



Macroscopic and Microscopic Evaluation of *Indoneesiella Echioides* (L.) Sreem

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ABSTRACT

Indoneesiella echioides (L.)Sreem., an annual herb occurring in South India, is listed in *Hortus Malabaricus* a 12–volume treatise on the plant wealth of Malabar during 17th century. The drug is mentioned in the name ‘*Peetumba*’ and is indicated as a remedy for poison of mad dog, cold and fevers. Research works have not been conducted in this plant from Ayurvedic fraternity. This paper deals with authentication of the drug by macroscopical and microscopical analysis. Organoleptic characters of root, stem, leaf, seed and whole plant powder was done along with section microscopy and powder microscopy. The section microscopy of root revealed features like single cell layered epidermis, followed by several cell layered cortex, 2 cell layered endodermis, 6-7 cells layered pericycle, phloem, exarch xylem and medullary rays. On analysing the section microscopy of stem features like longitudinally elongated epidermal cells which had striated cuticle, epidermal hairs, collenchyma cells, cortex, end arch xylem, cambium, phloem and pith were present. Section microscopy of leaf showed upper and lower epidermis with striated cuticle on outer surface of the cells with unicellular, uniseriate, trichomes. The mesophyll, made of palisade cells and spongy cells and stele in the midrib region along with distinct vascular bundles were present. The whole plant powder of *Indoneesiella echioides*(L.)Sreem., was dark green with granular texture characteristic penetrating odour, bitter and astringent taste. In microscopy tracheids with pitted thickening, xylem vessels with bordered pitted and spiral thickenings, calcium oxalate crystals and starch grains were also present. As the drug is not described in Ayurvedic Pharmacopoeia of India, this study will pave way to a novel drug research.

KEYWORDS: *Indoneesiella echioides*(L)Sreem., *Hortus Malabaricus*, Ayurveda, macroscopy, microscopy.

INTRODUCTION

More than 90% of crude drugs are derived from plant sources. Pharmacognostical study helps to confirm the genuinity of plants and raw drugs, hence can prevent adulteration and substitution and thus aids in quality control of finished products. According to Ayurvedic Pharmacopoeia of India, the standard procedures for assessing the genuineness of a raw drug are macroscopic evaluation, microscopic evaluation, physical examination and chemical examination. Evaluation of drugs by colour, odour, taste, size and shape constitute macroscopic evaluation. It is the simplest and important tool for the identification of raw drugs without the aid of an instrument. In microscopic evaluation more detailed examination of a drug and its identification by known histological characters is done with the help of a microscope. Microscopical evaluation is intended for different parts of plants or powder of the plant.

The time old application of the drug *Indoneesiella echioides*(L.)Sreem.by traditional Ayurvedic practitioners is evident from the mentioning of this drug in the *Hortus Malabaricus* a 12–volume treatise on the plant wealth of Malabar during 17th century¹. The then Dutch Governor of Cochin, Commodore Hendrik Adriaan Van Rheede compiled and promoted the work with the helping hands from Itty Achuden a famous *Collatt*

Vaidyan, (Dr.) at that time². Itty Achuden belonged to a family which had a rich tradition of Ayurvedic practice for many thousands of years. Also he is considered as the author of 'Keralaaraamam' a Malayalam book which is considered as the primordial source for *HortusMalabaricus*³. Itty Achuden, in his own handwriting in his native language (Malayalam) had certified the authenticity of these medicines. A good pictorial representation of the plant is given in the book. The drug is mentioned in the name 'Peetumba' ('pee' means wild, inferior; 'thumba' refers to *Leucasaspera*. 'Gopuramthangi' is the new name given which literally correlates to its tower like morphology (tower-gopuram; supporter-thangi). Brahmins called this plant as 'Butumbo' growing in humid places to the height of about 3 feet. The drug is said to occur throughout the Malabar. Its leaves are said to be alexipharmic (antidote to poison) against the poison of mad dog; when employed externally and juice something specific in cold and fevers⁴.

Even though the traditional usage of the drug is evident from the description given in *Hortus*, the plant is now an ignored common weed. At the same time this herb is popular among various tribes of Tamilnadu and is used in Siddha medicine⁵. The utility of the drug ranges from mild bodily ailments to acute conditions like snake bite⁶. Hence the present drug need to be studied more for enabling its full fledged utility in Ayurveda. In the present study the pharmacognostical evaluation of whole plant of *Indoneesiella ellaechioides*(L.)Sreem. has been conducted. The analysis of root, stem, and leaves were done macroscopically and microscopically. Powder microscopy of the whole plant was also done.

MATERIALS AND METHODS

1. Collection of the plant

The whole plant (Figure No.1(a)), *Indoneesiella echioides*(L.)Sreem. was pharmacognostically identified and collected from herbal garden, Department of Dravyagunavijnanam, Government Ayurveda College, Tripunithura during the month of December. Fresh plant material devoid of impurities was used for macroscopy as well as section microscopy and dried whole plant powder (Figure No.2) for powder microscopy.

2. Macroscopical and Microscopical Analysis

Macroscopic evaluation was carried out separately for root, stem, leaves and seed (Figure No.1(b-f)). Section microscopy for root (Figure No. 3), stem (Figure No. 4) and leaf (Figure No. 5) were done along with the powder microscopy of the whole plant powder (Figure No. 6). Magnifying lens, dissecting microscope, digital camera, razor or safety razor blade, dissecting needles, watch glasses, Petri dishes, glass slides, cover slips ¾ circles (No.2 thickness), camel hair brush (medium size), dropper, safranin stain, compound microscope, digital camera were used for this study.

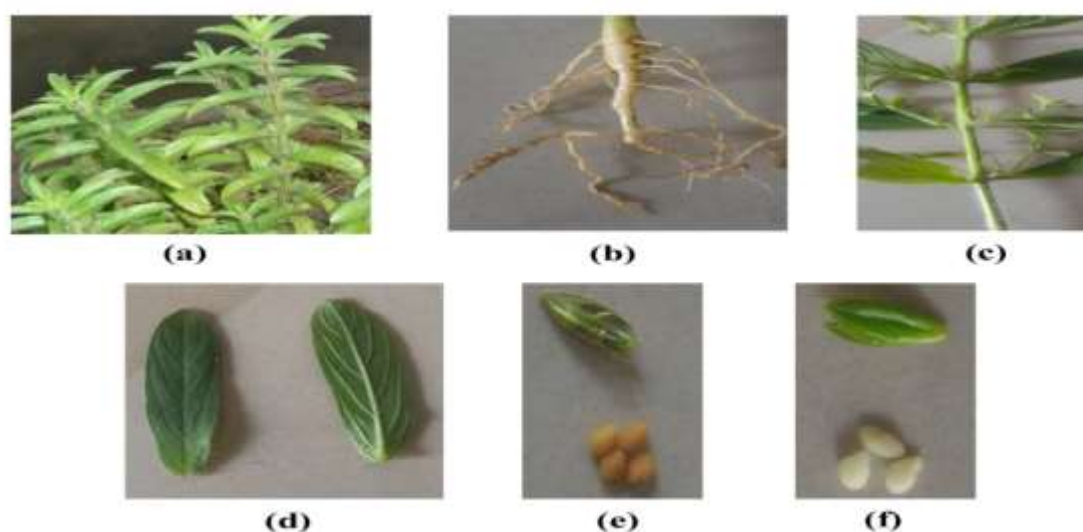


Figure No.1: (a) Whole Plant (b) Root (c) Stem (d) Leaf (e) Mature Seed
(f) Immature seed of *Indoneesiella echioides*(L.) Sreem.



Figure No.2: Powder of dried whole plant of *Indoneesi ellaechioides(L.)Sreem.*

RESULTS

1.Macroscopy

Table No 1: Organoleptic characters of fresh root of *Indoneesiella echioides(L.)Sreem.*

Type	Tap root
Size	5-8 cm length, 0.5- 1mm breadth
Shape	Cylindrical tapering
External characters	Fibrous, long hairs, hardly woody
Colour	green with white
Odour	Characteristic
Fracture	Fibrous
Taste	Bitter

Table No 2: Organoleptic characters of fresh stem of *Indoneesi ellaechioides(L.)Sreem.*

Shape	Quadrangular
Colour	Greenish
External characters	densely covered with dull white hairs, angles prominent, narrowly winged
Cut surface	Quadrangular
Fracture	fibrous
Taste	astringent

Table No 3: Organoleptic characters of leaf of *Indoneesi ellaechioides(L.)Sreem.*

Kind: simple	Shape: oblong - oblanceolate
Size: 3-7.5 by 1-2.5 cm	Base: cuneate
Petiole: sub- sessile/ sessile	Margin: entire, ciliate
Apex: obtuse	Surface: hairy
Venation: reticulate, main nerves 4-6 pairs	Taste: bitter
Colour: green	

Table No 4: Organoleptic characters of fruit of *Indoneesi ellaechioides(L.)Sreem.*

Type	Capsule
Shape	Ovoid, pointed above
External characters	Hairy
No. of seeds per capsule	Four
Colour of seeds	Immature-white, mature-yellowish brown

Table No. 5: Macroscopic features of dried whole plant powder of *Indoneesi ellaechioides*(L.)Sreem.

Features	Dried powder of <i>Indoneesiella echioides</i> (L)Sreem.(whole plant)
Colour	Dark green
Texture	Fine
Odour	Characteristic
Taste	Bitter

Microscopy

A.Section Microscopy

1.Histological features of fresh root of *Indoneesi ellaechioides*(L.)Sreem.

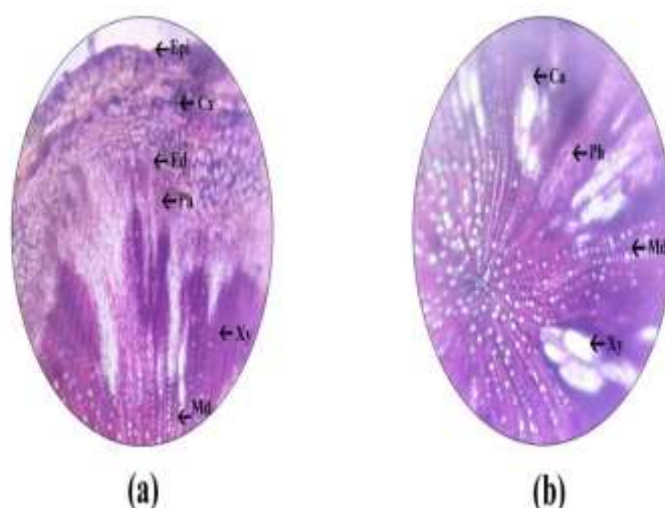
TS of root showed single cell layered epidermis, followed by several cell layered cortex. Cortical cells had oblique thin walled or straight cross walls. This was followed by endodermis and pericycle which consisted of irregular compactly arranged parenchyma cells. Exarch xylem occupied more than half of the root along with phloem with smaller cells and single cell wide medullary rays.Pith was absent.

2.Histological features of fresh stem of *Indoneesiella echioides*(L.)Sreem.

TS of stem showed epidermis, cortex, vascular bundle and pith. Epidermal cells were longitudinally elongated and the outer cell wall consisted of cuticle. Collenchyma was 2-3 layered with irregularly thick walled ovoid and elongated cells. Cortical cells were thin walled and elongated with oblique cross walls. Xylem was endarch and occupied half of the stem. 2 cell layered cambium and phloem with irregular cells were the other features. Prominent pith made up of large polygonal parenchyma cells had calcium oxalate crystals and starch grains.

3.Histological features of fresh leaf of *Indoneesiella echioides*(L.)Sreem.

TS of the midrib showed distinct upper and lower epidermis, chlorenchyma cells, mesophyll, vascular bundle and trichomes. Cuticle was present on the outer surface of the cells. Two horn like appendages of collenchyma cells was followed by chlorenchyma cells. Two small vascular bundles were seen towards the periphery and large ones occupied the centre of midrib. Xylem cells were surrounded by phloem cells. Lamina consisted of upper and lower epidermis, palisade and spongy tissue. Unicellular and uniseriate trichomes were present.



**Figure No. 3: (a) TS of root of *Indoneesiella echioides*(L.)Sreem.(10X)
(b) Vascular bundle of root of *Indoneesi ellaechioides*(L.)Sreem.(10X)**

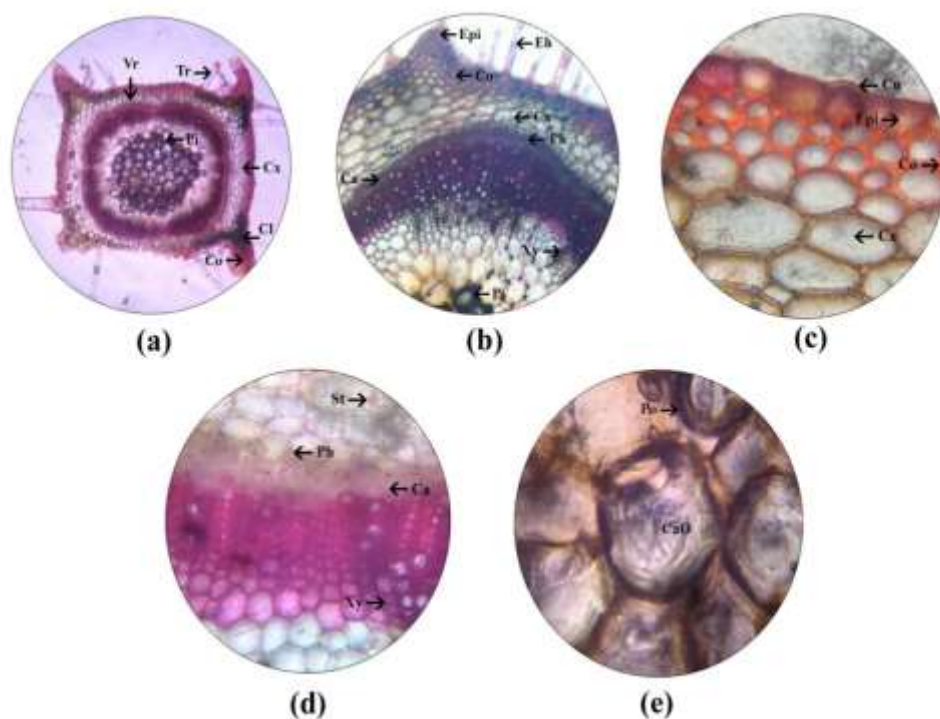


Figure No. 4: (a) TS of stem of *Indoneesiella echioides*(L.)Sreem. (b) TS of stem(10X) (c) TS of stem(40X) (d) Vascular bundle (40X)(e) Pith (40X)

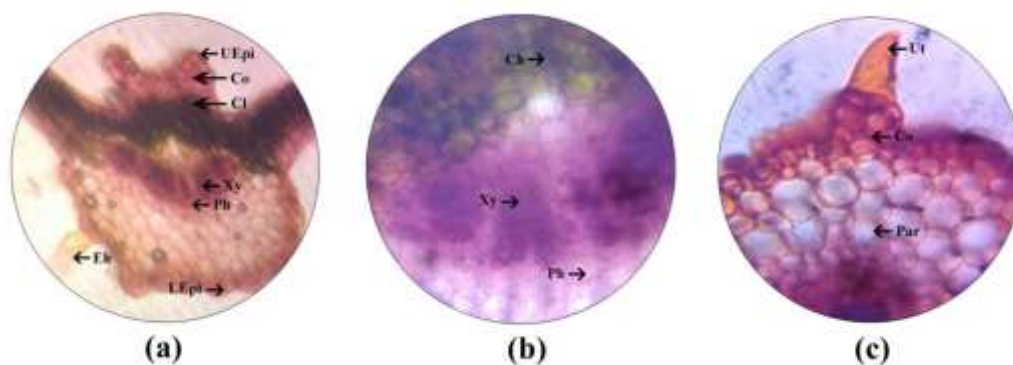


Figure No. 5: (a) TS of leaf of *Indoneesiella echioides*(L.)Sreem(10X) (b) Vascular bundle of leaf (40X)(c) TS of leaf (40X)

Epi: Epidermis, Cx: Cortex, Ed: Endodermis, Ph: Phloem, Xy: Xylem, Md: Medullary ray, Vr: Vascular ring, Tr: Trichome, Pi: Pith, Cx: Cortex, Cl: Chlorenchyma, Co: Collenchyma, Eh: Epidermis hair, Ca: Cambium, Cu: Cuticle, Ut: Unicellular trichome, Par: Paraenchyma cells with starch grains, St: Starch grains, Po: Polygonal parenchyma cells, CaO: Calcium Oxalate crystals, UEpi: Upper epidermis, LEpi: Lower epidermis.

Powder Microscopy

Under microscopical examination, the powder showed the presence of fibres with blunt end, fibre cells with tapering ends, and also fibres with simple pits. Xylem vessels were seen with bordered pitted thickening and spiral thickenings. The calcium oxalate crystals and starch grains were also present (Figure No. 6).

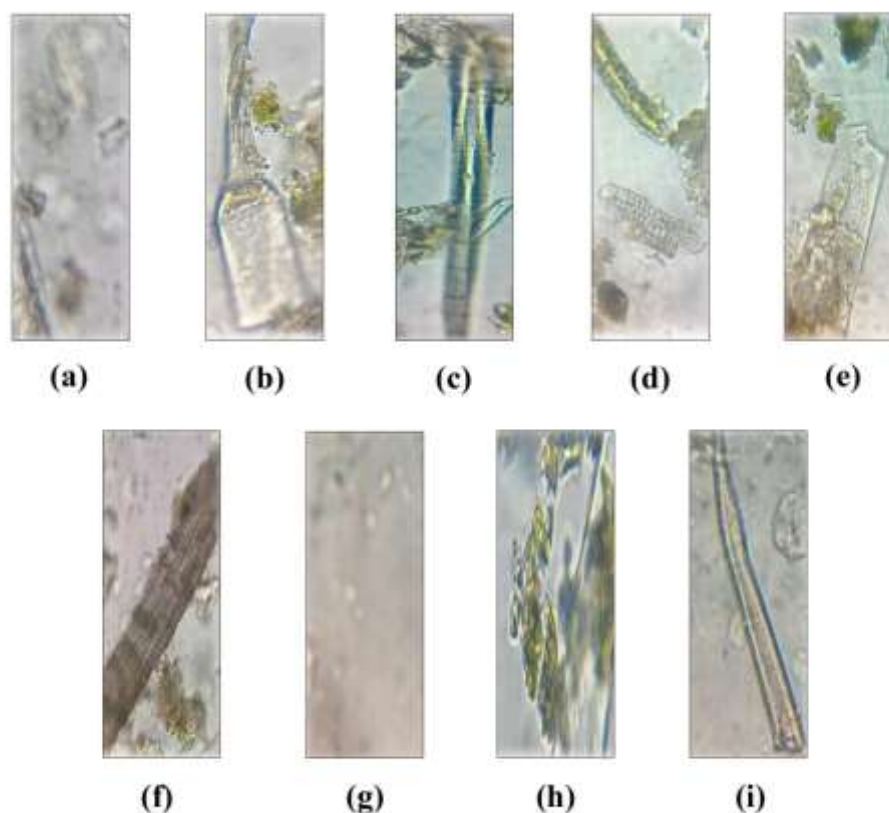


Figure No. 6: (a) Calcium Oxalate crystals (b) Curved trichome (c) Fiber with tapering end (d) Pitted vessels (e) Sclerenchyma cell (f) Spiral vessels (g) Starch grains (h) Tannins (i) Unicellular trichome.

DISCUSSION

In order to ascertain the genuineness of the drug, pharmacognostical studies were carried out on the basis of analysis of macroscopic features and microscopic features including the section microscopy and powder microscopy. The taxonomic features of the plant was compared with the description of authentic botany text books^{7,8}, as well as the descriptions in the research journals⁹⁻¹¹. The macroscopic features of the whole plant were found similar and the drug has been botanically identified as *Indoneesi ellaechoioides*(L.) Sreem.in the Department of Dravyagunavijnanam, Government Ayurveda College, Tripunithura. The whole plant, *Indoneesiella echioides*(L.)Sreem.was collected during the month of December. Being an annual herb, even though the aerial parts dies, the plant again developed from dispersed seeds when adequate water and sunlight is available. Similarity was noted in the aerial parts of the drug with that of *Leucasaspera* (Willd) Link. during the collection. Both are small herbs with quadrangular stems, opposite phyllotaxy, subsessile leaves, pubescent nature and white flowers. This may be reason for naming *Indoneesi ellaechoioides*(L.) Sreem.as 'peetumba' where the prefix 'pee' shows the wildly growing nature.

The organoleptic characters of the root, stem, leaves and seeds were included in this study. The powder microscopic characters such as fibre cells with tapering ends, fibres with simple pits, tracheids, xylem vessels with bordered pitted thickening and spiral thickenings, calcium oxalate crystals and starch grains were identified and recorded. From the pharmacognostical analysis the genuineness of the study drug, *Indoneesiella echioides*(L.)Sreem was proved.

CONCLUSION

Authentication of the original source is the initial step in the standardization of a raw drug. In this paper an attempt has been made to analyse various parts of *Indoneesi ellaechoioides*(L.)Sreem.both macroscopically and microscopically. More research works are needed from the Ayurvedic fraternity to include the drug in the Ayurvedic pharmacopeia. This paper is supposed to re-introduce an ignored drug to the Ayurvedic community so that a lost tradition can be regained.

ACKNOWLEDGEMENTS

I am extremely thankful to my guide Dr. Sara Monsy Oommen,co-guide Dr. Shincymol V V, Head of the Department Dr. Ansary P Y and Assistant Professor Dr. Sariga K.S for their valuable suggestions. I am grateful to the respected Principal, Government Ayurveda College, Tripunithura, Dr. T K Uma for giving me all the institutional support. I express my sincere thanks to the entire colleagues and staff of the Department of Dravyagunavijnanam, Government Ayurveda College, Tripunithura for their immense support.

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