A. *Loranthus parasiticus*

IX.A. 1 - Anatomical Study of Collected Plant Taxa

We prefer the time period from February to April, for worked done as this is the flowering period of these taxa. The materials are collected and preserved in mixture of glycerine-alcohol-water solution for anatomical study. The stem, leaves are transversely dissected for anatomical observations (2-3 samples for each species from 2-3 localities). Mounted with glycerine jelly for preparation of permanent slides (Vardar, 1987). The photograph of Well-stained sections were performed under Olympus- 0082721 light microscope. After preparation, light microscope [Leica DM 1000 LED] is used for slides observation under and simultaneously in contrast phase microscope is used for contrast picture and for better analysis.

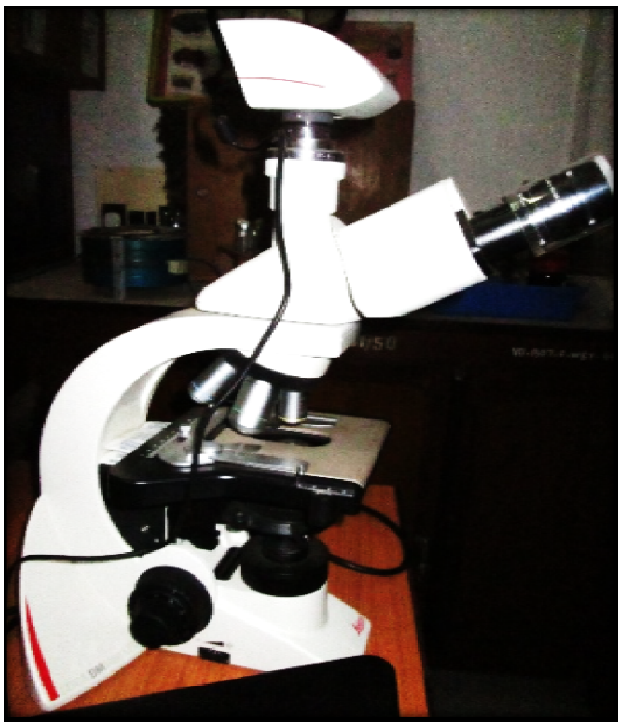


Fig – 40: Leica DM 1000 Light Microscope.

Calculation

We observed the shape, size, position, index occurrence and location of the stomata and anatomyof the stem, leafof selected plant taxa were studied under compound microscope (40x, 10x) measurement of size, shape, result of experiment.

Magnification

Microscope number- 0082721

Low power (10x) magnification

1 Stage Division=10µm

10 stage division=10×10 µm= 100 µm

Hence, 100 µm is magnified into 2.2 cm= 22 mm

= 22×1000µm

1 µm is magnified into 22×1000/100 = 220 times

High power (40x) magnification

1 Stage Division=10µm

10 stage division= 10×10 µm= 100 µm

Hence, 100 µm is magnified into 9.3 cm= 93 mm

= 93×1000µm

1 µm is magnified into 93×1000/100 =930 times

Area of Microscopic Field

Determination of area of field of vision (under high power).

No. of stage division = diameter of the microscopic field area =32 stage division

So, radius of the field of vision = 32×0.001cm =0.032/2 =0.016cm

(We know, 1 stage division = 0.01mm=0.001cm)

Area of the microscopic field = πr^2 = 0.0008038 cm^2

IX. A. 1.i – Results and Discussions

Macroscopic Characteristics of stem

Small twigs are observed on the stem at aerial branches with 2 mm to 2.5 cm thickening having bulged nodes on opposite leaves; stem bark is dark brown to lighter brown in colour, thin and lenticels are uniformly distributed slightly rough to touch; The wood become yellowish-brown after removing thin bark; irregular fracture and fibrous, No such odour with astringent taste.

Fig – 41: Stem of *Loranthus parasiticus*

Microscopic Characteristics of stem

In transverse section, the stem showed a circular outline. The epidermis present in outermost layer which made up of squarish or barrel shaped cells, and epidermal cell cover with cuticle. Below the epidermal cell the region consist of corticle cells, made up of tangentially elongated as well as rounded cells lying in several layers, with stone cells occurred in single or in pair. In cortex, there are bundles of pericyclic fibres present, just above the phloem of vascular bundle.

There are found 18 distinct vascular bundles (the vascular bundle varies relating to age of the plant). The vascular bundle is closed, conjoint, collateral type. Phloem is observed around the xylem in several thin patches. Xylem occupies maximum part on transverse section and is traversed by medullary ray which are seriate, radially elongated, lignified numbering from 1 to 4. Vessels are well-developed consist of tracheids, xylem fibres and xylem parenchyma. At the center of the stem, pith is prominent, made up of polygonal lignified thin walled parenchymatous cells; sclereides are also found in this region.

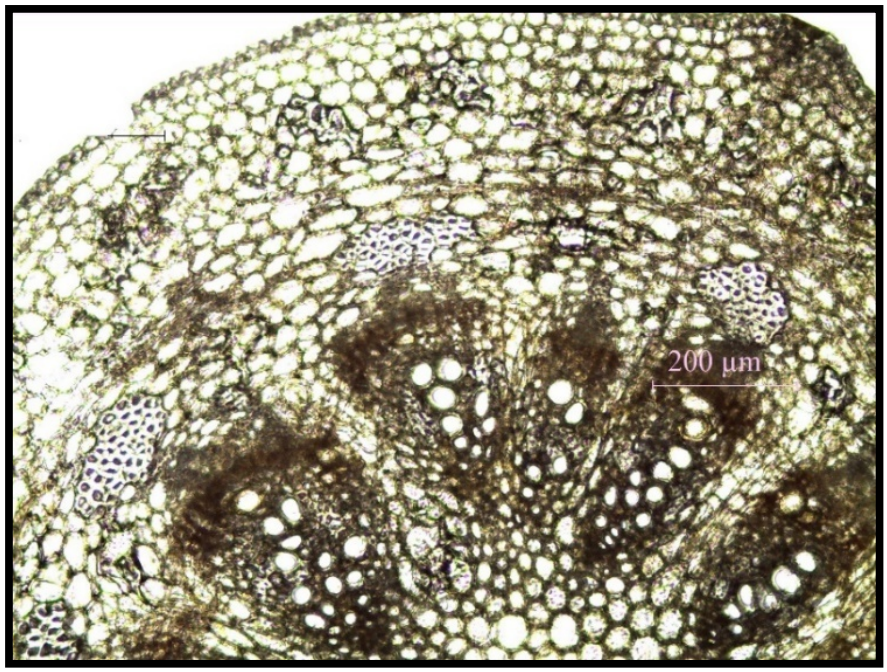


Fig – 42: T.S. of the *Loranthus parasiticus* stem

Macroscopic Characteristic of leaves

A single leaf is dorsiventraly distinct i.e. adaxial & abaxial side. Leaves are greenish in colour and with thick cuticles, length is 14.3 cm and width is 9.9 cm. Midrib is well distinct and midrib is reddish in colour on abaxial side of the young leaf. Leaf margin is entire and wavy & also reddish in colour. Reticulate venation is found on the leaf, surface of the leaves are smooth. No odour present.

Fig – 43: Upper surface of leaf

Fig – 44: Lower surface of leaf

Microscopic Characteristic of leave:

Thick cuticle is observed in transverse section; A special types of squarish cells are present in both surfaces. Both surfaces are nearly similar; stomata type is **Paracytic**, present on the both surfaces; mesophyll cell of the lamina arranged in 2 to 4 layers from inner to outer of the leaf section. Rectangular cells are arranged in both surface of epidermis with few intercellular spaces; occasional vascular bundles or strand are passing throughout the middle portion; midrib buldging prominently on both the surfaces and containing a group of 3 to 5 vascular bundles and here vascular bundle also closed, conjoint, collateral type. Vascular bundles of Xylem tissue oriented at upper epidermis, whereas phloem (vessels and parenchyma) located towards lower side and consisting of specialised thin walled cells; No bundle sheath is found; collenchymatous cells are associated with each vascular bundle outside the phloem.

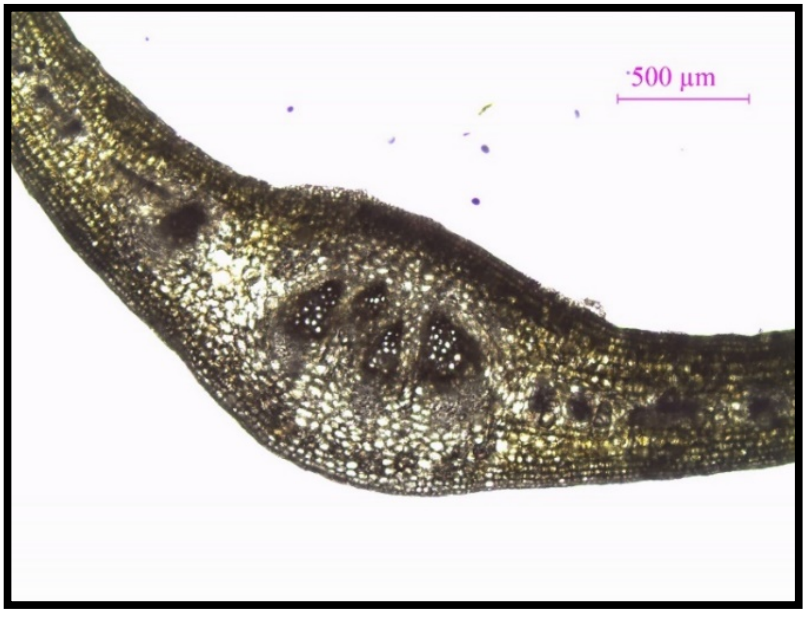


Fig – 45: T.S. of *Loranthus parasiticus* leaf

Table – 9: A Brief Account on Macroscopic and Microscopic characters of *Loranthus parasiticus*

	Plant parts	Characters
Macroscopy	Stem	dark brown incolor,2 mm to 2.5 cm in thick with bulged nodes, Slightly rough to touch
	Leaf	Green in color with cuticles, Short-stemmed, broadly elliptical to lanceolate.
Microscopy	Stem	Circular in outline, outermost layer consists of cork cell. Pericyclic fibers appear outside phloem throughout the cortex; medullary ray cells present, pith occupy the central part.
	leaf	Thick cuticulate, squarish cells present; stomata Paracytic, in middle portion group of 18 vascular bundles present.

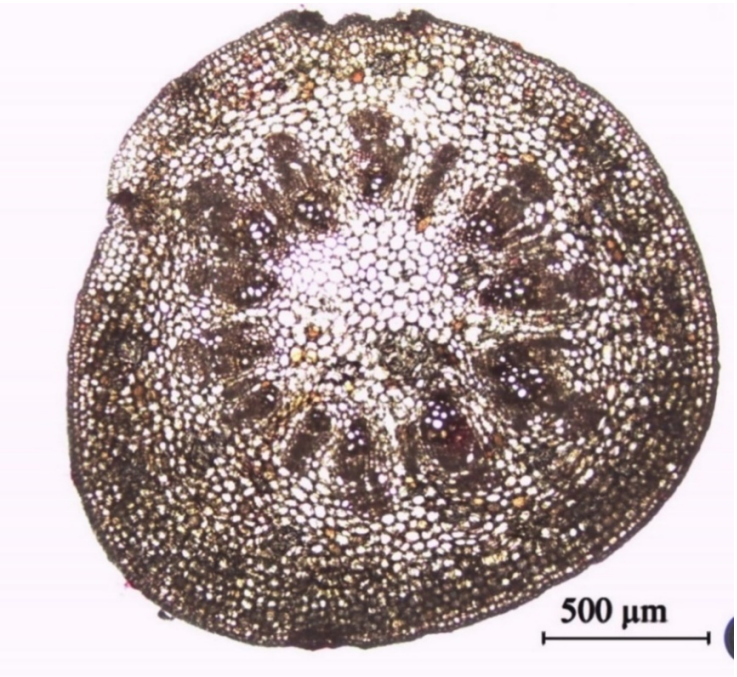


Fig – 46: T.S section of the stem showing circular in outline.

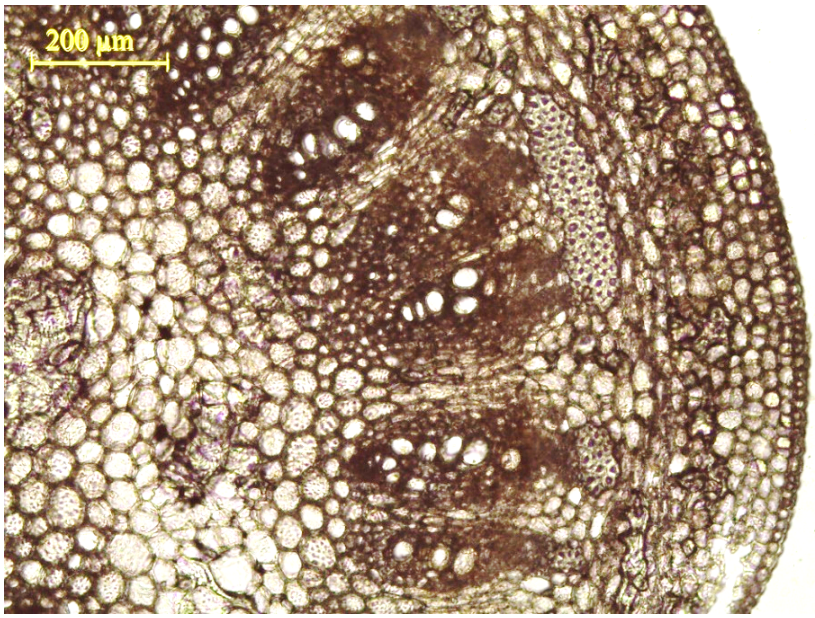


Fig -47: A portion of stem section showing vascular bundles & pericyclic fiber.

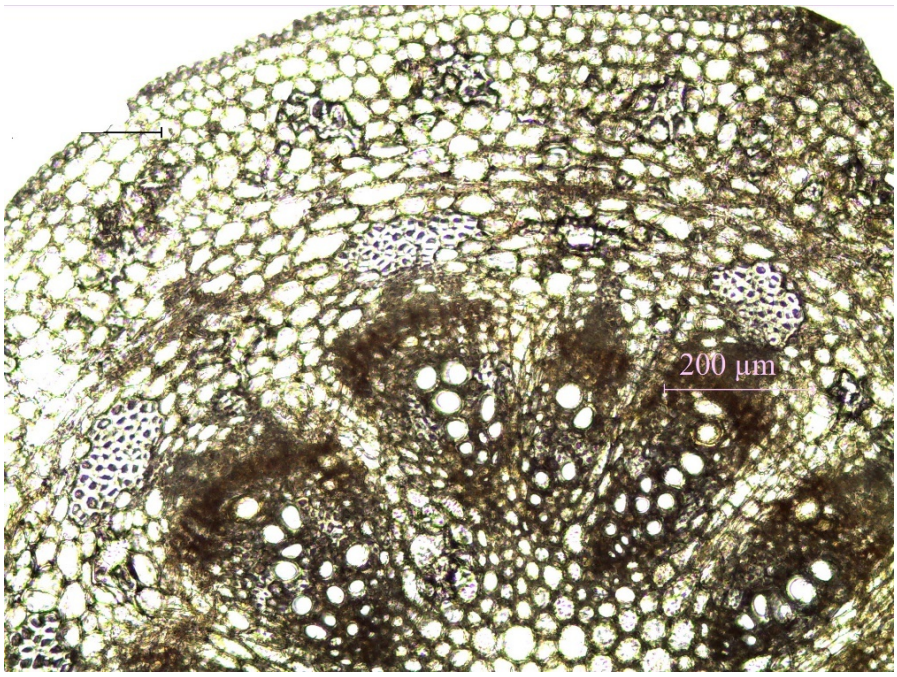


Fig – 48: A portion of stem section showing vascular bundles & pericyclic fiber

Fig -49: A portion of leaf section showing vascular bundle.

The study reveals to find additional features for better delimitation of the examined *Loranthus* taxa using micro- and macro-morphological characters. In previous taxonomic treatment of genus *Loranthus* in Iran, length of leaf and internodes characters have used for diagnosing particular species (Rechinger, 1976). Metcalfe and Chalk, (1957) gave information about the general anatomical characteristics of the family Loranthaceae, but there was little information about the anatomical structure of species.

Anatomy of leaf varies greatly species to species and several significant characters can find out which are important in systematic (Carlquist, 1961). Our selected taxa are similar in general aspects of leaf anatomy. There is no differentiation in palisade and spongy parenchyma within leaf mesophyll; this confirms results obtained by Xue-Zhi, et al. (2006), Demuth and Weber, (1987). In our study we also see the leaf mesophyll had no differentiation of palisade and spongy cells.

IX. A. 2 - Micro-morphological (Stomata) study of collected plant taxa

Materials and Methods

The foliar of mature leaves were pealed at middle of both leaf surfaces. Then the pealed parts were temporary mounted by glycerine. Camera Lucida is used to measure, stomatal frequency. Presence of stomata and their number were counted per unit area (1038660.2 cm^2). There are 3 consequent microscopic fields were counted and averaged to obtain the stomatal frequency. The following formula is used to calculate stomatal index (I) i.e. total number of stomata(S) and epidermal cells was present in a unit area [I=S/(S+E)]. Light microscope [Leica DM 1000 LED] and phase contrast microscope are used after slides preparation for detailed analysis and stomatatal nature observation.

IX. A. 2. i - Results

The result in this investigation is summarized in tables which include stomata count, stomata type.

Determination of Stomata Frequency of a Leaf (under high power): -

Surface Of The leaf	Region Of The Leaf	No. of Stomata Per Microscopic Field area			Avg. no. of Stomata Per Microsco-pic Field area	Avg. no. of Stomata At each Surface Per Micros-copic feid area	Total no. of Stomata On both Surface Per microscopic Field area	Area Of Micro-scopic Field (sq.cm)	Total Leaf Area (cm)
		1st	2nd	3rd					
Upper surface	Apex	5	4	4	4.33	4.66	4.66+3.33 =7.99	0.0008038	104.49
	Middle	5	5	6	5.33				
	Base	4	4	5	4.33				
Lower surface	Apex	4	4	3	3.66	3.33			
	Middle	3	5	4	3				
	Base	4	3	3	3.33				

Table No – 10: Determination of stomatal frequency *Loranthus parasiticus*

Calculation: -

Determination of area of field of vision (under high power).

No. of stage division = diameter of the microscopic field area =32 stage division

So, radius of the field of vision = 32×0.001cm =0.032/2 =0.016cm

(We know, 1 stage division = 0.01mm=0.001cm)

Area of the microscopic field = πr^2 = 0.0008038 cm^2

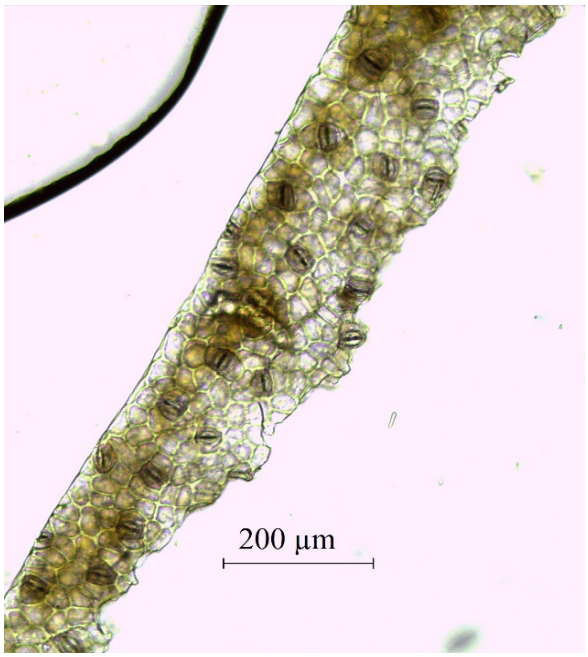
Total number of stomata on both surface per microscopic field area =7.99

Total number of stomata per unit area = 7.99/0.0008038 cm^2

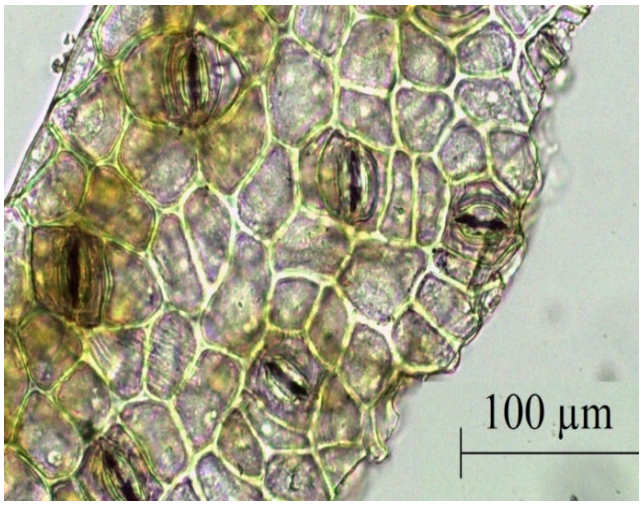
=9940.283 cm^2

The total number of stomata on the leaf surface = 104.49×21547.649

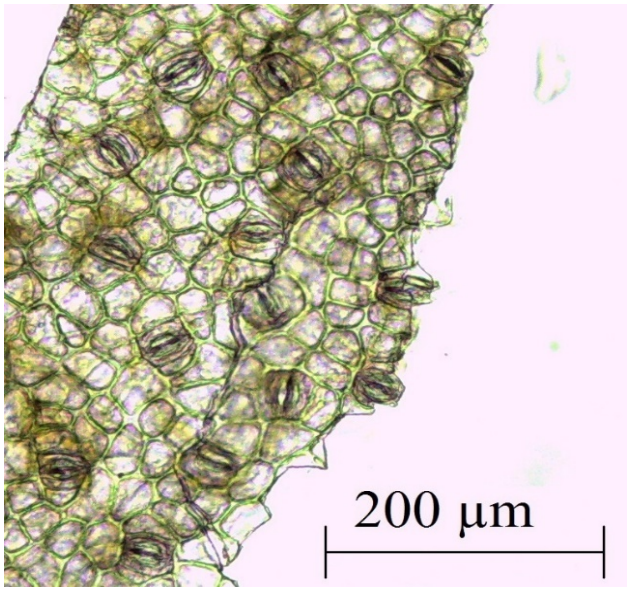
= 1038660.2



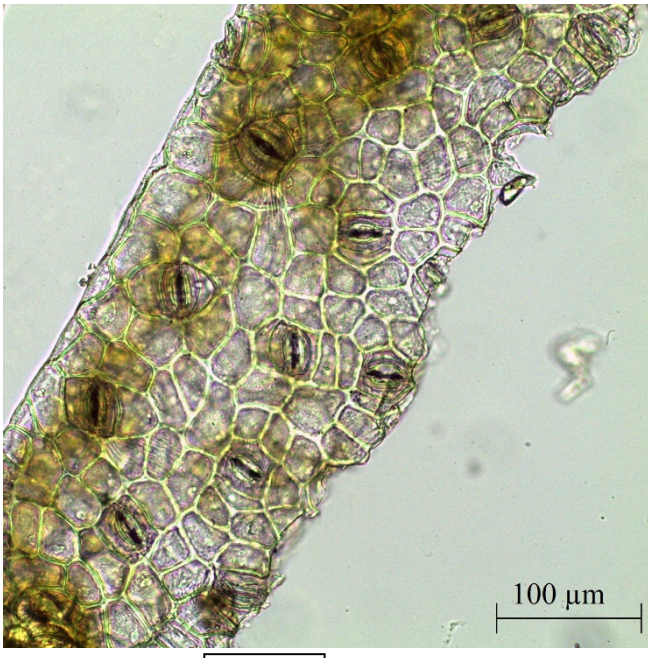
50 : a.



50 : b.



50 : c.



50 : d.

Fig – 50: **a.** Stomata on upper surface of leaf. **b.** Stomata at middle portion of upper surface of leaf. **c.** stomata Lower surface of leaf. **d.** Stomata at middle portion of lower surface of leaf

IX. A. 2. ii - Discussions :

The epidermal cell shape, anticlinal wall pattern & stomatal type might be of little taxonomic importance especially at the species level but it is useful to draw the affinity among family and important from taxonomic view to identify family. The stomatal shape and size are taxonomically important trait (Tahir & Rajput, 2009); in all taxa. Epidermal cell and nature of stomatal characters used in solving different taxonomic problems. Stomata were paracytic type. Thus they did not provide additional diagnostic features in this genus. Stace stated that environmental condition like humidity plays a key role which determines the anticlinal cell wall pattern. In dry environment the species exhibit to curve to straight cell wall. *Loranhus* are found on arial parts of the host and thus exposed to more light intensity, temperature and less humidity than their host.

IX. A. 3 - Study of dry Powder of leaves of *Loranthus parasiticus* (L) Merr.

Plants and its different parts are generally used to investigate the medicines and the natural resources are used to treat different diseases on pharmacological which are often found in all tribes of the world. There is a proof of using mistletoe preparations in complementary medicines to cure disease like cancer (Grossarth-Maticekand R. Ziegler, 2007) and in diabetes treatment (Osadebe, et al; 2004 and Obatomi, et al; 1994). In Africa, aqueous extract of some mistletoe are used to evoke a concentration dependent on smooth muscle contraction of the jejunum of rabbit and in ileum of guineapig (Tarfa, et al; 2002).

Materials and Methods

The leaves were sun dried for a period of one week and ground into a fine powder using a mortar pestle. Then the fine dust was collected. The study microscopic characters were done by Brain and Turner method.

IX. A. 3. i - Results and Discusions

Organoleptic character

The result was obtained in study of *Loranthus parasiticus* (L) Merr. Leaves (Table.5)

Table – 11: Organoleptic characters of leaf

Particulars	Leaf
Condition	Dried and broken
Colour	Yellowish green
Odour	Characteristic aromatic
Taste	Better
Texture	Smooth
Size	13.5×9.5 cm

Powder characters

Powder is fresh yellowish green in color containing pieces of cork cell, epidermal trichromes, epidermal peelings, pericyclic fibers, starch grain,stone cell, vessels and prismatic calcium oxalate crystals.The observation of this characters given in a table.

1. **Cork cell-** Cork cells are thick walled, pitted. Cork cells consist of few layers of radially arranged colorless lignified parenchymatous cells.
2. **Epidermal trichomes-** Unbranched, unicellular, non - glandular with thick lignified walls and echinate cuticle present,

3. **Epidermal peelings-** The stomata are paracytic type. The epidermal cells have straight, thin walls.
4. **Pericyclic fiber-** These fibers are long with tapered, blunt or branched ends; the cell walls are thick, lignified with simple or slightly bordered pits.
5. **Astero Scleride-** This scleride branch, pointed irregular often star shaped scleride .
6. **Starch grain-** Starch grain are not abundant in powder. They are simple and oblong to round in shape.
7. **Stone cell-** Stone cell are scarce in the powder. They are rectangular, square or triangular in shape, unpitted and have blunt ends and walls thick with narrow lumen.
8. **Vessels-**Vessel arise from a row of meristematic cells. Vessels are perforated at their ends. The lateral secondary walls of vessels are compound of lignified cellulose.
9. **Crystals of calcium oxalate-** crystals of calcium oxalate are solitary and not abundant in powder.

Table – 12: Organoleptic features of leaves powder of *Loranthus parasiticus*

S.No.	Features	Observation
1.	Cork cell	Thick walled, pitted
2.	Epidermal trichome	Non-glandular
3.	Epidermal peelings	Paracytic type
4.	Pericyclic fiber	Long, tapered, thick
5.	Starch grain	Simple ,oblong to round
6.	Stone cell	Rectangular, square
7.	Crystal of calcium oxalate	Solitary

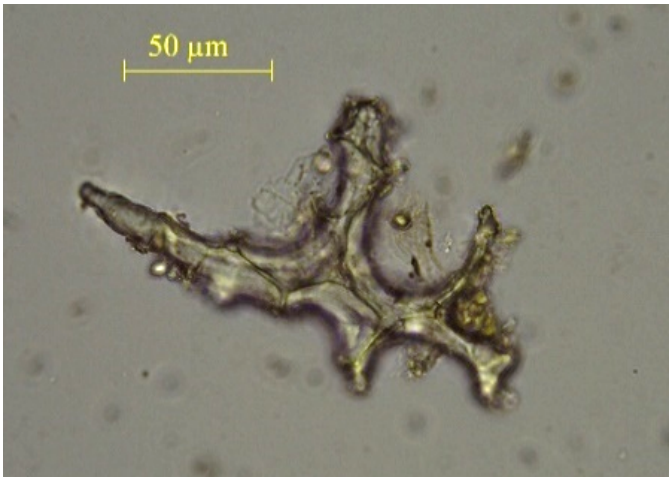


Fig – 51: a.

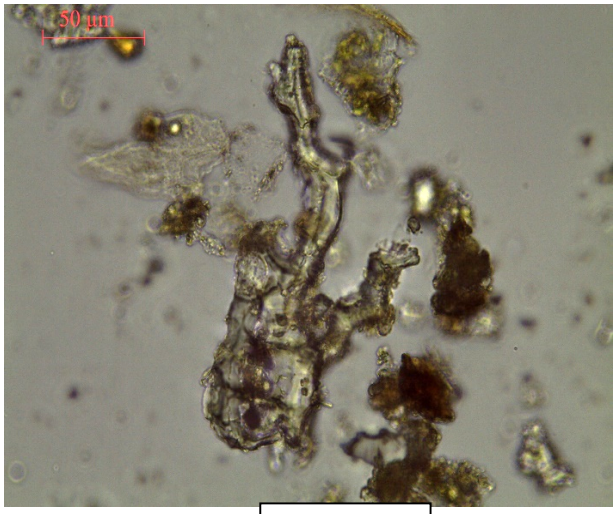


Fig – 51: b.

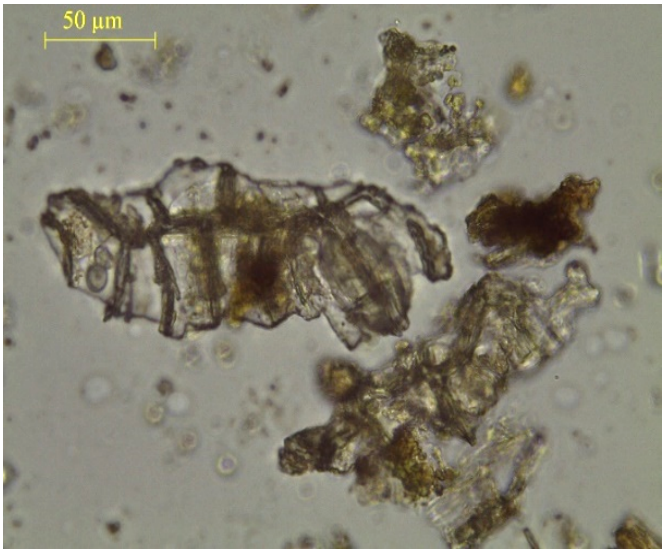


Fig – 51: c.

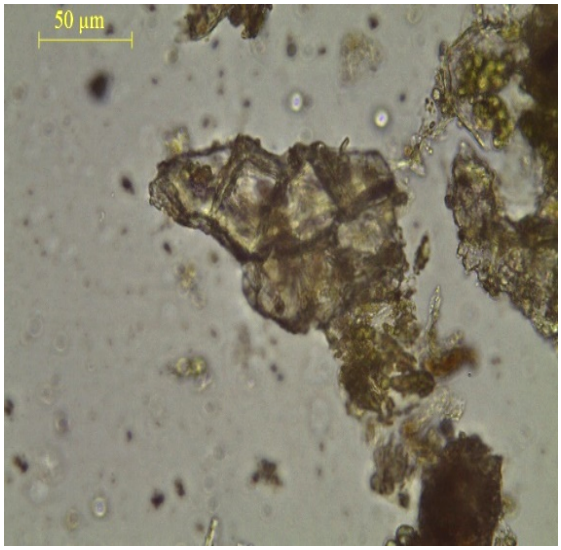


Fig – 51: d.

Fig- 51: a. Showing asteroscleride under light microscope; **Fig – 51:b.** Showing pericycle fibre under light microscope; **Fig – 51:c.** Showing Crock cell under light microscope; **Fig – 51:d.** Showing Crock cell under light microscope

IX.B. 1 - Anatomical study of selected plant taxa

Plant samples were placed in FAA and fixed with 70% ethanol for 3 days. The cross-sections were stained with methylene blue (to study xylem and fiber tissue) and Congo red (to study phloem, epidermis and parenchyma tissue) and mounted with glycerin jelly to make permanent slides (Vardar, 1987). Well stained sections were photographed with a Leica DM 1000[LED] light microscope.

IX. B. 1. i - Results and Discussions

Macroscopic Characteristics of stem

The bark is dark brown in colour, thin lenticels of lighter brown colour are uniformly distributed, slightly rough to touch. After Removal of thin bark, the wood showed yellowish-brown; the stem bark is dark brown to lighter brown in colour, thin and lenticels are uniformly distributed slightly rough to touch; if the thin bark is removed, the wood become yellowish-brown; irregular fracture and fibrous, No such odour with astringent taste.

Fig – 52: Stem of *M. cochinchinensis*

Microscopic Characteristics of stem

In transverse section, the stem showed a circular outline. The epidermis presnt in outermost layer which made up of squarish or barrel shaped cells, and epidermal cell cover with a thick cuticle. Below the epidermal cell the region consist of corticle cells, made up of tangentially elongated as well as rounded cells lying in several layers, with stone cells occurred in single or in pair. In cortex, there are bundles of pericyclic fibres present, just above the phloem. There are found 18 distinct vascular bundles (the vascular bundle may vary according to age of the plant). The vascular bundle is closed, conjoint, collateral type. Phloems are observed around the well-developed xylem in several thin patches. Xylem occupies maximum part on transverse section and is traversed by seriate radially elongated lignified medullary ray cells regularly numbering from 1 to 4. Vessels are well-developed consist of tracheids, xylem fibres and xylem parenchyma. Pith is prominent at centre of the stem, made up of parenchymatous cells, rounded or polygonal lignified thin walled; some groups of sclereides also found in this region.

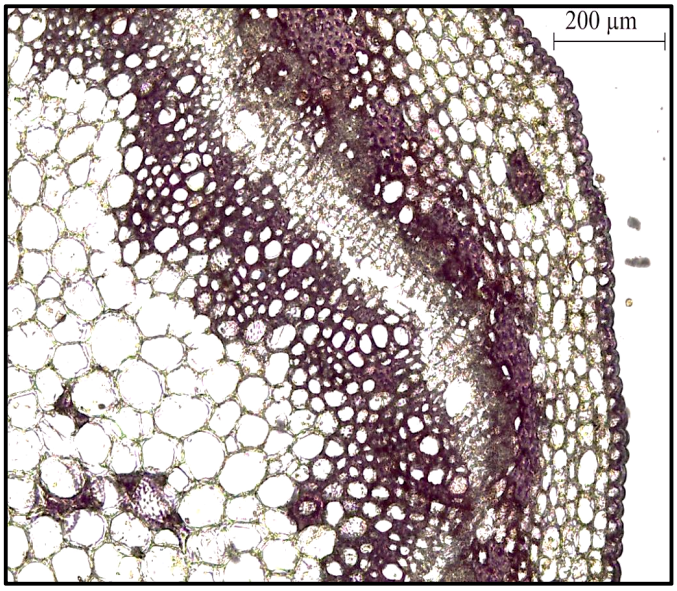


Fig – 53: T.S. of the stem of *M. cochinchinensis*

Macroscopic Characteristic of leaves

A single leaf is dorsiventraly distinct i.e. adaxial & abaxial side. Leaves are greenish in colour and with thick cuticles, length is 14.3 cm and width is 9.9 cm. Midrib is well distinct and midrib is reddish in colour on abaxial side of the young leaf. Leaf margin is entire and wavy & also reddish in colour. Reticulate venation is found on the leaf, surface of the leaves are smooth. No odour present.

Fig - 54: Upper surface of the leaf of *M. cochinchinensis*

Fig - 55: Lower surface of the leaf of *M. cochinchinensis*

Microscopic Characteristic of leaves

T.S of the leaf shows a thick cuticular layer, both surface of epidermis composed of squarish cells. surface views of upper and lower nearly similar; stomata are paracytic type. Mesophyll lamina consists of 2 to 4 layers of arranged compactly. occasional vascular strands passing through this middle portion; midrib buldging prominently on both the surfaces and containing a group of 3 to 5 vascular bundles; bundle sheath absent; each vascular bundle associated with patch of collenchymatous cells outside the phloem.

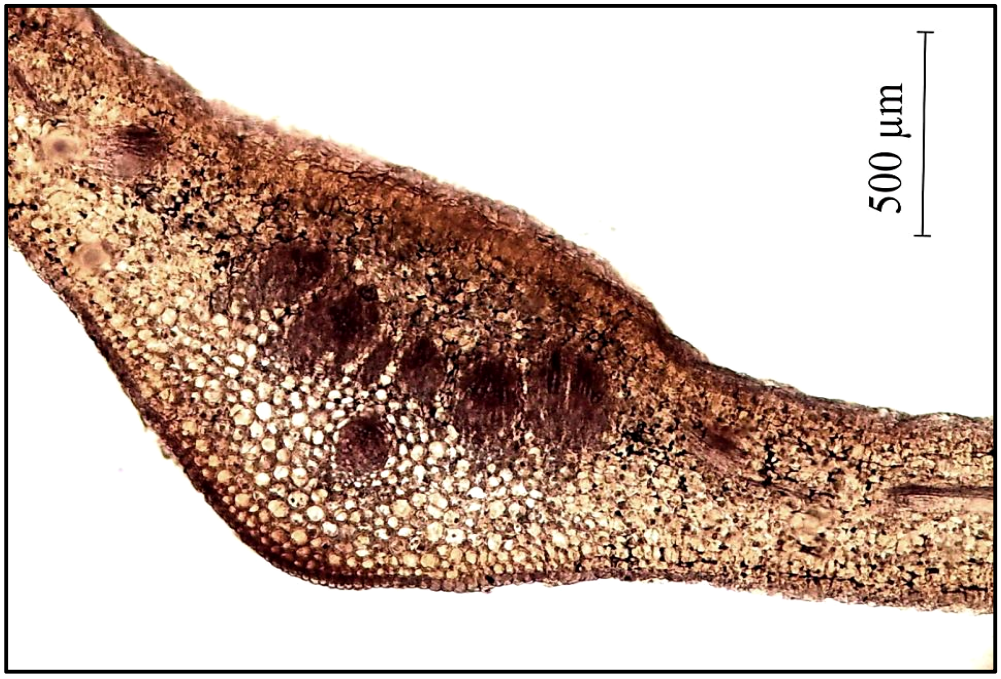


Fig - 56:T.S of the leaf of *M. cochinchinensis*

Table – 13: A Brief Account of Macroscopical and Microscopical Featurses of the *Macrosolen cochinchinensis* (Stem and Leaf)

	PLANTS PARTS	CHARACTERS
MACROSCOPY	Stem	dark brown incolor,2 mm to 2.5 cm in thick with bulged nodes, Slightly rough to touch
	Leaf	Green in colour with cuticles, Short-stemmed, broadly elliptical to lanceolate.
MICROSCOPY	Stem	Circular in outline, outermost layer consists of cork cell. Per cyclic fibres appear outside phloem throughout the cortex; medullary ray cells present, pith occupy the central part.
	Leaf	Thick cuticlulate, squarish cells present; stomata Paracytic, in middle portion group of 3 to 5 vascular bundles present.

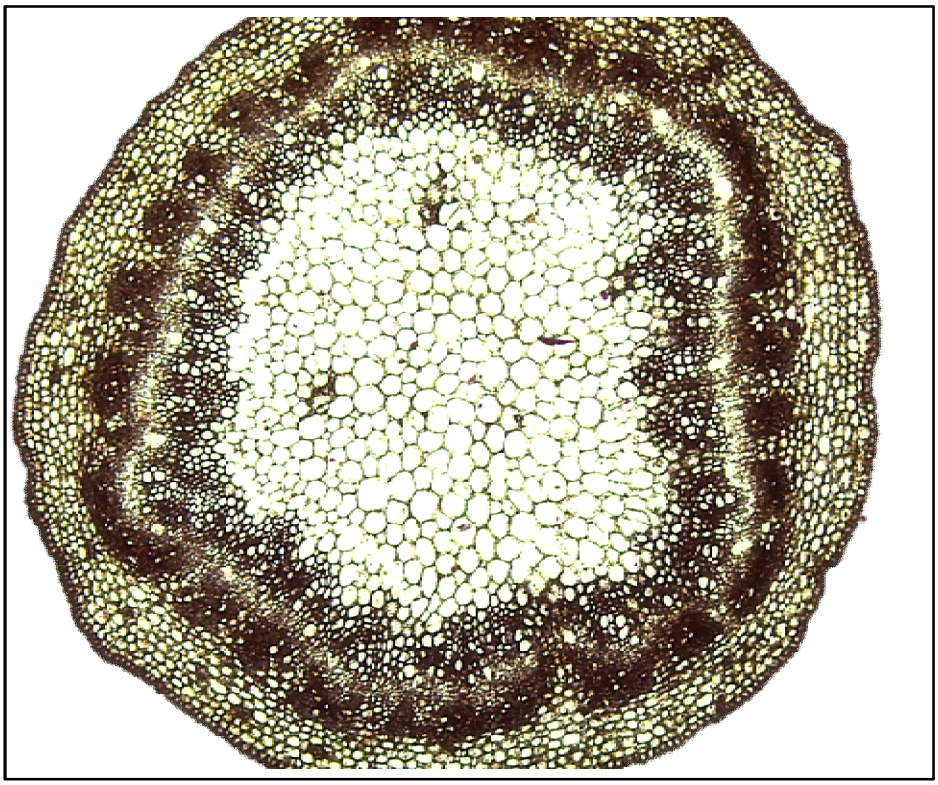


Fig - 57: T.S of stem of *M. cochinchinensis.*

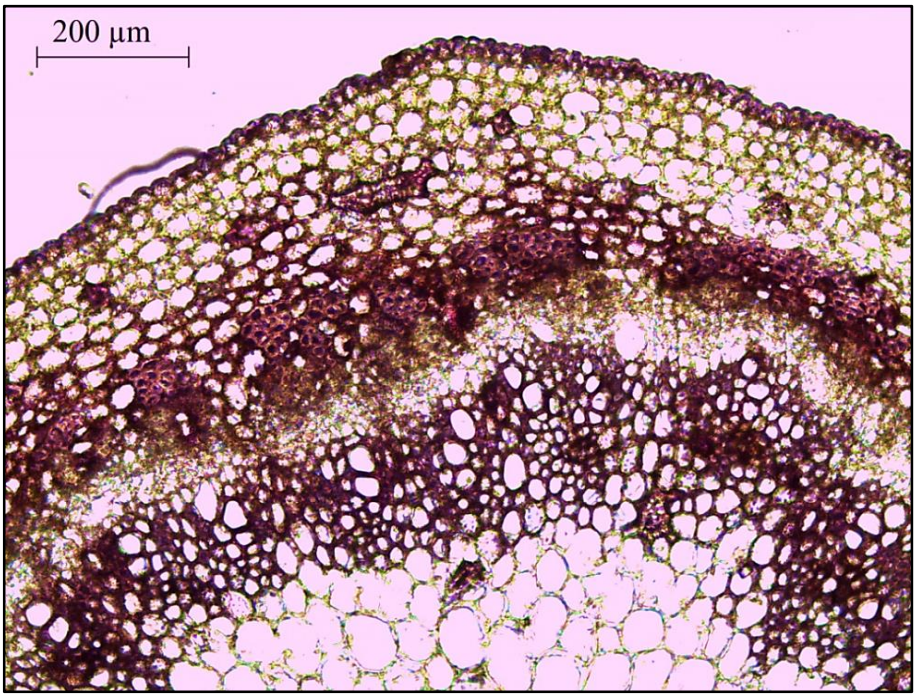


Fig - 58: T.S of *M. cochinchinensis* of stem showing wavy outline.

Fig - 59: T.S of leaf of *M. cochinchinensis*.

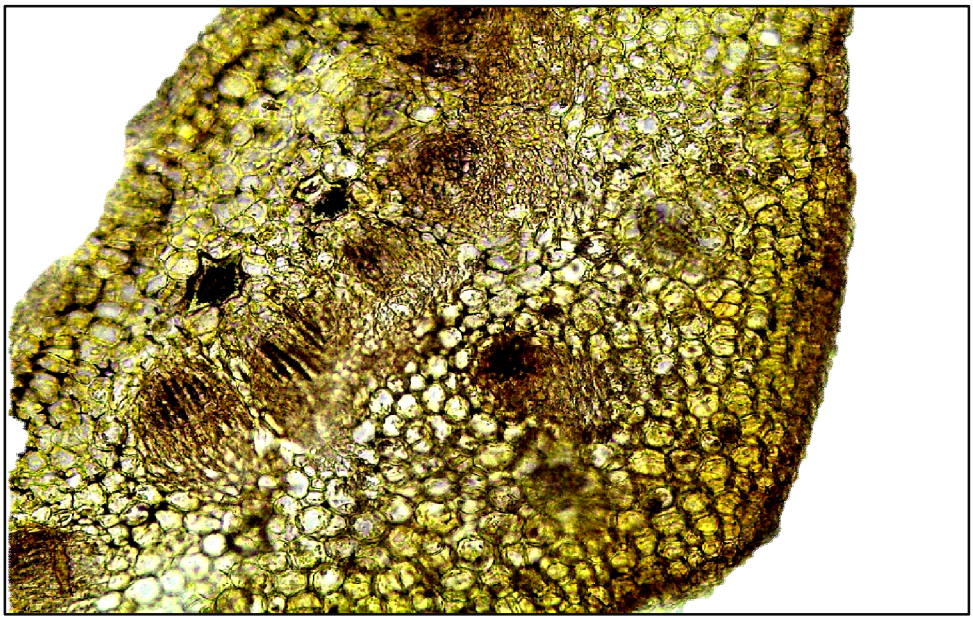


Fig - 60: Mid portion of leaf of *M. cochinchinensis* showing vascular bundle.

IX.B.2 - Micro-morphological (Stomata) study of collected plant taxa

The foliar epidermal peals were taken from the middle of both surfaces of mature leaves. Epidermal peals were stripped and temporary mount in glycerine. Stomatal frequency counts from camera Lucida drawing. The numbers of stomata were counted in each field (0.001386cm2). The stomatal frequency was based on average obtained from observation of 3 microscopic fields. Stomatal index (I) was calculated by the following formula using the no. of stomata(S) and epidermal cells was present in a unit area [I=S/(S+E)]. After preparing, slides were observed under light microscope [(40x) Leica DM 1000 LED] and phase contrast microscope for detailed analysis and obtaining better picture as well as measuring the length and breadth of stomata including guard cells. For measuring stomatal index was calculated according to the method described by Meidner and Mansfield (1968).

IX.B.2.i -Results

The result in this investigation is summarized in tables (Table 3 and 4) which include stomata count, stomata type and Stomata index, stomata measurement (length and breadth)

Table - 14: Determination of the Length and Breadth of Stomata of Selected Taxa

STOMATA	NO. OF OBSERVATION	MEASURMENT (µm)	AVERAGE (µm)
Length	1.	44.18	44.65
	2.	46.94	
	3.	42.83	
Breadth	1.	19.83	20.35
	2.	20.23	
	3.	20.99	

Surface Of The Leaf	Region Of The Leaf	No. of Stomata Per Microscopic Field area			Avg. no. of Stomata Per microscopic Field area	Avg. no. of Stomata At each Surface Per Microscopic field area	Total no. of Stomata On both Surface Per microscopic Field area	Area Of Microscopic Field (sq.cm)	Total Leaf Area (cm)
		1st	2nd	3rd					
Upper Surface	Apex	10	9	11	10	10.42	21.98	0.0000786	72.34
	Middle	12	8	9	9.6				
	Base	12	13	10	11.66				
Lower Surface	Apex	7	6	5	18	11.56			
	Middle	12	8	10	10				
	Base	8	7	5	6.67				

Table - 15: Determination of Stomatal Frequency of Leaf of selected plant Taxa

Calculation

Determination of area of field of vision (under high power)

No. of stage division = diameter of the microscopic field area

=10 stage division

So, radius of the field of vision = 10×0.001cm =0.01/2 =0.005cm

(We know, 1 stage division = 0.01mm=0.001cm)

Area of the microscopic field = πr^2 = 0.0000786 cm^2

Total number of stomata on both surface per microscopic field area =21.98Total number of stomata per unit area = 21.98/0.0000786 cm^2 =279643.76cm^2

Fig - 61: Stomata on the upper surface of the leaf of selected taxa

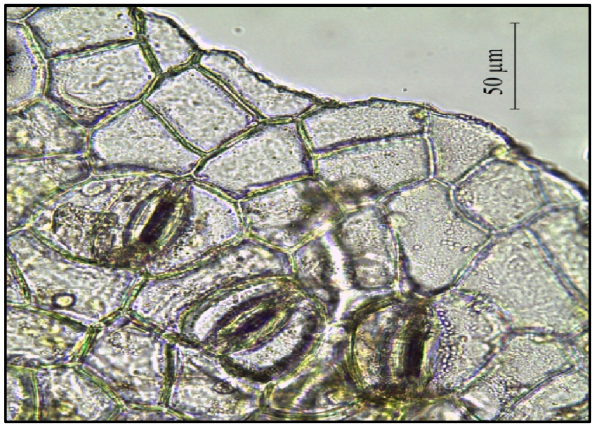


Fig: Stomata on the lower surface of the leaf

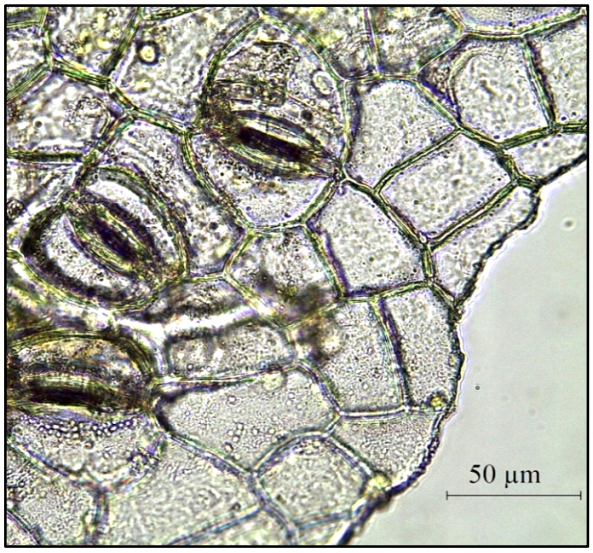


Fig – 62: Stomata on the base of the leaf of selected taxa

IX.B.2.ii -Discussions

Shape of the epidermal cell, anti-clinal wall pattern & stomatal type parasitic. There are taxonomic importances of size as well as shape of the stomata (Tahir and Rajput, 2009); in all taxa. Epidermal cell and stomatal characters have been found useful in solving taxonomic problems. Paracytic types of stomata are observed. *Macrosolen* are found on aerial parts of the host and thus exposed to higher light intensity.

IX.B.3 -Study of dry Powder of leaves of *Macrosolen cochinchinensis*

Plants powders is use as source of hypertensive rates and thereby investigates the medicines to treat the various ailments and disease for successful use in pharmacology of the plant condition is common to all tribal's peoples. Mistletoe preparation are commonly used in complementary medicines as anti-cancerous agents and in disease like diabetes mellitus.

Fig – 63: Mortar pestle

Materials and method

The leaves were sun dried and grind to convert into a fine powder using a mortar pestle. Then the fine dust was collected. The microscopic study follow through official method method (Brain and Turner, 1975)

the powder analysis had gone through official method (The Indian Pharmacopoeia, 1996).

IX.B.3.i - Results and Discussions

The result was obtained in study of *Macrosolen cochinchinensis* (Lour.) Tiegh. leaves powder. Leaf Powder is fresh yellowish green in color containing pieces of cork cell, epidermal trichromes, epidermal peelings, pericyclic fibers, starch grain, stone cell, vessels

and prismatic calcium oxalate crystals. The observations of this character are given in the table.

1. Cork cell

Cork cells are thick walled, pitted. Cork cells are made up of few layers of radially arranged in regular rows of colorless lignified parenchymatous cells.

2. Trichomes

Trichomes are Unicellular with echinate cuticle, covering – type or non - glandular type having thick lignified walls.

3. Stomata

Paracytic type stomata are observed. The epidermal cells have straight, thin walls.

4. Astrosclereids

These sclereids are branched, pointed, irregular (often star shaped) sclereids.

5. Starch grain

Starch grains are not abundant in powder. They are simple and oblong to round in shape.

6. Stone cell

Stone cells are scarce in the powder. They are triangular in shape or rectangular to square and have blunt ends and walls thick with narrow lumen.

7. Vessels

Vessels arise from meristematic cells. Vessels are perforated at their ends. The lateral secondary walls of vessel are compound of lignified cellulose.

8. Calcium oxalate Crystals

Calciumoxalates Crystals are solitary and not abundant in powder

Table - 16: Organoleptic features of leaf powder of *M. cochinchinensis*

Particulars	Leaf
Condition	Dried and broken
Colour	Yellowish green
Odour	Characteristic aromatic
Taste	Bitter
Texture	smooth
Size	12.5 x 5 cm

Table - 17: Microscopic characters of leaf powder of *M. cochinchinensis*

Sl.no	Features	Observation
1.	Cork cell	Thick walled, pitted
2.	Trichomes	Non-glandular
3.	Stomata	Paracytic type
4.	Astrosclerids	Branched, pointed
5.	Starch grain	Simple ,oblong to round
6.	Stone cell	Rectangular,square
7.	Vessels	Row of meristematic cell
8.	calcium oxalate crystal	solitary

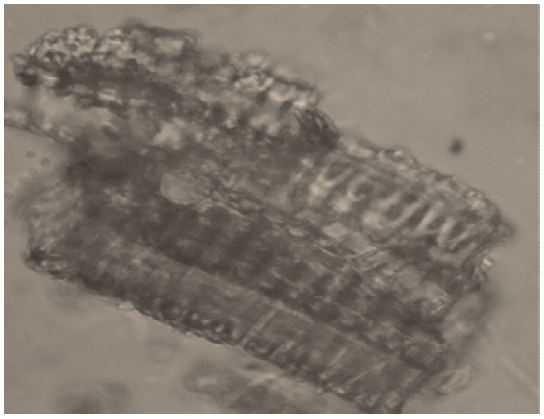


Fig: 64. a

Fig: 64. b

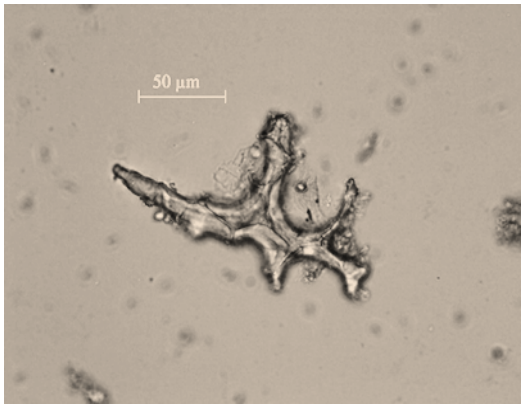


Fig: 64. c

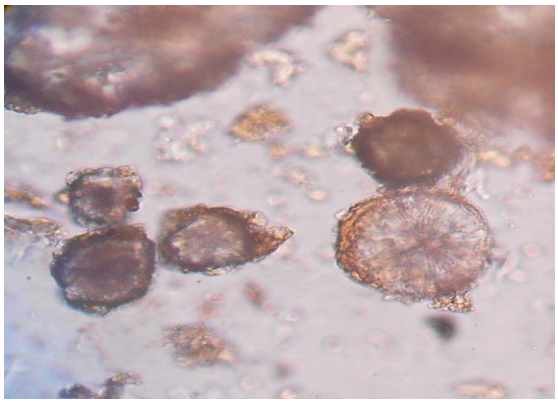


Fig: 64. d

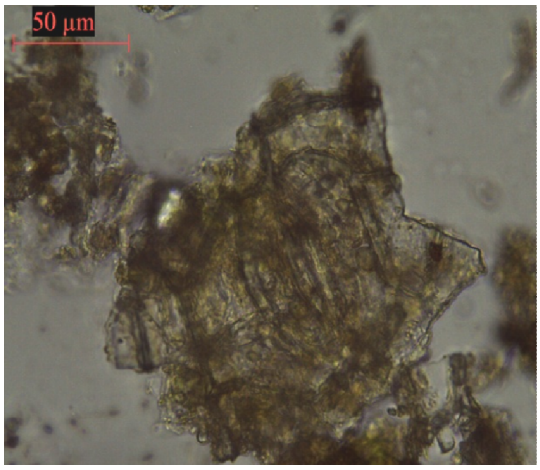


Fig: 64. e

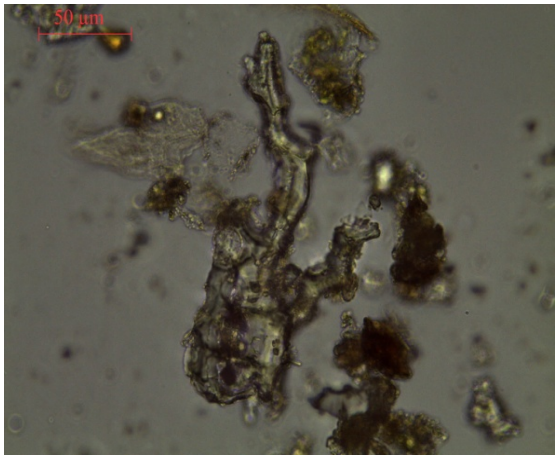


Fig: 64. f

Fig : 64. a- Showing vessels under LM **Fig: 64. b-** Showing Cork cell under LM **Fig : 64. c-** Showing astrosclerid under LM **Fig : 64. d-** Showing Starch grains under LM **Fig: 64. e-** Showing Stomata under LM **Fig : 64. f-** Showing Fibre under LM

C. *Viscum album*

IX.C.1 Anatomical study of collected plant taxa

The work was conducted from months of March to May (2015). A mixture solution of alcohol-water-glycerine was prepared for conserved materials for anatomical study. Anatomical observations were performed on transverse sections of the stem, leaf (2-3samples for each species from 2-3 localities).
For preparation permanent slides, glycerine jelly was used (Vardar, 1987). The stained sections were photographed with an Olympus- 0082721 light microscope.

IX.C.1.i - Result and Discussions

Macroscopic characters of Stem:

Small twigs are observed on aerial branches of the stem ranging from 3mm to 1 cm in thickness , the colour of the stem is dark green with uniformly distributed lenticels, Slightly rough in texture, after peeling of thin bark, the wood become greenish-brown; irregular fracture with no distinct odour.

Fig - 65: A portion of stem of *V.album*

Microscopic character of Stem:

T.S of the stem is nearly dumbled shaped in outline. The epidermis at the outermost consists of squarish or barrel shaped cells, and epidermal cell cover with cuticle. Below the epidermal cell the region consist of Corticle cells, made up of tangentially elongated cells arranged in several layers of and rounded cells, with few stone cells either single or in groups of two. In cortex, there are bundles of pericyclic fibres present, just above the phloem of the vascular bundle. There are found **12** distinct vascular bundles. The vascular bundle is closed, conjoint, collateral type. At centre of stem, prominent pith is present; groups of sclereids also observed.

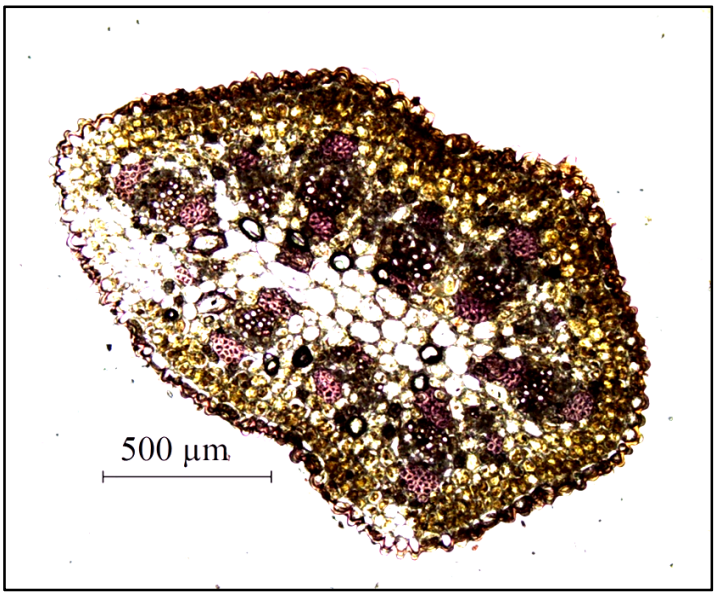


Fig - 66: Microscopic section of stem

Leaves:

A single leaf is dorsiventraly distinct i.e. Adaxial & Abaxial side. Leaves are arranged in pair. Leaf is green in colour and with thick cuticles, length is (5-6) cm and width is (2.5-3.5) cm. Midrib is not distinct and out of midrib 3 to 4 parallel vain are presence on the abaxial side of the leaf. surface of the leaf is smooth. No odour present.

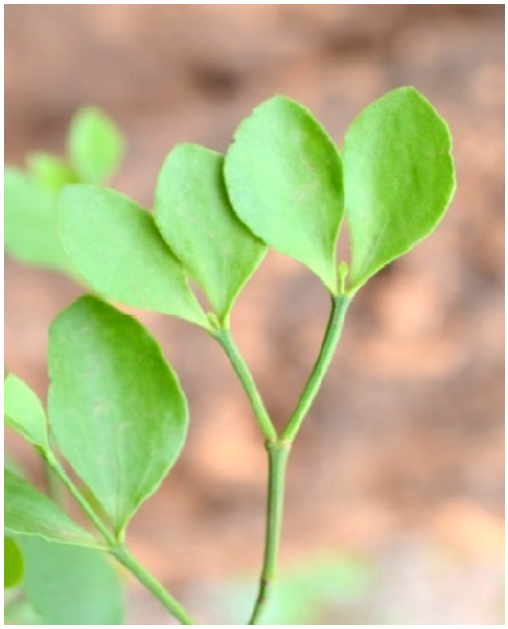


Fig - 67: A Pair of leaf

Microscopic characters

Leaves:

T.s of leaf shows characteristic thick cuticle on both surface; Leaves are amphistomatic. stomata type is paracytic, present on the both surfaces; mesophyll cell of the lamina arranged 2 to 3 layers from inner to outer of the leaf section. Upper and lower epidermis made up of compactly arranged short quadangular cells and irregularly arranged parenchyma cells of middle layers but possessing a few intercellular spaces; occasional vascular strands passing through middle portion; and containing a group of 3 to 5 vascular bundles & here vascular bundle also collateral type. There are also fibres associated with vascular bundle.

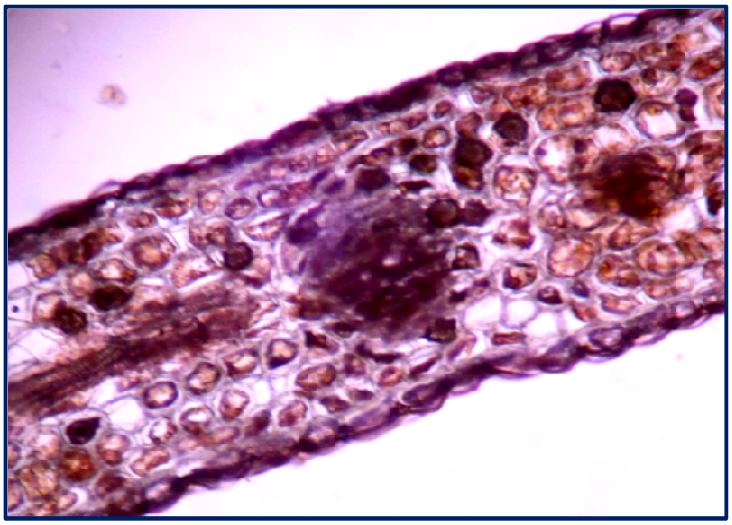


Fig - 68: Microscopic section of leaf

Table – 18: A Brief Account of Macroscopical and Microscopical Featurses of the *Viscum album* (Stem and Leaf)

	PLANTS PARTS	CHARACTERS
MACROSCOPY	Stem Leaf	Stem showed small twigs of aerial branches ranging from 3mm to 1 cm in thicknessbulged nodes having toppositeleaves bark of stem is thin, dark green and Specked with lighter brown uniformly distributed lenticels,with no distinct odour. A single leaf is dorsiventraly distinct i.e. Adaxial&Abaxial side. Leaves are arrange in pair. Leaf is green in colour and with thick cuticles,
MICROSCOPY	Stem Leaf	The outermost layer consists of epidermis, epidermis made up of squarish or barrel shaped cells, and epidermal cell cover with a thick cuticle. The vascular bundle is closed, conjoint, collateral type. Phloem seen in several thin patches around the well-developed xylem by 1 to 4 seriate radially Leaves are amphistomatic. stomata type is Paracytic, present on the both surfaces; containing a group of 3 to 5 vascular bundles & here vascular bundle also collateral type

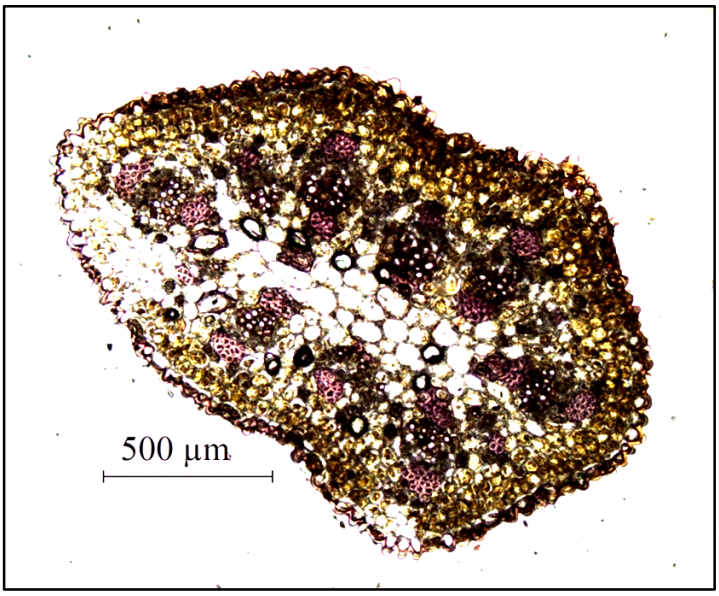


Fig - 69: Transverse section of stem

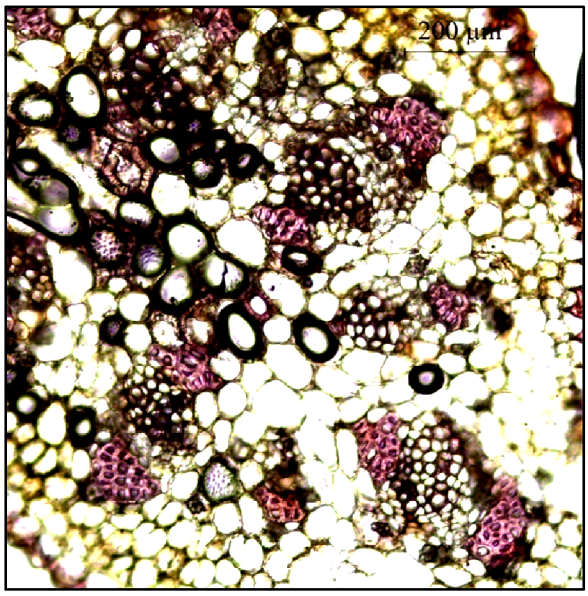


Fig – 70: T.S of the stem showing vascular bundle.

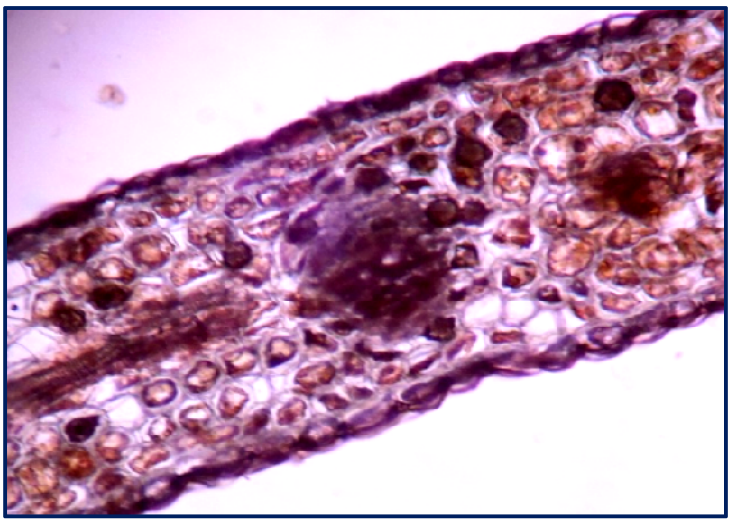


Fig - 71: Transverse section of leaves.

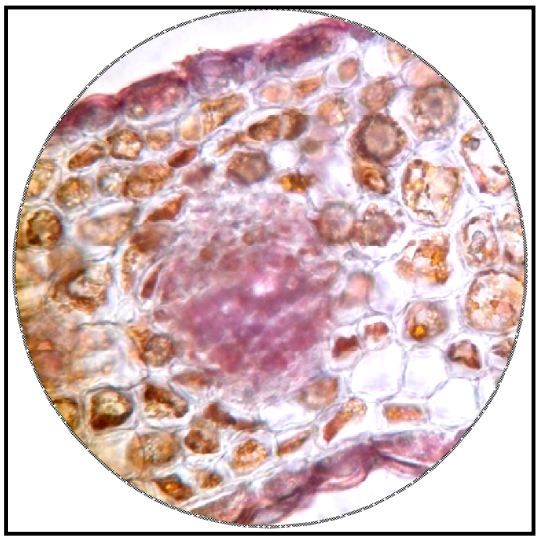


Fig - 72: T.S of the leaves showing vein portion

IX.C.2- Study of micro-morphology (Stomata) study of collected plant taxa

The work was conducted from months of March to May, (2015). The epidermal peals from leaf surface were stripped and glycerine was used for mounting purpose. Stomatal index (I) was calculated by the following formula using the no. of stomata(S) and epidermal cells was present in a unit area [I=S/(S+E)]. Light microscope [(40x) Leica DM 1000 LED] and phase contrast microscope are used for detailed analysis. Stomatal types were observed.

IX.C.2.i - Results

The result is summarized in following tables

Table – 19: Determination of Stomatal Frequency of a Leaf of Viscum album

Surface Of The Leaf	Region Of The Leaf	No. of Stomata Per Microscopic Field area			Avg. no. of Stomata Per Microsco-pic Field area	Avg. no. of Stomata At each Surface Per Micros-copicfeid area	Total no. of Stomata On both Surface Per microscopic Field area	Area Of Micro-scopic Field (sq.cm)	Total Leaf Area (cm^2)
		1st	**2nd**	**3rd**					
Upper surface	Apex	3	2	3	2.66	3.88	7.98	0.0000786	50763.35
	Middle	4	4	5	4.33				
	Base	5	4	5	4.66				
Lower Surface	Apex	3	3	3	3	4.10			
	Middle	4	5	5	4.66				
	Base	5	4	5	4.66				

Calculation:

Determination of area of field of vision (under high power).

No. of stage division = diameter of the microscopic field area =10 stage division

So, radius of the field of vision = 10×0.001cm =0.01/2 =0.005cm

(We know, 1 stage division = 0.01mm=0.001cm)

Area of the microscopic field = πr^2= 0.0000786 cm^2

Total number of stomata on both surface per microscopic field area =7.98

Total number of stomata per unit area = 7.98/0.0000786 cm^2

= 101526.718 cm^2

IX.C.2.ii- Discussions

The species the epidermal call shape, anticlinal wall pattern and stomatal type might be not so useful in other point of view but the helpful at the family level in showing affinity within the family in taxonomy. There are character like shape and size of stomata are taxonomically important (tahir & rajput, 2009); in all taxa. Epidermal call and stomatal characteristic features have been found used to solve taxomic problem. Stomatal type was paracyclic (Demuth and wever, 1987). Thus they did not provide additional diagnostic features in this genus. There is a correlation between the environmental condition like humidity and the cell wall characteristic pattern (anticlinal) stated by Stacestared. Dry condition of environment supports Straight or curved cell wall for particular species. *Viscum* are found on arial parts of the host and thus exposed to higher light intensity, temperature and less humidity.

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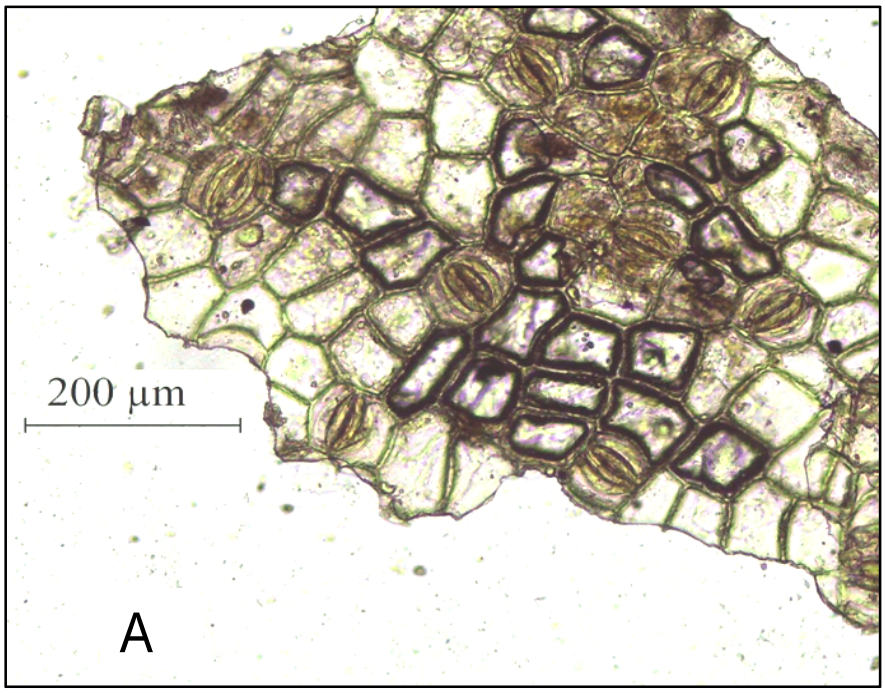

Fig - 73: Stomata of upper surface of the *Viscum* leaf.

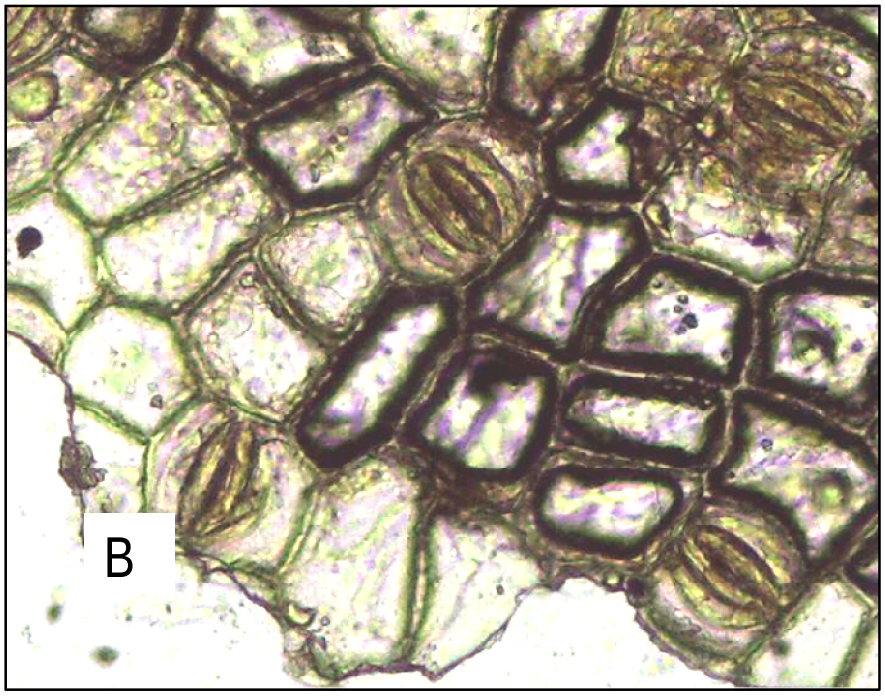

Fig - 74: Stomata showing in higher magnification

IX.C.3 Study of powder leaves of collected plant taxa

Materials and method

The *Viscum* leaves were rinsened in clean water to remove debris. They were sun dried at 40-45^{0}c for one week and ground into a fine powder using a mortar pestle. Then the fine dust was collected. The microscopic study followed by the method of Brain and Turner.

Fig – 75: Preparation of leaf powder

IX.C.3.i Results and discussions

Organoleptic character

The results were obtained in study of *Viscum album*

Table - 20: Organoleptic features of leaf powder of *V. album*

Particulars	Leaf
Condition	Dried and broken
Colour	Yellowish brown
Odour	Characteristic aromatic
Taste	Better
Texture	Smooth
Size	9 x 4 cm

Powder characters

Powder is fresh yellowish green in color containing pieces of cork cell, epidermal trichromes, epidermal peelings, pericyclic-fibers, starch grain, stone cell , vessels and prismatic like calcium oxalate crystals.

1. **Cork cell**

Cork cells are thick walled, pitted. Cork cells are made up of few layers

of radially arranged in regular rows of colorless lignified parenchymatous cells.

2. **Epidermal trichomes**

Unicellular nature, unbranched characteristic feature with covering – type or may be non - glandular type; lignified walls occurred with echinate cuticle.

3. **Stomata**

The stomata found within leaf dust are paracytic nature. Straight, thin epidermal cells construct the wall.

4. **Pericyclic fiber**

These fibers are with long tapering with blunt or branched ends .the cell walls of fibers are thick,lignified with bordered pits.

5. **Starch grain**

Starch grain are not abundant in powder. They are simple and oblong to round in shape.

6. **Vessels**

Vessel arise from a row of meristematic cells. Vessel are perforated their ends.

The lateral secondary walls of vessel members are compound of lignified cellulose.

7. **calcium oxalate crystal**

crystals of calcium oxalate are solitary and not abundant in powder.

Table - 21: Microscopic Characters of leaves powder of *Viscum album*

S.no	Features	Observation
1.	Cork cell	Thick walled,pitted
2.	Trichome	Non-glandular
3.	Stomata	Paracytic type
4.	Pericyclicfiber	Long, tapered,thick
5.	Starch grain	Simple, oblong to round
6.	Stone cell	Rectangular,square
7.	Vessels	Rounded
8.	Calcium oxalate crystal	Solitary

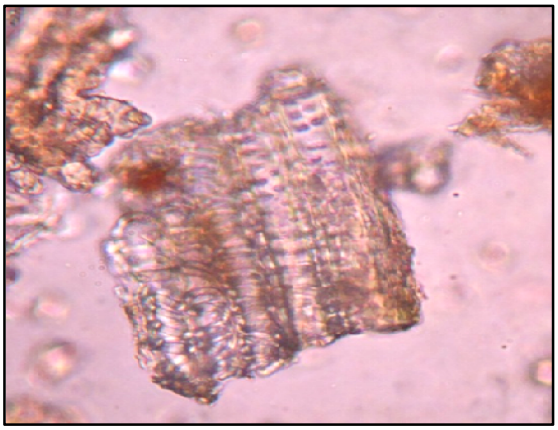

Fig – 76. a

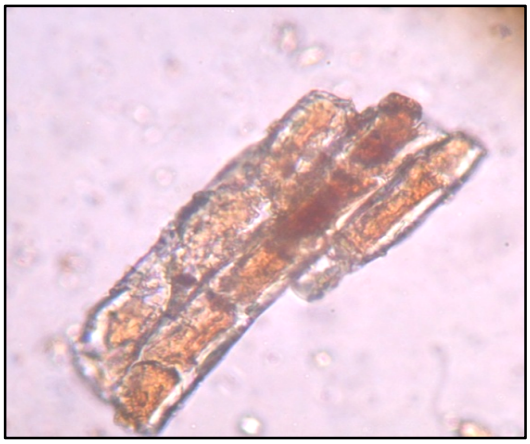

Fig – 76. b

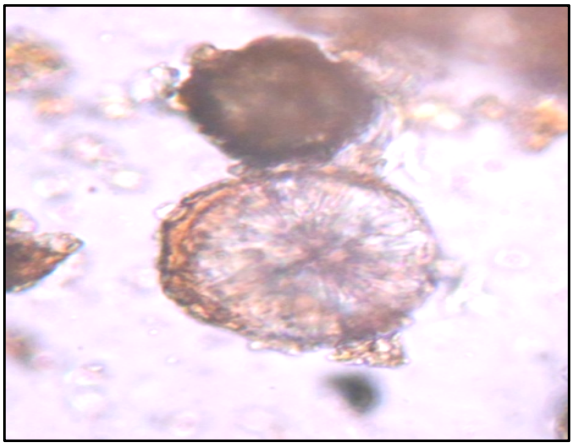

Fig – 76. c

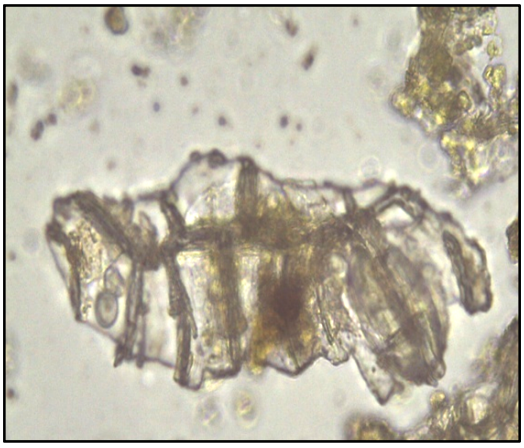

Fig- 76. d

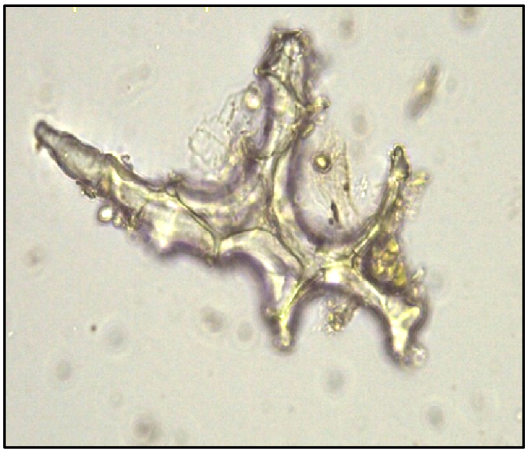

Fig- 76. e

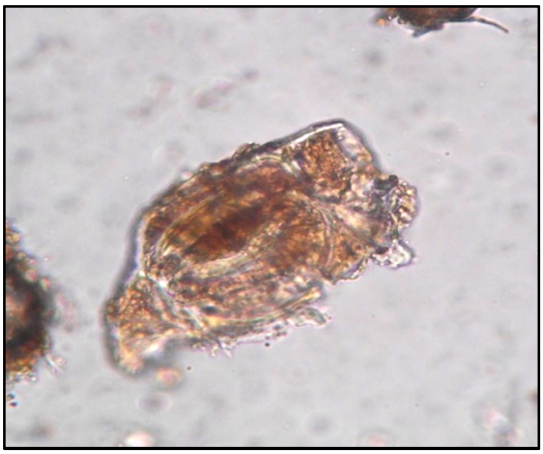

Fig – 76. f

Fig – 76. a: Leaf dust showing vessel; **Fig – 76. b:** Epidermal cells of leaf; **Fig – 76. c:** Starch grain; **Fig- 76. d:** Cork cell; **Fig- 76. e**: Asteroscleride, **Fig – 76. f:** Epidermal stomata