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Research Article

Development of Quality Standards of *Taverniera cuneifolia* (Roth) arn. Root – A Substitute Drug for Liquorice.

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ABSTRACT

The root of *Taverniera cuneifolia* (Roth) Arn. (Family – Fabaceae) is considered as one of the substitute drugs for Liquorice. There is no absolute pharmacognostic data or any quality parameters available for this root. The present investigation deals with the detailed pharmacognostic, physicochemical and phytochemical evaluation of roots of *Taverniera cuneifolia* . The important diagnostic characters include, thin walled cortical parenchyma typically found in a pairs wherein the adjoining walls were straight, distinct groups of fibers adhering to which were cells of crystal fibers containing prisms of calcium oxalate and gelatinized fibers. Chief characters of powder include crystal fibers, prismatic crystals of calcium oxalate, starch grains, thick walled fibers with narrow lumen and blunt tips, xylem vessels having bordered pits and annular thickening. Various physicochemical parameters were also established. Phytochemical screening revealed the presence of good number of phenolic acids such as vanillic, syringic, ferulic, *p*-Hydroxy benzoic, *o*-coumaric and melilotic acids of which the last two were characteristic to this drug other compounds were alkaloids, flavonoids, triterpenoids, saponins and coumarins. Glycyrrhizin which was identified by some workers, were found absent here. Such data would helpful in standardization and development of quality standards of the root of this plant. It would also help in distinguishing the plant material from genuine Liquorice.

Keywords: *Taverniera cuneifolia* root, Liquorice, *Glycyrrhiza glabra*, pharmacognostic, phytochemical evaluation, physicochemical analysis, quality standards.

INTRODUCTION

Taverniera cuneifolia (Roth) Arn. a substitute of *Glycyrrhiza glabra* L[1,2] belongs to the family of Fabaceae and is a branched undershrub endemic to the Northeast African and Southwestern Asian countries[3,4]. In India it is distributed in Plains of Punjab, Gujarat and the Deccan in waste places[2]. The plant locally known as Jethimadh or Jangali Jethimadh is used by the tribals of Barda hills and surroundings, Jamnagar as a substitute of Liquorice[5] and often referred as Indian Liquorice as its roots are sweet and taste very similar to that of *Glycyrrhiza glabra*, the commercial licorice[6]. This plant could be a good source for phytochemicals with useful bioactivities in parts of the world where *G. glabra* is not cultivated or not available[7]. The present investigation deals with pharmacognostic, physicochemical and phytochemical evaluation of the root material of *Taverniera cuneifolia* to establish its quality parameters. This thorough evaluation would also be useful in standardization of the drug and in distinguishing *Taverniera cuneifolia* from *Glycyrrhiza glabra.*

MATERIALS AND METHODS

The plant material was collected from Surendranagar, Gujarat. The voucher specimen of the plant has been deposited in Herbarium, Department of Botany (BARO), The Maharaja Sayajirao University of Baroda, Vadodara. Plant materials were washed, shade dried and completely dried by keeping in an oven at 60°C. The dried materials were powdered and used for the analysis of all the chemical constituents. Standard procedures are followed for the extraction, isolation and identification of the various plant products such as flavenoids, phenolic acids, quinones, steroids, alkaloides etc.[8,9].For anatomical studies, sections were taken, stained with saffranin and mounted in glycerin. Various physico-chemical parameters like ash values (total ash and acid-insoluble ash) and extractive values (water soluble extractives and alcohol soluble extractives) were established using the powdered drug[10] (Table 1).

RESULTS

Pharmacognosy

Macroscopic characters of the root: (Plate 1).: The roots occured in long, cylindrical slender pieces. The thickness and length of the roots varied and found up to about 25 cm. long and 0.8 cm. thick. The young roots were light yellow, little shiny and comparatively smooth non-lenticellate surfaced with faint longitudinal fissures whereas the surface of thicker mature pieces was grayish brown or light brown coloured and rough due to longitudinal fissures and

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Plate 1: Taverniera cuneifolia root; I. Young root, II . Mature root.

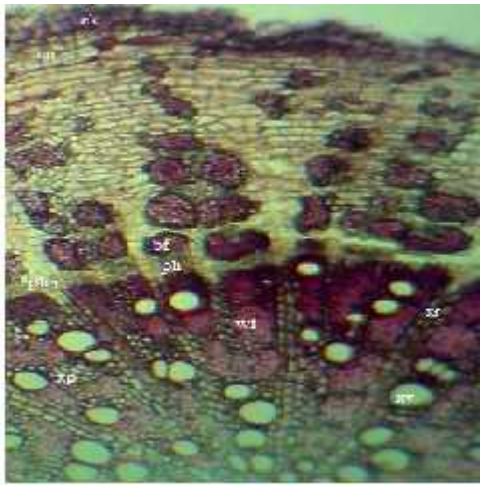

Plate 2: T. S. of root (X100).
(ck: Cork; co: Cortex; bf: bast fiber; ph: Phloem; ph.r: Phloem ray; wf: Wood fibers; xr: Xylem ray; xp: Xylem parenchyma; xv: Xylem vessels.)

Table 1: Data showing physico-chemical standard values.

		Mean ± SD (%)*		
Sr.No.	Parameter	Summer	Monsoon	Winter
1.	Total Ash Content	5.71±0.36	5.86±0.41	5.79±0.39
2.	Acid Insoluble Ash content	1.08±0.08	0.99±0.06	1.06±0.04
3.	Alcohol soluble extractives	16.01±0.63	16.87±0.53	16.03±0.61
4.	Water soluble extractives	18.80±0.46	19.02±0.29	18.73±0.42

**Each value is a mean of 3 readings.*

Table 2: Pharmacognostic differing between *Glycyrrhiza* and *Taverniera*.

Sr.no.	Characters	*Glycyrrhiza glabra*	*Taverniera cuneifolia*
1	Cortical cell	Round to oblong	tangentially elongated Polygonal
2	Compound starch grains	Rare	common
3	Cambium	Distinct	Indistinct
5	Ray cells	Thin walled	Thick walled with simple pits
6	Vessels end walls	Oblique	Almost straight
7	Tyloses	present	Absent

transversely elongated wrinkles. The fracture was fibrous externally and hard in the centre. The roots were faintly sweet.

Microscopic characters of the root: (Plate 2-4).: The root in transverse section was almost circular in outline with slightly undulating margin. The cork was composed of 3-6 rows of rectangular, tangentially elongate cells. Those of the outer rows were usually much compressed and have thick light brown walls but the inner cells were arranged in

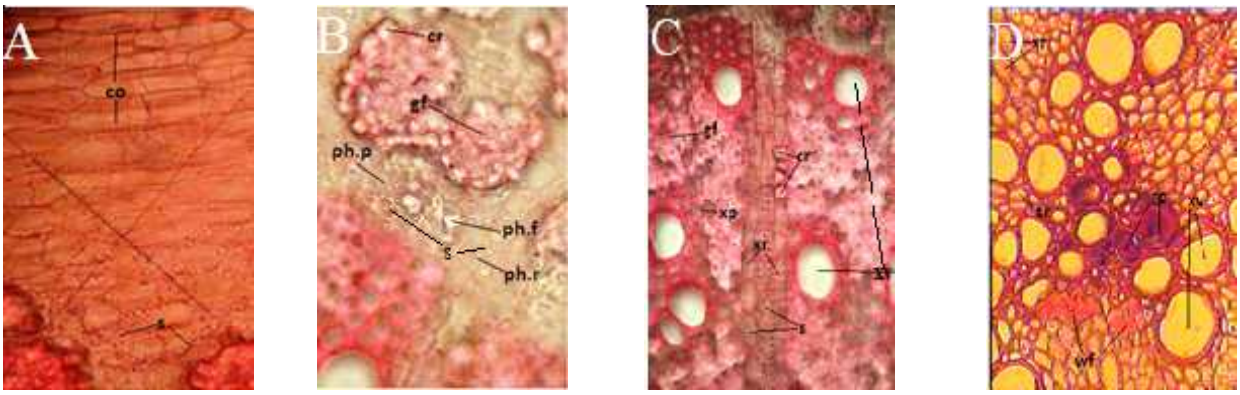

Plate 3: A-D: Different portions of T. S. of root enlarged (X200) (A.cortex, B,C. vascular tissue, D.central wood). (co: Cortex; s: Starch grains; cr: Crystals; gf: gelatinized fibers; ph.r: Phloem ray; ph.p: Phloem parenchyma; ph.f: Phloem fiber; xr: Xylem ray; tr: Tracheids; wf: Wood fibers; xp: Xylem parenchyma; xv: Xylem vessels; rc: reddish-brown contents).

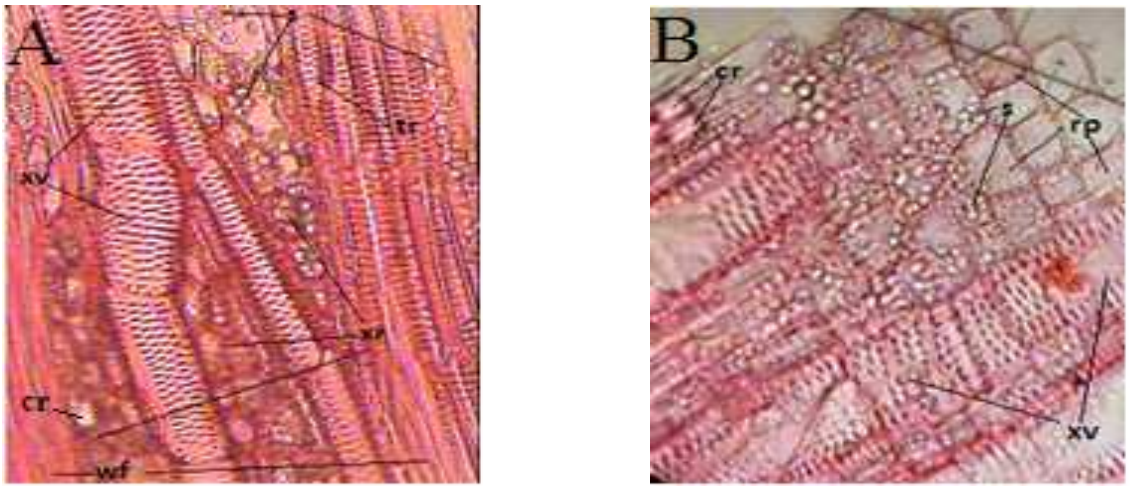

Plate 4: A. Portion of tangential longitudinal sections passing through vascular tissue of root (X200). B. Portion of radial longitudinal sections passing through vascular tissue of root (X200). (s: Starch grains; cr: Crystals; xr: Xylem ray; tr; Tracheids; rp: Ray parenchyma; wf: Wood fibers; xv: Xylem vessels).

regular rows and had comparatively thin light pinkish-brown walls and appeared small rectangular. The phellogen cells were found to be in collapsed condition. The phelloderm, consisted of usually 1 to 3 layers of thin walled parenchyma. The secondary cortex made up of 4 to 9 layers of thin walled tangentially elongated polygonal parenchymatous cells arranged compactly and lack in intercellular spaces, few of these cells were typical found in a pairs wherein the adjoining walls were straight (Plate 3.A) and also showed the presence of small isolated groups of fibres of about 2 to 4, associated with cells containing isolated prismatic crystal of calcium oxalate. Most of the cells except a few rows towards the outside were filled with the starch grains. Cambium was indistinct. The secondary phloem was 9-12 layered. Besides having usual phloem elements it showed the presence of distinct groups of bast fibers arranged radially in groups of about 10 to 50 fibres, adhering to which are cells of crystal fibres containing prisms of calcium oxalate and gelatinized fibers.

The phloem parenchyma present towards the cortex was comparatively larger than that of inner one present towards the wood. Phloem rays were thick walled pitted parenchymatous and the cells were tangentially elongated rectangular to polygonal in outline and slightly larger than the phloem parenchyma cells, loaded with starch grains (Plate 3.B). Xylem was dominated by fibers occurred in a groups similar to those of the bast. Xylem parenchyma were of two kinds, those associated with gelatinized fibers having thick pitted walls and the remaining with thin walls and lacking pits (Plate 3.C). The vessels were occurred mostly in a groups of 2-3 and have thick pitted walls and contained 3-5 rows of transversely oblique bordered pits. Vessels with annular thickening were also present. The cavities of some of the vessels present in the center were filled with reddish-brown contents (Plate 3.D). The medullary rays were almost uniform in size and 3 to 4 cell wide. Their cells were thick walled, pitted, radially elongate rectangular and fully loaded with starch grains of various sizes (Plate 4.A,B) and prismatic crystals of calcium oxalate was quite characteristic (Plate 3.C) and

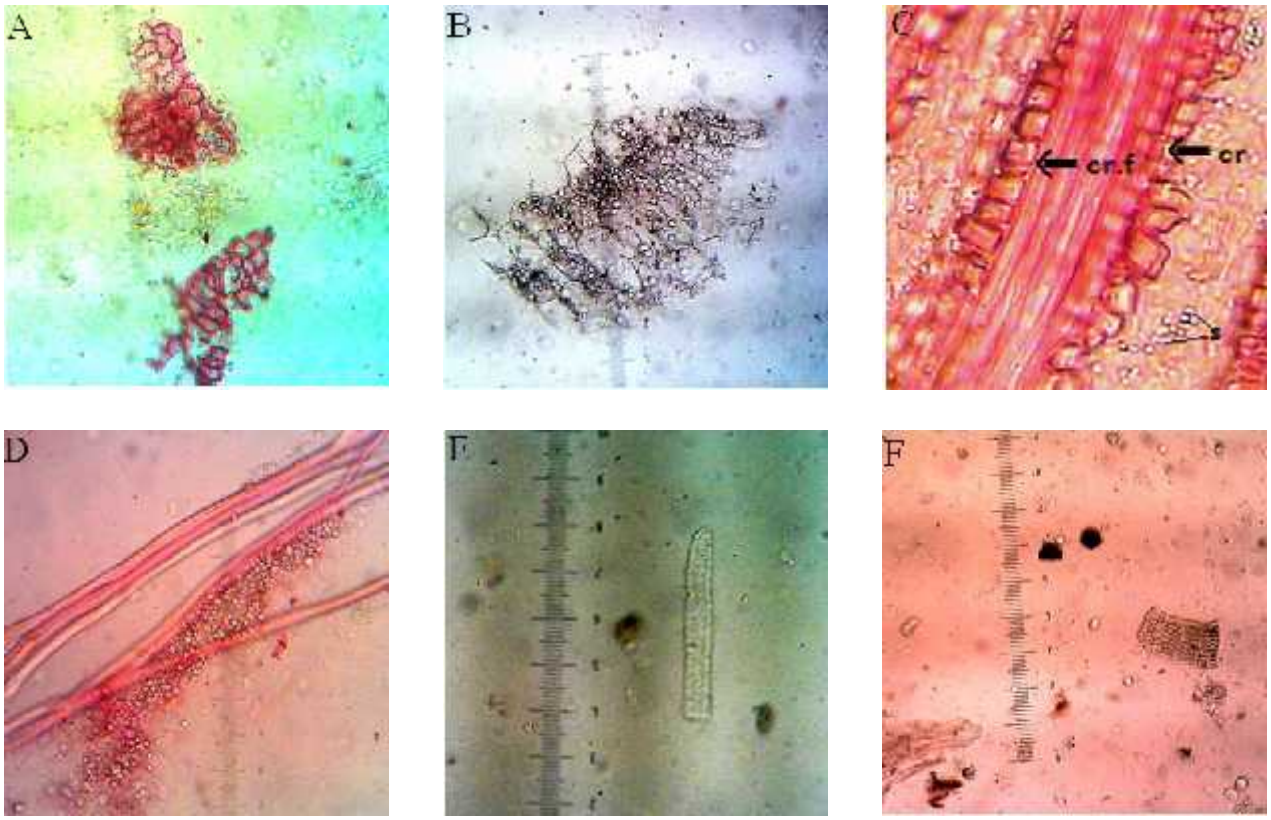

*Plate 5: **A-F**: Characters observed in powder of root (X200), A. Cork cells; B. Cortical parenchyma containing starch grains; C. Enlarged portion of fragments of crystal fibers (cr.f.: Crystal fibers ; cr: Crystals ; s: Starch grains); D. Thick walled fibers with narrow lumen; E. Ray cells; F. Vessel.*

measured up to 36 µm in length. Starch grains were of simple and compound, spherical, oval or elliptical or muller shaped, dimensions varying from 3 to 15 µm in length but sometimes attaining up to 21 µm. The compound starch grains with 2 components are common while 3 to 6 components were rare.

Powder study: (Plate 5): The powder was characterized by the presence of groups of light brown thick walled cork cells, cortical cells with starch, fragments of a large number of bast and wood fibers adhering to which were crystal fibers, containing prismatic crystals of calcium oxalate, thick walled fibers with narrow lumen and blunt tips, thick walled ray parenchyma cells having simple pits and starch grains. Boarded pitted vessels were also characteristically seen.

Phytochemical studies: The phytochemical analysis of root of plant showed that it is rich in phenolic acids such as vanillic, syringic, ferulic, *o*-coumaric, melilotic, and *p*-Hydroxy benzoic acids. It also showed the presence of coumarins and alkaloids. Flavonoids were in traces, while its mucilage contained sugar acids.

DISCUSSION

The present study unearths a number of phytochemical, physico-chemical as well as pharmacognostic features of the root of *Taverniera cuneifolia* . The plant root is similar to Glycyrrhiza, for which it is a substitute, in a number of pharmacognostic and phytochemical features. The crystal fibers which are very typical to Glycyrrhiza is characteristically also present here. Other features of similarities are cork cells, bast fibers, tracheids etc. but it is differs from Glycyrrhiza in having a number of characters, which are presented in Table 2.

Phytochemically the root of *Taverniera* contains a number of compounds reported from liquorice such as saponins, coumarins and phenolic acids. But the report of glycyrrhizin from *Taverniera* is found erroneous because HPLC studies in our Department could not prove the presence of glycyrrhizin. Liquiritin, the chalcone glycoside and Cinnamic acid reported in Glycyrrhiza also are absent here. Among the phenolic acids, *o*-coumaric acid which was in high concentration and melilotic acid found in *Taverniera* are absent in Glycyrrhiza and they could be used as distinguishing features. The Physico-chemical constants and diagnostic microscopic features reported in this work are useful for the development of quality standards for compilation of a suitable monograph and differentiating it from *Glycyrrhiza glabra* L. The identification of a good number of water-soluble compounds mainly phenolic acids with proven medicinal properties will also help in future to investigate its pharmacological actions and to check its phytochemical potency to used as a substitute for *Glycyrrhiza glabra*.

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