

PROXIMATE AND ORGANOLEPTIC ANALYSES OF FLOUR CONFECTIONERY PRODUCTS FROM COMPOSITE CORNCOB AND INDIGENOUS CHICKEN EGGS IN OLUMO ROCK, OGUN-STATE, NIGERIA

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ABSTRACT

Currently, people look for convenient and healthy food to cope with their hectic lifestyles. Therefore, food, especially that high in fiber becomes one of their priorities, hence, this study was carried out to optimize the usage of corn cob supplemented with indigenous chicken eggs in developing high fiber snacks that may be beneficial to all ages, hence the needs for proximate and organoleptic analyses of flour confectionery products from composite flour of corncob and indigenous chicken eggs in Olumo tourists' destination, Ogun-state, Nigeria. Thirty (30) tourists/visitors were conveniently sampled for the study. The study makes use of both primary and secondary sources of data to elicit useful information. A well-structured and scrutinized close ended 9-hedonic scale sensory evaluation questionnaire was used. The data was analyzed using SPSS 20 with one-way ANOVA and $p < 0.05$. Proximate analyses showed that white-corn-cob had higher crude fibre (42.68) compare to others. Sensory evaluation (appearance, colour, aroma, taste, texture) of the products showed that cake and steamed sponge pudding produced from corncob–wheat composite flour, indigenous chicken and duck eggs were generally accepted by the panellists. Differences in sensory attributes among the formulations were minimal, indicating that the incorporation of corncob flour and the use of indigenous chicken eggs did not adversely affect consumer acceptability. the study concludes that, corncob flour can be utilized as a component of composite flour in the production of cake and steamed sponge pudding due to its acceptable nutritional composition and sensory properties and therefore, recommended for the tourists.

Keywords: *Corn-cob, evaluation, sensory, indigenous chicken eggs*

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INTRODUCTION

Corn-cob flour is a byproduct of corn processing that is typically discarded or used as animal feed. However, recent research has shown that corncob flour can be a viable ingredient for confectionary products, providing a unique flavor profile and texture. Recently, health authorities all around the world have recommended an increase in cereal intake, which is an important source of dietary fibre. This is because dietary fibre intake has been associated with reduced risk for colon cancer and a

number of cardiovascular diseases including hypertension, stroke, as well as heart disease. It also provides consumers with a sense of satiety and fullness. (Castillo *et al.*, 2021, Islam *et al.*, 2023) When corn reaches maturity, the edible part for consumption is only around 60% and approximately 40% of the corn cob has becomes wastage. However, few reports are available on the usage of corn cob in food production. As a result, it will contribute to a major loss in food industries without considering the valuable fibre that is readily available in corn cob.

Therefore, it is a good idea to impart corn cob in the production of high fibre snacks such as Chinchin, Sausage roll, cake. Hence, besides whole meal snacks, this will eventually add another variety of high fibre food source for consumers and can also produce a value added product obtained from corn cob. Coeliac disease (CD) is a chronic inflammatory intestinal disorder that affects 0.5–1% of the world population and is induced by gluten ingestion in genetically susceptible individuals (Makharia *et al.*, 2022). Strict adherence to a gluten free diet throughout one's lifetime is the only effective treatment for patients diagnosed with CD (Wieser *et al.*, 2021). As a result, demand for gluten-free (GF) products has increased from people suffering gluten intolerance and sensitivity, in addition to the increased consumer demands for wheat free products (Woomer and Adedeji, 2021).

Statement of the Problem

Currently, people look for convenient and healthy food to cope with their hectic lifestyles. Therefore, food, especially that high in fiber becomes one of their priorities (Lau *et al.*, 2022). Corn cob is a major waste (40%) obtained from the corn industry (Lau *et al.*, 2022). Hence, this study was performed to optimize the usage of corn cob in developing high fiber snacks that may be beneficial to all ages and designing some therapeutic diet to treat some ailments like cardiovascular disease, Coeliac disease (CD), colon cancer, stroke, inflammatory diseases, Alzheimer, diabetes etc.

When it comes to the acceptability of confectionary products made with corncob flour and indigenous chicken eggs, consumer perception plays a crucial role. While some consumers may be open to trying new and innovative ingredients, others may be hesitant to deviate from traditional recipes. Similarly, confectionary products made with indigenous chicken eggs may provide a suitable option for consumers with dietary restrictions or ethical concerns about animal products. However, the texture and appearance of these products may differ from those made with eggs, potentially affecting their acceptability among consumers.

In conclusion, the acceptability of confectionary products made with alternative ingredients such as corncob flour and indigenous chicken eggs ultimately depend on consumer preferences and perceptions. While these ingredients offer potential benefits in terms of sustainability and health, their success in the market will depend on how well they can appeal to

the tastes and preferences of consumers. It will be interesting to see how these alternative ingredients continue to be incorporated into confectionary products and whether they will become a mainstream choice for sweet treats in the future.

Objectives of the Study

The main objective of this study focusses on sensory evaluation and acceptability of bakery and steaming product produce from corncob flour with indigenous chicken eggs. The specific objectives are to:

- i. determine the proximate analysis of the corn cob flour
- ii. evaluate the sensory properties of product sample (Cake and steamed sponge pudding) produce from composite flour of corncob supplemented with indigenous chicken eggs

Significance of the Study

The researcher is of the opinion that this research work will enable bakers and pastry makers to know the difference confectionary products that can be produced from corncob flour with indigenous chicken eggs. The result of this finding will create entrepreneurship opportunity in the aspect of corncob flour production which will in turn reduce over dependent of bakers on imported wheat flour.

MATERIALS AND METHODS

Study Area

The study area is Olumo Rock, Abeokuta North, Ogun State, Nigeria

Population of the Study

Thirty (30) tourists/visitors were conveniently sampled for the study.

Preparation of corncob flour (CCF)

- i) Corncob flour would be prepared using a modification of breadfruit flour procedures.
- ii) The corncobs would be cut into 2cm thick pieces and underwent steam blanching for 5 minutes.
- iii) Next the corncobs would be dried in oven at 60°C for 2-5 hours.
- iv) The dried corncobs would then cooled at room temperature for one hour.
- v) After cooling, the corncobs would be ground using commercial grounding machine.
- vi) The ground corncobs would then sieved at different sizes of < 125µm, 125 – 249µm, 250 – 499µm and 500 – 999µm by using sieve shaker. The milling and sieving process would then repeated until the required amounts of respective flour sizes were obtained.

Preparation of the Product Sample Method of Preparation (Cake and Steamed Sponge Pudding) based on 500g Composite Flour

S/N	INGREDIENT FOR CAKE AND PUDDING	Quantity	METHODS
1	Whole wheat and corn cob flour	500g each	Preheat oven to 350°F (175°C). Grease and flour 8by10 square cake pan and line it with parchment paper.
2	Baking powder/vanilla extract and salt	50g each/2 teaspoon	In a medium bowl, sift together the corn cob and whole wheat flour according to the variations, baking powder and salt. Set aside.
3	Unsalted butter, softened/Granulated sugar	400g/250g	In a large mixing bowl, cream together the softened butter and sugar until light and fluffy.
4	Chicken and local fowl eggs	500g each	Beat in the eggs separately on the 4 mixing bowls, one at a time, until well combined.
5	Peak tin milk	350ml	Gradually add the dry ingredients to the batter, alternating with the milk, beginning and ending with the dry ingredients. Mix until just combined, being careful not to over mix.
6			Divide the mixture into two equal part, one for cake and the other for pudding
			Pour the first half into the prepared cake pan and spread it evenly and the other one in a souffle pudding casserole and steam
7			Bake in the preheated oven for 25 -30 minutes, or until a toothpick inserted into the center comes out clean and the cake is golden brown.
8			Allow the cake to cool in the pan for about 10 minutes, then transfer it to a wire rack to cool completely.
9			Cut the steamed pudding into 2cm thick and neatly wrap and code in a transparent fancy sweet nylon wrapper

Source: Field Survey 2025

Table 3.4: Proximate Composition Results

Sample Flour	%Dry Matter	%Moisture Content	%Crude Protein	%Ether Extract	%Crude Fibre	%Ash Content	%CHO
Whitecorn cob flour	95.88 95.85	4.12 4.15	3.06 3.06	1.46 1.42	42.70 42.68	1.34 1.39	90.02 89.98
Yellowcorn cob flour	95.90 95.88	4.10 4.12	2.85 2.63	1.33 1.35	39.22 39.20	1.41 1.38	90.31 90.52
Wheat flour	88.67 88.55	11.33 11.45	12.26 12.48	1.73 1.70	1.06 1.05	0.42 0.40	74.26 73.97

Source: T and D Analytical Laboratory Services, 2024

Proximate compositions analysis was conducted on the white and yellow corn cob based on the official AOAC methods (2005). The parameters that were determined are moisture, ash, fat, crude fibre, protein, carbohydrate (by difference) and calorie content. It is therefore noted that white corn cob is slightly significant than yellow corn cob flour as it possesses higher fiber.

3.6 Variations of the Products (Cakes) in Terms of Flours and Eggs

Whole Wheat Flour (g)	Solo Corn cob (g)	Local Duck egg (g) (Queen Cakes)	Local Fowl (g) (Queen Cakes)
100	0	100g	100g
80	20	100g	100g
70	30	100g	100g
60	40	100g	100g
50	50	100g	100g
0	100	100g	100g
Total Output	50 pieces	50	50

Source: Field Survey 2025

Variations of the Products (Steamed Sponge Pudding) in Terms of Flours and Eggs

Whole Wheat Flour (g)	Solo Corn cob (g)	Local Duck egg (g) (Queen Cakes)	Local Fowl (g) (Queen Cakes)
100	0	100g	100g
80	20		
70	30		
60	40	"	"
50	50	"	"
0	100	"	"
Total Output	50 pieces	50	50

Source: Field Survey 2025

Sensory evaluation

A sensory evaluation was conducted for the confectionery's samples in terms of appearance, aroma, taste, texture and overall acceptability. All the panelists were provided with samples and a tray with tissue paper to clean hand. Each panelist was served with arranged samples in random numbers labelled on the plate. Water was provided for rinsing their mouth before and after each sample evaluation. The panelists were required to evaluate the four attributes and overall acceptability via a 9-point hedonic scale (1 = dislike extremely; 9 = like extremely). In order for a sample to be considered as acceptable, 6 will be the minimum mean score for the overall acceptability.

Data Collection

The study make use of both primary and secondary sources using in-dept interview, direct observation, administration of questionnaire, journals, text books etc. The data was collected personally from the respondents.

Instrument for Data Collection

In carrying out the study, a well-structured and scrutinized close ended 9-hedonic scale sensory evaluation questionnaire titled "Sensory Evaluation of Corn cob (SECC)" was developed and use to collect data for the study.

The "SECC" consists of section A, B and C, where section A includes demographic characteristics of respondents (Age, Sex, Gender, Marital status, Nationality, Employment Status, Nationality, Educational qualification etc.),

Section B assessed level of acceptability of sample products (Sizeable chunk of naked cake) made from corn cob and local egg types through 9-hedonic scale where 9 indicates like extremely and 1 means dislike extremely while Section C assessed level of acceptability of sample products (Sizeable chunk of pudding).

Statistical analysis

The data was analyzed using SPSS 20 with one-way ANOVA. The results were expressed as mean $\pm$ standard deviation. Analyses was conducted and the significant level was adjusted at $p < 0.05$.

Analysis of Respondents on Cake**Table 4.1: ANOVA Table**

	Appearance	Colour	Aroma	Taste	Texture
R ²	0.404305	0.230769	0.114561	0.321708	0.304813
F	14.06782	6.218182	2.681754	9.830782	9.088112
Pr > F	<0.0001	<0.0001	0.003	<0.0001	<0.0001

Signification codes: 0 < *** < 0.001 < ** < 0.01 < * < 0.05 < . < 0.1 < ° < 1

Table 4.2: Sample Descriptive Statistics

Category	Appearance	Colour	Aroma	Taste	Texture
C1	6.25±0.433	7.25±0.432	6.25±0.442	6.75±0.429	6.50±0.378
C2	7.00±0.433	7.25±0.432	6.75±0.442	6.75±0.429	7.25±0.378
D1	5.75±0.433	5.50±0.432	5.75±0.442	5.75±0.429	5.50±0.378
D2	8.50±0.433	6.25±0.432	6.75±0.442	8.75±0.429	6.25±0.378
D3	5.75±0.433	5.75±0.432	6.00±0.442	5.25±0.429	5.75±0.378
D4	7.00±0.433	6.25±0.432	7.00±0.442	5.75±0.429	4.75±0.378
D5	4.25±0.433	5.00±0.432	7.50±0.442	5.75±0.429	5.00±0.378
L1	3.75±0.433	4.25±0.432	6.00±0.442	6.50±0.429	3.75±0.378
L2	7.25±0.433	6.75±0.432	5.75±0.442	5.25±0.429	6.00±0.378
L3	5.50±0.433	6.00±0.432	5.00±0.442	4.50±0.429	4.25±0.378
L4	5.00±0.433	4.50±0.432	5.25±0.442	5.50±0.429	4.25±0.378
L5	2.75±0.433	4.25±0.432	6.25±0.442	3.25±0.429	3.75±0.378

Source: Field work 2025

Table 4.3: Sample Model Significant (Pr > |t|)

Source	Appearance	Colour	Aroma	Taste	Texture
Intercept	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
sample-C1	<0.0001	<0.0001	1.000	<0.0001	<0.0001
sample-C2	<0.0001	<0.0001	0.425	<0.0001	<0.0001
sample-D1	<0.0001	0.042	0.425	<0.0001	0.001
sample-D2	<0.0001	0.001	0.425	<0.0001	<0.0001
sample-D3	<0.0001	0.015	0.690	0.001	0.000
sample-D4	<0.0001	0.001	0.232	<0.0001	0.062
sample-D5	0.015	0.221	0.047	<0.0001	0.020
sample-L1	0.104	1.000	0.690	<0.0001	1.000
sample-L2	<0.0001	<0.0001	0.425	0.001	<0.0001
sample-L3	<0.0001	0.005	0.047	0.040	0.350
sample-L4	0.000	0.683	0.111	0.000	0.350
sample-L5	NA	NA	NA	NA	NA

Signification codes: 0 < *** < 0.001 < ** < 0.01 < * < 0.05 < . < 0.1 < ° < 1

Analysis of Steamed sponge pudding**Table 4.4: ANOVA Table**

	Appearance	Colour	Aroma	Taste	Texture
R ²	0.222222	0.341463	0.541667	0.138614	0.592
F	8.142857	14.77778	33.68182	4.586207	41.35294
Pr > F	0.001	<0.0001	<0.0001	0.014	<0.0001

Signification codes: 0 < *** < 0.001 < ** < 0.01 < * < 0.05 < . < 0.1 < ° < 1

Table 4.5: Sample Descriptive Statistics

Category	Appearance	Colour	Aroma	Taste	Texture
AC	7.00±0.303	6.00±0.199	6.50±0.311	5.50±0.357	5.00±0.273
BD	5.50±0.303	4.50±0.199	3.00±0.311	6.00±0.357	3.00±0.273
CL	7.00±0.303	5.00±0.199	5.50±0.311	7.00±0.357	6.50±0.273

Source: Field work 2025

Table 4.6: Sample Model Significant (Pr > |t|)

Source	Appearance	Colour	Aroma	Taste	Texture
Intercept	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
sample-AC	1.000	0.001	0.027	0.004	0.000
sample-BD	0.001	0.080	<0.0001	0.052	<0.0001
sample-CL	NA	NA	NA	NA	NA

Signification codes: 0 < *** < 0.001 < ** < 0.01 < * < 0.05 < . < 0.1 < ° < 1

Discussion of Findings

From table 4.1 ANOVA table, the R²= 40% of the variability of the dependent variable APPEARANCE is explained by the explanatory variable. Given the p-value (0.0001) of the F statistic computed in the ANOVA table is less than the significance level of 5%, the information brought by the explanatory variables is significantly and accepted by the respondents. The R²= 23% of the variability of the dependent variable COLOUR is explained by the explanatory variable. Given the p-value (0.0001) of the F statistic computed in the ANOVA table, and given the significance level of 5%, the information brought by the explanatory variables is significantly and accepted to be significant. The R²= 11% of the variability of the dependent variable AROMA is explained by the explanatory variable. Given the p-value (0.003) of the F statistic computed in the ANOVA table, and given the significance level of 5%, the information brought by the explanatory variables is significantly accepted. The R²= 32% of the variability of the dependent variable TASTE is explained by the explanatory variable. Given the p-value (0.0001) of the F statistic computed in the ANOVA table, and given the significance level of 5%, the information brought by the explanatory variables is significantly. The R²= 30% of the variability of the dependent variable TEXTURE is explained by the explanatory variable. Given the p-value (0.0001) of the F statistic computed in the ANOVA table, and given the significance level of 5%, the information brought by the explanatory variables is significantly.

Table 4.2 shows the sensory descriptive statistics of corn cob flour confetionery. In terms of appearance, D2 in the proportion of 70:30 of Duck egg was rated "like very much" with a mean score of 8.50 while the least L1 in the proportion of 80:20 was rated "Dislike very much" with a mean score of 3.75. In terms of Colour, L2 in the proportion of 70:30 of normal egg was rated "like slightly" with a mean score of 6.75 while the least L1 and L5 in the proportion of 80:20 and 00:100 were rated "Slightly Dislike" with a mean score of 4.25. In terms of Aroma, D5 in the proportion of 00:100 of Duck egg was rated "like extremely" with a mean score of 7.50 while the least L4 in the proportion of 50:50 was rated "neither like nor Dislike" with a mean score of 5.25. In terms of Taste, D2 in the proportion of 70:30 of Duck egg was rated "like extremely" with a mean score of 8.75 while the least L5 in the proportion of 00:100 was rated "Dislike very much" with a mean score of 3.25. In terms of Texture, D2 in the proportion of 70:30 of Duck egg

was rated “like slightly” with a mean score of 6.25 while the least L1 and L5 in the proportion of 80:20 and 00:100 were rated “Dislike very much” with a mean score of 3.75.

Table 4.5 shows the sensory descriptive statistics of corn cob cookies pudding. In terms of appearance, AC and CL in the proportion of 50:50 of was rated “like moderately” with a mean score of 7.00 while the least BD in the proportion of 50:50 was rated “neither like nor dislike” with a mean score of 5.50.

In terms of colour, AC in the proportion of 50:50 of was rated “like slightly” with a mean score of 6.00, followed by CL in the proportion of 50:50 rated “neither like nor dislike” with a mean score of 5.00 while the least BD in the proportion of 50:50 was rated “slightly dislike” with a mean score of 4.50.

In terms of Aroma, AC in the proportion of 50:50 of was rated “like slightly” with a mean score of 6.50, followed by CL in the proportion of 50:50 rated “neither like nor dislike” with a mean score of 5.50 while the least BD in the proportion of 50:50 was rated “dislike very much” with a mean score of 3.00.

In terms of Taste, CL in the proportion of 50:50 of was rated “like moderately” with a mean score of 7.00, BD in the proportion of 50:50 of was rated “like slightly” with a mean score of 6.00 while the least AC in the proportion of 50:50 was rated “neither like nor dislike” with a mean score of 5.50. In terms of Texture, CL in the proportion of 50:50 of was rated “like slightly” with a mean score of 6.50, followed by AC in the proportion of 50:50 rated “neither like nor dislike” with a mean score of 5.00 while the least BD in the proportion of 50:50 was rated “dislike very much” with a mean score of 3.00.

Conclusions

The results indicate that using corncob flour into baked items such as cookies, cakes, and pudding could be beneficial. Overall, these items received high acceptance ratings from both panelists and customers, suggesting widespread satisfaction. Remarkably, there were no discernible disparities noted in the sensory attributes and overall desirability of the baked products that contained corncob flour. Moreover, the steam pudding analysis provides confirmation that these items adhere to the safety requirements established by the BFAD for baked goods, therefore guaranteeing their suitability for consumption. Incorporating corncob flour improves the sensory characteristics and consumer acceptance of baked items. This implies that conducting additional study and advancement in this field could result in the creation of highly sought-after and financially profitable items enhanced with corncob flour.

Recommendations

According to recognized generalizations, it is recommended to use corncob flour as an effective component for making baked and steamed goods. This is because it has shown positive outcomes in terms of sensory characteristics and consumer approval. The positive feedback from both partially trained experts and consumers indicates that promoting these products in different markets could take advantage of their attractiveness. Displaying baked items crafted from corncob flour at events such as school food fairs and food exhibitions may generate interest due to their novelty and distinctive flavor profile. In order to ensure the durability of these products, it is recommended to seal their packaging, thereby preserving their freshness during transportation and for display in food centers. Moreover, promoting other researchers to investigate additional variations or aspects that were not addressed in the present study could result in more profound understandings and advancements in the utilization of corncob flour in the manufacture of baked goods. Promote composite flour to replace imported wheat and bolster food security. Feature corncob-based foods in hospitality menus for cultural and nutritional value. Organize sensory education to boost public acceptance of unconventional ingredients. Invest in indigenous chicken farming to improve confectionery quality and nutrition. Commercialize research through collaboration between government bodies and food regulators. Scale up production by encouraging local entrepreneurs to utilize agro-by-products, by following these suggestions, stakeholders can efficiently exploit the capabilities of corncob flour, thereby improving its marketability and attractiveness to consumer in the confectionery products sector.

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