REVIEW ARTICLE

MICROSCOPY TO MEDICINE: A COMPREHENSIVE REVIEW OF *CASSIA AURICULATA* PETALS IN TRADITIONAL AND MODERN HEALTHCARE

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Abstract:

Background: Medicinal plants continue to play a pivotal role in traditional and modern healthcare systems due to their therapeutic potential and cultural relevance. Among them, *Cassia auriculata* L., commonly known as Tanner's Cassia, is widely recognized for its medicinally active yellow petals.

Objective: This review provides a comprehensive pharmacogenetic evaluation of *Cassia auriculata* petals, emphasizing their macroscopic, microscopic, and powder characteristics, while also correlating these features with traditional and pharmacological significance.

Methods: Standard pharmacogenetic procedures were employed, including macroscopic examination, transverse section (TS) microscopy, and powder microscopy, to document diagnostic characteristics of the petals.

Results: Macroscopic analysis confirmed distinct morphological traits such as bright yellow, oblong petals with glabrous surfaces, and a mild astringent taste. Microscopy revealed well-defined epidermal layers, mesophyll tissues, vascular bundles, prismatic crystals, and starch grains. Powder analysis further identified key structures like spiral vessels, papillae, and parenchymatous cells.

Conclusion: The pharmacogenetic findings validate the traditional use of *Cassia auriculata* petals in Ayurveda and Siddha medicine. The presence of therapeutic bioactive like quercetin and kaempferol supports their antioxidant, antihyperglycemic, and anti-inflammatory activities. This profile reinforces the plant's potential for standardization in phytopharmaceutical development and community-based herbal healthcare.

Keyword: *Cassia auriculata*, Microscopy, Phytopharmacology, Herbal Medicine, Ayurveda, Petal Anatomy, Bioactive Compounds.

Introduction:

A vital resource for human health, medicinal plants have historically played a significant role in both traditional and modern therapeutic approaches. These plants are classified according to their biological activities or healing characteristics, and their medicinal benefits are based on the presence of secondary metabolites such as alkaloids, flavonoids, saponins, tannins, and essential oils.[1]

Around 80% of people worldwide are thought to rely on traditional medicine, which is mostly made from plant sources, as their main source of healthcare, especially in low- and middle-income nations where access to conventional medication may be limited [2]. Comparing these plant-based therapies to synthetic medications, they are frequently more accessible, less expensive, and culturally acceptable.

In addition to being important in ethnomedicine, medicinal plants are also important in modern pharmacology. Numerous traditional medications were created either directly from plant substances or with inspiration from them. [3] Furthermore, there is a renewed interest in natural and plant-based medicines due to the rise in chronic illnesses, antibiotic resistance, and pharmacological side effects. A promising source for finding new pharmaceutical compounds with improved biocompatibility and fewer side effects is medicinal plants[4]. Their research encourages biodiversity preservation and sustainable healthcare systems in addition to health innovation.

Therefore, increasing scientific research and global health initiatives requires a thorough understanding of medicinal plants, including their traditional applications, phytochemistry, pharmacological effects, and clinical relevance.

Plant Profile

Cassia auriculata L., often called Tanner's Cassia or "Avaram" in Tamil, is a shrub that grows quickly and is drought-resistant. It is a member of the Fabaceae family. Originating in South Asia, it is found throughout India, Sri Lanka, and Myanmar, especially in arid and semi-arid areas. The plant is frequently found beside roadsides, wastelands, and scrub woodlands and grows well in tropical areas [4]. In traditional medicine, *Cassia auriculata*'s vibrant yellow petals stand out among its many parts due to its powerful healing qualities. The antioxidant, antidiabetic, anti-inflammatory, and antibacterial properties of these petals are attributed to their abundance of flavonoids, tannins, and phenolic substances [5].

Traditionally, petal infusions or decoctions have been utilized in Ayurvedic and Siddha medical systems to treat eye diseases, diabetes, skin conditions, and urinary tract infections[6]**.** According to pharmacological research, the petals' extracts show strong antihyperglycemic and free radical scavenging properties, suggesting that they may be used to treat metabolic diseases [7].

Additionally, the inclusion of bioactive substances, including gallic acid, quercetin, and kaempferol, enhances the petals' medicinal efficacy, making *Cassia auriculata* a promising option for the creation of phyto-pharmaceuticals [8]. The plant also has potential for use in herbal farming in arid zones and community-based health initiatives because of its therapeutic effectiveness and climate adaptability.[9]

Pharmacognostical Studies Materials and Methods

1. **Macroscopy** (PCOG-004-SOP): The External feature of the test sample was documented using a Nikon D-5600 Digital camera.
2. **Microscopy** (PCOG-005-SOP): The Sample was preserved in fixative FAA for more than 48 h. The preserved specimens were cut into thin transverse sections using a sharp blade, and the sections were stained with 0.8% Safranin and 0.5% Astra blue. Transverse sections were photographed using an Axiolab5 trinocular microscope equipped with Zeiss Axiocam208 color digital camera under bright field light. Magnifications were indicated by a scale bar.
3. **Powder Microscopy** (PCOG-006-SOP): A pinch of the powdered sample was mounted on a microscopic slide with a drop of 50% glycerol after clearing with a saturated solution of chloral hydrate. The sample was treated with iodine solution to confirm the presence of starch grains. Characters were observed using a Nikon ECLIPSE E200 trinocular microscope attached with a Zeiss ERc5s digital camera under bright field light. Photomicrographs of diagnostic characters were captured and documented. [10-12]

Results:

1. Macroscopy

Fresh petals are bright yellow coloured, glabrous, oblong to elliptical in shape, measuring 2 to 3 cm long and 1.1 to 1.5 cm wide, unequal in size; with a characteristic odour and slightly astringent taste.

Figure 1: Flowering twig of *Cassia auriculata*

Microscopy

Corolla

Petal Base

TS of lower portion of corolla shows slightly circular shaped with a wavy outline; outer layer is single layered epidermis covered by cuticle; cortex is made up of 3 to 4 layers of parenchyma cells followed by parenchymatous ground tissue embedded with 3 vascular bundles arranged at the centre; xylem elements are arranged towards upper side and phloem towards lower side; some parenchyma

cells and cells of phloem are filled with some cell contents; few prismatic crystals are also found in cortical region.

Petal

TS of petal is flat ribbon shaped with wavy outline; upper and lower epidermii is single layered and covered by thick cuticle; a parenchymatous hypodermal layer is present just below the epidermii followed by 9 to 10 layers of mesophyll tissue formed of loosely arranged spongy parenchymatous cells with intercellular spaces; several small vascular bundles can be seen traversing through the mesophyll tissue; vascular bundles are formed of normal vascular elements; xylem arranged towards upper side and phloem towards lower side; a parenchymatous pericyclic layer covers the entire bundle (Fig. 2).

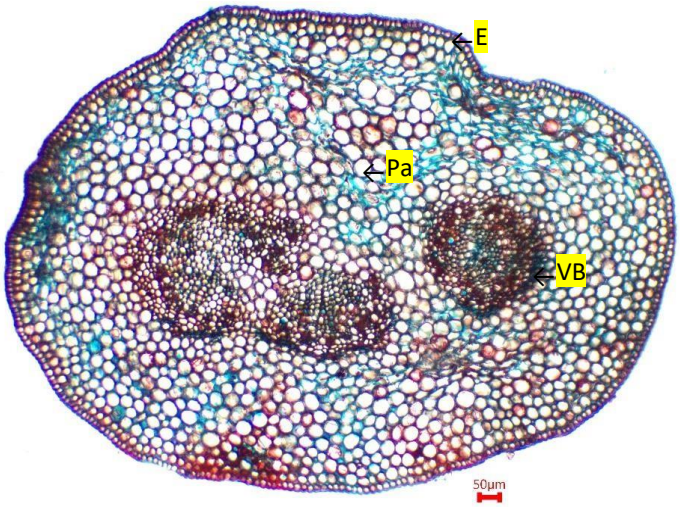


Figure 2: TS of petal base

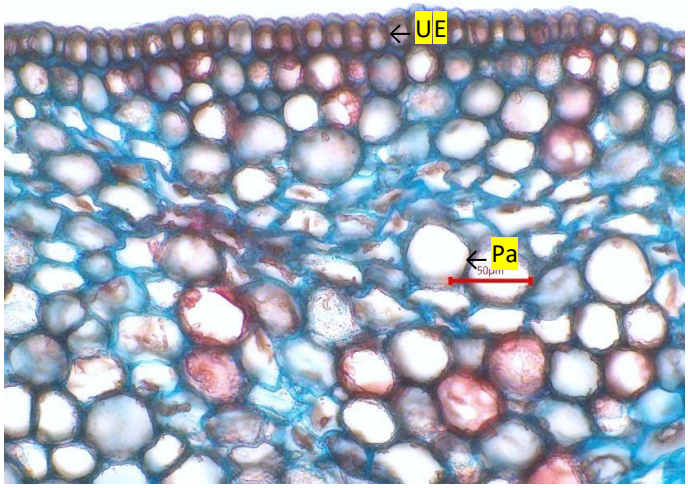


Figure 3. Enlarged upper portion

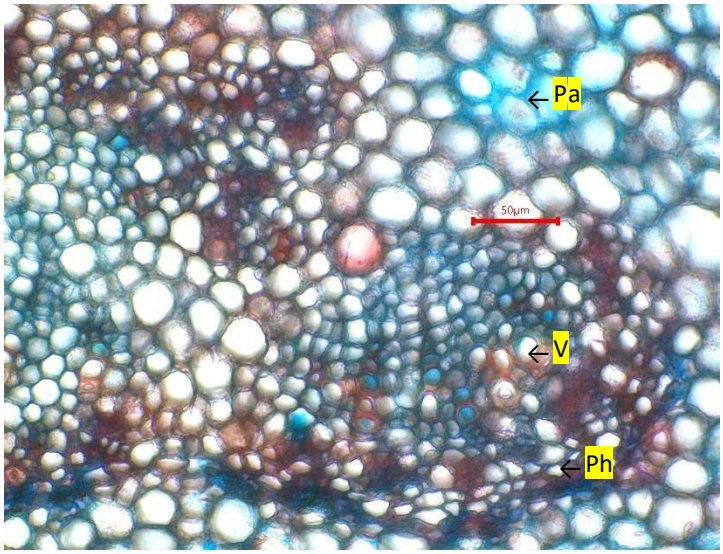


Figure 4: Enlarged vascular portion

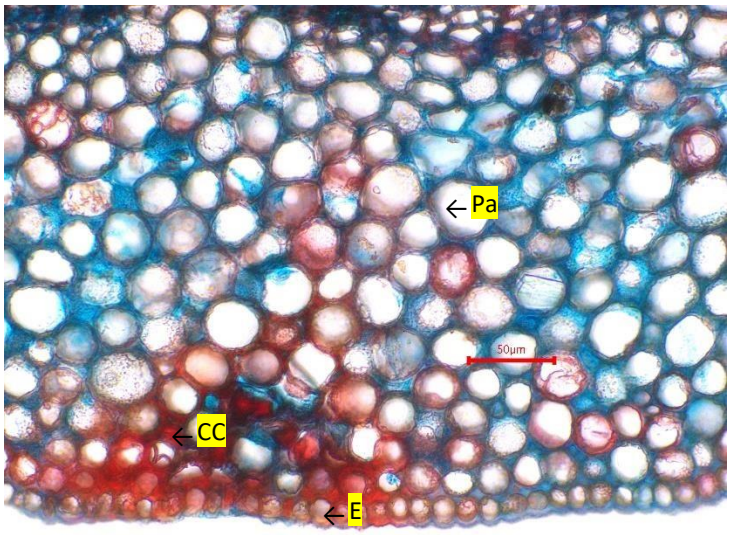


Figure 5: Enlarged lower portion

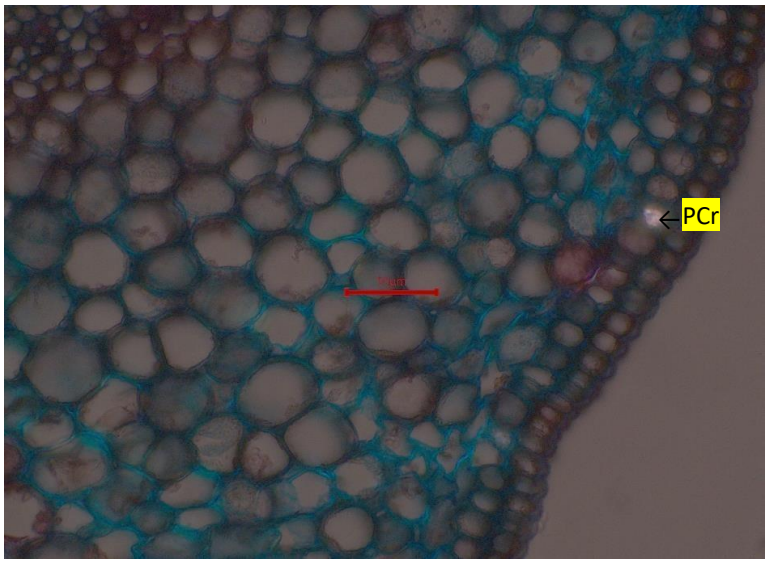


Figure 6. TS under polarizer

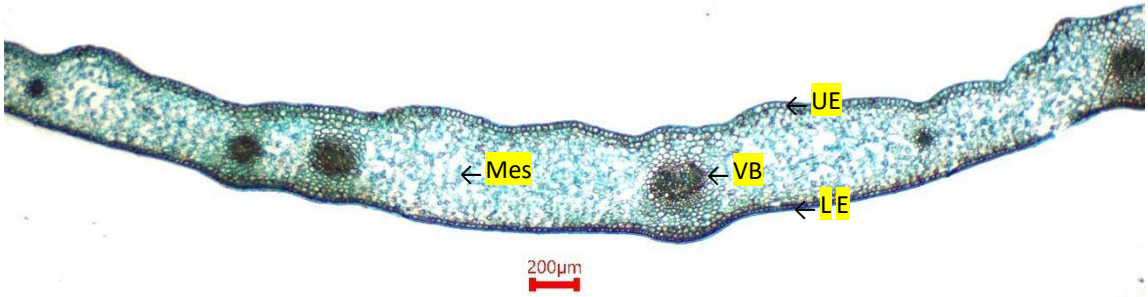


Figure 7: TS of petal

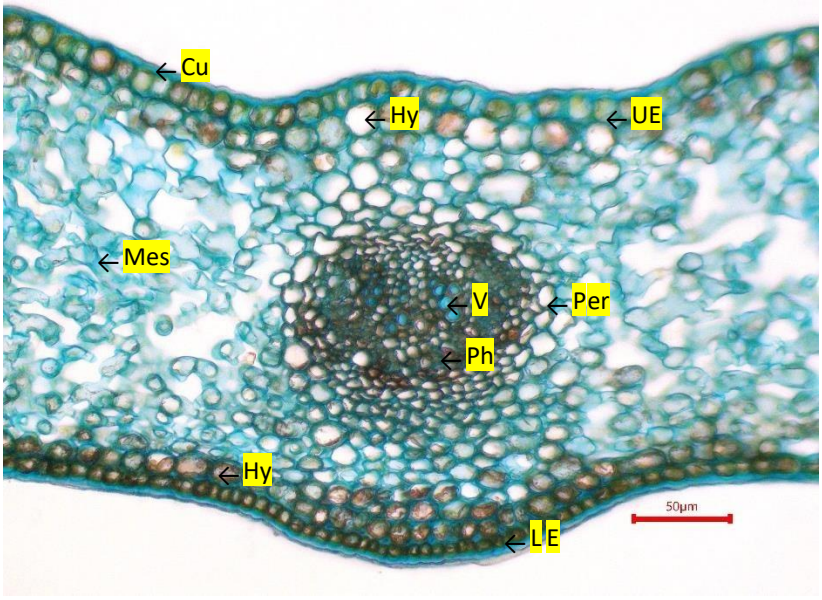


Figure 8: Enlarged view with vascular strand

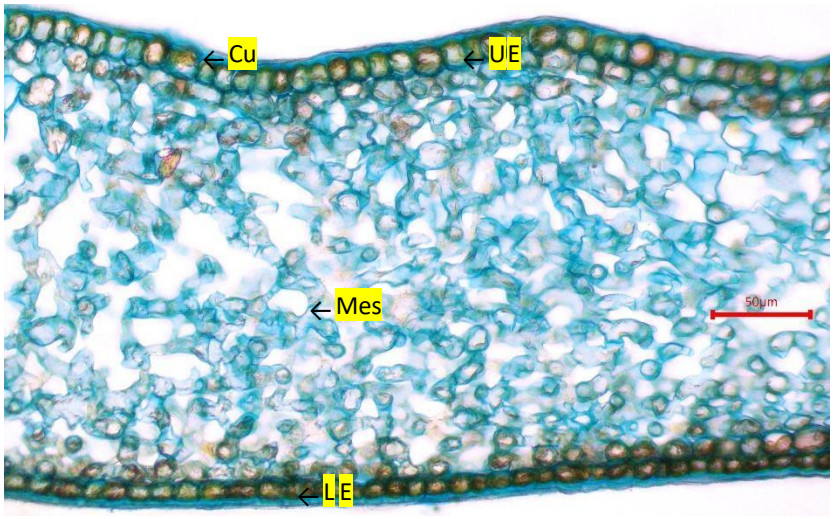
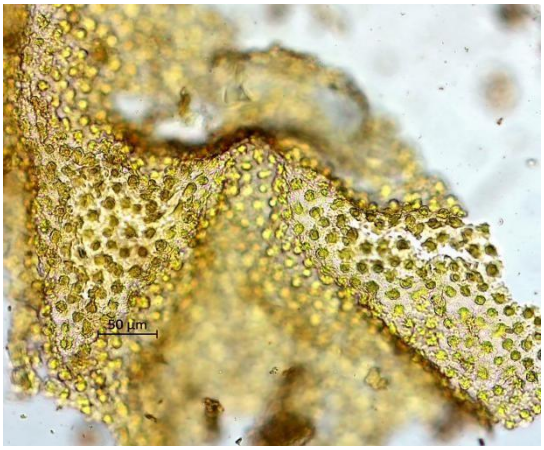


Figure 9: Enlarged view

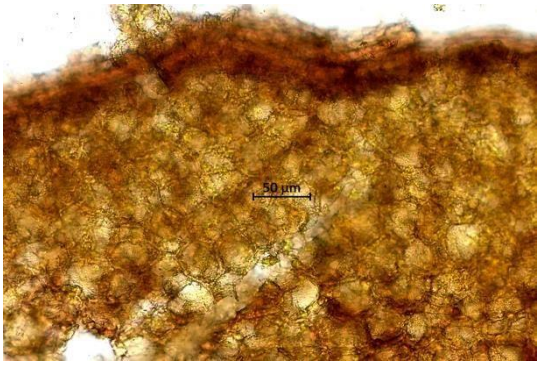
CC - cell contents; **Cu** - cuticle; **E** - epidermis; **LE** - lower epidermis; **Mes** - mesophyll cells; **Pa** - parenchyma; **PCr** - prismatic crystal; **Per** - pericycle; **Ph** - phloem; **UE** - upper epidermis; **V** - vessel; **VB** - vascular bundle

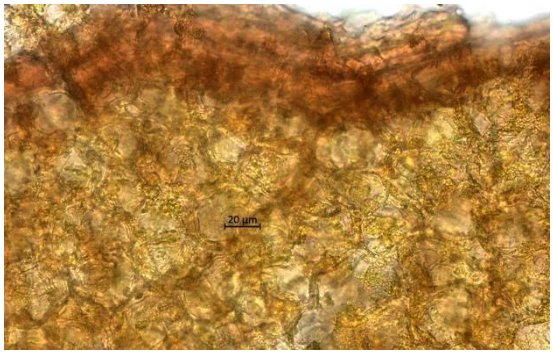
Powder Microscopy

The powder is yellow coloured with characteristic odour and mild astringent taste; it shows the characters like papillae on surface of epidermis, surface view of petal base, surface view of epidermis, mesophyll tissue, parenchyma cells from petal base, vessels with spiral thickening, prismatic crystals, starch grains and cells with contents.

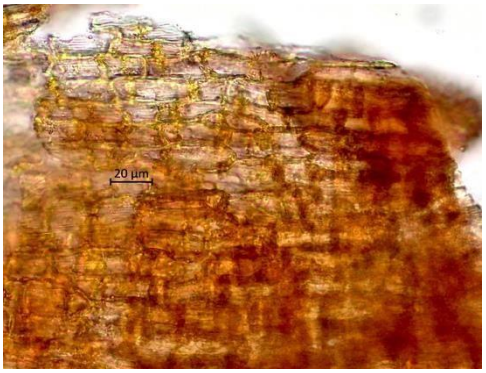


Figures 10, 11: Papillae on surface of epidermis





Figures 12, 13: Sectional view petal base



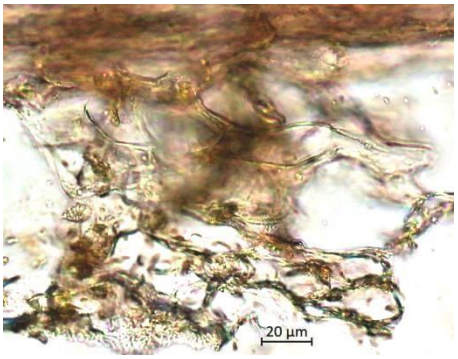
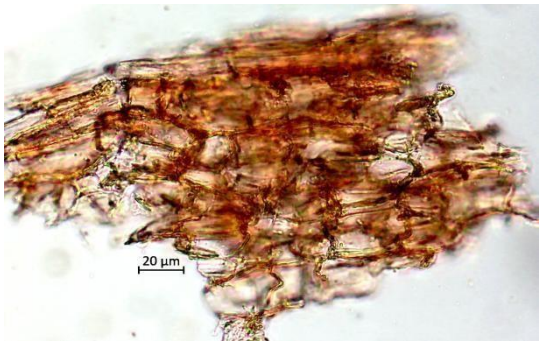
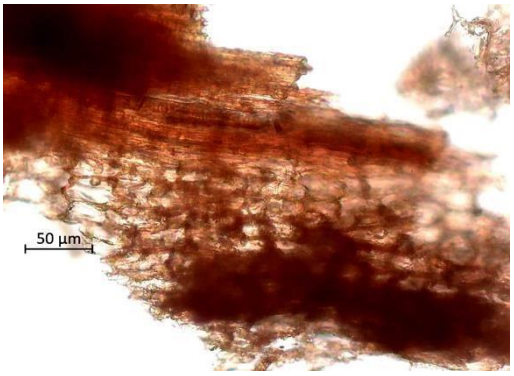
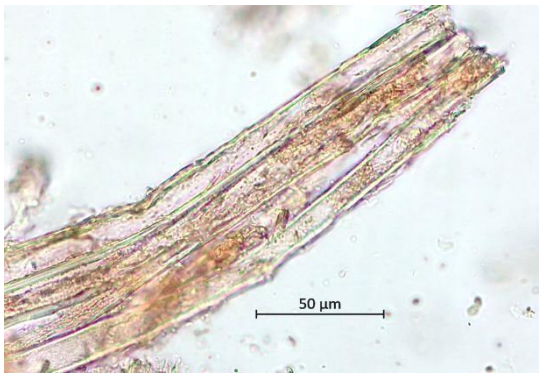


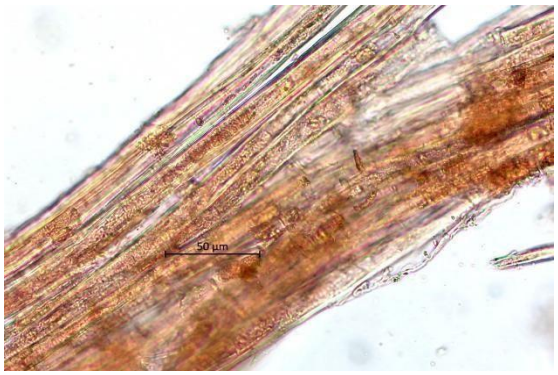
Figure 14: Epidermis in surface view Figure 15: Mesophyll tissue



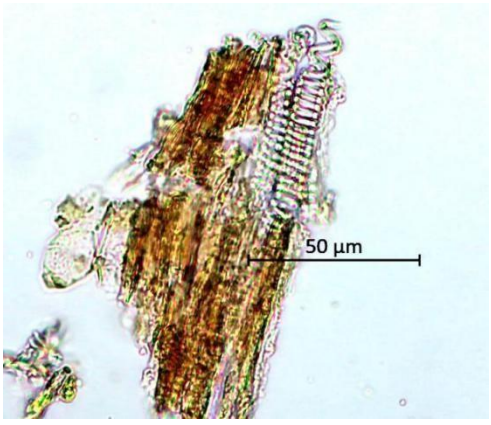


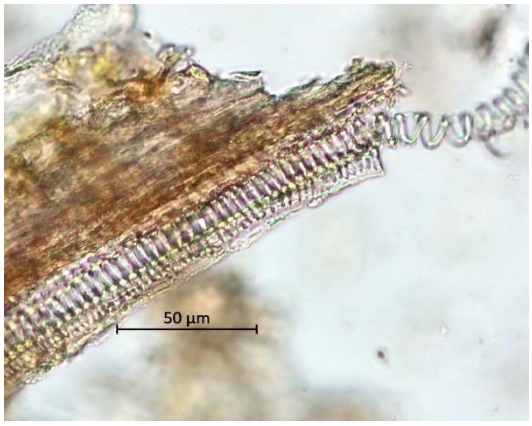
Figures 16, 17: Parenchyma cells from petal base



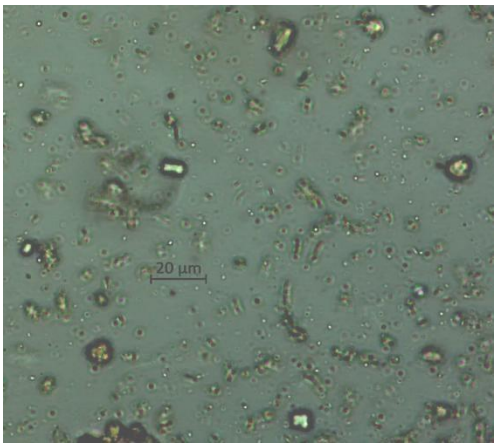


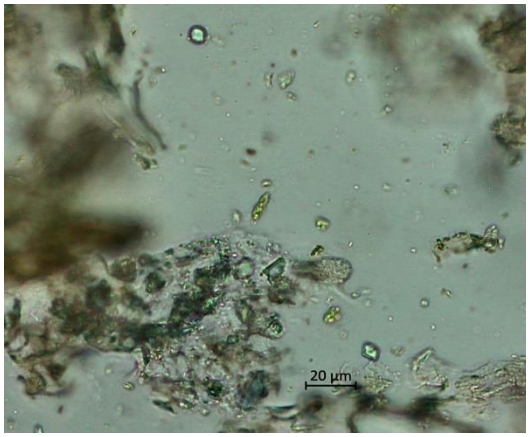
Figures 18, 19: Fiber bundles





Figures 20, 21: Vascular strand with spiral vessels





Figures 22, 23: Prismatic crystals

Figure 24: Starch grains

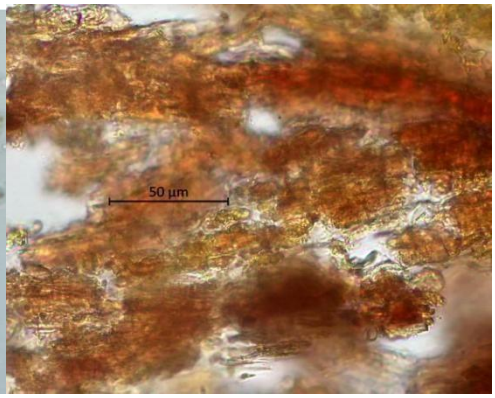


Figure 25: Cells with contents

Discussion:

The current pharmacognostic study of *Cassia auriculata* petals provides important new information on the plant's diagnostic characteristics and supports its acknowledged therapeutic benefits in both conventional and modern medicine.

Macroscopical Examination: It is confirmed by macroscopical analysis that the bright yellow, oblong to elliptical petals have unique shape and organoleptic properties, which can help authenticate crude pharmacological material. Their glabrous texture, somewhat astringent flavor, and distinctive smell are some of these traits that align with those listed in traditional pharmacopeias.

Microscopic Analysis: The diagnostic identification of the petals has been reinforced by microscopical investigation. Vascular bundles oriented dorsiventrally, multilayered mesophyll tissue rich in parenchymatous cells, and a distinct single-layered epidermis coated in a thick layer of cuticle were all visible in transverse sections (TS). The botanical identification is strengthened by the presence of specialized tissues, including starch grains and prismatic crystals, which further support the petals' historic medical use for their nutritional and therapeutic properties. The standardization and quality monitoring of raw materials derived from plants, which is a crucial prerequisite for the creation of phytopharmaceuticals, depend on these anatomical markers.

Powder Microscopy: Important taxonomic characteristics, including mesophyll tissue, spiral vessels, fiber bundles, prismatic crystals, starch grains, and papillae on the epidermis, were discovered via powder microscopy. These results are consistent with previous research that suggested a rich profile of bioactive secondary metabolites, including flavonoids (e.g., quercetin, kaempferol), phenolics, and tannins, are present in *Cassia auriculata* petals. The discovery of these substances is consistent with pharmacological studies showing petal extracts' antiinflammatory, antihyperglycemic, and antioxidant properties, suggesting their use in the treatment of inflammatory and metabolic diseases.

Crucially, the morphological and microscopic characteristics presented in this work support the traditional use of the petals in Siddha and Ayurvedic medicine to treat conditions such urinary tract infections, diabetes, and skin conditions. *Cassia auriculata* is a more credible contender for future medication development and herbal product standardization when thorough pharmacognostical profiling and ethnomedicinal relevance are combined. Because of its pharmacological strength and capacity to thrive in arid environments, the plant also has potential for community-based healthcare programs and sustainable herbal farming, especially in areas with few resources.

Conclusion:

In addition to providing essential diagnostic features for standardization, the pharmacognostic evaluation of *Cassia auriculata* petals described in this paper supports their traditional medicinal application. The presence of flavonoids and phenolic chemicals, which are responsible for the plant's pharmacological actions, is associated with the petals' unique morphological features, which include vascular bundles, prismatic crystals, and mesophyll tissues. In addition to confirming the plant material's botanical identity, these qualities increase its credibility as a source for the production of herbal drugs. The effectiveness, ecological adaptability, and cultural acceptance of *Cassia auriculata* make it a compelling candidate for inclusion in phytopharmaceutical research and sustainable healthcare programs. Its clinical effectiveness and bioactive chemicals need more research before this plant can be properly included in evidence-based medicine.

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