



E-ISSN: 2278-4136  
P-ISSN: 2349-8234  
JPP 2016; 5(5): 351-353  
Received: 09-07-2016  
Accepted: 10-08-2016

**K Babu**  
R & D Center, Cholayil Private  
Limited, Ambattur, Chennai,  
Tamilnadu, India

**Anoop Austin**  
R & D Center, Cholayil Private  
Limited, Ambattur, Chennai,  
Tamilnadu, India

## Macro and Micro-morphological studies on roots of *Plumbago indica* L. and *Plumbago zeylanica* L

**K Babu and Anoop Austin**

### Abstract

**Citraka** is an important and most popular medicinal plant extensively used in various indigenous systems of medicines. The root is used in various formulations in Ayurveda and found two varieties in the commercial market namely white flowered (*Plumbago zeylanica*) and red flowered (*Plumbago indica*). The present study was carried out to identify these species using macro and microscopical characters of the root to provide useful diagnostic tool.

**Keywords:** *Plumbago indica*, *Plumbago zeylanica*, Macro & Microscopic characters, Root anatomy, Identification.

### Introduction

Citraka is an important medicinal plant widely used in Ayurveda, Siddha, Unini and Homeopathy and also used in folk remedies. The roots are used in many Ayurvedic preparations such as Chitrakasavam, Dasamoolarishtam, Gulgulutiktakam kashayam, Yogaraja Churnam, Kumaryasavam, Pippalyasavam etc. It is an esteemed remedy for leucoderma and other skin diseases. The root is acrid, alterative, digestive, stimulant, pungent, astringent, diuretic, germicidal, vesicant, powerful abortifacient and also an oral contraceptive. Two varieties of Citraka are recognized by physicians of Ayurveda in Kerala viz. white flowered and red flowered. White flowered variety is equated with *Plumbago zeylanica*, used as medicine in North India and red flowered variety equated with *Plumbago indica* L. (Syn: *P. rosea* L.) is accepted source of Citraka in Kerala and is considered to be therapeutically more active than *P. zeylanica*. Hence, the roots of *P. zeylanica* intentionally adulterated with *P. indica* in the commercial market. Thus, the present study was carried out to identify these species using macro and microscopic characters of the root [1-3].

### Materials and Methods

The roots of both plants were collected freshly from authenticated specimens and were cut in to small pieces and fixed immediately in Formalin-Acetic-Alcohol for 24h. After fixation they were washed thoroughly in distilled water, dehydrated, embedded in paraffin wax after infiltration and sectioned using rotary microtome to the thickness of 8 to 14  $\mu\text{m}$  [4]. Sections were stained with toluidine blue and observed under Nikon Eclipse 400 microscope.

### Observation

#### Macroscopic characters of the root of *Plumbago indica* (Figure – 1):

Root up to 0.6-0.75 meter length, tuberous, light brown colour when fresh and dark brown to blackish brown when dry. Dried roots are irregular and angular in shape, wrinkled and very brittle with characteristic strong pungent odour.



**Fig 1:** *Plumbago indica* – Habit & Dried roots

### Correspondence

**K Babu**  
R & D Center, Cholayil Private  
Limited, Ambattur, Chennai,  
Tamilnadu, India

**Macroscopic characters of the root of *Plumbago zeylanica*** (Figure – 2):

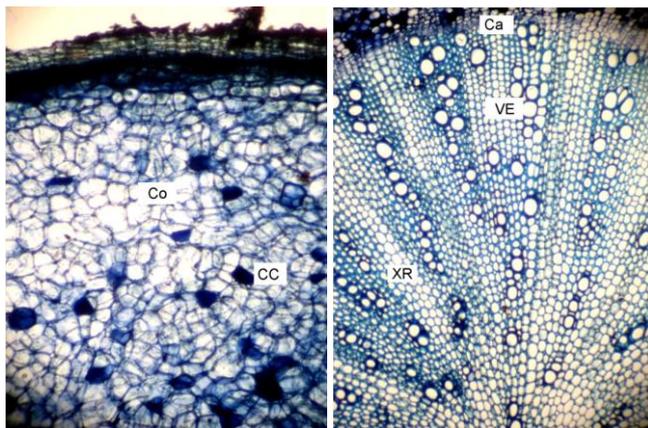
Root length up to 0.3-0.5 meter, wiry, light yellow colour when fresh and reddish to pale brown when dry. Dried roots are uniform, cylindrical in shape, smooth surface and woody hard with characteristic very light pungent odour.



**Fig 2:** *Plumbago zeylanica* – Habit & Dried roots

**Microscopic characters of the root of *Plumbago indica*** (Figure – 3):

Cork layer consist of 8-10 rows of thin-walled cells. Cortex is wide contains no phloem fibers and starch grains. Secondary xylem is  $\frac{1}{4}$  diameter of the root consist large vessel elements with short radial multiples arrangements. Xylem rays are tri to tetra-seriate.

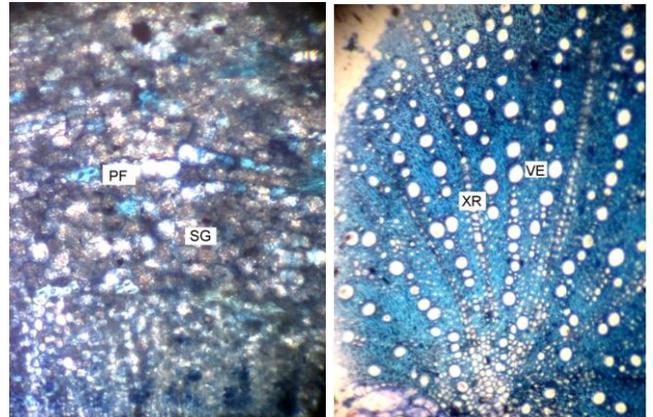


**Fig 3:** Root anatomy of *Plumbago indica*

1. Cross section of the root
2. Cortex enlarged
3. Secondary xylem & phloem enlarged
4. Cross section of the root under polarized light
5. Longitudinal section of xylem rays

**Microscopic characters of the root of *Plumbago zeylanica*** (Figure – 4):

Cork layer is 6-8 rows of thick-walled cells. Cortex is narrow contains phloem fibers and starch grains. Secondary xylem is  $\frac{3}{4}$  diameter of the root consist small vessel elements with long radial multiples arrangements. Xylem rays are bi to tri-seriate.



**Fig 4:** Root anatomy of *Plumbago zeylanica*

1. Cross section of the root
2. Cross section of the root under polarized light
3. Cortex enlarged
4. Secondary xylem & phloem enlarged
5. Cortex region under polarized light

(Ca – Cambium; CC – Cell content; Co – Cortex; Pd – Periderm; PF - Phloem fibers; SG – Starch grains; SPHl – Secondary phloem; Sxy – Secondary xylem; VE – Vessel element ; XF – Xylem fibres ; XR – Xylem rays)

**Discussion and Conclusion**

The identification of crude drugs is an imperative prerequisite before using in pharmaceutical preparation. Macro and micro-morphology perspective of medicinal plants in an integral component of pharmacognosy, especially while proposing diagnostic protocols for establishing the botanical identity and ascertaining the quality control of raw materials [5]. Hence, the present investigation was carried out to provide useful diagnostic tool for the authentication of *Plumbago indica* and *P. zeylanica*.

The following macroscopic and microscopic features of the above drugs are the key features that can be used to diagnose these plants.

**Table:** Diagnostic characters of the roots of *Plumbago indica* and *P. zeylanica*.

Characters	<i>Plumbago indica</i> L.	<i>Plumbago zeylanica</i> L.
Colour	Light brown when fresh, dark brown to black when dry.	Light yellow when fresh, reddish to pale brown when dry.
Texture	Irregular, angular, wrinkled & brittle.	Uniform, cylindrical, smooth & hard.
Cork	Made up of thin walled cells.	Made up of thick walled cells.
Cortex	Broad	Narrow
Starch grains	Absent	Present
Phloem fibers	Absent	Present
Vessel element	Large, short radial multiples	Small, long radial multiples.
Xylem rays	Tri to tetra-seriate	Uni or bi-seriate rarely tri-seriate
Secondary xylem	$\frac{1}{4}$ of diameter of the root.	$\frac{3}{4}$ of diameter of the root.

### Acknowledgement

The authors are thankful to Mr. Pradeep Cholayil, Chairman and Ms. Jayadevi Pradeep Cholayil, Directress - Cholayil Private Limited for their constant support and encouragement.

### References

1. Sivarajan VV, Indira Balachandran. Ayurvedic drugs and their sources, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1994.
2. Binoy Jose, Dhanya BP, Silja PK, Krishnan PN, Satheeshkumar K. *Plumbago rosea* L. A review on tissue culture and pharmacological research. Int J Pharm Sci Rev Res. 2014; 25(1):246-256.
3. Paras Jain HP, Sharma, Fauziya Basri, Binit Baraik, Soni Kumari, Chanchala Pathak. Pharmacological profiles of ethno-medicinal plant: *Plumbago zeylanica* L. A Review. Int J Pharm Sci Rev Res. 2014; 24(1):157-163.
4. Johansen DA. Plant Microtechnique, McGraw Hill Book Company, New York, 1940.
5. Brindha P, Saraswathy A. Micro-morphological standardization in raw drugs trade, In: Siddha Medicine, Eds., Prema S, Rajamanickam GV, Published by Tamil University, Thanjavur, India. 2002, 71-80.