BIOGLOBIA Vol. 3 (2): 45 – 49, 2016 **ISSN: 2349-5626**

Determination of nutritional composition of African Bread Fruit (*Treculia africana*)

ONWURAH CHRISTIAN OBIEKWE

Department of Food Technology, Federal Polytechnic OKO, Anambra State Nigera and Department of Biotechnology, Sharda University, Greater Noida (U.P) India.

ABSTRACT

Nutritional Composition of two varieties of African Bread Fruit (*Treculia africana*) were carried out. The result showed that the two varieties had high carbohydrates content ranging from 60.0 to 68.50% and gave an energy value of 432 KJ / KG Protein, fat, and vitamin ranged from 15. 30 to 18.37%, 7.76 to 12.45%, 24.7 to 28% respectively. It was also discovered that bread fruit seeds can furnish adequate amount of most essential amino acids in human diet with sulphur, amino acids an tryptophan as limiting amino acids. The high nutritional values of *Treculia africana* has led to it used as main food and food supplement.

INTRODUCTION

Bread fruit (Artocarpus) belongs to the genus Artocarpus of the family *moraceae* which is commonly called fig family. Bread fruits tree belongs to the mulberry African bread fruit (*Treculia africana*) properly known as **'Ukwa'** in igbo land of Eastern Nigeria is originated within the West and South wards to Angola and the Island of pricipe and Saotome (Okafor, 1985). It is a large tree in forest, mostly grown in compound farms, scattered in forests, often by streams and water courses. The soil under the tree is most throughout dry season from condensation as in the case of *Myrianthus arboreous*. The fruits attain 18 mm in diameter and 18-30 lbs in weight, the seeds are numerous brownish, 1/3 in or less in length buried in a spongy pulp. The taxonomy of *Treculia africana* has been reviewed by several workers (Okigbo, 1980). There are three varieties of *Traculia africana* which includes *Var africana, Var inversa* and *Var mollis*. They contain about 17-23% crude protein and 10.27% crude fat (Nwokolo, 1989). Uddo (1980) in his work found that *T. africana* contain 72.5% carbohydrates and gave an energy value of 435 KJ/KG. Accordingly, several food products have been prepared from the flour obtained from *T. africana* such as non-alcoholic beverages (Ejiofor *et al.*, 1988) whose consumer rating was quite high. In Nigeria, African bread fruit seeds are used in variety of ways including boiling the Kernels either alone or in combination with maize, rice, yam, *etc*. The fresh seeds could be salted, roasted, dehulled and eaten as snacks or could be boiled, pounded and eaten with soups and stew or cooked into porridge. In non-alcoholic foods, *T. africana* has been utilized in producing an acceptable beverage which can be taken with milk and sugar (Obiajulu, 1986). Such food drink has an obvious advantage over cocoa-derived beverage in view of the high cost of milk in rural areas of developing countries. Bread fruit as one of the important foods in the word forms the most staple portion of the diet in its native regions the island of the South Pacific where it is eaten after boiling or roasting with a chestnut flavor, it is however not so popular among the people in other parts of the world where in Nigeria for instance the variety, bread fruit can be found growing luxuriantly in few compound forms and near homesteads as ornamentals rather than as food resource.

AIMS AND OBJECTIVES

This work is therefore aimed at fulfilling the following objectives:

1) To determine the nutritional value/chemical composition of bread fruits with view to increase its acceptability as food, thereby fulfilling recent progress trends in chemical science for global.
2) To identify the various ways of utilizing this local tree crop.
3) To identify the factors limiting the use of African breadfruits.
4) To make some recommendation as regards to the factors limiting the use of breadfruits.

MATERIALS AND METHODS

Two varieties of breadfruit samples *Var africana* and *Var inversa* were obtained directly from their trees at OKO in Orumba North Local Government Area of Anambra state of Nigeria in order to avoid error in collecting the exact variety needed for the project. The project's step-wise methodology was as follows:

CONDITIONING

The seed were weighed out into triplicate 1 kg batches and poured into a water bath containing water pre-heated to the following temperature 70, 80, 90 and 100° C respectively. The seeds were allowed to stay in the conditioning water for periods of 5, 10 and 15 minutes respectively at each conditioning temperature employed in the test. The conditioned seeds were spread out in perforated trays to cool and dry before dehulling.

DEHULLING

The dehulling test equipment was the household milling (Corona). This machine cracks the seed coat open and frees the cotyledons either broken or whole. The dehulled and drilled seeds samples were then aspirated by putting the dehulled seeds and the husks in a shallow tray and the content propelled some few centimeters upwards into the air in order to allow air current to pass through and below of the husks. The seeds with fused membranous testa are handpicked to remove the adhering pieces of husks, finally a cleaned seed was obtained.

DRYING

The clean seeds were dried with constant rate drying using an oven at 80° C temperature until the moisture content reduced considerably. The drying took place for 6 hours. The dried seeds were milled to powdering form and were sent for chemical and physical analysis.

Analytical procedure for chemical properties of the flour samples was followed as:

MOISTURE CONTENT

This is by method of the Association of Official Analytical Chemists (AOAC, 1980). 5 g of the flour samples were placed in previously heated, cooled and weighed moisture dishes. The samples were dried. The samples were dried in a laboratory air at oven temperature of 80° C. As the drying proceeds, the samples were removed intermittently and weighed until the weight remains constant. The percentage moisture content was calculated as follows:

% Moisture Content = (Loss in Weight * 100)/ Original Weight

CRUDE FAT DETERMINATION

The fat was determined by Soxhlet extraction method. 2 g of sample were weighed into filter papers were placed inside the extractor system. Petroleum either was used as

solvent. The Soxhlet extractor components were assembled. The flask containing the solvent was placed on the heater and the condenser positioned for 2 hours for refluxing. The solvent free fat in round bottom flask was dried at 100° C for 3 hours and weighted. The fat contents were expressed as percentage of the weight of samples.

$$\% \text{ Crude Fat} = \left\{\frac{C-A}{B}\right\} * 100$$

While,

A = Wt. of empty flask, B = Wt. of the sample & C = Wt. of flask + Oil after drying

CRUDE PROTEIN

The micro Kjeldahl method as described by (Pearson, 1976) was used to determine the total nitrogen. This involved heating the breadfruit flour sample with cons. H_2S0_4 in long necked digestion flasks. The reaction rate was accelerated by adding sodium and potassium sulphate to raise the boiling points and catalysts containing usually copper, mercury or selenium. After making alkaline with conc. NaOH solution, the ammonia was distilled into standard acid and was estimated by titration. The oxidation involved in the digestion causes the nitrogen to be ammonium sulphate.

Crude protein was calculated by multiplying the total nitrogen by the empirical factor (6.25)

$$\% \text{ Crude Protein} = N*6.25$$

All measures were done in triplicates.

CRUDE FIBRE

Weendee's method was used. About 5 g of the flour sample was digested and washed with 1% HCl to neutralize the NaOH and several times with hot distilled H_2O. The residue was collected and put into a weighted crucible and dried at 100° C for 2 hours in an oven. It then cooled in a desicator, weighed and ashed after cooling. The ash obtained was cooled and weighed.

$$\% \text{ Crude Fibre} = \frac{loss\ in\ wt.\ after\ drying * 100}{Original\ wt.}$$

TOTAL ASH

The method of A.O.A.C (1980) was used. This was determined by weighing a cleaned dried crucibles, about 2 g of the breadfruit flour samples were added into them and heated in a muffle furnace at 550° C until a clean ash remains and allowed to cool in a dsicator and reweighed.

$$\% \text{ Ash} = \left\{\frac{W-A}{N}\right\} * 100$$

While, A = Wt. of empty crucible, N = Wt. of the sample & W = Wt. of the crucible ash.

CARBOHYDRATE CONTENT

This was determined by difference that is subtracting the sum of % ash, % protein, % fat, % moisture and % crude fibre from 100%.

ASCORBIC ACID CONTENT

The method of A.O.A.C (1980) was used. 2 g of the sample was diluted with H_2O to 100 ml flask. 25 ml of 20% metaphosphoric acid as stabilizing agent was added and make up

to mark with water. 100 ml of the solution was pipetted into a small flask. 2.5 ml of acetone was added and titrated with the indophenols solution until a faint pink colour persists for 15 sec. The Vitamin C content in the sample was calculated in mg/100g. The difference between the two titration gives a measure of the dehydroascorbic acid.

IRON CONTENT

The method of A.O.A.C (1980) was used to determine the iron content. 2 g of sample was weighed into a crucible and ashed in a muffle furnace at 550° C for 6 hours. The ash was cooled and 6NHCl was added and boiled for 10 minutes while covering the crucible with a watch glass. After boiling the sample cooled and filtered into 100 ml volumetric flask. The crucible was washed with distilled water and the washings added to the ash filtrate. The filtrate was then made up to 100 ml with distilled water. An aliquot of the filtrate was aspirated into the atomic absorption spectrophotometer and the absorption values corresponding to the different minerals recorded. Standard solutions of Fe was also prepared and aspirated into atomic absorption values of the samples and standard solution determined.

RESULTS AND DISCUSSION

CHEMICAL COMPOSITION OF THE BREADFRUIT FLOUR SAMPLES

Table 1a

Mean chemical composition of *Treculia africana* flour (% fry matter) for *Var Africana*

Temp (°C)	Time (mins)	Moisture	Ash	Fat	Protein	Crude Fibre	CHO	Iron (PPM)	Vit Cmg/100g
70° C	5	6.02	3.95a	10.19a	17.51	0.51	64.87	7.50	25.44a
	10	6.02	3.03a	10.20a	17.51	0.49	65.34	7.08a	25.05a
	15	5.55	2.36b	10.00b	17.49	0.48	66.65	7.00a	24.25a
80° C	5	6.78	2.50b	12.00c	17.51	0.39	66.61	6.50b	26.20b
	10	6.02	2.35b	12.01b	17.06	0.40	68.40	6.50b	24.55b
	15	5.56	2.34b	9.86b	16.64	0.44	68.64	6.00bd	22.30bc
90° C	5	6.98	2.25c	10.60b	8.39	0.60	63.78	6.48b	26.41c
	10	6.44	2.31b	9.80b	8.40	0.40	66.42	6.25a	24.38c
	15	6.18	2.00c	9.85b	7.57	0.49	68.45	6.00bd	22.45cd
100° C	5	6.44	2.18a	11.04c	18.39	0.42	64.13	6.30b	27.00d
	10	6.01	2.00c	10.20a	17.07	0.45	66.30	5.50c	24.20d
	15	6.00	1.31a	8.86	15.31	0.47	68.53	5.00cd	22.00d
F	LSD	NS	0.13	1.456	NS	NS	NS	0.812	0.28

*Values with the same letters in the same column are statistically the same at (P 0.05) and (P 0.1)

Table 1b

Mean chemical composition of *Var inversa* of *T. africana* (% dey matter)

Temp (°C)	Time (mins)	Moisture	Ash	Fat	Protein	Crude Fibre	CHO	Iron (PPM)	Vit Cmg/100g
70° C	5	7.04	2.10a	7.07	17.48	0.48	64.81	7.50a	26.50a
	10	7.01	2.05c	8.40b	17.00	0.40	65.34	7.50b	23.20a
	15	5.12	1.81a	7.71b	15.32	0.41	69.65	7.20c	22.05b
80° C	5	5.53	2.00b	8.81a	16.64	0.42	66.61	6.50b	26.10b
	10	5.37	2.05b	8.44b	15.32	0.40	68.40	6.00a	23.45b
	15	5.35	1.96b	8.36b	15.35	0.41	68.64	6.00b	21.95ca
90° C	5	6.37	2.06b	9.81b	17.51	0.50	63.78	6.55b	26.125b
	10	5.36	2.00b	8.78b	17.00	0.45	66.42	6.00a	23.20a
	15	5.32	1.96b	8.53a	15.32	0.50	68.45	6.00b	22.10b
100° C	5	5.30	1.80b	8.48	15.30	0.52	68.50	5.00	21.00
	10	5.28	1.75	8.45	15.25	0.55	68.80	4.80	20.50
	15	5.25	1.68	8.40	15.20	0.58	69.10	4.60	20.45
F	LSD	NS	0.43	0.732	NS	NS	NS	NS	0.092

The moisture content for both varieties range from 5-7% at their different conditioning temperature and time, this is similar to the moisture content of some legumes such as groundnut which is 7.3% etc (lhekoronye and Ngoddy, 1985). There is significant effect on ash content due to the fact that blanching causes leaching out of inorganic substances present in the food (Okaka *et al*., 1992). Fat content for both decreases with increase in temperature. The protein content for both ranges from 15.30 to 18.37% and compares favourably with leguminous crops such as Bambava nut 16%, beans 18.5% *etc*. as reported by (lhekoronye and Ngoddy, 1985). The result should that breadfruit has low fibre content. The carbohydrate ranges from 60.0 to 68.5% and compares favourably with Bambara nut 65% compares 61%, chickenpea 60.99% (lhekoronye and Ngoddy, 1985). The iron and ascorbic acid decreases with increase in temperature to the fact that blanching causes leaching out of water soluble nutrients (Okaka *et al*., 1992).

CONCLUSION

Conditioning temperature and steeping time affects some chemical properties ash, iron, vitamin C and fat content for both varieties and no effect on protein, moisture, carbohydrate and crude fibre. Nutritionally, breadfruit compares favourable with leguminous crops, in terms of composition and from the result it should be consumed be all for its high nutrient content.

REFERENCES

1. AOAC, 1980. Association of Official Analytical Chemists, 14th ed.
2. Ejiofor, M. A. N., Obidiju W. O. R and Okafor, J. C. 1988. Diversifiying utilities of African breadfruit as food and feed. *International T. C. P Journal* 5:125-134.
3. Lhekoronye, A. I. and Nogoddy P. O. 1985. Integrated food science and Technology for Tropics (1st edition) Macmillan Publishers *p* 283, 184.
4. Nwokolo, E. 1989. Nutritional qualities if the seeds of African physical breadfruit (*Treculia africana*) *Trop. Sc*. 27: 39-47.
5. Obiajulu, R. O. 1986. Studies on the utilization of African breadfruit in non-alcoholic beverage drink HND Thesis-Federal School of Agriculture Umudike *p* 3-7.
6. Okafor, J. C. 1985. Selection and improvement of indigenous tropical forest resources. *p* 1-3
7. Okaka, T. C, Akubundu N. T. and Okaka, N. C. A. 1992. Human nutrition and integrated approach Silicon Valley computer Ltd Enugu. *p* 271-283.
8. Okigbo, B. N.1980. Domestication of indigenous food plants, utilization of plants and potentials for crop diversification in Nigeria. Paper presented to Nigeria Academy of Science, JOS. *p* 1-5.
9. Pearson, D.1976. The chemical analysis of food 7th edition. Churchill Living Stone Publisher.*p* 24-27.
10. Uddo, 1980. Nutrition. The Macmillan Press Ltd. London. *p* 49-180.