

ANATOMICAL STUDIES OF SCHLEICHERA OLEOSA (LOUR.)

OKEN

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Article Received on
04 Oct 2015,Revised on 25 Oct 2015,
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ABSTRACT

Schleichera oleosa (Lour.) Oken belonging to family Sapindaceae is an important medicinal plant used in traditional system of medicine. The plant is popularly known as Kusum. The plant is found in the sub-Himalayan tract from Kashmir to West Bengal, throughout Central and Southern India. The plant is used for the treatment of different diseases and ailments of human beings. The bark of tree cures leprosy, skin disease, inflammation, ulcers. The present investigation has been carried out on the bark, leaf and stem of the *Schleichera oleosa* to determine its anatomical features. The leaves are hypostomatic and stomata are brachyparatetracytic & cyclocytic. Many unicellular trichomes are present on the lower epidermis. Venation is pinnate

camptodromous festooned brochidodromous.

KEYWORDS: Anatomy, *Schleichera oleosa*, Brachyparatetracytic, cyclocytic, camptodromous festooned brochidodromous.

INTRODUCTON

Schleichera oleosa (Lour.) Oken belongs to family Sapindaceae as mentioned by Hooker (1883). The plant is commonly called as Kusum. The plant is medium sized to large tree 15-32 meters in height with a dense spreading crown and smooth pale brown bark exfoliating in small irregular flakes as mentioned by Sala (2010). The leaves of the plant are 20-40 cm long, leaflets 2-4 pair, lowest pair usually about 1/3rd the size of terminal. The plant is commonly found in northwest Himalayas at Sirmour, throughout Central and Southern India. The bark cures skin diseases, inflammations and "Kapha". The unripe fruit is sour, heating to the body, heavy to digest, causes biliousness; destroys "Vata"; astringent to the bowels. The ripe fruit is sweet, sour, digestible, astringent to the bowels, heating; increases taste and appetite; cures

“Kapha” and “Vata”. The seed oil is used for the cure itch and acne reported by Kirtikar and Basu (2005).

The leaf architecture has been used as a major tool in identification of plant specimen. Etingshausen pioneered the leaf architectural studies in 1854. Madler and Strauss have presented systems of descriptive terminology and leaf architecture in 1971.

Dilcher presented the outline of leaf architecture of dicot leaves in 1974. Hickery and Wolfe revised the literature and classified the architecture of dicot leaves in 1975. Hickery has given an authentic and meaningful system of terminology of leaf architecture in 1979. Melville studied the leaf architecture of Family Apocynaceae in 1976. Later, Vaidya studied leaf architecture of twelve species of genus *Litsaea* in 2015.

Powder characteristics also play an important role in identification of the specimen as shown by Vaidya in the bark of *Holarrhena antidysenterica* in 2015.

MATERIAL AND METHODS

The leaf, stem and bark samples of *Schleichera oleosa* were collected from Naigaon region of Mumbai. The samples were then authenticated for their botanical identity from the standard herbaria at Blatter herbarium (Mumbai).

Processing of Plant material

The transverse section of fresh sample of leaves, bark and stem were taken with the help of sharp blade. Out of the many sections, thin sections were selected which were then stained with saffranine and mounted with glycerine to be examined for their anatomical characteristics.

For Leaf Architecture

The mature leaves fresh, dried or preserved were first cleared by keeping them in 5% sodium hydroxide solution at room temperature for 1-2 days. The decoloured leaves were washed and transferred to 5% sodium hypochlorite till they became transparent. For more clarity, the leaves were washed and put in the solution of trichloroacetic acid and phenol (2:1 by weight) for few minutes at room temperature. The leaves were then thoroughly washed to remove acid traces and stained with aqueous Saffranine by keeping them in it for 10-15 minutes. The leaves were further transferred to 50% Glycerin and mounted in Glycerin as per Payne (1969), Mohan Ram and Nayyar (1978).

For Epidermal Studies

For the study of stomata, the leaves were boiled in concentrated nitric acid with little potassium chlorate added to it. The leaves turned brown and then yellowish white. The leaves were then transferred to water to separate the epidermal peelings. These peelings were washed thoroughly, stained with aqueous Saffranine or Delafield Haematoxylin and mounted in glycerin as per Gupta (1961).

For Maceration

- Cut the material into small pieces (2mm x 5mm) or into small slices (about 1 mm thick).
- Prepare 50% Nitric acid solution and place these slices in 50% nitric acid solution and heat gently on a water bath until it shows effervescence.
- Continue heating until tissues are sufficiently softened and disintegrated.
- As and when separation of cell constituents takes place, stop heating.
- Tease out a piece of treated tissue on a slide with a mounted needle.
- Wash the material with water and make it free from acid.
- Stain the material with aqueous Saffranine and mount it in glycerine in accordance with Khandelwal (2012).

The terminology used in anatomical studies is in accordance with Hickey and Wolfe (1975), Melville (1976), Hickey (1973, 1979) and Dilcher (1974).

The microphotographs showing different anatomical features were taken by using Nikon Camera at various magnifications.

Powder Characteristics of Bark

Take 1gm of powdered drug and add dil. Sodium hydroxide, incubate at 37°C for 1 hr. Filter the powder with muslin cloth in a funnel. Wash it frequently with water. Take the residue in a test tube and add about 10 ml of Sodium hypochlorite solution. Keep it for 1 day. Next day, filter it again with Muslin cloth in a funnel. Wash its water and the bleached material is used for staining.

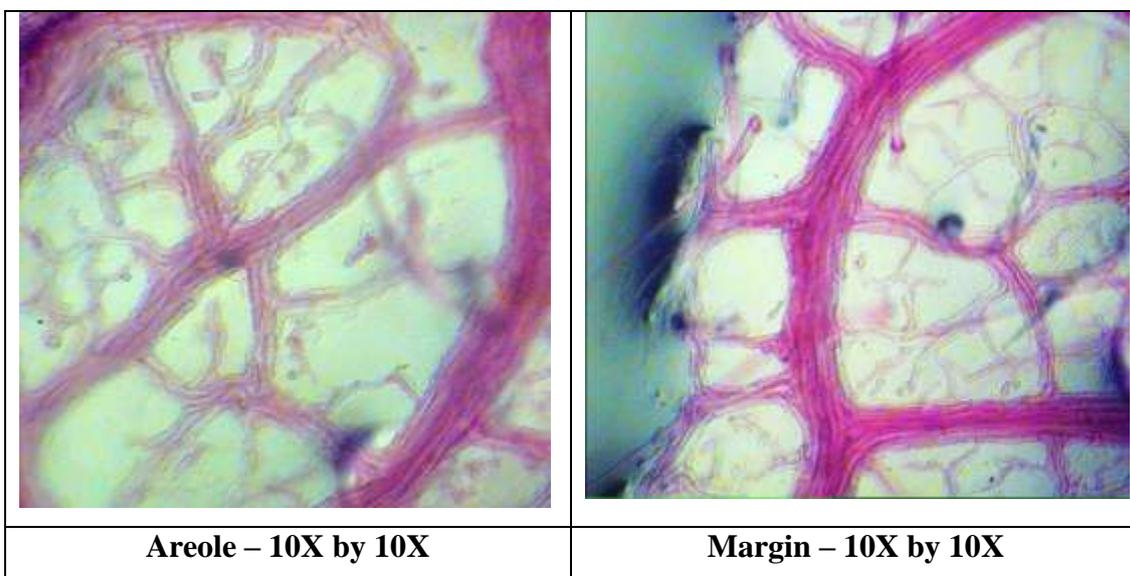
As the material is bleached it is to be stained Saffranine. This method was suggested by Trease & Evans (2002). Slides are mounted with pure Glycerol and sealed.

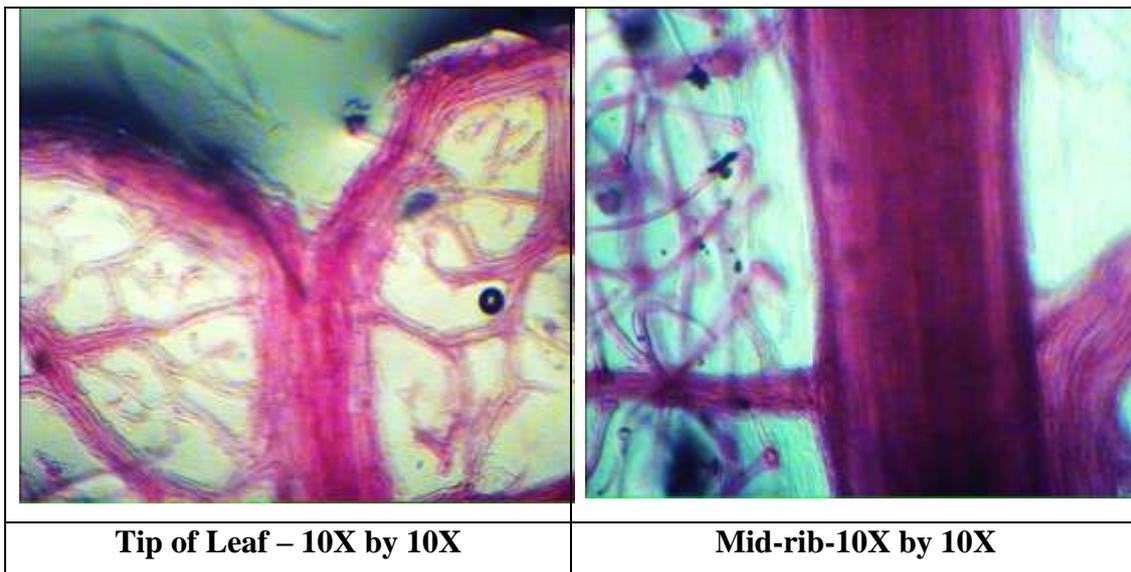
The slides are observed under microscope for various structures. All pictures were taken in image viewer.

OBSERATIONS AND RESULTS**Leaf Architecture**

Leaf organization is simple. With respect to leaf shape and size, the length of the whole leaf is 80mm and the width is 40mm. The lamina is symmetrical; base is asymmetrical; form is oblong; apex is emarginate and base is acute. The margin is entire. The leaf texture is coriaceous. There are no glands and the petiole is normal.

The type of venation is Pinnate Camptodromous festooned brochidodromous. Primary vein (1^0) is stout; its course is straight. Secondary veins (2^0) are present; angle of divergence is acute moderate. The variation in the angle of divergence is lower and upper secondary veins more obtuse than the middle sets. The relative thickness of secondary veins is moderate; its course is curved abruptly and unbranched. Intersecondary veins composite. Intramarginal vein is absent. Tertiary veins (3^0) are present; angle of origin exmedial to admedial side is RR/RO/AA; the pattern is orthogonal reticulate. The higher order venation forming a reticulum in which vein orders are distinct. Quarternary veins (4^0) are thin; its course is orthogonal. The highest vein order of leaf is 4^0 . The marginal ultimate venation is looped. Areoles are well developed; arrangement is random and shapes quadrangular, pentagonal and polygonal. Veinlets are simple, linear, curved and once branched with conventional tracheoids throughout the lamina, terminal or lateral in position, superimposed or juxtaposed in orientation; ellipsoidal in shape.





Transverse Section of Leaf

The leaf can be distinguished into lamina and mid-rib region.

Lamina portion

Upper Epidermis

Single layered made of long tangentially elongated thin walled cells.

Hypodermis

Hypodermis is made up of polygonal thin walled cells.

Mesophyll

The mesophyll of the leaf contains double layer of radially elongated palisade parenchyma followed by 4-5 layers of round shaped spongy parenchymatous cells.

Lower Epidermis

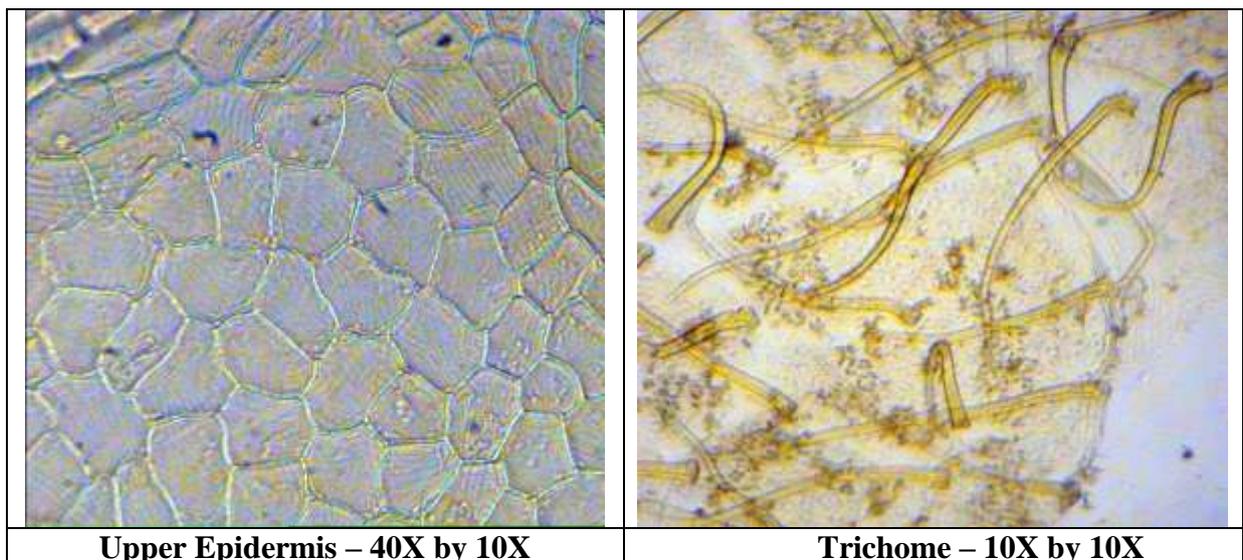
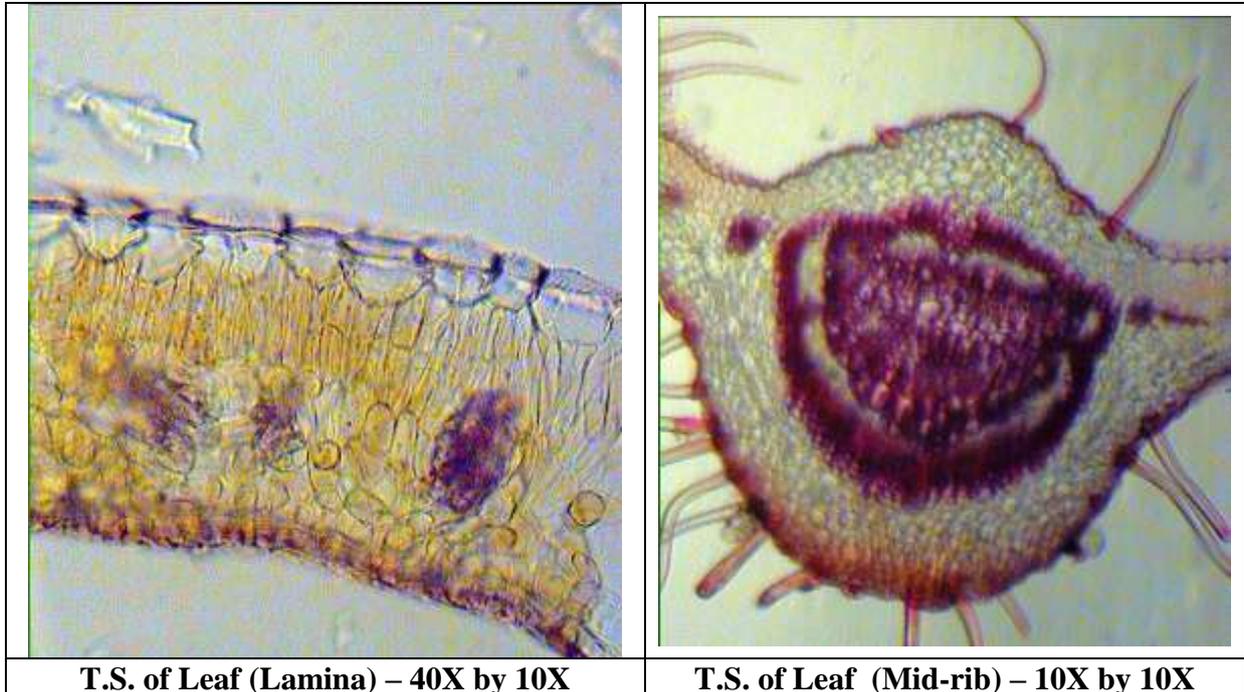
The lower epidermal cells are smaller than upper epidermal cells. The epidermal cells are interrupted with many unicellular trichomes and stomata.

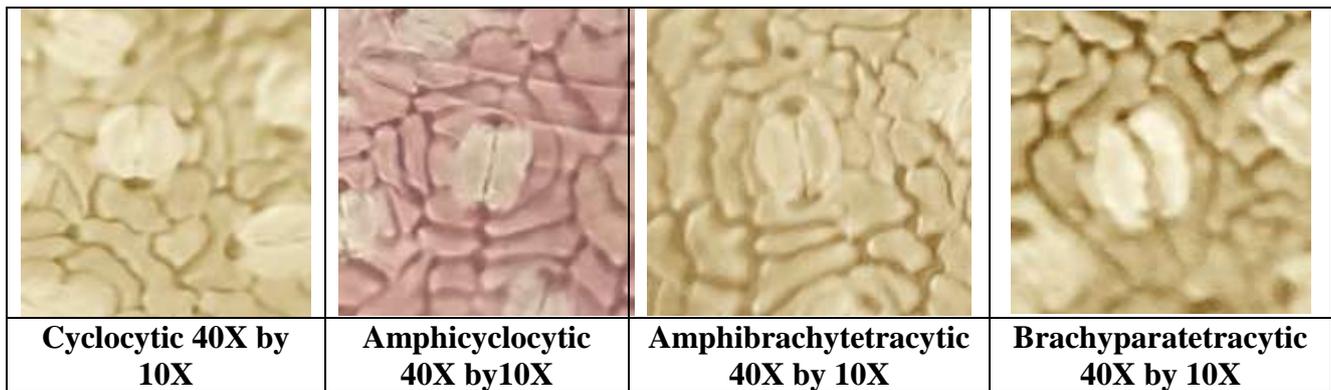
Mid-rib

The upper and lower epidermis is similar to lamina. Below the epidermis 6-7 layers of collenchymatous cells are observed which are followed by 7-8 layers of phloem. Next to the phloem, Xylem is observed. Pith is present in the centre.

Epidermal studies

The leaves are hypostomatic, stomata are present on the lower epidermis. Stomata are cyclocytic, amphicyclocytic, amphibrachytetracytic, brachyparatetracytic type. The guard cells are elongated and kidney shaped. The upper epidermal cells are large with straight outline and lower epidermal cells are small with wavy outline. The trichomes are unicellular.





Anatomy of Stem

Epidermis

Stem is bounded by single layer of epidermal cells. Epidermal cells are cubical in shape with straight walls.

Cortex

Cortex is made of sclerenchymatous and collenchymatous cells. Thick walled Sclerenchymatous cells are present in 2-3 layers. Below sclernchyma, thin walled Collenchymatous cells are present in 8-10 layers. They are cubicle in shape with straight walls and having no intercellular space.

Primary Phloem and Primary Xylem

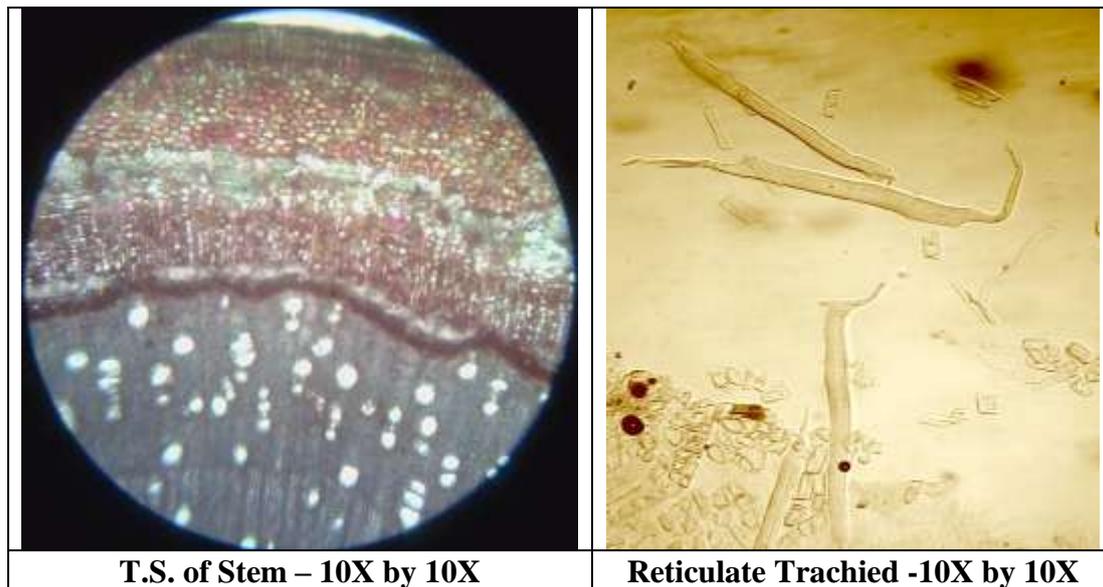
Primary phloem is present in 4-6 layers, which is followed by 4-6 layers of secondary Xylem.

Secondary Phloem and Secondary Xylem

Secondary phloem is present in 3-4 layer which is followed many layer of secondary Xylem.

Pith

Thin walled parenchymatous cells are present in the centre. These cells are hexagonal in shape.



ANATOMY OF BARK

Rhytidome

Rhytidome is outermost layer of bark. The dried phelloderm and phloem occupy the major part of rhytidome. A few patches of blackish brown dead cells interrupt compactly arranged cells. Intermittent cracks are also seen in these layers.

Phellem/Cork

many layers of cork cells make Cork. These cork cells are tangentially elongated.

Phellogen/Cork cambium

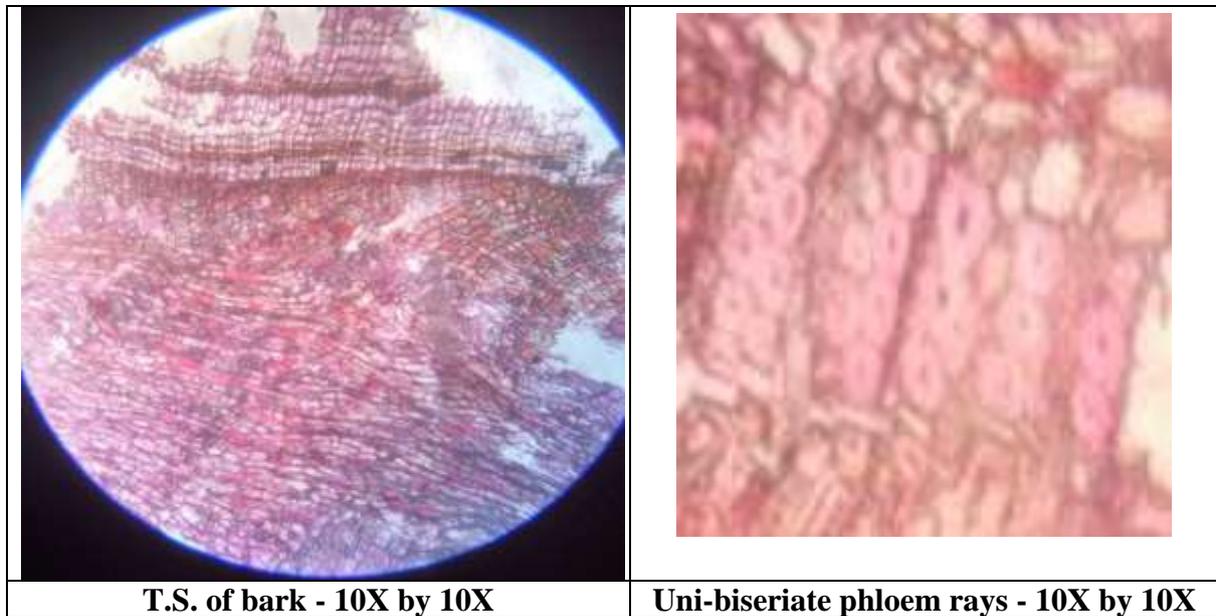
Two to three layers of dark brown thin walled tangentially elongated cells. Cork cambium is present in the middle of cork and secondary cortex. This cork cambium forms cork on the outer side and cortex in the inner side.

Phelloderm/cortex

It consists of thin walled loosely arranged barrel shaped cells. These cells show cell inclusions. This layer of phelloderm merges with the secondary phloem, because of which they cannot be distinguished from each other. The stone cells and tannin filled cells are also observed in the cortex. Each stone cell is elongated and oval in shape, lignified and with a broad lumen.

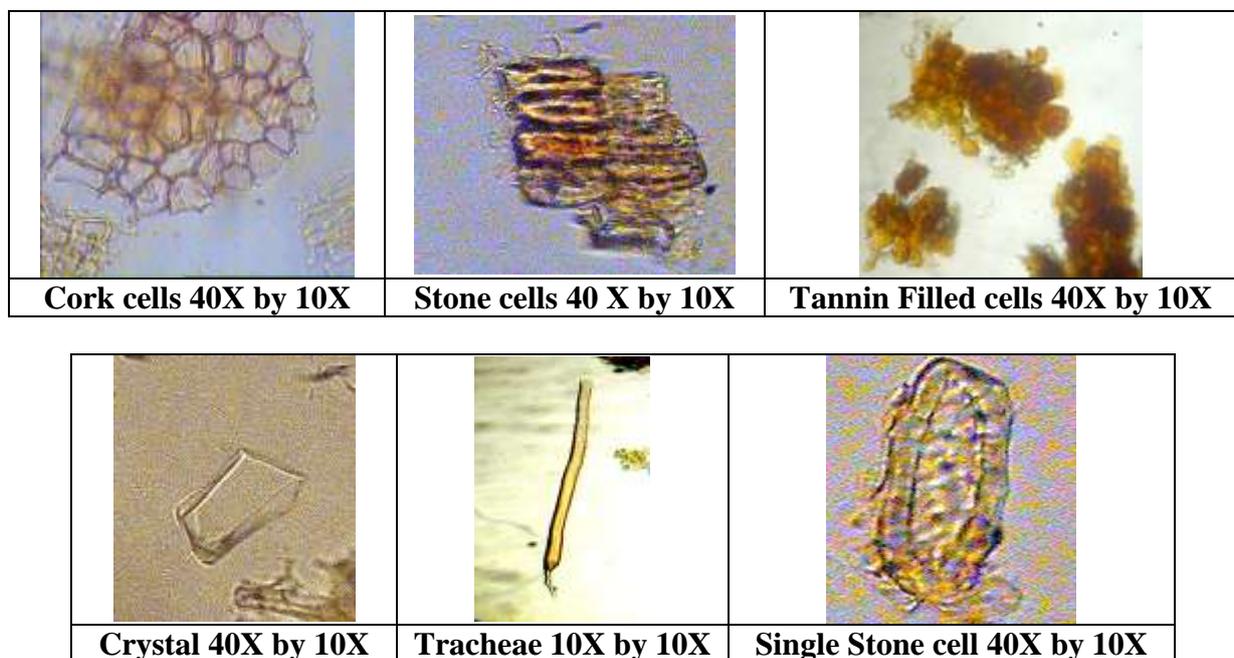
Secondary Phloem

Secondary phloem is present in patches separated by 3-4 layers of cortical cells. Phloem cells are thin walled, polygonal and are compactly arranged. These phloem cells are in uni-bi-multiseriate rays. Broad patches of phloem rays alternate with the stone cells.



Powder characteristics of Bark

Microscopic examination of powder of bark shows the presence of cork cells, stone cells, tannin filled cells, crystal, reticulate tracheae.



CONCLUSION

The powder characteristics show presence of tannin filled cells, stone cells, crystal and cork cells and tracheae. The type of venation is Pinnate Camptodromous festooned brochidodromous. Epidermal study shows that the leaves are hypostomatic. The upper epidermal cells are bigger with straight outline than the lower epidermal cells with wavy outlines. According to the World Health Organisation, the macroscopic and microscopic description is the first step towards the establishing the identity and degree of purity should be carried out before any other tests undertaken. This study is small contribution toward the standardization of plant material.

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