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Comparison of the Nutritive Value of the Yellow and Brown Varieties of Tiger Nut

*Emurotu, J.E
Department of Chemistry Kogi State University, Anyigba
Corresponding Author: Emurotu, J.E

***Abstract*:** *The proximate and mineral compositions of the brown and yellow variety of tiger nut (Cyperus esculentus) flour were determined using standard analytical technique. The proximate composition of the yellow variety was crude protein (7.70%), crude fat (21.9%), crude fiber (26.0%), ash (1.69%), carbohydrate (33.5%), moisture (11.2%), and pH (7.10). Corresponding values of the brown variety was crude protein (7.50%), crude fat (23.1%), crude fiber (23.3%), ash (1.71%), carbohydrate (34.3%), moisture (10.02%), pH (7.00). The mineral content (mg/100g) of the yellow variety is Na 160, K 696, Fe 2.28, Cu 2.0, Ca 120 and Mg 111. Corresponding values for the brown variety are Na 538, K 1634, Fe 1.04, Cu 2.0, Ca 515, and Mg 131. Lead and cadmium were not detected in both varieties. The results showed that tiger nut is highly nutritive and can provide a lot of energy like some starchy food.*

Keywords: *Cyperus esculentus, mineral element, nutritive value, proximate composition, tiger nut,*

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I. Introduction

Tiger nut *(Cyperus esculentus*) is a crop that belongs to the family of *Cyperaceae*. It is a monocotyledonous plant with over 4000 species known worldwide. It produces rhizomes and tubers at the base which are spherical like. Vegetative colonies of its plants are grown from the tubers and their rhizomes [1, 2]. It often called chufa, nut grass, yellow nut sedge, earth almond, edible galingale and ground almond [3, 4,]. In Nigeria, Hausa called it "Ayaya" the Igbo refer to it as Akiausa" while it is "Ofio" in Yoruba and Hausa groundnut in pidgin english. It is a worldwide nut but cultivated mainly in warm and temperate zones, especially in Southern Europe and Africa. It can either be eaten raw or roasted. Also the juice when pressed can be used to make beverage or milk [5]. Report has it that when ground and mixed with sugar, cinnamon vanilla and the cream, it makes a refreshing beverage. Similarly, the tubers when roasted serve as an alternative for coffee [6].
Tiger nut is of nutritional and health importance. Oguntona and Akinyele described it as an important food of high nutritional and economic values [7]. Tiger nuts have very good nutritional quality with a fat composition that can be compared with that of olive oil. It is also rich in mineral content, especially phosphorus and potassium [8, 9]. The rich nature of tiger nut in mineral content such as calcium, potassium, magnesium, zinc and traces of copper has also been reported [10, 11]. The milk extract is reported to contain more of protein and low in fat content [12]. The nutritional profiles and unique functional properties have made tiger nut as unique food [1] like beverage, flour [11, 13], edible oil [14, 15]. Tiger nuts are known for their health benefits because they are rich in fibre, protein and natural sugars, minerals (phosphorus, potassium), and vitamins E and C[16, 2]. Similarly, it is rich in monounsaturated fatty acid content as well as high vitamin E levels and prebiotic qualities [9, 17, 18]. The importance of vitamin E has been well documented as an antioxidant that helps to protect the body system from radical attack and cell membranes maintenance. Of particularly importance, is in the areas of the body exposed to oxidative stress like the lungs and the red blood cells [9, 19]. Tiger nut tubers can be processed in different ways to obtain different products such as milk, flour, oil, cake, cream cheese, chocolate, biscuits, cookies, etc. A whole lot of uses of tiger nut have been documented. Tigernut tubers are of different varieties, the popular ones are black, yellow and brown which come in various sizes [20]. The yellow variety is preferred to other varieties because of its larger size, more attractive color and has flesher body [21, 22, 16]. The aim of this study is to compare the proximate nutritive value of the preferred yellow variety to the brown variety. The study also looks out possible presence of some heavy metals in each of the variety.

II. Materials And Methods

2.1 Collection of samples

Tiger nut where collected from local vendors in Anyigba, Dekina Local Government Area in Eastern part of Kogi State.

2.2 Preparation of samples

Seven hundred grams (700g) each of the yellow and brown varieties was washed with distilled water to remove impurities and air dried on aluminium trays. Further drying was done in an oven at 50^{o}C for 24 hours. The tiger nuts were ground into powdered flour using mortar and pestle. This was sieved and ready for analysis.

2.3 Proximate analysis

The recommended methods of the association of official analytical chemists [23] were used for the determination of moisture, ash crude lipid, crude fibre and nitrogen content. Percentage of carbohydrates was determined by difference.

2.4 Determination of mineral element

1g of the sample (dry) was weighed into a digestion flask and 20ml of acid mixture (650ml Conc. HNO_3, 80ml $HClO_4$ and 20ml Conc. H_2SO_4) was added to it. The flask was heated in a fume cupboard until a clear digest was obtained. The digest obtained was transferred into a 100ml volumetric flask and made to mark with distilled water. Blank sample and standard solution for the various elements were similarly prepared. Flame photometer (Jenway PFP7 model) was used to determine Na, Ca, Mg and K. while the other elements Cu, Cd, Fe and Pb were determined using Atomic Absorption Spectrophotometer (AAS Buck 210 VGP Model).

Quality Assurance: Appropriate quality assurance procedures and precautions were carried out to ensure reliability of the results. Samples were generally carefully handled to avoid contamination. Glassware was properly cleaned, and the reagents were of analytical grade. Double distilled deionised water was used throughout the study. Reagents blank determinations were used to correct the instrument readings. Stock standard solutions for the atomic absorption analyses were prepared from Analar R grade salts. Working standards were made from the stock by dilution of measured aliquots.

III. Results And Discussion

3.1 Results of proximate analysis and Elemental analysis.

The result of the proximate composition of yellow and brown tiger nuts is given in Table 1. The index of nutritional potentials of a crop has been reported to be based on the food proximate composition [1]. The yellow variety gave proximate values (%) of 11.16, 7.70, 26.0, 21.9 and 33.5 for ash, crude protein, crude fibre, crude fat and carbohydrate respectively. Corresponding values of the brown variety gave 10.02, 7.50, 23.3, 23.1 and 34.34 ash, crude protein, crude fibre, crude fat and carbohydrate respectively. The pH of 7.10 and 7.00 was recorded for the yellow and brown variety respectively with an average value of 7.05±0.07. The pH values did not differ. These values are slightly higher than 6.12 reported by Belewu and Belewu [16]. The ash content of 1.69% and 1.71% of the yellow and brown variety is similar and can be use for the formulation of animal feed. The range of 1.5 to 2.5% has been recommended for feed formulation [24]. The obtained values compared well with 1.80 and 1.86 that has been reported previously [25, 26] but significantly different from 0.47 reported by other researcher [16]. The moisture content of the yellow variety was 11.16% while the brown variety was slightly lower with a value of 10.02%. The difference is however, not significant. The moisture content of this study is comparable to the value of 11.4% (raw) and 11.2% (roasted) tiger nut tuber flour [1]. However, this study values are significantly higher than 3.73% (raw) and 4.66% (cooked) reported by Aremu *et al*. [27]. The susceptible to microbial attack for these samples is therefore higher than the ones examined by Aremu et al. as high moisture content aid microbial attack. The protein content of the yellow variety was 7.70% while that of the brown was 7.50%. Both varieties contains substantial amount of protein. Either of the two depending on availability can serve as a source of protein as the difference in protein content is not significant. The protein content of this result is higher than 1.5%, 8.05%, 6.80%, and 4.33% previously reported in Nigeria and Egypt [28, 29]. The crude fibre of the yellow and brown variety was 26.0% and 23.3% respectively. This study result is comparable to 24.0% (raw) and 23.3 (roasted) previously reported [1].

Table 1: Proximate composition of yellow and brown tiger nut

Parameters	YTN	BTN	Mean
pH	7.10	7.00	7.05±0.07
Ash %	1.69	1.71	1.70±0.01
Moisture%	11.16	10.02	10.59±0.81
Crude protein%	7.70	7.50	7.60±0.14
Crude fibre%	26.0	23.3	24.7±1.9
Crude fat %	21.9	23.1	22.45±0.78
Carbohydrate%	33.5	34.3	33.92±0.59

Table 2: Result of some metals (mg/100g) in yellow and brown tiger nut

Metals	YTN	BTN	D*
Na	160	538	343
K	696	1634	86
Ca	120	515	100
Cu	2.00	2.00	4.86
Fe	2.28	1.04	4.12
Mg	111	131	94.4
Cd	ND	ND	-
Pb	ND	ND	-

D*

However, this study result is higher than 18.4%, 15.42%, 7.02 (raw) and 4.02% (cooked) in previous studies both in Nigeria and Egypt [28, 29, 27]. The high dietary fiber content of tiger nut makes it useful and effective in the treatment and prevention of many diseases such as colon cancer, coronary heart diseases, obesity, diabetics and gastro intestinal disorders [30]. The crude fat of the yellow variety was 21.9% and is slightly lower than 23.3% of the brown variety. The difference is not significant and any of the variety would rank well with other whole grains or starchy roots, such as potatoes, mature leguminous seeds, nuts and fruits [31]. Crude fibre in the diet consists mostly of the plant polysaccharides like cellulose that cannot be digested by human dietary enzymes. However, crude fibre is a vital component in the body since it increases stool bulk, and decreases the time that waste materials spend in the gastrointestinal tracts [32]. The carbohydrate content of the yellow variety was 33.5% while the brown variety was 34.3%. Basically no difference and the yellow and brown variety can be a good source of carbohydrate. The values recorded in this study are lower than 43.0% and 48.12% previously in Nigeria and Egypt respectively [28, 29]. Similarly this study results are also lower than 67.48% reported previously of Tiger nut cultivated in northern Nigeria.

Results of elemental analysis of yellow and brown tiger nut revealed that both varieties can provide a good source of minerals. For the yellow variety, the level (mg/100g) of Na, K, Ca, Cu, Fe and Mg are 160, 696, 120, 2.00, 2.28 and 111 respectively. Corresponding levels (mg/100g) of Na, K, Ca, Cu, Fe and Mg in the brown variety was 538, 1634, 515, 2.00, 1.04 and 131 respectively. The result revealed the brown variety has more mineral content compared to the yellow variety. The least abundant minerals were Cu and Fe while K was the most abundant. Potassium has previously also been reported as most abundant mineral in Nigerian agricultural products [33, 27]. The high content of K compared to Na content is good. The ratio of Na to K in the body has been reported to be of concern. In this regard the ratio of Na to K should be <1 for the prevention of high blood pressure [34]. The concentration ratio of Na to K of this study in both varieties are <1. Therefore intake of tiger nut may probably reduce high blood pressure a dreaded diseases. Pb and Cd were not detected in both varieties and this makes the tiger nuts safe for human consumption. Cadmium and lead are toxic metals that must not be present in any food item.

IV. Conclusion

The yellow and brown variety is highly nutritious. The yellow and brown variety can be easily substituted for each other. Although in the mineral composition there is a large difference between the two varieties with the yellow variety having a higher composition of mineral elements determined.

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