



ISSN (E): 2320-3862
ISSN (P): 2394-0530
NAAS Rating: 3.53
www.plantsjournal.com
JMPS 2021; 9(3): 233-237
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Received: 16-03-2021
Accepted: 18-04-2021

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Preliminary Micro morphological and Macro morphological Studies of roots & stems of medicinally important varieties of *Shankpushpi*

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Abstract

Study of plant morphology is one of the important character that put plants into limelight in the form of their external structures which are useful in plant identification that includes of comparative morphological analysis of different plant parts like stems, roots, rhizomes, flowers present in same or different plant species. Plant morphology also includes studies of plant characters at macro and micro level. Micro morphological study includes structures of cell at micro level by taking sections and observing them microscopically. Due to botanical ambiguity in different regions of India there is need of morphological characterization of collected different varieties of Shankpushpi. Present research study includes morphological characterization of four different ambiguous varieties of Shankpushpi: *Evolvulus alsinoids*, *Convolvulus microphyllus*, *Clitorea ternatea* white and *Clitorea ternatea* blue at macro and micro level. So main focus of this study is to analyze structural morphological difference among these varieties.

Keywords: Shankpushpi, transverse section of root and stem, varieties of Shankpushpi, macro morphological study, micro morphological study

Introduction

Increases metabolic rate during hyperthyroidism like thyroxin (coupler) and triiodothyronine. Shankpushpi is helpful syrup during treatment of ulcer as it is proven to be protective against expression of certain glycoprotein and secretion of mucin by goblet cells. Because of Shankpushpi has a crucial medicinal property though its individuality is ambiguous.

In different regions of India Shankpushpi is given various botanical names. In Western part of India *Convolvulus microphyllus* is known as Shankpushpi and in market of western part of India Shankpushpi is sold as *C. microphyllus*. In some part of northern India *Convolvulus microphyllus* is sold as source of Shankpushpi. As source of Shankpushpi white and blue variety of *Clitorea ternatea* which is commonly known as 'Aparajita' is used as source material and sometimes also sold as Shankpushpi. According to botanical survey actual source of Shankpushpi is *Evolvulus alsinoides* that is very rare plant. Therefore due to non-availability of actual plant source and botanical ambiguity in different regions of India there is need for morphological characterization of different collected different varieties of Shankpushpi. Present research study includes morphological characterization of four different ambiguous varieties of Shankpushpi: *Evolvulus alsinoids*, *Convolvulus microphyllus*, *Clitorea ternatea* white and *Clitorea ternatea* blue. So main aim of this study is to analyze structural morphological difference among these varieties.

Plant morphology is one of the important features that put plants into limelight in the form of their external structure which is useful in plant identification. Study of comparative morphology leads to study of different plant parts like stems, roots, rhizomes, flowers present in same or different plant species. Plant morphology includes both vegetative structures like root, leaf, rhizomes, stem and reproductive structures like fruit and seeds. So study of external structure is macro level study. Plant morphology also includes studies of plant characters at micro level. It includes study of structures of cell at micro level by taking sections and observing them microscopically. Descriptive morphology includes study of different external and internal characters of plants, their functions at developmental level. External characters involve size, shape and structure of different plant parts whereas internal characters involve information about pollen grains, pollens and ovules, embryo, ovary and embryo sac.

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Interactive morphology includes comparative study of different plant species of plant groups of different families. Goethe gave one best and important concept about this study like homology which is study of homologous nature of plants like leaves, flowers, petals etc. In this homology it is explained that there is no real boundary explained between leaves and flower petals. So basically plant morphology plays important roles in proper identification of plants by examine them at macro level and at microscopic level. So importance of plant morphology includes plant identification, their nomenclature, classification and phylogenetics that determines phylogenetic distance between different plant species of same family or different family.

Material and Methods

Collection of plant materials

Authentic source of *Evolvulus alsinoides* and *Convolvulus microphyllus* were collected from Vasad, Baroda and white and blue variety of *Clitorea ternatea* were collected from Karamsad to Ghana road near ARIBAS College, Vallabh vidyanagar, Gujarat and then they all were well maintained under optimum condition and taken care by frequent monitoring like proper watering and sunlight until they grew properly.

Estimative macro morphological characterization of three different varieties of shankpushpi

Significant different visual morphological characters like plant type, leaflets, leaf flower color, stem and root lengths were noted among these three varieties: *E. alsinoides*, *C. microphyllus*, and *C. ternatea* to find out visual structural similarity base on homology and convergence among varieties. Based on visual morphological characters qualitative and quantitative characters of these varieties are measured.

Microscopic examination of three different varieties of shankpushpi

For anatomical consideration very thin microscopic transverse sections of all these three varieties of Shankpushpi were taken. Transverse section of stems and roots were taken sterile blade and then put for few minutes in diluted saffranin and then view under microscope (40X).

Results and Discussion

Verities of Shankpushpi are currently used as brain tonic. So for standardization of raw drugs it is necessary to study morphological characters at macro level and micro level. Therefore macro and micro morphological characters of plants have been described and differentiate them from other species of same members or different family members. In field of pharmaceuticals assessment of plant morphology and plant materials is always been a part of professional expertise. Most of plant research occurs in field of authentication of true plant material from ambiguous one. (Pilaniya K *et al.* 2010 and Devi UK, 2000) [2, 3].

Collection of plant materials

All varieties of Shankpushpi were put under intensive care and growing plants were observed at least two to three times a day until they grew properly.

Estimative characterization of three different varieties of Shankpushpi

Different morphological characters like plant height and length of root and stems were comparatively studied.

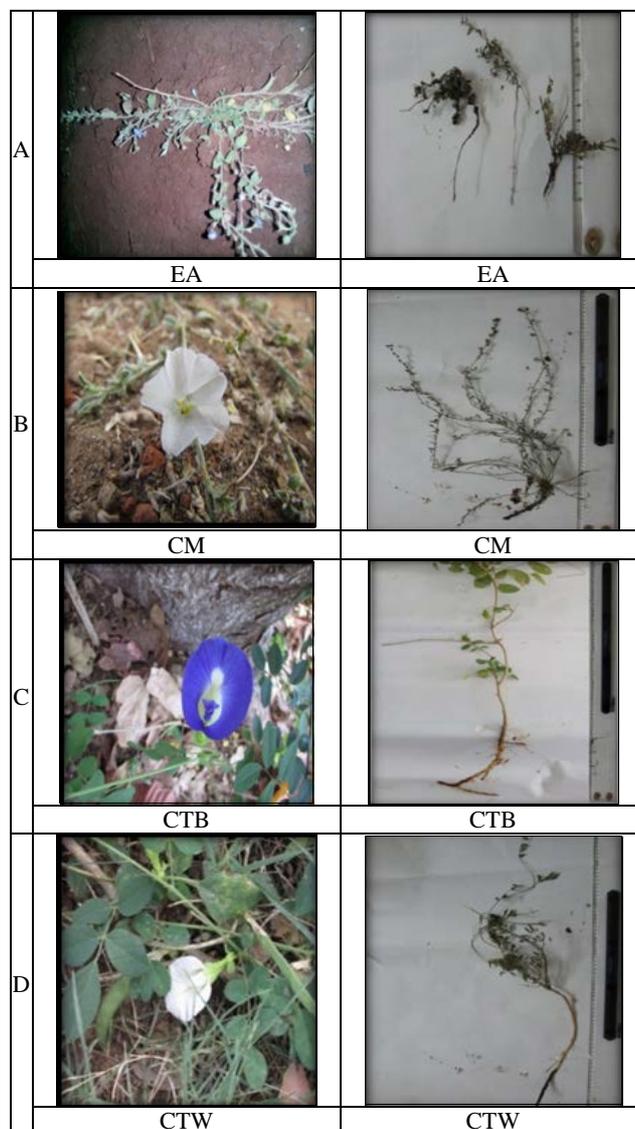


Fig 1: Comparative morphological characters of four different varieties of shankpushpi [(A) *Evolvulus alsinoides* (EA), (B) *Convolvulus microphyllus* (CM), (C) *Clitorea ternatea* Blue (CTB), and (D) *Clitorea ternatea* White (CTW)]

Comparative morphological studies of four different varieties

Earlier major morphological characters were reported among these varieties but they were almost similar characters (Sethiya *et al.* 2009) [4].

Evolvulus alsinoides

Type: Perennial herb.

Leaflets: Long, oval like elliptical in shape and are rounded at base.

Leaves: Leaves are fitted with long hairs on their surface looks like hairy leaves.

Flowers: Flowers are blue in colour and are originated at middle from the stem so flowers are axillary.

Root length: Root length ranges from 2.5 cm to 5.2 cm long.

Stem length: Stem length ranges from 3.5 to 6.5 cm.

Convolvulus microphyllus

Type: Annual or perennial herb.

Leaflets: Linear to oblong.

Leaves: Leaves are arranged spirally means in reverse inverted position.

Flowers: Flowers are white in colour and having long pointed jointed sepals.

Root length: Root length ranges from 4.5cm to 6.2 cm.
Stem length: Generally stems are prostrate and spreading everywhere having length ranges from 10.5 cm to 12.5 cm.

Clitorea ternatea blue

Type: Annual or perennial herb.
Leaflets: Leaflets are elliptical in shape.
Leaves: Leaves have pinnate arrangement means leaves are arranged on side by one other and having middle stem and rounded in shape.
Flowers: Flowers are blue in colour.
Root length: Root length ranges from 4.6 cm to 6.6 cm.
Stem length: Stem length ranges from 20.5 cm to 22.5 cm.

Clitorea ternatea white

Type: Annual or perennial herb.
Leaflets: Leaflets are elliptical in shape.
Leaves: Leaves have pinnate arrangement means leaves are arranged on side by one other and having middle stem and rounded in shape.

Flowers: Flowers are white in colour.
Root length: Root length ranges from 4 cm to 6 cm almost similar to blue variety.
Stem length: Stem length ranges from 20 cm to 22 cm nearly similar to blue variety.

Microscopic examination of three different varieties of shankpushpi

Transverse section of Root and stems of three different varieties of Shankpushpi were taken and different parameters at microscopic level were studied. Stem and root characters also plays crucial role in maintenance of water between plant and soil.

A. Transverse section of stem

Transverse sections of stems of three different varieties of Shankpushpi bearing chlorenchyma, endodermis, cuticle, phloem, pith and trichomes were examined under microscopic view of 40x.

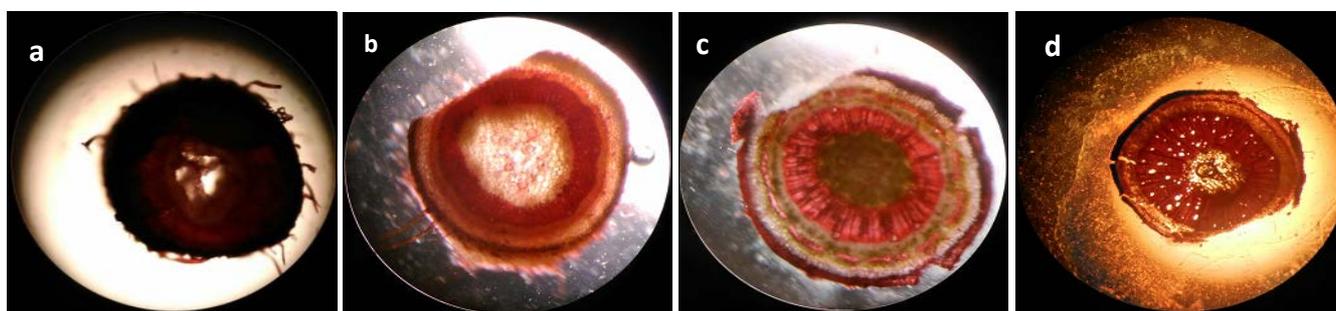


Fig 2: In shows whole transverse section of stems of three different varieties of Shankpushpi: a-*Evolvulus alsinoides*, b-*Convolvulus microphyllus*, c-*Clitorea ternatea* blue, d-*Clitorea ternatea* white

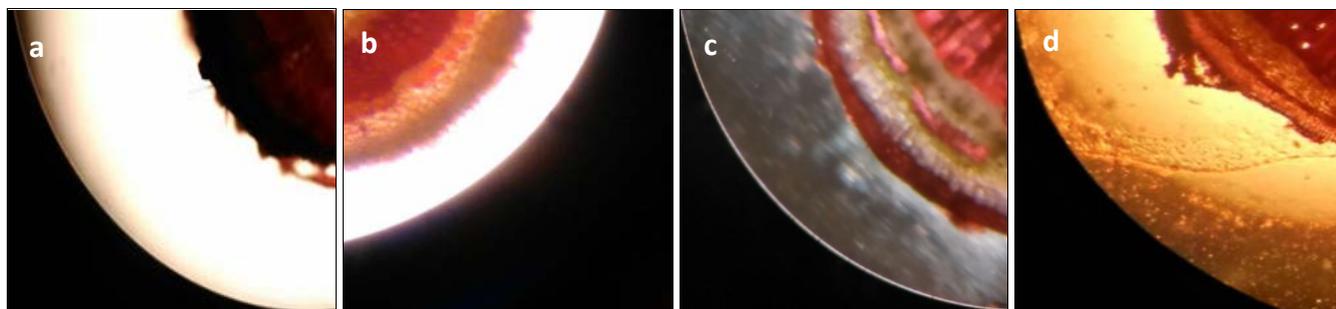


Fig 3: Transverse section of stem of three different varieties of Shankpushpi: a-*Evolvulus alsinoides*, b-*Convolvulus microphyllus*, c-*Clitorea ternatea* blue, d-*Clitorea ternatea* white shows three clear sections showing Chlorenchyma, Endodermis and cuticle

In figure-3 clear separated layers of chlorenchyma-endodermis and cuticle is shown. Generally chlorenchyma

layer is no single layer but it is of 2-3 layers. Cuticle is outermost layer of epidermis.

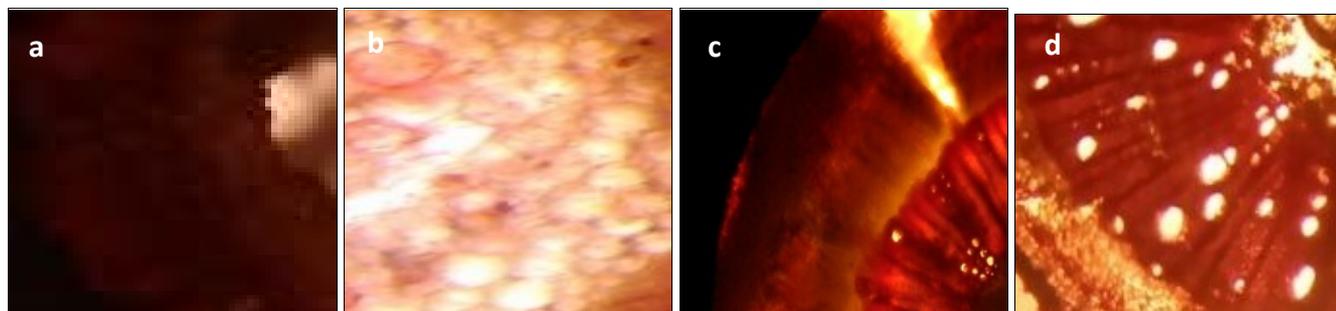


Fig 4: Transverse section of stem of three different varieties of Shankpushpi: a-*Evolvulus alsinoides*, b-*Convolvulus microphyllus*, c-*Clitorea ternatea* blue, d-*Clitorea ternatea* white shows visible layer of phloem pith

Transverse section of stem contains inner pith followed by layer of protoxylem followed by layer of xylem followed by layer of phloem followed by layer of cortex that is followed

by outermost boundary of epidermis. Inside layer of endodermis phloem and xylem are present. Phloem pith contains spongy parenchyma cells.

In figure-4 phloem pith is clearly visible in that spongy parenchyma cells are loosely arranged and having some intercellular space which makes pit like structure that are sites for storage of food particles. This pit like structure is present in xylem vessels and from figure-4 there is visible difference in xylem vessel numbers among three different varieties. More numbers are seen in stem of *Clitorea ternatea* white variety (d) and very less number is seen in stem of *Evolvulus alsinoides* (a). It is reported that variability in number of

xylem vessels in stem indicates their resistance behavior against water and drought (Kulkarni M and Deshpande U, 2006) [5].

In present study xylem vessel numbers are higher in transverse section of stem of *Clitorea ternatea* white variety (d) and they are very less in transverse section of *Evolvulus alsinoides* (a) that indicates that *E. alsinoides* is more drought tolerant than other varieties.

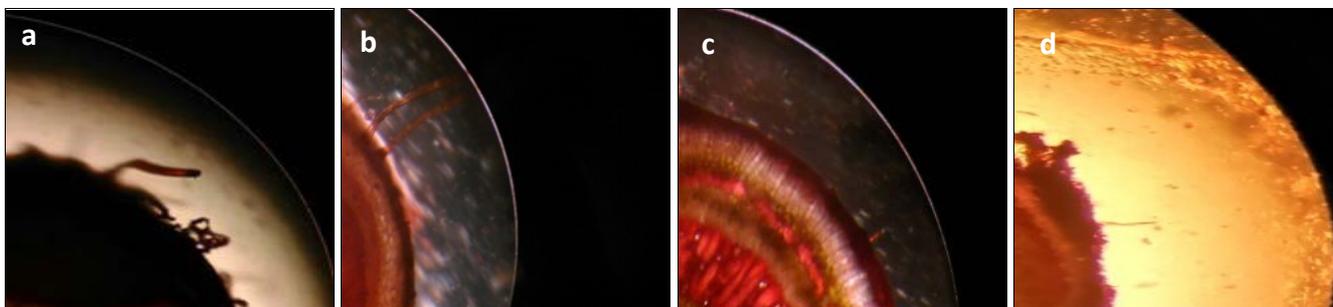


Fig 5: Transverse section of stem of three different varieties of Shankhpushi: a-*Evolvulus alsinoides*, b-*Convolvulus microphyllus*, c-*Clitorea ternatea* blue, d-*Clitorea ternatea* white shows clear visible trichomes

In figure -5 layers of trichomes in the form of outgrowth of plant epidermis is shown. Generally these outgrowths are developed in the form of small hairs and sometimes big hairs like thorns. Epidermis generally forms boundary between plant stem and external environment.

B Transverse section of root

Transverse sections of roots of three different varieties of Shankhpushi bearing visible trichomes and calcium oxalate crystals were examined under microscopic view of 40x.

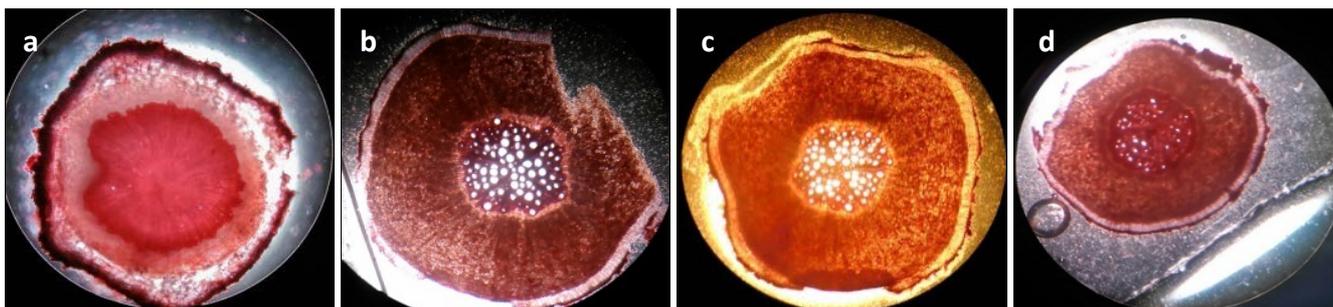


Fig 6: In Figure-6 shows whole transverse section of roots of three different varieties of Shankhpushi: a-*Evolvulus alsinoides*, b-*Convolvulus microphyllus*, c-*Clitorea ternatea* blue, d-*Clitorea ternatea* white

Figure -6 shows whole transverse sections of roots of all three varieties of Shankhpushi. In fresh form of roots of all three varieties colour was whitish while taking thin section before deeping them into stain, shape was round and small rootlets

were present on entire length of root. Root epidermis of all varieties is pentagonal in shape and layer of epidermis is densely arranged.

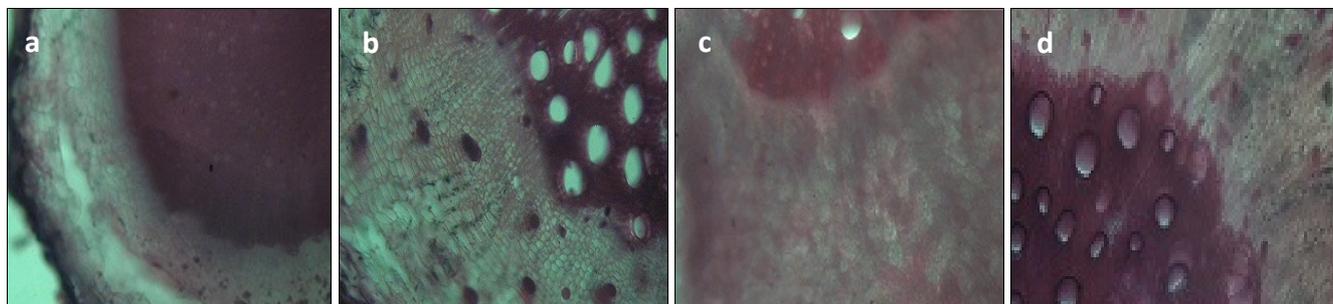


Fig 7: Transverse section of roots of three different varieties of Shankhpushi: a-*Evolvulus alsinoides*, b-*Convolvulus microphyllus*, c-*Clitorea ternatea* blue, d-*Clitorea ternatea* white shows clear visible trichomes and calcium oxalate crystals in the region of cortex

Sometimes there are kind of materials found in poisonous plant parts like stem, root, and leaves (Seçmen and Leblebici 1987) [6]. Among these materials some has toxicological significance like oxalates, alkaloids, glycosides, amino acids, proteins, minerals, acids, terpenes, phytotoxins,

photosensitizing compounds, phenols and tannins which are generally known as secondary metabolites (Frohne and Pfander 1984) [7]. Among these secondary metabolites oxalates having toxic effect if they are produced in very excess quantity because of having slower metabolic rate

(Franceschi and Horner 1980) ^[8]. High amount of calcium is also toxic to cells therefore plant having higher amount of both calcium and oxalate form calcium oxalate crystals to reduce toxic effect of oxalates and calcium (Çalışkan 2000). ^[9]. In figure-7 in variety of *Convolvulus microphyllus* (b) less number of calcium oxalate crystals are found in region of cortex.

Conclusion

From this small informative preliminary research studies it indicates that varieties of Shankpushpi, *E. alsinoides*, *C. microphyllus*, *C. ternatia* white and *C. ternatea* blue are macro morphologically different in type, flower colour, stem and root length. From Micro morphological studies of roots and stems indicates that all these varieties are different in their micro morphological characters. It has been observed that *E. alsinoides* is more drought tolerant than other three varieties because of less number of xylem vessels present in its stem. It has been also observed that *C. microphyllus* contains less amount of calcium oxalate crystals in its root cortex where as other three varieties contains less to moderate level of calcium oxalate crystals. However further study is required for comparative identification of different principal chemical compound present in different varieties of Shankpushpi.

Acknowledgement

Author is thankful to corresponding author Dr. Farzin M Parabia and all teaching and non-teaching members and my beloved friends of college for their constant support.

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