# Chapter 4

# *Grangea maderaspatana* (L.) Poir.: a medicinal herb of India

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## Abstract

*Grangea maderaspatana* (L.) Poir., commonly known as Madras Carpet, is a suberect or prostrate annual herb from the Asteraceae family, native to India and found in tropical and sub-tropical regions of Asia and Africa. This plant thrives in moist environments and has a long history of use in traditional Ayurvedic medicine for treating various ailments. Extensive research has revealed a diverse range of phytochemical compounds in *G. maderaspatana*, including flavonoids, sterols, alkaloids, tannins, phenolic compounds, and essential oils, contributing to its wide array of medicinal properties. These compounds confer significant antioxidant, anti-inflammatory, antimicrobial, antidiabetic, analgesic, antipyretic, gastroprotective, hepatoprotective, and anticancer activities. This review aims to provide a comprehensive overview of the morphology, habitat, bioactive compounds, and pharmacological activities of *G. maderaspatana*, highlighting its potential as a valuable medicinal plant and emphasizing the need for further research to fully elucidate its therapeutic benefits.

**Keywords:** Asteraceae, Traditional medicine, Bioactive compounds, Pharmacological properties

## Introduction

*Grangea* is a genus of suberect or prostate annual herbs. About fourteen species of *Grangea* are found in tropical and sub-tropical Asia and Africa (Singh et al. 2013). *Grangea maderaspatana* (L.) Poir. is a well-known medicinal plant from this genus, native to India and classified under the Asteraceae family. This plant, commonly referred to as Madras Carpet, thrives in moist environments (Galani and Rachchh 2015). For centuries, traditional Ayurveda Indian medicine has relied on this plant to address

various ailments (Chaudhary et al. 2023). Numerous phytochemical compounds have been extracted from this plant, showcasing its diverse range of medicinal properties. For centuries, it has been an integral part of traditional Ayurvedic medicine in India, offering remedies for various ailments (Galani and Rachchh 2015). Extensive research has explored its numerous therapeutic properties, including oestrogenicity, antifertility, analgesic, anti-inflammatory, antiarthritic, cytotoxic, antioxidant, hepatoprotective, diuretic, and antibacterial effects. Moreover, the leaves possess stomachic, sedative, carminative, emmenagogue, and antiflatulent properties (Chaudhary et al. 2023). The herb possesses beneficial properties for relieving pain in the eyes and ears. Its root acts as an appetizer and has astringent effects on the bowels. Additionally, it serves as a diuretic, anthelmintic, emmenogogue, galactogogue, and stimulant. It proves useful in alleviating griping, chest and lung issues, headaches, paralysis, rheumatism in the knee joint, piles, muscle pain, spleen, and liver disorders, as well as troubles related to the ear, mouth, and nose. Furthermore, it helps reduce excessive perspiration according to Unani medicine. Moreover, the plant acts as a stomachic and uterine stimulant (Dodiya and Jain 2017).

## Description

*Grangea maderaspatana* is a hairy herb, found wet, marshy areas but is also found along roadsides, in open fields, and in other disturbed areas. It has a prostrate to ascending growth habit, often spreading along the ground (Saxena and Bramham1995; Chandrul and Singh 2015; Figure 1- 2).

Stem: The stems are slender and may root at the nodes, especially when in contact with moist soil. They are usually green, cylindrical, and covered with fine hairs.

Leaves: Leaves are numerous, arranged alternately along the stem, sessile, 2.5-6.3 cm. Long, sinuately pinnatifid with 2-4 pairs of opposite or subopposite lobes smaller towards the base, the terminal lobe the largest, margins are serrated, with small, sharp teeth, pubescent on both surfaces, oblong or oblenceolate.

Inflorescence: The inflorescence is a capitulum (head), a common characteristic of the Asteraceae family. Flower heads are axillary (arising from the leaf axils) and terminal (at the ends of stems). Each flower head is surrounded by an involucre of small, green bracts.

Flowers: The capitulum consists of numerous small, tubular florets, truncate spherical head, 6-10 mm in diameter, solitary or 2-3 together, yellow and many flowered. The central florets are bisexual (hermaphroditic), while the peripheral florets are usually female. Florets have a tubular corolla with 5 lobes and are often covered with glandular hairs.



**Figure** 1: *Grangea maderaspatana* in wild



**Figure 2:** Habitat of *Grangea maderaspatana*

Fruit: The fruit is an achene, which is a small, dry, one-seeded fruit that does not open at maturity. Achenes are compressed and somewhat angular. Achenes often have a hairy surface, aiding in wind dispersal.

## Medicinal uses

The herb possesses a highly unpleasant bitter taste, but it serves as an antipyretic and is effective in alleviating pain in the eyes and ears. The root acts as an appetizer and has astringent properties that aid in regulating bowel movements (Galani and Rachchh 2015). Additionally, it acts as a diuretic, anthelmintic, emmenogogue, galactogogue, and stimulant. It proves beneficial in relieving griping, chest and lung issues, headaches, paralysis, rheumatism in the knee joint, piles, muscle pain, spleen and liver ailments, as well as troubles in the ear, mouth, and nose. Furthermore, it reduces excessive perspiration according to Unani medicine (Chaudhary et al. 2023). The plant acts as a stimulant for the stomach and uterus. Infusing the leaves with ginger and sugar is a common remedy for dyspepsia, hysteria, and obstructed menses. Externally, it serves as a soothing and antiseptic fomentation for inflamed and painful areas. The powdered leaves are applied as an antiseptic to wounds and ulcers. The leaves are reputed to have pain-relieving properties. They can be consumed in a tea or broth for digestive purposes (Galani and Rachchh 2015). When applied externally, the juice from the leaves is utilized to alleviate ear pain. Either the dried leaf powder or a moist leaf compress can be used to treat bruises (https://tropical.theferns.infoa). The plant is often used to treat arthritis, joint pain, muscle soreness, and other inflammatory conditions. The leaves and stems can be made into poultices or decoctions to apply to affected areas. Decoctions or infusions made from the plant are consumed to help reduce fever. Extracts from *G. maderaspatana* have been used to treat bacterial and fungal infections like skin infections and fungal conditions like athlete's foot (Dhal et al. 2015; Rachchh and Galani 2015).

## Bioactive compounds

*G. maderaspatana* contains several bioactive compounds that contribute to its medicinal properties. Extracts of *G. maderaspatana* contain flavonoids (quercetin and kaempferol), sterols (β-Sitosterol), alkaloids (grangeine), tannin (ctechins and epicatechins), and phenolic compounds (caffeic acid and gallic acid), terpenes (terpinolene and linalool). Also, it contains essential oils like α-Pinene, β-Pinene, Limonene, Caryophyllene, Myrcene etc (Abdoulaye et al. 2024). The presence of these various secondary metabolites could explain the therapeutic properties associated with

the plant. These results suggest that all the obtained extracts possessed significant antioxidant, anti-inflammatory, antidiabetic, analgesic, antipyretic, gastroprotective properties. Detailed studies are needed to identify and quantify all the bioactive compounds present in *G. maderaspatana*. This includes advanced analytical techniques like HPLC, GC-MS, and NMR spectroscopy (Abdoulaye et al. 2021). Steroidal constituents, hardwickiic acid, 1, 2- dehydro-derivative, acetylenic compounds, eight new clerodane diterpenes including five clerodane, a nor clerodane, a secoclerodane and a norsecoclerodane derivatives along with auranamide[5-7], grangolide and eudesmanolides have been reported from various parts of *G. maderaspatana* (Iyer and Iyer 1978; Pandey et al. 1984).

## Pharmacological activities

*G. maderaspatana* has been traditionally used for various medicinal purposes, and preliminary research supports several pharmacological activities attributed to its bioactive compounds (Singh et al. 2013; Rachchh and Galani 2016).

Antimicrobial Activity: Extracts of *G. maderaspatana* have shown antimicrobial effects against a range of bacterial pathogens. The plant also exhibits antifungal activity, making it potentially useful in treating fungal infections.

Anti-inflammatory Activity: Compounds such as quercetin, kaempferol, and β-sitosterol contribute to its anti-inflammatory effects. These compounds inhibit the production of pro-inflammatory cytokines and mediators.

Antioxidant Activity: The presence of flavonoids (quercetin, kaempferol), phenolic acids (caffeic acid, gallic acid), and tannins contributes to the plant's strong antioxidant activity. These compounds help in scavenging free radicals and reducing oxidative stress.

Antipyretic Activity: Traditional uses of *G. maderaspatana* include its application as an antipyretic agent. The plant’s extracts can help reduce fever, likely through the inhibition of prostaglandin synthesis.

Gastroprotective Activity: The plant's extracts have shown potential in protecting the gastrointestinal tract from ulcers. It has been traditionally used to treat digestive issues.

Hepatoprotective Activity: *G. maderaspatana* extracts can protect the liver from damage caused by toxins. This hepatoprotective effect is likely due to its antioxidant properties, which help in mitigating oxidative stress in liver tissues.

Antidiabetic Activity: Compounds such as β-sitosterol have been shown to exhibit antidiabetic properties. These compounds can help in regulating blood glucose levels, potentially beneficial for managing diabetes.

Anticancer Activity: Preliminary studies indicate that certain compounds in *G. maderaspatana* exhibit cytotoxic effects against cancer cells. Flavonoids like quercetin and kaempferol have been noted for their anticancer properties.

Antimalarial Activity: Traditional uses also include treating malaria, and some studies have shown that extracts from the plant can inhibit the growth of Plasmodium species, the parasites responsible for malaria.

## Conclusion

*G. maderaspatana*, a medicinal herb with a rich history in traditional medicine, presents a significant potential for modern therapeutic applications. The presence of diverse bioactive compounds such as flavonoids, sterols, alkaloids, tannins, phenolic compounds, and essential oils underpins its broad spectrum of pharmacological activities. Notably, the plant exhibits antimicrobial, anti-inflammatory, antioxidant, antipyretic, gastroprotective, hepatoprotective, antidiabetic, anticancer, and antimalarial properties, validating its traditional uses and suggesting potential new applications in medicine. Despite the promising preliminary findings, further research is essential to explore the full therapeutic potential of *G. maderaspatana*. Advanced analytical techniques should be employed to identify and quantify its bioactive compounds comprehensively. Detailed pharmacological studies, including clinical trials, are needed to confirm its efficacy and safety in human health applications.

## References

Abdoulaye Y, Constantin D, Harouna S, Remy BK, Arouna G, Assetous S, Edwige RN, Benjamin B, Dominique KS, Moumouni K, Eloi P, Roger NCH and Mouhoussi N. (2024). Total Alkaloid content and In vitro Antiplasmodial activity of *Grangea maderaspatana* collected from Burkina Faso. Asian Joirnal of Research Chemostry. 17(1):31-36.

Abdoulaye Y, Constantin D, remy BK. Adama H, Eloi P, Roger NCH and Danhabal SP. (2021). Phytochemical Screening, Total Phenolics Contentand Antioxydants Potential of Different parts of *Grangea maderaspatana* from Burkina Faso. International Research Journal of Pure & Applied Chemistry. 22(10): 36-44.

Chandrul KK and Singh B. (2015). Pharmacognostical, phytochemical and pharmacological profile of *Grangea maderaspatana* (L.) Poir. - an inclusive review. World Journal of Pharmaceutical Research. 4(11): 423-436.

Chaudhary N, Chauhan J and Maitreya B. (2023). A review on bioactivity of *Grangea maderaspatana* (L) poir. International Association of Biologicals and Computational Digest. 2 (1): 230-233.

Dhal N, Panda S and Muduli S. (2015). Traditional uses of medicinal plant by native people in Nawarangpur district, Odisha, India. Asian Journal of Plant Science Research. 5(2):27-33.

Dodiya T and jain V. (2017). Pharmacognostic, physicochemical and phytochemical investigation of *Grangea maderaspatana.* The Journal of Phytopharmacology. 6(6): 359-363.

Galani VJ and Rachchh RP. (2015). *Grangea maderaspatana* (L.) Poir. – a comprehensive review. Innoriginal International Journal of Sciences. 2(3): 1-2.

Iyer C and Iyer P. (1978). Steroids from *Grangea maderaspatana* Poir. Phytochemistry. 11:2036-2037.

Pandey U, Singhal A, Barua N and Sharma R. (1984). Stereochemistry of strictic acid and related furano-diterpenes from *Conyza japonica* and *grangea maderaspatana*. Phytochemistry. 23(2):391-397.

Rachchh RP and Galani VJ. (2015). Evaluation of antinociceptive and antirheumatic activity of *Grangea maderaspatana* (L) Poir Using experimental models. International Journal of Research in Ayurveda and Pharmacy. 36(4):425-31.

Rachchh RP and Galani VJ. (2015). Evaluation of antinociceptive and antirheumatic activity of *Grangea maderaspatana* (L.) Poir. Using experimental models. 36:425-431.

Saxena HO and Bramham M. (1995). The Flora of Orissa, Orrisa Forest Development Corporation Ltd & Regional Research laboratory, Bhubaneswar, Odisha.

Singh D, Mathela CS, Pande V and Panwar A. (2013). Antioxidant and antimicrobial activity of *Grangea maderaspatana* (L.) Poir. extract. Journal of Drug Discovery and Therapeutics. 1(7): 46-52.