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AS ANATOMICAL AND PHYTOCHEMICAL STUDIES OF *SCLEROPYRUM PENTANDRUM* (Dennst.) Mabb

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ABSTRACT

Scleropyrum pentandrum (Dennst.) Mabb belonging to family Santalaceae is a small tree, commonly found in the ever green 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. Much works on this plant is not done till and the present study explains the macro and microscopic and phytochemical characters of the leaves of *scleropyrum pentandrum*.

KEY WORDS

Scleropyrum pentandrum, Phytochemistry and Anatomical studies.

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INTRODUCTION

As *Scleropyrum pentandrum*. (Dennst.) Mabb (syn: *Scleropyrum wallichianum* Am.) belongs to the family santalaceaeae. The plant is distributed in Cambodia, China, Thailand, Sri Lanka, Laos and Peninsular India. In India it is distributed in, Western Ghats and south and central Sahyad hills. The plant grows to a maximum height of 7 meters and is normally 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. It is commonly called

malayammachi and malayamkki in Kozhikkode and Naikkuli in Kasargod of Kerala and mulkirayan in Tinnelveli of Tamilnadu². The whole plant parts are applied externally to treat skin irritation in Kani tribal settlement, Agasthyamalai biosphere reserve, Tinnelveli South India³. The crushed roots are given for curing stomach ailments in 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, anti-malarial and anti TB activities of *Scleropyrum pentandrum*⁷. Anticaryogenic and cytotoxic activity of methanolic extract of *S. pentandrum* leaves were carried out by Venugopal et al, (2011)⁸. The extract was found to be having anticaryogenic activity. Five unprecedented furan-2-carbonyl C- glycosides and two phenolic diglycosides were isolated from leaves and twigs of *Scleropyrum pentandrum* by Tripetch Kanchanapoom et al (2012)⁹. Fruits and seeds of *Scleropyrum pentandrum* also called *kirinda* 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. Extensive literature reviews revealed that much of the bioactivities of this 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. Various microscopic characters of fresh leaves of *Scleropyrum pentandrum* were recorded such as duration, type of leaf base, presence or absence of petiole and characters of lamina. 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 for usual staining and phloroglucinol and iodine solution for histochemical staining. 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

$$S \times 100$$

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

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. 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.

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 shortly acuminate, margin entire, blade leathery to coriaceous, upper surface shining, glabrous, under surface glabrescent along midrib. Midrib is canaliculated above primary vein single, secondary veins oblique to the midrib, widely parallel and anastomosing at margin, tertiary veins obscure. Petiole pubescent and exstipulated. Color, dark green on upper surface and light green colour on lower surface; Texture, leathery to coriaceous; odor, slightly aromatic and unpleasant; taste, slightly bitter. The stem is, green with smooth texture.

Qualitative microscopy

Petiole

TS of petiole is somewhat oval in shape with a depression on the upper side. Detailed TS 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 to the phloem, multi layered sclerenchymatous bundle cap is present. A few sclerenchymatous cells are also embedded in the ground tissue inner to the vascular bundle. Most of the parenchymatous cells of the ground tissue consist

Preliminary phytochemical investigation

The crude petroleum ether, chloroform, ethanolic and aqueous extracts were subjected to preliminary 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. Sclerenchymatous bundle sheath is present in each vascular bundle (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 intercellular 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.

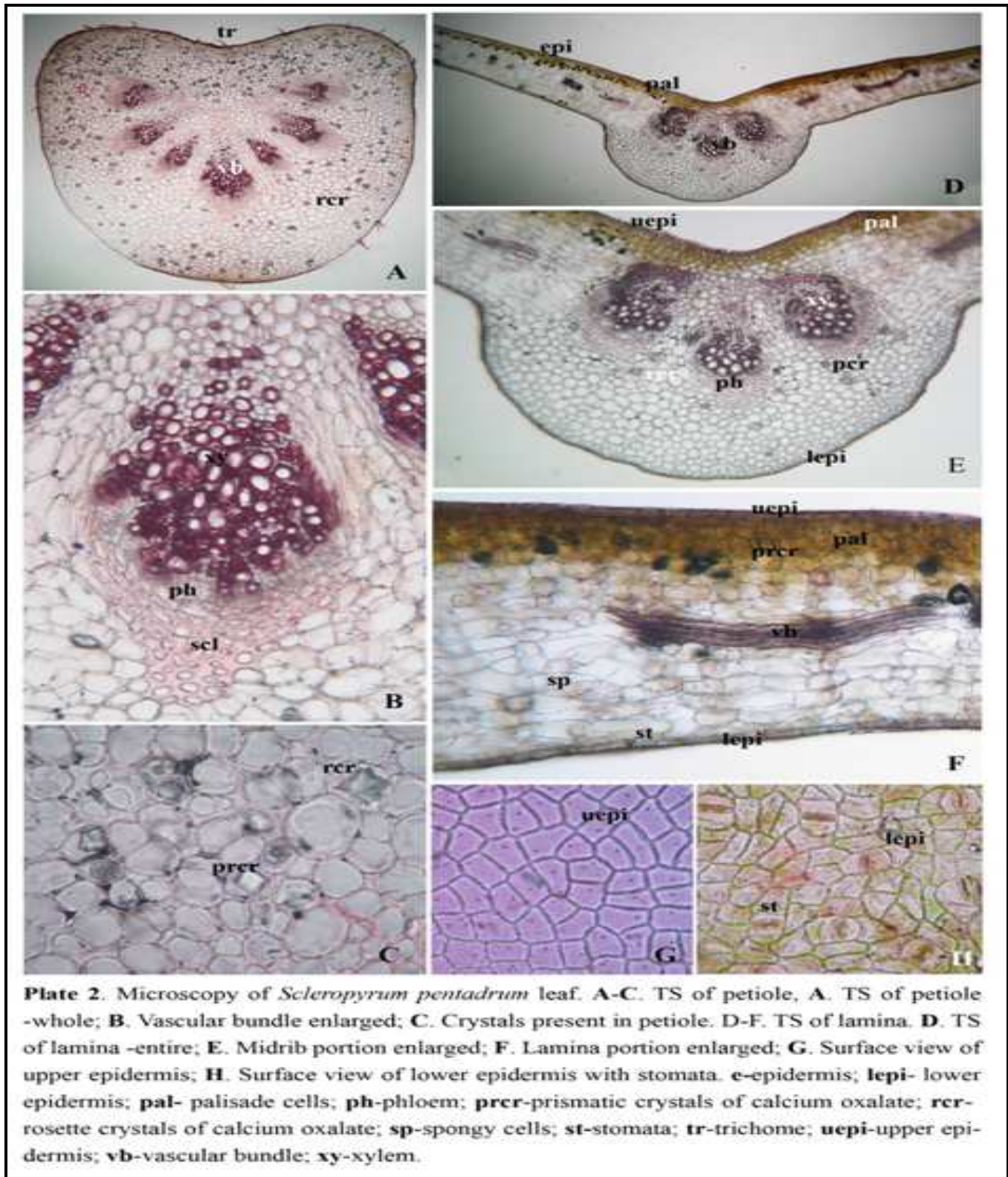


Figure No.1: Microscopy of *Scleropyrum pentadrum* leaf

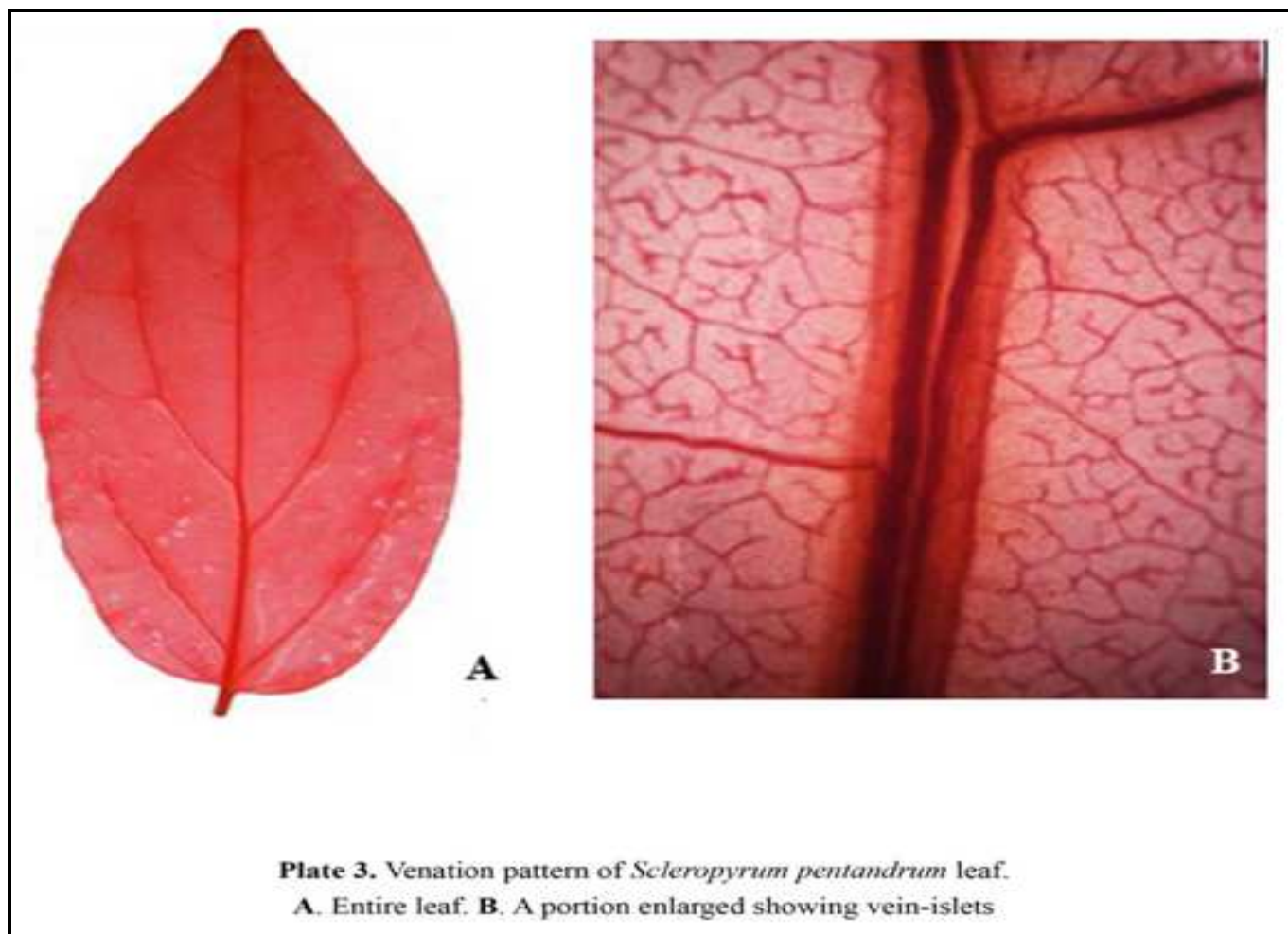


Figure No.2: Venation pattern of *Scleropyrum pentandrum* leaf

CONCLUSION

On the basis of the present study the anatomical features obtained is useful for the identification and standardization of *Scleropyrum pentandrum*.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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