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Research Article

Morphological, Microscopic, And Pharmacognostic Study of Euphorbia Thymifolia L.: A Comprehensive Analysis

Mr. K.G. Bhuktar[1], Dr. P Balaji[2*]

[1]School of Pharmaceutical Sciences, Vels Institute of Science, Technology and Studies (VISTAS), Vels University, Chennai-600117, Tamil Nadu, India. ketanbhutkar@gmail.com , 9822860634
[2*]Department of pharmacology School of Pharmaceutical Sciences, Vels Institute of Science, Technology and advance Studies (VISTAS), Pallavaram, Chennai-600117, Tamil Nadu, India.
Pharmacology.balaji@gmail.com , 9894992668

***Corresponding Author:** Dr. P Balaji
*Department of pharmacology School of Pharmaceutical Sciences, Vels Institute of Science, Technology and advance Studies (VISTAS), Pallavaram, Chennai-600117, Tamil Nadu, India.
Email - Pharmacology.balaji@gmail.com, Contact - 9894992668

ABSTRACT

The traditional system of medicine is an important part in various localities in the world. The plant *Euphorbia thymifolia* is a common observing plant on the earth. Now days the plant and their metabolites is higher dependence use of medicine. The present study focus on various standardization parameters such as morphology, microscopy, powder characteristic, leaf constant etc. The secondary metabolites derived from the primary metabolites and it is very useful to human for various disease, disorder and also in cosmetics purpose. The plant *E. thymifolia* obtained in various tropical and sub-tropical regions in the world. The plant is traditional folk medicine and commonly known as laghu-dudhika or choti-dudhi. Plant gives therapeutic activity due to present of secondary metabolites phytoconstituent like alkalois, flavonoid, steroids, tannin, terpenoid, polyphenol etc. and their dions and lactone structurein the isoprene unite. The therapeutic activity like antimicrobial, antifungal, antidiabetic, antitumor, antiplasmodia, wound healing, anti-infflamatory etc.

KEYWORDS: Euphorbia thymifolia, Pharmacognostic study, Morphology, Microscopy, Medicinal plant, Herbal medicine, Plant authentication

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INTRODUCTION

Commonly referred to as laghududhika, choti-dudhi, or nanhi dudhi, *Euphorbia thymifolia* Linn. is a tiny evergreen plant that is a member of the Euphorbiaceae family. It thrives in humid temperatures and is primarily found in tropical and sub-tropical areas. It grows on about 40% of the land in India and is frequently spotted at the sides of roadways. The plant is tiny, has green and radish-pink stalks, white or pink blooms, and milky latex [3,23,14]

Due to its many medicinal benefits, *Euphorbia thymifolia* has long been utilized extensively in traditional medicine. In addition to being used for detoxification and blood purification, it has been used to treat wounds, diarrhea, dysentery, jaundice, and acne. It is highly prized for its anti-inflammatory, anti-

rash, and laxative properties. It has also been used to treat children's worm infestations, stomach problems, and gonorrhea. It's interesting to note that the plant has a role in cosmetic customs, specifically in tattooing [1,20,7]

Numerous bioactive chemicals found in the plant have been identified through phytochemical research and extracted utilizing solvents such as ethanol, water, methanol, petroleum ether, and ethyl acetate. These investigations have assessed the pharmacological characteristics of the plant's ingredients and clarified their chemical structures. Numerous biological activities, such as antibacterial, anti-spasmodic, anti-hyperglycemic, hepatoprotective, and anti-inflammatory properties, are displayed by Euphorbia thymifolia. Additionally, it has demonstrated promise in treating bronchial asthma, arthritis, and reproductive dysfunction. In addition, it has sedative, anti-stress, and antioxidant qualities in addition to diuretic and anti-helminthic benefits. Its importance in managing oxidative stress is shown by its capacity to fight free radicals and prevent lipid peroxidation [2,4,12].

The plant's traditional and contemporary uses point to its promise in the fields of medicinal development, public health, and cosmetics. It provides affordable treatments for infections, metabolic issues, and tropical diseases. It is a viable option for additional study and development due to its accessibility and adaptable pharmacological characteristics. Isolating particular active ingredients, investigating synergistic effects with other plants or medications, and improving extraction methods for improved use could be the main goals of future research. *Euphorbia thymifolia* has the potential to make a substantial contribution to sustainable healthcare solutions by fusing traditional knowledge with contemporary research [9,6,17].

Pharmacognostic studies:

Euphorbia thymifolia L. belongs to Euphorbiaceae is a small branched plant contain white milky latex when it cut or blunt the stem or leaves. The pharmacognostic study of *Euphorbia thymifolia* observed different part of plant such as root, stem, leaves, flower and fruit. [16,22]

MATERIALS AND METHODS

This study was performed after authentication of plant material in the month of December 2020. At Trinity College of Pharmacy Pune, laboratory.

Apparatus- Microscope, watch glass, slide, brush, pointer nail, Test tube, Beaker, Mortar and Pestle, black cardshit paper, white pencil, camera Lucida.

Plant Materials- The present morphology and microscopy study was carried out on *Euphorbia thymifolia*. Fresh and dried plant. The plant species collected at western ghat region at Bopdev ghat college campus premises hill region in humid conditions. In India, the plant is found in the hilly and plain areas. *Euphorbia thymifolia* is a prostate annual plant producing stem up to 10 cm to 32 cm grow long. The stem usually produced numerous adventitious roots as well as the pubscient, soft ovate leaves.

Collection and authentication of plant materials:

The fresh plant material collected at Western Ghat region at Bopdev ghat Trinity college of Pharmacy campus premises and hill region in humid conditions morning at 08.30am to 10.00 am. After the collection of plant spacies, the first Specimen sample authenticated by Botanist Dr. P. B. Kamble, Head of Botany Department A. T. College Bhor, dated 29th September 2019. Fresh plants of *E. thymifolia* were collected from Bopdev Ghat near less than 10 km, area Pune Maharashtra India and deposited the specimen for identified and authenticated at Botanical Survey of India Western Regional Office Pune. The Voucher specimens N / No. BSI/WRC/100-1/Tech./2020/102 by Scientist Mrs. Priyanka A. Ingale and Assistant Ms. Prachati Mule give Comparison and authentication of plant species *Euphorbia hirita* and *Euphorbia thymifolia* which is further used it needs to be dried for extraction. To avoid decomposition of thermo-labile substance dried the sample in shade area below 30^0C. & dried sample convert coarse powder in blender avoids fineness of powder due to external factor oxidation will start of compound in it.

Macroscopic analysis:

The macroscopical analysis of plant *E. thymifolia l.* describe the various part of plant and their features such as root, stem, leaves, flower, fruit etc and their study of size, shape, colour, odour surface character ,venation, apex, margin, base, lamina and texture were studied.

Microscopic analysis:

The microscopical analysis of plant *E. thymifolia* l were done by taking free hand sections and stained with phloroglucinol and concentrated HCl in the ratio of 1:1 and other staining reagent to describe the arrangement of cell . The stained sections were mounted on glass slide with glycerin and observed under microscope (Olympus BX10) at 10X and 45X magnification lenses.

Powder characteristic:

A shade dried coarse powder of aerial part of plant pass through a sieve #80 and #160 and stain the sample with phlorogucinol and conc. HCl in the ratio of 1:1 and mount under 10X and 45 X magnification

Leaf constants:

For leaf constant determination of stomatal no , vain islet no , vain termination no and palisaid ratio with help of camera lucida using fresh leaves of *E. thymifolia* wash first 90% alcohol for 5 min and then mix with chloral hydrate solution to remove chlorophyll pigment and then wash with water with 2-3 times ato remove all unwanted material. Remove the external epidermal layer with help of sharp forceps and clean with water keep on slide and observe under microscope and arrange the camera lucida and start drawing on black cardsheet paperand calculate the result of stomatal no, vain islet no , vain termination no and palisaid ratio.

Procedure for Leaf Constant:

For determination of leaf constant fallowing parameter was studied such as stomatal no, stomatal index, Vain termination no, vein islet no and palisaid ratio. Select the part of leaves for observation and clean with alcohol and wash it again. Then the peace of leaf mixes with boiling chloral hydrate solution and remove the external epidermal layer. The section were observed under microscope with mounted camera lucida and proceed for drowing.

Stomatal index:
The epidermal cells and stomata were traced and then the number of stomata present in the area of 1 sq. mm was counted and stomatal index was calculated by the formula:
I = S/E+S*100
Where,
I is Stomatal index.
S is No. of stomata per unit area.
E is No. of epidermal cells in the same unit area.

Vein islet number:
It is defined as number of vein islet per square mm of leaf surface midway between midrib and margin.

Vein termination number:
It is defined as number of veinlet termination per square meter of leaf surface midway between midrib of leaf and its margin.

Palisade ratio:
It is the average number of palisade cells beneath each epidermal cell.

Microscopic examination of the stem:
The microscopic study fresh leaves, stems and root were treated with chloral hydrates solution followed by staining in 1% safranin for 5 to 10 min. and mounted in 15% glycerin For histological study select the fresh leaves and stain with different staining reagent to find out the histology of leaves, stem and root. The primary staining reagent phloroglucinol: conc. HCl, sudan red-III, iodine solution, glacial acatic acid etc. are used and observe the cell.

RESULTS AND DISCUSSION
E. thymifolia A small, erect or ascending annual herb reaching up to 03 cm to 30 cm with pink colour slender thin stems, having obligate oval shape green colour leaves with white pink colour flower and brown colour seeds. The plant cur or break any part it exclude the white colour milky latex. The exclude the latex convert in to sticky semisolid irregular globule.

Morphology of plant:
- **Size :** *E. thymifolia* is annual prostate herb with 3-30 cm length as per climatic condition and irrigation its grown up to 30 cm
  - Leaves are arrange in opposite, elliptic, oblong or ovate.
  - The tip of plant apex is oval or rounded.
  - The leaf blades are oval-oblong or obliquely oblong with dentate margin
  - Stem is cylindrical, slender and spreading on the ground.
  - Fruits are ovoid globose, acutely 3-lobed and short hairy

- **Color:** The plant is evergreen herb with pink colour stem with white pink colour flower.
  - The pink color Petiole present in small and thin.
  - Stem branches radiating, pubescent and pink in colour.
  - Involucres axillary, solitary or in axil.
  - Cyathia in auxillary cluster.
  - Flowers are campanulate white in colour, fully mature flower convert to light pink in colour.
  - Fibrous root systems consist of many small roots.

Taste:
Slightly bitter characteristic

Odour:
Plant having characteristic odour of plant leaves, stem and root.

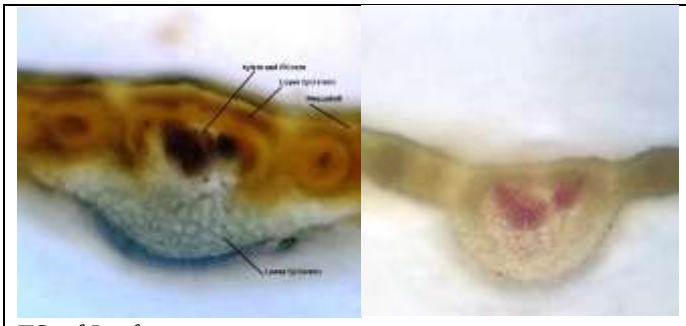
Extra features:
- The leaves of *E. thymifolia* are very thin, soft and easy to fingerprint when it slightly pressed.
- After drying the plant the leaves and stem are easy to break due to loss of water contain.
- The plant material was fractured to observe whether material is fibrous, smooth, rough and granular.
- When the plant is blunt or cut it start to drain milky latex from leaves, stem. The immature flower is white after mature it turns to pink. The stem is pink in colour.

			
a. Plant	**b. Stem**	**c. Flower and fruit**	**d. Root**

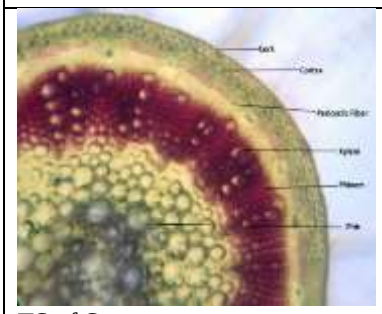
Fig. a. Full length of plant b. Length of leaf

Pharmacognostic study:

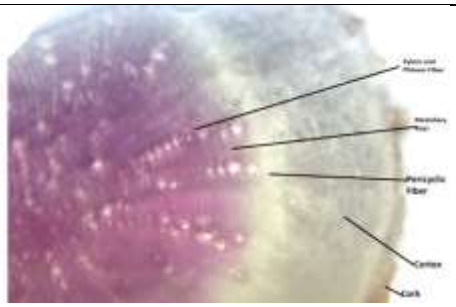
The transverse section of *E. thymifolia* leaf shows trichome, stomata, and arrangement of vascular bundle while stem shows lignified xylem vessels elements, endodermis and pericyclic fibers as distinguished.



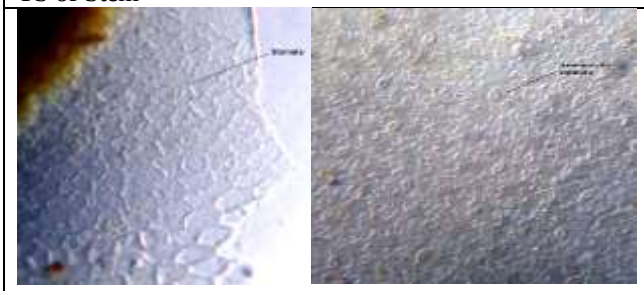
TS. of Leaf



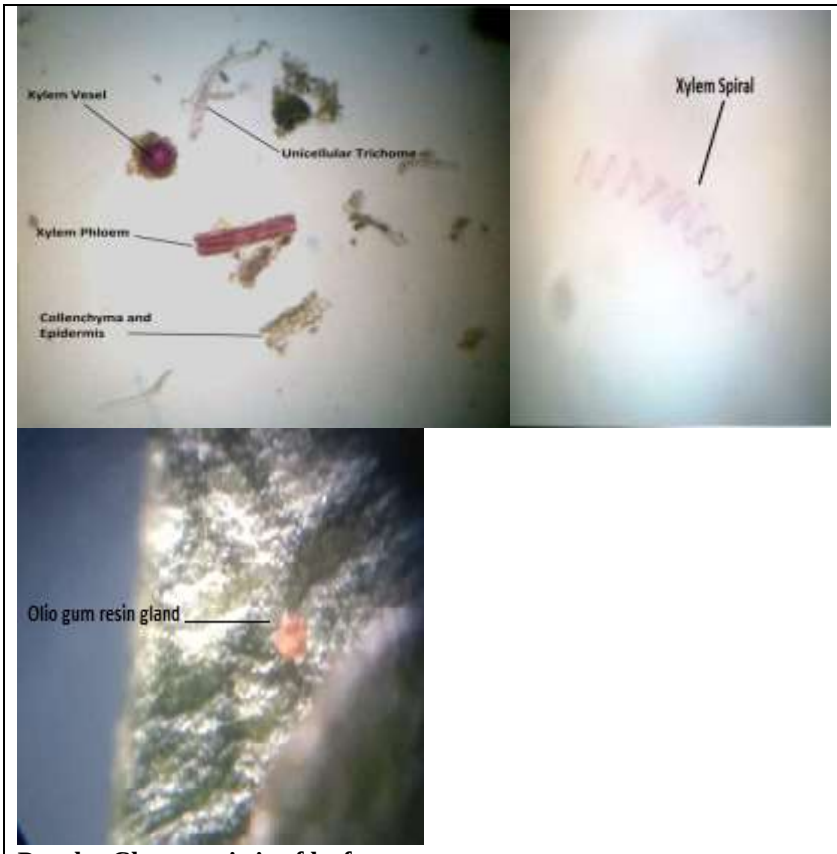
TS of Stem



TS of Root



Anomocytic stomata



Powder Characteristic of leaf

(Figure No 01)

Leaf:

A dorsiventral structure and a thin, homogeneous lamina are two distinctive physical characteristics of *Euphorbia thymifolia* leaves. The mesophyll area of the leaves exhibits a noticeable layer of palisade cells when seen transversely. The walls of the upper epidermis have an anticlinal configuration that makes the adaxial (upper) midrib stand out. Although the cuticle is not noticeable, the leaves' upper and lower surfaces both include epidermal layers made of cylindrical cells with thin walls.

Collateral vascular bundles with xylem and phloem encircled by uniform ground tissue make up the vascular system. Compact parenchyma cells with thin, round to oval walls and a high chloroplast concentration make up this ground tissue. The leaf surface has anomocytic stomata, which are distinguished by their amoeboid outlines brought on by the cell walls' deep, wavy folding. The leaf surface noticeably lacks trichomes.

The mesophyll region also contains mucilage cells and lactiferous ducts, which add to the leaves' functional value. Together, these characteristics support Euphorbia thymifolia's physiological and adaptive capacities in its native habitat.

Stem:

A mature *Euphorbia thymifolia* stem's transverse slice has compactly organized, elongated, cutinized epidermal cells with a comparatively modest number of unicellular trichomes. The development of a thin periderm, which is made up of three to four layers of small tubular cells, frequently causes the epidermis, the outermost layer, to break. The cortex, which lies underneath the periderm, is made up of compact, round parenchyma cells.

The pith, which is made up of parenchyma cells with thin walls, occupies the middle ground tissue. The vascular tissue follows a radial pattern and is placed in a circle. The secondary xylem is thick and dense, and the phloem and xylem are likewise oriented radially. The secondary xylem consists of radial files of xylem fibers with thick lignified walls and round, thick-walled, solitary vessels that are widely dispersed. Furthermore, the cortex, phloem, and pith all contain a large number of mucilage-containing cells. The stem's functional robustness and adaptability in a range of environmental situations are enhanced by this structural arrangement.

Cork:

4-6 layered cortex in distinct endodermis and lignified pericyclic fibers. Xylem vessel arranged Radially with fibres and tracheids; lignified medullary rays are arrange in uni-biseriate manner.

- Oleoresin containing cells are present.
- Numerous primary xylem groups are seen towards the pith region.
- Pith is wide and parenchymatous and starch grains are present in the pith region.

Root:

Phloem are narrow, contains latex duct followed by cambium and ring of xylem consisting of radially arranged vessels.

Powder studies:

After being dried in the shade at a temperature below 30°C (at least 13°C), the aerial portions of *Euphorbia thymifolia* were ground into a fine powder and run through sieves #160 and #120. The powdered sample was treated with a solution of strong hydrochloric acid and phloroglucinol before being mounted with glycerin for microscopic inspection. This preparation made it easier to use powder microscopy to examine plant tissues in depth.

The powder's microscopic analysis provided important insights on the plant's anatomical makeup. There were pitted xylem vessels, spiral xylem fibers, parenchyma cells, and epidermal cells with anomocytic stomata. Moreover, oleo gum resin glands, cork cells, unicellular trichomes, collenchyma cells, and epidermal cells were discovered. These results offer important new information about the structural elements of E. thymifolia's leaves and stems.

In order to further assist the plant's characterisation and identification, the inquiry also included quantitative leaf microscopy and surface analysis. Understanding the plant's functional characteristics and authenticity through these microscopic and anatomical traits is crucial for pharmacological and therapeutic research.

Pharmacognostic characters of leaf surface in *Euphorbia thymifolia*

Sr. no	Parameter	Range	Observed
1	Lower epidermal stomatal index	18.6 - 27.3	20.86 ± 3.8
2	Upper epidermal stomatal index	12.7-19.7	16.2 ± 2.5
3	Vein islet number	3-6	4.8 ± 1.5
4	Vein termination number	6-14	8 ± 3.2

DISCUSSION

A thorough grasp of Euphorbia thymifolia's structural, anatomical, and functional traits is provided by the in-depth morphological, microscopic, and pharmacognostic investigations. These results suggest its potential for future scientific and pharmacological applications in addition to validating its traditional use in folk medicine.

According to morphological findings, *E. thymifolia* is a small, evergreen plant with distinctive characteristics like oval-shaped leaves, pink stems, and distinctive white-pink blooms. When the plant is cut, it releases a sticky, milky latex that has long been recognized for its medicinal qualities. Its initial identification and separation from closely related species depend on certain physical traits.

By emphasizing important tissue features like dorsiventral leaves with palisade cells, anomocytic stomata, collateral vascular bundles, and mucilage cells in the mesophyll area, microscopic investigations reinforce the identification process even more. Secondary xylem with thick lignified walls and mucilage-containing cells in the pith, phloem, and cortical regions are visible in the transverse section of the stem. These structural features are essential for verifying the plant's legitimacy and offer information on how well it adapts to different environmental circumstances.

By detecting particular structural elements such as unicellular trichomes, spiral xylem fibers, and pitted xylem channels, powder microscopy provides an additional degree of confirmation. The presence of collenchyma, cork cells, and oleo gum resin glands emphasizes the plant's distinct makeup even more. These results are useful for standardizing and ensuring the quality of products derived from E. thymifolia. Finding leaf constants such the palisade ratio, stomatal index, vein islet number, and vein termination number provides quantitative information that can be used in the future. These constants are crucial for developing regular procedures for authenticating plant materials, especially in the fields of pharmacological research and the manufacturing of herbal medicines.

The significance of combining traditional knowledge with scientific validation is highlighted by this thorough investigation. *E. thymifolia* is positioned as a prospective option for the development of natural medicinal medicines due to its bioactive chemical richness, traditional usage, and pharmacognostic analysis. The plant's varied pharmacological actions, which include antibacterial, anti-inflammatory, and antioxidant qualities, are in line with contemporary medical requirements, especially when it comes to treating infections, oxidative stress, and tropical diseases.

In summary, Euphorbia thymifolia's morphological, microscopic, and pharmacognostic research offers a strong basis for its verification and potential applications. These results are essential for creating a thorough monograph on the plant, which will guarantee accurate identification, standardization, and incorporation into both conventional and contemporary therapeutic frameworks. This study demonstrates how *E. thymifolia* has the potential to make a substantial contribution to pharmaceutical development and sustainable healthcare solutions.

CONCLUSION:

Identification of Euphorbia thymifolia's anatomical features and tissue configurations in its leaf, stem, and root structures is made possible by morphological and microscopic analysis. This in-depth analysis makes it possible to fully comprehend the distinctive features of the plant, such as the makeup and arrangement of its vascular tissues, parenchyma, stomata, epidermal cells, and other cellular constituents. These results guarantee the precision of E. thymifolia's identification, which is essential for its dependable application in both modern

pharmacology and traditional medicine, in addition to helping to differentiate it from other plants in the same family or species.

In situations where the origin or identity of the plant must be confirmed for quality control objectives, these investigations are essential to the authentication of plant materials. The presence of particular cell types, such as spiral xylem fibers, pitted xylem channels, and oleo gum resin glands, among other microscopic characteristics, creates a distinct fingerprint that aids in identifying the plant. Its characterization is further supported by characteristics such as collenchyma in leaves and stems, unicellular trichomes, and anomocytic stomata.

Furthermore, these microscopic and morphological insights are important for both present-day uses and future study and recording. They establish the foundation for the creation of an extensive monograph on Euphorbia thymifolia. A monograph is a comprehensive reference work that covers every facet of the plant, including its morphology, anatomy, pharmacological characteristics, chemical makeup, and possible uses. These investigations guarantee the correct identification, application, and incorporation of the plant into scientific and medical contexts by offering a consistent description of it.

To sum up, a crucial component of studying *Euphorbia thymifolia* scientifically is morphological and microscopic analysis. In addition to being a useful resource for upcoming research and the creation of an authorized monograph on this significant medicinal plant, it aids in the precise identification and verification of the plant material.

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