

**PHARMACOGNOSTICAL AND PHYTOCHEMICAL INVESTIGATIONS
ON THE TUBEROUS ROOTS OF HEMIDESMUS INDICUS (LINN.)
R.BR. (ASCLEPIADACEAE)**

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ABSTRACT: *The macroscopic and microscopic characters, physical constant values, extractive values, ash values the behaviour of the powdered drug on treatment with different chemical reagents, microchemical and histochemical analyses were conducted to characterize some pharmacognostical parameters of Hemidesmus indicus (Linn) R.Br. (Asclepiadaceae).*

INTRODUCTION:

Hemidesmus indicus (Linn.) R.Br. belonging to Asclepiadaceae family is known as Indian Sarasaparilla, Country sarasaparilla and False sarsaparilla in English; Nannari, Naruninti, Narunenti, Narunari and paravalli in Malayalam: Ananta, Anantmula, Dhavalasariva, Gopa, Gopakanya, Gopabandhu, Gopavalli, Gopi, Karala, Krishodari, lata, Nagajihva, Pratanika Rakta Sariva, Sariva Sarda Shyama, sugandha and shgandhi in Sanskrit^{1,2} In ayurvedic dictionaries two kinds of sariba namely svetasariba and krsnasariba are mentioned. *Hemidesmus indicus* is the Latin name given for the former and *Ichnocarpus frutescens* (Linn) R.Br. and *Crytolepis buchanani* Roem. & Schult for the latter. But in Kerala for saribadvaya, *H. Indicus* (Sveta sariba) and *I. Frutescens* (Krsnasariba) are in use. The plant is distributed throughout India in plains and low hills. The root is sweet, bitter, cooling, aphrodisiac, antipyretic, cures leprosy, leucoderma, asthma, bronchitis and general debility^{2,3}.

It is used in more than fifty formulations such as saribadyasavam, Aravindasavam,

Dhanwantharam thailam, Asokaghritam, Narayana thailam etc.⁴

The present investigation deals with the studies on some important Pharmacognostical characteristics of the root of *H. Indicus* as whole and its powdered form.

MATERIALS AND METHODS

The tuberous roots of *H.indicus* were collected locally from matured plants during the month of July – August 2000. The plant material was identified and authenticated. A herbarium of plant is preserved in the Herbarium, Department of Botany, University of Calicut for future reference. The collected roots were washed with tap water to remove adhering dirt and dust, rinsed with distilled water, shade dried, powdered and used for the study.

The macroscopic characters⁵ of the roots were observed. Thinnest possible section of the root tuber was treated with 5% KOH to make the section clear. Sections were stained with safranin and suitably mounted

on a temporary mounting media. The microslides were scanned under a compound microscopes and the anatomical details were drawn with the help of a prism type Camera Lucida.

Measurements of the cells/tissues were made with the help of micrometers under a compound microscope⁶. The characteristics of the drug powder was analysed⁵ after homogenizing the shade dried, flaked root tubers with the help of a mortar and pestle. The ash values, alcohol soluble and water soluble extractive values of roots were determined as per the Indian Pharmacopoeial methods^{7,8}. Other extractive values were determined by extracting the plant material successively by soxhlet extraction apparatus with various solvents in the increasing order of polarity viz . Petroleum ether (60-80⁰C), benzene, chloroform, acetone, methanol and distilled water. The behaviour of the powdered roots with different chemical reagents were studied⁹. Preliminary phytochemical tests of different extracts were performed by using specific reagents^{10,11}.

RESULTS

Macroscopic Characters of the Tuberous Roots of *H. indicus*

Length	:	1ml or more
Width	:	1-2cms
Shape	:	Cylindrical
Colour	:	brown
Branching	:	Sparsely branched
Rootlets	:	Thin and wiry
Direction of growth	:	Vertical
Surface Characters	:	The tuberous root is dark tortuous with transversely cracked and longitudinally fissured bark, cork is

thin, separates easily and peels off in flakes.

Fracture and texture	:	Short, splintery
Odour	:	Agreeable
Taste	:	Sweetish, slightly acidic and aromatic

Histological Studies

T.S. of mature root of *Hemidesmus indicus* (Fig.1) consist of 3 outer layers of tissues, viz., phellem, phellogen and phelloderm.

Phellem: cork consists of 4-14 layers of narrow rectangular tangentially elongated cells which are filled with tannin. Phellogen: is single layered. Phelloderm: consist of 8-16 layers of polyhedral cells.

Secondary Phloem: consist of sieve tube, companion cells, phloem parenchyma and medullary rays. The phloem cells near the periphery are much bigger than those of the centre.

Medullary rays: they are 4-20 cells high and 1-3 cells wide, but uniseriate rays which are 5-8 cells high are very common.

Lactiferous vessels: non articulated but unbranched type are present both in the phelloderm and phloem.

Xylem: the wood shows 2to 3 growth rings and is composed of vessels, parenchyma, tracheids, fibre tracheids and medullary rays.

Vessels: the walls of the vessels as well as the tracheids are characterized by the presence of pitted markings.

Pith: absent and the whole of the central region is occupied by woody tissue. Most of

the parenchyma cells are filled with starch grains and some of the cortical cells contain crystals of calcium oxalate.

Powder Characteristics

The powder is creamish brown in colour it shows the following powder characteristics.

1. Tannin is present as deep brown granular mass in cork and outer phelloderm.
2. Latex, resin, prismatic crystals of calcium oxalate and volatile oil are found in the phloem and the phelloderm.
3. Starch grains are circular, oval, subspherical or subreniform with central linear hilum.

DISCUSSION

The macroscopic as well as microscopic studied of *Hemidesmus indicus* (Linn)R.Br. revealed that using these diagnostic features one can identify this plant very easily for further investigation. The presence of characteristic non-articulated but unbranched type of laticiferous vessels

present in the phelloderm and phloem tissues are useful identifying features obtained after studying the histology of the rhizomes of *H.indicus*.

The information obtained from ash values and extractive values are useful during the time of collection of tuberous root and also during the extraction process. The colour and consistency of the various polar and non-polar extracts of rhizomes, the behaviour of rhizome powder on treating with various chemical reagents and the histochemical changes observed on the T.S. of rhizomes due to the action of various reagents are useful phytochemical parameters which can be of great help in identifying samples of genuine drug. Using these standards especially histological and chemical studies the plant can be authenticated, identified and differentiated from other related species. Also these pharmacognostic parameters help in the detection of adulteration in commercial samples.

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Table 1
Micrometrical Measurement of cell/tissues of *H. indicus* roots

Cells/Tissues	Size in Microns
Cork cells	40-80 μ x 15-25 μ
Phellogen cells	40-80 μ x 12-201 μ
Parenchyma cells	140-180 μ x 30-49 μ
Xylem vessels	48-75 μ
Tracheids	28-40 μ
Starch grains	6-32 μ

Table 2:
Ash values of *H. indicus* root

Nature of ash	% age (w/w) ash
Total ash	2.64
Acid insoluble ash	15.5-18.8
Alcohol-soluble extractive	1.0-1.5
Water soluble extractive	18.6-18.9

Table 3:
Extractive values of *H. indicus* root

Solvent used	Percentage of extractive value
Petroleum ether (60-80 ⁰ C)	3.26
Benzene	0.32
Chloroform	0.62
Acetone	1.82
Methanol (90%)	8.12
Distilled water	4.66

Table 4:
The colour and consistency of the extracts of H.indicus root

Extract	Colour	Consistency
Petroleum ether	Pale brown	Sticky
Benzene	Pale Yellow	Slightly sticky
Chloroform	Pale brown	Slightly sticky
Acetone	Yellowish brown	Sticky
Methanol	Reddish Brown	Sticky
Distilled water	Dark brown	powdery

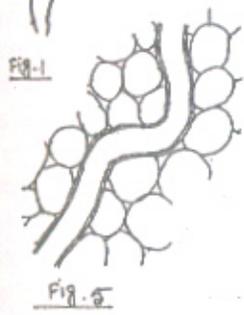
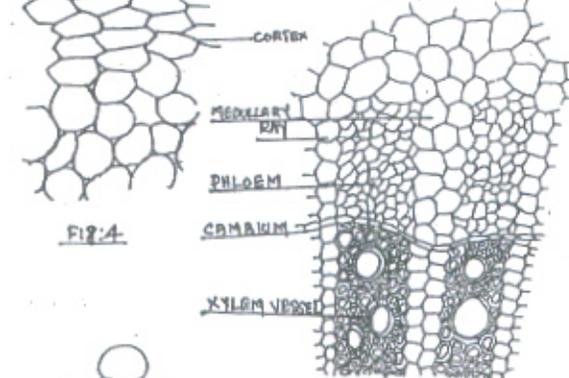
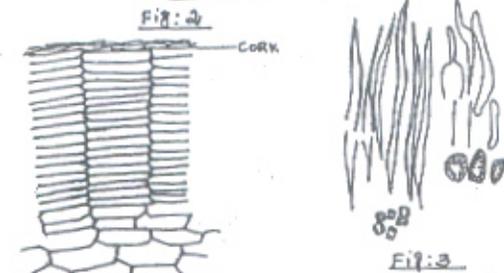
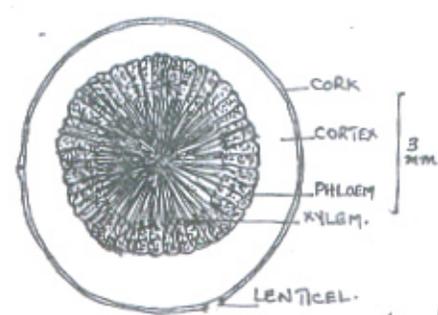
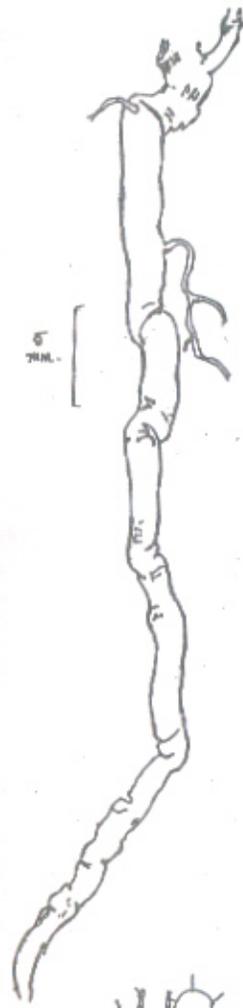
Table 5
Behaviour or root powder of H.indicus with different chemical reagents

Treatment	Colour Developed
Powder as such	Creamy brown
Picric acid (saturated soon)	Yellowish brown
Nitric acid (sp.gr.1.42)	Brownish yellow
Hydrochloric acid (sp.gr.1.16)	Dark brown
Acetic acid (glacial)	Creamy brown
Sodium hydroxide (5N) (aq.soln)	Yellowish brown
Ferric chloride (5% aq.soln.)	Pale yellow
Iodine solution (aq.)	Blackish brown
Antimony trichloride (5% aq.soln.)	Yellowish Brown

Table 6:
Histochemical analyses of the T.S. of roots of H.indicus

Reagents	Test for	Nature of change	Histological zone	Result
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1.	Phloroglucinol +conc HCL +alcohol	Lignin	Pink	Stelar tissue	+
2.	Iodine solution	Starch	Black	Cortical and medullary ray cells	+
3.	Aqueous ferric Chloride	Tannin	Greenish blue	Cork and cortical cells	+
4.	Sudan III solution	Oil	Pink	Phelloderm	+
5.	Sulphuric acid (20%)	Calcium Oxalate	Diminishes slowly and is replaced by crystals of calcium oxalate	stele	+
6.	Methylene blue	Mucilage	All cells appear blue in colour	Whole section	+



LEGENDS FOR THE FIGURES PROVIDED

- Fig1. Macroscopic appearance of the tuberous root of *Hemidesmus indicus*.
- Fig2. T.s. of the tuberous root showing cork cortex, xylem and phloem.
- Fig3. Xylem fibres, xylem tracheids, stone cells, calcium oxalate crystals X100.
- Fig4. A portion of the tuberous root showing cork and cortex X450.
- Fig5. Laticiferous duct X450.
- Fig6. Starch grains X 450.
- Fig7. A portion of vascular bundle X450.