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**Original Research Article**

# Proximate and Vitamin C Composition of some Selected Leafy Vegetables Grown in Burutu Town, Delta State, Nigeria

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**ABSTRACT**

*Three selected leafy vegetables grown and commonly consumed in Burutu Local Government Area of Delta State, Nigeria were investigated with a view to determining their nutrient content using standard methods of analysis. The vegetables are Talinum triangulare (water leaf), Telfaria occidentalis (fluted pumpkin) and Vernonia amydalina (bitter leaf). The results showed that Talinum triangulare had the highest moisture and crude fibre content (86.74%) and (1.54%). Vernonia amydalina had the highest amount of ash (2.74%), while Telfaria occidentalis had the highest protein, lipids and carbohydrate content of 6.98%, 5.33% and 10.43% respectively. The vitamin C analysis revealed that Telfaria occidentalis had the highest amount of vitamin C (374.65 mg/100g). The results obtained in this work indicates that the three selected leafy vegetables contain an appreciable amount of nutrients, and if consumed in sufficient amount would contribute greatly to the nutritional requirement for human health.*

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## 1. INTRODUCTION

The health of an individual depends on the quality and quantity of food (balanced diet or imbalanced diet) he or she consumes (Saidu and Jideobi, 2009). Most developing countries depend on starch-based foods for the supply of both energy and protein (Akubugwo *et al*., 2007). This accounts in part, for protein deficiency which prevails among the populace as recognized by Food and Agricultural Organization (Ladeji *et al*., 1995).

In a tropical Africa country like Nigeria, where the daily diet is dominated by starchy staple food, vegetables are found to be the cheapest and most readily available sources of proteins, vitamins, minerals and essential amino acids (Martin and Meitner, 1998). Vegetables are the edible parts of herbaceous plants that are consumed in parts or wholly, raw or cooked as part of main dish or salad. A vegetable includes leaves, stems, roots, flowers, seeds, fruits, bulbs, tubers and fungi (Uzo, 1989; Uwaegbute, 1989). Vegetables contain nutrients which can be assimilated by the body to be used as energy sources, body building, regulatory and

protective material. It is essential to prepare vegetables in a manner in which they will retain maximum amount of vitamin C because the vitamin is often lost before consumption through oxidation and leaching during preparation under high temperature (Igwemmar *et al.,* 2013). Oke and Ojofeitmi (1988), reported that vegetables contain calories and negligible quantities of utilizable energy hence they are ideal for obese people who can satisfy their appetite without consuming much carbohydrate.

Leafy vegetables are known to add taste, flavour, as well as substantial amounts of protein, fibre, minerals and vitamins to the diet (Mohammed and Sharif, 2011).

African leafy vegetables though readily available, have recorded low levels of consumption over the years, probably because they are often seen to be inferior in taste and nutritional value compared to exotic vegetables such as spinach (*Spinacea oleracea*) and cabbage (*Brassica oleracea*) (Weinberger and Msuya, 2004). The preference of leafy vegetable species depends on gender, age, cultural background and as well as the geographical location of the consumers (Jansen-Van-Rensberg *et al.*, 2004). In spite of the nutritional contribution of leafy vegetables to local diets, little effort has been made towards exploiting them in sub-Saharan Africa (Kwenin *et al*., 2011). Inadequate information on the specific nutrients of several different vegetables species is partly responsible for their under-exploitation.

This study was thus designed to determine the nutritional values of some selected leafy vegetables grown and consumed by locals in Burutu Local Government Area of Delta State, Nigeria.

## 2. MATERIALS AND METHODS

### 2.1. Reagents

All the chemicals and solvents used were of analytical reagent grade. n-hexane, petroleum ether, acetone, ethanol and methanol were purchased from Sigma-Aldrich, United State of America, while metaphosphoric acid, concentrated sulphuric acid and hydrochloric acid were procured from Merck, United State of America.

### 2.2. Plant Materials

The three selected leafy vegetables: *Talinum triangulare* (water leaf), *Telfaria occidentialis (*fluted pumpkin*) and Vernonia amygdalina* (bitter leaf) were collected fresh and at maturity from farmlands in Burutu town, Delta State. The leaves were detached from the stalk and part of the detached leaves was used for moisture content determination. The remaining leaves were rinsed with deionized water and sun-dried for 5 days on a clean filter paper (Fasakin, 2004). The sun dried sample was ground into fine powder using dried pestle and mortal and sieved through 2.0 mm mesh prior to analysis (Fasakin, 2004).

### 2.3. Proximate Analysis

Moisture, ash, crude fat, crude fat and crude fibre were determined using the official methods of the Association of Official Analytical Chemists (AOAC, 1999), while nitrogen was determined by the micro-Kjeldahl method and the percentage of nitrogen was converted to crude protein by multiplying by 6.25 (Pearson, 1976). Carbohydrates value was calculated using Equation (1). (FAO, 2002).

$$\text{Carbohydrates: } 100 - (\%\text{ moisture} + \%\text{ proteins} + \%\text{ lipids} + \%\text{ ash} + \%\text{ fibres}) \quad (1)$$

### 2.4. Vitamin C Analysis

The vitamin C content was determined by the method of Association of Official Analytical Chemists (AOAC, 2005). A measured volume (20 ml) of 1% acetic acid and 20 ml oxalic acid was added to about 2g

of each dried sample. The mixture was allowed to stand for two hours before it was filtered. The filtrate (10 ml) was pipetted into a conical flask and titrated with 2,4-dinitrophenol-hydrazine and the volume noted. Standard ascorbic acid of analytical grade (10 ml) was also titrated with indophenol dye solution. The weight of ascorbic acid oxidized by 1 ml of the dye was calculated in mg. A blank titration was also carried out in the same way without the sample. The value obtained was used to calculate vitamin C concentration using Equation (2).

$$\text{Vitamin C} = (mg/100g) = \frac{100VT(V_1 - V_2)}{W - V_3(V_T - V_o)} \quad (2)$$

Where:

W = weight of sample
$V_1$= value for standard ascorbic acid
$V_2$ = value for sample
$V_o$ = value for blank
$V_3$ = volume of extract used for titration
$V_T$ = total extract

## 3. RESULT AND DISCUSSION

The results of the analysis are summarized in Tables 1 and 2.

Table 1: Proximate (%) analysis of some selected leafy vegetables

| Sample | *Talinum triangulare* | *Telfaria occidentialis* | *Vernonia amygdalina* |
|---|---|---|---|
| Moisture | 86.74 ± 0.14 | 73.79 ± 0.16 | 76.84 ± 0.13 |
| Ash | 1.85± 0.07 | 2.45 ± 0.05 | 2.74 ± 0.03 |
| Crude fibre | 1.54± 0.02 | 1.02 ± 0.01 | 1.11 ± 0.04 |
| Crude protein | 2.71 ± 0.03 | 6.98 ± 0.05 | 5.52 ± 0.02 |
| Lipids | 2.12 ± 0.09 | 5.33 ± 0.10 | 4.25 ± 0.11 |
| Carbohydrates | 5.04 ± 0.05 | 10.43 ± 0.06 | 9.54 ± 0.08 |

*Values are expressed as the mean ± standard deviation of triplicate determinations.*

The moisture content of *Telfaria occidentialis* and *Talinum triangulare* were 73.79% and 86.74% respectively. This was higher than what was reported by Asaolu *et al.* (2012) but fell within the range of values reported for some leafy vegetables by Aafang *et al.* (2014) and Saidu and Jideobi (2009). The high moisture content of these vegetable would encourage microbial attack which could lead to deterioration. The high moisture content also enhances greater activity of water soluble enzymes and co-enzymes needed for metabolic activities of these leafy vegetables (Iheanacho and Udebuani, 2009).

The ash content varies from 1.85% in *Talinum triangulare* and 2.74% in *Vernonia amygdalina*. The ash content of the leafy vegetables is relatively higher when compared to the range of values (0.49%-0.83%) obtained by Adeniyi *et al.* (2012) for some staple leafy vegetables in Southern Nigeria. The ash contents were comparable to the values (1.52%-2.00%) reported by Aafang et al. (2014) for some local vegetables. However, values of ash content obtained in this study are much lower than the values reported in *Corchorus olitorius*, *Amaranthus cruentus* and *Celosia argentea* (21.20, 26.9% and 32.36%) (Onwordi *et al.*, 2009).

Crude fibre content ranged from 1.02% in *Telfeira occidentalis* to 1.54% in *Talinum triangulare*. These values are relatively higher than what was reported by Adeniyi *et al.* (2012), for *Talinum trianulare* (0.21%), *Ocinum gratissinum* (0.25%), *Telferia occidentalis* (0.32%) and Corchorus *olitorius* (0.33%) respectively. However, the crude fibre content was much lower than that reported by Oladele and Fadare (2015), for some local forest leafy vegetables in Port Harcourt-Nigeria. The substantial amount of fibre in all the vegetables

shows that they can help in keeping the digestive system functional and healthy (Slavin and Lloyd 2012). Dietary fibre aids and speeds up the excretion of waste and toxins from the body, preventing constipation and bowel problems which could lead to several diseases (Asaolu *et al*., 2012).

The crude protein content of *Talinum triangulare*, *Telfeira occidentalis* and *Vernonia amygdalina* were 2.71%, 5.52% and 6.98% respectively. These values are higher than those reported for some leafy vegetables (0.04-2.6%) by Omale and Ugwu (2011). However, the results for the crude protein was lower than those of *Ipomoea batatas* (24.85%), *Amaranthus cruentus* (12.70%) and *Telferia occidentalis* (61.70%) (Antia *et al.*, 2006; Onwordi *et al*., 2009; Asaolu *et al*., 2012). The three leafy vegetables studied contain appreciable amount of protein which indicates that the vegetables can be used for building and maintenance of body tissues.

The lipids content of the three vegetables ranged from 2.12% in *Talinum triangulare* to 5.33% in *Telfaria occidentalis*. The lipid values obtained in this study are relatively low. Leafy vegetables are poor source of lipids (Ejoh *et al*., 1996). According to Kris-Etherton *et al*., (2002), diet providing 1-2% of its caloric energy as fat is taken to be excessive intake of fat and could lead to cardiovascular disorders such as atherosclerosis, cancer and aging. Therefore, the consumption of these vegetables in large amount would be of great benefits to individuals suffering from overweight or obesity.

The carbohydrate contents (5.04%-10.43%) were higher than 2.96%, 3.92% and 3.96% reported for *Celosia argebtea*, *Myrianthus arboreus and Jatropha curcas* respectively (Aafang *et al.*, 2014). However, these values are lower than 26.19-57.48% reported by Oulai *et al.*, (2014), for some leafy vegetables consumed in Northern Cote d' Ivoire. Carbohydrate serves as stored forms of energy as glycogen in liver and muscles. It also provides major source of energy and responsible for breaking-down of fatty acids and preventing ketosis (Hassan and Umar, 2006).

Table 2: Vitamin C (absorbic acid) analysis of some selected leafy vegetables (mg/100g)

| Sample | Vitamin C |
|---|---|
| *Talinum triangulare* | 276.88 ± 0.12 |
| *Telfaria occidentialis* | 374.65 ± 0.17 |
| *Vernonia amygdalina* | 163.73 ± 0.15 |

*Values are expressed as the mean ± standard deviation of triplicate determinations*

The vitamin C content of the vegetables ranged from 163.73 mg/100g in *Vernonia amydolia* to 374.65 mg/100g in *Telfaria occidentalis*. These values were higher those reported by Achikanu *et al*. (2013) for some common leafy vegetables consumed in South eastern Nigeria. However, comparable data have been reported by Adeniyi *et al*. (2012), for *Corchorus olitoris* (316.80 mg/100g), *Ocimum gratissium* (241.06 mg/100g), *Talinum triangulare* (215.63 mg/100g) and *Telfaria occidentalis* (356.11 mg/100g). From the results obtained in the study, these vegetables appear to be good sources of vitamin C that could provide adequate amounts of vitamin C to ensure that the recommended daily allowance needed for proper body functioning is reached. The recommended daily requirement for vitamin C according to FAO (2001) is between 45.83mg/day to 68.50mg/day for both male and female adults between the ages of 19 to 65 years. Vitamin C is needed for the growth and repair of tissue in all parts of the body. It is a potent antioxidant and its deficiency results in scurvy and fragile blood capillaries.

## 4. CONCLUSION

Based on the results, the three leafy vegetables contain an appreciable amount of proteins, carbohydrates, crude fibre but with low lipids content. The vegetables contain substantial amount of vitamin C. The result suggests that these vegetables if consumed in sufficient amount would contribute significantly towards meeting human nutritional requirements for normal body functioning and life sustenance.

## 5. CONFLICT OF INTEREST

There is no conflict of interest associated with this work.

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