ±0.01	0.38 ±0.01
Vit_B2 (mg per/100g)	0.72 ±0.01	0.425 ±0.01
Vit_B3 (mg per/100g)	1.23 ±0.01	0.81 ±0.00
Vit_B6 (mg per/100g)	0.83 ±0.01	0.54 ±0.03
Vit_B12 (mg per/100g)	0.45 ±0.01	0.22 ±0.02
Vit_C (mg per/100g)	87.23 ±49.99	161.36 ±50.01
Vit_D (mg per/100g)	0.72 ±0.01	0.17 ±0.02
Vit_E (mg per/100g)	0.13 ±0.01	0.05 ±0.01
Vit_K (mg per/100g)	0.08 ±0.00	0.04 ±0.00

4.0 Discussion

4.1 Nutrition Composition and Health benefits of Breadfruit (*A. altilis*)

Results from the present study revealed that breadfruit flour is a rich nutrient food source although slight low nutrient fibre content value of 1.45 ±0.001, although lower than the 1.51 ±0.01 values observed for wheat flour, and slightly higher carbohydrate content values of 65.29 ±0.02 when compared to 62.22 ±0.02 observed for wheat flour (Table 1). The high fiber content is sometimes even higher than the content values found in most processed food product made from wheat (Tuia et al., 2007). Breadfruit have also been reported as a rich source of Omega -3 and Omega-6 according to Tukura and Obliva, (2015), although in the present study the analysis of the fatty acid content of the sampled Breadfruit flour was not classified into type to take accountability of the Omega -3 and Omega-6 fat content.

Breadfruit is among the tropical food with high amount of calories. According to Omobuwajo, (2003), 100grams of breadfruit can provide about 102 calories of energy. Bread fruit are excellent sources of vitamin C a natural antioxidant which are mostly derived though supplements, on consumption. One medium breadfruit is seen to provide 29mg of vitamin C accounting for 48% of the recommended daily body requirement (Tuia et al., 2007). The result of the studies captures a higher vitamin C of 137.23 ±0.01 for the breadfruit as compared to a slight lower value of 111.36 ±0.01observed for the wheat flour (Table 3).

The result of the study shows that seedless breadfruit can compete with other carbohydrate foods like; cocoyam, potato, cassava, plantain, banana, yam, and others (Ayodele, 2002). According to the reports of Nelson-Quartey (2007), its protein content is higher than cassava, banana, and potato, although in the present study the crude protein value of breadfruit with a value of 2.86 ±0.01 seem to be much lower than a value of 13.23 ±0.01 observed for the wheat flour (Table 1) although Nelson-Quartey *et al* (2007), in their findings reported a protein content of 6.19% for *A. altilis* flours. It is an excellent source of potassium, iron, and calcium (NocheraandCaldwell.1992). According to Oduro *et al* (2007), the crude fat content of *A. altilis* ranges between 2.26% and 2.82%, although the result of this study shows a lower crude fat protein of 1.87 ±0.01 for breadfruit flour and 2.53 ±0.01for wheat flour. Finding of the nutritional content of breadfruit flour in the present studies corroborates with the work of Ajani *et al.*, (2012).

Conclusion

In conclusion, the evaluation of nutrient composition of seedless breadfruit flour as an underutilized local food commodity showed a rich nutrient content and a wide range of health benefit. The production of breadfruit flour could be one of the effective ways toward providing a varied and affordable healthy food variety. It will also to help to fight micronutrient deficiency in individuals placed on therapeutic nutrition. Also the presence of high of some micronutrients can enhance complete metabolic processes of some macronutrients in the body thereby promoting adequate nutrition.

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