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Assessment of Nutritional Composition of Azanza Garckeana (Goron Tula) Seed in Gombe, Nigeria

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Abstract

The study examines the phytochemical, elemental, proximate and anti- nutrients composition of *Azanza garckaena* seed found in Gombe. The analysis was carried out following the standard methods. The result of phytochemical showed that Carotenoids (0.72 ± 0.01mg /100 g), alkaloids (2.45 ± 0.01 mg / 100 g), Flavonoids (1.05 ± 0.01 mg / 100 g), phenols (18.11 ± 0.03 mg / 100 g), Terpenoids (0.22 ± 0.01 mg / 100 g), Glycoside (0.25 ± 0.01mg / 100 g) and saponins (2.71 ± 0.02 mg/100 g) were present in the seed. The result of the elemental analysis also showed that K (457.35 ± 0.03), Ca (375.12 ± 0.02 mg 100 g), P (91.37± 0.01 mg / 100 g), Mg (11.03 ± 0.02 mg /100 g), Na (34.53 ± 0.03 mg / 100 g) and Fe(3.05 ± 0.00 mg / 100 g) were present in (*A. grackaena*) seed. The result of the proximate analysis revealed that the values of protein, fat, fibre, Ash, moisture and carbohydrate were 9.85 ± 0.01 %, 2.45 ± 0.01 %, 12.40 ± 0.02 %, 4.50± 0.01 %, 10.23 ± 0.00 % and 60.57 ± 0.03 respectively. The anti- nutrient compositions were: oxilate (2.10± 0.01 mg/ 100g), phytates (0.62 ± 0.01 mg / 100 g) and tannins (6.11 ± 0.02 mg / 100 g). These findings suggest that *A. grackaena* seed could serve as a source of supplement in human diet as well as source of raw materials in pharmaceutical industries.

Key words: phytochemical, elemental, proximate, anti- nutrients, *Azanza garckaena* and seed

Introduction

The investigation of medicinal properties of various plants attracted an increasing interest since last couple of decades because of their potent pharmacological activities. There is a growing interest in natural anti-oxidant present in medicinal and dietary plant that might help attenuate oxidative damage (Silva *et al.,* 2005; Williams *et al.,* 2020).

The nutritional value of indigenous fruit bearing tree species indicate that many are rich in sugar, essential vitamins and minerals while others were high in vegetable oil and protein. Indigenous

fruit trees are particularly used during period of seasonal food shortages and are often the only available food sources of high nutrient (Du *et al*., 2016).

Azanza garckeana is a deciduous shrub or small spreading tree 3- 13 m high with a diameter at breast height of up to 25 m (Ubwa *et al*., 2015). Over the range in its entirety, the species grow in variety of soil and found on or near termite mounds and deserted village field. Indigenous fruit trees are important traditional sources of nuts, fruits, species, leafy vegetables, edible oils and beverages (Timothy 2018). *A. garckeana* is 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 color, fibrous with longitudinal fissures and brown to yellow slash. The fruit is 2.5 – 4 m in diameter clearly divided into five segment, the fleshy gumming pulp which is generally eaten are a good sources of protein, mineral, fibre, vitamin and contain five seed inside with a seed in each compartment. The seed is hemispherical shape, up to 10 cm long, 7 mm thick with brownish and woolly floss (Afolayan and Jimoh 2009).

Phytochemical and pharmacological screenings of the plant indicates that it possesses anti-hyperglycemic properties making it a good source of blood sugar control (Willams *et al*., 2019). *A. garckeana* is a rich source of anti- oxidant which is used to prevent cancer. Goron Tula is used for both male and female fertility to enhance lubrication, cleanse the body system and boost immune function. *A. garckeana* is known for its aphrodisiac properties. In Gombe, large population of the indigenes use Goron tula fruit for the treatment of different kinds of diseases such as infertility, liver problems, menstruation problem, malaria and micro-bail infection. The seed is often discarded after eating the fruits because the nutritional values of the seed have not yet been known. Therefore the aim of this study is to determine the nutritional value of *A. garckeana* seed in the study area.

Materials and Methods

Sample collection and identification

The matured ripped unaffected fruit of Goron tula (*A. garckaena*) was bought from the Gombe market, identified and authenticate by a botanist in the department of crop production Adamawa State University Mubi.

Sample preparation

.The fruits were cut opened and the seeds were removed, then washed with distilled water, and dried at room temperature and pulverized in to powder.

Chemicals and reagents

The chemicals and reagents used in the analysis were of analytical grade

Preparation of extract

Twenty-five grams (25 g) of powdered seeds were extracted separately in the soxhlet apparatus and solvent were removed. The percentage yield was determined by following the method described by Harborne (1998): The yield percentage = weight of the extract recovered x 100 / weight of the dry powdered and the extract was used for the analysis of phytochemical, elemental, proximate and anti- nutrient composition.

Phytochemical analysis

The phytochemicals of the seed samples were estimated following the procedure adopted by Rwarinda (2016) and Williams *et al.* (2019).

Elemental Analysis

The mineral content of the samples were determined using the atomic absorption spectrophotometer and flame photometer following the procedure adopted by AOAC (2003).

Proximate analysis

The proximate composition (moisture, crude fibre, crude fat, ash content, protein and carbohydrate) of the powdered sample of Goron tula (*A. grackaena*) seed was determined following the method described by AOAC (2005).

Anti-nutritional Content Analysis

The anti-nutrient contents (oxalates, phytates and tannins) were determined using the high-performance liquid chromatography (HPLC) following the procedures adopted by AOAC (2003).

Statistical Analysis

All determinations were replicated three times and results were reported in mean (±) standard deviation.

Results and Discussion

The result of the phytochemical analysis of Goron tula (*A. grackaena*) seed was presented in Table 1 .The result revealed that carotenoids (0.72 ± 0.01 mg /100 g), alkaloids (2.45 ± 0.01 mg / 100 g), flavonoids (1.05 ± 0.01 mg / 100 g), phenols (18.11 ± 0.03 mg / 100 g), terpenoids (0.22 ± 0.01 mg / 100 g), Glycoside (0.25 ± 0.01mg / 100 g) and saponins (2.71 ± 0.02 mg/100 g) were present in (*A. grackaena*) the seed.

Phenol has the highest value and terpenoids has the lowest value (Table1). The value of phenol recorded (18.11 ± 0.03 mg / 100 g) in this study was higher than the one reported (1.90 mg / 100 g) by Williams *et al*. (2020). Phenol compounds are anti-microbial agents, hence it is extensively used in disaffection and remain the standard with which other bactericides are compared (Prashant *et al.,* 2011).

Saponnin is being used as mild detergent and in intracellular histochemistry staining to allow anti-body access to intracellular protein. It is of great importance in medicine and used in hypercholersterolaem, hyperglycaemia, anti-oxidant, anti-cancer, anti- flammatory and body loss. Alkaloids are used as anti-septic due to anti-biotic activity, it also have pharmacological application as anesthetics and central nerve system simulant (Madziga *et al.,* 2010). Alkaloids in clinical use include analgesic morphine and codeine, the muscles relaxants and anti-cancer agent (Ubwa *et al* 2015; Williams et al., 2018).

Flavonoids are natural biological response and have strong inherent ability to modify body's reaction to allergen, virus and cyanogen (Egharevba *et al*., 2010). It is also known to inhibit platelet aggregation and could exert a membrane stabilizing action that may protect liver from injury. Carotenoids is an important anti-oxidant and immune stimulant for developing embryos and adult birth (Panigrahi, 2018). Terpinoids play an important role in health by providing provitamin 'A' activity for vision, influencing the human immune system function and gap conjunctional communication (G.J.C).

Table 1 the result of the phytochemical analysis of goron tula (*A. grackaena*) seed

Phytoconstituents	value (mg / 100g)
Carotenoids	0.72 ± 0.01
Alkaloids	2.45 ± 0.01
Flavonoids	1.05 ± 0.01
phenols	18.11 ± 0.03
Terpenoids	0.22 ± 0.01
Glycoside	0.25 ± 0.01
saponins	2.71 ± 0.02

Table 2 contains the result of elemental analysis of Goron tula (*A. grackaena*) seed. The elements present in the seeds were K (457.35 ± 0.03 mg / 100 g), Ca (375.12 ± 0.02 mg /100 g), P (91.37± 0.01 mg / 100 g), Mg (11.03 ± 0.02 mg /100 g), Na (34.53 ± 0.03 mg / 100 g) and Fe (3.05 ± 0.00 mg / 100 g). The concentration of K was found to be the highest while that of Fe was the lowest. The value of K in this study was found to be higher than the one reported (261.90 mg / 100 g) by Sakata and Msousthi, (1994).

Potassium assist muscles contraction and in maintaining fluids and electrolytes balance in the body cells. Calcium is important for bone and tooth structure, blood clotting and nerves transmission. Deficiencies of Ca are associated with skeleton malformation and blood pressure abnormality. Phosphorus plays an important role in the body and is a key player for health cells, teeth and bones (Rongtsao, 2008). Sodium is used for preservation, maintaining the proper balance of water and relaxes muscles.

The concentration of Iron in this study was found to be the lowest among all the elements considered and still lower when compared to the one reported (84.00 mg / 100 g) by Sakata and Msousthi. (1994). Iron is an essential trace element for normal functioning of central nervous

system, oxidation and for oxygen transfer in human body. Magnesium also is an essential co-factor in maintaining enzymatic reactions in the intermediary metabolism; Mg is required for normal function of muscles, heart and immune system. It also helps in maintaining normal blood sugar level and blood pressure. Therefore, based on the result of the elemental analysis Goron tula (*A. grackaena*) seed can be a source of minerals in the human diet

Table 2 the result of elemental analysis of Goron tula (*A. grackaena*) seed

Minerals	concentration (mg / 100g)
K	457.35 ± 0.03
Ca	375.12 ± 0.02
P	91.37± 0.01
Mg	11.03 ± 0.02
Na	34.53 ± 0.03
Fe	3.05 ± 0.00

The result of the proximate analysis of Goron tula (A. grackaena) seed was presented in Table 3. The result showed the values of Protein, Fat, Fibre, Ash, Moisture and Carbohydrate were 9.85 ± 0.01 %, 2.45 ± 0.01 %, 12.40 ± 0.02 %, 4.50± 0.01 %, 10.23 ± 0.00 % and 60.57 ± 0.03 respectively.

The value of carbohydrate was the highest while that of fat was the lowest. The value of carbohydrate recorded in this study was higher than the one reported (35.2 %) by Sakata and Msousthi (1994). The difference observed in the values could be attributed to environmental factor variation (e.g. soil on which the plants were grown). Carbohydrate is necessary for a growing brain, increasing energy availability to human tissue with high glucose demand such as brain, red blood cell and developing fetus. Fibre is important in lowering plasma cholesterol and decreasing the incidence of colon cancer.

Moisture content is important during the mixing stage in the food manufacturing process as water affect the quality and consistency of the end product. Crude protein is required for the growth and maintenance of tissues, causes bio-chemical reaction that take place within and outside the cell, act as a messenger that aid communication between cells , tissue and organs, it provide structure, maintain proper pH, boost immune health, transport and store nutrients and provides energy.

The ash content can be used for building strong teeth, bones, blood clotting, reduce pain after exercise, regulate heart bit and assist in muscle contraction in human. Fat content play important role in the diet, provide the body with energy and contribute to the absorption of fat-soluble vitamins and act as structural elements of cell walls. The fat contents of *Azanza grackaena* seed in this study suggest that the seed could be recommended as a good source of food supplements for patient with lipid or fat induced disorder. Therefore, based on the result of the proximate analysis Goron tula (*A. grackaena*) seed can be a source of raw material for food industries

Table 3 the result of proximate analysis of Goron tula (*A. grackaena*) seed

Composition	Value (%)
Protein	9.85 ± 0.01
Fat	2.45 ± 0.01
Fibre	12.40 ± 0.02
Ash	4.50± 0.01
Moisture	10.23 ± 0.00
Carbohydrate	60.57 ± 0.03

The result of the anti-nutrient composition of Goron tula (*A. grackaena*) seed was shown in Table 4. The result revealed that oxilate (2.10± 0.01 mg/ 100 g), phytates (0.62 ± 0.01 mg / 100 g) and tannins (6.11 ± 0.02 mg / 100 g) were present in the seed.

Tannin had been reported to affect protein digestibility, adversely influencing the bio availability of none-haemiron leading to poor Fe and Ca absorption, also carbohydrate is affected leading to reduce energy value of a diet containing tannin. Tannin has biological activities that are of benefit in the production and management of many elements owing to their anti-viral, anti-bacterial and anti-tumor activities (Egharevba *et al.,* 2010; Akinwunmi and Omotayo 2016). Oxalate can have harmful effect on human nutrition and health especially by reducing Ca absorption and aiding the formation of kidney stone (Massey *et al*., 2001).

The problem with phytate in food is that it can bind some essentially mineral nutrient in the digestive tract and can result in mineral deficiencies (Gemede *et al*. 2015). However, its anti-nutrient effects depend upon their chemical structure and dosage (Massey *et al.,* 2001). Since the anti-nutrients composition of the seed was low, the seed could be used as a fertility enhancer.

Table 4 the result of anti- nutrient analysis of Goron tula (*A. grackaena*) seed

Anti-nutient	concentration(mg /100/g)
Oxilate	2.10± 0.01
Phytates	0.62 ± 0.01
Tannins	6.11 ± 0.02

Conclusion

The nutritional composition (phytochemical, elemental, and proximate) of Goron tula (*A. grackaena*) seed showed that the seed could serve as a source of human diet and animal feeds as well, as raw material for drug production in pharmaceutical industries. Since the anti- nutrients composition of the seed was low, the seed could be used as a fertility enhancer to minimize the dependence on synthetic drug fertility enhancing agents.

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