



Research Article

COMPARATIVE STUDY OF ROOT AND STEM OF *BHARANGI* (*CLERODENDRUM SERRATUM* (LINN.) MOON) WITH SPECIAL REFERENCE TO PHARMACOGNOSTIC INVESTIGATIONS

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ABSTRACT

Ayurved has a long tradition of using herbal medicines in the maintenance of health and management of diseases. *Bharangi* [*Clerodendrum serratum* (Linn.) Moon] is one of drugs of choice used systematically for the treatment of respiratory ailments. According to Ayurved, root of *Bharangi* should be used in the drug formulations. In a market many a times, instead of root, stem of *Bharangi* is marketed. There is a lack of evidence of efficacy of *Bharangi* stem to support its medicinal use. Ideally stem of *Bharangi* should not be used in place of its root unless it is proved similarly efficient. Identity, purity and quality of the raw drugs are the necessary requirements for preparation of the drug formulation. The success of the system depends on the proper use and availability of genuine raw material. However no scientific reports are available on pharmacognostic studies on the stem of *Bharangi*. Therefore in the present study macroscopic, microscopic, powdered characteristics investigations on the root and stem of *Bharangi* were carried out and compared. The study provided diagnostic and differentiating characters for identification of root and stem of *Bharangi*. The Pharmacognostic standards of stem of *Bharangi* are developed.

KEYWORDS: *Bharangi*, *Clerodendrum serratum*, Pharmacognostic, *Bharangi* stem.

INTRODUCTION

Herbs are highly esteemed for millennia as a rich source of therapeutic agents for prevention and treatment of diseases. Herbs are widely exploited in the traditional medicine and their curative potentials are well-documented.^[1] *Bharangi* (*Clerodendrum serratum* (Linn.) Moon) (Verbanaceae) is an efficacious cure for respiratory disorders. This blue flowered shrub is widely distributed throughout India and in tropical and subtropical regions of the world. This Perennial Shrub is commonly known as Blue Bush, Blue glory or Beetle killer in English, *Bharangi* in Hindi, Sanskrit and Marathi. According to Ayurvedic classics it is useful mainly in *Shwas* (asthma), *Kasa* (Cough), *Peenus* (Rhinitis) and *Jwar* (Fever) treatment^[2-9] as well as in *Apsmar* (Epilepsy)^[10], *Vatrog* (Nervous disorders)^[11], *Prameha* (Diabetes)^[12] and *Hikka* (Hiccough)^[13] management. Major chemical constituents include D-mannitol, γ -sitosterol, hydrolysis of crude saponin fraction gives oleanolic acid, queretaroic acid and serratagenic acid.^[14] Anti-histaminic, Anti-asthmatic, Anti-allergic, Mast-cell stabilization, Anti-fertility, Cholinesterase inhibition, ACE inhibition, Anti-bacterial, Antinociceptive, Anti-pyretic, Anti-fungal, Anti-inflammatory, Hepato-protective and CNS depressant activities of *Bharangi* have been reported.^[15] According to Ayurved, root of *Bharangi* should be used in the drug formulations. In a market many a times, in its place, stem of *Bharangi* is marketed.^[14] The root is more commonly adulterated with stem pieces.^[15] There is a lack of evidence of efficacy

of *Bharangi* stem to support its use in the treatment of respiratory and above mentioned disorders. The effectiveness of the system depends on the correct utilization and availability of genuine raw material. No scientific reports are available on pharmacognostic studies on the stem of *Bharangi* yet. Therefore the present study was undertaken to establish the pharmacognostic characteristics of *Bharangi* stem and to provide the differentiating diagnostic characters useful for identification of root and stem.

MATERIALS AND METHODS

The *Bharangi* roots and stems (2 kg) were collected in the end of May and beginning of June, 2010 respectively from the local area i.e. Sinhgad (near Kudje), Pune. According to the *Charak's* Guidelines roots should be collected in *Greeshma Rutu* (April-May) while stems should be collected in the beginning of *Varsha Rutu* (June-July) when it possessed optimum quality (*Sampad rasaviryata*). In the present study, this protocol was followed. Identification was confirmed by referring to its synonyms and with the help of Ayurvedic experts. Taxonomic authenticity was confirmed by referring to herbarium specimens at National Research Institute of Basic Ayurvedic Sciences, Pune and a Voucher specimen (Specimen Voucher No. 72-13/08/2010) was deposited at the herbaria of the same Institute. The fresh parts of the plant were subjected for morphological characterization. Free hand sections of the roots and

stem were taken as per method described by Trease and Evans.^[16] T.S. of root was stained with Saffranin (stains lignified tissue) and Fastgreen (stains phloem part) while Saffranin and Fluroglucinol (stains parenchymatous tissue) were used for staining T.S. of stem. The photographs of T.S. of Root and stem of *Bharangi* were taken with Inverted High Speed Resolution Microscope (TOWA BRAND) at National Research Institute of Basic Ayurvedic Sciences, Pune as shown in the figure no. 1 and 2. For the stem pharmacognostic characteristics were established. Microscopic examination of powdered root and stem was also carried out. The whole study was carried out at the same Institute at Pune.

RESULTS AND DISCUSSION

Pharmacognostic Investigations

In case of herbal drugs, the quality of raw materials and products can be furnished by regular Pharmacognostic investigations. Standards for morphological identification of *Bharangi* plant i.e., *Varvarak/Varvari/Barbarak* (Resemblance with Ber-leaves i.e. serrate margin), *Surupa* (Good looking), *Kalankavalli* (Lenticels on stem), *Brahmanyashti/Brahamanyashtika* (Stem resembles with stick of *Brahmana* i.e. smooth and long), *Padma* (flowers look like Lotus), *Kharashak/Kharashaka* (rough leaves), *Angarparni* (soft foliage looks like fire), *Gandhaparvani/Mahagardabhagandhika* (typical smell of fresh roots) have been given by Ayurvedic *Nighantus* which help for morphological identification of the plant. The detailed morphology of root and stem of *Bharangi* was carried out to support proper identification of drug selected for investigation and results are narrated in the Table No. 1.

Table 1: Macroscopy of *Bharangi* Root and Stem

No.	Parameter	<i>Bharangi</i> Root	<i>Bharangi</i> stem
1.	Size Length	3-8cm	3-8ft., average internodes length 8cm
2.	Thickness	5cm diameter	2.5cm diameter
3.	Weight	5gm/cm	1 gm/cm
4.	Shape	Cylindrical	Cylindrical
5.	Colour	Fresh- Creamish yellow. On maturity- Brown or light brown	Young-Quadrangular, green. Matured-Greyish or yellowish brown
6.	Taste	Acrid	Acrid
7.	Odour	Pungent	Pungent but tolerable
8.	External Surface	Hard, Woody and has elongated lenticels and thin and glabrous bark. Broad wood has marked medullary rays and concentric growth rings in a transversely cut surface.	Semi hard, woody and has round lenticels and thin, glabrous and simple bark.
9.	Fracture	Short and very Difficult	Short and Difficult
10.	Foreign matter	0.5%	0.5%

Microscopy

T.S of Root of *Bharangi*

It is circular in outline with distinct layer of outer cuticle the cells just beneath the cuticle are brick shaped and arranged one another, the number of storey ranges in 12-14 in each compartment. The central pith region is compactly arranged and surrounded by phloem parenchyma. The steles are of typical type without any deposition of any byproducts. The compactly arranged vascular bundles are arranged in circular fashion and is diametric cells comprises a complete bundle sheath cells. The cortex is very less and made up of narrow cells. The storage material probably starch is scattered all over the region.

T.S. of Stem of *Bharangi*

The transverse section passing through nodal region is triangular in Outline. The conspicuous notches show endodermis and extended cortex region. The Epidermis is single layered with thick cuticle having interruptions due trough and crest formation. The amount of chlorophyll, starch and other material is bit more just below the endodermis, making its appearance as a continuous patch of band of thickened cells. The

cortex region is very unique in nodal region where polygonal cells are more conspicuous and large in size. The intercellular spaces between cortex cells have been sporadically filled with starch materials. The compactly arranged cell pattern appeared to be in alternate to the next row of cells. But as they proceed towards centre, the size of parenchyma increases and cells remain arranged in ascending of order of size. The cortex with large cells may be 4-5 layers. The cells of specialized activities are manifested in next row, in the patches, with more amounts of stored materials. The phloem patches are irregular in shape and distinctly noticed in the lower most layers of cortex. The shape of phloem patches is ranging from semicircular to lunar shape. The stellar region is very specifically characterized by presence of conjoint collater open type of vascular bundles. The endodermis demarcates the cortex of stellar zone by a circular line of thick suberine cells casparian strips. The pith region is also seen, situated centrally with loosely arranged cells. Thus study has provided differentiating criteria for *Bharangi* root and stem. Comparison of Microscopy of *Bharangi* root and stem is tabulated in Table no. 2.

Table 2: Comparison of Microscopy of *Bharangi* Root and Stem

T.S. of Root	T.S. of Stem
i) T.S. of root is circular in outline.	i) T.S. of stem is triangular in outline.
ii) Cells just beneath cuticle are brick shaped.	ii) Single layered thick cuticle has interruptions due to trough and crest formation.
iii) Central pith region has compactly arranged cells.	iii) Central pith region has loosely arranged cells.
iv) Stele is of typical type without any deposition of any byproducts.	iv) Stellar region is characterized by presence of conjoint collater open type of vascular bundles.
v) Cortex is very less and made up of narrow cells.	v) Cortex is extended and made up of large polygonal cells.
vi) Starch grain: simple and compound with 2-4 components, oval to round, 15-20 μ in diameter and 3 rayed hilum is present in the centre.	vi) Starch grain: simple and compound with 2-4 components, oval to round, 5-10 μ in diameter and 3 rayed hilum is present in the centre.
vii) Xylem is exarch in nature i.e. extending as protoxylem to metaxylem towards pith.	vii) Xylem is endarch in nature i. e. extending as metaxylem to protoxylem towards pith.

Powder microscopy

Powder microscopy of Root of *Bharangi* shows the fragmented portion of vasculature, the cells of conducting system shows the lumen, which are surrounded by later rows of conducting tissues; reticulate, spiral with bordered pits. The cluster of cells shows overlapped xylem vessels. The vessels are narrow but longer than other cells. Sporadic clumps of stone cells, acicular crystals, starch grains, measuring not more than 20 μ . Powder microscopy of Stem of *Bharangi* shows the fragmented portion in majority of selected areas of observation. The cells of vascular systems are mainly vessels. The vessels shows mainly pitted areas, especially bordered pits. The tip area, where two vessels arranged one above other, the pt bordered pits are seen arranged in beads like manner. The number ranges from 8-10.

Thus studies confirm purity of samples and also give differentiating diagnostic features of test samples due to the differences of functions of root and stem.

CONCLUSION

The inadequacy of consistent quality standards of herbal drugs has been a discouraging factor for potential herbal drug manufacturer and also an impediment in regulating herbal drug market. The efficacy of the system depends on the accurate use and availability of authentic raw material. This effort has provided some diagnostic and differentiating characters for identification of root and stem of *Bharangi* macroscopically as well as microscopically. The Pharmacognostic standards of stem of *Bharangi* are developed. It is hoped that these findings shall be useful to all pharmacies and practitioners using *Bharangi*.

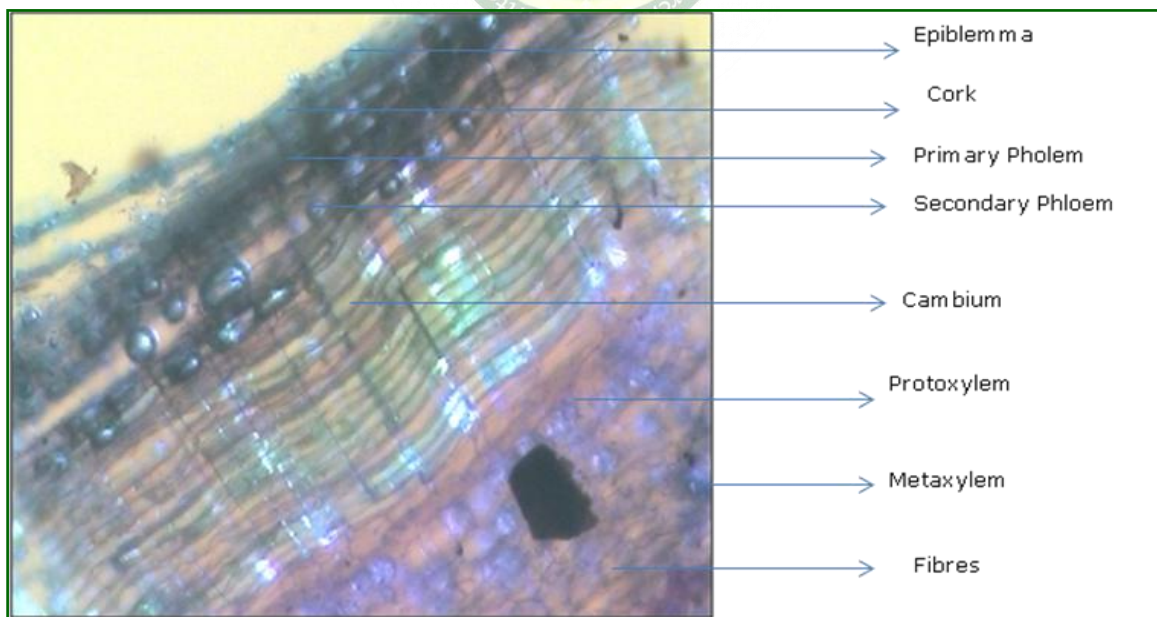


Figure1: Photograph of T.S of Root of *Clerodendrum serratum* (L.) Moon

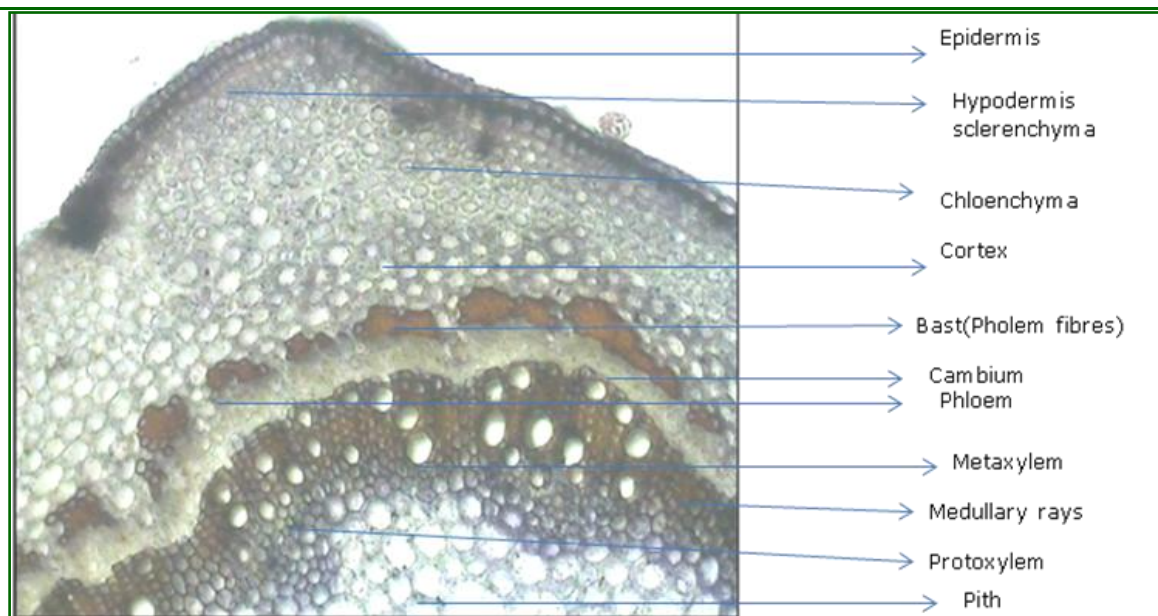


Figure 2: Photograph of T.S of Stem of *Clerodendrum serratum* (L.) Moon.

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