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Evaluation of Nutritional Values of Some Under Utilized Leafy Vegetables; Case Studies of Okra (Abelmoschus Esculentus), Pepper Elder (Peperomia Pellucida) and Bologi (Solanecio Biafrae) Leaves

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Abstract:- The proximate compositions,some minerals, some vitamins and antinutrients contents of Okra (Abelmoschus esculentus), Pepper elder (Peperomia pellucida)and Bologi (Solanecio biafrae) leaves were investigated by using the standard methods described by Association of Official Analytical Chemists (AOAC, 1990)., Association of vitamin chemists (1987) and Harborne. (1973).The results revealed that sample A (okra) contain protein (2.10 ± 3.25%), Hexane extract (1.84 ± 0.03%) ash (2.10 ± 0.04%), crude fibre (4.70 ± 0.13%), moisture (10.40 ± 0.61%) and carbohydrate (32.15 ± 2.17%) whole sample B contained (54.68±3.75%) Hexane extract (2.75±0.07%), ash (0.34 ± 0.01%), crude fibre (2.44 ± 0.05%) moisture (8.75 ± 1.33%) and carbohydrate (31.04 ± 0.18%) and sample C contained protein (46.69 ± 2.46%), Hexane extract (1.24 ± 0.01%), ash (2.66 ± 0.14%), crude fibre (3.743 ± 0.15%), moisture (12.46 ± 0.24%) and carbohydrate (33.52 ± 2.67%). The result showed that Okra leaf contained K (186.4 ± 0.42 mg / 100g), Na (0.341 ± 0.001mg / 100g), Ca (6.76 ± 0.04 mg/100g). Whole Sample B Contained Potasium K (191.46mg/100g) Na (5.45mg/100g) Ca (1.50 ± 0.02 mg/100g) and Cu (2.74 ± 0.03mg/ 100g) and sample C contained K (161.27mg / 100g) Na (3.74 mg/ 100g)Ca (2.92 ± 0.03 mg/ 100g), Mg (88.63 ± 0.15 mg/100g), Mn (3.7mg/100) and CU (1.36 ± 0.02 mg/100g).

The results of vitamin analsis revealed that Sample A contained Vitamin A (0.0051± 0.0001 (I.U)) ,Vitamin B1 (0.0037± 0.0001mg/100g) ,Vitamin B2 (0.0041± 0.0001 mg/100g),Vitamin B6 (0.0033± 0.0001 mg/100g),Vitamin B12(0.0027± 0.0001 mg/100g) ,Vitamin C (7.44 ± 0.0001mg/100g) , Vitamin E (0.004± 0.0001 mg/100g) and V itamin K(0.003 ± 0.0001mg/100g),Sample B also contained Vitamin A (0.034± 0.0001 (I.U)),Vitamin B1(0.058± 0.0001 mg/100g) ,Vitamin B2(0.048± 0.0001 mg/100g),Vitamin B6 (0.0030± 0.0001 mg/100g),Vitamin B12 (0.184± 0.0001mg/100g),Vitamin C (9.82± 0.0001 mg/100g), Vitamin E 0.024± 0.0001 mg/100g) and Vitamin K 0.046± 0.0001 mg/100g),While Sample C contained Vitamin A (0.014I± 0.0001.U)) ,Vitamin B1 (0.063± 0.0001 mg/100g),Vitamin B2 (0.043 ± 0.0001mg/100g),Vitamin B6(0.0024 ± 0.0001mg/100g) ,VitaminB12 (0.137± 0.0001 mg/100g), Vitamin C (18.9 ± 0.0001mg/100g) ,Vitamin E (0.026± 0.0001 mg/100g) and Vitamin K (0.008 ± ± 0.0001mg/100g),

The results indicate that sample A contained Tanmin (0.470 ± 0.002 mg/100g dried weight) saponin (0.374 ± 0.001 mg/100g dried weight) alkaloid (4.10± 0.03mg /100g dried weight), Phyte (0.135±0.135±0.001 mg/ 100g dried weight) Oxalate (0.122 ± 0.0mg / 100g dried weight) Cyan-o-Glucoside (0.003 ± 0.00mg/ 100g dried weight). While sample B contain Tannin Alkaloid (4.56 ± 0.03mg / 100 dried weight), Saponnin (0.24 ± 0.01 mg / 100g dired weight) alkaloid (4.56 ± 0.03 mg /100g dried weight), Phytate (0.09 ± 0.02 mg / 100 g dried weight), Oxalate (0.12 ± 0.01mg / dried weight) Cyanoglucoside (0.002 ± 0.001 mg/ 100 dried weight) and flavonoid (0.24±0.02 mg 100g dried weight) and flavonoid (0.21 ± 0.01 mg / 100g dried weight). And Sample C Contain Tanin (0.24 ± 0.02 mg/ 100 g dried weight).Saponin (0.24±0.01 mg/ 100g dried weight), Alkaloid (4.56 ± 0.02mg/ 100g dried weight)Phytate (0.10±0.02mg/100g dried weight), Oxalate (0.12 ± 0.01 mg/ 100g dried weight) cyanoglucoside (0.01±

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0.0mg/100g dried weight) and flavonoid (0.20 ± 0.03 mg/100g dried weight). Therefore, Okra (Abelmoschus esculentus), Pepper elder (Peperomia pellucida)and Bologi(Solanecio biafrae) leaves are good sources of proteins, carbohydrates, fibre, potassium, calcium, magnesium, vitamin C, alkaloids and flavonoids.

Keywords:- *Proximate Composition, Mineral, Vitamin, Antinutrient, Okra, Pepper Elder , Bologi.*

I. INTRODUCTION

In under developing countries such as Nigeria, Asia and North America, the population growth is at alarming rate. Hence, many people cannot afford the purchasing of conventional food materials such as, fish, meat, chicken and eggs due to unemployment, poverty, insurgences and diseases. Therefore, it is necessary for researchers and government planners to search into alternative sources of food that will be readily available to everybody. Plant nutrients play a vital role in human nutrition, particularly in developing countries where essential nutrients intake is less than that required.

Vegetables are annual or perennial horticultural crops, with certain sections (roots, stalks, flowers, fruits, leaves, etc.) that can be consumed wholly or partially, cooked or in raw form Vention(2015).They good in human diets because of their chemical compounds that are of health importance. Autumn (2023) has highlighted the health benefits of some vegetables.A lot of green leafy vegetables are under utilized as a result of scarcity of information on their chemical components.Some of them are Okra (Abelmoschus esculentus), Pepper elder (Peperomia pellucida)and Bologi(Solanecio biafrae) Leaves.

Okra or okro (*Abelmoschus esculentus*), is a flowering plant that belong to the mallow family. It has edible green seed pods. It can be found in West Africa, Ethiopia, Southeast Asia, Ila by the Yorubas living at the western part of Nigeria.

Peperomia pellucida otherwise known as pepper elder is a shining bush plant.it is tan annual, shallow-rooted herb, usually growing to a height of about 15 to 45 cm (6 to 18 inches), it has succulent stems, shiny, heart-shaped, fleshy leaves and tiny, dot-like seeds attached to several fruiting spikes. It smells like a mustard when crushed. This plant can be found in various shaded, damp habitats all over Asia,Africa and America(Aziba 2001). The Yoruba speaking people of Nigeria called it *Ewe Rinrin* .

Solanecio biafrae belongs to the Family Asteraceae, . It is a perennial plabt grown under cocoa trees in western part of Nigeria.It is called Efo Worowo or Bologi by the Yorubas in Nigeria. Despite the availability of these three vegetables, the number of people consume them is very low.This may be as a result of paucity of information on their proximate composion,mineral ,vitamine and antinutrients contents. Therefore,the present research work was aimed at provide it.

II. MATERIAL AND METHODS

➢ *Sources of Materials*

Fresh Okra (Abelmoschus esculentus) and Pepper elder (Peperomia pellucida) leaves were harvested at Biological garden, Science Laboratory Technology department, The Federal Polytechnic,Offa Kwara State. While fresh Bologi(Solanecio biafrae)leaves were obtained at a cocoa farm inAkure , Ondo State,Nigeria..They were identified and authenticated by a botanist in the department of science laboratory Technology,Federal Polytehnic ,Offa,kwara State. They were washed separately with deionized water,oven dried at 60 degree centigrade,grounded into fine powder with laboratory pestle and mortar and kept in clean polythene bags for analysis.

- *Analytical Grade Chemicals were used for Analysis.*
- *Methods*

➢ *Determination of Proximate Composition*

The proximate composition of each sample was determined by using standard methods of the Association of Official Analytical Chemists (AOAC, 1990). Analyais of each sample was done in triplicates.

➢ *Determination of Mineral Contents*

Mineral contents were determined using flame photometer and atomic absorption spectrophotometer. Analyais of each sample was done in triplicates.

➢ *Determination of Vitamin Contents*

Vitamin contents of each sample were determined using the methods described by Association of vitamin chemists (1987). Analyais of each sample was done in triplicates.

➢ *Determination of Antinutrient Contents*

Antinutrients of each sample were determined using the methods described by Harborne . (1973). Analyais of each sample was done in triplicates.

➢ *Statistical Analysis*

Data obtained from these studies were compared by ANOVA (SPSS 17.0.1 SPSS Inc.) and statistically significant means were separated by Duncan's Multiple Range Test. Statistical significance was set at 95% confidence interval. Results were reported as mean ± standard error.

III. RESULTS AND DISCUSSION

➢ *Necio Biafrae) Leaves..*

Table 1 Shows the Proximate composition of Okra (Abelmoschus esculentus), Pepper elder (Peperomia pellucida)and Bologi(Solanecio biafrae) leaves in Percentage dried Weight.

The result reveals that sample A (okra) contain protein (2.10 ± 3.25%), Hexane extract (1.84 ± 0.03%) ash (2.10 ± 0.04%), crude fibre (4.70 ± 0.13%), moisture (10.40 ± 0.61%) and carbohydrate (32.15 ± 2.17%) whole sample B

contained (54.68 ± 3.75%) Hexane extract (2.75 ±0.07%), ash (0.34 ± 0.01%), crude fibre (2.44 ± 0.05%) moisture (8.75 ± 1.33%) and carbohydrate (31.04 ± 0.18%) and sample C contained protein (46.69 ± 2.46%), Hexane extract (1.24 ± 0.01%), ash (2.66 ± 0.14%), crude fibre (3.743 ± 0.15%), moisture (12.46 ± 0.24%) and carbohydrate (33.52 ± 2.67%).

Among the three sample analyze sample B has the highest value of protein followed by sample A and sample C.

In terms of Ash content, sample C has the highest value content followed by sample A and sample B.

Table 1 Shows The Proximate Composition Of Okra , Pepper Elder And Sierra Leone Bolaji In Percentage Dried Weight.

The result reveals that sample A (okra) contain protein (2.10 ± 3.25%), Hexane extract (1.84 ± 0.03%) ash (2.10 ± 0.04%), crude fibre (4.70 ± 0.13%), moisture (10.40 ± 0.61%) and carbohydrate (32.15 ± 2.17%) whole sample B contained (54.68 ± 3.75%) Hexane extract (2.75 ± 0.07%), ash (0.34 ± 0.01%), crude fibre (2.44 ± 0.05%) moisture (8.75 ± 1.33%) and carbohydrate (31.04 ± 0.18%) and sample C contained protein (46.69 ± 2.46%), Hexane extract (1.24 ± 0.01%), ash (2.66 ± 0.14%), crude fibre (3.743 ± 0.15%), moisture (12.46 ± 0.24%) and carbohydrate (33.52 ± 2.67%).

Among the three sample analyze sample B has the highest value of protein followed by sample A and sample C.

In terms of Ash content, sample C has the highest value content followed by sample A and sample B.

Proteins can be used as sources of energy,repair warn out tissues,synthesize proteins,enzymes,nucleic acid and so on by the body Genton et.al., (2010) and Hermann, (2021)]. The key functions of carbohydrates was explained by Keith P. (2023) Several workers such as Slavin (2008), Marlett, McBurney and Slavin (2002) and Zunft et.al.,(2003) had reported the health benefits of dietary fibre.

Table 2 depicts Some Mineral contents of Okra (Abelmoschus esculentus), Pepper elder (Peperomia pellucida)and Bologi(Solanecio biafrae) leaves . The result showed that Okra Contain K (186.4 ± 0.42 mg / 100g), Na (0.341± 0.001mg / 100g), Ca (6.76 ± 0.04 mg/100g). Whole Sample B Contained Pottasium K (191.46mg/100g) Na (5.45mg/100g) Ca (1.50 ± 0.02 mg/100g) and Cu (2.74 ± 0.03mg/ 100g) and sample C contained K (161.27mg / 100g) Na (3.74 mg/ 100g), Ca (2.92 ± 0.03 mg/ 100g), Mg (88.63 ± 0.15 mg/100g), Mn (3.7mg/100) and CU (1.36 ± 0.02 mg/100g).

Among the three sample analyzed sample B has the highest Value of Potassium (K) followed by sample C.

Sample B has the highest value of (Na) followed by same C and Sample A .

In Addition Sample A has the highest Value of (mg) followed by Sample A and Sample C. Sample C has the highest value of (Mn) followed by sample B and then Sample A.

The health benefits of calcium, phosphorus, sodium, potassium and Magnesium had been reported by Dawson-Hughes et.al.,(1987), Draper et.al.,(1972), Erne et.al.,(1984),Ettinger et.al.,(1987),Garland et.al.,(1985), Harrison and Fraser. (1960),Heaney(1985),Heaney(1986), Kawashima(1986),Leichsenring et.al.,(1951),McCarron(1985), et.al., (1986), Miller(1985), Rafter et.al.,(1986),Resnick et.al.,(1986) and Seelig (1974).

Table 3 reveals Some Vitamin contents of Okra (Abelmoschus esculentus), Pepper elder (Peperomia pellucida)and Bologi(Solanecio biafrae) leaves. Sample A contained Vitamin A (0.0051± 0.0001 (I.U)) ,Vitamin B1 (0.0037± 0.0001 mg/100g) ,Vitamin B2 (0.0041± 0.0001 mg/100g),Vitamin B6 (0.0033± 0.0001 mg/100g), Vitamin B12(0.0027± 0.0001 mg/100g) ,Vitamin C (7.44± 0.0001 mg/100g) , Vitamin E (0.004 ± 0.0001 mg/100g) and V itamin K (0.003 ± 0.0001 mg/100g),Sample B also contained Vitamin A(0.034±± 0.0001 mg/100g 0.0001 (I.U)),Vitamin B1(0.058±0.0001 mg/100g) ,Vitamin B2(0.048± 0.0001 mg/100g),Vitamin B6 (0.0030± 0.0001 mg/100g),Vitamin B12 (0.184± 0.0001mg/100g),Vitamin C (9.82± 0.0001 mg/100g), Vitamin E 0.024 ± 0.0001 mg/100g) and V itamin K 0.046 ± 0.0001 mg/100g),While Sample C contained Vitamin A (0.014± 0.0001 (I.U)) ,Vitamin B1(0.063± 0.0001 mg/100g),Vitamin B2 (0.043± 0.0001 mg/100g),Vitamin B6(0.0024± 0.0001 mg/100g),VitaminB12 (0.137± 0.0001 mg/100g),Vitamin C (18.9± 0.0001 mg/100g) ,Vitamin E (0.026± 0.0001 mg/100g) and Vitamin K (0.008± 0.0001 mg/100g),

The results showed that sample B has the highest value of vitamin A followed by sample C and sample A.

Sample C has the highest value of vitamin B1 followed by sample B and sample A.

The highest value contain vitamin B2 is high in sample B followed by sample C and sample A. vitamin B6 content is the high in sample B followed by sample C and sample A.

Vitamin B12 content value is the highest in sample A followed by sample C and sample B. in addition sample B has the highest value of vitamin C followed by sample C and sample A. sample B has the highest value content of vitamin E followed by sample C and sample A. furthermore, the highest value of vitamin K is shows in sample A followed by sample B and then sample C.

Several workers like Afzal and Armstrong(2002),Aviram and Rosenblat (2005). Hidalgo *et.al.*,(2017), Halliwe ll *et.al.*, (1995),Kaur and Kapoor(2001),Percival(1998) and Williams *et.al.*, (2004) had earlier reported that foods containg green vegetables are rich in antioxidants such as vitamins (examples, vitamin C and vitamin E) and phytochemical compounds (e.g., flavonoids ,polyphenols and carotenoids) that can combat free radicals in our body.Thus preventing deadly diseases like cancer,cardiovascular disease and diabetes.

TABLE 4: Shows the Antiutrient contents of Okra (Abelmoschus esculentus), Pepper elder (Peperomia pellucida)and Bologi(Solanecio biafrae) leaves in mgl/100g dried weight .The results indicate that sample A contained Tanmin (0.470 ± 0.002 mg/100g dried weight) saponin (0.374 ± 0.001 mg/100g dried weight) alkalid (4.10± 0.03mg /100g dried weight), Phyte (0.135 ± 0.135 ± 0.001 mg/ 100g dried weight) Oxalate (0.122 ± 0.0mg / 100g dried weight) Cyan-o-Glucoside (0.003 ± 0.00mg/ 100g dried weight). While sample B contain Tannin Alkaloid (4.56 ± 0.03mg / 100 dried weight), Saponnin (0.24 ± 0.01 mg / 100g dired weight) alkaloid (4.56 ± 0.03 mg /100g dried weight), Phytate (0.09 ± 0.02 mg / 100 g dried weight), Oxalate (0.12 ± 0.01mg / dried weight) Cyanoglucoside (0.002 ± 0.001 mg/ 100 dried weight) and flavonoid (0.24 ± 0.02 mg 100g dried weight) and flavonoid (0.21 ± 0.01 mg / 100g dried weight). And Sample C Contain Tanin (0.24 ± 0.02 mg/ 100 g dried weight).Saponin (0.24 ± 0.01 mg/ 100g dried weight), Alkaloid (4.56 ± 0.02mg/ 100g dried weight)Phytate (0.10 ± 0.02mg/100g dried weight), Oxalate (0.12 ± 0.01 mg/ 100g dried weight) cyanoglucoside (0.01 ± 0.0mg/100g dried weight) and flavonoid (0.20 ± 0.03 mg/100g dried weight).

The result of the analysis shows that sample A has the highest Value content of Tannin while Sample B and Sample C has the same Value. Saponin Value is high in sample A while Sample B and Sample C has the same Value content. The Highest Value of Alkoloid Shows in Sample and Sample C follows Phytate followed by Sample C and Sample. The highest value content of Oxalate showed in sample A, which Sample B and Sample C have the same values .

In addition C has the highest value of Cyanoglucosede followed by Sample A and sample B. Sample A has the highest Value of Content of flavonoid follow by sample B and Sample C.Phytate can precipitate minerals by binding to them examples of such minerals include calcium, magnesium, iron, copper, and zinc. Thereby make them unavailable for absorption in the intestines(Cheryan ,1980).

Oxalates bind to calcium and prevent its absorption in the human body (Dolan *et.al.*, 2010).

According to Coudray *et.al.*, (2003), excessive intake of dietary fiber can reduce the transit time through the intestines to such a degree that other nutrients cannot be absorbed. However, this effect is often not seen in practice and reduction of absorbed minerals can be attributed mainly to the phytic acids in fibrous food(Cheryan,1980).

There are a widespread forms of antinutrients, such as flavonoids which are a group of polyphenolic compounds that include tannins (Scheers ,2013). These compounds chelate metals such as iron and zinc and reduce the absorption of these nutrients.

Saponins in plants are antifeedants (Boh et.al.,2014and Sparg et.al., 2004).

IV. CONCLUSION

In conclusion, the present research work has shown that, Okra (Abelmoschus esculentus), Pepper elder (Peperomia pellucida)and Bologi (Solanecio biafrae) leaves are rich in proteins, carbohydrates, fibre, potasium, magnesium, calcium, vitamin C, alkaloids and flavonoids. In addition, it can be seen that all the vegetables that were investigated contained low vakues of antinutrients such as tannin, phytate, oxalate, saponnin and cyanoglycoside.

RECOMMENDATION

Since the the three leafy vegetables that were analyzed are very rich in affore mentioned nutritional ingredients and low antinutrient contents,we hereby recommend them for consumption inorder to compliment the monotonous staple foods being consumed by large populace in under developing countries.Further studies should be carried out to determine their toxicity .

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Table1 Proximate Composition of Okra (*Abelmoschus esculentus)*, Pepper elder (*Peperomia pellucida*)and Bologi (*Solanecio biafrae)* leaves (% dried weight)

Parameters	Sample A	Sample B	Sample c
Crude protein	48.81 ± 3.25^{a}	54.68 ± 3.75^{b}	46.69 ± 2.46^{c}
Hexane extract	1.84 ± 0.03^{d}	2.75 ± 0.07^{e}	1.24 ± 0.01^{f}
Ash	2.10 ± 0.04^{g}	0.34 ± 0.01^{h}	2.66 ± 0.14^{i}
Crude fibre	4.70 ± 0.13^{j}	2.44 ± 0.05^{k}	2.44 ± 0.05^{k}
Moisture	10.40 ± 0.61^{m}	8.75 ± 1.33^{n}	12.46 ± 0.24
Carbohydrate	32.15 ± 2.17^{p}	31.04 ± 0.18^{g}	33.52 ± 2.67^{r}

Each value is a mean of three determinations $\pm$ S.D

a,b,c values with different superferipts are significantly different (P less than 0.05).

Key:

Sample A = Okra (*Abelmoschus esculentus)* leaves..

Sample B = Pepper elder (*Peperomia pellucida*) leaves..
Sample C= Bologi(*Sola*

Table 2 Some Mineral Contents of Okra (*Abelmoschus esculentus),* Pepper elder (*Peperomia pellucida*)and Bologi (*Solanecio biafrae)* leaves (% dried weight)

Parameters	Sample A	Sample B	Sample c
Potassium (K)	186.4 ± 0.42^{a}	191.46^{b}	161.27^{c}
Sodium (Na)	0.341 ± 0.001^{d}	5.45^{e}	3.74^{f}
Calcium (Ca)	6.76 ± 0.049^{g}	4.84 ± 0.03^{h}	2.92 ± 0.03^{z}
Magnesium (Mg)	90.75 ± 2.91^{j}	96.86^{k}	88.63 ± 0.015^{l}
Manganese (Mn)	1.29 ± 0.02^{m}	1.50 ± 0.02^{n}	3.7 ± 0.02^{o}
Copper (Cu)	1.65 ± 0.01^{p}	2.74 ± 0.03^{g}	1.36 ± 0.02^{r}

Each value is a mean of three determinations $\pm$ S.D
a,b,c values with different superferipts are significantly different (P less than 0.05).
Key:
Sample A = Okra (*Abelmoschus esculentus)* leaves..
Sample B = Pepper elder (*Peperomia pellucida*) leaves..
Sample C= Bologi(*Sola*

Table 3 Some Vitamin Contents of Okra (*Abelmoschus esculentus),* Pepper elder (*Peperomia pellucida*) and Bologi (*Solanecio biafrae)* leaves (% dried weight)

Parameters	Sample A	Sample B	Sample c
Vitamin A	0.0051 ± 0.0001 (I.U)^{a}	0.034 ± 0.0001 (I.U)^{b}	$.014 \pm 0.0001$ (I.U)^{C}
Vitamin B1	0.0037 ± 0.0001^{d}	0.058 ± 0.0001^{e}	0.063 ± 0.0001^{f}
Vitamin B2	0.0041 ± 0.0001^{g}	0.048 ± 0.0001^{h}	0.048 ± 0.0001^{h} 0.043^{i}
Vitamin B6	0.0033 ± 0.0001^{V}	0.0030 ± 0.0001^{W}	0.0024 ± 0.0001^{X}
Vitamin B12	0.0027 ± 0.0001^{H}	0.184 ± 0.0001^{k}	0.137 ± 0.0001^{l}
Vitamin C	7.44 ± 0.0001^{m}	9.82 ± 0.0001^{q}	18.9 ± 0.0001^{r}
Vitamin E	0.004 ± 0.0001^{p}	$0.024 \pm 0.0001 \pm 0.0001^{n}$	0.026 ± 0.0001^{0}
V itamin K	0.003 ± 0.0001^{s}	0.046 ± 0.0001^{t}	0.008 ± 0.0001^{u}

Each value is a mean of three determinations $\pm$ S.D
a,b,c values with different superferipts are significantly different (P less than 0.05).
Key:
Sample A = Okra (*Abelmoschus esculentus)* leaves..
Sample B = Pepper elder (*Peperomia pellucida*) leaves..
Sample C= Bologi(*Sola*

Table 4 Anti Nutrient Contents of Okra (*Abelmoschus esculentus),* Pepper elder (*Peperomia pellucida*)and Bologi (*Solanecio biafrae)* leaves (% dried weight)

Parameters	Sample A	Sample B	Sample c
Tannin	0.470 ± 0.002^{a}	0.24 ± 0.02^{c}	0.24 ± 0.02^{c} -
Saponiu	0.374 ± 0.001^{d}	0.24 ± 0.01^{e}	0.24 ± 0.01^{e}
Alkaloid	4.10 ± 0.03^{g}	4.56 ± 0.03^{h}	4.56 ± 0.001^{h}

Plytate	0.135± 0.002^{j}	0.09± 0.02^{k}	0.10±0.02^{l}
Oxalate	0.122± 0.0^{m}	0.12± 0.01^{n}	0.12± 0.01^{0}
Cyanoglycoside	0.003± 0.00^{p}	0.002± 0.001^{q}	0.01± 0.0^{r}
Flavonoid	0.33± 0.002^{s}	0.21±0.01^{t}	0.20± 0.03^{u}

Each value is a mean of three determinations±S.D

a,b,c values with different superferipts are significantly different (P less than 0.05).

Key:

Sample A = Okra (*Abelmoschus esculentus)* leaves..

Sample B = Pepper elder (*Peperomia pellucida*) leaves..

Sample C= Bologi(*Sola*