QUALITY EVALUATION OF COOKIES FROM WHEAT AND BREADFRUIT COMPOSITE FLOUR

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Abstract
The Quality evaluation of cookies from wheat and Breadfruit composite flour was studied. Breadfruit was processed using three different techniques i.e. Sulphiting, blanching and the control (no treatment). The breadfruit flour was supplemented with wheat at levels of 0, 10, and 20 for cookies production. The proximate compositions, sensory qualities, physical parameters of the cookies were evaluated. There was a significant difference (P<0.5) in the percentage composition of moisture content, crude protein, fat and carbohydrate but the crude fiber and ash did not show any significant difference (P<0.05). The diameter, thickness, weight, height and spread ratio ranges are 57.06-55.38 mm, 6.07-4.68 mm, 60.58-46.63 g, 23.38-30.37 mm and 2.42-1.9 respectively. There were no significant differences (P>0.05) between the diameter, thickness, height and spread ratio but there was a significant difference between the weight of the cookies, meanwhile sensory evaluation showed that the cookies produced were significantly different (p>0.05) in terms of all the sensory attributes tested but there were no significant differences in the flavor of all the wheat-breadfruit cookies produced. Therefore sample C and G which are 10% Sulphited and 10% Blanched Breadfruit flour (SBF and BBF) substituted with wheat flour were recommended due to their performance after being subjected to series of experimental analyses.

Keywords: cookies, breadfruit, wheat, quality, flour

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1.INTRODUCTION

Cookies are snacks that are popular and widely consumed all over the world by people of all ages. The "cookie" as it is known in the USA, or the "biscuit" as it is known in the UK is a small product usually of flat shape baked to a moisture content of less than 5% comprising three major ingredients: flour, fat and sugar (Manley, 2001; Pareyt and Delcour, 2008).They are ready-to-eat, convenient and inexpensive food product, containing digestive and dietary principles of vital importance (Kulkarni, 1997).

Breadfruit (*Artocarpus altilis*) is a traditional staple crop grown for its starchy fruit throughout Oceania (Ragone, 1997).It 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). It produces its fruit up to three times in a year and the number of fruits produced is very high. The fruit has been described as an important staple food of a high economic value (Soetjipto and Lubis, 1981). The objective of this work was therefore to provide information on the proximate composition and sensory acceptability of the cookies produced from breadfruit-wheat composite flour

2. MATERIALS AND METHODS

2.1 Materials

The breadfruit were purchased from the Oba market in Akure, Ondo state Nigeria. Also, the Wheat grain, sugar, salt, margarine, milk powder, and flavoring agents were sourced from the same location as the breadfruit. All the chemicals and reagents used were of analytical and productive grade.

2.2 Methods

2.2.1 Production of cookies from composite flour (wheat flour + breadfruit flour)

The raw materials used include flour (wheat and breadfruit flour 100g), sugar (33.3g), margarine (33.3g), egg (2 teaspoons), and milk (10g). These were weighed appropriately. All the ingredients except flours were mixed thoroughly in a kenwood mixer (a 3-speed hand mixer), it was then transferred to a bowl. The flour was added to the mixed ingredient and mixed for 15minutes until smooth dough was obtained. The dough was kneaded and cut into the desired shape after which they were baked at 180℃ for 20 – 25 minutes. After baking, the hot cookies were removed from the pan and placed on a clean tray to cool down. The cookies were then packed after cooling in polyethylene sachets of appropriate thickness and permeability using an impulse sealing-machine prior to further analysis. The flow chart for the production process of cookies is shown in figure 1.

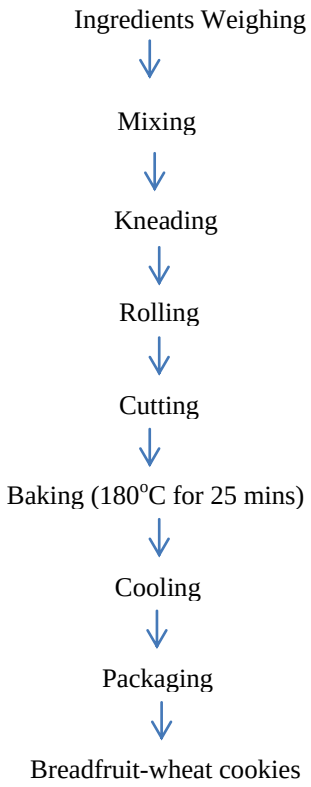

Figure 1: Flow chart of breadfruit-wheat cookies production

3. RESULTS AND DISCUSSIONS

3.1 Proximate composition of cookies from breadfruit-wheat composite flour

Table 1 shows the proximate composition (%) of cookies samples from breadfruit-wheat composite flour. There was a significant difference ($P<0.5$) in the percentage composition of moisture content, crude protein, fat and carbohydrate. This may be due to different processing techniques the breadfruits were subjected to, the ingredient used during the production of the cookies more so that the cookies were produced from different composition ratios. However there was no significant difference ($P<0.5$) in percentage composition of crude fiber and ash, this may be due to the fact that the samples were almost the same in terms of raw materials used (breadfruit and wheat) and were not subjected to severe processing such as frying, roasting etc. that could cause changes in the crude fiber and ash content. The values of moisture content ranges from (2.44- 4.58%) with sample F having the highest value; this suggests that the flour blends will have a longer shelf life compared to flours with higher moisture content.

The values of the fat content ranges from (11.98-13.56%). Cookies made from 100% wheat have the lowest fat content (11.98%) while cookies from 10% BBF had the highest value (13.56%) which justify that breadfruit flour has higher fat content compared to wheat flour 2.8 and 1.87 respectively. Olaoye *et al*. (2007) and Ajani *et al*. (2012) reported the same trend. 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). The value of crude fiber ranges from (2.95-3.13%).10% SBF had the highest crude fiber content which is as a result of the crude fiber content present in the breadfruit flour.

Table 1: Proximate composition (%) of cookies samples from breadfruit-wheat composite flour.

Samples	Moisture	Fat	Crude Fiber	Ash	Protein	Cho
A	3.55±1.00^{b}	11.98±0.02^{d}	3.10±0.05^{a}	0.95±0.11^{a}	14.44±0.10^{a}	65.98±0.78^{cd}
B	4.34±0.25^{a}	12.75±0.25^{c}	3.13±0.23^{a}	1.11±0.07^{a}	12.08±0.00^{d}	66.60±0.15^{c}
C	2.44±0.37^{c}	13.04±0.10^{b}	3.13±0.28^{a}	0.96±0.10^{a}	12.78±0.18^{c}	67.66±1.01^{b}
D	2.65±0.19^{c}	13.14±0.26^{b}	3.05±0.25^{a}	0.95±0.10^{a}	11.20±0.18^{e}	69.02±0.12^{a}
E	2.80±0.14^{bc}	13.20±0.13^{b}	3.03±0.23^{a}	1.16±0.43^{a}	12.08±0.00^{d}	67.74±0.47^{b}
F	4.58±0.19^{a}	13.14±0.13^{b}	3.10±0.10^{a}	1.10±0.05^{a}	12.78±0.18^{c}	65.30±0.03^{d}
G	2.65±0.24^{c}	13.56±0.04^{a}	2.95±0.00^{a}	1.31±0.16^{a}	13.91±0.09^{b}	65.61±0.27^{d}

KEY: values with same superscript within each column are not significantly different (p>0.05)
A=100% Wheat, E=20% Blanched Breadfruit flour (BBF), B=20% Sulphited Breadfruit flour (SBF), F=10% Untreated Breadfruit flour (UBF), C=10% Sulphited Breadfruit flour (SBF), G=10% Blanched Breadfruit flour (BBF), D=20% Untreated Breadfruit flour (UBF

Table 2: Physical parameters of cookies from breadfruit-wheat composite flour

Samples	Diameter (mm)	Thickness (mm)	Weight (g)	Height (mm)	Spread Ratio
A	56.45±2.01^{a}	5.92±0.44^{a}	50.35±0.01^{c}	29.62±2.22^{a}	1.92±0.20^{a}
B	57.06±1.21^{a}	5.94±0.51^{a}	59.39±0.01^{b}	29.68±2.53^{a}	1.93±0.12^{a}
C	56.78±1.09^{a}	5.88±0.27^{a}	60.58±0.01^{a}	29.40±1.36^{a}	1.93±0.08^{a}
D	55.96±0.22^{a}	5.22±0.90^{a}	46.71±0.01^{f}	26.10±4.52^{a}	2.19±0.41^{a}
E	56.94±0.87^{a}	5.28±0.83^{a}	48.61±0.01^{d}	26.40±4.15^{a}	2.20±0.39^{a}
F	55.38±0.37^{a}	4.68±0.86^{a}	48.58±0.00^{e}	23.38±4.31^{a}	2.42±0.40^{a}
G	55.74±1.66^{a}	6.07±1.44^{a}	46.63±0.00^{g}	30.37±7.20^{a}	1.91±0.51^{a}

KEY: values with same superscript within each column are not significantly different (p>0.05)
A=100% Wheat, E=20% Blanched Breadfruit flour (BBF), B=20% Sulphited Breadfruit flour (SBF), F=10% Untreated Breadfruit flour (UBF), C=10% Sulphited Breadfruit flour (SBF), G=10% Blanched Breadfruit flour (BBF), D=20% Untreated Breadfruit flour (UBF)

Table 3: Sensory qualities of cookies from breadfruit-wheat composite flour

Samples	Colour	Flavour	Texture	Taste	Over all acceptability
A	8.30±0.48^{a}	6.90±1.20^{a}	7.50±0.97^{a}	7.40±1.17^{a}	8.20±0.42^{a}
B	6.70±1.25^{b}	6.60±1.17^{a}	6.40±1.35^{b}	6.10±1.37^{b}	6.80±1.23^{b}
C	7.40±0.31^{ab}	7.10±1.10^{a}	7.20±0.79^{ab}	7.50±1.35^{a}	7.70±0.82^{ab}
D	7.00±0.82^{b}	6.40±1.07^{a}	7.20±0.79^{ab}	7.00±0.94^{ab}	7.20±0.79^{b}
E	6.90±1.20^{b}	6.60±1.34^{a}	7.30±0.95^{ab}	7.10±0.74^{ab}	7.30±0.95^{b}
F	6.80±0.92^{b}	6.60±0.97^{a}	6.50±1.27^{ab}	6.80±0.92^{ab}	7.10±0.74^{b}
G	6.60±1.35^{b}	6.90±1.66^{a}	7.10±1.10^{ab}	7.10±0.99^{ab}	7.40±1.17^{ab}

KEY: values with same superscript within each column are not significantly different (p>0.05)
A=100% Wheat, E=20% Blanched Breadfruit flour (BBF), B=20% Sulphited Breadfruit flour (SBF), F=10% Untreated Breadfruit flour (UBF), C=10% Sulphited Breadfruit flour (SBF), G=10% Blanched Breadfruit flour (BBF), D=20% Untreated Breadfruit flour (UBF)

This observation is also supported by (Ajani *et al*., 2012). The values of ash content obtained from the samples during this study ranged from (0.95-1.31%).10% BBF had the highest ash content and all the cookies made from breadfruit-wheat flour blends are higher in ash content compared to cookies made from wheat flour. This result is comparable to those reported by (Oshodi 1996; Ishaya and Oshodi, 2013) .The ash content of a food material could be used as an index of mineral constituents of the food because ash is the inorganic residue remaining after the water and organic matter have been removed by heating in the presence of an oxidizing agent (Sanni *et al*., 2008). The protein and carbohydrate content values ranges from (14.44-11.20%) and (69.02-65.30%) respectively. Cookies from 100% wheat flour had the highest value of protein content which justifies that wheat flour is higher in protein content than breadfruit flour and cookies from 20% (UBF) had the lowest value of protein content with the highest value of carbohydrate content. Cookies from breadfruit-wheat flour had high carbohydrate content which justify that breadfruit is a starchy crop. This observation may be attributed to the high content of carbohydrate in breadfruit than breadnut and the higher carbohydrate content in the breadnut (Malomo *et al*., 2011)

3.2 Physical properties of breadfruit-wheat cookies

Table 2 shows the physical properties of breadfruit-wheat cookies. The diameter, thickness, weight, height, spread ratio ranges from 57.06-55.38mm, 6.07-4.68mm, 60.58-46.63g, 23.38-30.37mm and 2.42-1.91. There were no significant differences (P>0.05) between the diameter, thickness, height and spread ratio but there was a significant difference between the weight of the cookies. The differences between the weights of the cookies may be due to the different processing techniques the breadfruit flour was subjected to and the levels of substitution of the breadfruit with wheat flour.

3.3 Sensory qualities of cookies from breadfruit-wheat composite flour

The results of sensory evaluation are shown in table 3. Sensory evaluation showed that the cookies produced were significantly different ($p>0.05$) in terms of all the sensory attributes tested but there were no significant differences in the flavor of all the wheat-breadfruit cookies produced. This result is actually contradictive to Olaoye *et al*.(2007) ; The analysis of variance showed that the BSBs were not significantly different ($p<0.05$) from the WWB up to 20% in terms of all sensory attributes, and up to 26% with respect to texture, appearance and general acceptability. In terms of crispiness, aroma and taste, the 20 and 25% BSB were not significantly different from each other at the same probability level.

4. CONCLUSION

The quality parameters of the cookies were affected by the processing techniques employed in the study. However, breadfruit is a crop that contains a reasonable amount of protein and its use in food formulation will provide a cheap source of protein to people that can hardly afford high proteineous food. Therefore, its cultivation can be encouraged throughout the country so as to generate high income for famers and resuscitate the market for this important local crop by improving its utilization industrially and domestically.

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