

# Nutrient and sensory evaluation of traditional soups consumed in Igberere community in Bende local government area, Abia State, Nigeria

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**Abstract:** This study evaluated the proximate and micronutrient composition of traditional soups (Nsala, Achara, Ofese and Uha) consumed in Igberere community, Abia State. The proximate composition, vitamin and mineral composition of the soups were determined using standard assay techniques. The protein content of the soup meals ranged from 31.77 to 40.20%. The Achara soup had the highest protein content (40.20%). The ash content of ofese (6.25%) was significantly higher ( $p < 0.05$ ) than the other soups (5.62%, 5.33% and 4.98%) achara, nsala and Uha soups respectively. The fat content of ofese (11.25%) was significantly higher ( $p < 0.05$ ) than the other soups (10.74%, 8.20 and 9.77%) Uha, Nsala, and achara soups respectively. The fibre content of achara soup (13.72%) was significantly higher ( $p < 0.05$ ) than the other soups (12.75%, 8.20% and 10.77%), ofese. Nsala and Uha soups respectively. The vitamin A ranged from 3.49 to 687.69mg and there was no significant difference. The vitamin C content of the soups varied, it ranged from 4.11 to 41.07mg, there was no significant difference in Achara, Nsala, Ofese and Uha (32.85mg, 4.11mg, 21.71mg and 41.07mg). The calcium content of ofese (41.42mg) was significantly ( $p < 0.05$ ) lower than the other soups, (69.47mg, 74.81mg, and 57.45mg), Achara, Nsala and Uha soups respectively. The iron content of the soups varied and ranged from 0.23 to 0.43mg/100g. The copper content ranged from 0.08 to 0.25mg. The magnesium content of Ofese (37.6mg) was significantly higher ( $p < 0.05$ ) than other soups, (20.0mg, 25.6mg and 18.4mg) Achara, Nsala and Uha soups respectively. The potassium content of the four soups were moderately high. They ranged from 48.13 to 118.93mg. The phosphorus content of Uha (199.85mg) was significantly higher ( $p < 0.05$ ) than other soups, (188.15mg 55.25mg and 54.17mg respectively. The zinc content of ofese (0.396mg) was significantly higher ( $p < 0.05$ ) than other soups, (0.364mg 0.23mg and 0.224mg), Achara, Nsala and Uha soups respectively. Sensory evaluation conducted revealed that all the soups were generally acceptable. Consumption of these soups should be popularized for other communities to use since they are vegetable based and ideal for therapeutic nutrition.

**Keywords:** Nutrient, Sensory Evaluation, Traditional Soups, Igberere Community

## 1. Introduction

Lack of nutrition education precipitates wrong choice of food and malnutrition. The Interrelationship between diet, food habits and micronutrient deficiency disease have called for urgent investigation on the nutrient content of traditional soups consumed in various parts of Nigeria including in Igberere Land. In Nigeria, diets are high in carbohydrate and low in protein (1).

Deficiencies of micronutrients are a major global health

problem. More than 2 billion people in the world today are estimated to be deficient in key vitamins and minerals, particularly vitamin A, iodine, iron and zinc. Most of these people live in low income countries and are typically deficient in more than one micronutrient. Deficiencies occur when people do not have access to micronutrient-rich foods such as fruit, vegetables, animal products and fortified foods, usually because they are too expensive to buy or are locally unavailable (2). Micronutrient deficiencies increase the general risk of infectious diseases because of compromised immune system as well as the risk

of dying from diarrhoea, measles, malaria and pneumonia. These conditions are among the 10 leading causes of disease in the world today (3).

The groups most vulnerable to micronutrient deficiencies are pregnant women, lactating women, women of reproductive age and young children, mainly because they have a relatively greater need for vitamins and minerals and are more susceptible to the harmful consequences of deficiencies. However, for a pregnant woman these include a greater risk of dying during childbirth, or of giving birth to an underweight or mentally-impaired baby. As well for a lactating mother, her micronutrient status determines the health and development of her breast-fed infant, especially during the first 6 months of life. More so, for women of reproductive age group, the risk of iron deficiency and hence anaemia due to monthly menstrual cycle is increased as well as other consequences associated with iron deficiency and anaemia. Lastly for a young child, micronutrient deficiencies increase the risk of dying due to infectious disease and contribute to impaired physical and mental development (2, 4).

Apart from poor feeding practices and shortfalls in food intake, micronutrient deficiency is a direct cause of child morbidity and mortality. Micronutrients such as iron, iodine, vitamin A, are necessary for the healthy development of children. Their absence in the diet cause serious disorders. For example, lack of sufficient iodine can lead to goiter, hypothyroidism, mental and physical impairment. Damages due to iodine deficiency can be avoided by ensuring that the salt used in households is iodized (5).

In Nigeria, important progress has been made in Micronutrient deficiency control over the last years. Today Nigeria is justifiably considered Africa's success story on iodization of edible salt. It is the only sub-Saharan country to attain universal Salt iodization with about 97% of the households using iodized salt. This was confirmed by an external review carried out by the Global Network for Sustainable Elimination of Iodine Deficiency in 2005. Vitamin A is a crucial micronutrient for the development of children's immune and visual systems (5, 6). According to the Vitamin and Mineral Damage Assessment Report (5), 25% of the Nigerian children are growing up with lower immunity, leading to frequent ill health and poor growth due to vitamin A deficiency. Only 27% of Nigerian children between 6 months and five years receive Vitamin A supplements routinely through health facilities although an average of 70 % received Vitamin A capsules during the National Immunization Days (5).

The individual diet is a primary vehicle for his/her interaction with the environment. It is the major source of nutrient, and can be a significant source of human exposure to infections; toxic and pharmacological agents. To maintain optimal nutritional status, an individual must consume diets adequate in quality and quantity. The nutritional status of a community depends to a large extent on the diets consumed. Food availability and food habit's differs from community to community hence emphasis on

local dishes should be made in order to achieve adequate growth, development and reproduction.

It is known that about 30% of the population in developing countries are currently suffering from one or more of the multiple forms of nutritional deficiencies, especially micronutrient (6). The major nutritional problem in these countries are insufficient intake of food nutrients which are related to food insecurity, diseases, lack of care and excessive or unbalanced food intake and/or particular dietary constituent. Social factors and cultural practices in most communities greatly influence what the people consume, how they prepared their food, their feeding practices and choice of food (7).

The traditional soup meals of most societies are good and only minor modifications are needed for them to meet the nutrient requirements of all members of family (7). The starchy foods are by far the most frequently consumed food in Nigeria especially among the low income groups. However, legumes and cereals provide the greatest contribution of plant protein and other nutrients. There is need to increase the production and consumption of major staples including vegetable which would help to bridge the gap between protein, energy and other nutrients. Inadequate nutrient intake predisposes to poor nutrition and chronic diseases. Deficiency disease caused by lack of such nutrients have been reported among the low income class in some parts of the country (1).

There has been no studies on the nutritional quality of indigenous soups in Igber community of Abia State. Based on these facts, a good knowledge of the nutritionally quality (adequacy) of soups eaten in Igber community and their preparation has necessitated the need for this study. Soup is a primarily liquid food, generally served warm (but may be cool or cold), that is made by combining ingredients such as meat and vegetable with stock, juice, water, or another liquid.

There is great need for all Nigerians to know the nutrient composition of their local foods. Our local soups are neglected in meal planning because information is lacking on their nutrient composition and as such, protein energy malnutrition and micronutrient deficiencies results. Some of these soups are rich in protein, calorie, vitamin and other components. As such there is need for the diversification and adequate consumption of the traditional foods and their products to combat PEM and micronutrient deficiencies. The knowledge of the nutritional composition of traditional soups will ease therapeutic meal planning and service.

The general objective of the study is to assess and determine the nutrient composition of traditional soups consumed in Igber community in Bende local government area of Abia state. Specifically, the study is aimed to:

1. Prepare four traditional soup meals consumed in Igber community of Abia state.
2. To assess the Nutrient (proximate and mineral vitamin composition of the soup meals.
3. To evaluate the organoleptic attributes of the soup meals.

The output of this work would serve as a baseline for nutrient composition and assessment of soup meal specifically consumed in Igberere community. There is little information on the nutrient composition of Nigerian diet and foods especially those consumed in Igberere community of Abia State. It would therefore add to the knowledge base on composition of Nigeria foods.

## 2. Methodology

### 2.1. Source of Materials

Four vegetable species used for this include, Uha (*Pterocarpus specie*), Achara (*Pannisetum purpurem*), Cocoyam leaves (*Dioscorea specie*), and okazi Leaf (*Gentum africana*) the leaves were collected/purchased from Nkwo Igberere market in Bende L.G.A of Abia State.

### 2.2. Sample Preparation

The vegetable leaves used for the studies were harvested fresh. The sensory evaluation was done at the department of Nutrition and Dietetics, Imo state University, whereby each soup samples (4 in numbers), were collected in a plastic container. The chemical analysis was done at the National Root Crop Research Institute (NRCRI) Umudike, Umuahia South L.G.A of Abia State.

### 2.3. Collections of Samples

Each soup sample (4 in number) were collected in a plastic container. The soup ingredients quantities and methods used in soup preparation were recorded below. The collected samples were stored in a deep freezer until used for analysis.

### 2.4. Soup Preparation

Uha leaves were plucked from the stalk, washed and shredded. Achara, the fleshy leaf Achara was cut off from its stalk. The edible part of the stalk or stem was obtained for preparation of soup. The newly sprouted cocoyam leaves were plucked from its stem, washed, tied together and separated for preparation of the soups. Okazi leaves were plucked from the stalk, washed and shredded for Nsala soup.

The soup ingredients such as Dry fish, Cray fish, stock fish, smoked fish and chicken was boiled together with onion, maggi, salt, and pepper and shared into four places for the soup preparation. Then pepper, ukpor, usu, yam, were grounded separately.

#### 2.4.1. Soup Preparation (Uha Soup)

Table 1. List and quantities of ingredients used in soup preparation

Ingredient	Quantity used
Uha leaves	100g
Dry Fish, stock fish, smoked fish, Cray fish, and chicken	200g

Ingredient	Quantity used
Palm oil	50g
Dry pepper	10g
Ukpor ( <i>Mucuna flagellipes</i> )	10g
Maggi	1 cube
Salt	To taste

Method: A pot of the boiled ingredient was put on a hot plate heater and allowed to boil, after 100g of water was added and allowed to boil for 5 minutes, palm oil was added and allowed to boil, then dry pepper, grounded ukpor and other ingredient was add and allowed to boil very well and after that the Uha leave was added and served.

#### 2.4.2. Ofe-ose Preparation

Table 2. Ingredients and quantities used in soup preparation

Ingredient	Quantity used
Cocoyam leaves	100g
Dry Fish, stock fish, smoked fish, Cray fish, and chicken	200g
Palm oil	50g
Egusi (melon) and usu (mixed)	85g
Dry pepper	10g
Maggi	1 cube
Salt	To taste

Method: A pot of the boiled ingredient was put on a hot plate heater and was added 100g of water and allowed to boil. After that the egusi mixed with usu was added and allowed to boil for 5 minutes after that oil, dry pepper, maggi and salt was added and allowed to boil very well and after that the cocoyam leaves was added and was allowed to boil before serving.

#### 2.4.3. Nsala Soup with Okazi Leaf

Table 3. Ingredients and quantities used in soup preparation

Ingredient	Quantity used
Okazi leaves	100g
Dry Fish, stock fish, smoked fish, Cray fish, and chicken	200g
Yam slice	85g
Ehuru & Uziza seed	5g
Dry pepper	10g
Maggi	1 cube
Salt	To taste

Method: A pot of boiled ingredients (meat & fish) was put on a hot plate heater and allowed to boil, then 100g of water was added and allowed to boil after that the pounded yam that was soft resilient dough was added and allowed for 5 minutes after that Ehuru and Uziza was added, pepper, maggi was added and allow for another 5 minutes then Okazi was added, salt was added to taste and served.

#### 2.4.4. Achara Soup Preparation

**Table 4.** List of ingredient and quantities used in preparation of Achara Soup

Ingredient	Quantity used
Achara	100g
Dry Fish, stock fish, smoked fish, Cray fish, and chicken	200g
Egwusi ( <i>Cucurris melon</i> )	75g
Ukpor ( <i>Mucuna flagellapes</i> )	10g
Dry pepper	10g
Maggi	1 cube
Salt	To taste

Method: A pot of the boiled ingredients was put on a hot plate heater and allowed to boil. And after that 100g of water was added and allowed to boil for 5 minutes, palm oil was added and allowed to boil, then dry pepper, ground ukpor and Egwusi was added, after that maggi, salt was added and allowed to boil for another 5 minutes after that the Achara was added and served.

#### 2.5. Data Analysis

All determinations were done in triplicates. The methods described below were used for the specific analysis.

#### 2.6. Proximate Analysis

##### 2.6.1. Moisture Determination

This was done by the gravimetric method (8). A measured weight of the sample (5.0g) was weighed into a previously weighed moisture can. The sample in the can was dried in the oven at 105°C for 3 hours. It was cooled in a desiccators and weighed. It was then returned to the oven for further drying. Drying, Cooling and weighing were done repeatedly at hourly (one hour) interval until there were no further diminutions in the weight (ie constant weight was obtained).

The weight of moisture lost was calculated and expressed as a percentage of the weight of sample analyzed. It was given by the expression below.

$$\% \text{ Moisture content} = \frac{100}{1} \times \frac{W_2 - W_3}{W_2 - W_1}$$

Where  $W_1$  = Weight of empty moisture can

$W_2$  = Weight of empty can + sample before drying

$W_3$  = Weight of can + sample dried to constant weight.

##### 2.6.2. Determination of Protein

This was done by the Kjeldahl method described by James (9). The total Nitrogen was determined and multiplied with factor 6.25 to obtain the protein procedures.

Half gramme (0.5g) of the sample was mixed with 10mls of Cone.  $H_2SO_4$  in a digestion flask. A tablet of selenium catalyst was added to it before it was heated under a fume cupboard until a clear solution was obtained (i.e. the digest).

The digest was diluted to 100mls in a volumetric flask and used for the analysis.

10mls of the digest was mixed with equal volume of 45% NaOH solution in a kjeldahl distillation apparatus. The mixture was distilled into 10ml of 4% boric acid containing 3 drops of mixed indicator (bromocresol green/methyl red) a total of 50mls of distillate was collected and titrated against 0.02N EDTA from green to a deep red end point. A reagent blank was also digested, distilled and titrated. The  $N_2$  content and hence the protein content was calculated using the formula below.

$$1 \text{ Mole of } INH_2SO_4 = 14mgN_2$$

$$\% \text{ Protein} = \% N_2 \times 6.25$$

$$\% N_2 = \left[ \frac{100}{W} \times \frac{N \times 14}{1000} \times \frac{V_t}{V_a} \right] T - B$$

W = Weight of sample (0.5g)

N = Normality of titrant (0.02N  $H_2SO_4$ )

$V_t$  = Total digest volume (100mls)

$V_a$  = volume of digest analyzed (10ml)

T = Sample titre value

B = Blank titre value

##### 2.6.3. Determination of Ash

This was done by the furnaces incineration gravimetric method James (9). Five grammes (5.0g) of the processed sample was measured into a previously weighed porcelain crucible. The sample was burnt to ashes in a muffle furnace at 550°C when it has become completely ashed, it was cooled in a desiccators and weighed. The weight of ash obtained was calculated by difference and expressed as a percentage of the weight of sample analyzed as shown below.

$$\% \text{ Ash} = \frac{100}{1} \times \frac{W_2 - W_1}{W_t \text{ of Sample}}$$

Where  $W_1$  = Weight of empty crucible

$W_2$  = Weight of crucible + ash

##### 2.6.4. Determination of Crude Fibre

The Wende Method (8, 9) was employed. 5.0g of the processed sample was boiled in 150mls of 1.25%  $N_2SO_4$  solution for 30 minutes under reflux. The boiled sample was washed in several portions of hot water using a two-fold Muslim cloth to trap the particles. It was returned to the flask and boiled again in 150mls of 1.25% NaOH for another 30 minutes under same condition. After washing in several portions of hot water, the sample was allowed to drain dry before being transferred quantitatively to a weighed crucible where it was dried in the oven at 105°C to a constant weight. It was thereafter taken to a muffle furnace in which it was burnt until only ash was left of it. By difference, the weight of fibre was obtained and expressed as a percentage of the weight of sample analyzed.

It was given by the formula below.

$$\% \text{ Crude fibre} = \frac{100}{1} \times \frac{W_2 - W_3}{\text{Wt of Sample}}$$

Where  $W_2$  = Weight of crucible + sample after boiling, washing and drying

$W_3$  = Weight of crucible + sample as ash

### 2.6.5. Determination of Fat

The solvent extraction gravimetric method (8, 9) was used, 5.0g of the sample was wrapped in a porous paper (Whiteman filter paper) and put in a thimble, The thimble was put in a soxlet reflux flask and mounted into a weigh extraction flask containing 200mls of petroleum ether. The upper end of the reflux flask was connected to a water condenser. The solvent (petroleum ether) was heated; it boiled, vaporized and condensed into the reflux flask. Soon the sample in the thimble was covered with the solvent, which contract the oil (fat). The sample remained in contact with the solvent until the reflux flask filled up and siphoned over, carrying its oil extract down to the boiling flask. This process was allowed to go on repeatedly for 4hours before the defatted sample was removed, the solvent recovered and the oil extract was in the flask. The flask (containing the oil extract), was dried in the oven at 60°C for 30mins (to remove any residual solvent). It was cooled in desiccators and weighed. By difference, the weight of oil (fat) extract was determined and expressed as a percentage of the weight of sample analyzed and given by the expression .below:

$$\% \text{ Fa} = \frac{W_2 - W_1}{\text{Wt of Sample}} \times \frac{100}{1}$$

Where  $W_1$  = Weight of empty extraction flask

$W_2$  = Weight of flask + oil (fat) extract

### 2.6.6. Determination of Carbohydrate

It was calculated using the formular below as described by James (9)

$$\% \text{ carbohydrate} = 100\% (\text{protein} + \text{fat} + \text{fibre} + \text{ash} + \text{moisture content})$$

## 2.7. Determination of Mineral

Mineral content of the sample was done following the dry ash extraction method (8, 9, 11).

A measured weight of the sample was burnt to ashes (as in ash determination) thereby removing all the organic materials leaving the inorganic ash. The resulting ash was dissolved in 5mls of dilute (0.1 m) HCl solution and then diluted to 100mls in a volume flask. This extracts was used in specific analysis for the different mineral elements.

### 2.7.1. Determination of Potassium by Flame Photometry

The instrument, Jaway digital flame photometer, was set up according to the manufactures instruction. It was switched on and allowed about 10 to 15 minutes to equilibrate. Mean while standard potassium solution were

prepared and diluted in series to contain 10, 8, 6, 4, and 2pp of K.

After calibrating the instrument, 1ml of each standard was aspirated into it and sprayed over the non-luminous flame. The optical density of the resulting emission from standard solution was recorded. Before flaming, the appropriate element fitter (K) was put in place with the standards measured, the test sample extracts were measured in time and there were plotted into standard curve which was used to extrapolate the content of each test element and calculated as shown below:

$$K \left( \frac{\text{mg}}{100\text{g}} \right) = \frac{X}{1000} \times \frac{V_f}{V_a} \times DX \times \frac{100}{W}$$

Where X is the concentration of the test element from the curve.

### 2.7.2. Determination of Phosphorus

Phosphorus in the test sample was determined by the molybdo vanadate colorimetric method (9,10, 11). A measured volume of the dry ash (2mg) digest of the samples was dispersed into a 50ml volume flask. At the samples time, the same volume of distilled water and standard p solution were measured into different flask to serve as reagent blank and standard respectively. 2mls of the phosphorus color reagent (molybdo vanadate solution) was added to each of the, flask and allowed to stand at room temperature for 15 minutes. Content of each flask was diluted to the 50ml mark with distilled water and its absorbance was measured in a spectrophotometer at a wavelength of 540nm with the reagent blank at zero.

The phosphorus content was calculated using the formular below:

$$K \left( \frac{\text{mg}}{100\text{g}} \right) = \frac{100}{W} \times \frac{a_u}{a_s} \times C \times \frac{V_t}{V_a}$$

Where W = Weight of sample ashes

$A_u$  = Absorbance of test sample

$A_s$  = Absorbance of standard phosphorus solution,

C = Concentration of standard phosphorus solution

$V_t$  = Total extract volume

$V_a$  = Volume of extract analyzed

### 2.7.3. Determination of Calcium and Magnesium by Compleximetric Titration

The versanate EDT A titrimetric method was employed (9, 10). 20ml portion of the extract was dispersed into conical flask and treated with pinches of the masking agents (hydroxylamine hydrochloride, sodium cyanide and sodium potassium ferrocyanide). The flask was shaken and the mixture dissolved 20mls of ammonia buffer was added to it be raise the PH to 10.00 (a point at which both calcium and magnesium form complexes with EDTA). The mixture was titrated against 0.02N EDTA solution using eriochrome black T as indicator. A reagent blank was also titrated and titration in each case was done from deep red to a permanent blue end point. The titration value represent both

Ca<sup>2+</sup> alone in the test samples.

Titration of calcium alone was done in similarity with the above titration however, 10% fJAOH was used in place of the ammonia buffer and solechrome Dark blue indicator in place of Eriochrome Black T. from the titre value obtained, the Ca<sup>2+</sup> and mg<sup>2+</sup> content were calculated as shown below:

Where:

W = Weight of sample

T = Titre value of sample

B = Titre value of Blank

C = Calcium equivalence

Mg = Magnesium equivalence

N = Normality of titrant (0.02N EDT A)

#### 2.7.4. Determination of Zinc, Copper, and Iron

The method of AOAC (8) was used 2g of each sample was collected and. was added into HCL for preparation of stock solution.

Aliquot of the diluted clear digest was used for spectrophotometric reading. A standard solution of the different elements were prepared in concentration of 0.0, 0.5, 1.0 and 1.5ppm.

#### Calculations

$$\text{Zn}(\text{mg}/1000) = \frac{100}{W} \times \frac{X}{10^3} \times \frac{V_f}{V_a}$$

$$\text{Cu}(\text{mg}/1000) = \frac{100}{W} \times \frac{X}{10^3} \times \frac{V_f}{V_a}$$

$$\text{Fe}(\text{mg}/1000) = \frac{100}{W} \times \frac{X}{10^3} \times \frac{V_f}{V_a}$$

X = Ppm off curve

W = Weight of sample used

V<sub>f</sub> = Volume of total sample

V<sub>a</sub> = Volume of sample solution used

#### 2.8. Determination of Vitamins

Vitamin A, C in the sample were determined using the method of the Association of vitamin chemists as described by Kirk and sawyer (11).

##### 2.8.1. Vitamin A Determination

The method of the association of vitamin chemists (11) was employed. A measured weight (5.0g) of the processed samples was dispersed, in 30ml of absolute alcohol 3ml of 5% KOH solution was added to it and boiled under reflux for 30min after cooling rapidly in running water, 30ml, of distilled water was added to it and the mixture was transferred into a separation funnel. Three portion of 50mls of ether was used to wash the mixture thus extracting the vitamin A the lower layer (aqueous) was discarded while the vat A extract was washed with a 50mls distilled water. Care was taken to avoid formation of emulsion. The extract

was then evaporated to dryness and dissolved in 10mls of isopropyl alcohol and its absorbance of the vitamin A extract was also measured at 325nm. The vitamin A content was calculated using the relationship below:

$$\text{Vitamin A}(\text{mg}/1000) = \frac{100}{W} \times \frac{\text{au}}{\text{as}} \times C$$

##### 2.8.2. Determination of Vitamin c. (9, 11)

Five grammes (5g) of the sample was dispersed in 50ml of EDTAITCA solution and homogenized.

The homogenate was filtered, what man No 42 filter paper and more of the extractant was used to wash the residue in the filter paper until 50ml filtrate was obtained. A 20ml portion of the filtrate was measured into a conical flask and 10ml of 30% KT solution was added to it mixed well and then followed by 1 % starch solution. The mixture was triated against 0.01m CuSO<sub>4</sub> solutions. A reagent blank was also titrated.

The vitamin C content was calculated based on the relationship that 1m10.01m CuSO<sub>4</sub> = 0.88mg vitamin C.

$$\text{Therefore vitamin C mg}/100\text{g} = \frac{100}{W} \times 0.88 \times (T - B) \times \frac{V_t}{V_a}$$

Where W = Weight of sample

T = Titre value of sample

B = Titre value of blank

V<sub>t</sub> = Total extract volume

V<sub>a</sub> = volum of extract of extract titrated.

##### 2.8.3. Organoleptic Evaluation

Organoleptic attributed (color, texture, aroma, mouth feel and general acceptability of the soup were evaluated using a nine point hedonic scale (12). Ten subjects who had participated in sensory evaluation of food products were selected as judges for the study. The judges were asked to taste each of the soup for color, mouth feel, aroma, texture and general acceptability and indicate their feeling about the product on the sensory evaluation sheet.

#### 2.9. Statistical Analysis

Means and standard deviation were subjected to analysis of Variance (ANOVA) to see if there are significant difference among the four samples of soup in their proximate composition, mineral compositions and vitamin composition (13).

### 3. Results

The soups consumed in Igber community include Ofese, Achara, Nsala with Ukazi and Uha soup.

#### 3.1. Proximate Composition of Soups

**Table 5.** Proximate composition of soups consumed in Igbere Community

Samples	Moisture (%)	Ash (%)	Protein (%)	Fat (%)	Fibre (%)	CHO (%)
A	54.96 <sup>b</sup> ±0.79	5.62 <sup>b</sup> ±0.028	40.20 <sup>a</sup> ±0.06	9.77 <sup>b</sup> ±0.04	13.72 <sup>a</sup> ±0.01	30.68 <sup>c</sup> ±0.10
B	52.49 <sup>c</sup> ±1.11	4.94 <sup>d</sup> ±0.028	31.77 <sup>c</sup> ±0.01	8.20 <sup>c</sup> ±0.05	8.20 <sup>d</sup> ±0.05	46.52 <sup>a</sup> ±0.19
C	57.88 <sup>a</sup> ±0.84	5.33 <sup>c</sup> ±0.042	39.39 <sup>a</sup> ±0.01	10.74 <sup>ab</sup> ±0.05	10.77 <sup>dc</sup> ±0.01	34.12 <sup>b</sup> ±0.015
D	56.86 <sup>ab</sup> ±0.99	6.25 <sup>a</sup> ±0.014	35.56 <sup>b</sup> ±0.59	11.25 <sup>a</sup> ±0.69	12.75 <sup>b</sup> ±0.01	34.19 <sup>b</sup> ±1.25

n= 4

\*a-d: Values with the same letters are statistically similar (p&gt;0.05) and those with different letters are different (p&lt;0.05)

Mean ±SD of 3 determinations

CHO = Carbohydrates

Where sample A is Achara soup

Sample B is Nsala soup

Sample C is Uha soup

Sample D is ofe- ose

The moisture content of the four soups varied. The values ranged from 52.49 to 57.88%. The moisture content of Uha soup (57.88%) is significantly (P<0.05) higher than Achara (54.96%) and Nsala (52.49%) soups but similar to Ofe-ose (56.86%). The ash content of the soups ranged from 4.94 to 6.25%. The ash content of Ofe-ose (6.25%) is significantly (P<0.05) higher than the other soups while that of Uha soup is significantly lower than the other soups. The protein content of the four soups varied. It ranged from 31.77 to 40.20%. The protein content of Achara soup (40.20%) is similar to that of Uha soup (39.39%) (P>0.05). The fat content of the four soups varied. It ranged from 8.20 to 11.25%. The fat content of Ofe-ose (11.25%) was significantly higher than other soups (P<0.05). The Nsala soup had the least fat content (8.20%). The fibre content of the achara soup is significantly (P<0.05) higher (13.72%) than the other soups while that of Nsala soup (8.20%) is significantly (P<0.05) lower than the other soups. Among all the soups studied, the carbohydrate content of Nsala soup (46.52%) is significantly higher than the other soups. However there is no significant (P>0.05) difference in Ofe-ose (34.19%) and Uha soup (34.12%).

### 3.2. Vitamin Composition of the Soup

**Table 7.** Mineral Composition of Soup Consumed in Igbere Community per 100g Portion

Samples	Potassium (mg)	Calcium (mg)	Magnesium (mg)	Phosphorus (mg)	Zinc (mg)	Iron (mg)	Copper (mg)
A	68.53 <sup>a</sup> ±0.23	69.47 <sup>a</sup> ±2.30	20.0 <sup>c</sup> ±1.39	188.15 <sup>b</sup> ±0.40	0.364 <sup>b</sup> ±0.004	0.43 <sup>a</sup> ±0.04	0.24 <sup>a</sup> ±0.04
B	85.47 <sup>a</sup> ±0.23	74.81 <sup>a</sup> ±2.32	25.6 <sup>b</sup> ±1.39	55.25 <sup>c</sup> ±0.46	0.23 <sup>bc</sup> ±0.03	0.38 <sup>a</sup> ±0.08	0.08 <sup>a</sup> ±0.06
C	118.3 <sup>a</sup> ±0.46	57.45 <sup>b</sup> ±2.32	18.4 <sup>c</sup> ±1.39	199.85 <sup>a</sup> ±0.64	0.224 <sup>c</sup> ±0.004	0.23 <sup>a</sup> ±0.03	0.23 <sup>a</sup> ±0.03
D	48.13 <sup>a</sup> ±0.83	41.42 <sup>c</sup> ±2.32	37.6 <sup>a</sup> ±1.39	54.17 <sup>c</sup> ±2.06	0.396 <sup>a</sup> ±0.005	0.37 <sup>a</sup> ±0.06	0.25 <sup>a</sup> ±0.05

n= 4

\*a-d: Values with the same letters are statistically similar (p&gt;0.05) and those with different letters are different (p&lt;0.05)

Mean ± SD of 3 determinations

Sample A -Achara soup

B-Nsala soup

C-Uha soup

D-Ofe-ose

The potassium, Iron and copper content of the four soups varied, however, there were no significant (P>0.05) difference among these nutrients in the four soup samples. The calcium contents of the four soups ranged from 41.42 to 74.81 mg. there is significant difference in calcium contents of the soups (P<0.05). The calcium content of Ofe-

**Table 6.** Vitamin Composition of Soups Consumed in Igbere Community

Samples	Vitamin A (mg)	Vitamin C (mg)
A	521.02 <sup>a</sup> ± 1.34	32.85 <sup>a</sup> ±1.01
B	3.49 <sup>a</sup> ± 0.18	4.11 <sup>a</sup> ± 1.02
C	687.69 <sup>a</sup> ± 0.54	41.07 <sup>a</sup> ± 1.02
D	649.23 <sup>a</sup> ± 0.62	21.71 <sup>a</sup> ± 1.02

n= 4

\*a-d: Values with the same letters are statistically similar (p&gt;0.05) and those with different letters are different (p&lt;0.05)

Mean ±SD of 3 determinations

Where sample A is Achara soup

Sample B is Nsala soup

Sample C is Uha soup

Sample D is ofe- ose

Vitamin C and A Composition of the four traditional soups consumed in Igbere Community are presented in table 6 there is no significant difference in the Vitamin content of the soups. The Vitamin A ranged from 3.49 to 687.69 mg The vitamin A content of the soup varied, There is no significant (P>0.05) difference in (Achara 521.02 mg), Nsala 3.49 mg, 687.69 mg, Ofe-ose 649.23mg.

### 3.3. Mineral Composition of the Soups

Ose (41.42mg) is significantly lower than the other soups while that of Uha is significantly higher than that of Ofe-ose, but there is no significant difference between Achara (69.47mg) and Nsala (74.81mg). The magnesium content of the soups studied ranged from 18.4 to 37.6mg. The magnesium content of Ofe-ose (37.6mg) is significantly

higher ( $P < 0.05$ ) than the other soups, while Nsala is significantly higher ( $P < 0.05$ ) than Achara (20.0mg) and Uha (18.4mg) and there is no significant ( $P > 0.05$ ) difference between Achara (20.0mg) and Uha (18.4mg). The phosphorus content of the soups ranged from 54.17 to 199.85mg. The phosphorus content of Uha (199.85mg) is significantly, higher ( $P < 0.05$ ) than the other soups, while Achara (188.15mg) higher ( $P < 0.05$ ) than Nsala (55.25mg) and Ofe-ose (54.17mg). However there is no significant ( $P > 0.05$ ) different between Nsala (55.25mg) and Ofe-ose

(54.17mg).

The zinc content of the soups ranged from 0.224 to 0.396mg. The zinc content of Ofe-Ose (0.396mg) is significantly ( $P < 0.05$ ) higher than other soups. While there is no significant ( $P > 0.05$ ) different between Achara (0.364 mg) and that of Nsala (0.23mg). Also there is no significant ( $P > 0.05$ ) different between Nsala (0.23mg) and Uha (0.224).

### Organoleptic Evaluations

**Table 8.** Organoleptic Properties of Soups Consumed in Igbere Community

Sample	Color	Mouth Feel	Aroma	Texture	General Acceptability
A	77 <sup>a</sup> ±0.02	82 <sup>a</sup> ±0.02	84 <sup>a</sup> ±0.02	60 <sup>a</sup> ±0.02	74 <sup>a</sup> ±0.01
B	78 <sup>a</sup> ±0.01	79 <sup>a</sup> ±0.01	83 <sup>a</sup> ±0.01	36 <sup>a</sup> ±0.02	53 <sup>a</sup> ±0.02
C	74 <sup>a</sup> ±0.01	66 <sup>a</sup> ±0.02	77 <sup>a</sup> ±0.02	37 <sup>a</sup> ±0.01	56 <sup>a</sup> ±0.01
D	70 <sup>a</sup> ±0.02	68 <sup>a</sup> ±0.01	75 <sup>a</sup> ±0.02	35 <sup>a</sup> ±0.02	44 <sup>a</sup> ±0.01

n= 4

\*a-d: Values with the same letters are statistically similar ( $p > 0.05$ ) and those with different letters are different ( $p < 0.05$ )

Sample A -Achara soup

B-Nsala soup

C-Uha soup

D- Ofe-ose

The color of the soups varied. The color ranged from 70 to 78%. And there was no significant difference. The month feel of the soups varied. The taste ranged from 66 to 82%. However there is no significant difference. The Aroma of the soup ranged from 75 to 84% and there is no significant different between Achara (84%), Nsala (83%), Uha (77%), and Ofe-ose (75%). The texture of the soup ranged from 35 to 60% and there is no significant difference found in them. The General acceptability of the soups varied it ranged from 44 to 74%. However there is no significant difference in Achara (74%), Nsala (53%), Uha (56%) and Ofe-ose (44%).

## 4. Discussion

The four traditional soup meals consumed in Igbere community Abia state were studied. The results of this present study are in line with earlier observation that food stuffs of vegetable origin are consumed in developing countries in quantities which contain most of the essential nutrients in excess of individual requirements (14). Uha had the highest moisture content of 57.88% followed by ofe-ose with a value of 56.86% while Nsala and Achara had the least value of 52.49% and 54.96% showing significant difference ( $p > 0.05$ ) from the rest. The high levels of moisture in all the samples investigated suggests that the leafy vegetable would not store for long without spoilage since high water activity could enhance microbial action bringing about food spoilage. The moisture content of vegetable varies with locality and season hence the moisture content might not be unrelated with the season and climatic condition prevailing in the locality where the research was conducted.

The result of this work indicates that achara soup had

higher fibre, content (13.72%) than the other soups, this suggest that achara soup is a good source of fibre compared to other soups. However, achara being grass is a good source of roughage for ruminant animals and the components are not easily digested hence the roughages are high. The fibre content of the soup meals is slightly higher than the observation of Eka (16). The moderately high carbohydrate and slightly moderate fat content of the four soups increased the energy value of the meals. The higher fat content of ofe-ose (17.25%) against those of Uha, Achara and Nsala soups (10.7%, 9.77% and 8.20% respectively) might be attributed to more egwusi and little palm oil used during preparation.

Achara showed significantly higher protein content ( $p > 0.05$ ) compared to the other soup's while Nsala had the least protein content. In general soups need to be combined with other foods of high protein value in order to meet the protein requirements of individuals' (17). The higher ash content of ofe-ose 6.25% against those of achara, Nsala and Uha soups (5.62%, 5.31% and 4.94%) suggests that ofe-ose is a better source of mineral and the Uha soup could not be used as a very good source of mineral though among the soups analysed, it has the highest content of potassium and phosphorus (see table 7). The low value of vitamin A content of Nsala soup (3.49mg) may be attributed its low content of palm oil which have been identified to be a good source of vitamin A. However, this result does not agree with that reported by Ene-obong (14). Furthermore Uha soup appears to be a good source of vitamin A due to its higher vitamin A content (687.69mg). The high vitamin C content of the soup meals suggests that the various vegetable used for the four soups during preparation are good sources of vitamin C. The high vitamin C content of the soup meals is higher than that reported by purpleglove



(18) and Ene-obong (14). Similarly, the iron content and zinc content of the soup meals is lower than those reported by Ene-obong.

The ofe-ose has the highest copper content (0.25mg) than the other soups and this suggest that ofe-ose is a good source of copper, and this aid iron metabolism because copper is an integral part of ceruloplasmin that converts ferrous to ferric prior to its transportation via transferring. Copper also participates in Immune system, function, red and white blood cells maturation and cholesterol and glucose metabolism.

The high potassium, calcium, magnesium and phosphorus content of the four soup meals might be attributed by large quantities of vegetable used during preparation.

The sensory evaluation of the soups varied. The variations in the soups might be attributed by the vegetables used for the soup. However all the soups were statistically similar were accepted equally on the organoleptic characters tested.

## 5. Conclusion

In this study, it was observed that the soups consumed in Igbere community are high in protein, vitamin A, vitamin C, calcium, phosphorus, potassium, magnesium and carbohydrate but low in fiber, fat, zinc, iron & Copper. However, Nsala and Uha soups had the least moisture content thus may have higher shelf life than the other soups. It was also identified that ofe-ose is a good source of crude fibre. Therefore, consumption of their soups may enhance the nutritional status of individuals. All the soups analysed in this study are nutritionally rich, all are recommended to be taken at different times since the nutrient densities differs and consumption of various kinds of foods ensures adequacy. It is also important to note the soups that are specifically high in various micro and macro nutrient tested during management of diseases in the case of restriction of a particular nutrient, hence this paper is a vital tool in the hand of dietitians in the hospitals where these soups are consumed.

## Recommendation

1. There is an urgent need for Nigeria to put in Place food composition table for local foods especially local vegetables.
2. Economic growth and development depends on good health of citizens extensive, intensive nutrition education programe is imperative to improve the diets of the masses. Also extension agents who have knowledge of nutrition should disseminate the knowledge of nutrition to the rural communities and methods of preparation and processing to avoid nutrient loss for example The B vitamin's, vitamin A and vitamin C.
3. Combination of vegetable to provide essential

nutrients in adequate quantity and quality should be encouraged in both rural and urban dwellers. In order to reduce micronutrient deficiency diseases and protein energy malnutrition, regular consumption of these soup meals are recommended as judged by the results and should be incorporated in meal planning.

4. However, nutrition education programmes and workshop should be intensified in public health centers and civic centers to promote its food use and diversification.

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