

Chapter 5

Caesulia axillaris Roxb.: a medicinal unexplored herb of India

Bhagwati Prashad Sharma¹, Sohan Lal², Gireesh Tripathi³, Balkar Singh⁴, Sweta Mishra^{5*} and Sanjeet Kumar⁵

¹Sidharth Government College, Nadaun, Himachal Pradesh, India

²Department of Botany, Govt. G.S.G. P.G. College, Balod, Chhattisgarh, India

³Department of Pharmacy, Shri Krishna University Chhatrapur, Madhya Pradesh, India

⁴Department of Botany, Arya PG College, Panipat, Haryana, India

⁵Ambika Prasad Research foundation, Odisha, India

*Email-Id: swetamishra.rdwu@gmail.com

Abstract

The genus *Caesulia*, belonging to the family Asteraceae, comprises a relatively small yet significant group of plants known for their unique adaptations to wetland environments and distinctive morphological features. *Caesulia axillaris* stands out as one of the most recognized species within this genus, native to tropical regions of Asia such as India, Bangladesh, and Nepal. Renowned for its ecological significance and structural adaptations. Moreover, its traditional medicinal uses underscore its cultural importance, with various parts of the plant employed to treat an array of ailments across generations. Recent scientific investigations have unveiled a plethora of bioactive compounds in *C. axillaris*, contributing to its pharmacological properties. This review offers a thorough examination of the physical characteristics, bioactive substances, and medicinal properties of *C. axillaris*. It underscores the plant's potential as a valuable source of medicine and emphasizes the necessity for additional research to fully understand its therapeutic advantages.

Keywords: *Caesulia*, wetlands, traditional medicine, bioactive compounds, pharmacological properties

Introduction

The genus *Caesulia* belongs to the family Asteraceae and is a relatively small genus but notable for its unique adaptations to wetland habitats and its distinctive morphological

features. Members of this genus are characterized by their herbaceous growth forms and their propensity to thrive in aquatic or semi-aquatic environments (Saxena and Bramham1995). Typically found in marshes, riverbanks, and other waterlogged areas, *Caesulia* species are adapted to fluctuating water levels and can tolerate submersion. This genus includes several species, with *Caesulia axillaris* being one of the most well-known. This species is native to tropical regions of Asia, particularly in countries like India, Bangladesh, Nepal and is known for its distinctive morphology and ecological significance (Naidu et al. 2005). It is well-adapted to its wetland environment. 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 stabilizing soil and assisting in water purification processes (Matthew 2004). Its role in traditional medicine and its potential pharmacological properties further underscore its importance, warranting continued study and conservation efforts.

Description

C. axillaris, an annual herb, thrives in wetland habitats like marshes, riverbanks, and other waterlogged areas. It is well-adapted to these environments and contributes significantly to the local ecosystem (Saxena and Bramham1995; Naidu 2012; Kumar 2015) (Figure 1).

Stems: The stems are erect and branched. This branching typically occurs from the base or lower parts of the stem, giving the plant a somewhat bushy appearance. Plants reach heights of up to 60 cm, although they may vary depending on the specific growing conditions and environmental factors. They are smooth and often exhibit a green coloration, sometimes with a slight reddish hue towards the base.

Leaves: The leaves are alternately arranged along the stem. They are lanceolate to elliptic, providing a streamlined and efficient shape for photosynthesis. Leaf margins are entire but can occasionally be slightly toothed, adding to their variability.

Flowers: The flowers are typically purple to blue, which can vary slightly in shade. Each flower is tubular and small, characteristic of many members of the Asteraceae family. The tubular structure is composed of numerous tiny florets. Flowers are grouped in axillary clusters, meaning they emerge from the axils (Figure 2).

Fruits: The fruit is a small, one-seeded achene. An achene is a type of simple dry fruit that does not open at maturity to release the seed.

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 utilized 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 diarrhea (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; Santar 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; Santar 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).

Bioactive compounds

C. axillaris is rich in various bioactive compounds that contribute to its pharmacological properties. These compounds include phenolic compounds, flavonoids, alkaloids, terpenoids, saponins, and essential oils, each playing a role in the plant's antioxidant, anti-inflammatory, antimicrobial, analgesic, and gastroprotective effects. The ongoing study of these bioactive compounds continues to reveal the potential therapeutic benefits of *C. axillaris* (Natarajan and Paulsen 2000; Farooqui et al. 2016; Tambe et al. 2022).



Figure 1: *Caesulia axillaris* in wild



Figure 2: Flowers of *Caesulia axillaris*

Pharmacological activities

C. axillaris, a plant with significant traditional medicinal uses, has been the subject of various scientific studies to explore its pharmacological properties. These studies have identified several bioactive compounds in the plant, contributing to its therapeutic potential (Varma et al. 2002; Pradhan et al. 2017; Chandra et al. 2022).

Antioxidant Activity: The plant contains various phenolic compounds, flavonoids, and other antioxidants. These compounds help neutralize free radicals, thereby reducing oxidative stress and potentially lowering the risk of chronic diseases such as cancer and cardiovascular diseases.

Anti-inflammatory Activity: The presence of anti-inflammatory compounds, such as flavonoids and saponins, has been noted. These compounds inhibit the production of pro-inflammatory cytokines and enzymes, such as cyclooxygenase (COX), which play a role in the inflammatory process.

Antimicrobial Activity: The plant contains compounds such as alkaloids, terpenoids, and flavonoids with antimicrobial properties. These compounds disrupt the cell walls or membranes of microbes, inhibit protein synthesis, or interfere with microbial DNA replication.

Antipyretic Activity: The antipyretic effect is attributed to compounds such as flavonoids and saponins. These compounds are believed to interfere with the body's production of prostaglandins, which are involved in the fever response.

Analgesic Activity: Flavonoids and other compounds in the plant contribute to its analgesic properties. The compounds likely act by inhibiting pain pathways and reducing the perception of pain.

Gastroprotective Activity: The presence of compounds with protective effects on the gastrointestinal tract has been noted. These compounds may help to strengthen the mucosal barrier, reduce gastric acid secretion, or exhibit antioxidant activity to protect the lining of the stomach.

C. axillaris exhibits a range of pharmacological activities, including antioxidant, anti-inflammatory, antimicrobial, antipyretic, analgesic, and gastroprotective effects. These activities are largely attributed to the various bioactive compounds present in the plant. Scientific research continues to explore these properties, providing a modern validation

of its traditional medicinal uses and highlighting its potential in the development of new therapeutic agents.

Conclusion

Caesulia axillaris exemplifies the remarkable synergy between ecological adaptation and medicinal utility within the genus *Caesulia*. Its structural resilience in wetland habitats, coupled with its rich pharmacological profile, positions it as a multifaceted resource worthy of conservation and exploration. Traditional knowledge of its medicinal properties finds contemporary validation through scientific inquiry, revealing various bioactive compounds with diverse therapeutic potentials. The antioxidant, anti-inflammatory, antimicrobial, analgesic, antipyretic, and gastroprotective activities attributed to *C. axillaris* underscore its relevance in modern pharmacology. As research progresses, the elucidation of its bioactive constituents and pharmacological mechanisms opens avenues for the development of novel therapeutic agents.

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