Natural Resources, 2021, 12, 237-249
https://www.scirp.org/journal/nr
ISSN Online: 2158-7086
ISSN Print: 2158-706X

Comparative Assessment of the Proximate and Mineral Composition of *Cucumis sativus* L. and *Solanum aethiopicum* L. Fruit Samples Grown in South Eastern and North Central Regions of Nigeria Respectively

H. C. Okeke[1*], O. Okeke[2], K. O. Nwanya[3], C. R. Offor[4], C. C. Aniobi[5]

[1]Department of Geological Sciences, Nnamdi Azikiwe University, Awka, Nigeria
[2]Plastic Production Unit, Scientific Equipment Development Institute, Akwuke, Nigeria
[3]Department of Scientific and Industrial Research, National Research Institute for Chemical Technology, Zaria, Nigeria
[4]Department of Biochemistry, University of Nigeria, Nsukka, Nigeria
[5]Department of Community Medicine, University of Nigeria Enugu Campus, Enugu Campus, Nigeria
Email: *onyekaokeke207@yahoo.com

How to cite this paper: Okeke, H.C., Okeke, O., Nwanya, K.O., Offor, C.R. and Aniobi, C.C. (2021) Comparative Assessment of the Proximate and Mineral Composition of *Cucumis sativus* L. and *Solanum aethiopicum* L. Fruit Samples Grown in South Eastern and North Central Regions of Nigeria Respectively. *Natural Resources*, **12**, 237-249.
https://doi.org/10.4236/nr.2021.128017

Received: June 23, 2021
Accepted: July 31, 2021
Published: August 3, 2021

Abstract

Studies were carried out to comparatively assess the proximate and mineral composition of *Solanum aethiopicum* L. and *Cucumis sativus* L. fruit samples grown in the South Eastern and North Central regions of Nigeria respectively, following standard analytical procedures and instrumentation. The mineral elements (Na, K, Zn and Ca) were determined using atomic absorption spectrophotometer after wet digestion of the samples while the proximate parameters (ash content, moisture content, crude fibre content, crude protein content, crude fat content and carbohydrate content) were determined in accordance with standard analytical procedures. The mean range of the moisture, crude fibre, crude protein, crude fat, ash and carbohydrate contents in the *S. aethiopicum* L. fruit samples grown in the North Central and South Eastern regions of Nigeria were 72.49 - 88.23, 2.15 - 3.67, 1.31 - 1.85, 0.43 - 0.76, 0.51 - 0.84 and 3.18% - 5.72% respectively. Additionally, the moisture, crude fibre, crude protein, crude fat, ash and carbohydrate contents in the *Cucumis sativus* L. fruit samples grown in the South Eastern and North Central regions of Nigeria, had mean range of values of 93.60 - 98.76, 0.53 - 0.77, 2.14 - 2.84, 0.29 - 0.46, 0.90 - 1.14 and 3.88% - 4.66% respectively. The range of mean values of Na, K, Zn and Ca in the *S. aethiopicum* L. fruit samples from the South Eastern and North Central regions of Nigeria were 0.36 - 0.57, 1.92 - 2.80, 0.84 - 1.01 and 0.43 - 0.61 μg/g respectively. Also, Na, K, Zn and

Ca had mean range of values of 1.36 - 4.08, 10.16 - 13.09, 0.45 - 0.66 and 5.85 - 9.3 µg/g respectively in the *C. sativus* L. fruit samples grown in the South Eastern and North Central regions in Nigeria. The levels of the determined proximate of parameters and mineral elements in the studied fruit samples from the investigated regions of Nigeria were statistically significant. This therefore indicates that the geographical locations where these fruit samples grew could have significantly impacted on their nutrient content levels. The levels of the determined proximate parameters from the selected regions of Nigeria shows that consumption of the fruit samples (*S aethiopicum* L. and *C. sativus* L.) especially regularly, would help supply the essential nutrients and minerals required for a healthy living.

Keywords

Solanum aethiopicum L., *Cucumis sativus* L., Proximate Parameters, Mineral Elements, South Eastern Region and North Central Region

1. Introduction

Plants are nature's gift to mankind in terms of providing us with food, oxygen, as well as shelter [1]. Plants are conveniently separated into those which are edible, those which serve as a source of food and drugs and those that are of ornamental value. Although almost intensively cultivated, plants rightly come under the domain of horticulture, primary effort is centered on the various traditional garden plants [1].

According to [2], plants have been a great source of nutrients to humans and animals. Humans have relied mostly on plants for nutritional and medicinal needs.

Vegetables and fruits are important edible crops and are essential part of human diet. They are rich in nutrients required for human health, and are an important source of carbohydrates, vitamins, minerals and fibers [3].

Cucumber (*Cucumis sativus* L.) belongs to the family *Cucurbitaceae*, and is the most widely cultivated vegetable crop all over the world [4]. Cucumber is the fourth most important vegetable crop after tomato, cabbage and onion [5].

Although its caloric and nutritional value is moderate, it is a primary source of vitamins and minerals in the human diet [6]. [7] reported that due to the high level of potassium in cucumber, it is a highly useful natural remedy for both high and low blood pressures.

[8] stated that the nutritional composition of *C. sativus* L. include protein, fat and carbohydrates as primary metabolites, along with dietary fibre which is important for the digestive system.

Solanum species (egg plants) belong to the family of *solanacaea* with over 1000 species worldwide and represented in Nigeria by about 25 species including those domesticated and the wild ones, with their leaves, fruits of both used as

vegetables or in traditional medicine [9]. Among these species known and cultivated in Africa including Nigeria is *Solanum aethiopicum* L. known as the African egg plant or Ethiopian egg plant [10]. It is often cultivated as an annual plant. The African egg plant or commonly called garden egg is also called "Afufa" or "Anara" in Igbo, "Dauta" in Hausa and "Igbaga" in Yoruba.

The African egg plant species are commonly consumed almost on daily basis by both rural and urban families.

The fruit said to represent blessings are offered as a token of goodwill during visits, marriages and other social events [11].

African egg plant contains many protein, minerals, vitamins, carbohydrates, fat, crude fiber, ash and water substances that are relevant and massively helpful in nutrient supplement and health promotion [12].

The fruits mostly possess high moisture content and low dry matter [13]. Several fundamental mineral elements, including calcium, magnesium, potassium, sodium, manganese, iron, copper, zinc and phosphorus are also contained in the fruits of *S. aethiopicum* L. [12].

These minerals are involved in functions such as maintenance of heart rhythm, muscle contractility, formation of bones and teeth acid-base, balance regulation of cellular metabolism and enzymatic reactions [14].

Both *Cucumis sativus* L. and *Solanum aethiopicum* L. fruits are widely grown in Nigeria especially in South Eastern and North Central regions, among others.

The use and consumption of these fruits across these regions are well documented [11]. The fruit species tastes varyingly across the two mentioned regions and their sizes and colour are equally varied and this can be attributed to the different environment conditions in which the fruit species are grown.

Since the fruit species of *S. aethiopicum* L. and *C. sativus* L. are consumed commonly by people of all ages across the six geographical regions of Nigeria, it is therefore important to comparatively determine the effect of geographical location on the mineral and proximate composition of the fruits in the most widely cultivated and grown regions in Nigeria, hence this research.

2. Sample Collection and Identification

The fruit samples of *Cucumis sativus* L. and *Solanum aethiopicum* L. were purchased in major fruit market outlets in Enugu and Ebonyi states respectively in South Eastern region of Nigeria while for the North Central region, the fruit samples were purchased at market outlets in Benue and Plateau states respectively. The fruit samples were identified in the department of Applied Biology, Enugu State University of Science and Technology, Enugu State. The healthy fruit samples were selected and thoroughly washed with water to remove dirts and unwanted particles.

3. Preparation of Samples

Fruit samples of *C. sativus* L. and *S. aethoiopicum* L. from the differently studied

environments were sliced into shreds and oven dried at 150˚C and then pulverized to obtain a fine dry powder.

The pulverized fruit samples were stored in air-tight containers at room temperature prior to analysis.

4. Proximate Analysis

The proximate analysis of the fruit samples of *C. sativus* L. and *S aethiopicum* L. in the investigated regions of Nigeria for moisture, ash, crude fat and carbohydrates contents were determined as described by [15]. The concentration of crude protein and crude fibre were determined using the methods described by [16]. All determinations were done in triplicates and the results were expressed as means of percentage values on dry weight basis.

5. Determination of Mineral Composition

Mineral compositions of the dried fruit samples were determined according to the procedures of [15].

2 g of each sample was dry-ashed with porcelain crucible in a muffle furnace at 500˚C for 24 hours.

The resulting ash was cooled in a dessicator and weighed. The ash samples were treated with 10 ml of 50% HCl. The quantification of mineral composition was carried out using 5 series atomic absorption spectrophotometer.

6. Statistical Analysis

The data obtained was expressed as mean ± standard deviation and subjected to one way analysis of variance (ANOVA) at 5% level of confidence using SPSS version 22.0.

7. Results and Discussion

7.1. Moisture Content

Result of **Table 1** shows that the mean moisture content of *S. aethiopicum* L. fruit samples from the South Eastern region was 72.49% ± 1.02% while the fruit samples from the North Central region of Nigeria had mean moisture content of 88.23% ± 0.05%. The moisture content of *S. aethiopicum* L. fruit samples from the N. Central region of Nigeria was significantly higher than the fruit samples of *S. aethiopicum* L. grown in the S. Eastern part of Nigeria. The different geographical locations in which the fruit samples were grown could be a significant factor for the varying moisture contents of the fruit samples. The topography of the location, nutrient density, specie of fruits and varying soil type where these fruit samples were harvested, could also have contributed to the variation in the moisture content values of the fruit samples in the investigated geographical locations.

Physical observation of the fruit samples show that the sizes of *S. aethiopicum* L. fruit samples from the North Central Region of Nigeria were larger than the

fruit samples from the South Eastern region and therefore could further explain the varying moisture contents in the fruit samples from the two studied locations.

[2] obtained a higher mean moisture content of 86.36% in *Solanum aethiopicum* L. fruit samples sold in Port Harcourt, of River state than what was reported as mean moisture content value in the fruit samples from the South Eastern region of Nigeria.

According to [17], the moisture content of any food is an index of its water activity and is used as a measured of stability and susceptibility to microbial contamination. [12] stated that fruits with high moisture content are of high nutritional value to people suffering from dehydration.

Result of **Table 2** shows that the mean moisture content of *Cucumis sativus* L. fruit samples from South Eastern of Nigeria were 93.60% ± 0.11% and 98.76% ± 0.34% for the *C. sativus* L. fruit samples grown in the North Central region. The mean moisture content values of the *C. sativus* L. fruit samples grown in the two studied regions of Nigeria were similarly observed to be statistically significant.

The reason for this variation has already been explained. *C. sativus* L. fruit

Table 1. Mean proximate composition of the *Solanum aethiopicum* L. fruit samples grown in the South Eastern and North Central regions of Nigeria respectively.

Proximate Parameter	Fruit samples from the South Eastern region (per 100 g of fresh Fruit)	Fruit samples from the North Central region (per 100 g of fresh fruit)	F test p value
Moisture content (%)	72.49 ± 1.02	88.23 ± 0.05	0.03
Crude fibre (%)	2.15 ± 0.06	3.67 ± 0.11	0.02
Crude protein (%)	1.85 ± 0.13	1.31 ± 0.04	0.02
Crude fat (%)	0.76 ± 0.08	0.43 ± 0.05	0.01
Ash content (%)	0.51 ± 0.06	0.84 ± 0.09	0.02
Carbohydrate (%)	3.18 ± 0.14	5.72 ± 0.23	0.00

The results represent mean ± standard deviation of triplicate experiment (n = 3).

Table 2. Mean proximate composition of the *Cucumis sativus* L. fruit samples grown in the South Eastern and North Central regions of Nigeria respectively.

Proximate parameter	Fruit samples from the South Eastern region (per 100 g of fresh Fruit)	Fruit samples from the North Central region (per 100 g of fresh fruit)	F test p value
Moisture content (%)	93.60 ± 0.11	98.76 ± 0.34	0.02
Crude fibre (%)	0.53 ± 0.07	0.77 ± 0.02	0.02
Crude protein (%)	2.84 ± 0.21	2.14 ± 0.10	0.01
Crude fat (%)	0.46 ± 0.03	0.29 ± 0.08	0.02
Ash content (%)	0.90 ± 0.05	1.14 ± 0.08	0.02
Carbohydrate (%)	3.88 ± 0.31	4.66 ± 0.20	0.01

The results represent mean ± standard deviation of triplicate experiment (n = 3).

samples from the South Eastern region had lower mean moisture content value than it was obtained in the fruit samples from the North Central region of Nigeria.

[8] obtained a mean moisture content of 94.2% ± 0.08% for *C. sativus* L. grown in Nsukka, South Eastern Nigeria, which compared very well with the mean moisture content value gotten for *C. sativus* L. fruit samples grown in the South Eastern Region of Nigeria as studied.

7.2. Crude Fibre

Result of **Table 1** shows that the mean crude fibre content of *Solanum aethiopicum* L. fruit samples from the South Eastern and Northern regions of Nigeria were 2.15% ± 0.06% and 3.67% ± 0.11% respectively. The mean crude fibre value for *S. aethiopicum* L. fruit samples from the South Eastern region were significantly lower than that from the North central region of Nigeria.

The size of *S. aethiopicum* L. fruit samples from the north Central region of region which always appear larger on account of its species different with that from the South Eastern region could have contributed to its increased crude fibre values. [11] reported a higher mean value of 21.33% ± 0.01% for crude fibre in *S. aethiopicum* L. fruit samples harvested from farms in Isiala Ngwa North Local Government Area of Abia State than what was gotten in this study for *S. aethiopicum* L. fruit samples and grown in North Central and South East regions of Nigeria respectively.

Result of **Table 2** shows that *C. sativus* L. fruit samples harvested in North Central and South Eastern regions of Nigeria had mean crude fibre values of 0.77% ± 0.02% and 0.53% ± 0.07% respectively.

The mean crude fibre values of *C. sativus* L. fruit samples grown in North Central and South Eastern regions of Nigeria were statistically significant. According to [18], crude fibre found in fruits such as pectin reduces the rate of sugar uptake and plays vital role in gastric emptying.

7.3. Crude Protein

Results of **Table 1** show that the mean crude protein values of *S. aethiopicum* L. fruit samples grown in the South Eastern and North Central regions of Nigeria were 1.85% ± 0.13% and 1.31% ± 0.11% respectively. The mean crude protein content of the fruit samples from the South Eastern Region was significantly higher than that from the North Central region. This could be due to the less moisture content in *S. aethiopicum* L. fruit samples from the S. Eastern region in addition to the fruit specie, soil type were the fruit grew and availability of minerals through fertilizer application at growth points.

The *C. sativus* L. fruit samples grown in the South Eastern and North Central regions of Nigeria had mean crude protein values of 2.84% ± 0.21% and 2.14% ± 0.10% respectively as given in **Table 2**.

Similarly, the crude protein content of *C. sativus* L. fruit samples grown in South Eastern region was observed to be signicantly higher than that grown and

harvested in the North Central region of Nigeria.

[2] reported a higher crude protein content of 4.38% for *S. aethiopicum* L. fruit samples sold in Port Harcourt, Nigeria than what was gotten as crude protein values for *S aethiopicum* L. fruit samples in the two studied regions of Nigeria.

Plant foods that provide more than 125 of its caloric value from protein are considered to be good sources of protein. This therefore indicates that the low values gotten in this study for *S. aethiopicum* L. and *C. sativus* L. fruit samples grown in South Eastern and North Central regions of Nigeria, makes the fruit samples not good sources of protein.

Protein is not generally known to be higher in fruits, however is of primary importance because they accelerate and catalyze enzyme reactions in the body.

7.4. Crude Fat

Result of Table 1 shows that the mean crude fat values of 0.76% ± 0.08% and 0.43% ± 0.05% were obtained for *S. aethiopicum* L. fruit samples grown in South Eastern and North Central regions of Nigeria respectively. The crude fat contents in the *S. aethiopicum* L. fruit samples grown in the South Eastern region were significantly higher than the fruit samples from the North Central region of the country. From the result of Table 2, the mean crude fat contents of 0.46% ± 0.03% and 0.29% ± 0.08% were for *C. sativus* L. fruit samples grown and harvested from South Eastern and North Central regions of Nigeria respectively.

The crude fat contents of the fruits samples from the two studied regions of Nigeria differed statistically at $p < 0.05$.

The low crude fat values obtained for the investigated fruit samples in the chosen regions in Nigeria suggests therefore that its regular incorporation and consumption in the diet would be very useful and healthy for people on low fat diet.

[8] reported a higher mean value of 0.55% ± 0.13% for *C. sativus* L. fruit samples from Nsukka, Nigeria than it was gotten for *C. sativus* L. fruit samples in the investigated regions of the study.

7.5. Ash Content

Result of Table 1 shows that the mean ash contents of 0.51% ± 0.06% and 0.84% ± 0.09% were obtained for *S. aethiopicum* L. fruit samples from the South Eastern and North Central regions of Nigeria respectively. The mean ash content of the fruit samples from the North Central region was significantly higher than the fruit samples from South Eastern region of Nigeria.

Result of Table 2 shows that the mean ash contents of 0.90% ± 0.05% and 1.14% ± 0.08% were obtained for *Cucumis sativus* L. fruit samples from South Eastern and North Central regions of Nigeria respectively. The result revealed that the fruit samples from the North Central region had higher ash content than those from the South Eastern region of Nigeria and equally differs statisti-

cally. This observation can be best explained by the fact that the specie variations of the fruits samples and soil type and climatic conditions where the plants grew which ultimately resulted in the huge sizes of the fruit samples from the North Central region could have significantly enhanced its fibre and consequently ash contents.

[2] reported an ash content of 0.55% for *S. aethiopicum* L. fruit samples from Port Harcourt, South-Southern Nigeria which compared favourably with the value reported for the fruit samples from the studied South Eastern region. According to [19] ash consent is an important fruit quality because it determines the mineral composition of fruit. Therefore the appreciable amounts of ash reported in this study for *C. sativus* L. and *S. aethiopicum* L. fruit samples from the South Eastern and North Central regions of Nigeria show that they could be recommended as effective sources of mineral nutrients.

7.6. Carbohydrate

The mean carbohydrate values for *S. aethiopicum* L. fruit samples from South Eastern and North Central regions of Nigeria were 3.18% ± 0.14% and 5.72% ± 0.23% respectively as presented in **Table 1**.

The fruit samples of *S. aethiopicum* L. from the North Central region of Nigeria had significantly higher amount of carbohydrates than those from the South Eastern region of the country.

Also, result of **Table 2** shows that the mean carbohydrate values of the *C. sativus* L. fruit samples from the North Central and South Eastern regions of Nigeria were 4.66% ± 0.20% and 3.88% ± 0.31% respectively.

The *C. sativus* L. fruit samples from South Eastern region had significantly lower values of carbohydrates than it was obtained for the fruit samples from the North Central region of Nigeria. [8] reported a lower mean value of 0.28% ± 0.09% for carbohydrate in *C. sativus* L. fruit samples from Nsukka, Enugu state, Nigeria than it was obtained in this study for carbohydrate in *C. sativus* L. fruit samples in the investigated regions of Nigeria.

[11] reported a higher mean value of 15.8% ± 0.03% for carbohydrate in *S. aethiopicum* L. fruit samples harvested in Isiala-Ngwa North Local Government Area of Abia State than it was obtained for the fruit samples from the studied South Eastern and North Central regions of Nigeria. [19] stated that carbohydrates are important due to their nutritional and metabolic functions in the body and that they are natural sweeteners and raw materials for many products of the industry.

7.7. Sodium

Result of **Table 3** shows that the mean levels of sodium in *S. aethiopicum* L. fruit samples from the South Eastern and North Central regions of Nigeria were 0.57 ± 0.13 and 0.36 ± 0.08 μg/g respectively. The levels of the macro element (Na) in the fruit samples grown in the North central and South Eastern regions of Nigeria

Table 3. Mean mineral composition of the *S. aethiopicum* L. fruit samples grown in the South Eastern and North Central regions of Nigeria respectively.

Mineral element (µg/g)	Fruit samples from the South Eastern region	Fruit samples from the North Central region	F test p value	[20] STD
Sodium	0.57 ± 0.13	0.36 ± 0.08	0.01	30
Potassium	2.80 ± 0.42	1.92 ± 0.10	0.01	25
Zinc	0.84 ± 0.26	1.01 ± 0.04	0.02	1.5
Calcium	0.43 ± 0.02	0.61 ± 0.18	0.02	30

The results represent mean ± standard deviation of triplicate experiment (n = 3).

Table 4. Mean mineral composition of the *Cucumis sativus* L. fruit samples grown in the South Eastern and North Central regions of Nigeria respectively.

Mineral element (µg/g)	Fruit samples from the South Eastern region	Fruit samples from the North Central region	F test p value	[20] STD
Sodium	4.08 ± 0.23	1.36 ± 0.41	0.00	30
Potassium	10.16 ± 0.17	13.09 ± 0.30	0.02	25
Zinc	0.43 ± 0.06	0.66 ± 0.12	0.02	1.5
Calcium	5.85 ± 0.10	9.31 ± 0.24	0.01	30

The results represent mean ± standard deviation of triplicate experiment (n = 3).

were statistically significant. The fruit samples from the South Eastern region were found to have higher levels of Na than that gotten from the North Central region of Nigeria.

This could be attributed to the variation in nutrient availability in the soils where the fruit plants grew, disparity in soil organic matter contents and varying topography of the soils.

Result of **Table 4** shows that the mean levels of sodium in *S. aethiopicum* L. fruit samples from the South Eastern and North Central regions of Nigeria were 4.08 ± 0.23 and 1.36 ± 0.41 µg/g respectively. The levels of Sodium in the fruit samples from South Eastern region was significantly higher than it was in the fruit samples harvested in the North Central region.

[11] reported a higher mean value of 0.63 ± 0.03 for sodium *in S. aethiopicum* L. fruit samples from Isiala-Ngwa North Local Government Area of Abia State than what was obtained for the metal in the *S. aethiopicum* L. fruit samples from South Eastern and North Central regions of Nigeria. The levels of sodium in the fruit samples studied were lower than the prescribed [20] standard limits for edible food products. Sodium is responsible for regulating body water content and electrolyte balance. According to [21] high sodium intake along with obesity and high alcohol intake are considered to be among the risk factors for high blood pressure which is a risk factor for cardiovascular disease and stroke. Deficiency of the mineral in the body can result from excessive sweating, diarrhea and renal failure [22].

7.8. Potassium

Result of Table 3 shows that the mean levels of potassium were 2.80 ± 042 and 1.92 ± 0.10 μg/g in the *S. aethiopicum* L. fruit samples from South Eastern and North Central regions of Nigeria respectively.

The level of potassium *in the S. aethiopicum* L. fruit samples from the South Eastern region was found to be significantly higher than the metal's level in the fruit samples from the North Central region of Nigeria. The mean levels of potassium in the *C. sativus* L. fruit samples from the North Central and South Eastern regions of Nigeria were 13.09 ± 0.30 and 10.16 ± 0.17 μg/g respectively as shown in Table 4. The *C. sativus* L. fruit samples from the North Central region had a significantly higher level of potassium than it was obtained for the metal in the fruit samples from the South Eastern region of Nigeria.

According to [21] potassium is essential for water and electrolyte balance and normal functioning of cells including nerves. They further stated that high supplementary doses of potassium can be harmful especially if the kidneys are not functioning properly.

7.9. Zinc

Result of Table 3 shows that the mean levels of zinc in the *S. aethiopicum* L. fruit samples from the South Eastern and North Central regions of Nigeria were 0.84 ± 0.26 and 1.01 ± 0.04 μg/g respectively.

The level of zinc in the *S. aethiopicum* L. fruit samples from South Eastern region was significantly lower than the metal's level in the fruit samples from the North Central region.

Just as similarly explained under sodium in the studied fruit samples, variation in the levels of zinc in the fruit samples from the two studied geographical regions of Nigeria could be attributed to the variations in the availability of nutrients in the soils where the fruits grew and disparity in the soil organic matter contents among other factors. This explanation was corroborated by [23], who stated that the mineral in the soil correlates with the mineral content of the plant grown in it.

Result of Table 4 shows that the mean levels of zinc in the *C. sativus* L. fruit samples grown in the South Eastern and North Central regions of Nigeria were 0.43 ± 0.06 and 0.66 ± 0.12 μg/g respectively. The levels of zinc in the *C. sativus* L. fruit samples from the North Central region was significantly higher than it was obtained for the metal in the fruit samples from the South Eastern region of Nigeria.

[22] reported a mean value of 0.40 ± 0.00 μg/g for zinc in *C. sativus* L. fruit samples from Rivers State, Nigeria, and this compared very well with what this study reported for *C. sativus* L. fruit samples from the South Eastern region of Nigeria. According to [21], zinc is directly or indirectly involved in the major metabolic pathways concerned with protein, lipid carbohydrate and energy metabolism and is also essential for cell division and therefore for growth and tissue

repair and for normal reproductive development. According to [11], excessive zinc intake in diets could cause damage to the liver and kidney.

7.10. Calcium

Result of Table 3 shows that the mean levels of calcium in the *S. aethiopicum* L. fruit samples from the South Eastern and North Central regions of Nigeria were 0.43 ± 0.02 and 0.61 ± 0.18 μg/g respectively.

The levels of the trace mineral in the *S. aethiopicum* L. fruit samples from the two investigated regions of Nigeria was statistically significant.

The level of calcium was significantly higher in the fruit samples from the North Central region than it was in the fruit samples from the South Eastern region of Nigeria.

Result of Table 4 shows that the mean levels of calcuim in the *Cucumis sativus* L. fruit samples grown in the South Eastern and North Central regions of Nigeria were 5.85 ± 0.10 and 9.31 ± 0.24 μg/g respectively.

The levels of calcium in the *Cucumis sativus* L. fruit samples from the North Central region were significantly higher than the metal's amount in the fruit samples from the South Eastern region of Nigeria.

According to [21], the body needs adequate dietary calcium to develop healthy bones and teeth and also plays a key role in intracellular signaling to enable the integration and regulation of metabolic processes, the transmission of information via the nervous system and the control of muscle contraction and blood clotting.

[22] stated that obtaining calcium as part of a varied diet is unlikely to cause any adverse effect but taking high dose supplements sometimes causes stomach pain and diarrhea.

8. Conclusions

Solanum aethiopicum L. and *Cucumis sativus* L. fruit samples from the South Eastern and North Central regions of Nigeria had small to moderate compositions of the determined proximate parameters (ash, moisture, crude fibre, crude protein, crude fat and carbohydrate contents) and mineral elements (K, Na, Ca, and Zn).

The levels of the determined parameters and mineral elements in the fruit samples from the two studied regions were found to be statistically significant. This was attributed to the varying availability of nutrients in the soils where the fruit sample grew, soil topography and chemistry among other factors.

Nutritive parameters such as crude protein, crude fat, carbohydrates, potassium, sodium, zinc and calcium which were in trace to moderate amounts in the fruit samples therefore indicates that these fruit samples if taken regularly could complement and fill the gap in the low nutrient diets consumed by people especially low income earners of the society, by supplying the body with the essential nutrient requirements.

Acknowledgements

The authors of this research are immensely grateful to the Managements of Springboard laboratory, Awka-Anambra, Scientific Equipment development Institute, Akwuke, Enugu State and Applied Biology department, Enugu State University of Science and Technology, Enugu State for their technical and material assistance in the execution of the research.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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