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RESEARCH ARTICLE

Study on pharmacognostical properties of leaf of *Helicteres isora* L.

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ABSTRACT

The micro morphology of the leaves of *Helicteres isora* L. (Sterculiaceae) was explored. The leaves are serrate, obliquely cordite or ovate, shortly acuminate and rough above and pubescent beneath. Microscopic analysis was informative and provides useful information in the botanical identification, standardization for purity and quality and immense value in authentication of the leaf. Microscopic evaluation of leaves revealed the presence the midrib is broadly conical on the adaxial side and broadly semicircular on the abaxial side. It is 900µm in vertical axis and 450 µm along the horizontal abaxial part. The lamina is 200µm thick and has fairly broad, distinct adaxial epidermis of squrish cells. Some of the epidermal cells are dilated and muliagenous. Calcium oxalate druses are abundant in the midrib, lamina and petiole. The lateral veins are uniformly thick forming mostly squarish or rectangular distinct vein-islets. This study of pharmacognostical features of *Helicteres isora* is useful for the detection of botanical identification and in authentication of the leaf of *Helicteres isora* L.

Key words : *Helicteres isora*, Sterculiaceae, Microscopical evaluation, Botanical authentication

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INTRODUCTION

Helicteres isora linn L. is a large arborescent shrub of the family Sterculiaceae. It is sometimes called the Indian screw tree and is found in Asia includingIndian Subcontinent, South China, Malay Peninsula, Java and Saudi Arabia and also in Australia(Drymock *et al*.,1890). However, it gregariously grows in dry deciduous forests of central and western India up to 1500m on the hill slopes. Flowers are brick red or orange-red in colour. Fruits are compound pod, twisted like screw with pointed end signifying the name “Indian Screw Tree”. The fruits are 5.0 cm long, greenish-brown, beaked and cylindrical with 5 spirally twisted carpals. Seeds are black-brown, highly polished, roughly rhomboid, rectangle or triangular in shape.

Fruits, seeds, bark and roots of *Helicteres isora* are widely used as an antigastrospasmodic, antihelmintic, antispasmodic, antipyretic, antidiarrheal, antidysenteric (Al Yahya, 1986) and as a tonic after childbirth (Burkill, 1966). Stems of this plant are used as antihelmintic, colic, and while fruits are used as colic, anticonvulsant and abdominalgia (Eisai,1995). Traditionally, the root juice is claimed to be useful in diabetes, emphysema and snakebite (Kirtikar and Basu, 1995). From the roots, betulic acid, daucosterol, sitosterol, isorin (Singh *et al*.,1984) were

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isolated. Cucurbitacin B and isocucurbitacin B were isolated and reported to possess cytotoxic activity (Qu *et al.*,1991). In addition, Hattori and co-workers reported an inhibitory activity of the water extract of fruits of *H.isora* against reverse transcriptase from avian myeloblastosis virus (Bean *et al*.,1985) and antiHIV-1 activity (Kusumoto *et al*.,1992). Six neolignans, the helicterins A–F were isolated from aqueous extract of the fruits (Otake *et al*., 1995), plant also contains flavonoid glucosides (Tezuka *et al.,* 2000). It was reported this plant contains antioxidants, carbohydrate, proteins, fibre, calcium, phosphorus and iron (Kamiya *et al*., 2001). Numerous studies have revealed the presence of phenols, flavonoids, alkaloids, glycosides, phytosterols, carotenoids, tannins (Gayathri *et al*., 2010), fixed oils and fats form different parts of *H.isora*, in varying concentrations. Well identified active phytoconstituents includes gallic acid, caffeic acid, vanillin, p-Coumaric acid was also studied (Jain *et al*., 2014). Bean and cowrkers (1985) isolated cucurbitacin b, isocucurbitacin b (steroids) from roots of *H.isora* (Gayathri *et al*., 2010). Additionally, Satake *et al*. (1999) isolated rosmarinic acid and their derivatives; isoscutellarein and their derivatives; D-glucopyranosyl isorinic acid with rosmarinic acid; Helisterculins A and B; Helisorin.

Indigenous medicinal system recognizes *H.isora* as "Avartani" or "Mrigshringa" (Warrier *et al*.,1994), *https://en.wikipedia.org/wiki/Helicteres_isora - cite_note-r2-3* often confused with Murva (another Ayurvedic drug *Marsdenia tenacissima* (Asclepiadaceae). There is a close similarity between the leaves of *H.isora* and *Grewia asiatica* L. (belonging to the Tiliaceae/ Malvaceae family from the same order Malvales). Without fruits and flowers, it is difficult to differentiate between both plant/shrub. It is easily adultered with the leaves of other plants while using as drug. An investigation to explore its pharmacognostic examination of *H.isora* is inevitable. Hence, in this work it is reported an attempt on microscopic evaluation screening for the standardization and quality assurance purposes of the cultivar.

MATERIALS AND METHODS

Plant collection and authentication :

The plant samples of *Helicteres isora* (L.) were collected from the hill regions of Tirunelveli, in June 2005 and were authenticated by V. Chelladurai, Government Siddha medical college, Tirunelveli, and the study was done by Dr. P. Jayaraman, Director of Plant Anatomy Research Institute, Tambaram, Chennai, Tamil Nadu.

Macroscopic analysis :

Macroscopic observation of the plant was done and the shape, size, surface characters, texture, colour, odour, taste etc. was noted (Kokate *et al*., 2005).

Microscopic analysis :

Transverse section midrib region of fresh leaf pieces were cut and fixed in FAA and then dehydrated by employing graded series of ethyl alcohol and tertiary butyl alcohol (Asokan, 2007). Sections were taken using microtome. Permanent mount was prepared using saffranin fast green double staining technique (Johansen, 1940). In order to supplement the descriptive part the photomicrographs in different magnifications of all necessary cells and tissues were taken. Coarse powder of the leaf was used to study the microscopical characters of the leaf powder (Evan, 2002).

RESULTS AND DISCUSSION

Organoleptic testing of a crude drug is mainly for qualitative evaluation based on the observation of morphological and sensory profile. In this report, various morphological, microscopical, physico-chemical standards have been developed. Hence, we have undertaken this study to serve as a tool for developing standards for identification, quality and purity of *Heilcteres isora* leaves.

Adulteration and misidentification of crude drugs can cause serious health problems to consumers and legal problems for the pharmaceutical industries. It can be conducted via a variety of techniques, namely macro and microscopic identification and chemical analysis especially description of microscopic botanical aspects to determine definitively the proper species of plant material while it is still in its non-extracted form. The observation of cellular level morphology or anatomy is a major aid for the authentication of drugs. These characters are especially important for identification of powdered drugs, because in these cases most of the morphological diagnostic features are lost (WHO,1998). Microscopic evaluation is one of the simplest and cheapest methods for the

correct identification of the source of the materials (Patel and Zaveri, 2011). The macroscopic and organoleptic characters of the leaf can serve as diagnostic parameters (Singh *et al.*, 2010).

Macroscopic of leaf :

Heilcteres isora is a large shrub or small tree (5–8 m in height) with grey bark and alternately arranged hairy, ovate shaped leaves with serrate margins. Young branches are rough with scattered stellate hairs. Bark is grayish in colour. The leaves are serrate, obliquely cordite or ovate, shortly acuminate and rough above and pubescent beneath (Fig.1).

Fig. 1 : *Helicteres isora*

Microscopic of leaf :

The leaf has quite prominent midrib and thin lamina (Fig.2).The lateral veins are also prominent; the lower surface of the lamina is densely and stellately hairy. Midrib: The midrib is broadly conical on the adaxial side and broadly semicircular on the abaxial side, It is 900µm in vertical axis and 450 µm along the horizontal abaxial part. The adoxial hump has the epidermal layer and a mass of collenchymatous ground tissue.The palisade tissue extends upto collenchyma zone on either side of the hump (Fig.3).The lower side of midrib has narrow, thin walled epidermal layer and ground tissue differentiated into outer zone of collenchymas and 7 or eight layers of inner, wide thin walled compact parenchyma cells. Many of the ground cells are mucilaginous densely filled with mucilage. The mucilaginous idioblasts are slightly larger than the neighboring cells. Vascular tissues occur in two systems: there is a wide bowl shaped, abaxically placed, main vascular bundle. Another vascular bundle, flat, plate like occur on the abaxical part, forming a lid on the abaxical bowl. Both abaxical and adaxical bundles are colerectral and have dense parallel files of xylem elements and zone of phloem. On the outer part of phloem zone is a thick pad of sclerenchyma of adaxial bundle and discom oxalate crystals are abundant in the midribntinuous patch of the abaxial bundle (Fig. 4).

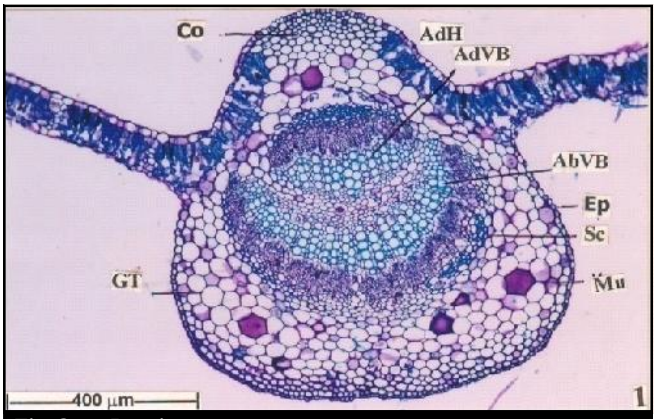

Fig. 2 : Lamina

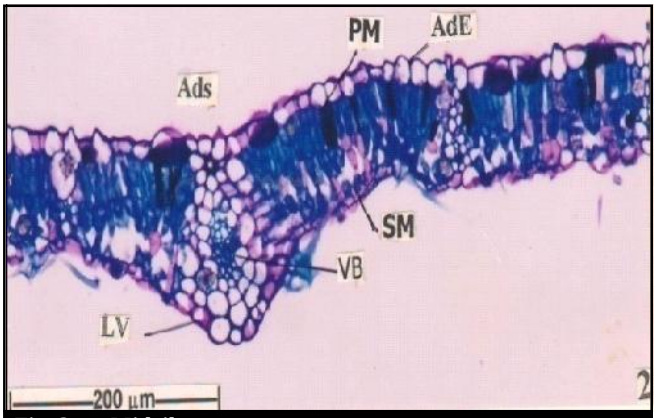

Fig. 3 : Midrib

Fig. 4 : Epidermal trichomes

The lamina is 200µm thick. It has fairly broad, distinct adaxial epidermis of squrish cells. Some of the epidermal cells are dilated and muliagenous. The abaxial epidermis undulate and thin bearing dense trichomes. The mesophyll tissues are differentiated into two layers of dense, short, densely packed palisade cells and a narrow zone of 2 layers of small, spherical, loosely arranged spongy parenchyma cells. The lateral vein is projecting as a wide conical structure on the abaxial side. It consists of small collarectal bundle and prominent hyaline bundle sheath parenchyma with adaxial extension. The veinlets also exhibits similar structures as a lateral veins.

Calcium oxalate druses are abundant in the midrib, lamina and petiole. In the midrib fairly large druses measuring 50µm are seen in the ground cells (Fig. 5). The druses in the phloem cells are smaller and denser. In the lamina, the druses are uniformly large and occur in the mesophylls. Epidermal trichomes (Fig. 6), Stellate trichomes are abundant on the leaf and young stem. The trichome complement consists of 4-12 arms, spreading parallel to the surface and the arms are thick liquefied and have pointed lips. The trichome cluster arises from a group of epidermal cells which are raised above the leaf surface; the arms of trichome are 200-400µm long.

Venation pattern : (Fig.7), the lateral veins are uniformly thick forming mostly squarish or rectangular distinct vein-islets. Along the veins, are seen circular wide containing idioblasts. hyaline, rectangular bundle sheath are also abundant in the lamina. The stomata are mostly anomocytic; the stomatal frequency ranges from 7-10/ mm^2. The epidermal cells are polygonal in outline: their anticlinal walls are thin and straight. Petiole: (Fig.8), the petiole is circular in outline with more or less even and smooth surface. It is 2.7 mm in diameter .The epidermal layer is thin and not conspicuous. The outer ground tissue is differentiated into 6 or more layers of idioblasts are of varying sizes collenchymas vines to the epidermis and 7 or 8 layers of thin walled, compact parenchyma cells, wide mucilaginous are abundant in the ground tissue. The vascular system of petiole is complex. It consists of a main circular cylindrical canal like narrow opening. It consists of closely arranged parallel rows of xylem

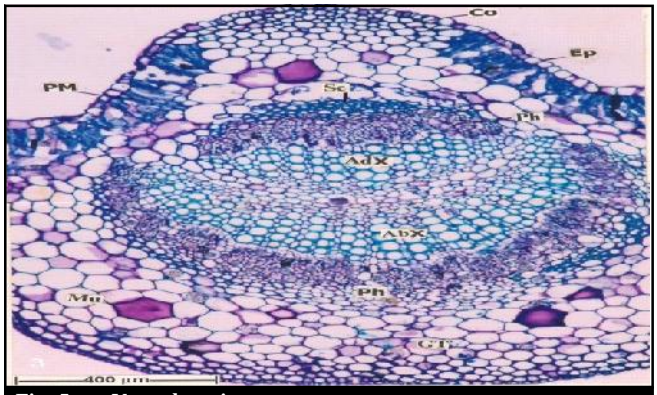

Fig. 5 : Vascular tissues

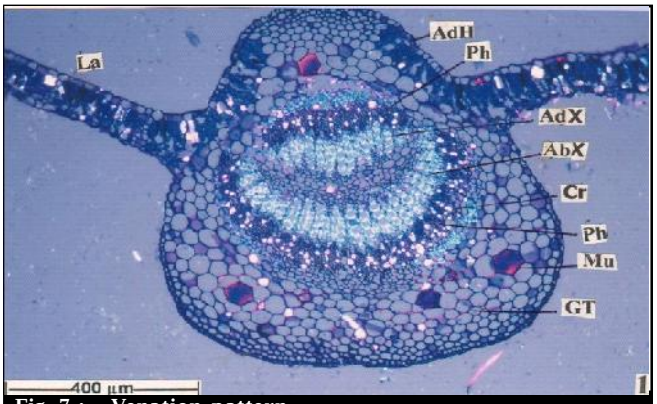

Fig. 7 : Venation pattern

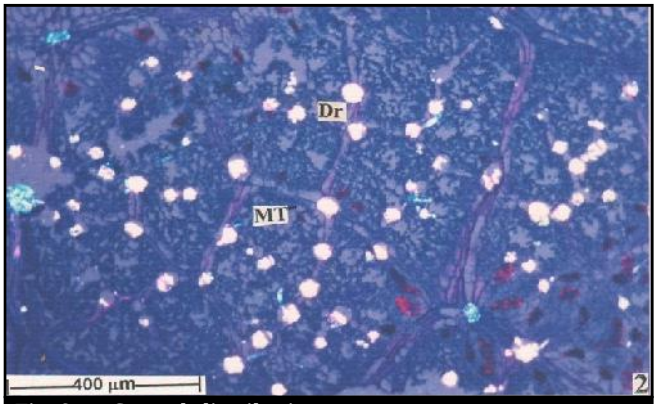

Fig. 6 : Crystal distribution

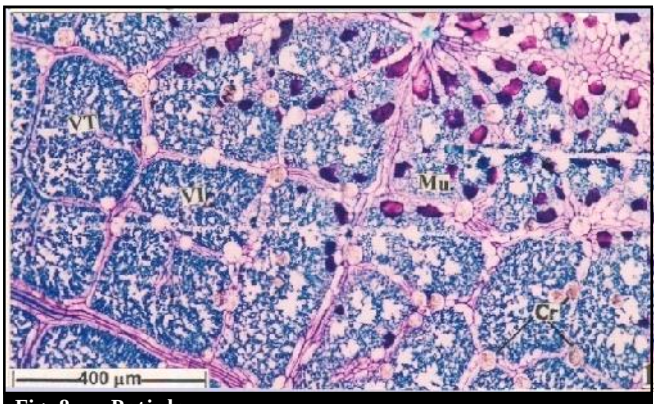

Fig. 8 : Petiole

elements surrounded externally by broad zone of phloem. In the wide central part, there are three or four; broad U shaped vascular bundles enclosing the central core of pith. These inner bundles have thin layers of diffusely differentiated vessels and broad zone of phloem towards the inner side of xylem bands (Inverted position of xylem and phloem), dense secondary xylem and wide pith. Though the xylem bands of inner vascular bundles are narrow, the phloem is as board as the phloem of the outer vascular cylinder. The extractive values are primarily useful for the determination of exhausted or adulterated drug and helpful in the detection of adulteration (Thomas *et al.*, 2008).

Conclusion :

The study of pharmacognostical features of *Helicteres isora* had shown the standards which will be useful for the detection of its identity and authenticity. Microscopic analysis provided useful information in the botanical identification, standardization for purity and quality and immense value in authentication of the leaf. In future, the other studies *viz.*, physical evaluation, phytochemical tests will add to its quality control and quality assurance for proper identification.

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