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Phytochemical and Mineral Analysis of *Gardenia aqualla* Seed Shell

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Abstract
This research was carried out on Phytochemical and Mineral composition of *Gardenia aqualla* seed shell collected in Uba, Hong Local Government Area Adamawa State. The Phytochemical analysis was carried out using standard procedure while analysis of some minerals was done using Atomic Absorption Spectroscopy (AAS). Phytochemical analysis shows that Flavonoid has the highest quantity in the sample with (2.47±0.01mg/100g), followed by Tannin, Alkaloids, Phenol and saponins with (2.27±0.05mg/100g, 2.07±0.05mg/100g, 1.98±0.01mg/100g and 0.98±0.01mg/100g) respectively. Results of mineral analysis of some mineral reveals that potassium (K) has the highest mineral composition with (715.22±0.01mg/100g) followed by Calcium ,phosphorus, Magnesium and Sodium with (188.61±0.01mg/100g,133.56±0.01mg/100g, 69.07±0.01mg/100g and 42.15±0.01mg/100g) respectively. These indicate that the plant has some important bioactive components and was to contained appreciable amount of nutrients which could be included in diets to supplement human and animal daily nutrient needs.

Keywords: *Phytochemical, Mineral, Gardenia Aqualla, seed shell and Atomic Absorption Spectroscopy (AAS).*

Introduction

In Africa much like else were in the world, plants have always been an important source of natural products with very high therapeutic values. Many people are still interested in using natural product from plants for curative and preventive measures. Many of the world advanced and rural areas strongly depends on medicinal plants for their health care. Indigenous plants provide fruits, seeds, tubers, and especially medicinal essences for the pharmacopeia, thus contributing to food, nutritional, and health benefits to local populations especially in rural areas (Gouwakinnou *et al.*, 2011). In the Sahelian countries and Burkina Faso in particular, plant species are known for their multipurpose uses (Etongo *et al*., 2017; Ayantunde *et al.*, 2008; Sop *et al.*, 2012), providing products and services and therefore, these resources constitute an important component of local livelihoods, hence the need to evaluate the knowledge of the populations on plant species that have the potentials for food and health benefits. In Nigeria, wild fruits are commonly consumed by both rural and urban dwellers especially during the dry season when most cultivated fruits are out of season (Barminas *et al.*, 1998). In Africa, studies indicated that vast number of indigenous wild plant exist and play a significant role in our diets. Several measures are being taken by various levels of government to boost food production by conventional agriculture. However, a lot interest is currently being focused on the possibilities of exploiting the vast number of wild plant resources (Abdullah and Abdullah, 2005).

Gardenia aqualla Stapf & Hutch. is a flowering plant belonging to the family *Rubiaceae* and it is found in the tropical and subtropical districts of Africa, including Nigeria as recorded in early studies (Hutchinson *et al*.,1963). *Gardenia aqualla* is a savanna shrub, up to 9 ft. high. Its flowers are white, turning golden-yellow later in the day and fragrant. *Gardenia aqualla* is a fruit that belongs to the Genus *Gardenia* in the phylum *Tracheophyta.* The fruit of *Gardenia aqualla* are oblong and woody. *Gardenia aqualla* is locally called 'Gaude' in Hausa language, Nigeria. (Sulaiman *et al*.,2015) Researches have shown that the seeds not only contain nutritionally important bio compounds but are also sources of other phyto-compounds which at certain critical levels have significant anti-nutritional effects (Omorayi and Dilworth, 2007).

Many of such plants have been identified, but lack of data on their chemical composition has limited the prospect of their utilization (Baumer, 1995). Many reports on some lesser known seeds and fruits indicate that they could be good sources of nutrients for both man and livestock (Elemo *et al*., 2002). it has been reported to be utilized for ear treatments, oral treatments and used as farming, forestry, hunting and fishing apparatus. (Burkill, 1997).

One of the greatest challenges in the world is to secure sufficient and healthy foods and good medicinal content which aid at good living. Hence there is a need for research. This research work is aimed at determining the Phytochemical, and mineral analysis, of *Gardenia aqualla* seed shell.

Materials and Methods

Sample collection and preparation

The sample was collected from Mubi North Local Government Area of Adamawa State, Nigeria. The *Gardenia aqualla* shell was separated from the seed by pilling with hands and the shell was obtained only. After which the shell was dried at room temperature for two weeks. The dried shell was pulverized to a fine powder using laboratory mill at the Department of Chemical Laboratory, Federal Polytechnic, Mubi.

Preparation of the extract

Twenty five grams (25 g) of powdered seed were extracted separately in a soxhlet apparatus and ethanol as solvent were removed. The percentage yield was determined by following the method described by Harborne (1998): The yield percentage=weight of extract recovered x 100 / weight of dry powdered and the extract was used for the analysis.

Qualitative Phytochemical Analysis

Phytochemical analysis was performed using standard procedures. *Gardenia aqualla* seed shell was tested for the presence of Alkaloids, Flavonoid, Glycoside, Saponins, Tannin. (Selvan 2017)

Tests for tannin

A small amount of extract was dissolved in distilled water. To this solution 2 ml of 5% ferric chloride solution was added. Formation of blue, green or violet color indicates presence of phenolic compounds. (Ejikeme, *et al.*, 2014)

Test for Flavonoids (Alkaline Reagent Test)

Extract of 200 mg was mixed with 2 ml of 2% solution of NaOH. An intense yellow colour formed which turned colorless on addition of few drops of diluted acid was observed. (Sofowara, 1993) and (Harborne, 1973)

Test for Alkaloids

Extract of 200 mg was mixed with 10 ml of methanol. To 2 ml of the filtrate was added 1% HCl
and then steamed. To 1ml of the filtrate was added 6 drops of Wagner reagent. Brownish-red
precipitate was observed. (Hikino *et al*., 1984)

Test for Glycoside

200 mg of extract was mixed with 2 ml of chloroform. Then 2 ml of concentrated H_2S0_4 was added carefully and shaken gently. A reddish brown color was observed which indicated the presence of steroidal ring, that is, glycone portion of the Glycoside.(Hikino *et al.,* 1984)

Test for Saponins

200 mg of extract was mixed with 5 ml of distilled water in a test tube and was shaken vigorously. The formation of Stable foam (for 10 minutes and add 1 ml HCl 2 M, the foam persistent stable) was observed which shows an indication of the presence of saponins. (Ejikeme, *et al.*, 2014)

Test for phenol

A small amount of extract was dissolved in distilled water. To this solution 2 ml of 5% ferric chloride solution was added. Formation of blue, green or violet color indicates presence of phenolic compounds. following the procedure adopted by (Ezekiel T.W *et al.,* 2020a)

Determination of Phytochemical by HPLC

5 g of prepared sample was placed into 25 cm^3 standard volumetric flask and made up to mark over diluent. The solution was re-fluxed, shaken, centrifuged and decanted. Then filtrate was filtered using the HPLC grade filter paper and then inject to HPLC, following the procedure adopted by (Ezekiel T.W *et al.,* 2020b)

Statistical Analysis

All determinations were replicated three times and results were presented in mean (±) standard

deviation.

Results and Discussion:

Table 1: Qualitative and Quantitative Phytochemical analysis of Ethanolic extract of Gardenia aqualla seed shell.

Phytocompound	Qualitative Value	Quantitative Value
Phenol	+	1.98±0.01mg/100g
Tannin	++	2.27±0.05mg/100g
Glycoside	--	not detected
Saponins	+	0.98±0.01mg/100g
Flavonoid	+++	2.47±0.01mg/100g
Alkaloids	++	2.07±0.05mg/100g

Key: ++ = Present. - = Not detected.

Table 2: Mineral composition of Gardenia aqualla seed shell (mg/100g) Standard (WHO)

Minerals	**Composition (mg/100g)**	**WHO Standard**
Na	42.15±0.01	30
K	715.22±0.01	755
Ca	188.61±0.01	450
Mg	69.07±0.0	90
P	133.56±0.01	135

Key: values are expressed as mean ± S.D $n^{=3}$.

Qualitative and Quantitative Phytochemical analysis

Results from table one shows that *Gardenia aqualla* seed shell is rich in important Phytochemical. Qualitative Phytochemical analysis showed that *Gardenia aqualla* seed shell contains phenol, alkaloids, flavonoid, saponins and tannin. Glycoside is absent in the sample. High level saponins has been associated with gastroenteritis manifested by diarrhoea and dysentery (Awe and Sodipo, 2001) but it was reported that saponins reduces body cholesterol by preventing its re absorption and suppresses rumen protozoan by reacting with cholesterol in the protozoan cell membrane thereby causing it to lyse. Tannin have been shown to possess anti-diabetic properties (Iwu, 1983). Alkaloids are known to possess pharmacological activities such as antihypertensive, antiarrhythmic and anticancer effects. A number of alkaloids are used as drugs and the best known is quinine used as an antimalarial (Iwu, 1983).

The quantitative analysis was used to find out the quantity of each compound in the sample of *Gardenia aqualla* seed shell. The Phytochemical quantitative analysis reveals that *Gardenia aqualla* seed shell are rich in flavonoid with (2.47±0.01) then tannin (2.27±0.05), alkaloids (2.07±0.05), phenol (1.98±0.01) and saponins with (0.98±0.01). Alkaloids are known to play some metabolic roles and control development in living system (Edeoga *et al.*, 2006).

Plants produce Phytochemical as part of their normal metabolic activities which they use for defense against predators (Muller, 1998). Phytochemical are bioactive non-nutrient plant compounds present in fruits, vegetables, grains and other plant foods, whose ingestion has been linked to reductions in the risk of major chronic diseases. Findings suggest that Phytochemical may reduce the risk of coronary heart disease by preventing the oxidation of low density lipoprotein (LDL) cholesterol, reducing the synthesis or absorption of cholesterol, normalizing blood pressure and clotting, and improving arterial elasticity (Mathai, 2000). Phytochemical have been promoted for the prevention and treatment of diabetes mellitus, high blood pressure, and muscular degeneration (Mathai, 2000).

Alkaloids are beneficial chemicals to plants serving as repellant to predators and parasites. This probably endows these group agents its antimicrobial activity. Flavonoid have also been

implicated as antioxidants both in physiological and diseased states. For instance, tea flavonoid has been reported to reduce the oxidation of law-density lipoprotein, lower the blood level of cholesterol and triglycerides (Erdman. 2007). Flavonoid are also expressed in plants in response to microbial infection suggesting their antimicrobial activity (Kujumgiev *et al.* ,1999). Saponins are believed to react with the cholesterol rich membranes of cancer cells, thereby limiting their growth and viability (Roa *et al.*, 1995). Saponins in medicinal plants are responsible for most biological effects related to cell growth and division in humans and have incivility effect on inflammation. Tannin is known to have potentials anti-viral activity (Cheng *et al.*, 2002) as well as potential prophylactic and therapeutic effect against cancer cells (Narayanan *et al.*, 1999). The results obtained seems to justify the use of Gardenia aqualla in Africa as appreciable number of important compounds such as phenol, saponins, flavonoid, alkaloid and tannin were present in the seed shell and their role in physiological activity of the human body is imperative.

Mineral composition of Gardenia aqualla seed shell (mg/100g)

The different mineral composition of *Gardenia aqualla* seed shell were obtained from table 2 above which reveals there important to human and also animals. From the result of mineral analyses, Potassium (K) has the highest mineral composition with (715.22±0.01) followed by Calcium with (188.61±0.01) followed by Phosphorus in the sample with (133.56±0.01) then Magnesium in the sample with (69.07±0.01) and Sodium (Na) with (42.15±0.01) has the lowest composition in the sample. High amount of potassium in the body was reported to increase iron utilization (Adeyeye, 2002) and beneficial to people taking diuretics to control hypertension and suffer from excessive excretion of potassium through the body fluid (Arinathan, *et al*., 2003). Magnesium plays a major role in relaxing muscles along the airway to the lungs thus, allowing asthma patients to breathe easier. Calcium helps in regulating muscle contraction. It is also required by children, pregnant and lactating women for bones and teeth development (Margaret and Vickery, 1997). Comparing the results with the standard of World Health Organization (WHO, 2011), the results are within the range of the standard only sodium (Na) exceed the range of the standard with (42.15±0.01) of which the required standard for sodium is 30 mg/100g and can be a bit harmful to humans and animals.

Conclusion

The results revealed the presence of medicinally active constituents in the *Gardenia aqualla* seed shell which indicate that it has potential mineral property. The elemental analysis has further shown the appreciable amount of minerals contained. The seed shell of Gardenia *aqualla has* mineral in diet to supplement human and animal nutrient.

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