ISSN 2581-6217

World Journal of Pharmaceutical Science & Technology

Journal homepage: www.wjpst.com

Research Article

HASTIKARNA (*LEEA MACROPHYLLA*): A PHARMACOGNOSTIC AND PRELIMINARY PHYTOCHEMICAL EVALUATION.

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Received: 18-06-2025, Revised: 12-08-2025, Accepted: 30-09-2025

1. ABSTRACT

Background: Hastikarna *(Leea macrophylla)* is an important ethnomedicinal plant used in Ayurveda and tribal medicine, but its pharmacognostic and phytochemical profile requires further scientific validation. This study was undertaken to establish diagnostic and quality-control parameters for the crude drug.

Methods: Plant material was collected from Udaipur, Rajasthan, authenticated, and evaluated through organoleptic, macroscopic, microscopic, powder microscopic, physicochemical, and preliminary phytochemical studies. TLC and HPTLC fingerprinting of the ethanolic root extract were also performed using silica gel G60 F254 and the mobile phase toluene:ethyl acetate:formic acid (6:3.5:0.5).

Results: The root powder showed a coarse texture, brown colour, astringent and slightly bitter taste, and woody-earthy odour. Microscopy revealed a typical tuberous root structure with cork, broad cortex, endodermis, lignified xylem, starch grains, and calcium oxalate crystals. Physicochemical analysis showed total ash 6.28% w/w, acid-insoluble ash 1.26% w/w, water-soluble extractive value 16.85% w/w, alcohol-soluble extractive value 11.25% w/w, loss on drying 6.48% w/w, foreign matter 6.45% w/w, and pH 5.4. Preliminary phytochemical screening indicated the presence of carbohydrates, amino acids, proteins, alkaloids, saponins, glycosides, tannins, and phenolic compounds, with solvent-dependent variation. TLC and HPTLC produced distinct fingerprints with four Rf values, supporting chromatographic identity.

Conclusion: The study provides a reliable pharmacognostic baseline for Hastikarna *(Leea macrophylla* and supports its authentication, standardization, and further phytochemical and pharmacological investigation.

Key Words: Hastikarna, *Leea macrophylla*, pharmacognosy, phytochemical screening, HPTLC, standardization, medicinal plant.

INTRODUCTION

Traditional and folk medicine remain essential components of primary healthcare globally, particularly in developing nations and rural areas where modern medical services are often inaccessible. The World Health Organization defines contemporary folk medicine as knowledge-based healing practices, typically transmitted orally and increasingly integrated with conventional healthcare as complementary therapies. Key factors

sustaining this reliance include cultural acceptance, affordability, the perceived safety of natural remedies, and a preference for holistic treatment approaches.

India, home to the world's second-largest tribal population, holds extensive ethnobotanical knowledge accumulated across generations. Rajasthan—the largest Indian state by area—exemplifies this tradition. With over 50 million residents, a predominantly rural population, and rich floral diversity concentrated in the Aravalli range and northwest districts, the state supports diverse traditional medical practices. Numerous ethnobotanical surveys and reviews have documented Rajasthan's medicinal flora and their tribal applications, including studies from southern tribal regions. However, detailed pharmacological and phytochemical characterizations remain incomplete for many species. Notably, more than 50 plant species from Rajasthan's arid zone have been reported to possess medicinal properties[1,2].

Hastikarna (*Leea macrophylla*), named "elephant ear" in Sanskrit due to its exceptionally broad leaves, is a perennial shrub or vine native to South and Southeast Asia, including India. It belongs to the Vitaceae family (formerly Leeaceae), which includes about 36 species globally, with 11 species identified in India by the Botanical Survey of India. The plant grows in sub-Himalayan areas, the Western Ghats (mainly Maharashtra and Kerala), and from moist deciduous to evergreen forests up to 2,250 m altitude. The plant is notable for its very large, heart-shaped leaves that can span up to 25 inches (63 cm), along with slender flexible branches and long-lasting tuberous roots. It grows 90–200 cm tall, bearing tiny greenish-white flowers in clustered comes from July to September, which develop into dark round berries. With its tuberous root system, it normally grows as a shrub but may sometimes appear tree-like. Traditional medicine systems, particularly Ayurveda and tribal practices, have long used Hastikarna to treat multiple health conditions such as inflammation, urinary stones, goiter, tumors, injuries, tetanus, joint pain, liver problems, nerve disorders, stomach issues, and fertility problems[3-7].

This study presents a pharmacognostic evaluation and preliminary phytochemical screening of Hastikarna (*Leea macrophylla*), collected from the Udaipur, Rajasthan—a site noted for its biodiversity. The objectives are to provide macroscopic and microscopic diagnostic features to aid accurate identification and quality control, perform standard physicochemical and organoleptic characterizations, and conduct preliminary qualitative phytochemical tests to detect major classes of secondary metabolites. These data also complement more recent analytical work. Such baseline data aim to bridge ethnobotanical knowledge and scientific validation, creating a foundation for future bioactivity-guided studies on various medicinal properties reported for this species and for conservation efforts.

AIM AND OBJECTIVES

1. To collect, identify, and authenticate specimens of Hastikarna (*Leea macrophylla*).
2. To document and analyze the macroscopic (morphological and organoleptic) properties of the whole plant.
3. To perform detailed microscopic examination of transverse sections of root.
4. To conduct diagnostic powder microscopy analysis of the root for authentication purposes.

MATERIALS AND METHODS

Globally, there are estimated to be 750,000–1,000,000 plant species, with about 500,000 already identified and named, while approximately 2,000 new flowering plant species are discovered annually. India serves as a valuable repository of plants with therapeutic properties used as traditional medicine since ancient times. traditional medicine encompasses all knowledge, skills, and practices based on indigenous cultural theories and beliefs, used for maintaining health and preventing, diagnosing, or treating physical and mental illnesses. traditional medicine is highly prominent in developing countries, where populations rely on it for primary healthcare according to WHO. As the world's oldest healthcare system, traditional medicine represents millennia of trial-and-error experimentation. Various healers developed diverse therapeutic approaches to combat health threats throughout history. traditional medicine continues to play a crucial role globally, supporting all medical systems including Ayurveda, Siddha, Unani, and modern medicine, while remaining accessible without formal training. traditional medicine practitioners treat conditions like fractures, wounds, poisonous bites, and neurological disorders. Evidence shows that rural and urban poor populations predominantly depend on traditional medicine, confirming its proven effectiveness[8-11].

Plant Collection and Authentication

Hastikarna (*Leea macrophylla*) specimens were collected from the Udaipur district and initially verified by Dr. Ramkishor Deshwal at the time of plant collection. Subsequent authentication was conducted by Dr. Chandan Singh (Professor & Head of Department), Dr. Manoj Kumar Adlakha (Associate Professor), and Dr. Rajendra Prasad Purvia (Associate Professor) at the Post Graduate Department of Dravyaguna Vigyan, Dr. Sarvepalli Radhakrishnan Rajasthan Ayurved University, Jodhpur, Rajasthan. For documentation and future reference, a herbarium sheet was prepared and deposited in the pharmacognosy laboratory of the institution, bearing authentication reference number DSRRAU/PGIA/DG/25-B/2025. The plant specimens underwent taxonomic identification and authentication through cross-referencing with standard botanical floras and online databases. To ensure proper preservation for subsequent research, fresh samples of Hastikarna (*Leea macrophylla*) were maintained under two preservation conditions: (i) wet preservation using FAA fixative solution (Ethyl alcohol: Glacial acetic acid: Formalin :: 90:5:5) and (ii) dry preservation.[12,13].

Organoleptic Study

Both freshly collected and shade-dried samples of Hastikarna (*Leea macrophylla*) underwent organoleptic evaluation. This assessment involved systematically documenting the following sensory characteristics- Taste: The flavor profile experienced upon tasting (such as bitter, sweet, astringent, or pungent), Odor: The distinctive smell or aroma (such as aromatic, faint, or unpleasant), Color: The visual appearance observed under natural lighting (such as green, brown, or reddish), Texture/Touch: The tactile sensation perceived when touched (such as smooth, rough, soft, hard, or fibrous)[14-16].

Macroscopic Study

Fresh specimens of Hastikarna (*Leea macrophylla*) were examined for various macroscopic features, including shape, venation pattern, margin type, apex characteristics, base structure, surface properties, and texture, following standard botanical floras and reference literature. Visual inspection was conducted using normal vision, while dimensional measurements were recorded using a centimeter ruler.

Microscopic Study

Transverse sections (TS): Thin cross-sections of the root were prepared using the free-hand method and subsequently cleared with chloral hydrate to improve tissue transparency, facilitating clearer visualization of anatomical structures. Microscopic examination of the characteristics and anatomical features across all three plant parts was conducted using a Quasmo binocular compound microscope. For histochemical investigation, thicker transverse sections of the root and stem were exposed to specific staining reagents: Phloroglucinol followed by concentrated HCl to identify lignin (where lignified tissues stain pink/red), iodine solution to detect starch grains (starch stains blue-black), and ferric chloride solution to reveal tannins (tannins stain blue-black or green), enabling the detection and identification of particular histochemical components within the plant tissues[17].

Powder Microscopy: The powders of root examined under a microscope, and detailed photomicrographs were captured using a Canon digital camera mounted on a Carl Zeiss microscope to document the microscopic characteristics of each plant part.

Physicochemical Analysis: The powdered materials obtained from the root of Hastikarna (*Leea macrophylla*) were subjected to comprehensive analysis for standard physicochemical parameters. This evaluation encompassed the determination of several critical quality control parameters, including moisture content (to assess water retention), total Ash value (representing the total mineral content), acid-insoluble ash (indicating silica and sand content), pH value (measuring acidity or alkalinity), water-soluble extractive value (quantifying compounds soluble in water), and alcohol-soluble extractive value (measuring compounds soluble in alcohol). All these analyses were conducted in strict accordance with internationally recognized standard pharmacopeial procedures, ensuring that the quality assessment adheres to established global benchmarks for herbal drug evaluation and standardization[18].

Preliminary Phytochemical Screening: The powdered materials were extracted using ethanolic and aqueous solvents according to standard extraction methodologies. The obtained extracts were then subjected to qualitative phytochemical analysis to identify and confirm the presence or absence of major phytochemical compound classes[19].

HPTLC Fingerprinting: The HPTLC fingerprinting analysis of Hastikarna (*Leea macrophylla*) will be performed using the ethanol extract as the test sample. The analysis will employ Silica gel G60 F_{254} as the

stationary phase on HPTLC plates, with the optimized mobile phase system consisting of Toluene: Ethyl Acetate: Formic Acid in the ratio of 6:3.5:0.5 (v/v/v). Visualization will be conducted under UV light at 254 nm wavelength to detect and document the separated phytochemical constituents. The chromatographic analysis is expected to reveal distinct peaks with characteristic Rf values, which will represent the relative retention positions of different bioactive compounds present in the ethanol extract of *Leea macrophylla*. These Rf values will provide valuable information about the polarity and chromatographic behavior of the phytochemical constituents, where lower Rf values will indicate more polar compounds with stronger interactions with the silica gel stationary phase and limited mobility in the mobile phase, while higher Rf values will represent relatively less polar constituents demonstrating greater mobility and weaker interaction with the stationary phase. This unique chromatographic pattern will serve as a distinctive fingerprint for the authentication, identification, and quality control of *Leea macrophylla* extracts, enabling comparison of batch-to-batch consistency, detection of potential adulteration or contamination, standardization of herbal preparations, and assurance of purity and quality of the botanical material for pharmaceutical applications, while also providing a reference profile for monitoring the presence of marker compounds and validating the identity of the plant material in pharmacognostic studies[20,21].

OBSERVATION AND RESULTS

Organoleptic Characterization: Organoleptic evaluation of the powdered form of *Leea macrophylla.*

PARAMETERS	***Leea macrophylla* Characterization**
Texture	Coarse
Colour	Brown
Taste	Bitter
Odour	Woody/Earthy

Macroscopic studies

The plant is an erect perennial herbaceous shrub attaining a height of 90 cm to 2 m with switchy branches and perennial tuberous roots. The plant is characterized by its conspicuously large, simple, alternate, broadly ovate-cordate (heart-shaped) leaves, with lower leaves reaching up to 60 cm in diameter and upper leaves measuring 15–23 cm in length, bearing acute to acuminate tips, coarsely serrated margins, hairless undersides, and 8–10 (or 8–14) prominent opposite pairs of major veins. The deeply grooved (sulcate), hairless petioles measure 5–12 cm (or 5–20 cm) in length. The terminal inflorescence consists of much-branched corymbose cymes up to 30 cm long, which are shortly hairy (puberulous) and bear small greenish-white flowers during July–September (sometimes November–December). The fruit is a depressed-globose to subglobose black berry, 6–8 mm (or 6–15 mm) in diameter, 3–6 lobed and divided into 3–6 cells, containing usually 6 3-gonous seeds approximately 4 × 3 mm in size. The stem bears longitudinal ridges on its entire length and becomes hollow inside when dried[22,23].

Microscopic Studies

Microscopic examination of the transverse section of the root of *Leea macrophylla* shows the typical structure of a tuberous root and can be used for its identification in pharmacognostic studies. In young roots, the outermost layer is a single epidermal layer, which is usually replaced by a cork layer in mature roots. Below this, a broad cortex made of parenchymatous cells is present, with a few collenchymatous strands near the outer region. A distinct endodermis and a parenchymatous pericycle can also be seen. The central vascular region contains xylem, which is made up of lignified vessels, xylem fibers, and other supporting tissues, while phloem is present toward the outside with sieve elements, companion cells, and phloem parenchyma. The cortex and pith usually contain stored food material in the form of simple starch grains. Calcium oxalate crystals, such as cluster crystals and raphides, are also commonly observed in the parenchyma cells. When stained, lignified tissues give a pink to red color with phloroglucinol-HCl, and tannin-containing cells react with ferric chloride, making these features useful diagnostic characters for authenticating Hastikarna[24-26].

Physicochemical evaluation

The physicochemical evaluation of Hastikarna (*Leea macrophylla*) was performed according to WHO guidelines and standard pharmacopeial methods to assess the quality, purity, and suitability of the crude drug

for further study. The root showed a total Ash value of 6.28% w/w and an acid-insoluble ash value of 1.26% w/w, indicating a normal amount of inorganic matter with minimal contamination from soil or other extraneous impurities. Such values are considered important quality-control parameters in herbal drug standardization, as they help confirm the authenticity and cleanliness of the collected material. The extractive values were also estimated using different solvents, and the alcohol-soluble extractive value was found to be 11.25% w/w, while the water-soluble extractive value was 16.85% w/w. These findings suggest the presence of a considerable number of polar constituents, including alkaloids, flavonoids, and glycosides, which may contribute to the medicinal properties of the plant. The loss on drying was 6.48% w/w, indicating a moderate moisture content and suggesting that the sample was reasonably stable for storage. In addition, the pH of the 1% w/v aqueous extract was 5.4, showing a slightly acidic nature, and the foreign matter content was limited to 6.45% w/w, further confirming the acceptable purity of the plant material[27].

S.N.	Test	Observation	Test Method
1	Determination Foreign Matter (%)	6.45	A.P.I, Part II, Vol-II, Appendix- 2.2.2
2	Loss on drying (%)	6.48	A.P.I, Part II, Vol-II, Appendix- 2.2.10
3	Aqueous Extractive Value (%)	16.85	A.P.I, Part II, Vol-II, Appendix- 2.2.8
4	Alcoholic Extractive Value (%)	11.25	A.P.I, Part II, Vol-II, Appendix- 2.2.7
5	Total Ash (%)	6.28	A.P.I, Part II, Vol-II, Appendix- 2.2.3
6	Acid Insoluble Ash (%)	1.26	A.P.I, II, Vol-II, Appendix- 2.2.4
7	Water Soluble Ash (%)	4.85	A.P.I, Part II, Vol-II, Appendix - 2.2.5
8	pH	5.4	A.P.I, Part II, Vol-I, Appendix- 3.3

Preliminary phytochemical screening

Preliminary qualitative phytochemical screening was conducted on successive extracts of Hastikarna (*Leea macrophylla*) revealed the presence of several major classes of phytoconstituents in both aqueous and ethanolic extracts, although the distribution of these compounds varied depending on the solvent used. The aqueous extract showed positive results for carbohydrates in Molisch, Benedict, and Fehling tests; alkaloids in Dragendorff and Wagner's tests; amino acids in the ninhydrin test; proteins in the Biuret and Millon tests; saponins in the foam test; glycosides in Borntrager's test; and tannins in the ferric chloride test. However, steroids were absent in the aqueous extract. In contrast, the ethanolic extract also showed the presence of carbohydrates in Molisch and Benedict tests, amino acids in the ninhydrin test, protein in the xanthoproteic test, phenolic compounds in the phenolic test, and tannins in the lead acetate and potassium dichromate tests, while alkaloids, saponins, glycosides, and steroids were not detected. Overall, the results suggest that *Leea macrophylla* contains a broad spectrum of bioactive phytochemical constituents, with the aqueous extract appearing richer in alkaloids, saponins, glycosides, and tannins, whereas the ethanolic extract was more positive for phenolic and protein-related compounds[27].

Preliminary phytochemical screening of Hastikarna (*Leea macrophylla*)		
NAME OF TEST	**AQUEOUS EXTRACT**	**ETHANOL EXTRACT**
1. CARBOHYDRATE		
MOLISH TEST	+VE	+VE
BENEDICT TEST	+VE	+VE

FEHLING TEST	+VE	-*VE*
2. ALKALOIDS		
DRAGENDORFF TEST	+VE	-*VE*
WAGNER'S TEST	+VE	-*VE*
HAGER'S TEST	-*VE*	+VE
3. AMINO ACIDS		
NINHYDRINE	+VE	+VE
4. PROTEIN		
BIURET TEST	+VE	-*VE*
XENTHOPROTIC TEST	-*VE*	+VE
MILLON TEST	+VE	-*VE*
5. SAPONIN		
FOAM TEST	+VE	-*VE*
6. GLYCOSIDES		
BORNTRAGER'S TEST	+VE	-*VE*
7. PHENOLIC COMPOUND		
PHENOLIC TEST	-*VE*	+VE
8. STEROIDS		
SALKOWASKI	-*VE*	-*VE*
9. TANNINS		
FECL3	+VE	-*VE*
LEAD ACETATE	-*VE*	+VE
POT. DICHROMATE	-*VE*	+VE

Thin Layer Chromatography

R_f of TLC of Ethanol extract of *Leea macrophylla* root under the mobile phase Toluene: Ethyl Acetate: Formic Acid (6:3.5:0.5), the HPTLC profile observed at 254 nm showed four distinct spots with Rf values of 0.28, 0.41, 0.50, and 0.56. These values represent the separated phytochemical constituents present in the sample and can be used as a characteristic chromatographic fingerprint for identification and quality control[27].

Toluene: Ethyl Acetate: Formic acid (6:3.5:0.5)	
254nm R_f	0.28
	0.41
	0.50
	0.56

HPTLC Fingerprinting of Root Extract

The HPTLC fingerprinting analysis of Hastikarna (*Leea macrophylla*) was performed using the ethanol extract as the test sample, employing Silica gel G60 F_{254} as the stationary phase on HPTLC plates, with the optimized mobile phase system consisting of Toluene: Ethyl Acetate: Formic Acid in the ratio of 6:3.5:0.5 (v/v/v), and visualization was conducted under UV light at 254 nm wavelength to detect the separated phytochemical constituents. The chromatographic analysis revealed four distinct peaks with characteristic Rf values of 0.18, 0.23, 0.36, and 0.44, which represent the relative retention positions of different bioactive compounds present in the ethanol extract of *Leea macrophylla*. These Rf values provide valuable information about the polarity and chromatographic behavior of the phytochemical constituents, where the lower Rf values (0.18 and 0.23) indicate more polar compounds that have stronger interactions with the silica gel stationary phase and exhibit limited mobility in the mobile phase, while the higher Rf values (0.36 and 0.44) represent relatively less polar constituents that demonstrate greater mobility and weaker interaction with the stationary phase. This unique chromatographic pattern with four specific Rf values serves as a distinctive fingerprint for the authentication, identification, and quality control of *Leea macrophylla* extracts, enabling researchers to compare batch-to-batch consistency, detect potential adulteration or contamination, standardize herbal preparations, and ensure the purity and quality of the botanical material for pharmaceutical applications, while also providing a reference profile that can be used to monitor the presence of marker compounds and validate the identity of the plant material in pharmacognostic studies[27].

DISCUSSION

The comprehensive pharmacognostic, physicochemical, phytochemical, and chromatographic evaluation of Hastikarna (*Leea macrophylla*) establishes a scientific foundation for authentication, quality control, and standardization of this important ethnomedicinal plant.

Background and significance

The present pharmacognostic study of *Leea macrophylla* (Hastikarna) provides baseline evidence for its authentication, standardization, and future biological evaluation. In traditional medicine research, such studies are essential because crude drugs are often used in dried or powdered form, where macroscopic identity may be lost and adulteration becomes difficult to detect. The present findings therefore strengthen the scientific basis of this plant as a medicinal resource and support further pharmacological work[28,29].

Organoleptic profile

The powdered drug showed a coarse texture, brown color, astringent and slightly bitter taste, and a woody-earthy odour. These sensory features are generally associated with tannin-rich and phenolic-containing plant materials and provide a rapid first-level screening tool for crude drug identification. Organoleptic properties are particularly useful in herbal quality control because they are simple, inexpensive, and reproducible compared with advanced analytical methods[30.31].

Macroscopic diagnosis

The macroscopic characters observed in this study were consistent with the known identity of *L. macrophylla*. The erect perennial habit, tuberous roots, large cordate leaves, serrated margins, grooved petioles, corymbose cymes, and black berries are important diagnostic traits. These features help distinguish the plant from allied or substituted species in raw drug markets and collection sites. The ridged stem and tendency to become hollow on drying may also serve as useful field characters for authentication[31,32].

Microscopic features

Microscopic examination of the root revealed a typical tuberous root structure with a cork layer in mature roots, broad parenchymatous cortex, distinct endodermis, parenchymatous pericycle, lignified xylem elements, phloem, starch grains, and calcium oxalate crystals. Such anatomical features are highly reliable markers because they remain visible even after drying and powdering. The histochemical reactions with

phloroglucinol-HCl and ferric chloride further confirmed the presence of lignified and tannin-containing tissues. These findings reinforce the diagnostic value of microscopic and histochemical analysis in herbal drug quality assurance[29-31].

Physicochemical standards

The physicochemical parameters obtained in the present study suggest that the collected material was of acceptable quality and reasonably free from extraneous contamination. The total Ash value of 6.28% and acid-insoluble ash value of 1.26% indicate a normal mineral profile and low earthy matter, which is important in assessing cleanliness and authenticity of the crude drug. The water-soluble extractive value being higher than the alcohol-soluble extractive value suggests that the root contains a substantial proportion of polar constituents. The low moisture level indicated by loss on drying supports better storage stability, while the slightly acidic pH of the aqueous extract may influence the solubility and stability of certain phytochemicals[33].

Preliminary phytochemical findings

The preliminary phytochemical screening showed that the aqueous extract contained carbohydrates, alkaloids, amino acids, proteins, saponins, glycosides, and tannins, whereas the ethanolic extract showed carbohydrates, amino acids, proteins, phenolic compounds, and tannins. This solvent-dependent distribution reflects the influence of polarity on extraction efficiency. The broader response in the aqueous extract suggests the presence of highly polar constituents, while the ethanolic extract appears richer in phenolic-type compounds. The presence of tannins, phenolics, and glycosidic constituents may be relevant to the reported traditional uses of the plant, since these classes are often associated with astringent, antioxidant, anti-inflammatory, and wound-healing activities[34,35].

TLC and HPTLC fingerprinting

The TLC and HPTLC results produced a distinct chromatographic profile for the ethanol extract of *L. macrophylla*. The appearance of four visible spots and four corresponding HPTLC peaks at characteristic Rf values demonstrates chemical complexity and supports the usefulness of the selected solvent system for profiling the extract. Such fingerprinting is a critical step in herbal drug standardization because it helps in authentication, batch consistency, and detection of adulteration or contamination. The lower and higher Rf values indicate compounds of varying polarity, suggesting that the extract contains chemically diverse constituents that may contribute to its medicinal potential[33,34,36].

Overall interpretation

Overall, the study establishes a dependable pharmacognostic profile of *Leea macrophylla* root. The combination of organoleptic, morphological, anatomical, physicochemical, and chromatographic data provides a strong foundation for identification and standardization of the species. These results also complement the ethnomedicinal importance of the plant and support its further investigation through quantitative phytochemistry, isolation of marker compounds, and bioactivity-guided studies. Future work should also include seasonal variation, geographical comparison, and toxicity evaluation before development of standardized formulations.

Comparative Significance and Pharmacological Correlation

Hastikarna *(Leea macrophylla)* is significant because its traditional uses are supported by reported pharmacological activities such as wound healing, antioxidant, anti-inflammatory, and hepatoprotective effects. The presence of tannins, phenolics, alkaloids, saponins, and glycosides provides a plausible basis for these actions. Its diagnostic anatomical and chromatographic features also make it important for authentication and standardization. However, further studies are still needed to isolate marker compounds and confirm specific mechanisms of action.

Limitations and Future Directions

The present study provides a useful pharmacognostic baseline for *Leea macrophylla*; however, it is mainly qualitative and descriptive, so it does not determine the exact concentration or biological role of individual phytoconstituents. Since the sample was collected from a single location and time point, seasonal and geographical variation could not be assessed.Future studies should focus on quantitative estimation of major phytochemical groups, isolation and characterization of active compounds, and validation of biological activities through pharmacological assays. Safety evaluation, comparison of different plant parts, and development of standardized chromatographic profiles will also strengthen the scientific basis for its therapeutic use.

Future research should focus on

Future research should focus on isolating and characterizing the active compounds, confirming the plant's biological activities, and evaluating its safety. Studies on seasonal variation, different plant parts, and standardized extract profiles would also strengthen its scientific basis.

CONCLUSION

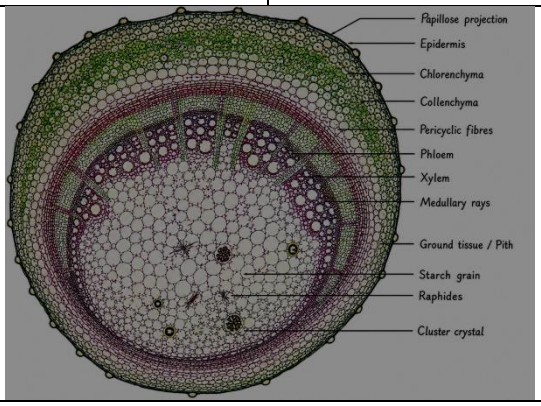
The present study establishes a comprehensive pharmacognostic profile of Hastikarna (*Leea macrophylla*) through organoleptic, macroscopic, microscopic, physicochemical, and preliminary phytochemical evaluations. The findings provide useful diagnostic characters for authentication and quality control of the crude drug and confirm the presence of diverse bioactive phytoconstituents. The TLC and HPTLC profiles further support the use of this plant in standardization studies by providing a characteristic chromatographic fingerprint. Overall, the data generated in this work form a scientific basis for future phytochemical isolation, pharmacological validation, and safe development of Hastikarna *(Leea macrophylla)* as a standardized herbal drug.

Muffles Furnace (Total Ash, Acid Insoluble Ash, Water Soluble Ash

Hot Air Oven (Loss on Drying)

Soxhlet Apparatus (Aq. And Alcoholic Extractive Value

pH Meter



Microscopy

CONFLICT OF INTEREST

Authors have declared no conflict of interest exist.

ACKNOWLEDGEMENT

The authors are thankful to the Bilwal Medchem and Research Laboratory Pvt. Ltd. Office: 5/35 Vidhyadhar Nagar, Jaipur, Rajasthan Laboratory & Factory: H-9SKS Reengus Industrial Area, Reengus, Rajasthan.for providing laboratory reports to carry out the research work.

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