



PHARMACOGNOSTICAL AND PHYTOCHEMICAL PROFILES OF *Peltophorum pterocarpum* LEAVES

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ABSTRACT

Peltophorum pterocarpum (Family- Caesalpinaceae) is used in different systems of traditional medicine. The present study was planned to investigate the macroscopy, microscopical characters, quantitative profiles, powder microscopy, physico-chemical parameters of leaves of *Peltophorum pterocarpum* and preliminary phytochemical screening of HAEPP (Hydroalcoholic extract of *Peltophorum pterocarpum*). Pharmacognostical parameters are helpful in identification, authentication and control the adulteration of crude drugs. The preliminary phytochemical screening reveals the presence of alkaloids, carbohydrates, flavonoids, proteins, amino acids, sterols, terpenoids, tannins and coumarins.

Key words: *Peltophorum pterocarpum*, Traditional medicine, Pharmacognosy, phytochemistry.

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INTRODUCTION

In many communities around the world, plants are the primary source of health care. They also serve as resources for the development of biomedicine and traditionally used species have made significant contributions to the advancement of biomedical drug development (Estevão N. F., 20118). *Peltophorum pterocarpum* (Family- Caesalpinaceae) is a large ornamental tree grown around the world. This plant is commonly known as copper-pod, yellow Poinciana and golden flamboyant. Tamil name is perungondrai and iyalvagai.

This upright, handsome, spreading, semi-evergreen, deciduous tree has a rounded canopy and is capable of reaching 50 feet in height with a 30 to 50-foot spread. *Peltophorum pterocarpum* is the important plant species in traditional medicine (Dharmasoth Rama Devi and Ganga Rao Battu., 2018, Arul Sheeba Rani, M and Mary Josephine, R., 2018). The plant is used in different parts of the world for the treatment of several ailments like stomatitis, insomnia, skin troubles, constipation, ringworm, dysentery, muscular pains, sores, and skin disorders (Corners, E. J. H., 1997, Tan. Hugh T.W. and T. Morgany., 2001, Nathan VK., 2012, Swee Ping and Wee Mei Lynn., 2001).

MATERIALS AND METHODS

PLANT COLLECTION AND AUTHENTICATION

Leaves of *Peltophorum pterocarpum* was collected from Alwarpuram, Madurai district and it was authenticated by **Dr. D.Stephen, M.Sc., Ph.D.**, Assistant Professor, Department of Botany, The American College, Madurai -20, Tamil Nadu. The herbarium of this

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specimen was kept in the department for further reference.

PHARMACOGNOSTICAL STUDIES

MACROSCOPICAL STUDIES

The fresh leaves are studied for its morphological characters like colour, odour, taste, shape, arrangement, apex, base, margin, length and width by organoleptic evaluation.

MICROSCOPICAL STUDIES

TRANSVERSE SECTION

Sample (fresh *Peltophorum pterocarpum* leaves) was preserved in fixative FAA (Formalin – 5ml + Acetic acid – 5ml +70% Ethyl alcohol – 90ml) for more than 48 hr. The preserved specimens were cut into thin transverse section using a sharp blade and the sections were stained with safranin. Transverse sections were photographed using trinocular microscope under bright field light.

QUANTITATIVE MICROSCOPY

The vein islet and vein termination number, stomatal number and stomatal index were determined on fresh leaves by using standard procedure.

POWDER MICROSCOPY

A pinch of the powdered sample was mounted on a microscopic slide with a drop of 50% glycerol. Characters were observed using trinocular microscope and Photomicrographs of diagnostic characters were captured and documented (Iyengar M.A and Nayak S.G.K., 1994, Wallis TE., 1946).

PHYSICO-CHEMICAL PARAMETERS

The foreign matters, loss on drying, extractive value and ash value were determined according to the methods given in pharmacopoeia (Anonymous., 1998, Anonymous., 2001).

PHYTOCHEMICAL STUDIES

EXTRACTION

The leaves of *Peltophorum pterocarpum* was collected, shade dried and coarsely powdered. The powdered leaves were defatted with petroleum ether and then the defatted marc was allowed to macerate with hydroalcohol using 70% ethanol for about 72 hours. The extracts were filtered through whatman filter paper No. 42 (125 mm). The entire extracts were concentrated to dryness. The final dried extract was stored in an air tight and labelled container.

PRELIMINARY PHYTOCHEMICAL ANALYSIS

Various phytochemical tests were performed to identify the phytoconstituents present in HAEPP by using standard protocol (Harbone JB., 1973, Kokate C.K., 1994., Payal M. Panchal., 2012, Abdullahi R., 2020).

RESULTS AND DISCUSSION

MACROSCOPICAL STUDIES

Macroscopy of the *Peltophorum pterocarpum* leaves was studied (Figure 1) and reported (Table-1). The leaves of *Peltophorum pterocarpum* is bipinnate, alternate, stipulate, dried leaves are yellowish green in colour. Odour and taste are not characteristic.

TS OF RACHILLA

TS of rachilla shows Single layered epidermis covered with thick cuticle shows uni to multi cellular covering trichomes. Ground tissue possesses centrally arranged prominent vascular bundle and two trace bundles located at the upper side, under each elevation. Vascular bundles are closed; phloem consists of usual elements embedded with a few rosette crystals of calcium oxalate. Xylem consists of radially arranged vessels surrounded by tracheids and fibres. In the centre small parenchymatous pith is found (Figure 2- 5).

Leaflets

Midrib

TS of leaflet passing through midrib are broadly convex at the lower side and shows slightly convex upper surface. Single layered epidermis covered with thick cuticle is followed by a sub-epidermal layer having one to two layers of parenchymatous cells over the vascular bundle. Centrally placed vascular bundle is closed and collateral (Figure 6).

Lamina

TS of lamina are dorsiventral, hypostomatic, shows single layered upper and lower epidermis covered with thick cuticle and simple covering trichomes (Figure 7, 8).

QUANTITATIVE MICROSCOPY

The quantitative parameters of leaves of *Peltophorum pterocarpum* were recorded (Table 2). The leaf lower side shows numerous paracytic, few anomocytic stomata and they are very rare on the upper surface (Figure 9-11).

POWDER MICROSCOPY

Peltophorum pterocarpum leaves powder was brownish green in colour and shows various powder characters (Figure 12).

PHYSICO-CHEMICAL PARAMETERS

Foreign matter, loss on drying, extractive value and ash values were determined and reported (Table 3).

The preliminary phytochemical screening reveals the presence of alkaloids, carbohydrates, flavonoids, proteins, amino acids, sterols, terpenoids, tannins and coumarins (Table 4).

PRELIMINARY PHYTOCHEMICAL ANALYSIS

TABLE: 1 MORPHOLOGICAL FEATURES OF *Peltophorum pterocarpum* LEAF

LEAF TYPE	Bipinnately compound
LEAF ARRANGEMENT	Alternate, 11- 17 pairs of leaflets.
LEAF SHAPE	Oblong
SIZE	Rachis 25 to 35 cm long Lamina 1 to 2 cm length and 0.4 to 0.8 cm width
LEAF VENATION	Pinnate
LEAF – MARGIN APEX BASE BENEATH MIDRIB	Entire Obtuse to retuse Truncate Puberulent Prominent
LEAF COLOUR	Fresh leaf – Green Dried leaf – Yellowish green

TABLE: 2 QUANTITATIVE MICROSCOPY OF *Peltophorum pterocarpum* LEAF

PARAMETERS	UPPER EPIDERMIS (/mm ²)	LOWER EPIDERMIS (/mm ²)
Epidermal number	1536 – 1648	1344 – 1616
Stomatal number	-	208 – 256
Stomatal index	-	13.90
Palisade ratio		4-7
Vein islets number		9
Vein termination number		31

TABLE: 3 PHYSICO-CHEMICAL PARAMETERS OF *Peltophorum pterocarpum* LEAF

S. NO	PARAMETERS	RESULTS
1	FOREIGN MATTER	NIL
2	LOSS ON DRYING	10.88 ± 0.126 % w/w
3	EXTRACTIVE VALUE	
	❖ Petroleum ether extract	1.46 ± 0.042 % w/w
	❖ Chloroform extract	4.06 ± 0.117 % w/w
	❖ Acetone extract	7.53 ± 0.218 % w/w
	❖ Ethanolic extract	13.20 ± 0.381 % w/w
	❖ Hydroalcoholic extract	23.06 ± 0.665 % w/w
	❖ Diethyl ether extract	1.86 ± 0.054 % w/w
	❖ Aqueous extract	12.40 ± 0.357 % w/w
4	ASH VALUE	
	❖ Total ash	11.18 ± 0.129 % w/w
	❖ Water soluble ash	5.66 ± 0.065 % w/w
	❖ Acid insoluble ash	9.26 ± 0.107 % w/w

TABLE: 4 PRELIMINARY PHYTOCHEMICAL ANALYSIS OF HAEPF

S.NO	TEST	INFERENCE
1	ALKALOIDS	PRESENT
	MAYER'S TEST	+
	WAGNER'S TEST	+
	HAGER'S TEST	+
	DRAGENDORFF'S TEST	+

2	CARBOHYDRATES	PRESENT
	MOLISCH'S TEST	+
	FEHLING'S TEST	+
	BENIDICT'S TEST	+
3	GLYCOSIDES	
	ANTHROQUINONE GLYCOSIDES	ABSENT
	BORNTRAGER'S TEST	-
	MODIFIED BORNTRAGER'S TEST	-
	CARDIAC GLYCOSIDES	ABSENT
	KELLER KILIANI TEST	-
	LEGAL'S TEST	-
BALGET'S TEST	-	
4	STEROLS	PRESENT
	SALKOWSKI'S TEST	+
	LIBERMAN BURCHARD'S TEST	+
5	FLAVONOIDS	PRESENT
	SHINODA TEST	+
	ALKALI TEST	+
	LEAD ACETATE TEST	+
	ZINC HYDROCHLORIDE TEST	+
6	PROTEINS	PRESENT
	MILLON'S TEST	+
	BIURET TEST	+
7	AMINO ACIDS	PRESENT
	NINHYDRIN TEST	+
	NITRIC ACID TEST	+
8	TERPENOIDS	PRESENT
	NOLLER'S TEST	+
	TRITERPENOIDS	PRESENT
9	GUM	ABSENT
10	MUCILAGE	ABSENT
11	SAPONINS	ABSENT
	FOAM TEST	-
12	TANNINS	PRESENT
	FERRIC CHLORIDE TEST	+
	GELATIN TEST	+
13	VOLATILE OIL	ABSENT
14	FIXED OIL AND FATS	ABSENT
15	COUMARINS	PRESENT

FIGURE: 1 *Peltophorum pterocarpum* leaf



FIGURE: 2 TS OF *Peltophorum pterocarpum* RACHILLA

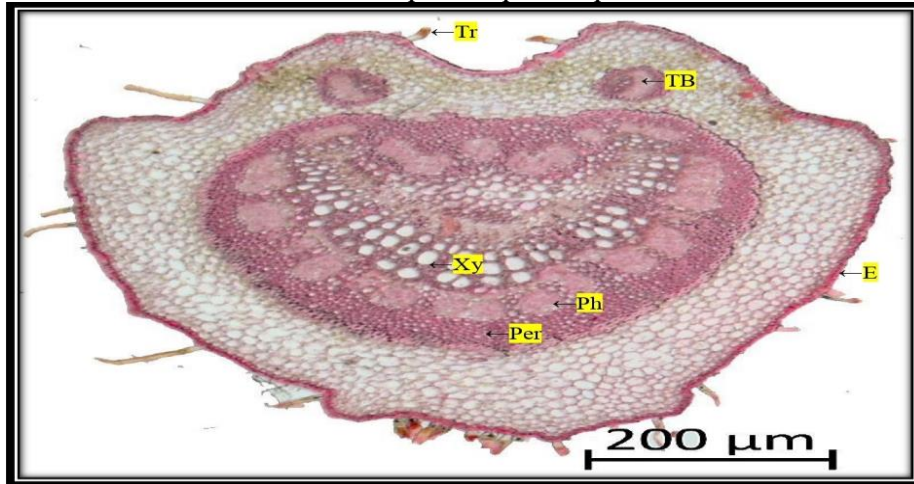


FIGURE: 3 TS OF RACHILLA UPPER PORTION ENLARGED VIEW

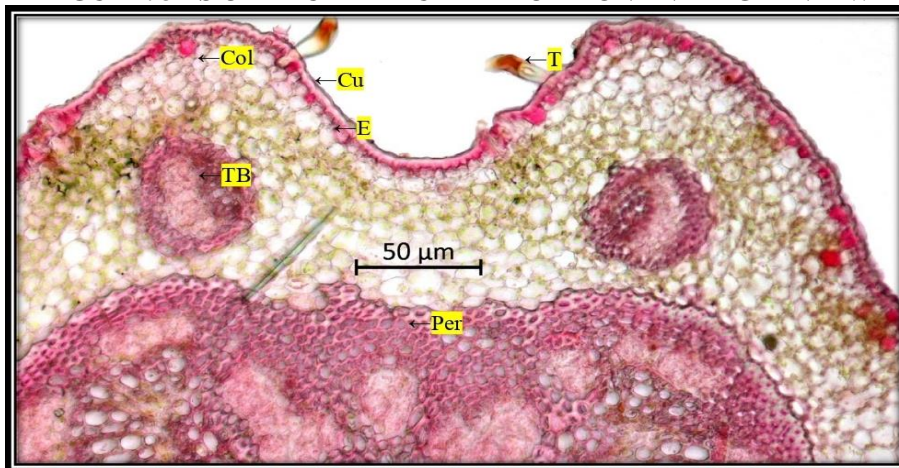


FIGURE: 4 TS OF RACHILLA MIDDLE PORTION ENLARGED VIEW

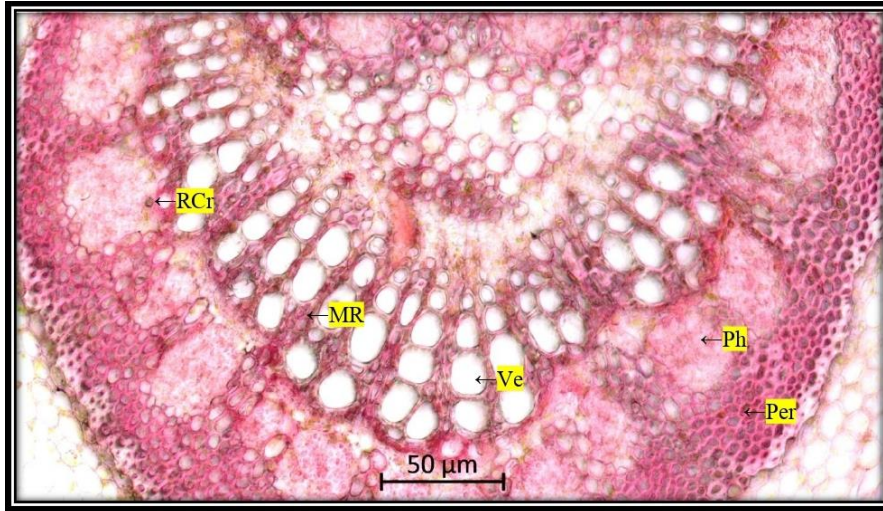
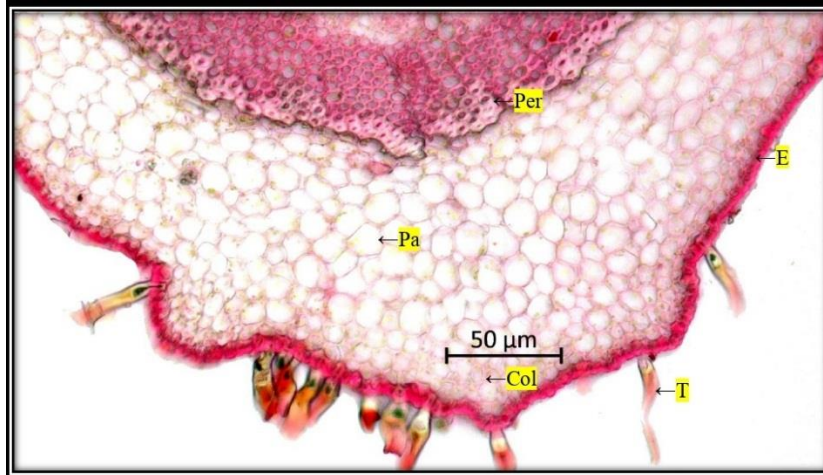


FIGURE: 5 TS OF RACHILLA LOWER PORTION ENLARGED VIEW



Col - collenchyma; Cu - cuticle; E - epidermis; MR - medullary ray; Pa - parenchyma; Per - pericycle; Ph - phloem; RCr - rosette crystal; T - trichome; TB - trace bundle; Ve - vessel; VB - vascular bundle

FIGURE: 6 TS OF *Peltophorum pterocarpum* MIDRIB

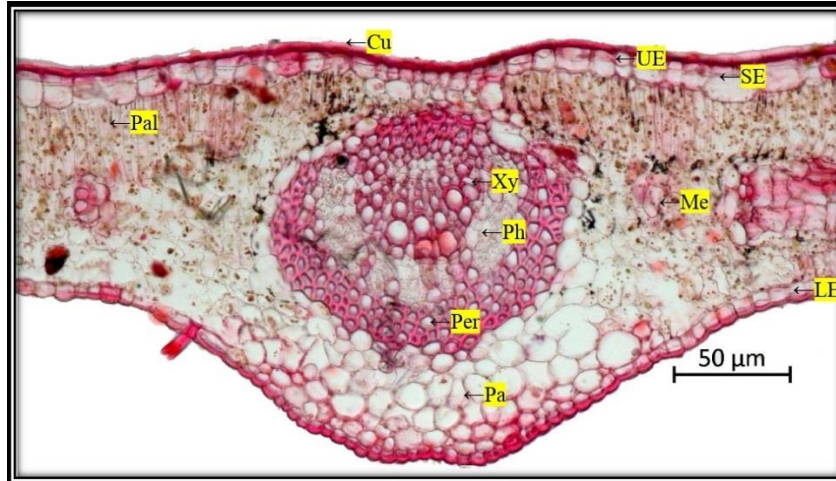


FIGURE: 7 TS OF LAMINA PASSING THROUGH MIDRIB

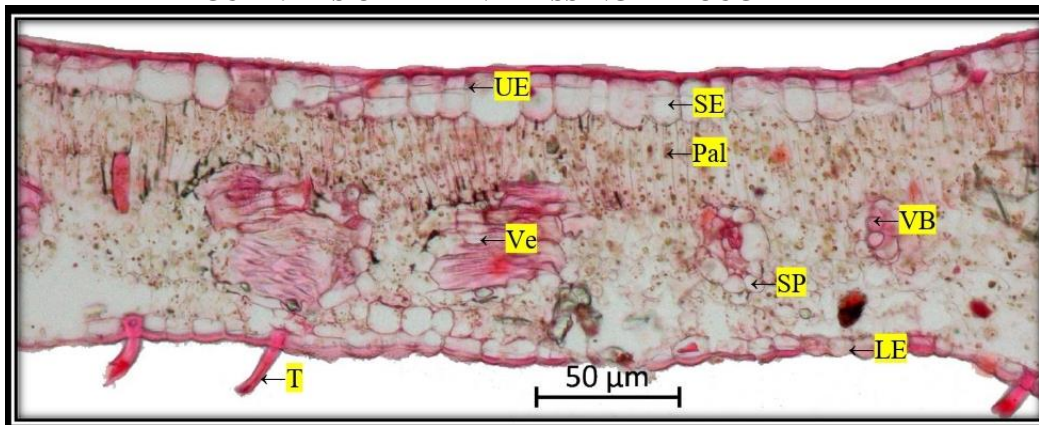


FIGURE: 8 TS OF LAMINA PASSING THROUGH MARGIN

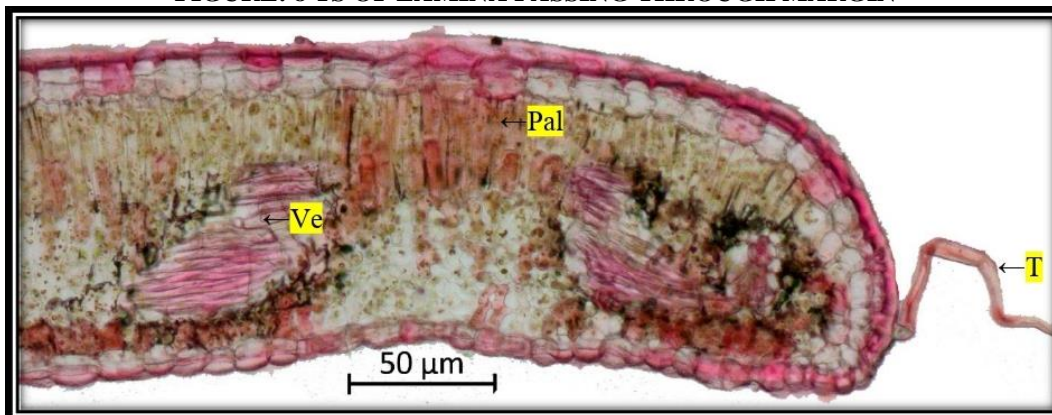


FIGURE: 9 VEIN ISLET AND VEIN TERMINATION

Cu – cuticle; E – epidermis; Lat – laticiferous cells; LE – lower epidermis; Me – mesophyll; Pa – parenchyma; Pal – palisade; Per – pericycle; Ph – phloem; SE – sub-epidermis; Sp – spongy parenchyma; T – trichome; UE – upper epidermis; Ve – vein; Xy – xylem



FIGURE: 10 UPPER EPIDERMIS

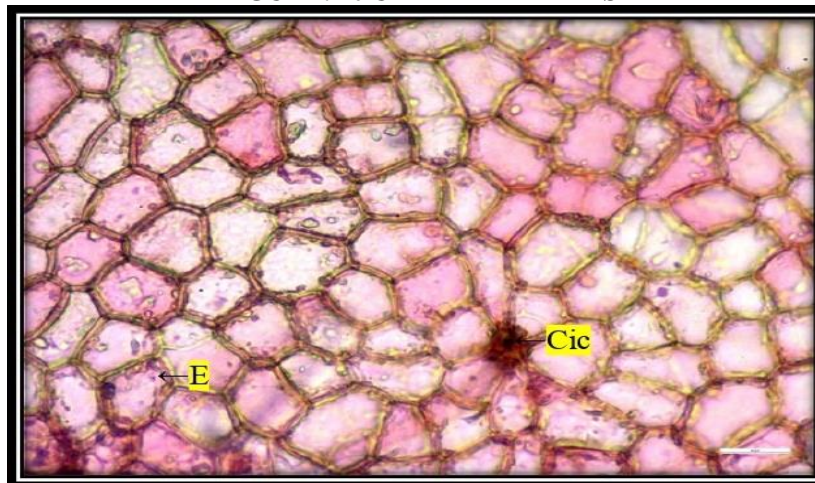
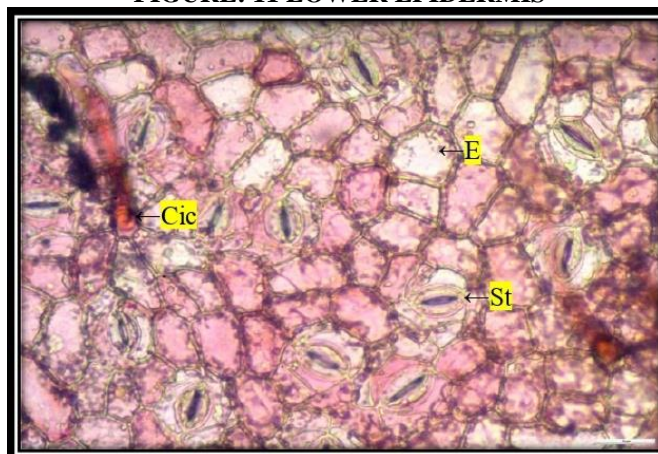


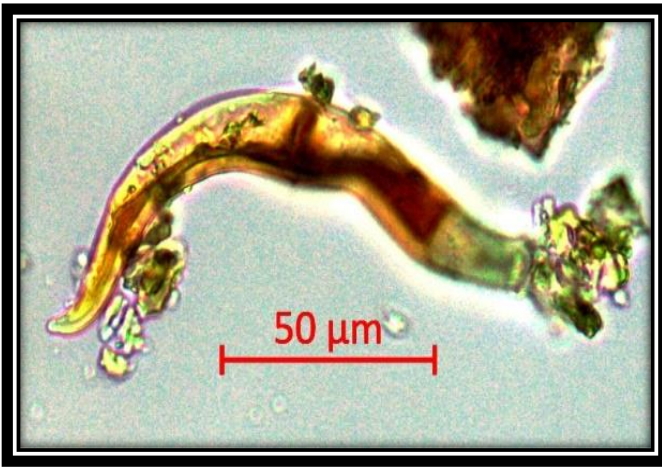
FIGURE: 11 LOWER EPIDERMIS



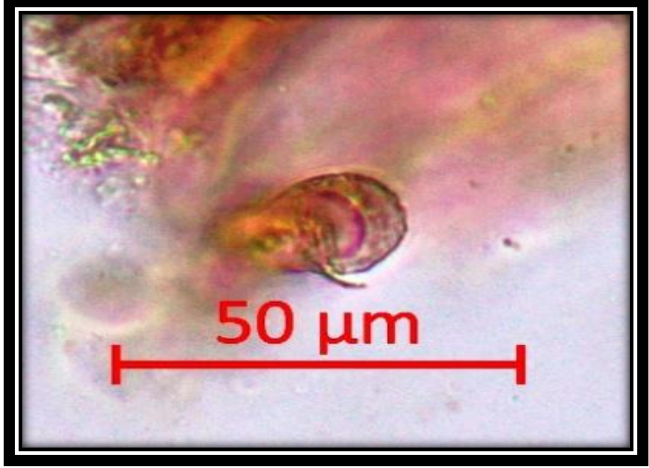
Cic – cicatrix; E - epidermis; St - stomata; VT - vein islet; VI - vein termination

FIGURE: 12 POWDER MICROSCOPY OF *Peltophorum pterocarpum* LEAF

Trichome with brownish content



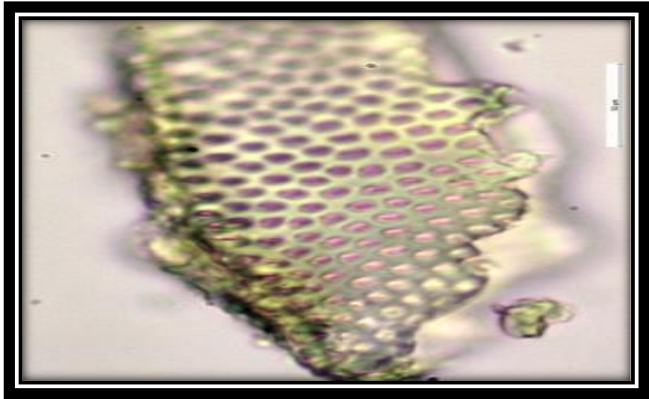
Glandular trichome



Annular, spiral and pitted vessels



Pitted vessel



Trichomes and starch grains

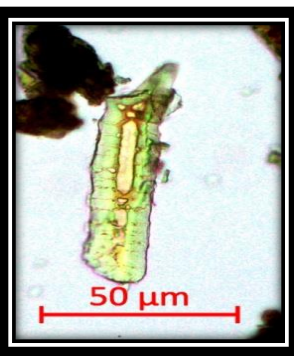


Fibres

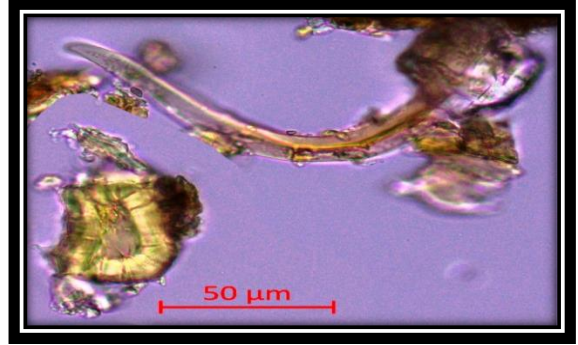


Sclereids

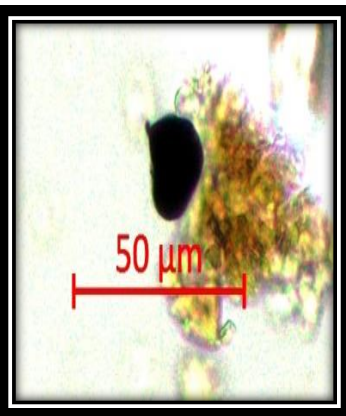
Sclereids



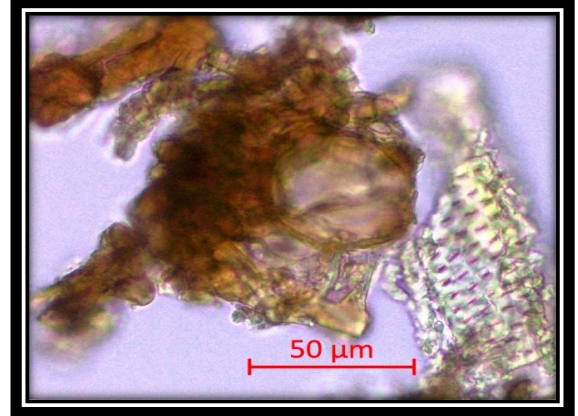
Starch grains



Mucilage cavity and pitted vessel



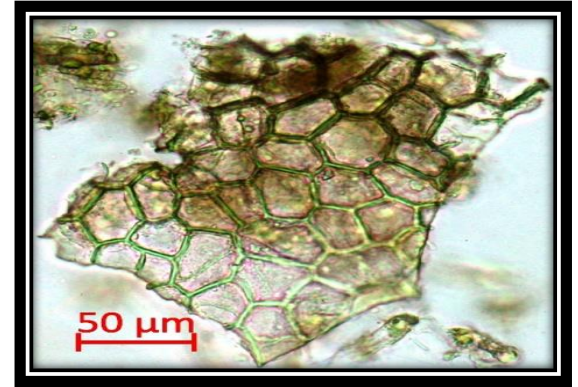
Lower epidermis with stomata



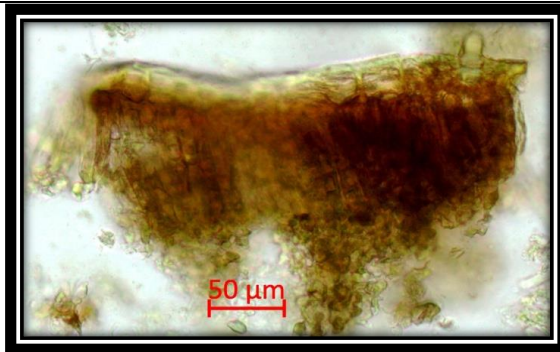
Upper epidermis in surface view



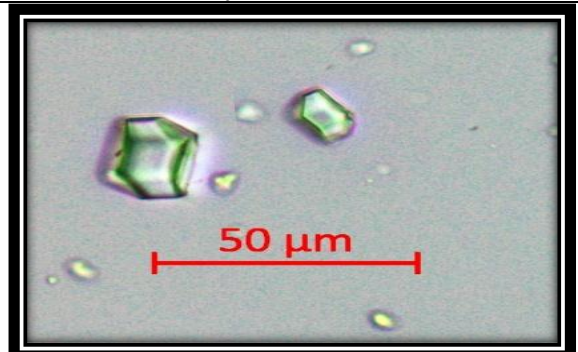
Lamina in section view



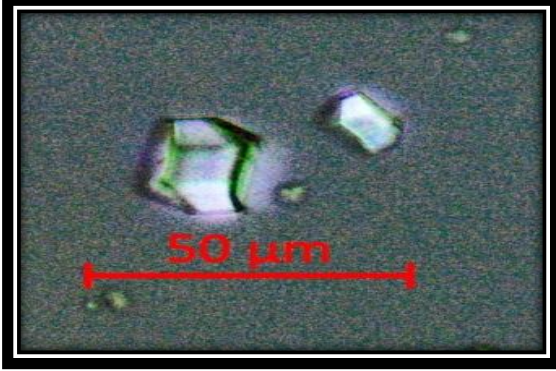
Prismatic crystals of calcium oxalate



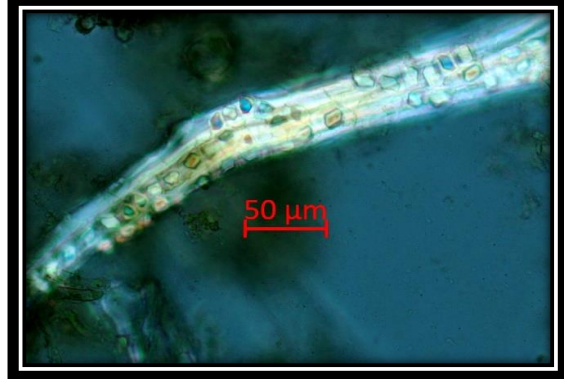
Prismatic crystals of calcium oxalate under polarizer light



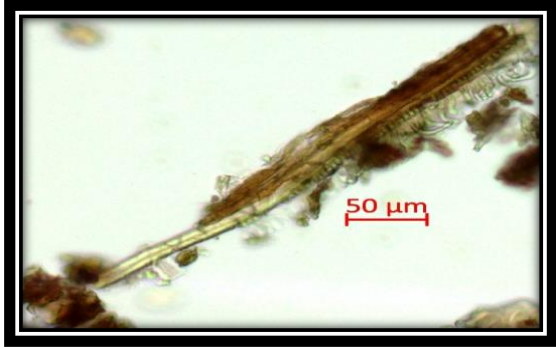
Crystal fibre under polarizer light



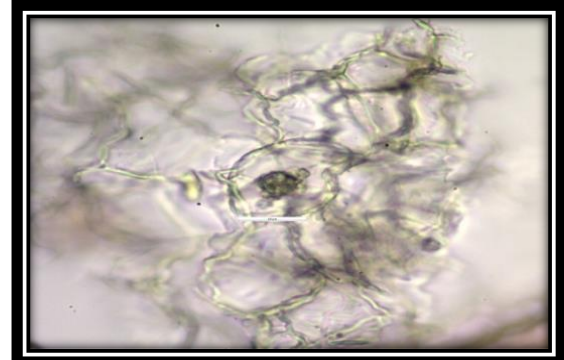
Fragment of vascular bundle



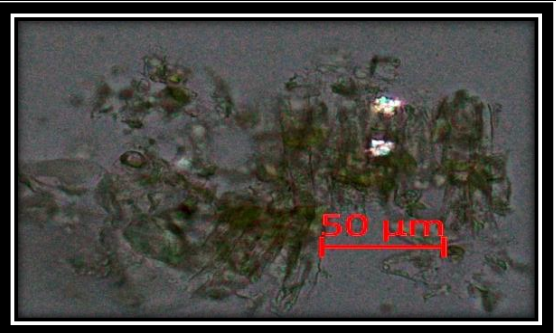
Fragment of parenchyma cells with cluster crystals of calcium oxalate



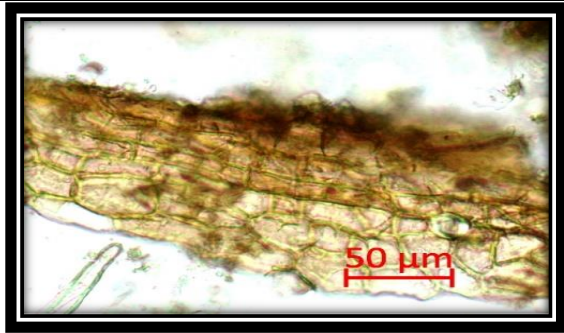
Parenchyma cells with clustar crystals of calcium oxalate under polarizar light



Epidermal cells of rachilla



Pitted parenchyma



CONCLUSION

The Pharmacognostical parameters of *Peltophorum pterocarpum* leaves are helpful in identification, authentication and acquire genuine plant materials. The phytochemical studies revealed the presence of various phytoconstituents. These parameters are very helpful in the new drug development.

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REFERENCES

- Abdullahi R. Abubakar and Mainul Haque., (). Preparation of Medicinal Plants: Basic Extraction and Fractionation Procedures for Experimental Purposes. *J Pharm Bioall Sci.*, 12, 2020, 1-10.
- Anonymous. 'Quality Control Methods for Medicinal Plant Materials', WHO, 1998, 8-37.
- Anonymous. 'The Ayurvedic Pharmacopoeia of India', part I, volume I(1), Ministry of Health and Family Welfare, Government of India, 2001, 140- 142.
- Arul Sheeba Rani, M and Mary Josephine, R. A study on selected individual tree canopy of *Peltophorum pterocarpum*, (DC.) K. Heyne. *IJCRT*, 6(2), 2018, 824-831.
- Corners, E. J. H. *Wayside Trees of Malaya: in two volumes*. Fourth edition, Malayan Nature Society, Kuala Lumpur; 1: 1997, 1-476. Plates, 1-38; 2: 477-861, plates 139-236.
- Dharmasoth Rama Devi and Ganga Rao Battu. A phytochemical and pharmacological review on *Peltophorum pterocarpum*. *Wjpps*, 7(6), 2018, 166 -176.
- Estevão N. F. Souza., Elizabeth M. Williamson and Julie A. Hawkins. Which plants used in ethnomedicine are characterized? Phylogenetic patterns in traditional use related to research effort. *Front. Plant Sci.*, 9, 2018, 834.
- Harbone JB. *Phytochemical Analysis, a guide to modern techniques of plant analysis*. Chapman & Hall, London. 1973.
- Iyengar M.A and Nayak S.G.K. *Pharmacognosy lab manual*. Manipal press, Manipal, 1994, 78-87.
- Kokate C.K., Purohit A.P. and Gokhale S.B. *Text book of Pharmacognosy*, Nirali prakashan, 13th edition: 1994, 593-597.
- Nathan VK., Antonisamy JM., Gnanaraj WE and Subramanian KM. Phytochemical and bio-efficacy studies on methanolic flower extracts of *Peltophorum pterocarpum* (DC.) Baker ex Heyne. *Asian Pacific Journal of Tropical Biomedicine*, 2(2), 2012, S641-S645.
- Payal M. Panchal. Pharmacognostical and Phytopharmacological Investigation of *Peltophorum pterocarpum* (DC) Backer ex. Heyne. *International journal of ayurvedic medicine*, 3(4), 2012, 196-217.
- Swee Ping and Wee Mei Lynn. *Trees of our Garden City*. National Parks Board, 202, 2001.
- Tan. Hugh T.W. and T. Morgany. *Growing the Native Plants of Singapore*. BP Science Centre Guidebook, 168. 2001.
- Wallis TE. *Text book of pharmacognosy*, 1st edition, J and A churuchill Ltd, London. 1946