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# Nutritional and Anti-nutritional Levels of Some Local Vegetables(*Vernomia anydalira, Manihot esculenta, Teiferia occidentalis, Talinum triangulare, Amaranthus spinosus)* from Delta State, Nigeria

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**ABSTRACT:** Levels of nutritional and antinutritional levels of five leafy green vegetables from Delta State, Nigeria were assessed. Analyses were done using standard analytical methods. Crude protein, crude lipid, carbohydrate, moisture, ash, crude fiber and colorific values, had values 4.74%±1.48, 4.78%± 0.62, 4.98% ± 1.79,80.84%±4.69,1.96%±0.19,2.00%±1.25,78.92±21.94Kcal/100g respectively. The mineral contents were; sodium 4.83 ± 0.29ug/g, calcium 2.18 ± 1.54ug/g, potassium 0.97 ± 0.04ug/g, magnesium 1.61 ± 0.20ug/g, iron 0.34 ± 0.21ug/g, zinc 0.04 ± 0.03ug/g, phosphorus 1.43 ± 0.81ug/g, copper 0.09±0.13ug/g. The antinutrient compositions are oxalate 1.43 ± 0.61mg/l, phytate 9.15 ± 2.31mg/l and hydrocyanide 0.15 ± 0.1mg/l. These results showed that these vegetables contain an appreciable amount of nutrients, mineral elements and low levels of anti-nutrients and should be included in diets to supplement our daily allowance needed by the body. @JASEM

*Keywords:* Local vegetables, minerals, nutrients and antinutritional.

Vegetables are known to be important sources of protective foods (Nnamami, Oselebe and Agbatutu, 2009; Sheele, et al., 2004). Vegetables have also been reported to be good sources of oil, carbohydrates, minerals as well as vitamins (Adenipenkun, and Oyetunji 2010). According to George (2003), the potassium content of leafy vegetable is good in the control of diuretic and hypertensive complications. George in 2003 also ascertained that the proteins in vegetables are superior to those in fruits but inferior to those in grains. Vegetable fats and oils are known to lower blood lipids thereby reducing the occurrences of diseases associated with the damage of the coronary artery (Adenipenkun, and Oyetunji 2010). These vegetables however contain antinutritional factors that can affect the availability of the nutrients. Antinutritional factor is known to interfere with metabolic processes such that growth and bioavailability of nutrients are negatively influenced (Abara, 2003; Binta and Khetarpau, 1997). According to Ademoroti (1996), phytate and oxalates have the ability to form chelates with di-and tri-valent metallic ions such as Cd, Mg, Zn and Fe to form poorly soluble compounds that are not readily absorbed from the gastrointestinal tract thus decreasing their bioavailability. He further stated phytate inhibits the functions of some digestive enzymes. It has also been reported that oxalates causes irritation and swelling in the month and throat (Ladeji, et al 2004). High level of hydrogen cyanide has been implicated for cerebral damage and lethargy in man and animals (Ekop, 2007). The purpose of this study therefore is to evaluate the levels of nutritional and anti-nutritional factors of some common leafy vegetables in Delta State Nigeria.

## MATERIALS AND METHODS

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*Sampling*: Five leafy vegetables were obtained from farms within the University. They were then taken to the Botany department of the Delta State University for identification. The vegetables are *Vernomia anydalira, Manihot esculenta, Teltairia occidentalis, Talium trianglulare and Amararathus spinosus*. The vegetable leaves were harvested, destalked, washed with clean cold tap water. The fresh leaves were used for the study.

*Sample Preparation***:** 5.00g of each sample was weighed and mashed. 100ml of distilled water was added and then filtered. Filtrate was used for further analysis.

*Determination of Carbohydrate***:** This was done be the anthrone standard method (David, 1978). A standard curve was obtained using the following concentration of sucrose in (mg/ml). 1.00 0.50, 0.25, 0.13 and 0.06. 1ml of each vegetable sample was measured into test-tube and 2ml anthrone solution added. This was shaken for 15 minutes and boiled for 30 minutes. It was then allowed to cool. The absorbance was then read off a spectrophotometer (spectrum lab 22) at 625nm. The sugar concentration was then obtained by extrapolation from the standard curve.

*Determination of Protein***:** The burette method (Okon & Akpanyung 2005; Plummer, 1978) was adopted. 1ml of the sample was measured into test-tube and 4ml of biuret reagent was added. This was allowed to stand for 20 minutes. The absorbance was then read off at 540nm in a spectrophotometer. The quantity of protein was obtained by extrapolation from a calibration curve prepared with bovine serum albumin (BSA).

*Determination of Fat:* The oil from the samples was extracted by solvent extraction in petroleum ether. Percentage oil was calculated using the formula below;

$$\% \text{ Oil} = \frac{\text{Weight of oil}}{\text{Weight of dry sample}} \times 100$$

*Determination of Ash:* This was determined using the method of Association of official analytical chemist (1984).
*Determination of Crude Fibre:* This was carried out using the standard methods of the Association of official Analytical Chemist (1984).
*Determination of Moisture:* This was done according to standard method of the Association of official Analytical Chemist (1984).
*Energy Value:* This was calculated using at water factor method as described by Osborne, & Voogt (1978). [(9 x fat) + (4 x carbohydrate) + (4 x protein)

*Oxalate Determination:* The titration method as described by Day, and Underwood, 1986 was followed. 1g of sample was weighed into 100ml conical flask. 75ml $3MH_2SO_4$ was added and stirred for 1hr with a magnetic stirrer. This was filtered using a Whatman No 1 filter paper. 25ml of the filtrate was then taken and titrated while hot against 0.05M $KMnO_4$ solution until a faint pink colour persisted for at least 30 sec. The oxalate content was then calculated by taking 1ml of 0.05m $KMnO_4$ as equivalent to 2.2mg oxalate (Chinma, & Igyor 2007; Ihekoronye and Ngoddy 1985).
*Phytate Content Determination***:** This was determined by the method of wheeler and Ferrel (1971). 100ml of the sample was extracted with 3% trichloroacetic acid. The extract was treated with $FeCl_3$ solution and the iron content of the precipitate was determined using Atomic Absorption spectrophotometer (Cye Unicam 2900). A 4:6 Fe/P atomic ratio was used to calculate the phytic acid content. (Okon & Akpanyung 2005)
*Hydrogen Cyanide Determination:* The alkaline titration method of AOAC (1984) used for the determination. 100ml of sample was steam-distilled into a solution of NaOH. The distillate was treated with dilute KI solution. This was then titrated against 0.02M $AgNO_3$ solution. The endpoint was obtained when there was a change from clear to a faint but permanent turbid solution. The hydrogen cyanide content was determined by taking 1ml of 0.02m $AgNo_3$ as equivalent to 1.08mg HCN.
*Mineral Element Content:* This was determined after wet acid digesting of samples using the Cye Unicam 2900 model of Atomic Absorption Spectrophotometer with appropriate hollow cathode lamps. Phosphorus determined spectrophotometrically.

*Statistical Analysis***:** Results were presented as simple means, ranges, standard Deviations and percentages.

## RESULTS AND DISCUSSION

The result of proximate composition of samples is as shown in table 1 above. The moisture content was high 80.84±4.69%. This value is similar to report from similar workers (Abidemi et al 2009, Chinma and Igyor 2007,FAO 1990) This high moisture content would result in rapid deterioration of these vegetables and so reduced shelf-life.

Crude protein had a value of 4.94± 1.48%. This indicates that the protein content of these vegetables varied and not similar. The higher protein contents as compared with results by Abidemi et al., 2009 makes them a good source of plant protein which can supplement animal protein.

Crude lipid had a value of 4.68 ± 0.67%. This is comparable with result from the work of Ekop (2007). Carbohydrate content varied from vegetable to vegetable. This value is however low as compared with those obtained by Abidemi et al 2007. These vegetables can therefore not be recommended solely to vegetarians. It has to be mixed with other sources of carbohydrate. The ash content which is a means of the mineral content of food was 1.96 ± 0.61%. According to Lucas (1988), this is the acceptable range for edible vegetables in Nigeria. This result is also similar to that obtained by Abidemi et al 2007. Energy value was 78.92 ± 21.94Kcal/100g.

This showed a great variation with the different vegetables. That is it varied from one vegetable to another. This value is however similar to what was obtained by Chinma et al (2002). The result of the mineral analysis is shown in table 2 above. Minerals are very important in human nutrition. It is well known that enzymatic activities as well as electrolyte balance of the blood fluid are related to adequacy of Na, K, Mg and Zn. Potassium is important in maintaining the body fluid volume and osmotic equilibrium. Metal deficiency syndrome like rickets and calcification of bones is caused by calcium deficiency. The result of mineral analysis as shown in table 2, above is generally low as compared with other workers (Ekop 2007 and Yildrin 2001).

**Table I:** Proximate composition of samples

| | Botanical/common names | Moisture content % | Crude protein % | Crude lipid & | Carbo hydrate % | Ash content % | Fiber content % | Energy value Kcal |
|---|---|---|---|---|---|---|---|---|
| 1 | *Vernomia anydalira* (bitter leaf) | 79.00 | 5.80 | 4.40 | 6.30 | 2.60 | 1.40 | 88 |
| 2 | *Manihot esculenta* (cassava leaf) | 75.00 | 6.50 | 5.80 | 6.30 | 1.40 | 4.20 | 103.4 |
| 3 | *Teiferia occidentalis* (Ugu leaf) | 82.80 | 5.20 | 4.20 | 4.40 | 1.80 | 1.40 | 76.2 |
| 4 | *Talinum triangulare* (water leaf) | 87.60 | 2.60 | 4.80 | 2.10 | 1.40 | 1.20 | 44 |
| 5 | *Amaranthus spinosus* (Green vegetable) | 79.80 | 4.60 | 4.20 | 5.80 | 2.60 | 1.80 | 83 |
| | Mean | 80.84 | 4.94 | 4.68 | 4.98 | 1.96 | 2.00 | 78.92 |
| | Standard Deviation | ±4.69 | ±1.48 | ±0.67 | ±1.79 | ±0.61 | ±1.25 | ±21.94 |
| | Range | 12.6 | 3.90 | 1.60 | 4.20 | 1.20 | 3.00 | 59.40 |
| | | 75.00-87.60 | 2.60-6.50 | 4.20-5.80 | 2.10-6.30 | 1.40-2.60 | 1.20-4.20 | 44.00-103.40 |

**Table 2:** Mineral composition of samples

| | Na (ug/g) | Cd (ug/g) | K (ug/g) | Mg (ug/g) | Fe (ug/g) | Zn (ug/g) | Phosphorus (ug/g) | Cu (ug/g) |
|---|---|---|---|---|---|---|---|---|
| *Vernomia anydalira* (bitter leaf) | 0.44 | 0.26 | 0.55 | 0.38 | 0.49 | 0.02 | 0.28 | 0.01 |
| *Manihot esculenta* (cassava leaf) | 0.36 | 0.24 | 0.62 | 0.21 | 0.39 | 0.02 | 0.04 | ND |
| *Teiferia occidentalis* (Ugu leaf) | 0.60 | 0.34 | 0.62 | 0.21 | 0.69 | 0.03 | 0.33 | 0.02 |
| *Talinum triangulare* (water leaf) | 0.37 | 0.50 | 0.33 | 0.15 | 0.02 | 0.05 | 0.40 | 0.02 |
| *Amaranthus spinosus* (Green vegetable) | 0.32 | 0.23 | 0.24 | 0.18 | 0.03 | 0.04 | 0.92 | 0.01 |
| Mean(standard deviation) | 0.42±11 | 0.31±0.11 | 0.43±0.15 | 0.23±0.09 | 0.32±0.29 | 0.03±0.01 | 0.39±0.32 | 0.01±0.008 |
| Range | (0.28) 0.32-0.60 | (0.27) 0.23-0.50 | (0.38) 0.24-0.60 | (0.23) 0.15-0.38 | (0.69) 0.02-0.69 | (0.03) 0.02-0.05 | (0.88) 0.04-0.92 | |

**Table 3:** Anti-nutritional factor of samples

| | Oxalate (ug/g) | Phytate (ug/g) | HCN (ug/g) |
|---|---|---|---|
| *Vernomia anydalira* (bitter leaf) | 1.00 | 8.11 | 0.11 |
| *Monihot esculenta* (cassava leaf) | 1.05 | 6.26 | 0.20 |
| *Teiferia occidentalis* (Ugu leaf) | 1.60 | 7.10 | 0.16 |
| *Talinum triangulare* (water leaf) | 0.92 | 6.18 | 0.14 |
| *Amaranthus spinosus* (Green vegetable) | 0.76 | 5.80 | 0.09 |
| Mean(standard deviation) | 0.07 ±0.32 | 6.69±0.92 | 0.14±0.04 |
| Range | 0.84 | 2.31 | 0.11 |
| | 0.76-1.6 | 5.8-8.11 | 0.09-0.2 |

The result of the anti-nutrient is as shown in table 3 above. The oxalate value of 1.07 ± 0.32ug/g is low as compared with similar works (Chinma and Igyor 2007; Ekop 2007) but it is comparable with values obtained by Okon and Akponyung 2005. Phytate had value of 6.69 ±.92ug/g. This value was again comparable with those obtained by Okon and Akpanyung 2005. The hydrocyanide value of 0.14 ± 0.04ug/g is low as compared with results obtained by Okon and Akpanyung 2005. The low antinutitional factors may not pose any serious nutritional problems when these vegetables are consumed. It is known that high content of these antinutrients exert negative effects on the bioavailability of some mineral nutrients. The consumption of these vegetables was therefore encouraged.

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