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ASSESSMENT OF NUTRITIONAL VALUE OF AZANZA GARCKENEA (GORON TULA/APPLE SNOT) IN MAIDUGURI METROPOLIS

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Abstract

This study investigates the nutritional and non-nutritional components of Azanza garckeana (commonly known as Goron Tula or Apple Snot) to assess its potential health benefits and limitations. Employing a survey research design, data collection included proximate and sensory analysis of fruits, leaves, stem bark, and roots, along with questionnaires administered to participants in Maiduguri Metropolis, Nigeria. Results revealed that the fruit contains the highest protein (12.0%) and moisture (6.50%), while the stem bark has the highest carbohydrate content

Keywords: Azanza Garckeana, Nutritional Value, Anti-Nutritional Factors, Goron Tula, Sensory Evaluation

INTRODUCTION

Wild edible plants play an essential role in ensuring food and nutritional security, particularly in rural communities across sub-Saharan Africa. These plants are often rich in essential nutrients and serve as affordable alternatives to cultivated crops, which are frequently inaccessible to low-income households. Recent research has increasingly recognized the potential of indigenous fruits in combating malnutrition, a persistent issue in developing countries. *Azanza garckeana* commonly referred to as Goron Tula or African snot apple, is a notable example of such plants. Its nutritional profile and purported health benefits have garnered attention as a potential solution to food insecurity challenges (Chivenge, Mabhaudhi, Modi, & Mafongoya, 2015).

The exploration of underutilized wild fruits has gained momentum due to their capacity to diversify diets and address micronutrient

(72.16%). Crude fiber is most abundant in the fruit (45%), suggesting benefits for digestion. However, the presence of non-nutritional components, such as oxalates, raises concerns about potential adverse effects, including renal stone formation. Sensory evaluation indicates favorable taste and texture for Goron Tula, though its color was less appealing compared to traditional cola nuts. The study concludes that Azanza garckeana has significant nutritional value and potential for addressing nutrient deficiencies but recommends caution regarding its non-nutritional components. Future research should focus on processing methods to mitigate anti-nutritional factors.

deficiencies. *Azanza garckeana*, in particular, has demonstrated a rich composition of essential nutrients, including fiber, iron, and magnesium, which are critical in preventing ailments such as anemia and supporting overall physiological health. Additionally, the fruit contains bioactive compounds, such as flavonoids and phenols, known for their antioxidant properties and ability to mitigate oxidative stress in the body (Phan, Wang, & Holdt, 2020). These attributes position *A. garckeana* as a promising candidate for improving dietary quality in regions facing chronic nutritional deficits (Nyadanu & Lowor, 2015).

Despite its nutritional potential, the presence of anti-nutritional factors in *A. garckeana* poses challenges to its adoption as a mainstream dietary supplement. Compounds such as oxalates and phytates, which occur naturally in the plant, can bind to key minerals and reduce their bioavailability. This limitation may hinder its ability to deliver sufficient nutrient benefits, particularly for individuals already vulnerable to deficiencies (Awuchi, Igwe, & Amagwula, 2021). Overcoming these challenges through proper processing methods and consumer education is critical to maximizing its utility.

As the global focus shifts toward sustainable food sources, the value of underutilized plants like *Azanza garckeana* becomes increasingly evident. In northern Nigeria, where malnutrition remains a significant issue, the potential of *A. garckeana* to fill nutritional gaps is substantial. This study seeks to investigate the nutritional composition, sensory characteristics, and anti-nutritional factors of *A. garckeana* to highlight its viability as a dietary supplement while addressing its limitations.

Objectives of the Study

The objectives of this study include the following:

I. To determine the nutritional value of Azanza garkeana (Apple snot or Goron Tula) and
II. To determine some of the non-nutritional elements.

MATERIALS AND METHOD

This study employed a survey research design, focusing on research materials, data collection methods, research settings, data analysis techniques, and ethical considerations. Materials used included trays, polythene bags, and samples of both modern and traditional Goron Tula fruits. The survey design was chosen for its suitability

in studying a large population by collecting and analyzing data from a representative subset (Omoifo, 2018). This approach is particularly effective in addressing research questions, solving observed problems, assessing needs, and establishing baseline data for comparison (Glasow, 2005). Notably, the method avoided manipulating independent variables and instead focused on naturally occurring relationships, making it well-suited for this study's sensory analysis of Goron Tula and traditional cola as a control.

The study was conducted in Maiduguri Metropolis, the capital and largest city of Borno State, Nigeria. Located along the seasonal Ngadda River, Maiduguri has grown significantly since its establishment as a British military outpost in 1907, with its population exceeding one million by 2007. The research setting was selected to ensure accessibility to participants and samples.

Data collection involved administering questionnaires to respondents with the assistance of two trained research assistants. Guidelines were provided to ensure clarity and accuracy of responses, and completed questionnaires were retrieved promptly. Sensory data were collected using a 9-point Hedonic scale, ranging from "extremely dislike" to "extremely like."

Ethical considerations were rigorously observed. An introductory letter was obtained from the Department of Home and Rural Economics, Mohamet Lawal College of Agriculture, granting permission for the study. Respondents were assured of confidentiality, and participation was entirely voluntary.

The fruits of Azanza garckeana (Goron Tula) were sourced from Monday Market in Maiduguri. The plant was authenticated by the Department of Biological Sciences at the University of Maiduguri, Borno State, Nigeria. The fruits were meticulously cleaned to remove extraneous materials and prepared for sensory analysis at the Mohamet Lawal College of Agriculture.

RESULTS AND DISCUSSION

Table 1. Proximate composition of A. garckeana (%)

Part of Plant	Moisture	protein	Crude fiber	Lipid	Carbohydrate	Total ash
Fruit	6.50	12.00	45.30	1.10	6.70	28.40
Leaves	5.50	5.60	25.00	0.96	11.00	49.94
Root	2.70	7.42	11.89	0.68	8.70	70.81
Stem bark	0.50	4.91	13.75	1.12	7.56	72.16

The findings, as presented in Table 1, highlight that the fruit of *Azanza garckeana* (Goron Tula) is the most protein-rich component, containing 12.0% protein, and has the highest moisture content (6.50%). In contrast, the stem bark contains the lowest protein (4.91%) and moisture (0.50%). Carbohydrate content is most concentrated in the stem bark (72.16%), followed closely by the roots (70.81%), while the fruits have the lowest carbohydrate content (28.40%). Crude fiber content is significantly higher in fruits (45.00%), followed by leaves (25.00%), stem bark (13.75%), and roots (11.89%). The high fiber content, especially in fruits and leaves, indicates the potential of *A. garckeana* to aid digestion by promoting stool softening, regularity, and optimal bowel function.

Analysis of non-nutritional compounds in the various parts of *A. garckeana* revealed the presence of alkaloids, steroids, cardiac glycosides, terpenes, resins, and saponins across fruits, leaves, roots, and stem bark. Volatile oils were detected in the fruits, leaves, and roots, while flavonoids were present in the fruits and leaves. Phenols and tannins were exclusively found in leaves and fruits, respectively. These findings align with previous research on the bioactive components of medicinal plants (Idris et al., 2015). However, the presence of these non-nutritional compounds may limit the plant's usability, as some compounds, such as oxalates, can form complexes with minerals, potentially reducing bioavailability and causing health concerns such as renal stones.

As shown in Table 2, sensory attributes of Goron Tula were evaluated, with taste and flavor receiving the highest scores. These attributes were closely followed by texture, which was praised for the slippery sensation experienced during consumption. However, the color of Goron Tula scored lower than other attributes, possibly due to its dull appearance, which some panelists found unappealing. Despite these minor drawbacks, the fruit's taste, flavor, and texture were favorably received, indicating its potential for consumer acceptance if its visual appeal can be improved.

This comprehensive analysis demonstrates the nutritional promise of *Azanza garckeana*, particularly its fiber and protein content, alongside challenges posed by its non-nutritional components and visual attributes.

Table 2. Raw sensory score of azanza garckeana (Goron Tula)

Taste	Color	Flavor	Texture
8.5	6.3	8.2	7.3
7.8	7.0	6.9	7.8
6.9	8.1	6.5	7.5
8.2	7.0	8.0	8.2
7.7	6.5	7.9	7.4

The raw sensory score of traditional cola nut as presented in Table 3 shows that generally the flavour and texture were rated satisfactorily compared to the colour. The highly rated attributed of the cola was the colour which had high values than any assessed variables. However most panelist rated the taste of traditional colour by the youth, the traditional cola nut have bitter taste scores low among other qualities.

Table 3 Raw sensory score of traditional cola nut .

Taste	Colour	Flavour	Texture
4.5	7.2	8.5	6.0
5.1	7.5	6.9	6.3
5.4	8.0	5.6	6.4
4.9	7.9	6.2	6.7
4.6	6.9	6.7	7.0

Table 4 shows raw sensory scores of both goron tula and traditional cola nut. Goron tula had highest score for taste, flavour and texture of (7.82, 7.50 and 7.40) respectively and

colour of goron tula was not much appealing to the panelists, therefore had least score 6.98 whereas the colour of traditional cola ranked highest among other parameters (7.50) followed by the texture, flavour and the least parameter was taste (4.90). This indicated that goron tula had high sensory score for the taste, flavour, and texture than the traditional cola nut. However, the cola nut is preferred to the panelists (7.50) than the goron tula which had the least sensory score (4.90). Most of its better taste, flavour, and texture.

Table 4: Sensory scores for both Goron Tula and Traditional cola nut

Taste	Colour.	Flavour	Textur
7.82	6.98	7.50	7.40
4.90	9.50	6.44	6.80

CONCLUSION

The results demonstrate that the fruit of Azanza garckeana is the most nutrient-dense part of the plant, containing the highest protein content (12.0%) and moisture level (6.50%). In contrast, the stem bark exhibits the lowest protein (4.91%) and moisture (0.50%). Carbohydrate concentration is highest in the stem bark (72.16%), closely followed by the roots (70.81%), with the lowest carbohydrate content found in the fruits (28.40%). The crude fiber content is greatest in the fruits (45.00%), followed by leaves (25.00%), stem bark (13.75%), and roots (11.89%). This significant fiber concentration, particularly in the fruits and leaves, underscores the potential role of A. garckeana in promoting digestive health, aiding stool softening, and supporting regular bowel movement. Such attributes make it a valuable addition to a fiber-rich diet, addressing conditions like constipation, hemorrhoids, and diverticulitis (Nkafamiya et al., 2006).

The mineral composition of A. garckeana fruits and other plant parts is noteworthy, particularly in comparison to commonly cultivated fruits. The mineral levels, especially iron and zinc, are substantially higher in the fruits and leaves of A. garckeana, meeting a considerable portion of daily requirements (15 mg for iron and 18 mg for zinc). For example, the iron content of A. garckeana surpasses that of oranges (0.2 mg/100 g) and mangoes (0.4 mg/100 g). The consumption of A. garckeana, particularly its fruits and leaves, can significantly contribute to addressing deficiencies in essential minerals. This is particularly relevant for conditions such as hypercholesterolemia, bone demineralization, microcytic anemia, and immune impairment, which often result from deficiencies in copper, iron, magnesium, and zinc. Additionally, adequate intake of these minerals is crucial for pregnant and menstruating women to prevent anemia and related complications (Idris et al., 2025).

The vitamin content of A. garckeana is similarly promising. Except for vitamin C, the levels of vitamins in the fruits and leaves are higher than those found in other wild fruits like C. congoensis and N. latifolia. Regular consumption of these parts can provide an essential source of vitamins, making A. garckeana a valuable dietary supplement (Idris et al., 2015). These findings highlight the nutritional potential of A. garckeana while emphasizing its suitability as a natural source of dietary fiber, essential minerals, and vitamins for improving health outcomes.

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