COMPARATIVE ASSESSMENT AND ACCEPTABILITY OF *EGBO* ENHANCED WITH *ỤGBA, EFOLO,* AND *ỤTAZI* FOR SALE IN THE LOCAL FOOD INDUSTRY

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Abstract
The research evaluates the sensory attributes and acceptability of Egbo enhanced with Ụgba, Efolo and Ụtazi, in relation to the conventionally prepared Egbo. Two different portions of Egbo dish were prepared for comparison, and presented for sensory assessment to a group of taste panelists. A sensory assessment checklist prepared in a nine-point hedonic scale was used to collect data from 44 taste panelists, made up of year three Hospitality Management students of The Federal Polytechnic Ilaro, Nigeria. The data collected was subjected to descriptive and inferential statistics using SPSS (Version 20). The results show there is no significant variation in the appearance, color, texture, flavor, and aroma of the food samples. However, there is significant variation in the taste and overall acceptability of the food samples, while proximate analysis revealed a greater content of micronutrients in the enhanced sample of Egbo. The study presents an upward trajectory for gastronomy tourism in the local restaurant industry wherein culinary experts could harness new opportunities to create a niche for sustainable traditional cuisine production and marketing across ethnic backgrounds. Recommendation includes a careful selection and handling of the food ingredients, and a gradual introduction of the food product into the local restaurant industry.

***Keywords**: Efolo, Egbo, gastronomy tourism, indigenous foods, Ụgba, Ụtazi.*

Introduction

The indigenous culinary system has been an essential element of the food security of many indigenous societies in Africa (Rwamasirabo, 2021; Oktay & Sadıkoğlu, 2018; Pinstrup-Andersen, 2010). In Nigeria, particularly, the indigenous societies have numerous food products that are either neglected, forgotten or going extinct in the food chain. Nigeria is a multicultural society blessed with a variety of traditional foods prevalent to different ethnic nationalities, consumed with customary staple foods derived from a variety of fruits, vegetables, grains, and tuber food products (Oktay & Sadıkoğlu, 2018; Ndulaka et al., 2017). Most of the local dishes are prepared using local vegetables that are not only nutritious but also known for their health benefits (Asaolu, 2012). For instance, taking antioxidants from these vegetables is beneficial in preventing a number of diseases (Nwokorie, 2017; Sumazian et al., 2010; Huda-Faujan et al., 2007). In addition to promoting health, increased consumption of these native foods helps improve plant variety, stimulate poverty reduction and enhance food security (Barry, 2009).

Undoubtedly, from the gastronomy tourism perspective, destination savvy visitors crave for new culinary experiences at local and exotic destinations in relation to the experience economy (Nwokorie & Ayogu, 2021). The absence of exotic food products at local destinations has a way of diminishing the remarkable experience of visitors, thereby affecting the net profit score of the tourist destination (Nwokorie, 2015).

There are numerous indigenous foods that have either been neglected by restaurant practitioners or entirely forgotten in the food chain (Nwokorie & Kwusi, 2020). Some of these food products, which have a way of attracting inbound tourists and improving the local economy are the original delicacies of the indigenous people of Nigeria from the different ethnic nationalities, and they include, *Ikoko* from Abia State, Nigeria, *Odudu* from Imo State, Nigeria, and *Egbo* from Ogun State, Nigeria.

Most indigenous foods of many Nigerian ethnic nationalities are gradually disappearing from the local food chain due to the enormous presence of processed food products, and multiplicity of quick service restaurants (Nwokorie & Ayogu, 2021; Nwokorie, 2017). Research has been inadequate on the need to rejuvenate exotic Nigerian ethic food products, hence the necessity to prepare these foods in their natural form fortified with sauce and confirming their acceptability and nutritional significance through sensory assessment and proximate analysis. Therefore, this study

intends to rejuvenate the *Egbo* food product in a nutritiously enhanced form and introduce it into the restaurant industry in its local state.

Furthermore, there seem to be a huge decline in the production for, and consumption of traditional foods by the Z-Generation. The reduction is mostly due to urbanization and increase in the number of working class women (and mothers) leading to drastic reduction in the act of cooking meals for the family (Chiaka et al., 2022). Thus, the changing pattern of consumption leads to the gradual extinction of some important traditional meals, and an increase in the eating out habit of the populace.

Again, the poor dietary quality of food products used to prepare the quick home meals and other food products presented in fast food locations (Mekonnen et al., 2021) calls for concern. Food experts have pointed out that food fortification legislation is needed to fortify certain foods and reduce vitamin and protein insufficiencies in vulnerable groups of the society (Odetokun & Oladimeji, 2002). This research is reminiscent of ways to improve the protein and vitamin status of foods consumed by the general public. There has been a lot of research on food fortification, but there is no evidence on the protein and vitamin enrichment of *Egbo*. Therefore, the need to improve the nutritional content of the dietary intake of the local populace, adding value, and creating varieties in the food content becomes imperative.

To this end, the core objective of this study is to carry out sensory analysis and determine the proximate composition of *Egbo* fortified with E*folo*, *Ụgba* and *Ụtazi* in relation to the conventional *Egbo* delicacy. Specifically, the study is intended to:

a. Develop a recipe for the enhanced *Egbo* dish
b. Examine the effect of the processing parameters (cooking temperature, cooking time and quality of *Ụgba*, *Efolo* and *Ụtazi*) on the physio-chemical functional, nutritional and sensory properties of the food product
c. Carry out sensory analysis on the two *Egbo* dishes.
d. Determine the proximate composition of *Egbo* dishes comparatively.

This study is necessary because the local restaurant industry is making concerted effort to explore means of ensuring continuous improvement in offering new and exotic food products to its variety of customers. Therefore, food producers and restaurant entrepreneurs will seize the opportunity to ensure food product diversification thereby enhancing the product chain of the industry. The study will also encourage local food commodity producers and food sellers in the area of food security by ensuring that this particular food product is always available in a very nutritious and acceptable form. The raw materials for producing the enhanced *Egbo* dish (*Ụgba* and *Ụtazi* most particularly) are exotic food raw materials that require sustainable cultivation to promote their survival and availability. The diversified use of these food raw materials will ensure their year-round availability thereby enriching the local food chain, since food producers will better understand the nutritional qualities of the raw materials.

Egbo is a popular local food in Southwestern Nigeria. The conventional *Egbo* is made from corn berries, in which all corn berries are crushed, dried and shelled. The shelled seeds are boiled and eaten while served with vegetable, stew and coconut.

Efolo refers to a dry float of various fish species. Floats are usually discarded in contemporary fishing, but dried cod maws are available in several local markets that are considered as delicacies. In most average Nigerian families, *Efolo* which is considered to possess medicinal properties – Omega-3 fatty acids and antioxidants – (Banna et al., 2022; Siddhnath et al., 2022; Onweluzo & Eilittä, 2003) is a good source of protein additive for food products, and it assists poor households to improve their protein intake.

Ụgba is an alkaline fermented food product derived from the seeds of the African oil beans (*Pentaclethra macrophylla bent*). *Ụgba* is very common with the Igbos and other ethnic nationalities in the Southeastern part of Nigeria. The product serves both as a specialty food and food flavouring material. According to studies, *Ụgba* is very rich in amino acids and can provide a number of health benefits (Eze, 2022; Nwokorie, 2017; Okpala, 2015).

Ụtazi (in Igbo language) is a year-round shrub specie of African origin predominantly used in the Southern part of Nigeria. It is known as *Arokeke* in Yoruba language, Bush Buck in English and scientifically referred to as

Gongronema latifolium (*G. latifolium*). *Ụtazi* has been traditionally used by local producers of herbal medicines in the treatment of malaria and also used during pregnancies as it contains essential oils and possesses antibacterial and anti-inflammatory properties (Ugochukwu et al., 2003; Ugochukwu & Babady, 2002). Additionally, it is used in spicing palm oil sauce in various traditional Igbo dishes because of its bitter-sweet taste (Nwokorie, 2017). Among its various health benefits, *Ụtazi* is a good regulator of blood sugar levels, fights respiratory diseases and improves the immune system (Mbaeyi-Nwaoha et al., 2023; Al-Hindi et al., 2019; Eleyinmi, 2007). Additionally, it is known to enhance the digestive system, lowers cholesterol levels, has cancer prevention qualities and is a good source of liver detoxifier (Mbaeyi-Nwaoha et al., 2023; Ekine et al., 2021; Morebise, 2015).

To this end, a combination of these vital ingredients is the preparation of *Egbo* will go a long way in enhancing its nutritional qualities. However, a careful and methodical procedure has to be adopted to ensure a balance is the active nutrients of the raw materials. This is because an erroneous methodology in food preparation will alter the sensory attributes of the food product and affect the nutritive constituents.

Methodology

Study Area

The food product was prepared at the Main Kitchen of the Department of Hospitality Management (HMT), The Federal Polytechnic Ilaro, Ogun State Nigeria, wherein the preparation utensils were sourced. The major raw materials (corn, beans *Ụgba*, *Efolo*, *Ụtazi*) used for the study were purchase from the local markets in Ilaro and Oja-Odan, Yewaland, Ogun State, Nigeria.

Population and Sample

The population of the study were 50 students of HMT Department, The Federal Polytechnic Ilaro, who are in their 300 level. The choice of selection was premised on the fact that at their level, the students understand the fundamentals of sensory assessment, hence eliminating the element of bias in completing the research instrument. The Taro Yamane formula for calculating sample size for finite population was used to arrive at a sample of 44 taste panelists for the study.

Research Instrument

A structured sensory evaluation sheet was prepared in a nine-point hedonic scale to obtain the responses from the panelists. The scale which ranged from 9 to 1 (like extremely to dislike extremely) was used to obtain responses from the panelist. The panelists were trained to observe and taste for the sensory attributes of aroma, color, flavor, texture and overall acceptability of the food products. To eliminate bias, panelists are allowed to sip a little amount of water after the initial taste session to freshen the taste bud before tasting the comparative food product.

Recipe Development

1. Utensils required

i. Mixing bowl – 3 (15ltr)
ii. Chopping knife – 2
iii. Presuure pots – 3
iv. Gas stove (at least, 3 burners)
v. Measuring cups – 1 set
vi. Measuring spoons – 1 set
vii. Wooden spatula – 3
viii. Weighing scale – 1
ix. Glass jug – 2

2. *Viscosity Additive*

Ngụ is produced from an inert ash that serves as alternative to edible potash and baking soda. *Ngu* is predominantly used in the Southeastern region of Nigeria as thickening material when cooking certain traditional foods that involve transformation of the required quantity of raw palm oil into a sauce of a certain level of density and viscosity. The preparation of *Ngu* is done by getting a specified quantity of ash derived from burnt palm fruit stalk and adding a specified quantity of potable water. Specifically, a 75cl bottle could be used for the preparation.

3. *Preparation of Ngu*

The harvested ash was put into a quarter of a 75cl bottle and filled with potable water. The 75cl bottle of water was shaken thoroughly and allowed to settle (6pm to 7am) overnight. The water was drained out carefully in a clean glass jug, leaving the ash residue in the bottle.

4. *Egbo* recipe

Item	Quantity
Corn (dried)	1.4Kg
Beans	1.7Kg
Salt	to taste

5. Preparation of *Egbo*

The dried corn was carefully picked to separate dirt and chaff, then soaked in clean water (with a bowl) at night (7pm). The soaked corn was thoroughly rinsed with clean water, up to three time, in the morning (7am). The corn was put in a pressure pot and with water filled to cover the corn. At first cook, and at high temperature, enough water was added to cook until the corn becomes pulpy. The corn was check to have become tender enough or more water is added to continue boiling until cracked and tender. The cooking process to up to 150 minutes. Salt is, thereafter, added to taste.

6. Preparation of Beans

Dirt in the beans was picked out, and the beans was rinsed in clean water. The beans was poured into a pressure pot and covered with water. Cooking was done at high temperature, for about 105 minutes, until the beans became very tender. Salt was allowed to taste while the water lowered from top level before the pressure pot is removed from the fire.

7. Sauce recipe

Item		Quantity
Ngụ		150ml
Palm oil	75cl	
Onion		150g
Pepper		0.7g
Salt		to taste
Efolo		700g (heads discarded)
Ụgba		800g

8. Preparation of the sauce

The 75cl of palm oil is poured into a mixing bowl. The *Ngụ* is gradually poured into the bowl of palm oil and stirred scrupulously (simultaneously) to produce the sauce, until it the viscosity is achieved. Ground pepper was added into the sauced and stirred. Thereafter, the *Efolo*, and the *Ụgba* and stirred, while salted is also added to taste.

9. Finishing (combination)

The sauce is dispensed in a cooking pot and placed on mild fire to simmer for two minutes to be ready. Then, the *Egbo* and beans were poured into the mixing bowl (in their hot temperature) and the sauce added. The combination is stirred thoroughly and poured into service plate. Chopped onions is added. Thereafter, the thinly chopped fresh *Ụtazi* leaves (1g) were added, mixed thoroughly and served.

2.5 Data Analysis

The data from sensory assessment were analyzed with the version 20.0 of the Statistical Package for Social Science (SPSS). Analysis of Variances (ANOVA) was carried out to examine the significant variations in treatment means as well as least significant differences (LSD) analysis ($P \leq 0.05$) to separate means.

Results and discussion

There are two samples of the *Egbo* dish labelled A and B which were served to the 44 taste panelists. A 9-point hedonic scale was prepared to determine the degree of preference of the food samples. The scale contains the elements of: Dislike extremely (1), Dislike very much (2), Dislike moderately (3), Dislike slightly (4), Neither like not dislike (5), Like slightly (6), Like moderately (7), Like very much (8), and Like extremely (9). The samples were presented in identical serving plates. However, the researchers identified the enhanced *Egbo* dish as 'Sample A', while the conventional *Egbo* dish was labelled as 'Sample B' without recourse to the taste panelists. The sensory attributes measured are; appearance, colour, texture, taste, flavour, aroma and overall acceptability. All the data were subjected to ANOVA (completely randomized design). Mean values were compared at $p \leq 0.05$ significant level using Tukey's Test.

3.1 Analysis of the Sensory Evaluation and Proximate

Table 1: Descriptive Statistics of the Samples

Sample	Appearance	Colour	Texture	Taste	Flavour	Aroma	Overall Acceptability
A	8.38±0.8053	8.08±0.9223	8.20±1.3401	8.44±0.8369	8.36±0.8514	8.32±0.8192	8.18±0.8003
B	8.24±1.0984	8.04±1.0294	8.16±1.3149	8.26±1.0461	8.20±0.8330	8.32±0.7939	8.36±0.7762
Mean	8.31±0.9608	8.06±0.9726	8.18±1.3210	8.35±0.9468	8.28±0.8418	8.32±0.8025	8.27±0.7895

Researchers' Computation, 2023

The presentation in Table 1 confirms the average responses of the two samples with respect to the attributes measured. The overall averages indicate 8.31±0.9608 for appearance, 8.06±0.9726 for colour, 8.18±1.3210 for texture, 8.35±0.9468 for taste, 8.28±0.8418 for flavour, 8.32±0.8025 for aroma and 8.27±0.7895 for overall acceptability. The result indicates a variation in responses between the samples.

Table 2: Summary of the ANOVA for the Sensory Attributes

	Appearance	Colour	Texture	Taste	Flavour	Aroma	Overall acceptability
R^2	0.9276	0.9551	1.7624	0.8973	0.7094	0.6506	0.6214
F	0.5238	0.0419	0.0227	0.9027	0.9022	0.0000	1.3034
Pr > F	< 0.0469	0.0838	0.0880	< 0.0344	< 0.0344	1.0000	< 0.0256

Researchers' Computation, 2023

Table 2 presents the summary of ANOVA for the sensory attributes of the samples. The result indicates an F-value ≤ 0.05 for the attributes of appearance, taste, flavour, and overall acceptability for the samples. Consequently, the study affirms that there is significant variance between the samples based on the aforementioned sensory attributes. Conversely, the result indicated an F-value ≥ 0.05 on the attributes of colour, texture, and aroma for the samples to assert that there is no significant variation between the samples in relation to their colour, texture, and aroma.

Table 3: Correlation among the attributes

	Appearance	Colour	Texture	Taste	Flavour	Aroma	Overall acceptability
Appearance	1.0000	0.5204	0.1625	0.4347	0.3037	0.3155	0.2481
Colour	0.5204	1.0000	0.3296	0.4048	0.4358	0.2599	0.2155
Texture	0.1625	0.3296	1.0000	0.1672	0.1268	0.0595	0.0595
Taste	0.4347	0.4048	0.1672	1.0000	0.4207	0.4227	0.2642
Flavour	0.3037	0.4358	0.1268	0.4207	1.0000	0.3146	0.0371
Aroma	0.3155	0.2599	0.0595	0.4227	0.3146	1.0000	0.3565
Overall Acceptability	0.2481	0.2155	0.0595	0.2642	0.0371	0.3565	1.0000

Researchers' Computation, 2023

The correlation among the attributes (Table 3) shows that there is a strong positive relationship between appearance and colour (r=0.5204), as well as appearance and taste (r=0.4347). However, a weak positive relationship exists between taste and flavour (r=0.4207) and taste with aroma (r=0.4227).

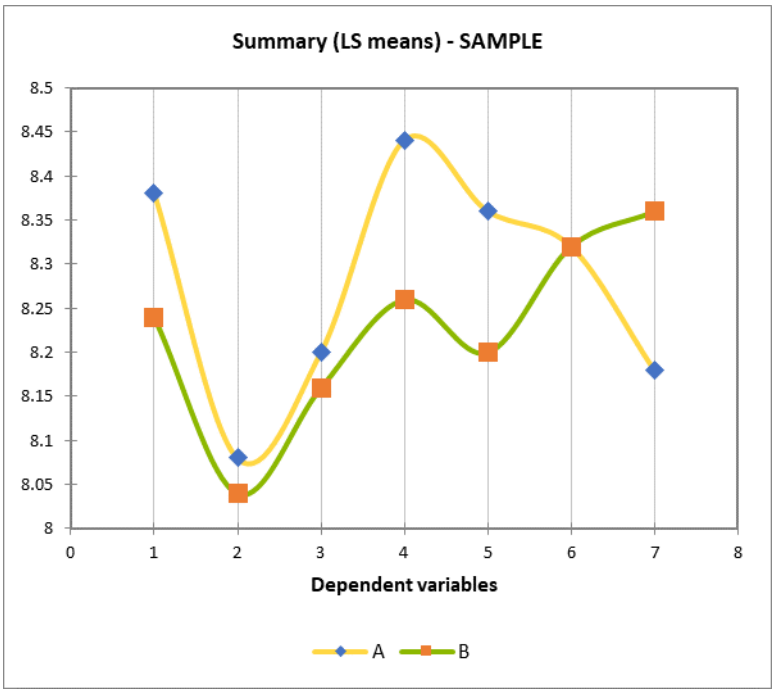

Figure 1: Line plot for the samples

The line plots for the samples means with respect to the attributes are as presented in Figure 1 (lines 0-8 on the Y axis are representative of the attributes, in which 1 = appearance, and 7 = overall acceptability). This further establishes the fact that there is significant variation in the samples with respect to the attributes of taste (line 4), flavour (line 5), and overall acceptability (line 7).

Table 4: Descriptive Statistics of the Samples (Proximate)

Sample	Moisture	Dry Matter	Fat	Ash	Crude Fibre	Crude Protein	Carbohydrate	Phytate
A	51.4±0.035	48.6±0.035	13.44±0.0212	5.65±0.0283	10.145±0.0212	12.875±0.0212	6.49±0.0566	0.57±0.001
B	60.64±0.035	39.37±0.035	10.85±0.0212	3.22±0.0141	9.35±1.372	12.235±0.0212	4.71±0.0566	0.71±0.002

Researchers' Computation, 2023

The result in Table 4 shows the mean and the standard deviations for each of the samples regarding the presence of micronutrients of moisture, dry matter, fat, ash, crude fibre, crude protein, digestible carbohydrate, and phytate. The result indicates a higher value of moisture in sample B, higher value of dry matter in sample A, higher value of fat in sample A, and higher value of ash in sample A. Relatively, more crude fibre was observed in sample A, more crude protein observed in sample A, and more digestible carbohydrates observed in sample A. However, more content of phytate was observed in sample B.

Table 5: Summary of the ANOVA on the Proximate

	Moisture	Dry Matter	Fat	Ash	Crude Fibre	Crude Protein	Carbohydrate	Phytate
R^2	1.0000	1.0000	0.9999	0.9998	0.2514	0.9978	0.9980	0.9995
F	68154.3200	68154.3200	14906.8889	11809.8000	0.6716	910.2222	990.1250	4032.8000
Pr > F	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.4986	< 0.0011	< 0.0010	< 0.0002

Researchers' Computation, 2023

The summary of the AVOVA (Table 5) indicates that, except for crude fibre content of the two samples that does not significantly vary from each other since the p-value is greater than the 0.05 significance level, there is a significant variation in the two samples in terms of their moisture content, dry matter content, fat content, ash, crude fibre, crude protein, digestible carbohydrate and phytate, because the p-values are less than the 5% significance level.

Table 6: Post Hoc test on the Proximate

Category	Tukey means	Groups	
	Moisture Content		
A	51.4050	A	
B	60.6350		B
	Dry Matter Content		
A	48.5950	A	
B	39.3650		B
	Fat Content		
A	13.4350	A	
B	10.8450		B
	Ash Content		
A	5.6500	A	
B	3.2200		B
	Crude Fibre Content		
A	10.1450	A	A
B	9.3500	A	B
	Crude Protein Content		
A	12.8750	A	
B	12.2350		B
	Digestible Carbohydrate Content		
	LS means (Moisture Content)		
A	6.4900	A	
B	4.7100		B
	Phytate Content		
B	0.7140	A	
A	0.5720		B

Researchers' Computation, 2023

Result of the post hoc test for the proximate is presented in Table 6, in which the result indicates a significant different between the samples in terms of moisture content to further reveal that moisture content is greater in sample B. There is equally a significant different between the samples in terms of dry matter content, fat content, ash content, crude fibre, digestible carbohydrate, and phytate contents in favour of sample A. However, there is less variation between the samples in terms of crude protein content. This could be attributed to the closeness of their average values as seen in Table 6

Conclusion

This study, to a reasonable extent, presents an ascending curve for gastronomy tourism in the local restaurant industry. Culinary experts could harness new cuisine opportunities to create a niche for sustainable traditional cuisine production and marketing by studying consumer behaviour while serving the food product and differentiate further towards continuous improvements. More specifically, the study carefully combined the cuisine expertise of the Yoruba and Igbo ethnic nationalities of Southern Nigeria to produce the enhanced delicacy which is traditionally of Yoruba origin.

The study affirms the acceptability of the enhanced *Egbo* dish by the respondents. A standard recipe for the preparation of the enhanced *Egbo* dish has subsequently been developed from the study, which would give the desired result when replicated carefully. Although the sensory evaluation of the enhanced *Egbo* reveals no significant variation with the conventional *Egbo* in terms of the attributes of colour, texture, and aroma, there is significant variation on appearance, taste, flavour, and overall acceptability. In terms of the proximate composition of the samples, there is a significant variation between the enhanced *Egbo* and the conventional *Egbo* delicacies. Although the conventional *Egbo* has a higher moisture content, the enhanced *Egbo* has a higher content of dry matter, fat, ash, crude fibre, crude protein, digestible carbohydrate, and phytate, thus proving to be of a higher nutritive significance.

The findings affirm the enhanced *Egbo* as a traditional food product not bereft of nutritive qualities. The fortification of the *Egbo* delicacy is a way of ensuring the retention of the micronutrients that would have been lost during the preparation of the principal raw material (maize and beans) of the food product, hence ensuring food security. To this end, introducing the food product in to local restaurants will improve the product line of the industry with the assurance that the nutritional intake of restaurant customers is not jeopardized.

Recommendation

a. A careful selection of the commodities for preparing the enhanced *Egbo* is necessary. The quality of the maize, beans and the fermented *Ụgba*, for instance should be considered. Poor quality food commodities have a way of affecting the organoleptic qualities of food products.
b. Care should be taken on using right alternative viscosity liquid for the sauce. Baking soda could be a better alternative to *Ntụ ngụ* than the use of potash.
c. A cautious and tender handling of the *Ụtazi* leave is equally advisable to avoid loss of the essential properties and alteration of its taste. Adequate timing during the preparation of the food product is equally essential to ensure that the sauce maintains normal viscosity post-preparation.
d. A gradual introduction of the food into the restaurant industry will minimize ethno-cultural criticisms that may cause outright rejection by majority of the ignorant buying population. Persons serving the food product to customers should be acquainted with the appropriate dietary information to stimulate purchases, and for avoidance of doubt.

Suggestion for Further Research

This study suggests that food analysis be performed on the enhanced *Egbo* to understand the chemical composition of the enhanced dish and the actual balance of the dietary constituents in the food. It is also necessary to identify if there are contaminants or adulterants in the food product, which would assist in improving the processing parameters.

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