



PHARMACOGNOSTICAL EVALUATION OF *RAUVOLFIA TETRAPHYLLA* L.

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ABSTRACT

Rauvolfia belongs to the family Apocynaceae. *Rauvolfia tetraphylla* L. is an endangered evergreen woody shrub and it is economically important medicinal plant because of the presence of various alkaloids. Because of a wide use and demand for this plant in the trade, it has been banned to be exported, which has increased the sort of adulterations made to it. To avoid this we need a correct identification of drug. So here an attempt has been made for the correct identification through its morphological and pharmacognostical parameters of the root stem and leaves. Study revealed the presence of stone cells and twin prismatic crystals characteristically present in the root. Presence of non-lignified fiber in cortex and stone cells in pith is characteristic to stem where as in leaf, parasitic stomata in lower epidermis and trichomes in both epidermis.

Keywords: *Rauvolfia tetraphylla*, Microscopy, Macroscopy, Powder microscopy

INTRODUCTION

Rauvolfia is a genus of evergreen trees and shrubs in the *Apocynaceae* family. It has approximately 85 species in the genus, can mainly be found in tropical regions¹. The *Rauvolfia* species is mainly known for its phytochemical 'Reserpine' which was widely used as an antihypertensive drug². *Rauvolfia tetraphylla* L. is an endangered evergreen woody shrub, abundant in moist and warm regions of west Bengal, particularly in 24 parganas and howrah and kerala as a weed. *Rauvolfia tetraphylla* is a native of the West Indies but naturalized in south India^{3,4}.

It is rich in a number of phyto-chemical alkaloids - ajmaline, ajmalicine, reserpine, serpentine and tetraphyllicine, rauvolsine, canescine, pseudoyohimbine, yohimbine, corynathene, raunescine, iso-raunescine and recanescine. Reserpine is a potent alkaloid that depresses the central nervous system and used in hypertension^{5,6}. Plant juice mixed with castor oil is applied in skin diseases and also to destroy parasites⁷. Its root is used to stimulate uterine contraction there by facilitating labour⁸. Alkaloid yohimbine, a cardiovascular depressant, aphrodisiac and hypnotic⁹ is present in *R. tetraphylla* root bark 0.1%, stem bark 0.2% and in leaves 0.5%. The roots of *R. tetraphylla* are often used as a substitute for *R. Serpentina*¹⁰. Besides the above uses, it also possesses anti-inflammatory, diuretic, expectorant, narcotic & tranquilizing actions and it is also used in toothache, ulcer, stomatitis, swelling, syphilis, sore throat, fever, gingivitis, malaria and nervousness¹¹.

Being an endangered species in the Genus *Rauvolfia*, Government of India has banned export of this species in order to prevent over exploitation from the wild¹². Because of wide use and banned to export there is an adulteration of this drug will be more; to avoid this we need a correct identification of drug. So here made an attempt for correct identification through its morphological and pharmacognostical parameters of a root stem and leaves.

Synonyms:

Rauvolfia canescens, *R. canescens* var. *glabra* Mull. arg., *R. heterophylla*, *R. hirsuta*, *R. canescens* var. *intermedia*

markgr. *R. canescens* var. *tomemtosia* mull. arg., *R. canescens* var. *typical* markgr. *R. heterophylla* wild. Ex Roem & Schult., *R. heterophylla* var. *puberula* A. Gray, *R. hirsuta* Jacq., *R. hirsuta* var. *glabra* (Mull. Arg), *R. latifolia* var. *minor* Mull. Arg., *R. odontophora* Van Heurck & Mull. Arg., *R. subpubescens* L., *R. tomentosa* Jacq.¹³

Vernacular names¹⁴:

English: Wild snake root, Devil pepper, Still tree, Amercian serpentwood, Milkbush

Hindi: *Barachadrika*, *Chandrabhaga*

Tamil: *Pampukaalaachchedi*

Malayalam: *Pampumkolli*, *Kattamalpori*

Telugu: *Papataku*

Kannada: *Dodda chandrike*

Bengali: *Bar chandrika*, *gandhanakuli*

Oriya: *Patalagarudi*

Sanskrit: *Vanasarpagandha*, *Sarpanasini*

Classification:

Kingdom: *Plantae*

division: *Angiosperms*

Subdivision: *Eudicots*

Class: *Rudicots*

Series: *Asterids*

Order: *Gentianales*

Family: *Apocynaceae*

Genus: *Rauvolfia*

Species: *Tetraphylla*

Binomial name: *Rauvolfia tetraphylla*

MATERIALS AND METHODS

Collection of plant material

The fresh plant material of *R. tetraphylla* was collected from Koppa (Tq.) of Chikkamagalur district, Karnataka State, India, in the month of June. The plant was identified, confirmed and authenticated by Prof. Radhakrishna Rao, Taxonomist, A.L.N Rao Memorial Ayurvedic Medical College, Koppa using various floras.¹⁵ and voucher specimen was placed in the department for future reference (Voucher Ref no. PGDG/VHM - 103). After authentication of the plant, the leaf, stem and root were separated and used for study.

Organoleptic evaluation:

The color, odor and taste of root powder were recorded separately.

Microscopic evaluation:

Surface preparation of leaf was done by placing wet leaf on a glass slide & tissues were scrapped off with the sharp edge of razor blade with utmost care. Water was slowly & continuously added & scrapping was done till transparent &

colorless epidermis was exposed. Free hand transverse sections of root, stem & leaves were used for microscopic evaluation. diagnostic characters were drawn with camera lucida. The photomicrographs were taken by Carl Zeiss binocular microscope.^{16, 18, 19}

Histochemical evaluation:

Histochemical tests are done for lignified tissue, starch grains and crystals.²⁰



Fig 1: Plant in habitat



Fig 2: Drug measurement
2.1 Leaves 2.2 Stem 2.3 Root



Fig 3: T S of Leaf

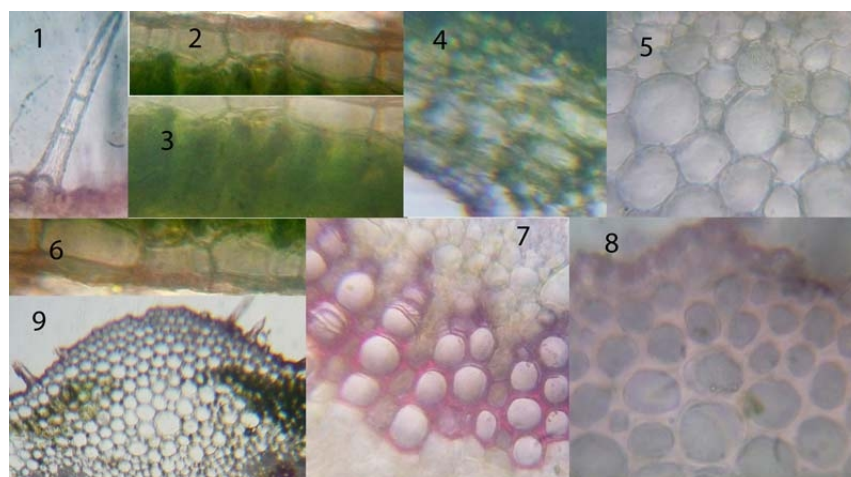


Fig 4: Leaf characters

4.1 trichomes 4.2 upper epidermis 4.3 upper palisade 4.4 lower spongy parenchyma 4.5 parenchyma of mid rib 4.6 lower epidermis 4.7 vascular bundles 4.8 Collenchymatous cells

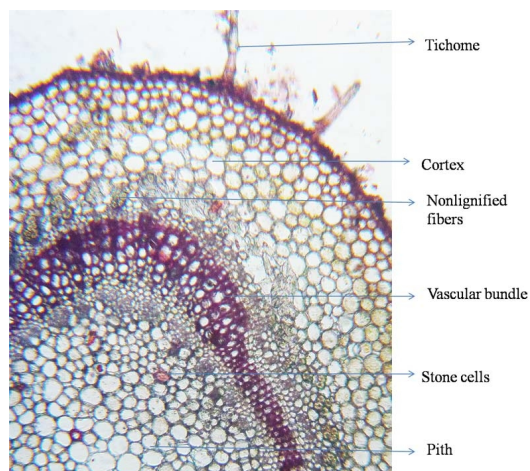
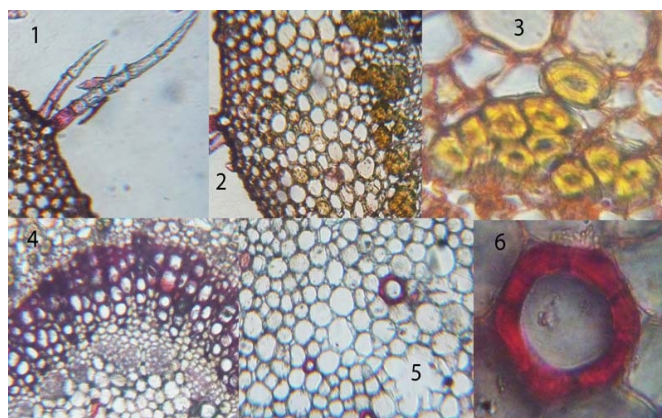


Fig 5: T S of Stem



6.1 trichomes 6.2 cortex 6.3 nonlignified fiber 6.4 vascular bundle 6.5 pith 6.6 stone cell

Fig 6: Stem characters

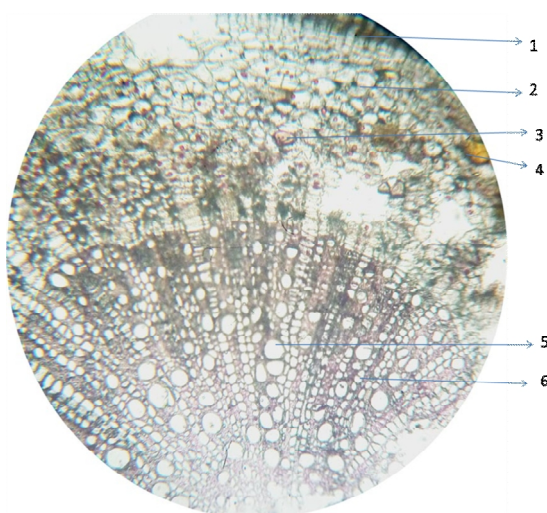


Fig 7 T S of Root

7.1 Cork 7.2 cortex 7.3 stone cells 7.4 oil resin 7.5 xylem 7.6 Medullary rays

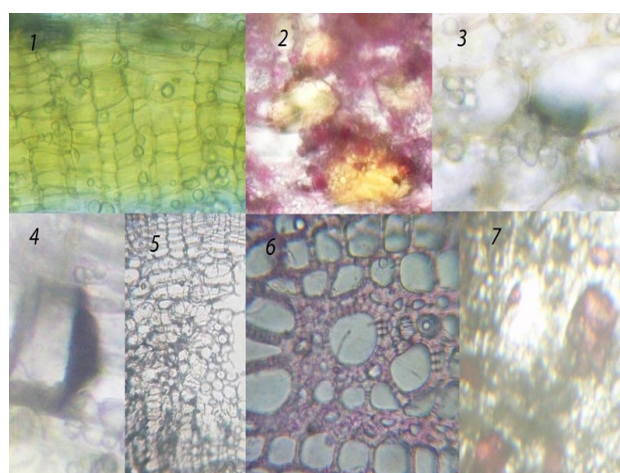


Fig 8: Root characters

8.1 cork 8.2 oil resin 8.3 starch grains 8.4 prismatic crystals 8.5 cortex 8.6 xylem and Medullary rays 8.7 stone cells

RESULT AND DISCUSSION:

Leaves:

Macroscopic chareters:

Leaves in whorls of 4, unequal, 5–9×3–4cm, elliptic-ovate in shape. Apex is acute and base is round, entire margin, reticulate venation. Both surfaces are pubescent, dark green in color (Fig 2). Odor characteristic, texture is smooth.

Microscopic characters:

On surface preparation, the leaves showed that upper epidermis was devoid of stomata and it contained innumerable uniserate, multicellular trichomes. But in lower epidermis innumerable paracytic stomata were observed and trichomes similar to that of upper epidermis were observed.

Transverse section of the midrib of leaves showed a single layer of upper and lower epidermis with a thin cuticle. In both the epidermis, numerous uniserate and multicellular trichomes were seen. Just below the upper epidermis 5–7 layer of collenchymatous cells (which turned pink on addition of saffranin as a staining agent), which were polygonal in shape and smaller than parenchymatous cells. Similar Collenchymatous cells were observed above the lower epidermis too. The vascular bundles consisted of xylem at the center with phloem on both the sides which makes them bicollateral vascular bundle. Other areas of the midrib

contained parenchymatous cells. The mesophyll tissue comprised of upper palisade and lower spongy parenchyma cells. Chlorophyll was present in the whole of the section (Fig 3 and 4).

Stem:

Macroscopic chacteristic:

Stem is round, its length and breadth is 12-19× 0.2-05, Surface is rough, hairy, externally green and internally creamish yellow. Odor characteristic, texture is rough and fibers.

Microscopic characters:

Transfer section of stem shows the single layer of epidermis with uniserate, multicellular trichomes. Just below the epidermis cortex is filled with 10-12 layer of parenchymatous cells which are oval to oblong in shape of different size. At the end of cortex we can see the patches of non-lignified fibers which has yellowish ting. After the cortex is vascular bundle here xylem in the center and phloem in both the side so it is bicollateral vascular bundle. In center the big pith which is filled with parenchymatous cells, but at places we can see the stone cells in cortex and pith region. (Fig 5 and 6)

Root:

Macroscopic character:

Pieces of roots is about 8 to 15cm long and 0.5 to 2cm in thickness, sub cylindrical in shape, curved, outer surface is brown and its inner surface creamish yellow, longitudinal fissures are seen in outer surface, fracture short. Slight odor and bitter in taste.

Microscopic character:

Root comprises of simple rectangular cork about 15 layers, big cortex which are made up of parenchyma cells and it is filled with simple starch grain and at places we can observe presence of oil resin in cortex. Presence of stone cells in cortex is the character which helps to different from *R. serpentina*. Thick walled Medullary rays which are uniseriate or biseriated, which are arises from end of cortex region that's above the cambium, which are almost rectangular in shape. Xylem is lignified xylem fibers and xylem parenchyma cells are seen in the stellar. There is small pith at the center. Starch grains and twin prismatic crystals are seen the section. (Fig 7 and 8)


CONCLUSION

Pharmacognostical evaluation of *Rauvolfia tetraphylla* for whole plant provided specific parameters that will useful in scientific evaluation, identification and authentication of the drug. Presence of stone cells and twin prismatic crystal is identified character of root. Presence of non-lignified fiber in cortex and stone cells in pith is character of stem where as in leaf parasitic stomata in lower epidermis and trichomes in both epidermis.

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