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COMPARATIVE AND PROXIMATE ANALYSES ON THE PRODUCTION OF SNACKS USING WHEAT AND BREADFRUIT FLOUR FORTIFIED WITH GINGER IN DIFFERENT RATIO

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Abstract

This project work hinges on comparative and proximate analysis on the production of snacks using breadfruit and wheat flour fortified with ginger extract. The cake and meat pie were subjected to sensory analysis and samples were taken to laboratory to know the nutritional qualities. The cake and meat pie were produced using processed breadfruit flour, wheat flour, ginger extract and other ingredients like sugar, flavoring, rising agent, eggs, and margarine. The cake and meat pie samples were assessed in term of taste, flavor, colour, texture, and overall acceptability by using twenty (20) respondents consisting members of staff both academic and non academic of Oyo State College of Agriculture and Technology, igboora, 9 point hedonic scale ranging from like extremely(9) to dislike extremely(1). The result of sensory evaluation shows that 55% of the respondents accepted the cake which is of 50% wheat flour and 50% breadfruit flour and the proximate analysis result shows that meat pie made from wheat flour 50% and 50% breadfruit flour had highest value of 12.38 with lowest value of 8.39 also cake (90:10), had highest value of 15.26 and 0.28 in crude fibre, meat pie(50:50) had highest of 3.95 of ash, cake (50:50) had 7.78. Moisture content of meat pie (90:10) had highest of 96.22 in dry matter and 70.96 in carbohydrate content. It is recommended that food processor should produced snacks from breadfruit flour and wheat flour to maximize degree of likeness of consumers.

Keyword: proximate, breadfruit, wheat, flour, cake, meat pie, production,

Introduction

Breadfruit (*Artocarpus altilis*) is a species of flowering tree in the mulberry and jackfruit family (Maraceae). Breadfruit root and leaves are taken by mouth for arthritis, asthma, back pain, diabetes, fever, gout, high blood pressure, liver disease and toothaches. It latex is taken by mouth for diarrhea and stomach pain. It root and leaves are applied to the skin for boils, burns, ear infections, herpes, skin infection, sore or tired eyes, and thrush. Breadfruit latex is applied to the skin for broken bones, sprains and seratica associated by A Maxwell, Jones, Jerome A Klun, Chatles, Cantles, Diane Ragone (2012). It is rich in complex carbohydrates and finer. A study published in the journal Amino acid also deemed it as good source of high quality protein as it's found to contain higher amounts of essentials amino acids, particularly phenylalanine, leucine, isoleucine and valine. According to the United States department of Agriculture (USDA) National Nutrient Database, a cup of raw breadfruit contains a variety of beneficial vitamins and minerals, including calcium, iron, magnesium, phosphorus, potassium, sodium, zinc vitamin C and vitamin B complex among others with a wide array of nutrient on breadfruit illustrated by Ragone, Diane (2011). Farm and forestry production and marketing profile for breadfruit, it is use to enhance food supply which is rich in energy dietary fiber, minerals and vitamin, the fruit has a unique flavor and texture used in substance as other tropical stable food such as rice, sweet potatoes, taro-banana and coconut. In many if East Asian, Micronesia, Polynesia and Caribbean countries suggested by Zerega, Ragone, and Motley (2004). The complex origins of breadfruit implication for human migrations in Oceania by American Journal of Botany 91(5): 760-766.

Breadfruit tree bears hundreds (100) of fruits during each season, the fruit however can come in varieties of colour, shapes and size, each fruit generally features round on globular shape and weight about one to five kilogram

(1.5kg), the flesh fruit of breadfruit is an excellent source of potassium and this potassium is an important component of cell and body fluids that helps in the regulation of heart rate and blood pressure, its pulp is a good in copper, iron, magnesium and phosphorus. Breadfruit seeds contain average level of protein 100g and the seeds provide 7.4g or 13% of daily recommended values, however they are excellent source of mineral like potassium, iron, calcium, zinc, selenium, manganese suggested by Ragone, Diane (2006).

Wheat (*Triticum aestivum*) is a staple crop for a significant proportion of the whole world's population and its rich in carbohydrates, protein and essential vitamins and minerals such as vitamin B and E, calcium and iron, as well as fibre illustrated by Verma, Shailender Kumar;Kumar, Satish;Sheikh,Imran;Malik, Sachin;et al;(2016).The nutritional composition of wheat grains varies somewhat with differences in climate and soil also wheat used for food requires processing. Enriched wheat flour may be a good source of iron, thiamine, niacin, calcium, and vitamin B6, in addition to the above nutrients, whole wheat may be a decent source of several vitamins and minerals, including selenium, manganese, phosphorus, copper and folate suggested by Delcour; Joye; Pareyt; Wilderjans; Brijs and Lagrain; (2012).

Ginger (*Zingiber officinale*) is a flowering plant that originated from china. It belongs to the zingiberaceae family and is closely related to turmeric, cardomon and galangal. The rhizome (underground part of the stem) is the part common used as a spice (Nair, Kodoth Prabhakaran; 2019). It is often called ginger root, or simply ginger, it is a popular ingredient in cooking and especially in Asian and Indian cuisine. It has many health benefits including balancing blood sugar and supporting heart health, it is an ancient spice with powerful anti-inflammatory properties, it has a surprising amount of health benefits of ginger is tend to fight cancer to better brain function illustrated by Ank, Zhao and Wang; (2016). Ginger as an anti-metic modality for chemotherapy induced nausea and vomiting: A systematic review and meta-analysis. It can be used to make tea, chopped or crushed in curries and savory dishes and dried or crystallized in sweets and confectionary, possible health benefits includes reducing nausea, pain and inflammation, root or powdered ginger adds flavor to many dishes and it can benefits health too, scientific analysis shows that ginger contains hundreds of compound and metabolites some of which may contributed to health and healing. Of these the gingerols and shogaols have been most extensively researched. It also appears to have beneficial effects on the enzymes trypsin and pancreatic, lipase and to increase motility through the digestive tract. It helps to prevent colon cancer, constipation mainly for the treatment of pain associated by Terry, Posadzki, Watson, et al; (2011).

Objectives of the Study

The general objective of the study is to assess the comparative and proximate analysis of the production of snack using breadfruit. The specific objectives are to:

- i. produce snack (cake and meat pie) using 90% wheat flour and 10% breadfruit flour and 50% wheat flour and 50% breadfruit flour with ginger enrichment.
- ii. determine the proximate analyses on the production of cake and meat pie using breadfruit and wheat enriched with ginger extract in ratio (90:10) (50:50)
- iii. examine the comparative analyses of the production on cake and meat pie with ginger extract using different percentages.
- iv. assess the sensory evaluation of cake and meat pie produced from wheat and breadfruit flour using different percentage with ginger enrichment

Processing of Breadfruit into flour

African breadfruit were washed 3-4 times to remove any dirt and rinse neatly, with the use of knife the back will be removed and re-washed, sliced and soak in water for 1-2 hours and drained to removed excess moisture, and spread in a direct sunlight depends on the temperature, when its dried, dry-milled and sieved before use

Ingredient for Cake (using 90% wheat flour &10% breadfruit flour)

Recipes	Quantity
Wheat flour	900g
Breadfruit flour	100g
Ginger	10g
Margarine	250g
Sugar	30g
Egg	7 big size
Nutmeg	1 teaspoon (tsp)
Flavor	1teaspoon (tsp)
Baking powder	1 teaspoon (tsp)

Ingredient for cake (using 50% wheat flour & 50% breadfruit flour)

Recipe Quantity

Wheat flour	500g
Breadfruit flour	500g
Ginger	10g
Margarine	250g
Sugar	30g
Eggs	7 big size
Nutmeg	1 teaspoon (tsp)
Flavor	1 teaspoon (tsp)
Baking powder	1 teaspoon (tsp)

Method Used in the Preparation of Cake (90:10 and 50:50)

- i. The margarine and sugar were mix thoroughly until the sugar dissolve
- ii. The egg was break into a clean bowl and mix thoroughly until it is foamed
- iii. The mixed egg was pour in the margarine and mix gently
- iv. The sieved breadfruit flour and wheat flour were pour in a bowl, mix with whisked egg and margarine
- v. Before the breadfruit flour is pour baking powder, grinded nutmeg, ginger was added.
- vi. Add flavor
- vii. Portion into baking pan and ready to bake

Ingredient for Meat pie (using 90% wheat flour and 10% breadfruit flour)

Recipe	Quantity
Wheat flour	900g
Breadfruit flour	100g
Ginger	10g
Salt	pinch
Onion	1 bulbs
Minced meat (grounded meat)	300g
Carrot	3 medium size
Irish potatoes	2 medium size
Margarine	250g
Seasoning (magi)	1 cube
Thyme & curry	1 teaspoon (tsp)

Ingredient for meat pie (using 50% wheat flour & 50% breadfruit flour)

Recipe	Quantity
Wheat flour	500g
Breadfruit flour	500g
Ginger	10g
Salt	pinch
Onion	1 bulb
Minced meat	300g
Carrot	3medium
Irish potatoes	2 medium size
Margarine	250g
Seasonings (magi)	1 cube
Thyme & curry	1 teaspoon (tsp)

Method Used in Meat pie Preparation

- i. Sieved the breadfruit flour and wheat flour, add baking powder, pinch of salt and rub in margarine

- ii. Add little water
- iii. Rinse the meat boiled and grounded
- iv. Dice the medium onion, rinse before dice
- v. Cut the carrot, rinse before dice into good shape
- vi. Mix the above ingredient together in a clean bowl, add seasoning (thyme and curry, maggi), salt to taste
- vii. Pour little of plain flour in the above mix ingredient to ferment together, put it down from fire, to allow it to cool
- viii. Mix margarine and breadfruit flour, add salt to taste, then fix the ingredient in already cutout by meat pie cutter and ready to bake

Sensory qualities: The result obtained on the sensory qualities of cake and meat pie are presented below: CAKE(90% Wheat flour and 10% Breadfruit flour)

Source: Field survey, 2019.

Parameter	Score	Texture	Flavour	Aroma	Taste	Colour	Overall acceptability
Like extremely	9	2(10.0)	1(5.0)	4(20.0)	2(10.0)	7(35.0)	1(5.0)
Like very much	8	3(15.0)	7(35.0)	9(45.0)	3(15.0)	7(35.0)	6(30.0)
Like moderately	7	9(45.0)	5(25.0)	4(20.0)	6(30.0)	3(15.0)	10(50.0)
Like slightly	6	5(25.0)	3(15.0)	-	3(15.0)	2(10.0)	3(15.0)
Neither like nor dislike	5	1(5.0)	4(20.0)	2(10.0)	4(20.0)	1(5.0)	-
Dislike slightly	4	-	-	1(5.0)	2(10.0)	-	-
Dislike moderately	3	-	-	-	-	-	-
Dislike very much	2	-	1(5.0)	-	-	-	-
Dislike extremely	1	-	-	-	-	-	-
		20(100.0)	20(100.0)	20(100.0)	20(100.0)	20(100.0)	20 (100.0)

(A) CAKE (50% Wheat flour and 50% Breadfruit flour)

Parameter	Score	Texture	Flavour	Aroma	Taste	Colour	
		Overall acceptability					
Like extremely	9	2(10.0)	1(5.0)	3(15.0)	2(10.0)	7(35.0)	
1(5.0)							
Like very much	8	3(15.0)	5(25.0)	6(30.0)	3(15.0)	6(30.0)	
	4(20.0)						
Like moderately	7	5(25.0)	5(25.0)	5(25.0)	5(25.0)	2(10.0)	
	11(55.0)						
Like slightly	6	6(30.0)	6(30.0)	5(25.0)	7(35.0)	5(25.0)	
1(5.0)							
Neither like nor dislike	5	3(15.0)	1(5.0)	1(5.0)	2(10.0)	—	—
Dislike slightly	4	1(5.0)	2(10.0)	—	1(5.0)	—	—
Dislike moderately	3	—	—	—	—	—	—
Dislike very							
Much	2	—	—	—	—	—	—
Dislike Extremely	1	—	—	—	—	—	—
		20(100.0)	20(100.0)	20(100.0)	20(100.0)	20(100.0)	—
		20(100.0)					

Source: Field Survey

(C) MEAT PIE (90% Wheat flour and 10% Breadfruit flour)

Parameter	Score	Texture	Flavour	Aroma	Taste	Colour	Overall
acceptability							
Like extremely	9	2(10.0)	2(10.0)	2(10.0)	1(5.0)	5(25.0)	7(35.0)
Like very much	8	6(30.0)	8(40.0)	8(40.0)	9(45.0)	9(45.0)	9(45.0)
Like moderately	7	5(25.0)	6(30.0)	7(35.0)	6(30.0)	3(15.0)	4(20.0)
Like slightly	6	4(20.0)	2(10.0)	2(10.0)	4(20.0)	2(10.0)	—
Neither like							
nor dislike	5	3(15.0)	2(10.0)	1(5.0)	—	1(5.0)	—
Dislike slightly	4	—	—	—	—	—	—
Dislike moderately	3	—	—	—	—	—	—
Dislike							
very much	2	—	—	—	—	—	—
Dislike extremely	1	—	—	—	—	—	—
		20(100.0)	20(100.0)	20(100.0)	20(100.0)	20(100.0)	20(100.0)

Source: Field survey, 2019.

MEAT PIE (50% Wheat flour and 50% Breadfruit flour)							
Parameter acceptability	Score	Texture	Flavour	Aroma	Taste	Colour	Overall
Like extremely	9	3(15.0)	—	5(25.0)	1(5.0)	6(30.0)	8(40.0)
Like very much	8	4(20.0)	7 (35.0)	8(40.0)	3(15.0)	4(20.0)	8(40.0)
Like moderately	7	11(55.0)	8(40.0)	2(10.0)	8(40.0)	7(35.0)	4(20.0)
Like slightly	6	2(10.0)	4(20.0)	1(5.0)	3(15.0)	2(10.0)	—
Neither like nor dislike	5	—	—	3(15.0)	3(15.0)	1(5.0)	—
Dislike slightly	4	—	—	—	2(10.0)	—	—
Dislike moderately	3	—	—	—	—	—	—
Dislike very much	2	—	1 (5.0)	1(5.0)	—	—	—
Dislike extremely	1	—	—	—	—	—	—
		20(100.0)	20(100.0)	20(100.0)	20(100.0)	20(100.0)	20(100.0)

Source: Field survey, 2019.

Discussion

Texture: The rate scores obtained in the texture of cake produces varies from 55.0, 56.0 and 3.0%, the highest scored rate is from meat pie produced from 50% of wheat flour with 50% of breadfruit flour with 7.0 in score rate of like moderately in parameter indicated that it was liked by the panelists among other production of snack in different percentage.

Flavour : Data obtained in the sensory attributes of cake and meat pie using different percentage ranges from 40.0%,35.0%,and 30.0% and the highest is 40.0% from meat pie(90% wheat flour and 10% breadfruit flour) and meat pie(50% wheat flour and 50% breadfruit flour).Here both meat pie of different percentage were acceptable by the consumers.

Aroma: The scores of highest percentages in term of aroma were from meat pie (90% wheat flour and 10% breadfruit flour)and (50% wheat flour and 50% breadfruit flour) had highest percentage of 40.0% in frequency both had 8.0 in scores and like very much in parameter accepted by the taste panelists.

Colour: Highest score ranges is from meat pie produced from 90% wheat flour and 10% breadfruit flour which had frequency of 9 and 40.0% with 8 in score and like very much in parameter indicating that the colour of meat pie where liked by the consumer.

Taste: The highest taste scores of meat pie and cake ranges from 45.0%,35.0% and 30.0% in which meat pie produced from (90% wheat and 10% breadfruit) had the highest percentage with 9 in frequency and 8 in scores obtained with like very much in parameter.

Overall acceptability: From the observation in term of texture, flavor, aroma, colour, and taste, the overall acceptability of the consumer or taste panelists were obtained from cake produced from 50% wheat flour and 50% breadfruit flour with highest score of 55.0 and 11 in frequency with 7 in score and finally like moderately in parameter as an excellent performed in the production of cake and meat pie produced accepted by trained panelists.

The result obtained on the proximate composition of cake and meat pie with ratio (90:10 & 50:50) using wheat flour, breadfruit flour and ginger extract are presented below:

Sample	Treatment	CP (%)	CFAT (%)	CFIBRE (%)	ASH (%)	M (%)	DM (%)	NFE (%)
CAKE	WF/BFF(90:10)	8.39	15.26	0.28	2.57	7.61	93.39	65.89
CAKE	WF/BFF(50:50)	8.08	14.38	0.21	2.39	7.78	92.22	67.16
MEATPIE	WF/BFF(90:10)	11.57	9.75	0.16	3.78	3.78	96.22	70.96
MEATPIE	WF/BFF(50:50)	12.38	9.69	0.19	3.95	5.75	94.25	68.04

Source: Omotosho, S.M (2019)

Crude protein: Cake and meat pie production with the use of wheat flour and breadfruit flour enriched with ginger extract in the percentage of (90:10) and meat pie (50:50) had the highest protein content ranging from 8.39 to 12.38%. Plant protein is very beneficial to humans especially breadfruit flour. They are one of the building blocks of body tissue, breadfruit and ginger are rich in protein, essential minerals and other nutrient, also contain fibre which is an essential compound that helps in binding the toxic properties in the intestine and as well helps to reduce bad cholesterol in the body, also enhance the movement of food through the digestive system thereby regulating the bowel movement.

Crude fat: Breadfruit as a food and fruit which plays important role on which is not just limited to human health, but also contributes in maintaining beautiful skin. However, higher ($p < 0.05$) significant amount of fat ranging from 15.26% to 9.75% were obtained in cake produced wheat flour 90% and breadfruit flour 10% enriched with ginger to meat pie produced from wheat flour of 90% and breadfruit flour 10% enriched with ginger extraction.

Crude fibre: Lower amount of crude fibre raising from 0.16% to 0.19% were obtained across the snacks (cake and meat pie) samples. These lower the value of crude fibre which is not likely to have positive effect in the gastro intestine organ in human body.

Ash: Ash is the inorganic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within food. The ash content were not significantly ($P > 0.05$) different across the snacks. However, higher amount of ash were obtained in cake production (90:10) with 2.57% and meat pie (50:50) with 3.95%. The ash content is the indicative of the mineral composition. Therefore, the snacks with higher ash value are likely to have higher amount of food minerals which must be included in diet intake.

Moisture content: Although there was no significant different in moisture content among the snacks produced under consideration meat pie produced with wheat flour and breadfruit flour enriched with ginger in 50:50 were higher than other in moisture. Generally, the moisture content could likely lead to faster deterioration of snacks and it tends to undergo microbial degradation upon long time storage.

Dry matter: The dry matter or dry weight is a measurement of mass when its completely dried and it includes food in carbohydrates, fats, proteins, vitamins, minerals, and antioxidants, among the sample of the snacks that



produces higher percentage of dry matter were cake (50:50) with 7.78% and meat pie (50:50) with 5.75% indicating that they have more higher percentage in nutrient contents.

Carbohydrate content: The carbohydrate content in snack produced are mainly of sugars and starches which helps in strong bones and tissue, meat pie produced with wheat flour 90% and 10% breadfruit flour with ginger had highest percentage denoted as 70.96%.

Conclusion: From the result obtained in the cake and meat pie produced, its concluded that meat pie using wheat flour 90% with 10% breadfruit flour (90:10) are rich in crude protein, fibre, essential mineral and other nutrient, in the degree of degree of likeness and cake using 50% wheat flour and 50% breadfruit flour (50:50) is also acceptable by the panelists.

Recommendation: It is hereby recommended in this study that;

1. Processing and proximate analyses methods should be done, so as to know the nutritional contents of food or snacks
2. Sensory evaluation should be carried out on different snacks produces with breadfruit to ascertain the most acceptable ones.
3. The preparation and consumption of such acceptable snacks should be promoted through nutrition education at woman gatherings by Home Economics Extension agents.

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