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A DETAILED COMPARATIVE PHARMACOGNOSTICAL STUDY OF SIX IMPORTANT FICUS BARKS (FAMILY – MORACEAE)

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ABSTRACT

***Background*:** Plant medicines have been in use since time immemorial and have proved reliable and effective in treating and preventing diseases affecting man and other animals. India, due to its unique variety of geographical and climatic factors, has had a rich and a rich and varied flora of medicinal plants since the *Vedic* period. Any part of the plant may contain active components like bark, leaves, flowers, roots, fruits, seeds, etc. The genus, *Ficus*, consists of over 800 species and is one of about 40 genera of the mulberry family, Moraceae. Many *Ficus* species consist of numerous varieties, significant genetic diversity, and outstanding pharmacological activities and these are of remarkable commercial importance. ***Aims*:** The study was aimed to evaluate the pharmacognostical study of six ficus barks and the microscopical study including its histochemical evaluation along with a comparative pharmacognostical study of six ficus barks. ***Material and Methods*:** All samples were collected from natural habitats, and all samples were identified, and authenticated by subject experts of the Pharmacognosy Laboratory, of the institute. ***Result*:** The evaluation of all six barks both raw and powered samples was done by their various characteristics like colour, texture, odour, taste etc., and also were done complete macro and microscopic studies along with their histochemical tests. Fracture of the outer two-thirds of the bark breaks with a clean short fracture exposing a rosy-coloured granular tissue; the inner portion which is fibrous does not easily break. The bark has an astringent taste. On exposure, the entire cut surface turns a uniform dull rose brown and ultimately becomes light brown. A transverse section of young bark consists of cork tissues, sclereids are present at the periphery of the cortex, and stone cells are mostly oblong to rectangular, spherical, or polygonal and have thick, pitted walls shows the following details of the structure. In medullary rays, cells contain starch grains; some have pitted walls

while others are thin-walled. Wood fibers, wood parenchyma, and medullary rays. Histochemical tests of stem Barks results provided the preliminary phytoconstituents i.e. tannins, lignin, calcium oxalate, and starch. ***Conclusion*:** All the Plant bark belongs to the family Moraceae based on their morphological characteristics. All six drug plants were tree species, on stem cutting gives milky latex which confirms the family's dominant character. Macro and micro-morphological features of stem bark described distinguish it from other family members of the genera and species. Transverse section of stems bark and its powder microscopy shows rhomboidal and prismatic calcium oxalate crystals, starch grains, latex content, and tannin-containing cells multiserriate medullary rays annular, pericyclic fibers, stone cells, and sclereids were unique to the Bark and were required for its standardization.

***Index Terms*:** Ayurveda, *Ficus benghelensi* L., *F. religiosa* L., *F. recemosa* L, *F. hispida* L.f., *F. carica* L, *F. infectoria* Roxb.

1. INTRODUCTION

Rapid commercialization of traditional medicines led to adulteration and substitution of authentic drugs. The problem is compounded by the ready ability of raw plant material sometimes of questionable quality, in the form of powders in the market. This has mandated the development of proper microscopic profiles of these powdered drugs. The spectrum of definable and identifiable features in powders is very narrow for individual plant drugs. This calls for a considerable degree of expertise, experience, sharp eye, and keen judgment to work out microscopic standards for powdered plant drugs.

Bark constitute a major chunk, around 25% of the total herbal drugs used in India and abroad for treating various diseases. The therapeutic applications of barks are as wide as the number of diseases known today. Besides stem barks, Ayurveda directs the use of root barks in certain cases like *Gmelina arboria*, *Punica granatum* etc. But in practice root barks are usually found to be substituted by stem bark. In such cases, microscopic examination is the only easiest way for their differentiation.[1] Today medicinal plants are considered to be an important source for the production of inexpensive new drug formulations.

India has an ancient heritage of traditional medicine. Indian traditional Medicine is based on various systems including Ayurveda, Siddha, Unani, and Homoeopathy. Any part of the plant may contain active components like bark, leaves, flowers, roots, fruits, seeds, etc. The genus, ficus , consists of over 800 species and is one of about 40 genera of the mulberry family, Moraceae. Many ficus species consist of numerous varieties, significant genetic diversity, and outstanding pharmacological activities and these are of remarkable commercial importance.[1] Reference to these plants was found in various classical literature and other Ayurveda textbooks. **[Table 1]** Various books provided different information about ficus species like synonyms, etymology, properties according to Ayurveda, therapeutic uses **[Table 2]**, action and research in detail. With all above mentioned aspects to overcome from the adulteration in the present study attempt has been taken on six important barks of the Moraceae family *Ficus benghelensi* L. (Fig 1-A1), *F. religiosa* L.

(Fig 4-B1), *F. recemosa* L (Fig 7-C1), *F. hispida* L.f. (Fig 10-D1), *F. carica* L (Fig 13-E1), *F. infectoria* Roxb (Fig 16-F1).

Table 1:- Ficus species in Ayurvedic classification

Sr. no.	Ayurveda text	*Varga / Gana*
1	*Charak Samhita*[2]	*Shrmahar Mahakashaya* (*Anjeer, Kathgular*), *Mutrasangrahneeya mahakashaya* (*Vat, Pipal, Udumbar, Plaksha*)
2	*Sushuruta Samhita*[3]	*Phala Varga* (*Falgu*), *Nyogrodhadi Varga* (*Vat, Pipal, Udumbar, Plaksha*).
3	*Vagbhatta Samhita*[4]	*Nyogrodhadi Gana* (*Vat, Pipal, Udumbar,* Plaksha), *Phala Varga* (*Vat, Pipal, Udumbar,* Plaksha)
4	*Bhavprakah Nighantu*[5]	*Vatadi Varga*
5	*Raj Nighantu*[6]	*Amradi Varg*
6	*Dhanwantari Nighantu*[7]	*Aushadhi Varga*
7	*Madanpal Nighantu*[8]	*Vatadi Varg* (*Vat, Pipal, Udumbar, Plaksha*) *Phala Varga* (*Falgu*)
8	*Nighantu Adarsh*[9]	*Vatadi Varga*
9	*Kaiydev Nighantu*[10]	*Amradi Varg*

Table 2: Part uses six ficus species

Sr. no.	Ficus species	SU.[3]	BP. N.[5]	R. N.[6]	N. A.[8]	K. N.[9]	D. G.[10]
1	*Ficus benghelensis* L	Fruit	Fruit, latex, bark, leaves, root, aerial root,	Fruit, latex, bark, seed, aerial root	Fruit, latex, bark, leaves, root, aerial root,	Fruit, leaves	Fruit, latex, bark, leaves, aerial root,
2	*Ficus religiosa* L	Fruit	Bark, Fruit, leaves,	Fruit, latex, bark, leaves, laakh, seed	Fruit, bark, shoot, leaves, whole plant,	Fruit, leaves	Fruit, bark, shoot, latex,
3	*Ficus racemosa*L	Fruit	Root, leaves, bark, fruit, latex	Flower, bark, leaves, seed	Fruit, latex, bark, leaves, root,	Fruit, leaves	Fruit, latex, bark
4	*Ficus hipida* L.f.	-----	Bark , fruit	Fruit, latex, bark, leaves	-------	Fruit,	Fruit, latex, rootbark
5	*Ficus carica* L	Fruit	------	------	Fruit, latex	------	Fruit,
6	*Ficus infectoria* Roxb	Fruit	Bark	Fruit, bark	leaves, bark,	Fruit, leaves	Bark

SU: Sushuruta Samhita, BPN: Bhavprakah Nighantu, RN: Raj Nighantu, NA: Nighantu Adarsh, KN: Kaiydev Nighantu, DG: Dravyaguna

2. AIMS AND OBJECTIVES:

Comparative Pharmacognostical Evaluation of six ficus barks and detailed microscopical & histochemical evaluation.

3. MATERIAL AND METHODS:

All samples were collected from natural habitats, Rakakhtiya, Jamnagar and all samples were identified, and authenticated by subject experts of the Pharmacognosy Laboratory, of the institute IPGT and RA, Gujarat Ayurveda University, Jamnagar, Gujarat.

3.1. PHARMACOGNOSTICAL ANALYSIS:

Pharmacognostical study carried out as per API standards. Barks of six *Ficus* species was identified as *Ficus benghelensis* L, *Ficus religiosa* L, *Ficus racemosa* L, *Ficus hispida* L F, Ficus carica L, *Ficus infectoria* Roxb of the family Moraceae and authenticated by Pharmacognosist.

The stems barks were collected in the month of August and September and preserved as standard sample for all experimental study, after being shade dried and powders were stored in air tight bottles, used for powder microscopy.

- ***Macroscopic***

The collected sample was identified and authentified by studying their characters were studied systematically as per the methods described in the textbooks of pharmacognosy. The specimen was observed as such with necked eyes.

- ***Organoleptic***

Evaluation of the both raw and purified samples were done by their various characters like, colour, texture, odour, taste etc.[11]

- ***Microscopic***

Free hand sections of the plant material observed under distilled water under the microscope for the presence of primary and secondary metabolites, like starch grains which were confirmed by staining them with iodine. The sections cleared with chloral hydrate to observe the various ergastic cell contents like, crystals of calcium oxalate, calcium carbonate, and silica if present any. The natures of these crystals were also confirmed by performing some tests like, solubility of them in acids (HCl). The sections then stained with Phloroglucinol and HCl for detecting lignified elements like fibres, sclereids, xylem vessels, tracheids etc Repeat the same method for the powder samples[11] (Fig 1-A1, Fig 2-B3, Fig 3-C3, Fig 4-D3, Fig 5-E3, Fig 6-F3).

- ***Histochemical evaluation***

Sample thick sections subjected to histochemical tests to find starch grins, tannin, calcium etc. by treating various reagents.

4. OBSERVATIONS AND RESULTS

4.1. *FICUS BENGHELENSIS* Linn.

Macroscopy

The appearance and thickness of the bark varies according to the age of the branch or stem. The original color of the bark is dark slate grey but this is most often masked by thin patches of closely appressed ashy white, light blue green, or grey, crustose lichens which impart a mottled appearance to the surface. The young bark is comparatively smooth even though longitudinal and transverse rows of small lenticels are present. The lenticels are generally spherical or oblong, one tenth to one fourth inch long but devoid of wide diverging rim. In older barks the lenticels are more numerous, closely spaced and prominent. The rind is ¼", to ¾" in thickness. Its outer part frequently flakes off in hard woody circular or oblong slices. These pieces which can be easily lifted off with a knife are irregular in outline, about a quarter of an inch or more thick, about an inch wide and it's inner surface is granular , light green yellowish brown or reddish brown . the inner part of rind is about one or two mm. in thickness and adheres closely to the inner tissue. The fresh cut surface exudes plenty of latex, and is of a beautiful pale pinkish or flashy colour mottled with numerous scattered specks of a deeper tint, and occasionally with somewhat larger whitish patches. But the colour is not uniform throughout the thickness of the bark. The outer 2/3 has a deep pink to reddish ting and a granular appearance. The inner third, i.e. the part adjoining the wood is lighter colored of even whitish and fibrous. This fibrous portion is composed of several layers of oblique fibers running in opposite directions in alternate layers. On exposure the entire cut surface turns a uniform dull rose brown and ultimately becomes light brown.

Fracture the outer two thirds of the bark breaks with a clean short fracture exposing a rosy colored granular tissue; the inner portion which is fibrous does not easily break. The bark has an astringent taste (Fig-1, A-2).

Organoleptic characters

Color dark grey; shape irregular; fracture smooth, short, and fibrous; taste astringent

Microscopy

A transverse section of young bark of *Ficus bengalensis* L. shows the following details of structure. The outermost zone viz. the cork-tissue or phellem is composed of three to six rows of thick-walled rectangular cells nearly twice as long as broad. The cork cambium is distinct and is formed of two rows of narrow

rectangular cells rich in protoplasm. The cortex is fairly wide and is composed of several rows of cells. A wide continuous or annular band of sclereids is present at the periphery of the cortex. The stone cells are mostly oblong to rectangular, spherical or polygonal and have thick, pitted walls. In addition to this band of mechanical tissue, the cortex contains several, scattered, one to few celled groups of stone cells. The cortical parenchyma cells are thin walled and more or less cubidal to oblong. Several of them are loaded with compound starch grain, while other contains calcium oxalate crystals and tannin. The inner bark or baste is thin and consist of radial segments of phloem alternating with two to five seriate medullary rays. Irregular groupe of sclerenchyma as well as group of stone cells and latex tubes also occur abundantly, wood fibers, wood parenchyma and medullary rays. The wood parenchyma and rays are packed with starch .the walls of the medullary rays cells are pitted in the wood region. Vessels occur singly or in groups of two or three.

Structure of old bark, the outer bark or rind is composed cork tissue and hard woody dead elements of secondary cortex which include large masses of stone cells and compressed thin walled cortical elements.

The regular cork cells are rectangular and somewhat thick walled. Many of them have brownish contents. The cortex is a fairly wide zone forming more than half the thickness of the officinal bark. The entire cortex is secondary in origin and is almost completely beset with large groups of stone cells. The stone cells are rectangular oval, or cubital between groups of stone cells. Most of the parenchyma cells contain tannin while others contain rhomboidal crystals of calcium oxalate or compound starch grains.

Stone cells are also developing in the inner bark or bast. There are only very few phloem parenchyma cells and these are comparatively thick walled sclerenchymatous groups are fewer. Latex tubes occur abundantly in the middle and extend up to the middle bark. The Medullary rays, cells contain starch grains; some have pitted walls while others are thin walled. Wood fibers, wood parenchyma and medullary rays. The medullary rays cells have pitted walls. Wood fibres and wood parenchyma are arranged in alternating bands. The medullary rays cells and wood parenchyma are thickly packed with starch grains (Fig-2, A4-A9).

Powder microscopy

Organoleptic characters

Color yellowish brown; odor characteristic; touch coarse; taste bitter, astringent

Microscopy

Diagnostic characters of powder shows fragments of rhytidoma in surface view, exhibiting thick-walled hexagonal to pentagonal lignified cork cells embedded with dark brown tannin cells, stone cells and prismatic crystals of calcium oxalate; abundant isolated or groups of circular to oval, pitted stone cells; few beaded thin-walled, rectangular sclereids scattered as such throughout; fragment of longitudinally cut septet fibers associated with laticiferous tubes; tangentially and radially cut medullary rays associated with fibres

and stone cells; prismatic crystals of calcium oxalate and simple and few compound starch grains scattered as such throughout or embedded in the parenchymatous cells (Fig-3, A10-A17).

4.2. *FICUS RELIGIOSA* LINN.

Macroscopy

The bark is gray or ash coloured and half to 1 inch or more in thickness. Those of younger branches are all most smooth, but in the older trunks and branches it exfoliates in irregularly circular woody flakes of varying size. the appearance of the bark as in the case of *Ficus bengalensis* various according to the age of stem or branch. Yong barks are greenish to orange brown and have a fairly smooth and none lanticellate surface. In these, the outer part of the rind i.e. the outer skin exfoliates in extremely thin or membranous flakes that are easily scraped or rubbed off as in the case of *Ficus glomerata*. Barks of trunks and older branches ½ to 1 or/and 1/2 inches in thickness are light brown but covered with whitish or ash coloured crustose lichen patches. portion of the outer bark frequently flake off, leaving deep irregularly round oval or elliptic orange brown depressions with scattered droplets of dried exudations of latex. As a result of the flaking the surface of the bark appears rugged and uneven, though devoid of prominent lenticels, cracks of fissures.

The rind or outer bark is not of uniform thickness. In old barks it consists of uniformly thin corky zones alternating with hard "woody'' layers of varying thickness, which often exfoliate (Fig-4, B2).

Organoleptic characters

Color creamish yellow; shape irregular; fracture smooth, short, and fibrous; taste astringent

Microscopy

The woody part of the rind or outer consists essential of dead elements of secondary cortex namely masses of stone cells interposed with layers of collapsed, compressed cortical parenchyma with brownish contents. The phellem or cork tissue is composed of broadly rectangular to almost cubical, fairly thick-walled cells. A distinct phellogen and three or four rows of newly formed phelloderm are also present.

The cortex (secondary), the calls of the cortical parenchyma are thin walled and circular to oblong in transverse section, most of them are loaded with starch grains while several others contain rhomboidal crystals of calcium oxalate is an almost continuous, broad band of sclereids, seven to ten or more rows deep, but in the inner region the sclerids occur in scattered irregular groups. The walls of the stone cells are pitted but comparatively thin. Broadened terminal portions of a number of medullary rays can also be made out in the cortex. There is no clear demarcation between the cortex and baste. The inner bark namely the baste region constitutes the widest part of the bark and consists of redial segments of phloem, alternating with

three to five seriate medullary rays. The phloem contains in addition to the regular thin walled phloem elements, several scattered small sized groups of sclerenchyma, each group consisting of two to five to seven or ten cells. Their walls are very thick but not pitted. Several of the phloem parenchyma cells contain rhomboidal crystals of calcium oxalate. The medullary ray cells have thick pitted walls and are fully packed with compound, starch grains. A distinct cambiform tissue of 4-6 rows of cells separates the bark from the wood. (Fig-5, B4-B9)

Powder microscopy

Organoleptic characters

Color yellowish brown; odor characteristic; touch coarse; taste bitter, astringent

Microscopy

Diagnostic powder characters Showed that fragments of lignified cork in surface view, the cells of the former being thick –walled and pitted, while those of the latter are often associated with underlined rows of cortical stone cells; abundant isolated or groups of stone cells and sclereids; the sclereids are of various sizes and shapes, few of them bear peg-like extensions; abundant fragments of isolated or groups of thin- and thick-walled, pitted fibres; abundant prismatic crystals of calcium oxalate of various sizes and shapes and few very small sized simple starch grains scattered as such throughout or embedded in the parenchymatous cells; fragments of radially and tangentially cut medullary rays, embedded with dark brown contents, prismatic crystals of calcium oxalate and starch grains and cells filled with latex. (Fig 6, B10-B-17)

***4.3. FICUS RACEMOSA* Linn**

Macroscopy

Barks obtained from fairly old trunks and branches appear rusty greenish, though the actual colour of the surface skin is rusty brown. The surface is fairly smooth and soft, and not deeply cracked or fissured or prominently lenticellate or with exfoliating woody outer rind. The thickness of the entire bark varies from less than a quarter of an inch to about three quarters of an inch, according to the age of the trunk or branch. The surface skin is extremely thin or thinly papyraceous and somewhat translucent. It is always found cracking in very close irregular vertical series and exfoliating in very small oblong or circular flakes about a tenth of an inch wide, except in very young bark in which it is very thin. Because of this condition the surface is almost invariably covered with minute separating flakes of whitish tissue which can be easily removed by rubbing. The freshly formed skin thus revealed, has a characteristic rusty brown tint. In some of the older barks small areas of the outer bark ranging from a quarter to one inch or more in length and about a quarter to half an inch in width become hard and woody and these exfoliate as thin slices, leaving shallow depressions. In such cases the bark appears somewhat uneven. The entire bark has a more or less homogeneous leathery texture. In older and thicker barks the outer portion is slightly gritty. In transverse

sections of the fresh bark the skin appears as a thin brownish streak. The rest of the bark has a more or less uniform light fleshy tint, which becomes lighter on drying. The bark has an astringent taste but no noteworthy odour. (Fig-7, C2)

Organoleptic characters

Color yellowish brown; shape irregular; fracture smooth, short, and fibrous; taste astringent

Microscopy

The cork tissue or phellem is composed of ten or often a lesser number of rows of slightly thick-walled rectangular cell, generally with brownish content. A distinct phellogen of one or two rows of narrow rectangular cell is present and beneath this is a phelloderm composed of six to ten or more rows of regularly arranged thin-walled rectangular cell, several of which contain starch grains and others rhomboidal crystals. The cortex is a fairly wide zone. The cortical parenchyma cells are spherical to oblong, thin-walled and a few have purplish brown contents. The cells of few peripheral rows contain chloroplasts. The majority of remaining cells are packed with starch grains which occur as triad and tetrad groups, while others contain cubical and rhomboidal crystals of calcium oxalate. Sparsely scattered in the cortex are irregular groups of stone cell each group being formed of one to eight or more cells. The walls of the sclereids are comparatively thin but pitted. The medullary rays are two to five seriate and their distal ends are very wide, with large and tangentially elongate cells. These distal ends almost extend to the periphery of the cortex. The inner bark or baste forms the widest part of the bark. It is composed of alternating radial segments of phloem and medullary rays. The best is somewhat densely scattered, with small groups of sclerenchyma. The sclerenchyma cells are fairly large, very thick-walled and occur as single or few celled groups without any regular arrangement. Some of the phloem parenchyma cells contain rhomboidal crystals of calcium oxalate. The cut ends of several latex tubes can be made out in the bast. The more recently formed phloem elements consist of thin-walled sieve tubes companion cells and phloem parenchyma. A number of the parenchyma cells have bluish purple contents. (Fig-8, C4-C9)

Powder microscopy:

Organoleptic characters

Color creamish brown; odor characteristic; touch coarse; taste bitter

Microscopy

Diagnostic characters of powder study showed that fragments of non-lignified, septate fibres, isolated or in groups, with narrow or broad lumen and often getting separated at the septa. Stone cells are isolated or in groups, lignified, polygonal, spherical to squarish, with wide pitted lumen and beaded walls. The abundant fragments of suberised cork cells, polygonal to hexagonal in surface view. The fragments of parenchymatous tissue filled with simple and compound starch grains, dark yellowish brown contents, prismatic crystals of

calcium oxalate and spherical granular masses of latex. The fragments of radially and tangentially – longitudinally cut medullary rays associated with fibres and other elements of the phloem. Prismatic crystals of calcium oxalate and simple and compound starch grains scattered as such or filled in parenchymatous cells. Isolated or groups of tubular laticiferous canals. (Fig 9, C10-C17)

4.4. FICUS HISPIDA Linn.

Macroscopy

The bark is 2-5 cm thick, and rusty greenish grey in colour. The surface skin is extremely thin. Colour of the bark is not uniform throughout its thickness. Outer two thirds has brick red colour and granular appearance while inner portion is light coloured. Outer barks with clean short fracture. Taste is astringent. (Fig-10, D2)

Organoleptic characters

Color creamish yellow; shape irregular; fracture smooth, short, and fibrous; taste astringent

Microscopy

Transverse section shows a narrow zone of phellem consisting of 6-8 rows of thin walled cells; one or two rows of phellogen and 8-10 or more rows of phelloderm composed of thin walled rectangular cells. Several cells of phelloderm contain starch grains, rhomboidal crystal and resinous mass. Cortex is fairly wide and composed of parenchyma, some cells packed with starch grains or containing cubical and rhomboidal crystals of calcium oxalate. Irregular groups of stone cells having 8 to 10 or more cells are also present. Medullary rays are multiseriate. Inner bark consists of medullary rays and phloem segments, alternating each other. Small groups of sclerenchyma are scattered in the phloem region. Phloem parenchyma cells show rhomboidal crystals of calcium oxalate. Several latex tubes are also seen. (Fig. 11, D4-D9)

Powder microscopy:

Organoleptic characters

Color yellowish brown; odor characteristic; touch coarse; taste bitter

Microscopy

Powder microscopic Shows fragments of non-lignified cork in surface and sectional view, the cells of the former being thick –walled and pitted, while those of the latter are often associated with underlined rows of cortical stone cells; abundant isolated or groups of stone cells various sizes and shapes,; abundant fragments of isolated or groups of thin- and thick-walled, pitted fibres; abundant prismatic crystals and show rhomboidal crystals of calcium oxalate of various sizes and shapes and few very small sized simple starch grains scattered as such throughout or embedded in the parenchymatous cells; fragments of radially and

tangentially cut medullary rays, embedded with dark brown contents, prismatic crystals of calcium oxalate and starch grains and cells filled with latex. (Fig-12, D10-D17).

4.5. FICUS CARICA Linn.

Macroscopy

The bark is 2-5 cm thick, and rusty greenish grey in colour. The surface skin is extremely thin. Colour of the bark is not uniform throughout its thickness. Outer two thirds has brick red colour and granular appearance while inner portion is light coloured. Outer barks with clean short fracture. Taste is astringent. (Fig-13, E2)

Organoleptic characters

Color yellowish brown; shape irregular; fracture smooth, short, and fibrous; taste astringent

Microscopy

The transverse section shows a narrow zone of phellem consisting of 6-8 rows of thin walled cells; one or two rows of phellogen and 8-10 or more rows of phelloderm composed of thin walled rectangular cells. Several cells of phelloderm contain starch grains, rhomboidal crystal and resinous mass. Cortex is fairly wide and composed of parenchyma, some cells packed with starch grains or containing cubical and rhomboidal crystals of calcium oxalate. Irregular groups of stone cells having 8 to 10 or more cells are also present. Medullary rays are multiseriate. Inner bark consists of medullary rays and phloem segments, alternating each other. Small groups of sclerenchyma are scattered in the phloem region. Phloem parenchyma cells show rhomboidal crystals of calcium oxalate, several latex tubes are also seen. (Fig-14, E4-E9)

Powder microscopy:

Organoleptic characters

Color creamish green; odor characteristic; touch coarse; taste bitter

Microscopy

Powder microscopic Shows fragments of lignified cork in surface and sectional view, the cells of the former being thick –walled and pitted, while those of the latter are often associated with underlined rows of cortical stone cells; abundant isolated or groups of stone cells and sclereids; the sclereids are of various sizes and shapes,; abundant fragments of isolated or groups of thin- and thick-walled, pitted fibres; abundant prismatic crystals of calcium oxalate of various sizes and shapes and few very small sized simple starch grains scattered as such throughout or embedded in the parenchymatous cells; fragments of radially and tangentially cut medullary rays, embedded with dark brown contents, prismatic crystals of calcium oxalate and starch grains and cells filled with latex. (Fig-15, E10-E17)

4.6. FICUS INFECTORIA Linn.

Macroscopy

Bark is flat to curve, measuring 2 to 3 mm in thickness. External surface ash or grayish-brown in colour. Surface is rough with numerous lenticels. Internal surface rough, fibrous, longitudinally striated, pale reddish, fracture. (Fig-16, F2)

Organoleptic characters

Color Yellowish brown; shape irregular; fracture smooth, short, and fibrous; taste astringent

Microscopy

Outer bark is represented by a narrow zone of simple periderm, which is superficial in origin. Periderm is 138 mm thick. It consists of a phellem zone, which is 5-10 layers of cells forming thin continuous membranes. The outermost layers of phellem peel off as membranes of 1-cell thickness. Phelloderm is also distinct, consisting of about 8-10 layers of cubical cells containing chloroplast or tannin. Along frequent places, the periderm zone in vaginates towards the inner side forming a sac like pouch filled with tannin containing dead and crushed phellem cells. Sometimes the pouch is detached from the surface and gets buried in the inner part of the bark. In cross-sectional view this detached periderm appears as a circular structure and this type of structure is designated as “periderm tubes. Secondary phloem is clearly distinguished into inner broad non-collapsed phloem. This zone consists of randomly oriented sieve tube members, tannin containing axial parenchyma cells, and scattered groups of gelatinous fibres. The outer zone has collapsed sieve tube members, dilated phloem rays, and larger groups of gelatinous fibres. The dilated rays or the axial parenchyma of the phloem remain parenchymatous, non-differentiated in sclerenchymatous elements as in other cases. Phloem rays are both uniseriate and multiseriate. The rays appear homocellular or heterocellular. Laticifers are not abundant both in inner and outer phloem. Cubical p-protein bodies are seen almost in all sieve tube members somewhat abutting the sieve plates. Prismatic calcium oxalate crystals are fairly abundant in the axial parenchyma and ray parenchyma cells. They are mostly solitary in each cell. The frequency of crystals increases from centre towards the periphery. (Fig-17, F4-F9)

Powder microscopy

Organoleptic characters

Color creamish brown; odor characteristic; touch coarse; taste bitter, astringent

Microscopy

Fragment of dark brown rytidoma traversed with fibrous sclereids and stone cells, tannin cells, fragments of cork cells in surface view and cut transversely, abundant prismatic crystals of calcium oxalate and starch grains scattered as such and embedded in the parenchymatous cells. (Fig-18, F10-F17)

5. Comparative Histochemical evaluation:

Sample thick sections subjected to histochemical tests to find out starch grins, tannin, calcium etc. by treating various reagents. Results are depicted in the table 3.

Table 3:- Histochemical evaluation

Sl. no	Reagent	Observation	Characteristics	***F. B E N.***	***F. R E L.***	***F. R E C.***	***F. H I S.***	***F. C A R.***	***F. I F T.***
1.	Phloroglucinol + Conc. HCl	Red	Lignified cells	+	+	+	–	+	+
2.	Iodine	Blue	Starch grains	+	+	+	+	+	+
3.	Phloroglucinol + Conc. HCl	Dissolved	Ca Ox - crystals	+	+	+	+	+	+
4.	$Fecl_3$ solution	Dark blue	Tannin cells	+	+	+	+	+	+
5.	Sudan III	Red	Oil globule	–	–	–	–	–	–
6.	HCl	Effervesces	Ca Co_3	–	–	–	–	–	–

F. B E N.: *Ficus benghelensi* L., ***F. R E L.:*** *Ficus. religiosa* L., ***F. R E C.:*** *Ficus recemosa* L, ***F. H I S.:*** *Ficus hispida* L.f., ***F. C A R.:*** *Ficus carica* L, ***F. I F T.:*** *Ficus infectoria* Roxb.

6. DISCUSSION

6.1. Macroscopy

Ficus benghalensis bark is dark slate grey but this is most often masked by thin patches of closely appressed ashy white, light blue green, or grey, crustose lichens which impart a mottled appearance to the surface. The young bark is comparatively smooth even though longitudinal and transverse rows of small lenticels are present. The fresh cut surface exudes plenty of latex, and is of a beautiful pale pinkish or flashy colour mottled with numerous scattered specks of a deeper tint, and occasionally with somewhat larger whitish patches. This fibrous portion is composed of several layers of oblique fibres running in opposite directions in alternate layers. On exposure the entire cut surface turns a uniform dull rose brown and ultimately becomes light brown.

Ficus religiosa bark is gray or ash coloured and half to 1 inch or more in thickness. Those of younger branches are all most smooth, but in the older trunks and branches it exfoliates in irregularly circular woody flakes of varying size. The appearance of the bark as in the case of *Ficus bengalensis* various according to the age of stem or branch. Yong barks are greenish to orange brown and have a fairly smooth and none lanticellate surface. In these, the outer part of the rind i.e. the outer skin exfoliates in extremely thin or membranous flakes that are easily scraped or rubbed off as in the case of *Ficus glomerata*. Barks of trunks and older branches ½ to 1 or/and 1/2 inches in thickness are light brown but covered with whitish or ash coloured crustose lichen patches. portion of the outer bark frequently flake off, leaving deep irregullary round oval or elliptic orange brown depressions with scattered droplets of dried exudations of latex. As a result of the flaking the surface of the bark appears rugged and uneven, though devoid of prominent lenticels, cracks of fissures.

The lamellated condition of the inner bark with its alternating layers of granular and fibrous tissues is an important structural feature which distinguishes the bark from that of *F. bengalensis*, In *F. bengalensis* the cortical portion of the bark is fairly thick, coarsely granular and breaks with a short fracture. But in *F. religiosa* the cortile zone is narrower, more homogeneous and finely granular. In *F. bengalensis* the entire rind is comparatively thick and woody and the exfoliating pieces are generally larger and thicker, on exposure the colour of the cut surface becomes light purplish at first. On drying colour of the cut surface becomes light purplish at first. On drying the entire cut surface assumes a characteristic uniform orange brown colour and the lamellation is clearly visible.

Ficus recemosa Barks obtained from fairly old trunks and branches appear rusty greenish, though the actual colour of the surface skin is rusty brown. The surface is fairly smooth and soft, and not deeply cracked or fissured or prominently lenticellate or with exfoliating woody outer rind as in *Ficus bengalensis* L and *F. religiosa* L. The thickness of the entire bark varies from less than a quarter of an inch to about three quarters of an inch, according to the age of the trunk or branch. The surface skin is extremely thin or thinly papyraceous and somewhat translucent. It is always found cracking in very close irregular vertical series and exfoliating in very small oblong or circular flakes about a tenth of an inch wide, except in very young bark in which it is very thin. Because of this condition the surface is almost invariably covered with minute separating flakes of whitish tissue which can be easily removed by rubbing. The freshly formed skin thus revealed, has a characteristic rusty brown tint. In places this skin gets cracked in close vertical series as the result of the constant expansion of the tissues within. Through these cracks an inner greenish tissue is exposed and this is responsible for the characteristic rusty green tint of the bark. In some of the older barks small areas of the outer bark ranging from a quarter to one inch or more in length and about a quarter to half an inch in width become hard and woody and these exfoliate as thin slices, leaving shallow depressions. In such cases the bark appears somewhat uneven. The entire bark has a more or less homogeneous leathery texture. In older and thicker barks the outer portion is slightly gritty. In transverse sections of the fresh bark

the skin appears as a thin brownish streak. The rest of the bark has a more or less uniform light fleshy tint, which becomes lighter on drying. The bark has an astringent taste but no noteworthy odour.

Ficus hispida bark is 2-5 cm thick, and rusty greenish grey in colour. The surface skin is extremely thin. Colour of the bark is not uniform throughout its thickness. Outer two thirds has brick red colour and granular appearance while inner portion is light coloured. Outer barks with clean short fracture. Tast is astringent.
Ficus carica bark is 2-5 cm thick, and rusty greenish grey in colour. The surface skin is extremely thin. Colour of the bark is not uniform throughout its thickness. Outer two thirds has brick red colour and granular appearance while inner portion is light coloured. Outer barks with clean short fracture. Taste is astringent.
Ficus infectoria bark is flat to curve, measuring 2 to 3 mm in thickness. External surface ash or grayish-brown in colour. Surface is rough with numerous lenticels. Internal surface rough, fibrous, longitudinally striated, pale reddish, fracture.

6.2. Microscopy

F. benghalensis cork cells are rectangular and somewhat thick walled. Many of them have brownish contents. The entire cortex is secondary in origin and is almost completely beset with large groups of stone cells. Most of the parenchyma cells contain tannin while others contain rhomboidal crystals of calcium oxalate or compound starch grains. Latex tubes occur abundantly in the middle and extend up to the middle bark. The Medullary rays, cells contain starch grains; some have pitted walls while others are thin walled. The medullary rays cells have pitted walls. Wood fibres and wood parenchyma are arranged in alternating bands.

F. religiosa compressed cortical parenchyma with brownish contents. The cortex (secondary), the calls of the cortical parenchyma are thin walled and circular to oblong in transverse section, most of them are loaded with starch grains while several others contain rhomboidal crystals of calcium oxalate is an almost continuous. The walls of the stone cells are pitted but comparatively thin. Broadened terminal portions of a number of medullary rays can also be made out in the cortex. The medullary ray cells have thick pitted walls and are fully packed with compound, starch grains.

F. recemosa composed of ten or often a lesser number of rows of slightly thick-walled rectangular cell, generally with brownish content. Ten or more rows of regularly arranged thin-walled rectangular cell, several of which contain starch grains and others rhomboidal crystals. The cortex is a fairly wide zone. The cortical parenchyma cells are spherical to oblong, thin-walled and a few have purplish brown contents. The cells of few peripheral rows contain chloroplasts. Sparsely scattered in the cortex are irregular groups of stone cell each group being formed of one to eight or more cells. The medullary rays are two to five seriate and their distal ends are very wide, with large and tangentially elongate cells.

F. hispida consisting of 6-8 rows of thin walled cells; one or two rows of phellogen and 8-10 or more rows of phelloderm composed of thin walled rectangular cells. Phelloderm contains starch grains, rhomboidal crystal

and resinous mass. Medullary rays are multiseriate. Inner bark consists of medullary rays. Irregular groups of ston cells having 8 to 10 or more cells are also present. Cortex is fairly wide and composed of parenchyma, some cells packed with starch grains or containing cubical and rhomboidal crystals of calcium oxalate.

F. carica phellem consisting of 6-8 rows of thin walled cells; one or two rows of phellogen and 8-10 or more rows of phelloderm composed of thin walled rectangular cells. Irregular groups of stone cells having 8 to 10 or more cells are also present. Medullary rays are multiseriate. Inner bark consists of medullary rays and phloem segments, phelloderm contain starch grains, rhomboidal crystal and resinous mass. Cortex is fairly wide and composed of parenchyma, some cells packed with starch grains or containing cubical and rhomboidal crystals of calcium oxalate

F. infecoria outer bark is represented by a narrow zone of simple periderm, which is superficial in origin. Periderm is 138 mm thick. It consists of a phellem zone, which is 5-10 layers of cells forming thin continuous membranes. The outermost layers of phellem peel off as membranes of 1-cell thickness. Phelloderm is also distinct, consisting of about 8-10 layers of cubical cells containing chloroplast or tannin. Prismatic calcium oxalate crystals are fairly abundant in the axial parenchyma and ray parenchyma cells. The dilated rays or the axial parenchyma of the phloem remain parenchymatous, non-differentiated in sclerenchymatous elements as in other cases. Phloem rays are both uniseriate and multiseriate. Laticifers are not abundant both in inner and outer phloem. Secondary phloem is clearly distinguished into inner broad non-collapsed phloem. This zone consists of randomly oriented sieve tube members, tannin containing axial parenchyma cells, and scattered groups of gelatinous fibres.

6.3. Powder microscopy

Stem Bark powder of all six species showed that all the four barks powder brown in colour except *F. recemosa* and *carica* whereas that showed creamish in colour and rough in touch. All six barks powder taste bitter astringent and slightly aromatic in odour. Diagnostic characters of stem bark powder shows that starch grains, rhomboidal crystals of calcium oxalate, tannin and, lignified cork in surface view, annular, pitted, scalariform vessels and fibres were observed

6.4. Histo-chemical evaluation

Histochemical evaluation reveals that the all six barks showed that the presence of tannin, calcium oxalate, lignine and starch very commonly this showed that the family members exhibiting the similar chemical constituents.

6.5.Comparative study

This comparative study was carried out for Pharmacognostical features of six *Ficus* species barks.

Ficus benghalensis bark is dark slate grey but this is most often masked by thin patches of closely appressed ashy white, light blue green, or grey, crustose lichens which impart a mottled appearance to the surface.

Whereas *Ficus religiosa* bark is gray or ash colored and half to 1 inch or more in thickness, exfoliates in irregularly circular woody flakes of varying size. Whereas *Ficus racemosa* barks obtained from fairly old trunks and branches appear rusty greenish, though the actual color of the surface skin is rusty brown. The surface is fairly smooth and soft, and not deeply cracked or fissured or prominently lenticellate or with exfoliating woody outer rind. Where *Ficus hispida* bark thick, and rusty greenish grey in color. The surface skin was extremely thin. Color of the bark was not uniform throughout its thickness. Outer two thirds has brick red colour and granular appearance while inner portion was light colored. Where *Ficus carica* bark was thick and rusty greenish grey in colour. The surface skin was extremely thin. Color of the bark was not uniform throughout its thickness. The *Ficus infectoria* Bark was flat to curved, thick. Externally ash or grayish-brown coloured. Surface was rough with numerous lenticels.

Transverse section of the stem bark shows cork, cortex with rhomboidal and prismatic crystals of calcium oxalate, and also tannin containing cells, groups of pericyclic fibres, multiserriate medullary rays. Parenchyma cells loaded with starch grains.

Stem Bark powder of all six species showed that all the four barks powder brown in colour except *F. racemosa* and *carica* whereas that showed creamish in colour and rough in touch. All six barks powder taste bitter astringent and slightly aromatic in odour. Diagnostic characters of stem bark powder shows that starch grains, rhomboidal crystals of calcium oxalate, tannin and, lignified cork in surface view; annular, pitted, scalariform vessels and fibres were observed.

7. CONCLUSION

All the Plant Barks belonging to family Moraceae based on its morphological characteristics. All the six drugs plants were tree species, on stem cutting gives milky latex which confirms the family dominant character. Macro and micro-morphological features of stem bark described, distinguishes it from other family members of the genera and species.

Transverse section of stems bark and its powder microscopy shows rhomboidal and prismatic calcium oxalate crystals, starch grains, latex content and tannin containing cells multiserriate medullary rays annular, pericyclic fibres, stone cells and scelraids were unique to the Bark and were required for its standardization.

Histochemical tests of stems Barks results provided the preliminary phytoconstituents i.e. tannins, lignin, calcium oxalate and starch.

Conflict of interest: No

REFERENCES

1. Chawla Anshul, *et. al*., (2012), *Ficus carica* Linn.: A Review on Its Pharmacognostic, Phytochemical and Pharmacological Aspects, Int. J. Pharm. Phytopharmacol. Res.;1(4):215-232.
2. Brahmanand Tripathi. Charak Samhita, Ch. 4, Ver. 40. Varanasi: Chaukhamba Surabharati Prakashan: pp. 89, 92, 2004.

3. Kaviraj Ambikadatta Shastri. Sushruta Samhita, Varanasi: Chaukhamba Sanskrit Sansthan, Ch. 38, pp. 187,257, 2014.
4. Chunekar KC. Bhavprakash Nighantu, Chaukhamba Bharti Academy: pp. 501-506, 2010.
5. Indradev Tripathi. Raj Nighantu, Varanasi: Chaukhamba Surbharti Prakashan. pp 264, 362-365, 2010.
6. Dhanvantari Nighantu. Chaukhamba Orientalia, Varanasi, Adhyaya 4, Shloka 40, pp. 161-163, 1982.
7. Gyanendra Pandey, *Madanpal Nighantu*, Chaukhamba Orientalia, Varanasi, Adhyaya 6, pp. 402,468, 2012.
8. Bapalal G, *Nighantu Adarsh*, Chaukhamba Bharti Academy, Varanasi, Edi 2009, Pp. 470-71,484-87,97,501
9. Sharma PV, *Kaiydev Nighantu*, Chaukhamba Orientalia, Varanasi, Adhyaya 1, Pp. 5,78,80,82, 2009.
10. Sharma PV, *Dravraguna Vijanan* Chaukhamba Bharti Academy, Varanasi, Vol II, pp. 182,410,664, 2003.
11. Wallis TE, Textbook of Pharmacognosy, 5th Ed., New Delhi: CBS Publishers & Distributors, pp. 123-132, 210-215, 2002.

Figure legend

Figure 1: *FICUS BENGHELENSIS* LINN

A- 1 Live photo of *Ficus benghelensis* linn

A- 2 Raw drug bark of *Ficus benghelensis* linn

A- 3 Powder drug of *Ficus benghelensis* linn

Figure 2: TRANSVERSE SECTION OF *FICUS BENGHELENSIS* LINN.

A- 4 Section showing cork, cortex.

A- 5 Cortex region with parenchyma containing starch grains.

A- 6 Lignified cork along with stone cells, sclerides with medullary rays.

A- 7 Sections with stone cells layer sclerides and parenchyma cells with starch grain.

A- 8 Parenchyma cells with lactiferous cells.

A- 9 Sections with a group of pitted with the wide lumen of stone cells.

Figure 3: POWDER MICROSCOPY OF *FICUS BENGHELENSIS* LINN.

A- 10 Stone cells.

A- 11 Simple fibers.

A- 12 Rhomboidal crystals of calcium oxalate.

A- 13 Lignified fibers.

A- 14 Tannin content.

A- 15 Simple starch grains.

A- 16 Lignified stone cells in the group.

A- 17 Lignified fibers in the group.

Figure 4: *FICUS RELIGIOSA* LINN.

B- 1: Live photo of *Ficus religiosa* linn

B- 2: Raw bark of *Ficus religiosa* linn

B- 3: Powder drug of *Ficus religiosa* linn

Figure 5: TRANSVERSE SECTION OF *FICUS RELIGIOSA* LINN.

B- 4: Section showing cork, cortex,

B- 5: Section with medullary rays

B- 6: Parenchyma cells with prismatic crystal

B- 7: Cortex zone consist stone cells layer

B- 8: Section showing medullary rays and pericyclic fibers rows

B- 9: Section with stone cells

Figure: 6 POWDER MICROSCOPY OF *FICUS RELIGIOSA* LINN.

B- 10: Cork in surface view with starch grain

B- 11: Stone cells

B- 12: Cork in surface view

B- 13: Prismatic crystal of calcium oxalate

B- 14: Pitted stone cells

B- 15: Simple fiber

B- 16: Prismatic crystal of calcium oxalate with brown content

B- 17: Lignified stone cells and simple starch grains

Figure 7: *FICUS RACEMOSA* LINN.

C- 1: Live photo of *ficus racemosa* linn

C- 2: Raw bark of *ficus racemosa* linn

C- 3: Powder drug of *ficus racemosa* linn

Figure 8: TRANSVERSE SECTIONS OF *FICUS RACEMOSA* LINN.

C- 4: Section showing cork, cortex, and medullary rays

C- 5: Cortical parenchyma with starch grains

C- 6: Cortex with medullary rays

C- 7: Section with a group of stone cells

C- 8: Section showing isolated pericyclic fibers

C- 9: Parenchyma cells with rhomboidal crystal

Figure 9: POWDER OF *FICUS RELAGI FICUS RACEMOSA OSA* LINN.

C- 10: Rhomboidal crystal of calcium oxalate

C- 11: Prismatic crystal of calcium oxalate

C- 12: Simple fiber

C- 13: Parenchyma cells with starch grains

C- 14: Cork in surface view

C- 15: Tannin content

C- 16: Tannin content with prismatic crystal of calcium oxalate

C- 17: Lignified stone cells and simple starch grains

Figure: 10 *FICUS HISPIDA* LINN.

D- 1: Live photo of *Ficus hispida* linn

D- 2: Raw bark of *Ficus hispida* linn

D- 3: Powder drug of *Ficus hispida* linn

Figure: 11 TRANSVERSE SECTION OF *FICUS HISPIDA* LINN.

D- 4: Section showing cork, cortex, and medullary rays

D- 5: Cortical cells with rhomboidal crystals of calcium oxalate

D- 6: Parenchyma cells with starch grains

D- 7: Simple starch grains

D- 8: Section showing pericyclic fibers with sclerides

D- 9: Section with a group of stone cells

Figure12: POWDER OF *FICUS RELAGI FICUS HISPIDA* LINN.

D- 10: Starch grains with b

D- 11: Cells with tannin content

D- 12: Cork in surface view

D- 13: Rhomboidal crystal of calcium oxalate

D- 14: Cork in tangential group

D- 15: Pitted stone cells

D- 16: Lignified fibers

D- 17: Simple fiber

Figure13: *FICUS CARICA* LINN

E- 1: Live photo of *Ficus carica* linn

E- 2: Raw bark of *Ficus carica* linn

E- 3: Powder drug of *Ficus carica* linn

Figure14: TRANSVERSE SECTION OF *FICUS CARICA* LINN.

E- 4: Section showing cork, cortex along with medullary rays

E- 5: Section with cortical parenchyma cells containing starch grain and prismatic crystal of calcium oxalate

E- 6: Section showing with group of pericyclic fibers

E- 7: Parenchyma cells with simple starch grains

E- 8: Section showing isolated selerides

E- 9: Section showing a group of stone cells

Figure15: POWDER OF *FICUS CARICA* LINN.

E- 10: Starch grains

E- 11: Fragment of cork in surface view

E- 12: Group of fibers

E- 13: Fibers in section view

E- 14: Cells with brown content

E- 15: Parenchyma cells latex content

E- 16: Cork in surface view

E- 17: Lignified stone cells with fibers

Figure 16: *FICUS INFECTORIA* LINN.

F- 1: Live photo of *Ficus infectoria* linn

F- 2: Raw bark of *Ficus infectoria* linn

F- 3: Powder drug of *Ficus infectoria* linn

Figure 17: TRANSVERSE SECTION OF *FICUS INFECTORIA* LINN.

F- 4: Section showing cork, cortex with medullary rays

F- 5: Section with a rhomboidal crystal of calcium oxalate and brown content

F- 6: Section showing a group of stone cells and medullary rays

F- 7: Section with a group of stone

F- 8: Medullary rays along with pericyclic fibers

F- 9: Section showing a group of pitted cells with a wide lumen

Figure 18: Powder of *FICUS INFECTORIA* LINN.

F- 10: Prismatic crystal of calcium oxalate

F- 11: Pitted stone cells

F- 12: Cork in tangential view

F- 13: Group of pericyclic fibers

F- 14: Simple fiber

F- 15: Pitted stone cells with a wide lumen

F- 16: Group of sclerides

F- 17: Cells with tannin content

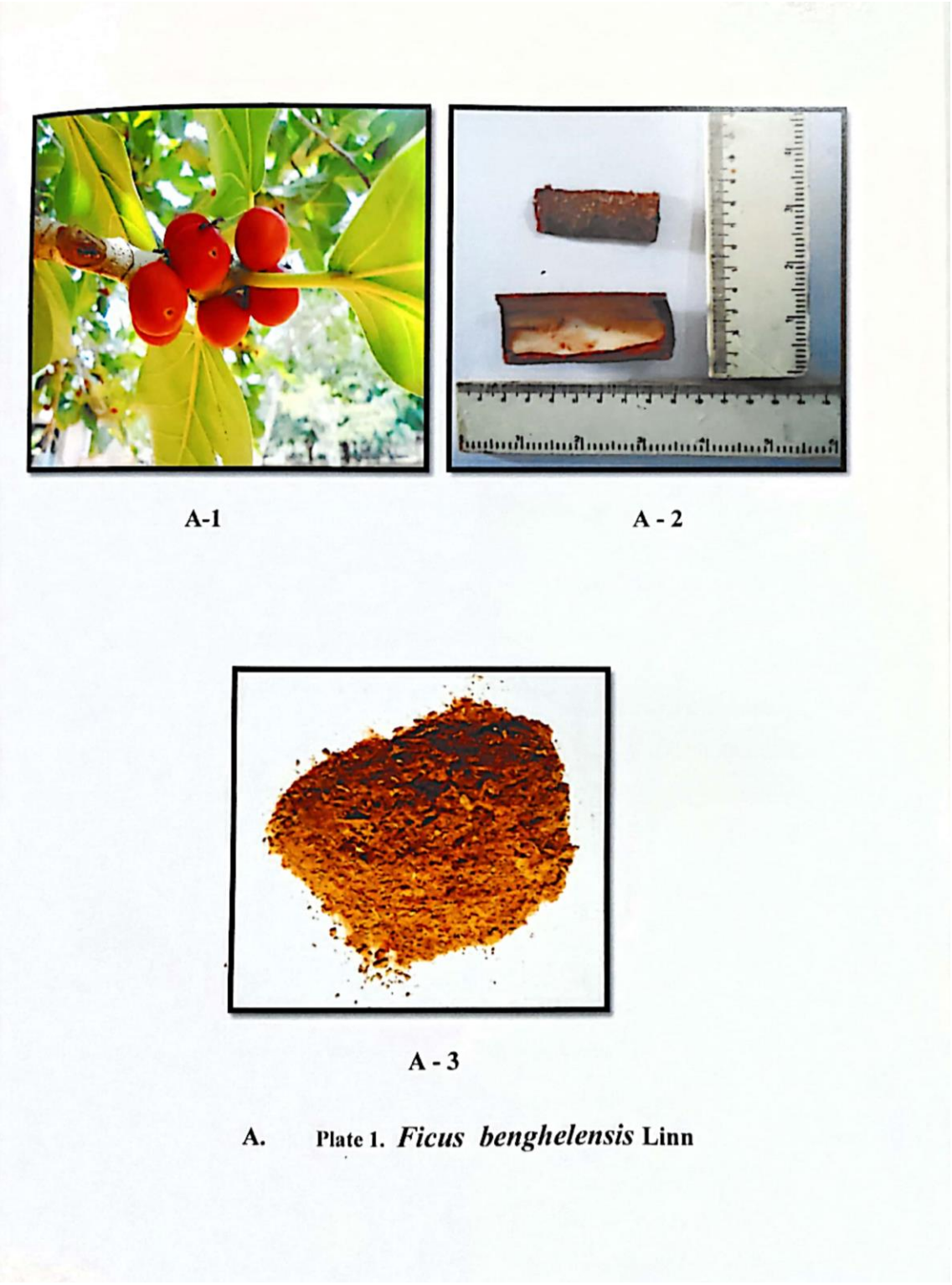


Figure 1: A1-A3

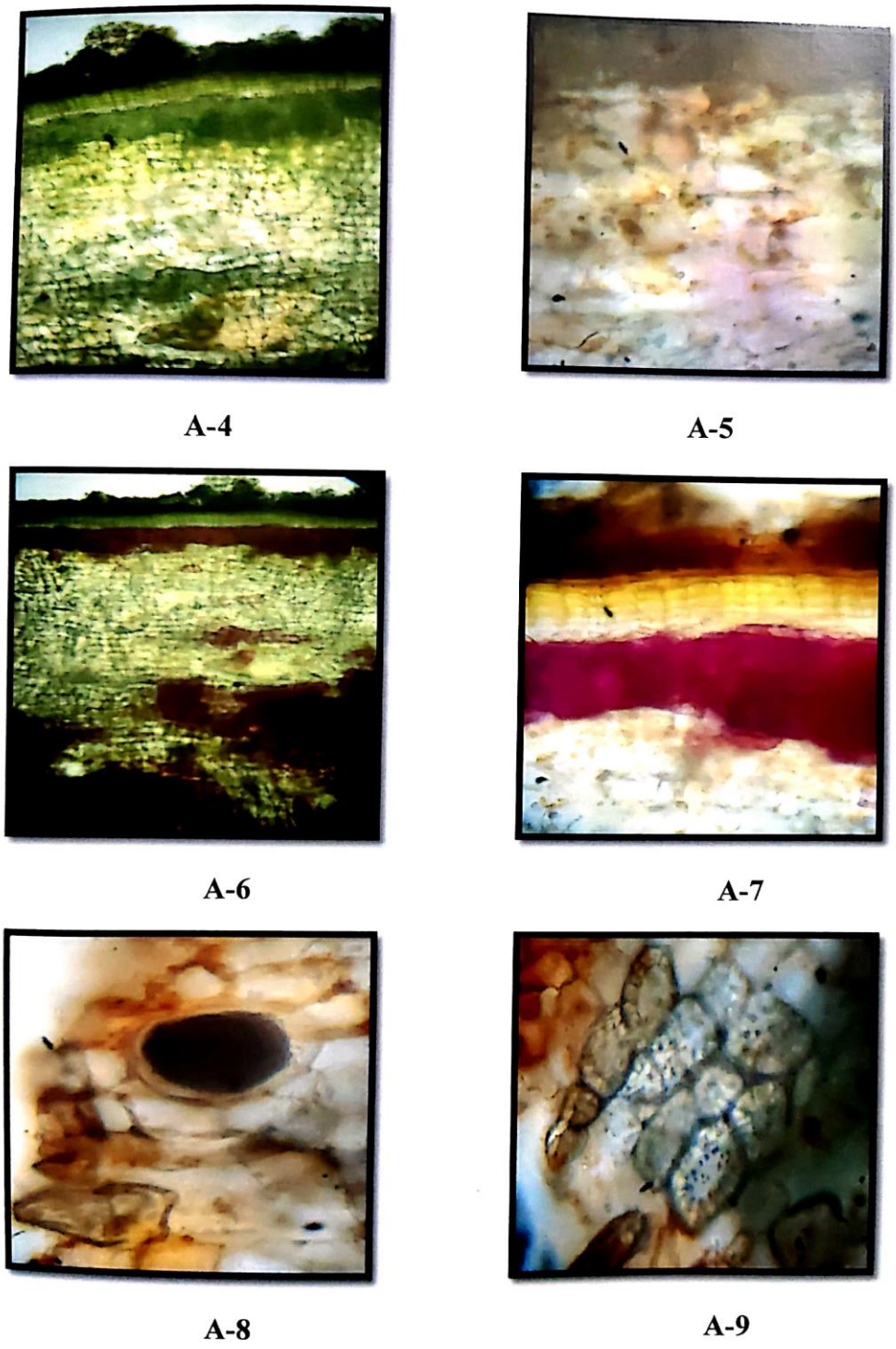


Plate 2. Transverse sections of *Ficus benghelensis* Linn

Figure 2: A4-A9

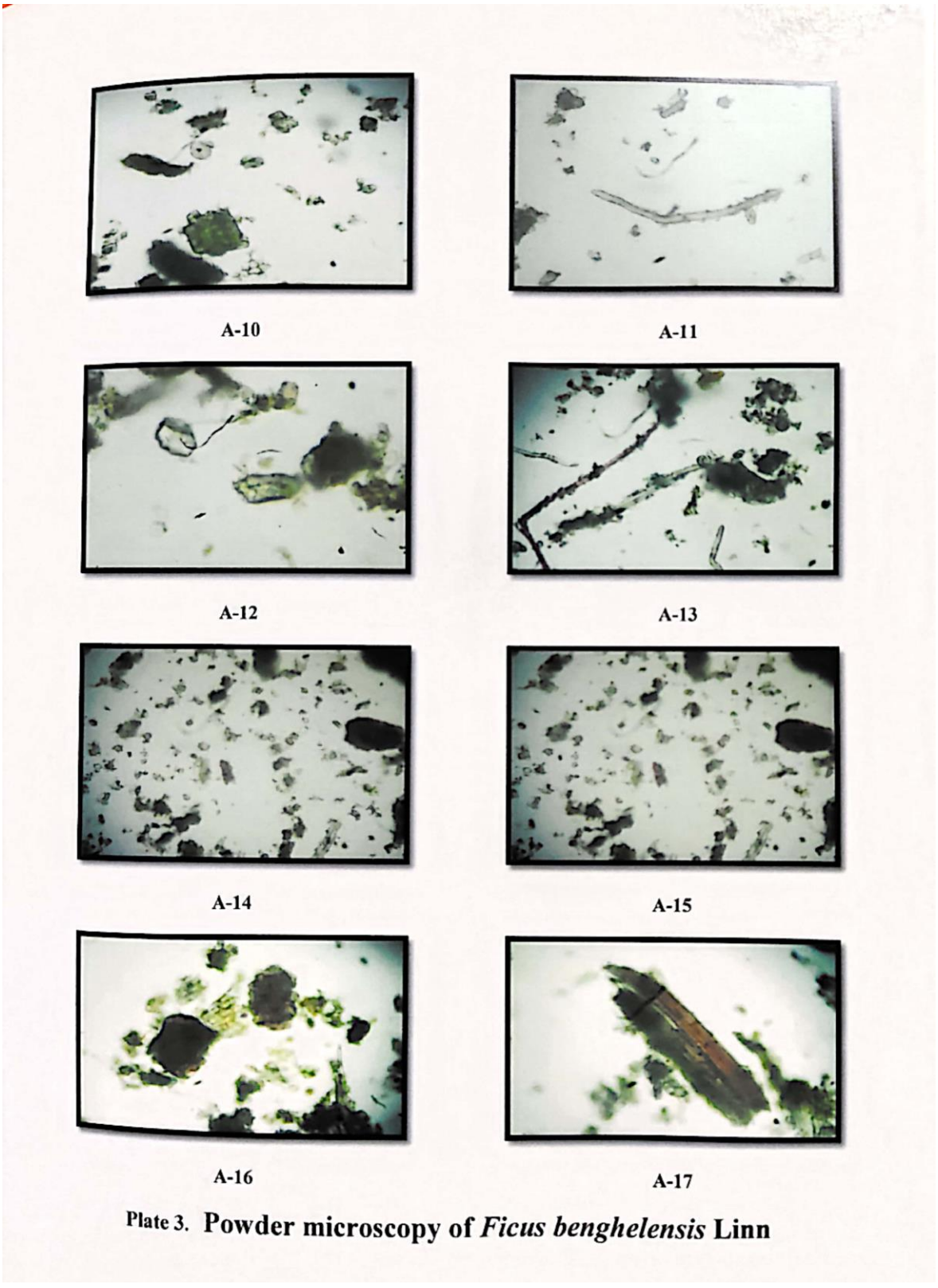


Figure 3: A10-A17

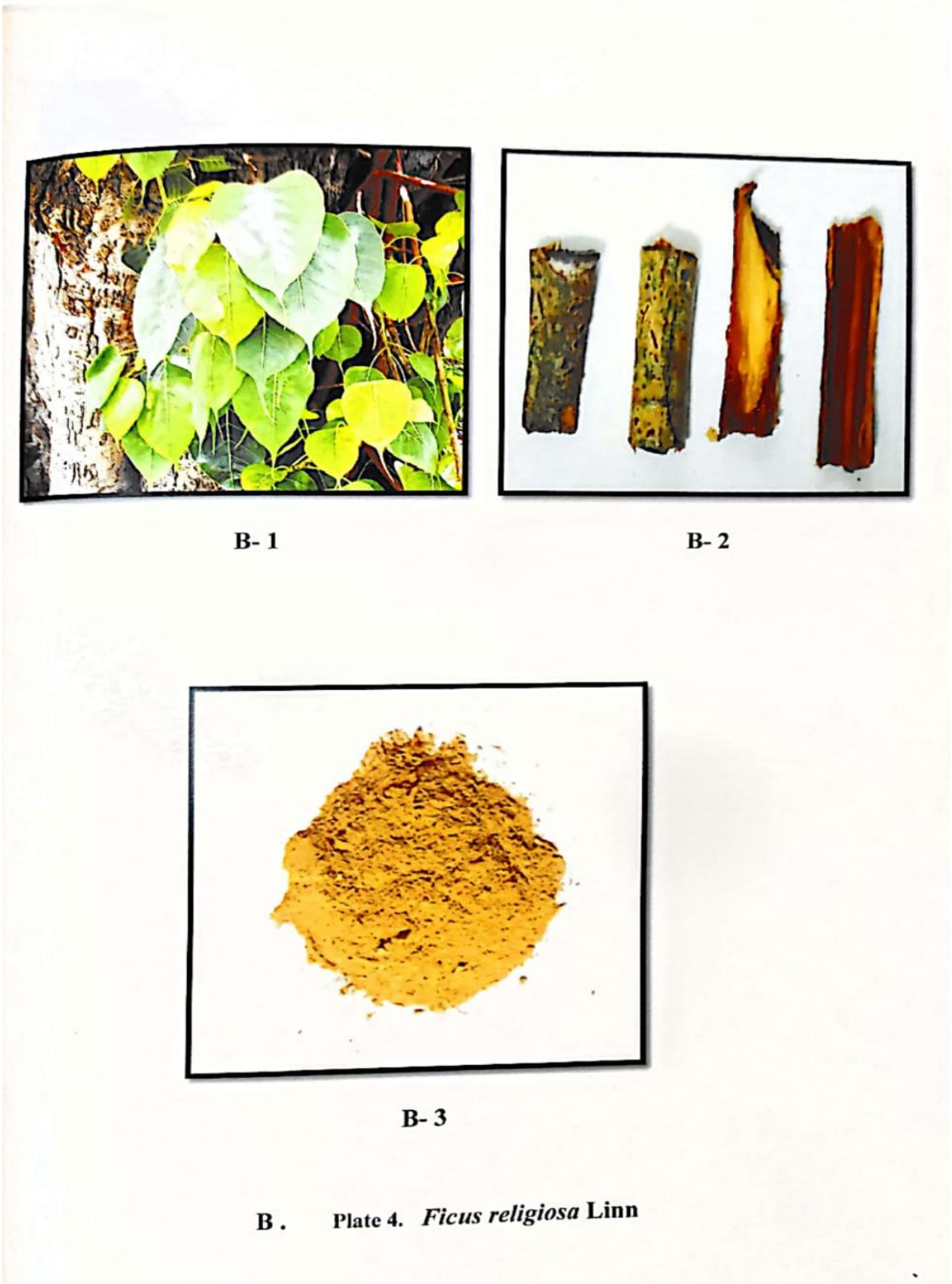


Figure 4: B1-B3

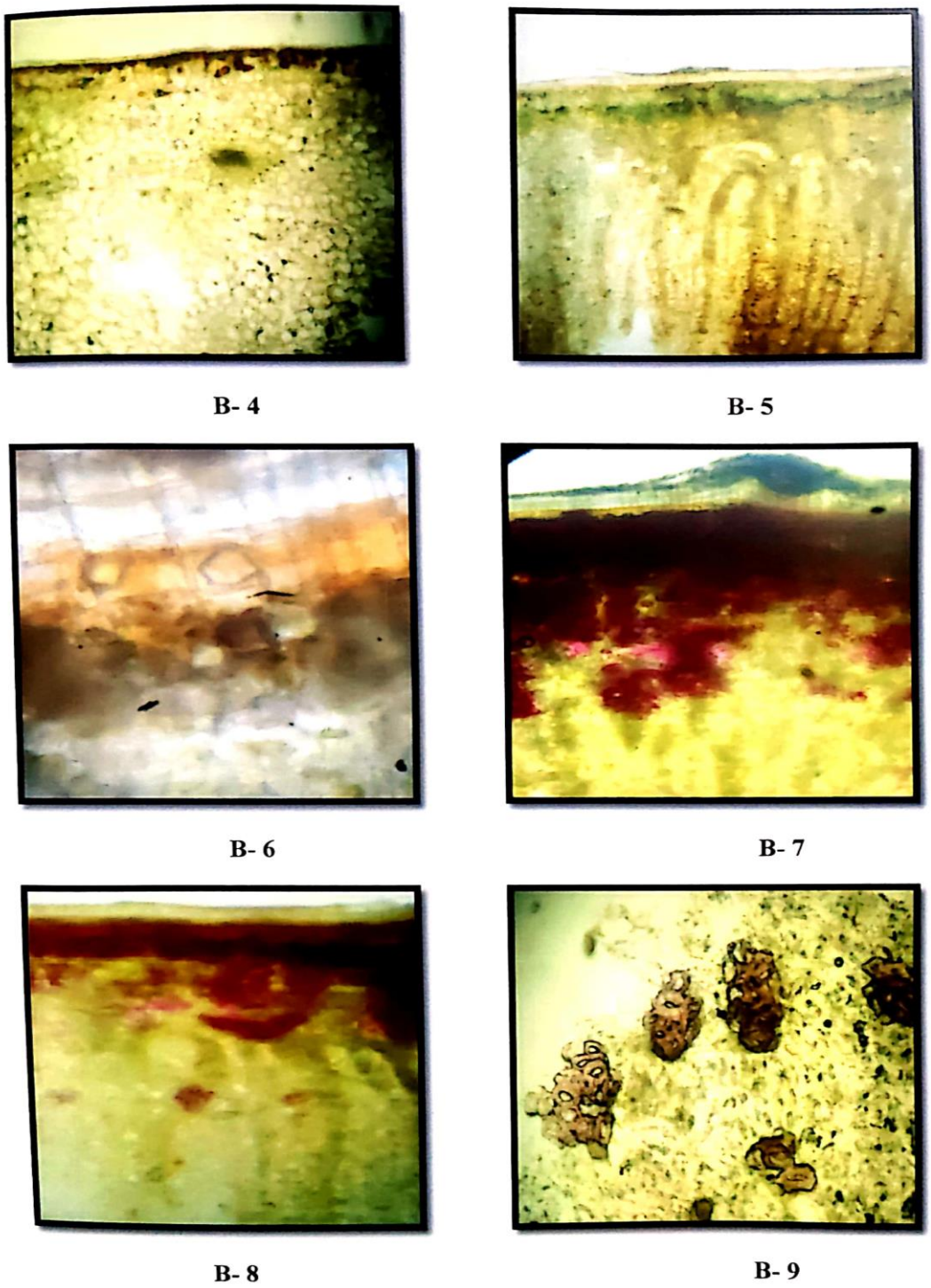


Plate 5. Transverse Section of *Ficus religiosa* Linn

Figure 5: B4-B9

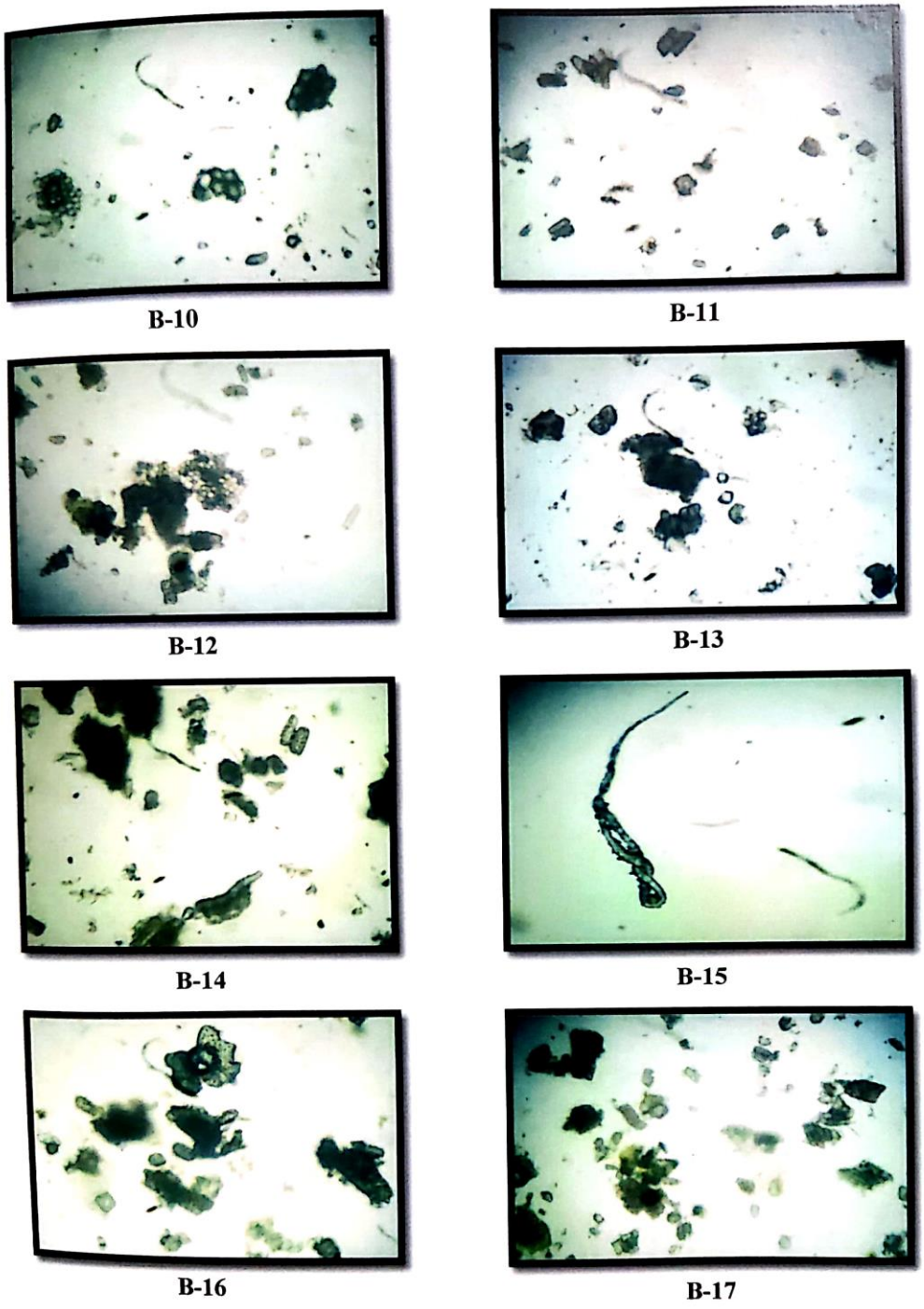
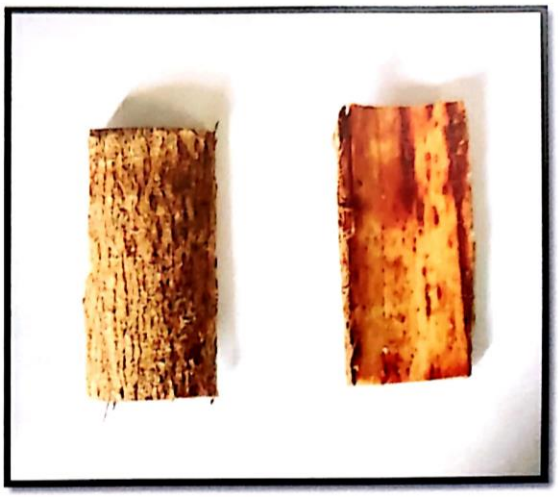


Plate 6. Powder microscopy of *Ficus religiosa* Linn

Figure 6: B10-B17

C- 1



C- 2

C- 3

C. Plate 7 *Ficus racemosa* Linn

Figure 7: C1-C3

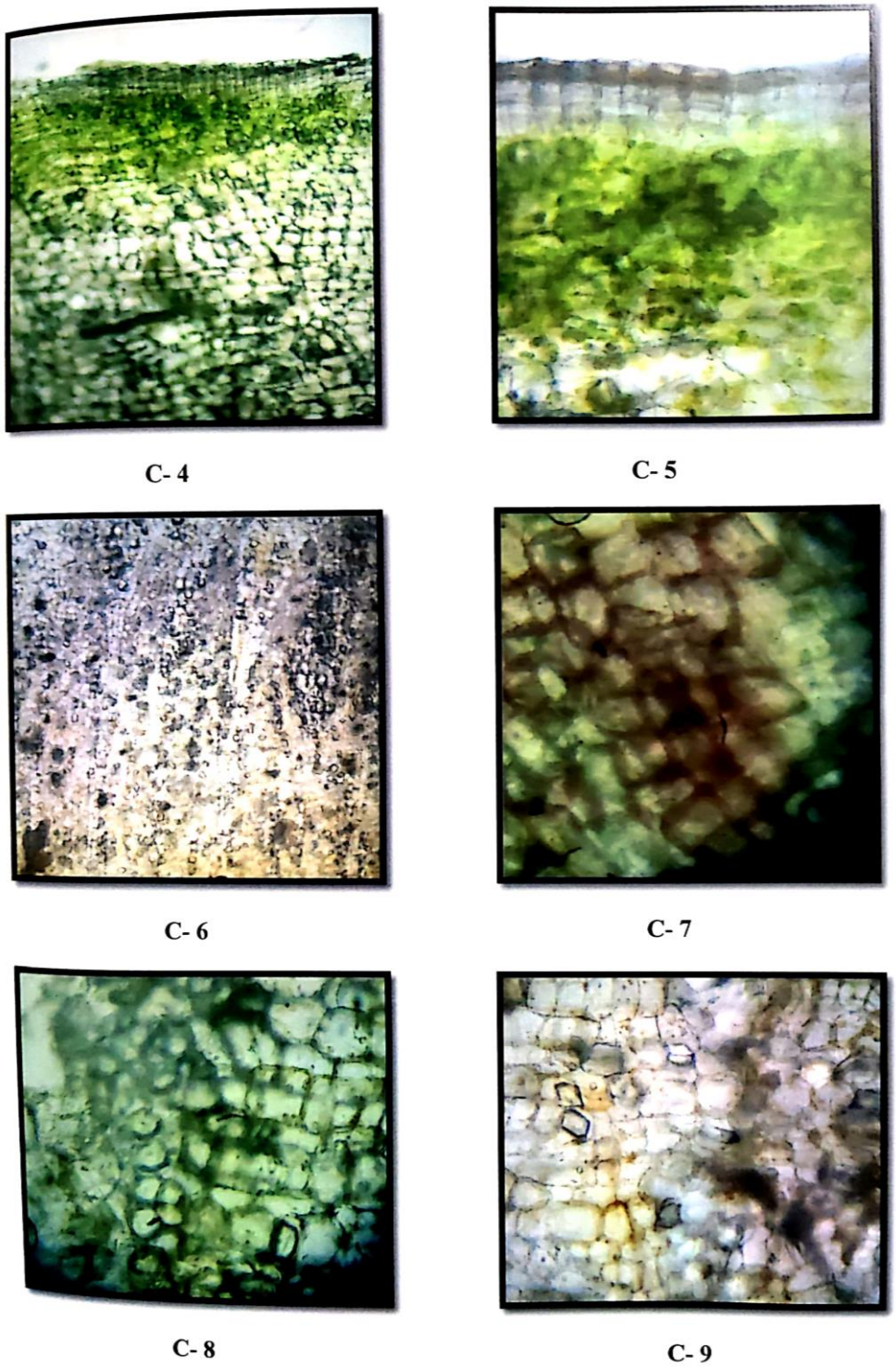


Plate 8. Transverse section of *Ficus racemosa* Linn

Figure 8: C4-C9

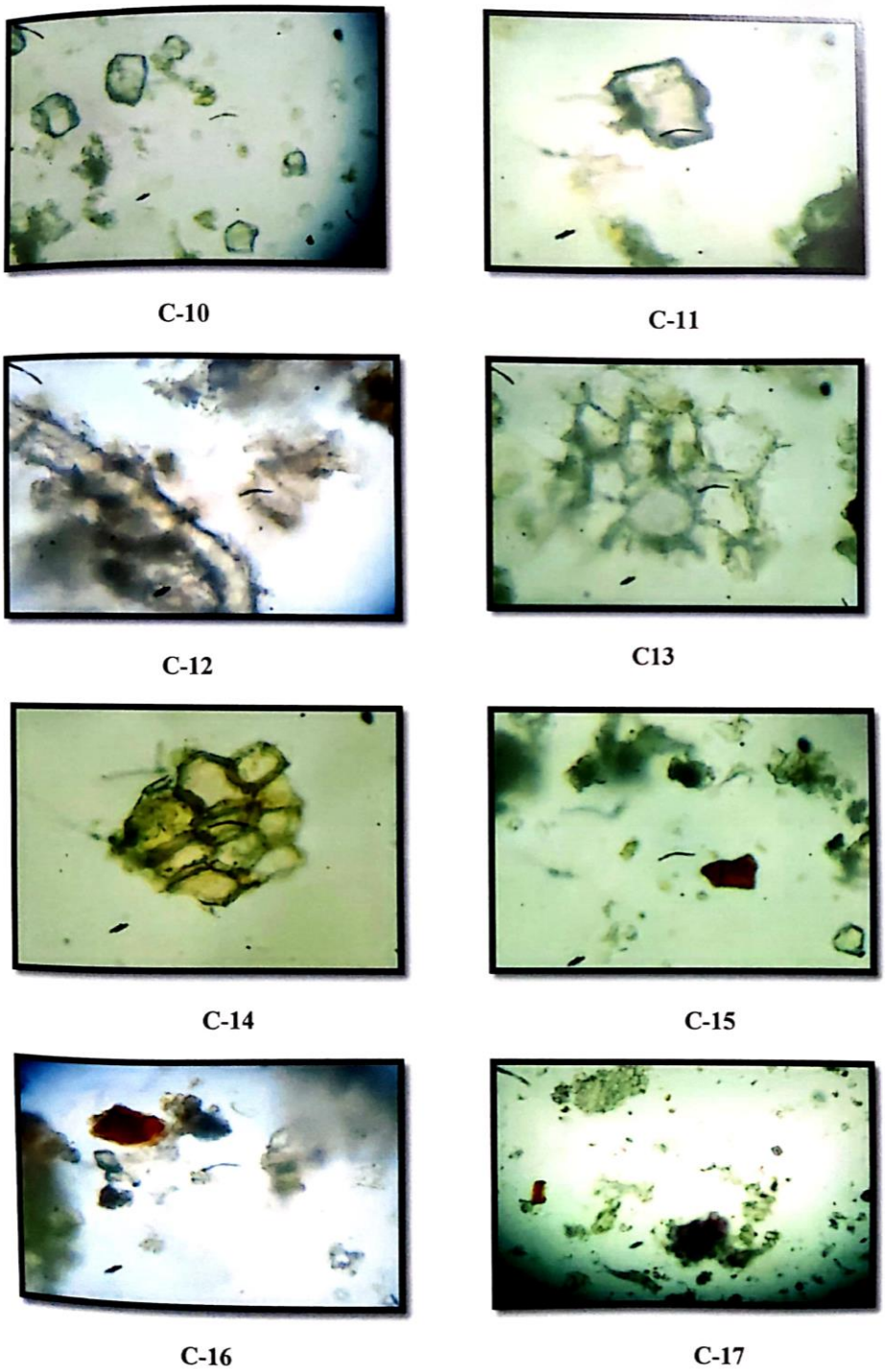


Plate 9. Powder microscopy of *Ficus racemosa* Linn

Figure 9: C10-C17

D-1

D-2

D-3

D. Plate 10. *Ficus hispida* Linn

Figure 10: D1-D3

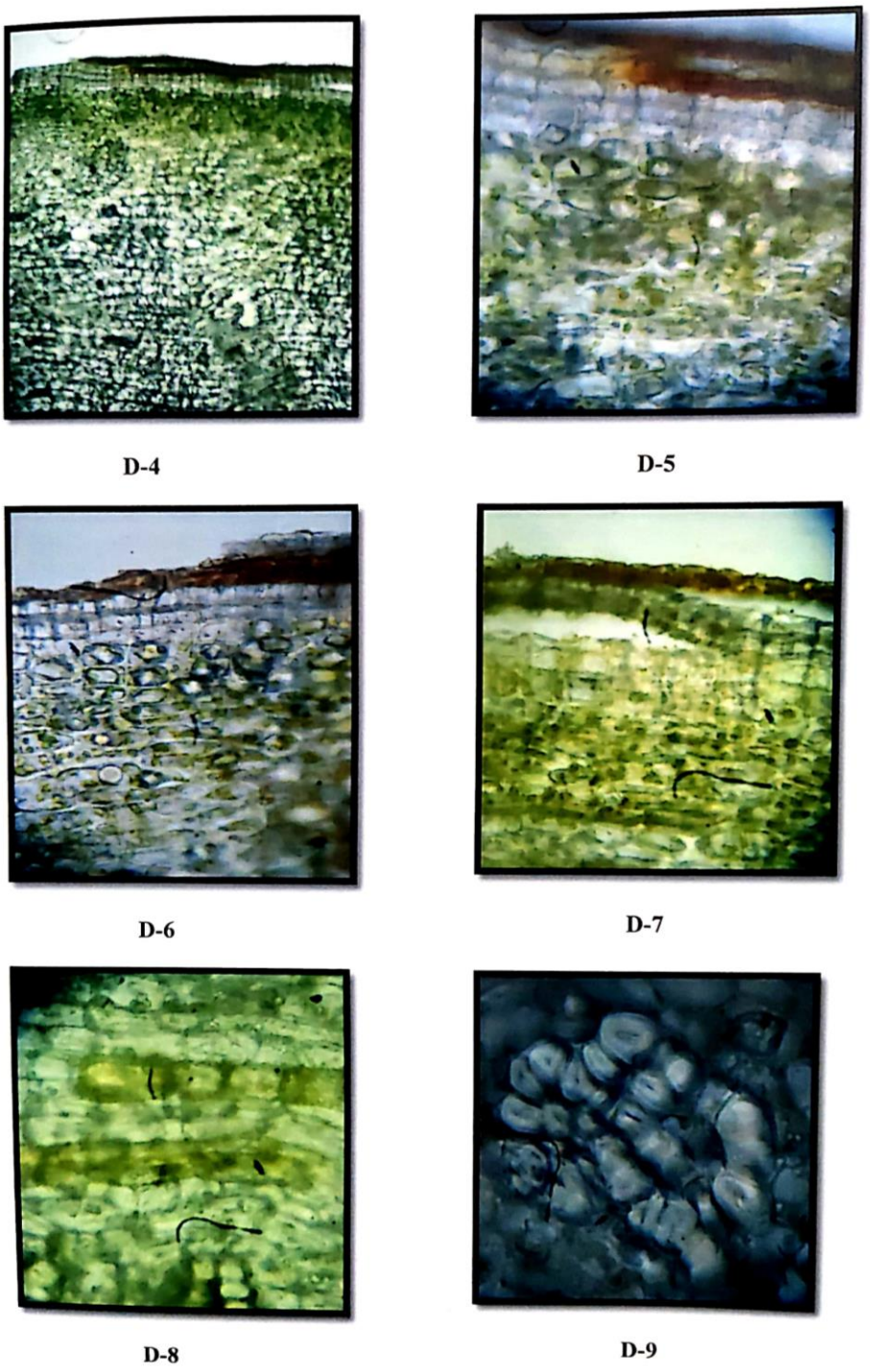


Plate 11. Transverse section of *Ficus hispida* Linn

Figure 11: D4-D9

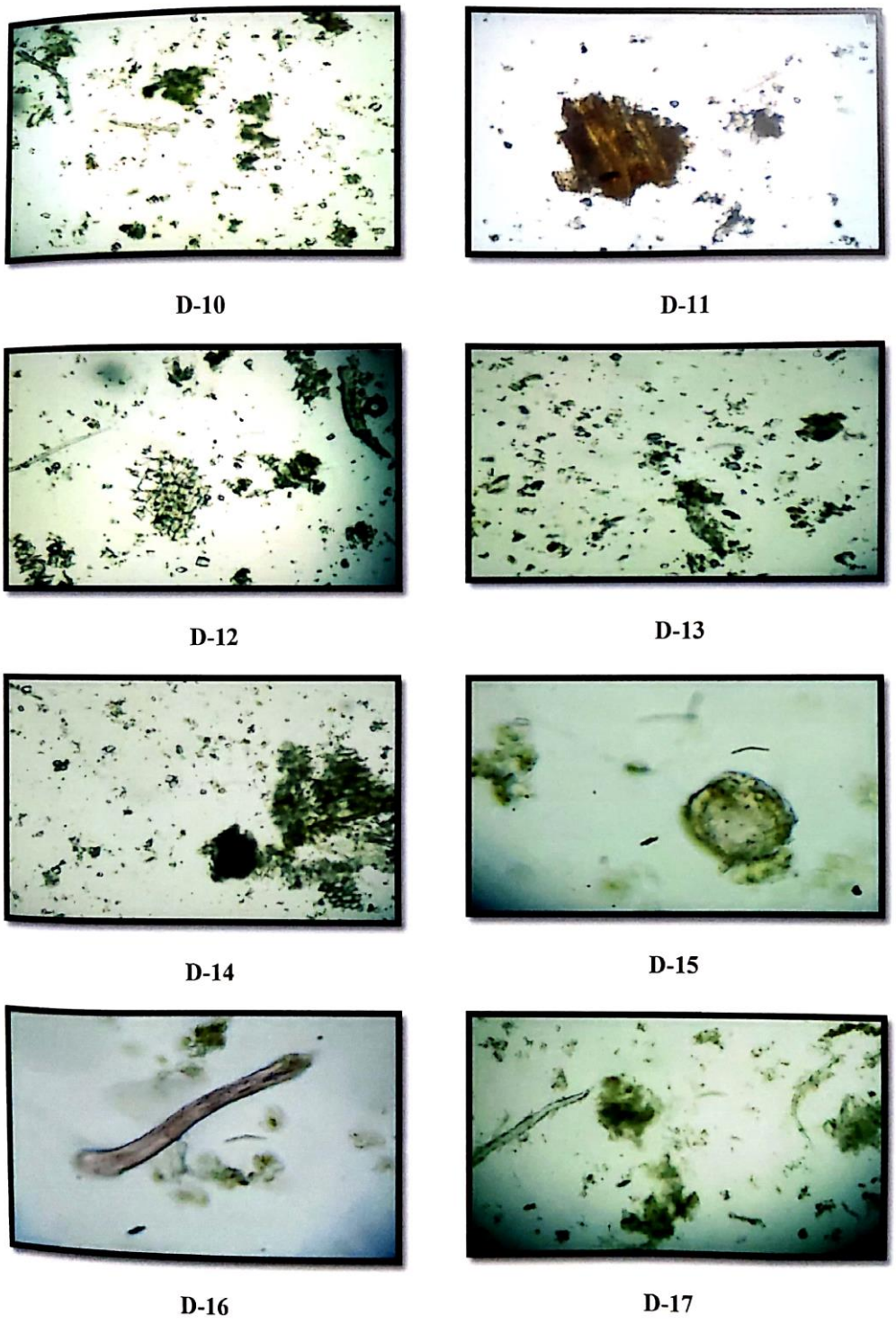


Plate 12. Powder microscopy of *Ficus hispida* Linn

Figure 12: D10-D17

E- 1

E-2

E-3

E. Plate 13. *Ficus carica* Linn

Figure 13: E1-E3

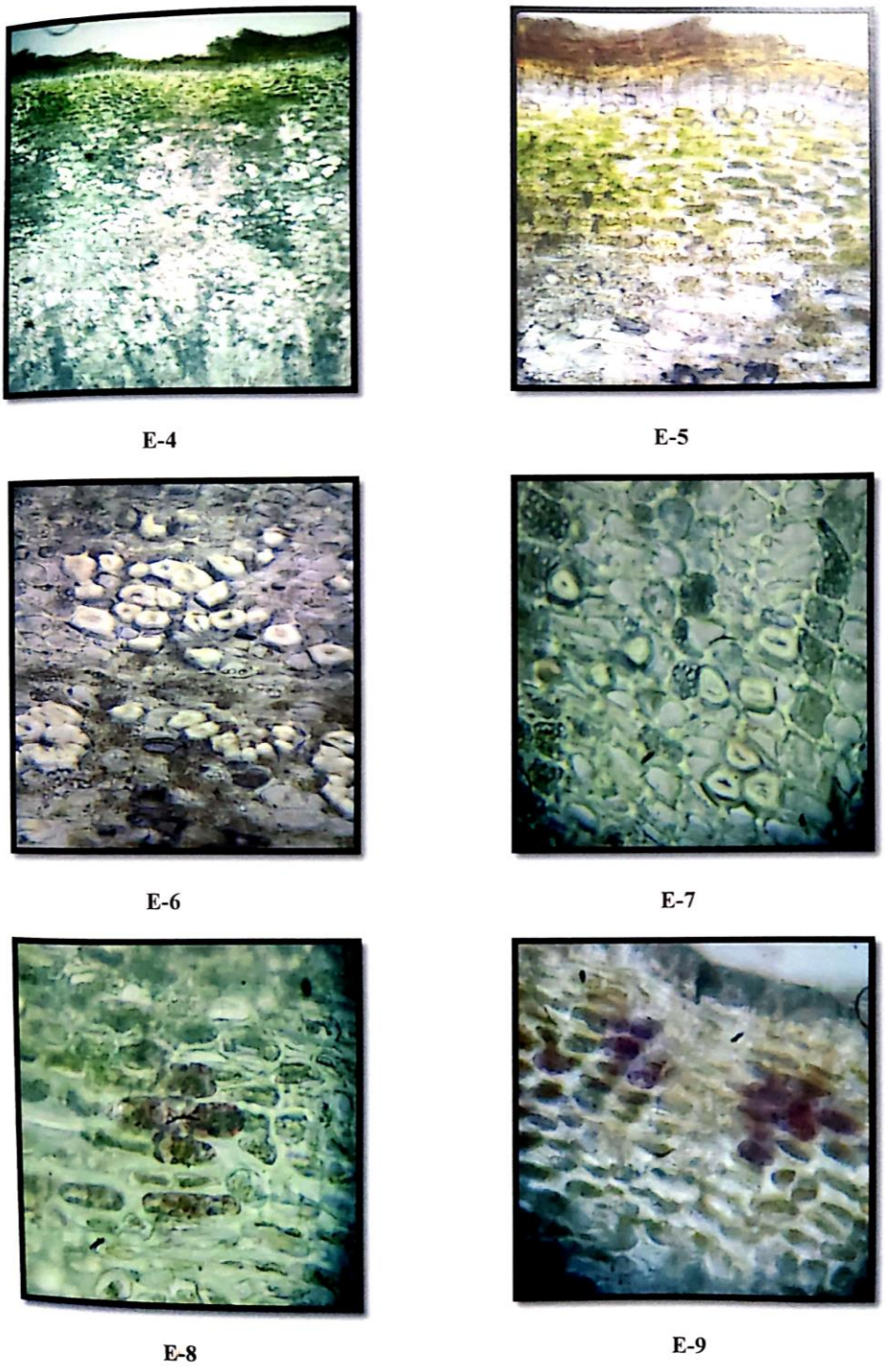


Plate 14 Transverse sections of *Ficus carica* Linn

Figure 14: E4-E9

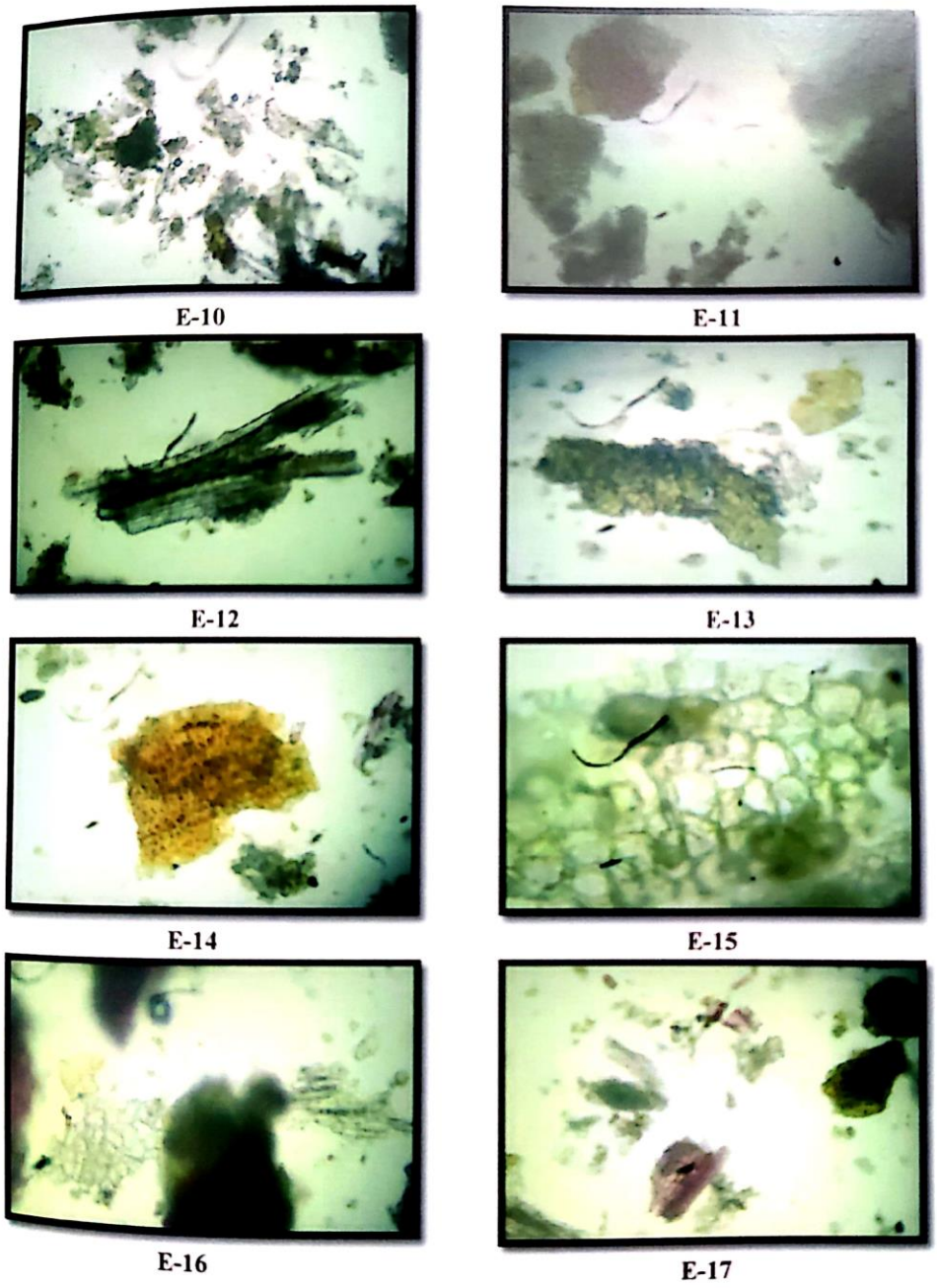


Plate 15. Powder microscopy of *Ficus carica* Linn

Figure 15: E10-E17

F-1

F-2

F-3

F. Plate 16. *Ficus infectoria* Linn

Figure 16: F1-F3

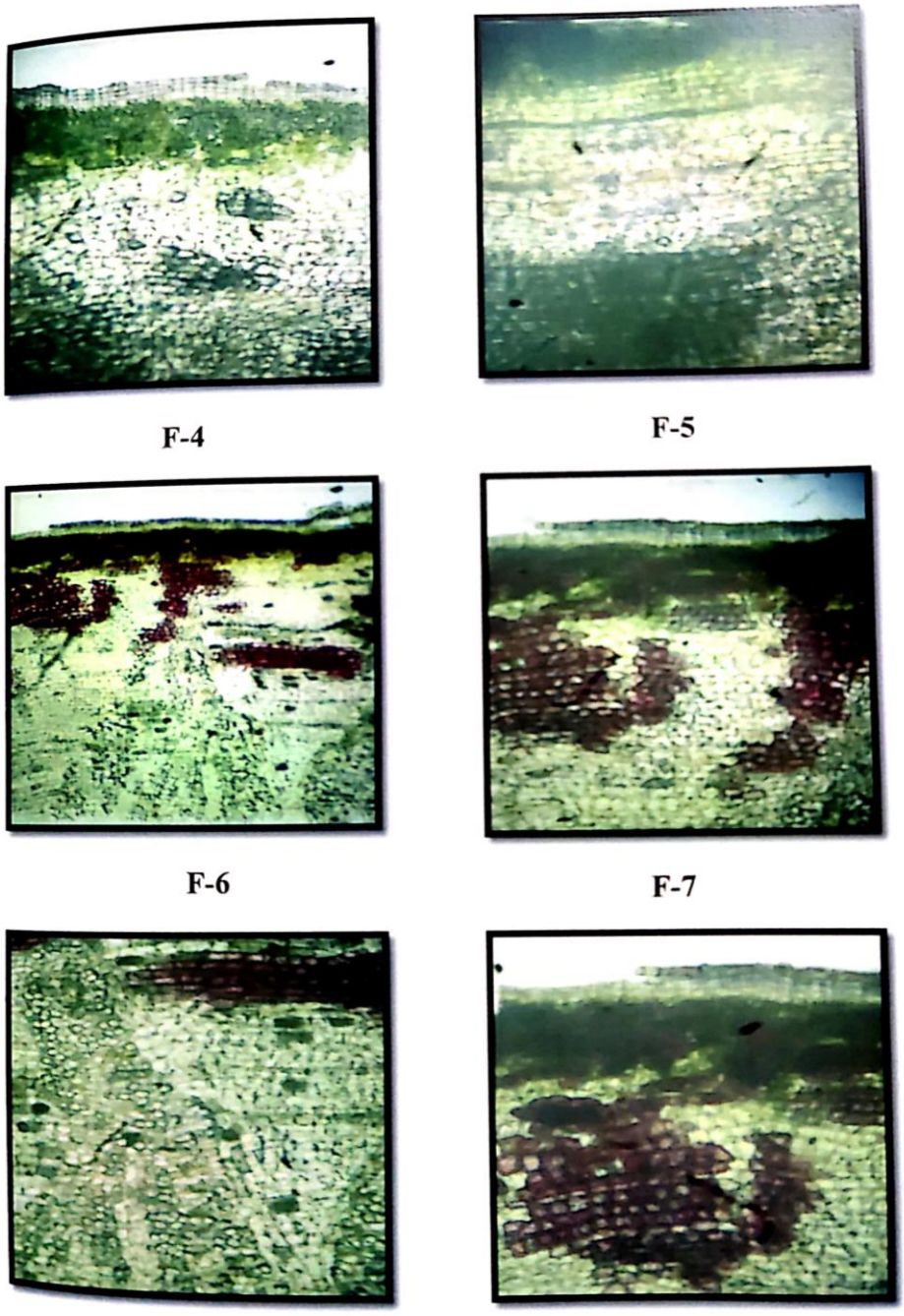


Plate 17. Transverse section *Ficus infectoria*Linn

Figure 17: F4-F9

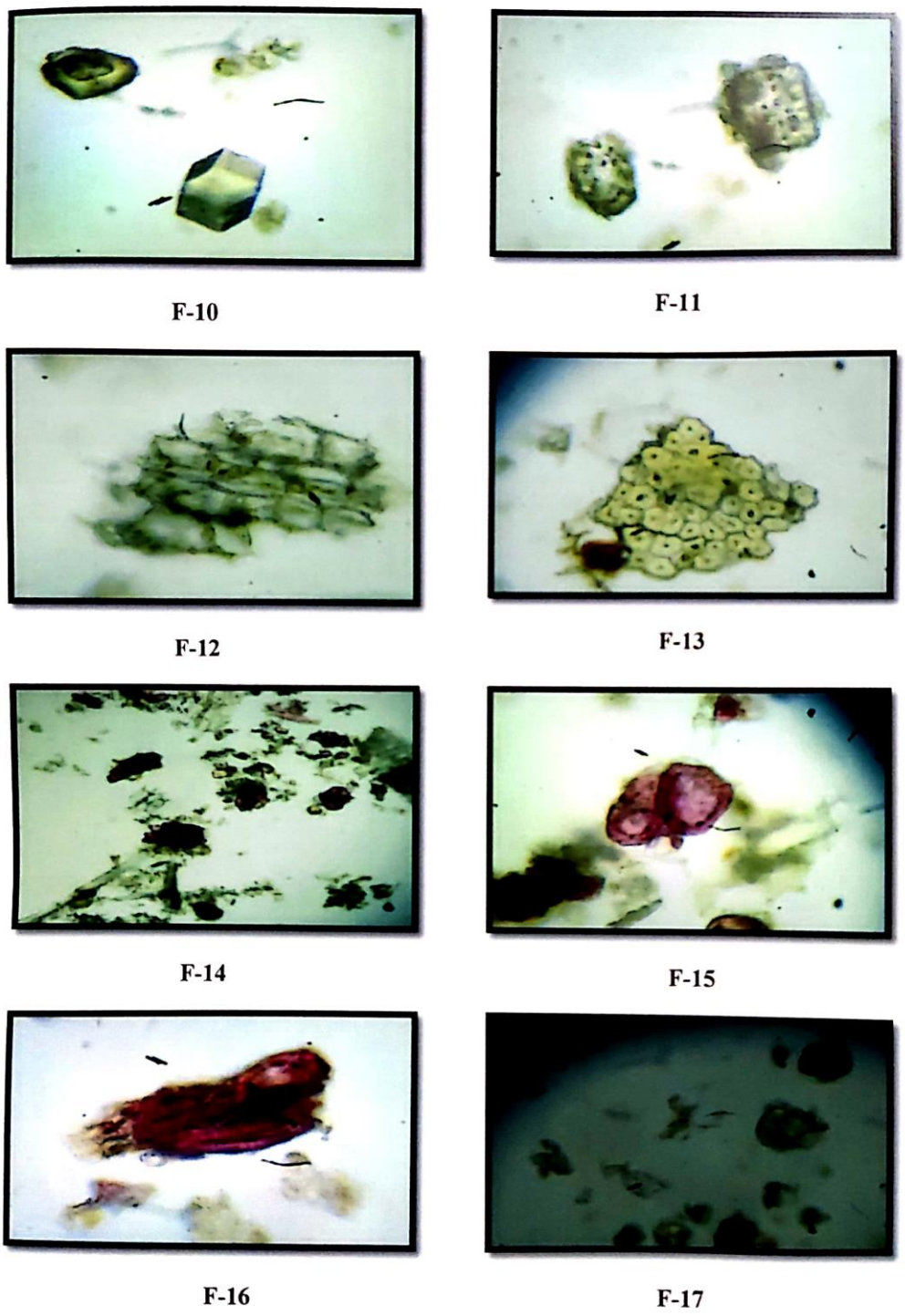


Plate 18. Powder microscopy of *Ficus infectoria* Linn

Figure 18: F10-F17