



Morphological and Microscopic Studies of Aerial Parts of Ceylon Leadwort

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Authors' contributions

This work was carried out in collaboration among all authors. Author VA has designed this work. Author CB has performed the microscopic study of leaf, fruit and seed. Authors SK and KG have performed the morphology of aerial parts and microscopy of stem portion. All authors read and approved the final manuscript.

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ABSTRACT

Plumbago zeylanica Linn. is a perennial shrub comes under the category of Angiosperm commonly known as Ceylon leadwort belonging to family Plumbaginaceae. In Indian System of Medicine i.e. Ayurveda, *Plumbago* (Chitrakmool) used as ingredient in various formulations as an effective appetizer, anti-inflammatory and aids in digestion by stimulating gastric secretions. The present investigation deals with morphology and microscopy of aerial parts of Ceylon leadwort. Morphological study of glandular trichomes of fruits revealed the insect attracting property of plant. Microscopic study of leaves, fruit, stem and seed shows identifying characteristics which are helpful in further standardization of this plant.

Keywords: *Plumbago*; morphology; microscopy.

1. INTRODUCTION

Plumbago zeylanica Linn. is a perennial shrub that grows throughout India particularly in

peninsular India and west Bengal, and cultivated in gardens throughout India [1]. This plant is commonly known as Ceylon leadwort and Chitraka in Sanskrit used to treat number of

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diseases [2]. It is an ingredient of large number of Ayurvedic formulations like Yogaraja guggulu vati, Punarnava guggulu vati [3], Chitrakadi taila [4], Satyadi churna and gutika [5], Abhayarishtah [6]. Different species of *Plumbago* exhibit diverse pharmacological activities like wound healing [7], reduces obesity [8], anti-cancer [9], anti-candida [10] and inhibits neurotoxicity [11]. Plumbagin inhibit the growth of esophageal squamous cell carcinoma both in vitro and in vivo [12], mosquito repellent [13], inhibits neuronal apoptosis [14] and as an effective appetizer, anti-inflammatory and stimulates gastric secretions [15]. The glandular trichomes secrete sticky exudates which aid in trapping insects and attributes to its insect capturing property [16].

2. MATERIALS AND METHODS

2.1 Collection of Plant

Different plant samplings were collected in the month of January 2019 from herbal garden of Government College of Pharmacy Rohru, Distt. Shimla, Himachal Pradesh, India and the collected samples were subjected to morphological and microscopic studies. The herbarium specimens were authenticated and deposited in Department of Pharmacognosy for future reference.

2.2 Morphology and Microscopy [17-18]

Morphological studies of leaf, flower, fruit and seed were carried out with the help of magnifying

lens. Transverse sections of the fresh leaf, stem, fruit and seed were prepared for the microscopic studies and examined under Tri-nocular microscope Olympus-CH-20i model.

2.2.1 Section cutting

Sections were cut with the help of sharp razor blade. Thinner sections were subjected for observations of tissues under microscope.

2.2.2 Staining process

Phloroglucinol solution was prepared by dissolving 2gm of phloroglucin in 100 ml of 90% alcohol along with minute quantity of concentrated hydrochloric acid and for preparation of safranin stain 1% solution of safranin was dissolved in 50% alcohol. This stain is retained by lignified, suberized and cutinized walls.

2.2.3 Mounting process

Sample was taken in a clean glass slide and on this slide a section was transferred with the help of drawing brush. One or two drops of glycerin-water were added on the section with a dropper and finally with the help of forecep section was mounted.

3. RESULTS AND DISCUSSION

The results of morphological and microscopic examination of aerial parts of Ceylon leadwort are given in the Fig. 1(a-c) and Fig.2 (a-g).



Fig. 1a. Morphology of leaf and flower

LF: Leaf, FR: Flower



Fig. 1b. Morphology of seed and fruit
SD: Seed, FR: Fruit



Fig. 1c. Insect trapped by ceylon leadwort
IS: Insect

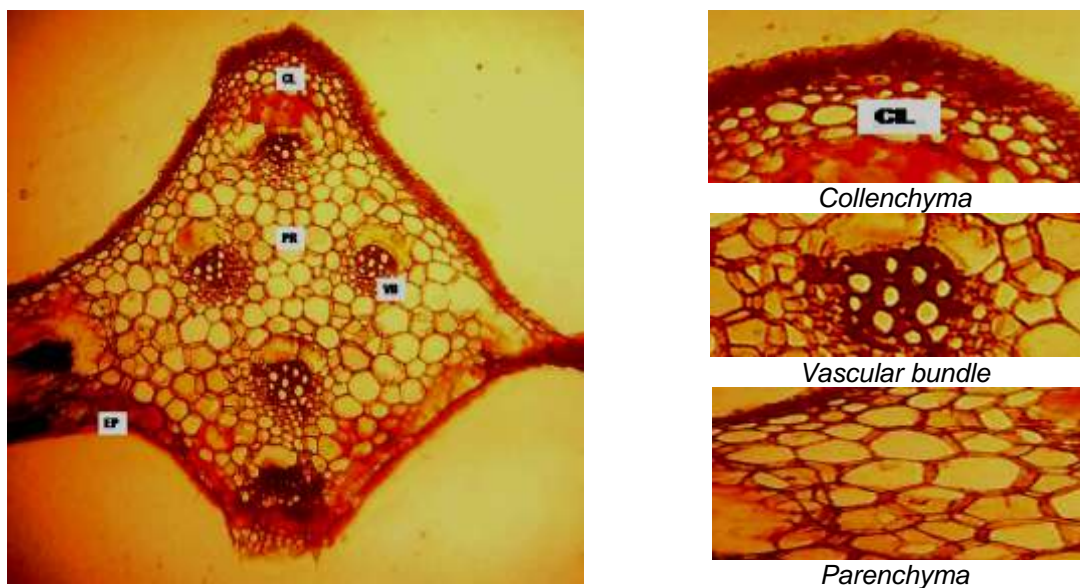


Fig. 2a. Transverse section of leaf
CL: Collenchyma, PR: Parenchyma, VB: Vascular bundle, EP: Epidermal cells



Fig. 2b. Leaf epidermis
ST: Stomata, EP: Epidermal cells



Fig. 2c. Transverse section of fruit
MS: Mesocarp, ED: Endocarp

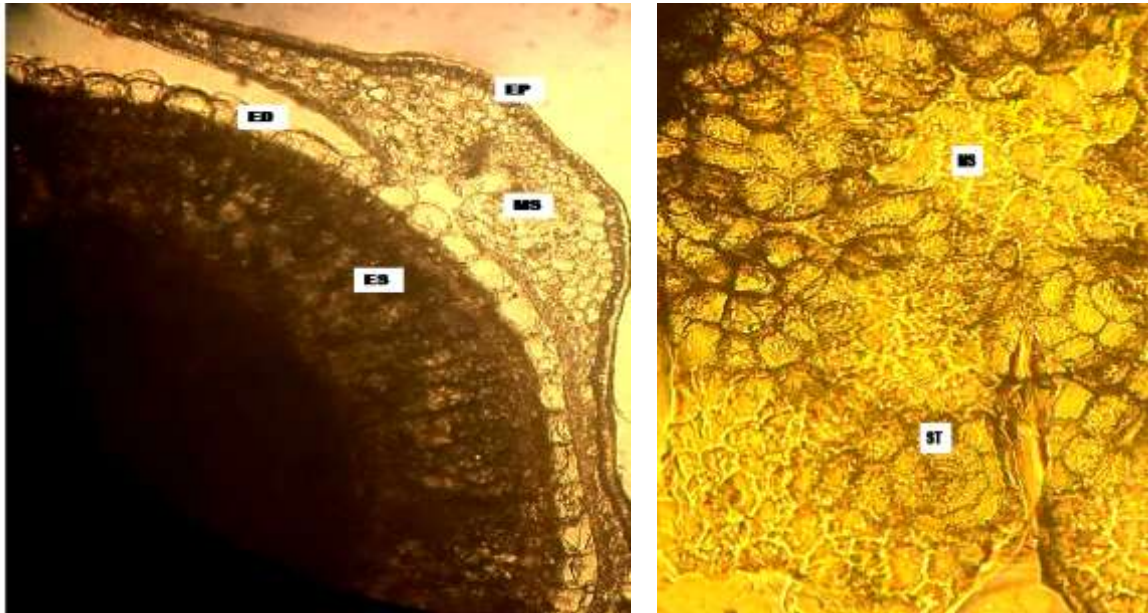


Fig. 2d. Transverse section of fruit
EP: Epicarp, MS: Mesocarp, ED: Endocarp, ES: Endosperm, ST: Stomata

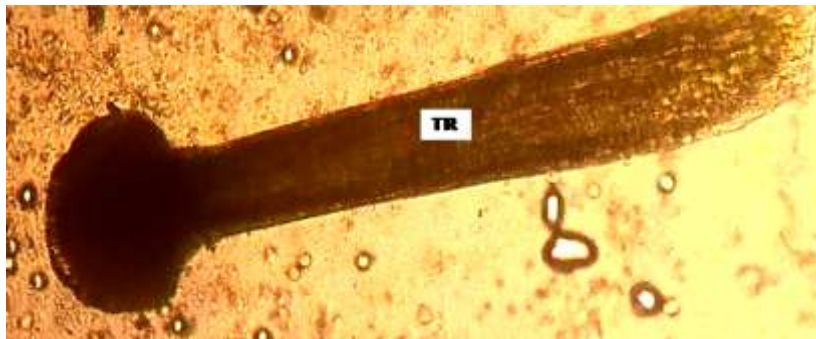
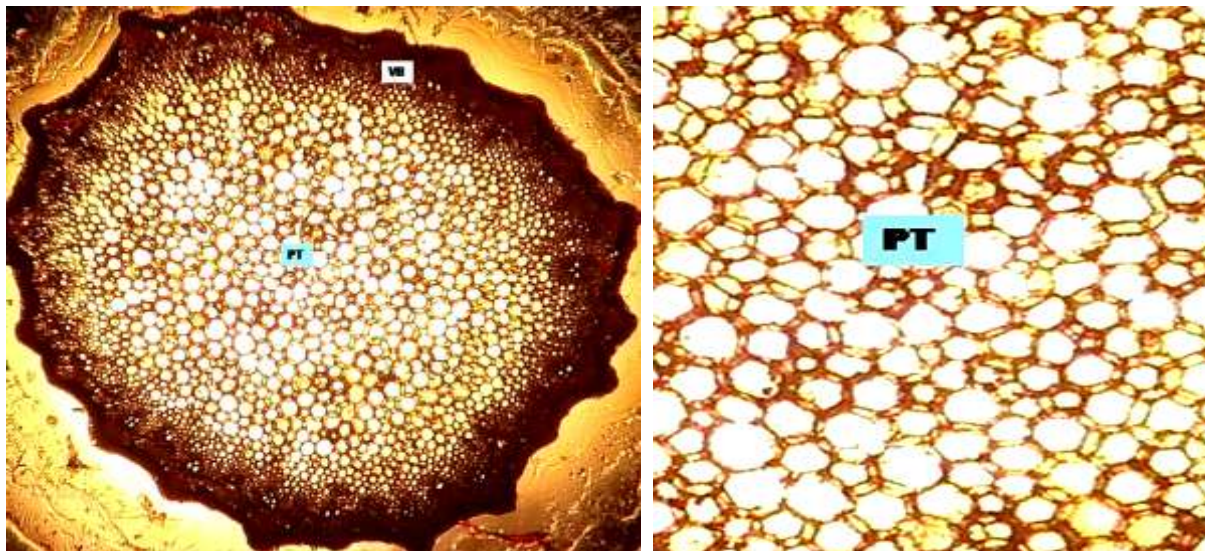


Fig. 2e. Glandular trichome in fruit
TR: Trichome



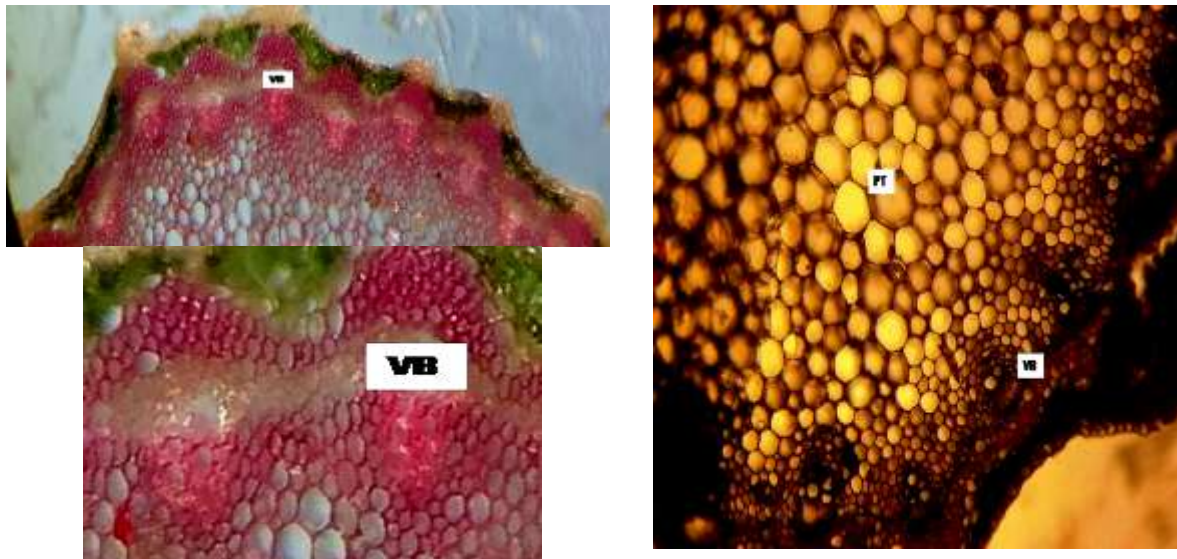


Fig. 2f. Transverse section of stem

PT: Pith, VB: Vascular bundles

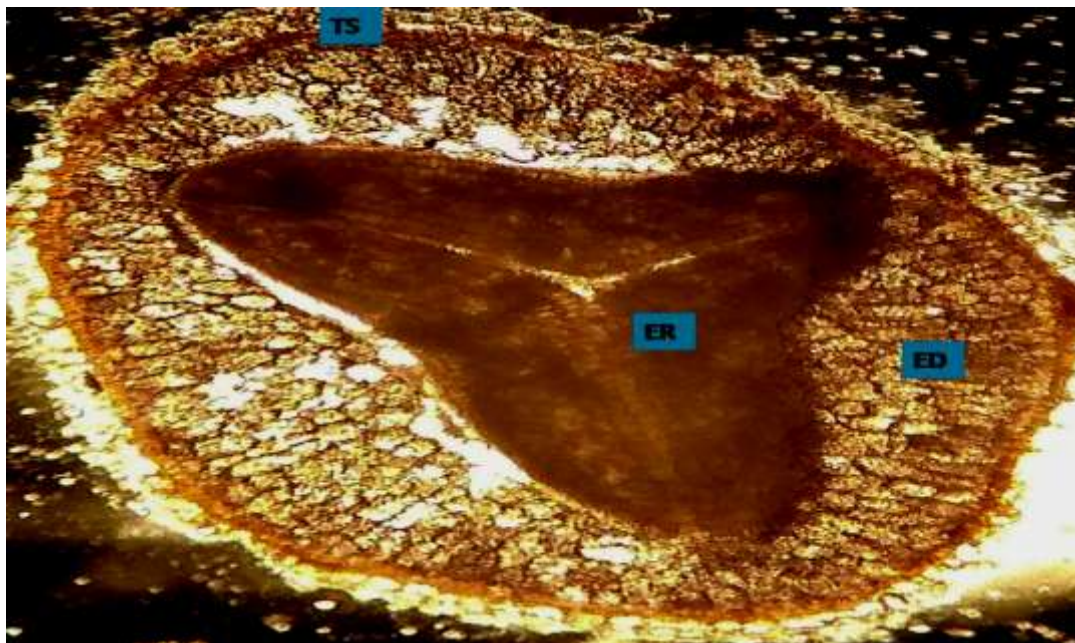


Fig. 2g. Transverse section of seed

TS: Testa, ER: Embryo, ED: Endosperm

Leaves are cordate in shape with hairy margin, 6-12 cm in length and 4-7.5 cm in breadth. Flowers varies from white to light blue in colour and are bisexual, regular, pentamerous and sweet scented. The stamens are free, the style is filiform with five elongated stigma lobes and ovary is superior. They are also characterized by having tubular calyx with glandular trichomes (hairs) secreting a sticky mucilage. The plant pollination is mainly by insect. The fruit of the

plant is oblong (0.1-0.2 mm) long. The seeds are also oblong in shape, 0.5-0.8 mm in length and dark brown in colour. The mucilaginous glands aid in trapping insects and fruit dispersal by animals. Transverse section of leaf shows the presence of epidermal cells, four to five layered collenchyma, parenchymatous tissue and vascular bundles arranged in the form of ring. Anisocytic or cruciferous stomata surrounded by three subsidiary cells are present in leaf

epidermis. T.S. of fruit shows layer of epicarp, mesocarp, endocarp and anisocytic stomata is also present in mesocarp layer alongwith glandular trichome in outer epicarp. Transverse section of stem shows the presence of pith and lignified vascular bundles arranged in the form of ring. Layers of testa, embryo and endosperm are present in the seed.

4. CONCLUSION

The anatomical description of *Plumbago zeylanica* Linn. leaf, stem, fruit and seed is presented for the first time in this research paper which contributes to further knowledge of this plant. Presence of cruciferous stomata, collenchyma and parenchymatous tissue in leaf, lignified vascular bundles in stem, glandular trichome in fruit and layers of testa, embryo and endosperm in seed shown in study. This will be helpful in anatomical studies of this particular species plant *Plumbago* belonging to family Plumbaginaceae.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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