PROXIMATE AND MINERAL COMPOSITION OF FIVE LEAFY VEGETABLES COMMONLY CONSUMED IN OGUN STATE

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ABSTRACT

Proximate analysis and mineral composition of some leafy vegetables; Bitter-leaf (*Vernoniaamygdalina*), Water-leaf (*Talinumtriangulare*), African-spinach (*Amaranthushybridus*), Fluted-pumpkin leaf (*Telfairiaoccidentalis*), and Jute-leaf (*Conchorusolibrius*) were carried out using standard analytical procedures. The moisture content of the samples ranged between (87.68 ± 2.13^{d} - 93.16 ± 0.04^{c} %), crude protein (1.53 ± 0.01^{d} - 4.37 ± 1.15^{a} %), crude fiber (1.00 ± 0.33^{a} - 1.82 ± 0.03^{a} %), crude fat (0.35 ± 0.01^{a} - 1.17 ± 0.11^{c} %), ash content (0.62 ± 0.08^{a} - 7.63 ± 2.70^{d} %), and carbohydrate (6.84 ± 0.04^{a} - 12.33 ± 2.12^{d} %). Proximate analysis shows that Biter-leaf has the highest crude protein, Jute-leaf has the highest crude fiber, Water-leaf has the highest crude fat, Bitter-leaf has the highest ash content and carbohydrate, while Jute-leaf has the highest moisture. Mineral element analysis showed that leafy vegetables contained high level of calcium in African spinach and least calcium in Bitter-leaf (31.84 ± 0.01^{a} - 44.39 ± 0.02^{a}), iron (3.24 ± 0.01^{a} - 6.35 ± 0.0^{a}), zinc (3.66 ± 0.01^{a} - 6.43 ± 0.0^{a}), and magnesium had the lowest value which ranged between (1.17 ± 0.01^{a} - 3.31 ± 0.01^{a}) mg/100g respectively. The study showed that the leafy vegetables contained high amount of some minerals. Hence, they are good sources of calcium, iron, zinc and magnesium.

Keywords: Proximate, mineral, analysis, leafy vegetables

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Proximate analysis and Mineral composition of some Leafy vegetables; Bitter-leaf *(Vernonia amygdalina),* Water-leaf *(Talinum triangulare),* African2-spinach *(Amaranthus hybridus),* Fluted-pumpkin leaf *(Telfaria occidentalis),* and Jute-leaf *(Conchorus olibrius)* were carried out using standard analytical procedures. The moisture content of the samples ranged between (87.68 ± 2.13^{d} - 93.16 ± 0.04^{c} %), crude protein (1.53 ± 0.01^{d} - 4.37 ± 1.15^{a} %), crude fiber (1.00 ± 0.33^{a} - 1.82 ± 0.03^{e} %), crude fat (0.35 ± 0.01^{e} - 1.17 ± 0.11^{c} %), ash content (0.62 ± 0.08^{a} - 7.63 ± 2.70^{d} %), and carbohydrate (6.84 ± 0.04^{a} - 12.33 ± 2.12^{d} %). Proximate analysis shows that Biter-leaf has the highest crude protein, Jute-leaf has the highest crude fiber, Water-leaf has the highest crude fat, Bitter-leaf has the highest ash content and carbohydrate, while Jute-leaf has the highest moisture. Mineral element analysis showed that Leafy Vegetable contained high level of calcium in African spinach and least calcium in Biter-leaf (31.84 ± 0.01^{a} - 44.39 ± 0.02^{e}), iron (3.24 ± 0.01^{a} - 6.35 ± 0.0^{e}), zinc (3.66 ± 0.01^{a} - 6.43 ± 0.0^{e}), and magnesium had the lowest value which ranged between (1.17 ± 0.01^{a} - 3.31 ± 0.01^{e}) mg/100g respectively. The study showed that the Leafy vegetables contained high amount of some minerals. Hence, they are good sources of calcium, iron, zinc and magnesium.

Keywords: *Proximate, Mineral, Analysis, Leafy Vegetables*

INTRODUCTION

Vegetables are the edible parts of plant that are consumed wholly or in parts, raw or cooked as part of main dish or salad (Dhellot et al.2006). The term vegetable is somewhat arbitrary, and largely defined through culinary and cultural tradition. Vegetables are all other plant parts, such

as roots, leave and stems (Ajewole 1999). Vegetable provides essential amino acids that body needs to survive. Vegetables can be eaten either raw or cooked and play an important role in human nutrition, being mostly low in fat and carbohydrates, but high in vitamins, minerals and dietary fiber depending on the vegetable consumed (Ihekoronye and Ononugbu, 2002) reported that vegetable fats and oil lower blood lipids thereby, reducing the occurrence of disease associated with damage of coronary artery. They contain valuable food ingredients which can be successfully utilized to build up and repair the body (Chionyedua *et al.,* 2009).

Leafy vegetable are important items of diet in many Nigerian homes. A part from the variety which they add to the menu (Mepha *et al.,* 2007). They are valuable sources of nutrients especially in rural areas where they contributes substantially to protein, minerals, vitamins, fiber and other nutrients which are usually in short supply in daily diets(Mohammed, and Sharif,2011). It is worth-while to note that consumption of numerous types of edible plants as sources of food could be beneficial to nutritionally marginal population especially in developing countries, where poverty and climate is causing havoc to the rural populace. In many developing countries the supply of minerals is inadequate to meet the mineral requirements of farm animals and rapidly growing population. In Nigeria, leafy vegetables such as bitter leaves combine with condiments are used to prepare soup (Chionyedua *et al.*,2009). Other minerals cannot be synthesized by animals and must be provided from plants or mineral rich water (Anjorin, *et al.*, 2010).Bitter-leaf (*Vernonia amygdalina*) is a shrub or small tree that can reach 23m in height when fully grown. Bitter-leaf has a grey or brown colored bark. The bark has a rough texture and flanked. The bitter-leaf is believed to help restore the stermina when consumed inform of a tonic

food called Indole. The bitterness is caused by sesquiterpene lactones, example steroid glycosides(Vernoniosides) (Challand, 2009, Ayoola, *et al.*,2010).

African spinach (*Amaranthus hybridus*):African-spinach(*Amaranthus hybridus*) belongs to the family of *Amaranthacae*. The leaves are green, variable in shape and size (Iheanacho, and Ubebani, 2009).Water-leaf (*Talinum triangulare*): Water-leaf (*Talium triangulare*) belongs to the family of *Hydrophyllaceae*. It is a shade loving leafy vegetable, grown throughout the year. The crop is adapted to wide range of soil conditions. It is an ethnic food with high nutritive value. It has the rich amount of protein, iron, calcium, vitamin A, and vitamin C in the leaf and succulent stems. It plants are typically small and often cluster together. Its originated from Africa, Asia (Schippers, 2000).Jute-leaf (*Conchorus olibrius*): Jute-leaf(*Conchorus olibrius*) belongs to the family of *Malvaceae*. It is a long shiny vegetable fiber. The leaves of *Conchorus* are rich in beta-carotenoid, iron, calcium, and vitamin C. It also has an antioxidant activity with a significant equivalent vitamin E. The root scraping of *C olibrius* are used for the treatment of toothache and root decoction as tonic (Schippers, 2000).Fluted pumpkin (*Telfaria occidentalis*): Fluted Pumpkin-leaf (*Telfairia occidentalis*) belong to the family of plants called *Cucurbitaceae*. In Nigeria it is known as pumpkins and it is grown in South-Eastern Nigeria. The crop which is originated from West Africa is a perennial climber, it leaves and seeds are very nutritive. In the recent times fluted pumpkin has gained medicinal recognition. It has been discovered to be blood purifiers, and could therefore be useful in maintenance of good health most especially in developing countries. The problem with the people in western part of Nigeria is that they are not consuming enough Green Leafy Vegetable on a daily basis. In several studies, many nutrients in

green leafy vegetable such as dietary fiber, potassium and antioxidants have been associated with reduced risk for cardiovascular disease.

Intake of green leafy vegetables lower or reduce the risk or incidence of cardiovascular disease and also valuable for the person with type 2 d iabetes. An increase of 1 serving/day of Green Leafy Vegetables was associated with a 9percent lower the risk of diabetes. High level of Vitamin K in Green Leafy Vegetables make them important for the production of Osteocalcin, a protein essential for bone health.This work is aimed at evaluating the mineral content and the proximate composition of five (5) leafy vegetables consumed in Ilaro, Ogun state.

MATERIALS AND METHODS

Materials

Bitter-leaf (*Vernonia amygdalina*), Water-leaf (*Talinum triangulara*), Jute-leaf (*Conchorus olibrius*), African Spinanch (*Amaranthus hybridus*), Fluted Pumpkin (*Telfaria occidentalis*).

Sample preparation

The leafy vegetables was purchased in Ilaro at sayedero market.The leafy vegetables are picked washed and mashed to extract the juice, using mortar and pestle.

Methods

Proximate composition determination: The proximate analysis (Moisture, content, crude fibre protein, ash, fat was determine by AOAC,(2000). Carbohydrate was calculated by differences.

Mineral analysis

The ash of mineral content was prepared by adding about 5ml of concentrated hydrochloric acid to the crucible containing the previously ashed sample. The mixture was boiled for 5minutes on a hot plate in fume cupboard and more acid was added to maintain the volume. The contents of the crucible after boiling was transferred and washed in a beaker, adjusted to about 40ml and boiled for 10minutes. It was cooled, filtered through a glass wool into 100ml volumetric and beaker rinsed with distilled water into the volumetric flask. The ash solution was cooled and made up to volume. (AOAC, 1990)

Determination of calcium

About 1ml of the sample was pipette into a test-tube in a duplicate. Then 3ml of the calcium working reagent was added and absorbance at 512nm was read against the blank. Calcium content were determined by Versenate Ethylenediamine Tetraacetic Acid (EDTA) complexiometric titration method described by James.

Determination of iron

About 1.70g of $FeCl_3$ was dissolved in 99ml of distilled water and mixed well and labeled 1% iron. Serial dilution was prepared in steps of 10 fold dilution by using pipette to measure 10ml which was added to 90mlof distilled water. Concentration of 0.1%, 0.01%, 0.001%, 0.0001%, 0.00001%, 0.000001% of the original was prepared. 5ml of each solution was added to a separate small test-tube. To each tube, 5ml of 0.1m KSCN solution was added. The mass of raisin was determined, It was heated strongly in an evaporating dish or crucible until a gray ash remains. The sample may burn, after cooling 5ml of distilled water was added to the ash and

stirred very well. It was then filtered and transferred into another test-tube of the same size as the standards. 5ml of 0.1m KSCN solution was added and the color was compared to the standards. Iron content was determined using atomic absorption spectrophotometer (Jenway model) as described by James.

Determination of magnesium

About 5ml of the sample was pipette into a test-tube in a duplicate. Then 1ml of 0.67U sulphuric acid (H_2SO_4) was added and 1ml of 0.05% titan yellow was added. Then 1ml of 0.01% gum acacia and 2ml of 10% sodium-hydroxide (NaOH) was added. The solution was mixed and the absorbance was taken at 520nm against the blank (AOAC, 2005). Magnesium content were determined by Versenate Ethylenediamine Tetraacetic Acid (EDTA) complexiometric titrationn method described by James.

Determination of zinc

0.5g of the sample, 10 concentrations HCl was added and boiled for several minutes, 3 drops of NH_3 was added and boiled until the NH_3 was expelled. 40 concentration NH_4Cl solution was added and 15 concentration NH_4OH was boiled. It was then filtered off and washed well with hot NH_4Cl solution. Methyl orange indicator was added, 3 concentration of extra HCl was added to acidify. Water was then added and lead was tested to precipitate the copper and then boiled. When the solution was boiled until it is cleared, 5 concentration HCl was added and cooled slightly with water and was been titrated with standard solution of potassium ferrocyanide using ammonium molybdate as outside indicator.

ACKNOWLEDGEMENT

I would like to appreciate the assistance of Miss Atobajaye Sakirat Oriyomi in the laboratory for her effort towards the success of this work.

RESULT AND DISCUSSION

Result

Table 1: *Proximate Analysis of Leafy Vegetables Commonly Consumed in Ogunstate*

Proximate (%)	**Water-leaf (%)**	**African Spinach**	**Jute-leaf (%)**	**Fluted Pumpkin leaf**	**Bitter-leaf (%)**
Moisture	92.83±0.11^{cd}	92.36±0.18^{c}	93.16±0.04^{c}	90.81±0.17^{b}	87.68±2.13^{d}
Carbohydrate	7.18±0.11^{ab}	7.64±0.18^{b}	6.84±0.04^{a}	9.14±0.10^{c}	12.33±2.12^{d}
Ash content	1.44±0.11^{c}	1.35±0.04^{b}	0.62±0.08^{a}	3.7±0.01^{e}	7.63±2.70^{d}
Crude fat	1.17±0.11^{c}	0.38±0.01^{d}	0.35±0.01^{e}	0.73±0.01^{b}	1.15±0.37^{a}
Crude fiber	1.65±0.11^{d}	1.35±0.01^{c}	1.82±0.03^{e}	1.09±0.01^{b}	1.00±0.33^{a}
Crude protein	1.87±0.03^{b}	1.57±0.04^{a}	1.53±0.01^{d}	2.95±0.06^{c}	4.37±1.15^{a}

Values are mean ± Standard deviation in duplicate determination

Table 2: *Mineral Contents of Leafy Vegetables Commonly Consumed in Ogun state.*

Minerals	**Jute-leaf**	**Bitter-leaf**	**African**	**Fluted**	**Water-leaf**

(mg/100)	(mg/100)		spinach	pumpkin	
Calcium	38.02±0.01^{c}	31.84±0.01^{a}	44.39±0.02^{e}	40.19±0.01^{d}	33.16±0.03^{b}
Iron	3.82±0.01^{d}	5.31±0.01^{b}	4.72±0.0^{c}	6.35±0.0^{e}	3.24±0.01^{a}
Magnesium	2.48±0.01^{c}	2.01±0.01^{b}	3.31±0.01^{e}	3.13±0.01^{d}	1.17±0.01^{a}
Zinc	3.66±0.01^{a}	3.83±0.01^{b}	5.29±0.01^{c}	4.32±0.02^{d}	6.43±0.0^{e}

Values are mean ± Standard deviation in duplicate determination

DISCUSSION

Proximate Analysis: The proximate Analysis (%) of the selected Leafy Vegetable are shown in Table 1. The percentage moisture contents ranged from (87.68 ± 2.13^{d} to 93.16 ± 0.04^{c} %) in Bitter-leaf and Jute-leaf. The high moisture contents provides for greater activity of water soluble enzymes and co-enzymes needed for metabolic activities of these Leafy Vegetables (Iheanacho and Udebuani, 2009). Carbohydrate ranged from the least to the highest (6.84 ± 0.004^{a} to 12.33 ± 2.12^{d} %) in(*Conchorus olibrius*) Jute-leaf and (*Vernonia amygdalina*) Bitter-leaf, Ash content ranged from (0.62 ± 0.08^{a} to 7.63 ± 2.70^{d} %) in Jute-leaf and Bitter-leaf, Crude fat ranged from (0.35 ±0.01^{e} to 1.17 ±0.11^{c} %) in Jute-leaf and Water-leaf, Crude fiber ranged from (1.00 ± 0.33^{a} to 1.82 ± 0.03^{e} %) in (*Vernonia amygdalina*)Bitter-leaf and (*Conchorus olibrius*)Jute-leaf, and Crude Protein ranged from (1.53 ± 0.01^{d} to 4.37 ± 1.15^{a} %) in Jute-leaf and Bitter-leaf. African spinach had (0.62 ± 0.08^{a} to7.63% ± 2.70^{d} %) of ash content when compare with fluted pumpkin leaf (0.35 ± 0.01^{e} to1.17 ± 0.11^{c} %) of crude fat which is the least of the Leafy Vegetable investigated. The % of fat content are low, which ranged from (0.35 ± 0.01^{e} -1.17 ± 0.11^{c} %) in jute-leaf and water-leaf respectively.

The crude protein content ranged between (1.53± 0.01^{d} - 4.37 ± 1.15^{a} %). Plant foods that provide more than 12% of their calorific value from protein have been shown to be good source of protein (Ali, 2009). This shows that all the Leafy Vegetables investigated are low in protein content. The values recorded were lower to the findings of (Chionyedua *et al.,* 2009)

The crude fiber content ranged between 1.00 ± 0.33^{a} -1.82 ± 0.03^{e} %). Dietary fiber helps to prevent constipation, bowel problems and piles. Adequate intake of dietary fiber can lower the serum cholesterol level, risk of coronary heart disease, hypertension, constipation, diabetes, colon and breast cancer (Ishida, *et al.,*2000). African spinach had higher value of calcium (44.39±0.02^{e}) and lower value in Bitter-leaf (31.84±0.01^{a}), Fluted pumpkin (6.35±0.0^{e}) leaf had higher value of iron and lower value recordedin Water-leaf (3.24±0.01^{a}), Water-leaf (6.43±0.0^{e})had higher value of zinc and lower value in Jute-leaf (3.66±0.01^{a}), African spinach (3.31±0.01^{e}) had higher value of magnesium and lower value were seen in Water-leaf (1.17±0.01^{a}).

Table 2.shows that mineral composition of Leafy Vegetables, significant of element when compare with the standard recommended dietary allowance. The content of calcium is higher compared with standard dietary allowance levels of magnesium, iron and zinc.

African spinach had higher value of calcium (44.39±0.02^{e}) and lower value in Bitter-leaf (31.84±0.01^{a}), Iron ranged from (3.24 ± 0.01^{a} – 6.35 ± 0.0^{e} mg/100),. Fluted pumpkin (6.35±0.0^{e}) leaf had higher value of iron and lower value recordedin Water-leaf (3.24±0.01^{a}), Water-leaf (6.43±0.0^{e})had higher value of zinc and lower value in Jute-leaf (3.66±0.01^{a}), The magnesium content ranges between (1.17 ± 0.01^{a} -3.31 ± 0.01^{e} mg/100g) African spinach (3.31±0.01^{e}) had higher value of magnesium and lower value were seen in Water-leaf

(1.17 ± 0.01^{a}). In all the minerals determine, magnesium has the least value. Although all the leafy vegetables are good sources of minerals.

CONCLUSION

This research shows that Vegetables are good source of fiber, which lower the body cholesterol level, consequently decreases the risk of cardiovascular diseases and they are nutritious food that provide sufficient amount of nutrients needed for normal body function, maintenance and reproduction.The study also shown that the leafy vegetables examined have high content of moisture with low fat content and crude fiber. It was also shown that the vegetable leaves are good sources of calcium, magnesium, iron and zinc.

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