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# DETERMINATION OF CHEMICAL PROFILE OF *Azanza garckeana* FRUIT

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***Abstract:*** ***Azanza garckeana*** **(Gongotula) also known as 'Miracle plant' is an important economic and pharmaceutical plant. In this study the fruit was evaluated for its chemical profile due to its acclaimed multipurpose use. The mean results revealed higher amounts of tannins (7.0 mg/100g) and flavonoids (6.8 mg/100g) than steroids (1.5 mg/100g), terpenoids (1.5 mg/100g), anthraquinones (0.8 mg/100g), alkaloids (0.8 mg/100g) and saponins (0.8 mg/100g). Oxalates were found abundant (36.1µM) while phytic acid (3.6 µM) and cyanide (1.4 µM) were detected low. Carbohydrates (60.3%) was the most abundant constituent of the proximate composition while crude protein (10.3%), crude fibre (11.3%) and moisture content (9.7%) were found moderate while ash content (4.7%) and total fat (3.7%) were detected low. Calcium (98.0mg/g) was detected higher followed by magnesium (66.0 mg/g), phosphorus (0.10 mg/g) was the least mineral detected. The order of amino acid composition was proline > valine > 1soleucine > glycine > threonine > cysteine > Aspartic acid = Methionine = Tyrosine = Histidine > arginine = leucine > alanine > serine > glutamic acid. The work carried out showed** ***Azanza garckeana*** **fruit as a good source of important phytochemicals, minerals and amino acids. isolation and purification of these bioactive agents from** ***Azanza garckeana*** **fruit is hereby recommended.**

***Keywords:*** **phytochemical, mineral, antinutritional factor, proximate, amino acid.**

## 1. INTRODUCTION

Medicinal plants have undoubtedly been considered by human beings since ancient times. It can be said that before the history and since the early humans recognized and exploited the plants around them for use as fuel, clothing, shelter and food; they became aware of their properties more or less. Medicinal plants have been transformed into one of the oldest sciences in countries such as China, Greece, Egypt and India. In ancient Persia, plants were commonly used as a drug and disinfectant and aromatic agent (Hamilton *et al.*, 2004; Jamshidi-Kia *et al.*, 2018).In fact, the use of medicinal plants for the treatment of diseases dates back to the history of human life, that is, since human beings have sought a tool in their environment to recover from a disease, the use of plants was their only choice of treatment (Halberstein, 2005).

*Azanza garckeana* with the common name Snot Apple, also known as Tree Hibiscus popularly called *Gorontula* in Hausa language is one of the trees with massive economic and pharmaceutical importance. In Nigeria, it is native to the Northern part and widely cultivated in Gombe and Adamawa States. It is used in Nigeria folklore medicine as sex enhancer, fertility enhancer, vagina lubricant and cleanser. It is also called African chewing gum (Akinwale, 2019). Nutritional value of indigenous fruit bearing tree species such as *Azanza garckeana* indicates that many are rich in sugars, essential vitamins and minerals, while others are high in vegetable oil and protein contents.

In addition to fruit production and cash, the extensive list of benefits includes firewood, fodder, building material, shade and medicine especially to rural communities. Edible wild leaves and fruits are consumed frequently in Northern Nigeria especially in rural communities where a variety of edible leaves and fruits abound. Some of these are cultivated while others grow in the wild (Nkafamiya *et al.*, 2016).

Plants are a source of large amount of drugs comprising of different groups such as antispasmodics, emetics, anticancer, antimicrobials etc. A large number of plants are claimed to possess the antibiotic properties in traditional system and are also used extensively by the tribal people worldwide. It is now believed that nature has given the cure of every disease in one way or another (Prashant *et al.*, 2011).

The plant kingdom represents an enormous reservoir of biologically active compounds with various chemical structures and disease preventive properties (phytochemicals). (Shakeri *et al.*, 2012). Mahesh and Satish (2008) reported that the potential of higher plants as source for new drugs is still largely unexplored. Among the estimated 250,000-500,000 plant species, only a small percentage has been investigated phytochemically and the fraction submitted to biological or pharmacological screening is even smaller.

According to Mohammed *et al.*, (2021), phytochemicals are often secondary metabolites present in smaller quantities in higher plants. The most important of these bioactive constituents of plants are alkaloids, saponins, terpenoid, tannins, flavo noids and phenolic compounds. Secondary metabolites are the classes of compounds which are known to show curative activity against several ailments in man, and therefore could explain the traditional use of medicinal plant for the treatment of some illnesses.

Therefore, the objective of this study was to determine the chemical profile of *Azanza garckeana* fruit.

## 2. MATERIALS AND METHODS

Sample Collection and Study Area: Matured *Azanza garckeana* fruits (gorontula) (2kg) were obtained from Keffi main market in Nasarawa State, Nigeria. The fruits were collected in a polythene bag. Keffi is located within $8^0$50'55''N and on the longitude $7^0$52'25''E with a tropical humid climate which is characterized by two distinct seasons, rainy and dry seasons.

Chemicals/ Reagents

All chemicals and reagents used were of analytical grade, Poole – England. Reagents were prepared with distilled water unless otherwise stated. Reagents were stored in reagent bottles for further analysis.

Apparatus and Instruments

All glasswares used were products of Simax, Czevaslovakia. Others included Soxhlet apparatus (SOX606, China), Whatmann No. 1 filter paper (dDBiolab. ESPANA), blender (CB-318SA, China), micro- kjeldahl flask (6037500 - USA), Marklam distillation apparatus (SKU MRKH-STL), pH meter (P017100010, C.A 10101), water bath (BHS-6, China), mortar and pestle (Haryana, India), digital electronic balance (ALE-223 India), thermometer, Atomic Absorption Spectrophotometer (230ATS, USA ), retort stand and clamp (Haryana, India), volumetric flask (Haryana, India), measuring cylinder (Haryana, India), oven (SW705P, Thailand), desiccators (55201, India).

Preparation of *Azanza garckeana* sample

The fruits were cleaned through handpicking of dirts and other foreign materials, the cleaned samples were chopped into smaller sizes, sundried for 5 days and grounded into powder which was passed through a sieve of 75µm mesh size. The powder obtained was kept in a clean bottle for further analysis.

Determinations

Proximate composition: The procedures described in AOAC (2000) were used to determine the proximate composition (Ash Content, crude protein, crude lipid, crude fibre and carbohydrates by difference) of *Azanza garckeana* fruit.

Antinutrient: Phytic acid was determined using the method described by Haugh and Lantzsch, (1993). Cyanide and oxalate contents were determined using the procedures described by Bradbury *et al.*, (1985) and AOAC (2005) respectively.

Phytochemical screening: Standard procedures described by Harborne, (1998); Sofowora, (1993) and Mshelia *et al.*, (2007) were used to identify and quantify the phytochemical constituents of *Azanza garckeana* fruit crude extract.

Mineral: The Atomic Absorption Spectrophotometry (AAS) method of AOAC (1990) was used to determine calcium, magnesium, iron and zinc contents of *Azanza garckeana* fruit while flame photometry method was used to determine the sodium and potassium contents.

Amino Acid profile: Modification of the method described by Xu *et al.*, (2020) was used to determine the amino acid profile of *Azanza garckeana* fruit.

## 3. RESULTS AND DISCUSSION

The results of phytochemical analysis of *Azanza garckeana* fruit is presented in Figure 1. The mean values of phytochemical concentration revealed higher amounts of tannins (7.0 mg/100g) and flavonoids (6.8 mg/100g) than steroids (1.5 mg/100g), terpenoids (1.5 mg/100g), anthraquinones (0.8 mg/100g), alkaloids (0.8 mg/100g) and saponnins (0.8 mg/100g) while phlobatannins and cardiac glycosides were not determined in the quantitative analysis of gongotula fruit . The order of amount of phytochemicals detected was tannins> flavonoids> terpe noids = steroids> anthraquinones = alkaloids = saponnins.

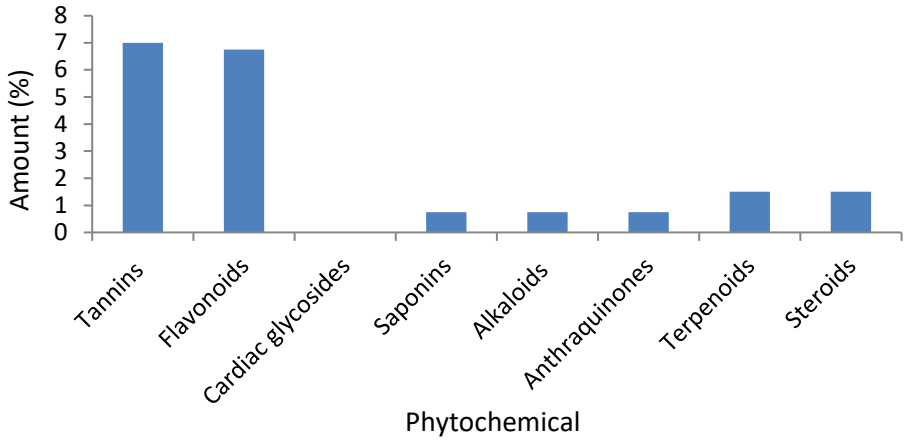


**Figure 1: Phytochemical constituent of *Azanza garckeana* fruit.**

The results of antinutritonal factor of *Azanza garckeana* fruit is presented in Figure 2. Oxalates were found abundant (36.1µM) while phytic acid (3.6 µM) and cyanide (1.4 µM) were detected low in gongotula fruit. The order of concentration of the antinutritional factor was oxalates > phytic acid > cyanide.

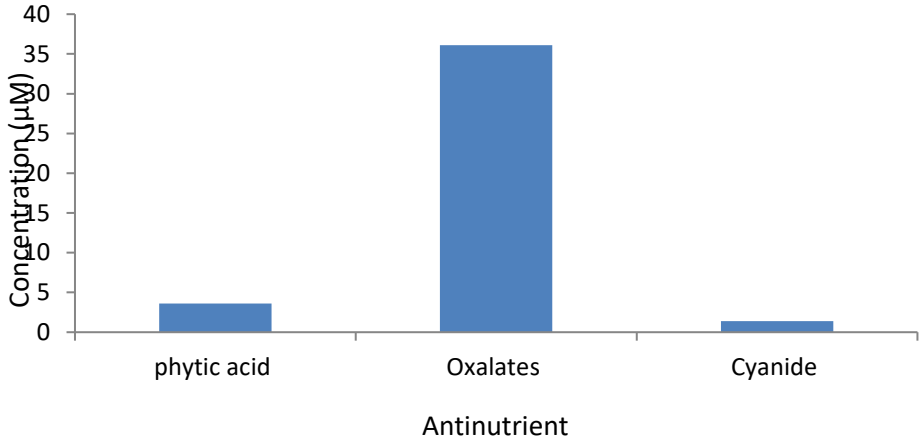


**Figure 2: Antinutritional factor constituent of *Azanza garckeana* fruit.**

The results of proximate composition of *Azanza garckeana* fruit is presented in Figure 3. The mean values revealed carbohydrates (60.3%) as the most abundant constituent while crude protein (10.3%), crude fibre (11.3%) and moisture content (9.7%) were found moderate while ash content (4.7%) and total fat (3.7%) were detected least in the proximate composition of gotongula fruit. The order of composition was carbohydrates> crude protein> crude fibre> moisture content> ash content> total fat.

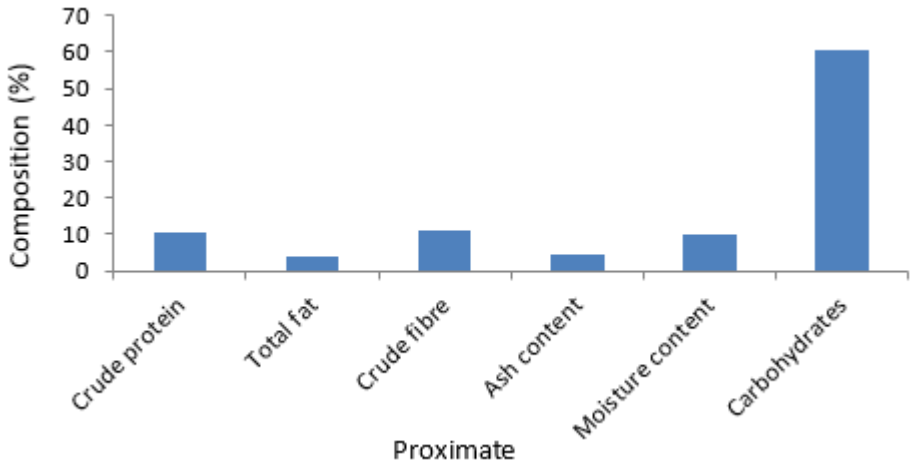


**Figure 3: Proximate composition of *Azanza garckeana* fruit.**

The results of mineral content of *Azanza garckeana* fruit is presented in Figure 4. The mean values revealed calcium (98.0mg/g) as the most abundant mineral constituent of gongotula fruit followed by magnesium (66.0 mg/g) while phosphorus (0.10 mg/g) was the least mineral detected. The order of mineral content was calcium> magnesium> zinc> iron> potassium> sodium> phosphorus.

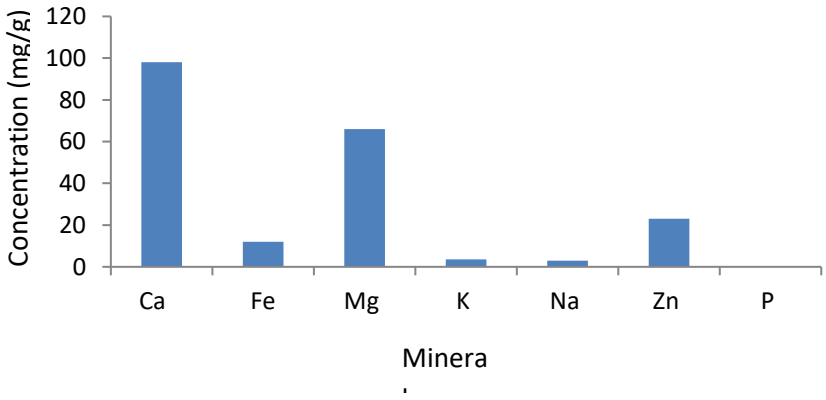


**Figure 4: Mineral content of *Azanza garckeana* fruit.**

The results of amino acid composition of *Azanza garckeana* fruit is presented in Figure 5. Proline (12.5 g/100 g), valine (12.2 g/100 g) and isoleucine (11.0 g/100 g) were detected higher than other amino acids determined in the gongotula fruit. Glutamic acid (0.2 g/100 g) was the least amino acid detected. The order of amino acid composition was proline > valine > 1soleucine > glycine > threonine > cysteine > Aspartic acid = Methionine = Tyrosine = Histidine > arginine = leucine > alanine > serine > glutamic acid.

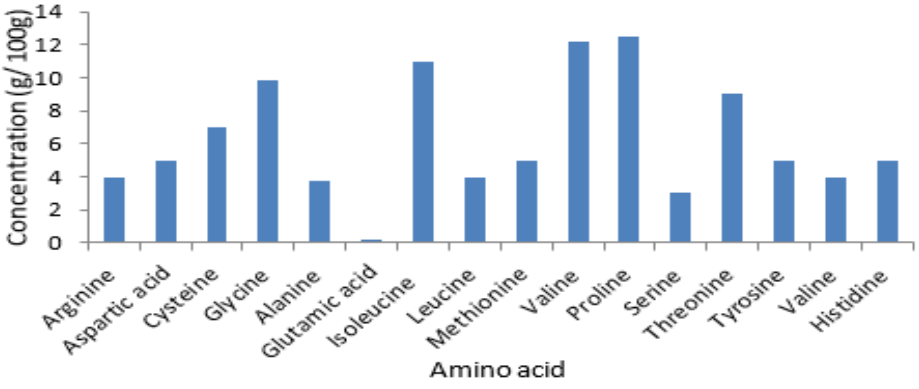


**Figure 5: Amino acid constituent of *Azanza garckeana* fruit.**

Doughani *et al*., (2009) and Liu, (2004) defined phytochemicals as bioactive non-nutrient plant compounds in fruits, vegetables, grains, and other plant foods that have been linked to reducing the risk of major chronic diseases. The word 'phyto-' is derived from the Greek phyto which means - plant. The presence of these bioactive components are said to confer them with resistance against bacterial, fungal and pesticidal pathogens. These bioactive components are said to be responsible for the antimicrobial effects of plant extracts in vitro (Abo *et al.*, 1991; Nweze *et al.*, 2004). Many phytochemicals have been classified as phytoestrogens, with health-promoting effects resulting in the phytochemicals to be marketed as nutraceuticals (Moutsatsou, 2007). It has been reported by Doughani *et al*., (2009) that phytochemicals act in synergy with chemotherapeutic drugs, phytochemicals play significant roles in prevention of cancer. The detection of phytochemical of pharmaceutical importance in *Azanza garckeana* fruit in this study suggests the antimicrobial (anti-bacteria and anti-fungi) potential of the fruit; the anti-cancer property of the fruit may also be established due to the presence of these phytochemicals.

*Azanza garckeana* fruit contains high amount of oxalates, oxalates have been implicated to form water soluble salts with alkali and alkaline earth metals. This thus makes important nutritional minerals unavailable. However, low amounts of phytic acid and cyanide in *Azanza garckeana* fruit suggest safety of the fruit from these antinutritional factors poison.

Proximate analysis is an important criterion in the determination of contamination and the quality of the sample used for experiment (Nasreen and Radha, 2011). High amount of carbohydrates in *Azanza garckeana* fruit is an indication that the fruit is a good source of energy, crude fibre and protein also show that *Azanza garckeana* fruit may serve the purposes of glucose dispersal, aiding of digestibility, repairing of worn out tissues and enhancing of general growth in the body.

The minerals detected in *Azanza garckeana* fruit are relevant and important to the enhancement of complete metabolic functions in the body. These minerals are important to the development and structure of bones and teeth. Potassium modulates is a motivator of carbohydrate and protein enzymatic reactions. It also prevents body pH related conditions such as acidosis and alkalosis. Balance in body fluid, homeostasis and irritability in the body are mediated by sodium. Zinc is an antioxidant which combats the effects of oxidative stress while blood oxygen carrying capacity is mediated by iron.

Amino acid profile of *Azanza garckeana* fruit shows that the fruit is rich in almost all the amino acids require to make available nutritional protein requirements of the body.

## 4. CONCLUSION

The work carried out showed the presence of phytochemicals, proximate, minerals, antinutritional factors and amino acids of economic and pharmaceutical importance in *Azanza garckeana* fruit. Thus, *Azanza garckeana* fruit may be considered a good source of these chemical (bioactive, nutritional and antinutritional) indices.

## 5. RECOMMENDATION

Isolation and purification of these active chemical indices for use and application in pharmaceutical, food and drink industries is hereby recommended in this study.

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