



PHARMACOGNOSTICAL STANDARDIZATION ON LEAVES, STEM AND ROOTS OF *GLOSSOCARDIA BOSVALLEA* (L.f.) DC.

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ABSTRACT

Glossocardia bosvallea is a one of the botanical source for the drug Parpatak for the treatment of different diseases like fevers, cough and fungal diseases^{02&09}. The authentication of this botanical source in dried form is arduous. To prevent the adulterations of the drug whole plant of *G. bosvallea* was subjected to botanical, macroscopic, microscopic, maceration, histochemical and physico-chemical studies. Microscopical studies revealed the presence of vessels and fibers, narrow phloem, cortex with tangentially elongated parenchymatous cells in case of root, in case of leaf exhibited lithocyst consists cystolith, kranz anatomy, secretory canal on either side of middle vascular bundle and in case of stem it showed secretory cavities in cortex. Physicochemical parameters like a loss on drying, total ash value, acid insoluble ash, water insoluble ash, various extractive values etc., were carried out.

KEY WORDS: Macro, Microscopic characters, Parpatak, Physico chemical studies, Leaves, Root and Stem



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INTRODUCTION

In Ayurveda Parpatak was an important Ayurvedic drug used in the treatment of fevers. It is bitter, light, cooling and constrictor. It checks kapha and also increases vaata. It is useful in the treatment of Raktapitta (haemorrhage), Jwara (fever), Trishna (thirst) Bhrama (giddiness) Daaha (burning sensation) in fevers of pitta type i.e. when predominant symptoms like thirst, burning sensation In spite of its manifold uses of the drug remains controversial because several plants are used and sold under the name parpatak in different parts of the country and in local markets. As per literature⁰² the accepted source of the drug mentioned botanical sources are *Glossocardia bosvallea* (L.f.) DC. *Fumaria indica* (Hassk) Pug., *Polycarpaea corymbosa* Lam., *Mollugo stricta* L., *Hedyotis corymbosa* L., *Justicia procumbens* L., *Rungia repens* Nees., *R. parviflora* L. and *Peristrophe bicalyculata* Nees. are used under the name Parpatak. The species *Glossocardia bosvallea* distributed in throughout the India as a common weed of wastelands and fields. It belongs to family Asteraceae. The Plant yields an essential oil and it is used as substitute for Parpatak in Ayurveda¹⁷. The plant has bitter and fennel like odor. It is eaten as a vegetable especially in times of scarcity⁰¹. It is also used as emmenagogue¹⁶. Whole plant was used as medicine in fevers¹³. Its uses are similar to *Hedyotis corymbosa*¹⁷. Whole plant juice (25 ml) is administered at bed time for a fortnight to cure vaginal itching. Leaf decoction (10 ml) is taken once a day for 45 days to cure leucorrhoea and menstrual pains¹⁵. It is much used in gynecological diseases⁰⁹. On perusal of the literature it revealed that no pharmacognostical work has been carried out on this taxon⁰⁴ hence this study has been taken up. During critical market survey on the South Indian market samples of crude drugs, it was found by the authors that a totally different drug is sold in the markets of South India and used by the physicians in the name of parpatak and the authentication of this botanical source in dried form is arduous. To prevent the adulterations of the drug whole plant of *G.*

bosvallea was subjected to botanical, macroscopic, microscopic, maceration and histochemical and physico-chemical study which help to differentiate this drug from the accepted source.

Taxonomy of the plant

Glossocardia bosvallea DC. In Wight, Contrib. Bot. India. 19. 1834; Gamble 2: 709 (499). 1921. *Verbesia bosvallea* L.f. Suppl. pl. 379. 1781. *Glossocardia linearifolia* cass. Dict. Sci. Nat. 19: 62. 1821; FBI. 3: 308. 1881. Annual diffuse or ascending herb, to 25 cm. Leaves alternate, 1-2 pinnatisect, in rosette at the base, pinnules linear, 1 x 0.6 mm, base decurrent, apex apiculate, petiole 2 cm long, heads solitary, terminal, flowers yellow stalked, heterogamous, receptacle flat, involucre cylindrical, 0.7cm long. Phyllacies 2-4 seriate, outer 3, oblong-lanceolate, 3x1 mm, scarious, fimbriate, intermediate ones oblong, 6x2 mm, longitudinally folded, margin scarious, acute. Outer florets female a few, inner bisexual. Paleae linear – lanceolate, scarious, 6x.5-1 mm, acute. Pappus of 2 soft awns 3 mm. Bisexual florets: corolla yellow, 0.7 mm across, tubular-campanulate, 2 mm, lobes 4, ovate-acute. Stamens 4, included, anthers oblong, flat, 0.7 mm, ovary compressed 4 mm, narrowed below, scarious along angles, style 2.5 mm, stigma linear, puberulous acute. Ray florets: corolla shortly radiate, tube 2 mm papillose without; Ray 1.5x1 mm 2-lobed. Ovary 3-quetrous, 4 mm, scarious along angles, style 2 mm, minutely 2-fid and stigma obtuse. Achenes compressed, 3-lobed. (Fl. & Fr: September – January) (Herbarium specimen examined: DR 329 (S.V.U)^{03 & 09}.

MATERIALS AND METHODS

5, 6, 7, 8, 9, 10, 11, 14 and 15 Fresh plant material was collected from Chittoor district, Andhra Pradesh. Identification and confirmation were done by the Department of Botany Sri Venkateswara University, Tirupathi, Andhra Pradesh, India. The voucher herbarium specimen was processed followed by standard procedures⁰⁶. Microscopical studies of leaf used fresh plant material were carried out with

standard procedures^{05,07,08&14}. During these studies T.S of the leaf, stem, root, Powder microscopical studies and maceration were carried out to observe diagnostic characters of the leaf, stem and root. Physicochemical studies like, total ash, acid insoluble ash, water soluble ash; water soluble, alcohol soluble, Hexane soluble Chloroform soluble extractive values were computed according to the methods described in Indian Pharmacopoeia. Fluorescence analysis was carried out according to methods^{08, 10 &11}.

RESULTS

Root

Macroscopical Characters

Elongated, slender, brown colored, with many lateral roots, outerzone not peelable, aromatic.

Microscopical Characters

Taproot is thin and measures 570 μm . Epidermis is thin and not distinct due to breaking of some of the cells. Cortex made up of five layers of thin walled compactly arranged parenchymatous cells. Vascular cylinder 300 μm in diameter and consists of thin continuous layers of secondary xylem, secondary phloem and wide pith cavity. Secondary xylem comprises of vessels and fibers (Fig. 1A).

Root - Diagnostic Characters

1. Presence of discontinuous epidermis with broken surface.
2. Presence of five layers of tangentially elongated parenchymatous cells.
3. Presence of narrow secondary phloem.
4. Presence of circular secondary xylem, comprising vessels and fibers.

Stem

Young stem

Macroscopical Characters

Stems are prostrate, 2 mm thickness, outerzone not peelable aromatic and taste bitter.

Microscopical Characters

Stem measuring 570 μm thick was studied (Fig. 2). Epidermal layer is thin and not distinct due to breaking of some of the cells. Cortex is

made up of 5 layers of thin walled, compactly arranged parenchyma cells. Vascular cylinder about 300 μm in diameter and consists of continuous layers of secondary phloem and thin secondary xylem with a pith cavity. Secondary xylem consists of diffusely distributed scanty vessels and radial rows of thick walled fibers.

Mature Stem

Microscopical Characters

Transverse section of mature stem shows stomatiferous epidermis, with wide cortex and vascular cylinder. Epidermal layer is 50 μm thick and cell walls are thin walled. (Fig. 3.2) Cortical zone is 100 μm wide and made up of about 5 layers of tangentially stretched parenchyma. Within the cortex fairly wide secretory cavities are unsheathed by densely stained epithelial cells (Fig. 3.1-2). Secondary phloem is fairly wide and continuous around the xylem. Phloem elements are thin radial files. Pith is wide and the central core was occupied by a pith cavity. There are four wedge shaped primary xylem bands around the pith. Secondary xylem consists of thick walled vessels and fibers. Vessels are in radial multiples and more or less uniform in diameter. Xylem cylinder is 120 μm thick. Vessels are 15 μm wide. (Fig. 3.3)

Stem - Diagnostic Characters

1. Presence of five layered thin walled, compactly arranged parenchymatous cells
2. Presences of wide secretory cavities are present in the cortex unsheathed by densely stained epithelial cells.
3. Presence of wide secondary phloem.
4. Presence of cylindrical and narrow vessels with annual thickenings.

Stem and Root – Macerate

Stem and root macerate exhibits the following disintegrated tissues.

Fibers (Fig. 4.1)

Fibers are narrow, thick walled tapering cells with a wide or narrow lumen. Elliptic or slit-like simple pits are abundant in the lateral walls, 350-500 μm long.

Tracheids (Fig. 4.2)

Similar to fibers, shorter and wider with abundant, bordered lateral pits, length up to 370 μm .

Xylem parenchyma (Fig. 4.1; 5.1)

Wide rectangular, thick walled cells with abundant circular, simple pits, 80-140 μm long, 30-40 μm wide.

Vessel elements

Narrow, cylindrical, long cells with simple, oblique or horizontal perforation plates (Fig. 4.1-2). Tails usually absent, when present short and thick. Lateral wall pits elliptic, alternate and dense, some of the vessel elements have annular or spiral thickenings (Fig. 4.2). Vessel elements were 150-210 μm .

Leaf

Macroscopical Characters

Leaves alternate, pinnatisect; pinnules linear, 7 x 0.7 mm, chartaceous, puberulous, base decurrent, apex apiculate; petiole to 2 cm.

Microscopical Characters

Leaves are 240-330 μm wide and 440-680 μm thick. Leaf exhibits different shape and size depending upon the region of sectioning (Fig. 6, 7). Irrespective of the variation in sectional outline, leaf shows epidermis with dilated cells and prominent cuticle. In the lamina region, some of the epidermal cells are modified into lithocysts containing cystoliths. Epidermis 30-50 μm thick, the cells were radially rectangular, thin walled and stomatiferous. Stomata occur at the level of the epidermis (Fig. 6.1). A single layer of radially oblong compactly arranged palisade parenchyma present beneath the epidermis. Next to the palisade zone, a single

layer of dilated barrel shaped cells with prominent chloroplasts aggregated on the tangential walls. Median part of the leaf has a horizontal row of vascular strands. Vascular Strands are collateral and may be 3 or 5 in a leaf. One of the bundles in median position and other bundles are marginal and lateral in position (Fig. 7.2). Cells which accommodate the vascular bundles are large, thin walled, compact angular parenchyma. In this region, there are two secretory canals, one on either side of the median bundle. The secretory canal is angular, surrounded by 4 or 5 epithelial cells (Fig. 6.2).

Leaf: Diagnostic Characters

1. Presence of lithocysts consists cystoliths in the lamina region.
2. Presence of collateral and top shaped vascular bundle.
3. Presence of kranz anatomy of leaf.
4. Presence of secretory canal on either side of middle vascular bundle.

Histochemical Tests

The sections were treated with different reagents and the observations were provided in Table 01.

Physico-chemical details

Ash and Extractive values of a drug give an idea of the earthy matter or the inorganic composition and other impurities present along with the drug. The results are given in Tables-4&5.

Fluorescence study

Fluorescence analysis were studied and recorded in Table-6&7

Table-01
Histochemical Tests

Drug	Reagents	Test for	Reaction	Results
Section	Iodine solution	Starch	Blue colour	+
Section	Ferric chloride solution	Tannin	Black	+
Section	Sudan III solution	Oil globules	No effervescence	+
Section	Phloroglucinol + dil. HCl + Alcohol	Lignin	Magenta	+
Section	Conc. HCl	Crystals	No effervescence	-

+ = Present; - = Absent

Table-02
Powder Characteristics

Name of the Plant	Colour	Appearance	Odour	Taste
<i>Glossocardia bosvallea</i>	Pale green	Coarse powder	Aromatic	Bitter

Table-03
Powder Analysis

Treatment	Observation
	<i>Glossocardia bosvallea</i>
Powder treated with water	Non-sticky
Powder shaken with water	Foam like froth
Powder treated with 5% aqueous NaOH	Green
Powder treated with 60% aqueous sulphuric acid	Reddish brown
Powder pressed between filter paper for 24 hours	No oil stain

Table-04
Ash Values

Total ash (%)	Water soluble ash (%)	Alkalinity of water soluble ash (ml)	Acid insoluble ash (%)
12.51	2.57	3.1275	2.15

Table-05
Extractive values

Alcohol soluble extract (% w/w)	Water soluble extract (% w/w)	Hexane soluble extract (% w/w)	Chloroform soluble extract (% w/w)
0.848	1.02	0.33	0.3916

Table-06
Fluorescence analysis of *Glossocardia bosvallea*

Experiments	Visible / Day light	UV Light	
		254 nm	365 nm
Drug powder	Pale green	Green	Brown
Drug powder + 1 N NaOH (aq.)	Green	Yellowish green	Green
Drug powder + 1 N NaOH (alc.)	Green	Yellowish green	Yellowish green
Drug powder + 1 N HCl	Green	Black	Black
Drug powder + 50% H ₂ SO ₄	Reddish brown	Green	Black
Drug powder + 50% HNO ₃	Orange	Green	Black
Drug powder + Picric acid	Green	Yellow	Green
Drug powder + Acetic acid	Brown	Green	Black
Drug powder + Ferric chloride	Green	Yellowish green	Black
Drug powder + HNO ₃ + NH ₃	Reddish orange precipitate	Yellowish green	Green

Table-07
Fluorescence analysis of various extracts

Extract	Treat-ment	Observation
<i>Glossocardia bosvallea</i>		
Alcohol (ethanol)	Daylight	Yellowish green
	Short UV	Yellowish green
	Long UV	Dark olive
Water	Daylight	Orange
	Short UV	Fluorescent yellow
	Long UV	Orange
Hexane	Daylight	Off white
	Short UV	Fluorescent green
	Long UV	Mid cream
Chloroform	Daylight	Dark olive
	Short UV	Yellowish green
	Long UV	Black



Figure1

***Glossocardia bosvallea* (L.f.) DC. With flowering and Whole Plant in Dried Form. Plant has bitter taste and fennel like odour. It is eaten as vegetable especially in the times of scarcity. It is also used as emmenagogue. (Anonymous, 1956)**

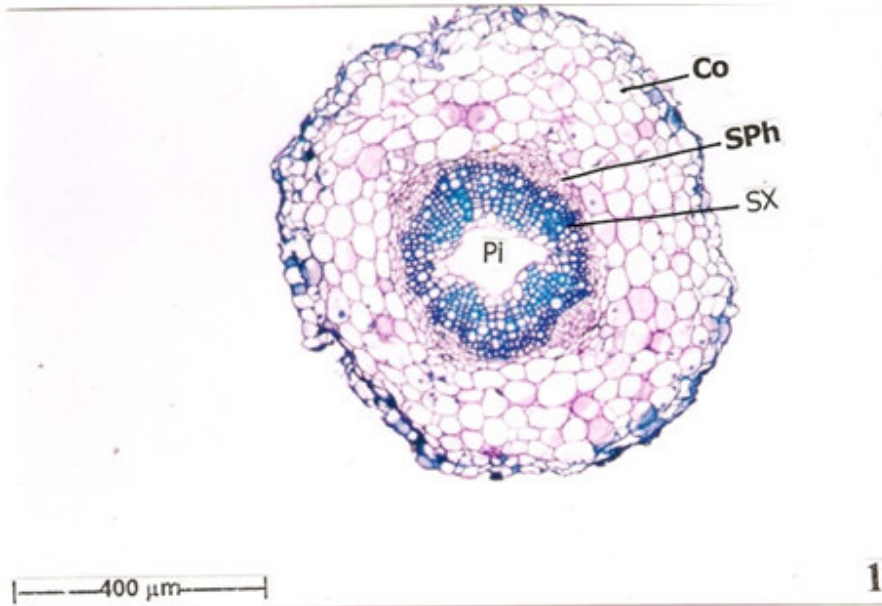


Figure1A
Glossocardia bosvallea Microscopical characters of root
T.S. of root – Entire view

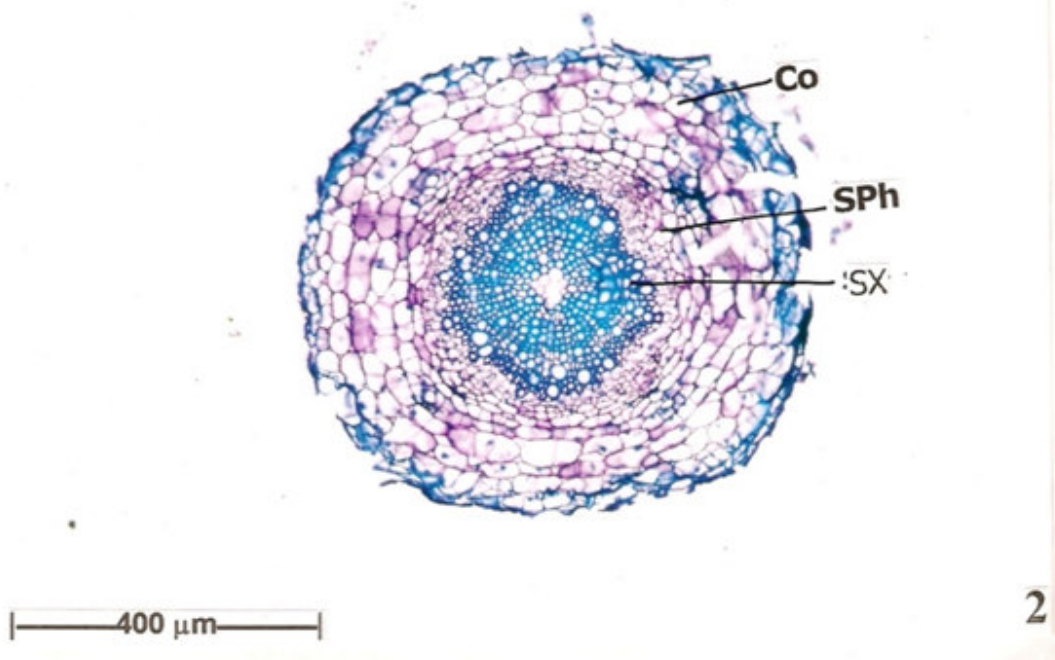


Figure 2
Glossocardia bosvallea Microscopical characters of young stem
T.S. of stem – Entire view

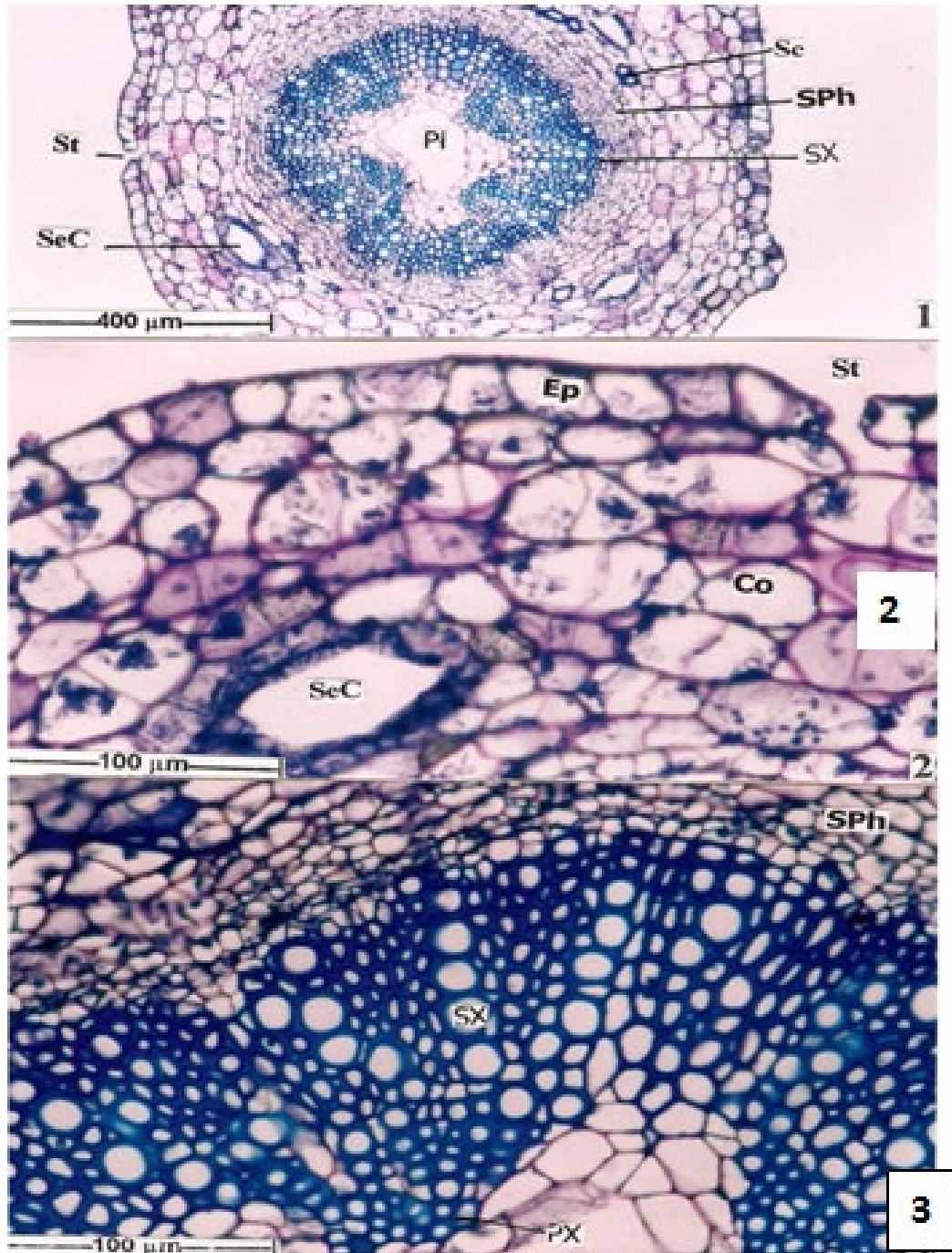


Figure 3

***Glossocardia bosvallea* Microscopical characters of mature stem**

1. T.S. of stem – Whole section
2. T.S. of stem – Epidermis and cortex region enlarged
3. T.S. of stem – Secondary xylem and Secondary phloem enlarged

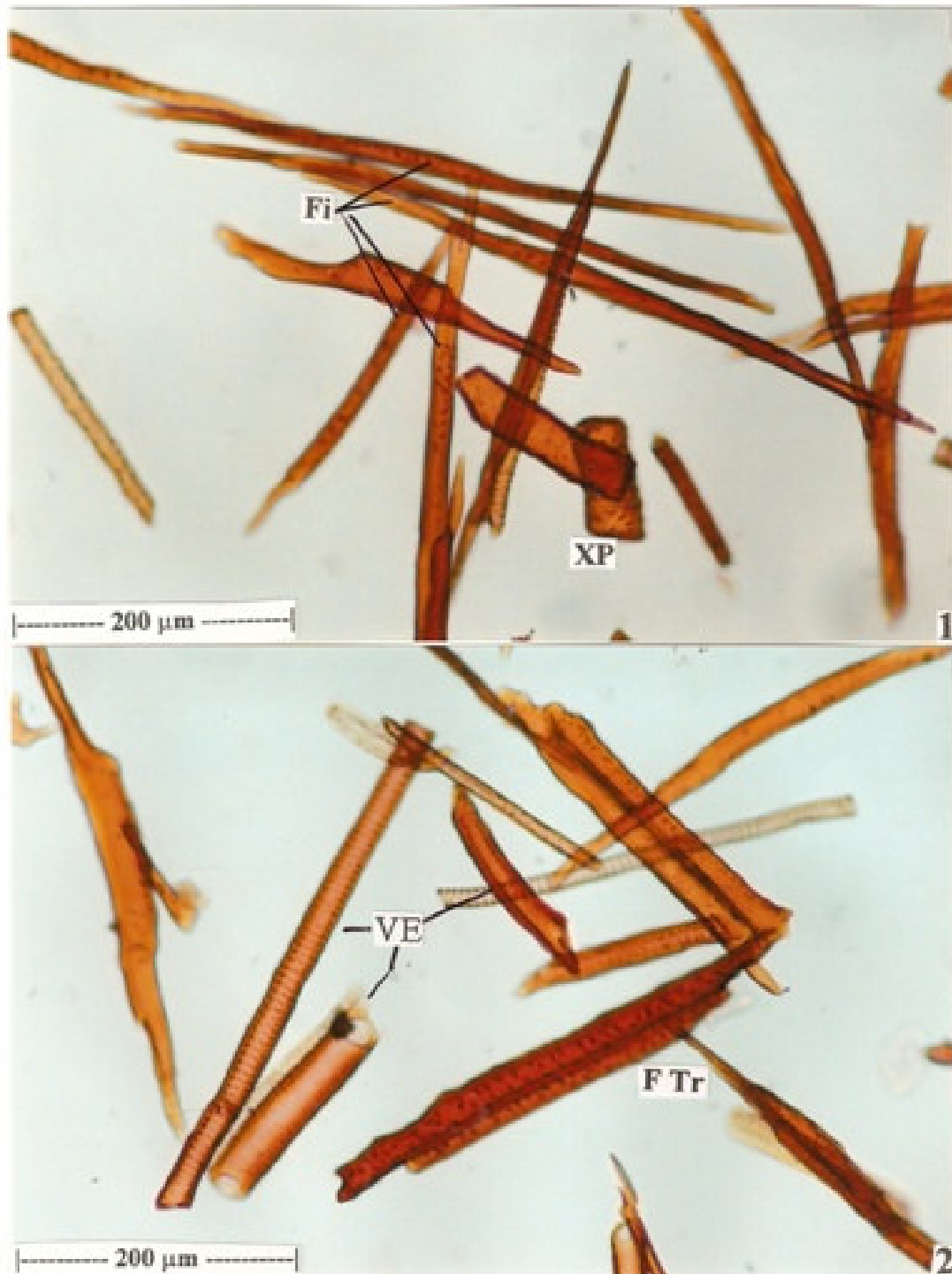


Figure 4
***Glossocardia bosvallea* 1-2 Stem and Root macerate** Fi – Fibres; FTr – Fibre tracheids; VE – Vessel elements; XP – Xylem parenchyma

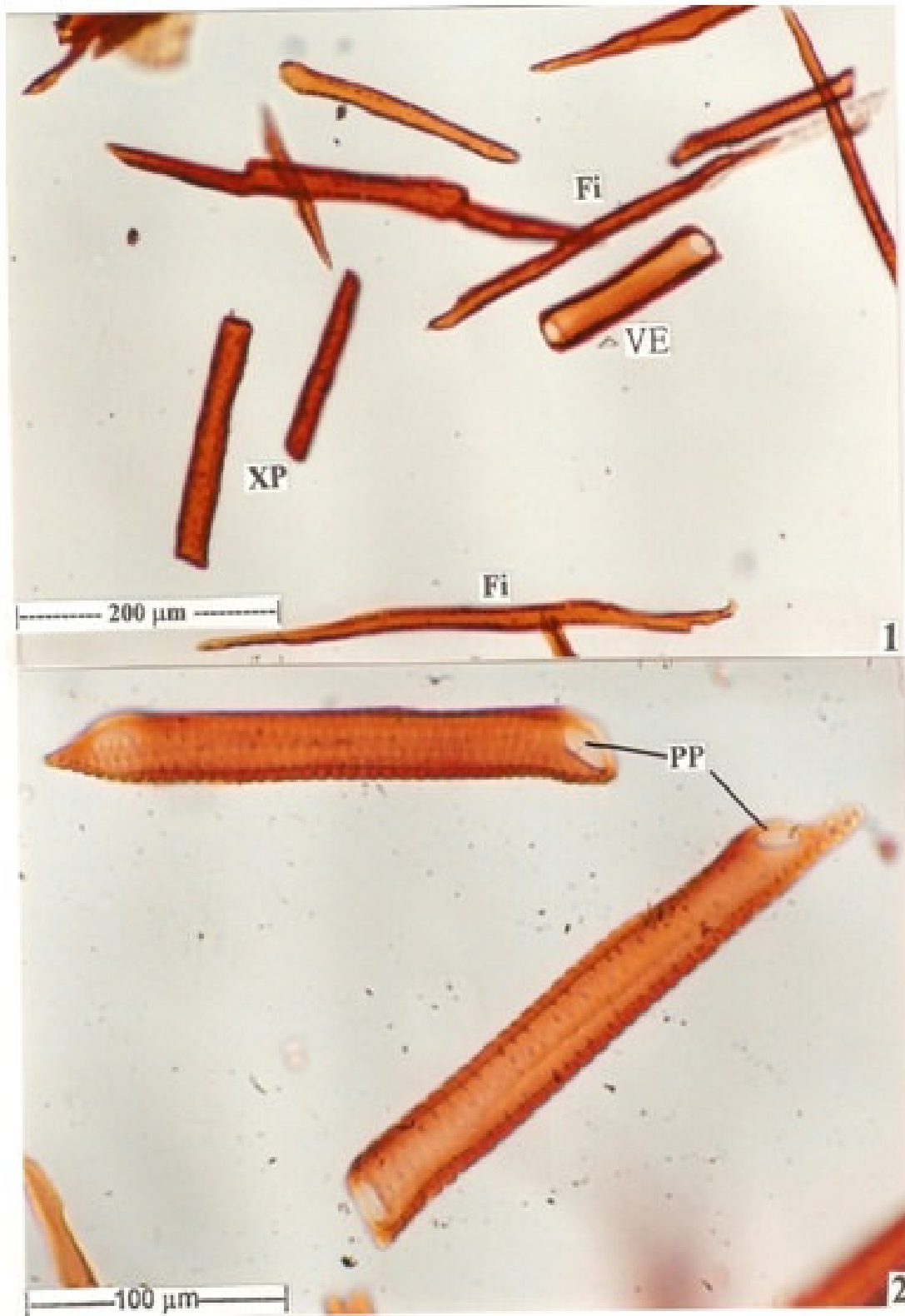


Figure 5

***Glossocardia bosvallea* 1-2 Stem and Root macerate Fi – Fibres; FTr – Fibre tracheids; VE – Vessel elements; XP – Xylem parenchyma; PP – Perforation plate**

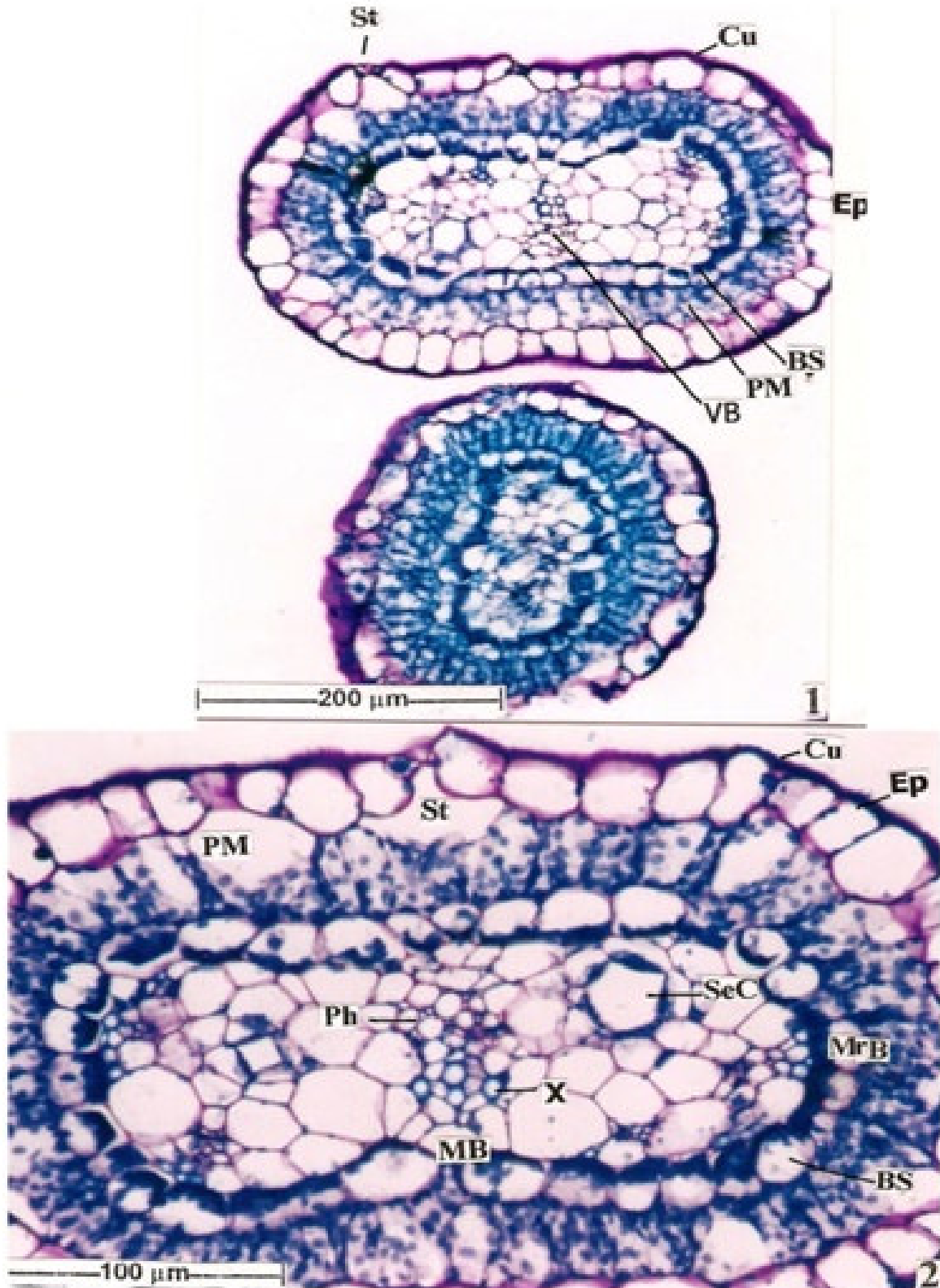


Figure 6

Glossocardia bosvallea Microscopical characters of Leaf

1. T.S. of basal part of the flat leaf and terminal circular leaf T.S. of flat leaf enlarged

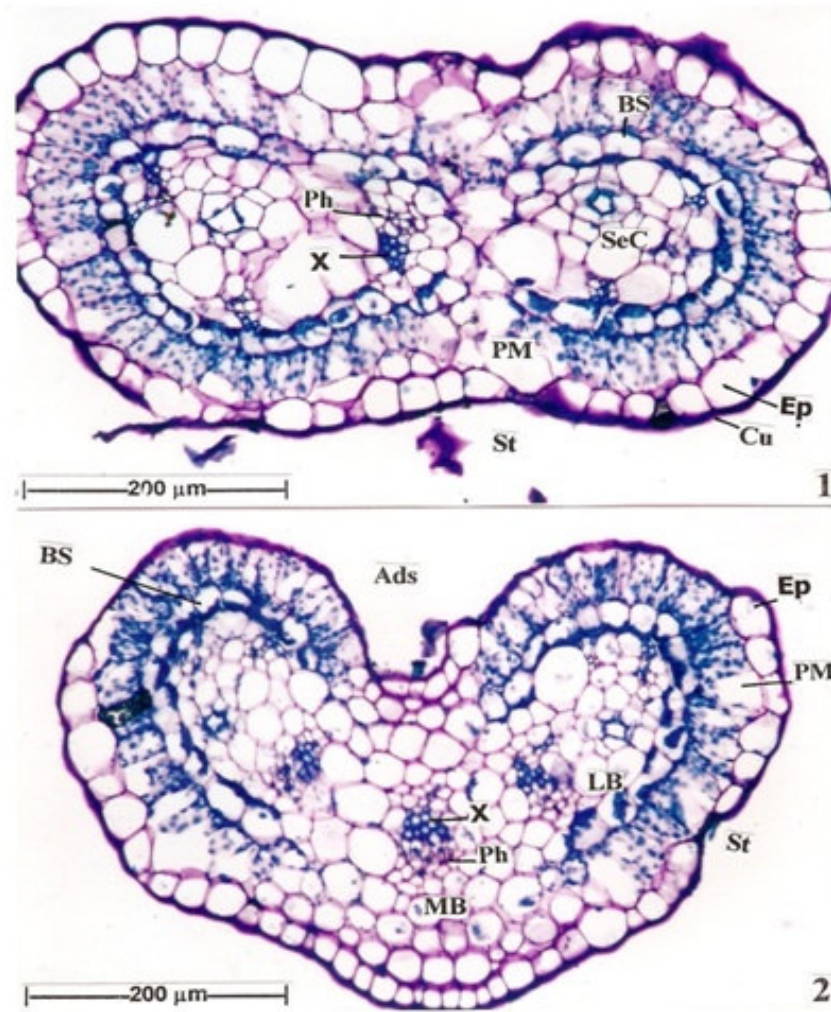


Figure 7
***Glossocardia bosvallea* Microscopical characters of leaf**
 1. T.S. of basal flat region of leaf
 2. T.S. of leaf before for king region

CONCLUSION

Glossocardia bosvallea is one of the alternative botanical sources for the drug Parpatak which is used for the treatment of different diseases like fevers, cough and fungal diseases. Since different sources of Parpatak are being sold in the different markets, this type

of studies will be useful for the identification of different sources of Parpatak. Hence standardization on *G. bosvallea* has been studied in root, leaf and stem which will be useful for further revalidation of the drug with more advanced studies like HPTLC and HPLC along with clinical evaluations for the prevention of adulteration of the drug Parpatak.

Abbreviations

Pharmacognosy terminologies

AdS	:	Adaxial surface
BS	:	Bundle sheath
CO	:	Cortex
Cu	:	Cuticle

Ep	:	Epidermis
Fi	:	Fibres
FTr	:	Fibre Tracheid
LB	:	Lamina bundle
MB	:	Midrib bundle
Ph	:	Phloem
Pi	:	Pith
PM	:	Palisade mesophyll
PP	:	Perforation plate
PX	:	Primary xylem
SeC	:	Secretory canal
SPh	:	Secondary phloem
St	:	Stomata
SX	:	Secondary xylem
Ve	:	Vessel
VB	:	Vascular bundle
X	:	Xylem
XP	:	Xylem parenchyma

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