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AS ANATOMICAL AND PHYTOCHEMICAL STUDIES OF *SCLEROPYRUM PENTANDRUM* (DENNST.) MABB

T. K. Ajithbabu^{*1}, V. Ganesan², P. Sajith³

¹Department of Pharmaceutical Chemistry, Research Scholar, Vinayaka Missions University, Salem, Tamilnadu, India.

²Department of Pharmaceutics, Erode College of Pharmacy, Erode, Tamilnadu, India.

³Department of Pharmacology, J.D.T. Islam College of Pharmacy, Calicut, Kerala, India.

ABSTRACT

Scleropyrum pentandrum (Dennst.) Mabb from family Santalaceae is a small tree, commonly found in the evergreen sacred groves of northern Kerala. It is traditionally used for its anti-inflammatory activity. It is used for various activities by tribal people in different parts of the world. Only few scientific works were reported till and the present study explains the macro and microscopic and phytochemical characters of the leaves of *Scleropyrum pentandrum*.

KEYWORDS

Scleropyrum pentandrum, Phytochemistry and Anatomical studies.

Author for Correspondence:

Ajithbabu T K,
Department of Pharmaceutical Chemistry,
Vinayaka Missions University,
Salem, Tamilnadu, India.

Email: ajithbabutk@gmail.com

INTRODUCTION

As *Scleropyrum pentandrum*. (Dennst.) Mabb (syn: *Scleropyrum wallichianum* Am.) belongs to the family santalaceae. The plant is distributed in Cambodia, China, Thailand, Sri Lanka, Laos and Peninsular India. Ramasubbu Ret al reported that in India it is distributed in, Western Ghats and south and central Sahyahills. The plant grows to 7 meters height and is usually found on sandy soil, as well as in semi and dry evergreen forests, in open forest near stream and in lowland Dipterocarp forest. Flowering season of the plant is January to March, fruiting season is August to October¹. Ayyanar M et
January – March

al reported other name asmalayammachi and malayamkki in Kozhikkode and Naikkuli in Kasargod of Kerala and mulkirayan in Tinnelveli of Tamilnadu². Debritto A J et al reported the use of the whole plant and parts externally to treat skin irritation in Kani tribal settlement, Agasthyamalai biosphere reserve, Tinnelveli South India³. Rajith N P et al were reported the use of crushed roots in stomach ailments by Kurichyas tribal community in Kannur district, Kerala⁴. The roots are boiled, and the decoction is taken as a contraceptive by semalai people. It is believed that women will become barren after consuming the decoction. Paste of stem bark and leaf is applied externally to treat skin diseases⁵. Stem is used as galactagogue⁶. Gale et al, (2007) presented the cyclo oxygenase inhibiting, antimalarial and anti TB activities of *Scleropyrum pentandrum*⁷. Venugopal et al, carried out the anticaryogenic and cytotoxic activity of methanolic extract of *S. pentandrum* leaves. (2011)⁸. The extract was found to be having anticaryogenic activity. Tripetch Kanchanapoom et al done the isolation of five unprecedented furan-2-carbonyl C-glycosides and two phenolic diglycosides from leaves and twigs of *Scleropyrum pentandrum* by (2012)⁹. George A Galereported the usage of fruits and seeds of *Scleropyrum pentandrum* is also called *kirinda* and is consumed by *Paniya*, *Kattunaika* and *Kuruma* tribes of Wynad district, Kerala, India¹⁰. It is also called irumulli and is used as a mechanical barrier (fencing) in dried or live condition¹¹. Further literature reviews of the plant revealed that much work is not done with the plant and the bioidentities of the plant remain unexplored.

EXPERIMENTAL

Plant materials

The leaves of *S. pentandrum* were collected from sacred groves of Poyilkavu Durga temple, Calicut, Kerala, in May 2012. The plant is identified at Centre for Medicinal Plant Research, Kottakkal and Dr. A. K. Pradeep, Assistant professor, Department of Botany (NO: 1077864) and the herbarium is deposited at Botany department, Calicut university, Kerala, India.

Macro and Microscopic studies

Macroscopic characters

Various sensory parameters of the plant material (such as color, odor, size, shape and taste) were studied by organoleptic evaluation. Different microscopical parameters like duration, type of leaf base, presence or absence of petiole and characters of lamina of *Scleropyrum pentandrum* fresh leaves were recorded. Lamina consists of Characteristic features such as composition, incision, shape, venation, margin, apex, base, surface and texture.

Qualitative microscopy

Free hand sections were cut for anatomical and histochemical studies. The sections were stained with safranin and phloroglucinol and iodine solution for usual staining and histochemical staining respectively. Various identifying characters, such as type of trichomes and cell composition were recorded. Photographs were taken using canon digital camera connected to the Zeiss Axiostar plus microscope and measurements were taken using ocular and stage micrometers. Data were subjected to statistical analysis.

Quantitative microscopy

Stomatal index

The stomatal index is calculated with the equation

$$\text{Stomatal index} = \frac{S \times 100}{E+S}$$

S = the number of stomata in a given area of leaf.

E = the number of epidermal cells (including the trichomes) in an area of leaf.

Vein-islet number

Vein islet is the minute area of photosynthetic tissue encircled by the ultimate division of the conducting strands in leaves. This vein-islets per millimeter are termed the vein-islet number. The numbers of vein-islets are counted, within the square including those overlapping on two adjacent sides by the other two sides. For each sample of leaf make, not fewer than three determinations and calculate the average number of vein-islets per square millimeter¹².

Palisade ratio

The average number of cells beneath epidermal cells was calculated, known as palisade ratio.

Preliminary phytochemical investigation

The crude petroleum ether, chloroform, ethanolic and aqueous extracts were subjected to preliminary phytochemical analysis (Table No.2) in order to detect the presence of various groups of phytoconstituents by carrying out the following chemical analysis^{13,14}.

RESULTS AND DISCUSSION

Morphology

Leaves are simple alternate and spiral with 10-20 cm long and 2.5-9 cm width. They are narrowly to broadly elliptic or ovate with acute apex. Leaves are short, acuminate, margin entire, blade leathery to coriaceous, upper surface shining, glabrous, under surface glabrescent along midrib. The midrib of leaf is canalculated, above primary vein single, secondary veins are oblique to the midrib. They are widely parallel and anastomosing at the margin, tertiary veins are obscure. Petiole pubescent and exstipulated. Color of the leaf is dark green on upper surface and light green at lower surface. Texture is leathery to coriaceous. Odor is slightly aromatic and unpleasant; taste, slightly bitter. The stem is, green with smooth texture.

Qualitative microscopy

Petiole

TS of petiole is somewhat oval shaped with a depression on the upper side. T S of the leaf shows an outermost single layered epidermis with cuticle and unicellular trichomes. Inner to the epidermis is a wide zone of thick walled parenchymatous ground tissue with intercellular spaces. The centre is occupied by five vascular bundles arranged in the shape of 'U'. Each bundle composed of numerous xylem elements arranged towards the upper region and a few phloem elements towards the lower side. Outer region of the phloem contains multiple layers of sclerenchymatous bundle cap. Few numbers of sclerenchymatous cells are also embedded in the ground tissues, inner to the vascular bundle. Most of the parenchymatous cells of the ground tissue consist of rosette and prism crystals of calcium oxalate which is seen scattered throughout the ground tissue (plate 2A-C) (Figure No.1).

Leaf

TS of leaf passing through the midrib shows dorsiventral nature. Midrib is comparatively large and rounded on the lower side and deep concave towards the upper side. Epidermis is single layered and inner to the epidermis 1 to 2 layers are collenchymatous in the lower side. On the upper side palisade cells extend into the midrib and are in 2 to 3 layers just below the epidermis. The ground tissue is parenchymatous and three vascular bundles are embedded in the ground tissue slightly towards the upper side. In each vascular bundle sclerenchymatous bundle sheath is present. (Plate 2D and E) (Figure No.1).

In the lamina portion also, both epidermis are single layered with cuticle. Upper epidermis is followed by 2 to 3 layers of compactly arranged palisade cells which are short oval or rectangular and the size is more or less same as that of epidermal cells. Some of the palisade cells consists of prismatic crystals of calcium oxalate. The major portion of the lamina is occupied by spongy mesophyll tissue traversed with vascular strands. Spongy parenchyma cells are tangentially elongated and arranged with large inter cellular spaces (Plate 2F). Stomata and trichomes are present only on the lower epidermis. Stomata are of paracytic with two subsidiary cells (Plate 2G and H). Venation pattern of the leaf shows primary and secondary veins. Secondary veins are oblique to the midrib and reticulate (Plate 3) (Figure No.2).

Quantitative microscopy

The quantitative values such as stomatal index, palisade ratio and vein-islet number are 10.12 ± 1.08 , 1 and 38.61 ± 2.78 respectively (Table No.1).

Table No.1: Quantitative microscopy analysis

S.No	Leaf constant	Value
1	Stomatal index	10.12±1.08
2	Vein-islet number	38.61±2.78
3	Palisade ratio	1

Table No.2: Preliminary phytochemical investigation

S.No	Class of compounds	Presence
1	Carbohydrate	+
2	Phenols	++
3	Flavanoids	++
4	Tannins	+++
5	Alkaloids	+
6	Glycosides	+
7	Saponins	-
8	Sterols	+
9	Aminoacids	-
10	Terpenoids	+

- : not present, +: present in traces, ++: present in moderate amount, +++: more amount present.

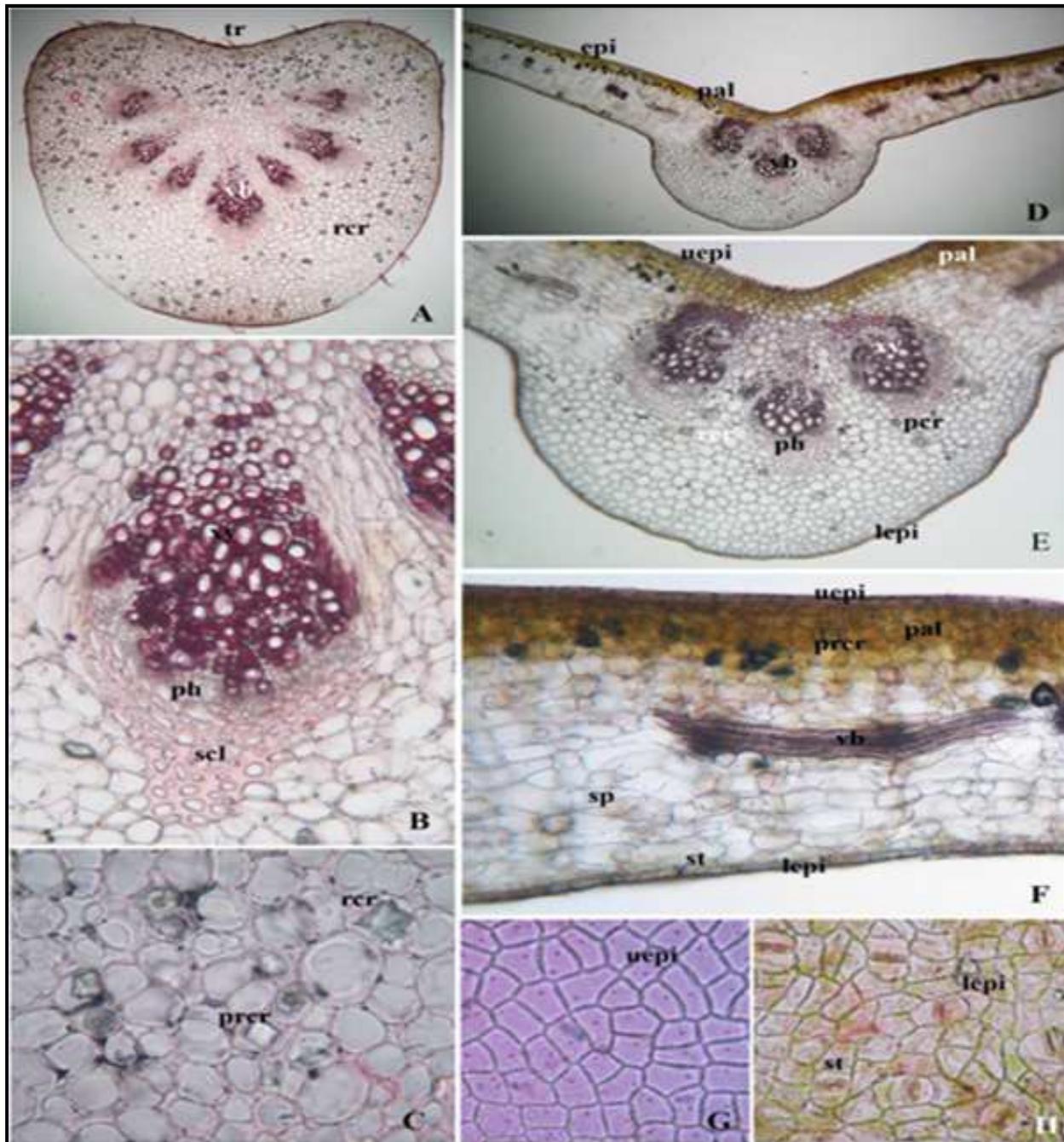


Plate 2. Microscopy of *Scleropyrum pentadrum* leaf. **A-C.** TS of petiole, **A.** TS of petiole -whole; **B.** Vascular bundle enlarged; **C.** Crystals present in petiole. **D-F.** TS of lamina. **D.** TS of lamina -entire; **E.** Midrib portion enlarged; **F.** Lamina portion enlarged; **G.** Surface view of upper epidermis; **H.** Surface view of lower epidermis with stomata. **e-**epidermis; **lepi-** lower epidermis; **pal-** palisade cells; **ph-**phloem; **prcr-**prismatic crystals of calcium oxalate; **rcr-**rosette crystals of calcium oxalate; **sp-**spongy cells; **st-**stomata; **tr-**trichome; **uepi-**upper epidermis; **vb-**vascular bundle; **xy-**xylem.

Figure No.1: Microscopy of *Scleropyrum pentadrum* leaf

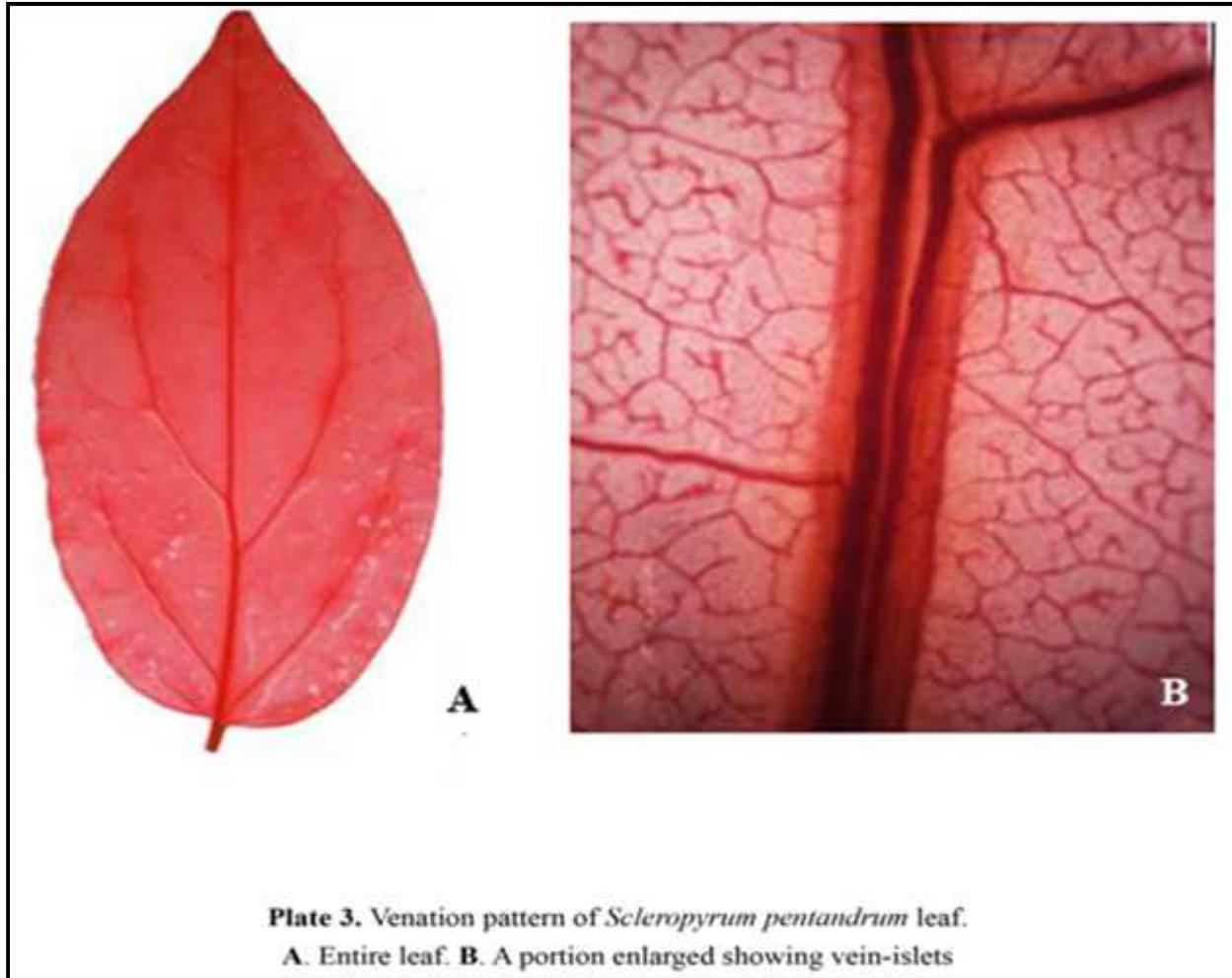


Figure No.2: Venation pattern of *Scleropyrum pentandrum* leaf

CONCLUSION

The present study on anatomical features of *Scleropyrum pentandrum* contributes to the identification and standardization of the medicinally important plant.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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