



## PHYTOCHEMICAL AND PHARMACOGNOSTICAL INVESTIGATION ON SOLANUM DUBIUM FRESEN.ROOT

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### ABSTRACT

*Solanum dubium Fresen.* is an erect shrub belonging to the family Solanaceae. The present study deals with the pharmacognostical and phytochemical study of root including chromatographic evaluation. *Solanum dubium Fresen.* root is woody, cylindrical, branched with few wiry lateral roots. Root of the plant can be identified microscopically by the presence of starch grains, sclereids, stone cells, sandy crystals, biseriate medullary rays. Purity test shows loss on drying (2.8% w/w), total ash (3.8% w/w), alcohol soluble extractive (20.70% w/w) and Water-soluble extractive value (17.40% w/w), pH 6.10. Preliminary analysis revealed the presence of carbohydrates, saponins, alkaloids, tannin and triterpenes. 1.32 % of total alkaloid content and on heavy metal analysis, lead, Arsenic, Mercury and Cadmium contents were not found. TLC study of alkaloid showed the presence of three spots in long UV rays. The information generated by this study provides relevant Pharmacognostical and Physico-chemical data needed for proper identification and authentication of root of *Solanum dubium Fresen.*

**KEYWORDS:** *Solanum dubium*, Starch grain, Alkaloid, Sclereid

### INTRODUCTION:

*Solanum dubium Fresen.* is an erect spinous shrubby plant covered with mealy tomentose, at length glabrous. Leaves 3-7.5cm long, ovate or ovate-lanceolate, apex acuminate or obtuse, margins wavy or slightly lobed, clothed with stellate tomentose on both surfaces, petioles 1-3.5cm long. Flowers in leaf opposed, few, flowered cyme. Pedicels and peduncles stellate tomentose, enlarged in fruit.

Calyx campanulate, spiny lobes ovate, acuminate. Corolla violet, stellately hairy outside, lobes ovate-lanceolate, acute, reflexed. Stamens 5, one longer than the rest, anthers oblong, obtuse, pore terminal, ovary globose, hirsute at the apex, style thickened upwards, declinate, hairy at the base. Fruit globose 0.5-1cm in diam, yellow nearly covered by the inflated spiny calyx<sup>1</sup>.

### MATERIALS AND METHODS:

### Collection and authentication:

*Solanum dubium Fresen.*, identified and authenticated by comparing the plant with different regional floras and standard references, growing in Saurashtra, Gujarat, India<sup>[1]</sup>. The fresh plant samples were collected from its natural habitat of peripheral region of Junagadh. The collected plant samples were shaken to remove adherent soil and dirt. The roots were washed with running fresh water and few pieces stored in solution of AAF (Alcohol: Acetic acid: Formalin) in the ratio of (90:5:5)<sup>[11]</sup> to utilize them for microscopic studies. The remaining roots were shade dried and then powdered with mechanical grinder and passed through mesh no.40# and preserved in an air-tight glass container. Morphological characters were studied by observing the roots as such and also with the help of the dissecting microscope. For detailed microscopical observation, free hand thin

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transverse section was taken, and cleared with chloral hydrate and observed as such then were stained with Phloroglucinol and Hydrochloric acid to notice the lignified elements like fibers, vessels etc. of the meristele and other parts<sup>[IV]</sup>. Photographs of the section were taken with the help of Canon digital camera attached to Zeiss microscope. Powder characters were observed and histochemical tests carried out, as per the guidelines of Ayurvedic Pharmacopoeia of India. Physicochemical parameters and Phytochemical screening were also carried out as per the guidelines of Ayurvedic Pharmacopoeia of India<sup>[V]</sup>. Both qualitative and quantitative analyses for various functional groups were conducted. Chromatographic analysis<sup>[VI]</sup> was also carried out with standard procedures. Presence of heavy metals like Lead, Arsenic, Cadmium and Mercury were estimated<sup>[VII]</sup>.

## OBSERVATION AND RESULTS

### Microscopic Study

The section of *Solanum dubium* Linn. was more or less circular in outline showing outermost cork followed by cortex and centrally wood surrounded by phloem.

**Cork:** It is an outer most thin layer consisting of 5 – 6 layers of yellowish brown colored rectangular tangentially elongated thin walled lignified parenchymatous cork cells.

**Cortex:** Inner to the cork is cortex which is a wide zone. Here the cortical cells elongated thin walled embedded with starch grains and some cells deposited with sandy crystals. The cells scattered throughout the cortex associated with sclerenchyma fibres and stone cells & sclereids.

**Phloem:** Phloem tissue narrow irregularly arranged found next to the cortex composed of thin walled parenchyma cells covers central portion of wood, made up of phloem parenchyma, sieve tubes and fibres.

**Medullary rays:** medullary rays extend to the cortex region and uni to biseriate. The ray cells are in the phloem region are thin walled elongated at ends, embedded with starch grains.

**Wood:** wood occupies largest part composed of vessels, parenchyma, fibers and medullary rays.

**Vessels:** vessels varying in size and in groups of 2 -3 isolated units.

The Wood occupies largest portion of thick walled fibers.

**Xylem:** The xylem parenchyma which is also thick walled with starch grains.

### Organoleptic Characters

Table 1: *Solanum dubium* F. organoleptic characters

Drug	Taste	Colour	Odour	Texture
<i>S. dubium</i> S.	Bitter	Brownish cream	Nil	Smooth

### Powder Microscopy

- Cork cells in surface and transverse view.
- Simple and compound starch grains
- Pitted vessel.
- Stone cells and sclereids.
- Thin walled fibres
- Simple and spongy parenchyma cells

**Table 2: Physico-chemical Analysis of *S.dubium* F root**

S. No.	Name of the Test	<i>S.dubium</i> root
1.	Loss on Drying(%w/w)	2.8
2.	Ash value(%w/w)	3.8
3.	Water soluble extractive (%w/w)	17.40
4.	Alcohol soluble extractive (%w/w)	20.70
5.	pH value	6.10

**Table 3: Results of qualitative tests for various functional groups in *S.dubium* F root**

Sl. No.	Name of the test	<i>Solanum dubium</i> F. root
1.	Carbohydrates	+
2.	Phenol	-
3.	Saponin	+
4.	Flavonoid	-
5.	Tannin	+
6.	Alkaloid	+
7.	Triterpenoid	+

'+' Present, '-' Absent

**Table 4: TLC Profile of stem of *S.dubium* F. root at 254 nm and 366 nm.**

	Number of spots	Rf value
Short UV 254	--	--
Long UV 366	3	0.85, 0.92, 0.98

**Table 5: Quantitative analysis of the *S.dubium* F. root**

Sr. No.	Qualitative analysis	Result
1	Total Alkaloid content	1.32 %

**Table 6: Heavy metal analysis of the *Solanum dubium* F.root**

sample	Lead	Arsenic	Mercury	Cadmium
<i>S. dubium</i> S. root	--	--	--	--

**CONCLUSION**

Pharmacognostical and Phytochemical evaluation of root of *Solanum dubium Fresen.* was found to be authentic and meet the standard parameter. Further Pharmacognostical findings like, simple and compound starch grains, sclereids, stone cells,

sandy crystals, biseriate medullary rays were important characters to identify the plant *Solanum dubium Fresen.* Phytochemical screening and TLC results can be considered as standards for further research works. 1.32% of total alkaloid content and on heavy metal analysis lead, Arsenic, Mercury and cadmium were not found in *Solanum dubium Fresen.*



*Solanum dubium* plant



*Solanum dubium* Fruit



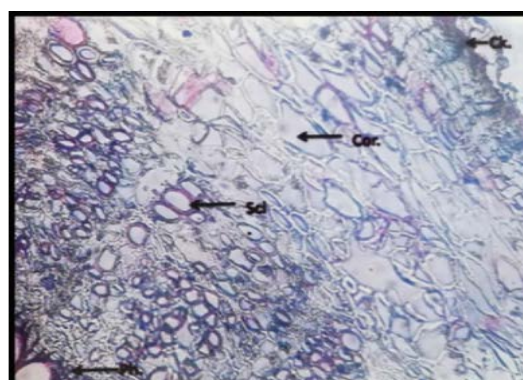
*Solanum dubium* root



Root powder

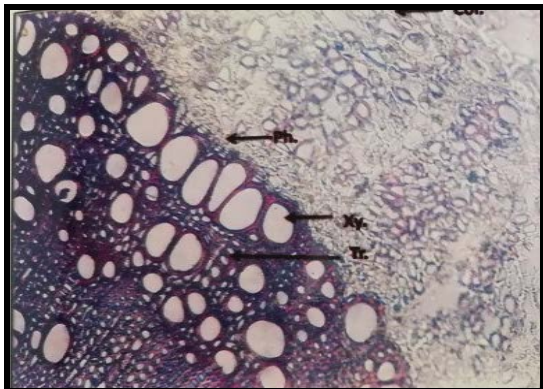


TS showing sandy crystals in cortex



Cork, Cortex with stone cells, sclereids, phloem

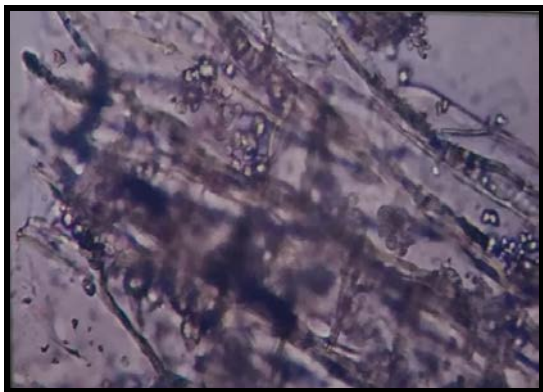




Cortex, phloem & central xylem with medullary rays



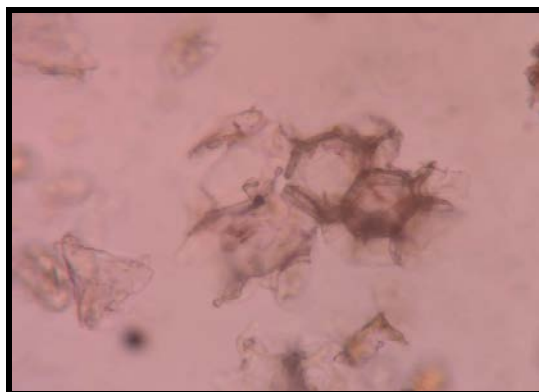
Fragment of Fibres



Pitted vessel



Cortical parenchyma with starch grains



Cork in surface view



Sclereids



Tangentially cut cork cells

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