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Keywords : *breadfruit flour, wheat flour, proximate composition, sensory evaluation.*

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The proximate composition showed that 40% breadfruit flour blend had highest protein content (1.39%). The value for 100% wheat flour was 1.05%, while that of breadfruit flour only was 1.31%; this showed that supplementation of breadfruit flour would improve the protein nutritional quality of the products. The moisture content of the samples varied between 12.77% and 9.57%, decreasing with increasing substitution of breadfruit flour , hence prolonging the shelf-life. Protein content had range of (1.05-1.39%) and ash content (0.94-1.12%). The 10% flour blend in all cases gave results comparable to the 100% wheat flour cake and chin-chin and produced better quality products than 20% and 30% flour blends. The sensory evaluation showed that there were no significant differences ($p>0.05$) between 100% wheat products and 10% breadfruit flour blend in the sensory attributes.

Keywords : breadfruit flour, wheat flour, proximate composition, sensory evaluation.

I. Introduction

Breadfruit (*Artocarpus altilis*) is widely cultivated to appreciable extent in South-West States of Nigeria. Present level of breadfruit production in the South-Western Nigeria has been estimated to about 10million tonnes dry weight per year with potentials for exceeding 100million tonnes every year (Adewusi *et al.*, 1995; Ajayi, 1997). Breadfruit (*Artocarpus altilis*) is a tree and fruit native to Malaysia and countries of the South Pacific and the Caribbean. It is an important food in these areas (Taylor and Tuia, 2007). Breadfruit is a fruit tree that is propagated with the root cuttings and the average age of bearing first crop is between 4 to 6 years (Amusa et al.,2002). The tree has a great productive ability with an average sized tree producing 400 to 600 fruits per year (NTBG,2009). It produces fruit twice a year, from March to June and from July to September with some fruiting throughout the year. Breadfruit is highly nutritious, cheap and readily available in overwhelming abundance during its season, it has found limited applications in the food industries (Omobuwajo, 2003).The breadfruit pulps are made into various dishes; it can be pounded, fried, boiled, or mashed to make porridge; it can also be processed into flour and used in bread and biscuit making (Amusa et al.,2002). Breadfruit has also been reported to be rich in fat, ash, fibre and protein (Ragone,1997).

Usually, farmers helplessly watch their harvested stored breadfruits rot away because routine methods of processing are inadequate to utilize all the breadfruits harvested. Other constraints include the short shelf-life of the fruit. Much of the food problems in the developing countries have been attributed to huge post-harvest losses (Adebayo and Ogunsola, 2005). One way to minimize post-harvest losses and increase the utilization of breadfruit is through processing into flour , which is a more stable intermediate product. The use of composite flours in bread making has been reported by many researchers.

Olaoye et al. (2006), investigated the use of supplementation of flours of soybean and plantain in wheat in the production of bread. Also, Mepba et al. (2007), produced composite breads and biscuits from mixed flours of wheat and plantain, with 30% supplementation of plantain flour. Though the breadfruit has been made into flour and evaluated in bakery products (Omobuwajo, 2003; Olatunji and Akinrele, 1978; Graham and De-Bravo, 1981), except the work by Oyeniyi (2006), not much has been done in the area of chin-chin like and cake products. The objective of this work was therefore to provide information on the proximate composition and sensory acceptability of the snacks produced from breadfruit flour. Also, to reduce

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wheat flour inflation and curtail excessive losses of breadfruit during season.

II. Materials and Methods

a) Materials

Matured green ripe and wholesome fruits of breadfruit (*Artocarpus altilis*) were obtained from a farm in Ile-ife, Osun state. A commercial wheat flour (Eagles flour Mill, Ltd, Ibadan, Nigeria) and all other ingredients of baking cake and chin-chin such as fat, sugar, milk powder, salt, flavor, egg, sodium bicarbonate and vegetable oil were purchased from Bodija market in Ibadan, Nigeria.

b) Processing of Breadfruit flour

The breadfruits were processed into flour as shown in Figure 1. Breadfruit samples were washed, peeled and sliced manually into 1cm thick slices using stainless steel knife. The washed sliced breadfruit pieces were immersed in a 70ppm solution of sodium metabisulphite. The sulphited slices were steam blanched at 70^0C for 10mins in a water bath (Clifton model) and then dried at 55^0C for 16hrs using a cabinet dryer. The dried chips were milled and sieved through a 0.25mm British standard sieve (Model BS 410) (Giami et al.,2004) . The flour was packaged in thick gauge (0.04mm) transparent polyethylene nylon for further use.

c) Processing of cake

The recipe for the cake production is shown in Table 2

The cake samples were in ratios of wheat flour: breadfruit flour of 100:0, 90:10, 80:20, 70:30 and 0:100. All the ingredients (butter, sugar, salt, egg, milk) except flour and sodium bicarbonate were added with continued mixing in a mixer. Then, flour and sodium bicarbonate were added. Mixing was carried out for 5mins. The batter was dispersed into small baking pans. Baking was done at 100^0C for 30mins in an oven.

d) Processing of Chin-chin

The chin-chin recipe is shown in Table 4

The chin-chin samples were in ratios of wheat flour : breadfruit flour of 100:0, 90:10, 80:20, 70:30 and 60:40. Flour, salt and nutmeg were sieved first into a bowl. Then margarine was mixed together with flour evenly. Egg, sugar and other ingredients were added to make fairly stiff dough. The stiff dough was rolled tightly to 1cm thickness on a board and cut into cubes. Cut dough was fried in deep hot vegetable oil until golden brown. Chin-chin is then drained, cooled and packaged.

Chin-chin is a fried snack popular in Nigeria and West Africa. It is a sweet, hard, donut-like baked or fried dough of wheat flour. Chin-chin may also contain cowpeas. Many people bake it with ground nutmeg for flavour. It is usually kneaded and cut into small squares of 1 square inch or to about a quarter of an inch thick before frying. This can be served as a side dish and make no ideal savoury snack with drinks at parties or simply in between meals (Akubor, 2004; Mepba et al., 2007).

e) Proximate Analysis

The proximate composition of the breadfruit blend samples were determined using suitable methods. The samples were analyzed for moisture, ash, crude fibre, crude protein, crude fat and carbohydrate

f) Sensory Evaluation

The sensory attributes, including colour, taste, aroma, texture, and general acceptability, were evaluated by a semi trained 10-member panel ,using a 7-point Hedonic scale with 1 representing the least score(Dislike very much) and 7 the highest score (Like very much).Analysis of variance(ANOVA) was performed on the data gathered to determine differences, while the least significant test was used to detect significant differences among the means(Ihekoronye and Ngoddy,1985).

III. Results and Discussion

The proximate composition of the breadfruit flour blends are presented in the Table 1. The protein content increases with increase in the level of breadfruit substitution. The values ranged from 1.08 – 1.43%. At 40%, breadfruit flour blend had the highest protein, followed by 30% and 20%. It was observed that the protein value for 100% breadfruit flour was higher than 100% wheat flour. This was similar to the work of Bhandary and Amadi (2004) who worked on the development of composite flour using breadfruit and wheat flour. Hence, protein is an important component that determines the rheological properties of composite flours. The ash content of the flour blends were high in values (0.82 – 1.11%), suggesting that the breadfruit is high in minerals. This is in agreement with report by Morton, 1987; Ragone, 1997. Therefore, the increase in substitution of breadfruit flour will improve the nutritive value of the snacks. This will be an advantage in the preparation of weaning food formulation. It can also contribute to the dietary intake of consumers or serve as special diet/meal.

Moisture content of the flour blends ranged between 9.61 – 12.87%. The decrease in moisture content with increase in level of substitution showed the certainty of prolonging shelf-life. Besides, the range of moisture content implied that the breadfruit blends flour had good storage potential, since it was known that moisture and water activity of the product determine greatly the keeping quality of the foods. These values were minimal and may not have adverse effect on the quality attributes of the product (Kure et al., 1998).

The fat content of the flour blends increase with increment in substitution levels. The values ranged from

0.37 – 0.60%. It was also noticed that fat content in breadfruit flour is higher compared to wheat flour, 0.59 and 0.42% respectively but the incremental values were minimal (Olaoye et al.,2007).Fat plays a significant role in the shelf life of food products and as such relatively high fat content could be undesirable in baked food products. This is because fat can promote rancidity in foods, leading to development of unpleasant and odorous compounds (Ihekoronye and Ngoddy, 1985)

Fibre content for the blends increase with increase in substi tution of breadfruit (0.84–1.26%). Breadfruit has relatively higher crude fibre than wheat and this could justify the result obtained for the different snack samples. This observation is in support of the findings of Olaoye et al.,2007;Esuoso and Bamiro(1995)

The carbohydrate content of the flour blends were slightly higher than that reported by Oyeniyi (2006). Flour blends of 10% breadfruit had the highest percentage, although the differences between the other blends were not appreciable. The highest carbohydrate content was observed with 100% wheat flour, while the lowest was recorded for 100% breadfruit flour. High percentage of carbohydrate content in all the flour blends suggested that the blends were good source of energy. Also, it might found application as soup thickeners, useful in food formulation for diabetics and hypertensive patients requiring low sugar diet. This is similar to the work by Oladunjoye et at.,2010 who found that the mature fruit is a good source of carbohydrate(84%) with starch constituting more than 60% of the total carbohydrate.

The results of sensory evaluation are shown in Table 4 and Table 5. Sensory evaluation showed that the cakes produced were not significantly different ($p>0.05$) up to 20% in terms of all the sensory attributes tested but there were slight differences in 30% and 100% breadfruit flour.

Table 5 indicated that there were no significant difference in chin-chin ($p>0.05$) up to 20% in terms of appearance, taste, aroma, texture and general acceptability. Although, there were slight differences in the snacks produced, however, the snacks were successfully produced, appealing and acceptable for consumers' consumption. This is similar to work done by Olaoye et al., 2007 in using breadfruit flour for baking biscuit.

IV. Conclusion

The breadfruit flour produced was creamy in colour, smooth and odourless. During the production, the ratio of the flour blends were more than five ratios, but only the chosen ratios found acceptable. Substitution of wheat flour with breadfruit flour would greatly improve the protein nutritional quality of cake and chin-chin. This would be of nutritional importance in most developing countries such as Nigeria, where people can hardly afford high proteinous foods because of their expensive costs. However, other methods of processing could increase the protein content if properly done Also, research breakthrough will increase the utilization of the breadfruit. The result output will benefit growers of the crop economically and open other area of research.

References Références Referencias

1. Adebayo SF, Ogunsola EM (2005). The proximate analysis and functional properties of fortified instant pounded yam flour. In: Proceed 29th Annual Conference of Nigerian Institute of Food Science and Tech (NIFST). 244.
2. Adewusi SRA, Akpobome JU, Osuntogun BA (1995). Studies on the carbohydrate content of breadfruit (*artocarpus communis forst*) from South-West Nigeria. Starch/starke. 47:287-294.
3. Ajayi OP (1997). Studies on some physic-chemical and enzymatic changes in breadfruit (artocarpus altilis) during storage.M.Sc Research Thesis. Food Technology Department, University of Ibadan.
4. Akbor PI (2004). Protein contents, physical and sensory properties of Nigerian snack foods (cake, chin-chin and puff-puff) prepared from cowpea-wheat flour blends. International Journal of Food Sci and Techn. 39(4): 419-424.
5. Amusa NA, Kehinde IA, Ashaye OA (2002). Bio-deterioration of breadfruit (*Artocarpus communis*) in storage and its effects on the nutrient composition. *Afri. J. Biotechnol*. 1(2): 57-60.
6. Bhandary CS, Amadi EC (2004). Proximate Composition of Fortified pasta from blends of the African breadfruit (*Treculia africana*) Flour and Wheat (*Tritium durum*) Semolina. In: Proced.*29th Annual Conference of Nigerian Institute of Food Science and Tech*. (NIFST). 56.
7. Giami SY, Amasisi T, Ekiyor T (2004). Comparison of bread making properties of composite flour from kernels of roasted and boiled African breadfruit (*Treculia africana decne*) seeds. J. Material Res. 1(1): 16-25.
8. Graham HD, Negron de Bravo E (1981). Composition of the breadfruit.*J. Food Sci.* 46: 535-539.
9. Mepba HD, Achinewhu SC, Aso SN, Wachukwu CK (2007). Microbiological quality of selected street foods. In Port Harcourt, Nig. Journal of Food safety 27(2): 208-218.
10. Mepba HD, Eboh L, Nwaojigwa SU (2007). Chemical composition, functional and baking properties of wheat-plantain composite flours. Afri. J. Food Nutri. Devt. 7(2): 1-22.
11. Morton JF, Miami FL (1987). Breadfruit: *Artocarpus altilis*. Fruits of warm climates.pp.50-58

12. National Tropical Botanical Garden (NTBG) (2009). Hunger Initiative. Breadfruit Institute. National Tropical Botanical Garden. (http://www.ntbg.org/breadfruit/hunger.phb).
13. Oladunjoye IO, Ologhobo AD, Olaniyi CO (2010). Nutrient composition, energy value and residual anti-nutritional factors in differently processed breadfruit (Artocarpus altilis) meal. Afri. J. Biotechnol., 9(27): 4259-4263.
14. Olaoye OA, Onilude AA, Oladoye CO (2007). Breadfruit flour in biscuit making: effects on product quality. Afri. J. Food Science: 20-23.
15. Olaoye OA, Onilude AA, Idowu OA (2006). Quality characteristic of bread produced from composite flour of wheat, plantain and soybeans. Afri. J. Biotechnol. 5(11): 1102-1106.
16. Olatunji O, Akinrele IA (1978). Comparative rheological properties and bread qualities of wheat flour diluted with tropical tuber and breadfruit flours. Cereal Chemistry. 55(1): 1-6.
17. Omobuwajo TO (2003). Compositional characteristics and sensory quality of biscuit, prawn-crackers and fried chips produced from breadfruit. J. Innovative Food Science and Emerging Technologies.4 (2): 219-225.
18. Oyeniyi OO (2006). Compositional Characteristics and Sensory Quality of Biscuits, Cake and Prawn crackers from breadfruit (*Artocarpus communis*). Unpublished M.Sc. Thesis. University of Ibadan, Ibadan.
19. Ragone D (1997). Breadfruit (*Artocarpus altilis*) (Parkinson) Fosberg. Promoting the conservation and use of underutilized and neglected crops. Institute of Plant Genetics and Crop Plant Research, Gatersleben International Plant Genetic Resources Institute, Rome, Italy.
20. Taylor MB, Tuia VS (2007). Breadfruit in the pacific region. Acta Horticulturae (ISHS) 757: 43-50.

Table 1 : Proximate Composition of Wheat and Breadfruit Flours

	WHEAT FLOUR/BREADFRUIT FLOUR SAMPLES (MEAN ± SD)					
CONSTITUENTS	A	B	C	D	E	F
% Moisture Content	12.755 ± 0.015	12.87 ± 0.02	12.125 ± 0.025	12.34 ± 0.04	11.29 ± 0.02	9.605 ± 0.035
%Protein	1.08 ± 0.03	1.165 ± 0.025	1.325 ± 0.055	1.26 ± 0.03	1.425 ± 1.00	1.345 ± 0.035
%Fat	0.42 ± 0.01	0.37 ± 0.02	0.500 ± 0.01	0.455 ± 0.015	0.54 ± 0.01	0.595 ± 0.15
%Fibre	0.08425 ± 0.247	1.12 ± 0.01	1.165 ± 0.015	1.195 ± 0.015	1.225 ± 0.015	1.26 ± 0.01
% Ash	0.93 ± 0.01	0.82 ± 0.01	1.02 ± 0.01	1.07 ± 0.02	1.105 ± 0.015	1.045 ± 0.015
%Carbohydrate by difference	97.57 ± 0.01	97.645 ± 0.005	97.155 ± 0.035	97.215 ± 0.005	96.93 ± 0.01	96.91 ± 0.100

Note:
A = Wheat flour (100%)
B = Wheat flour (90%) and breadfruit flour (10%)
C = Wheat flour (80%) and breadfruit flour (20%)
D = Wheat flour (70%) and breadfruit flour (30%)
E = Wheat flour (60%) and breadfruit flour (40%)
F = Breadfruit (100%)

Table 2 : Ingredients Composition for Cake Production.

Ingredients	Weight (g)
Flour	500g
Fat	250g
Sugar	150g
Salt	10g
Sodium bicarbonate	5.4g
Egg	10 pieces
Milk	50g

Source: Oyeniyi (2006)

Table 3 : Sensory Evalution of Cake

Samples	Appearance	Taste	Aroma	Texture	Overall Acceptability
100% WF	6.0^{a}	5.7^{a}	6.0^{a}	6.1^{a}	6.1^{a}
90%WF 10%BF	6.5^{a}	4.4^{a}	5.5^{a}	5.5^{a}	5.7^{a}
80% WF 20% BF	5.5^{a}	5.4^{a}	5.3^{ab}	5.2^{a}	5.3^{ab}
70% WF 30% BF	4.0^{b}	4.7^{a}	4.9^{ab}	5.2^{a}	4.3^{b}
100% BF	3.7^{bc}	2.6^{b}	3.8^{b}	2.3^{b}	2.3^{c}

Any samples with the same alphabet in the vertical line are not significantly difference at 1% level while anyone with different alphabet is significantly difference.

NB:

WF = Wheat flour

BF = Breadfruit flour

Table 4 : Ingredients Composition for Chin-chin Production.

Ingredients	Weight (g)
Flour	200g
Fat	4g
Sugar	40g
Salt	2g
Sodium bicarbonate	2g
Egg	50g
Water	20ml

Source: Robert (1990)

Table 5 : Sensory Evaluation of Chin-Chin

Samples	Appearance	Taste	Aroma	Texture	Overall Acceptability
100% WF	6.1^{a}	6.0^{a}	5.7^{a}	5.7^{a}	6.1^{a}
90%WF 10%BF	5.5^{ab}	6.1^{a}	5.7^{a}	5.6^{a}	5.7^{a}
80% WF 20% BF	5.4^{ac}	4.4^{ac}	4.9^{ab}	4.5^{ab}	4.9^{ab}
70% WF 30% BF	3.7^{d}	4.1^{abc}	4.3^{ab}	3.9^{b}	4.0^{b}
60% WF 40% BF	4.0^{cd}	3.3^{c}	4.0^{b}	3.1^{bc}	2.9^{bc}

Any samples with the same alphabet in the vertical line are not significantly difference at 1% level while anyone with different alphabet is significantly difference.

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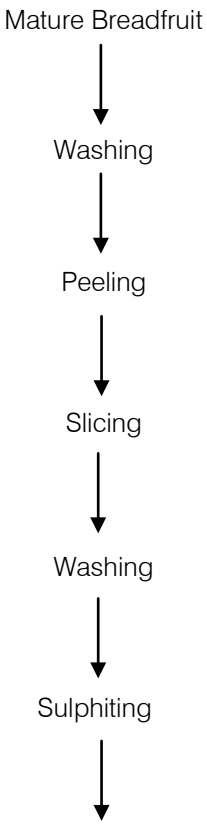


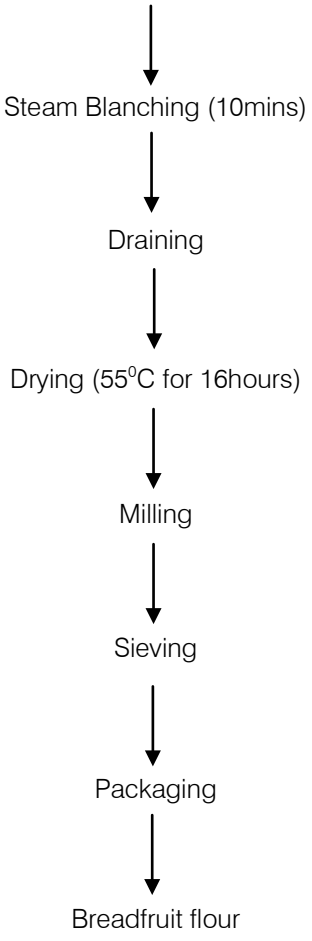
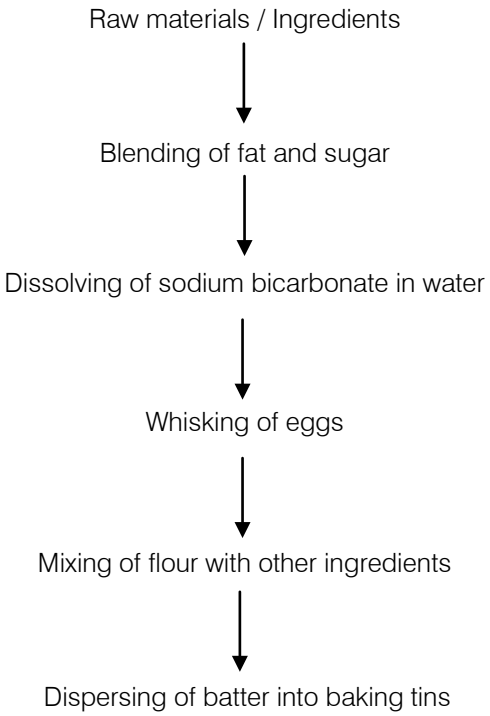


Figure 1 : Flow Chart for the Processing of Breadfruit Flour.



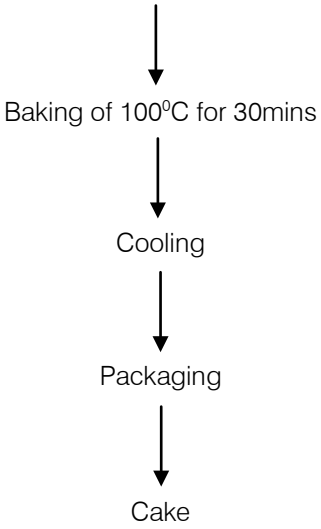


Figure 2 : Flow Chart for Cake Processing.

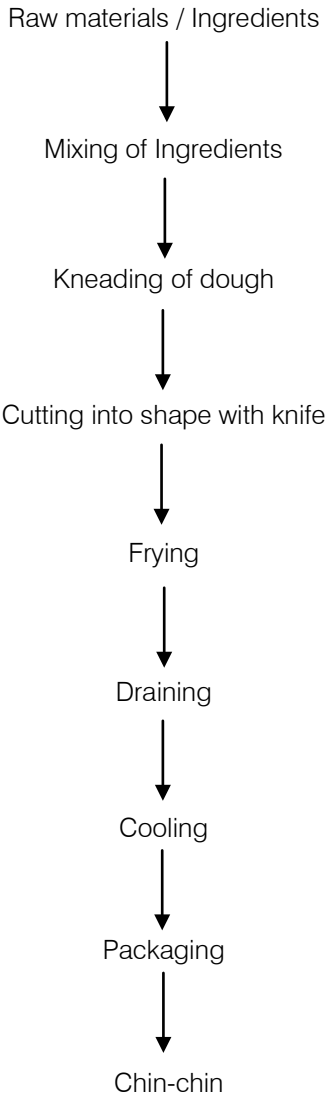


Figure 3 : Flow Chart for Chin-Chin Processing.