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Full Length Research Paper

Sensory evaluation of wheat/cassava composite bread and effect of label information on acceptance and preference

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The performance of 10, 20 and 30% cassava composite bread was carried out by evaluating the colour, aroma, texture, acceptability and buying preference. The samples were served to semi-trained panelists. The result showed that bread baked with 10 and 20% composite flour were not significantly different in all sensory attributes, acceptability and readiness to buy from the control. However, bread baked from 30% composite flour showed low mean scores to all the attributes. There was a tendency for bread baked with 10 and 20% composite flour to be rated higher than the control especially in flavour, acceptability and desire to buy. Uniformity in the scores between all labeled and unlabelled samples was also observed. Values obtained for proximate composition of cassava composite bread samples were comparable to those obtained for whole wheat bread. Adoption of wheat/cassava flour for bread making is advocated in this work as an alternative to 100% wheat.

Key word: Wheat/cassava composite bread, acceptability.

INTRODUCTION

The major or mandatory ingredients in bread making are flour, water and yeast (Akobudu, 2006; Osuji, 2006). The flour should have good amylase activity, the moisture content should be less than 14% and the colour or appearance should be satisfactory (Giami et al., 2004). Due to the high cost, geographical scarcity and high demand of wheat flour, efforts are been directed toward the provision of alternative source of flour. For example, Horsefall et al. (2007) reported that composite bread can be made by substituting 5, 10, 15, 20 and 30% plantain flour for wheat flour. Cocoyam flour is a good substitute for wheat flour in bread making (Essien, 2006). According to Idowu et al. (1996), the possibility of using starchy staples for bread making depends on the physical and chemical properties of the product. On the light of this, cocoyam, cassava, taro and other tubers crops have been found to be an alternative source of major raw materials for bread making (Edward, 1974; Giami et al., 2004). Nigeria and most developing countries are largest importer of American red winter wheat (David, 2006; FAO/GIEWS, 2001; Edema et al., 2005). This implies that these countries are totally dependent on foreign country for their bread production. Therefore the use of cassava flour for production of baked goods if feasible would help to lower the dependency of developing nations on imported wheat. Cassava (*Manihot esculenta* Crantz) is a perennial crop, it grows well in the tropical poor soil and can withstand drought. Nigeria is rank highest in the production of cassava (DYFMC, 2002; IITA, 2005; Oke, 1969). In spite of its high cyanide content, cassava products with encouraging international market efforts are being made to achieve the quality standards especially if processed to reduce its cynide content (Damarajati et al., 1993; FAO/WHO, 2004; Rosling, 1987). According to Giami et al. (2004) and Akubundu (2005), up to 20% substitution of cassava flour had no adverse sensory and organoleptic effect on bread while more development was still being expected. In addition at the high temperature required for baking, cyanides are easily gotten rid

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Table 1. Proximate composition of bread samples.

Parameter	A	B	C	D
Moisture (%) w/w	18.10	18.00	20.00	17.17
Ash (%)	1.40	1.39	1.72	1.71
Crude protein (%)	12.00	11.32	10.08	9.37
Lipid (%)	1.73	2.33	1.48	1.15
Fiber (%)	1.86	0.43	0.86	0.66
Carbohydrate (%)	87.00	87.14	82.33	88.00
Energy (Kcal/l00 g)	400.00	400.81	400.00	399.11

*where A, B, C and D are 100%, 90, 80 and 70% wheat bread respectively.

of the flour (Edward, 1974; Enresto et al., 2002; Howlett et al., 1990; Oluwole et al., 2000; Okaka and Isieh, 1990; NAFDAC, 1993).

The present study is aimed at assessing the suitability and acceptability of cassava composite bread through proximate and sensory evaluations.

MATERIALS AND METHODS

100% hard winter wheat flour was obtained from the Niger Mills, Calabar, Tms (4) 1425 cassava variety was obtained from a local farmer, the oven was fabricated locally, yeast, fat, baking powder, sugar, salt were obtained from the baking shop, all in Ikot Ekpene, Nigeria.

Preparation of cassava flour

The cassava tubers were peeled between 10 and 24 h post-harvest, washed, sliced thinly with a papaya shredder. The shredded cassava was washed with enough water to remove part of the starch and water allowed to drain. It was thinly spread on a clean concrete surface on a straw mat and left in the sun for about 11 h until it became brittle. The brittle shredded cassava was ground through a corn meal grinder and passed through a No. 120 mesh sieve (Burman, Germany). The cassava flour was packed in plastic buckets.

Preparation of composite flours

10, 20 and 30 part by weight of cassava flour were intimately mixed with 90, 80 and 70 part by weight of 100% wheat flour to obtain 10, 20 and 30% of cassava/wheat composite flour respectively. They were stored in flour sack in a dried condition for use.

Preparation of dough

100% wheat flour dough was prepared according to the method used by Akubundu, (2004). The composite flour dough was prepared and baked according to the method specified by the National Root Crop Research Institute, Umudike, (IITA, 2005; Giami et al., 2004; Eddy, 2004).

Chemical analysis

4 bread samples, 100% wheat, 90, 80 and 70% composite flour bread were analysed for moisture, dry matter, ash, proteins and fat contents using analytical methods recommended by A. O. A. C (1995) and James (1984).

Sensory evaluation

The 3 samples of composite bread and the control were served to a 10 semi-trained panelists made up of a population of staff and students of Akwa Ibom State Polytechnic, who were familiar with the sensory attributes - taste, aroma, texture, colour, of the samples. A 9-point hedonic scale was designed to measure the degree of preference of the samples. The samples were presented in identical containers, coded with 3-digit random numbers served simultaneously to ease the possibility of the panelists to re-evaluate a sample. The categories were converted to numerical scores ranging from 1 to 9, with 1 as the highest and 9 at the lowest level of preference (Bushman and Stack, 1996; Christenso, 1992; Iwe, 2002). Necessary precautions were taken to prevent carry-over flavour during the tasting by ensuring that panelists passed a piece of lemon fruit in their mouths or rinsed with water after each stage of sensory evaluation.

Experimental design and statistical analysis

All the data were subjected to analysis of variance (ANOVA) (completely randomized design). Mean values were compared at $p < 0.05$ significant level using LSD. SPSS statistical software was used for the analysis (SPSS. for Windows, 2000).

RESULTS AND DISCUSSION

Table 1 shows the result of the proximate composition of the cassava-wheat composite bread samples. From Table 2, it can be seen that the moisture content of the samples ranged from 18.10 to 11.17%. At the baking temperature (which is normally greater than 100°C) the moisture content of the raw samples must have been greatly reduced. However, different food materials have different capacity for absorbing/retaining moisture which may exist as occluded or absorbed water. As a result, it can be deduced that even at the high baking temperature, some moisture will be found in the samples as observed during the study (Eddy, 2004; James, 1984).

Crude protein content of whole wheat and composite bread samples were 12.00%, 11.32%, 10.08% and 9.57% for sample A, B, C and D respectively. The protein contents decreased as the amount cassava flour increases. Generally, the protein content of all the samples were relatively low because wheat and cassavas are poor sources of protein (Oyenuga, 1992; Okaka et al., 2002), Ether extract, were found to be low in value in all

Table 2. Mean score for hedonic sensory attributes of samples.

Samples	Colour	Taste	Aroma	Texture	Preference	Acceptability
100R	8.50^a	8.50^a	8.40	8.60	8.40a	7.90^a
70L	7.70^b	7.40^c	7.00	5.40	7.90^c	7.90^b
80L	7.80^a	7.80^b	7.80	7.80	7.80^c	7.80^b
90L	7.10^c	8.30^b	8.30	8.00	8.10^b	8.30^a
70NL	6.60^a	7.80	7.80	5.70	7.80^c	7.80^b
80NL	8.20a	8.10	8.20	8.10	8.10^b	8.10^b
90NL	8.10^a	8.10	8.10	8.10	8.10^b	8.10b

Mean scores in columns with same letters are not significantly different ($p < 0.05$).
100R = 100% wheat flour bread, 70L = 70% composite flour bread (labeled), 80L = 80% composite flour bread (labeled), 90L = 90% composite flour bread (labeled), 70NL = 70% composite flour bread (unlabeled), 80NL = 80% composite flour bread (unlabeled), 90NL = 90% composite flour bread (unlabeled).

the samples and control, 100% (1.73%), 90% (2.33%), 80% (1.48%), 70% (1.15%) respectively, These values were comparable to values reported by Ekop et al., (in press) for some bread sold in Akwa Ibom State. Generally, the fat content of the bread decreased in the order of supplementation. This shows that the composition of the bread samples may have had a negative effect fat content. However, there was not significant difference between the fat contents of all-wheat flour bread and the composite flour bread.

Fibre showed an increase from all-wheat-flour to 10% flour 100% (1.01%), 90% (1.43%), 80% (1.88%), 70% (1.93%) respectively. The fibre content of the composite bread samples were higher than those of 100% wheat bread and tend to increased as the level of supplementation increases.

The nutritional roles of fibre have not been fully established but it is known that fibre contributes to the health of the gastrointestinal system and metabolic system in man. Because crude fibre consists of cellulose and lignin, its estimation affords an index for evaluation of dietary fibre whose efficiency has been implicated in a variety of gastrointestinal disorder. By increasing intestinal mobility, fibre causes increased transit time for bile salt derivatives as deoxycholate, which are effective chemical carcinogen, hence reducing incidence of carcinoma of the colon.

The carbohydrate of the bread samples ranged from 77.00 to 88.87% with higher values obtained in composite flour bread compared to the 100% wheat bread. This observation may be attributed to the high content of carbohydrate in cassava. According to Enwere (1998), of all the solid nutrients in roots and tubers, carbohydrate predominates. Carbohydrate supplies quick source of metabolisable energy and assists in fat metabolism.

The ash content of the composite bread samples were 100% (1.40%); 90% (1.39%); 80% (1.72%) and 70% (1.71%) respectively. Generally the ash content of composite breads increases the level of supplementation increases implying that the inorganic nutrients in the composite bread is richer than that of wheat bread.

The crust colour scores for the colour of the bread samples ranged from 6.60 to 8.50 with the highest score been recorded for 100% wheat bread. The observed scores show that the level of supplementation of cassava flour in composite bread does not reduce the caramilisation process which forms the brown colour during baking. The rating for the taste of the produced composite breads were comparable to those of 100% wheat bread and ranged from 7.40 to 8.50; no panelist showed a total dislike for the taste of any of the samples, implying that the taste of the samples was not affected by the level of supplementation. Aroma is related to taste, this attribute showed a high level of correlation ($r = 0.776$, $\propto = 0.01$), with taste. A good level of aroma intensity influences taste. The texture of samples ranged from 5.40 to 8.60 with the highest obtained in the control and lowest in the 30% substituted composite bread. This showed that the level of supplementation influences the quality of dough that could provide the texture known for bread. The results for 10 and 20% substituted breads were comparable to that of the control. This suggests that the quality of bread that can be produced from wheat-cassava flours mixtures depends on the level of substitution.

Preference to buy the samples scored a mean that ranged from 7.90 to 8.40 with the highest been recorded for 100% -wheat bread, and lowest for 30 and 20% cassava substituted composite breads. However, the acceptability of the samples was comparable to the mean score of the control. It was also noticed that the label information on nutrition, the composition of the composite flour did not significantly ($p = 0.824$) affect the acceptability and preference of the samples, this may have been caused by the good taste and aroma of the samples and long period of consumption of cassava without cyanogenic toxicity.

Conclusion

Although the proximate composition of the composite breads were slightly different from that of 100% wheat bread, it has been found that bread baked with 10 and 20% composite flour were not significantly different in most sensory attributes, acceptability and readiness to buy from the control. Bread baked from 30% composite flour showed low means score to all the attributes. There was a tendency for bread baked with 10 and 20% composite flour to be rated higher than the control especially in aroma, colour, flavour, general acceptability and preference to buy. There was uniformity in the scores between all labeled and unlabelled samples, indicating that nutrition information label on percentage composition of cassava flour did not significantly lower acceptability and preference of the samples. These results showed that the 10 and 20% wheat/cassava composite flour bread recipe could be a viable alternative to achieve the desired economic, food security and health.

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