http://dx.doi.org/10.4314/bajopas.v12i1.7

Bayero Journal of Pure and Applied Sciences, 12(1): 40 - 51
Received: April, 2018
Accepted: December, 2018
ISSN 2006 – 6996

COMPARATIVE STUDY OF NUTRITIONAL CONTENTS OF *Ocimum basilicum* AND *Ocimum gratissimum* PLANT LEAVES AND SOIL SAMPLES FROM BORNO AND ENUGU STATES, NIGERIA

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ABSTRACT
O. basilicum and O. gratissimum leaves are one of the important nutritious and medicinal plants used in Nigeria and other parts of the world. The aim of this work was to determine the nutritional contents of O. basilicum and O. gratissimum leaves with its associated soil. The elemental analysis for leaves showed that Ca (33024.60 mg/kg), Cu (28.50 mg/kg), K (2350.00 mg/kg), Zn (98.80 mg/kg) and S (5091.33 mg/kg), were highest in leaves found in Awgu town, while Fe (2940.00 mg/kg) and P (4123.24 mg/kg) were highest in leaves found in Nsukka town. Mn (101.60 mg/kg) in leaves found at G. R. A Damboa Road and N (34.05 mg/kg) in leaves found at 707Housing Estate were highest in O. basilicum leaves found at Maiduguri. Cobalt was not detected in both O. basilicumand O. gratissimum leaves. The soils where both O. basilicumand O. gratissimum were planted were analyzed and showed that Ca (7911.20 mg/kg) and K (490.00 mg/kg) in 707Housing Estate samples were the highest and Co (2.40 mg/kg), Cu (18.30 mg/kg), Fe (35480.20 mg/kg), Mn (338.60 mg/kg), Zn (211.20 mg/kg) and P (1012.72 mg/kg) in Nsukka town samples were the highest; S (1988.23 mg/kg) and N (2.27 mg/kg) in Awgu town samples were the highest in soil. Both the leaves and soil were not toxic or contaminated compared with WHO/FAO standard for vegetable and soil and NAFDAC standard for food in the elemental concentration except with Fe. The proximate analysis showed that highest Carbohydrate content (31.58%) and ash content (15.33%) were found at 707Housing Estate; highest moisture content (26.66%), crude fiber (32.0%), and crude fat (18.66%) were found at G.R.A Damboa road while highest protein content (7.61%), was found in O. gratissimum leaves at Nsukka town. The pH of O. basilicum leaves was slightly acid while that of O. gratissimum leaves was slightly basic. Both leaves showed good nutrition content with respect to the elemental composition, and proximate contents. Statistically both leaves showed no differences in all the content checked in respect to the nutritional contents.
Keywords: Elemental composition, O. basilicum and O. gratissimum leaves, Proximate contents and Soil.

INTRODUCTION

Nutrient is the basic substance that provides nourishment for the maintenance and sustenance of life and for growth. "Macronutrients are needed in larger quantities for the metabolic system to function; whilst micronutrients are needed in very small amounts which provide the necessary co-factors for metabolism to be carried out"(Clementson, 2014). Minerals such as calcium, potassium, sodium, phosphorus, magnesium, zinc, iron, and copper are confirmation of nutritional values (Bolanle *et al.,* 2014).

Ocimum (Scent) leaf is an important nutritious plants commonly used in Nigeria and other parts of the world. In the northern part of Nigeria the leaf is called "Daidoya" by the Hausas while in the southern part of Nigeria it is called "Nchonwn" by the Igbo (Effrain *et al*., 2000).Scent leaves contain nutrients such as protein, carbohydrate, fat, vitamin, and mineral elements which are very useful to the human body (Katarzyna, 2010). Soil is the major source of nutrients in plant and soil nutrient can be affected by environmental factors. The wide consumption of scent leaves by Nigerians necessitates the determination of the quality of the two species of the *Ocimum* leaves in terms of their elemental composition and proximate content to know the different constituents which might affect human health. Also the quality of the soil on which the *Ocimum* plants are grown can affect the quality of their leaves.

MATERIALS AND METHODS

Collection, identification and preparation of plants and soil samples

Fresh samples of *Ocimum basilicum* leaves and soil were collected from Government Residential Area along Damboa road, and 707 housing Estate at Maiduguri town, Borno state in North-Eastern Nigeria and *Ocimum gratissimum* plant leaves and soil were collected at Nsukka and Awgu towns Enugu town in South-Eastern part of Nigeria. Both leaves were examined and authenticated at the herbarium laboratory in the Department of Biological Science Ahmadu Bello University Zaria. The *voucher* number; 1285 for *Ocimum gratissimum* and 044 for *Ocimum basilicum* were given to the plants. The soil was collected at each sampling location using clean hand trowel by piercing the soil to 10 cm from the top soil within the garden. Fresh samples of scent leaves was washed with distilled water and dried at room temperature separately for 3 days. The two samples were then crushed in a mortar separately; the resulting powder was sieved, weighed and stored in black polyethene leather for further analysis. Likewise soil collected in three places at each sampling location was air dried at room temperature for 3 days then sieved and stored in a polythene leather for all the four sampling sites for further analyses.

Mineral elements composition (determination)

The mineral composition were determined by the Aqua regia method digesting both leaves and soil sample in a mixture of 6cm ^{3} nitric acid and 6cm ^{3} hydrochloric acid (1:2) for metals. Ca, Cu, Co, Fe, Fe, Mn and Zn were determined using 280FS AA Model Atomic absorption spectroscopy adopting standard method (Saeid, 2012). P and S were determined using Carry 300 model UV-Vis spectroscopy and N was determined using Kjeldhl nitrogen method (AOAC, 1990). Exactly 1g of each of the sample was used in both analyses.

Proximate analysis

The proximate contents of *Ocimum basilicum* and *Ocimum gratissimum* leaves were determined by following the official method of analysis. Exactly 1.5g of each of both samples was carried out for each of the analysis. The moisture and crude fiber were determined (Owoso and Ogunmoyela, 2001). Crude protein, fats, pH and carbohydrate contents were determined (Gul and Mahpara, 2009) and ash contents was determined (Udo and Ogunwele, 1986). Exactly 1.5g of samples was used in the analysis and all the proximate values were reported in percentages.

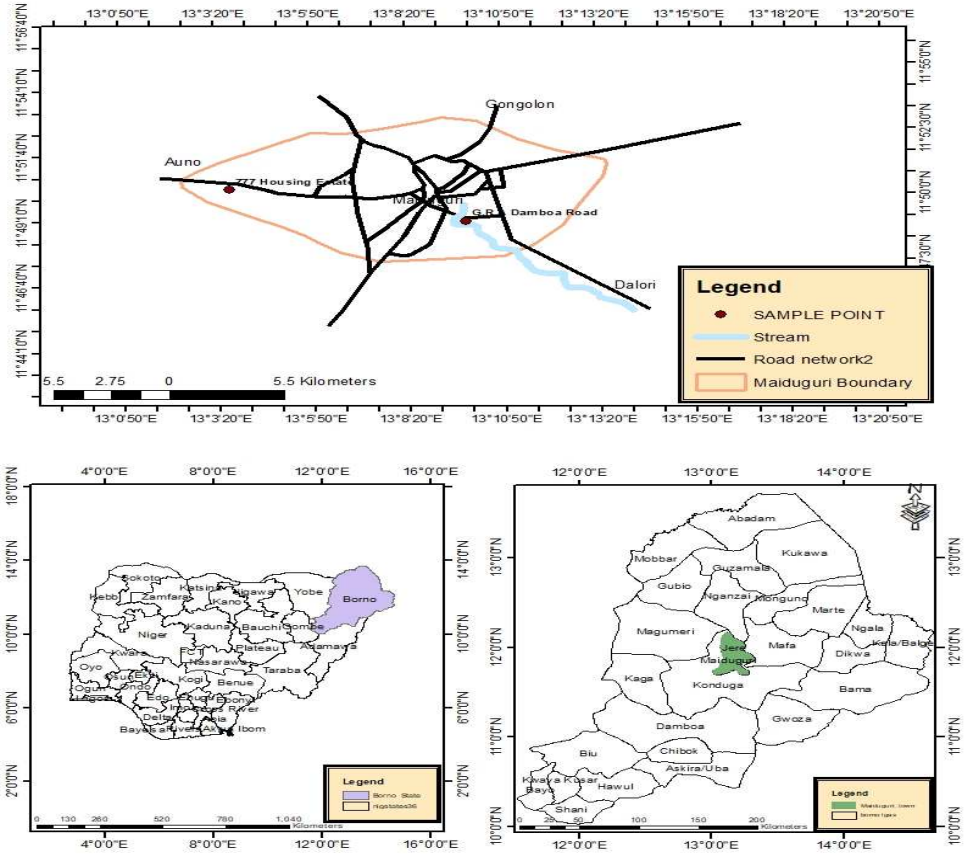

Figure 1: Map of Maiduguri town, Borno state, showing the sampling site.

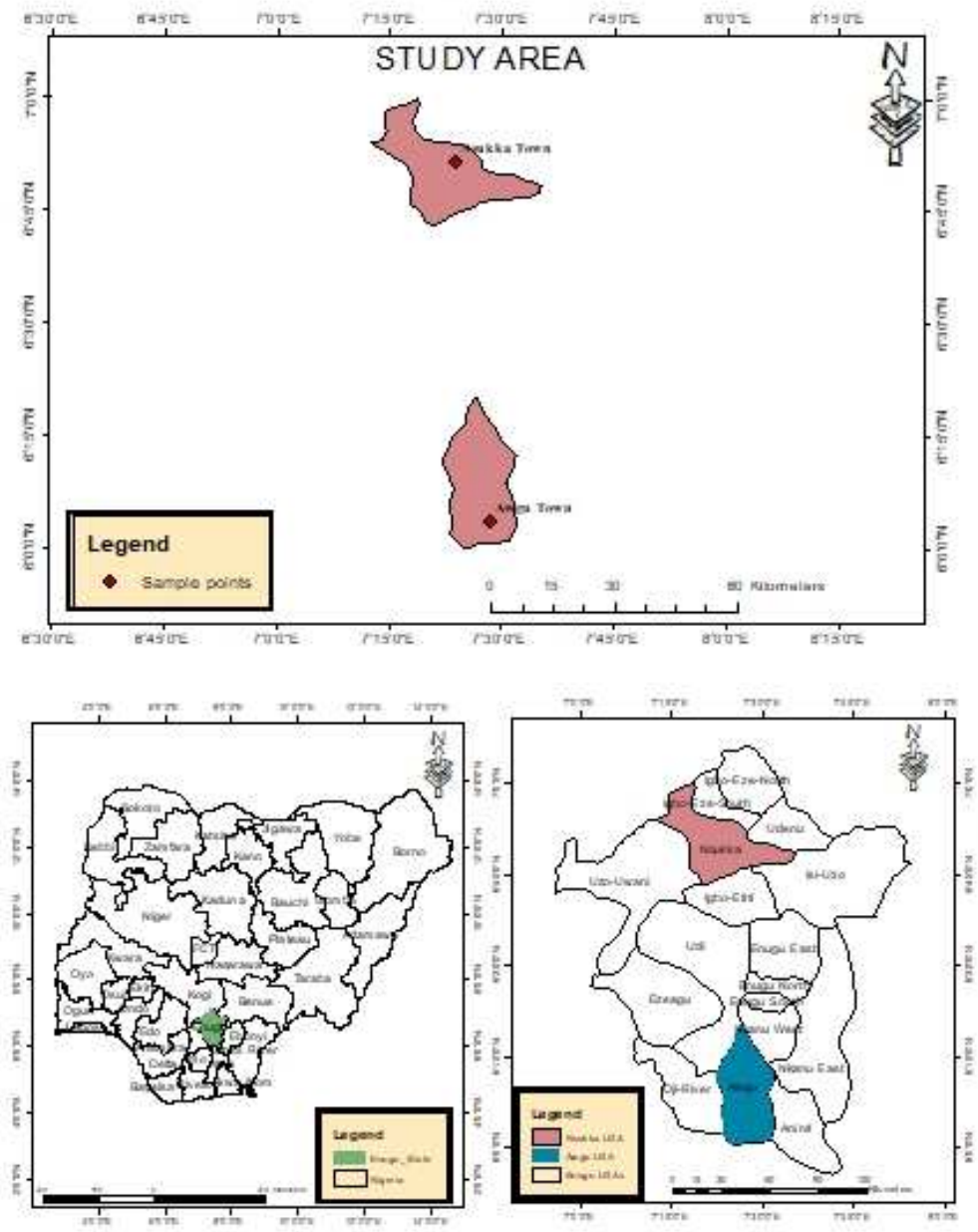

Figure 2: Map of Enugu town, Enugu state, showing the sampling site.

Statistical analysis

All results were presented as mean ± standard deviation, the mean data of elemental analysis and proximate analysis of *Ocimum basilicum* and *Ocimum gratissimum* plant leaves with soil was done using special package for social science software (SPSS) version 16.

RESULTS AND DISCUSSION

Table 1: Mean concentration ± STD of metals concentration of *Ocimumbasilicum* and *Ocimumgratissimum*plant leaves.

METAL	707HEMOB	GRADMOB	NTEOG	ATEOG	FAO/WHO STD	NAFDAC STD
Ca (mg/kg) R^2=0.998	17089.90 ± 94.89	19160.00 ± 26.85	14096.00 ± 133.22	33024.60 ± 477.19	-	-
Cu (mg/kg) R^2=0.998	5.10 ± 0.09	12.30 ± 0.22	18.30 ± 1.84	28.50 ± 0.31	73.00	0-40.00
Co (mg/kg) R^2=1.0	ND	ND	ND	ND	50.00	0-3.50
Fe (mg/kg) R^2=0.996	526.00 ± 34.12	1797.30 ± 12.95	2940.00 ± 28.94	973.70 ± 12.52	425.00	10-40.70
K (mg/kg) R^2=0.999	1497.50 ± 85.20	1795.00 ± 43.13	1400.00 ± 113.13	2350.00 ± 212.13	-	-
Mn (mg/kg) R^2=0.998	54.00 ± 0.56	101.60 ± 0.41	84.80 ± 4.00	71.10 ± 0.60	500.00	-
Zn (mg/kg) R^2=0.999	37.30 ± 1.43	59.10 ± 1.52	88.20 ± 0.00	98.80 ± 1.10	100.00	0-50.00

Key: 707HEMOB = 707 Housing Estate Maiduguri*Ocimumbasilicum*, GRADMOB = G.R.A Damboa Road Maiduguri*Ocimumbasilicum*, NTEOG = Nsukka Town Enugu*Ocimumgratissimum*, ATEOG = Awgu TownEnugu*Ocimumgratissimum*, FAO/WHO STD = Food and Agricultural Organization/ World Health Organization standard in Vegetable Maximum Permissible limit, NAFDAC STD = National Agency for Food and Drug Administration and Control In Food Maximum Permissible limit, ND = Not Detected.

Table 2: Mean concentration ± STD of non-metals concentration of *Ocimum basilicum* and *Ocimumgratissimum* plant leaves.

Non metals	707HEMOB	GRADMOB	NTEOG	ATEOG
P (mg/kg)	3580.66 ± 51.21	3219.02 ± 17.05	4123.24 ± 102.30	1530.49 ± 72.14
S (mg/kg)	2351.00 ± 332.48	2057.15 ± 83.15	3467.72 ± 83.12	5091.33 ± 202.34
N (mg/kg)	34.05 ± 1.06	6.75 ± 0.35	29.10 ± 1.55	12.42 ± 0.24

Key: 707HEMOB = 707 Housing Estate Maiduguri *Ocimumbasilicum*, GRADMOB = G.R.A Damboa Road Maiduguri *Ocimumbasilicum*, NTEOG = Nsukka Town Enugu *Ocimumgratissimum*, ATEOG = Awgu Town Enugu *Ocimumgratissimum*,

Table 3: Mean concentration ± STD of Metal concentration in soil were *Ocimum basilicum* and *Ocimumgratissimum*plants are planted compared with FAO/WHO STD.

Metals	707HEMSS	GRADMSS	NTESS	ATESS	FAO/WHO STD in soil
Ca(mg/kg) R^2=0.998	7911.20 ± 24.91	4568.60 ± 23.15	1503.50 ± 8.71	2779.00 ± 66.19	-
Cu (mg/kg) R^2=0.998	9.30 ± 0.94	7.00 ± 0.04	18.30 ± 0.89	34.00 ± 0.31	100.00
Co (mg/kg) R^2=1.0	ND	ND	2.40 ± 0.34	ND	50.00
Fe (mg/kg) R^2=0.996	2866.10 ± 197.58	5745.00 ± 64.47	35480.20 ± 481.33	22016.70 ± 108.71	5000.00
K (mg/kg) R^2=0.999	4900.00 ± 29.69	3407.50 ± 14.03	2370.00 ± 15.98	610.00 ± 18.38	-
Mn (mg/kg) R^2=0.998	100.00 ± 4.80	76.80 ± 2.09	338.60 ± 1.16	200.30 ± 1.21	2000.00
Zn (mg/kg) R^2=0.999	28.40 ± 0.84	69.10 ± 5.11	211.20 ± 1.22	37.70 ± 1.61	300.00

Key: 707HEMSS = 707 Housing Estate Maiduguri Soil Sample, GRADMSS = G.R.A Damboa Road Maiduguri Soil Sample, NTESS = Nsukka Town Enugu Soil Sample, ATESS = Awgu TownEnugu Soil Sample, FAO/WHO STD = Food and Agricultural Organization/ World Health Organization Standard Maximum permissible limit in soil, ND = Not Detected.

Table 4: Mean concentration ± STD of non-metal concentration in soil where *Ocimumbasilicum* and *Ocimumgratissimum*plants are planted.

Non metals	707HEMSS	GRADMSS	NTESS	ATESS
P (mg/kg)	694.89 ± 5.18	643.00 ± 22.73	1012.72 ± 22.73	658.28 ± 33.24
S (mg/kg)	301.71 ± 16.62	305.63 ± 11.08	1684.88 ± 55.41	1988.23 ± 75.87
N(mg/kg)	1.08 ± 0.04	1.04 ± 0.01	1.31 ± 0.12	2.27 ± 0.24

Key: 707HEMSS = 707 Housing Estate Maiduguri Soil Sample, GRADMSS = G.R.A Damboa Road Maiduguri Soil Sample, NTESS = Nsukka Town Enugu Soil Sample, ATESS = Awgu TownEnugu Soil Sample.

Concentration of elements in leaves of *Ocimumbasilicum* and *Ocimumgratissimum* and soil

Table 1 and 2 show the concentrations of Ca, Cu, Co, Fe, Mn, K, Zn, P, S and N in *O. basilicum* and *O. gratissimum* leaves. The results showed that Awgu town had the highest concentrations of Ca, Cu, K, and Zn of 33024.60 ± 477.19 mg/kg, 28.50 ± 0.31 mg/kg, 2350.00 ± 212.13 mg/kg, and 98.80 ± 1.10 mg/kg respectively in *O. gratissimum* leaves, Nsukka town had the highest concentration of Fe of 2940.00 ± 28.94 mg/kg in *O. gratissimum* leaves and G.R.A Damboa road had the highest concentration of Mn of 101.60 ± 0.41 mg/kg in *O. basilicum* leaves. Co showed low concentrations in both *O. gratissimum* and *O. basilicum* leaves. The concentrations of all the metals showed lower value compared with the WHO/FAO and NAFDAC except Fe as illustrated in Table 1.

The results for the non-metals showed that Nsukka town had the highest concentration of Phosphorus of 1530.00 ± 72.14 mg/kg whileAwgu town had the highest concentration of sulphur of 5091.33 ± 202.34 mg/kg in *O. gratissimum* leaves. However 707Housing Estate had the highest concentration of nitrogen of 34.05 ± 1.06 mg/kg in *O. basilicum* leaves as illustrated in Table 2.

Tables 3 and 4 show the result for metals analyzed associated soil where the plants were grown. It was observed that 707Housing Estate had the highest concentrations of Ca and K of 7911.20 ± 24.91 mg/kg and 490.00 ± 29.69 mg/kg respectively in the soil, Nsukka town had the highest concentrations of Cu, Co, Fe, Mn and Zn of 18.30 ± 0.89 mg/kg, 2.40 ± 0.34 mg/kg, 3548.02 ± 481.33 mg/kg, 338.60 ± 1.16 mg/kg and 211.20 ± 12.20 mg/kg respectively in the soil. All the soil samples showed low concentration of metals as compared with WHO/FAO standard except Fe at G.R.A Damboa road, Nsukka and Awgu town showed in Table 3. The result for the non-metals analyzed in soil showed that Awgu town had the highest concentrations of sulphur and nitrogen of 1988.23 ± 75.87 mg/kg and 2.27±0.24 mg/kg respectively in the soil and Nsukka town had the highest concentration of phosphorus of 1012.72 ± 22.73 mg/kg in soil as illustrated in Table 4.

The contamination of vegetables with minerals due to soil and atmospheric contamination poses a threat to its quality and safety. Dietary intake of elements also poses risk to animals and human health (Nazemi*et al.,* 2012).

Awgu town had the highest concentration of Ca (33024.60 mg/kg) in *O. gratissimum* leave followed by G.R.A Damboa road and 707 Housing Estate (19160.00 and 17089.90 mg/kg) in *O. basilicum*leaves respectively. Nsukka had the lowest concentration (14096.00 mg/kg) of Ca in *O. gratissimum leaves*. The WHO/FAO agency had not provided the standard of Ca in vegetable likewise NAFDAC as shown in Table 1. High concentration of Ca in *O. basilicum leaves* had been reported by Daniel *et al.* (2011) which was agreed with reference to the result obtained. For *O. gratissimum* leaves, however, concentrations reported by Idris*et al.* (2011) and Asaolu*et al.* (2012) were very low compared to what we obtained. In soil, 707Housing Estate had the highest concentration of Ca (7911.20 mg/kg) followed by G.R.A Damboa Road and Awgu town of (4568.60 and 2779.00 mg/kg) respectively. Nsukka town had the lowest concentration (1503.50 mg/kg). The WHO/FAO had no standard for Ca in soil as well shown in Table 3.

Awgu town having the highest concentration of Cu (28.50 mg/kg) followed by Nsukka town (18.30 mg/kg) in *O. gratissimum* leaves and G.R.A Damboa road (12.30 mg/kg) in *O. basilicum*leaves. 707Housing Estate had the lowest concentration (5.10 mg/kg) of Cu in *O. basilicum* leaves. Both leaves species showed low concentration of Cu when compared with WHO/FAO and NAFDAC standards in vegetable and foodrespectively shown in Table 1. Low concentration of Cu in *O. basilicum* leaves was reported by Agunbiade*et al.* (2015) and in *O. gratissimum leaves* as reported by Idris*et al.* (2011) and Asaolu*et al.* (2012). The results agreed with the results obtained in the current study. In soil sample from Nsukka town had the highest concentration of Cu (18.30 mg/kg) followed by 707Housing Estate (9.30 mg/kg) and G.R.A Damboa road (7.00 mg/kg) in soil. Awgu town had the lowest concentration (3.40 mg/kg) in soil samples. The soil samples showed low concentrations of Cu when compared with WHO/FAO standard in soil as shown in Table 3.

Cobalt was not detected in any of the leaf samples analyzed shown in Table 1. In soil samples however, only Nsukka samples confirmed Co at a concentration of 2.40 mg/kg. The WHO/FAO standard shows that the soil was not contaminated with Co as illustrated in Table 3.

Nsukka town had the highest concentration of Fe (2940.00 mg/kg) in *O. grtissimum* leaves followed by G.R.A Damboa road (1797.30 mg/kg) in *O. basilicum* leaves and Awgu town (973.70 mg/kg) in *O. grtissimum* leaves. 707Housing Estate had the lowest concentration of Fe (526.00 mg/kg) in *O. basilicum* leaves. Both leaves species were above the permitted limit concentration of Fe when compared with WHO/FAO and NAFDAC standardsin vegetables andfood respectively as shown in Table 1. Low concentration of Fe in *O. basilicum*leaves was reported by Agunbiade*et al.* (2015); also low concentration of Fe in *O. gratissimum leaves* was reported by Idris*et al.* (2011) and Asaolu*et al.* (2012). These results disagreed with our results. In soil,Nsukka town had the highest concentration of Fe (35480.20 mg/kg) followed by Awgu town (22016.70 mg/kg) and G.R.A Damboa road (5745.00 mg/kg). 707Housing Estate had the lowest concentration of Fe (2866.10 mg/kg). Soil at Awgu town, Nsuka town and G.R.A Damboa road were above the permitted limit concentration of Fe when compared to WHO/FAO standard in soil Therefore, the soil samples had high content of Fe at those sampling sites shown in Table 3.

Ocimumgratissimum leaves had the highest concentration of K (2350.00 mg/kg) atAwgu town followed by G.R.A Damboa road (1795.00 mg/kg) in *O. basilicum* leaves and 707Housing Estate (1497.50 mg/kg) in *O. basilicum* leaves. Nsukka town had the lowest concentration of (1400.00 mg/kg) in *O. gratissimum* leaves. The WHO/FAO and NAFDAC standard of K were not available for vegetables and food respectively as shown in Table 1. High concentration of K in *O. basilicum*leaves was reported by Daniel *et al.* (2011) and high concentration of *O. gratissimum* leaves was reported by idris*et al.* (2011). These agreed with our result. In soil, 707Housing Estate had the highest concentration of K (4900.00 mg/kg) followed by G.R.A Damboa Road (3407.50 mg/kg) and Nsukka (2370.00 mg/kg). Awgu town had the lowest concentration (610.00 mg/kg). The WHO/FAO standard for K in soil was not available for soil as shown in Table 3.

Ocimumbasilicum leaves found at G.R.A Damboa road had the highest concentration of Mn (101.60 mg/kg) followed by Nsukka town (84.80 mg/kg) in *O. gratissimum* leaves and Awgu town (71.10 mg/kg) in *O. gratissimum* leaves. 707Housing Estate had the lowest concentration (54.00 mg/kg) of Mn in *O. basilicum* leaves. The WHO/FAO and NAFDAC standard of Mn show that the entire leaves sample were lower than the permissible limits as shown in Table 1. Low concentration of *O. gratissimum* was reported by Idris *et al.* (2011) and Asaolu *et al.* (2012). In soil, Nsukka town had the highest concentration (338.60 mg/kg) in soil followed by Awgu town (200.30 mg/kg) and 707Housing Estate (100.00 mg/kg). G.R.A Damboa road had the lowest concentration of Mn (76.80 mg/kg). The WHO/FAO standard of Mn in soil show that all soil samples were lower than the permissible limit as shown in Table 3.

Ocimumgratissimum leaves found at Awgu town had the highest concentration of Zn (98.80 mg/kg) followed by Nsukka town (88.20 mg/kg) in *O. gratissimum* and G.R.A Damboa road (59.10 mg/kg) in *O. basilicum*. 707Housing Estate had the lowest concentration of Zn (37.30 mg/kg) in *O. basilicum* leaves. The WHO/FAO and NAFDAC Standards of Zn show that the entire samples were lower than the permissible limit in vegetable and food respectivelyas illustrated in Table 1. High concentration of Zn in *O. basilicum* leaves was reported by Agunbiade *et al.* (2015); also high concentration in *O. gratissimum* leaves was reported by Idris*et al.* (2011) and Asaolu *et al.* (2012). In soil,Nsukka town had the highest concentration of Zn (211.20 mg/kg) followed by G.R.A Damboa road (69.10 mg/kg) and Awgu town (37.70 mg/kg) in soil. 707Housing Estate had the lowest concentration of Zn (28.40 mg/kg) in soil. The WHO/FAO standard show that the entire soil samples were below the permissible limit in soil as shown in Table 3.

Nsukka town had the highest concentration of P (4123.23 mg/kg) in *O. gratissimum* leaves followed by 707Housing Estate (3580.66 mg/kg) in *O. basilicum* leaves and G.R.A Damboa road (3219.02 mg/kg) in *O. basilicum* leaves. Awgu town had the lowest concentration (1530.49 mg/kg) in *O. gratissimum* leaves shown in Table 2. Low concentration of P in *O. gratissimum* was reported by Idris *et al.* (2011) and Asaolu*et al.* (2012); high concentration of P in *O. basilicum* leaves was reported by Agunbiade *et al.* (2015). In soil, Nsukka had the highest concentration of P (1012.72 mg/kg) followed by 707Housing Estate (694.89 mg/kg) and G.R.A Damdoa road (643.00 mg/kg) in *O. basilicum* leaves. Awgu town had the lowest concentration of P (658.28 mg/kg) as shown in Table 4. The concentration of phosphorus in leaves at Awgu town was due to the high concentration of phosphorus in the soil.

Ocimumgratissimum found at Awgu town had the highest concentration of sulphur (5091.33 mg/kg) followed by Nsukka town (3467.72 mg/kg) in *O. gratissimum* leaves and 707Housing Estate (2351.00 mg/kg) in *O. basilicum* leaves. G.R.A Damboa road had the lowest concentration of S (2057.15 mg/kg) in *O. basilicum* leaves as shown in Table 2. In soil,Awgu town had the highest concentration (1988.23 mg/kg) followed by Nsukka town (1684.88 mg/kg) and G.R.A Damdoa road (305.63 mg/kg). 707Housing Estate had the lowest concentration of S (301.71 mg/kg) as shown in Table 4. The high concentration of sulphur in the leaves at Awgu town might be due to the high concentration of sulphur in the soil.

*Ocimumbasilicum*l eaves found at 707Housing Estate had the highest concentration of Nitrogen (34.05 mg/kg) in *O. basilicum* leaves followed by Nsukka town of 29.10 mg/kg in *O. gratissimum* leaves and Awgu town (12.42 mg/kg) in *O. gratissimum* leaves. G.R.A Damboa road had the lowest concentration of N (6.75 mg/kg) in *O. basilicum* leaves as shown in Table 2. In soil,Awgu town had the highest concentration of N (2.27 mg/kg) followed by Nsukka town (1.31 mg/kg) and 707Housing Estate (1.08 mg/kg). G.R.A Damboa road had the lowest concentration (1.04 mg/kg) as shown in Table 4.

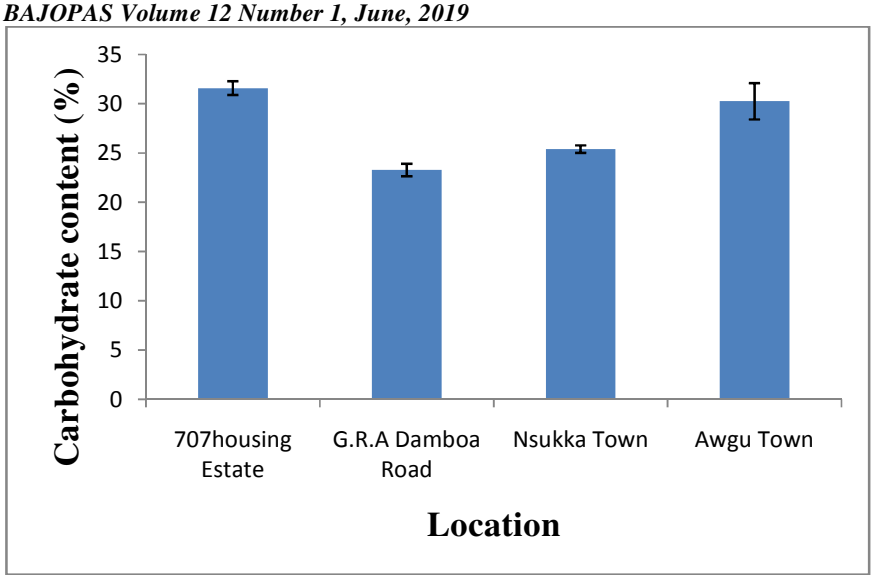

Figure 3: Percentage of carbohydrate in leaves of *Ocimumbasilicum* obtained from 707housing Estate and G.R.A Damboa road and leaves of *Ocimumgratissimum* obtained from Nsukka town and Awgu town.

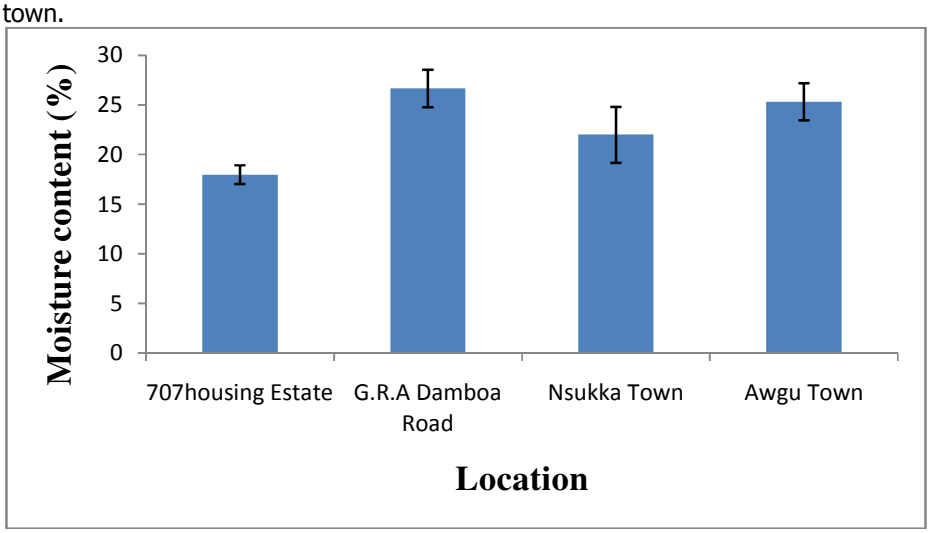

Figure 4: Percentage of moisture content in leaves of *Ocimumbasilicum* obtained from 707Housing Estate and G.R.A Damboa road and leaves of *Ocimumgratissimum* obtained from Nsukka town and Awgu town.

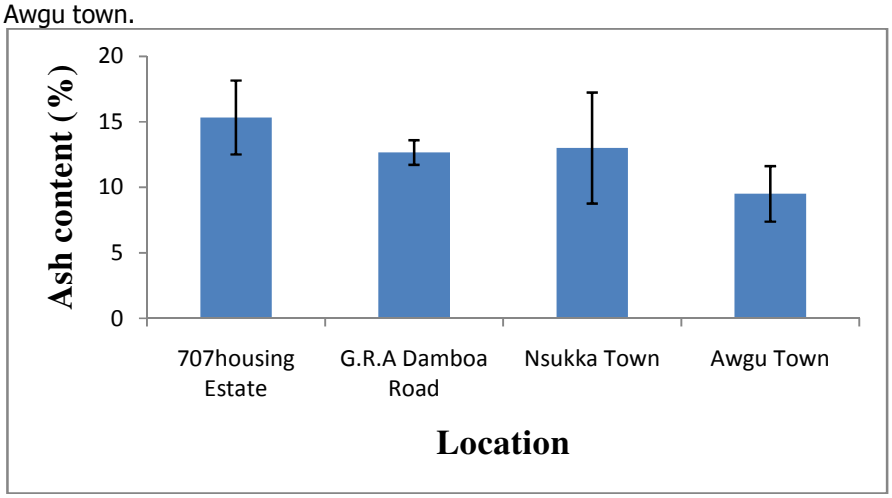

Figure 5: Percentage of ash content in leaves of *Ocimumbasilicum* obtained from 707Housing Estate and G.R.A Damboa road and leaves of *Ocimumgratissimum* obtained from Nsukka town and Awgu town.

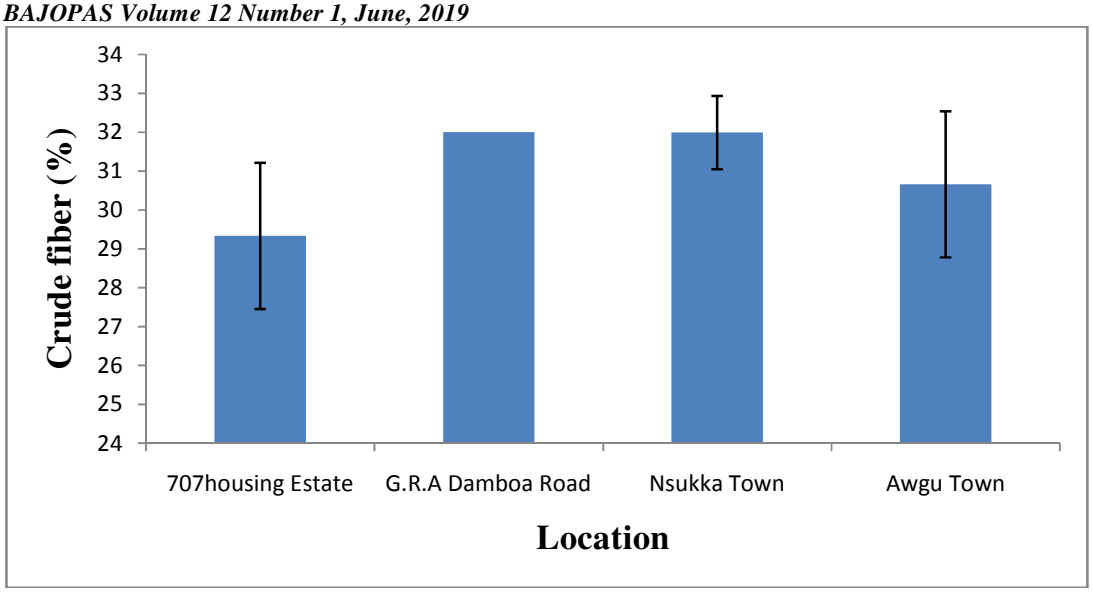

Figure 6: Percentage of crude fiber in leaves of *Ocimumbasilicum* obtained from 707Housing Estate and G.R.A Damboa road and leaves of *Ocimumgratissimum* obtained from Nsukka town and Awgu town.

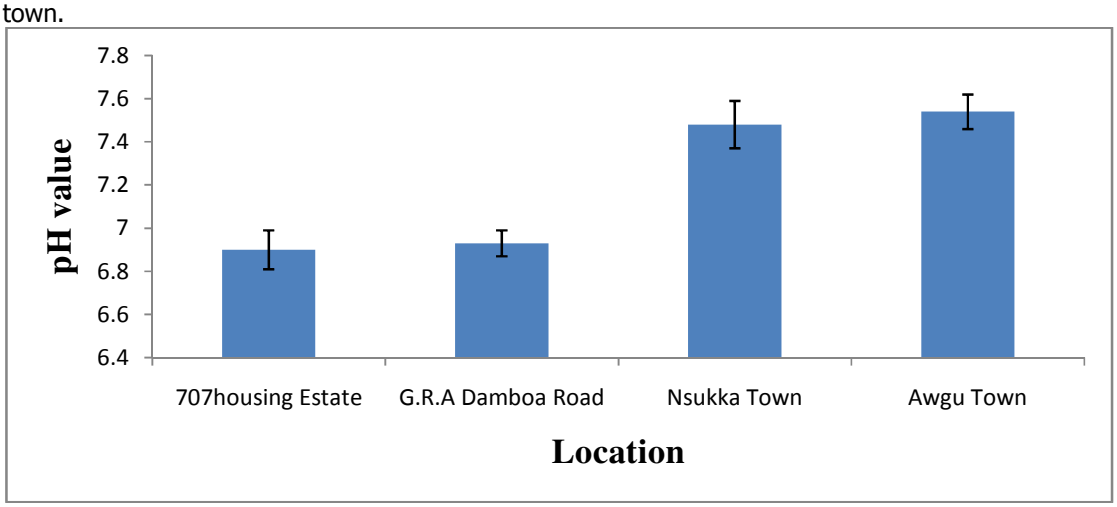

Figure 7: pH value in leaves of *Ocimumbasilicum* obtained from 707Housing Estate and G.R.A Damboa road and leaves of *Ocimumgratissimum* obtained from Nsukka town and Awgu town.

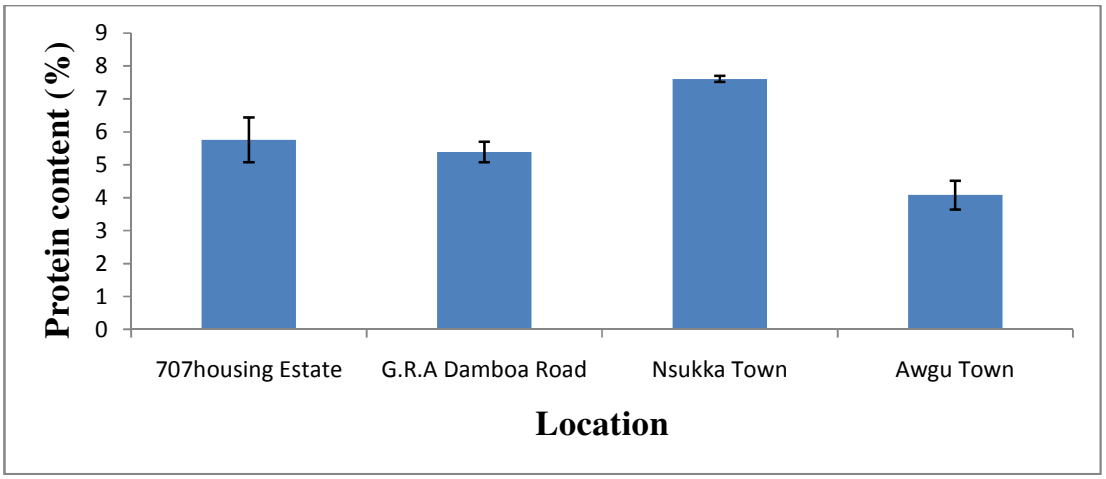

Figure 8: Percentage of protein content in leaves of *Ocimumbasilicum* obtained from 707Housing Estate and G.R.A Damboa road and leaves of *Ocimumgratissimum* obtained from Nsukka town and Awgu town.

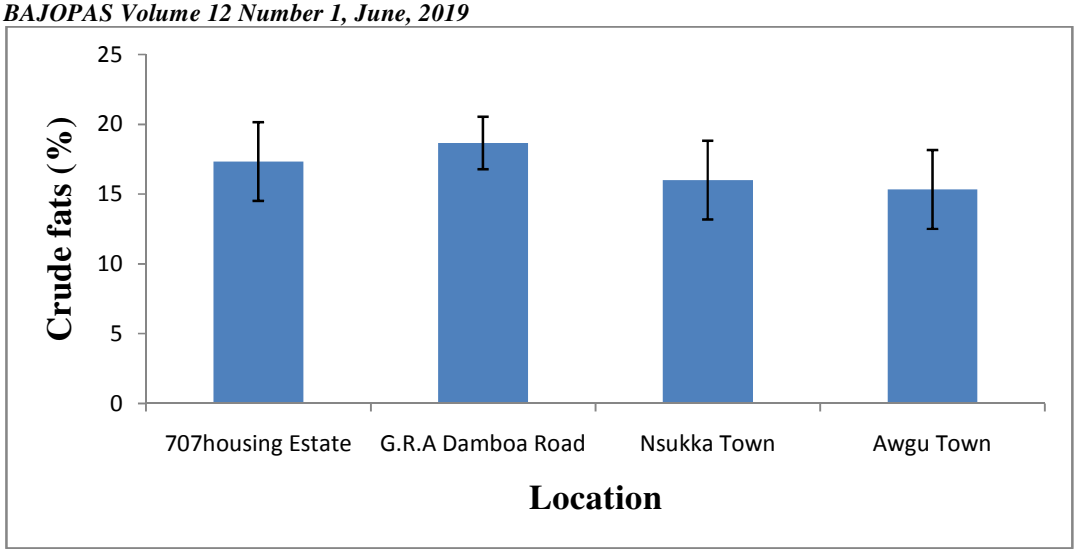

Figure 9: Percentage of crude fats in leaves of *Ocimumbasilicum* obtained from 707Housing Estate and G.R.A Damboa road and leaves of *Ocimumgratissimum* obtained from Nsukka town and Awgu town.

Proximate contents of plant leaves of *Ocimumbasilicum* and *Ocimumgratissimum*

Figure 3 to 9 showed the mean percentage of proximate contents of Carbohydrate, moisture, ash, crude fiber, pH value, protein and fats in *Ocimumbasilicum* and *Ocimumgratissimum leaves*.The result showed that 707Housing Estate has maximum percentage of carbohydrate and ash content of 31.58 ± 0.69% and 15.33 ± 2.82% respectively as illustrated in Figure 3 and 5, G.R.A Damboa road has maximum percentage of moisture, crude fiber and crude fats content of 26.66 ± 1.88, 32.00% ± 0.00% and 18.66 ± 1.88% respectively asillustrated in Figure 4, 6 and 9 in*O. basilicum* leaves.Nsukka town has maximum percentage of protein content of 7.61 ± 0.09% in *O. gratissimum* leaves illustrated in Figure 8. 707Housing Estate and G.R.A Damdoa road has a pH of 6.90 ± 0.09 and 6.93 ± 0.06 respectively in *O. basilicum* leaves which are slightly acidic and Nsukka town and Awgu town has a pH of 7.48 ± 0.11 and 7.54 ± 0.08 respectively in *O. gratissimum* leaves which are slightly basic as illustrated in Figure 7.

Scent leaf contains nutritional constituents such as fats, protein, carbohydrates etc. (Nwankwo *et al.,* 2014). Vegetables constitute an important part of the human diet since they contain carbohydrates, proteins, vitamins, minerals as well as trace elements (Nazemi, 2012). High percentage contents of carbohydrate and protein were obtained in this work, also low percentage contents of ash and crude fiber were also obtained. High percentage contents of carbohydrate and protein and low percentage contents of ash, fats and fiber were reported in *O. gratissimum leaves* by Nwankwo*et al.*, Asaolu*et al.* and Idris*et al.* (2014, 2012 and 2011) respectively.

Ocimumbasilicum leaves at 707Housing Estate had the highest percentage ofcarbohydrate contents (31.58%) follow by Awgu town (30.25%) in *O. gratissimum* leaves and Nsukka town (25%) in *O. gratissimum leaves*. G.R.A Damboa road had the lowest percentage of carbohydrate content (23.28%) in *O. basilicum* leaves as shown in Figure 3.

Similarly, *Ocimumbasilicum* leaves at G.R.A Damboa road had the highest percentage of moisture contents (26.66%) follow by Awgu town (25.33%) in *O. gratissimum leaves* and Nsukka town (22.00%) in *O. gratissimum leaves*. 707 Housing Estate had the lowest percentage (17.99%) in *O. basilicum* leaves as shown in Figure 4.

Also *Ocimumbasilicum leaves* at 707Housing Estate had the highest percentage of ash content (15.33%) follow by Nsukka town (13.00%) in *O. gratissimum* leaves and G.R.A Damdoa road (12.66%) in *O. basilicum*leaves. Awgu town had the lowest percentage of ash content (9.50%) in *O. gratissimum leaves* as shown in Figure 5.

Furthermore, G.R.A Damboa road had the highest percentage of crude fiber content (32.00%) in *O. basilicum*leaves follow by Nsukka town (31.99%) in *O. gratissimum leaves* and Awgu town (30.66%) in *O. gratissimum* leaves. 707Housing Estate had the lowest percentage of crude fiber (29.33%) in *O. basilicum* leaves as shown in Figure 6.

The pH value in *O. basilicum* leaves found at 707Housing Estate (6.90) and G.R.A Damboa road (6.93) were slightly acidic, while pH values in *O. gratissimum leaves* found at Nsukka town (7.48) and Awgu town (7.54) were slightly basic as shown in Figure 7.Slightly acidic was obtained in *O. basilicum*l eaves as reported by Agunbaide *et al.* (2015).

Nsukka town had the highest percentage of crude protein content (7.61%) in *O. gratissimum* leaves followed by 707Housing Estate (5.76%) in *O. basilicum*leaves and G.R.A Damboa road (5.39%). Awgu town had the lowest percentage of proteins (4.08%) in *O. basilicum*leaves as shown in Figure 8.

Ocimumbasilicum leaves at G.R.A Damboa road had the highest percentage of crude fats content (18.66%) follow by 707Housing Estate (17.33%) in *O basilicum*leaves and Nsukkatown (16.00%) in *O. gratissimum leaves*. Awgu town had the lowest percentage of crude fats (15.33%) in *O. gratissimum* laves as shown in Figure 9.

Table 5: Significant difference of nutritional contents of *O. basilicum, O. gratissimum* leaves and soil samples found in the four sampling locations against their concentrations.

Nutritional contents	p value
Elemental composition for leaves	0.956
Elemental composition for soil	0.505
Proximate contents of leaves	1.000

pvalue at ≤ 0.05 significant

Statistical Analysis of data of Elemental analysis and proximate analysis of *Ocimumbasilicum* and *Ocimumgratissimum*plant leaves with soil.

Analysisof variance (ANOVA) was explored for nutritional contents (elemental compositions and proximate contents) for*O. basilicum* and *O. gratissimum* leaves samples and soil found in the four sampling locations against their concentrations. The following significant of the nutritional contents was obtained at p≤ 0.05 shown in Table 5.

All recorded p values there were greater than 0.05, indicating lack of significant difference between the compared groups based on difference of species and geographical variation.

CONCLUSION

The nutritional contents of leaves of *O. basilicum*and *O. gratissimum* showed that *O. gratissimum* had higher concentrations of Ca, Cu, K, Zn, Fe, S and P while *O.basilicum*had higher concentration of Mn and N in the essential element concentration. However, the soil where both leaves were planted were not contaminated. Fe concentration in both leaves was higher than WHO/FAO standard in vegetable and soil and NAFDAC standard for food. *O. basilicum*had higher contents of carbohydrate, ash, moisture, fiber and fat content and was slightly acidic while *O. gratissimum* had higher protein content and was slightly basic. Both leaves showed good nutrition content with respect to the elemental composition, and proximate contents. Statistically both leaves showed no differences in all the content checked in respect of the antioxidant properties and nutritional contents.

RECOMMENDATION

Both leaves of *O. basilicum*and *O. gratissimum* have good nutritional values. Therefore, applying scent (*Ocimum*)leavesin daily meal will help in building and boosting the body system; also the consumption of both leaves have to be regulated due to the high content of iron.

ACKNOWLEDGEMENT

I wish to thank the lab technicians, Dr. Bashir, Muti-user Lab, MrAlhamdu and Colic of Chemistry Department, Ahmadu Bello University for their support, encouragement and assistance in carrying out the analysis.

Conflict of interest

There was no conflict of interest exist among the authors regarding the publication of this article.

Contribution of authors

AnjiliMalgwi Ezekiel design and carryout the research work, NuhuAbdulkadir Abdulmumin and UbaSani supervised the research work.

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