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PHARMACOGNOSTICAL EVALUATION OF TUBEROUS ROOTS OF *DECALEPIS HAMILTONII*

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ABSTRACT

The objective of the current study was to determine the pharmacognostical parameters for the plant *Decalepis hamiltonii's* tuberous roots (Asclepiadaceae). The Root is traditionally used for blood disorders, diabetes, gout, urticaria, haemorrhage, thirst, and depurative purposes. To fully harness this folk herb's therapeutic potential, an effort has been made to correctly identify it. The morphoanatomy of tuberous roots, in conjunction with microscopic linear measurements, WHO-recommended physico-chemical determinations, and genuine phytochemical procedures, are the key diagnostic characters that have been carried out to help with the thorough pharmacognostical evaluation of the plant. The parameters discussed in this paper could be suggested as the benchmarks for determining the legitimacy of *Decalepis hamiltonii*. This research aids in separating this medication from its other species.

KEYWORDS

Decalepis hamiltonii (Asclepiadaceae), Pharmacognostical and Tuberous roots.

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INTRODUCTION

Pharmacognosy includes an important component called anatomical studies of phytodrugs. Micro morphological techniques for phytodrugs are frequently disregarded or discounted earlier. Pharmacognosy pioneers like Wallis[1], Evans[2], and Claus[3] have proposed a paradigm of principles as the basis for the micro morphological spectrum of herbal medicines. Their writings served as the foundation for pharmacognostical studies conducted all over the world. In order to conduct a thorough

research of pharmacognostical standards for the chosen tuberous herbs along modern scientific lines, the author has therefore grown quite interested in doing so. A thorough analysis of the macroscopic and microscopic descriptions, important for determining the identification, is the first step in the pharmacognostical evaluation process. This is followed by a look at the physico-chemical characteristics and a phytochemical inquiry.

The *Asclepiadaceae* family includes the species *Decalepis hamiltonii*[4-7]. It can be found all across India, sporadically in deciduous woods and on slopes, among rocks, by stream banks, and in shrubs and thickets. Talakona's Papanasanam (Tirumala), Dhanambanda region, and Jagamarla Reserve Forest are all close to Palamaner. The Root is traditionally used for blood problems, diabetes, gout, urticaria, haemorrhage, thirst, and depurative purposes. Despite the plant's many uses, there is no scientific evidence to distinguish the authentic sample. The goal of the current experiment was to identify tuberous roots using their morphology, microscopy, and physicochemical properties in order to standardise the medication.

EXPERIMENTAL

MATERIAL AND METHODS

Collection and authentication of plant material

The study's chosen herb, *Decalepis hamiltonii* was gathered from its native habitat at Tirumala Hills in Chittoor District, Andhra Pradesh, India, namely from Talakona Hills and Nagapatla Reserve Forest. Prof. P. Jayaraman, a taxonomist and the director of the Plant Anatomy Research Centre (PARC), in Chennai, Tamil Nadu, recognised it. The college of pharmaceutical sciences, AU, Visakhapatnam has received the voucher specimens for *Decalepis hamiltonii* (PARC/2007/182). For the investigation of macroscopical and microscopical features as well as quantitative microscopy, the specimens (leaf and stem) were employed. The extracted values, ash values, qualitative chemical analysis, and phytochemical components present in the chosen plants were all determined using the dried powdered material.

Instruments and chemicals

The main equipment and tools utilised for the investigation were a rotary microtome, a compound microscope, watch glass, glass slides, cover slips, and other glassware. Using a Nikon Labphoto 2 Microscopic equipment, microphotos were taken. Petroleum ether, chloroform, and ethanol (95%) are examples of solvents, and toluidine blue, phloroglucinol, glycerin, HCl, chloral hydrate and sodium hydroxide are examples of reagents. The analytical grade reagents used were provided by Ranbaxy Fine Chemical Ltd. in Mumbai, India, or Sigma Chemicals Co. in St. Louis, USA.

Macroscopic and microscopic analysis

The approach of Brain and Turner[8] was used to study the macroscopy and microscopy of the leaves. Cross sections were produced and stained according to Johansen's[9] method for microscopical examinations.

Physico-chemical analysis

Physical-chemical analysis was carried out in accordance with the approved procedures outlined in the Indian Pharmacopoeia[10] and the WHO/QCMMPM guidelines[11] for quality control methodologies for medicinal plant materials.

Preliminary phytochemical screening

Initial phytochemical screening was done using the established methods outlined by Kokate[12] and Harborne[13].

RESULTS AND DISCUSSION

Macroscopical characters

It is a twiner of Woody. Branchlets have terete roots and bulging, winged nodes. The leaves are subooriaceous, orbicular or ellipticobovate, whole, undulate, and longitudinally folded. Flowers in axillary peduncled cymes are yellow. Five rectangular, brown-tinged, valvate calyx lobes. Corolla camanulate, having five valvate, villous and asymmetrical lobes. Five connivent stamens. Oval, lanceolate, or cylindrical folicles. Fruit epicarp is wrinkly and thick. Oval seeds with a long, white, silky coma at the tip. Fruits and flowers from June to January.

Microscopic characters of *Decalepis hamiltonii*

Microscopy of the *Decalepis hamiltonisi* thin root (Figure No.1)

It has a diameter more than 2 mm. It possesses superficial periderm that is up to 200 m thick and is quite thin. It is made up of three or four layers of thin-walled, colourless phelloderm cells and an outer layer of black, compressed phellem cells (Figure No.1).

The vascular cylinder features large parenchymatous cells on the outside, along with phloem fragments that are dispersed. Thin-walled cells with an abundance of starch grains make up the parenchyma zone. A dense cylinder of xylem components forms the central core of the root. Wide, circular, thick-walled vessels, which are sporadic and isolated, and thin, thick-walled fibres make up the xylem (Figure No.2).

Microscopy of the *Decalepis hamiltonii* thick root (Figure No.3 and No.4)

The thick root is tuberous, long, and meaty. It is a root of storage (Figure No.3). The thick root tuber's TS reveals a wide superficial periderm, a solid cylinder of xylem in the centre, and a vast parenchymatous storage tissue between the periderm and xylem.

Periderm

The periderm has exterior darkly pigmented, suberised tabular phellem cells that are narrow and appear in regular radial files. It is roughly 60m broad. The phelloderm, which has four to six layers of cells, is the zone inside the periderm and is made up of narrow tabular cells that are not suberised and seem lighter in colour (Figure No.3).

Ground parenchyma (Figure No.3)

The broad parenchyma zone is the area between the core xylem and the outer periderm. The phloem parenchyma is proliferating extensively. The cells have tiny, thin walls and are tightly packed. It has a significant buildup of calcium oxalate crystals and starch grains.

Central secondary xylem cylinder

Has a diameter of 1.1mm. It is made up of fibres and large, isolated, angular vessels with somewhat thick walls that are sparse. The xylem fibres have a broad lumen and thin walls. The boats are up to 30 metres wide (Figure No.4).

Cell inclusions

The cells of the parenchyma contain a lot of starch granules. They are of a modest size, circular, concentric design. The parenchyma cells contain large amounts of calcium oxalate crystals. Granules are how the crystals appear.

Physico-chemical constants

A drug's ash values provide information about any earthy or inorganic components as well as other contaminants that may be present. According to the Indian Pharmacopoeia 15 and WHO guidelines 14, the percentages of total ash, acid-insoluble ash, water soluble ash, and sulphated ash values of the tuberous root powder were calculated. The results are given in Table No.1.

Extractive values

Using the described methods by kokate12 and Harborne 13, the tuberous root powder was treated to serial solvent extraction using petroleum ether, chloroform, ethanol and water as solvents. Table No.2 contains percentages of the extractive values that were determined using air-dried medication as a reference.

Preliminary phytochemical screening

Initial phytochemical analysis found the presence of bitters, steroids, glycosides, alkaloids, and carbohydrates (1:50 dilutions). The outcomes are displayed in Table No.3.

Table No.1: Quantitative determinations (ash and extractive values) of *Decalepis hemiltonii*

S.No	**Parameter →**	**Ash values (% w/w)**
	Parts used →	**Aerial parts**
1	Total ash	7.25
2	Water soluble ash	5.50
3	Acid insoluble ash	4.50
4	Sulphated ash	6.50
5	**Parameter →**	**Extractive values (% w/w)**
6	Ether soluble	1.60
7	Alcoholic soluble	5.65
8	Water soluble	6.67

Table No.2: Physical characteristics of extracts of *Decalepis hemiltonii*

S.No	**Physical characteristics of aerial parts extracts**			
		Nature	**Colour**	**% yield (w/w) g**
1	Petroleum ether	Waxy	Pale yellow	2.50
2	Chloroform	Waxy	Dark brown	1.33
3	Alcoholic	Viscous	Dark brown	14.75
4	Aqueous	Sticky	Dark brown	12.36

Table No.3: Qualitative chemical tests for phytoconstituents of *Decalepis hamiltonii*

Part used →	**Aerial parts**				**Part used →**	**Aerial parts**			
Plant constituents and Chemical tests↓	**Pet. Ext**	**Chl. Ext**	**Alc. Ext**	**Aq. Ext**		**Pet. Ext**	**Chl. Ext**	**Alc. Ext**	**Aq. Ext**
Tests for Steroids (a) Salkowski test	-	-	-	-	(c) Wagner's test	-	-	-	-
(b) Liberman Burchards test	-	-	-	-	(d) Hager's test	-	-	-	-
Triterpenes (a) Salkowski test	+	+	+	+	**Tests for Carbohydrates** (a) Molisch's test	-	-	+	+
(b) LibermanBurchard test	+	+	+	+	(b) Fehling's test	-	-	+	+
(c) Tschugajeu test	+	+	+	+	(c) Benedict's test	-	-	+	+
(d) Briekorn and Brinars test	+	+	+	+	(d) Barfoed's test	-	-	+	+
Tests for Saponins (a) Foam test	-	-	-	-	**Tests for Flavanoids** (a) Shinoda test	-	-	+	+
(b) Haemolysis test	-	-	-	-	(b) Ferric chloride test	-	-	+	+
Tests for Steroidal saponins a) Salkowski test	-	-	-	-	(c) Lead acetate test	-	-	+	+
					(d) ZnCl/HCl reduction test	-	-	+	+
(b) Haemolysis test	-	-	-	-	**Tests for Tannins** (a) Ferric chloride test	-	-	+	+
Tests for Triterpenoidalsaponins (a) Salkowski test	-	-	-	-	(b) Gelatin test	-	-	+	+

(b) Liberman Burchard test	-	-	-	-	**Tests for Glycosides** (a) Baljet's test	+	+	+	+
(c) Tschugajeu test	-	-	-	-	(b) Legal's test	+	+	+	+
(d) Briekorn and Brinars test	-	-	-	-					
Tests for alkaloids (a) Mayer's test	-	-	-	-	(c) Keller-Killiani test	+	+	+	+
					Tests for Bitters (a) Vanillin sulphuric acid	-	-	-	-
(b) Dragendorff's test	-	-	-	-	(b) Serial dilutions	-	-	-	-

Note: "+": Present, "-": Absent, Pet. Ext: Petroleum ether extract, Chl. Ext: Chloroform extract, Alc Ext: Alcoholic extract and Aq Ext: Aqueous extract.

Anatomy of the thin root *Decalepis hamiltonii*

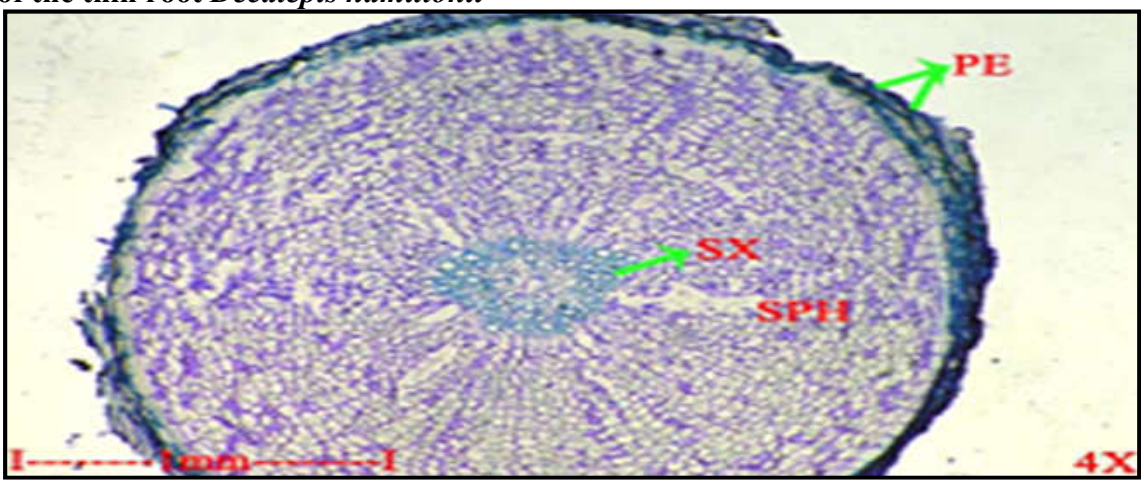

Figure No.1: T.S of root entire view

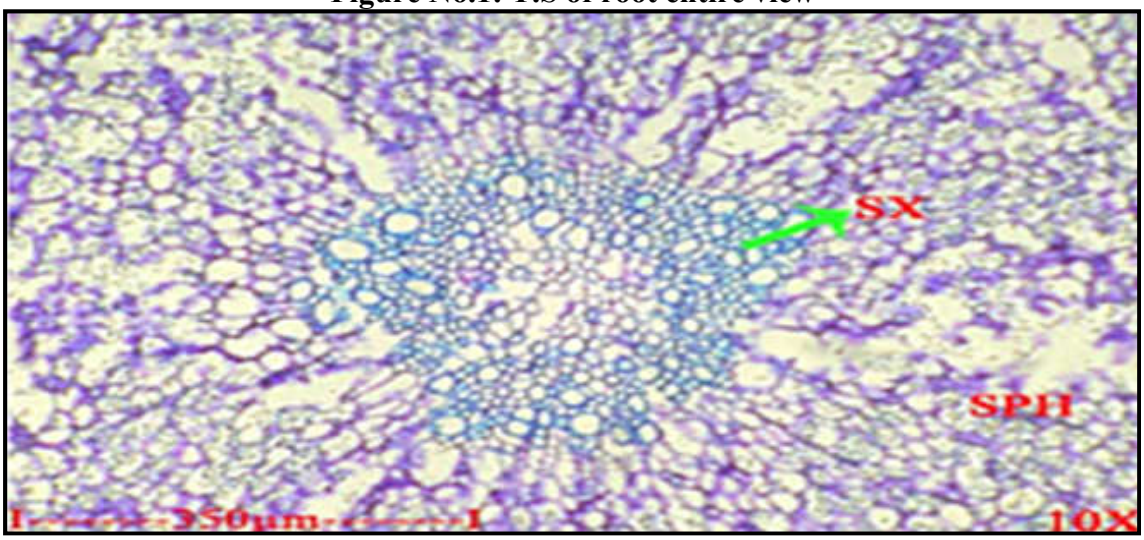

Figure No.2: T.S of root showing secondary phloem and secondary xylem

PE-Periderm; SPH-Secondary phloem; SX-Secondary xylem

Anatomy of the thick root *Decalepis hamiltonii*

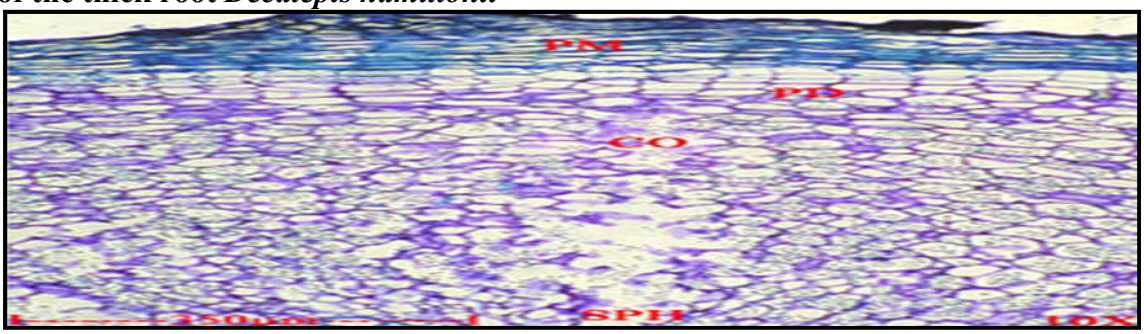

Figure No.3: T.S of root-periderm and cortex

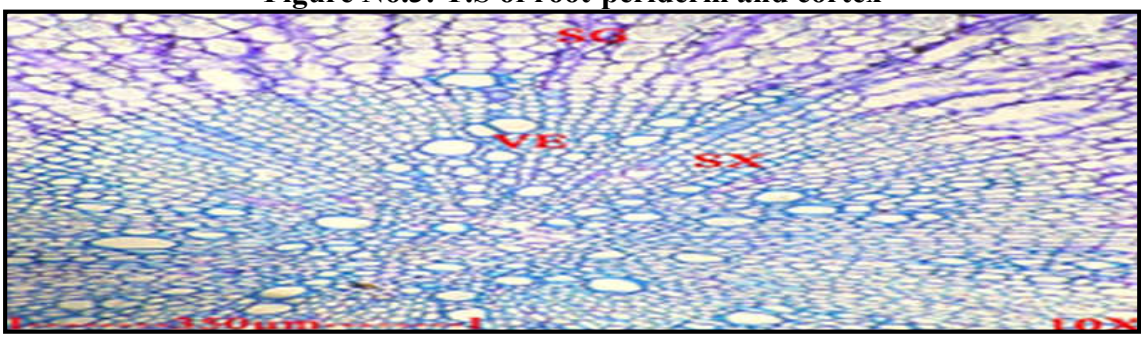

Figure No.4: T.S of root-secondary xylem and secondary phloem

CO-Cortex; PD-Phelloderm; PM-Phellem; SG-Starch grains; SPH-Secondary phloem; SX-Secondary xylem; VE-Vessel

Crystal and starch grains distribution in thin root (Under polarized light microscope)

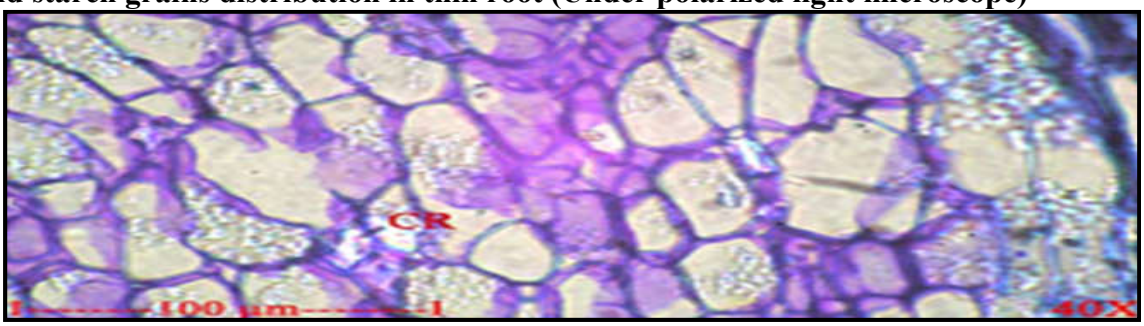

Figure No.5: T.S of thin root showing crystals and starch grains in the corical tissue

CR-Crystal; SG-Starch grains

Crystal and starch grains distribution in thick root (Under polarized light microscope)

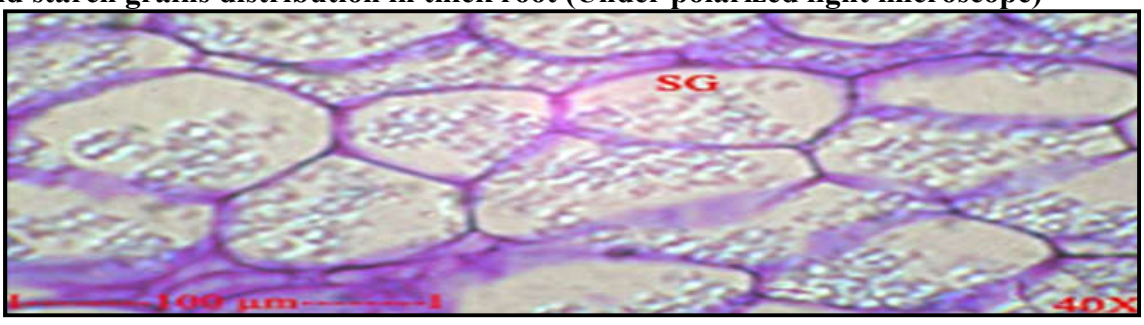

Figure No.6: T.S of thick root showing starch grains in the cortical tissue

CR-Crystal; SG-Starch grains

CONCLUSION

In conclusion, the present study on pharmacognostical evaluation of *Decalepis hemiltonii* will be providing useful information in regard to its correct identity and help to differentiate from the other closely related species. The other parameters observed may be useful for the future identification of the plant.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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