

The macroscopic, microscopic and histochemical analysis of bark of *Kydia calycina* Roxb.

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ABSTRACT: *Kydia calycina* Roxb.. is a flowering tree belonging to the family Malvaceae. It possesses a wide range of pharmacological activities, including antioxidant, hepatoprotective, analgesic, anti-inflammatory, anticancer, and antimicrobial properties. Traditionally, the bark has been used in the treatment of skin ulcers and for promoting wound healing. The primary objective of the present study was to investigate the microscopical and histochemical characteristics of the bark of *Kydia calycina* Roxb.. Various microscopical features and histochemical constituents were observed and documented. The findings provide valuable diagnostic parameters for the authentication and identification of the crude drug. Furthermore, these characteristics support the pharmacognostic standardization of the bark and indicate its potential for significant pharmacological applications.

KEYWORDS: *Kydia calycina* Roxb., Malvaceae, Microscopical study, Histochemical analysis, pharmacognostical standardisation, crude drug authentication.

I. INTRODUCTION:

Kydia calycina Roxb. a member of the Malvaceae family and a significant medicinal plant. It is commonly known as Pula and is found in tropical areas and has been used in traditional medicine to heal wounds, fever, inflammation, skin conditions, bodily aches, and digestive issues. Alkaloids, phenolic compounds, mucilage, starch, and oil globules are among the bioactive phytochemicals found in the plant that are thought to contribute to its therapeutic potential. This comprises a thorough examination of the anatomical components, histochemical testing, and powder microscopy. The goal of the current study on *Kydia calycina* Roxb.. bark was to gather preliminary scientific information that could aid in its authenticity and future pharmacological investigations.^{1,2}

II. MATERIALS AND METHODS:

1. Plant collection and authentication

The plant was identified, collected and authenticated by “kottakkal Aryavydhyashala, Kottakkal, Malappuram, Kerala.”

2. Drying

The bark of *Kydia calycina* Roxb.. was shade dried for 20 days.

3. Macroscopy

A clean bark sample at a room temperature was examined for its physical characteristic.^{3,4}



Fig:1 Dried bark of *Kydia calycina* Roxb. Roxb.

III. Microscopy

- 3.1 The bark sample was taken. The bark was preserved in FAA (Formalin-5ml: 70% Alcohol-90ml: Glacial acetic acid-5ml) solution for better sectioning.⁵
- 3.2 Supporting material was prepared using thermocol (Expanded Polystyrene - EPS). The thermocol was cut into equal dimensions and a slit was made at the centre to hold the bark sample firmly.
- 3.3 A small piece of the bark was cut and then inserted into the slit of the thermocol for proper support during sectioning.
- 3.4 Using a sharp blade, thin transverse sections of about 20–30 μ m thickness were carefully cut.

- 3.5 The obtained thin sections were placed on the slide with one drop of glycerine and covered with the cover slip, avoiding air bubbles.
- 3.6 The prepared slide was observed under the microscope (Compound Light Microscope) at different magnifications (5X, 10X, 20X, and 40X).

IV. Powder Microscopy

- 4.1 The bark sample was powdered and a pinch of sample was placed over slide.
- 4.2 Add one drop of glycerine to the sample and place the cover slip on it and make sure no air bubbles were formed.
- 4.3 After that, remove any excess glycerine spread across the cover slip using the tissue paper and analyse the sample on the Compound Light Microscope with a digital camera connected to the computer ZEISS Axiolab5 (zen software).⁶

V. Histochemical tests

- 5.1 The bark sample was taken. The bark was preserved in FAA (Formalin-5ml:70% Alcohol-90ml:Acetic acid-5ml) solution for better sectioning.⁵

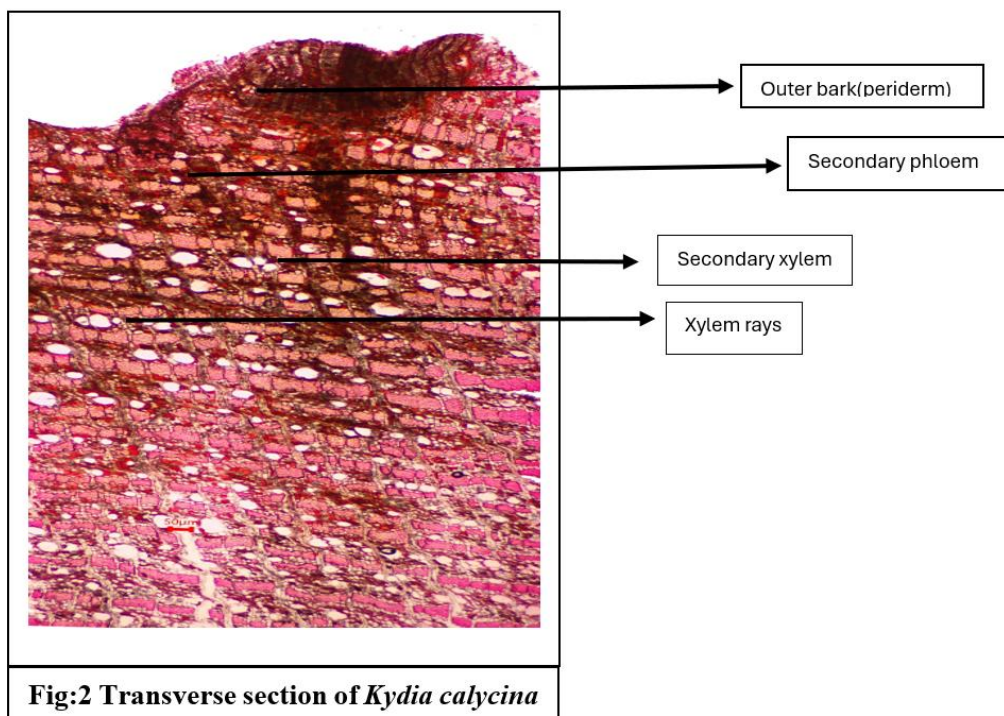
- 5.2 Supporting material was prepared using thermocol (Expanded Polystyrene - EPS). The thermocol was cut into equal dimensions and a slit was made at the centre to hold the bark sample firmly.
- 5.3 A small piece of the bark was cut and then inserted into the slit of the thermocol for proper support during sectioning.
- 5.4 Using a sharp blade, thin transverse sections of about 20–30 μ m thickness were carefully cut.
- 5.5 The sections obtained were transferred to either water containing a Petri dish or glass slide with a single drop of water.
- 5.6 Sections were taken in each of six glass slides.
- 5.7 Six glass slides for the histochemical test were prepared.
- 5.8 Different reagents were used to detect and localize specific chemical constituents within tissues:⁷
- 5.9 The stained section was carefully mounted on a clean glass slide and then covered with a cover slip, avoiding air bubbles.
- 5.10 The prepared slide was observed under the microscope (Compound Light Microscope) at different magnifications (5X, 10X, 20X, and 40X).

Table:1 Reagents used in histochemical analysis

S.NO.	REAGENT	COMPOUND
1.	Wagners reagent	Alkaloids
2.	Alcoholic ferric chloride (5%)	Tannins
3.	Ruthenium red	Mucilage
4.	Phloroglucinol	Lignin
5.	Sudan IV	Oil globules
6.	Iodine	Starch

VI. RESULT:

1. **Macroscopy:** characters by physical appearance were observed as follows:
Irregular flakes with 5-6 mm thick, colour observed was greyish brown, bitter in taste and aromatic odour.
2. **Microscopy:** transverse section of the bark of *Kydia calycina* Roxb., was performed and the following microscopic characters shown in (figure 2).



- 2.1 Calcium oxalate crystals: **Calcium oxalate crystals** are naturally occurring biomineral deposits of calcium oxalate (CaC_2O_4) formed within specialized plant cells called **idioblasts**. calcium oxalate crystals play important roles in maintaining calcium homeostasis, detoxifying excess oxalic acid, providing mechanical support, and protecting the plant against herbivores and pathogens. **Prismatic calcium oxalate crystals** were observed

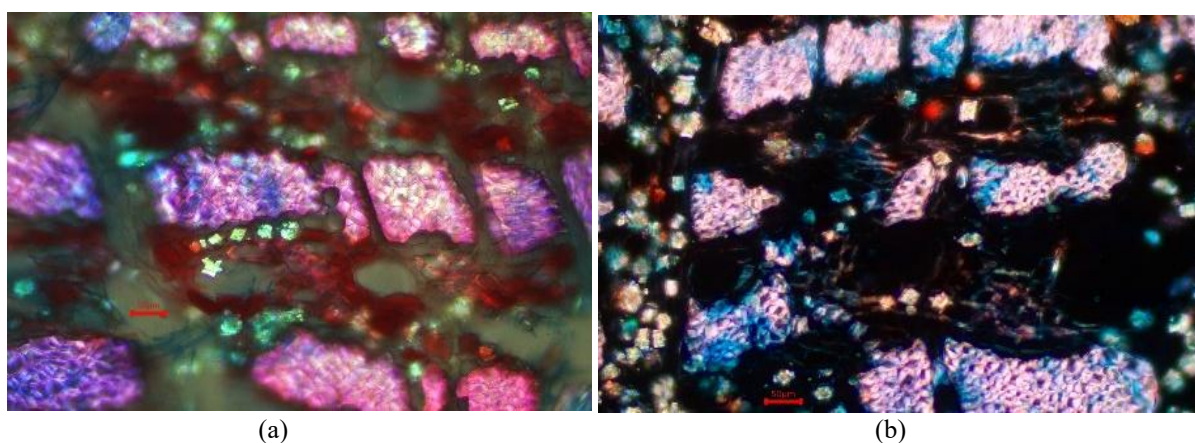


Fig:4 Prismatic calcium oxalate crystals

- 2.2 Stone cells: also known as **sclereids**, are specialized **thick-walled, lignified sclerenchymatous cells**. They possess heavily thickened secondary cell walls with numerous pits and a narrow lumen, providing mechanical strength and protection to plant organs.

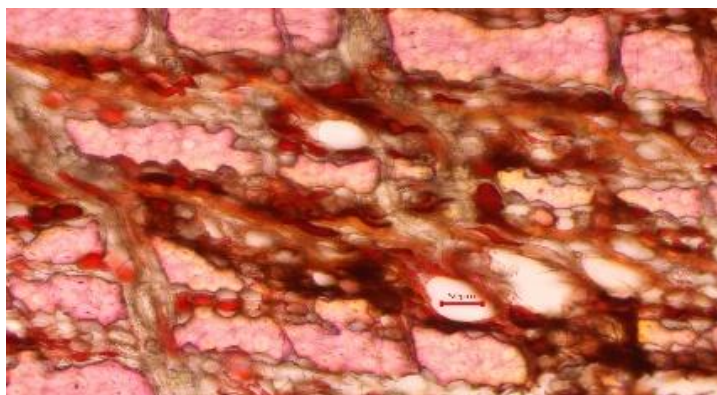


Fig:4 Stone cells

3. **Powder microscopy:** the powder microscopy of the bark of *Kydia calycina* Roxb.. Roxb.. Shows the following parts:

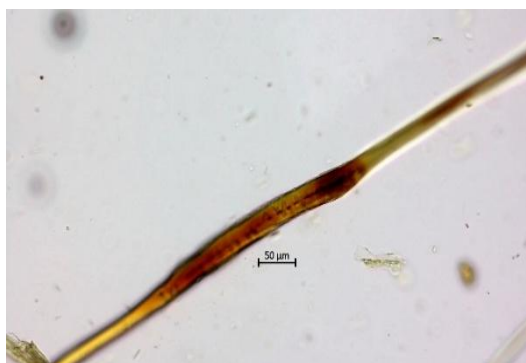


Fig:5 Stone cells



Fig:6 Thick-walled fibre



Fig:7 Fibre bundle



Fig:8 Medullary rays

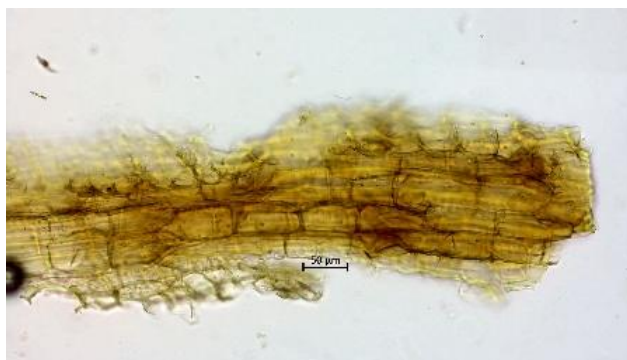


Fig:9 Parenchymatous cells (elongated and rectangular shaped)

4. **Histochemical analysis:** the histochemical analysis was performed in which reagents react with particular biomolecules, producing characteristic colours and the presence and distribution of the following compounds were observed:

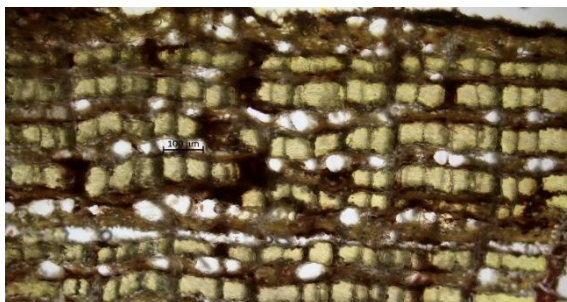


Fig:10 Starch

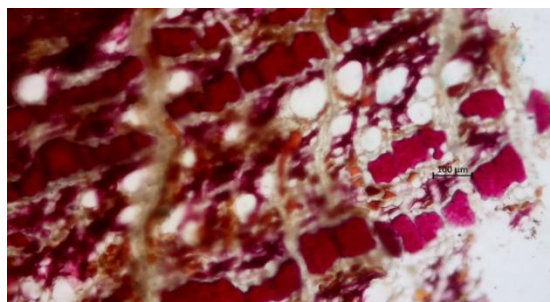


Fig:11 Lignin

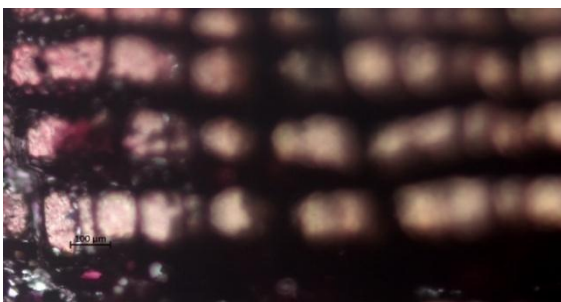


Fig:12 Mucilage



Fig:13 Alkaloid

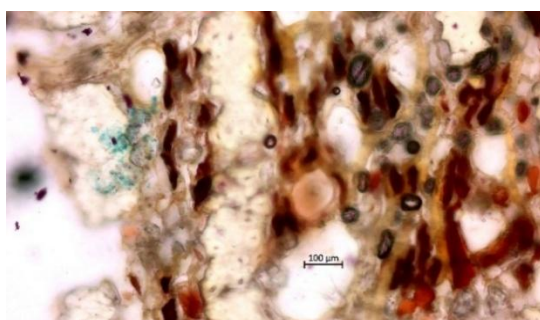


Fig:14 Oil globules

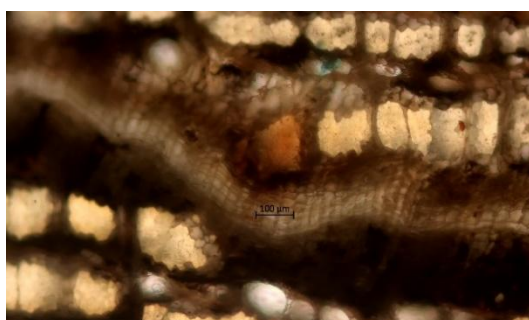


Fig:15 Phenolic compounds

VII. DISCUSSION:

The predominance of fibres, fibre bundles and lignified elements explains the mechanical strength of the bark and supports its traditional use as a source of coarse fibre material. The occurrence of stone cells and calcium oxalate crystals provides diagnostic anatomical markers useful for identification and for distinguishing the material from potential adulterants. The simultaneous presence of mucilage commonly provides wound protection, reduce irritation, and modulate inflammation and water-holding and oils facilitate solubilization and dermal delivery of lipophilic constituents. Detected phenolic compounds contribute to reported activity of Antioxidant, Anti-inflammatory, Cardioprotective and Anticancer.

VIII. CONCLUSION:

The present investigation successfully established a comprehensive pharmacognostic profile of the bark of *Kydia calycina* Roxb., through integrated anatomical, powder microscopy, and histochemical characterization. The anatomical studies revealed distinctive tissue architecture and cellular arrangements that serve as diagnostic markers for botanical authentication.

These systematic pharmacognostic standards not only facilitate accurate identification and prevent adulteration but also establish a scientific foundation for predicting the bark's medicinal efficacy. The evidential data generated through this multi-dimensional approach will serve as essential reference material for pharmaceutical standardization, quality assurance protocols, and future phytochemical and pharmacological investigations of this botanically significant species.

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REFERENCES:

- [1] Kumar Vijay M, Tiwari S, Kahar L, *et al.* Exploring the Versatility of *Kydia calycina* Roxb.: A Comprehensive Review on Utility, Botany, Conservation, and Cultivation

Aspects. Biological Forum-An International Journal. 2024;16(3):14.

- [2] Kumar Goyal P, Jeyabalan G. A COMPREHENSIVE REVIEW ON PHARMACOLOGICAL PROPERTIES OF KYDIA CALYCINA. International Journal of Pharmacognosy [Internet]. 2020;7(7):162–169.
- [3] Matthew O. N, Bala AP, Emmanuel E, *et al.* Macroscopic Evaluation and Clarification of Popular Medicinal Plants in Kabarole, Fort Portal, Uganda. European J Med Plants. 2025;36(6):70–79.
- [4] Asadullaeva ZM, Ishmuratova MY, Atazhanova GA, *et al.* The macroscopic, microscopic and histochemical analyses of aerial parts of *Achillea salicifolia* growing in the Republic of Kazakhstan. Res J Pharm Technol. 2024;17(11):5463–5468.
- [5] Shtein I, Gričar J, Lev-Yadun S, *et al.* Priorities for Bark Anatomical Research: Study Venues and Open Questions. Plants. MDPI; 2023.
- [6] Jagtap T, Koche D. Powder Microscopy, Fluorescence, Qualitative Phytochemistry, and GC- MS analysis of a Neglected Ethnomedicinal Weed - *Ruellia brittoniana* Leonard. Haya: The Saudi Journal of Life Sciences. 2023;8(05):71–77.
- [7] Demarco D. Histochemical analysis of plant secretory structures. Methods in Molecular Biology. Humana Press Inc.; 2017. p. 313–330.