



Pharmacognostic evaluation of the leaves of *Azanza garckeana* (F. Hoffm.) Exell et Hillc. (Malvaceae)

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Abstract

Plants have been used as medicines from ancient periods. During the past decades, traditional systems of medicine have become a topic of global importance. *Azanza garckeana* (F. Hoffm.) Exell et Hillc. belongs to Malvaceae family. In Nigeria, *Azanza garckeana* is found abundantly in Tula, a town in Kaltungo Local Government Area, Gombe State. Ethno-medical uses of the leaf, stem, root decoction or ripe fruits of *A. garckeana* are taken orally as remedy for infertility, cough and liver problems in Botswana, Kenya, Malawi, and Nigeria. In the present investigation, detailed pharmacognostic study of *Azanza garckeana* leaf is carried out to lay down the standards, which could be useful in future experimental studies. The study includes macroscopy, microscopy, chemomicroscopy and physicochemical evaluation. These parameters are used as a diagnostic tool in the identification and standardization of the plant *Azanza garckeana* and also to establish the quality and purity of this valuable drug. It can also be added as enrichment of the pharmacopoeia of the plant.

Keywords: Pharmacognostic evaluation; Leaves, *Azanza garckeana*

INTRODUCTION

Plants have been used as medicines from ancient periods. During the past decades, traditional systems of medicine have become a topic of global importance [1]. With the ever-increasing use of herbal medicines worldwide and the rapid expansion of the global market for these products, the safety and quality of medicinal plant materials and finished herbal medicinal products have become a major concern for health authorities, pharmaceutical industries and the public [1,2]. Some reported adverse events following the use of certain herbal medicines have been associated with a variety of possible explanations, including the

inadvertent use of the wrong plant species, adulteration with undeclared other medicines and/or potent substances, lack of standardization resulting in an adverse drug interaction [3]. With this backdrop, it becomes extremely important to make an effort towards standardization of the plant material to be used as medicine. The process of standardization can be achieved by stepwise pharmacognostic studies [4]. These studies help in identification and authentication of the plant material. Correct identification and quality assurance of the starting materials is an essential prerequisite to ensure reproducible quality of herbal medicine which will contribute to its safety

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and efficacy. Simple pharmacognostic techniques used in standardization of plant material include its morphological, organoleptic, microscopical, chemo-microscopical and physico-chemical characteristics [5].

Azanza garckeana (F. Hoffm.) Exell et Hillc. belongs to Malvaceae family. The generic name "Azanza" is derived from the word "Azania", a word meaning black and surviving in Zanzibar [6]. The specific name "garckeana" is in honour of Professor August Garcke (1819-1904), a German botanist and plant collector who specialized in pharmacognosy [6,7]. Synonyms of *A. garckeana* include *Bupariti garckeana* (F. Hoffm.) Rothm., *Shantzia garckeana* (F. Hoffm.) Lewton and *Thespesia garckeana* F. Hoffm. [6]. *Azanza garckeana* has been recorded in Botswana, Burundi, Democratic Republic of Congo (DRC), Kenya, Malawi, Mozambique, Namibia, Nigeria, South Africa, South Sudan, Sudan, Tanzania, Zambia and Zimbabwe. It grows naturally over a wide range of altitudes from 0-2000 m above sea level, from semi-arid areas receiving lowest annual rainfall of 250 mm and highest rainfall of 1270 mm [8]. *Azanza garckeana* is a shrub or small tree, growing up to 3-10 m tall, with stem diameter at breast height of up to 25 cm, [8]. The leaves are alternate, simple, round, 3-5 lobe up to 20×20 cm in size, sub-circular in outline and palmately with 3-5 lobes [7]. The leaf lobes are rounded to broadly tapering at the apex, the base is cordate, margins are entire, 5-7 veined from the base, sparsely hairy above, woolly and leathery below with a petiole up to 13 cm long [7]. The flowers are 6 cm in diameter, yellow or purplish in colour with dark purple or dark red centre [7]. The peduncle is 2-7 cm long, the calyx is fused, with 9-10 teeth, each tooth up to 12 mm long and petals are 6×4 cm in size [7]. The staminal tube is 10-12 mm long with 2-5 cm long filaments. The fruit is a round woody

capsule about 35 mm in diameter, red when mature, covered with short dense hairs. The seeds are 10×7 mm in size, hemispheric, with brownish woolly floss [7].

In Nigeria, *Azanza garckeana* is found abundantly in Tula, a town in Kaltungo Local Government Area, Gombe State, Nigeria. It is also found around Kankiya, Katsina State and Daggish Kali hills of Zah district, Michika local government area of Adamawa State [9]. The plant is resistant to and can withstand mild frost [8]. Flowering occurs from May to October and fruiting/ ripening from November to April [10]. The fruit epicarp turns from a greenish to a brownish colour on ripening with the capsule showing clear division into 4 or 5 segments [7, 11]. Ethno-medical uses of the leaf, stem, root decoction or ripe fruits of *A. garckeana* are taken orally as remedy for infertility and liver problems in Botswana, Kenya, Malawi, Nigeria [12-17]. In Nigeria, fruit poultices are applied on abscesses [12,14]. In addition, ripe fruits are taken orally as aphrodisiac [17]

EXPERIMENTAL

Plant collection and identification. Fresh mature leaves of *A. garckeana* were collected in April 2018 from Tula in Kaltungo L. G. A. of Gombe State, Nigeria. The plant was identified and authenticated by a botanist, Malam Namadi Sanusi of Department of Biological Science; Ahmadu Bello University Zaria with a voucher number 07276 was also deposited in the herbarium for further references. The fresh leaves were used for morphological, organoleptics and microscopical evaluation while the remaining leaves were air-dried for two weeks under shade in the laboratory and subsequently pulverized into powder using milling machines. The fine powder was used for chemo-microscopy and physical constant evaluation. Pharmacognostic studies were carried out using standard techniques. [18].

Macroscopic/organoleptic examination.

Fresh mature leaves of *A. garckeana* were examined based on the shape, colour, texture, surface characteristics, taste, odour, length, using the method as described in WHO, 2011 manual [18]

Microscopical evaluation. The surface preparation and anatomical section of fresh leaves of *A. garckeana* were examined for diagnostic characters using the method as described in WHO, 2011 manual [18]

Chemo-microscopy evaluation. The powdered leaf of *A. garckeana* was mounted on the microscope slides followed by drops of different reagents to detect the presence of cell wall materials and cell content such as tannin, lignin, mucilage, starch, calcium oxalate, etc. using the method as described in WHO, 2011 manual [18]

Physico-chemical evaluation. Physico-chemical characters such as total ash value, moisture content acid insoluble value, extractive values were evaluated using the method as described in WHO, 2011 manual [18]

Statistical analysis. The data obtained was analyzed using Descriptive statistical tools; table and mean \pm standard error of the mean (Mean \pm SEM).

RESULTS AND DISCUSSION

Morphological and organoleptic characteristics of the leaves of *Azanza garckeana*. The macroscopic and organoleptic features of the plant leaves reveal some unique features that will aid in plant identification and authentication of the

plant, these features are colour, taste, odour, shape, texture as shown in table 1.

Chemo-microscopic characteristics of the powdered leaves of *Azanza garckeana*. The microscopic and chemo-microscopic examination of *Azanza garckeana* leave were determined, revealing several diagnostic features which will help in identification, authentication and standardization of the plant, such features include, cell wall materials; mucilage, lignin, cellulose. While cell content/cell inclusions materials include inulin, calcium oxalate, starch, tannin as shown in Table 2.

Physico-chemical constant of the powdered leaves of *Azanza garckeana*. The physicochemical parameters are also unique to a plant and are important in correct identification of the plant and also in detecting the presence of adulterant or any foreign matter that may contaminate the drug. Such parameters are total ash value, represents the amount of the substance not volatilized on ignition at 450°C when the crude drug is ignited. Acid insoluble value to detect for any contamination from the soil, also water-soluble value, moisture content, water and alcohol extractive value as shown in Tables 3 & 4.

Microscopic features of *Azanza garckeana* leaves. The anatomical section of the fresh leaves were mounted on microscope and viewed. Unique diagnostic microscopical characters were revealed such as epidermal cells, anomocytic stomata, stellate trichomes, calcium oxalate as shown in plate A-H.

Table 1: Organoleptic/macrosopic features of *Azanza garckeana* leaves

FEATURES	DESCRIPTION
i. Colour	Upper surface Green: Lower surface dull green
ii. Odour	Odourless
iii. Taste	Astringent
iv. Leaf Size	Length; 5.99 cm \pm , 0.27* Breadth; 7.82cm \pm 0.32*
v. Leaf Shape	Elliptical to oblong
vi. Surface Texture	Upper; rough wooly/hairy, Lower; Rough and hairy.
vii. Apex	Obtuse
viii. Margin	Sub-entire
ix. Phyllotaxy	Opposite
x. Lope	3-5 lobes
xi. Vein	5-7 veins

*SEM \pm Average values of 20 determinations. (n=20)**Table 2:** Chemo-microscopical characteristics of the powdered leaves of *Azanza garckeana*

Constituents	Detecting reagents	Observation	Inference
Starch	N/50 iodine	Blue-black colour within the cell.	Starch present
Lignin	Phloroglucinol	Red-pink colour on the walls of lignified cell.	Lignin present
Tannins	5% FeCl ₃	Greenish-black colour in some parenchyma cells.	Tannins present
Mucilage	Ruthenium red reagent	Red-pink colouration On the cell wall	Mucilage present
Calcium oxalate	HCl	Dissolution of crystals on the cell wall with no effervescence.	Calcium oxalate present
Calcium carbonate	HCl	No effervescence in the cell.	CaCO ₃ absent
Cellulose	Chlor-Zinc- Iodine	Blue coloration	Cellulose present
Suberin	Sudan red reagent	No colour change	Suberins absent
Aleurone grains	Iodine in ethanol	Yellowish brown Colouration	Aleurone grains present
Inulin	1-naphthol and H ₂ SO ₄	Reddish colouration	Inulin present

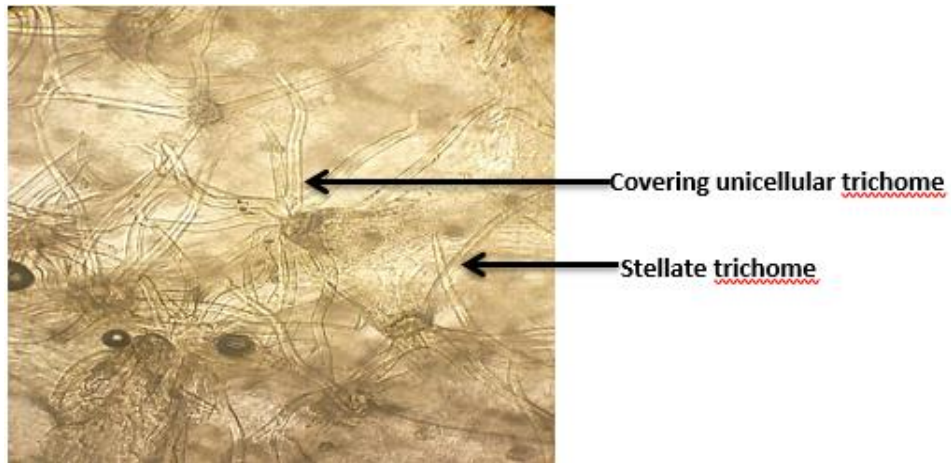
Table 3: Physicochemical constant of the powdered leaves of *Azanza garckeana*

Parameters	Values (% w/w) \pm SEM*
Moisture content	5.26 \pm 0.26
Total Ash value	9.28 \pm 0.74
Acid Insoluble ash	1.78 \pm 0.27
Water Soluble ash	2.16 \pm 0.36

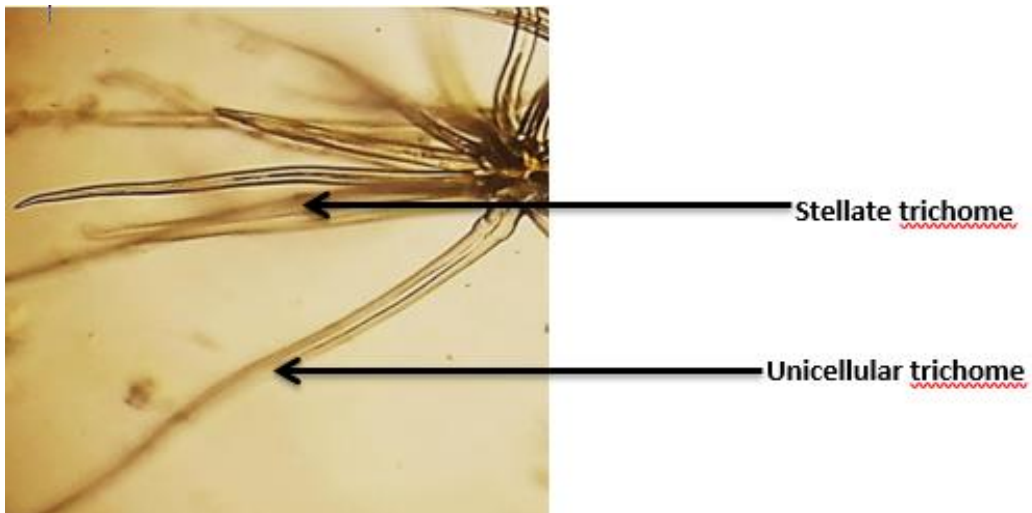
*SEM \pm Average values of five determinations. (n=5)**Table 4:** Alcohol and water extractive values

Parameters	Value (% w/w) \pm SEM*
Ethanol Soluble Extractives	18.60 \pm 0.98
Water Soluble Extractives	22.40 \pm 0.93

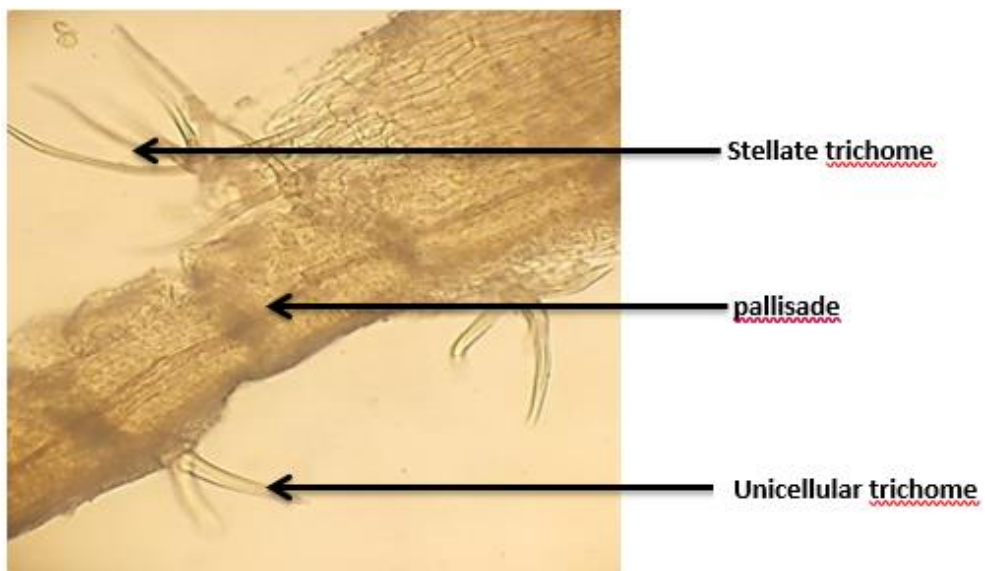
*SEM \pm Average values of five determinations. (n=5)



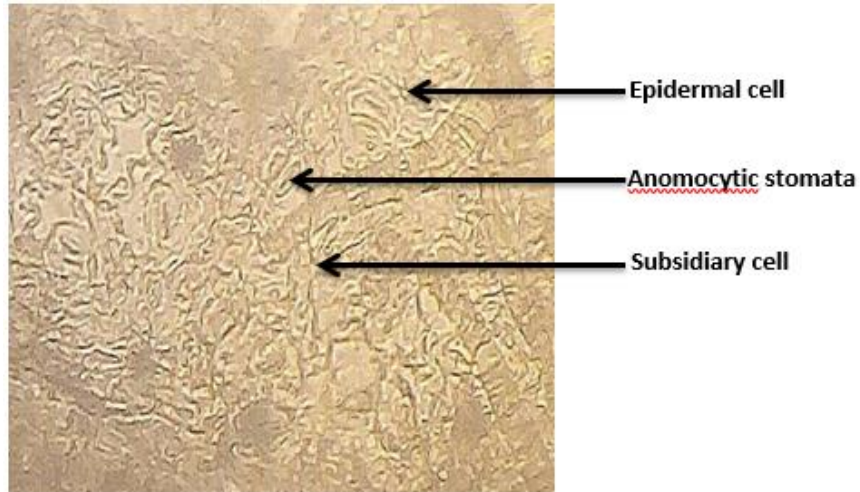
A = Covering unicellular stellate trichomes (X40)



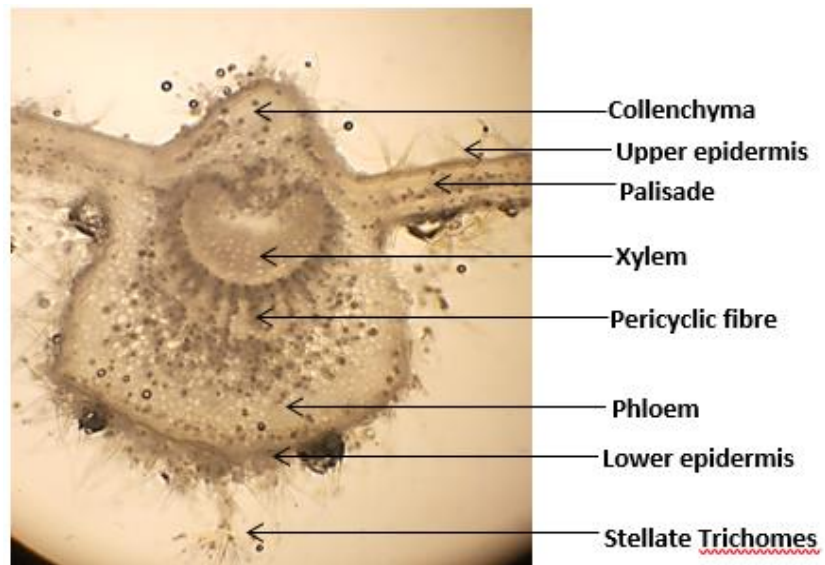
B= Stellate trichomes (X40)



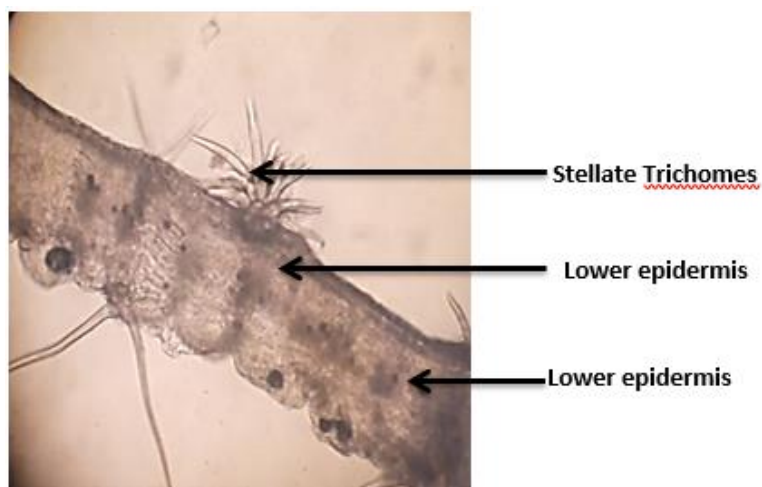
C= Stellate trichomes (X40)



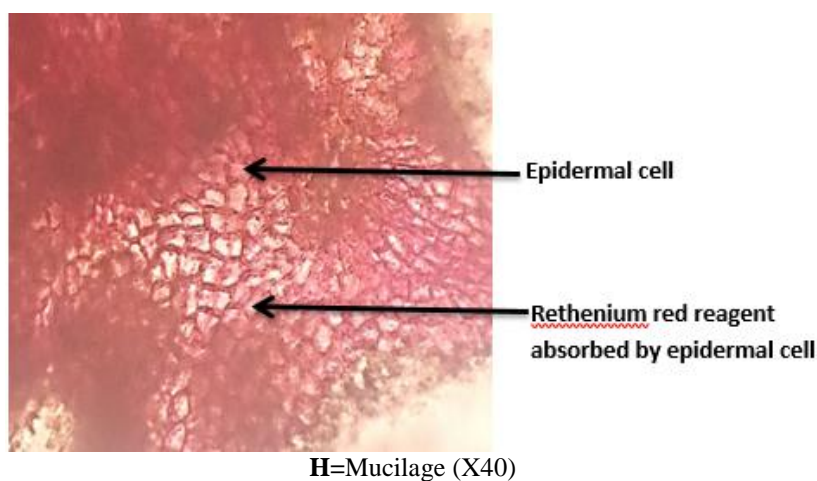
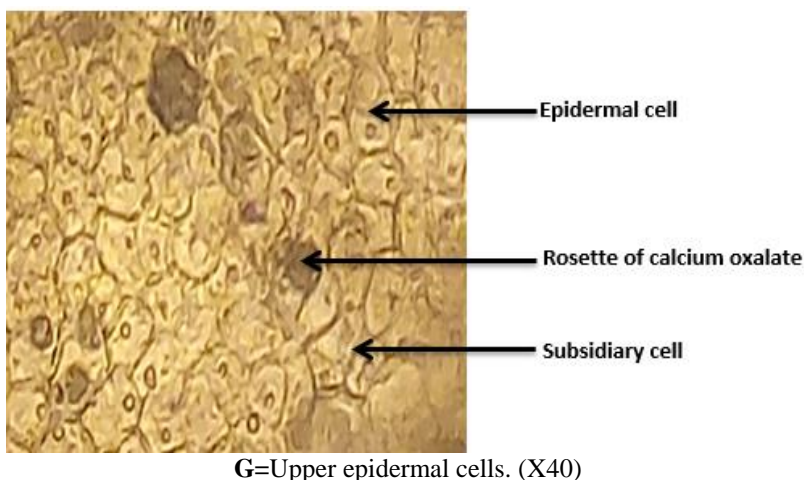
D= Anomocytics stomata (X40)



E= Midrib transvers section (X10)



F=Longitudinal section of the leaves (X40)



Plates A-H: Photomicrograph of *Azanza garckeana* leaves showing some diagnostic features

Conclusion. The data obtained in the pharmacognostic evaluation of *Azanza garckeana* can assist in the proper identification, collection and investigation of this plant as well as be suitable for inclusion in the pharmacopoeias of medicinal plants.

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