



The Mineral Composition and Proximate Analysis of *T. occidentalis* (Fluted Pumpkin) Leaves Consumed in Kano Metropolis, Northern Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author AMM designed the study, performed the statistical analysis and wrote the protocol. Author MBI wrote the first draft of the manuscript. Authors AMM and MBI managed the analyses of the study. Author AA managed the literature searches. All authors read and approved the final manuscript.

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Short Communication

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ABSTRACT

The work is aimed at the determination of the proximate and mineral composition of *T. occidentalis* leaves consumed in the Kano metropolis. The leaves used in this study were obtained from Sabon Gari market in Kano metropolis, Nigeria. The standard methods of food analysis were used for the proximate analysis, while the method of wet digestion was used for mineral composition. The results of the study revealed that *T. occidentalis* leaves contain high amount of crude protein and carbohydrate, while fat content in the present study was very low. Likewise, the chemical composition shows that the leaves are rich in Na, Mg, Ca, K, Cu and Zn. Hence, the *T. occidentalis* leaves could be good sources of nutrients in diets for consumption.

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1. 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 [1]. They are valued mainly for their high carbohydrate, vitamin, protein, fats and mineral contents which may be edible roots, stems, leaves, fruits or seed. Leafy vegetables are important items of diet in many Nigerian homes and are valuable sources of nutrients especially in rural areas where they contribute substantially to protein, mineral, vitamins, fiber and other nutrients which are usually in short supply in daily diets [2]. Although there is low level of protein in vegetables, there is increasing awareness of the importance of vegetable in maintaining health, particularly in areas where animal protein is scarce [3]. According to [4], vegetables contain low calories and negligible quantities of utilizable energy, hence are ideal for obese people who can satisfy their appetite without consuming much carbohydrate [5].

T. occidentalis (fluted pumpkin) commonly known as Ugwu is a creeping vegetable that spread across the ground with lobed leaves and thrives best in soils rich in organic matter. *T. occidentalis* leaves play important role in human and livestock nutrition as it is believe to be source of protein, oils, fats, minerals and vitamins. It's mostly cultivated and often used in the preparation of many soups in southern Nigeria; one of this is "Edikang Ikong soup". There is limited numbers of literature on the nutritional composition of *T. occidentalis* consumed in the northern part of Nigeria. Therefore the aim of this work was to determine the proximate and mineral composition of the *T. occidentalis* leaves consumed in Kano metropolis, northern Nigeria.

2. MATERIALS AND METHODS

Analytical (AnalaR) grade reagents and deionized water were used for the study. All glassware and plastic containers used were washed with liquid soap, rinsed with water, soaked in 10% (v/v) nitric acid for 24 hrs, cleaned thoroughly with distilled water and dried.

2.1 Sample Collection

The *T. occidentalis* leaves used in this study were obtained from Sabon Gari market in Kano metropolis, Nigeria.

2.2 Sample Treatment

The *T. occidentalis* (fluted pumpkin) leaves were thoroughly washed with distilled water to remove soluble impurities; air dried inside the laboratory at room temperature and then crushed using mortar and pestle into fine powder.

2.3 Proximate Analysis

Proximate analysis (moisture, ash, protein and fat content) was determined using standard method of AOAC [6]. Carbohydrate was determined by difference.

2.4 Determination of Mineral Composition

2 g of the sample were accurately weighed into porcelain crucible and ashed at 450-500°C and then cooled to a room temperature in a dessicator. The ash was digested using 5 mL mixture of HNO₃, HClO₄ and HCl in a 3:1:1 ratio; the digested solution was carefully transferred into a 100 mL volumetric flask and made up to the mark with distilled water. The minerals content (K, Na, Ca, Mg, Cu, Zn, and Fe) was determined using atomic absorption spectrophotometry ("AA-6800) analysis. Triplicate digestion of samples and blank were carried out to ensure precision. Appropriate quality assurance procedures and precautions were carried out to ensure reliability of the data.

3. RESULTS AND DISCUSSION

The results of the proximate and mineral composition are shown in Tables 1 and 2 respectively.

Table 1. Proximate composition of *T. occidentalis* (fluted pumpkin) leaves

Composition	[%] amount
Moisture	7.45 (6.6 [7], 10.94 [8])*
Ash	7.73 (12.3 [7], 8.31 [8])*
Fat	2.0 (10.7 [7], 6.46 [8])*
Protein	56.0 (35.4 [7], 21.14 [8])*
Carbohydrate	26.82 (33.4 [7], 53.10 [8])*

*the values in the brackets were obtained by Adeyeye [7] and Usunobun, [8] respectively

The result of the proximate analysis is comparable with those obtained by other workers [7,8]. The present study shows that *T. occidentalis* leaves contain high percentage of protein (56%), and carbohydrate (26.82%), while

the % composition of fat (2%) is relatively low. This might be attributed to the quantity of fertilizer applied during cultivation. Comparatively, the crude protein content of *T. occidentalis* leaves is higher than protein content of many vegetable leaves consumed in Nigeria as reported in many literatures [5,7,8]. According to Pearson [9], plant foods that provide more than 12% of its calorific value from protein is considered good source of protein hence *T. occidentalis* leaves could be considered as a readily available and cheap source of protein for normal body function. When an animal is deprived of food, stored glycogen and fats are the first food reserves to be respired. When all these reserves are exhausted, protein is broken down as fuel for energy: when this happens cell structure soon degenerates and metabolism slows down and finally stops [10]. Adults, children, pregnant and lactating mothers require 34 - 56, 13 - 19 and 17 - 71 g of protein daily, respectively [11]. The % carbohydrate composition obtained in the present study is comparable to 20%, and 23.7% reported for *Senna obtusifolia*, *Amaranthus incurvatus* leaves, respectively [12,13]; and *Amaranthus cruentus*, (29.41%), *Celusia argenta* (32.84%) and *Corchorus olitorius* (31.34%), respectively [5]. The recommended carbohydrate dietary allowance values for children, adults, pregnant and lactating mothers are 130, 130, 175 and 210 g, respectively [13]. High moisture content makes vegetable easily susceptible to deterioration, however the % moisture composition of *T. occidentalis* leaves was very low. This value is lower than those reported earlier for some Nigeria green vegetables [14]. Vegetables are deficient in fats and this makes them good for health, likewise, % fat content of *T. occidentalis* leaves was significantly low and may be recommended for obese patients. The fat content (2%) of the studied leaves is lower than those values reported in some vegetables consumed in West Africa [15,16]. Ash residue is generally taken to be a measure of the mineral content of the original food. It was observed that *T. occidentalis* leaves have a considerable amount of crude ash.

The result of the mineral analysis shows that Na, Mg, Ca and Zn were present in considerable amount and the result is comparable with those obtained by [8], but higher than in [7]. However, moderate amounts of copper, zinc, and magnesium were present. Sodium is involved in the regulation of plasma volume, acid-base balance, nerve and muscle contraction [17].

Magnesium is a component of chlorophyll; an important mineral element in connection with ischemic heart disease and calcium metabolism in bones [18]. Iron is an important constituent of haemoglobin. The leaves has a considerable amount of calcium which is good for growth and maintenance of bones, teeth and muscles. Zinc is involved in normal function of immune system and is a component of over 50 enzymes in the body [19]. The leaves can supplement the daily requirements of Ca, Na, Mg and Zn.

Table 2. Mineral composition of fluted pumpkin leaves

Mineral	Concentration (mg/100 g)
Sodium	89.7 (31.2 [7], 51.49 [8])*
Magnesium	33.0 (14.3 [7], 61.03 [8])*
Calcium	75.0 (14.3 [7], 61.03 [8])*
Potassium	352.0 (20.4 [7], ND [8])*
Copper	36.4 (ND [7], 0.93 [8])*
Iron	3.7 (6.4 [7], 25.75 [8])*
Zinc	19.3 (11.6 [7], 13.15 [8])*

*the values in the brackets were obtained by Adeyeye [7] and Usunobun, [8] respectively.
ND=Not detected by the author

4. CONCLUSION

This study evaluated the proximate and chemical compositions of *T. occidentalis* leaves consumed in Kano metropolis, northern Nigeria. The result in the present study revealed that *T. occidentalis* leaves contain high amount of crude protein and carbohydrate, while fat content was very low. Generally, *T. occidentalis* are poor sources of fat which make them good food for obese people. Likewise, the chemical composition shows that *T. occidentalis* contain Na, Mg, Ca, K, Cu and Zn in significant amount. The leaves of this vegetable could be good sources of nutrients for local consumption.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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