



ANATOMY AND PHARMACOGNOSY OF *TAVERNIERA CUNEIFOLIA* ROOT (ROTH) ARN., A POSSIBLE SUBSTITUTE OF *GLYCYRRHIZA GLABRA* L.

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ABSTRACT

Taverniera cuneifolia is an important traditional medicinal plant of India belonging to the family of Fabaceae. The roots of *Taverniera cuneifolia* is a potential substitute of *Glycyrrhiza glabra* (Licorice). In order to differentiate *G. glabra* from *T. cuneifolia*, macroscopic as well as microscopic studies of *T. cuneifolia* were done. The present investigation deals with pharmacognostic characters, which includes anatomy, powder studies and histochemical test.

KEY WORDS: *Taverniera cuneifolia*, Licorice, pharmacognosy, roots.



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INTRODUCTION

The genus *Taverniera* belongs to the family of fabaceae and includes twelve species. It is endemic to the Northeast African and Southwest Asian countriesⁱ. *T. cuneifolia* is often referred to as Indian licorice owing to its sweet taste which is very similar to that of *G. glabra*ⁱⁱ. *T. cuneifolia* locally known as Jethimadh is used by the tribal's of Parada Hills of Jamnagar in Western India as a substitute of Licorice or in other words the plant itself is considered to be *G. glabra*ⁱⁱⁱ. *T. cuneifolia* is known to have various properties like expectorant, blood purification, anti-inflammatory, wound healing, antiulcer and used in treating spleen tumors^{iv}. *G. glabra* L., is popularly known as commercial licoriceⁱⁱ. The roots of *G. glabra* are very widely used in traditional systems of medicines all over the world^v. *G. glabra* is rich in bioactivities like antiviral, anticancer, anti-ulcer, anti-diabetic, anti-inflammatory, anti-oxidant, anti-thrombic, anti-malarial, anti-fungal, anti-bacterial, estrogenic, immunostimulant, anti-allergenic and expectorant activities^{viii, viiiix}. The commercial licorice has a huge demand in the Indian system of medicine, Ayurveda and majority of the requirement of the Ayurvedic drug industry in India is met through import from Afghanistan and Pakistan^{ix}. Owing to huge demand plants like *A. precatarius* is used as adulterant or as a substitute for *G. glabra*^{x, xi}. The anatomical and pharmacognostic features of the plant are used to determine the identity and the family of a species. Present study deals with the scientific pharmacognostic validity of indigenous alternative *T. cuneifolia* to identify the distinguishing biomarkers useful in quality control of this drug.

MATERIALS AND METHODS

i. Collection and authentication of the plant material

Roots of *Taverniera cuneifolia* were collected from Gondal road, Rajkot during June and October, 2009. The specimens collected were identified with the help of the "Flora of Gujarat State". Further the species was confirmed by comparison with the specimen available at in the Herbaria of Botanical Survey of India, Jodhpur, Rajasthan, India. (BSI/AZC I. 12012/Tech./2011-12 (PI.ID.)-551.

ii. Anatomy

Roots were collected and cut into blocks of 4-5cm in length and were immediately fixed into Formalin: Acetic acid: Alcohol (90: 5: 5). (Berlyn & Miksche, 1986). Trimmed blocks were sectioned in transverse planes at a thickness of 12-15µm by using Leitz sliding microtome. After staining with Safranin : Toluidine blue sections were passed through alcohol : xylene series and mounted in dibutyl phthalate xylene (DPX). The sections were photographed under Leica DFC 295 Compound Research microscope connected to Digital Camera.

iii. Powder studies

Completely dried plant material was finely powdered. The fine powder obtained was stained with safranin and observed under a microscope to trace and identify the characters present. The characters observed were photographed under a Leica DME compound research microscope connected to its digital camera.

iv. Histochemical test

Slides were prepared using water, chloral hydrate as a clearing agent, stained with phloroglucinol and HCl for lignified tissues and mounted in glycerin.

Sr.no.	Test	Reagents
1	Test for lignin	Phloroglucinol + Conc. HCl
2	Test for tannin	FeCl ₃ solution
3	Test for starch	Iodine solution

RESULTS

The results of the studies conducted on roots of T. cuneifolia are described below

The root was circular in outline, with the xylem forming the entire section. The outermost layers were quite disrupted and were composed of 5-7 layers of barrel shaped lignified cork cells. Underneath the cork was reduced cortex consisting of parenchyma cells loaded by starch grains. Pericyclic fibres were distributed all over the cortex zone. Phloem had presence of scattered bast fibres. Between xylem and phloem there were few

strips of cambium. Next to cambium was xylem which was exarch in condition. Medullary rays were biseriate to multiseriate loaded with starch grains. The longitudinal sections of the root showed xylem vessel elements possessing simple pits. Medullary rays were $366.9\mu\text{m} - 884.3\mu\text{m} \times 25.09\mu\text{m} - 100.3\mu\text{m}$ broad with polygonal ray cells having varying dimensions $95.3\mu\text{m} - 173.4\mu\text{m} \times 43.9\mu\text{m} - 76.56\mu\text{m}$. Prismatic crystals ($17.25\mu\text{m} - 61.15\mu\text{m} \times 15.68\mu\text{m} - 54.87\mu\text{m}$) of calcium oxalate were found to be abundant in fibres.

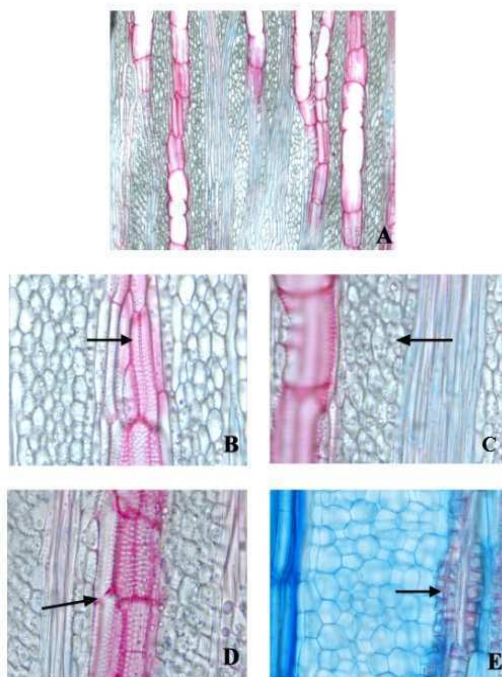


Figure 1

Longitudinal section of the root of Taverniera cuneifolia

A. Section of the root in 10x (200 μm) B. Vessel elements C. Starch grains in ray cells D. Vessel elements and perforation plate in vessel elements E. Prismatic crystals. B-E 40x (200 μm)

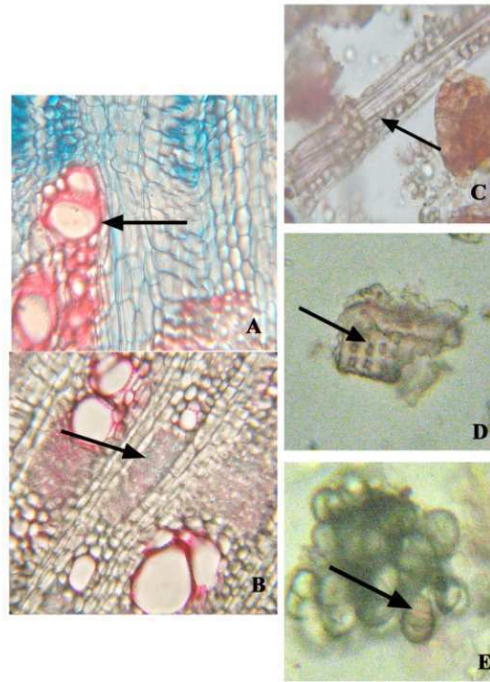


Figure 2

Transverse section and powder study of the root of Taverniera cuneifolia

A. Xylem vessel B. Fibres C. Prismatic crystal D. Pitted ray parenchyma E. Starch grains (100µm)

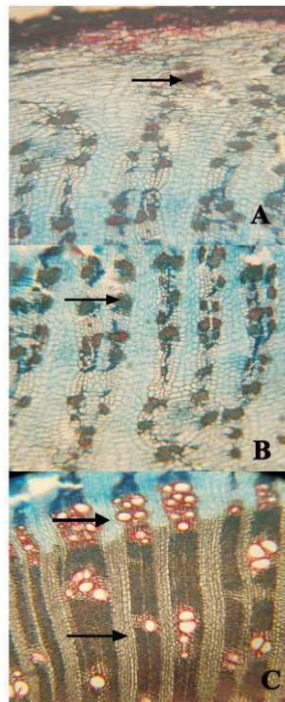


Figure 3

Transverse section of the root of Taverniera cuneifolia

A. Stone cells B. Bast fibres C. Xylem ray parenchyma and medullary rays (100µm)

Table 1
Histochemical tests

Sr. no.	Reagents	Observation	Characteristics
1	Phloroglucinol + Conc. HCl	Red	Lignified cells
2	FeCl ₃ solution	Dark blue to black	Tannin cells
3	Iodine solution	Blue	Starch

DISCUSSION

The present study brings out a number of distinguishing features of the roots of this important medicinal plant. Pericyclic fibres, bast fibre, prismatic crystals, starch grains form key characters for identification. The multiseriately arranged medullary rays and the pitting in xylem elements are noteworthy. All these characters could be used as diagnostic biomarkers for *T. cuneifolia*, in both fresh material as well as in powder and also in checking adulteration of the same. However, there are no reports on the anatomy of the root, which is considered to be the most potent part of the plant. A detailed study of longitudinal sections of the root has been carried out in the present study, which is the first report of the plant. There are no reports of

the measurements and dimensions of important characteristics in roots so far of the measurements and dimensions of important characteristics in root, which has been carried out in this work.

CONCLUSION

The present study shows important diagnostic biomarkers of the roots of *T. cuneifolia*, in both fresh materials as well in powder. This data can be of great value in the authentication of *Taverniera cuneifolia*, as well checking adulteration of the same while comparing with *Glycyrrhiza glabra*

Department of Botany, The Maharaja Sayajirao University of Baroda, Vadodara for providing necessary lab facility and accessibility to the instruments.

ACKNOWLEDGEMENT

The authors wish to thank the University Grants Commission, New Delhi for providing research grant, Dr. Susy Albert, and The Head,

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