

Sensory Evaluation, Mineral, and Amino Acid Composition of “Ntubiri” and “Ntiti-Ikpa”, Traditional Foods of Ikwerre Ethnic Nationality in Nigeria.

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ABSTRACT

Sensory evaluation, mineral, and amino acid composition of “Ntubiri” and “Ntiti-Ikpa”, traditional foods of the Ikwerre ethnic nationality in Nigeria were carried out. The foods were prepared following their traditional methods of preparation. Results obtained for sensory evaluation showed that none of the parameters used by the panellists were significantly ($p>0.05$) affected among the studied foods. Mineral result showed that sodium, potassium, and manganese were significantly ($p<0.05$) higher in “Ntubiri” than in “Ntiti-Ikpa”. Ca/K in “Ntiti-Ikpa” and Fe/Cu in both the investigated food samples exceeded their ideal values. Amino acid screening revealed essential (such as Lucien, Phenylalanine, etc.) and non- essential amino acids in the studied food samples.

(Keywords: essential amino acids, traditional foods, Ntubiri, Ntiti-Ikpa, Ikwerre ethnic nationality)

INTRODUCTION

Edible substances which when ingested, digested, and assimilated in the body perform the functions of replacement of worn-out cells, growth facilitation, protection of the body, generation of energy, etc., are known as foods [Uwakwe and Ayalogu, 1998; Okaka and Okaka, 2005; Olusanya, 2008]. Different compounds found in foods are responsible for these functions. For instance, proteins are compounds responsible for replacement of worn-out cells and growth; fats and oils are for protection and energy generation, while carbohydrates are for energy generation, etc. [Uwakwe and Ayalogu, 1998; Olusanya, 2008].

Carbohydrates, proteins, fats and oils found in foods are classified as nutrients [Olusanya, 2008]. There are also other compounds found in foods that are not nutritive compounds but play vital protective roles in the body [Umoh, 1972; Okwu, 2005]. Foods come in different forms and types and are sometimes given continental names including Western, European, and African foods. Most of the existing African foods are rooted in traditions and customs of the people hence the name traditional foods [Achi, 2005b; Achi, 2005a; Cayot, 2007].

Nigeria, the most populous black nation of the world is among the countries of African continent where traditional African foods are routinely consumed. The country has more than 250 ethnic groups, each with two or more traditional foods rooted in the traditions and customs of the people [Duru *et al.*, 2012].

“Ntubiri” and “Ntiti-Ikpa” are among such traditional foods found in Nigeria that are rooted in the traditions and customs of the people. These foods are associated with the Ikwerre ethnic nationality of South-South geopolitical zone of Nigeria [Nduka, 1993]. The Ikwerre people of Nigeria speak the Ikwerre language as their dialect and are traditionally farmers. “Ntubiri” and “Ntiti-Ikpa” foods perform the functions of showcasing the traditions and customs of Ikwerre people, and serve as symbols of unity among the people [Amadi *et al.*, 2011].

Sequel to efforts by researchers to study the constituents of existing traditional foods in Nigeria and Africa [Temple *et al.*, 1996; Achi, 2005b; Achi, 2005a; Kpikpi *et al.*, 2009; Amadi *et al.*, 2011; Benjamin *et al.*, 2012]. The present study investigated the sensory evaluation, mineral, and

amino acid composition of “Ntiti-Ikpa” and “Ntubiri” traditional foods of Ikwerre ethnic nationality in Nigeria.

MATERIALS AND METHODS

The study of “Ntubiri” and “Ntiti-Ikpa” was carried out in Isiokpo in Ikwerre Local Government of River State, South-South, Nigeria where they are produced for home consumption.

Sample Collection: The ingredients used in the preparation of “Ntubiri” and “Ntiti-Ikpa” were purchased from a local market in Isiokpo, Ikwerre Local Government Area of River State, South-South, Nigeria.

“Ntubiri” Preparation: Six hundred and fifty grams (650g) of peeled water yam (*Dioscorea alata*) was properly washed and crushed by scraping with kitchen knife to a semi-molten form into a bowl. 220ml of water was heated in a cooking pot on a cooking stove and allowed to boil. 40g of ground prawn and 120g of dried tilapia fish were added to the pot and allowed to boil. After boiling for about 5min, 7g of ground dried pepper, 10g of salt, a cube of maggi, 20g of crayfish, 30g onion were added and allowed to boil for another 5min. 100ml of red palm oil (RPO) was added to the crushed water yam bowl to hold it together because of its adhesive properties and mixed thoroughly. Portions of the mixed, crushed water yam were collected with spoon and put into the boiling pot containing the ingredients, covered and allowed to boil for 20 min.

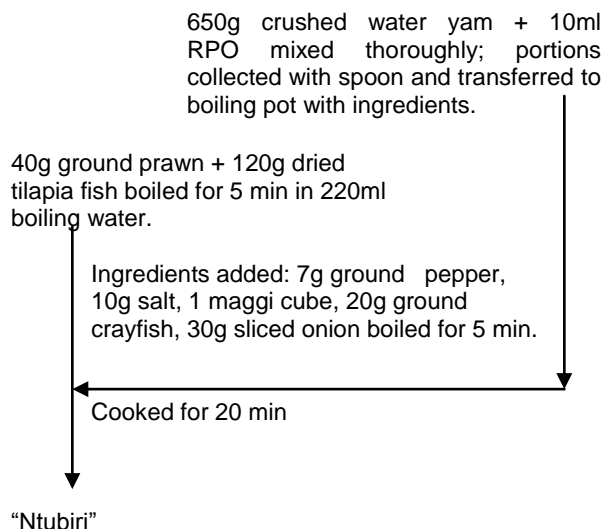


Figure 1: Flow-chart for Preparation of “Ntubiri”.

“Ntiti-Ikpa” Preparation: Ground corn of 4,120g weight was put into a mixing bowl. 1,200g of peeled ripe banana was washed, meshed and transferred to mixing bowl containing the corn. They were both mixed with a turning ladle for 5min. 400ml of red palm oil (RPO) was added to the mixture of corn and banana and mixed thoroughly to a homogenous mixture. After mixing, 210g of sliced onion, 40g of ground crayfish and 15g of sliced fresh pepper were added separately to the mixture in the bowl and mixed thoroughly to a light consistency. 80g of salt was added to the contents of the bowl and also stirred continuously for 10min to get a smooth consistency. The mixture was put in fresh clean leaves of *Pandanus candelabrum* (etere) which were folded and tied with strings of rope. The wrapped samples were placed one by one into a cooking pot steaming with water on a cooking stove and allowed to steam for 30 min. After cooking, the contents were unwrapped and served.

4,120g ground corn + 1,200g mashed banana mixed in a bowl for 5min

Ingredients added with subsequent stirring 400ml RPO, 210g sliced fresh tomatoes, 100g sliced onion, 40g ground crayfish, 15g sliced fresh pepper, 80g cooking salt stirred continuously for 10min.

Wrapped in fresh *Pandanus candelabrum* (etere) leaves, folded and tied with string. Then, steamed for 30min and unwrapped.

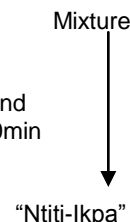


Figure 2: Flow-chart for Preparation of “Ntiti-Ikpa”.

Preparation of Samples for Analysis: The prepared traditional food samples were dried in an oven for 70°C for 48 hours. The dried samples were ground with a hand mill into powdered form and stored in air-tight sample containers at 4°C until required for analysis.

Sensory Evaluation: Freshly prepared “Ntubiri” and “Ntiti-Ikpa” were subjected for sensory evaluation following the method described by Amadi *et al.*, [2004].

Mineral Content Determination: The mineral contents of the studied samples were determined following the methods described by Amadi *et al.* [2011].

Mineral Ratio Determination: The mineral ratios were determined as described by David [2010].

Amino Acid Screening: Amino acids were screened using the methods of Akubugwo *et al.* [2006].

Statistical Analysis: Results obtained in the present study were presented as mean and standard deviation while Student's t-test described by Pearson and Hartley [1966] and Steel and Torris [1960] were used for test of significance between the samples.

RESULTS AND DISCUSSION

Table 1: Sensory Evaluation of "Ntubiri" and "Ntiti-lkpa".

Parameter	Ntubiri	Ntiti-lkpa
Appearance	7.95±0.60	7.35±0.67
Taste	7.20±1.10	7.50±1.24
Aroma	7.35±0.95	7.45±0.76
Texture	6.75±0.78	7.50±0.76
Colour	6.75±1.02	7.60±0.68
Overall acceptance	7.80±0.62	7.85±0.74

Values are means and standard deviations of triplicate determinations.

Stone and Sidel [1993] noted that sensory evaluation has been defined as a scientific method used to evoke, measure, analyze and interpret those responses to products as perceived through the senses of sight, smell, touch, taste, and hearing. Among the importance of sensory evaluation are comparing similarities and differences in a range of dishes, evaluating a range of existing dishes and food products, analyzing food samples for improvements, determining the acceptable or unacceptable nature of food samples, etc., [BHF, 2010]. Sequel to this importance, sensory evaluation of food should be an integral part in defining and controlling food product quality. Perceptions of the sensory characteristics of food or food products are very important to food manufacturers, retailers, as well as consumers.

Table 1 shows the sensory evaluation of "Ntubiri" and "Ntiti-lkpa" traditional foods. The sensory evaluation parameters such as appearance, taste, aroma, texture, and colour as rated by the panellists were insignificantly affected ($p>0.05$) among the studied diets. These parameters are known to affect palatability and acceptability of foods. The values obtained for "Ntubiri" and "Ntiti-lkpa" traditional foods in terms of taste, aroma, texture, and colour are in line with the values reported by Benjamin *et al.*, [2012] on sensory evaluation of "Onunu" and "Mgbam" traditional diets of Ikwerre people of Nigeria. observed appearance values of the studied foods were lower than that of "Onunu" a traditional food of Ikwerre people of Nigeria [Benjamin *et al.*, 2012] while their overall acceptance were lower than those of that of "Mgbam" [Benjamin *et al.*, 2012] traditional food of Ikwerre in South-South, Nigeria. It could be that in terms of appearance, "Onunu" is preferred to the studied foods while in terms of acceptance "Mgbam" may be preferred to "Ntubiri" and "Ntiti-lkpa" traditional foods.

Table 2: Mineral Element Contents of "Ntubiri" and "Ntiti-lkpa" (mg/100g).

Mineral Element	Ntubiri	Ntiti-lkpa
Sodium	27.00±2.00	3.61±1.10
Potassium	36.00±19.12	5.60±2.16
Calcium	44.02±0.13	45.00±0.01
Magnesium	49.15±0.10	51.08±0.01
Copper	0.25±0.18	0.27±0.14
Zinc	0.30±0.10	0.31±0.12
Iron	0.59±0.21	0.63±0.12
Manganese	0.42±0.22	0.08±0.01

Values are means and standard deviations of triplicate determinations.

The importance of mineral elements in human nutrition cannot be overstated. Sodium and potassium contents of "Ntubiri" were significantly ($p<0.05$) higher than that of "Ntiti-lkpa" in the present study. The high sodium content of "Ntubiri" may not be an added advantage due to the relationship of sodium intake and high blood pressure in human [Dalh, 1972]. Potassium is known for its intracellular fluid functions such as maintenance of osmotic pressure and acid-base balance of the body [Olusanya, 2008]. Okaka and Okaka [2005] noted that potassium participates in certain enzyme systems in the body. The same authors noted that its deficiency is very rare. Calcium, magnesium, copper, zinc, and iron were insignificantly ($p>0.05$) affected among the

studied food samples. Calcium is required for bone formation, magnesium plays a key role as an essential ion in many fundamental enzymatic reactions in intermediary metabolism, copper is a constituent of many metallo-enzymes, facilitates incorporation of iron into red blood cells and as well needed for iron absorption; zinc is known to function in lipid, protein, carbohydrate, and nucleic acid metabolism; iron is a major component of red blood cell cytochromes of electron transport chain, etc. [WHO, 1996; Osuaqwu *et al.*, 2007; Olusanya, 2008].

Manganese functions as a co-factor to many important enzyme systems of the body. The manganese content of "Ntubiri" is significantly ($p < 0.05$) higher than that of "Ntiti-Ikpa" as observed in this study. It therefore implies that "Ntubiri" may be better position to offer more manganese to the body than "Ntiti-Ikpa" on consumption of same quantities of both recipes. Sodium, potassium, calcium, magnesium, zinc and iron values of the studied foods are higher than those of "Nduduagworagwo" a traditional food of Akokwa people in Ideato L.G.A of Imo State, Nigeria [Duru *et al.*, 2012]. Copper contents of the investigated traditional foods were higher than that of "Mgbam", a traditional diet of Ikwerre people of Nigeria [Benjamin *et al.*, 2012]. Observed manganese contents of "Ntubiri" and "Ntiti-Ikpa" were lower than those "Onunu" and "Mgbam" [Benjamin *et al.*, 2012].

The mineral ratios are often more important than the individual mineral levels [David, 2010]. Mineral ratios also known as significant ratios reveal not only the importance balance between elements but they also provide information regarding the many possible factors that may be represented by a disruption of their relationship, such as disease state, physiological and developmental factors, etc., [David, 2010]. Table 3 depicts that aside Ca/K ratio of "Ntiti-Ikpa" and Fe/Cu ratio of "Ntubiri" and "Ntiti-Ikpa" other mineral ratios were below their ideal ratios. Elevation of Ca/K ratio of "Ntiti-Ikpa" above its ideal ratio may result in poor calcium utilization in the body if the food is consumed hence making the recipe a poor source of calcium. Elevation of Fe/Cu ratio above its ideal ratio could affect iron utilization in the studied foods samples in relation to the body.

Amino acids are important due to their roles in the body. They are the building block of proteins and are components of most enzyme systems [Young and Pellet, 1990; Uwakwe and Ayalogu, 1998]. Table 4 shows the amino acid screening of "Ntubiri" and "Ntiti-Ikpa. According to a known classification on how these amino acids are produced in mammals, leucine, histidine, arginine, lysine, methionine, phenylalanine, and threonine are essential amino acids and must be supplied to the body [Young and Pellet, 1990; Okaka and Okaka, 2005; Olusanya, 2008].

Table 3: Mineral Element Ratio of "Ntubiri" and "Ntiti-Ikpa".

Mineral Element Ratio	Ntubiri	Ntiti-Ikpa	Ideal Ratio
Sodium/Potassium	0.75	0.64	2.4
Calcium/Potassium	1.22	8.04	4.2
Sodium/Magnesium	0.55	0.07	4.0
Calcium/Magnesium	0.90	0.88	7.0
Zinc/ Copper	1.20	1.15	8.0
Iron/Copper	2.36	2.33	0.9

Table 4: Amino Acid Screening of "Ntubiri" and "Ntiti-Ikpa".

Amino Acid	Ntubiri	Ntiti-Ikpa
Cystine	++	++
Leucine	+++	+++
Histidine	++	++
Arginine	+++	+++
Proline	++	++
Alanine	++	++
Lysine	+++	+++
Methionine	++	+
Phenylalanine	++	++
Threonine	++	++
Glycine	++	++

+++ = Present in high concentration; ++ = Present in moderate concentration; + = Present in low concentration.

Aside the observed low concentration of methionine in “Ntiti-Ikpa”, leucine, arginine, and lysine are present in high concentrations while the other amino acids found in the studied food samples are present in moderate concentrations. All put together, the studied foods could be rich in amino acids.

CONCLUSION

This study has shown the sensory evaluation, mineral and amino acid composition of “Ntubiri” and “Ntiti-Ikpa” traditional foods of Ikwerre ethnic nationality in Nigeria. Suggestively, there is need to quantify the amino acids found in the studied foods and as well examine the *In vivo* status of the foods.

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