

**MORPHOLOGICAL AND MICROSCOPIC STUDIES OF AERIAL PARTS OF INDIAN FIG TREE****Dr. Tanvi Sood\*<sup>1</sup>, Dr. Vikrant Arya<sup>2</sup>, Dr. Ashwani Upadhaya<sup>3</sup>, Dr. Navneet Sharma<sup>4</sup>**<sup>1</sup>Asst. Professor, Shiva Ayurvedic College, Bilaspur, Himachal Pradesh, India.<sup>2</sup>Department of Pharmacognosy, Govt. College of Pharmacy, Rohru, Himachal Pradesh, India.<sup>3</sup>Professor P.G. Deptt. Of Dravyaguna RGGPGAC Paprola, Kangra HP.<sup>4</sup>Reader, P.G. Deptt. Of Dravyaguna RGGPGAC Paprola, Kangra HP.**\*Corresponding Author: Dr. Tanvi Sood**

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**ABSTRACT**

*Ficus racemosa* Roxb. is a deciduous tree comes under the category of Angiosperm commonly known as Indian fig tree, cluster fig tree, Goolar belonging to family Moraceae. In Indian System of Medicine i.e. Ayurveda, *Ficus racemosa* belongs to Panchavalkal group i.e combination of five herbs having properties like Shodhana (cleaning) and Ropana (healing) of wounds. It is used as ingredient in various formulations as an effective anti-microbial, anti-bacterial, anti-ulcer, anti – tussive activity. The present investigation deals with morphology and microscopy of aerial parts of Indian fig tree. Morphological study of fruits revealed the insect enters through ostiole in syconium for pollination. Microscopic study of leaves, fruit, bark shows identifying characteristics which are helpful in further standardization of this plant.

**KEYWORDS:** *Ficus*; morphology; microscopy.**INTRODUCTION**

*Ficus glomerata* Roxb. is deciduous tree found throughout greater part of India from outer Himalayan ranges, Punjab, Khasia mountains, Chota Nagpur, Bihar and Orissa, W. Bengal, Rajasthan, Deccan and common in South India from sea level to about 1800m in evergreen forests and near streams in deciduous forests. It is not found in Jammu and Kashmir, lower region of Himachal Pradesh and in Sikkim.<sup>[1,2]</sup> It is used as ingredient in various formulations as an effective anti-microbial, anti-bacterial, anti-ulcer, anti – tussive activity.<sup>[3-6]</sup>

**MATERIALS AND METHODS****Material**

For the purpose of pharmacognostical study, leaves, fruit and bark were used as a material. A detailed macroscopic and microscopic study on the plant and powder of Udumbara fruit, bark and leaves was carried out in College of Ayurvedic Pharmaceutical Sciences Joginder Nagar, Distt.Mandi to establish the identity of the drug.

**Collection of Plant**

The sample of the plant was collected from the Harichakiyaan village, Distt. Kangra (H.P.) and the area has an altitude between 3500 to 5000 ft., but sample was discarded after that the sample was collected from seona village of Patiala district of Punjab and the area has sea

level ranges from 1800 to 2000ft. The authenticity of these samples was confirmed by comparing their characters with various floras and standard herbarium sample in the month of April 2019.

**Morphology and Microscopy<sup>[7-10]</sup>**

Morphological studies of leaf, fruit and bark were carried out with the help of magnifying lens. Transverse sections of the fresh leaf, bark, fruit and also powder prepared of bark and unripe fruit for the microscopic studies and examined under Tri-nocular microscope Olympus-CH-20i model.

**2.2.1 Section cutting**

Sections were cut with the help of sharp razor blade. Thinner sections were subjected for observations of tissues under microscope.

**Reagent used**

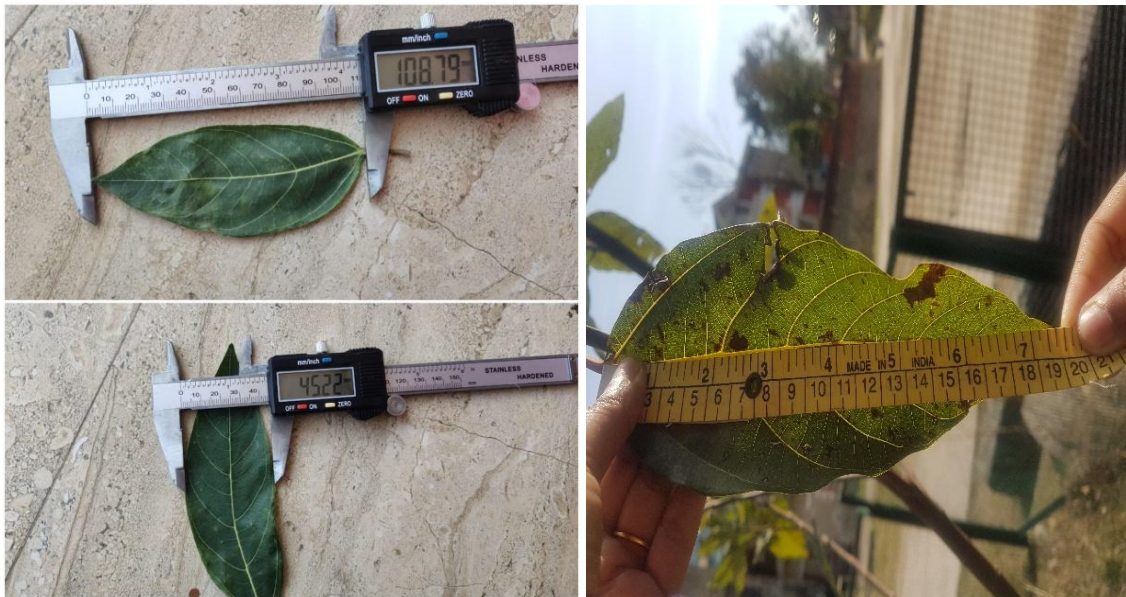
Chloral hydrate, Glycerine, Glycerine and water in 1:1, Sodium-hypochloride Sudan red 3, Distilled water were used.

**2.2.3 Mounting process**

Sample was taken in a clean glass slide and on this slide a section was transferred with the help of drawing brush. One or two drops of glycerin-water were added on the section with a dropper and finally with the help of forecep section was mounted.

**3. RESULTS AND DISCUSSION**

The results of morphological and microscopic examination of aerial parts of Indian fig tree are given in the Fig. 1(a-c) and Fig.2 (a-f).



**Fig. 1a: Morphology of leaf.**



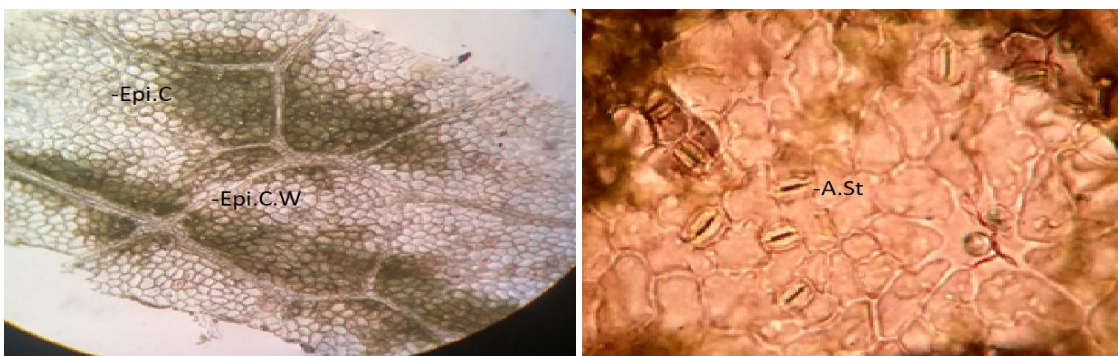




Fig. 1b: Morphology of fruit.



Fig. 1c: Morphology of Bark.





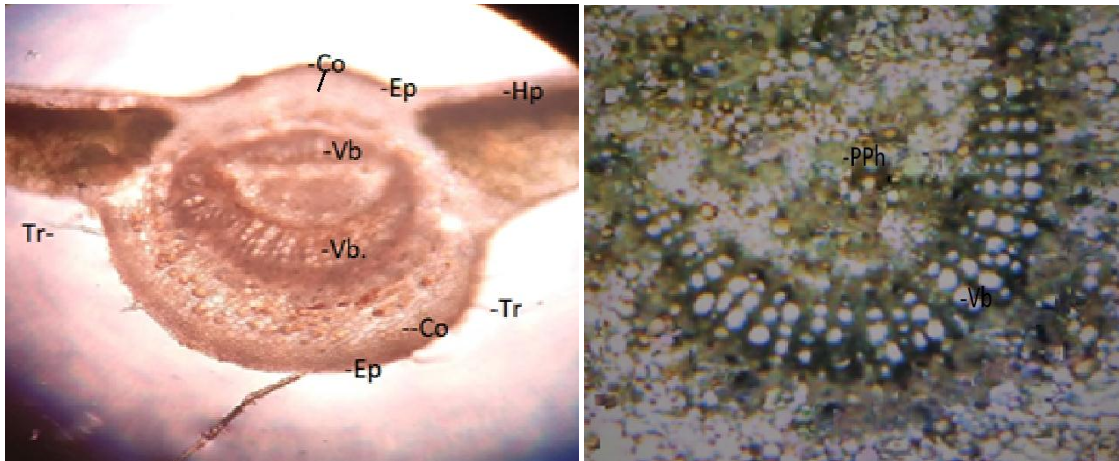


Fig. 2a: Leaf microscopy : Leaf stomata and transverse section.

Epi C W – Epidermal Cell Wall, Epi C – Epidermal cells, A.S – Anomocytic stomata, PPh – Peri-medullary phloem, VB – Vascular bundle, Tr – Trichomes, Ep –

Epidermis, Hp – Hypodermis, Pal – Palisade, Co – collenchyma, Ep – Epidermis, Hp – Hypodermis, VB – Vascular bundles, Tr – Trichome.





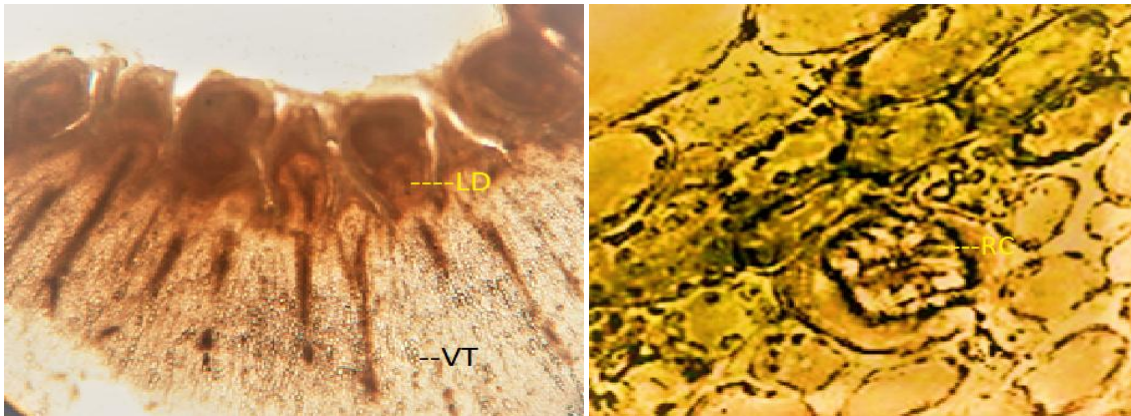


Fig. 2b: Fruit microscopy : Tr – Trichome, SC – Stone Cell, WL – Wide Lumen, Epi – Epidermis, Co.C – Collenchymatous Cell, Pa.C – Parenchymatous Cell, RC – Rosette Crystal, Pa.C – Parenchymatous Cell, LD – Lactiferous Duct, VT – Vascular Traces.

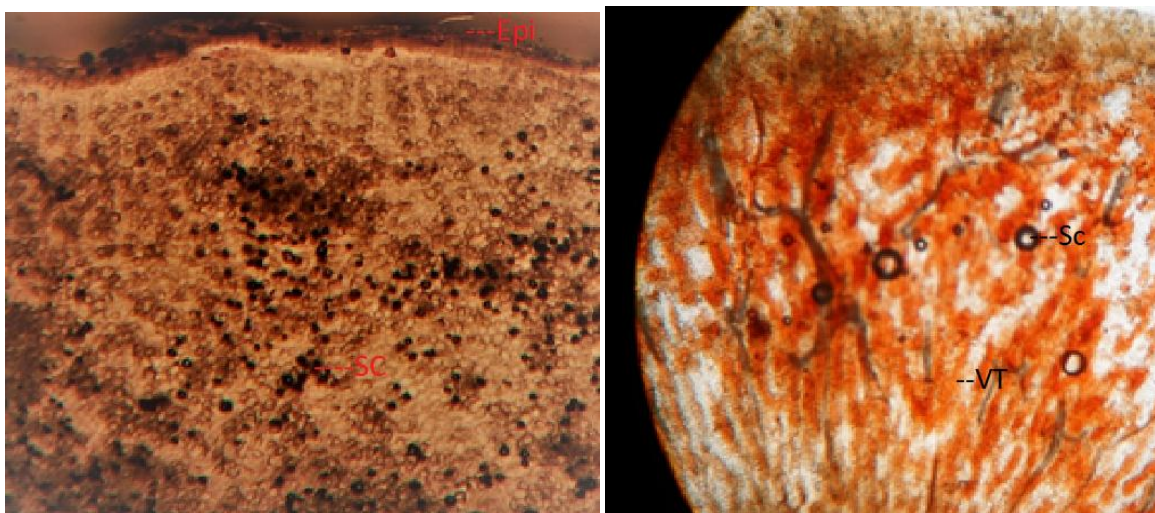


Fig. 2c. Mature bark microscopy : Epi – Epidermis, SC – Stone Cell, VT – Vascular Traces.

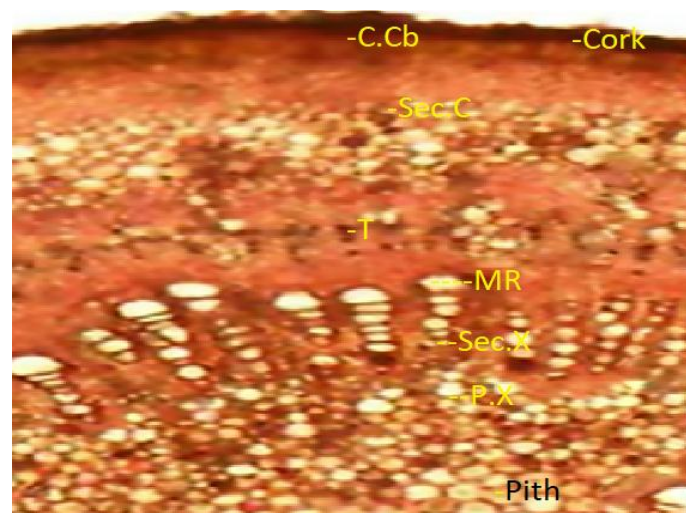


Fig. 2d: Fresh Stem along with bark microscopy T.S- Cork, C.Cb – Cork Cambium, Sec.C – Secondary Cortex, T – Tannins, MR – Medullary Ray, Sec.X – Secondary Xylem, P.X – Primary Xylem, Pith.

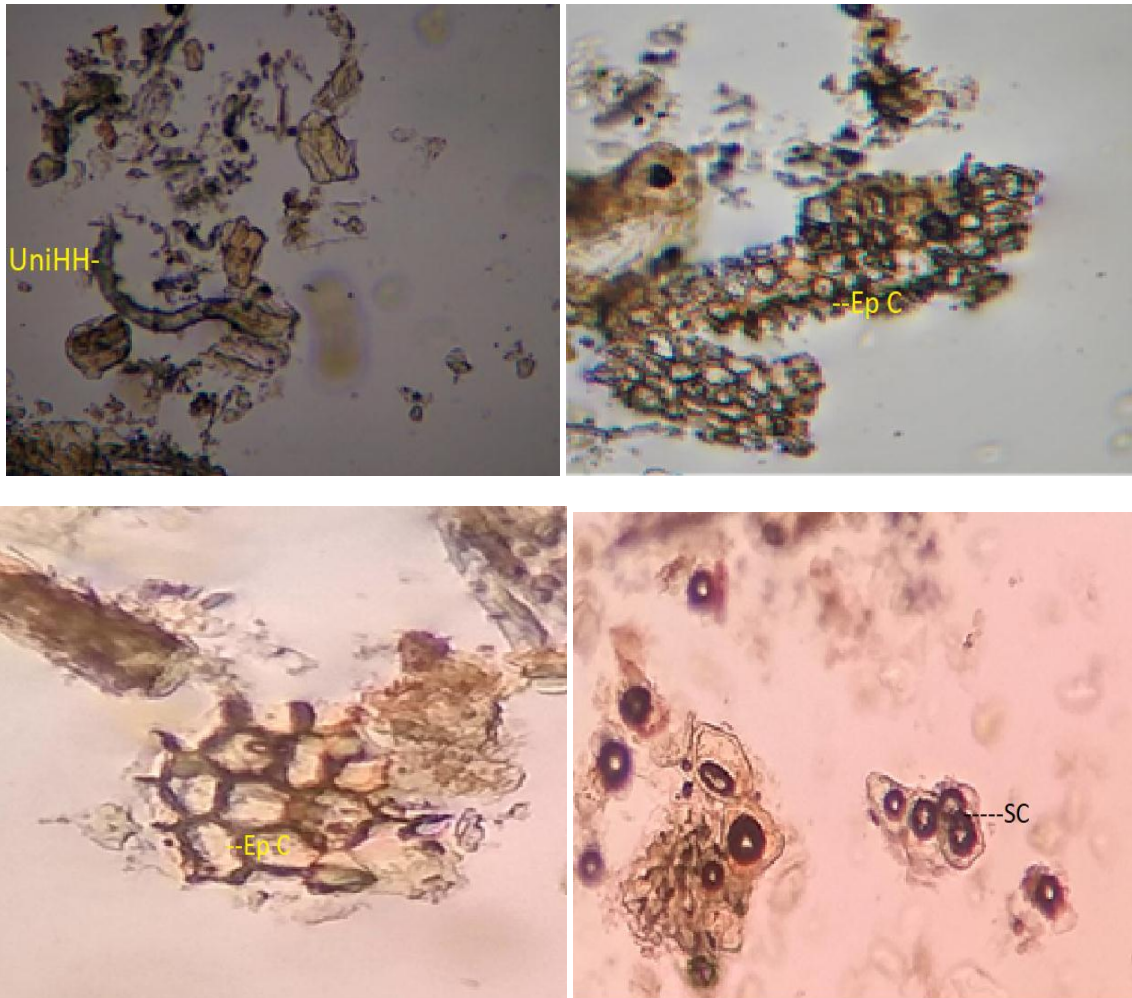
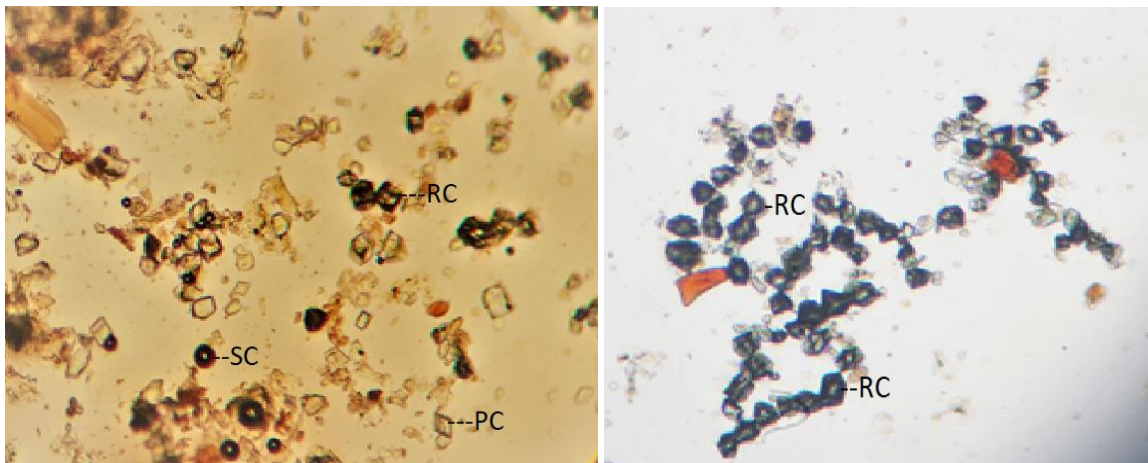


Fig. 2e: Fruit powder microscopy - Uni HH – Unicellular Hooked Hairs, Ep C – Epithelial Cell, SC – Stone Cell.





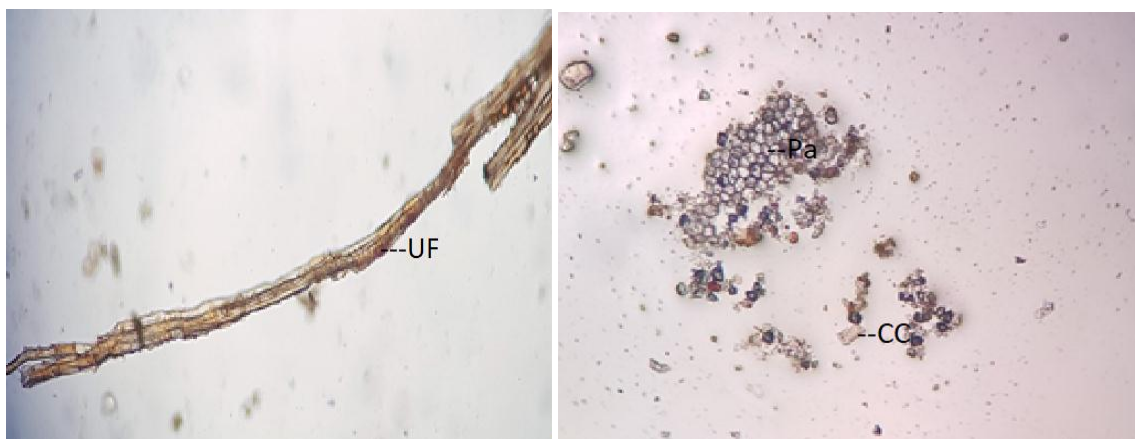


Fig. 2f: Stem-bark powder microscopy : PC – Prismatic Crystal, RC – Rhomboidal Crystal, RC – Rhomboidal Crystal, PC – Prismatic Crystal, SC – Stone Cell, RC – Rhomboidal Crystal, Pa – Parenchyma, UF – Unalignified Fibres, Pa – Parenchyma, CC – Cork Cell.

## LEAF

Fig.1a: Macroscopic character.

Characters	Description
Size	Lamina: Length 5- 20 cm, Breadth 3-7cm
Type	Simple
Shape	Ovate, Ovate-lanceolate
Arrangement	Alternate-spiral
Margin	Entire, plane, faintly undulate
Leaf Apex	Acute
Leaf base	Rounded-acute
Venation	Reticulate, Three prominent veins seem to be arising from the base of the lamina. Midrib raised above, lateral veins 10-15 pairs, curved very faint on both surfaces.
Stipule	2.2 cm long, ovate-lanceolate.
Petiole	Petiole:3.2-8cm, Angular and reddish brown
Surface Colour	Color of upper surface dark green and lower surface light green. Greenish brown (dried)
Texture	Glabrous
Odour	Not significant
Taste	Slightly acrid

## Microscopic study of leaf

Leaf has anomocytic stomata. Lamina of the transverse section shows hypodermis beneath the upper epidermis. Underlying the hypodermis are bi-layer, mesophyll composed of 3-4 layers of loosely arranged parenchymatous cells with scattered calcium oxalate cluster crystals. Vascular bundles are bicollateral, having patches of peri-medullary phloem and 3-4 secondary vascular bundles above the primary vascular bundle. Sheath of calcium oxalate cluster crystals are present below the primary vascular bundle. Starch grains are scattered throughout the ground tissue. Trichomes are covering, long, unicellula, few having a hooked-top.

Fig.2a.

## Stomatal index of leaf of *Ficus glomerata* Roxb.

## MATERIALS AND METHODS

The plant specimens of Udumbara were collected fresh from plants, growing in their natural environments. Samples of the material for slide preparations were taken

identical regions of each leaf, generally from mid-away between the leaf base and apex of lamina including the mid rib. The epidermal peels were obtained using a sharp pointed forceps. The stripes were thoroughly washed with distilled water, stained with 1% saffranin and then mounted in a drop of pure glycerol on a glass slide. A cover glass was placed over the drop. The slides were examined with light microscope and the epidermal features studied. The features observed includes- type of stomata, nature of the epidermal cells; nature of trichomes (If present), nature of distribution and dimension of stomata. The stomatal dimension considered were the length and breadth and also the stomatal number and stomatal index (SI) which is given as formula (Salisbury, 1927, 1932).

$$SI = \frac{S \times 100}{E+S}$$

Where, S- The number of stomata per field of view. E- The corresponding number of epidermal cells.

**Stomatal complex-** The stomata in *Ficus glomerata* studied is hypostomatic. The stomata were anomocytic in *F. glomerata*. The stomatal number is 46.37 and the Stomatal Index is 27.3 in leaf adaxial (Lower surface) of *F. glomerata*.

## Fruit

### Macroscopic character

Fig of Udumbara commonly referred as a fruit, but it is actually the infructescence or scion of the tree, known as a false fruit or multiple fruit, in which the flowers and seeds are borne. It is a hollow-ended stem containing many flowers. The small orifice visible on the base of the fruit is a narrow passage, known as ostiole which allows the passage of female wasp inside the fig. The edible fruit consists of the mature syconium containing numerous one-seeded fruits. The fruit is 1.5 to 3 centimeters long, pyriform to subglobose with a green

skin, sometimes ripening towards purple or brown. It has milky sap. **Fig.1b.**

### Microscopy of fruit

Fruit shows single layered epidermis covered with thick-cuticle having numerous unicellular hooked hairs and reddish-brown content; epidermis followed by 5-8 layers oval to polygonal, collenchymatous cells and oval to polygonal, thin-walled parenchymatous cells respectively; a few rosette crystals of calcium oxalate and reddish content found in collenchymatous cells; vascular traces, lactiferous cavities and pitted, round to oval lignified stone cells, with wide lumen present in parenchymatous zone. **Fig. 2b.**

### Fruit powder microscopy

Brown, shows unicellular hooked hairs, epidermal cells and stone cells. **Fig. 2e**

## Bark

### Macroscopic character: Fig.1c

Characters	Fresh bark	Dry bark
Conditions	Moist, soft, sticky, thick, fissured and warty or corky, becoming rough. When wounded, the bark exudes a gum which is initially white in color but changes to reddish brown or brownish black on exposure.	Hard and contracted
Shape of the pieces	Semicircle but not contracted	Recurved and channeled quills.
Thickness	Varies, 0.8-1.4 cm	Varies, 0.6-1.0 cm
Colour	Outer surface pale greenish with white flakes Inner surface light brown	Outer surface: blackish brown Inner surface: brownish buff colored
Odour	Odourless	Slight woody odour
Taste	Bland and woody	Same as fresh bark
Fracture	Fibrous; outer surface of the bark had scattered lenticels and small and large scars left by the prickles and branches. Outer surface was marked by wavy longitudinal striations; inner surface also had longitudinal striations. The cork was found frequently exfoliated	Splintery

### Microscopic study of bark

**Mature bark:** Mature bark was brittle and contained large amounts of secondary dead cells. **Fig. 2c.**

**Young stem comprising of bark:** The transverse section (T.S.) of young stem comprising of bark was taken as the mature bark was brittle and contained large amounts of secondary dead cells. The T.S. showed a periderm consisting of the following three layers.

1. Outer phellum (cork): consisted two layers of thickly suberised cells.
2. Middle phellogen (cork cambium): forms a continuous layer of tangentially elongated and thin walled cells.
3. Inner phelloderm (secondary cortex): consisted a few layers of parenchymatous cells, some of the cells contained numerous chloroplasts, while a few others showed thick walled fibers. The cortex region showed tannin filled cells and calcium oxalate crystals (rhomboidal and prismatic). Next to cortex,

secondary phloem was present followed by secondary xylem. In between few layers of conjunctive tissues were seen. Next to secondary xylem, primary xylem followed by central pith were seen. **Fig. 2d**

**Bark powder microscopy:** It is characterized by the presence of abundant prismatic crystals of calcium oxalate either free or in detached parenchymatous cells, sclereids separated or more or less in small intact groups; individual sclereids of various shapes, rectangular, isodiametric, elongated and broken unligified fibres. It also have occasional parenchymatous cells with brownish contents. **Fig. 2f.**

## CONCLUSION

The anatomical description of *Ficus glomerata* Roxb. fruit and powder microscopy of bark and fruit powder presented for the first time in this research paper which contributes to further knowledge of this plant. Presence of anomocytic stomata, stomatal index in leaves and



vascular traces and lactiferous ducts in fruit are shown in study. Calcium oxalate crystals is hallmark in identifying *F.glomerata* Roxb. Both samples i.e fruit and stem-bark powder microscopically exhibit prismatic crystals. This will be helpful in anatomical studies of this particular species plant *Ficus racemosa* Roxb. belonging to family Moraceae.

#### REFERENCES

1. Database on Medicinal Plants used in Ayurveda (CCRAS), Vol-3, Edi-2001, 2005; 536.
2. <https://indiabiodiversity.org/species/show/31344>.
3. Md.Shahadat Hossain, Md. Abu Sayeed, Md. Nasir Uddin, 2014.
4. Mandal SC, Maity TK, Das J, Saha BP, Pal M, 2000.
5. Rao CHV, Verma AR, Vijay KM,Rastogi S, 2008.
6. Bhaskara RR, Murugesan T,Pal M,Saha BP,Mandal SC, 2003.
7. Floral Simlensis (Sir Henry Collett); Phylogenetic characters of urticaceae, Ficus genus, Third impression, 457-458.
8. Indian Medicinal Plants (K.R.Kirtikar & B.D.Basu), Vol-3, Second Edition Reprint, 1999; 2327.
9. API: (Govt of India Ayush deptt.), Part-1, Vol-1(pp-156).
10. API: (Govt of India Ayush deptt.), Part-1, Vol-3 (pp-217).