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NUTRITIONAL AND SENSORY QUALITY OF BREAD PRODUCED FROM COMPOSITE FLOUR OF WHEAT AND CASSAVA

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Abstract
The study produced bread (a daily asset on every table) samples using two kinds of flour, i.e. cassava and wheat (wheat, being the dominant ratio). A standard baking method was employed. Results pinpointed that macro-nutrient content was similar in all the samples, noting that Sample A had a higher value of moisture (24.79%), fibre (1.44%) and protein (13.0%). Sample B (90:10) had an appreciable amount of carbohydrate (59.82%), protein (12.32%) and moisture (23.70%). Sample C had the highest amount of ash (2.23%), energy (314.04 kcal) and carbohydrate (64.1%) when compared with the first two samples. Sensory evaluation showed that Sample A was preferred by the panellists; there was a significant difference ($P \leq 0.05$) in the sensory attributes (appearance, texture, taste) of the products. A new variety of bread can be produced to encompass a good nutrient profile, leading to healthy living through a proper diet.

Keywords: Bread, wheat, cassava, sensory quality, composite flour

Introduction

Bread is known to be one of the world's frequently consumed staples; it is prepared by mixing dough and later baked in an oven. In every culture, nation and dispensation, bread is a diet that is as old as time. The bread recipe can be varied by the inclusion of one or more optional ingredients, or unconventional ingredients, resulting in a wide range of bread types, shapes, sizes and textures. Yeast is the agent that leavens bread or makes the dough rise, before baking; a condition known as proofing. By preference, some products are left unleavened due to religious or traditional practices (Wikipedia, 2024).

The main ingredients when baking bread include flour, sugar, warm water and yeast (Akobodu, 2006; Osuji, 2006). The quality of flour used, from experience, is known to be standard; complaints are rarely heard of. Bread is famous because it is served with other types of food items like fried eggs, milk, tea, butter, *akara*, mayonnaise, *moimoi*, etc. It is also eaten as a snack (instant food) or used as an ingredient in other food preparations.

Despite the high profile of benefits of eating bread, improvement is always welcome, making people try other food substances that can serve as a source of flour. For example, Horsfall et al. (2007) said that bread can be made from a blend of wheat flour and plantain flour in a ratio of 80:20. Starchy foods are important and can yield flour for bread making. Other foods or raw materials which can be processed into flour include cocoyam, cassava, yam, and potato (Edward, 1974; Giam *et al*, 2004).

Cassava is widely cultivated in Ghana, Nigeria and other African countries. It thrives in the tropics, and is a life-saver, in the face of global economic hardship. It is classified as a starchy root, and dense in

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energy supply. The leaves may contain some minerals and vitamins, but these leaves are not consumed as vegetables (at least by Nigerians). Even when the starchy root is processed into *gari* or *fufu*, it is prepared (cooked) and eaten with popular vegetables like *ugwu*, bitter leaf, *efo*, beni seed and *egusi*/melon seeds made into soup. The taste is one of a kind and appetizing. It is the combination of cassava meal with different soups that makes it worthy to be described as nutritious.

Other anti-nutritional agents may be present in cassava; it is reported that it contains anti-carcinogens, and some antioxidants, which play crucial roles in the body system. (FAO, 2004; Roseling, 1994). Among the compounds found in cassava, cyanogenic glycosides seem to stand out, right from the onset. It is believed to have an adverse effect on the eyes (vision), but the good news is that the amount of cyanide is greatly reduced during peeling and later during the fermentation process of the product. Cassava is only dangerous when eaten raw (Ajmera & Elliot, 2023). The inclusion of meat and fish in soups while eating cassava meal will help to remove cyanide from the body because protein is a removal agent of cyanide (Ajmera & Elliot, 2023).

Giam *et al*. (2004) opined that using 20% cassava flour by substitution had acceptable preference during the organoleptic assessment. Some cassava species are known to be yellow, this may suggest that they contain carotenoids, though in small quantity. The Agricultural sector may develop ways to enhance this feature.

Cassava (Manioc) flour is gluten-free, and this makes it a suitable option for those with gluten intolerance or celiac disease. This suggests that the making of baked products using 80% cassava flour should be encouraged.

Commercially, every country trades in wheat more than they do with other crops. Cash crops also play a prominent role in commercial activities, but wheat remains superior (Curtis et al., 2002). A variety of convenience foods produced from wheat flour include cookies, breakfast cereal, oatmeal, biscuits, etc (Cauvain *et al.*, 2003).

Materials and Methods

Wheat flour was purchased from Oja Oba in Owo, while the cassava flour was bought from a local farmer and the oven was fabricated locally. Other ingredients like yeast, fat, baking powder, sugar and salt were bought from a Provision shop.

Methods

Preparation of cassava flour

The cassava tubers were peeled, washed, sliced and shredded. The resulting mash was washed with water to remove excess starch and drained. It was spread on a clean concrete surface using a straw mat and dried in the sun. The dried sample was sent to a miller and stored in a plastic container, awaiting further use.

Preparation of Wheat flour

Suitable wheat flour was obtained from the marketplace. Stones and unwanted impurities were removed from the wheat flour by sieving. The flour was measured for the bread-making process.

Preparation of composite flour

10 and 20 parts by weight of cassava flour were intimately mixed with 90 and 80 parts by weight of 100% wheat flour to obtain 10 and 20 % of cassava/wheat composite flour respectively. They were stored in flour sacks in a dry condition before use.

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Production of Bread

The bread samples were produced in batches by mixing and kneading manually each of the flour blends with the ingredients using a stainless bowl. After thorough kneading in each case, the dough was allowed to prove and develop for 15 minutes before being knocked back and moulded into a cylindrical shape. After moulding, the dough was placed in greased baking pans where it was to be cooked for 40 minutes at room temperature before it was baked in an oven at 220°C for 25 minutes. After baking, the samples were removed from the oven, removed from the pans using padded gloves or napkins, and placed on a table to cool.

Proximate Analysis of Cassava/ Wheat Composite Bread

Three bread samples 100% wheat, 90 and 80 % composite flour breads were analysed for moisture, ash, proteins and fat content using the analytical method recommended by A.O.A.C (2005). Moisture was determined by oven drying at 105°C for 24 hours. Ash by dry ashing method in a muffle furnace. Crude fibre by a modified Weede method. Fat was by Soxhlet extraction. Protein was determined by the Micro-Kjeldahl procedure. Carbohydrate was estimated by difference.

Result and Discussion

Table 1: Proximate composition of the Bread samples

Parameters	Sample A	Sample B	Sample C
Moisture (%)	24.79 ± 0.06^{a}	23.70 ± 0.03^{b}	20.10 ± 0.01^{c}
Ash (%)	1.92 ± 0.01^{b}	1.99 ± 0.06^{b}	2.23 ± 0.02^{a}
Fat (%)	2.33 ± 0.02^{a}	1.73 ± 0.02^{b}	1.48 ± 0.05^{c}
Protein (%)	13.00 ± 0.01^{a}	12.32 ± 0.01^{b}	11.08 ± 0.01^{c}
Fibre (%)	1.44 ± 0.02^{a}	1.34 ± 0.02^{b}	1.03 ± 0.00^{c}
Carbohydrate (%)	56.93 ± 0.02^{c}	59.82 ± 0.01^{b}	64.1 ± 0.01^{a}
Energy Value (kcal/100g)	300.69 ± 0.06^{c}	304.13 ± 0.02^{b}	314.04 ± 0.01^{a}

Values with different superscripts in each *row* are significantly different ($P<0.05$)
Key:
A = 100% wheat bread
B = 90% wheat flour with 10% cassava flour composite bread
C = 80% wheat flour with 20% cassava flour composite bread

Table 2: Mean score for hedonic sensory attributes of the samples

Samples	Appearance & Colour	Texture	Flavour	Taste
Sample A	5.3 ± 0.02^{a}	4.9 ± 0.01^{a}	4.9 ± 0.01^{a}	5.0 ± 0.02^{a}
Sample B	5.2 ± 0.01^{b}	4.4 ± 0.01^{b}	4.6 ± 0.01^{b}	4.7 ± 0.01^{b}
Sample C	4.3 ± 0.02^{c}	4.1 ± 0.01^{c}	4.5 ± 0.01^{c}	4.5 ± 0.02^{c}

Values with different superscripts in each *column* are significantly different ($P<0.05$)
Sample A = 100% wheat bread
Sample B = 90% wheat bread, 10 cassava flour
Sample C = 80% wheat bread, 20 cassava flour

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Bread is consumed worldwide as a daily source of energy and other nutrients. It is quick to use (combined with tea) as a breakfast meal because it is already made from the local bakery. This eliminates unnecessary cooking while trying to make it to the office on time.

The approximate composition of the bread samples revealed that the general moisture content was less than 25% (Table 1). This implies that the samples may deteriorate within a week duration, as moisture reduces the shelf life of processed foods. Ash content was significant in sample C with 2.23% (Table 1 and is an indication of minerals present in the product. The fat content decreased in the order of supplementation, indicating that 100% wheat bread had more fat (2.33%) than the others (Table 1). This may be because wheat has more fat than cassava. Crude protein was present in the samples at 13.00%, 12.32% and 11.08% respectively (Table 1). The protein content decreased as the amount of cassava flour increased. Although wheat has some appreciable amount of protein, cassava appears to be a poor source of protein (Oyenuga, 1992). The major protein in wheat is gluten (about 75% of gross protein), and this accounts for the high protein content of the 100% wheat flour bread. Low fibre content (<1.5%) in all the samples may be an effect of the processing method in which wheat grains were milled into flour, and further sieved to ensure smooth flour. Benefits that could be obtained from dietary fibre are minimal when these products are consumed.

Carbohydrates contained in the bread samples ranged from 56.93 to 64.1% with sample C having the highest value (Table 1). The 20% cassava portion may contribute to this energy function, and showcase that tuber roots contain more energy than cereal grains.

Sensory parameters of the samples were assessed, and sample A was preferred above the others (Table 2). This may be because they are familiar with regular bread made from wheat. The little addition of cassava flour to the new samples will impart new tastes and may take time for people to adjust. There was a significant difference ($P<0.05$) in the sensory attributes of the bread products (Table 2). Overall, the samples were well accepted.

Conclusion

The bread was produced using composite wheat and cassava flour. The profile of nutrients is acceptable and beneficial to health. Sample C contained more energy, ash and carbohydrates, while sample A had higher values of moisture, fat, fibre and protein. When these samples are eaten with tea, milk, or fish stew, a balanced diet is obtained, leading to proactive health and nutritional status. The samples were well accepted by the panellists or assessors. People should seek information on healthy eating and lifestyle, to help them make better decisions about food intake.

Recommendation

More work should be done on the anti-nutritional and antioxidant content of bread made from composite flour. Third-world countries should find ways to cultivate wheat and other important crops, to reduce over-dependence on advanced nations.

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