Tropical Journal of Applied Natural Sciences
Vol. 2 Issue 3 (2024)

Tropical Journal of Applied Natural Science
ISSN: 2449-2043

# COMPARATIVE SCIENTIFIC STUDIES ON NUTRITIONAL PLANTS OF SOUTH EAST AND SOUTH WEST OF NIGERIA

**[*1]Ezeokoli, Akachukwu W., [1] Ukpaka, C.G, [1] Ezenwata, I.S, [1]Chinemelu, Uzomaka C.**

1.Department of Biological Sciences, Chukwuemeka Odumegwu University, Uli Campus

***Corresponding Author:** akagodchukwu8@gmail.com **08067593761**

## Abstract

This Research work on the Comparative Evaluation of Nutritional plants of South East and South West of Nigeria was carried on between July and December, 2023. Whereas the aim of the study is to holistically establish high profile Nutritional plants of these zones for National recognition and scientific recommendation, the specific objectives include: identification of the said plants in their domains; establishment of their proximate compositions; ascertaining the concentrations of relevant mineral elements inherent in them and undertaking a comparative analysis of these plants (quantitatively) so as to be able to produce a synchronized checklist of nutritionally beneficial plants of the nation. Study design included both survey and experimental methods. Field survey was by means of questionnaires and species identified, confirmed and validated by professionals from Botany Department; and reliability established through test, retest method, together with focused group discussion. Experimental assay was carried on using Proximate and Mineral analysis. Biostatistical evaluation was carried on using T-tests; and ANOVA. Tabulated Result showed that top Nutritional plants of the South East included: *Cucurbita argyrosperma, Parkia biglobosa, Colocasia esculentum, Vigna subterranea, Cajanus cajan, Pentaclethra macrophyla, Ricinus communis, Dioscorea dumetorium, Monodora myristica* and *Telfairia occidentalis* for south east. *Dioscorea alata, Crassocephalum crepidioides, Amaranthus viridis, Parkia biglobosa, Juglans regia, Talinum fruticosum* and *Cocos nucifera* for the South west. There were subtle differences in proximate and mineral, constituents of plants from the two regions but the differences were not statistically significant. In summary therefore, top nutritional plants from this work include: *Treculia africana, Vigna subterranean, Cajanus cajan, Dioscorea alata, Musa paradisiaca, Celosia olitorius.* We have to a reasonable extent attempted a documentation of the nutritional plants of the south east and south west of Nigeria. The onus is now on individuals, Schools, Parastatals, Health institutions, Universities, and Regional governments to adopt these plants, make out lands and plant them en mass so that Nigeria has to offer in terms of plant resources to avoid the tales of woe of the past in terms of deficiency diseases, neglected tropical diseases, pregnancy and age related problem.

**Keywords:** Nutritional plants, *Cucurbita argyrosperma, Parkia biglobosa, Cajanus cajan,* Proximate.

# INTRODUCTION

Food is essential in human life because it is a source of energy and nutrients. Eating the right amount of different kinds of food is the key to a balanced diet and optimal nutrition. Many chronic diseases such as coronary heart disease, diabetes and certain types of cancer are related to imbalance in diet. These nutritional related diseases are important public health problems in many parts of the world. Diets high in fruits and vegetables are highly recommended for their health promoting properties. Fruits and vegetables have historically held a place in dietary guidance because of their concentration of vitamins, especially vitamin C and A (Bertoia, *et al.*, 2015). A diet rich in vegetables and fruits can lower blood pressure, reduce the risk of heart disease and stroke, and have a positive effect upon blood sugar, which can keep appetite in check. Eating non-starchy vegetables and fruits like apples, pears and green leafy vegetables may even promote weight loss. Their low glycemic loads prevent blood sugar spikes that can increase hunger. Nutrition is one of the major lifestyle risk factors related to development of non-communicable diseases. Unhealthy diets, together with physical inactivity are among the leading cause of non-communicable diseases including cardiovascular disease and certain types of cancer. Fruits and vegetables are important components of a healthy diet. Accumulating evidence suggests that they could help prevent major diseases such as cardiovascular diseases and certain cancers principally of the digestive system. Plants provide a major part of a nutritious diet. Fruits and vegetables are harvested directly from plants (Emmanuel, 1972). They are important sources of minerals, vitamins, water, sugar, fats, proteins fiber and energy. Many common foods like bread, cereals and paste are processed from ingredients that come from plants, even our animal based foods such as meat, eggs, diary and fish depends on plants. Understanding how plants collect, produce and store health beneficial nutrients is an important goal of the plant scientist. Plant nutrition is the study of the chemical elements and compounds necessary for plant growth and reproduction, (plant metabolism). In its absence, the plant is unable to complete a normal life cycle, or that the elements are part of some essential plant constituent or metabolite. This is in accordance with Justus Von Liebig's law of the minimum (Emmanuel, 1972). The total essential plant nutrients include seventeen different elements - carbon, oxygen and hydrogen which are absorbed from the air, whereas other nutrients including nitrogen are typically obtained from the soil. The soil supplies nitrogen, phosphorus, potassium, calcium, magnesium and sulfur which

are often called the macronutrients. In relatively small amounts, the soil supplies iron, manganese, boron, molybdenum, copper, zinc, chlorine and cobalt, the so called micro nutrients. These must be available not only in sufficient amounts but also in appropriate ratios (Norman *et al*; 2008). Fruits and vegetables are an essential part of a nutritious diet. They contain vitamins, minerals, fiber and other nutrients. Although they both make up the basis of nutritious diet, fruits and vegetables have classifications based on their botanical structure. The fruits people eat are the seed bearing structure in flowering plants. While vegetables consist of edible plant, stems, leaves and other plant components. Fruits and vegetables are considered in dietary circles because of their high concentrations of dietary fiber, vitamins, minerals, especially electrolytes and more recently phytochemicals, especially antioxidants (Slavin and Lioyd, 2012). Various reviews have associated low intake of fruits and vegetables with chronic diseases such as cardiovascular diseases, blood pressure, hypercholesterolemia, osteoporosis, many cancers, respiratory problems as well as mental health (Payne *et. al;* 2012). Despite an increasing focus on the health benefits of fruits and vegetables, their consumption is below the recommended daily intake among adults. Therefore, considering how nutritional related health problems have risen drastically globally, it seems critical that formal nutrition education aiming to increase knowledge on fruits and vegetables intake be given priority in health education programs and health promotion. This review provides an insight into the importance of fruits and vegetables as well as the benefits and progress of nutrition education in improving intake. Sufficient intake of fruits and vegetables has been related epidemiologically with reduced risk of many non-communicable diseases. Currently, much interest is focused on the vital role of antioxidants which impart bright color to fruits and vegetables and act as scavengers cleaning up free radicals before they cause detrimental health effects (Kaur and Kapoor, 2001). Moreover, fiber found in fruits and vegetables have been shown to reduce intestinal passage ratios by forming a bulk, leading to a more gradual nutrient absorption, hence preventing constipation. They can be fermented in the colon, increasing the concentration of short chain fatty acids having anti carcinogenic properties and maintaining good health. An increased consumption of cruciferous vegetables was also reported to cause a decrease in the risk of intestinal bowel, typhoid, pancreatic and lung cancer. Fruits and vegetables have also been suggested to prevent osteoporosis in adults mainly for their rich sources of calcium and other vitamins which are vital in bone health. The high fiber content of fruits and vegetables may play a role in calcium

absorption and reduce the acid load of the diet, enhancing bone formation and suppressing bone resorption which consequently result in greater bone strength. Moreover, phyto ingredients in fruits and vegetables such as gooseberry, curcumin and soya isoflavones has been shown to be protective against lens damage which occurs due to hyperglycemia, and certain flavonoids such as quercetin can prevent oxidative stress in the pathogenesis of glaucoma (Miyamoto *et al*; 2014). Phytochemicals in fruits and vegetables have been found to act as anti-obesity agents because they may play a role in suppressing growth of adipose tissue. Adiposity is closely related to biomarkers of oxidative stress and inflammation and a diet rich in fruits and vegetables can modify these adiposities related metabolic biomarkers in overweight women. A recent study of Vilaplana *et al.,* 2014 demonstrated that *Carica papaya* and *Morinda lucida* exhibited high lipase inhibition which can be considered as potential options for the management of obesity and maintaining body weight. It is also understood that fruits and non- starch vegetables are very low in energy since they contain high amounts of water and fiber and can be consumed in a relatively large amount contributing to increase satiety to maintain normal weight. Fibers also form a gel-like environment in the small intestine, resulting in reduced activity of the enzymes involved in the digestion of fat, protein and carbohydrates. Additionally, fruits have been suggested to prevent obesity since they add up to dietary variety both between and within food groups and palatability to the diet which has been revealed to be an important predictor of body fat. However, discrepancies exist with respect to fruits and vegetables with high glycemic index carbohydrates that are related to a more immediate disease in appetite and increase in food intake in the short term. High consumption of fructose in fruits and vegetables is related to obesity in rodents but no effect has yet been demonstrated in humans. Fruits and vegetables in over – weight and obese people is much lower than the recommendation since they tend to restrict intake of the fruits and vegetables when trying to lose weight.

## MATERIALS AND METHODS

### Description of the Study Area

The study was carried out in Anambra state (Ufuma and Agulu) for the south east. For the south west, was carried out in Osun state (Esa-Oke and Ife). Anambra state is bounded by the state of Kogi to the north, Enugu to the east, Delta to the west. Anambra state has the geographical co-ordinates of $6^{0}20$ north and $7^{0}00$ east of the equator. It experiences dry season lasting from

October to February and rainy season that lasting from March to October yearly. Anambra is characterized by forest (predominantly) and Savannah vegetation. It has major rivers, lakes, timber, palms, vegetables and domesticated animals. The soil is ferralitic. Osun state is bounded to the north by Kwara state, to the east by Ondo state, to the south by Ogun state and to the west by Oyo state. Osun state has the geographical co-ordinates of $07^{0}30$ north and $4^{0}30$ east of the equator. It experience rainy season lasting from April to October and dry season from November to February. The vegetation is ever green tropical rainforest and weather and climate conditions are relatively warm and moist all year round. They are home to numerous plants, fruits and vegetables. The study lasted for six months, from July to December 2023.

**Study Design**

The research design utilized in this work was experimental and descriptive survey design. Experimental design was employed in the proximate and mineral content analysis, while descriptive design made use of questionnaires for the collection of data from Igbo and yoruba populations based on their nutritional, semi-structured questionnaires were used to obtain field data from students, parents, workers, traders and lecturers.

**Analytical Method**

The result obtained was presented in tables and analyzed stastically using T- test and Anova in SPSS 2.0 at 5% significance.

**Study Population**

Three hundred (300) questionnaires were distributed to Igbo and Yoruba students, lecturers and traders.

$$\frac{215}{300} \text{x } \frac{100}{1} = \frac{21500}{300} = 71.66$$

**Sampling Techniques**

Selection of respondents was randomized to ensure sound statistics and complete elimination of bias.

**Validity of the Instrument**

This was done by the Departmental team of lecturers (Biology option)

**Reliability of Instrument**

This was ascertained using the test-retest method by the repetition of the same questions on the same group of respondents after an interval of two weeks.

**Sample Collection**

Samples of fresh vegetables, fruits and foods from south east and south west were collected from Anambra (Ufuma and Agulu) and Osun (Esa-oke and Ife) state. This plant parts were sundried, milled to fine powder and kept in an air tight container and the voucher specimen deposited for laboratory analysis at the Botany Department herbarium. The milled plant powder was weighed and used for the analysis.

**Extraction of Plants**

**Ethanol and water extract**

The plant materials were with ethanol and water. They was allowed to stand for 48 hrs and then filtered. Filtrates were evaporated under reduced pressure and was dried using rotary evaporation at $55^0$C. The dried extracts were stored in a labeled sterile screw capped bottles at $20^0$C.

**Proximate Analysis**

**Moisture Content Determination**

The method described by AOAC (1995) was adopted. A clean crucible was weighed and dried in oven ($W_1$); 0.1 g of the sample was added into the crucible ($W_2$) and dried at $100^0$C. The crucible was transferred from oven to desiccator and it was reweighted ($W_3$).

The percentage (%) moisture content was calculated as

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

**Crude Protein Determination (**AOAC, 1995).

Kjeldahi method was used and it is divided into three methods.

i) **Digestion Method:**

One gram of ground sample was weighed into a clean dried Kjeldashi flask for digestion. And 0.1g of copper tetraoxosulphate (IV) crystal, 0.5g of sodium tetraoxosulphate (IV) crystal and 25ml of concentrated acid was added into the flask. Some glass bead bread was also added into the flask to serve as an anti-bumping agent. The Kjeldahi flask and it content was transferred to the digesting chamber in a fume cupboard so that it was digested. Digestion was continuing with constant rotation of the digestion flask until it changes colour (that is from black to light blue).

The digestion flask was allowed to cool. The digest was made up to 100ml using distilled water and shake vigorously to homogenous solution.

**ii) Distillation Method**.

Twenty mills of sample were transferred into a distillation flask using a pipette. Twenty mills of 40% of sodium hydroxide solution were added carefully inside the flask using funnel. Then 50ml of 20% boric acid solution was pipette and added into a conical flask and two drops of methyl red indicator was added. The distillation unit was fitted such that the condenser was pipette in reoccurring flask. The distillation unit will be heated on heating mantle for 35 minutes until the pink solution of boric acid turned blue and the volume increased to about 100 mills by the distillate.

**iii) Titration Method:**

Hundred mills of the distillate were titrated against 0.1N hydrochloric acid to a colourless end point. The black solution was also titrated to get recorded. The percentage crude protein was calculated as follows:

% crude protein = Nitrogen x 6.25

Where % Nitrogen = 28 x ut-vb

100 $W_0$

Vt = titre volume of sample

Vb = titre volume of blank

$W_0$ = weight of sample

**Ash Content Determination (AOAC, 1995):**

The porcelain crucible was dried in an oven at $100^0$C for 10 minutes, cooled in a dessicator and weighed ($W_I$). Two grams of the sample was placed into the previously weighed porcelain crucible and it was re-weighed ($W_0$) and it was placed in the furnace for few hours at $600^0$C to ensure proper ashing. The crucible containing the ash was removed and was cooled in the desiccators and after it was reweighed ($W_3$). Then the percentage ash content was calculated as follows.

$$\text{Percentage Ash content} = \frac{W_2 - W_0}{W_2 - W1} \times \frac{100}{1}$$

**Fat Content Determination. (AOAC, 1995):**

A clean dried 500ml round bottom flask containing few anti-bumping granules was weighed ($W_1$) and 150ml ethanol and normal-hexane was weighed and transferred into the flask fitted with soxhlet extraction apparatus. The round bottom flask and a condenser were connected to the soxhlet extractor and cold water circulation was put on. The heating mantle was switched on and the heating was adjusted until the solvent was refluxing at a steady rate. Extraction was carried out in an hour. The round bottom flask and extracted oil was cooled and then weighed ($w_2$).

$$\% \text{ crude fat content} = \frac{W_2 - W_1}{\text{Weight of sample}} \times \frac{100}{1}$$

**Determination of Carbohydrate:**

The total carbohydrate content was determined by difference. The sum of the percentage moisture, ash, crude fat, and crude protein was subtracted from 100.

Total carbohydrate = 100 – (%moisture + %Ash + %Fat + %protein).

**Determination of Crude Fiber:**

The method described by AOAC (1995) was used, 2.0g of the finely ground sample was weighed out into a round bottom flask. Hundred mills of 1.2% sulphuric acid solution was added and the mixture boiled under a reflux for 30 minutes. The hot solution was quickly filtered under suction. The insoluble matter was washed several times with hot water until it will be acid free. It was quantitatively transferred into the flask and 100ml of hot 1.25% sodium hydroxide (NaOH) solution was added and the mixture boiled again under reflux for 30 minutes and was quickly filtered under suction. The soluble residue was dried to constant weight in the oven at $105^0$C, cooled in desiccators and weighed ($C_1$). The sample was heated in furnace at $300^0$C for about 30minutes, cooled in the desiccators and reweighed ($C_2$), the loss in weight of sample of incineration = $C_1 - C_2$

$$\% \text{ Crude fiber} = \frac{W_2 - W_3}{\text{Weight of original sample}} x \frac{100}{1}$$

**Methods for the Heavy Metal Analysis**

Heavy metal analysis was conducted using Agilent FS240AA Atomic Absorption Spectrophometer according to the method of AOAC 1995 (American Public Health Association)

**Working principle:** Atomic absorption spectrometer's working principle is based on the sample being aspirated into the flame and atomized when the AAS's light beam is directed through the flame into the monochromator, and onto the detector that measures the amount of light absorbed by the atomized element in the flame. Since metals have their own characteristic absorption wavelength, a source lamp composed of that element is used, making the method relatively free from spectral or radiational interferences. The amount of energy of the characteristic wavelength absorbed in the flame is proportional to the concentration of the element in the sample.

## RESULTS

From Table 1, nutritional plants of South East Nigeria with the highest/ richest concentration of nutritional values are *Xylopia aethiopica* (19.699); *Parkia biglobosa* (19.156); *Bryophyllum pinnatum* (18.551); *Colocasia esculentum* (17.799) and *Telfairia* occidentalis (16.066). Those with the highest ash content include *Dioscorea dumetorum (*10.138); *Monodora myristica* (9.302);*Piper guineense* (7.631); and *Xylopia aethiopica* (7.255). Those with the highest Protein content include: *Parkia biglobosa* (28.35); *Cajanus Cajans* (25.2); *Vigna subterranean* (24.5); *Rieinus Communis* (23.8), and *Xylopia aethiopica* (20.3) and *Monodora myristica* (17.5).

**Table 1: Table of Proximate Analysis of the Nutritional plants of South East**

| S/n | Plants | Percentage Moisture | Percentage Ash | Percentage Fats & oil | Percentage Fibre | percentage Protein | Percentage Carbohydrate | Total | Mean SD |
|---|---|---|---|---|---|---|---|---|---|
| 1 | *Telfairia occidentalis* (Ugu) | 5.788 | 4.591 | 4.350 | 2.179 | 14.7 | 64.788 | 96.396 | 16.066±0.13 |
| 2 | *Piper guineense* (Uziza) | 11.893 | 7.631 | 4.559 | 5.849 | 13.3 | 51.881 | 95.113 | 15.856±0.11 |
| 3 | *Cucurbita maxima* (Anyu) | 12.650 | 5.385 | 0.398 | 2.887 | 7.35 | 56.343 | 85.013 | 14.169±0.08 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4 | *B.pinnatum* (Odaa opue) | 24.638 | 1.458 | 0.250 | 1.547 | 13.65 | 69.762 | 111.305 | 18.551±0.15 |
| 5 | *Dioscorea dumetorum* (Ona) | 7.484 | 10.738 | 4.881 | 10.763 | 15.05 | 42.098 | 91.014 | 15.169±0.09 |
| 6 | *Colocasia esculenta* (Ede) | 23.680 | 5.743 | 7.422 | 1.896 | 12.25 | 55.804 | 106.795 | 17.799±0.14 |
| 7 | *Parkia biglobosa* (Ogiri igbo) | 11.596 | 0.742 | 7.870 | 5.044 | 23.8 | 44.67 | 93.722 | 15.620±0.09 |
| *8* | *Cajanus cajan* (Fiofio*)* | 8.437 | 0.549 | 9.108 | 6.167 | 25.2 | 26.491 | 75.952 | 12.659±0.06 |
| 9 | *Vigna subterranean* (Okpa) | 11.650 | 3.529 | 2.146 | 9.702 | 24.5 | 42.527 | 94.054 | 15.676±0.10 |
| 10 | *Rieinus communis* (Okpei) | 22.016 | 5.871 | 4.990 | 2.708 | 28.35 | 51.003 | 114.938 | 19.156±0.15 |
| 11 | *Xylopia aet*hiopica (Uda) | 19.608 | 7.255 | 10.742 | 13.281 | 20.3 | 47.007 | 118.193 | 19.699±0.17 |
| 12 | *Monodora myristica* Efuru | 7.078 | 9.302 | 7.179 | 8.958 | 17.5 | 29.722 | 79.739 | 13.290±0.06 |
| | Total | 166.518 | 62.794 | 63.895 | 70.981 | 215.95 | 582.096 | 1162.23 | |
| | Mean | 13.877 | 5.233 | 5.325 | 5.915 | 17.996 | 48.508 | 96.854 | |

From Table 2, nutritional plants of South West Nigeria with the highest/ richest concentration of nutritional values are *Corchorus olitorius* (20.231); *Sorghum bicolor* (18.624); *Dioscorea alata* (18.392); *Mitracarpus hirtus* (18.224) and *Musa paradisiaca* (18.224). Those with highest ash content include: *Tetrapleura tetrapters* (15.677); *Zanthoxylum zanthoxyloides* (15.362); *Corchorus olitorius* (9.661); *Salixalba* (8.995) and *Celosia celosia* (8.232). Those with highest protein content include: *Corchorus olitorius* (17.15); *Celosia celosia* (17.5); *Zanthoxylum zanthoxyloides* (17.5) and *Salix alba* (17.5).

**Table 2: Table of Proximate Analysis of the Nutritional plants of South West**

| S/n | Plants | Percentage Moisture | Percentage Ash | Percentage Fats & oil | Percentage Fibre | percentage Protein | Percentage Carbohydrate | Total | Mean SD |
|---|---|---|---|---|---|---|---|---|---|
| 1 | *Corchorus Olitorius* (Jute leaf) | 27.689 | 9.661 | 3.088 | 6.029 | 17.15 | 57.771 | 121.388 | 20.231±0.16 |
| 2 | *Celosia celosia* (Lagos spinach) | 6.301 | 8.232 | 17.886 | 5.010 | 17.15 | 32.451 | 87.03 | 14.505±0.09 |
| 3 | *Vitellaria paradox* (Shea butter) | 19.271 | 4.602 | 22.147 | 0.479 | 10.15 | 43.64 | 100.289 | 16.715±0.12 |
| 4 | *Dioscorea alata* (Water yam) | 22.683 | 1.199 | 0.200 | 1.092 | 4.9 | 80,269 | 110.349 | 18.392±0.13 |
| 5 | *Sorghum bicolor* (Broom corn) | 11.039 | 5.777 | 8.982 | 3.077 | 14.7 | 68.175 | 111.745 | 18.624±0.14 |
| 6 | *Mitracarpus hirtus* (Girdle pod) | 11.815 | 4.699 | 7.422 | 9.970 | 7.0 | 66.0 | 107.804 | 17.967±0.13 |
| 7 | *Zanthoxylum zanthoxyloides* (Artar root) | 18.982 | 15.326 | 1,761 | 9.100 | 17.15 | 37.841 | 100.196 | 16.699±0.12 |
| *8* | *Nauclea Latifolia* (Pin cushion) | 5.781 | 5.787 | 5.882 | 5.513 | 9.8 | 49.324 | 82.093 | 13.682±0.08 |
| 9 | *Musa paradisiacal* (Plantain) | 26.557 | 6.690 | 5.029 | 3.220 | 11.2 | 56.6639 | 109.344 | 18.224±0.15 |
| 10 | *Enantia chlorantha* (African | 23.694 | 7.350 | 5.842 | 5.058 | 10.15 | 50,737 | 102.831 | 17.139±0.12 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | yellow wood) | | | | | | | | |
| 11 | *Tetrapleura tetraptera* (Aidan fruit) | 16.553 | 15.677 | 4.019 | 6.029 | 3.5 | 64.19 | 109.968 | 18.328±0.13 |
| 12 | *Salix alba* (Willow bark) | 12.536 | 8.995 | 1.761 | 9.100 | 17.5 | 37.841 | 87.383 | 14.564±0.09 |
| | Total | 202.913 | 94.029 | 84.019 | 63.681 | 14,0 | 645.678 | | |
| | Mean | 16.909 | 7.836 | 7.002 | 5.307 | 11.667 | 53.807 | | |

From Table 3, the plants with the collective highest concentrations of the assayed Mineral (Iron, magnesium, Zinc, Calcium and lodine) are as follows: *Monodora myristica* (4.416);*Dioscoreadumentorium* (3.936); *Parkia biglobosa* (3.780); *Piper guineense* (3.773); *Colocasia esculentum* (3.675); *Bryophyllum pinnatum* (3.112); *Xylopia aethiopica* (3.109) and *Cucurbita argyrosperma* (3.095). Plantswith the highest Iron concentrations are *Monodora myristica, Dioscorea dumentorium,Bryophyllumpinnatum* and*Colocasia esculentum*. Plants with the highest magnesium concentrations are *Monodoramyristic, Monodora myristica, Parkia biglobosa, Piper guineense, Rieinus communis, Cajanus cajan, Cucurbita argyrosperma, Dioscorea dumentorium, Bryophyllum pinnatum* and *Colocasia esculentum*. Plants with the highest concentrationsof zinc include: *Parkia biglobosa, Monodora myristica, Cajanuscajan, Telfairia occidentalis*and *Dioscorea dumentorium*. Plants with the highest, calcium concentrations are: *Dioscorea dumentorium, Parkia biglobosa, Vigna subterranean,Xylopia aethiopica,Cajanus cajan*and *Piper guineense*. Plants with the highest concentrations of lodine include: *Monodora myristica, Bryophyllum pinnatum, Dioscorea dumentorium, piper guineense, Parkia biglobosa* and *Xylopia aethiopica.*

**Table 3: Mineral composition of the plants species from South East**

| S/n | Plants | Percentage Iron | percentage Magnesium | Percentage Zinc | Percentage Calcium | Percentage Iodine | Total | Mean | SD |
|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | *Telfairia occidentalis* (Ugu) | 1.141 | 5.131 | 0.298 | 3.047 | 3.066 | 12.683 | 2.537 ±0.17 |
| 2 | *Piper guineense* (Uziza) | 2.315 | 4.217 | 0.253 | 5.011 | 7.069 | 18.865 | 3.773 ±0.32 |
| 3 | *Cucurbita argyrosperma* (Anyu) | 2.140 | 4.129 | 0.092 | 4.047 | 5.065 | 15.473 | 3.095±0.20 |
| 4 | *Bryophyllum pinnatum* (Odaa opue) | 3.115 | 4.102 | 0.207 | 0.046 | 8.091 | 15.561 | 3.112±0-22 |
| 5 | *Dioscorea dumetorium* (Ona) | 3.175 | 4.111 | 0.296 | 6.041 | 6.055 | 19.678 | 3.936±0.33 |
| 6 | *Colocasea esculentum* (Ede) | 3.045 | 4.021 | 0.187 | 4.051 | 7.071 | 18.375 | 3.675±0.23 |
| 7 | *Parkia biglobosa* (Ogiri igbo) | 0.931 | 4.220 | 0.203 | 3.079 | 5.060 | 13.493 | 2.699±0.18 |
| 8 | *Cajanus cajan* (Fio fio) | 0.864 | 4.145 | 0.433 | 4.053 | 3.033 | 12.528 | 2.506±0.17 |
| 9 | *Vigna subterranean* (Okpa) | 0.712 | 3.138 | 0.263 | 5.051 | 2.069 | 11.233 | 2.247±0.13 |
| 10 | *Rieinus communis* (Okpei) | 2.336 | 4.414 | 0.789 | 5.153 | 6.207 | 18.899 | 3.780±0.31 |
| 11 | *Xylopia aethiopica* (Uda) | 1.107 | 3.103 | 0.237 | 5.041 | 6.057 | 15.545 | 3.109±0.21 |
| 12 | *Monodora myristica* (Efuru) | 3.393 | 5.660 | 0.609 | 4.237 | 8.180 | 22.079 | 4.416±0.35 |
| | Total | 24.274 | 50.391 | 3.867 | 48.857 | 67.023 | 194.412 | 36.348±2.51 |
| | Mean | 2.023 | 4.200 | 0.322 | 4.071 | 5.585 | 16.201 | |

From Table 4, the plants with the collective highest concentrations of the assayed minerals (Iron, magnesium, zinc, Calcium, iodine) are as follows: *Celoasia celosia* (4.839), *Corchorus olitorius* (4.520), *Vitellaria paradox* (4.084); *Zanthoxylum zanthoxyloides* (3.973);*Tetrapleura tetraptera* (3.722), *Salixalba* (3-582); *Sorghum bicolor* (3.577); *Nauclea latifolia* (3.560) and *Enantia chlorantha* (3.574). Plants with the highest Iron concentrations include: *Zanthoxylum zanthoxyloides* (4.423); *Vitellaria paradoxa* (4.420); *Sorghum bicolor* (4.135). Plant with the

highest Magnesium concentrations include: *Tetrapleuratetraptera* (5.306); *Celoasia celosia* (4.456); *Zanthoxylum zanthoxyloides*(4.393); *Corchorus olitorius* (4.333) and *Enantia chlorantha* (4.315). Plants with the highest concentration of Zine include: *Salix alba* (1.446); *Celoasia celosia*(0.975); *Enantia chlorantha* (0.881);*Tetrapleura tetraptera*(0.561); *Corchorusolitorius* (0.555) and *Nauclea latifolia* (0.543). Plants with highest Calcium concentrations are: *Celoasiacelosia* (7.165); *Zanthoxylum zanthoxyloides* (4.141); *Tetrapleura tetraptera* (4-138); *Salix alba*(4.061), and *Mitracarpus hirtus* (4.065). Plants with highest Iodine concentrations are: *Celoasia celosia* (8.228); *Vitellaria paradoxa* (8.195); *Corchorus olitorius* (8.165) *Sorghum bicolor* (7.073) and *Nauclea latifolia, Zanthoxylum zanthoxyloides, Tetrapleura tetraptera,Salix alba* and Enant*ia chlorantha* in that order.

**Table 4: Mineral composition of the plants species from South West**

| +S/n | Plants | Percentage Iron | Percentage Magnesium | Percentage Zinc | Percentage Calcium | Percentage Iodine | Total | Mean SD |
|---|---|---|---|---|---|---|---|---|
| 1 | *Corchorus olitorius* (Jute leaf) | 3.399 | 4.333 | 0.555 | 6.150 | 8.165 | 22.602 | 4.520±0.24 |
| 2 | *Celosia celosia* (Lagos spinach) | 3.372 | 4.456 | 0.975 | 7.165 | 8.228 | 24.196 | 4.839±0.26 |
| 3 | *Vitellaria paradox* (Shea butter) | 4.420 | 3.387 | 0.275 | 4.141 | 8.195 | 20.418 | 4.084±0.26 |
| 4 | *Dioscorea alata* (Water yam) | 3.102 | 3.105 | 0.133 | 2.037 | 4.103 | 12.48 | 2.496±0.08 |
| 5 | *Sorghum bicolor* (Broom corn) | 4.135 | 3.144 | 0.482 | 3.052 | 7.073 | 17.886 | 3.577±0.18 |
| 6 | *Mitracarpus hirtus* (Girdle pod) | 2.061 | 3.124 | 0.277 | 4.065 | 5.062 | 14.589 | 2.918±0.15 |
| 7 | Zanthoxylum *zanthoxyloides* (Artar root) | 4.423 | 4.393 | 0.708 | 4.141 | 6.198 | 19.863 | 3.973±0.22 |
| 8 | *Nauclea latifolia* (Pin cushion) | 3.321 | 3.528 | 0.543 | 3.138 | 7.267 | 17.797 | 3.560±0.18 |
| 9 | *Musa paradisiaca* (Plantain) | 2.124 | 3.152 | 0.325 | 5.055 | 4.076 | 14.732 | 2.946±0.16 |
| 10 | *Enantia chlorantha* (African yellow wood) | 3.306 | 4.315 | 0.831 | 3.111 | 6.309 | 17.872 | 3.574±0.18 |
| 11 | *Tetrapleura tetraptera* (Aidan fruit) | 2.345 | 5.306 | 0.561 | 4.138 | 6.273 | 18.611 | 3.722±0.20 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 12 | *Salix alba* (Willow bark) | 3.321 | 3.339 | 1.446 | 4.069 | 6.261 | 18.436 | 3.687±0.19 |
| | Total | 39.329 | 45.582 | 7.183 | 50.262 | 77.21 | 219.563 | 33.417±2.30 |
| | Mean | 3.277 | 3.799 | 0.599 | 4.189 | 6.434 | 18.298 | 36.596 |

## DISCUSSION

Major Nutritional plant of South East and South West according to our Questionnaire findings include: *Elaeis guineensis, Vigna subterranean, Cajanus cajans, Dioscorea dumentorum, Cucurbita arygrosperma, Tetrapleura tetraptera, Cucumeropsis mannii, Telfairia occidentalis, Pentaclethra macrophyta, Phaseolus vulgaris, Colocasia esculaeta, Ricinus communis, carica papaya, Ananas comosus, Musa species, Dioscorea combilum (Amala), Corchorus olitorius (Ewedu), Gbegiri (Black eyed vigna unguiculata soup), ofada rice (Oryza sativa), Crassocephalum crepidioides, musa species (Bole), Arachis hypogea, Amaranthus viridus (African spinach), Celoasia celosia (Lagos spinach), Telfairia occidentales, Cucumeropsis mannii, Tetrapleura tetraptera, Carica papaya* respectively**.** The Proximate analysis is a chemical method of assessing and expressing the nutritional value of food, which reports the moisture, ash (mineral), crude fiber, crude fat and crude protein percentage of dry weight (Bardley, 1998). The proximate analysis gives the overall nutritional composition of the sample in question. South East nutritional plant with the highest and lowest average indices of proximate analysis are *Xylopia aethiopica* with mean value of (18.551) and *Cajanus cajan* with mean value of (12.659) respectively. South west, nutritional plants with the highest and lowest average, indices of proximate analysis are *Corchorus olitorius* with mean value of (20.231) and *Nauclea latifolia* with mean value of (13.682). Taking Breadfruit (ukwa) and Pigeon pea (fio fio), from the South East for instance, Bread fruit which belongs to the family moraceae, is rich in nutrients and complex carbohydrates, while being low in fat and cholesterol (Robert 2007). It also contains a wide range of amino acid and is particularly high in leucine, isoleucine, phenyalanine

and valine making. It a good source of essential amino acids. Bread fruit is a good source of carbohydrate and Fibre. It is also known to have higher quality protein compared to other global staple Food (Liu, *et. al.*, 2014). It is also a good source of vitamin C, riboflavia, riiacin and thiamine and some minerals such as potassium, phosphorus and magnesium. Pigeon pea, on the other hand is a high utility tropical grain legume, endowed with rich dietary protein in its seed provides the much-needed protein requirements. The seed contains 18-29% proteins (Hari, *et. al.*, 2006). This protein is of excellent quality because it is high in Lysine. It is a good sound of carbohydrates, proteins, fats, and mineral, and makes a significant contribution to human and animal's nutrition. Carbohydrates, proteins, fats, and mineral, vital amino acid and vitamin are abundant in both mature (dry) and immature seeds of Pigeon pea. It contains Proteins, fiber, mineral, vitamin E, vitamin C, thiamine, Riboflavin, and niacin. It is a balanced diet in itself especially for many individual in under developed nations. It makes a significant contribution to meeting the nutritional needs of small holders in terms of fibre, ash, fat, and minerals (Hari, *et al.*, 2006). For the South west, look at *Sorghum bicolor* (poroporo) and India Gooseberry (Amala). This highly nutritional Legume (*Sorghum bicolor*) contains carbohydrates, fiber, water, minerals and vitamins. It is grown for storage, syrup, sugar, as a medicinal plant and as a colourant. It is used as folk remedy for cancer epilepsy, flux, Stomach ache, as a blood enhancing concoction, and as a tonic for anemia and general lack of vitality. Amala, on the other hand - India Gooseberry (*Dioscores alata*) is a rich native Yoruba food of miscellaneous nutritional combination of yam, cassava, and unripe plantain. It is also called elubo and served with Ewedu (*Corchorus olitorius* soup), Gbegiri (Bean soup), Efo (vegetable soup) and a variety of other soups. One can only imagine how rich such a food combination will be. There were subtitle difference in proximate analysis of South east and South west nutritional plants comparatively, but their comparative T-test, ANOVA and Correlation Analysis tests failed to show significance in those difference (Tables 1 and 2). On mineral composition of nutritional plants of south east Nigerian, the plant with the highest and the lowest mineral compositions respectively were *Monodora myristica* with mean values of (4.416) and *Vigna subterranean* with mean values of (2.247) respectively. South west nutritional plant with the highest and lowest average Mineral composition indices were *Celosia celosia* with mean values of (4.839) and *Dioscorea alata* with mean values of (2.496) respectively. Nutritional food of South East Nigeria rich in minerals, include Africa oil bean seed (Ukpaka). They are excellent source of

protein, vitamins, calcium, energy, amino acids, phosphorus, magnesium, iron and copper. It is also high in phytonutrients such as flavonoids, tannins, glycosides, alkaloids, sterols, and saponins. Another nutritionally formidable plant of South East Nigeria is Bambara nut- (Okpa- *Vigna subterranean*). It is rich in complex carbohydrates, proteins, fats and oils, vitamins, and minerals, particularly calcium which helps to build and maintain strong bones and muscles in the body, and Potassium which prevents deficiencies, signs and symptoms of diseases such as weakness and fatigue. For mineral rich nutritional plants of south west Nigeria, we have Jute Leaves (Ewede – *Corchorus olitorius*), these are green leafy vegetable rich in beta carotene for good eyesight, iron for healthy red blood cells, calcium for strong bones and vitamin for smooth, clear skin, strong immune cells and fast wound healing. It is good for weight loss because its low calorific content and it helps to fight off stress and heart disease. It is a folk remedy for aches and pains, dysentery, fever and tumors. They are also rich in fibre, help to bulk up stool and thus speed up digestion. Another highly nutritional plant common to South West Nigeria is Aiden Fruits (*Tetrapleura tetraptera*). It is utilized as an exotic spice, medicine and as a dietary supplement. Extract from the fruit is used to treat diabetes and its complications such as oxidative stress. It treats call categories of Asthma. It is effective in the prevention, shrinking and total treatment of fibroid in women. Aidan fruit is effective in the treatment of the infectious disease known as Schistosomiasis, caused by the parasites Schistosoma (Margaret, 1998).

## CONCLUSION

We have to a reasonable extent attempted a documentation of the nutritional plants of the south east and south west of Nigeria. The onus is now on individuals, Schools, Parastatals, Health institutions, Universities, and Regional governments to adopt these plants, make out lands and plant them en mass so that Nigeria has to offer in terms of plant resources to avoid the tales of woe of the past in terms of deficiency diseases, neglected tropical diseases, pregnancy and age related problem. Therefore, top nutritional plants from this work include: *Treculia Africana, Vigna subterranean, Cajanus cajan, Dioscorea alata, Musa paradisiaca, Celosia olitorius.*

## REFERENCES

AOAC, (1995). Association of Official Analytical Chemist Official Methods of Analysis 16th edn, Washington DC.Pp 514.

Bertoia, M. L., Mukamal K. J., Cashill L.E., Ludwig D.S., Moaffarian D., Willett W.C, and Rimm E.B. (2015). *Changes in intake of fruits and vegetables and weight change in United StatesMen and Women*. Plos medicine Pp 22, 12.

Emmanuel Epstan, (1972). *Mineral nutrition of plants, principles and perspective*. New York Wiley.

Hari, D., Upadhyaya, K. N., and Reddy, L. L. (2006). "Patterns of diversity in pigeon pea Cajanuscajan (L.) germplasm collected from different elevations in Kenya," *Journal of Genetic Research Crop Evolution,* vol. **54:** 1787–1795.

Kaur, C.,and Kapoor, H.C. (2011). Antioxidants fruits and vegetables; the millennium's health *International Journal of Food Science Technology,* **36**: 703-725.

Liu, Y., Jones, A.M.P. and Ragone D. (2014). Crop productivity, yield and seasonality of breadfruit (Artocarpus spp., Moraceae). *Fr uits***69**, 345-361.

Margaret, S. (1988). *Flowering plants in West Africa*. Cambridge University press.

Miyamoto, N, Izumi, H., Tawara, A. and Kohnok. (2014). Quercetin and Glaucoma In: Hand book *of nutrition, Diet and the Eye. Eds preedy V.R. Ist ed, Elsevier* Inc Pp. 97-103.

Norman, P.A., Huner, and William Hopkins. (2008). *Introduction to plant physiology*, 4th edition. John Wiley and Sons, Inc Pp 3 and 4.

Payne M.E., Steck S.E., George, P.R., Steffens, D.C. (2012). *Fruit, Vegetable, and Antioxidant in-takes are lower in older Adults with Depression*. J. Acad Nutr Diet, 112 Pp.

Roberts, N.L.(, An overview of breadfruit (Artocapus altilis) in the Caribbean. *Acta Hortic* **752:** 51-60.

Slavin, J.L., Lioyd B. (2012). Health Benefits of fruits and vegetables. *Adv Nutr*; **3**(4): 506-16.

Vilaplana, A.G., Baenas, N., and Villano D. (2014). Evaluation of Latin-American fruits rich in phyto-chemicals with biological effects. *Journal of functional food* **7**:599-608.