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Evaluation of Phytochemicals in *Azanza garckeana* (Goron tula) Seed

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Abstract: *Azanza garkeana (Goron tula) is a valuable edible indigenous fruit tree species confined to Tula in Kaltungo Local Government Area of Gombe State. The fruit has rough and hairy bark it is grayish brown in colour, fibrous with longitudinal fissures and brown to yellow slash, young Branchlets stellate – tomentose becoming glabrescent when mature. The fruit is 2.5 – 4cm in diameter, clearly divided into 5 segments, the fleshy gummy pulp which is generally eaten are a good source of proteins, minerals, fibre, vitamins, and contains five seeds inside with a seed in each segment. The seed is hemispherical in shape, up to 10mm long, 7mm thick with brownish and woolly floss. The phytochemical composition of Azanza garckeana seed revealed (0.22%) Tannin, (1.72%) Saponin, (3.70%) Alkaloids, (1.00%) Flavonoids, (2.60%) Phenols, (0.33ug/g) Cyanogenic glucosides, and (3.40%) Carotenoids.*

Keywords: *Azanzagarckeana, indigenous fruit, phytochemical.*

I. Introduction

A. garckeana is a valuable edible indigenous fruit tree species. In Nigeria *A. garckeana* is found in Tula area of Kaltungo Local Government Area of Gombe State. *A. garckeana* is a deciduous shrub or small spreading tree, 3-13m high, with a diameter at breast height of up to 25cm [1]. [2] reported that *A. garckeana* grows naturally in semi-arid areas receiving lowest annual rain fall of 250mm and height rain fall of 1270mm. [1] stated that the mean annual rain fall is between 250mm to 500mm with attitude of 0 – 1900m. The fruit has rough and hairy bark; it is grayish brown in colour, fibrous with longitudinal fissures and brown to yellow slash, young Branchlets stellate – tomentose becoming glabrescent when mature. According to [1] the fruit is 2.5 – 4cm in diameter, clearly divided into 5 segments, the fleshy gummy pulp which is generally eaten are a good source of proteins, minerals, fiber, vitamins, and contains five seeds inside with a seed in each segment. The seed is hemispherical in shape, up to 10mm long, 7mm thick with brownish and woolly floss.

Indigenous fruit trees although undomesticated play many important roles in people living in rural areas of Botswana. Indigenous fruit trees are important traditional sources of nuts, fruits, spices, leafy vegetables, edible oil and beverages [3].Like vegetables, indigenous fruit trees provide vitamins and minerals essential for the proper maintenance of human health [4]. According to [5] and [6], the nutritional value of indigenous fruit bearing tree species indicate that many are rich in sugars, essential vitamins and minerals while others are high in vegetable oil and proteins. In addition to fruit production and cash, the extensive list of benefits includes firewood, fodder, building material, shade and medicine to rural communities. Indigenous fruit trees are particularly used during periods of seasonal food shortages and are often the only available fruit source of high nutrients. In Botswana indigenous fruit trees yield a crop in poor rainfall years when arable agriculture fails, thereby improving food security for rural households. The growing of trees means less dependence on arable agriculture, which in turn decreases environmental degradation. On average, one year in three years is a crop failure for arable agriculture in Botswana, hence the importance of indigenous fruit trees. *A. garckeana* is one of the indigenous fruit tree species found in cropland and protected by local people [7]. It is the only indigenous fruit tree species that is semi domesticated by local people in Botswana who grow it in their homesteads and crop fields [8].

[1]Stated that *A. garckeana* is a source of food, fodder for animals, fuel (fire wood), timber, medicine (roots are taking orally for pain relief, to treat cough and chest pains) and for shelter. While [9] reported that the fruits and the leaves of *A. garckeana* are most useful (Fig. 1). The fruits are eaten while slightly green or when ripe. The fruits can be soaked in a small amount of water to make it jelly. It can also be boiled and used as relish or made into porridge. The leaves are used for making relish and can be burned to produce salt [10]. The leaves can also be cooked and use as vegetable by man and can also be used as green manure for land productivity. Chemical composition and % dry matter of *A. garckeana* fruits are pH 5.96, Ascorbic acid 20.5, Crude protein 12.0%, Fat 1.1%, Fiber 45.3%, Total carbohydrate 35.2%, Energy value 80010kj/100g, Phosphorus 1476µg/g, Calcium 95µg/g, Magnesium 1453µg/g, Iron 84µg/g, Potassium 26190µg/g, Sodium 202µg/g [1], [9] and [4].

Fig 1: *Azanza garckeana* Tress showing fruit and leaves [9].

A. garckeana belong to a family malvacene, which is the distrimotive family to which the hibiscus belongs. Most of the malvacene in Nigeria are shrubs. *A. garckeana* is the species name (F. hoffin), the source of the generic name is absure. The strip soil desert cost extending below the equator in Africa was once known as the course of *Azanza*. The name *Azanza* being based on a word meaning black and survival in Zanzibar and it is possible that Azanza is derived from this. The specific name *garckeana* was given after Professor August Garcke (1891 – 1904), a German botanist [1].

A. garckeana is widely distributed in east and southern Africa [11], [12]. The specific countries where the species is found are Botswana, Kenya, Malawi, Mozambique, Namibia, Nigeria, South Africa, Tanzania, Zambia and Zimbabwe[12],[13]. [11], [14] and [15] reported the species growing from Sudan to South Africa. The species grows naturally in all types of woodlands from sea level to about 1700 m above sea level [16], [13], [14], and [15]. It grows in semi-arid areas receiving lowest annual rainfall of 250mm and highest rainfall of 1270mm [2]. Over the range in its entirety, the species grows in a variety of soils and is found on or near termite mounds and deserted village fields [16], [2], [14], [15]. In Botswana *Azanza garckeana* grows in open woodland in north-eastern parts of the country. In Nigeria, they are found in Northwest Katsina State in Kankiya, Daggish, in the middle belt of River Benue or mile north of River Benue. In northern Nigeria, they are found in Tula area of Kaltungo local government area of Gombe State, Kali hills of Zah district of Michika local government area of Adamawa State [17] and available in most of the Northeast markets especially in rural areas.

The bioactive non nutrient plant compounds in fruit, vegetables, grains, and other plant foods—have been linked to reductions in the risk of major chronic diseases. It is estimated that more than 5000 phytochemicals have been identified, but a large percentage still remain unknown [18] and need to be identified before their health benefits are fully understood. However, more and more convincing evidence suggests that the benefits of phytochemicals in fruit and vegetables may be even greater than is currently understood because oxidative stress induced by free radicals is involved in the etiology of a wide range of chronic diseases [19].
The aim of this study is to identify the phytochemicals present in *A. garckeana* seed.

II. MaterialsandMethods

2.1 Experiment Site

The plant materials *A. garckeana* fruits were obtained from a local market in Tula Kaltungo local government areas, Gombe State, Nigeria. Its headquarters are in the town of Kaltungo in the west of the area on the A345 highway at Latitude 9°48′51″N and Longitude11°18′32″E [20].

2.2 Preparationof*A. garckeana* Seed

The outer coats (pulp) were removed and the seed sun - dried and milled using pestle and mortar to give fine powder and sieved using a sieving material of 0.8mm size in diameter.

2.3 Phytochemical Analysis of *A. garckeana* seed

2.3.1 Procedure

2g of *A. garckeana* seed powder was dissolved with hexane in a 1.0ml vial. The prepared sample was then injected into a Buck Scientific (USA) BLC 10/11. High Performance Liquid Chromatography (HPLC) system with a fluorescence detector (excitation at 295nm and emission at 325nm) and an analytical silica column (25cm x 4.6mm ID, stainless steel, 5µm) was used to analyze phytochemicals. The mobile phase used was hexane: tetrahydrofuran: isopropanol (1000:60:4 v/v/v) at a flow rate of 1.0ml/min. Standard samples was also prepared using similar method. Concentration of phytochemicals in samples was calibrated using authentic standards. Using the results obtained the concentration of phytochemicals in the sample was calculated, using the formula below:

$$[PHYTO] = [A_{sample} \times [STD] (ppm) \times VHEX (ml)] / [A_{std} \times Wt\ sample\ (g)]$$

Where;

[PHYTO]	=	Concentration of phytochemical in ppm
[STD]	=	Concentration of standard
A_{sample}	=	Area of sample
$A_{standard}$	=	Area of standard
V_{Hex}	=	Volume of hexane
Wt_{Sample}	=	Weight of sample [21]

III. Results

The phytochemical composition of *Azanza garckeana* seed are presented in (Table 1), showed (0.22%) Tannin, (1.72%) Saponin, (3.70%) Alkaloids, (1.00%) Flavonoids, (2.60%) Phenols, (0.33ug/g) Cyanogenic glucosides, and (3.40%) Carotenoids.

Table 1: Phytochemical Composition of *Azanza garckeana* Seed

Samples	Composition
Tannin	0.22%
Saponin	1.72%
Alkaloids	3.7%
Flavonoids	1.0%
Phenols	2.60%
Cyanogenicglucosides	0.33ug/g
Carotenoids	3.40%

IV. Discussion

The phytochemicals present in *A.garckeana* seed consist of Tannin, Saponins, Alkaloids, Flavonoids, Phenols, Cyanogenic glucosides and Carotenoids. These anti-nutrients are very vital due to their multipurpose functions such as medicinal, nutritional and genetical[4].[22]stated that Tannins, Phenols, Saponins, Alkaloids, and Flavonoids have been linked or suggested to be involved with antibacterial and anti-viral activity. Investigations of the mode of action have indicated that Tannins and Flavonoids increase colonic water and electrolyte reabsorption and other phytochemicals act by inhibiting intestinal mobility, while some components have been shown to inhibit particular entheropathogens [23]. Similarly, Saponins and Alkaloids are considered important due to their toxicity in *A. garckeana* seed. These toxic metabolites occur in varying concentrations such as 1.72mg/100g of Saponins and 3.70mg/100g concentration of Alkaloids in *A. garckeana* seed. Properties of Saponins include formation of foams in aqueous solution, haemolytic activity, cholesterol binding properties and bitterness. Saponins natural tendency to ward-off microbes, make them good candidates for treating fungal and yeast infections. These compounds served as natural antibiotics, which help the body to fight infections and microbial invasion [24]. Medicinally, *A. garckeana* because of the presence of Saponins can help human fight fungal infections, combat microbes and viruses as well as boost the effectiveness of knocking out some kinds of tumor cells, particularly lung and blood cancers [25].

Flavonoids are widely distributed group of polyphenolic compounds, characterised by a common benzopyrone ring structure, that have been reported to act as antioxidants in various biological systems. The biological functions of flavonoids apart from its antioxidant properties include protection against allergies, inflammation, free radicals, platelet aggregation, microbes, ulcers, hepatoxins, viruses and tumors [25],[26]. Due to the presence of flavonoids, *A. garckeana* seed can reduce cancer by interfering with the enzymes that produce estrogen, for example flavonoids inhibit estrogensynthesase, an enzyme that binds estrogen to receptors in several organs [26],[22].

The presence of phenolic compounds helps to act as antimicrobial agent which makes the *A. garckeana* to be an antimicrobial agent [27]. The slight bitter taste of *A. garckeana* may be due to the presence of Tannins

in them because Tannin has bitter characteristic taste. As a result, *A. garckeana* can act as a repellent against rottenness.

V. Conclusion

A. garckeana is an important multipurpose edible indigenous fruit tree. The species has great potential to be usedan agroforestry species. No organized planting of *A. garckeana* has been reported in Nigeria, therefore *i*t is recommended that farmers should be encouraged to establish small plantations or orchards of the species.

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