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Nutritional Quality of *Corchorustridens* Linn

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***Abstract**: The nutritional content of the leaves of Corchorustridens*Linn *(a less utilized green leafy vegetable) was analyzed using some analytical methods. Significant amounts of carbohydrate (7.29 %), protein (7.72 %), lipids (5.63 %), fiber (8.40 %), vitamins (Vitamins A, B_1, B_2, B_3 and C), moisture (67.62 %) and ash (4.27 %) were found. Their amounts in this plant's leaves compares favorably well with those found in exotic vegetables. Therefore, its consumption can supplement the nutritional requirement (RDA) of its consumers. Though some amounts of anti-nutritionals were detected and quantified (Phytates, 0.33 mg/100g; Oxalates, 1.26 mg/100g; Tannins, 0.59 mg/100g and HCN, 1.11mg/100g) in the plant which may interfere with its nutrient utilization but their concentrations are not up to toxic levels and may be removed during processing before consumption.It is concluded that the young leaves of C. tridens*L. *are rich in these nutrients and their levels fall within other popular ediblevegetables. It is therefore recommended for human consumption in every household. It is also suggested that further research be carried out on its economic status.*

***Key words:** Corchorustridens*Linn, *Nutrients and Anti-nutrients.*

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I. Introduction

The indices of nutritional quality for food itemsdepend on the quantity and quality of the various classes of nutrients contained in them [1] and amounts of anti-nutritional factors that hinder better utilization of the items [2]. These classes of food include carbohydrates, proteins, lipids, vitamins, mineral elements, fibers and water. Evidences have shown that no food item can contain all these classes of nutrients in quantities that can sustain the healthy living of an individual. In fact, in the developing and the underdeveloped countries, malnutrition has been prevalent due to poverty, poor diet, near exclusive reliance on plant sources for nutrients and high rates of infections. According to the Food and Agricultural Organization (FAO), there are about 840 million undernourished people in 1998–2000, of whom 799 million are in developing countries, 30 million in the countries in transition and 11 million in theindustrialized countries [1, 2, 3,4, 5, and 6]. These figures are on the increase every year.

To overcome the situation, interests have been focused on empowerment of the people, propagation, exploitation, utilization and quantification of food plants, especially the vegetables [4, 6, 7, and 8] that may improve the nutrition status of the people in these areas.

Vegetables being rich source of carbohydrates, fats and proteins, form a portion of the human diet and are cheaper source of energy [6]. The plants that serve as vegetables may be cultivated, semi-cultivated or uncultivated (wild). The ones cultivated or semi-cultivated may be grown in homes, gardens or intercropped with other crops. Though vegetables are known to be integral part of dishes in many regions of Nigeria, an insignificant proportion of our indigenous vegetable species are cultivated, most of them remain as wild species to which the plant in this work (*C.tridens* Linn) belongs [9].

The plant *C.tridens* L. belongs to the family *Tiliaceae*. Its common names include turgunnuwa, or Lalo – Hausa/Fulani [10]. The leaves and young shoots of the plant are used as a vegetable and soup herb, and are also a good fodder for camels and other domestic stock. It yields a good fiber used for fishing lines in northern Nigeria and elsewhere. When long, the stems are used for horizontal ties of conical hut roofs [10].

Phytochemical analysis of the *Corchorus* sp. to which C. *tridens* L. belongs indicates the presence of cardiac glycosides, triterpenes, ionones, phenolics, sterols,coumarins, steroids and fatty acids [11]. The plant was also found to contain some substantial amount of P, Na, K, Mg, fat, carbohydrate and amino acids [12, 13].

In this work an attempt has been made to ascertain the nutritional quality of the plant by determining parameters such as moisture, ash, carbohydrate, protein, lipids, vitamins and anti-nutritionals.

II. Materials and Methods

C.tridens Linn was identified at the Department of Biological Sciences of Ahmadu Bello University (ABU) Zaria and voucher specimen is kept there.Samples of the plant materials (roots, stems, fruits and leaves)

were collected from Karkari village, Gwarzo Local Government Area of Western part of Kano State, Nigeria and transported in polythene bags. After collection, the samples were washed twice with tap water and rinsed with deionised water. They were air dried and then further dried in an oven at 60^{o}C. After drying, the samples were ground using pestle and mortar and passed through 125µm mesh sieve.

Standard analytical methods [14] were used for the proximate analysis;moisture content was calculated from a weighed sample after heating at 105^{o}C for 4hrs.Total nitrogen was determined by the Micro-Kjeldahl method, and crude protein estimated by multiplying thetotal nitrogen (N) by 6.25, a conversion factor. Total lipids were estimated by petroleum ether extraction, usingSoxhlet apparatus. Carbohydrate content was estimated by difference while calorific value was estimated by multiplying the percentages of crude protein, crude lipid and carbohydrate by the recommended factors (2.44, 8.37 and 3.57 respectively) used in vegetable analysis [15]. The total ash was estimated afterincinerating in an ashing muffle furnace for 12hrs at 550^{o}C.Spectrophotometric methods [16] were used for the determination of vitamins A and B in the samples while iodine method was used for the determination of vitamin C [17]. For anti-nutritional content of the leaves of C.*tridens* Linn the method of Reddy and Love [18] was used; for oxalates, the method of Day and Underwood was used [19]; tannins and HCN the method of AOAC, 1995 [14].

III. Results and Discussion

Table 1 below depicts the results of some nutrition parameters of *C.tridens*Linn. The moisture content on wet weight basis (67.84 %) is high as expected and is higher than what was obtained in *Z. zanthoxyloides*, *V. doniana*and *A. cissampeloides*(9.6 – 10.8 %) on dry basis [13]. The significance of moisture content of green leafy vegetables is to act as a solvent that aid in all biochemical reactionsand physiological activities during digestion. However, foods with high moisture contents are prone to easy microbial spoilage and subsequent short shelf life [14 – 15]. Moderate moisture content of ≤ 12mg/g is preferred for shelf stability of fruits, vegetables and other food items on long storage [13].

The ash content of this plant is 4.27 mg/100g and is lower than that of *A. digitata,* (8.14mg/100g)[6], *Cassia tora* (9.86%) and *Celtisintegrifolia* (13.53 %). Ash content representsthe index of mineral elements present in a sample [16]. Its amount is useful in assessing a plant andgives an idea of the amount of minerals present in a sample [17].

Table 1: Nutrient contents of*C.tridens*Linnin percentage (%)

Nutrient	Concentration	RDA
Moisture	67.62±0.41	NA
Ash	4.27±1.6	NA
Crude protein	7.72±1.56	56.0
Crude lipid	5.63±012	30.0
Crude fiber	8.40±0.51	21 – 38
Carbohydrate	7.29±0.07	130.0
Calorific value	100.20	2600 – 2800

Source of RDA for the nutrients: National Research Council (NRC), 1989 [20]

Table 2: Vitamin contents ofC. *tridens* Linn in mg /100 g

	Concentration	RDA
VitaminA(Retinol)	345.84±0.21	900.0µg
Vitamin B_1 (Thiamin)	0.68±0.35	1.20mg
Vitamin B_2(Ribflavin)	1.072±0.22	1.30mg
Vitamin B_3(Niacin)	0.72±0.02	90.0mg
Vitamin C (Ascorbic acid)	178.33±5.7	15.0mg

Source of RDA for Vitamins: U.S. Food and Nutrition Board, 2001 [21].

Table 3: Anti-nutrient content ofC. *tridens* Linn in mg/100g

Anti-nutrient	Concentration	RDA
Phytates	0.33±0.04	400.0 – 800.0
Oxalate	1.26±0.32	71.0
Tannins	0.59±0.13	50.0
HCN	1.11±0.09	0.5 – 3.

Source of critical values of anti-nutrients: Munro and Bassir, 1973 [22] and Ikediobi*et. al*, 1980 [23].

The crude protein and crude lipid contents of C. *tridens* Linn as indicated in table 1 above are 7.72 % and 5.63%. These values are not inferior when compared to other commonly used vegetables (*DigeriaMuricata* L. 8.8% and 3.2 % [24]; Moringaoleifera, 10.74% and 10.21 %) [25]. The crude fiber content of C. *tridens*Linnis high (8.4 %) when compared to lower values in some vegetables (0.3 – 1.2 %) [26] and (0.21 – 0.33 %) [27]. Vegetables are good sources of fiber, which lowers the body cholesterol level and consequently

decrease the risk of cardiovascular diseases. The carbohydrate content of this plant (7.29 %) is relatively high when compared to some other vegetables (e.g. 6.25 % in *Corchorusolitorious* Linn, 4.45 % in *Ocimumgratissimum,* 3.17 % in *Talinumtriagulare* and 5.65 % *Telfariaoccidentalis*) [28]. The percentage of carbohydrate in the plant is an indication that, it can be used to regulate various metabolic processes in the body as key molecules in the central metabolic pathways of the body. Carbohydrate also 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 [16].

For the calorific value of *C.tridens* Linn, the 100 g sample of it provides 100.20 Kcal of energy. This implies that, the sample plant can contribute meaningfully to the daily energy requirement of a person. Alhough the calorific value of the plant is high as compared to *A. viridus*(31.63 Kcal), *S. pecten-veneris*(50.23 Kcal) [29]. It is lower than that of *A. caudatus*326.7 Kcal, *Dioscoreabulbifera (*304.7 Kcal)*Aeglemarmelos*(134.6 Kcal) and *Ficusbengalensis (*333.1 Kcal) [30].

The results of the vitamin analysis of the leaves of *C.tridens* Linn (table 1) showed that the plant is rich in vitamins (table 1). Retinol (vitamin A) is 345.84mg/100g, thiamin (vitamin B_1), 0.68mg/100g, riboflavin (vitamin B_2), 1.072 mg/100g, ascorbic acid (vitamin C), 178.33 mg/100g and niacin (vitamin B_3) 0.72 mg/100g.

The anti-nutritional composition of *C.tridens* Linn is also depicted in Table 3. Amount of phytate is low and is at 0.33 mg/100g levels because it is necessary to select those vegetables possessing low amounts of phytate for consumption. Phytates reduce the uptake of essential dietary minerals such as iron, zinc and calcium in the human intestine [30]. Amounts of oxalates and tannins are also low (1.26 and 0.59 mg/100g) compared to what is obtainable elsewhere in some other vegetables [31 – 32]. Oxalate like phytate can bind to calcium present in food thereby rendering it unavailable for normal physiological and biochemical role such as the maintenance of strong bone, teeth, cofactor in enzymatic reaction, nerve impulse transmission and as clotting factor in the blood [33]. The calcium oxalate, which is insoluble, may also precipitate around soft tissues such as kidney, causing kidney stones [34]. Tannins also bind with carbohydrates and with metal ions and more importantly inactivate digestive enzymes. They also damage gut cells and are responsible for astringent taste due to a cross-linking between tannins and proteins and glycoproteins and as an anti-nutritional factor limit the wide spread use of some plants. The combined effect of tannins with concentrations of several other anti-nutritional factors can further reduce the nutritional value of the plant [2].

The results of the analysis have also indicated that, the level of hydrogen cyanide in *C.tridens*Linn (1.11mg/100g)seems to be negligible when compared with lethal level of hydrogen cyanide (36 mg100 g^{-1}) [33].

IV. Conclusion

This study suggests that leaves of *C.tridens* Linn is a rich source of carbohydrate, lipids, proteins, fiber, vitamins and energy and can supplement the nutritional status of its consumers. Although, the plant has been found to possess a number of anti-nutritionals that may limit the availability of the nutrients on consumption, the amounts are lower than the established toxic levels. In fact their levels can be drastically reduced or eliminated by subjecting the leaves to certain processes (e.g cooking, soaking in water, boiling etc.) before consumption [32 – 35].

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