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Research Article

# Proximate Analysis on Ungingered and Gingered Tiger Nut's Drink Commercialized in Some Major Towns in Rivers State, Nigeria

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**Abstract:** Fresh tigernut drink (*Cyperus esculentus*) was investigated for its proximate composition for ungingered and gingered tigernuts drink in some commercialized towns in Rivers State, Nigeria using the various methods described by the Association of Official Analytical Chemist (AOAC), 2010. The proximate analysis of the fresh tigernut drinks revealed that moisture content (86.51 ±2.10; 82.26 ± 1.36) has the highest value followed by carbohydrate (7.20 ± 2.05; 10.17 ± 1.82), crude protein (2.83 ± 0.25; 3.34 ± 0.42) crude fat (1.62 ± 0.17; 2.50 ± 0.23), crude fiber (1.52 ± 0.18; 1.43 ± 0.31) and ash content (0.320 ± 0.16; 0.30 ± 0.03) respectively for ungingered and gingered tigernuts drinks. This study observed statistically significant variation ($P<0.05$) in the moisture content, protein value, fat concentration and carbohydrate between the ungingered and gingered tigernut drinks. However, the fibre and ash contents showed no significant statistical variations ($P>0.05$). In conclusion, the results provide additional information about the nutritional value of ungingered and gingered tigernuts drinks. The gingered tigernut drinks were revealed to contained higher level of energy-giving nutrients which is found to be beneficial for consumer's population in Port Harcourt metropolis.

**Keywords:** Proximate, Tigernut, Ungingered, Gingered, Nutrients.

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## 1. Introduction

Tigernut, or (Cyperus esculentus,) is a monocotyledonous perennial that grows to a maximum height of 24-55 cm and has a fibrous, upright root system (Maduka and Ire, 2018). The Cyperaceae family of plants is an excellent source of many nutrients, including but not limited to: energy, fat, carbs, fibre, glucose, and protein (Muhammed et al. 2011). Many essential nutrients, including vitamins and minerals, and digestive enzymes like catalase, lipase, and amylase, are abundant (Adejuyitan, 2011). Raw tiger-nut has been shown to contain several phytochemicals and antinutrients, including alkaloids, cyanogenic glycosides, resins, tannins, sterols, oxalates, phytates, and saponins (Chukwuma et al. 2010). Europe, South America, Asia, and Africa all have tigernut plantations. Food shortages have made this sweet tuber a popular dish (Bilikis and Olanrewaju, 2015). This was found to be the case by (Djomdi et al., 2013). Due to their availability throughout the year, tigernut tubers are routinely processed into new forms for consumption. In Africa, where tubers are widely consumed, this method of preparation is commonplace. These diets are inadequate for encouraging infant growth in developing countries due to their high anti-nutrient

content (Nnam 1995; Onilude et al. 1999). They have a better nutritional profile when mixed with other foods, which is well proven. It's also common knowledge that certain types of processing can increase a food's nutritional content by making it more digestible and reducing the amount of antinutritional chemicals (Ejoh et al. 2006). Many cultivars are produced, but only the yellow and brown varieties with some therapeutic characteristics make it to market (Suleiman et al. 2018; Farre, 2003). In particular, the yellow variety was in high demand because of its eye-catching colour, greater size, and meatier nuts. It produces more milk each lactation, is higher in protein content, and is lower in fat and anti-nutritional factors like polyphenols (Maduka and Ire, 2018). Such findings were published in 2013 (Musa and Hamza). Tigernut juice, a naturally energizing drink, is produced by blending crushed tigernut tubers with cinnamon, sugar, and vanilla. After ingesting this beverage, many people report feeling energised (Sánchez-Zapata et al., 2012).

Because of its high nutrient content, including carbs, glucose, proteins, minerals like phosphorus and potassium, and vitamins C and E, tigernut drink is a healthy and energising beverage. Similarly, it contains a high concentration of oleic acid, which strengthens the immune system and reduces the risk of contracting diseases including diarrhoea, constipation, and heart disease (Suleiman et al. 2018; Bixquert, 2003). Widespread consumption of tigernut drink in Nigeria has been linked to no adverse events (Onuoha et al. 2017). Several studies have been conducted on the nutritional composition of tigernut tuber variations from different locales (Nwaoguikpe, 2010). Nutritionists have taken an interest in tigernut tubers because of their widespread application in food production (Maduka and Ire, 2018). For more than just their ability to relieve thirst, people have been interested in and buying plant-based milk alternatives like tigernut in recent years. Because of its perishable nature, tiger-nut drink is best consumed within two to four hours at temperatures between forty and one hundred degrees Celsius (Akoma et al. 2006). Scientists discovered that tiger-nut milk, when pasteurised and flavoured with citric acid, ginger, and garlic, can stay fresh for an additional 2–3 days (Nwobosi et al. 2013). The anti-nutrient properties of the tigernut drink were drastically altered when spices were added as natural preservatives; these spices prevented the growth of micro-organisms throughout cold storage (from 5 days to indefinitely) (Kayode et al. 2021; Maxwell et al. 2018). This study aims to do just that by contrasting the nutritional profiles of ginger-infused and ginger-free tiger nut drinks already on the market.

## 2. Materials and Methods

### 2.1. Sample Collection

The tiger nut drink samples used in this study were purchased from three (3) vendors from different location in Choba, Eleme and Alakahia in pairs, stored with an ice chest container and then transported to the laboratory for proximate analysis.

### 2.2. Standards and Reagents

All reagents were of analytical reagent grade. De-ionized water was used for all dilutions. Nitric acid was not less than 65%, with a density of approximately 1.4 g/mL. Sulfuric acid (concentrated, N-free), Petroleum ether or Diethyl ether,

Catalyst/salt mixture (Kjeldahl digestion tablets), Nitrogen-free, anhydrous Sodium Sulphate, Sodium hydroxide solution, 50 %, w/v, Boric acid solution and Standardized HCl solution.

### 2.3. Sample preparation

**Figure 1.** Flow chart for Tigernut milk drink production

Fresh Tigernuts
↓
Sorting and washing
↓
Grinding/ milling
↓
Extracting/ sieving
↓
Pasteurizing (72$^{o}$C for 5s)
↓
Homogenizing
↓
Bottling
↓
Cooling
↓
Tigernut milk

Source: Udeozor, (2012)

**Figure 2.** Picture of Tigernut seed and Milk extract

### 2.4. Sample analysis

**Proximate analysis of ungingered and gingered tiger nuts drinks tigernuts**

The standard methods were used to determine the dry matter, crude protein, total ash, crude fibre, and carbohydrate contents (AOAC, 2010). Water content was determined using the oven drying method at 105 °C for 5 hours, crude protein was measured using the micro-Kjeldahl method, total ash was obtained by igniting 2 g of sample in a muffle furnace at 550 °C for 4 hours, and crude fibre was measured using the digestion method to arrive at an estimate of carbohydrate content. Diethyl ether was employed in a standard soxhlet extraction to remove the fat (AOAC, 2010).

**Quality assurance and quality control**

All of the water used in the study was deionized, distilled twice, and purified (Prajapati and Patel 2010). The glassware and plasticware (Merck, Germany) were prewashed in 10% HNO3, then rewashed in distilled water. The quality control results can be trusted because they were triple-checked using each sample. We followed the AOAC's suggested methods for proximity analysis to ensure the highest level of precision. The ICP Standard was used to develop certified reference solutions for individual elements, which were then used to calibrate the equipment (Merck, Germany).

### 2.5. Statistical Analysis

The laboratory data was analysed using IBM SPSS (version 23). One-way analysis of variance (ANOVA) was carried out to determine the significance level. Significance of differences was evaluated using a confidence interval spanning from 5% to 95%. Microsoft Excel and Word were used for the statistical and mathematical work. The data was presented as a Mean Standard Deviation.

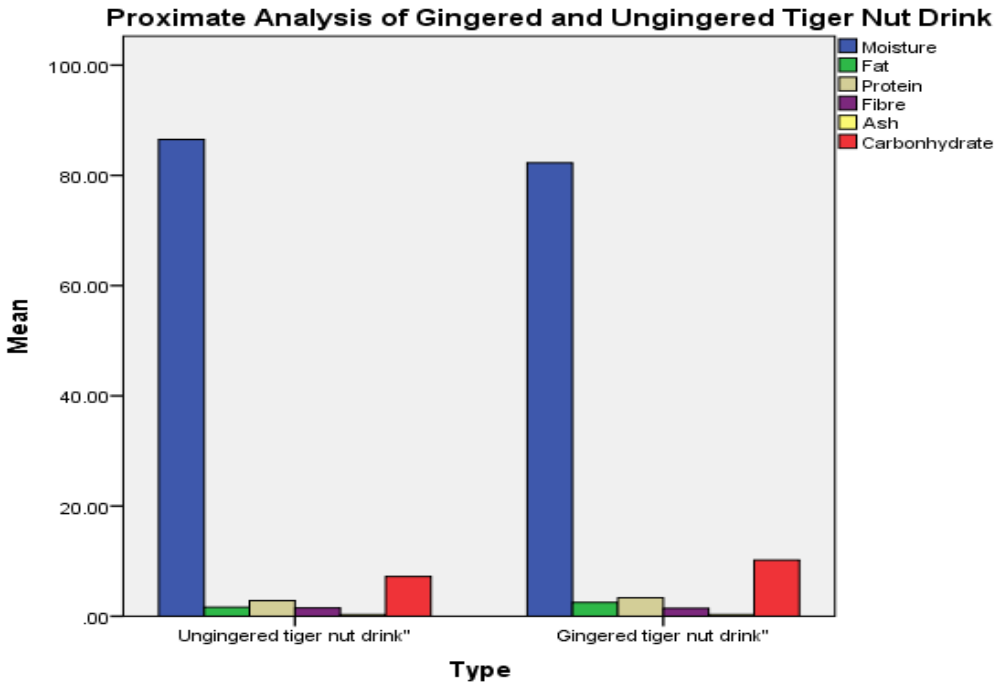
## 3. Result and Discussion

**Table 1.** Proximate Analysis of Tiger Nut Drinks (*Cyperus esculentus*) from Port Harcourt Metropolis

| Proximate Analysis | Ungingered Tiger Nut Drink (Mg/l) | Gingered Tiger Nut Drink (Mg/l) | F | Significance of Variation |
|---|---|---|---|---|
| Moisture | 86.51 ±2.10 | 82.26 ± 1.36 | 14.43 | 0.005 |
| Fat | 1.62 ± 0.17 | 2.50 ± 0.23 | 48.28 | 0.000 |
| Protein | 2.83 ± 0.25 | 3.34 ± 0.42 | 5.37 | 0.049 |
| Fibre | 1.52 ± 0.18 | 1.43 ± 0.31 | 0.31 | 0.593 |
| Ash | 0.320 ± 0.16 | 0.30 ± 0.03 | 0.09 | 0.773 |
| Carbohydrate | 7.20 ± 2.05 | 10.17 ± 1.82 | 5.88 | 0.042 |

Data are expressed as Mean ± Standard deviation

**Figure 3.** Variation in proximate analysis of Gingered and Ungingered Tiger nut drink from Port Harcourt Metropolis




## Discussion

The mean concentration and standard deviation of the proximate composition of Gingered and Ungingered tiger nut (*Cyperus esculentus*) drink is presented in Table 1 while Figure 1 showed the variation in proximate analysis of gingered and ungingered tiger nut drink from Port Harcourt metropolis. The moisture content for the ungingered and gingered tiger nut drink was 86.51% and 82.26% respectively. These results were higher with those reported by Aremu *et al.* (2015); Oladele and Aina, (2007). The high moisture content may make the tiger nut drink relatively vulnerable to microbial attack. However, lower moisture content in gingered flavoured tiger nut could however reduce the rate of inhibition of the growth of microorganisms. Also, result from this research were also found to be higher when compared with moisture content values from treated and untreated unmalted tigernuts and treated and untreated malted tigernuts (Ndubuisi, 2015).

The fat content of these tiger nuts is lower than that found in the scholarly work of Ndubuisi, (2015) on the evaluation of food potentials of tigernut tubers (Cyperus esculentus) and its products (milk, coffee, and wine), but it is comparable to that of nuts and seeds, higher than that of cereals, and on par with soya beans (Sanchez-Zapata et al. 2012).

When compared to studies on the nutritional value of tiger nut (Cyperus esculentus) tubers and its products by Sabah et al. (2019) and studies on the nutritional value of protein-rich foods like soyabean, cowpeas, kersting nut, pigeon peas, and some oil seeds, the protein values for ungingered (2.83) and gingered (3.34) tiger nut drink are low (Oloafe et al. 2006).

The fibre content may improve digestion by lowering stomach pressure and speeding up the digestive process (Temple et al. 1990). As fibre helps reduce gas, it makes

sense to consider incorporating tiger nut fibre into meal plans for people struggling with digestive issues, constipation, and chronic conditions like colon cancer, diverticulitis, heart disease, and obesity (Wardlaw et al. 2002). The body relies heavily on crude fibre. It lengthens the amount of time waste takes to pass through the digestive system and increases stool volume. Most of the plant polysaccharides that make up crude fibre in the diet are indigestible by human digestive enzymes; they include cellulose, hemicellulose, and other components of plant cell walls (Southland, 1975). The fibre content of raw tiger nut, as reported by Oladele et al. (6.26% for the yellow variation and 5.62 for the brown variant), is significantly higher than the crude fibre values for ungingered and gingered tiger nut drinks (1.36% and 1.73%, respectively) (2007).

The ash concentration of both the ginger-infused and non-gingered beverages was very low, at between 0.11 and 0.56 percent, compared to the 1.18 percent found in tigernut (Suleiman et al. 2018).

Gingered tiger nut drink (10.17%) had a larger carbohydrate value than ungingered tiger nut drink (7.20%), making the former a more nourishing choice for energy generation. These findings exceeded those found in Moringa oleifera-flavored tiger nut drinks (3.600.06%) reported by Oyetoro et al. (2019). Moisture, carbohydrates, proteins, fats, fibres, and ashes were found to be present in descending order in the tiger nut drink proximate composition results. This means that the fat, fibre, and ash levels of tiger nut drinks are rather low.

Significant levels of proxies between ungingered and gingered Port Harcourt city tiger nuts were determined using one-way analysis of variance. Differences in moisture content, protein value, lipid concentration, and carbohydrate content between ungingered and ginger-infused tiger nuts were shown to be statistically significant (P 0.05). There were no statistically significant differences in the levels of fibre or ash content, however (P>0.05). Although all of the samples were generally accepted in terms of sensory quality, the research confirmed what Udeozor (2012) found when he analysed the proximal and sensory quality potentials of tiger nut-soy milk drink: a significant difference (P0.05) in taste and overall acceptability. Because of its high nutrient contents (protein, fat, etc.), it was determined that tiger-nut drink should be promoted in order to address the issue of protein-calorie malnutrition.

## 4. Conclusion

The results of this study provide new information about the nutritional value of tiger nut drinks with and without ginger. The research showed that the tigernuts drink used often in the Greater Port Harcourt Region is a nutritious and energising beverage due to its high protein content and abundance of carbs and lipids. The addition of different spices to tigernut drink such as ginger can increase the nutrients present in tigernut drink. The gingered tigernut drinks were observed to contained higher level of nutrients which is beneficial for adults and children population in Port Harcourt metropolis.

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**Data Availability**

If you ask the author of record, you can get data that backs up this work.

**Declarations**

**Conflict of Interest**

The people who wrote this article and anyone in their immediate families do not have any financial or other ties that could be seen as having influenced the work described here.

**Consent for Publication**

Each author has looked over the final draught and given it their approval.

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