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Original Article

Pharmacognostic and Phytochemical Characterization of *Ixora finlaysoniana*

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ABSTRACT

Background and Aim: *Ixora finlaysoniana* is a flowering plant belonging to the family *Rubiaceae*, commonly found in tropical regions and valued for its ornamental clustered inflorescences and aesthetically attractive flowers. The plant exhibits typical *Ixora* characteristics such as opposite leaves and dense terminal flower clusters. Like other species of the genus, *Ixora finlaysoniana* is expected to contain bioactive phytochemicals, including flavonoids, phenolic compounds, and tannins, which may contribute to several pharmacological activities. Herbal medicines have gained global importance as safer and cost-effective alternatives to synthetic drugs. Traditionally, *Ixora* species have been used to treat inflammation, microbial infections, and wounds. Therefore, the present study aimed to perform a detailed pharmacognostic and phytochemical evaluation of *Ixora finlaysoniana* leaves to support its medicinal importance and provide scientific data for its identification and standardization. **Materials and Methods:** Macroscopic evaluation of the leaves was carried out by observing characteristics such as shape, size, texture, colour, and venation pattern. Microscopic analysis was performed to identify diagnostic anatomical features useful for authentication. In addition, physicochemical parameters, including total ash value, moisture content, and extractive values, were determined. Preliminary phytochemical screening was conducted to identify the major classes of secondary metabolites present in the plant extract. **Results:** Microscopic studies revealed characteristic features such as trichomes, paracytic stomata, vascular tissues, and rosette crystals, which are important markers for plant identification and quality control. Physicochemical evaluation supported the purity and standardization of the crude drug. Phytochemical screening indicated the presence of alkaloids, flavonoids, tannins, glycosides, phenolics, saponins, and essential oils, suggesting diverse biological activities. **Conclusion:** The findings scientifically support the ethnomedicinal uses of *Ixora finlaysoniana*. Further studies using advanced chromatographic and spectroscopic techniques may aid in phytochemical fingerprinting, ensuring quality control and promoting its potential use in herbal drug development.

Keywords: *Ixora finlaysoniana*, Medicinal plant, Pharmacognosy, Quality assessment, Sustainable use, Traditional use.

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INTRODUCTION

Pharmacognosy is a branch of science that deals with the study of the history, distribution, cultivation, collection, processing, and preservation of crude drugs. Medicinal plants have been a fundamental part of traditional and modern medicine due to the presence of bioactive compounds and their therapeutic properties. They serve as a primary source for drug discovery and pharmaceutical formulation.[1] The World Health Organization (WHO) estimates that nearly 80% of the global population relies on herbal medicine for primary healthcare.[2] These plants provide pharmacologically active compounds such as alkaloids, flavonoids, tannins, and glycosides, which contribute to their medicinal properties.[3]

Table 1 shows the taxonomic classification of *Ixora finlaysoniana*. The genus *Ixora* belongs to the family *Rubiaceae* and consists of approximately 500 species predominantly found in tropical and subtropical regions.[4] Various *Ixora* species have been traditionally used for their antimicrobial, anti-inflammatory, antioxidant, and wound-healing properties.[5] *Ixora finlaysoniana* is an evergreen shrub characterized by glossy dark green leaves and clusters of white flowers. It is commonly found in India, Sri Lanka, and other

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Asian countries.[6] The leaves are opposite, simple, and elliptic with an entire margin, and the plant is rich in secondary metabolites that contribute to its pharmacological properties.[7]

Traditionally, *Ixora finlaysoniana* leaves have been used in folk medicine for treating skin disorders, fever, wounds, and gastrointestinal ailments.[8] Different parts of the plant, including leaves, flowers, and roots, are used in Ayurveda and Siddha medicine for their potential anti-inflammatory and antimicrobial effects.[9] Pharmacognostic studies are crucial for establishing the identity, purity, and quality of medicinal plants.[10]

Different species of *Ixora include Ixora coccinea L.* (scarlet jungle flame), *Ixora acuminata* Roxb. (*bola de nieve*), *Ixora ferrea* (Jacq.) *Benth., commonly known as palo de hierro; Ixora finlaysoniana Wall. ex G. Don; Ixora grandiflora* Zoll. and Moritz, referred to as large flower jungle flame*; Ixora macrothyrsa* (Teijsm. and Binn.) *T. Moore; Ixora pavetta Andrews,* commonly referred to as torch tree*; Ixora thwaitesii* Hook. f., identified as white jungle flame.[11] *Ixora triantha Volkens; Ixora arborea* (*Ixora parviflora*)*; Ixora duffijavanica (Ixora singaporensis); Ixora alba; Ixora albersii; and Ixora chinensis.* Other species include *Ixora brachiata, Ixora lutea, Ixora undulata, Ixora amplexicaulis, Ixora javanica, and Ixora philippinensis*.[12]

Vernacular Names of *Ixora*

English: Flame of the woods, Jungle flame, Tamil: Sinduram, Thetti, Hindi: Rangan, Malayalam: Chethi, Kannada: Kisukare, Bengali: Kullai Rangan.[13]

Phytoconstituents in *Ixora*

Phytochemical investigations have been conducted on several species of *Ixora*, including *Ixora coccinea, Ixora alba, Ixora brachiata, Ixora arborea, Ixora predeepii, Ixora philippinensis, Ixora decaryi, Ixora fuscovenosa, Ixora gautieri, Ixora longipedicellata, Ixora masoalensis, Ixora pallens, Ixora pedali, Ixora ripicola, Ixora jourdanii, Ixora ooumuensis, Ixora spathoidea, Ixora tahuataensis, Ixora uahukaensis, Ixora finlaysoniana, Ixora hookeri, Ixora casei,* and *Ixora undulata.*[14] Different species of *Ixora* are illustrated in Figure 1. Previous studies have reported the presence of various phytoconstituents such as terpenoids, flavonoids, anthraquinone glycosides, cardiac glycosides, tannins, steroids, alkaloids, carbohydrates, starch, and saponins in different *Ixora* species. Anatomical profiles of *Ixora coccinea, Ixora nicotiana*, and *Ixora predepii* have also been studied to understand their microscopic characteristics.[15] In addition, rubiothiazine was isolated from *Ixora undulata*, and novel cycloartenol esters were reported from *Ixora coccinea.*[16]

(Talpade *et al*., 2016) investigated the ethnomedicinal applications, chemical composition, and pharmacognostic characteristics of *Ixora finlaysoniana* with the aim of evaluating its ethnopharmacological potential and identifying future research opportunities. Their study involved preliminary phytochemical screening of the methanol extract of *Ixora alba*, which revealed the presence of various chemical constituents including anthracene and arbutin derivatives, bitter and pungent principles, alkaloids, cardiac glycosides, coumarins, essential oils, flavonoids, and tannins.[17]

(Rajayan *et al*., 2024) evaluated the phytochemical composition of *Ixora* species and reported the presence of phytosterols, flavonoids, proteins, amino acids, alkaloids, carbohydrates, phenols, tannins, and diterpenes predominantly in *Ixora coccinea* and *Ixora alba*. The study also explored elemental analysis and antimicrobial properties of these species.[18]

Further phytochemical investigations on *Ixora finlaysoniana* reported the isolation of several compounds from different solvent fractions of the methanolic extract. The n-hexane fraction yielded a hydrocarbon alcohol, nonacosanol, along with amyrin and sitosterol. The chloroform fraction contained gallic acid, protocatechuic acid, 3-hydroxyhexan-5-olide, and β-sitosterol glucoside. Additionally, parasorboside, D-1-O-methyl-myo-inositol, and galactitol were isolated from the ethyl acetate fraction. The structures of these compounds were identified using physical, chemical, and spectroscopic analyses.[19]

MATERIALS AND METHODS

Collection of Plant Material

The plant material was collected from the campus of Sri Ramachandra Institute of Higher Education and Research (SRIHER), Chennai, India. Based on preliminary morphological observation, the specimen was initially identified as *Ixora alba* due to the similarity in flower colour. However, subsequent taxonomic authentication confirmed the species as *Ixora finlaysoniana*. The collection and identification of the plant were challenging because *Ixora alba* and *Ixora finlaysoniana* possess flowers of similar

Table 1: shows the Taxonomical Classifications of *Ixora finlaysoniana*.

Kingdom: Plantae	Plantes, planta, vegetal, plants
Subkingdom *viridaeplantae*	Green plants
Infra kingdom *streptophyta*	Land plants
Division tracheophyta	Vascular plants, tracheophytes
Subdivision spermatophytina	Spermatophytes, seed plants, phanerogames
Infradivision angiospermae	Flowering plants, angiosperms
Class	Magnoliopsida
Superorder	Asteranae
Order	Gentianales
Family rubiaceae	Madders, Rubiaceae
Genus	Ixora

colour and closely related morphological characteristics, which may lead to misidentification during field collection. Therefore, proper taxonomic authentication is essential for researchers working with *Ixora* species to ensure accurate identification and reliable scientific reporting.

The authenticated plant material was used for all further pharmacognostic and phytochemical investigations reported in this study. These investigations included macroscopic and microscopic analysis of the leaves, physicochemical evaluation for determining quality control parameters, and DNA barcoding for molecular authentication. The present study was undertaken to examine the macroscopic and microscopic characteristics of *Ixora finlaysoniana* leaves, evaluate physicochemical parameters for quality control and standardization, and perform phytochemical screening to identify the presence of bioactive compounds. The findings of this study are expected to contribute to the scientific validation and potential pharmaceutical applications of *Ixora finlaysoniana*. Establishing pharmacognostic parameters is essential for preventing adulteration and ensuring the therapeutic efficacy and safe use of medicinal plants in herbal medicine.

These studies include

Macroscopic and Microscopic Analysis: Examining leaf morphology, venation, and histological characteristics.

Physicochemical Evaluation: Determining moisture content, ash values, and extractive yields to assess purity.

DNA Barcoding

This study aims to

Examine the macroscopic and microscopic characteristics of *Ixora finlaysoniana* leaves.

Evaluate the physicochemical parameters for quality control and standardization.

Perform phytochemical screening to identify bioactive compounds.

Contribute to the scientific validation and potential pharmaceutical applications of *Ixora finlaysoniana.*This research will provide valuable data for the standardization of *Ixora finlaysoniana* leaves, supporting their safe and effective use in herbal medicine. Establishing pharmacognostic parameters is essential to prevent adulteration and ensure the therapeutic efficacy of medicinal plants

Methods

Macroscopy (SOP NO. PCOG-004-SOP)

External feature of test sample was documented using Nikon D-5600 Digital camera.[19]

Quantitative Microscopy (SOP NO. PCOG-007-SOP)

Leaf fragments of about 5 x 5 mm in size were placed in a test-tube containing about 5 mL of saturated aqueous solution of chloral hydrate and heated in water bath for 10-15 min. Then it was kept on slide and mount it in glycerin. Examine under a microscope with a 4x objective and a 10x eyepiece, equipped with a camera lucida. Leaf parameters such as Stomatal number, Stomatal index, Vein islet number, Vein termination number and Palisade ratio were determined.[20]

Powder Microscopy (SOP NO. PCOG-006-SOP)

A small amount of the powdered sample was positioned on a microscopic slide accompanied by a drop of 50% glycerol after being treated with a saturated chloral hydrate solution. Subsequently, the sample underwent treatment with iodine solution to confirm the existence of starch grains. Observations were conducted utilizing a Nikon ECLIPSE E200 trinocular microscope linked to a Zeiss ERc5s digital camera under bright field illumination. Photomicrographs capturing the diagnostic features were obtained and recorded.[21]

Microscopy (PCOG-005-SOP)

The sample was preserved in FAA fixative for a duration exceeding 48 hr, the preserved specimens were cut into thin transverse sections using a sharp blade. These sections were then stained with 0.8% Safranin and 0.5% Astra blue. The transverse sections were photographed with an Axiolab5 trinocular microscope, which was fitted with a Zeiss Axiocam208 color digital camera under bright-field illumination conditions.

Magnifications were indicated by scale bar.[22]

DNA Barcoding (PCOG-009-SOP)

Genomic DNA Isolation: About 100 mg of plant tissue was pulverized with liquid nitrogen to create a fine powder using a mortar and pestle. Subsequently, 1 mL of preheated CTAB extraction buffer was added.

with 20 µL of β-mercaptoethanol to the mortar and finely ground. The contents were transferred into a 2 mL centrifuge tube and incubated for 20 to 30 min at 65°C on a water bath. After centrifuging using Refrigerated Centrifuge (Eppendrof 5418R) the tube at 12,000 rpm for 10 min the supernatant was transferred to a fresh centrifuge tube and added equal volumes of chloroform: isoamyl alcohol (24:1) mixture and mixed gently by inverting tubes till an emulsion was formed. The tubes were centrifuged at 13,000 rpm for 12 min. The clear aqueous phase was transferred to fresh centrifuge tubes and an equal volume of ice-cold isopropanol was added. The sample was incubated overnight at at- 20°C the mixture was centrifuged at 12000 rpm for a duration of 3 min. The supernatant was removed, and the pellet was subsequently washed with 70% ethanol. DNA pellets were then air-dried at room temperature by allowing evaporation

Table 2: Ash Value Parameters of the Sample (% w/w).

% Organic matter	% Total Ash	% Acid Insoluble Ash	% Water Soluble Ash
93.5%	6.5%	0.9%	2.3%

of uncovered centrifuge tubes. The pellets were suspended in an appropriate volume (20-30 µL) of $T_{10}E_1$ buffer.[23]

Qualitative and Quantitative estimation of DNA: The quality and concentration of genomic DNA were checked by running the DNA sample on 1% agarose gel. The DNA concentrations were rechecked by visual assessment of band intensity under UV-trans-illuminator (Biorad, GelDoc Go, USA). The quantity of 1 µL of isolated DNA was checked using Nanodrop (Thermoscientific, Nanodrop One, USA).

PCR Amplification: The DNA barcode candidate ITS was used for PCR amplification as the same resulted in amplification. The isolated DNA was used as a template for PCR reaction and carried out in a thermocycler (Applied Biosystem, Veriti™, USA). The PCR products were then loaded onto 1% agarose gel and the amplification was confirmed.

Sequence analysis: FASTA format of the nucleotides were obtained using Finch TV from the chromatogram. The FASTA was fed into Basic Local Alignment Search Tool (BLAST) algorithm of NCBI to identify the closest matching sequence in the nucleotide database of GenBank. The sequence was converted to a barcode using the software BioRad barcode generator.

NCBI submission: After confirmation of the species, the sequence was submitted to NCBI with the necessary details to obtain a GenBank ID.

Determination of Total Ash Value

Place 2 g of the powdered air-dried material, accurately weighed in a silica crucible which is previously ignited and weighed. The powdered drug is spread as an even layer in the crucible and ignited at a temperature not exceeding 450°C until it turns white, signifying the lack of carbon. Cool it in a desiccator and measure its weight. If it is not possible to obtain carbon-free ash through this method, allow the crucible to cool and dampen the residue with approximately 2 mL of water or a saturated ammonium nitrate solution. Dry it first on a water-bath, then on a hot-plate, and ignite until a constant weight is achieved. Let the residue cool in an appropriate desiccator for 30 min, and then weigh it immediately. Calculate the percentage of total ash with reference to air dried material. The ash content parameters measured in the study are shown in Table 2, reflecting the mineral residue and purity level of the sample.[24]

Determination of Moisture Content

The powdered drug sample, or a portion of it (1.5 g), is placed on a pre-weighed evaporating dish without any prior drying. It is then dried at a temperature of 105°C for a duration of 6 hr

Table 3: Moisture Content of the powder of *Ixora finlaysoniana*.

	Loss of Moisture	% Moisture content
Ixora finlaysoniana (Leaf)	0.4 g	8.6%

before being weighed. The drying process is continued until two consecutive measurements are identical, or the difference between two successive weighing does not exceed 0.25%. A constant weight is achieved when two consecutive weighings, following a 30-min drying period in a desiccator, indicate a difference of no more than a 0.01g difference. The moisture content of *Ixora finlaysoniana* was determined and is presented in the Table 3, indicating the amount of water present in the sample and its suitability for storage and stability. To calculate the percentage of moisture content of the drug, use the following formula:[25]

$$\text{Moisture content of the drug (\%)} = \frac{\text{Loss in weight of the sample}}{\text{Weight of the sample taken}} \times 100$$

Determination of Vein Islet and Veinlet Termination Number

Boil several leaves in a Sodium Hydroxide solution within a test tube that is situated in a boiling water bath. If the leaves prove difficult to clear using this method, immerse them in water, then treat them sequentially with chlorinated soda for bleaching, followed by 10% hydrochloric acid to eliminate calcium oxalate, and finally with alcohol. Prepare the specimen using Safranine dye and glycerin water. Set up the camera lucida and partition the paper into squares measuring 4 square millimeters using the stage micrometer. Substitute the stage micrometer with the cleared leaf preparation and trace the veins across four continuous squares, either in a square of 1 mm x 1 mm or a rectangle of 1 mm x 4 mm. Observe the vein-islet and veinlet terminations through the microscope, ensuring that a superimposed image of the leaf section and the paper is visible simultaneously. Count the number of vein-islets and veinlet terminations present within the square or rectangle, taking into account any incomplete vein-islets and the two adjacent sides of the square or rectangle. Document the observations in the form of a range and also specify the mean value.[26]

Determination of Stomatal Number and Stomatal Index

Remove the leaf fragments from the center of the lamina by boiling in a Sodium hydroxide solution or in chlorinated soda. Carefully peel off the upper and lower epidermis using forceps. Set up a camera lucida along with drawing paper for the purpose of marking the drawing. Mount the upper and lower epidermis

separately in glycerin water. On the drawing paper, draw a square measuring 1 mm using a stage micrometer and the camera lucida. Substitute the stage micrometer with the cleared leaf preparation, focus under the same magnification, and trace the epidermal cells and stomata while observing through the microscope, ensuring that a superimposed image of the leaf is visible simultaneously. Count the number of epidermal cells and stomata (considering the two guard cells and ostiole as one unit) within the square, counting a cell if at least half of its area lies within the square, with two adjacent sides being taken into account for the calculation. Document the results for each of the ten fields and compute the stomatal number, which is the number of stomata per square millimeter of the leaf preparation. Calculate the stomatal Index using the formula provided.[27]

$$\text{Stomatal Index (S.I.)} = \frac{S \times 100}{E + S}$$

RESULTS AND DISCUSSION

Macroscopy

Fresh leaves of *Ixora finlaysoniana* are dark green in colour, opposite, simple, glossy, and glabrous. The leaves are oblong to elliptic in shape with an entire margin. The apex is obtuse to bluntly acuminate, and the base is rounded to sub-cuneate. The leaves measure approximately 6-10 cm in length and 3-5 cm in width. The petiole is short and stipulate. The leaves possess a characteristic odour and an unpleasant taste (Figure 2).

Quantitative Microscopy

The quantitative microscopic measurements obtained from epidermal peelings of the leaf are presented in Table 4. The leaf is hypostomatic in nature, with paracytic stomata present on the lower epidermis. These microscopic characteristics serve as important diagnostic features for the identification and authentication of the plant material.

Powder Microscopy

A. Leaf

The leaf powder is green in colour with a characteristic odour and slightly woody taste. Microscopic examination shows diagnostic features including surface view of the upper epidermis, surface view of the lower epidermis with paracytic stomata, palisade cells, parenchyma cells, vessels with spiral thickening, fibre bundles, rosette crystals, and latex tubes (Figure 3).

B. Petiole

The Transverse Section (T.S.) of the petiole is broadly convex on the lower surface and relatively flat on the upper surface with a small elevation at the centre and two lateral sides. The epidermis

Table 4: Quantitative microscopy of *Ixora finlaysoniana* leaf.

Parameters	Upper epidermis (/mm²)	Lower epidermis (/mm²)
Epidermal number	185 - 190	460 - 550
Stomatal number	-	180 - 185
Stomatal index	-	28 - 25.2
Palisade ratio	4 - 5	
Vein islets number	13 - 15	
Vein termination number	35 - 40	

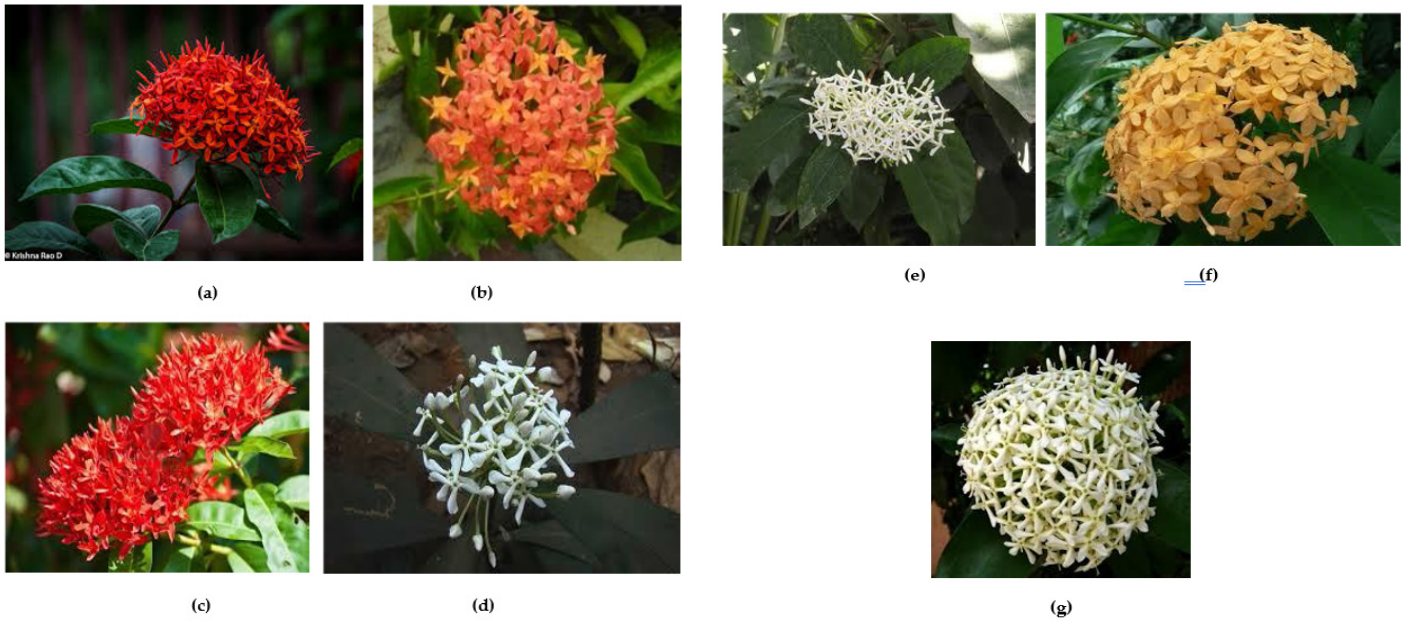


Figure 1: Different Species of Ixora: a: Ixora coccinea (Red); b: Ixora coccinea (Orange); c: Ixora chinensis; d: Ixora parviflora; e: Ixora finlaysoniana; f: Ixora javanica; g: Ixora alba.

is single-layered and covered with a thick cuticle, followed by a broad region of parenchymatous ground tissue. Several parenchyma cells contain cellular inclusions, and numerous rosette crystals are distributed throughout this region. Two trace bundles are observed below the wing region in the ground tissue. The vascular bundle is concentric and closed, with xylem elements surrounded by phloem tissue. A small parenchymatous pith is present at the centre containing cellular contents (Figure 4). The microscopic features observed in the transverse section of the petiole are depicted in Figure 5.

C. Midrib

The transverse section of the midrib shows upper and lower epidermal layers covered by cuticle. The upper epidermis consists of tangentially elongated cylindrical cells, whereas the lower epidermal cells are smaller and rounded. Below the epidermis, 3-4 layers of collenchyma cells are present, followed by a broad parenchymatous ground tissue. A concentric vascular bundle is present at the centre, where xylem tissue is surrounded by phloem. The vascular bundle consists of normal vascular elements. A parenchymatous pith is present at the centre containing cellular contents, and a few rosette crystals are distributed throughout the ground tissue. The transverse section of the leaf shows an elevated upper surface and a broad convex lower surface of the midrib with lateral laminar extensions (Figure 6).

D. Lamina

The transverse section of the lamina shows upper and lower epidermal layers covered with cuticle. The upper epidermis

Figure 2: Macroscopy of *Ixora finlaysoniana* leaf.

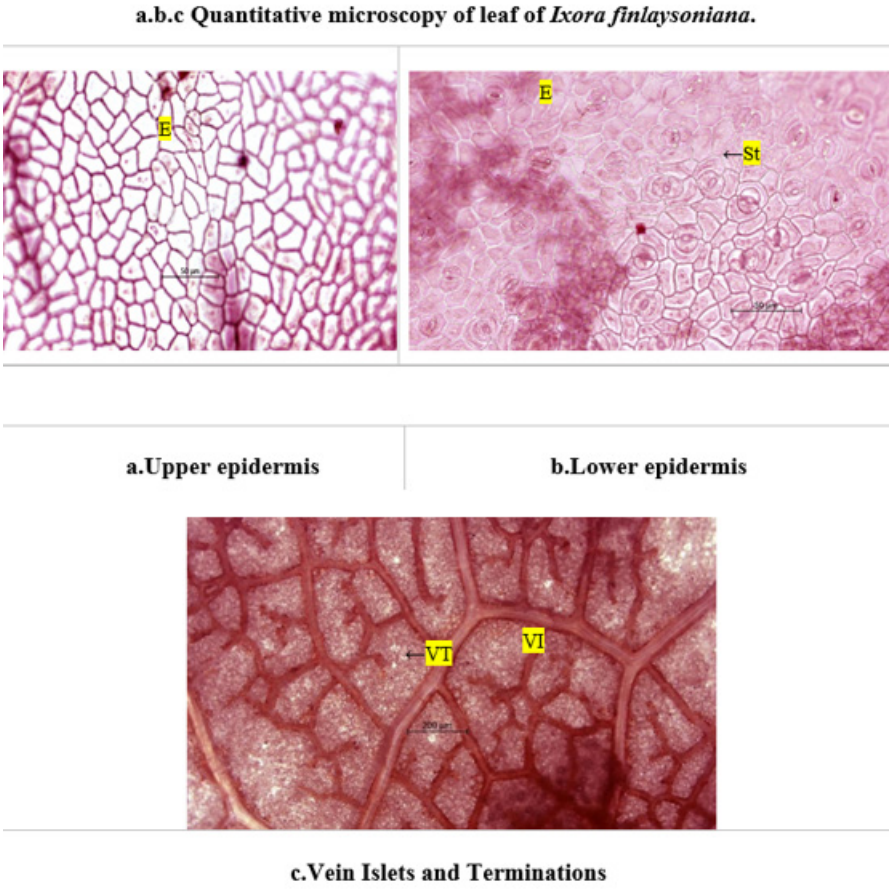


Figure 3: Powder microscopy of *Ixora finlaysoniana* leaf. E - Epidermis; St - Stomata; VI - Vein Islet; VT - Vein Termination.

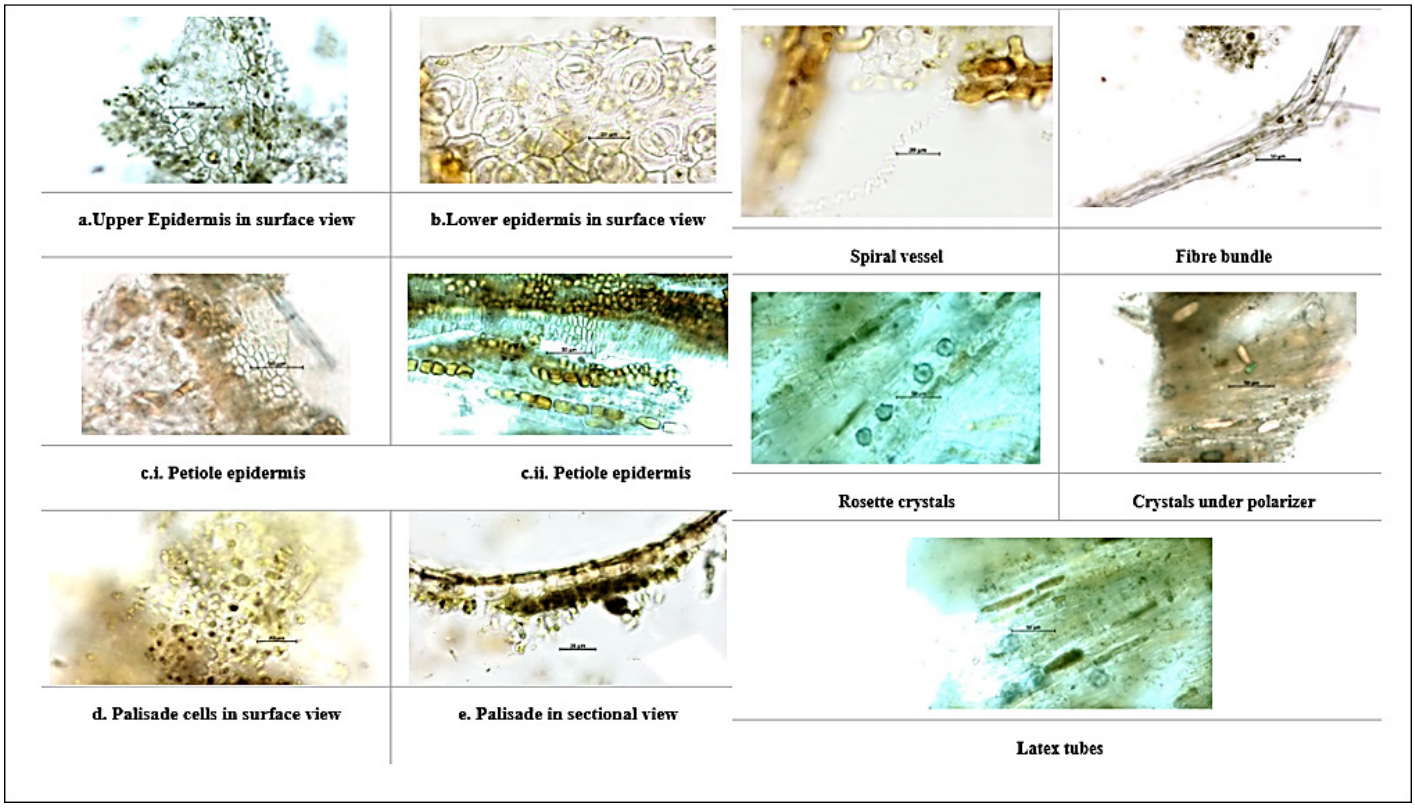


Figure 4: Microscopy of *Ixora finlaysoniana* petiole.

Table 5: Quality check and quantification of DNA.

Sample code	Concentration in ng/µL	$A_{260/280}$	$A_{230/260}$
I26032507F	243/54	1.83	0.97

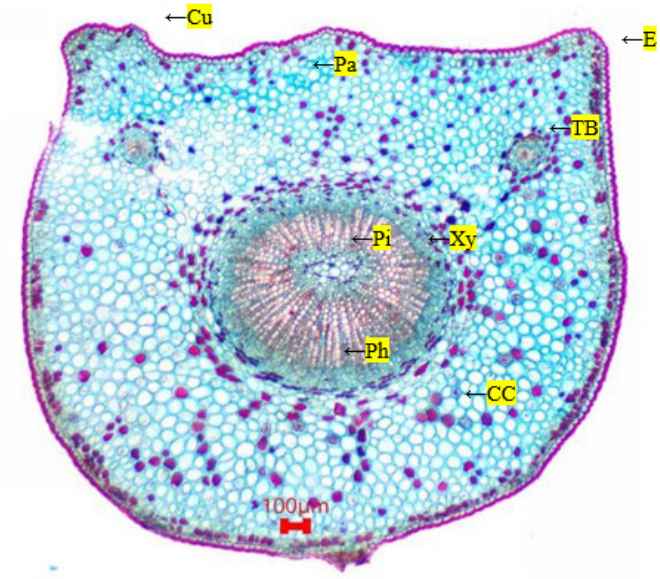
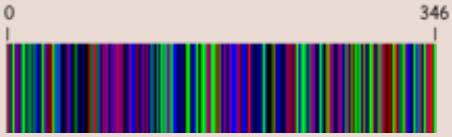


Figure 5: Illustrates the T.S. of the petiole, highlighting key anatomical features.

Table 6: Sequence obtained *Ixora finlaysoniana*.

Sample code	Sequence with Barcode
>SCRIPCOGIF80	gtcgaatcctgcaaagcagacgaccgcgaactcgt gtaaccaccgggcgtccgggagcgggcggggt gacttgacc gtctctcgctccttctctggcgctccccgtgcgctcgtc gcacggacgaaca actcaaccccggcgc ggaaag cgccaaggaaaacttcaaaatgatcgct cgctccccctctgcccc gttcgcgg cgcgcaacgggggatgccgcggcgtctgtcg taaccaaaacgactctcg gcaacggatatctcggctctcgcatc gatgaagaacgtag cgaaatgcgatacttggtgtga attgcagaatcccgcgaaccatcgaatctttgaa



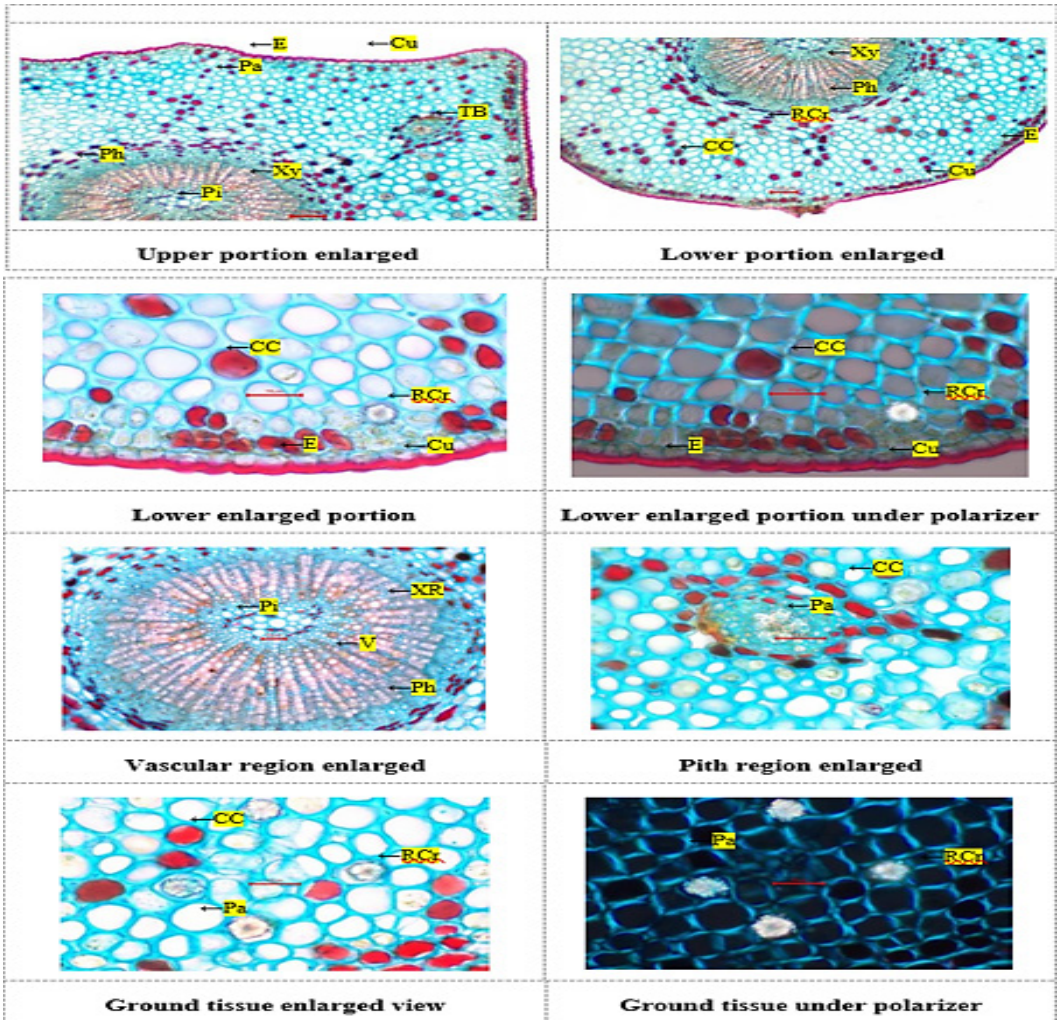


Figure 6: Microscopy of *Ixora finlaysoniana* leaf passing through midrib. CC - cell contents; Cu - cuticle; E - epidermis; Pa - parenchyma; Ph - phloem; Pi - pith; RCr - rosette crystals; TB - trace bundle; V - vessel; Xy - xylem; XR - xylem ray.

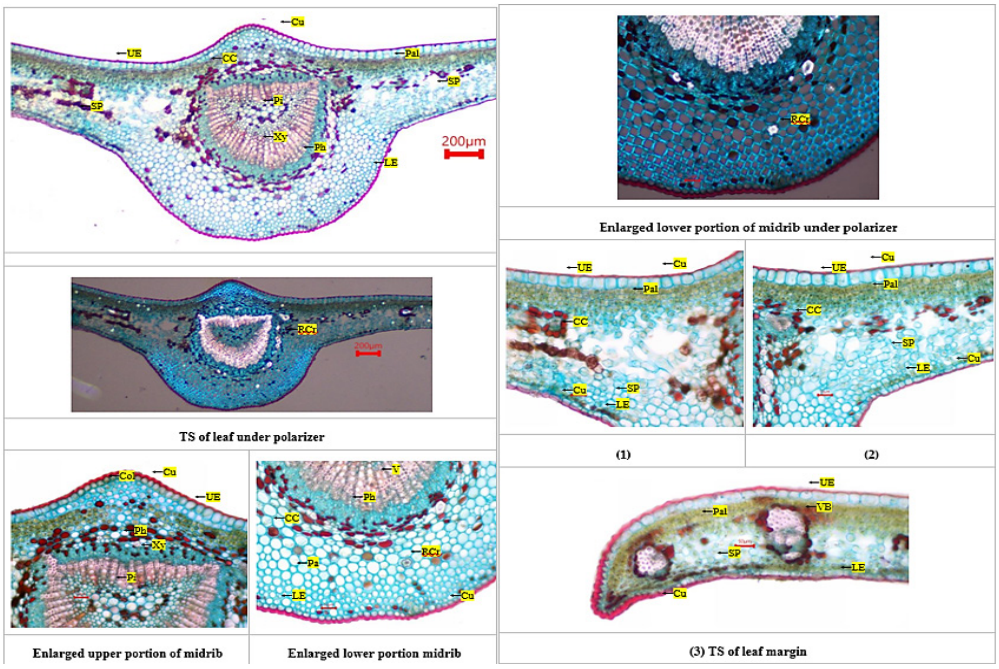


Figure 7: T.S. of the lamina shows a dorsiventral structure with distinct vascular bundles.

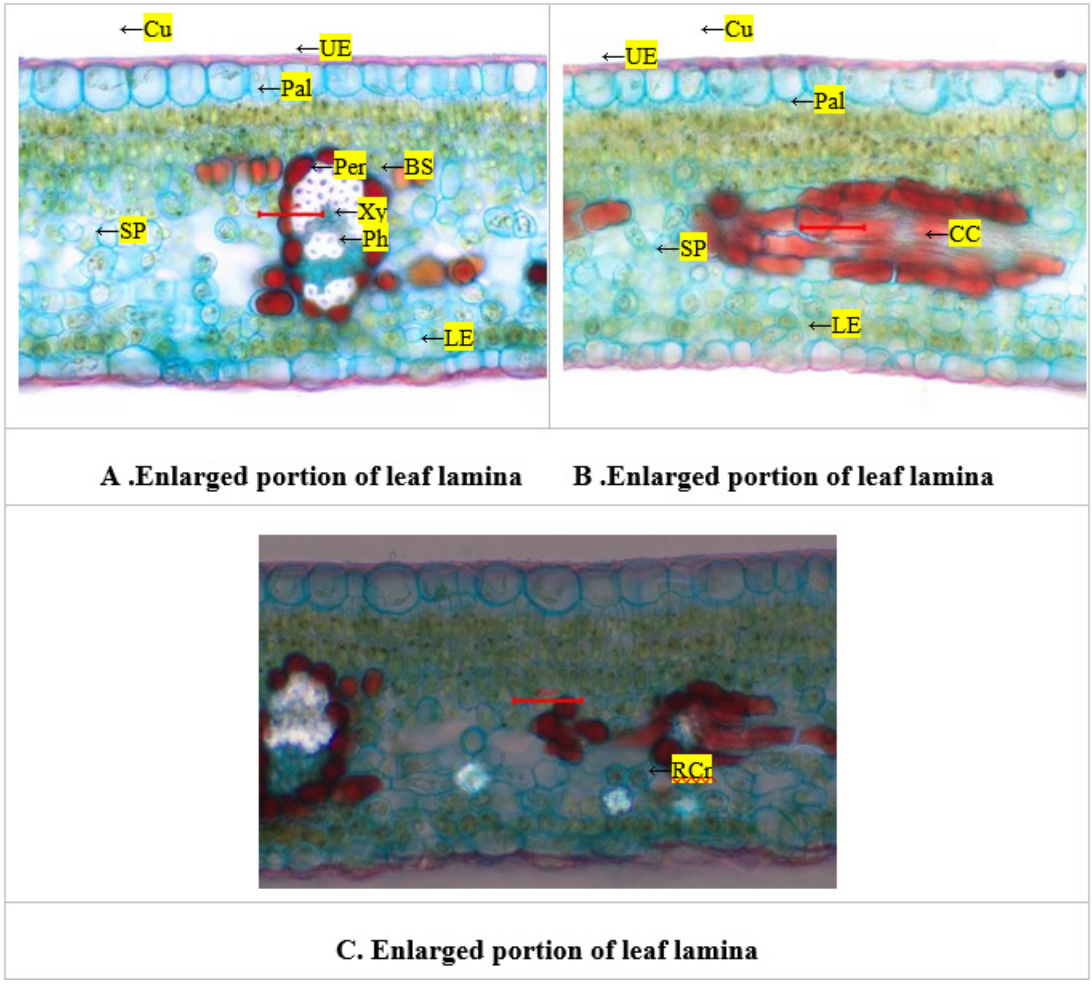


Figure 8: Gel image of PCR amplified product. BS - bundle sheath; CC - cell contents; Cu - cuticle; LE - lower epidermis; Pa - parenchyma; Pal - palisade cells; Per - pericycle; Ph - phloem; Pi - pith; RCr - rosette crystals; SP - spongy parenchyma; UE - upper epidermis; V - vessel; VB - vascular bundle; Xy – xylem.

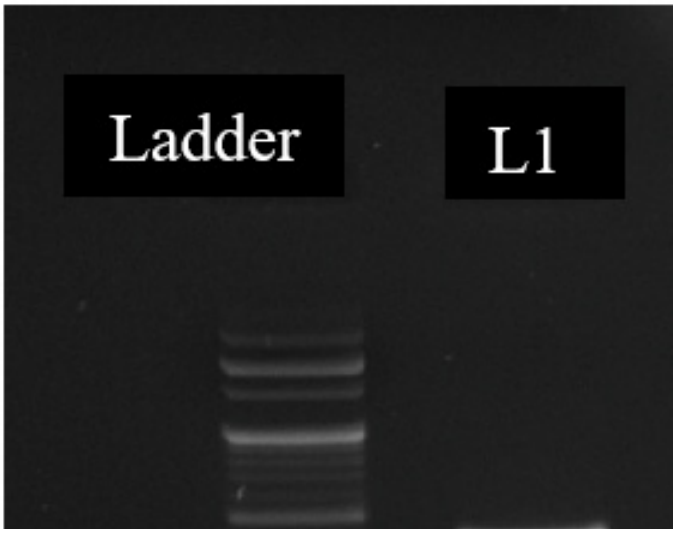


Figure 9: Chromatograms of *Ixora finlaysoniana*.

consists of tangentially elongated cylindrical cells, whereas the lower epidermal cells are small and rounded. The mesophyll tissue is differentiated into an upper compact layer of elongated palisade cells followed by 4-5 layers of loosely arranged spongy parenchyma cells. Small vascular bundles are observed traversing through the mesophyll tissue.[7] These vascular bundles consist of normal vascular elements surrounded by discontinuous patches of pericycle and further enclosed by a bundle sheath containing cellular inclusions (Figure 7).

DNA Barcoding

Genomic DNA was extracted from the authenticated plant sample, and its quality was evaluated using spectrophotometric analysis followed by agarose gel electrophoresis (Table 5 and Figure 8). The concentration of genomic DNA and the absorbance ratio (A260/A280) are presented in Table 5. PCR amplification of the ITS region was performed, and the amplified products were analyzed using gel electrophoresis along with a 100 bp DNA ladder (Figure 9). The chromatogram of the obtained sequence using the ITS marker is shown in Figure 9, while the BLAST analysis result confirming the sequence identity is presented in Figure 10. The generated DNA barcode of the sample is shown in Table 6.

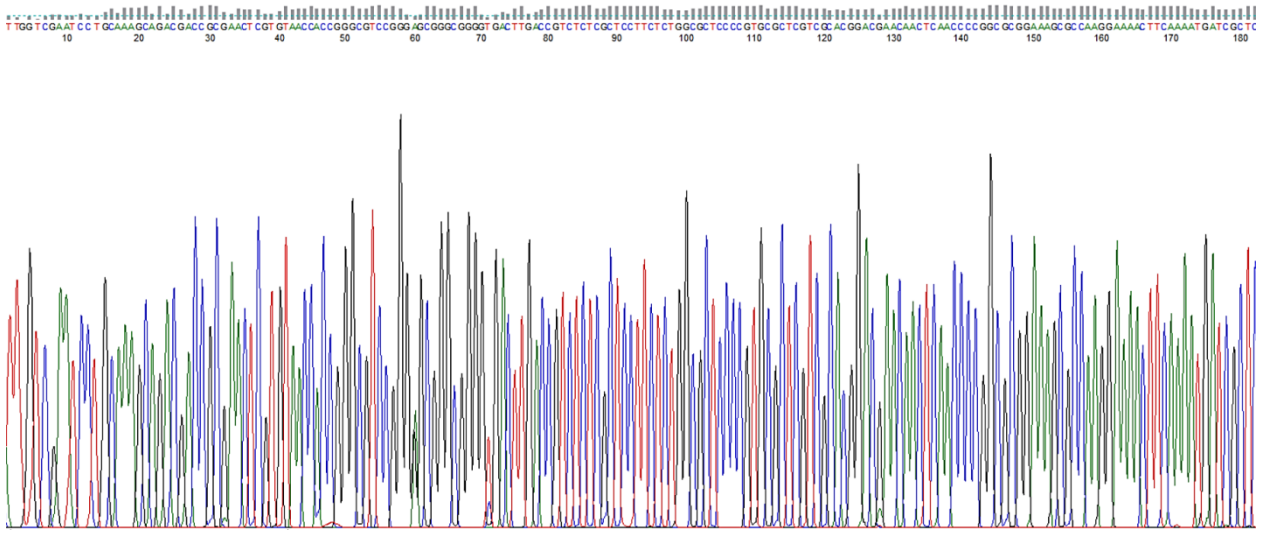


Figure 10: BLAST Hit.

Total Ash Value

The total ash value of *Ixora finlaysoniana* leaves was determined to evaluate the amount of inorganic matter such as minerals and possible impurities present in the plant material. The results indicated that the ash content was within acceptable limits, suggesting that the plant material is relatively free from excessive contaminants such as dust, sand, or other inorganic substances. A lower ash value generally indicates better quality and purity of the crude drug. Similar ash values have been reported for other *Ixora* species, which further supports the authenticity of *Ixora finlaysoniana*. Determination of ash value is an important parameter for quality control, as an abnormally high ash content may indicate adulteration or improper processing of the plant material.

CONCLUSION

The present study provides a comprehensive pharmacognostic and phytochemical evaluation of *Ixora finlaysoniana* leaves, establishing essential baseline data for their identification, standardization, and potential medicinal applications. Detailed macroscopic and microscopic analyses revealed distinctive morphological and anatomical features that facilitate accurate authentication of the plant material. The physicochemical parameters, including total ash value and moisture content, were found to be within acceptable limits, indicating the purity and quality of the crude drug. Preliminary phytochemical screening confirmed the presence of various bioactive constituents such as flavonoids, alkaloids, tannins, glycosides, and essential oils, which may contribute to the therapeutic potential of the plant. Furthermore, DNA barcoding confirmed the identity of *Ixora finlaysoniana* at the molecular level, strengthening the reliability of the taxonomic identification. The findings of this study support the traditional medicinal uses of the plant and provide a scientific basis for its inclusion in herbal formulations. Further studies focusing on the isolation and characterization of individual phytoconstituents, along with pharmacological evaluation, may lead to the development of novel plant-based therapeutic agents. Overall, *Ixora finlaysoniana* shows promising potential in herbal medicine and highlights the importance of its sustainable utilization and conservation.

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ABBREVIATIONS

FAA**:** Formalin-Aceto-Alcohol; SOP**:** Standard Operating Procedure; DNA**:** Deoxyribonucleic Acid; CTAB**:** Cetyltrimethylammonium bromide; PCR**:** Polymerase Chain Reaction; ITS**:** Internal Transcribed Spacer; BLAST**:** Basic Local Alignment Search Tool; NCBI**:** National Center for Biotechnology Information; S.I.**:** Stomatal Index; T.S.**:** Transverse Section; CC**:** Cell contents; Cu**:** Cuticle; E**:** Epidermis; Pa**:** Parenchyma; Ph**:** Phloem; Pi**:** pith; RCr**:** Rosette crystals; TB**:** Trace bundle; V**:** Vessel; Xy**:** Xylem; XR**:** Xylem ray; VB**:** Vascular bundle; BS**:** Bundle sheath; Per**:** Pericycle; SP**:** Spongy parenchyma; UE**:** Upper epidermis; LE**:** Lower epidermis; Col**:** Collenchyma; Pal**:** Palisade cells.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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