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PRODUCTION AND COMPARATIVE PROXIMATE ANALYSIS OF CAKES, BREADS AND COOKIES USING PLANTAIN FLOUR AND POTATOE FLOUR

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Abstract

The study investigated the production and proximate composition analysis of cake, bread and cookies using plantain and potatoe flour. The cake, bread and cookies produced from plantain flour and potatoe flour blends 50:50% in proportion and 100% of plantain flour and 100% potatoe flour respectively. The products were subjected to proximate analysis to determine the moisture, crude protein, crude fibre, crude fat, Dry matter, carbohydrate and were also subjected to sensory evaluation on taste, texture color, appearance and overall acceptability. The results showed that sample A1 (Cake) (100% P) had crude proteins 8.05: ash content 0.40: crude fibre 1.3: fat 9.50: dry matter 85.15, moisture 14.85: and carbohydrate 65.90. Sample A2 (50:50%) had crude protein, 12.25: ash content, 2.10: crude fibre, 1.23: fats 8.90, dry matter, 87.40: moisture, 12.60: and carbohydrate, 62.80. Sample B1 (Bread) (100%) had crude protein, 6.65: ash content, 1.60: crude fibre, 1.33: fats, 8.50: dry matter, 84.30: moisture, 15.70: and carbohydrate 66.22 Sample B2 (50:50%) crude protein, 18.55: ash content, 2.20: crude fibre, 1.20: fats, 11.20: dry matter, 98.10: moisture, 10.90: and carbohydrate, 55.95. Sample C1 (Cookies) (100%) crude protein, 5.60: ash content, 1.80: crude fibre, 1.36: fats, 9.10: dry matter, 85.70: moisture, 14.30: and carbohydrate, 67.84: Sample C2 crude protein, 9.80: ash content, 12.10: crude fibre, 1.29: fats, 9.70: dry matter, 87.57: moisture, 12.43: and carbohydrate, 64.68: respectively. The sensory evaluation of the product showed that the implication of this finding is that cake with 100% plantain flour had higher taste preference potatoe flour. The insignificant difference in overall acceptability of the snacks as well as minimum overall acceptability score of the snacks, which exceeds 13.3 in a 6-point hedonic scales (likeness) scale, indicates that the sensory qualities of snacks product are generally acceptable to the consumer. Cookies with 50% plantain flour and 50% potatoe flour, and cookies 50% plantain flour and 50% potatoe flour are therefore recommended for consumption because of their richness in crude protein and carbohydrates.

Keyword: *comparative, proximate analysis, plantain flour, cookies, bread, cake*

Introduction

There is increased advocacy on the consumption of functional foods by World human nutrition due to different health problems related with food consumption such as diabetes and coronary heart diseases (WHO/FAO, 2003). Food professional/industries might face challenges of producing food products containing functional ingredients in order to meet the nutritional requirements of individuals with health challenges Oke and Adeyemi (1991). This is because of the effect of added sugar and lipids in the industrial production of food products. Oke and Adeyemi (1991) advocated alternative source of food production in tackling food crises. The prospect of blending tubers, roots and plantain with cereals and legumes for the production of household food products is receiving considerable attention (Nnam, 2002; Onoja and Obizoba, 2009). This might make the products to be nutritious, relatively cheap and affordable to the rural poor to stem-off hunger and malnutrition.

Plantain is the common name for herbaceous plants of the genus *Musa*. Plantain (*Musaparadisiaca*) is an important staple food in Central and West Africa. It is a basic food crop and cheap source of energy in Nigeria (Faturoti, 2007; Adeniyi, 2006). Several food consumption surveys in Nigeria identified plantain among the major starchy staples (Odenigbo, 2012; Okeke, 2008; Ogechi, et al 2007). According to FAO (2005), over 2.11 million metric tons of plantains are produced in Nigeria annually. However, about 35-60% post-harvest losses had been reported and attributed to lack of storage facilities and inappropriate technologies for food processing (Olorunda and Adelusola, 1997). An average plantain has about 220 calories and is a good source of potassium and dietary fiber (Randy et al., 2007). It is rich in carbohydrate, dietary fiber, iron, vitamins, and minerals (Olorunda and Adelusola, 1997). This nutritious food is ideal for diabetics, children, and pregnant women. It can also be a good supplement for marasmus patients. Plantain contains small amount of serotonin that has the ability to dilate the

arteries and improve blood circulation. Its regular consumption helps to cure anaemia (low blood level) and maintain a healthy heart (USDA Nutrient Database, 2010). A diet of unripe plantain is filling and can also be a good inclusion in a weight loss diet plan (Oke et al., 1998).

Sweet potato (*Ipomea batatas* L.) is very important vegetable crop food in many countries including Egypt (Burri, 2011). It is a member of the family *Convolvulaceae*, in which there are over 400 *Ipomea* species distributed throughout the tropics, but sweet potato is the only one of economic importance (Burri, 2011). Sweet potato is one among the two important crops: common beans and sweet potato, which help so much in the traditional foods of many countries (Burri, 2011). Beta-carotene-rich sweet potato (also known as orange - fleshed sweet potato) is one of a few new crops, which is both an excellent source of energy and important nutritive substances that can contribute to improve the nutrient status of the community (Burri, 2011).

2. Materials and methods

This study was carried out at the Home and Rural Economics Department, Food Science Laboratory, Oyo State College of Agriculture and Technology Igboora. Plantain and potatoe were purchased from a retail outlet at Towobowo market Iberekodo, Igboora Oyo State, Nigeria and all other baking ingredient such as eggs, baking-powder, fat, milk and flavoring was also be obtained from the same source. Green plantains were soaked in hot water for about 10-15 minutes to soften the peel without causing over blanching. The blanched fruits were then hand peeled and stored in water to avoid browning before slicing. The pulp was sliced with using hand slice. It took 8 man hours to slice 100kg of pulp to a thickness of about 15mm. The slices were placed on standard trays which were loaded in a cabinet dryer for drying. Drying was complete in 6 hours at a temperature not higher than 70°C. The dried slices were milled using hammer mill. Milling was continued until the desired particle size was obtained. Sieves of aperture size 150-850 µm were used to produce flour of different particle sizes as required. The flour produced was graded according to particle size and packaged for use. Potatoe were soaked in lookwarm water for about 9 minutes to soften the peel without causing over blanching. The blanched potatoes were then hand peeled and stored in water to avoid browning before slicing. The pulp was sliced using an automatic hand slice. It took 9 man hours to slice 10kg of pulp to a thickness of about 15mm. The slices were placed on standard trays which were loaded into a cabinet dryer for drying. Drying was complete in 18 hours at a temperature not higher than 70°C. The dried slices were milled using hammer mill. Milling was continued until the desired particle size was obtained. Sieves of aperture size 150-850 (µm) were used to produce flour of different particle sizes as required.

Data analysis

Data were analyzed using proximate analysis the characteristics evaluated were ash, moisture, crude protein, crude fibre, crude fat, carbohydrate and dry matter all data collected were subjected to descriptive tools such as frequency, percentages and cumulative score. In addition, the questionnaire produced was centred on texture, appearance, color, and overall acceptability in the form of excellent, very good, good and average as administered by the respondent.

Method of making bread

Sieve the plantain flour and other flour, add salt to both flour and rub in the fat.

Add sugar, yeast, egg and luke warm water and mix to a soft dough

Knead well until smooth and leave side of bowl (about 10minutes)

Cover dough with a plate or put dough in a plastic bag; put in a warm place to rise 1 hour until double the size

Turn out and knock back the risen dough

Shapes into 2 loaves, place in warm greased bread firm, three quarters full

Cover again, leave to prove (i.e rise) until at top of the tin

Place in hot oven until brown and crisp, reduce heat to 190oc No. bake 30-40minutes

Time: 30-40minutes

Oven temperature: 250oc

Position in oven: middle shelf

Data analysis

The raw and processed (as described below) products were analysed for their nutritional composition using referenced methods. Analytical reagents were used and analysis of nutrients in samples was replicated thrice except otherwise stated.

Results and discussion

The results obtained in the sensory qualities of snacks are presented in Table 1 with their frequencies.

Table 1 proximate chemical composition of snacks produced.

Sample	Percentage (%)	M (%)	CP (%)	CF (%)	CF (%)	Ash (%)	DM (%)	CHO (%)
Bread Sample A1	100% plantain flour	14.85	8.05	1.30 ^a	9.50	0.40	85.15 ^a	65.90 ^a
Cake Sample A2	100% plantain flour	15.70	6.65	1.33 ^b	8.50	1.60	84.30	66.22 ^a
Cookies Sample A3	100% plantain flour	14.85	8.05	1.30 ^a	9.50	0.40	85.15 ^a	65.90 ^a
Bread Sample B1	100% potatoe flour	15.70	6.65	1.33 ^b	8.50	1.60	84.30	66.22 ^a
Cakes Sample B2	100% potatoe flour	14.30	5.60	1.36 ^c	9.10	1.80	85.70 ^c	67.84 ^c
Bread Sample B1	100% potatoe flour	15.70	6.55	1.43 ^b	8.60	1.70	84.30	66.22 ^a
Cookies Sample B3	50% potatoe flour and 50% plantain flour	12.43	9.80	1.19 ^c	8.60	2.03	77.57 ^c	64.68 ^c
Cookies Sample B3	50% potatoe flour and 50% plantain flour	10.43	9.80	1.49 ^c	9.40	2.05	77.57 ^c	74.68 ^c

M= moisture, CB= crude protein, CF= crude fibre, CF= crude fat, DM= Dry matter, CHO= carbohydrate

Moisture content

Although there was no significant difference in moisture content among the various snack with 100% and 50% wheat and plantain under consideration (Bread, cake and cookies). In 100% plantain flour, 100% potatoe flour and 50% of plantain flour and 50% of wheat flour generally have high moisture content ranging between 14.85 to 15.70 (Hussein, 2016). However, The highest moisture content in snacks is cookies produced with 100% plantain flour could likely lead to faster deterioration of the snacks, which tend to undergo microbial degradation upon long time storage while 50% of potatoe flour and 50% of plantain flour have lower moisture content because the wheat flour has absorbed the moisture content which will take long time storage (Hussein, 2016).

Crude protein

Cookies and bread made with 50% of plantain flour and 50% of potatoe flour had the highest crude protein content ranging between 18.55 and 12.25%. Plant protein is very beneficial to humans. They are one of the building blocks of body tissue Hussein. (2016). This makes the two snacks particularly suited for people recovery from sickness and to maintain healthy body system while cake and cookies with 100% of plantain flour had lower food protein content ranging between 6.65% and 5.60% in which the snacks cannot promote healthy protein content in the body of the consumers Balogun *et al.* (2016)

Crude fibre

Lower amounts of crude fibre 1.20% to 1.23% were obtained across the snack samples and both were in 50:50% in plantain flour and potatoe flour in cake and bread Hussein. (2016). These lower values of crude fibre are not likely to have positive effect in the gastro intestinal organ of human while higher amount of crude fibre from 1.36% to 1.30% were obtained across the snacks sample and both were in 100% plantain flour in bread and cookies these higher value of crude fibre are good for people such diabetics patient Balogun *et al.* (2016).

Crude fat

The snacks generally had low fat content, higher ($P < 0.05$) significant amounts of fat ranging from 9.70% to 11.20% were obtained in 50% of plantain flour and 50% potatoe flour in cake, and 50% of plantain flour with 50% wheat flour in cookies. The 100% plantain flour for bread range from 9.10% to 9.50% respectively. This signifies that the crude fat obtains from 100% of plantain flour, 100% potatoe flour and 50:50% of plantain flour and potatoe flour is high in crude fat.

Ash

Ash is the organic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agent, which provides a measure of the total amount of mineral in food. The ash content were obtained with higher amount of ash presented in bread with (50% plantain flour and 50% potatoe flour), 2.10, cake (50:50%) with (2.10), and finally in cookies (50:50%) with 2.20. The ash content is indicative of the mineral composition (Hussein, D.H, 2016). Therefore, the snacks with higher ash value are likely to have higher amount of food minerals while 100% plantain flour only have lower amount of food mineral.

Dry matter

Dry matter is snack production help in the long shelf life of food also preserve deterioration (Nnam *et.al* 2009). The dry mater content is not significantly different across the snacks so therefore higher amounts were obtained in all snacks produced in 50:50% and 100:100% in bread, cookies and cake respectively. This implies that the product produce from plantain flour can spent more time before it get spoilt because of the level of dry matter content in the produce.

Carbohydrate

Carbohydrate is very important in human diets, which help to perform daily activities, help to control muscle and nerve function. The study results show that there was significant different ($P > 0.05$) in carbohydrate content of snacks (Odenigbo, 2013). Besides, cookies with 100% plantain flour and cake of 100% plantain flour had high carbohydrate content than 50% plantain flour and potatoe flour in which would affect the perform daily activities help to control muscle and nerve function (Odenigbo, 2013)..

Conclusion

The results obtained in this study, it was concluded that cookies 100% and bread: 100% are very rich in moisture content, cookies 50%:50% of highest crude protein and cake 100% are very rich in carbohydrate. In addition, there were marginal but in significant ($P < 0.05$) differences in the degree likeness between 100% and 50%:50% in bread, cookies and cake. These were ever repeated in the acceptability.

Recommendations

From the result obtained from this study, I hereby recommended that food processors should produce bread, cookies and cake using 100% of plantain flour and potatoe flour, also with 50% plantain flour and 50% potatoe flour to maximize degree of likeness of consumers. Besides, cookies 50% plantain flour and 50% potatoe flour are particularly recommended for consumption because of its richness in crude protein and carbohydrates. In addition, this study recommends to food processors to include the use of plantain flour for maximal utilization of the composite flour especially to increase protein level in confectioneries production.

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