Comparative Assessment of Sensory Qualities and Proximate Analysis of Different Methods of Preparing Unripe Plantain Swallow

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ABSTRACT

This study was carried out to assess the comparative effects of different methods of preparing unripe plantain swallow on sensory evaluation and proximate analysis. Three varieties of unripe plantain swallows were prepared from sundried unripe plantain, boiled unripe plantain and blended unripe plantain slurry. The proximate composition, antinutritional factor and sensory qualities of the prepared swallows were determined. Results of the ANOVA test as indicated in the findings showed that sundried unripe plantain swallow had highest values of sensory attributes in terms of texture, aroma, taste, fluffiness and overall acceptability. While boiled unripe plantain swallow had highest values in appearance, colour and consistency with blended unripe plantain having the least values of all sensory attributes. Based on the proximate composition, boiled unripe plantain swallow had the highest value of dry matter, fat content, ash content, crude fibre, crude protein carbohydrate contents and phytate value. Blended unripe plantain had highest value in moisture content and least values in fat content, ash content, crude fibre, crude protein, carbohydrate content and average value of phytate content while, sundried unripe plantain swallow had average proximate values and least phytate value. The sundried unripe plantain swallow was mostly preferred by the panelist but, boiled unripe plantain swallow had the best result nutritionally. The study concludes that due to the exceptional food value and ease of production, this study recommends that boiling and pounding of matured unripe plantain method of producing plantain swallow should be adopted.

KEYWORDS: **Boiled plantain, Food value, Plantain flour, Plantain slurry, Swallow**

Introduction

In Nigerian swallows refer to foods that are swallowed in mouth portions they are usually not chewed (allnigeriafoods.com, 2019). Popular Nigeria swallows include: amala, fufu, eba, semovita, pounded yam, pounded cocoyam, wheat, tuwo and plantain swallow. Swallows are served with soups peculiar to that particular tribe. Such soups include ogbono, vegetable, egusi, ewedu, okro and gbegiri.

Plantain (*Musa Paradisiaca*), an inexpensive source of calorie staple food crop in the West and Central Africa where fifty percent of the world plantain crop is produced (iita.org, 2022). In Nigeria, matured unripe plantain can be used in many ways for food: boiled, roasted, deep fried as chips, baked as biscuits, chopped up and used as an ingredient in soup, pounded as fufu also dried and ground into flour.

Matured unripe plantain is processed in different methods for consumption with varieties of soups amongst tribes in Nigeria. Traditionally the Yoruba tribe makes use of the processed plantain flour while Igbos tribe makes use of both processed plantain flour and pounded boiled unripe plantain methods.

Processed plantain flour (sundried unripe plantain swallow): This method involves flaked matured unripe plantain sundried and milled into flour consistency. The plantain flour is incorporated in to boiling water stirred to form a dough then allowed to cook into a smooth pliable consistency.

Pounded boiled plantain: This method involves pounding boiled matured unripe plantain with mortar and pestle to a smooth pliable consistency.

With the advent of technology, labour saving kitchen equipment are available to make preparation of plantain swallows more interesting, pleasing and satisfying for housewives and other food production practitioners. Kitchen equipment such as electric blender and yam pounder are labour saving devices that can be used to prepare plantain

swallow pleasurably and within a short period of time. Plantain swallow can be prepared using these kitchen equipment as thus:

Boiled pounded unripe plantain: Fresh or frozen matured unripe plantain is sliced, boiled with the peel, when cooked the peel is removed, then pounded in electric yam pounder in just two minutes to a smooth pliable consistency.

Blended unripe plantain slurry: Fresh or frozen matured unripe plantain is sliced, blended into slurry with electric blender in 2minutes then cooked into dough to a smooth pliable consistency.

Unripe plantain swallow is not as frequently consumed as other regular swallows such as cassava fufu, eba, amala, tuwo, semolina, wheat to mention a few probably because the traditional method of processing and adulteration. Unripe plantain can be prepared within a short time with the trend in technology. From studies reviewed , unripe plantain has immense health benefits.

According to finelib.com, (2017). unripe plantain contains complex carbohydrates which includes starch, fibre and sugar. The breaking down and absorption of these carbohydrates are slow which gives fullness thereby reducing appetite and making one lose weight. The fibre content, is capable of lowering cholesterol and helps to relieve constipation and hence prevention of colon cancer. Psyllium contained in unripe plantain can help to control blood sugar, therefore constant eating of unripe plantain can aid in prevention and treatment of diabetes. Regular eating of unripe plantain helps in improving male fertility. Unripe plantain contains some amount of serotonin which expands the arteries, promotes blood flow and reduces the risk of homocysteine which involves a disease condition that leads to coronary artery diseases and stroke. Potassium contained in plantain also plays a great role in preventing heart attack and hypertension. Unripe plantain is low in fat. It is recommended for people trying to lose weight.

This study therefore intends to identify the different methods of preparing unripe plantain swallow, evaluate and compare the sensory attributes of the varieties of unripe plantain swallows prepared, identify the factors affecting the preparation process of the varieties of unripe plantain swallows prepared and to evaluate the nutritional composition of the varieties of unripe plantain swallows prepared.

1 Methodology

Materials

Equipment used includes gas cooker, working table, electric blender, electric pounding machine, weighing scale, measuring cups, spatula, mixing bowls, joint plates, knife, sieves, cellophane bag, trays, water glass, water jug and napkins. Bunches of matured unripe plantain were purchased from Sayedero market, Ilaro, Ogun state.

Method

Three (3) different varieties of unripe plantain swallows were prepared from sundried unripe plantain, boiled unripe plantain and blended unripe plantain slurry. The recipes used for the preparation are presented in Table 1.

Table 1: Recipes of the three varieties of unripe plantain swallows

Ingredients	Sundried unripe plantain	Boiled Pounded unripe plantain	Blended unripe plantain
Unripe plantain	500g	500g	500g
Water	500Ml	750mL	400mL
Preparation time	2Min	2Min	5Min
Cooking time	10Min	12Min	5Min

Total time	12Min	14Min	10Min

*g ; grams, *mL ; millimetre, *Min ;minuites,

STUDY DESIGN

Sensory Evaluation

The sensory qualities of all the samples was assessed by 44 trained panelists comprising of staff and Higher National Diploma (HND) students of hospitality management department of the Federal Polytechnic Ilaro, Ogun state. The samples of plantain swallows were coded and displayed for the panelists to taste.

Data Collection

Based on sensory methods and analysis (Iwe, 2002), the taste panelist were asked to assess the plantain swallows for the attributes of; appearance, colour, texture, aroma, taste, consistency, fluffiness and overall acceptability on a nine point hedonic scale. Thus 9 -1 descending order. i.e. like extremely 9, like very much 8, like moderately 7, like slightly 6, neither like nor dislike 5, dislike slightly 4, dislike moderately 3, dislike very much 2 and dislike extremely 1. The mouth was rinsed with water after tasting each sample.

Data Analysis and Statistical Tools Used Data obtained were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.0. One way Analysis of variance (ANOVA) was used to determine the differences between the means and the significant differences were separated at 5% probability level using Duncan's Multiple Range Test.

3. RESULTS

Results

Table 2: Descriptive Statistics of three varieties of unripe plantain swallows based on sensory attributes

Sample	SP	BP	BS
Appearance	8.30±0.65	8.33±0.75	8.20±0.60
Colour	8.30±0.65	8.33±0.72	8.20±0.67
Texture	8.42±0.64	8.10±0.65	8.22±0.64
Aroma	8.36±0.66	8.27±0.76	8.27±0.70
Taste	8.32±0.62	8.24±0.79	8.31±0.62
Consistency	8.32±0.65	8.35±0.72	8.31±0.68
Fluffiness'	8.28±0.67	8.27±0.73	8.27±0.70
Overall acceptability	8.33±0.65	8.27±0.74	8.27±0.65

Sample SP = Sundried Unripe Plantain, Sample BP = Boiled Pounded Unripe Plantain, Sample BS = Blended Unripe Plantain

Table 3: Tests of Between-Subjects Effects (ANOVA)

Source	Sum of Squares	Df	Mean Square	F	Sig.
Model	72136.900a	9	8015.211	17452.073	.000
Sample	.840	2	.420	.915	.401
Attribute	.623	6	.104	.226	.968
Error	478.100	1041	.459		
Total	72615.000	1050			
a. R Squared = .944 (Adjusted R Squared = .944)					

Table 4: Tests of Overall Mean

Sample	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
A	8.329	.036	8.257	8.400
B	8.268	.037	8.196	8.340
C	8.269	.036	8.199	8.339

Table 5: Duncan Multiple Range Tests on Homogeneous Subsets Based on Plantain swallow Samples

Plantain swallow	N	Subset
		1
BP	343	8.27
BS	357	8.27
SP	350	8.33
Sig.		.270

Table 6: Duncan Multiple Range Tests on Homogeneous Subsets Based Attributes

Attributes	**N**	**Subset**
		1
Texture	150	8.25
Fluffiness	150	8.27
Appearance	150	8.27
Taste	150	8.29
Aroma	150	8.30
Colour	150	8.31
Consistency	150	8.33
Sig.		.391

Table 7: Proximate analysis the three varieties of unripe plantain swallows

Sample	Moisture Content	Dry Matter content	Fat Content	Ash Content	Crude Fibre Content	Crude Protein Content	Carbohydrate Content	Phytate Content
SP	78.24	21.76	0.10	1.86	4.18	4.56	11.06	0.69
B**P**	77.56	22.44	0.1 2	1.91	4.45	4.81	11.10	0.91
BS	86.26	13.74	0 .06	1.57	2.86	3.11	6.14	0.86

g/100g sample

Sample SP = Sundried Unripe Plantain, Sample BP = Boiled Pounded Unripe Plantain, Sample BS = Blended Unripe Plantain

Duncan Multiple Range Tests on Homogeneous Subsets Based Attributes

Table 8: Tests of Between-Subjects Effects (ANOVA) of Plantain Swallow and Attributes
Test of Significant Effect

Source	Sum of Squares	Df	Mean Square	F	Sig.
Model	21030.216[a]	10	2103.022	274.148	.000
Sample	5.751	2	2.876	.375	.694
Attributes	15613.959	7	2230.566	290.775	.000
Error	107.396	14	7.671		
Total	21137.611	24			
a. R Squared = .944 (Adjusted R Squared = .944)					

4. DISCUSSION

Table 2, shows the descriptive statistics of analyzed plantain swallows. Based on appearance, mean response indicated that boiled pounded unripe plantain swallow was found to be the most attractive. This is likely to due to the unique smooth appearance.

Based on the colour attributes of the plantain swallow, boiled pounded unripe plantain swallow was rated highest approximately 8.33 and standard deviations of ±0.718. This also implies that the selected plantain swallow has the best ratings based on colour attribute. This is likely due to the unique creamy colour of boiled plantain.

Average texture of the plantain swallow indicated that sundried unripe plantain swallow was rated highest in terms of texture (mean 8.42±0.642). Other samples were moderately liked with mean value approximately 8. This may be due to the similarities in texture and colour with regular amala prepared from flaked, sundried yam.

With respect to aroma, analysis from Table 2, indicated that sundried unripe plantain swallow was rated highest with mean value of 8.36 and standard deviation of .663. This may be due to the processing method that is similar to amala prepared from flaked, sundried yam. Both cannot be easily differentiated although sundried unripe plantain swallow has a lighter colour.

On taste attribute, analysis indicated that sundried unripe plantain swallow has highest rating mean value of 8.32±0.62 followed by blended unripe plantain swallow and the least was boiled pounded unripe plantain swallow. This may be due to similar taste with amala prepared from flaked, sundried yam.

On fluffiness, analysis indicated that all the samples have approximately 8 rating on average. This shows that all the samples have the same rating in terms of fluffiness. Likewise the consistency of the samples, indicated that all the samples were found to have the same ratings of approximately 8.0 with standard deviation of 0.653 for sundried unripe plantain swallow, 0.723 for boiled pounded unripe plantain swallow and 0.678 for blended unripe plantain swallow. Invariably this implies that the varieties of swallows were prepared appropriately.

Based on overall acceptability of the sensory evaluation of varieties of plantain swallows under study, analysis showed that sundried unripe plantain swallow was rated highest with approximately 8.33. This implies sundried unripe plantain swallow is the most acceptable.

Sampled Plantain Swallow and Attribute Test of Significant Effect

The test of significance in Table 3 indicated a non-significant difference in the mean response of the plantain swallows evaluated since F-value of 0.915 with associated p-value 0.401> 0.05 level of significance. This implies that there is no variation in extent of likes per each of the plantain swallow samples by the evaluators. In addition, result of the ANOVA test as indicated from the table above showed that attributes of these plantain swallows such as

appearance, colour, texture, taste, aroma, fluffiness, consistency and overall acceptability was also found not to be different from one plantain swallow sample to another as responded by evaluators.

Table 4, showed the marginal means of likeness codes of the plantain swallows combinations. It can also be deduced that overall acceptability of each of the plantain swallow, sundried unripe plantain swallow was found to be higher than others with minimum standard error.

On the homogenous subsets list of the samples in Table 5, the table indicated the Duncan post hoc test that does provide homogenous subset results as the groups are listed in order of ascending means. The means that are listed under each subset comprise a set of means that are not significantly different from each other.

It can also be seen from subset 1 of Table 6 that mean response from the overall acceptability of consistency, colour and aroma in that order were found to be highest among other attributes.
The proximate analysis in the Table 7, above shows that blended unripe plantain swallow has highest moisture content of 86.26, with boiled pounded unripe plantain swallow, having the least moisture content. Similarly, in terms of dry matter content, blended unripe plantain swallow had the least dry matter with value of 13.74, while boiled pounded unripe plantain swallow, has the highest dry matter.

Furthermore, boiled pounded unripe plantain swallow, has the highest fat content (0.12), the least fat content was observed in blended unripe plantain swallow. In terms of ash content, boiled pounded unripe plantain swallow has highest value (1.91).

Boiled pounded unripe plantain swallow, has the highest crude fibre content value of 4.45. In terms of crude protein content, boiled pounded unripe plantain swallow had highest value of 4.81 and blended unripe plantain swallow had the lowest value of 3.11.

Furthermore, boiled pounded unripe plantain swallow has highest carbohydrate content (11.10) with blended unripe plantain swallow having the least value of 41.97. However, the highest level of phytate (%) was found in boiled pounded unripe plantain swallow, (0.91), compared to 0.69 in sundried unripe plantain swallow.

Duncan Multiple Range Tests on Homogeneous Subsets Based Attributes

The test of significance in Table 8, indicated a non-significant difference in the mean response of the samples evaluated since F-value of 0.375 with associated p-value 0.694> 0.05 level of significance. This implies that there is no variation in plantain swallow samples over moisture content, dry matter content, fat content, ash content, crude fibre content, crude protein content, carbohydrate content, phytate content.

5. CONCLUSION

Plantain swallow was prepared in three different procedures. Results of ANOVA test in the findings showed that the three different methods were all good nutritionally and organoleptically with minimal differences, as indicated in the test of significance.The sensory properties displayed in the study indicated that terms of texture, aroma, taste, fluffiness and overall acceptability ratings were highest in sundried unripe plantain swallow. Boiled unripe plantain swallow significantly increased the dry matter, fat, ash, fibre, protein, fat and carbohydrate contents. Boiled unripe plantain swallow resulted in notable increase in food value, which is be nutritionally advantageous to all categories of persons. Thus the results of the study concluded that sundried unripe plantain swallowed were mostly preferred by the trained taste panelist but, nutritionally boiled unripe plantain swallow is recommended.

REFERENCES

ALL NIGERIA FOODS. (2019). Retrieved 2 July 2022 from: https://allnigerianfoods.com.

FINELIB. (2017). Retrieved 27 September 2021 from: https://www.finelib.com

IITA. (2022). Retrieved 25 July 2022 from: https://www.iita.org.