CHAPTER-31

ANATOMICAL AND PHYTOCHEMICAL CHARACTERISATION OF *CAESULIA AXILLARIS R.*

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Summary

An anatomical and phytochemical investigation of the species *Caesulia* of the family Asteraceae situated in the Akola region was carried out. The species was collected from the Akola region and identified with the help of flora. An anatomical and phytochemical study of vegetative parts such as root, stem, and leaf was conducted. Anatomical characteristics such as quadrangular stem , in which cork cambium is observed. In leaf anatomy trichomes are observed. In root, the fleshy tap root is observed and the endodermis of the root has thickened walls these both are the characteristic of Asteraceae family. These anatomical characteristics are important for systematic studies. Anatomical studies also reveal adaptations to environmental conditions, such as drought or salinity. Anatomical and phytochemical studies inform the development of herbal medicines and pharmaceuticals. Phytochemicals can be used as biomarkers for monitoring and monitoring environmental pollution. The phytochemical analysis of plants is very important commercially, and pharmaceutical companies are greatly interested in the production of new drugs for curing various diseases. Medicinal plants of the Asteraceae family have many bioactive compounds which are used for curing various human diseases and also play an important role in healing. Hence the anatomical study of the root, stem and leaf and the aqueous extract of the root, stem and leaf powder of *Caesulia* have been screened for qualitative determination of different secondary metabolites like glycoside, alkaloids, flavonoids, tannins, reducing sugar, saponin and terpenoids etc. The phytochemicals which are present in *Caesulia axilllaris* are carbohydrates, proteins, glycosides, cardiac glycosides, quinones, steroids, alkaloids, flavonoids, phenols, saponin, lignins, and terpenoids. The phytochemicals are uses in herbal medicines, traditional chinese medicines and and as lead compounds in the development of new medicines. They have anti-

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inflammatory, anti-microbial and anti-viral, anti -cancer properties. The *Caesulia axillaris* is used by tribal people to treat respiratory diseases and to cure various skin problems.

Keyword: Anatomy, Phytochemistry, Bioactive Compounds, Asteraceae, Medicinal plants, Traditional Medicine.

Introduction

Caesulia axillaris, R., a member of the family Asteraceae, is the only species of the genus *Caesulia,* Roxb. Its common name is the pink node flower. It is native to tropical regions of Asia particularly in countries like Bangladesh, Burma, India, Nepal, and Sri Lanka. It is a common marshy herb found throughout the greater part of this country in swamps, on the margin of lakes and streams, and wet meadows. It may grow on wet land or float in water bodies. It grows in rice paddies in some areas, but it is usually not weedy. It is well-adapted to its wetland environment .Recent scientific investigations have unveiled a plethora of bioactive compounds in *C. axillaris*, contributing to its pharmacological properties. Its structural characteristics, such as the erect and branched stems, allow it to thrive in areas prone to flooding, while its axillary flowers ensure effective pollination even in dense vegetation (Naidu 2012). The plant's fruit, designed for wind dispersal, ensures its propagation across a wide area, maintaining its presence in suitable habitats. The presence of *C. axillaris* in wetland ecosystems provides habitat and food for various insects, including pollinators like bees and butterflies, and supports the overall health of the wetland environment by stabilising soil and assisting in water purification processes (Matthew 2004).

Medicinal uses

C. axillaris is a plant with a long history of use in traditional medicine across its native range in tropical Asia. Traditional healers have utilised various parts of the plant to treat a variety of ailments, often relying on indigenous knowledge passed down through generations. The leaves and stems are often used to reduce fever (Shrivastava and Jain 2014). Traditional practitioners prepare decoctions or infusions from these parts to help bring down high body temperatures. Poultices made from the leaves are applied to inflamed areas, helping to reduce swelling and pain. Extracts from *C. axillaris* are used to alleviate digestive problems such as stomach aches, dysentery, and diarrhoea (Shrivastava and Jain 2014; Arya et al. 2022). The plant's compounds are believed to have soothing effects on the gastrointestinal tract. In some traditions, the plant is used to stimulate appetite and improve digestion, promoting overall gastrointestinal health. The plant is also used in the treatment of respiratory conditions like coughs and colds (Shrivastava and Jain 2014). Infusions made from the leaves are taken orally to help relieve symptoms and support respiratory health. Some traditional uses include employing the plant's extracts as an expectorant to help clear mucus from the respiratory tract. The leaves are applied to wounds and cuts to promote

healing (Naidu et al. 2005; Suntar 2014; Arya et al. 2022). The plant's antiseptic properties help prevent infections and support the healing process. Traditional medicine also uses the plant to treat skin conditions such as dermatitis. Topical applications of the leaf extracts can help soothe irritated skin (Natarajan and Paulsen 2000; Suntar 2014). The plant is sometimes used for its analgesic properties to relieve pain. Poultices and infusions are employed to manage pain from various sources, including headaches and joint pain (Kumar 2015).

Materials and Methods

Plant material of *C.axillaris* is collected from the Akola region of Maharashtra. The material such as root, stem and leaf anatomy as well as it is allowed to shed dry and make fine powder before using its extraction for further phytochemical investigation.

Fig. 1: *Caesulia axillaris* habitat and habit

Caesulia axillaris taxonomic classification.

Kingdom :	Plantae
Unranked :	Angiosperms
Subclass :	Asteridae
Order:	Asterales
Family :	Asteraceae
Genus :	*Caesulia*
Species :	*axillaris*

Anatomical study

The collected plant material, such as roots, stems, and leaves, is stored properly to avoid dehydration. Sections of root, stem, and leaf were taken with the help of razors and needles. After that, staining, mounting, permanent slide

preparation, and microscopic examination of the material were done (Fahn, 1989 and Rudall, 2007).

Phytochemical screening

The shade-dried plant material was ground into a fine powder for preliminary phytochemical analysis. The extracts were filtered into pre-weighed beakers. The prepared crude aqueous, methanolic and chloroform extract of the root, stem and leaf of the plant was tested for the presence or absence of reducing sugar, tannins, flavonoids, saponins, steroids, alkaloids etc. by using standard phytochemical procedures (Koche et al., 2010).

Observations and Results

Anatomy of Root

The following anatomical structure is prominently showing mature root.

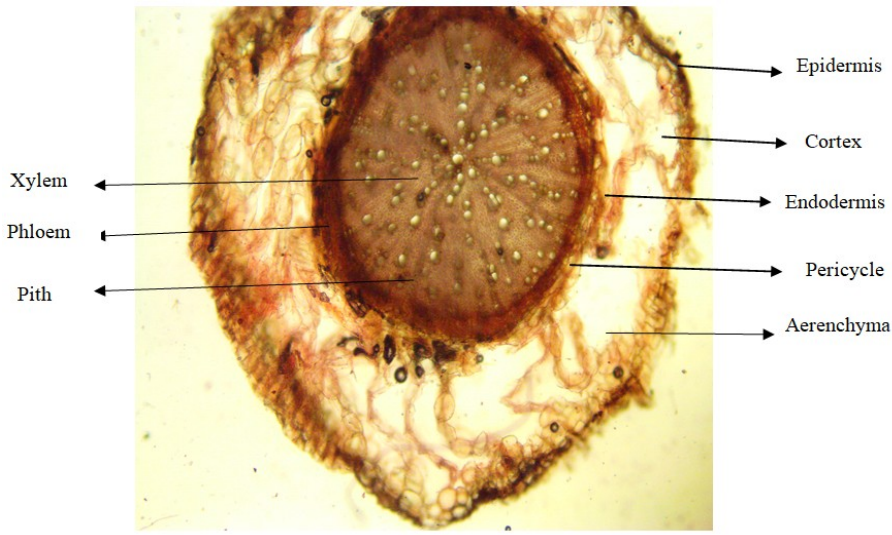

Fig. 2 T. S. of Root of *C. axillaris*

Epidermis : The epidermis is single layered and loosely arranged. The epideral cells are oval in shape .Epidermal hairs also seen .

Cortex: The cortex is followed by epidermis. It is relatively wide. The cortex is composed of aerenchyma cells, which are thin-walled and have intercellular spaces.This special adaptation of cortical region is supporting its marshy habitat.

Endodermis: The endodermis is not distinct and forms a boundary between the cortex and the stele. Endodermal cells are barrel shaped and arranged compactly , thick walled, often with Casparian strips.

Pericycle: Pericycle layer is 3 to 4 layer thick and having two type of cells – parenchyma and sclerenchyma. The pericycle forms a ring around the vascular bundles.

Vascular Tissue: In the centre vascular cylinder , which is developed by the secondary growth activity of vascular cambium. It prominently reveals large cylinder of secondary xylem with dispersed vessels. Secondary phloem tissue is seen above the xylem cylinder.

Pith: The pith is comparatively smaller in roots.

Anatomy of Stem

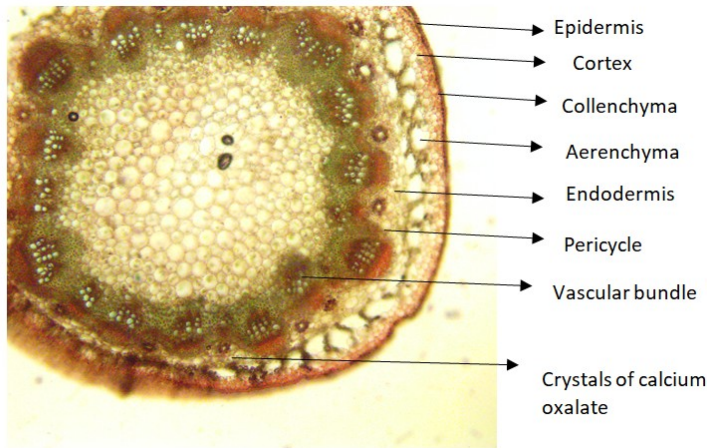

Fig. 3: T. S. of Stem *C. axillaris*

Epidermis: The epidermis is composed of a single layered and compactly arranged. Epidermal cells are circular in shape.The epidermis is covered with trichomes (hairs).

Cortex: The cortex is relatively wide and followed by epidermis. The cortex is divided into outer and inner cortex. Outer cortex is composed of compactly arranged collenchymatous cells. While it is followed by aerenchyma which consists of air chambers mostly round in shape.

Endodermis: The endodermis is distinct and forms a clear boundary between the cortex and the stele. Endodermal cells are oval shaped and arranged compactly.

Vascular Bundle: Vascular bundles are arranged in a ring. Large and small vascular bundles are arranged in alternate fashion. Each vascular bundle is having sclerenchyma cap .Vasular bundle are conjoint ,collateral and open. Each vascular bundle consists phloem, cambium and xylem , xylem tissue consists of meta xylem and proto xylem .A vascular cambium ring is observed in some matured stems.

Table 1: Qualitative Phytochemical screening of *Caesulia axillaris*.

Sr. No.	Chemical constituents	Root	Stem	Leaf	Root	Stem	Leaf	Root	Stem	Leaf
		Aqueous			Methanol			Chloroform		
1.	Test for Reducing sugars	+	+	+	+	+	+	+	+	+
2.	Test for Proteins	+	+	+	+	+	+	+	+	+
3.	Test for Anthraquinones	+	+	+	+	+	+	+	+	+
4.	Test for Cardiac Glycosides	+	+	+	+	+	+	+	+	+
5.	Test for Coumarins	+	+	+	+	+	+	+	+	+
6.	Test for Quinones	+	+	+	+	+	+	+	+	+
7.	Test for Steroids	+	+	+	+	+	+	+	+	+
8.	Test for Alkaloids	+	+	+	+	+	+	+	+	+
9.	Test for flovonoids	+	+	+	+	+	+	+	+	+
10.	Test for Phenolics and Tannins	+	+	+	+	+	+	+	+	+
11.	Test for Saponins	+	+	+	+	+	+	+	+	+
12.	Test for Lignin	+	+	+	+	+	+	+	+	+
13.	Test for oil and fats	+	+	+	+	+	+	+	+	+
14.	Test for terpenoids	+	+	+	+	+	+	+	+	+

Pith : The pith is central part of the stem relatively large in size.The pith is composed of parenchyma cells, which are thin-walled , round and have large intercellular spaces.

Anatomy of Leaf

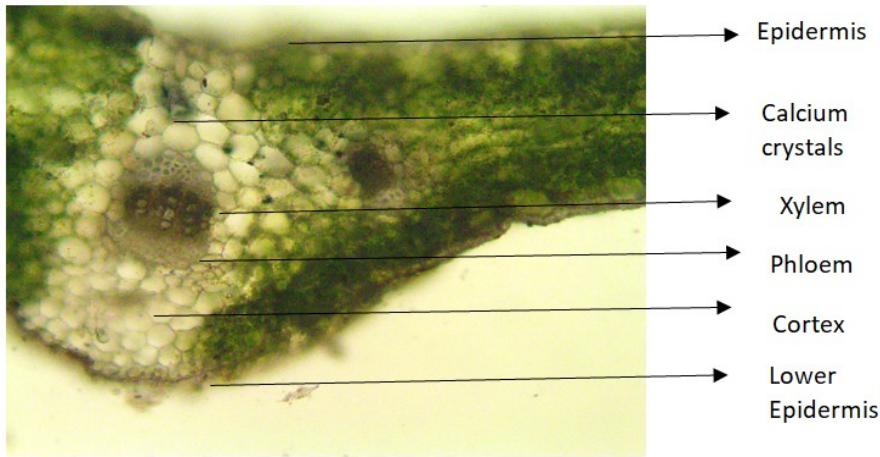

Fig. 4. T. S. of Leaf of *C. axillaris*

Epidermis: The epidermis is composed of a single layer of cells.The upper and lower surface of leaf are bounded by upper and lower epidermis. Epidermal cells are round in shape. Epidermis is made up of parenchymatous cells. Trichomes (hairs) are present on both the upper and lower epidermis.

Mesophyll: The mesophyll consists of palisade and spongy tissues.The lower mesophyll consists of spongy parenchyma cells, which are irregularly shaped and have large intercellular spaces. The chlorenchyma is also present. The cortex also have crystals of calcium oxalate that is the main source of calcium in plants. They also protect the plant from herbivores. They help the plant to get rid of excess calcium by eliminating cells.

Vascular Bundle : The vascular bundle is present in midrib region. In lateral part of the leaf vascular bundles are small in size. Vascular bundles are collateral, conjoint and closed. Vascular bundle consists of xylem and phloem.

Conclusion

In the present study detailed anatomical characterisation is done which is revealing and supporting its marshy habit. Phytochemical screening of the plant extract confirmed the presence of several bioactive compounds like glycosides, terpenoids, alkaloids etc. which could be responsible for the versatile medicinal properties of this plant. Studying the effects of these compounds on biological systems needs more studies as these compounds might be responsible for combating different diseases and ailments.

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