Archives of Food Science and Technology

Research Article
Published: 26 Apr, 2019

Production and Physico-Chemical Properties of Canned Breadfruit Porridge

*Nwakalor Chizoba N**

Department of Food Science and Technology, Federal Polytechnic Oko, Anambra State, Nigeria

Abstract

African breadfruit (*Treculia Africana*) seeds were used in producing canned breadfruit porridge. Three samples of canned breadfruit porridge were produced from the breadfruit seeds. The samples were sample AAA (breadfruit porridge without utazi and bitter leaf), sample ABB (breadfruit porridge with bitter leaf) and sample ABC (breadfruit porridge with utazi leaf). The sensory evaluation of the breadfruit porridge was investigated before the canning using 10 (ten) untrained panelists on a nine point Hedonic scale. The sensory attributes such as colour, taste, aroma, mouth feel and general acceptability were also investigated. The proximate composition of the breadfruit porridge was studied before and after canning and was stored for one month under ambient condition. The result of the proximate composition showed significant difference ($p<0.05$) in protein (7.69% to 9.93%) and (6.96% to 8.92%) for breadfruit porridge before canning and after canning respectively, Fat content (8.60% to 18.50%) and (5.50% to 7.40%), moisture content (59.50% to 61.00%) and (68.50% to 72.75%), fiber content (1.50% to 4.00%) and (1.00% to 3.00%), carbohydrate (7.8% to 19.96%) and (9.88% to 13.04%) while ash showed no significant difference (1.50% to 2.00%) and (1.50% to 2.00%) for sample AAA, ABB, and ABC before canning and after canning respectively. From the sensory scores, sample ABB was most preferred in aroma and general acceptability while sample AAA was most accepted according to taste and there were no significant different in mouth feel and color of the three samples. The storage stability was monitored at 30°C (room temperature) for one month.

Keywords: Breadfruit; Proximate composition; Sensory evaluation

Introduction

African breadfruit (*Treculia africana*) is a tree species in the genus *Treculia*. It is used as a food plant. It contributes immensely to the diet of the people of Nigeria. It is widely consumed in southern Nigeria, especially among the traditional communities in Igbo land. It is a native of many parts of western and Tropical Africa. It can be found in Sudan, Mozambique and Angola. It is always a common feature of evergreen and deciduous forest, found often by streams and may sometimes by plant. In Nigeria, it is very common in western and eastern states. This common forest tree is given many names by various localities where it is found. For instance, the Igbo's calls it "ukwa", the Yorubas, "afon", the Hausas, "Barafuta".

The most interesting about African breadfruit is the different ways it is eaten. The seeds are seldom eaten raw but can be baked, boiled (porridge), roasted, fried before consumption and can be grounded into flour which can be used as a substitute for wheat flour in baking products [1]. African breadfruit seeds (Figure 1) are highly nutritious and constitute a cheap source of vitamins, minerals, proteins, carbohydrate and fats. Since breadfruit is a leguminous crop, a large number of traditional food preparations are made from various species of legumes. The differences in the form are indicated in part to food habit but the process steps in the various localities generally include boiling in water with ingredients like salts, pepper, crayfish and dry fish. This is the commonest method of preparing African seeds in eastern part of Nigeria and the product is a thick porridge depending on choices, oil could be added.

Canning is a method of preserving food in which the food contents are processed and sealed in a tight container. Canning provides a shelf-life typically ranging from one to five years, although under specific circumstances it can be much longer. Canning is also a way of processing food to extend its shelf-life. The idea is to make food available and edible long after the processing time. There are two home canning methods; water bath canning and pressure canning. Water bath canning is saving for high acid foods such as tomatoes, fruits, jams and jellies. In this method, jars of food are heated completely covered with boiling water (212°F at sea level) while pressure canning

Correspondence:
Nwakalor Chizoba N, Department of Food Science and Technology, Federal Polytechnic Oko, Anambra State, Nigeria,
E-mail: chizobanwakalor@ymail.com

Received Date: *01 Apr 2019*
Accepted Date: *23 Apr 2019*
Published Date: *26 Apr 2019*

Citation:
Nwakalor Chizoba N. Production and Physico-Chemical Properties of Canned Breadfruit Porridge. Arch Food Sci Technol. 2019; 1(1): 1001.

Figure 1: Breadfruit seeds.

Figure 2: Canned breadfruit porridge.

is the only safe method of preserving low acid foods like vegetables, meat, breadfruit and poultry. Jars of food are placed in 2 to 3 inches of water in a special pressure cooker which is heated to a temperature of at least 240°F. A microorganism called *Clostridium botulinum* is the main reason why pressure canning process is necessary. They can form spores that can withstand these temperatures. The spores grow well in low acid foods, in the absence of air. The only way to destroy these spores is by pressure cooking the food at a temperature of 240°F, or above, for a specific amount of time depending on the type of food and altitude. Foods that are low acid have a pH of 4.6 and because of the danger of botulism; they must be prepared in a pressure canner.

The suitable packaging materials for canned products include; tinplate, glass jars and aluminum. The functions of these packaging materials are to hermetically seal the product in the container while delivering a thermal process which renders it commercially sterile and to prevent recontamination of the product after processing and during subsequent transport and storage. But the most suitable packaging for low acid food (breadfruit porridge) products is tinplate which is fabricated into two and three piece cans of variety of shapes and sizes which can also be lacquered. Tin plate also has an advantage of withstanding high temperature [2].

Despite the different varieties of breadfruit, i.e. it's natural resources, nutritional value and consumption, researchers have not shown much interest in the canning of porridge breadfruit as a means of preservation, increase in the yield of national and natural resources by modification and for conveniences.

From the above background, it is evident that breadfruit is nutritional, natural resources and it is widely consumed among different countries, there is need to process it as a canned food so as to make it available all through the year, easily accessible and also with extended shelf-life.

Therefore the aim of this study was to determine the physico-chemical properties of the canned breadfruit porridge before canning and after canning.

Materials and Methods

Breadfruit seeds, bitter-leaf and utazi leaves were obtained from a farm land in Akpu settlement in Anambra State, Nigeria. Breadfruit seeds (1.3 kg), crayfish (34.16 g), pepper (3.84 g), monosodium glutamate (8.20 g), salt (5.5 g) and a drop of oil were cooked for 1 hour. The cooked breadfruit porridge was divided into three samples: sample AAA (no vegetable was added), sample ABB (3 leaves of bitter-leaf were added), sample ABC (3 leaves of utazi were added) and each sample was allowed to cook for another five minutes before canning.

Sensory evaluation was carried out by ten untrained panelists and the attributes evaluated were taste, mouth feel, color, aroma and general acceptability using 9 point Hedonic scale where 1=disliked extremely and 9=liked extremely. The proximate composition was determined by the method described by AOAC [3]. One-way Analysis Of Variance (ANOVA) was the experimental design used for the analysis of the data obtained from the means of the proximate composition and sensory evaluation. The means were separated using Duncan's multiple range tests.

Results and Discussion

The sensory attributes of porridge breadfruit without bitter leaf and utazi (Sample AAA), porridge breadfruit with bitter leaf (sample ABB) and porridge breadfruit with utazi (sample ABC) were presented in Table 1. The mean scores indicated that sample AAA was most preferred with respect to taste (6.50), sample ABB was most preferred with respect to aroma and general acceptability (7.80 and 8.10) respectively. The high score rated by the panelist on sample AAA with respect to taste could be attributed to the fact that it was produced without bitter leaf or utazi. The reasons for chosen sample ABB with respect to aroma and general acceptability could be as a result that the panelists are familiar with breadfruit porridge with

Table 1: Sensory Mean Score of the Freshly Canned Breadfruit Porridge Samples.

Samples	Taste	Mouth feel	Colour	Aroma	Genera acceptability
AAA	$6.50^{a} \pm 1.72$	$7.30^{a} \pm 1.25$	$7.40^{a} \pm 0.69$	$7.10^{a} \pm 1.37$	$7.00^{a} \pm 1.41$
ABB	$8.10^{ab} \pm 0.99$	$7.60^{a} \pm 0.97$	$7.40^{a} \pm 1.07$	$7.80^{b} \pm 1.23$	$8.10^{b} \pm 1.10$
ABC	$6.90^{ab} \pm 1.10$	$6.80^{a} \pm 1.81$	$7.20^{a} \pm 1.39$	$6.50^{a} \pm 1.43$	$6.70^{a} \pm 1.49$

Values are mean scores of duplicate determinations. Means with different superscript in the same column are significantly different (P<0.05)
Sample AAA= Breadfruit porridge without bitter leaf or Utazi
Sample ABB= Breadfruit porridge with bitter leaf
Sample ABC= Breadfruit porridge with utazi

Table 2: Proximate composition of breadfruit porridge before canning.

Samples	Moisture	Crude fiber	Protein	Crude fat	Ash	CHO
Sample AAA	61.00^{a} ± 0.71	1.50^{a} ± 0.00	9.71^{b} ± 0.01	18.50^{c} ± 0.14	1.50^{a} ± 0.00	7.80^{a} ± 0.56
Sample ABB	59.50^{ab} ± 0.71	2.25^{b} ± 0.35	7.69^{a} ± 0.61	8.60^{a} ± 0.00	2.00^{b} ± 0.00	19.96^{b} ± 0.45
Sample ABC	59.50^{a} ± 0.71	4.00^{ab} ± 0.00	9.93^{b} ± 0.19	17.40^{b} ± 0.00	2.00^{b} ± 0.00	8.18^{a} ± 0.52

Values are mean scores of duplicate determinations. Means with different superscript in the same column are significantly different (P<0.05).

Table 3: Proximate composition of breadfruit porridge after canning and stored over a period of one month.

Samples	Moisture	Crude fiber	Protein	Crude fat	Ash	CHO
Sample AAA	72.75^{b} ± 0.35	1.00^{a} ± 0.0	8.75^{b} ± 0.0	5.50^{a} ± 0.00	1.50^{a} ± 0.00	10.50^{a} ± 0.49
Sample ABB	68.50^{a} ± 0.71	1.50^{b} ± 0.00	6.96^{a} ± 0.18	7.40^{c} ± 0.00	2.00^{b} ± 0.00	04^{b} ± 0.33
Sample ABC	69.25^{b} ± 0.35	3.00^{c} ± 0.00	8.92^{b} ± 0.07	6.90^{b} ± 0.14	2.00^{b} ± 0.00	9.88^{a} ± 0.21

Values are mean scores of duplicate determinations. Means with different superscript in the same column are significantly different (P<0.05).

bitter leaf according to previous research work [4].

Similarly, in terms of mouth feel and color, there were no significant difference (P>0.05) among the three samples. The ranges are (7.30, 7.60, 6.80) and (7.40, 7.40, 7.20) for sample AAA, ABB and ABC respectively. This could be attributed to the fact that the three samples were produced with the same quantity of ingredients before demarcation and addition of bitter leaf and utazi to sample ABB and ABC.

Proximate composition

Moisture content estimates directly the water content and indirectly the dry matter content of the samples. It is also an index of storage stability of the flour. From the result in Table 2, the moisture content of the samples was 61.00%, 59.50%, and 59.50% for sample AAA, ABB and ABC respectively. From the results obtained it was observed that the moisture contents were relatively high. The results were higher than the results reported by [5] in the proximate composition of five lima bean accession. This could be attributed to the fact that he worked on flours not on porridge.

Crude fiber refers to the indigestible plant material. It lowers blood cholesterol level in humans, prevents cancer and reduces the risk of developing diabetes, hypertension and hypercholesterolemia. The fiber content recorded in the current study in Table 2 was 1.50%, 2.25%, and 4.00% for sample AAA, ABB and ABC respectively. From the result it was observed that sample ABC recorded high crude fiber content and is within the range reported by Yellavilla on five lima beans. From Table 2, the protein content were 9.71%, 7.69%, 9.93% respectively and are lower when compared with the work reported by [5]. The crude fats obtained in Table 2 are 18.50%, 8.60% and 17.40% for sample AAA, ABB and ABC respectively. The crude fat is the term used to refer to the crude mixture of fat soluble material present in a sample. The results obtained on crude fat in Table 2 are higher than the crude fat of five lima beans accessions [5]. This could be attributed to the fact that he worked on flour not on porridge.

Results for ash content in Table 2 demonstrated significantly lowest amounts in sample AAA (1.50%) while sample ABB and ABC are 2.00% and 2.00% respectively. The high ash content of sample ABB and ABC indicated high concentration of minerals than the other varieties and this is lower to the work of [5] on five lima beans. The carbohydrate content is lower from the results reported by Yellavila on proximate composition of five lima beans accessions. The differences in carbohydrate contents are as a result of the differences in protein content, ash, fat, and fiber contents.

Breadfruit porridge after canning and stored for a period of one month

The moisture content which shows the index of stability from Table 3 recorded 72.75%, 68.50% and 69.25% for sample AAA, ABB and ABC respectively. The moisture content are relatively high with sample AAA bearing the highest value indicated that it is more susceptible to spoilage compared to sample ABB and ABC. These are higher than the result reported by [6] in correlations between chemical composition and canning quality attributes of Navy bean. These could be attributed to the fact that he worked on correlation between two raw navy beans not on porridge. The indigestible plant material (crude fiber) obtained in Table 3 are 1.00%, 1.50%, 3.00% for sample AAA, ABB and ABC with sample ABC recording the highest crude fiber content. The high value on crude fiber recorded by sample ABC could be due to the fact that it was cooked with utazi which contributed to the fiber content. The protein content obtained in Table 3 is 8.75%, 6.96% and 8.92% for sample AAA, ABB and ABC respectively. The results obtained are high from the work of [6]. The crude fat is the term used to refer to the crude mixture of fat soluble material present in a sample. The crude fat in Table 3 recorded 5.50%, 7.40% and 6.90% which is relatively low compared to the crude fat obtained in Table 2. The difference in crude fat content in Table 2 and Table 3 could be as a result of storage conditions on the samples in Table 3.

The ash content in Table 3 recorded 1.50%, 2.00% and 2.00% for sample AAA, ABB and ABC which are lower than the results obtained by [6] on correlation of navy beans, the difference could be attributed to the fact that they worked on raw navy beans not on breadfruit porridge while the carbohydrate content in Table 3 are 10.50, 13.04, and 9.8 for sample AAA, ABB and ABC respectively.

From the results in Table 2 and Table 3, it was observed that the moisture content in Table 3 are relatively higher than the moisture content in Table 2 therefore, samples in Table 3 are more susceptible to spoilage than the samples in Table 2. The result obtained in the protein content in Table 2 are higher than the protein content in Table 3 for sample AAA, ABB, and ABC respectively. The variations in protein content can be attributed to different environment conditions, genotype and analytical methods. In addition, protein content was sensitive to rainfall, light intensity, length of growing season, day duration, temperature and agronomic practices.

Conclusion

Based on the findings, it reveals that breadfruit porridge can be subjected to canning and the canned breadfruit porridge can be

stored well for some months at room temperature (30°C). Since the food product (canned breadfruit porridge (Figure 2)) contains great amount of nutrients. It would be of economic importance in many developing countries such as Nigeria, and African as a whole in promoting the use, utilization and processing of local crops and can also improve the countries revenue when exported.

References

1. Balick M, Cox. Plants, people and culture, the science of ethnobatany New York: scientific American Library HpHlpp. 1996;85.
2. Fellows P, Axtell B. Appropriate food packaging: materials and methods for small businesses. Essex, UK, ITDG Publishing. 2002;25-77.
3. AOAC. Association of official Analytical chemist official methods of Analysis. 17th ed. Virginia: Association of official Analytical chemists international. 2000.
4. Olapade AA, Umeonuora UC. Chemical and Sensory Evaluation of African Breadfruit (Treculia africana) seeds processed with Alum and Trona. Nigerian Food J. 2014;32(1):80-8.
5. Yellavila SB, Agbenorhevi JK, Asibuo JY, Sampson GO. Proximate composition, minerals content and functional properties of five lima bean accessions. J Food Security. 2015;3(3):69-74.
6. Lu W, Chang KC. Correlations between chemical composition and canning quality attributes of navy bean (*Phaseolus vulgaris L*). Cereal Chemistry. 1996;73(6):785-7.