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Microscopic and Histological Observations of the Medicinal Stem 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 stem 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 stem was 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 stem 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, oil glands, conjoint and collateral vascular bundle arranged in rings, stone cells and pith, while powder microscopy revealed the presence of xylem vessels, tracheids, starch grain, fibres and oil glands. 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*, Stem, Histology, Microscopy, Standards

ORIGINAL ARTICLE

INTRODUCION

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 (Sandoval et al., 2005).

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 (Dwivedi and Dubey, 2009). 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. In spite of its numerous medicinal attributes, till date no work was reported on the microscopic examination of stem of selected plant. Therefore, the present investigation was undertaken to set standards and revealed the anatomical features of the stem of *Guizotia abyssinica*.

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,

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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 stem was collected, dried under shade, powdered and stored in an air-tight container for further use.

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 (Dutta,1964; Sardana and Sharma, 2007). The figure and details are given in the results.

Powder Microscopy

The stem was powdered and fine powders were taken in glass slide mounted with glycerine and was observed in microscope (Jackson and Snowdon, 2005), photographs were taken using microscope with camera, Nikon (14 mp).

RESULT AND DISCUSSION

Stems are usually above ground organs and grow towards light (positively phototropic) and away from the ground (negatively geotropic), except in the case of certain metamorphic (modified) stems. The main stem develops from the plumule of the embryo, while lateral branches develop from auxillary buds or from adventitious buds. In normal stems clearly defined internodes and nodes can be distinguished, the latter being the regions where the leaves are attached. In younger stems stomata are found in the epidermis while in the mature stems lenticels are evident. Depending on the hardness of the stem one can also distinguish between herbaceous and woody stems. In the present paper the internal structures of dicotyledonous stem of *Guizotia abyssinica* (L.f.) Cass., Niger were studied and reported. The microscopic study revealed the presence of multicellular trichomes, oil glands, conjoint and collateral vascular bundle arranged in rings, stone cells and pith (Fig. 1), while powder microscopy revealed the presence of xylem vessels, tracheids, starch grain, fibres and oil glands (Fig. 2). The detailed histological features are discussed below:

Epidermis: It is the outermost layer**,** consist of single row of cells, flattened tangentially and fitted closely along their radial walls with a well-defined cuticle.

It bears multicellular hairs and few stomata, but no chloroplast.

Cortex: It lies below the epidermis consist of external collenchymas, central parenchyma and internal endodermis (starch sheath). It is dived in to hypodermis, cortical parenchyma and endodermis. Hypodermis (Collenchyma) lies below epidermis and consist of 4 or 5 layers of collenchymas cells. These cells are specially thickened at the corners and contains number of chloroplast. Cortical parenchyma or general cortex lies internally to the hypodermis and consist of a few layers of thin walled, large, oval parenchyma.Endodermis is the innermost layer of cortex, barrel shaped and fit closely without intercellular spaces and contains numerous starch grains known as starch sheath.

Pericycle: It is the region present between endodermis and vascular bundle and consists of alternate bonds of parenchyma and sclerenchymatous cells.

Medullary rays: Two layers of radialy elongated parenchymatous cells occur between two vascular bundles.

Pith: It is the large central part occupies major portion and is central part consists of oval shaped parenchymatous cell with conspicuous intercellular spaces.

Vascular bundles: Vascular bundles are arranged in ring and are conjoint, collateral and open type. Pholem present below sclerenchymatous patches of pericycles and made up of sieve tube, companion cells, phloem parenchyma and phloem fibers. Xylem is situated towards pith and consists of tracheids, vessels, xylem parenchyma and xylem fibers.

Powder Microscopy

The powder is light to dirty green in color with faint odor and slightly bitter taste having following features:

1. Parenchymatous cells are oval shaped, thin walled, isodiametric and are present in cluster and are present in groups in union with epidermal cells.
2. A cortex cell consists of round shaped parenchyma.
3. The abundant starch grains which are composed with two, three or more components, individual granules are flat and fairly small. A hilum is visible in some of the granules.
4. Many multicellular trichomes are visible. They are 5-6 celled.
5. The fibrous cells which are generally found in groups vary in shape but are usually narrow and elongated with blunt end.
6. Tracheids and xylem vessels are also visible in cluster, 2-3 celled and compact in nature.
7. Oil glands are also visible.

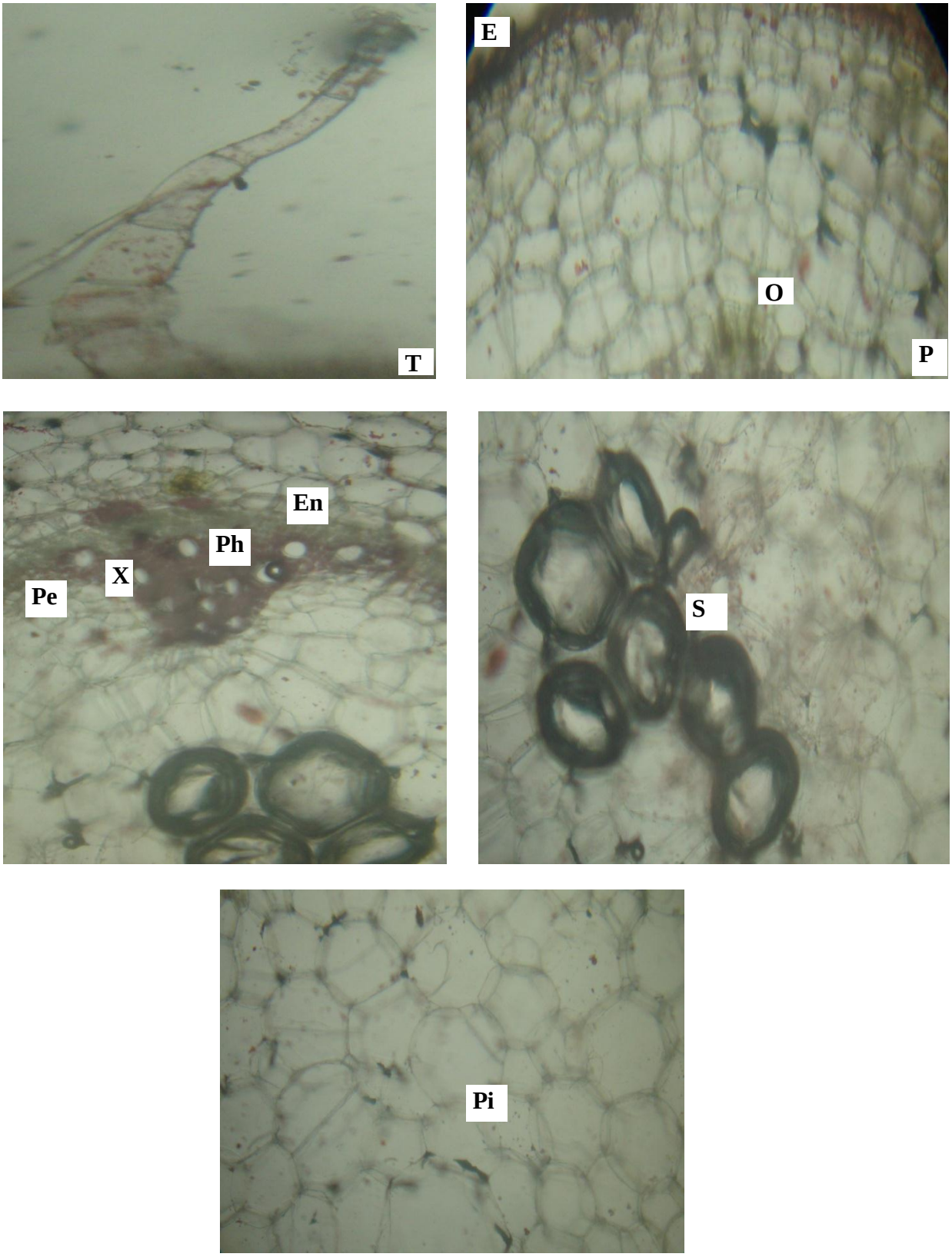

Fig. 1: Microscopic and histological features of stem of *Guizotia abyssinica* (L.f.) Cass. Niger (x450), T: Trichomes, E: Epidermis, P: Parenchyma, O: Oil glands, Pe: Pericycles, X: Xylem, P: Phloem, En: Endodermis, S: Stone cells, Pi: Pith

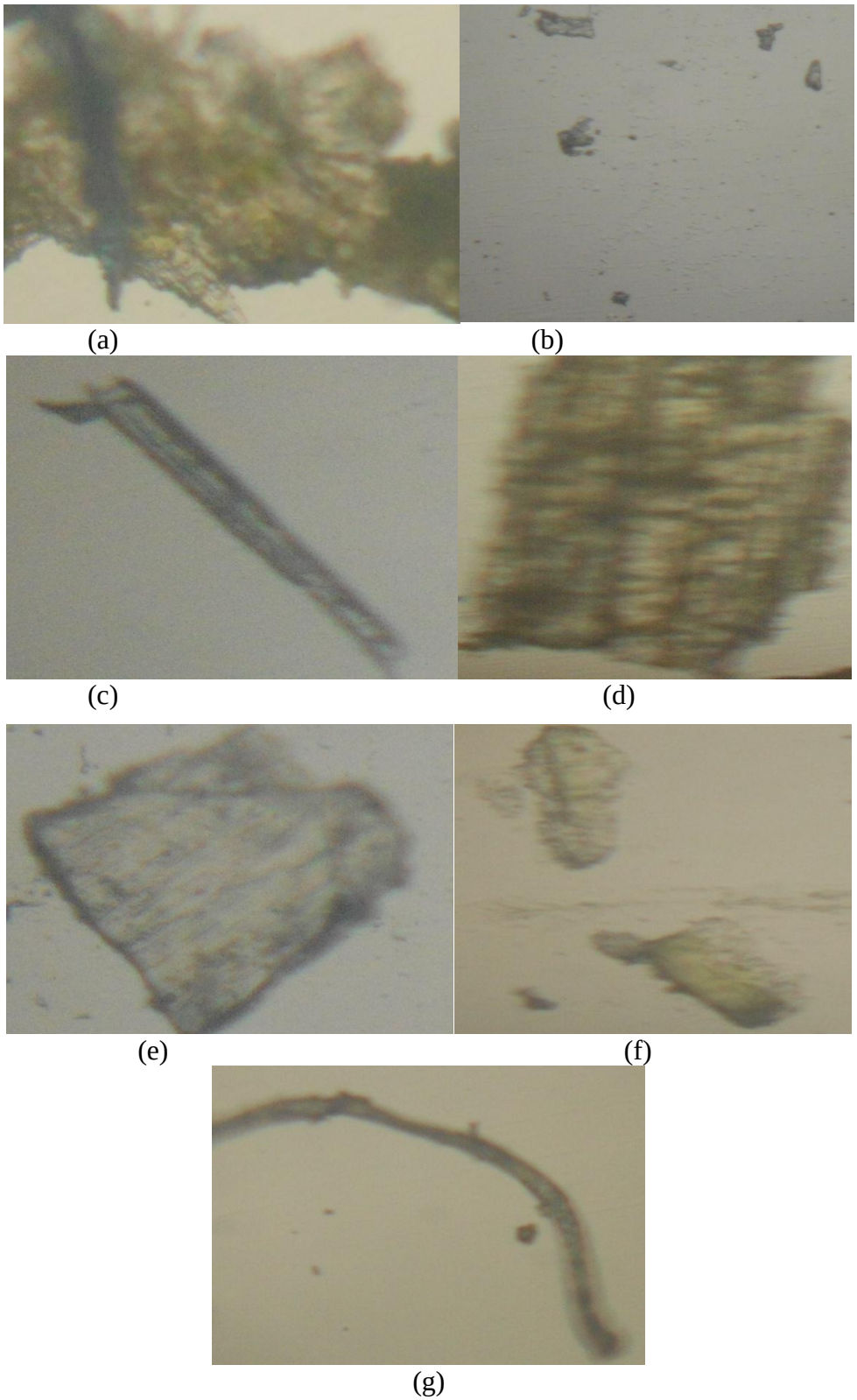

Fig. 2: Powder microscopic features ofstem of *Guizotia abyssinica* (L.f.) Cass. Niger (x450), (a): Parenchyma cells with epidermis, (b): Starch grains, (c): Fibers, (d): Xylem vessels, (e): Vessels, (f): Oil globules, (g): Trichomes

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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