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Microscopic and Histological Observations of the Medicinal Leaves of *Guizotia abyssinica* (L.f.) Cass. (Asteraceae)

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ABSTRACT

Guizotia abyssinica (L.f.) Cass., Syn. *G. oleifera* D.C., *Polymnia abyssinica* L.f., Suppl., *Verbesina sativa* Roxb., *Jaegeria abyssinica* Spr., commonly known as Ramtil in Hindi and Niger in English belongs to family Asteraceae (Compositae) is native of Abyssinica (South Africa). The plant is used in the treatment of various diseases such as arthritis, microbial infections and seed oil serve as contraceptives. The leaves of *Guizotia abyssinica* (L.f.) Cass. (Asteraceae) are popular in Indian traditional medicine and as such provides good to develop herbal drug preparation to be used as phytomedicine. International criteria for validation and standardization of an herbal material as phytomedicine include microscopy and histological examination of raw material to guarantee its authenticity. The fresh leaves were taken to study the histology of the species. The thin section was made and treated with saffranine, chloral hydrate and iodine solution, mounted with glycerine and observed under microscope. Similarly, the dried leaves was made in to powder and was taken in glass slide, stained and mounted with glycerine, observed under microscope to reveal the powder character. The anatomical study revealed the presence of multicellular trichomes, stomata, chloroplast, conjoint and collateral vascular bundle, while powder microscopy revealed the presence of xylem vessels, parenchyma, calcium oxalate crystals etc. Thus, the present paper aims at setting the anatomical standards to establish quality control parameter for the raw material. The data obtained in present study will serve as valuable tool for identification, authentication and detection of adulterants, standardization and quality control of the plant *Guizotia abyssinica* (L.f.) Cass.

Keywords: *Guizotia abyssinica*, Leaves, Histology, Microscopy, Standards

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INTRODUCTION

The systematic study of flora traditional uses has led to the identification of plant species with bioactive compounds that could eventually developed as new drugs. Among the quality control parameters of medicinal plants recommended by WHO the visual macroscopy and microscopic verification are very essential. Since the macroscopic verification of botanicalsare most subjective and substitutes or adulterant exit which closely related, therefore anatomical studies are important. The microscopic examination compares the diagnostic tools in correct identification of botanicals.[1]

Herbal medicine is a triumph of popular therapeutic diversity. Almost in all traditional medicine, the medicinal plants play a major role and constitute the backbone for the same.[2] In order to make sure the safe use of these medicines, a necessary first step is the establishment of standards of quality, safety and efficacy.[3] Keeping these facts in consideration the present work was undertaken to reveal the microscopic and histological characteristics of *Guizotia abyssinica* (L.f.) Cass. Syn. Syn. *G. oleifera* D.C., *Polymnia abyssinica* L.f., Suppl., *Verbesina sativa* Roxb., *Jaegeria abyssinica* Spr., commony known as Ramtil (H) and Niger (E) belonging to family Asteraceae (Fig. 1). In spite of its numerous medicinal attributes, till date no work was reported on the microscopic examination of leaves of selected plant. Therefore, the present investigation was undertaken to set standards and revealed the anatomical features of the leaves of *Guizotia abyssinica*.

Figure. 1 *Guizotia abyssinica* (L.f.) Cass.: A Flowering Twing

MATERIAL AND METHODS

Selection, collection and authentication of plant/plant material

The seeds of the selected plant were collected in the months of July 2011 from the Jawahar Lal Nehru Krishi Vishwavidhalay (JNKVV) Agriculture University, Jabalpur, M.P. and identified & authenticated by Dr. (Mrs.) Neeta Singh, Prof. and Head, Department of Botany, Govt. Girls PG College, A.P.S. University, Rewa, M.P. and was deposited in our Laboratory, Voucher specimen No. PCog/GA/0914. The seeds were then sown in soil, irrigated regularly and after 3-4 months leaves was collected, dried under shade, powdered and stored in an air-tight container for further use.[2]

Microscopic and histological studies

The specimens of the proposed study were collected, care was taken to select healthy part and for normal organs. Then required samples of organ were fixed in FAA (formalin-5ml+ Acetic acid 5ml+ 70% Ethyl alcohol-90ml). Free hand transverse sections of fresh stem were taken, cleaned in chloral hydrate solution with gentle warming, stained with phloroglucinol and concentrated hydrochloric acid. They were mounted on slide in glycerine and studied under microscope. Microphotographs of sections were documented using microscope with camera, Nikon (14 mp). Descriptive terms of the anatomical features are as given in the standard anatomy book. The figure and details are given in the results. [4-5]

Powder Microscopy

The leaves was powdered and fine powders were taken in glass slide mounted with glycerine and was observed in microscope, photographs were taken using microscope with camera, Nikon (14 mp). [6]

RESULT AND DISCUSSION

The leaves of *Guizotia abyssinica* (L.f.) Cass. is a typical dorsi-ventral leaf revealed the following characters (Figure. 2).

Epidermis:

It is in two layers, one on each surface of the leaf, both the layers are composed of compactly arranged barrel shaped cells. Intercellular spaces are absent. Lamina of transverse section shows an upper and lower epidermis covered by thin cuticle. Multicellular hairs called covering trichomes are present on both the epidermis. Underlying the upper epidermis is a single-layered, compact, radially elongated palisade having scattered rosette crystals of calcium oxalate followed by spongy mesophyll composed of 2-3 layers of loosely arranged parenchymatous

cells. Midrib consists of well developed collenchyma beneath the epidermis.

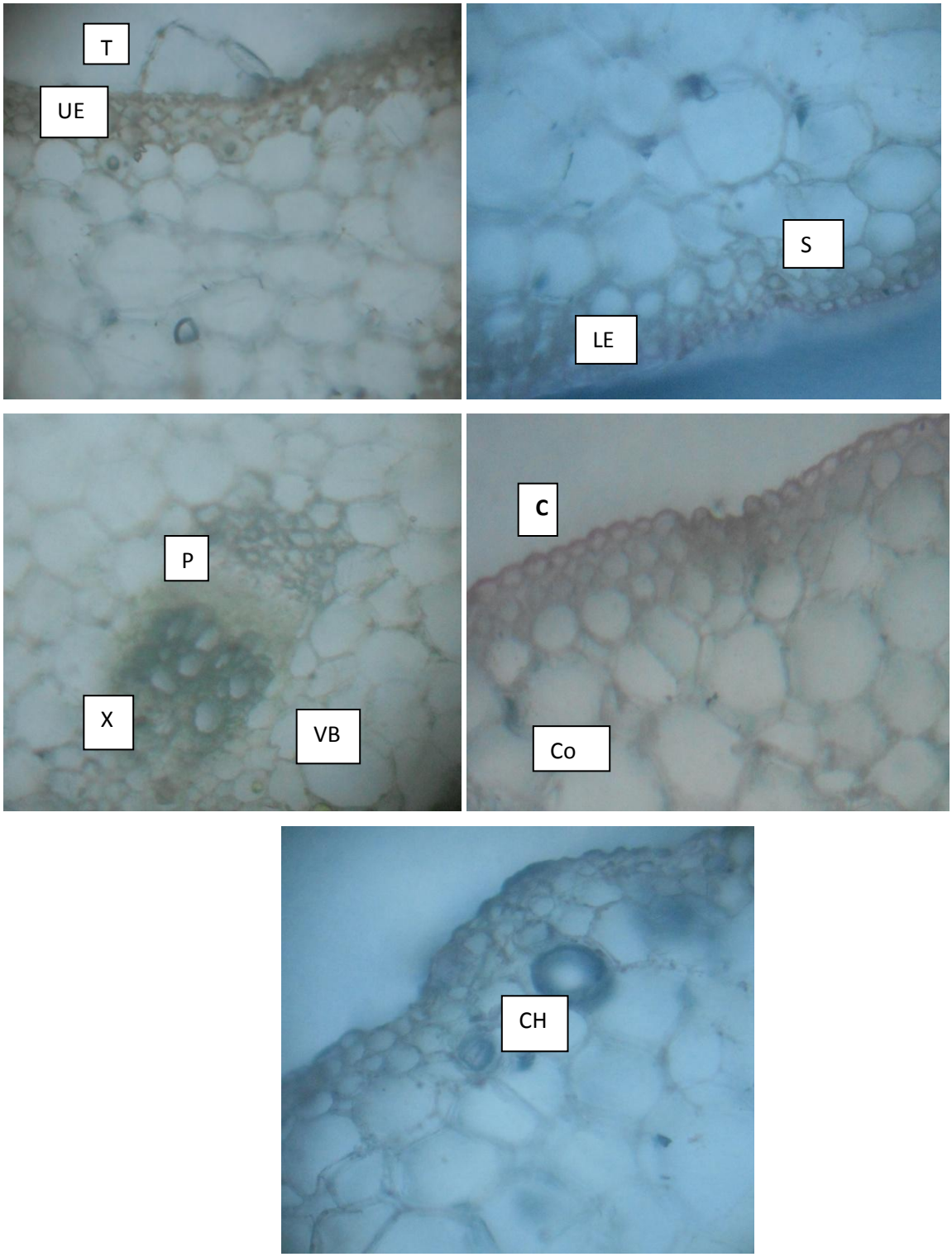

Figure. 2: Microscopic and histological features of leaves of *Guizotia abyssinica* (L.f.) Cass. Niger (x450), T: Trichomes, UE: Upper Epidermis, LE: Lower Epidermis, S: Stomata, VB: Vascular bundle, X: Xylem, P: Phloem, C: Cuticle, Co: Collenchyma, Ch: Chloroplast

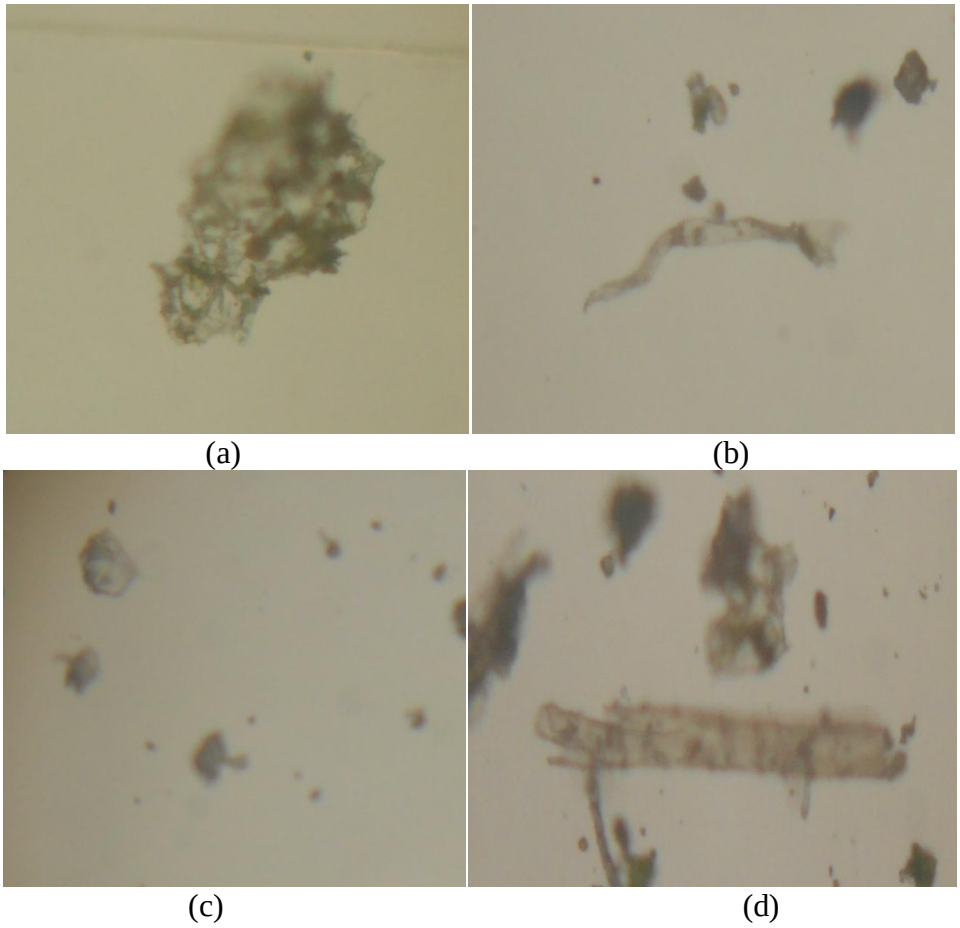

Figure. 3: Powder microscopic features of leaves of *Guizotia abyssinica* (L.f.) Cass. Niger (x450), (a): Parenchyma cells with epidermis, (b): Trichomes, (c): Vessels, (d): Calcium oxalate crystals

Mesophyll:

It is the ground tissue that occurs between two epidermis region, composed of collenchymas cells. The mesophyll is characterized differentiated in to two region i.e., upper palisade parenchyma and lower spongy parenchyma.

Pallisade parenchyma:

It is composed of two to three layers of elongated, compactly arranged collenchymas cells. Intercellular spaces are absent. The cells contain very large number of chloroplast.

Spongy parenchyma:

It is composed of few layers of loosely arranged spherical or oval cholenchyma cells with prominent intercellular spaces. These cells contain few chloroplast cells.

Vascular bundles:

Veins represents the vascular bundles. They are found irregularly scattered in mesophyll due to reticulate venation. Each vein has bundle sheath composed of single layer of barrel shaped

parenchyma cells. These bundle sheath included xylem and phloem. Xylem is found towards the upper epidermis and phloem towards lower epidermis. The vascular bundles are conjoint collateral with endarch xylem.

Powder microscopy

The powder is dirty green to brownish in color with faint odor and slightly bitter taste. The diagnostic features of the powder include covering trichomes, bordered pitted xylem vessels, parenchyma cells fibers and stomata (Figure. 3)

CONCLUSION

The anatomical studies can be used as a diagnostic tool for the correct identification of the species of *Guizotia*. Therefore, these features are useful in detecting the adulterants if any in this plant and will lead to efficacy and purity of the selected plant. Hence, these findings will be helpful in the correct identification, identity and purity of the selected medicinal plant.

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