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Research Article

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Nutrient and Anti-Nutrient Composition of Ugwu (*Telfairia Occidentalis)* Leaves Obtained from Minna Metropolis Niger State

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Abstract From this present study, standard analytical procedures were used to determine proximate, mineral and anti-nutrient factors of the ugwu leaves. The proximate composition of the study samples was 30.00±0.60% for moisture content, 6.21±0.33% for ash, 12.11±0.22% for crude protein, 22.03±0.12% for crude fibre, 16.14±0.20% for fat content, 13.51±0.55% for carbohydrate content as well as 1032.83±0.32 kJ (metabolisable energy) obtained for bitter leaves respectively. The mineral concentration obtained from this studied shows reasonable contents which can be use particularly for pregnant women and children and anti-nutrient factor analyzed in this work is within permissible limits. Also, amino acids concentration of the work is shows great advantage since its has higher values of essential amino acid content, though both essential and non-essential amino acid are to complete each other.

Keywords Ugwu, proximate, mineral, amino acids

Introduction

Currently the need for sustainable development and economic recovery in the developing regions of the world is crucial particularly in the area of access to quality proteinous food and food security. Conversely, the commonly relied source of quality protein which is animal protein is grossly expensive and scarce [1]. Thus, legumes are rich sources of plant proteins present a substitute for the scarce animal proteins. Of the thousand known legumes species, less than 20 are used extensively today as food. Those commonly used include: peanuts, soyabeans, peas, lentils, pigeon pea, bambara groundnut and African yam beans. Oils, proteins, gums, resins and medicinal compounds could be derived from this extremely large family. Some leguminous leaves contain 20 to 40% protein on dry matter basis dry weight which is nearly twice the value found in cereals and 20 times that of cassava. Only a few grain legumes contain up to 50% proteins [2].

Vegetables are known to be important sources of protective foods [3]. Vegetables have also been reported to be good sources of oil, carbohydrates, minerals as well as vitamins [4]. According to George [5], 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 [4]. These vegetables however contain anti-nutritional factors that can affect the availability of the nutrients.

The aim of this study is to determine the nutrient and anti-nutrient compositions of this plant. In this work, proximate, mineral, amino acids and anti-nutrient was determined.

Material and Methods

The sample of *Telfairia occidentalis* used in this study was collected from a farm site at Wushishi town, Niger state, Nigeria. Prior to analysis, the leaves were washed with tap water then rinsed with distilled water. The residual moisture was evaporated at room temperature thereafter the leaves were oven dried at 60 °C until properly dried. The dried leaves were then ground in porcelain mortar, sieved through 2 mm mesh sieve and stored in polythene bag.

Methods

Proximate Analysis

Standard analytical methods of AOAC, [6] was used to determined moisture, crude protein, ash content, crude fibre, crude fat and carbohydrate was determined by difference.

Minerals Analysis

Sodium and potassium were determined using Gallenkamp Flame analyzer, while calcium, magnesium, iron, manganese, zinc, chromium and copper were determined using Buch Model 205 Atomic Absorption Spectrophotometer. Phosphorus level was determined using the phosphovanadomolybdate colorimetric techniques on JENWAY 6100 Spectrophotometer [6].

Anti-nutritional Analysis

Oxalate, phytate and cyanide contents was determined using the methods of Mathew *et al.*, [7].

Amino acid profile

The amino acid profile date palm sample was determined using methods described by AOAC, [6]. From the ground sample, 0.50 g was defatted with chloroform and methanol mixture in a ratio of 1:1. Then, 0.25 g of the defatted sample was put into a glass ampoule, 7 cm^3 of 6 M HCl prepared from 36% BDH stock solution was added and oxygen expelled by passing nitrogen into the ampoule. This was put in the oven at 105°C for 22 h, allowed to cool and filtered. The filtrate was then evaporated to dryness at 40°C under vacuum in a rotary evaporator. The residue was dissolved with 5 cm^3 acetate buffer (pH 2.0) and loaded into the amino acid analyser and the samples were determined by ion exchange chromatographic (IEC) method using the Technicon Sequential Multi-sample Amino acid Analyzer (Technicon Instruments Corporation, New York).

Statistical Analysis

Data generated in triplicates were expressed as mean ± standard deviation using SPSS version 16 statistical packages.

Results and Discussion

Table 1: Result of Proximate analysis of *Telfairia occidentalis* leaves (%)

Parameters	Values
Moisture	30.00±0.60
Crude fat	16.14±0.20
Crude fibre	22.03±0.12
Crude protein	12.11±0.22
Ash	6.21±0.33
Carbohydrate	13.51±0.55
Calorific value (kcal/100g)	1032.83±0.32

Values are Mean±SD of three differences

Table 2: Mineral compositions of *Telfairia occidentalis* leaves (mg/100g)

Parameters	Values
Potassium	106.23±0.03
Sodium	50.67±0.11
Calcium	16.27±0.50
Phosphorus	39.15±0.43
Magnesium	10.50±0.21
Copper	2.00±0.22
Iron	16.79±0.30
Manganese	11.46±0.13
Zinc	8.00±0.54

Values are Mean±SD of three differences

Table 3: Anti-nutritional compositions of *Telfairia occidentalis* leaves (mg/100g)

Parameters	Values
Cyanide	21.78±0.31
Phytate	30.02±0.14
Oxalate	26.30±0.22

Values are Mean±SD of three differences

Table 4: Amino Acids compositions of *Telfairia occidentalis* leaves (g/100g proteins)

Amino Acid	Concentration
Leucine	9.00
Lysine	3.82
Isoleucine	3.40
Phenylalanine	3.99
Tryptophan	1.00
Valine	3.51
Methionine	1.39
Proline	4.06
Arginine	6.19
Tyrosine	3.27
Histidine	2.43
Cystine	1.33
Alanine	3.34
Glutamic acid	13.70
Glycine	3.56
Threonine	3.11
Serine	3.73
Aspartic acid	9.99

Discussion of Results

The moisture obtained was30.00 ± 0.60%, though it was relatively low compared to the value of 81.4 -90.3% reported by Ifon and Bassir [8] in some Nigerian green leaf vegetables but high when compared with *U. lobata* (7.39 ± 0.06%) reported by Shaba *et al.*[9]. The Crude fat content of *T. occidentalis* leaves obtained for this work was 16.14 ± 0.60% is low which is in agreement with general observation that leafy vegetables are low lipid containing food, thus advantageous health wise to avoid over weighting but higher than value obtained for *Telfairia occidentalis* leaves 14.20±0.02 mg/100g reported by Idris, [10]. The concentration of fiber in the leaves of the sample was found to be 22.03± 0.12%. Compared to the RDA of fiber which are 19-25% for children, 21-38% for adult, 28% for pregnant mothers and 29% for breast-feeding mothers, the leaves of this plant could be a source of dietary fiber in human nutrition [10]. Carbohydrates provide the body with a source of fuel and energy that is required to carry out daily activities and exercise. Low carbohydrate content in *T. occidentalis* leaves 13.51± 0.55%; this was low compared to ugwu leaves (39.64 ± 0.28%) give rise to energy value of 1032.83±0.32 Kcal/100g. Leafy vegetables may not be important sources of carbohydrate as they are eaten along with other carbohydrate rich food such as cereals. Proteins are responsible for the formation of bones, teeth, hair and the outer layer of skin [11]. The Crude protein content of *T. occidentalis* leaves (12.11 ± 0.22%) indicated that this leafy vegetables are good sources of protein, the result obtained from this work was low when compared with 17.50% reported for *Gnetum africana* leaves by Ekop [12].

Table 2 shows the results of the mineral content of *Telfairia occidentalis* leaves. The potassium content in the sample was 106.23± 0.03 mg/100g which was found to be low compared to 2760.05 ± 0.02 mg/100g obtained for *T. occidentalis* leaves reported by Idris [10]. The result indicated that *Telfairia occidentalis* leaves are useful potassium sources which are advantageous health wise since any diet rich in this mineral element is important in preventing hypertension as potassium depresses blood pressure. Sodium, in combination with potassium in the body is involved in maintaining proper acid–base balance and proper nerve transmissions. The sodium concentration of this sample was 50.67 ± 0.11 mg/100g which is lower compared to 122.49 mg/100g for *Momordica balsamina* L. reported by Hassan and Umar [13]. The human body needs iron for the formation of the oxygen carrying protein haemoglobin and myoglobin. 16.79 ± 0.30 mg/100g was recorded as iron content in

T. occidentalis leaves. The leaves of this plant are good sources of this mineral element based on the RDA for iron which are 10 mg/day for adult male and children (7-10 years), 13 mg/day for pregnant and lactating mothers and 15 mg/day for adult female respectively [14]. Calcium plays an important role in building strong and keeping healthy bones and teeth's both early and later in life. The calcium level in the sample was 16.27 ± 0.50 mg/100g. Main function of Phosphorus in the human body is in the formation of bones and teeth. The leaves Phosphorus content was found to be 39.15± 0.43 mg/100g; this results was high compared to 13.02 ± 0.08 mg/100g obtained for *U. lobata* leaves reported by Shaba *et al.* [9]. This study recorded magnesium content to be 10.50± 0.21 mg/100g; the value was lower compared to 76.46 ± 0.02 mg/100g obtained for *U. lobata* leaves reported by Shaba *et al.* [9]. Magnesium is an important mineral element in connection with circulatory diseases such as ischemic heart disease and calcium metabolism in bone [15]. Zinc help to speed up the healing process after an injury. The concentration of zinc in *T. occidentalis* leaves was 8.00 ± 0.54 mg/100g. Compared to the RDA of zinc which is 10-19 mg/day, the leaves of the sample study was a moderate source of this mineral element. 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 [16]. The copper content obtained from this work was 2.00 ± 0.22 mg/100g. The value obtained from this work was similar to 2.32 mg/100g found in bitter leaf (*Vernonia amygdalina*) reported by Ibrahim *et al.* [17]. Manganese activates various enzymes which are important for proper digestion and utilization of foods. The leaves of *T. occidentalis* were found to contain 11.46 ± 0.13 mg/100g of manganese. The RDA for manganese are 2 – 5 mg/day for adult male and female, pregnant and lactating mother, 2 – 3 mg/day for children (7 – 10 years) [14], based on the RDA, it clearly indicated that this sample are good source of manganese.

The result of anti-nutritional compositions of the study sample was reported in the Table 3. The concentration of phatate was 30.02 ± 0.14 mg/100g and is relatively higher compared to 0.83 mg/100g reported for *Amaranthus hybridus* L. leaves by Akubugwo *et al*. [18]. The oxalic acid content was 26.30 ± 0.22 mg/100g and is relatively higher than 5.36l±0.14 mg/100g for *V. amygdalina* reported by Richard *et al.* [19]. The cyanogenic glycoside obtained from this sample was 21.78 ±0.31 mg/100g. This value was high compared with 16.99 mg/100g for *A. hybridus* L. leaves reported by Akubugwo *et al*. [18].

Table 4 shows the result of amino acids analyzed from this work, where all the essential amino acids were present. The 9.00, 6.19, 4.06, 3.99 and 3.73 g/100 proteins were analyzed for leucine, Arginine, proline, phenylalanine and serine respectively. The essential amino acid in this work was glutamic acid which content is dominant in this vegetables, this was about 13.70 g/100 proteins. The values derived from consumption of this plant is attributable to the glutamic acid content and its importance as explained by Gold, [20] some of which are: healing and repair of muscle tissues, clotting at site of injuries, production of growth hormones, regulation of blood sugar, increasing endurance and provision of energy in the body. Phenylalanine in pumpkin leaf was 3.99 g/100 proteins. Gold, [20] stated that phenylalanine is needed in treating brain disorder, normal functioning of the central nervous system, control of symptoms of depression and chronic pain, while tryptophan is important in the manufacture of neurotransmitter serotonin, which regulates mood and sleep pattern, treatment of jet lag, depression and binge eating. It is also required for treating vascular migraines, panic attacks, rheumatoid arthritis, and normal functioning of the central nervous system. Even though the free amino acids dissolved in tissue and plasma represents only a very small proportion of the body's total mass of amino acids, they are critical for the nutritional and metabolic control of the body's proteins. Unlike total body protein, the concentrations of individual free amino acids in body fluids can change substantially in response to dietary variations orpathological conditions [21] thus the leafy vegetables analyzed in this study could provide specific amino acids needed by the body. The body's capacity to conserve individual amino acids at low intakes varies widely, so the pattern of amino acids needed in the diet to match their individual catabolic rates does not correspond precisely with the composition of body protein [22]. The most notable non-essential amino acids in this research work was aspartic acid in pumpkin leaf (9.99 g/100 proteins). Cysteine is observed to be the limiting amino acid in this research showing the lowest content of 1.33 g/100 proteins. In some circumstances such as illness or nonavailability of enzymes, some non-essential amino acids, such as glutamine, tyrosine, and arginine, may not be synthesized by the body. When this occurs, such nonessential amino acids are said to be

conditional essential amino acids and thus must be provided through food intake. This is why even the non-essential amino acids from leaf vegetables as understudied are important should such situation arise. Other essential amino acid with appreciable content obtained in the analyzed vegetable was tryptophan 1.00 g/100 proteins.

Conclusion

The study shows that *T. occidentalis* is rich in carbohydrate, protein, fats and oil and some essential elements such as potassium, calcium, phosphorus and sodium. However, anti-nutritional factors obtained indicated that, the sample may be free of some of these anti-nutritive substances. Therefore, the nutritional composition of *T. occidentalis* was high enough for its inclusion in the diets of Nigerians as staple food. The amino acids compositions obtained for essential and non-essential amino acids were appreciable for contributing to human diet.

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