Proceedings of the 12th ChemClass Conference.
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NUTRITIVE AND ANTI-NUTRITIVE COMPOSITION OF *Urena lobata* LEAVES OBTAINED FROM PATI SHABA-KOLO, NIGER STATE, NIGERIA

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ABSTRACT

The aim of this study is to evaluate the nutritional qualities of Urena lobata leaves consumed in Pati Shaba-kolo, Niger State, Nigeria. The sample was analyzed using the methods recommended by the association of analytical chemists. The proximate parameters analyzed were ash content (9.12 ± 0.40), moisture content (7.39 ± 0.06), carbohydrate (47.64 ± 0.57), crude fibre (6.33 ± 0.03), crude protein (19.28 ± 0.41) and fat (10.33 ± 0.09) %. The leaf has a calorific value (360.65 kj/100g). The sample was found to have reasonable amount of mineral content particularly Potassium (1650.01 ± 1.53), Calcium (34.19 ± 0.46), Phosphorus (905 ± 1.97) and Magnesium (66.11 ± 0.19) mg/100g. The anti-nutrients (oxalates, alkaloids, tannins, flavonoids. saponins and cyanogenic glycosides) analysed showed that the values obtained are within the WHO permissible limit and they are safe for human consumption. Amino acids like histidine, leucine, aspartic acid, serine, valine. alanine, and tryptophan were all accounted for. Essential amino acid aspartic acid with a concentration of 8.25 g/100g protein was found to be the highest while non-essential amino acid tryptophan with a concentration of 1.01 g/100g protein was found to be the least.

Keywords: *Urena lobata*, mineral, amino acids, proximate and anti-nutritional composition.

INTRODUCTION

Food is any substance which after consumption by animals is capable of being digested, absorbed and utilized by body, is described as nutrients. Nutrition is the process through which organisms absorb broken down food substances to enable growth, development and reproduction (McDonald and Yellin, 1995). Foods are materials that enable growth, maintenance and reproduction in animals. Food contains chemicals in different combination which are essential to life, as water and oxygen which are also important constituents of food (Vigil, 1992).

The leaf of *Urena lobata* are commonly consumed among local people in Pati Shaba-kolo and locally prepared in a way similar to green beans which has a pleasant sour taste. The flowers can be consumed when cooked and have a mushroom-like taste. The leaf is also given to lactating woman who have problem of producing milk as it induces milk production. The aim of this study is to determine the proximate, amino acids, some of anti-nutritional factors and mineral contents of the leaves of this plant.

METHODOLOGY

Collection of Samples

The leaves of Caesar weed was obtained from a farm in Pati shaba-kolo, Niger state, Nigeria. Sample was air dried for a week under room temperature. The dried leave sample was pounded into fine powder using pestle and mortar. The ground sample was sieved to obtained a fine powder and stored in an air tight container for further analysis.

Proximate Analysis

Standard Procedures of the association of official analytical chemist (AOAC, 2006) were used to determine moisture content, crude protein, crude lipid, ash content, crude fiber and carbohydrate as well as the energy value of the leaves of *Urena lobatal*.

ANTI-NUTRITION COMPOSITIONS OF *URENA LOBATA*

Alkaloid Determination

5g of the sample was measured and weighed into a 250cm^3 volumetric flask; addition of 10% acetic acid in ethanol was carried out, closed and allowed to settle for 24hrs. The sample was then filtered, after filteration, the extract was then concentrated on a water bath to one third of the initial volume. Concentrated ammonia hydroxide was introduced drop wisely to the extract until the precipitate was collected and was then treated with dilute ammonium hydroxide and then filtered. The deposit is alkaloid which is dried and weighed (Harborne, 1998). Weight of filter paper = x, Weight of filter paper + sample after drying = y and Weight of residue i.e precipitate = y - x = z

$$\text{Percentage } (\%) = \frac{z}{Weight\ of\ Sample} \times \frac{100}{1}$$

Flavonoid Determination

10g of the plant sample was extracted repeatedly with 100cm^3 of 80% aqueous methanol at room temperature and the solution was filtered using Whatman filter paper No. 42 (125mm). The filtrate was later transferred into a water bath, heated to dryness and weighed (Edeoga*et al.*, 2005). Weight of empty beaker = W1, Weight of empty beaker + sample after drying = W2 and Weight of sample used = 10g

$$\text{Percentage Flavonoid} = \frac{w2-w1}{Weight\ of\ Sample\ used} \times \frac{100}{1}$$

Tannin Determination

0.5g of the dried powdered sample was weighed into a 250cm^3 conical flask; 50cm^3 of distilled water was added and shake continuously for 1h in a rotatory shaker, filtered into 500cm^3 volumetric flask. 5cm^3 of the filtrate was pipetted into 50cm^3 volumetric flask. 0.1g of tannic acid was dissolved in 100cm^3 of water to form tannic acid solution. A blank sample was prepared using 5 cm^3 of distilled water. The sample was placed in an incubator for one and a half hours made up to the 50cm^3 mark, and the absorbance of the sample was measured at 760nm using spectrophotometer 20 (Edeoga *et al.*, 2005).

Let absorbance of 5 cm^3 of the extract be = x, let absorbance of tannic solution be = Y and let blank be = Z

$$\frac{Tannin\ in\ mg}{100} = \frac{X-Y}{Y-Z} = \frac{Extract-Blank}{Standard-Blank}$$

Glycoside Determination

5g of the sample was weighed into a beaker and 100 cm^3 of distilled water was added, soaked for 3hrs filtered to get filtrate. 1 cm^3 of the filtrate was pipetted into a test tube, 2 cm^3 of 3, 5, dinitrosalicilic acid (3.5-D-NS) was added, and boiled in a water bath for 10-15minutes. The test tube was allowed to cool and 10 cm^3 of distilled water was added. The absorbance was read at 5e40nm for Glycosides. 2cm^3 DNS was also added to the blank to standardize it. On getting the absorbance through the spectrophotometer, the glucose graph is used to trace the concentration by making necessary calculations.

Concentration X Total Volume of Extract /1000 X 100/Weight of Sample

Saponins Determination

20g of the plant leaf sample was weighed into a 250cm^3 conical flask and 100cm^3 of 20% ethanol was added. The mixture was heated over was heated over a water-bath for 4hrs with continuous stirring at 55°C, cooled and filtered. The residue was re-extracted with another 200cm^3 of 20% ethanol. The combined extract was concentrated to 40cm^3 over a water bath at about 90°C. The concentrated extract was transferred into a 250cm^3 separating funnel and 20cm^3 of diethylether was added and shaken energetically. The aqueous layer was removed while the ether layer was cast-off. The collective n-butanol extract was cleansed twice with 10cm^3 of 5% aqueous sodium chloride. The residual solution temperature was raised in a water bath. After evaporation, the samples were dried in the oven to a constant weight; the saponin content was determined as percentage (Edeoga *et al.*, 2005). W1 = Weight of empty beaker. W2 = Weight of beaker + sample after drying and W3 = Weight of sample used 20g.

$$\%\ saponin = \frac{w2-w1}{Weight\ of\ sample\ used\ (w3)} \times 100$$

Oxalate determination

Oxalate presence in the leaf sample was analyzed by $KMnO_4$ titrimetric method as reported by Oke, (1966). 2g of the leaf sample was immersed in a volume of distilled water 190cm^3 in a flask with a volume capacity of 250cm^3. 10cm^3 of 6M HCL was added and the suspension digested at 100°C for an hour, cooled , made to the mark before carrying out filtration. Identical portion of 125cm^3 of the filtrate were meassured twice into beakers and 4 drops of methyl red indicator were added. This is followed by the addition of conc. NH_4OH solution drop wise until the test solution changes from salmon pink to a yellow color (pH 4-4.5). Each portion is then heated to 90°C and 10cm^{3}of 5% $CaCl_2$ solution was introduced while being stirred continuously. After heating, it was allowed to cool and left overnight at constant temperature of 5°C. The solution was then made to undergo centrifugation at 2500rpm for 5mins. the supernatant was removed via decantation and it was ensured the precipitate was completely dissolved in 10cm^3 of 20% (v/v) H_2SO_4 solution. The resultant filtrate from the

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prior digestion was made up to $300cm^3$. Aliquots of $125cm^3$ of the resultant filtrate was then heated until it's about to boil and then was made to undergo titration against 0.05M standardized $KMnO_4$ solution to a slight pink color which was visible for 30secs. The calcium oxalate is calculated using the formula;

$$\frac{T \times (Vme)(Df) \times 10^5}{(ME) \times Mf} \quad (mg/100g)$$

T is the titre of $KMnO_4$ (cm^3), Vme is the equivalent volume-mass of $1cm^3$ of 0.05M $KMnO_4$ solution is equivalent to 0.00225g anhydrous oxalic acid, Df is the dilution factor and A is the Aliquot used (125 cm^3 $KmNo_4$ redox reaction), Me also describes the molar equivalent of $kMnO_4$ in oxalate and Mf is the mass of the flour used

RESULTS AND DISCUSSION

Table1: The result of proximate analysis of *Urena lobata* leaf (%) except the calorific value in KJ/100g

Parameters	Value
Ash	9.12 ± 0.40
Carbohydrate	47.64 ± 0.57
Crude fibre	6.33 ± 0.03
Crude protein	19.28 ± 0.41
Fat	10.33 ± 0.09
Moisture content	7.39 ± 0.06
Calorific Value	360.65

Table 2: The result of Mineral analysis of *Urena lobata* leaves (mg/100g)

Parameters	Value
Calcium	34.19 ± 0.46
Magnesium	66.11 ± 0.19
Potassium	1650.01 ± 1.53
Sodium	849.25 ± 0.42
Manganese	23.19± 3.00
Phosphorus	905 ± 1.97
Copper	14.04 ± 0.10
Zinc	52.41 ± 0.50

Table 3: The result of amino acid content of *Urena lobata L.*

Amino acid	Concentration g/100g proteins
Tryptophan	1.01
Lysine	4.59
Histidine	1.92
Arginine	5.52
Aspartic acid	8.25
Threonine	2.95
Serine	4.10
Glutamic acid	12.27
Proline	2.34
Glycine	3.80
Alanine	3.61
Cysteine	1.19
Valine	4.31
Methionine	1.20
Isoleucine	3.62
Leucine	7.48
Tyrosine	2.38
Phenylalanine	4.39

Table 4 The anti-nutritional factors of *Urena lobata* leaves

Parameters	mg/100g
Alkaloids	2.90 ± 1.02
Cyanogenic glycosides	12.28 ±0.62
Flavonoids	1.96 ± 0.17
Oxalates	3.90 ± 0.25
Saponins	2.72 ± 0.43
Tannins	1.80 ± 0.70

Discussion of results

The result of the proximate composition analysis of *Urena lobata L.* leaves is shown in table 1. The amount of carbohydrates obtained from this work was 47.64 ± 0.08%. This is slightly higher than the findings of Abolaji *et al*,. (2007) reported for *Bligia sapida* leaves (44.09%). The plants crude protein value was 19.28 ± 0.41%; this value was high when compared with 17.50% reported for *Gnetum Africana* leaves by Ekop 2007.The plant contained 10.33 ± 0.09% of crude fat which was compared to *Baseila Alba* leaves (8.71%) reported by Akindahunsi and Salawu, (2005). Fat increases food palatability via the process of absorption and retention of flavours (Antia *et al.*, 2006). The ash content obtained is 9.12 ± 0.40% which is significantly lower than the 20.05% for leaves of *T. triangulare* as reported by Ladan, (1996).The major drawbacks to the use of vegetables in human nutrition is their high fibre content which invariability causes intestinal irritation and lower nutrient bioavailability, hence large quantities of plant vegetables have to be consumed to provide adequate levels of nutrients (Vadivel and Janardhanan, 2000). On the other hand, intake of dietary fibre can lower the serum cholesterol level, risk of coronary heart disease, hypertension, constipation, diabetes and breast cancer (Ramula and Rao, 2003).The crude fibre content of *Urena lobata L.* leaves is 6.33 ± 0.03%. Similar value was reported for *I. batatas* 7.20% thus compares favorably as reported by Akindahunsi and Salawu, (2005).The content of moisture obtained is 7.39 ± 0.06%, though it was far lower compared to the value of 81.4 -90.3% reported by Ifon and Bassir (1980) in some Nigerian green leafy vegetables.

Table 2 shows the results of concentration of minerals. The sodium concentration of this sample was 849.25 ± 0.42 mg/100g. This value is high compared to 122.49 mg/100g for *Momordica balsamina L.*reported by Hassan and Umar (2006). This high value recorded in this sample is an indication that *Urena lobata* can serves as dietary supplement for sodium.The potassium content was 1650.01 ± 1.53 mg/100g. This value is high when compared with 1320.00 mg/100g reported by Hassan and Umar (2006) for *Momordica balsamina L.* Adequate intake of this mineral from the diets may be found to lower blood pressure by antagonizing the biological effects of sodium (Einhorn and Landsberg, 1988). The zinc concentration was 52.41 ± 0.50 mg/100g. This result is similar to most values reported for green leafy vegetables (Ibrahim *et al.*, 2001).The phosphorus content of was 905 ± 1.97 mg/100g. This value is higher than166 - 640 mg/100g found in some green leafy vegetables consumed in Sokoto (Ladan *et al.*, 1996). Magnesium is an important mineral element in connection with circulatory diseases such as ischemic heart disease and calcium metabolism in bone (Ishida *et al.*, 2000). The content of magnesium obtained from this work was 66.11 ± 0.19 mg/100g. The value was lower compared to 220 mg/100g obtained for *M. balsamina L.* as reported by Hassan and Umar (2006). The concentration of calcium was 34.19 ± 0.46 mg/100g. This value was lower when compared to 941 mg/100g reported by Hassan and Umar (2006) for *M. balsamina L.* Copper is an essential trace element in human body where it exists as an integral part of copper proteins ceruloplasmin, which is concerned with the release of iron from the cells into the plasma and is involved in energy metabolism (Adeyeye, 2002). The copper content obtained from this work was 14.04 ± 0.10 mg/100g. The value obtained from this work was higher than 2.32 mg/100g found in bitter leaf (*Vernonia amygdalina*) reported by Ibrahim *et al.*, (2001). Manganese is another microelement essential for human nutrition; it acts as activator of many enzymes (McDonald *et al.*, 1995).The concentration manganese was 23.19± 3.00 mg/100g. This value was lower when compared to 15-115mg/100g reported in some leafy vegetables found in Cross Rivers State, Nigeria (Ifon and Bassir, 1979), but within the range of 0.98 - 38.0mg/100g as reported by Sena *et al.* (1998).

Table 3 indicated the values of amino acids concentration of the analyzed leaves of *Urena lobata L.*The result indicated that nonessential amino acids (alanine, arginine, aspartic acid, glutamic acid, glycine, histidine, proline and serine) are higher in concentration (55.73%) compared to essential amino acids (isoleucine, leucine, lysine, methionine, cysteine, phenylalanine, tyrosine, threonine, valine) which constitute 44.27% of the total amino acids analyzed. Similar values were reported for nonessential amino acids in concentration of about 59% and essential amino acids which were about 41% by Hassan and Umar (2006) for *M. balsamina L.* The leaves is rich in both essential and non-essential amino acids with aspartic acid recorded to have the highest value of 8.25 and tryptophan recorded as the least amino acid concentration present in the leaves.

Table 4 showed the result of anti-nutritional composition of *Urena lobata L.* leaves. The alkaloidscontent was 2.90 ± 1.02 mg/100g. This value was lower compared to 3.54 mg/100g of *Amaranthus hybridus* L. leaves reported by Akubugwo *et al.* (2007). Alkaloids have been found to have anti-diarrheal and microbiocidial effects, this is due to their actions on the small intestine and anti-hypertensive effects (Trease and Evans, 1995). The concentration of flavonoids was 1.96 ± 0.17 mg/100g. This value was high compared to 0.83 mg/100g reported for *Amaranthus hybridus* L. leaves by Akubugwo *et al.* (2007). The oxalatic content obtained in this work was 3.90 ± 0.25 mg/100g. This value was low 5.361±0.14 mg/100g for *V. amygdalina* reported by Richard *et al.* (2007). The cyanogenic glycoside obtained from this sample was 12.28 ±0.62 mg/100g.·This value was low compared with 16.99 mg/100g for *A. hybridus* L. leaves reported by Akubugwo *et al.* (2007). The concentration of tannin was 1.80 ± 0.70 mg/100g. The value obtained from this work was high compared to 0.49

mg/100g reported for *A. hybridus* L. leaves by Akubugwo *et al.* (2007). The concentration of saponnin was 2.72 ± 0.43 mg/100g. This value was high compared to the value of *V. calvoana*var. non bitter (1.905±0.191 mg/100g) by Richard *et al.* (2007)

CONCLUSION

The result of the study showed that *Urena lobata L.* is rich in carbohydrate, protein, fats and oil and some essential elements such as potassium, calcium, phosphorus and sodium. The leaves are rich in essential amino acids like histidine, lysine, valine, methionine and leucine thus enabling continuous growth and regeneration of cells and tissues. It also contains non-essential amino acids like alanine, argine, aspartic acid, glycine and proline. Aspartic acid is the most abundant amino acid present in this sample with tryptophan been the least available. However, anti-nutritional factors obtained from this work such as alkaloids, flavonoids, tannins, saponins and oxalates which indicated that, the sample may be free of some of these anti-nutritive substances.

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