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Research Article

# Morpho-Anatomical and Phytochemical Studies on *Corchorus capsularis* (L)

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## ABSTRACT

*Objective: A study of the morphological and molecular characteristics of the Corchorus capsularis L (Tiliaceae) Tossa jute, also known as "Nalta jute," is an important crop in India that is used to make fibre. The leaves of this plant are consumed for their demulcent, diuretic, lactagogue, purgative, anti-diabetic, anti-cancer, antioxidant, and anti-inflammatory properties.*

***Methods:*** *In this study, the morphoanatomical, (organoleptic, macroscopic, and microscopic), and phytochemical profiles of C. capsularis leaves were evaluated. In addition, other WHO-recommended techniques were utilised to ensure the consistency of the results.*

***Results:*** *This is the first known description of the morphoanatomical characteristics of the leaves of the C. capsularis plant, which include a serrated margin, stipules at the base of the leaf, and an acute to acuminate apex. The epidermal cell frequency (ECF) was determined to be 5200 per square millimetre for polygonal anisodiametric to linear epidermal cells with 5-7 sides and polygonal anisometry. It was discovered that costal cells have 5 or 6 sides, a striated surface, mildly dense contents, and frequently contain calcium oxalate crystals. Microscopical examination of the leaf surface revealed that the epidermal cells were polygonal and anisodiametric to linear. The leaves are amphistomatic, indicating that they possess both anisocytic and anomocytic stomata, as well as uniseriate clavate filaments. The transverse section of a leaf reveals an oval midvein, as well as a faint ridge on the adaxial side and discernible ribs on the abaxial side. In addition, the secondary veins have a ribbed surface on the abaxial side and a grooved surface on the adaxial side, as well as abundant uniseriate filiform clavate hairs. Mesophyll is broken down by a limited number of sphaerocystalliferous idioblasts and mucilaginous cells. There is an arcuate bundle of vascular tissue in the middle, and a palisade on both extremities. The phytochemicals were extracted using a Soxhlet apparatus following a continuous and heated extraction. Alkaloids, flavonoids, tannins, polysaccharides, proteins, saponins, glycosides, terpenoids, phenols, steroids, coumarins, cardiac glycosides, and phytosterols are examples of phytochemicals. Phytochemicals such as phenols, steroids, and cardiac glycosides are also present.*

***Conclusions:*** *The study results can be used as a reference and as benchmarks for identifying this plant material in future research and applications, as well as for quantifying and isolating the chemical compounds responsible for the pharmacologically active properties of the plant.*

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**Keywords-** Anatomy, phytochemical, *Corchorus capsularis* L. Uniseriate clavate hair and Malvaceae

## INTRODUCTION

Traditional medical practices, such as Ayurveda and Siddha, significantly rely on plant-based medicines for their various preparations. Each batch of raw herbal medicine must undergo an exhaustive pharmacognostic analysis to ensure its authenticity and identify any potential adulterants. Traditional physicians trained in Siddha, Ayurvedic, or another herbal practice collects the majority of these herbs. Their distinguishability is largely based on their outward appearance or other easily recognizable characteristics. In such a scenario, it is conceivable that unsuitable raw medications or adulterants would be selected. To eliminate all doubt, it is necessary to undertake histological and phytochemical screenings on all natural medicines; this type of study will also serve as a road map for future research [1].

Xylem, phloem, sclereids, starch granules, crystals, stomata, and trichomes are all examples of quantitative microscopy [2].

The search for medicinal plants with therapeutic value has a lengthy history in modern medicine. Despite the increasing number of people who rely on herbal medicines for treatment, many plants are still utilized based solely on their traditional use [3]. In addition to assuring the safety and efficacy of the medicine, the quality of the plant raw material is essential to the production of herbal medicines. Therefore, microscopic research is indispensable for the standardization of medicinal plants [4]. Corchorus capsularis L. (Malvaceae), also known as "White Jute," is extensively distributed throughout the world's tropics, subtropics, and warm-temperate regions, as well as India's warmer


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regions. It is an annual plant with a stem that is straight, smooth, cylindrical, extremely tall and branched at the very top. The leaves are slender, oblong, and pointed and are a light shade of green. Individual or three-stemmed clusters of golden, microscopic blossoms. Five-valved capsules that are short, spherical, top-flattened, wrinkled, and ribbed. The low number of seeds per valve and no transverse divisions [5,6].People are realizing that natural products are not only effective, safe, non-narcotic, affordable, and free of side effects, but can also be used to treat a wide variety of human maladies, including C.capsularis [7]. Due to their abundance of protein, vitamins, and even hormone precursors, the edible leaves of certain Corchorus species have been extolled as a high-quality nutritional resource [8,9].In addition to the micro and macronutrients, the leaves of C. capsularis have been reported to have protective properties, including potent antipyretic, diuretic, analgesic, antioxidant, antimicrobial, anti-inflammatory, and anticancer properties[10,11,12,13,14,15,&16]. The leaves are said to have diuretic, demulcent, deobstruent, purgative, refrigerant, carminative, acrid tonic, lactagogue, and blood purifying properties; the leaves' twigs and stalks are used to treat cardiac issues and cardiovascular disorder, respectively [17, 18]. In ethnomedicine, the leaves are used to treat inflammation, pain, cystitis, dysuria, diarrhoea, malaria, enteritis, fever, gonorrhea, diabetes, dyspepsia, liver issues, pectoral symptoms, and tumours [19,20,21,22,23].

## MATERIAL AND METHODS

### Collection and Authentication of Plant Material

During the months of August and September of 2021, juvenile Corchorus capsularis L. leaves were collected in Ramagiri Khilla, Peddapalli District, Telangana state, India. The Department of Botany at Osmania University (O.U) identified the plant, and a specimen was sent to the Herbarium, Hyderabadens, Department of Botany, Osmania University (O.U), and Hyderabad for long-term storage (Accession number. OU-0445).

### Chemicals

Thermo Fisher Scientific India Pvt. Ltd., Rankem laboratory reagent, and Finar chemicals, India, supplied us with high-quality chemicals for use in our analyses. These businesses are all located in India

### Organoleptic parameters

Parameters like color, odor, and taste were evaluated organoleptically

### Macroscopic evaluation

Observed macroscopic characteristics of a fresh C. capsularis leaf included the characteristics of the lamina, the presence of the petiole, and the leaf base. Venation, shape, texture, apex, phyllotaxis, petiole, margin, and surface distinguish laminae. Other distinguishing characteristics comprise [24].

### Microscopic evaluation

Before the leaves are encased in paraffin wax, they are boiled, fixed in F.A.A. (Formaldehyde-Acetic Acid-Alcohol), and dehydrated with a sequence of xylene and alcohol. The leaves are then encapsulated with paraffin wax. To analyse sections cut at 10–12 m with an Optica rotating microtome, crystal violet and basic fuchsin combination staining was conducted, followed by Canada balsam mounting [25]. The microscopical examinations conducted included both quantitative and qualitative evaluations. The microphotographs were captured using a digital Sony camera and a trinocular Olympus BX-53 microscope.

### Qualitative microscopy

Using a microscope, the surface and cross-section of the leaf were observed and analysed in great detail. According to the method, the segment was stained with a 1:1 mixture of chloroglucinol and hydrochloric acid. Numerous microscopic structures were meticulously analysed and photographed [26,27&28].

### Surface view of leaf

Before creating epidermal peels, the skin was scratched and peeled with a razor blade. The peels were then stained with safranine and suspended in glycerine. After being submerged for several hours in a 4% sodium hypochlorite solution, the leaf lost all of its chemicals and colour as a consequence of the treatment. The works from [29]. Various aspects of bleached leaves, including the lamina, midrib, and petiole, were examined in great detail under a microscope.

### Transverse section (T.S.) of Leaf

After submerging the new leaf in water, we randomly divided it along its midrib to produce cross-sections. Fine sections were fixed on a glass plate with glycerine in the absence of a staining agent, and the resulting images were then examined under a microscope. Two components were used to produce the tissue section stain: phloroglucinol and concentrated hydrochloric acid. Trichomes, stomata, and a number of other distinguishing characteristics were observed [30,31].

### Powder microscopy

There was a microscopic examination of desiccated, finely powdered leaves lignified substances can be distinguished from other kinds of substances using a colouring solution (phloroglucinol and hydrochloric acid, mixed in a 1:1 ratio). When viewed through a microscope, a minute amount of foliage that had been reduced to a granular consistency was observed. After mounting the powder in glycerol with 1-2 drops of phloroglucinol solution (0.1% w/v) and concentrated hydrochloric acid, a coverslip was positioned on top. Before the material was examined under a microscope, this was performed. There were indications of trichomes, stomata, epidermis cells, xylem arteries, fibres, and additional structures. As a direct result, photomicrographs of the cellular structures were able to be taken for use in subsequent research [32].

### Quantitative microscopy

#### Estimation of the stomatal number and stomatal index

Stomatal number is the average number of stomata present in the epidermis of a leaf, measured in millimetres squared. Calculating the stomatal index of a leaf involves dividing the total number of stomata on the leaf by the total number of epidermal cells in a particular location and expressing the result as a percentage. The following algorithm will be utilised to calculate the stomatal index: SI represents the stomatal index, S represents the number of stomata per unit area, and EP represents the number of epidermal cells per unit area. This index is computed by multiplying the ratio between S and S plus EP by 100. A section of the leaf's epidermis was separated into its upper and lower layers using forceps. Glycerol was utilised to apply it to the film. The prepared sample was placed on the microscope's stage, and a camera lucida was used to record the epidermal cells and stomata on a piece of black paper divided into four 4 mm2 fields. We counted the stomata and epidermal cells in each region to ascertain their total number. Using the described method, we determined the stomatal index for both the upper and lower epidermis. The stomatal index is the average number of stomata present per unit of skin surface area [33].


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## Estimation of vein termination and vein-islet number

Between the leaf's margin and midrib, leaf area was measured in millimetres per square millimetre. This enabled the determination of variables such as the number of vein-islets and the veinlet termination point. A sketching camera was prepared and Lucida and black paper were inserted within it. In the exact centre of the playing field, a square measuring precisely 4 millimetres on each of its four sides was constructed. We traced every vein within the square, all the way to the overlapping islands that formed in the spaces between the four corners [34]. For four neighbouring squares, the average vein islet count and veinlet termination were recorded [33].

## Estimation of palisade ratio

In a section through the epidermis of a leaf, palisade cells were visible immediately underneath the epidermal cells. The palisade layer that resides beneath the epidermis cells was then reconstructed using a camera lucida. The palisade ratio was calculated by averaging the number of epidermis cells of four distinct types within five groups from five distinct leaf regions [34].

## Determination of width and length of vessels and fibers

Through the use of Schultze's maceration solution, the xylem arteries were separated from the other histological characteristics. In order to create Schultze's maceration fluid, potassium chlorate was combined with a 50% volume by volume solution of nitric acid, and the resulting mixture was heated in a water boiler. The above-described macerating solution was applied to a fragment of the leaf to be processed. On occasion, potassium chlorate was utilised in order to dissolve and soften the foliage fibres. By mounting the treated leaf tissue on a microscope slide, agitating it with a needle, and repeatedly flushing it with water, the acid was eliminated. This procedure was performed multiple times. The diameter and length of the arteries were measured and recorded with the aid of a calibrated micrometre eyepiece. This investigation measured the lengths and diameters of fifty distinct xylem vessels and filaments [35].

## Determination of biocrystals of leaf

After the Ca Ox crystals had been bleached, they were separated so that they could be examined under a microscope. With the aid of photomicrographs, the diameters and patterns of the crystals were analysed. The formation of crystals in leaves results from a variety of metabolic processes, with the majority of crystals found in leaves being stored in the cytoplasm and cell vacuoles. In the production of crystals, calcium compounds such as calcium carbonate and calcium oxalate are frequently employed. According to the findings of a number of researchers [36] the plant's cells contain numerous Ca oxalate crystals. Moreover, according to [37] aluminium is the only element present in these prismatic crystals.

## Phytochemical screening

In most instances, the secondary metabolites of a substance are responsible for the substance's pharmacological effects. The laboratory analysis of the extract of the powdered drug in pet. ether, chloroform, ethyl acetate, and methanol revealed the presence of alkaloids, flavonoids, saponins, steroids & terpenoids, phenolic compounds, tannins, glycosides, coumarins, phytosterols, and resins [38,39].

## Drying

Using sharp instruments, the freshly collected leaves were chopped into very tiny pieces after being washed. These components had final dimensions of 0.5 x 1.5 x 1 x 0.2 cm3. During the ten days that they were exposed to air, the newsprint was extended out in the shade. Before the extraction procedure could begin, the fruit was dried for an hour in a 40-degree Celsius oven with hot air.

## Successive Extraction Using Soxhlet Apparatus

In order to acquire a powder of uniform particle size, the dried leaves were first ground by machine and then sieved. This was done in order for the powder to be utilised. The berry powder was extracted using petroleum ether at 60 degrees Celsius, chloroform at 61 degrees Celsius, ethyl acetate at 77 degrees Celsius, and methanol at 77 degrees Celsius in a Soxhlet apparatus (65 degrees Celsius). So that the cycling of fresh solvent could be completed more rapidly, extraction temperatures were increased to their boiling points. Each solvent was allotted six hours during the heated continuous and sequential extraction procedures. After recovering the compounds, they were heated to 45 degrees Celsius in an oven in order to concentrate and dehydrate them. After the screening had been concluded, desiccated compounds were subjected to a phytochemical examination [40,41].

## Calculation of percentage yield

The yield was determined by comparing the weights of the air-dried plant material and the desiccated extracts generated with each solvent type.

$$\textbf{Percentage Yield} = \frac{\text{Weight of the crude(mg/g)}}{\text{Weight of the plant material}} \times 100$$

## Screening of Phytochemicals

The leaf samples were subjected to a phytochemical screening in order to identify secondary metabolites. The phytochemical analyses were conducted in accordance with generally accepted procedures. Numerous qualitative analyses have been conducted to determine whether or not there are functional substances present [42,43,44,45,46,47,48,49, &50].

1. **Detection of Alkaloids:** The Mayer's Test involved dissolving extracts in a diluted hydrochloric solution and then sieving them to detect alkaloids. The optimal quantity of Mayer's reagent to apply to a 2 ml ml filtrate was determined to be between two and three drops.
2. **Test for Flavonoids:** After magnesium tube turnings and a minute amount of concentrated hydrochloric acid were added to the test liquid, it was brought to a simmer for five minutes. If flavonoids are present in the concoction, it will have a crimson hue.
3. **Test for Saponins:** After being boiled at a low temperature for two minutes with twenty millilitres of water, the pulverised substance was passed through a small sieve to remove impurities. Then, the filtrate was combined with water until it reached a volume of 5 mL, and it was vigorously agitated. When foaming occurs, there is a strong indication that saponins are present.
4. **Detection of Steroids & Terpenoids:** For the Liebermann-Burchardt test, one millilitre of extract was mixed with one millilitre of chloroform, two millilitres of acetic anhydride, and one to two molecules of concentrated sulfuric acid. The liquid's dark green hue indicated the presence of steroids.


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5. **Test for Phenolic compounds :** The following substances were used to determine whether or not a pulverised sample contained phenolic compounds, and the results were consistent with expectations. a. 5% ferric chloride solution: A very dark, nearly violet-black hue. b. a white residue remaining in the lead acetate solution.
6. **Test for Tannins:** A small quantity of the powdered drug was extracted with water. To the aqueous extract, a few drops of ferric chloride solution were added. A bluish-black color indicates the presence of tannins.
7. **Detection of Glycosides**

   Heat was applied to the extract in either alcohol or a hydro-alcoholic solution to produce the test solution.

   **a) Baljet's test**

   A 2% concentration of sodium picrate was added to the mixture in order to conduct the test. The pigment exhibited a yellowish-orange hue, which indicated the presence of glycosides.

   **b) Legal 's test**

   The sample contained glycosides after the test solution was alkalized with pyridine and the addition of 2% sodium nitroprusside caused it to change colour from pink to crimson.

   **c) Keller-Killiani test**

   Before combining, one millilitre of glacial acetic acid and one drop of ferric chloride solution were added to one hundred milligrammes of extract. As a base, 1 millilitre of concentrated $H_2SO_4$ was then added to the mélange. The appearance of a brown band at the interface is indicative of the presence of glycosides in the sample.
8. **Detection of Coumarins:** After diluting the water-based extract to a volume of 2 millilitres, a volume of 3 millilitres of a 10% NaOH solution was added. The contents' yellow hue suggested the presence of Coumarins.
9. **Test for Phytosterols:** After vigorously agitating the extract solution, concentrated sulfuric acid was added to it, and it was then stored. When phytosterols are present, the chloroform layer at the bottom of the solution turns reddish, indicating their presence.
10. **Detection of Quinones:** After being treated with diluted sodium hydroxide, one millilitre of crude extract acquired a hue indicating the presence of quinones. This hue may be either blue-green or red.
11. **Detection of Resins:** Before adding 0.5 millilitres of sulphuric acid, 2 millilitres of extract were dissolved with 5 to 10 drops of acetic anhydrate over moderate heat. It is probable that resins were present because they produced a strikingly dark purple hue.
12. **Detection of Cardiac Glycosides:** Two millilitres of supernatant were combined with one millilitre of glacial acetic acid, one millilitre of ferrous chloride, and one millilitre of concentrated sulphuric acid for the Kellar-Kiliani test. The solution's transformation into an emerald hue when exposed to light suggested that it contained cardiac glycosides.
13. **Detection of leuco anthocyanins:** In the concoction, equal amounts of aqueous extract and isoamyl alcohol were combined. As a result of the presence of leucoanthocyanins, the upper layer has turned red.
14. **Detection of anthraquinone:** After five minutes of agitating the mixture in chloroform, one gramme of finely ground plant material was added. After filtering the contents, 5 ml of a was ammonia solution was added, and the mixture was swiftly shaken prior to analysis. Indicative of the possible presence of anthraquinone, the aqueous layer on the surface of the sample displayed a vibrant pink hue.
15. **Detection of fixed oils:** The extract is extracted from a minute sample by squeezing it between two filtration papers. Any sign of fixed oils, such as an oil residue on paper, indicates that such substances exist.

## OBSERVATION AND RESULTS

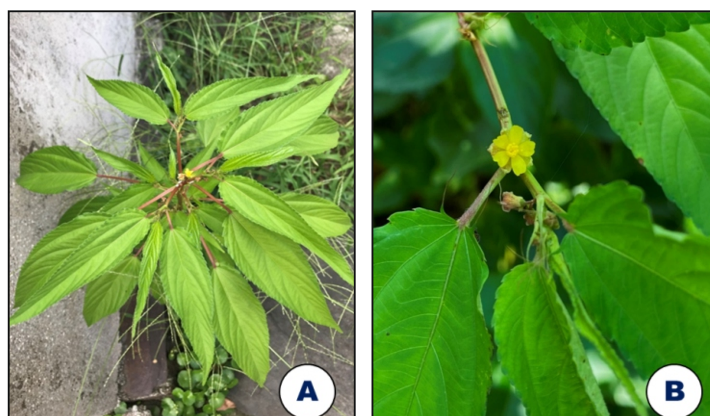
### Plant profile (51, & 52)

Table -1: Taxonomic classification

| | |
|---|---|
| **Kingdom** | Plantae |
| **Sub Kingdom** | Viridaeplantae |
| **Infra Kingdom** | Streptophyta |
| **Phylum** | Magnoliophyta |
| **Division** | Tracheophyta |
| **Subdivision** | Sparmatophytina |
| **Class** | Magnoliopsida |
| **Order** | Malvales |
| **Family** | Malvaceae |
| **Genus** | *Corchorus* |
| **Species** | *Capsularis* L |

### Macroscopic evaluation of the leaf

Researchers analysed morphological traits and taxonomies to obtain a global perspective on the subject. An analysis of the leaf morphology revealed that the plants are annuals. The stems and branches of these annuals are glabrous, and they can attain vast heights when cultivated. The length of the leaves ranges from 7 to 10 centimetres, and their girth from 2 to 3.2 centimetres. They may be acute or acuminate, glabrous and serrate, with a rounded or acute base. The average length of the petioles was 2.2 centimetres, and the stipules are long and filiform (6–12 mm). Additionally, floral clusters are relatively small, with few flowers per cluster and even shorter pedicels than the flowers themselves. The few wedge-shaped seeds are contained in subglobose, flattened, five-valved, woody receptacles with a subglobose shape. (Figure 1A-D).





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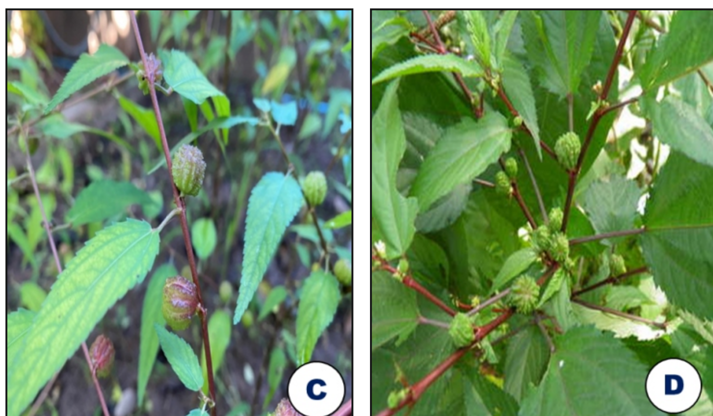



Figure 1A-*C. capsularis* habitat; 1B-flower; 1C-fruits; 1D-twig with fruit.

**Microscopic evaluation of the leaf** (Surface View)

## Leaf – Adaxial surface: (Fig.2A)

The photomicrograph of the ventral leaf surface shows 3 veins including the midrib. The epidermal cells 5-7 sided, polygonal anisodiametric to linear, few isodiametric, sides thick, straight to curved, surface striated, contents dense in few, often with calcium oxalate crystals.

**Dist:** Common, all over, except on veins, irregularly arranged, variously oriented.

E.C.F. 5200 per sq.mm.

Costal cells: 5-6 sided, few up to 7 sided, polygonal anisodiametric to linear, sides thick, straight to curved, surface striated, contents slightly dense, often with calcium oxalate crystals.

**Dist:** On primary and secondary veins, irregularly arranged, parallelly oriented.

Stomata: Mostly anisocytic, rarely anomocytic, subsidiaries 3-4, indistinct, mostly f – types, few a – type, rarely c-type; guard cells reniform to linear, surface smooth, contents slightly dense.

**Dist:** Common all over, except on veins, irregularly arranged, variously oriented.

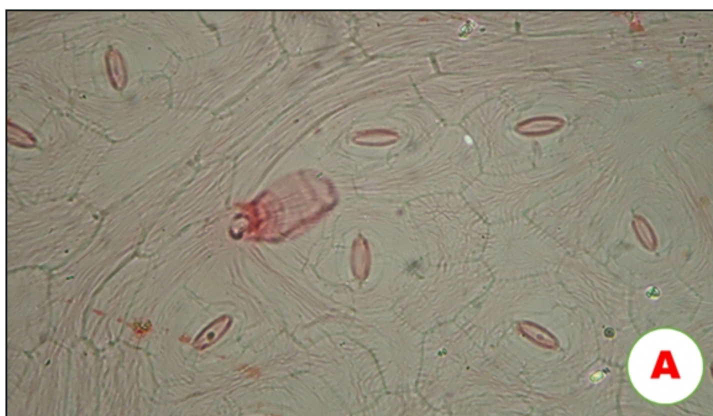
S.F. 190 per sq.mm; S.I. 2.8.

Trichomes: Uniseriate clavate hair: Foot: 1 – celled, rounded, submerged and raised above. Stalk: 1- celled, cells broader than long, contents scanty. Head: uniseriate, 3-4 celled, clavate, cells longer towards apex, contents scanty. Dist: Common, all over, mostly on veins rarely elsewhere.

### 3.3.2 Leaf – abaxial surface: (Fig.2B)

As described on lamina adaxial except stomata mostly c – type, few a – type and rarely f – type.

E.C.F. 4620 per sq.mm; S.F. 320 per sq.mm; S.I. 6.2.



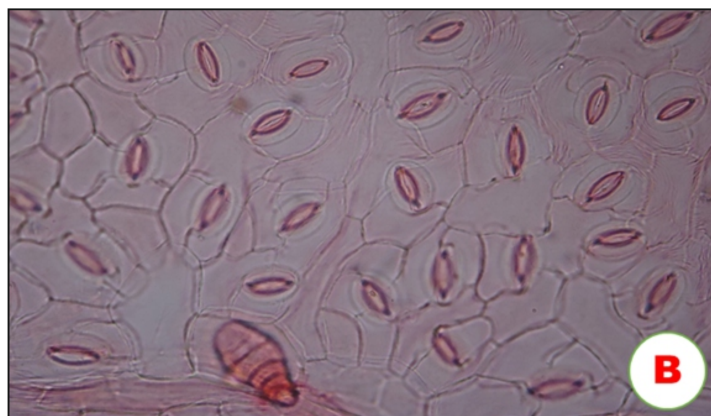




**Figure 2A** adaxial surface **X 145;** 2B abaxial surface **X 156**

## Transverse Section of leaf: (Fig. 3A&B)

Near the veins, the dorsiventral lamina is typically thicker (164 m) and more densely covered in uniseriate filiform clavate hairs (146 m), while the midvein is ovoid, slightly ridged adaxially, and conspicuously ribbed on abaxial (164 m thick) in transection. Typically, the thickness of the dorsiventral lamina close to the veins is 119 m.

**Epidermis** is a large, barrel-shaped, tabular, rectangular to spherical, and isodiametric epidermal cells range between 14–22(17) m in width and 19–36 (29) m in length. These cells are oriented towards the epidermis' adaxial side. 11–22 (16) m in diameter; thick walls and cuticle; limited number of dense contents; often interspersed with mucilaginous cells 19–38 (27) m in diameter; epidermal cells fill stomata; cells on the lamina abaxial are smaller, narrower, and more numerous. 11–22 (16) m in diameter; thick walls and cuticle; limited number of dense contents; frequently interspersed with mucilaginous cells 16–30 m in length and 8–19 m in breadth, with isodiametric cells measuring 8–22 m in diameter, thin walls and stomata flush with epidermal cells, and contents that are only slightly dense.

**Mesophyll** with palisade on adaxial and spongy parenchyma towards abaxial.

**Palisade** In a few spots, it is double-layered. Palisade extends into midvein and secondary veins with a small opening in the middle; minor veins have a bundle sheath; palisade is often interrupted by mucilaginous cells and a few sphaerocystalliferous idioblasts. Three-layered cells are cylindrical, columnar, and chloroplast-packed densely. With a minor gap in the centre, Palisade extends into the midvein and secondary veins.

**Spongy parenchyma** 4-5 layered, cells oval to spherical, 14 – 27 (19) μm in diameter, closely packed with dense chloroplasts, often dispersed with spheroidal idioblasts.

**Ground tissue** epidermis consists of a single layer, the cells are extremely minute and oval to spherical, there are very few tabular cells, the contents are moderately dense, the cuticle is moderately thick, the midvein is on the adaxial side, and the palisade extends horizontally on both sides. Collenchyma cells in the hypodermis can assume a diversity of forms, from spherical to asymmetrical, and their sizes range from 12 to 18 m. Adaxial parenchyma is sparse, 4-6 stratified, and predominantly arranged in radial rows; its cells vary in shape from polygonal to spherical and range in diameter from 16-33 (24) m. The adaxial parenchyma is predominantly organised in radial segments. Abaxial epidermis cells resemble adaxial epidermis cells in that they are tiny, oval to spherical, 11-19 (15) m in diameter, and contain dense contents in a relatively small number of cells. In addition, abaxial epidermis cells

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and adaxial epidermis cells have the same number of mitochondria. The diameters of the oval to polygonal and angular cells that make up the solitary layer of the hypodermis range from 14-22 (17) m. There are four to six layers of parenchyma, and the cells within them range in diameter from 14 to 30 m. Some of the cells contain moderately dense contents, while others are dispersed with large mucilaginous cells.

**Vascular tissue** 11-25 (19) m in diameter; central arcuate bundle measuring 129-159 (145) m in lateral length and 88-115 (104) m in vertical width. Tracheary elements are bicollateral, endarch, and interspersed with xylem parenchyma in radial strata. Tracheary cells range in morphology from polygonal to spherical. The phloem itself is composed of lignified walls on both sides, bast filaments, phloem tissue, and sieve cells. The arteries and trachea of the L.S. are expanded in a spiralling and scalariform pattern.

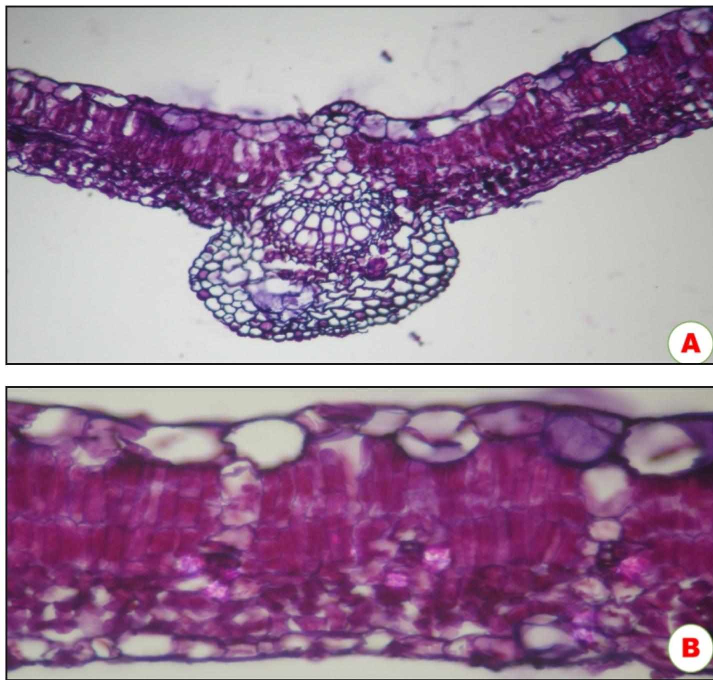


**Figure 3A** T.S of Leaf **X225;** 3B T.S of Lamina **X210**

## Powder Microscopy: (Fig. 4A-H)

The powder prepared from the leaves was dark green in colour and had a strong, unmistakable odour and astringent flavour. There was a fragment of each of the following in the substance:

1. Fragmented epidermal cells with both straight or curved stomata and margins.
2. Depending on their location, costal cell segments that can be essentially linear or gently curved.
3. Numerous fragments of uniseriate clavate hairs with severed ends.
4. Typically, stone cells exist singly or in small clusters, distinct from the adjacent tissue cells.
5. Calcium oxalate crystals that are either arranged singly or in very minute clusters.
6. The sixth category consists of containers with a significant number of rimmed openings.
7. A significant number of the strands have been severed or separated.
8. There are both spiral and scalariform thickenings on the tracheary components.

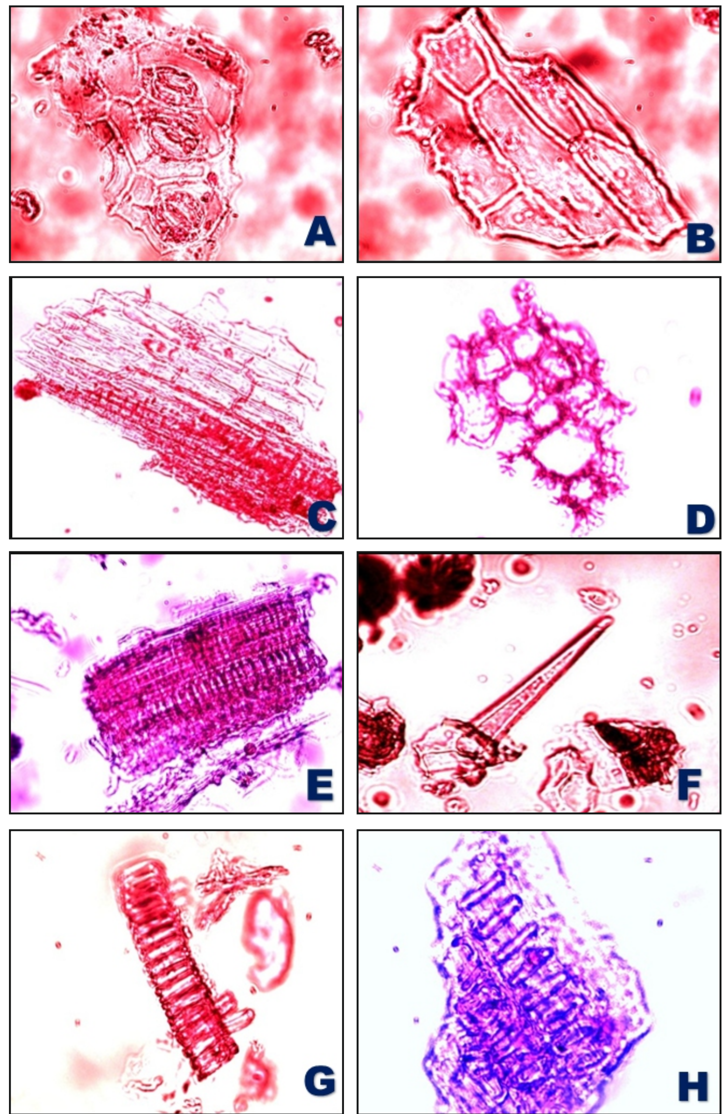


**Figure 4A** H powder microscopic fragments

## Organoleptic characters

**Colour** – Dull woody yellow; **Touch** – Coarse; **Odour** – No characteristic; **Taste** – No characteristic.

## Quantitative microscopy

The various parameters evaluated for leaf surface constants were observed like stomatal number (upper and lower), stomatal index (upper and lower), E.C.F, (upper and lower), Spongy parenchyma, palisade ratio, vascular bundles tracheary elements. The results are shown in Table- 2.

| Parameters | Results |
|---|---|
| Epidermal cell frequency (E.C.F. adaxial) | 5200 per sq.mm. |
| Stomatal index (S.I. adaxial) | 2.8 |
| Stomatal frequency (S.F. adaxial) | 190 per sq.mm; |
| Epidermal cell frequency (E.C.F. abaxial) | 4620 per sq.mm; |
| Stomatal index (S.I. abaxial) | 320 per sq.mm; |
| Stomatal frequency S.F. (abaxial) | 6.2 |
| Palisade ratio | 19-44(30) µm long; 8-18(12) µm wide |
| Spongy parenchyma | 14-27(19) µm dia. |
| Parenchyma (adaxial)) | 16-33(24) µm dia. |
| Parenchyma (abaxial)) | 14-30(24) µm dia. |
| Vascular bundle (laterally) | 129-159(145) µm long |
| Vascular bundle (vertically) | 88-115(104) µm wide |
| Tracheary elements | 11-25(19) µm dia. |


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## Phytochemical Screening

The leaf extracts of C. capsularis were subjected to a phytochemical analysis to identify secondary metabolites. We looked for alkaloids, flavonoids, saponins, steroids and terpenoids, phenolic compounds, tannins, glycosides, coumarins, phytosterols, quinones, anthraquinones, cardiac glycosides, leuco anthocyanins, fixed oils, and resins in extracts suspended in petroleum ether, ethyl acetate, chloroform, and methanol. We also examined these

The qualitative analysis of the fruit of the plant C.capsularis L. revealed the presence of a number of distinct phytochemical classifications. The presented results (Table 3 and Image 5) permit a comparison of the solvents utilised during the extraction procedure.

Alkaloids were present in both ethyl acetate and methanol extracts, but only the methanol extract contained saponins. With the exception of the pet. ether extract, all of the extracts passed the phytochemical test for flavonoids, glycosides, steroids, and terpenoids. This was determined through the analysis of phytochemicals. None of the extracts contained quinones, anthraquinones, leuco anthocyanins, or resins. Phytosterols were only detected in the ethyl acetate extract, tannins in the ethyl acetate and methanol extracts, cardiac glycosides in the chloroform and methanol extracts, fixed oils in the pet. ether extract, etc. The most effective solvent for extracting polyphenols from plant material is methanol; ethyl acetate and chloroform are the second and third most effective solvents, respectively. The method of data extraction had a substantial effect on the variety of results obtained. The technique used for phytochemical extraction and screening led to the discovery of phytochemicals with physiological activity in the extracted material. Pet. ether, chloroform, ethyl acetate, and methanol all produce percentages of output that are less than that of methanol (39.15%).

**Figure 5:** Different leaf extracts of C. *capsularis*

### Table -3 Phytochemical analysis of *Corchorus capsularis* L.

| S. No | Phyto. Name | Pet. ether | Chloroform | Ethyl acetate | Methanol |
|---|---|---|---|---|---|
| 1 | Alkaloids | - | - | + | +++ |
| 2 | Flavonoids | - | + | +++ | + |
| 3 | Saponins | - | - | - | +++ |
| 4 | Steroids & Terpenoids | - | ++ | ++ | + |
| 5 | Phenols | + | + | +++ | ++ |
| 6 | Tannins | - | - | + | + |
| 7 | Glycosides | - | +++ | ++ | ++ |
| 8 | Coumarins | + | + | ++ | +++ |
| 9 | Phytosterols | - | - | + | - |
| 10 | Quinones | - | - | - | - |
| 11 | Resins | - | - | - | - |
| 12 | Cardiac Glycosides | - | + | - | ++ |
| 13 | Leuco anthocyanins | - | - | - | - |
| 14 | Anthraquinones | - | - | - | - |
| 15 | Fixed oils | + | - | - | - |

**"+" = present; "-"= absent**

## DISCUSSIONS

This is the first description of these anatomical characteristics that we are aware of, and to our knowledge, they have not been investigated methodically. This information is useful for determining the authenticity of Corchorus capsularis L. and determining its identity. Despite its lack of extensive recognition, the plant is well-known for its use in folklore and traditional medicine. Capsularia sp. These C. capsularis L. leaves were collected from the Peddapalli District of the Ramagiri Khilla in the Indian state of Telangana. Current morphoanatomical investigations of the leaf have revealed that the epidermal cells are 5-7-sided, polygonal anisodiametric to linear, few isodiametric, thick, straight to curved, with a striated surface, dense contents in few, and frequently with calcium oxalate crystals on both surfaces. A small number of isodiametric epidermal cells have also been identified. In addition to these characteristics, the organism also possesses amphistomatic stomata (mostly anisocytic, rarely anomocytic). This study provides evidence supporting both viewpoints of the uniseriate clavate hair debate. A transected leaf will have a midvein that is elliptical in shape, faintly ridged on the adaxial side, and noticeably ribbed on the abaxial side. Mesophyll consists of a two-layered palisade on the adaxial and four or five layers of porous parenchyma on the abaxial. There are sphaerocystalliferous idioblasts interspersed in both of these structures. Large mucilaginous cells are disseminated throughout the differentiated collenchyma and parenchyma of the ground tissue. Additionally, the basal tissue has undergone differentiation. It has been determined that the midvein contains one arcuate collection of vascular tissue. On both sides of the bast filaments, which are separated from one another by lignified walls, phloem tissue, and sieve cells, there is phloem. During observations, the blood arteries and tracheids of the L.S. displayed spiral and scalariform thickenings. Diverse substances, including alkaloids, flavonoids, tannins, saponins, phenols, steroids, terpenoids, coumarins, glycosides, and fixed oils, have been isolated from various preparations for phytochemical analysis. Pet.ether, chloroform, ethyl acetate, and methanol were used to analyse these preparations. None of the samples contained any traces of the compounds known as leuco-anthocyanins, anthraquinones, quinones, or resins. The methanol crude extract yield was the highest at 39.5%, whereas the chloroform crude extract yield was the lowest at 9.0%..

## CONCLUSION

In conclusion, the report of these factors for the first time may prove useful for devising diagnostic indices for detecting C. capsularis and writing its monograph. This is due to the fact that the determinants have not been previously reported. In order to determine the morphoanatomical and phytochemical criteria for evaluating plant material, the current study was conducted. These standards have the potential to serve as a benchmark for authenticating commercial samples of the unprocessed drug and maintaining quality control.

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**Conflict of Interest.** None


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