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Macro-microscopic standards of an abortifacient drug- langali (tubers of *Gloriosa superba* Linn.)

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Abstract

Gloriosa superba Linn., a striking herbaceous tendril climber with underground cylindrical white tuberous root, forms as a source of Langali -a upavisha dravya. The root contains an alkaloid colchicine (0.23- 0.3%). Though a poisonous root, having the magnificent therapeutic benefit, deliberate attempt to record its standard macro-microscopic features by photomicrography is lacking. Matured, authenticated tuberous roots were collected from its natural habitat. Macro-microscopic and powder characters were recorded using standard methodology. Thin walled parenchymatous cells with plenty of simple and compound starch grains, collateral vascular bundles scattered in the ground tissue, and absence of any sclerenchymatous tissue are microscopic recordings of transverse section of root. The powder has shown the presence of starch grains and cells of scaly leaves in surface view. This study along with photographic atlas will serve as reference for the correct identification of the drug and to differentiate it from their substitute and adulterants.

Keywords: Abortifacient, *Gloriosa superba*, Langali, Upavisha, Pharmacognostic.

Introduction

Langali consists of dried tuberous roots of *Gloriosa superba* Linn.,¹ a drug of herbal origin mentioned in all texts of *Ayurveda* since *Vedic era*. It is a climber with very attractive flowers. *Brihatrayees* did not report the *Shodhana* (purification) of *Langali* except being considered as *Mulavisharoot poison*) by *Charaka*.² Whereas other classical texts categories it under nine *upavisha varga*(group of less toxic drugs) and advocate certain *shodhana* procedures, before its internal administration.³ It is said to be attributed with *katu-tiktha-kashaya rasa*, *katu vipaka* and *ushna veerya*; has *teekshna*, *ruksha*, *sara* and *laghu gunas*.⁴ The roots are said to be *garbhashaya sankochaka*(uterine contractor), *ksobhaka*(irritants), *rechaka*(purgatives), *raktashodhaka*(blood purifier), *krimighna*(antimicrobial), *kandughna*(antipruritic)³. It forms as an ingredient of some important formulations like *mahavishagarbha taila*, *kasisaadi taila*, *karaviraadi taila*, *vishyandana taila*, *langali rasayana*⁵ etc. Categorization under *upavisha varga* may be due to its abortifacient activity or the extremely poisonous alkaloid colchicine and colchicoside.⁶ Colchicine is used as mitosis-arrest agent and in cancer therapy and diabetes.⁷ Colchicoside is used against acute inflammation like gout and arthritis.⁸ Because of this the plant is being exploited extremely due to increased demand by pharmaceutical companies both within and outside India.⁹ Hence it has become endangered within a very short period. But the drug forms an ingredient of many popular formulation of *Ayurveda*, as well as a demanded drug from modern pharmaceutical science. As the drug is not available in

the market, rhizomes of *Costus speciosus* (Koen.) Sm., known as *Kebuka* in *Ayurvedic* pharmacopeia, are sometimes sold in the market under the name of *Langali*.^{4,5} Under these circumstances it was thought essential to explore its pharmacognostical standards by recording macro-microscopic fingerprints. The study would be a first step to ensure its originality in any traditional formulation.

Materials and methods

Collection of plant sample

Tuberous roots were collected during month of October after flowering and fruiting, from its natural habitat and were authenticated by referring to Flora of Udupi.¹⁰ Voucher specimen was deposited in Pharmacognosy department of the institute for further documentation (Voucher no. 306/1309120). As per the general practice of raw material processing, collected raw material was cleaned by washing under running water. Organoleptic, macroscopic, and microscopic characters were studied as described in quality control methods.^{11,12} For microscopic study roots were preserved in a fixative solution FAA (Formalin-5ml + Acetic acid-5ml + 70% Ethyl alcohol-90ml). The materials were left in FAA for more than 48 hours before cutting sections. The remaining roots were dried under shade and then were powdered.

Microscopy: The preserved specimens were cut into thin transverse section using a sharp blade and the sections were stained with saffranine. Transverse sections were photographed using Zeiss AXIO trinocular microscope with attached camera under bright field light. Magnifications of the figures are indicated by the pre-calibrated scale-bars using Zeiss AxioVision software.

Powder microscopy: About a gram of powder was sift through 80 pore size mesh. A pinch of the powder was mounted on a microscopic slide with a drop of glycerin-water. Characters were recorded as mentioned above.

Results

Macroscopy

Roots tuberous, almost cylindrical or slightly laterally flattened, thick, 15- 30 cm long and 2.5 - 3.8 cm thick, often bifurcated with tapering ends, resembling a ploughshare, one arm generally more than double the

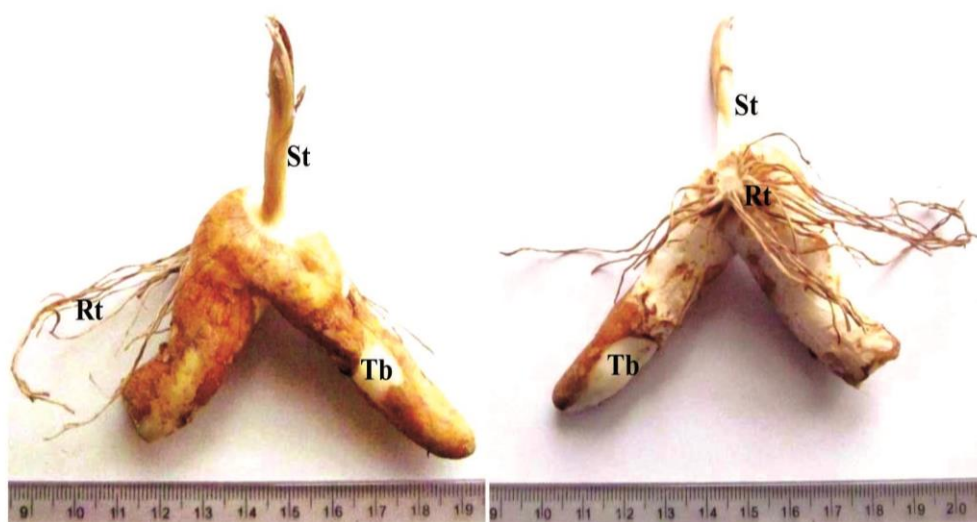
length of the other (Figure 1.1). Transversely cut pieces are yellowish brown externally and yellowish off-white internally; fracture, short; taste, acrid and bitter (Figure 1.2 and 1.3).

Microscopy

Transverse section of an entire tuber is circular to oval in outline often compressed laterally. The section is covered by thin layer of brownish scales forming skin over the tuber. The peeled off thin brown outer skin is composed of two or three rows of thin walled rectangular tangentially elongated cells in well developed tubers in transverse view. On surface view it is composed of mostly elongated cells of various sizes with thin brownish walls, often with few stomata. The epidermis is formed of nearly rectangular cells with thickened outer walls. Some of these cells contain large globules of a greenish yellow colour nearly filling the cells. The outer cortical region of the sections shows four to eight rows of parenchymatous cells with thin colourless walls containing small starch grains, and the cortex is traversed by a single vascular bundle. Inner to this region is a homogenous fleshy parenchymatous ground tissue with many small scattered vascular bundles. The parenchyma cells are large, polygonal, fully loaded with starch grains and with prominent intercellular spaces. The starch grains are mostly simple and oblong rounded or polyhedral in outline; 8 to 72 μm in length; hilum distinct or clear, 2 to 5 radiate; compound grains with 2 to 3 components are often. The vascular bundles are simple, collateral, many, scattered in the ground tissue. Vessels are mostly annular and spiral. Phloem parenchyma cells are small and thin walled, sieve tubes and companion cells are not prominent. Bundle sheath formed by small sized parenchyma cells, cells smaller than those of adjacent ground tissue and is devoid of starch grains. Any kind of mechanical tissue is completely absent. High content of starch grains of comparatively very large size up to 72 μm is a diagnostic feature (Figure 2).

Microscopy of powder

Brown; shows epidermis of tuber in surface view; fragments of parenchyma cortex containing starch grains, simple and few 2 to 3 compound starch grains showing clear hilum and concentric striations; thick-walled fragment of scaly leaf in surface view; a few xylem vessels and tracheids with scalariform and pitted thickenings; and fragment of vascular bundle with vessels, tracheids and indistinct phloem (Figure 3).



1.1 Fresh tuber showing upper and lower surfaces



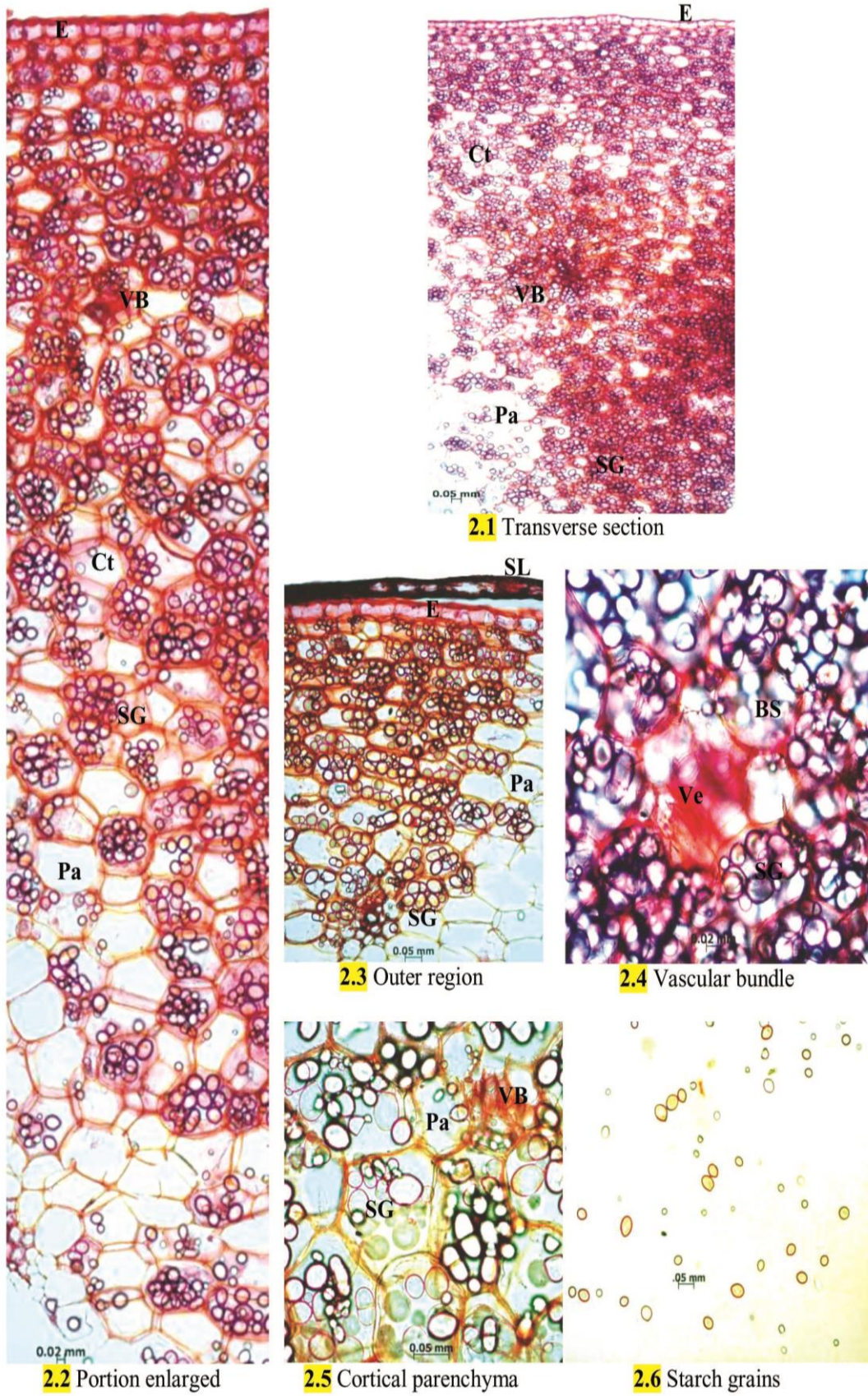
Fig. 1.2 Dried sliced tubers



Fig. 1.3 TS of tuber

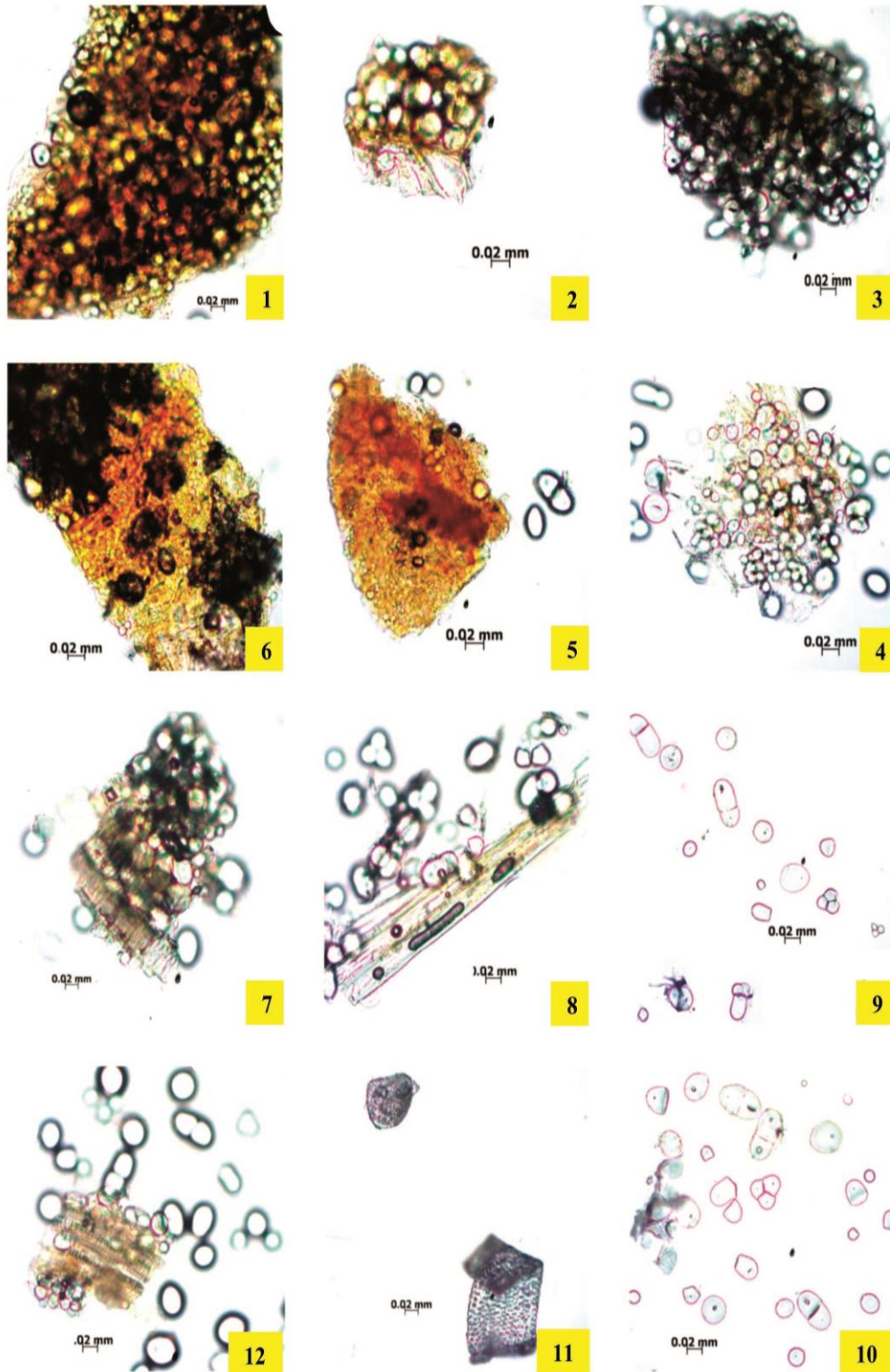
E, epidermis; GT, ground tissue; Rt, root; St, stem; Tb, tuber.

Figure 1: Macroscopic features of tuber of *Gloriosa superba*



BS, bundle sheath; Ct, cortex; E, epidermis; Pa, parenchyma; SG, starch grains; SL, scaly leaf; St, stem; TS; transverse section; VB, vascular bundle; Ve, vessel.

Figure 2: Detailed microscopic features of TS of tuber of *Gloriosa superba*



1-4, parenchyma of the cortex containing starch grains; 5, epidermis of tuber in surface view; 6, fragment of scaly leaf in surface view; 7, scalariform vessels; 8, cells of scaly leaves in surface view; 9, 10, simple and compound starch grains; 11, pitted vessel and tracheid; 12, fragment of vascular bundle with vessels and tracheids.

Figure 3: Microscopic features of powder of tuber of *Gloriosa superba*

Discussion

Langali consists of dried tuberous roots of *Gloriosa superba* Linn., classified as one among upavisha dravya. Garbha patani, garbhantaka, and garbhaghna are some special synonyms suggestive of its abortifacient activity. Colchicine an alkaloid and its glycoside colchicoside are the two compounds which of its roots and having increased demand by the pharmaceutical companies within and outside India. As *Langali* forms an ingredient of many popular Ayurvedic formulations it has become an endangered species. Rhizomes of *Costus speciosus* are said to be sold in the market under the name of Langali. Authentication should be the primary criteria of any research using plants, which will help to ensure the quality of any medicinal product. A characteristic macro-microscopic fingerprint of a drug is diagnostic in identifying crude drugs of plant origin.

Conclusion

In the present study, the macroscopic, microscopic and powder characters of the tuberous roots of *Langali* (*Gloriosa superba* Linn.) have been recorded. This drug can be identified macroscopically by a typical ploughshare appearance. Thin walled parenchymatous cells with plenty of simple and compound starch grains, collateral vascular bundles scattered in the ground tissue, and absence of any sclerenchymatous tissue are microscopic recordings of transverse section of root. Powder has shown the presence of starch grains and cells of scaly leaves in surface view. This study along with photographic atlas will serve as reference for the correct identification of the drug and to differentiate it from their substitute and adulterants.

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Conflicts of Interest

There is no conflict of interest.

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