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Research Article

Exploring The Pharmacognostical Attributes Of *Barleria Cristata*: A Comprehensive Study

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ABSTRACT

Barleria cristata, known as Philippine violet, has been traditionally used for medicinal purposes in Southeast Asia. However, scientific studies on its stem are lacking. The purpose of this study was to contribute to the medical and pharmaceutical potential of Barleria cristata by providing a through pharmacognostical evaluation of the plant. Barleria cristata stem sections were gathered, verified, and thoroughly examined under a microscope, and physicochemical analyzer. Identification was aided by the exterior morphology and tissue architecture that were revealed by macroscopic and microscopic investigations. Standard procedures were followed to determine the physicochemical characteristics, which included moisture content, ash values, extractive values, and Swelling index. Important information about the morphological, microscopic, and physicochemical properties of Barleria cristata stem was obtained from the pharmacognostical evaluation. These details can be used as quality control parameters for the stem's authentication, standardization, and quality assurance in pharmaceutical formulations and herbal medicine. The existence of a variety of phytoconstituents points to possible medicinal uses, necessitating more research into the pharmacological actions and formulation creation of this substance. Conclusively, our pharmacognostical investigation advances our comprehension of the botanical identification of Barleria cristata stem and establishes the foundation for its application in phytotherapy and medication development. Further research focusing on the isolation, identification, and biological activites of bioactive compounds from the stem is recommended in order to fully exploit the therapeutic potential of the stem.

INTRODUCTION

Herbal, botanical, or phytomedicine refers to the use of plants or plant extracts for therapeutic purposes. This kind of medicine has long been a vital part of human culture and healthcare systems, dating back thousands of years before modern

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medications [1]. Herbal medicine has long been used for therapeutic purposes in many historical societies, such as Native American healing techniques, traditional Chinese medicine, Indian Ayurveda, and the medical systems of the ancient Greeks and Egyptians. After discovering that some plants had medicinal properties, these societies developed intricate systems of herbal medicine to treat a variety of ailments [2]. Herbal medicine employs a vast range of plants, each with a unique chemical composition and potential health advantages [3]. In addition, a lot of people like how gentle it is and how much less likely it is to have negative effects than other traditional treatments. Despite the lengthy history of use of herbal medicine, it is important to use caution and seek the advice of experienced practitioners before using it. Herbal therapies may not be appropriate for everyone and may interfere with medicines, just like any other type of medicine [4]. Additionally, there is a wide range of scientific evidence about the safety and efficacy of particular herbal medicines, which emphasizes the need for more study and regulation in this area [5]. Known by most as the Philippine violet, Barleria cristata is a species of flowering plant endemic to Southeast Asia, specifically found in the Philippines, Malaysia, Indonesia, India, and Sri Lanka. It belongs to the family of flowering plants known as Acanthaceae, which comprises a wide variety of tropical and subtropical species. Herbal therapy has traditionally used Barleria cristata for a very long time. Traditional medicine uses parts of the plant, such as the leaves, stems, and roots, to treat a variety of illnesses. For example, Barleria cristata is used to treat skin conditions, respiratory infections, and digestive problems in traditional Ayurvedic medicine because it is said to have anti-inflammatory, antibacterial, and analgesic qualities. [6]

MATERIALS AND METHODS:

Collection and Authentication:

The plant of Barleria cristata was collected from Neyveli, cuddalore district, Tamil Nadu during winter of November, 2023. The plant material was identified and authenticated as Barleria cristata (certificate NO. 722.18012401) by Dr. K.N. Sunil kumar R.O and HOD pharmacognosy, central Sidhha Research Institute, Government of India, Arumbakkam, Chennai-106. The fresh stems were used for the macroscopic and microscopic characters and histochemical studies.

Processing of raw material:

The gathered plant material underwent a thorough cleaning. Plants were dried for about a week in the shade. After it had completely dried, it was ground into coarse powder and sieved number 10. It was then kept in an airtight container and utilized to analyze Physico-chemical characteristics and Powder microscopy.

PHARMACOGNOSTICAL STUDIES

Macroscopy:

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

Microscopy:

The sample was kept for longer than 48 hours in fixative FAA. Using a sharp knife, thin transverse sections of the preserved specimens were cut, and the sections were dyed with 0.8% Safranin and 0.5% Astra Blue. Under bright field light, transverse slices were captured on camera using an Axiolab5 trinocular microscope coupled to a Zeiss Axiocam208 colour digital camera. A scale bar was used to show magnifications.

Powder microscopy:

Once the powdered sample had been cleared with a saturated solution of chloral hydrate, a pinch was placed on a tiny slide using a drop of 50% glycerol. To verify that there were starch grains present, the sample was treated with an iodine solution. Under bright field light, characters were seen with a Nikon ECLIPSE E200 trinocular microscope attached to a Zeiss ERc5s digital camera.

Diagnostic character photomicrographs were taken and recorded.

Histochemical tests:

Plant sections were treated following the standard procedures:

1. **Crystals:**

Acetic acid was used to irrigate one end of the cover slip while the portion was submerged in water. Using a piece of filter paper at the other end of the cover slip, the water within was replenished while the microscope was being used. If no air bubbles developed, the experiment was repeated with concentrated HCl, and the presence of calcium oxalate crystal was indicated by the development of needle shaped calcium sulphate and the dissolution of crystals.

2. **Fats, Fatty oils volatile oils and resins:**

After adding one or two drops of Sudan-IV, the area was left to stand for a little while. Orange-red, pink, or red coloured globules indicated the presence of fatty oil components; red-hued irregular contents suggested resin.

3. **Starch:**

A drop of 2% iodine water solution was added - blue colour indicated starch.

4. **Phenolic compounds:**

A drop of alcoholic ferric chloride was added - bluish black coloured contents indicated phenolic compounds like flavonoids/ tannins etc

5. **Mucilage:**

A drop of ruthenium red was added - pink to red coloured contents indicated mucilage.

6. **Lignified cell walls:**

A drop of phloroglucinol was added to the section and allowed to stand for about 2 min or until almost dry. A drop of 50% HCl was added and observed over a cover-glass - cell walls-stained pink to cherry red indicating presence of lignin.

7. **Suberized or cuticular cell walls:**

A drop of Sudan red III added, and the cell walls turned orange-red or crimson, indicating the deposition of Suberin or cutin over the cell wall. The mixture was then let to stand for a few minutes, gently warmed if needed.

8. **Alkaloids:**

A drop of Wagner's reagent was added - the presence of yellow to reddish brown coloured contents confirmed alkaloids [7-10].

9. **Physico-chemical Analysis**

Ash value, Extractive value, Loss on drying, Swelling index, Foaming index and Crude fiber content were among the Physico-chemical parameters that were measured in accordance with the official protocol and the WHO standards on quality control procedures for medicinal plant materials [11-15].

RESULTS AND DISCUSSION

Macroscopical characteristics

Colour:

Green to Brown.

Taste :

Bitter, astringent or slightly pungent flavours

Odour :

Mild

Size :

about 1-3 feet tall, diameter 0.5-2 cm

Shape :

Slender, slightly ribbed or grooved, erect and cylindrical.

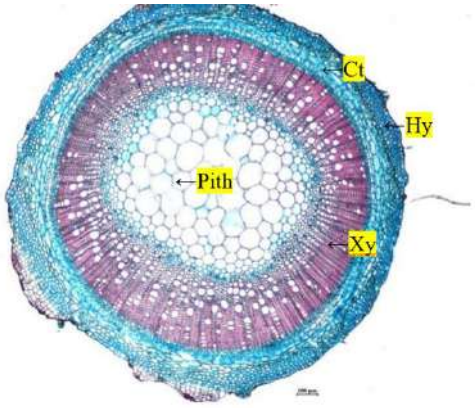
Description :

Stem is typically erect and cylindrical in shape. It is often slender and may have some branching as it grows taller. It is slightly ribbed or grooved especially when young. As the plant matures, the stems become woody at the base while remaining relatively flexible towards the top.

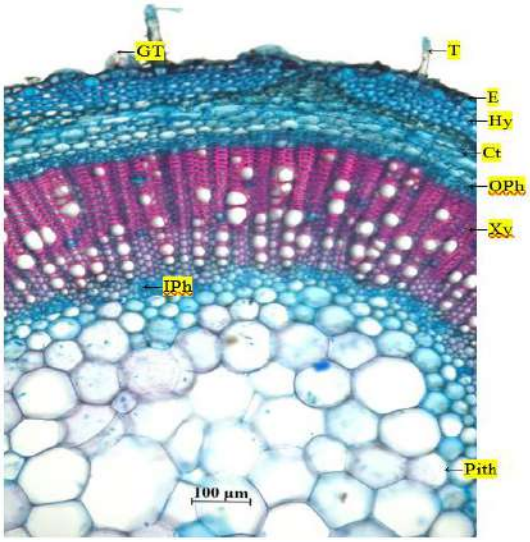
Figure 1: Macroscopy of Barleria cristata stem

Microscopical characteristics

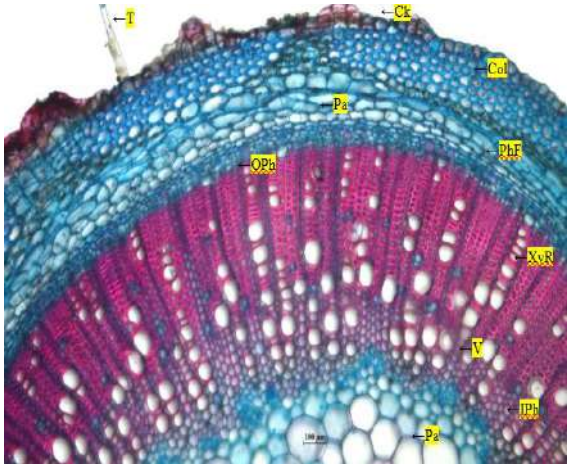
TS of stem is nearly circular shaped; outer layer is single layered epidermis covered by cuticle and bears several simple, multicellular covering trichomes and few glandular trichomes; cork layer formation can be seen in some places of epidermal layer; 5 to 6 layers of collenchymatous hypodermis is present followed by 2 to 3 layers of parenchymatous cortex; a ring of vascular bundle is present in the inner cortex; xylem is well developed with vessels, fiber, parenchyma, and xylem rays; phloem surrounds both sides of xylem; outer phloem found in more layers compared to inner phloem; few phloem fibers can be clearly seen in outer phloem; central portion of the section is occupied by parenchymatous pith with abundant of acicular crystals.



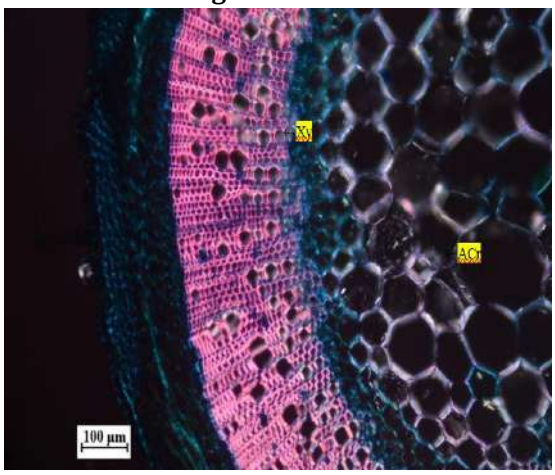
Diagrammatic TS of stem



Detailed TS of stem



Enlarged view of stem



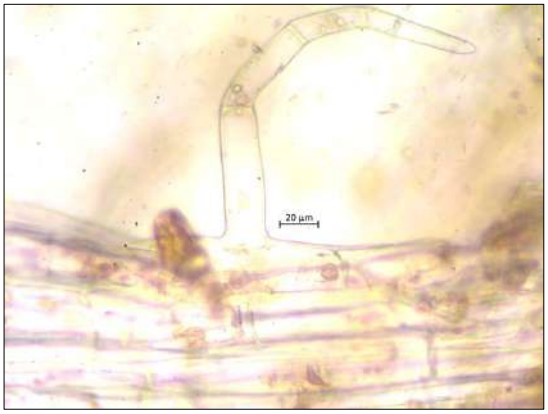
TS of stem under Polarized field

ACr - acicular crystals; Ck - cork; Col - collenchyma; E - epidermis; GrT - ground tissue; GT - glandular trichome; Hy - hypodermis; IPh - inner phloem; OPh - outer phloem; Pa -

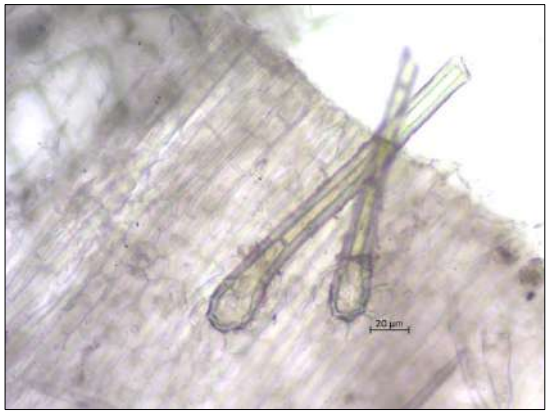
parenchyma; Ph - phloem; T - Trichome: V - vessel; VB - vascular bundle; Xy - xylem; XyR - xylem ray

Powder microscopy

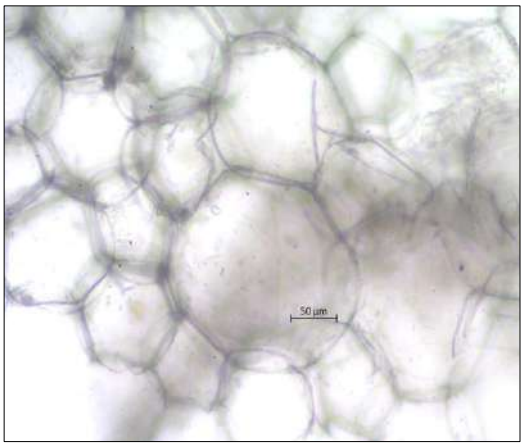
The powder sample is dark green in colour with characteristic odour and tasteless; it shows the characters like simple covering trichomes, glandular trichomes, surface view of upper epidermis, surface view of lower epidermis with diacytic stomata, palisade cells, stem epidermis with multicellular trichomes, cortical parenchyma cells, vessels with simple and bordered pitted, reticulate, and spiral thickenings, acicular crystals from stem, starch grains and cell contents.



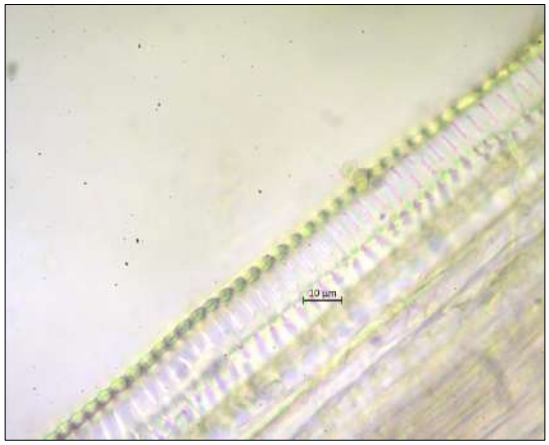
Stem epidermis with multicellular trichome



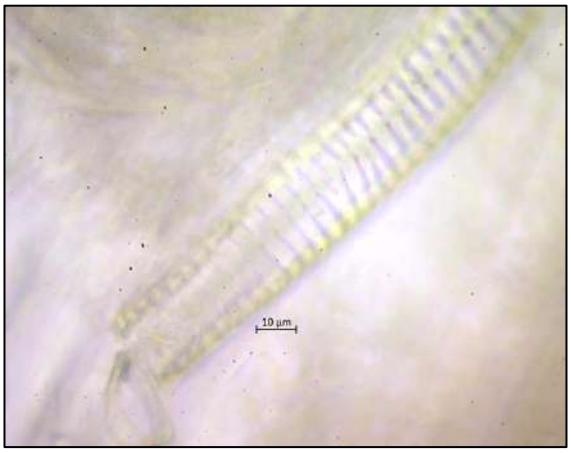
Epidermis with stomata from stem



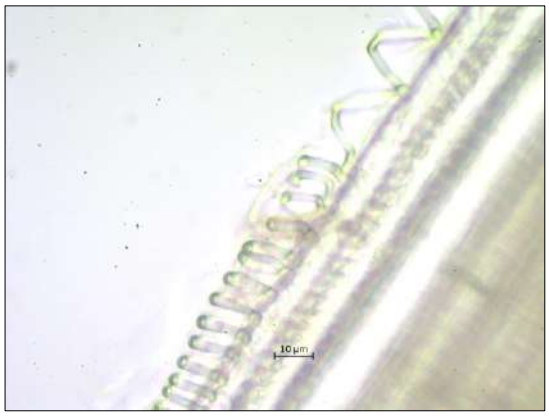
Cortical parenchyma cells



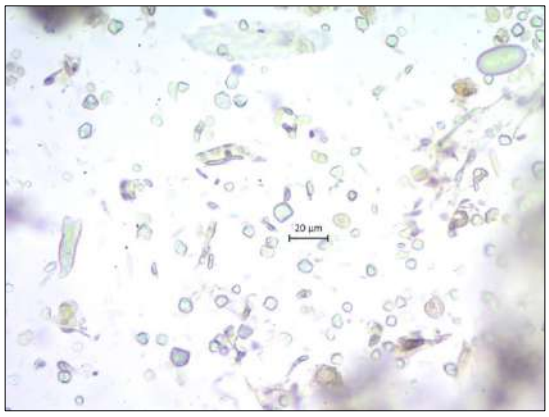
Pitted vessel



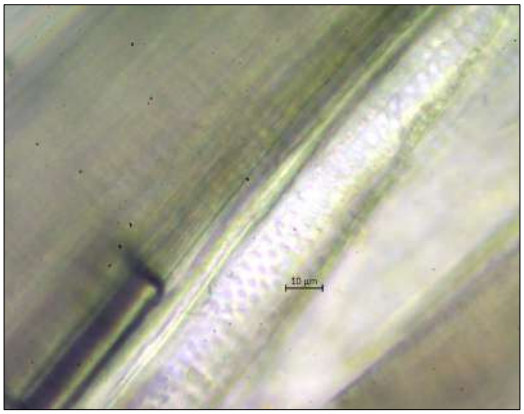
Reticulate Vessel



Spiral vessels



Starch grains



Bordered pitted vessel

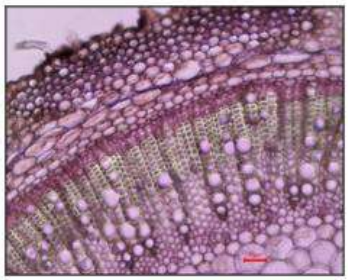
Cells with contents

Acicular crystals from stem

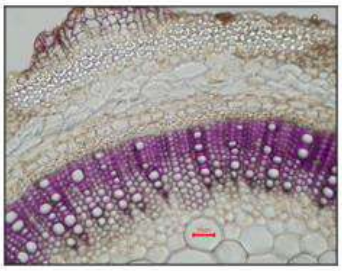
Histochemistry

Stem

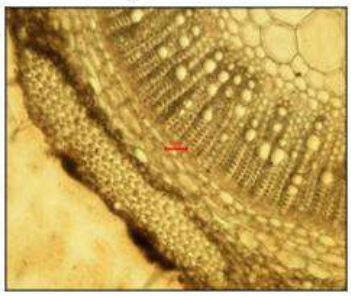
Cutin present on epidermis; alkaloids observed in phloem region; phenolic compounds found in cortex and vascular region; lignin detected in xylem; resin contents present in outer and inner cortical region; acicular crystals observed in pith parenchyma; mucilage absents in stem.



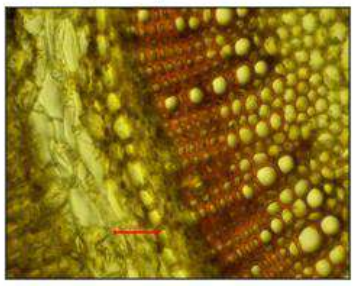
Mucilage absent



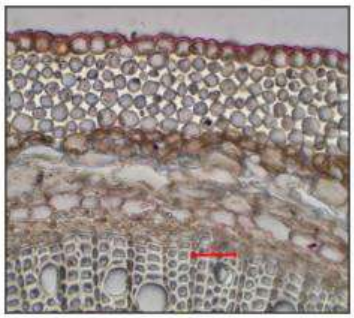
Lignified xylem elements



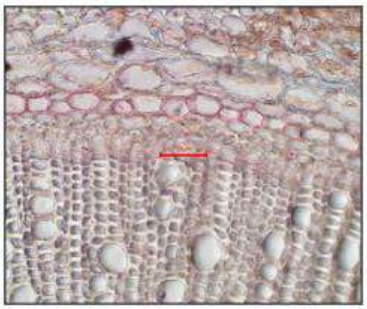
Phenol content in cortex and vascular region



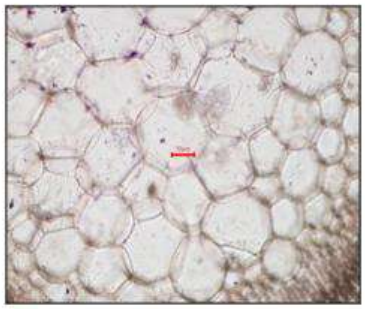
Alkaloid content in Phloem region



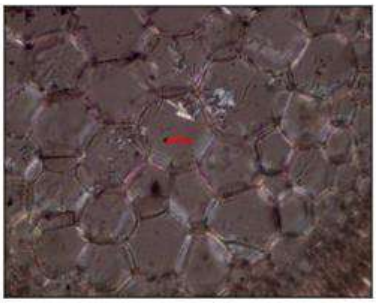
Thick cutin epidermis



Thin resin like content in outer and inner cortex



Acicular crystals of calcium oxalate



Acicular crystals of calcium oxalate under polarizer light

Physico-chemical constant

Sr. No	Physicochemical Constant	Results (%W/W)
I Ash Value		
1	Total ash	15.13 ± 0.15
2	Acid insoluble ash	8.03 ± 0.5
3	Water soluble ash	4.07 ± 0.5
4	Sulphated ash	10.23 ± 0.15
II Extractive Value		

1	Water soluble extractive	12 ± 0.6
2	Alcohol soluble extractive	10.35 ± 0.55
III	LOSS ON DRYING	1.4 ± 0.6
IV	FOAMING INDEX	<100
V	SWELLING INDEX	Absence of mucilage
VI	FOREIGN ORGANIC MATTER	1% w/w
VII	CRUDE FIBRE CONTENT	29± 0.12

CONCLUSION

The botanical, macroscopic, microscopic, and physico-chemical characteristics of Barleria cristata have all been thoroughly understood thanks to our extensive pharmacognostical study. We have carefully examined each specimen to determine the essential physical characteristics that set Barleria cristata apart from other species, making identification of the species easier. Its authenticity was aided by the microscopic examination, which disclosed complex cellular structures and diagnostic characteristics. Furthermore, the study's examination of our physico-chemical parameters offers insightful information about the composition and quality of Barleria cristata, a plant with therapeutic qualities. Important features including total ash, extractive values, and other pertinent factors have been clarified. The results of this study lay the groundwork for future investigations into the pharmacological characteristics and formulation of treatments based on Barleria cristata, ultimately encouraging the plant's long-term use in medical procedures.

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