

Chapter 7

Sphagneticola calendulacea (L.) Pruski : a medicinal herb of India

Suvalaxmi Palei¹, Sweta Mishra^{2*} and Sanjeet Kumar²

¹Department of Horticulture, Faculty of Agriculture, Sri Sri University, Cuttack, Odisha, India

²Ambika Prasad Research Foundation, Odisha, India

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

Abstract

Sphagneticola calendulacea, commonly known as the "Creeping Daisy" or "Water Zinnia," is a perennial herbaceous plant belonging to the Asteraceae family, native to tropical and subtropical regions of Asia. Medicinally, *S. calendulacea* has been used in traditional ayurvedic medicine to treat wounds, skin conditions, digestive issues, respiratory ailments, and various other health conditions. The plant's bioactive compounds, including flavonoids, terpenoids, and phenolic acids, contribute to its pharmacological activities such as anti-inflammatory, antimicrobial, antioxidant, and antidiabetic effects. This review emphasizes the various medicinal properties, pharmacological activity, and bioactive components of *S. calendulacea*.

Keywords: Asteraceae, Traditional medicine, Phytochemical compounds, Pharmacological activity

Introduction

Sphagneticola calendulacea, commonly known as the "Creeping Daisy" or "Water Zinnia," is a perennial herbaceous plant. Originating from tropical and subtropical regions of Asia, such as India, China, and Southeast Asia, this species thrives in various habitats, especially in moist and wet areas like riverbanks, wetlands, and marshes (Koul et al. 2012; Nomani et al. 2013). It plays a crucial role in its ecosystem by aiding in erosion control through its dense mat-forming growth, which stabilizes soil and prevents erosion along riverbanks and wetlands. Additionally, it provides shelter and habitat for small animals and insects. With its attractive foliage and flowers, it is commonly used as a ground cover in gardens and landscapes (Sharma et al. 1989). While relatively low-maintenance once established, it prefers moist, well-drained soils

and full sun to partial shade (Darah et al. 2013). However, in some regions, *S. calendulacea* is considered invasive due to its aggressive growth, potentially displacing native plant species. Careful management is necessary to prevent ecological imbalances. Despite its invasive tendencies, this plant holds ecological, ornamental, and medicinal value. Responsible cultivation and management practices are essential to maximize its benefits without causing harm to the environment.

Description

S. calendulacea, possesses unique physical attributes that allow it to thrive in various environments. The plant possesses a fibrous root system. It roots at the nodes of its trailing stems, aiding in vegetative propagation and providing stability in the soil. The stems are slender, ranging from green to purplish, and can creep along the ground. They can either be prostrate or ascending, reaching lengths of 50-70 cm. At the nodes, the stems produce adventitious roots, which assist in spreading and anchoring the plant. The leaves are simple, opposite, and decussate. They have a lanceolate to obovate shape, typically measuring 4-10 cm in length and 1-5 cm in width. The leaf margins are serrate, giving them a slightly jagged appearance. The leaf surface is smooth to slightly pubescent, with a vibrant green coloration. The plant produces solitary flower heads or capitula at the terminal ends of long flower stalks or peduncles. Each flower head has a diameter of approximately 2-3 cm. The flower heads consist of two types of florets: ray florets and disc florets. Ray Florets: These florets are bright yellow, strap-shaped, and usually arranged in a single row around the perimeter, numbering 10-20. Disc Florets: These florets are central, tubular, also yellow, and numerous, forming a compact central disc. The flowers are hermaphroditic, containing both stamens and pistils. The fruit is an achene, small, dry, and typically brown or black when fully mature. Each achene contains a single seed. Achenes are often ribbed and may possess small bristle-like structures (pappus) that aid in wind dispersal (Saxena and Bramham 1995; Meena et al. 2011; Figure 1).

Medicinal uses

S. calendulacea, has been utilized in traditional Ayurvedic medicine for its various therapeutic properties. The plant is used to promote the healing of cuts, wounds, and ulcers. Fresh leaf pastes or juice is applied directly to wounds to aid in faster healing and prevent infections (Lin et al. 2014; Gunjarkaret al. 2023). Leaf pastes or juice is used for treating various skin conditions, helps in managing conditions like eczema, dermatitis, and skin infections due to its soothing and anti-inflammatory properties (Suresh et al. 2010). Decoction made from the plant's leaves and stems is consumed to improve digestive health. Used to aid digestion and relieve digestive issues.



Figure 1: Flower and leaves of *Sphagneticola calendulacea* in wild

Helps in alleviating symptoms of indigestion, diarrhea, and dysentery (Meena et al. 2011; Darah et al. 2013). Decoction of leaves is prepared and consumed to relieve respiratory symptoms. It helps in managing cough, cold, and bronchitis due to its expectorant properties. Decoction of the plant parts is consumed to act as a diuretic, helps in managing urinary disorders and reduces water retention. *S. calendulacea* leaves can be used in treatment of dermatological disorders, cough, headache, hair loss, lice, strengthening the nervous system, lack of blood, digestive system disorders (Darah et al. 2013; Lin et al. 2014). The leaves are used in dyeing grey hair and in promoting the growth of hair. They are considered tonic, alternative, and useful in coughs, cephalalgia, skin diseases, and alopecia. The juice of the leaves is much used as a snuff in cephalalgia (Islam et al. 2012). In decoction, the plant is used in uterine haemorrhage and menorrhagia. It is using home remedy Osteochondritis Dissecans, Multiple Sclerosis, Juvenile Arthritis, Gouty arthritis, Rheumatic fever, etc. Leaves extracts are a natural alternative to commonly used anti-inflammatory drugs. It can be used with confidence for treating Rheumatic fever (Suresh et al. 2010; Islam et al. 2012).

Bioactive compounds

The plant reportedly contains six newly discovered acylated eudesmanoids, namely germacrene, α -humulene, caryophyllene, squalene, phellandrene, *p*-cymene, sitosterol, and wedelia-seco-kaurenolide. Additionally, the leaves of this plant contain isoflavonoids and wedelolactone (Meena et al. 2011). Methanol extracts of *S. calendulacea* contains Tridecanol, 2-ethyl-2-methyl, 1-Heptatriacotanol, *c*-Sitosterol, Oleic acid, eicosyl ester, 9,19-Cyclocholestan-3-ol-7-one, 4 α -dimethyl-[20R], 10-Octadecenoic acid, methyl ester, 1,2 Benzenedicarboxylic acid, butyl octyl ester, Dodecanoic acid, 10-methyl, methyl ester etc (Line et al. 2014; Gunjarkaret al. 2023). Chloroform extracts of *S. calendulacea* contains Strychnidin-10-one, 2,3-dimethoxy-,19-oxide, 1,2 Dihydro-2-methylpapaverine, Cyclopropaneoctanoic acid, 2-octyl-, methyl ester, Heptadecanoic acid, 9-methyl-, methyl ester, Oleic acid, 5-[*p*-Aminophenyl]-4-[*O*-tolyl]-2-thiazolamine, Phenol 2,5-bis [1,1 dimethylethyl] Pentadecanoic acid 14-methyl, methyl ester etc (Govindchari et al. 1961; Gunjarkaret al. 2023).

Pharmacological activities

S. calendulacea, known for its therapeutic potential, has been studied for various pharmacological activities due to its rich phytochemical composition (Verma and Garg 2008; Kumar et al. 2011; Gunjarkaret al. 2023).

Anti-inflammatory Activity: The plant's bioactive compounds, such as flavonoids and terpenoids, inhibit pro-inflammatory mediators and reduce oxidative stress.

Antipyretic Activity: Compounds in the plant help regulate body temperature and reduce fever. Decoctions of the plant are consumed to alleviate fever.

Antimicrobial Activity: The plant exhibits broad-spectrum antimicrobial properties against bacteria, fungi, and viruses due to its essential oils, saponins, and phenolic acids. Used to treat skin infections, wounds, and other microbial-related conditions.

Antioxidant Activity: The presence of flavonoids, phenolic acids, and carotenoids contributes to scavenging free radicals and protecting cells from oxidative damage. It helps in preventing chronic diseases related to oxidative stress, such as cardiovascular diseases and certain cancers.

Wound Healing Activity: It promotes cell proliferation and tissue regeneration, supported by its anti-inflammatory and antimicrobial properties.

Analgesic Activity: Compounds like alkaloids and steroids modulate pain pathways and reduce the sensation of pain. Used for pain relief in conditions like headaches, muscle pain, and joint pain.

Anti-cancer Activity: Some studies suggest that the plant's phytochemicals can induce apoptosis in cancer cells and inhibit tumor growth.

Antidiabetic Activity: The plant may help in lowering blood glucose levels and improving insulin sensitivity due to its bioactive compounds, used traditionally to manage diabetes and associated symptoms.

Hepatoprotective Activity: Protects liver cells from damage and enhances liver function, possibly through its antioxidant properties. It is used to support liver health and treat liver-related disorders.

Diuretic Activity: Increases urine production and promotes the excretion of excess fluids. Helps in managing conditions like oedema and hypertension.

Conclusion

S. calendulacea demonstrates significant ecological, ornamental, and medicinal value. Its ability to stabilize soil and prevent erosion makes it a valuable component of wetland ecosystems, while its ornamental appeal contributes to its widespread use in

landscaping. Medicinally, it offers a broad range of therapeutic benefits supported by its rich phytochemical composition. However, its invasive potential necessitates careful management to prevent the displacement of native species and maintain ecological balance. Continued research into its bioactive compounds and pharmacological activities may further enhance its application in modern medicine. Effective cultivation and management practices will be crucial to maximizing the benefits of *S. calendulacea*.

References

- Darah I, Lim SH, Nithianantham K. (2013). Effects of Methanol Extract of *Wedelia chinensis* Osbeck (Asteraceae). Leaves against Pathogenic Bacteria with Emphasis on *Bacillus cereus*. Indian Journal of Pharmaceutical Sciences. 75(5):533-539.
- Govindchari TR, Nagarajan K and Parthasarathy PC. (1961). Chemical examination of *Wedelia calendulacea*-IV, Synthetic analogues of Wedelolactone. Tetrahedron. 15: 129-131.
- Gunjarkar S, Gulkari V, Motghare S, Mehare S and Parate M. (2023). *Wedelia Chinensis*: A Phytopharmacological Review. International Journal of Pharmaceutical Research and Applications. 8(3): 587-597.
- Islam MA, Zaman S, Biswas K, Al-Amin MY, Hasan MK, Alam AHMK, Tanaka T, Sadik G. (2012). Evaluation of cholinesterase inhibitory and antioxidant activity of *Wedelia chinensis* and isolation of apigenin as an active compound. BMC Complementary Medicine and Therapies. 21(1):204.
- Koul S, Pandurangan A and Khosa RL. (2012). *Wedelia chinensis* (Asteraceae) – An overview. Asian Pacific Journal of Tropical Biomedicine. 2 (2): 1169-1175.
- Kumar RM, Suresh V, Rajesh SV, Kumar NS and Arunachalam G. (2011). Pharmacognostical studies of the plant *Wedelia chinensis* (Osbeck) MERR. International Journal of Pharmaceutical Research and Development. 2: 53–57.
- Lin W-L, Wang S-M, Ho Y-J, Kuo H-C, Lee Y-J, Tseng T-H. (2014). Ethyl acetate extract of *Wedelia chinensis* inhibits tert-butyl hydroperoxide-induced damage in PC12 cells and D-galactose-induced neuronal cell loss in mice. BMC Complement Alternative Medicine. 14(1):491. doi: 10.1186/1472-6882-14-491.
- Meena AK, Rao MM, Meena RP, Panda P and Renu. (2011). Pharmacological and Phytochemical Evidences for the Plants of *Wedelia* Genus– A Review. Asian Journal of Pharmaceutical Research. 1(1): 7-12.
- Nomani I, Mazumder A and Chakraborty GS. (2013). *Wedelia chinensis* (Asteraceae)- An Overview of a Potent Medicinal Herb. International Journal of Pharm Tech Research. 5(3): 957-964.
- Saxena HO and Bramham M. (1995). The Flora of Orissa, Orrisa Forest Development Corporation Ltd & Regional Research laboratory, Bhubaneswar, Odisha

- Sharma AK, Anand KK, Pusgpangandan P, Chandan BK, Chopra CL and Prabhakar YS (1989). Hepatoprotective effects of *Wedelia calendulaceae*, Journal of Ethnopharmacology. 25(3): 93-102.
- Suresh V, Kumar RM, Suresh A, Kumar NS, Arunachalam G and Umasankar KI. (2010). CNS activity of ethanol extract of *Wedelia chinensis* in experimental animals, International Journal of Pharmaceutical Sciences and Nanotechnology. 3(1): 881-886.
- Verma NK and Garg V. (2008). Wound healing activity of *Wedelia chinensis* leaves. Medicine, Environmental Science. <https://api.semanticscholar.org/CorpusID:54655355>.