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Organoleptic Attributes of Bread and Biscuit Produced from Composite Flour of Plantain (*musa abb*) and Wheat (*triticum aestivum l*)

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Abstract

This paper assessed organoleptic attributes of bread rolls and biscuits made from wheat and plantain composite flour, with wheat as control. Four kg of unripe plantain was processed into plantain flour and mixed with wheat in a ratio of 70:30, used to bake bread and cake. A 9 point hedonic scale was used to assess organoleptic attributes, Proximate analysis was also carried on product samples. One hundred judges were involved in the study. The result showed that the products had an appreciable protein 10.50%, 13.40% and 8.61% and 8.50%. The sensory texture of the plantain bread ranked 18.6%, wheat bread 20.3% plantain biscuit 17.8%, wheat biscuit 22.4%. All products were acceptable with acceptable percentages; plantain bread 24.2%, wheat bread 22.9% plantain biscuit 20.1%, wheat biscuit 19.4%, respectively. Plantain composite flour products which are acceptable also had a protein content of plantain bread 10.50%, and plantain biscuit 13.40%.

Key words: Organoleptic, Attributes, Acceptability, Biscuit, Bread, Composite.

Introduction

Wheat (*triticum aestivum*) is one of the important cereal grains. Wheat flour which is traditionally used for baked products in Nigeria is becoming more expensive. Wheat can be blended with various types of flours including plantain flour.

Plantain (*musa abb*) is an important staple food in Central and West Africa and other developing countries. International Institute of Tropical Agriculture (IITA,) (2012) reported that in West Africa, plantain production in West Africa was 8,462.530 ton, with Nigeria having a production ton of 2,733.300, Ghana, 3,532.730 and Cote D'voire, as the greatest producers. Plantain (*musa abb*) is among the major staple food crops in Nigeria. It ranked third after yam and cassava in consumption (Oyebade, Adeyemo and Olafide, 2013). It is often consumed, boiled, fried or roasted. Food and Agricultural Organization (FAO, 2004) stated that amidst the over millions of metric tons of plantains that are produced in Nigeria annually, about 35-60% post harvest losses has been reported and attributed to lack of storage facilities and inappropriate technologies for food processing. The unripe plantain is processed into flour and is used for the preparation of plantain gruel when mixed with appropriate quantities of boiling water to form a thick paste. Unripe plantain contains large amount of carbohydrates and some minerals such as phosphorus, calcium,

potassium and vitamin A and B (IITA 2006). Unripe plantain as a plant food contains iron of the non-heme type (Ene-Obong 2001). The unripe plantain is also a rich source of dietary fiber. The three main ways of preparation of plantain for consumption (boiling, roasting and frying) make the consumption of plantain monotonous (Food and Agricultural Organization, FAO, 2003). It therefore becomes necessary to evolve other ways of preparing plantain so as to enhance variety of plantain dishes and plantain consumption. Such ways should also promote processing, storage and preservation of plantain. Processing plantain into flour is a promising way in this direction.

Horsefall (2010) showed that plantain flour has a good potential for use as a functional agent in bakery products on account of its high water absorption capacity. Since unripe plantain composite flour has been found by (Horsefall 2010) to have good baking qualities, it becomes necessary to find a means of incorporating the composite flours for making confectionaries such as if accepted, can be a novel food carrier for plantain consumption because it will add variety to the common ways of consuming it before. This carrier, when established could ultimately become part of the diet of Nigerian. When the unripe plantain is processed into composite flour, it helps in preservation; (Egbebi, and Badamosi 2011). The plantain composite flour contains resistant starch and dietary fiber (FAO, 2004). Resistant starch (RS) is a starch fraction that does not produce glucose to the body and resist enzymatic digestion in the small intestine but fermented in the colon by bacterial microflora, producing gas and short chain fatty acids (IFPRI and WFP 2010). The effects of RS are comparable to those of dietary fiber and it is therefore usually considered as a component of the friction (Olagunju and Ifesan 2013). Composite flour production from unripe plantain presents high variability for the food industry mainly in bakery products and infants feeds because of its free sources of RS and mineral salts such as potassium, iron, calcium, magnesium and surphur (Adelekan, Aminat, Alamu, Ogunfowora, 2003). At the end of this research work, the results might help to provide a novel recipe of baked products in an acceptable form that might increase the consumption of unripe plantain food crops in Nigeria.

Purpose of the Study

The general purpose of the study was to carry out a sensory assessment and acceptability of bread and biscuit products made from plantain (*musa abb*) and wheat composite flour. Specifically, the study,

1. determined the proximate composition of the products produced from processing unripe plantain into plantain/wheat composite flour.
2. determined the acceptability of plantain/wheat bread and plantain/wheat biscuit

Methodology

Material: four kg of unripe plantain fingers were purchase at Eke Ehamufu in Isi-Uzo Local Government Area of Enugu State, Nigeria. The plantain fingers were picked, pilled and sliced into thin slices of about 1/18 inches. The slices were soaked for 3hrs in deionized water to avoid discoloration. Drying was carried out in an air oven at a temperature of 80^{o}c and milled. The flour was stored in an air tight container, and put into the refrigerator.

The plantain/wheat composite flour was formulated at the ratio of 70:30 after one week, margarine, sugar, baking powder, yeast and egg were purchased and panelists were ready for the sensory evaluation.

Recipe for plantain/wheat bread roll (Experiment)		**Recipe for wheat bread (Control)**	
Ingredients	**Weight (g)**	**Ingredients**	**Weight (g)**
Composite flour	50	Wheat flour	50
Nutmeg	4	Margarine	70
Margarine	70	Sugar	50
Sugar	50	Baking powder	37
Baking powder	37	Milk	55mls
Milk	55mls	Vanilla	8
Vanilla	8g	Nutmeg	4
Egg	6	Egg	5
Water	5mls	Water	5mls
Yeast	15	Yeast	15

Procedure for the production of plantain/wheat bread roll.

- Weight the ingredients and set them on a surface table
- Mix the flour, sugar, margarine, salt and baking powder with the finger tips till the mixture looks like bread crumb or fried garri.
- Add the reconstitute powdered milk with the water and add into the mixture.
- Whisk the egg and add to the mixture.
- Add the vanilla and the nutmeg and mix the dough thoroughly. Knit well to incorporate air.
- Use a rolling pin, and roll out, then cut into the desired shape, each weighing 10g.
- Allow to stand for about 2hrs.
- Re roll each dough and set back finally into the greased bread mould and allow standing for another 15mins.
- Bake into pre-heated oven at 100^{o}c for twenty minutes.

Production of wheat bread (control)

Procedure for the production of plantain/wheat bread roll.

- Weight the ingredients and set them on a surface table
- Mix the flour, sugar, margarine, salt and baking powder with the finger tips till the mixture looks like bread crumb or fried garri.
- Add the reconstitute powdered milk with the water and add into the mixture.
- Whisk the egg and add to the mixture.
- Add the vanilla and the nutmeg and mix the dough thoroughly. Knit well to incorporate air.
- Use a rolling pin, and roll out, then cut into the desired shape, each weighing 10g.
- Allow to stand for about 1:30 mins.
- Reroll each dough and set back finally into the greased bread mould and allow to stand for another 15mins.
- Bake into pre-heated oven at 100^{o}c for twenty minutes.

Recipe for Plantain/wheat biscuit (Experiment)		Wheat biscuit (Control)	
Ingredients	**Weight (g)**	**Ingredients**	**Weight (g)**
Composite flour	50	Wheat flour	50
Margarine	70	Margarine	35
Sugar	50	Sugar	25
Milk	55	Milk	25
Baking powder	37	Baking powder	10
Vanilla	8	Vanilla	3
Nutmeg	3	Nutmeg	3
Water	3mls	Water	1.5mls
Egg	6	Egg	3

Procedure for the production of plantain/wheat biscuit

- Weight all the ingredients and set them on a surface table
- Crème the margarine and sugar together.
- Add the liquid ingredients and continue to crème.
- Add the flour bit by bit and continue to mix using cutting and folding method.
- Cut some portion and roll out on a greased rolling bread
- Cut into desired shape using a biscuit cutter.
- Use ice pipe to pipe some of the biscuit into the greased baking tray
- Bake into pre-heated oven for 15 minutes.

Production of plantain/wheat biscuit (control)

- Weight all the ingredients and set them on a surface table
- Crème the margarine and sugar together.
- Add the liquid ingredients and continue to crème.
- Add the flour bit by bit and continue to mix using cutting and folding method.
- Cut some portion and roll out on a greased rolling bread
- Cut into desired shape using a biscuit cutter.
- Use ice pipe to pipe some of the biscuit into the greased baking tray
- Bake into pre-heated oven for 15 minutes.

Sensory Evaluation

***Population of judges*:** One hundred students and 32 members of staff of school at Vocational Education Federal College of Education, Eha-Amufu, Isi-Uzo Local Government Area of Enugu State were used for the study.

***Sample for Judges*:** the population of the judges was made up of 100 students and 32 members of staff of School of Vocational Education, Federal College of Education, Eha-Amufu. One hundred (100) judges were randomly selected comprising 45 males and 55 Females.

***Instrument for Data Collection*:** A 9-point hedonic scale was developed as an instrument for sensory evaluation. The organoleptic attributes evaluated were:

- flavours,
- colour,
- texture, and
- general acceptability of the bread roll and biscuits.

The instrument was validated by five (5) lecturers in the Department of Home

Economics, Federal College of Education, Eha-Amufu.

***Data Collection/Analysis Technique*:** The study was carried out at the Food Laboratory, Home Economic Department, Federal College of Education, Eha-Amufu. The laboratory environment was quiet without interruption. The judges came into the laboratory for the evaluation in batches of 25 persons each. They were served separately one batch after another. Each had a glass of water to rinse mouth after the tasting of each sample. Data were analyzed using mean and standard deviation.

Chemical Analysis

***Moisture Content*:** Moisture was determined by hot air oven drying at 105^{o}c to constant weight Association of Official Analytical Chemists (AOAC, 1990, 1995). Protein ash and carbohydrate micro Kjeidahi, N x 6.25), crude fiber and fat were determined by AOAC (2010). Moisture was determined by placing two grammes of the baked samples in a clean weighted porcelain dish and placed inside the oven to dry. After this, the dishes were brought out again, cooled and re-weighted till the weight became constant. The moisture accumulation was done in percentage.

***Protein determination*:** The sample was weighed into Hach digestion flask and heated for 45 minutes at 44^{o}c till the sample became charred. Clean tap water was added to each sample to clear off the small black particles to obtain a colourless liquid. The flask was allowed to cool and the content was made to 100ml in a 100ml volumetric flask with deionized water, some drops was added in mineral stabilizers and allowed to mix together. Add Nessler's reagents, wait for 5minutes and then calculate:

***Fat determination*:** The sample was added to some meals of a corn oil to a 5ml conical graduated centrifugal tube, stirred to dissolve the sample in the oil. The sample stood for a period of 30 minutes prior to centrifuge at 5000rpm for 25mins, the volume of free oil was reacted. Fat absorption was expressed as the amount of oil bound by long sample on moisture or on dry basis.

***Carbohydrate determination*:** Ethanol was used to extract sugar from the product. The residue was hydrolysed with percarbohydrateric acid to be a monosaccharide. The sugar was made colourimetric using phenol and sulphuric acid. The sugar was analysed by converting residue sugar and multiplying the residue by 0.09. The residue fraudigar analysis was added to some perchoric acid and stood for 1 hour, then the mixture was diluted with distilled water and an adequate of ml was taken for analysis. The colour here developed with phenol and H_2SO_4

***Ash determination*:** Porcelain crucible was washed oven dried and allowed to cool in a dessicator and weighed. The sample was placed inside the already weighed crucible. The product was ignited over a low flame for 3 hours. The crucible was taken out to a dessicator, allow to cool then weighed.

***Crude fibre determination*:** The products were weighed into long beaker containing 200ml boiling water. Sulphuric acid (H_2SO_4) was added, boiled and reflewed for 30minutes. After the boiling, the sample was filtered through Whitemanerf. The residue transferred from the paper bag to the beaker with the aid of hot water 1.25% to NaOH to 200ml of water. The procedure was reflacted – paper was

transferred with residue into a crucible dried over night, cooled in to obtain weight a. The samples were put back in furnace at 600^{o}C to for 3hours and weighed to obtain weight B. The loose in weight occurred during incineration.

Result of the study

Table 1: Proximate composition of bread and biscuit products

Parameters	Plantain bread (PB)	Plantain biscuit PB_1	Wheat bread WB	Wheat biscuitWB_1
Moisture %	5.00	5.13	3.45	3.95
Protein %	10.50	13.40	8.61	8.50
Fat %	9.20	8.80	12.00	8.30
Crude fibre %	19.20	19.32	12.77	10.40
Ash %	3.80	2.85	2.90	1.72
Carbohydrate %	22.30	21.20	20.03	2.20

Table 1 shows the proximate composition of bread and biscuits produced from unripe plantain composite flour and wheat flour. The proximate composition of the experimental bread and biscuit showed that the moisture content of the plantain biscuit had significant differences from that of biscuit and wheat. Plantain/wheat bread and plantain/wheat biscuit had less value; 3.00%, 3.13% as against 5.45% and 5.95% respectively. The protein content of the products in the four samples in the composite flour mixture had appreciable protein more than the wheat control 10.5% versus 8.61% and 13.46% versus 8.50% respectively maybe because of the quantity of eggs incorporated into the mixture. The fat content of wheat bread ranked higher 12.00%, followed by plantain bread 9.20%. The crude fiber of the combine composite flour mixtures ranked higher 19.20%, 19.32% versus 12.97% and 10.40% respectively.

The ash values of the composite products differed from that of the wheat 3.8% and 1.72% respectively. The slight increase in carbohydrate content of the product is not surprise 22.30%, 21.20% versus 20.30% and 20.20%.

Sensory evaluation

Table 2: Sensory Evaluation of the respondents that participated in the study n = 100

Organoleptic attributes	Plantain bread	Plantain biscuit	Wheat bread	Wheat biscuit
Colour	17.9 ± 5.10	14.4 ± 4.8	22.7 ± 7.5	14.4 ± 4.8
Texture	17.8 ± 5.6	18.6 ± 6.2	22.4 ± 7.5	20.3 ± 6.8
Flavour	23.2 ± 7.7	25.3 ± 8.4	20.4 ± 6.8	18.1 ± 6.0
General acceptability	20.1 ± 7.3	24.2 ± 8.1	19.4 ± 6.5	22.9 ± 7.6

PB = Plantain bread, PB_1 = Plantain Biscuit, WB = Wheat bread, WB_1 = Wheat Biscuit.

Table 2 shows that the wheat bread had more appreciable colour 22.7% while that of plantain and wheat biscuit, non had an edge over the other 14.4% versus 14.4%. The test of the products ranked 22.4%, 17.8%, 20.3% and 18.6% respectively. All the four samples had appreciable test acceptance.

The wheat biscuit had more acceptable flavour than all 25.3% while the plantain biscuit had lower ranking 18.1% respectively. The general acceptability of the test samples showed wheat biscuit 15.24%, followed by plantain biscuit 22.9%, wheat bread 21.9% and plantain bread 19.49% respectively.

Discussion

The low moisture content of the PWB and PWB_1 is an indication that the products will have a better shelf life than the WB and WB_1. This is in line with Onimawo and Akubor, (2012) which said that low moisture content of flour product increase it's shelf life. Akubor and Eze, (2012) also indicated that low moisture help in keeping with the shelf life value of the product. The higher ash is an indication that the minerals in the composite flour blends is better than that of wheat may be because of the processing effects of the wheat flour (Omole, Ajasin, Oluokuno and Obi, 2008, in Akubor and Ishiwu, 2003) had already identified the mineral concentration on natural less processed food crops. The higher protein indicated that apart from the iron content of plantain, if animal source is added it will help to increase protein content of the product. Therefore, the higher animal source (AS) in form of eggs added to the mixture increases the protein quality more than the WB and WB1. This is in line with (IFPRI and WFP, 2010) that (AS) increases the protein quality of plant based foods. Moreover, Akubor (2005) had also found out that nutritional enhancement is an advantage in the use of composite food products. The increase carbohydrate in PB and PB_1 shows that plantain is a starchy food. Horsfall 2010 had already discovered that plantain is consumed as an energy yielding food which is predominantly starchy yielding food. The sensory evaluation showed significant difference between the colour of the PB and WB $P<0.04$. The colour of PB_1 and WB_1 had no significant value, the lower texture ratings of the PB and WB_1 might be attributed to the greater water binding capacity of plantain in baked products IITA (2014). The flavour ratings of the responds in the PB and PB_1 are appreciable than the WB and WB_1. Egbebi and Bademosi (2011) had already found out that plantain composite flours has good functional properties that can enable it to be incorporated into baked products, especially bread, which has been identified as playing dual roles of serving as food as well as snacks. The general acceptability of the PB and PB1 might be because people are used to WB and WB_1. This agrees with Olagunju and Ifesan, 2013) who had identified that people like to eat or take new products, especially from plant foods when prepared different from the normal monotony forms which they were known and consumed before. Mature unripe composite plantain flour with wheat mixture has quality products in bakery implication as already said by Egbebi and Badmosi, (2011). They have also identified that mixture unripe plantain composite flour had higher nutrients therefore it is not surprising that the baked products had better qualities. (Oyebode and Olajide, 2013), had also identified that unripe plantain flour promote health and prevent or control diseases like diabetes. Plantain flour has a coarse nature that has fiber and that is why it has higher fiber and ash contents (Horsefall, 2010). Moreover, researchers had already identified plantain as natural source of dietary fiber (Ene-Obong, 2001). The fiber and ash content of the PB_1 and PB are also appreciable 19.20%,

19.32% for fiber and 3.80% and 2.85% for ash.

Conclusion

The study showed that plantain composite flour products had an appreciable shelf life which will be of great help in food security. The product if put into use, can increase intake of dietary fibre which has a low prevalence of chronic disease. The low moisture content ensures the availability of the product all the year round because it stays long after production. The good functional and flavor properties of the products is an indication that the composite flours may be used in producing snacks, especially bread, which serve dual purposes in most families as snacks and main meals. The study helps in the assurance of food security in the country because plantain is a yearly crop that is always available in all the producing areas of the country.

Recommendation

The following recommendations are put in place to help to ascertain more plantain and other food crops that yield much more and some of them are at the verge of extinction.

1. Divulge recipe so that only plantain composite flour can be used for baking.
2. Awareness can be created which will inform Industrialists about the functional quality.
3. More work had to be done on composite flours because of the present nutritional need: consumption of dietary fiber products.

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