**Journal of Cardiovascular Disease Research**

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

# Pharmacognostic Analysis of Michelia champaca Bark, Scoparia dulcis Whole Plant, Ziziphus mauritiana Leaves

**SEGU PRATHYUSHA[1], MALARKODI VELRAJ[2*]**

1. Depertment of Pharmacognosy, VELS Institute of Science, Technology & Advanced Studies, Chennai, Tamil Nadu. segu.prathyu@gmail.com

2. Department of Pharmacognosy, VELS Institute of Science, Technology & Advanced Studies, Chennai, Tamil Nadu, geethakeralaph.d@gmail.com.

**ABSTRACT:**

Plants are used as medicine to maintain human health and are major natural sources of medicinal compounds. The initial step for documenting quality of the herbal material is authentication which may be followed by developing standard numerical values for assessment. *Michelia champaca* Linn. (Family-Magnoliaceae) commonly known as champaca, consists of 12 genera and 220 species of evergreen trees and shrubs, traditionally used to treat diabetes, fever, colic, leprosy. *Scoparia dulcis* is ubiquitous weed seen in areas at low to medium altitudes along roadsides, and other more or less shaded and moist places. *Ziziphus mauritiana* is believed to have originated in Indo-Malaysian region. The leaves are alternate, ovate or oblong elliptic with rounded apex, with 3 depressed longitudinal veins at the base. The present study aims at Pharmacognostical standardization of *Michelia Champaca* bark, *Scoparia dulcis* whole plant, *Ziziphus mauritina* leaves that would be useful in preparing suitable monographs which help in the proper identification of the plants as well as in detecting adulteration and substitution. The present study has provided detailed description of the Pharmacognostic and physicochemical features of *Michelia Champaca* bark, *Scoparia dulcis* whole plant, *Ziziphus mauritina* leaves, clearly giving distinguishing characteristics, which are useful in laying down standardization and pharmacopeial parameters.

**Key words:** Pharmacognostic Analysis, *Michelia champaca* Bark, *Scoparia dulcis* whole plant, *Ziziphus mauritiana* leaves.

## INTRODUCTION

India has wide-ranging traditional medicines based on ancient, diverse medical systems like Ayurveda, Unani, Siddha and Homeopathy. Plants are used as medicine to maintain human health from ages[1] and are also major natural sources of medicinal compounds in current pharmacopoeias.[2] The initial step for documenting quality of the herbal material is authentication which may be followed by developing standard numerical values for assessment.[3] In this direction, detailed Pharmacognostic evaluation, including external appearance, internal microscopy, physicochemical characteristics and fluorescence analysis, is vital for standardization of the crude drug.[4]

*Michelia champaca* Linn. (Family-Magnoliaceae) commonly known as champaca, consists of 12 genera and 220 species of evergreen trees and shrubs, native to tropical and subtropical South and Southeast Asia, including Southern China.[5] In India, it is highly distributed in Eastern Himalayan tract, Assam, Myanmar, Western Ghats, South India, Arunachal Pradesh and Bihar. Traditionally, this plant bark is used to treat diabetes and leaves used for the treatment of fever, colic, leprosy, postpartum protection and in eye disorders. Juice of the leaves is given with honey in colic.[6,7]

*Scoparia dulcis* is ubiquitous weed seen in areas at low to medium altitudes along roadsides, and other more or less shaded and moist places.[8] It is an erect, branched, smooth, herbaceous, or half-woody plant grows up to 25 to 80 centimeters in height.[9,10]

*Ziziphus mauritiana* is believed to have originated in Indo-Malaysian region of South-East Asia. It is widely distributed throughout Southern Africa, Indian Subcontinent, China, Australia and the Pacific Islands. The leaves are alternate, ovate or oblong elliptic with rounded apex, with 3 depressed longitudinal veins at the base. The leaves are dark-green and glossy on the upper side and pubescent and pale-green to grey-green on the lower side, and about 2.5 to 3.2 cm long and 1.8 to 3.8 cm wide having fine tooth at margin.[11]

The present study aims at Pharmacognostical standardization of *Michelia Champaca* bark, *Scoparia dulcis* whole plant, *Ziziphus mauritina* leaves that would be useful in preparing suitable monographs which help in the proper identification of the plants as well as in detecting adulteration and substitution.

## MATERIALS AND METHODS

### Collection of plant specimens

The plant specimens for the proposed study were collected from Dr. K. Madhava Chetty Asst. Professor, Sri Venkateshwara University, Tirupati, A.P in the month of February 2018. They were identified and authentified by Prof. Jayaraman, Director of Plant Anatomy Research Centre, West Tambaram, Chennai.

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

**Chemicals and Equipment**

All chemicals and reagents used were obtained from M/S Merck Specialties, Mumbai. fluorescence analysis was performed with UVGL-58 Handheld UV lamp (254/365 nm), Cambridge, UK.

**Organoleptic and Macro-morphological Studies**

*Michelia Champaca* bark, *Scoparia dulcis* whole plant and *Ziziphus mauritina* leaves were organoleptically and macroscopically examined to determine their features. This included odour, colour, leaf shape and arrangement.[12]

**Anatomical Studies of Plants**

Care was taken to select healthy plants and normal organs. The required samples of different organs were cut and removed from the plant and fixed in FAA (Farmalin-5mL+ Acetic acid-5mL + 70% Ethyl alcohol-90mL). After 24hrs of fixing, the specimens were dehydrated with graded series of tertiary butyl alcohol (TBA) as per the schedule given by Sass, et al., 1940. Infiltration of the specimens was carried by gradual addition of paraffin wax (melting point 58-60ºC) until TBA solution attained super saturation. The specimens were cast into paraffin blocks. The paraffin embedded specimens were sectioned with the help of Rotary Microtome. The thickness of the sections was 10-12 µm. Dewaxing of the sections was done by customary procedure.[13] The sections were stained with Toluidine blue.[14] Since Toluidine blue is a polychromatic stain. The staining results were remarkably good; and some cytochemical reactions were also obtained. The dye rendered pink colour to the cellulose walls, blue to the lignified cells, dark green to suberin, violet to the mucilage, blue to the protein bodies etc., wherever necessary sections were also stained with safranin and Fast-green and IKI (for Starch).

For studying the stomatal morphology, venation pattern and trichome distribution, paradermal sections (sections taken parallel to the surface of leaf) as well as clearing of leaf with 5% sodium hydroxide or epidermal peeling by partial maceration employing Jefferey's maceration fluid were prepared.[15] Glycerin mounted temporary preparations were made for macerated/ cleared materials. Powdered materials of different parts were cleared with NaOH and mounted in glycerin medium after staining. Different cell component was studied and measured.

Microscopic descriptions of tissue are supplemented with micrographs wherever necessary. Photographs of different magnifications were taken with Nikon lab photo 2 microscopic Unit. For normal observations bright field was used. For the study of crystals, starch grains and lignified cells, polarized light was employed. Since these structures have bifringent property under polarized light, they appear bright against dark background. Magnifications of the figures are indicated by the scale-bars. Descriptive terms of the anatomical features are as given in the standard Anatomy books.[16]

**Powder Microscopy**

Coarsely powdered *Michelia Champaca* bark, *Scoparia dulcis* whole plant and *Ziziphus mauritina* leaves were viewed under the microscope at different magnifications using mountants including chloral hydrate, phloroglucinol in concentrated HCl, water and iodine. Photomicrographs of the different cellular structures and inclusions were taken.[17]

**Physicochemical Parameters**

Powdered bark *Michelia Champaca* bark, *Scoparia dulcis* whole plant and *Ziziphus mauritina* leaves were subjected to physicochemical analysis. Their solvent soluble extractives, ash values, loss on drying, swelling and foaming index were determined according to the official methods described in the Indian pharmacopeia and WHO guidelines on quality control methods for medicinal plant materials.[18-20]

**Fluorescence Analysis**

The powdered materials of *Michelia champaca* bark, *Scoparia dulcis* whole plant and *Ziziphus mauritiana* leaf were examined as such and then treated with freshly prepared acids, alkaline solutions and different solvents like $FeCl_3$, Conc. HCl, 10% $HNO_3$, NaOH, Conc. $HNO_3$, Bromine water, 5% $H_2O_2$, $CCl_4$, methanol, acetic acid, and iodine solution. They were subjected to fluorescence analysis in daylight and in UV- light (254 nm).[21]

**RESULTS AND DISCUSSION**

**Organoleptic and Macro-morphological Studies**

The Organoleptic characters of the *Michelia champaca* bark, *Scoparia dulcis* whole plant and *Zizyphus mauritiana* leaves powder are tabulated as Table 1 and shown in Fig 1.

**Table 1:** Organoleptic Properties of *Michelia champaca* bark, *Scoparia dulcis* whole plant and *Zizyphus mauritiana* leaves powder

| **Parameter** | **MC** | **SD** | **ZM** |
|---|---|---|---|
| Appearance | Powder | Coarse powder | Powder |

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

| | | | |
|---|---|---|---|
| Colour | Reddish brown | Yellowish brown | Green |
| Odour | Fragrant | Pungent | Slight odour |
| Taste | Slightly bitter | Bitter | Sour to sweet |

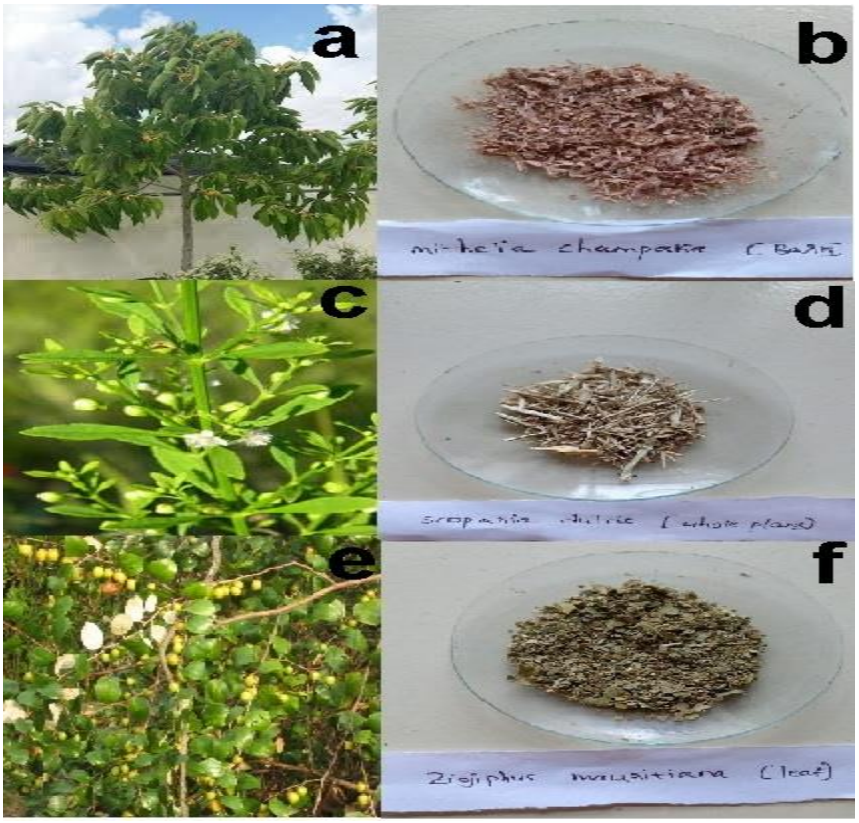



**Fig 1: a.** *Michelia champaca* plant, **b.** *Michelia champaca* bark powder, **c.** *Scoparia dulcis* plant, **d.** *Scoparia dulcis* whole plant powder, **e.** *Ziziphus mauritiana* plant, **f.** *Ziziphus mauritiana* leaf powder.

**Anatomy of *Michelia champaca* bark**:

The surface of the bark is grey colour and slightly rough. The epidermal layer is broken and peeled off. There is a thick periderm layer which includes outer phellem and inner phelloderm (Fig 2 a, b). Inner to the periderm is thick cortex which includes thin zones of parenchyma cells. The periderm consists of about 8 layers of thick-walled rectangular dead suberised cells. Inner to the Phellem layers is a thin zone of phelloderm cells. These cells are more cellulose. Walls and are living cells. The phelloderm is four layered and the cells are rectangular (Fig 2c). In the deeper part of the bark there is second zone of periderm, originated from phelloderm cells. The second layer of periderm consist of four or five layers rectangular suberised cells (Fig 2d). Along the inner boundary of the cortex, there is a thin continuous layer of brachy sclereids. These sclereids are isodiametric cells with thick lignified walls and canal like simple pits (Fig 2e). These features could be beneficial in differentiating the species from other species.

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

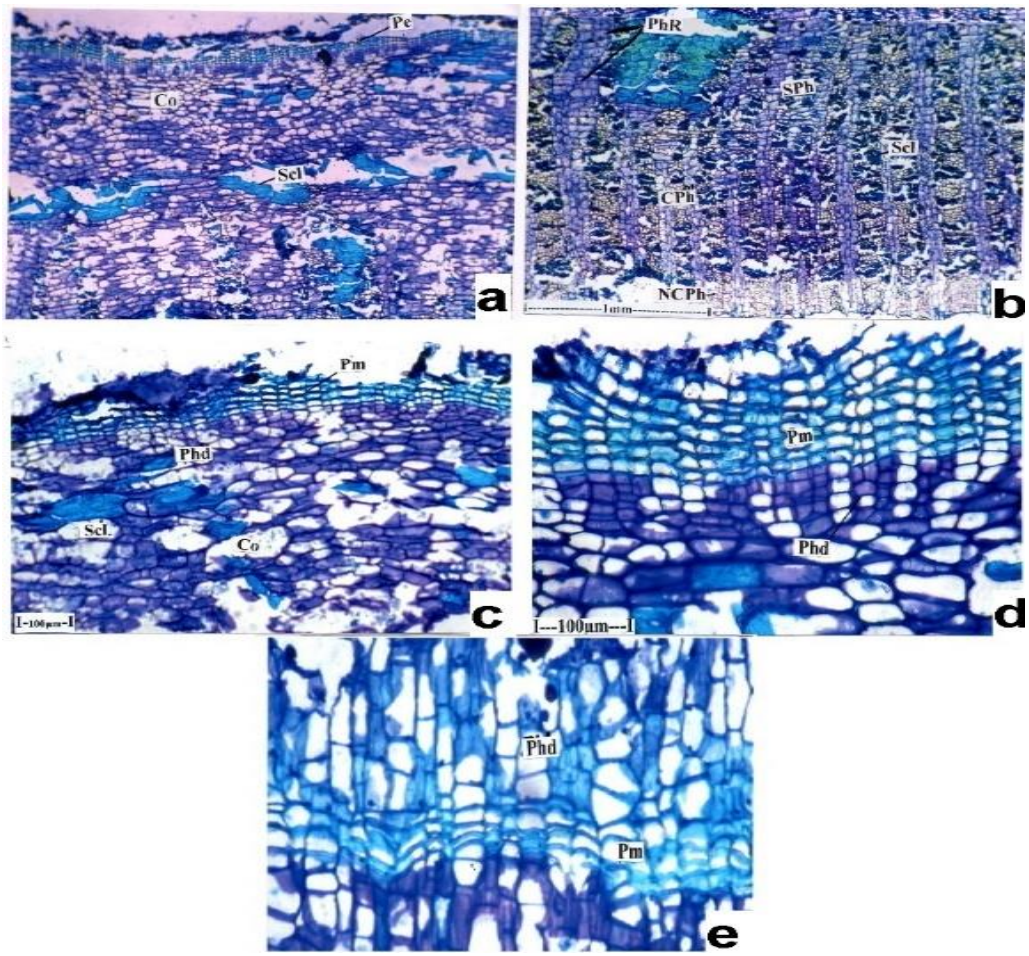



**Fig 2: a, b** T. S of bark entire view (4 X) **c.** T.s of bark Showing Periderm and cortex (10 X) **d.** Periderm with Phellem and Phelloderm-enlarged (20 X) **e.** Secondary zone of periderm formed from inner tissue (40 X)

**Secondary phloem:** It consists of two regions, namely, outer collapsed phloem zone and inner narrow zone of non-collapsed phloem. The collapsed phloem zone consists of slightly dilated straight phloem rays, numerous small groups of scattered sclereids and crushed and collapsed sieve elements and companion cells (Fig 3a). The non-collapsed phloem consists of intact well-preserved sieve elements with intact companion cells (Fig 3b, c). Mixed with the sieve elements are slightly wide parenchyma cells. The sieve elements are angular in outline, thin walled and compactly arranged. The companion cells are small and they are located at the corners of the sieve elements (Fig 3d).

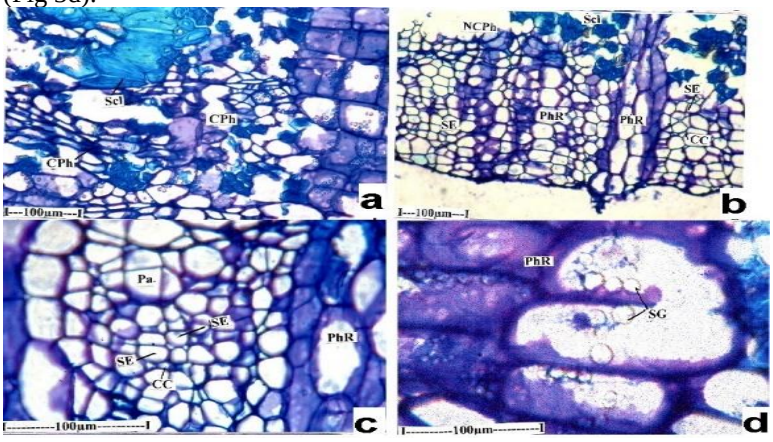



**Fig 3: a.** T.s of Collapsed Phloem – enlarged (20 X) **b.** T. S of Non - Collapsed Phloem (20 X) **c.** T.s of non - Collapsed Phloem (40 X) **d.** Ray cells with starch grains (40 X)

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

**Tangential longitudinal section of phloem (TLS):** In TLS view, the phloem rays appear spindle shaped and the rays are not storied but are at different levels. The rays are multiseriate, thick and spindle shaped. There are also biseriate rays which consist of two vertical rows of cells. The biseriate rays are elliptical in shape. The multiseriate rays are 400 µm in height and 110 µm wide. The rays are all heterocellular; they have middle polygonal or horizontally rectangular cells which are called procumbent cells, the cells at the upper and lower ends are vertically elongated and are called upright cells. Since the rays have two types of cells, they are heterocellular type (Fig 4). Starch grains are densely accumulated in the ray cells. Phloem fibers are in vertical alignment in TLS view.

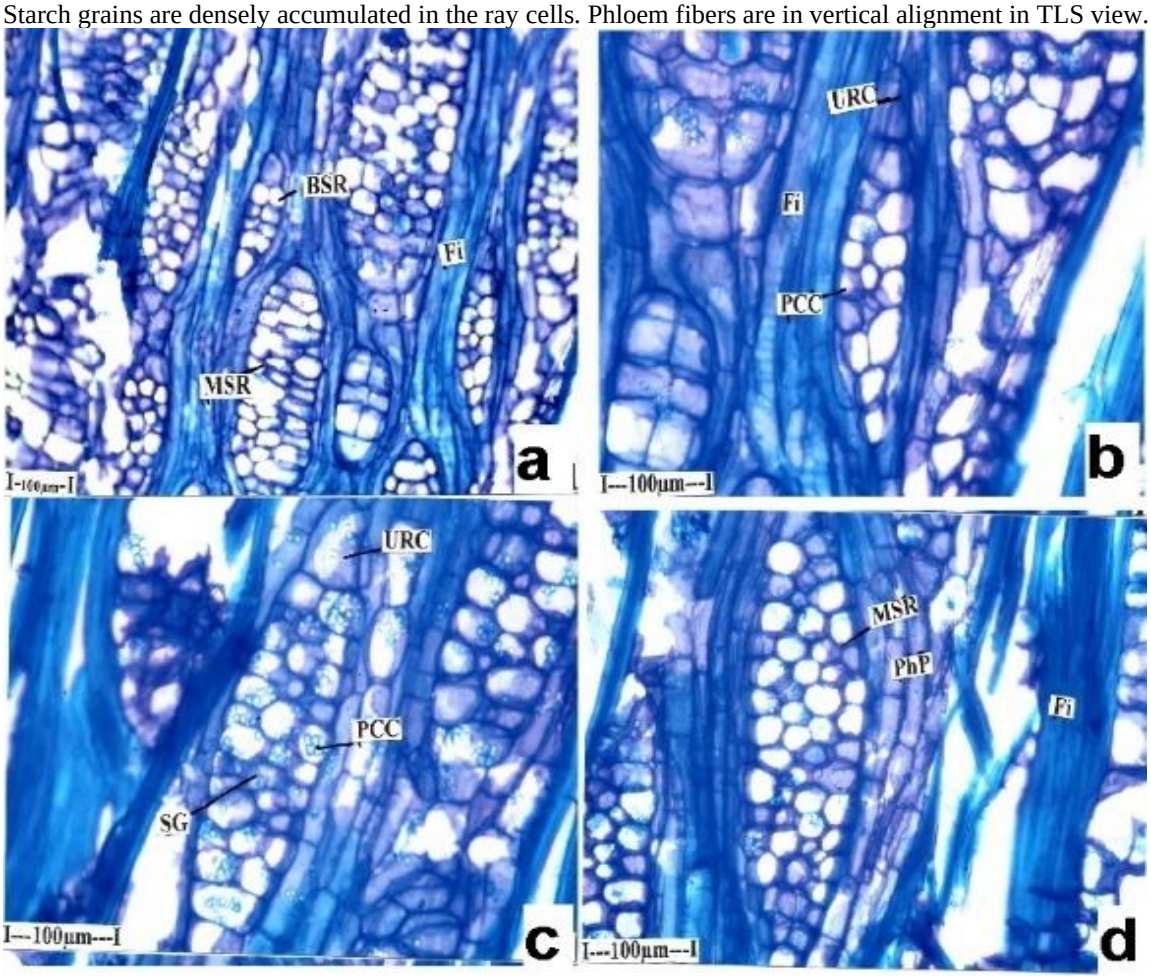



**Fig 4: a.** T. S of Phloem rays (10 X) **b.** Phloem rays enlarged (20 X) **c.** Phloem ray having procumbent cells and upright cells. Starch grains are seen (20 X) **d.** Multiseriate ray and axial parenchyma cells (20 X)

**Radial longitudinal section view (RLS): (5 a, b) In** RLS view, the phloem ray appears flat and thin sheath of cells, resembling the bricks of the wall. The cells are in horizontal rows one above the other. The cells in the middle portion of the ray are horizontally rectangular, the cells in the upper and lower margin of the ray are vertically elongated and erect. These cells are upright cells. (Fig 5 c, d). Thus, the Phloem rays are heterocellular.

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

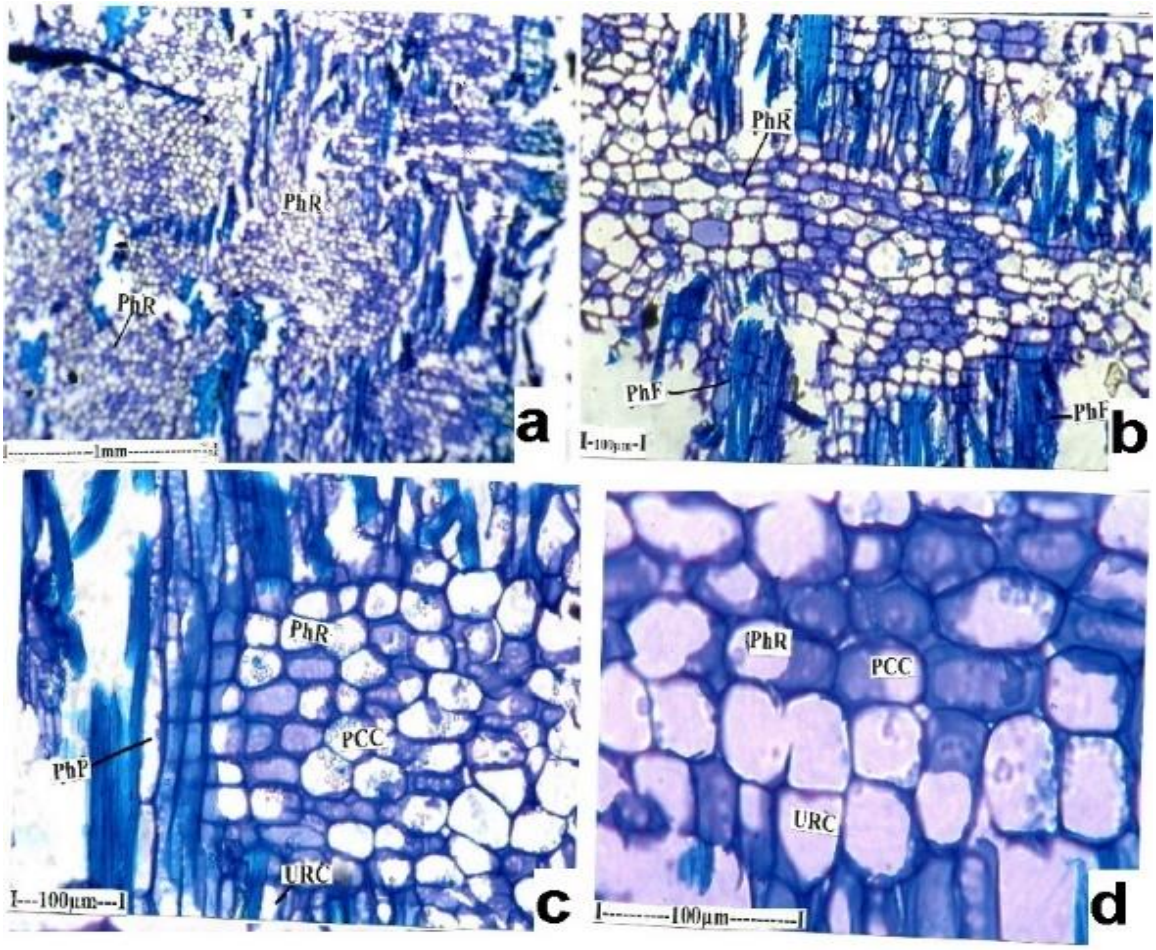



**Fig 5: a.** RLS of Phloem rays (4 X) **b.** Phloem ray - enlarged (10 X) **c.** Phloem Ray and axial parenchyma cells with Starch grains (20 X) **d.** Heterocellular nature of a ray (40 X)

**Anatomy of *Scoparia dulcis* whole plant**

**Leaf:** The leaf is mesomorphic and bisymmetry. It has a prominent midrib which is flat on the adaxial side and prominently projecting on the abaxial side (Fig 6a). The midrib measures 380 µm in vertical plane and 280 µm in horizontal plane. The adaxial epidermal cells of midrib are quite wide, spindle shaped and thin walled. The abaxial epidermal layer consists of wide squired cells with thick cuticle. Beneath the adaxial epidermal layer occurs extension of palisade cells from the lamina. The ground tissue of the midrib consists of angular or circular wide compact parenchyma cells (Fig 6b).

The vascular strand of the midrib is planoconvex with flat adaxial part and convex abaxial part (Fig 6c). The vascular strand consists of several wide angular thick-walled xylem elements. The protoxylem elements of the vascular bundle are directed towards adaxial side. All along lower part of xylem strand occurs discontinuous layer of phloem elements. The phloem is small, thick walled and they are in groups of two to three cells (Fig 6c). All around the vascular bundle occurs two layers of wide angular, fairly thick-walled hyaline band sheath cells.

**Lamina:** The lamina has prominent adaxial epidermis with varying shape of the cells. The adaxial epidermal cells are small and less prominent. The mesophyll tissue is differentiated in to single horizontal layer of cylindrical compact palisade cells and lower part of four or five layers of spherical compact Spongy Mesophyll cells. Small vascular bundle of the lateral vein may be seen in the mesophyll tissue. The lamina is 150 µm thick (Fig 6d).

**Leaf Margin:** The marginal part of the lamina is slightly curved down and measures 140 µm thick. The palisade spongy mesophyll differentiation and epidermal cell structures remained more or less unchanged (Fig 6e).

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

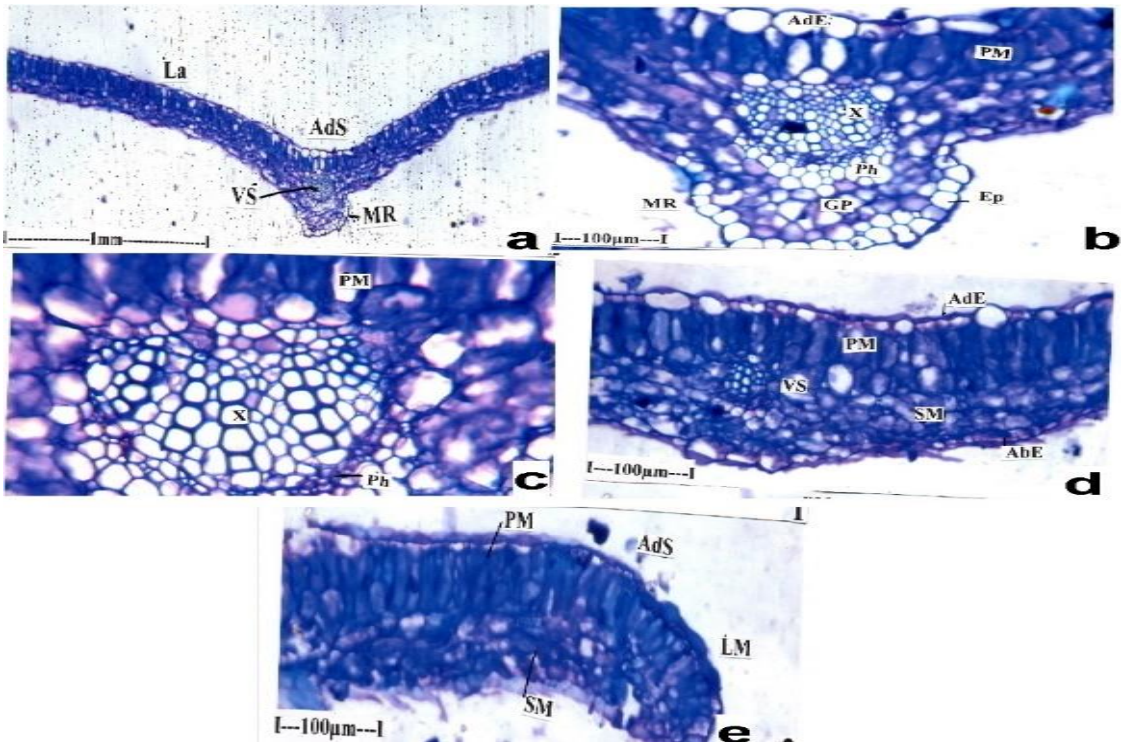



**Fig 6: a**. T. S of leaf through midrib (4X) **b.** T.S of midrib enlarged (20 X) **c.** Vascular bundle of the midrib-enlarged (20 X) **d.** TS of lamina (20 X) **e.** TS of leaf margin (20 X)

**Glandular trichome:** Peltate type of glandular trichome is occasionally seen on the adaxial epidermis. The gland has a short wide stalk cells which is attached on epidermal cell. The stalk beans a horizontal umbrella shaped gland. The gland consists of several radiating secretory cells forming circular disc. The gland is 60 µm in height and the circular disc is 110 µm wide (Fig 7a).

**Young stem:** The young stem is four angled and four winged as seen in Fig 7b. It is 1.5 mm thick. The wings are short and thick they are 10 µm long. The stem consists of their epidermal layer of small circular cells with prominent cuticle. The cortical zone is 6 or 7 layers of small circular compact parenchyma cells.

The vascular system is the young stem consists of thick hollow cylinder of secondary xylem ensheathed by this phloem layer (Fig 7c). The phloem elements are small and darkly stained. The secondary xylem cylinder is 270 µm thick. It consists of small angular thick-walled xylem elements dense, thick-walled lignified xylem fibers and thin short straight xylem rays (Fig 7d). The central portions occupied by wide pith, where the cells are circular, large and compact. The cells have dense tannin.

**Old stem:** The old stem is six angled and six winged (Fig 7e). The wings are thick, short and slightly curved ranging 150 µm long and 120 µm thick. The wing has their epidermal layer and thick parenchymatous cortical zone. The vascular cylinder is thick and hallow. It comprises outer thin layer of phloem and thick cylinder of secondary xylem. This is discontinuous layers of fibers on the outer part of phloem (Fig 7f). Phloem elements are small, thick walled and compact. Secondary xylem consists of compact cylinder of radial fibers of angular xylem elements, thick-walled angular fibers and radial thin lines of rays (Fig 7g, h).

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

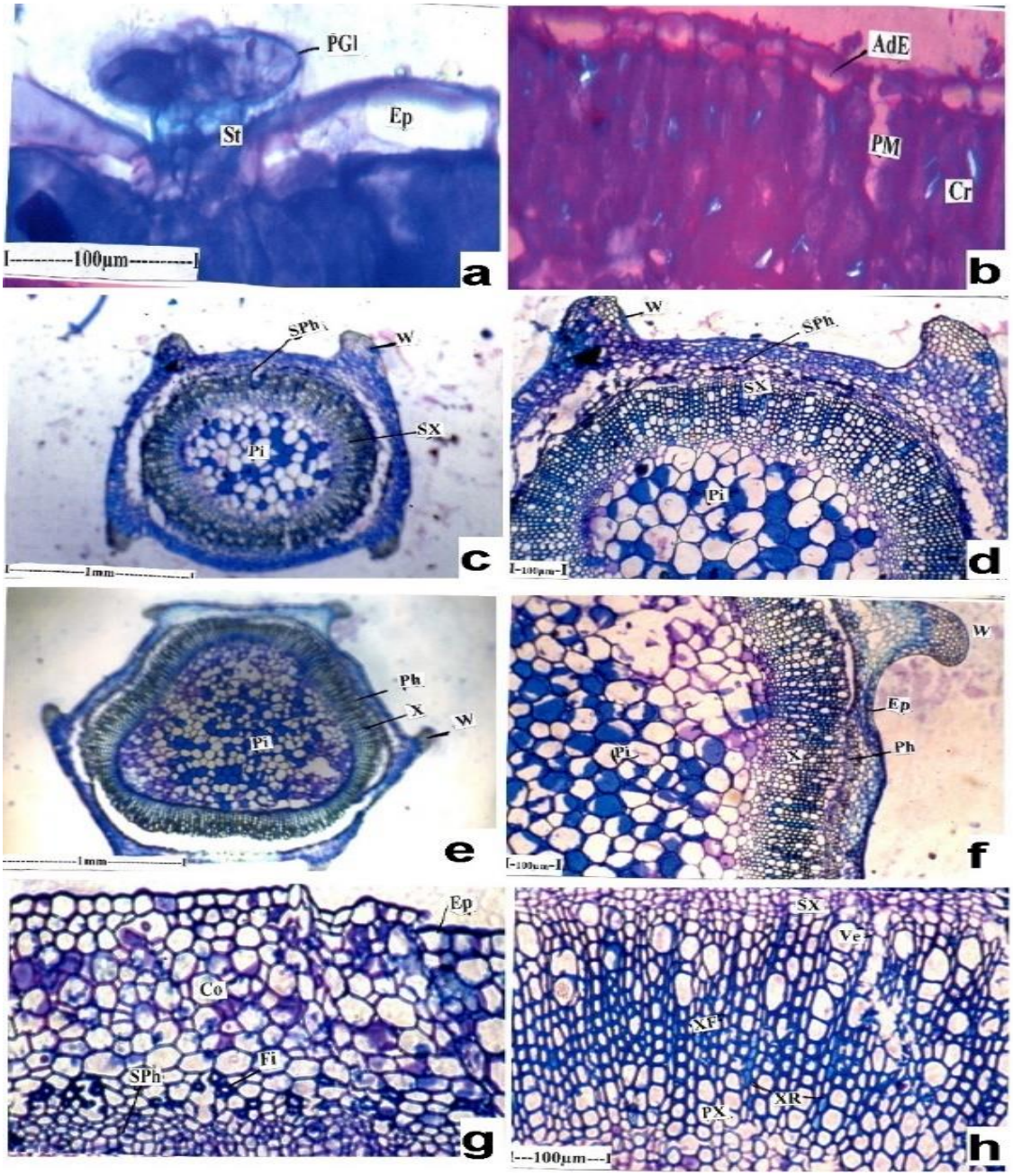



**Fig 7: a.** TS of lamina with Peltate Gland (40 X) **b.** Crystal distribution in the lamina (40 X) **c.** Young stem TS: entire view (4 X) **d.** Young stem TS - A sector enlarged (10 X) **e.** TS of old stem (4 X) **f.** TS of old stem - Sector enlarged (10 X) **g, h.** Thick stem a sector enlarged (20 X)

The wings have small, thick-walled sclerenchyma cells (Fig 8a). In the wing tissue there are numerous thin, short spindle shaped calcium oxalate crystals (Fig 8b). These crystals have pointed ends and are diffuse in distribution. The crystals are solitary in each cell.

**Root:** Three sizes of root were studied. Very thin root measures 1mm thick. It consists of broken epidermis and 2 or 3 layers of fairly wide view called cortical cells (Fig 8c, d). These are wide raising air chambers separated by the radial partition filaments. The central core has vascular cylinder which has endodermal layer and thin circle of phloem. The major central part is occupied by solid thick cylinder of secondary xylem. The secondary xylem has narrow xylem elements in the centre and wide circular xylem elements in the periphery. The ground tissue of the xylem cylinder in the xylem fibers which are small thick walled and lignified (Fig 8e). Slightly thicker than the previous root is 1.7mm thick. The epidermal layer is broken; the outer cortical part has two or three layers of cells.

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

The inner cortex has several radiating wide air chambers. The air chambers are separated from each other by thick, multi-layered partition filaments. There is an endodermal layer encircling the vascular cylinder (Fig 8f).

The vascular cylinder has fairly thin layer of phloem. Phloem tissue is disintegrated at certain places leaving empty space. The secondary xylem cylinder consists of wide, circular or angular thick walled xylem elements which are in radial lines. Xylem fibers are in straight radial lines these are thick walled and lignified (Fig 8f).

**Thick Root:** The thick root is 2.1mm thick. It has thick cortical tissue. The air chambers as separated from each other by thick conical partition segments (Fig 8g). Phloem tissue is wide and surrounds the xylem cylinder. Xylem cylinder is quite wide and thick. It includes numerous solitary and multiples two or three xylem elements. The xylem elements are elliptical and circular these are thin straight xylem rays. Xylem fibers are small, angular and lignified (Fig 8h).

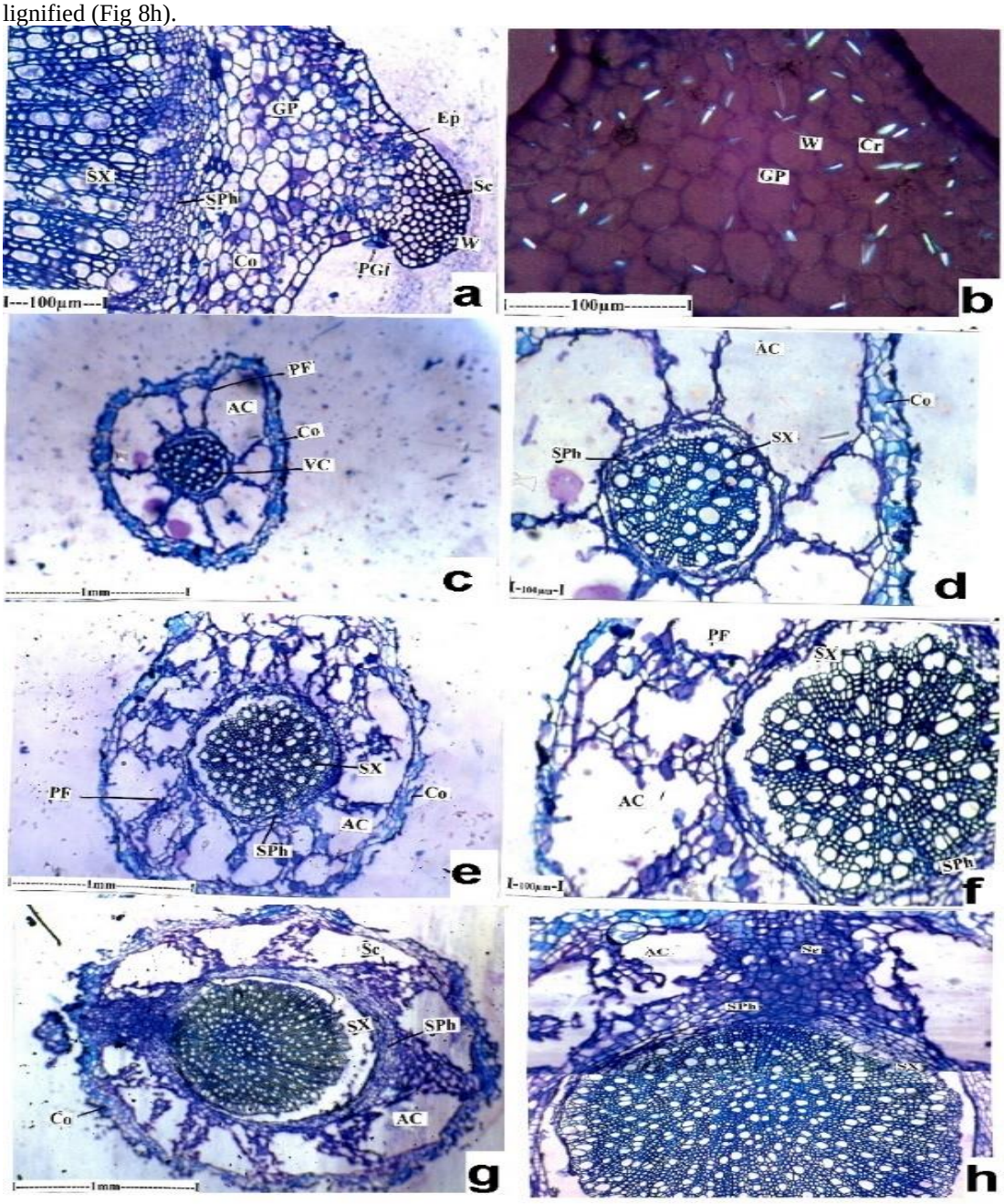



**Fig 8: a.** TS of thick stem curved wide wing (20 X) **b.** Needle shaped calcium oxalate crystals in wing (40 X) **c.** TS of thin Root - entire view. (4X) **d.** TS of thin Root - A sector enlarged (10 X) **e.** TS of Fairy thick Root - entire view.

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

(4X) **f.** TS of Fairy thick Root - A sector enlarged (10 X) **g.** TS of thick old Root - entire view (4X) **h.** TS of thick old Root - A sector enlarged (10X)

**Anatomy of *Zizyphus mauritiana* Leaf:**

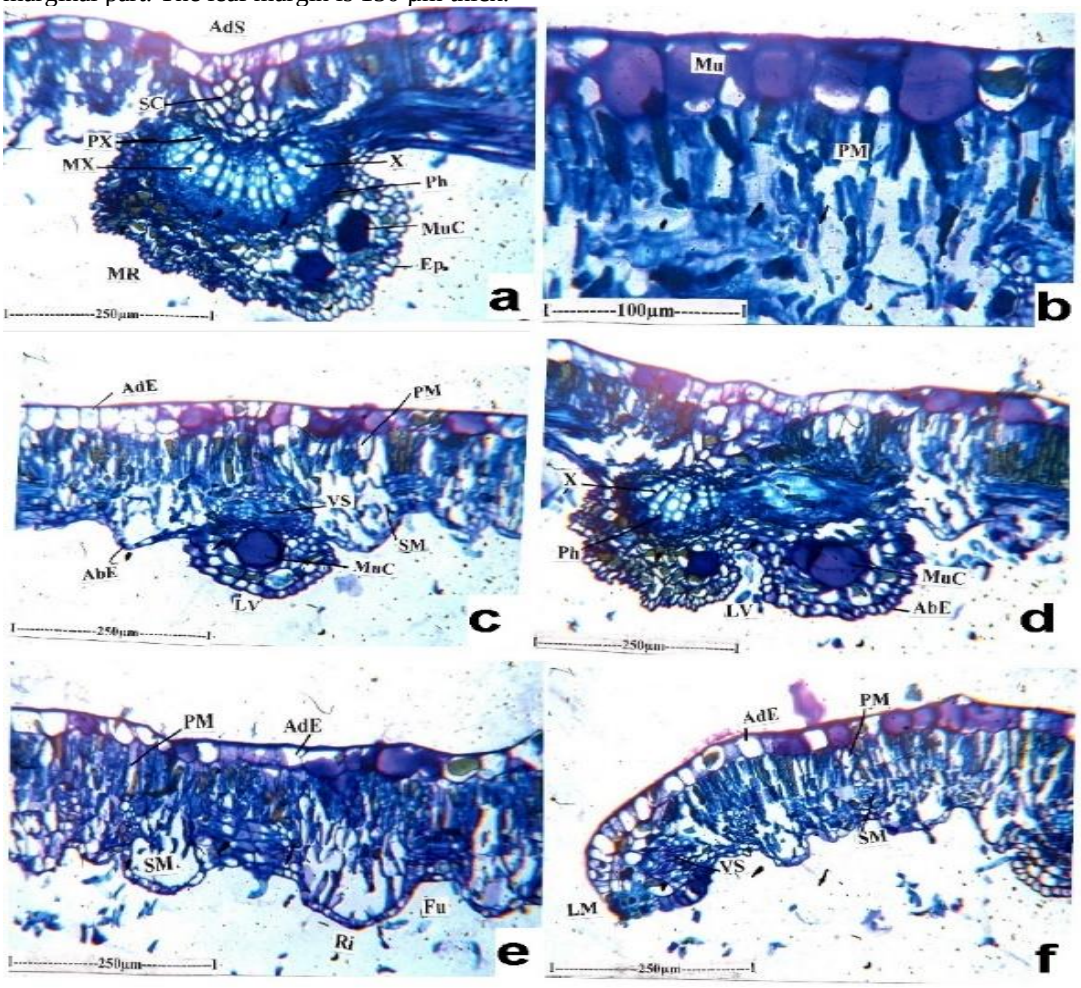
In transactional view the leaf exhibits the thick midrib and smaller lateral veins. The leaf is dorsiventral with thick ridges and wide furrows on the lower. The midrib is prominently projecting on the abaxial side of them and it is smooth and even on the adaxial side (Fig 9a). The midrib is 400 µm in vertical plane and 390 µm in horizontal plane. The midrib consists of a thick vascular strand which is collateral. It includes about 15 vertical parallel lines of xylem elements with the protoxylem been directed towards the adaxial side. The xylem elements are circular, highly thick walled and lignified. Along the lower part of xylem occurs a thick continuous phloem (Fig 9a). These are wide circular cavities possessing dense mucilage content.

**Lamina:** Lamina has dilated hypodermal cells on the adaxial side. These cells are circular or angular, thick walled and possess dense mucilaginous substance (Fig 9b).

**Lateral veins:** The lateral veins are prominent and project below the abaxial side (Fig 9c). The veins are subspherical with thick-walled epidermal layer, which is either smooth or wavy (Fig 9d). The lateral veins have single semi-circular vascular bundles with adaxial short and compact lines of xylem elements, and abaxial phloem elements. In middle part of the veins, there is wide circular mucilaginous cavity.

**Lamina of the leaf:** The lamina is dorsiventral with flat even adaxial side and prominent ridges and furrows. The abaxial side has dense non glandular epidermal trichomes. The adaxial epidermal cells are wide, rectangular or squarish and thin walled. The adaxial epidermal layer has small cells located on the raised ridges. The palisade layer is single and the cells are narrow, elongated and compact. The spongy mesophyll consists of small, lobed elongated and spherical fewer compact cells. The lamina is 200 µm (Fig 9e).

**Leaf - Margin:** Leaf margin (Fig 9f). The marginal part of the lamina is slightly bulged and curved down. The epidermal layer and mesophyll tissues are not altered in the marginal part. There is a small vascular strand at the marginal part. The leaf margin is 150 µm thick.



ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

**Fig 9: a.** T S of leaf through midrib (16 X) **b.** T S of leaf Adaxial mucilaginous sub epidermal cells enlarged (40 X) **c.** T. S OF LATERAL VEIN (16 X) **d.** Midrib (16 X) **e.** T S of lamina (16 X) f. T S of leaf margin (16 X)

**POWDER MICROSCOPIC OBSERVATION**

**Powder microscopic observation of *Michelia Champaca* bark**

Powder preparation of the bark shows the following inclusions in the powder.

**Fiber Sclereids:** Sclereids resembling fibers are common in the powder. These cells are long cells with thick middle part and tapering ends (Fig 10a). The sclereids resemble fiber in shape and size. The fiber sclereids have wide Lumen and Prominent dense canal like simple pits that are absent in fibers. The fiber sclereids range from 650 µm long and 20 µm thick.

**Parenchyma cells:** Long, cylindrical cells and elongated polygonal cells are seen in the powder. These cells are parenchymatous with thin walls. Starch grains are abundant in the cells (Fig 10b). The starch grains are circular and they vary in size.

**Brachy Sclereids:** The Brachy sclereids are common in the powder. They are commonly isodiametric in size (Fig 10c). But, some of these are elongated and cylindrical in shape (Fig 10d, e, f). These sclereids are characterized by very thick secondary walls, which are lignified. The walls have wide canal like simple pits and wide cell lumen. The isodiametric sclereids measure 90 X 90 µm in size. The elongated sclereids are up to 200 µm long and 30 µm thick.

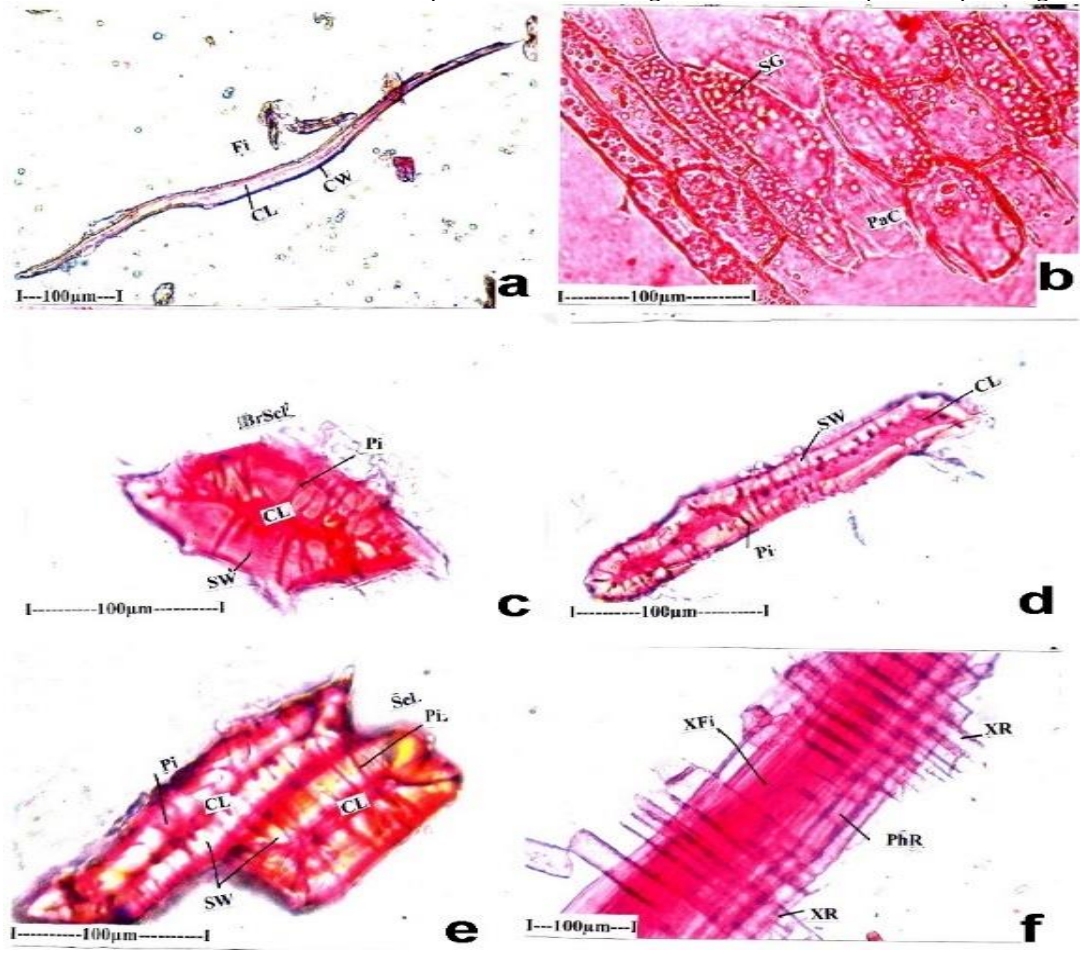



**Fig 10: a.** Macerated fibre - Sclereid (20 X) **b.** Compact Parenchyma cells with starch grains (40 X) **c.** Squarish Brachy Sclereids (40 X) **d.** Elongated Sclereid (40 X) **e.** Long and short Sclereids (40 X) **f.** Ray cells with vertical system parenchyma cells and fibers (20 X)

**Powder Microscopy of *Scoparia dulcis* whole plant**

Powder preparation of leaf, stem and Root shows the following elements when viewed under the microscope.

**Glandular trichomes on the leaf:** Unique type glandular trichomes called Peltate trichomes are abundant in the leaf powder (Fig 11 a, b, c). The trichome has a short thick stalk with which it is attached on the epidermal layer of the lamina. At the top of the stalk is a circular Umbrella Shaped multicellular body called peltate body. The glandular body consists of several cube shaped cells which are attached to the stalk by their narrow ends. The broad ends of

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

the trichome spread all around the centre in the form of an umbrella. These cells are secretory in function (Fig 11 a, b). The circular body has a distinct cuticle all around. The peltate trichome is 100µm in diameter and 250 µm in height.

**Epidermal fragments:** Epidermal peelings of adaxial side of the lamina are common in the powder. The epidermal peelings appear in surface view (Fig 11 d, e, f). The epidermal are cells amoeboid in outline due to wavy nature of the tangential walls of the cells. The stomata are surrounded by three or four wide epidermal cells which are called subsidiary cells. The stomata are called cyclocytic type. The guard cells are 20x30 µm in size.

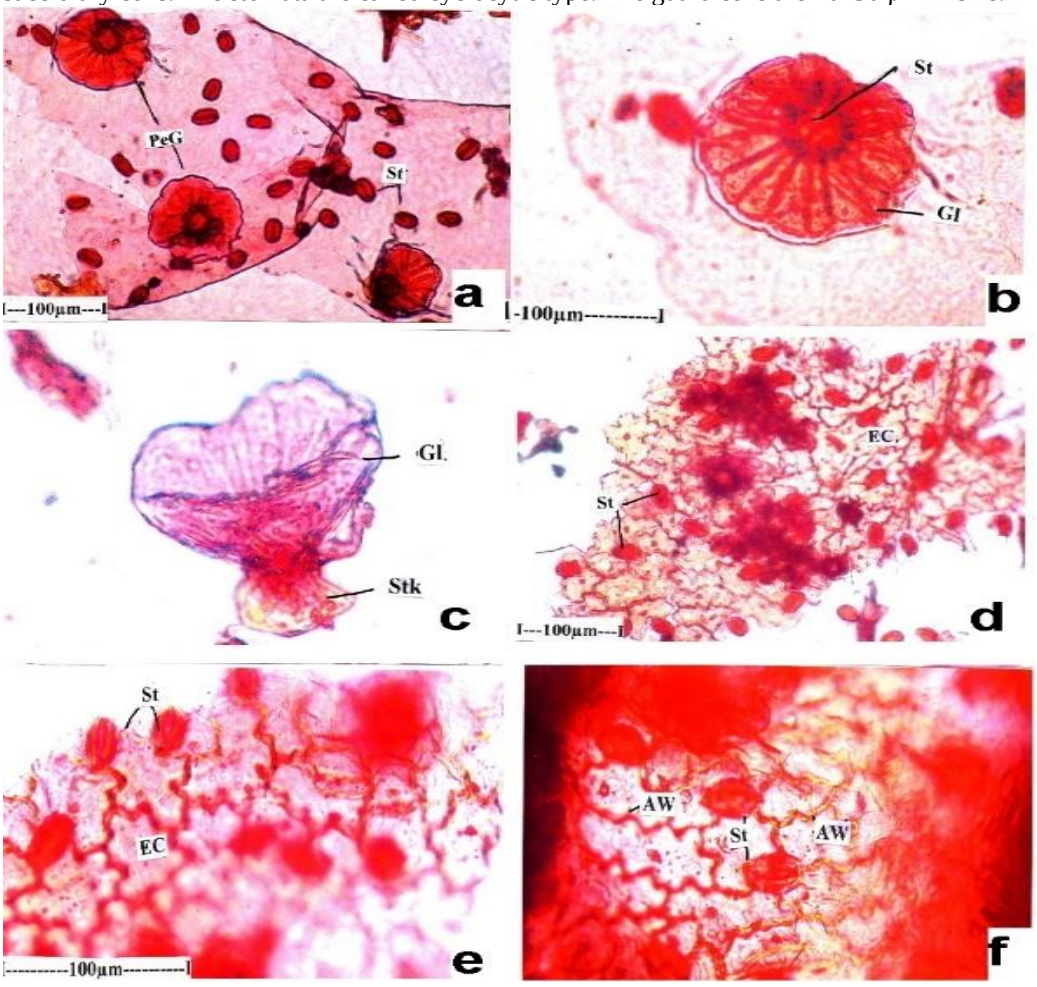



**Fig 11: a.** Peltate Trichomes and stomata (20 X) **b.** A peltate trichome-enlarged (40 X) **c.** An entire trichome with stalk (20 X) **d.** Abaxial epidermis with stomata (20 X) **e.** Abaxial epidermis with stomata (40 X) **f.** Two stomata (40 X)

**Stem powder:** The powder of the stem shows libriform fibers, xylem parenchyma and vessels elements (Fig 12a, c). Libriform fibers are true fibers which very long with pointed ends. The cell walls are very thick and lignified. The cell lumen is narrow. No cell inclusions are seen in the fibers. These fibers are up to 650 µm long and 10 µm thick (Fig 12 a).

**Wide fibers:** Some of the fibers are wide, short with wide lumen and thin walls. The wide fibers are less than 550 µm in length and are 20 µm wide (Fig 12 e).

**Parenchyma cells:** Rectangular, squarish parenchyma cells arranged as compact vertical fiber and are seen very frequently. The cells are in flat vertical rows, have thin walls and prominent nucleus (Fig 12 b, c).

**Vessel elements:** Vessel elements which are long, narrow cylindrical cells. They have wide oblique openings called perforations at the end walls. They have also minute circular multiseriate bordered pits. The vessels are 700 µm long and 50 µm wide (Fig 12 d, Fig 13 a, c).

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

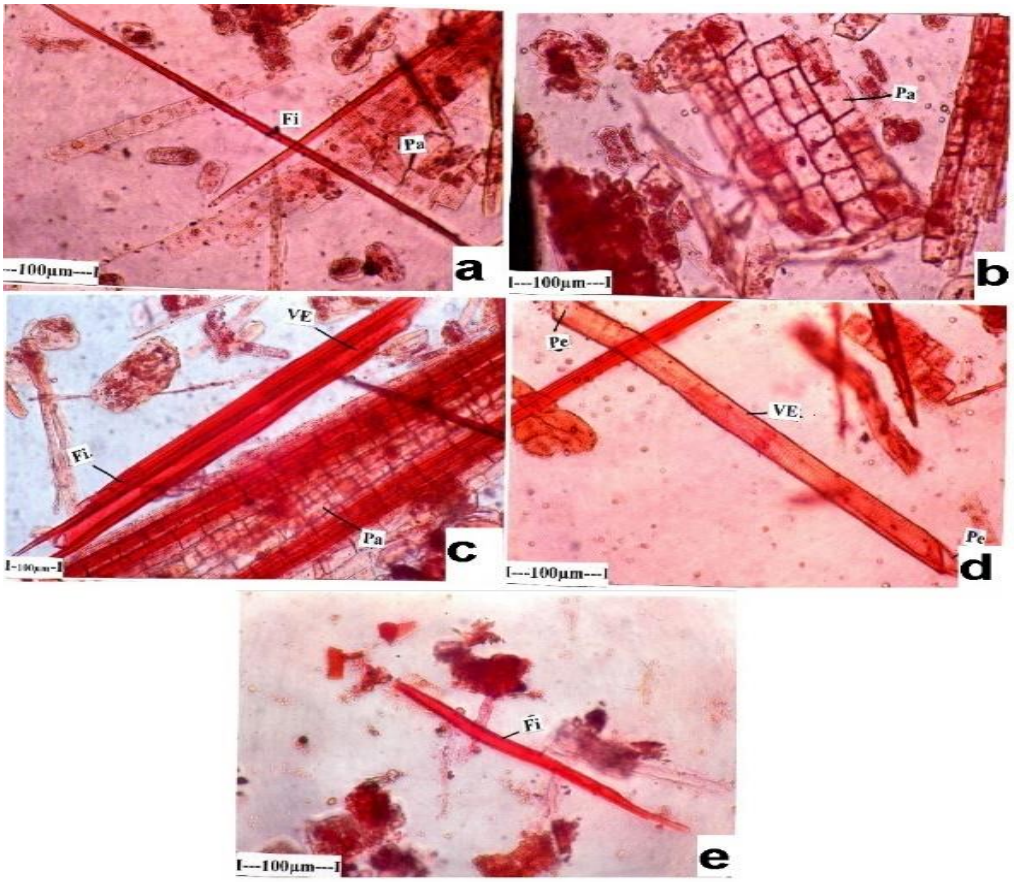



**Fig 12: a.** Narrow libriform fibers (20 X) **b.** Plate of parenchyma cells (20 X) **c.** Powder possessing vessel element, Fibre and Parenchyma cells (10 X) **d.** Vessel element with end wall perforation and lateral wall bordered pits (20 X) **e.** A wide fiber (20 X)

**Ray cells:** In the vascular tissues, these occurs ray cells. These are horizontal layer of pad of cells called ray cells. Such vascular rays are occasionally seen in the stem powder the rays have small central row of cells called procumbent cells. Cells at the upper and lower parts are called upright cells. The ray cells are hetero cellular with two types of cells (Fig 13 d). Some of the parenchyma cells in the powder have dense accumulation of spherical starch grains. The starch grains are compact and vary in shape and size (Fig 13 e).

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

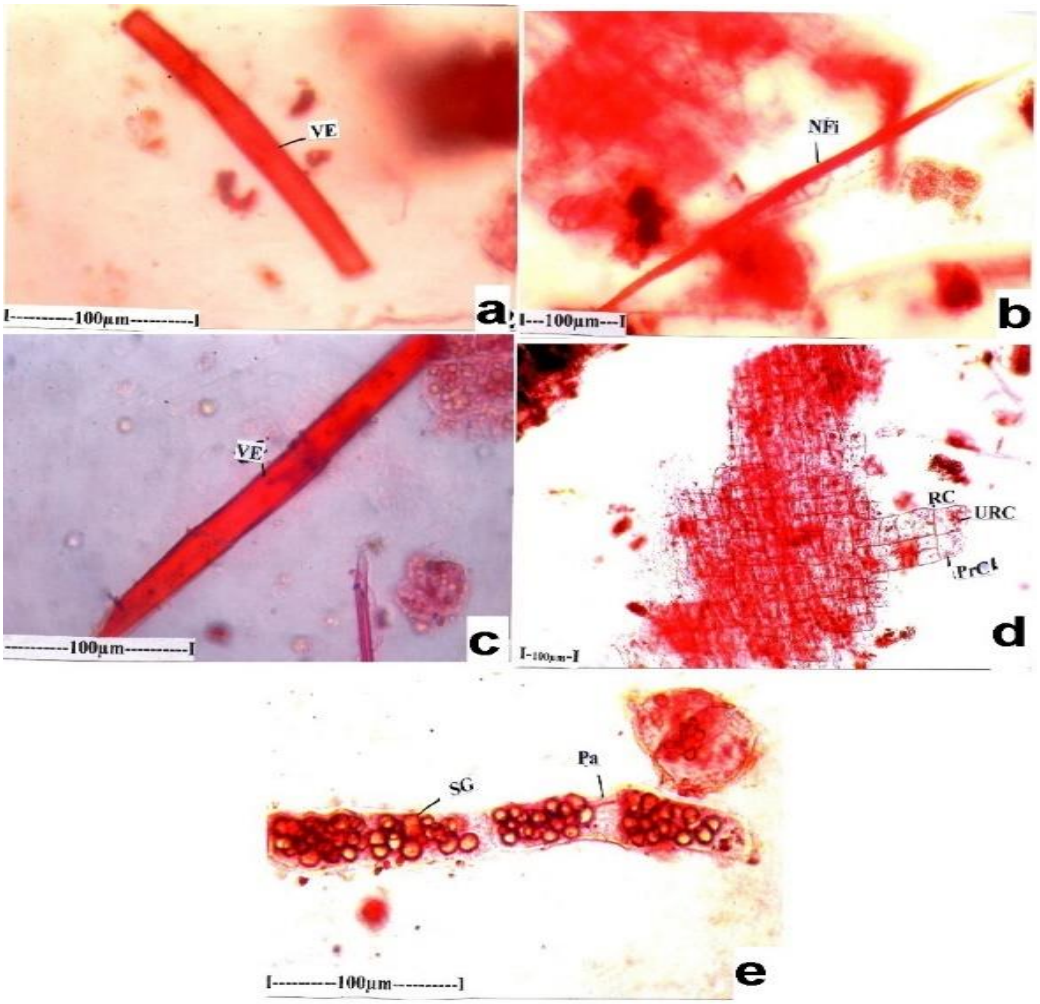



**Fig 13: a**. A vessel element (40 X) **b.** A narrow fiber (20 X) **c.** A vessel element (40 X) **d.** Powder with horizontal ray cells (10 X) **e.** A parenchyma cell with dense accumulation of starch grains (40 X).

**Powder Microscopy of *Zizyphus mauritiana* leaves**

The powder preparation of the leaf of *zizyphus* shows the following structures:

**Adaxial epidermal peeling:** Small pieces of adaxial epidermal layer are frequently seen in the powder. Epidermal peeling is in surface view showing the cells as seen from above. The adaxial epidermal cells are polyhedral in outline. The anticlinal walls are straight and thick and wall surface is smooth (Fig 14a). The adaxial epidermis is apo stomatic (without stomata).

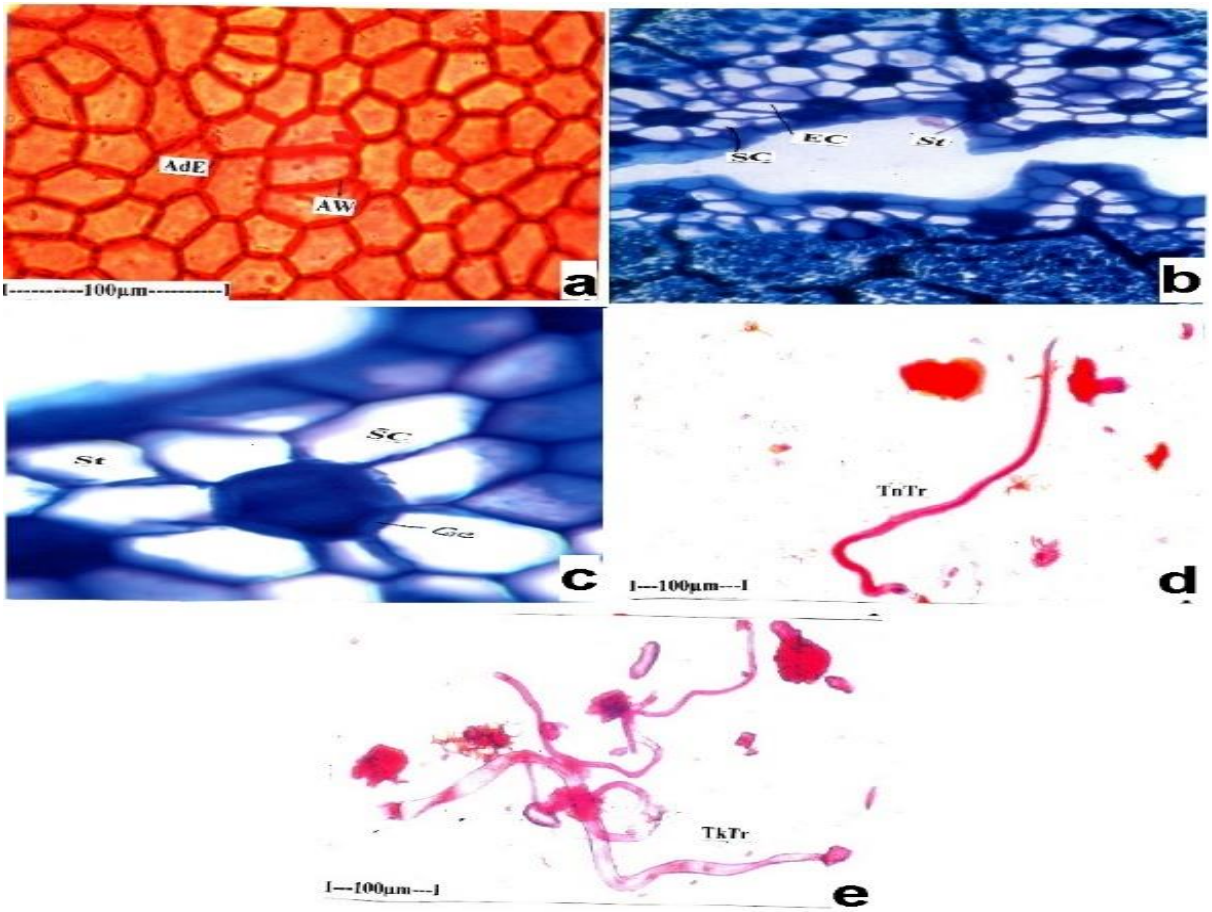
ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

**Abaxial epidermal peeling:** The epidermal cells of abaxial side are slightly smaller in size. The epidermal cells have thin straight and smooth walls. The epidermis is densely stomatiferous. The stomata are abundant and densely aggregated (Fig 14b). The guard cells are broadly elliptical. Each stoma is surrounded by 7 to 9 subsidiary cells which are triangular in shape and they radiate from the guard cells the stoma surrounded radiating subsidiary cells is called stellate stoma (Fig 14c).

**Fig 14: a.** Adaxial epidermis in surface view (40 X) **b.** Abaxial epidermis with stomata (20 X) **c.** Single stoma with actinocytic subsidiary cells (40 X) **d.** Thin trichome (20 X) **e.** Thick trichome (20 X)

**Epidermal Trichomes:** The lamina is densely covered with epidermal trichomes. The trichomes are non-glandular type. The long, coiled and look like worms these trichomes are called vermiform trichomes. Trichomes are of two types viz**.,** Narrow trichomes and Thick trichomes. The narrow trichomes are long, highly coiled and they are 10µm thick (Fig 14d). Thick trichomes have thin walls and wide lumen. They are not much coiled. The trichomes are 20 µm thick (Fig 14 e). Both thin and thick trichomes are inter mingled on the lamina and densely cover the leaf surface.

**PHYSICOCHEMICAL PARAMETERS:**




The physiochemical parameters are mainly used in detecting adulteration or improper handling of drugs. Extractive values are useful in the detection of adulterated drugs and also give information about the chemical constituents present in the drug. Ash values reveals about inorganic composition or earthy matter or other impurities. The results of the present study are shown in Table 2. Loss on drying infers about the percentage of moisture present in the drug. The moisture content of dry powder of *Michelia champaca*, *Scoparia dulcis* and *Ziziphus mauritiana* was 8.5, 7 and 4 % respectively, these results suggest that, it would discourage bacteria, yeast or fungi growth. Low total ash and acid insoluble ash in all the three plants suggest that the inorganic and non-physiological matter is less. High alcohol soluble extractive values infer the presence of polar substance like glycosides, phenols and tannins.[22]

**Table 2:** Physical Parameter of plants *Michelia champaca*, *Scoparia dulcis* and *Ziziphus mauritiana*

| **Physical Parameter (%)** | **MC** | **SD** | **ZM** |
|---|---|---|---|

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

| | | | |
|---|---|---|---|
| Total Ash | 15 | 7.75 | 17.05 |
| Acid-insoluble Ash | 8.4 | 6.8 | 5.46 |
| Alcohol soluble extractive | 36.1 | 52.6 | 14.7 |
| Water-soluble Extractive | 3.2 | 2.8 | 9.34 |
| Loss on drying | 8.5 | 7 | 4 |
| Swelling Index | 5 | 7 | 2 |
| Foaming index | 8 | 10 | 8 |

**FLUORESCENCE ANALYSIS**

Fluorescence analysis of *Michelia champaca*, *Scoparia dulcis* and *Ziziphus mauritiana* plant powders was carried out individually after treating with several solvents. Fluorescence was observed at 254 and 365 nm relating its change of colour in visible light. The observations showing the variation in colour of *Michelia champaca*, *Scoparia dulcis* and *Ziziphus mauritiana* are presented in Table 3, 4 and 5 respectively.

**Table 3:** Fluorescence analysis of *Michelia champaca*

| CHEMICAL TREATMENT | DAY LIGHT | FLUORESCENCE | UV LONGER (365 nm) | UV SHORT (254 nm) |
|---|---|---|---|---|
| Drug powder | Light brown | Brown | Moss green | Sage green |
| Water | Tortilla brown | Brown | Pea green | Light green |
| 1N NaOH (aq) | Peanut brown | Ginger bread brown | Cinnamon brown | Tawny brown |
| 1N NaOH (alk) | Brunette Brown | Chocolate brown | Peanut brown | Chocolate brown |
| 5% NaOH | Russet brown | Walnut brown | Umber brown | Wood brown |
| 10% NaOH | Tawny brown | Ginger bread brown | Russet brown | Wood brown |
| Conc. $HNO_3$ | Brown | Tawny brown | Mocha green | Dark green |
| Conc. $H_2SO_4$ | Ochre orange | Cider | Chocolate brown | Pickle green |
| Con HCl | Ochre orange | Brown | Olive green | Sage green |
| 5% $FeCl_3$ | Green | Emerald | Lime green | Pine green |
| Picric acid | Amber orange | Golden red | Light green | Shamrock green |
| Dil. $NH_4$ | Sea weed green | Sage green | Olive green | Lime |
| Iodine water | Tortilla brown | Brown | Green | Sham rock green |
| Acetic acid | Tortilla brown | Tortilla brown | Sage | Fern green |

**Table 4:** Fluorescence analysis of *Scoparia dulcis*

| CHEMICAL TREATMENT | DAY LIGHT | FLUORESCENCE | UV LONGER (365 nm) | UV SHORT (254 nm) |
|---|---|---|---|---|
| Drug powder | Tortilla brown | Tortilla brown | Sea weed | Green |
| Water | Clay | Moss green | Sage | Pine |
| 1N NaOH (aq) | Orange | Pumpkin | Basil | Pine |
| 1N NaOH (alk) | Russet brown | Cinnamon | Parakeet | Emerald |
| 5% NaOH | Caramel | Burnt | Syrup | Green |
| 10% NaOH | Pawny | Russet | Sage | Emerald |
| Conc. $HNO_3$ | Apricot | Ochre | Mass | Shamrock |
| Conc. $H_2SO_4$ | Orange | Bronze orange | Olive | Pine |
| Con HCl | Ochre | tawny brown | Tiger | Green |
| 5% $FeCl_3$ | Apricot | Tortilla | Mint | Juniper |
| Picric acid | Tortilla | Brown | Sage | Green |

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

| | | | | |
|---|---|---|---|---|
| Dil $NH_4$ | Green | Dijon | Pine | Emerald |
| Iodine water | Tottilla | Light green | Mint | Shamrock |
| Acetic acid | Apricot | Tortilla | Mass | Fern |
| Con HCl | Brown | Mocha | Moss | Green |
| 5% $FeCl_3$ | Light green | Sage | Fern | Emerald |
| Picric acid | Golden red | Pine | Moss | Shamrock |
| Dil $NH_4$ | Light green | Dijon | Moss | Green |
| Iodine water | Olive green | Sage | Fern | Mint |
| Acetic acid | Light brown | Brown | Moss | Seaweed |

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

**Table 5:** Fluorescence analysis of *Ziziphus mauritiana*

| CHEMICAL TREATMENT | DAY LIGHT | FLUORESCENCE | UV LONGER (365 nm) | UV SHORT (254 nm) |
|---|---|---|---|---|
| Drug powder | Light green | Light green | Sage | Light green |
| Water | Dark green | Crocodile | Green | Emerlad |
| 1N NaOH (aq) | Light brown | Mass | Sedar | Brown |
| 1N NaOH (alk) | Cinnamon | Brown | Brown | Brown |
| 5% NaOH | Mocha | Umber | Wood | Green |
| 10% NaOH | Burnt | Walnut | Furn | Emerlad |
| Conc. $HNO_3$ | Caramel | Cidar | Pine | Shamrock |
| Conc. $H_2SO_4$ | Pine | Furn | Pear | Shamrock |
| Con HCl | Brown | Mocha | Moss | Green |
| 5% $FeCl_3$ | Light green | Sage | Fern | Emerald |
| Picric acid | Golden red | Pine | Moss | Shamrock |
| Dil $NH_4$ | Light green | Dijon | Moss | Green |
| Iodine water | Olive green | Sage | Fern | Mint |
| Acetic acid | Light brown | Brown | Moss | Seaweed |

The Pharmacognostical study is an important and reliable criterion in the identification of plant drugs. The proper identity of a starting material is of key importance to ensure quality and purity of herbal products. Organoleptic and microscopic evaluation has become crucial in the recognition of plants, identification of small fragments of powdered or crude herbal material and detection of adulterants and any foreign matter.[23]

## CONCLUSION

The present study provides useful data for identification, authentication and standardization of herbal drugs. The present study, to the best of our knowledge, has provided the first report of detailed description of the Pharmacognostic and physicochemical features of *Michelia Champaca* bark, *Scoparia dulcis* whole plant, *Ziziphus mauritina* leaves, clearly giving distinguishing characteristics, which are useful in laying down standardization and pharmacopeial parameters.

## REFERENCES

1. Upadhya V, Hegde HV, Bhat S, Hurkadale PJ, Kholkute SD, Hegde GR. Ethno medicinal plants used to treat bone fracture from North-Central Western Ghats of India. J Ethno Pharmacol.2012; 142: 557-562.
2. Kingston DG. Modern natural products drug discovery and its relevance to biodiversity conservation. J Nat Prod. 2011; 74: 496-511.
3. Vikas V. Patil, R. Vijay Patil Ficus bengalensis Linn.-An overview Int J Pharm Bio Sci. 2010; 1-11.
4. Rakholiya k, Chanda S. Pharmacognostic, physicochemical and phytochemical investigation of Mangifera indica L. var. Kesar leaf. Asian Pac J Trop Biomed. 2012; 2(2): S680-S684
5. Anonymous. The Wealth of India. Vol.6, New Delhi: Council of Scientific & Industrial Research (CSIR); 1962; 370-2.
6. Chopra RN. Nayar SL, Chopra IC. Glossary of Indian Medicinal Plants. New Delhi: National Institute of Science Communication (NISCOM) CSIR; 1986; 1986: 166.
7. Varier PS. Indian Medicinal Plants. 1st ed, Chennai: Orient Longman Pvt Ltd; 2003. 4.
8. Branch LC, IMF da Silva. Folk medicine of Alterdoes chao, para. Branza Acta Amazonica.1983; (13):737-767.
9. Edeoga HO, Okwu DE and Mbaebie BO.Phytochemical constituents of some Nigerianmedicinal Plants. African Journal of BiotechnologyJuly 2005; 4(7): 685-688
10. Mongalo NI, Mashele SS, Makhafola TJ. Ziziphus mucronata Willd. (Rhamnaceae): it's botany, toxicity, phytochemistry and pharmacological activities. Heliyon. 2020; 6(4):e03708.
11. Yadav SM, Sharma V, Sharma P. Ziziphus mauritiana L: An overview. Tropical Journal of Pharmaceutical and Life Sciences. 2020; 7(1):01-18.
12. Wallis TE. Text Book of Pharmacognosy. 5th. New Delhi: CBS Publishers and Distributors; 2002; p. 123-32, 210-5.
13. Johansen DA. Plant Microtechnique. McGraw-Hill; 1940, 523.
14. O'Brien TP, Feder N, McCully ME. Polychromatic staining of plant cell walls by toluidine blue O. Protoplasma. 1964; 59(2):368-373.
15. Sass JE. Elements of Botanical Microtechnique. Bente Press; 2013.

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

16. Esau K. Plant Anatomy. John Wiley & Sons; 1967.
17. Wallis TE. Text Book of Pharmacognosy. 5th. New Delhi: CBS Publishers and Distributors; 2002, 210-5, 123-32
18. Government of India. Ayurvedic Pharmacopoeia of India. New Delhi: Government of India; 1990.
19. Baxi AJ, Shukla VJ, Bhatt UB. Method of Qualitative Testing of some ayurvedic Formulations. Jamnagar: Gujarat Ayurved University; 2001; 5-12.
20. Ravishankar S. Textbook of Pharmaceutical Analysis. 4th ed. Pune: Rx Publication; 2010.
21. Adediwura F, Ayotunde A. Phytochemical and pharmacognostic studies of Telosma africanum (N.E. Br) colville leaf and stem. JPSR 2012; 3:1860-2
22. Bhattacharya S, Zaman MK. Pharmacognostical evaluation of Zanthoxylum nitidum bark. Int J Pharm Tech Res. 2009; 1(2):292-8.
23. Sandhya S, Ventaka RK, Vinod KR. Pharmacognostical standardization of Tephrosia purpurea pers root. Ancient Science of life. 2010; 30(1):1.