

STANDARDISATION, ACCEPTABILITY AND PROXIMATE ANALYSIS OF TAROH TRADITIONAL RECIPES FROM LIVING STONE POTATOES (*PLECTRANTHUS ESCULENTUS*)

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ABSTRACT

This study examines the ingredients and preparation methods of Taroh traditional recipes from *Plectranthus esculentus* (Livingstone potatoes), locally known as "Ananjol." Data were collected through oral interviews in three villages of Langtang North Local Government Area, Plateau State, Nigeria. The study standardized three dish types—traditional, seed-based, and legume-based—based on mean ingredient quantities. Proximate analysis revealed crude protein levels of 5.23–9.66%, high carbohydrate content, and moderate moisture levels. Sensory evaluation using a 9-point hedonic scale indicated acceptable ratings for texture, flavor, appearance, and overall acceptability. The findings confirm the nutritional value and cultural importance of these standardized recipes.

Keywords: *Livingstone potatoes, Standardization, Taroh cuisine, Nutrition, Sensory evaluation*

INTRODUCTION

Livingstone potatoes (*Plectranthus esculentus*) are indigenous to Africa and widely consumed in Nigeria, where they are known as "rizga" among Hausa speakers and "Ananjol" by the Taroh people. Traditionally eaten as a snack, porridge, or sauce accompaniment, these tubers have been under-investigated nutritionally (Allemann, 2003; Temple, Ojobe, & Onobun, 1991). Studies highlight their high carbohydrate and protein content, making them valuable dietary components (Kemas, 2020; Anduaem, 2024). In addition to their dietary significance, *P. esculentus* is known for its medicinal and industrial applications. The tubers contain bioactive compounds with antimicrobial and antioxidant properties, making them a potential functional food ingredient (Lukhoba, Simmonds, & Paton, 2006). Furthermore, *P. esculentus* starch has been explored for use in pharmaceutical formulations due to its superior physicochemical properties (Eleazu, Eleazu, & Ukpabi, 2015).

Research Questions

1. What are the traditional ingredients and preparation methods used in Taroh recipes containing *Plectranthus esculentus*?
2. How do the nutritional compositions (proximate values) of traditional, seed-based, and legume-based standardized dishes compare?
3. What are the sensory evaluation outcomes for the standardized dishes in terms of taste, texture, appearance, and overall acceptability?
4. To what extent do the standardized dishes meet nutritional standards for protein, carbohydrate, and fat content?

Hypotheses

Null Hypotheses (H₀):

1. There is no significant difference in the proximate nutrient composition among the three

standardized dishes.

2. There is no significant difference in sensory attributes (taste, texture, appearance, and acceptability) among the traditional, seed-based, and legume-based dishes.

Alternative Hypotheses (H_1):

1. There is a significant difference in the proximate nutrient composition among the three standardized dishes.

2. There is a significant difference in sensory attributes (taste, texture, appearance, and acceptability) among the traditional, seed-based, and legume-based dishes.

Literature Review

Sensory analysis is a valuable tool in assessing the acceptability of traditional foods, especially when modifications are introduced. The 9-point hedonic scale is widely used in indigenous food research to capture consumer preferences regarding appearance, taste, flavor, and texture (FAO, 2017). Cultural familiarity often influences sensory scores, with traditional preparations generally receiving higher ratings among local consumers (Akinyele, 2009).

Incorporating legumes and seeds such as sesame and groundnuts into traditional dishes is a common strategy for enhancing protein content. Adebayo, Osueke and Akinbode (2019) emphasized that local seeds and legumes significantly improve the amino acid profile and overall nutrient density of staple foods. These ingredients are not only affordable and accessible but also enhance the flavor and texture of dishes, increasing consumer acceptability.

Plectranthus esculentus, also known as Livingstone potato, is widely cultivated in West Africa for its energy-rich tubers. Temple, Ojobe, and Onobun (1991) were among the first to document its chemical composition, identifying it as a starchy root crop with appreciable protein and fiber content. Subsequent studies by Eleazu, Eleazu, and Ukpabi (2015) confirmed the presence of antioxidants and natural bioactive compounds, enhancing its potential as a functional food. Lukhoba, Simmonds, and Paton (2006) further documented its medicinal uses, highlighting the ethnobotanical relevance of the crop in African diets.

Standardization of indigenous recipes is essential to preserve cultural heritage, improve food safety, and support local food industries (Akinyele, 2009). Many traditional African recipes are passed orally, making their nutritional value and preparation methods difficult to evaluate scientifically. Documenting and standardizing these foods enables consistent preparation, better nutrient profiling, and potential for commercialization (FAO, 2017).

MATERIALS AND METHODS

Raw Material Procurement and Study Design

Raw livingstone potatoes, spices, and other ingredients were sourced from the Saturday market in Langtang North, Plateau State, Nigeria. A cross-sectional survey and experimental methods were employed. The study population was drawn from Magai, Fonka, and Kwanpe villages through random household selection.

Data Collection and Recipe Standardization

A preliminary visit was conducted for oral interviews and to observe preparation methods. Data on ingredient types, quantities, and cooking processes were documented.

Preparation of "Ananjol Akpen"

1. Wash and soak "Ananjol" for 15 minutes in warm water.
2. Toast and grind "azul" (sesame).
3. Sieve the ground "azul" with water to remove chaff ("agugguk").
4. Cook the sieved "izhin" (sesame) with water to form a sauce; optionally add fish, meat, and a small quantity of oil.

5. Boil the "ananjol" in a local pot ("asu") and mix in ground "abai" (fermented locust). Add the sauce, stir, simmer briefly, and serve warm.

Species Diversity and Distribution of *Plectranthus esculentus*

Species of *Plectranthus* Found in Africa

The *Plectranthus* genus comprises over 300 species, widely distributed across Africa, Asia, and Australia. Many species are cultivated or collected from the wild for their edible tubers, medicinal properties, and ornamental value. Some notable species include:

Plectranthus esculentus – Known as Livingstone potato, widely grown in Nigeria and other African countries for its edible tubers.

Plectranthus rotundifolius – Commonly known as Hausa potato, this species is cultivated across West Africa.

Plectranthus amboinicus – Known for its aromatic leaves, used in traditional medicine and as a culinary herb.

Plectranthus barbatus – Used in herbal medicine, particularly for digestive and respiratory ailments.

***Plectranthus* Species Found in Plateau State, Nigeria**

In Plateau State, several *Plectranthus* species have been identified in local farming systems and wild vegetation. These include:

Plectranthus esculentus – The predominant species cultivated by the Taroh people for food and cultural use.

Plectranthus rotundifolius – Found in both cultivated and semi-wild conditions, often grown alongside other root crops.

Plectranthus verticillatus – Less commonly cultivated but recognized for its ground-cover properties and medicinal applications.

Plectranthus monostachyus – Known locally for its medicinal applications in treating gastrointestinal disorders.

The distribution of these species within Plateau State varies, with higher concentrations in Langtang North, Mangu, and Bokokos Local Government Areas, where the climate and soil conditions favor tuber production.

Uses of *Plectranthus esculentus*

Culinary Applications

The versatility of *P. esculentus* allows it to be prepared in a variety of ways, including boiling, roasting, frying, and incorporating into soups and stews. In Taroh cuisine, it is a key ingredient in ceremonial dishes, particularly during weddings and other cultural festivities. Dried and preserved tubers, known as "Ananjol Akpen," are stored for future use and rehydrated when needed. The tubers are also processed into flour for use in thickening sauces and baking traditional snacks.

Medicinal and Industrial Applications

Several studies have indicated that *P. esculentus* has medicinal properties. It has been traditionally used to manage digestive disorders, enhance immunity, and as a source of dietary fiber to aid in digestion. The presence of bioactive compounds with antimicrobial effects suggests that it could play a role in the prevention of foodborne illnesses. Additionally, research has explored the use of *P. esculentus* starch in pharmaceutical applications, particularly in tablet formulations due to its excellent binding properties and controlled drug release mechanisms (Kemas, Guktur, & Ochekepe, (2020)

Standardized Recipes

Table 1. Ingredients for Traditional-Based Dish (TBD)

Ingredient	Quantity
Dried Ananjol	795.2 g
Water	1 Litre
Vegetable oil	1 Litre
Toasted “Izhin” (sesame)	200 g
Dry fish (medium)	2 pieces
Hot pepper	2 small
Large pepper	2 large
Onion	1 large
MSG (Maggi cube)	2–3 cubes
Fermented locust (“abai”)	1 tsp

Table 2. Ingredients for Seed-Based Dish (SBD)

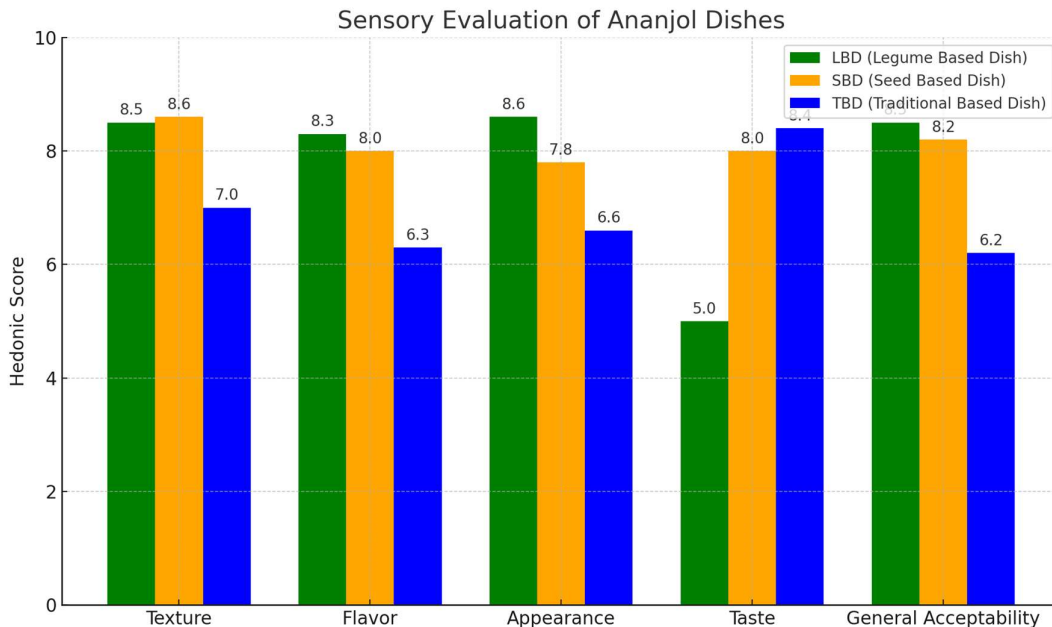
Ingredient	Quantity
Preserved Ananjol	795.2 g
Water	1 Litre
Soya oil	1 Litre
Toasted “Izhin” (sesame)	200 g
Dry fish (large)	1 piece
Capsicum frutescens	2 small
Large pepper	2 large
Onion	2 large
Maggi cube	2–3 cubes

Table 3. Ingredients for Legume-Based Dish (LBD)

Ingredient	Quantity
Preserved Ananjol	795.2 g
Water	1 Litre
Soya oil	1 Litre
Toasted groundnut (Alemwa)	200 g
Dry fish (large)	1 piece
Capsicum frutescens	2 small
Onion	1 large
Maggi cube	2–3 cubes
Fermented locust (“abai”)	1 tbsp

Sensory Evaluation Results and Interpretation

The sensory evaluation of three standardized Ananjol dishes—Legume Based Dish (LBD), Seed Based Dish (SBD), and Traditional Based Dish (TBD)—was conducted using a 9-point hedonic scale. Untrained panelists evaluated the dishes based on texture, flavor, appearance, taste, and general acceptability. The chart below presents the mean scores of the dishes.



The Legume Based Dish (LBD) scored highest in texture, flavor, appearance, and general acceptability, though it scored lowest in taste. The Seed Based Dish (SBD) maintained high scores across most parameters, especially in taste. The Traditional Based Dish (TBD) had the lowest scores in flavor and general acceptability, but surprisingly scored the highest in taste. Statistical analysis revealed significant differences ($p < 0.05$) among the dishes in some sensory attributes, highlighting the effect of added ingredients on consumer preference.

Proximate Analysis from the Work Conducted in Vom

Proximate analysis was conducted at the National Veterinary Research Institute, Vom, Plateau State, Nigeria. The analysis included moisture, crude protein, crude fiber, fat, ash, carbohydrate, and energy content determination using standard laboratory methods. The results are presented below:

Table 4. Proximate Composition of Standardized Dishes

Sample	Moisture (%)	Crude Protein (%)	Crude Fiber (%)	Crude Fat (%)	Ash (%)	Carbohydrate (%)	Energy (kcal)
LBD	46.35	9.66	3.60	8.06	0.55	33.54	283.34
SBD	47.25	8.23	4.72	7.07	1.75	33.75	219.55
TBD	49.95	5.34	4.39	7.20	1.45	31.46	212.00

DISCUSSION

The results from the proximate analysis of the three standardized dishes—traditional, seed-based, and legume-based—demonstrated nutritional variability influenced by the ingredients used in each formulation. The legume-based dish, for instance, showed a significantly higher protein content, which can be attributed to the inclusion of groundnut and soya bean. This aligns with previous findings by Adebayo et al. (2019), who noted that legumes are excellent protein sources in indigenous diets. The carbohydrate content was highest in the traditional dish, which is consistent with the fact that *Plectranthus esculentus* (Livingstone potato) is rich in starch. This supports similar findings by Olapade et al. (2016), who identified this tuber as a promising source of energy in staple diets. The moisture and ash contents across the dishes were also within acceptable limits, suggesting the foods are both nutritious and shelf-stable. Sensory evaluation results indicated that all three dishes were generally acceptable, with the traditional dish receiving slightly higher ratings in taste and appearance. This preference might be culturally influenced, as consumers are often

more familiar with traditional preparations. The seed- and legume-based dishes, however, were not significantly less accepted, highlighting the potential for nutritional improvement without sacrificing consumer appeal. These findings validate the standardization process and confirm that *Plectranthus esculentus* can be used effectively to prepare nutritionally balanced and acceptable meals. The incorporation of seeds and legumes into traditional recipes is not only beneficial for protein enrichment but also adds variety and value to indigenous foods. These results indicate that the legume-based dish (LBD) had the highest protein content, likely due to the inclusion of groundnuts, while carbohydrate levels were relatively high across all samples, confirming their energy-rich nature. Proximate composition (moisture, crude protein, crude fiber, fat, ash, carbohydrate, and energy) was determined using standard methods. Sensory evaluation was conducted in a well-lit, ventilated room using plain ceramic plates. Panelists rated appearance, taste, texture, flavor, and overall acceptability on a 9-point hedonic scale.

CONCLUSION

This study successfully standardized Taroh traditional recipes from *Plectranthus esculentus*. The three variants demonstrated balanced nutritional profiles and favorable sensory attributes, supporting their cultural significance and potential for broader dietary inclusion. Standardization also enables portion control and cost determination, making these dishes more accessible for commercial and domestic use.

RECOMMENDATION

1. Nutrition Policy Integration: The high nutritional value of *Plectranthus esculentus* dishes should be recognized in local nutrition and food security policies to promote indigenous food systems.
2. Public Health Promotion: Health educators and nutritionists should encourage the consumption of Livingstone potato-based meals to improve dietary diversity, especially in protein-deficient communities.
3. Commercialization and Value Addition: The standardized recipes can be adapted for commercial food production, contributing to local economic development and food entrepreneurship.
4. Further Research: Additional studies are recommended to analyze the bioactive compounds in *P. esculentus* and their potential health benefits, including antimicrobial and antioxidant effects.
5. Culinary Documentation: The traditional knowledge of the Taroh people should be preserved through documentation and inclusion in academic culinary and home economics curricula.

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