

CHAPTER 9

Pharmacological and Medicinal Importance of *Pergularia daemia* (Forssk.) Chiov.

Bhagwati Prashad Sharma¹, Sweta Mishra² and Ghodke Anita Sureshrao^{3*}

¹Department of Botany, Sidharth Government College, Nadaun, Himachal Pradesh, India

²Ambika Prasad Research Foundation, Odisha, India

³Amaltas Institute of Ayurveda and Amaltas Ayurved Hospital and Research Center, Dewas, Madhya Pradesh, India

*Email ID: anitaghodke24@gmail.com

DOI:



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ABSTRACT

Pergularia daemia (Forssk.) Chiov. is a widely distributed perennial twining herb belonging to the family Apocynaceae. Traditionally valued in Indian, African, and Southeast Asian medicinal systems, the plant is known for its diverse therapeutic applications. Various parts of the plant including the leaves, roots, latex, stem, and fruits have been extensively used in the treatment of numerous ailments such as fever, asthma, rheumatism, menstrual disorders, skin diseases, gastrointestinal issues, and infections. Recent pharmacological studies have validated several of its traditional uses, revealing a broad spectrum of bioactivities including hepatoprotective, anthelmintic, antimicrobial, antioxidant, antifertility, and antidiabetic properties, due to rich presence of bioactive phytochemicals such as flavonoids, alkaloids, saponins, and terpenoids. Moreover, *P. daemia* has found a prominent place in Siddha medicine, particularly in Varmam therapy, for its efficacy in healing trauma and nerve injuries. This review highlights the significance of *P. daemia* as a versatile medicinal plant and its potential role in bridging traditional knowledge with modern herbal medicine.

Keywords: *Pergularia*, phytochemical studies, pharmacological studies, traditional uses

INTRODUCTION

Pergularia daemia (Forssk.) Chiov. (family Apocynaceae), is a perennial, latex-producing, twining herb commonly found along roadsides in tropical and subtropical regions (Nyam et al. 2024). It is known as Uturudi in Odia, Veliparuthi in Tamil, Uttran in Hindi, Uttaravaruni in Sanskrit and Hariknot in English (Chandak and Dighe 2019). Interestingly, in Siddha medicine, only two medicinal plants are named as protective shields for humans, and *Pergularia daemia* is one of them. It is widely distributed across tropical and subtropical regions of India, typically found up to altitudes of 1000 meters, and around 900 meters in the Himalayan region and southern India. Beyond India, the plant is also found throughout tropical Africa and extends into parts of the Arabian Peninsula (Karthishwaran and Mirunalini 2010; Nithyatharani and Kavitha 2018). The aerial parts of *P. daemia* are used for their anti-helminthic, antiseptic, and anti-venom properties. It is also employed in the treatment of gastric ulcers, as well as uterine and menstrual disorders (Ananth et al. 2021). The leaves serve as a remedy for anemia, leprosy, arthritis, haemorrhoids, amenorrhea, dysmenorrhea, infantile diarrhea, general body pain, asthma, bronchitis, and whooping cough (Raut et al. 2019). Recent studies have confirmed the pharmacological potential of the aerial parts of *P. daemia* in treating a wide range of ailments.

TAXONOMY

P. daemia, is a slender, perennial, twining herb with a fetid odour and characteristic milky sap. The plant is known for spreading hairy stems that can reach up to 4 meters or more in length. These stems typically die back during the dry season and reappear with the onset of rains. Leaves are opposite, membranous, and broadly ovate to suborbicular in shape. They measure between 3-10 cm in length and 3.8- 9 cm in width, with a deeply cordate base and an acuminate apex. The upper surface is glabrous or sparsely pubescent, while the lower side is generally pubescent with ciliate margins. Petioles are 2- 6.3 cm long and pubescent. Flowers are borne in axillary, long-peduncled, drooping clusters or pseudo-umbels which later become racemose. The peduncles are 3 - 6 inches or more in length and covered with fine hairs. Flowers are greenish-yellow or dull white, often tinged with purple, and open in the evening. The corolla is creamy-white or greenish, with lobes that are long and fringed. The outer corona is membranous, subquadrate, and truncate, while the inner corona has lobes ending in subulate horns that curve over the staminal column. Fruits are lanceolate follicles, 5- 7.5 cm long, reflexed, and

tapering into a long beak. They are covered with soft, echinate spines. The seeds are ovate, truncate at the apex, and densely pubescent on both sides with long silky hairs. The margins are narrowly crenate. Flowering typically occurs from August to January, with fruits maturing from October to February (Hase and Nasreen 2016; Bhusari et al. 2018; Plate 1).

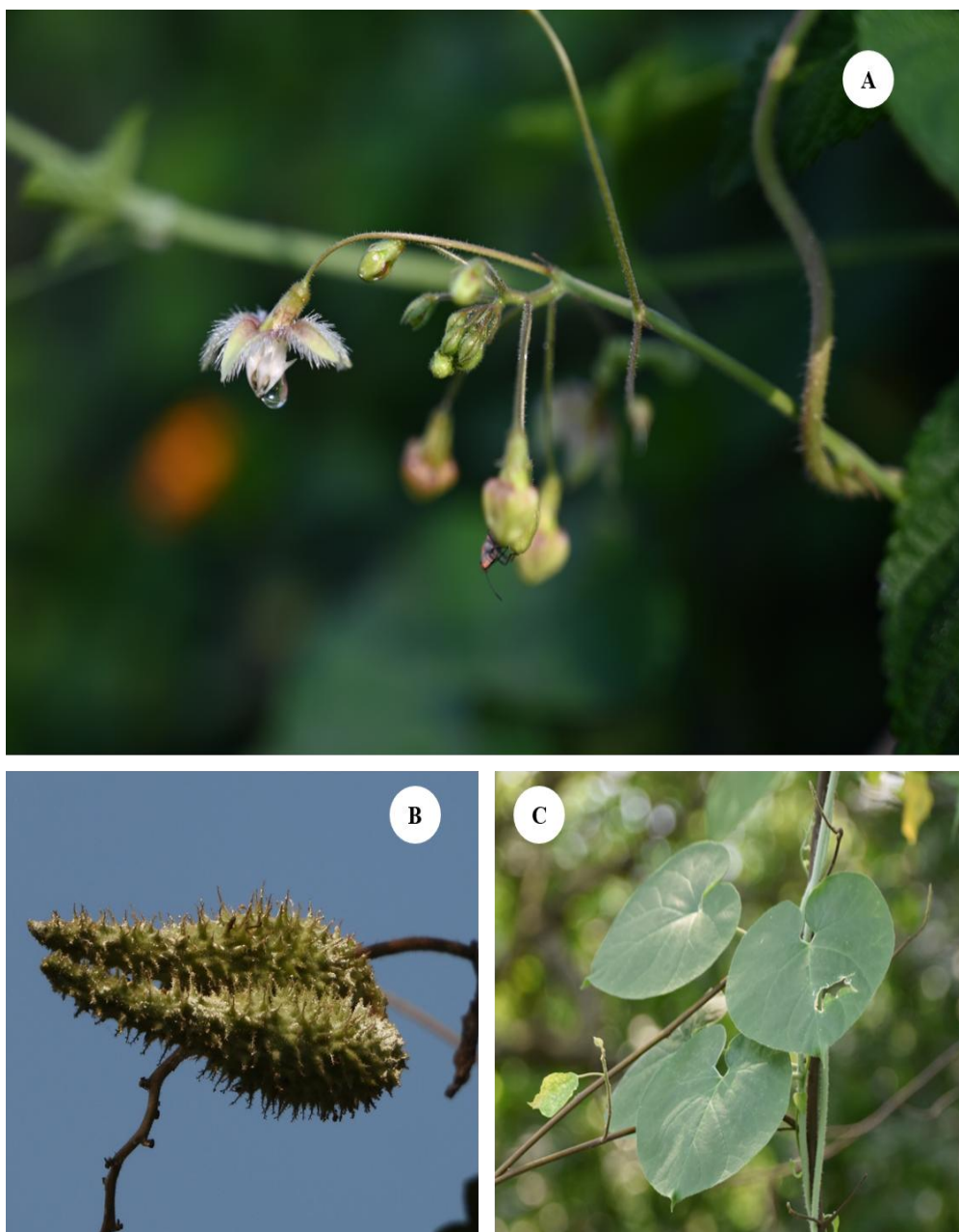


Plate 1: Vegetative parts of *P. daemia*, A) Flowers, B) Fruits, C) Leaves

TRADITIONAL USES

Whole Plant: *P. daemia* has been traditionally used for a wide range of ailments. It is known for treating malaria, fever, rheumatism, uterine and menstrual disorders, and infantile diarrhea. The plant is widely recognized in Ayurveda for its effectiveness in delayed childbirth, amenorrhea, asthma, post-partum hemorrhage, and rheumatic swellings. Additionally, it is used to facilitate parturition and treat diabetes mellitus (Hebbbar et al. 2004; Omobuwajo et al. 2008; Karthishwaran and Mrinalini 2010; Nithyatharani and Kavitha 2018).

Leaves: Leaves of *P. daemia* are extensively used in folk medicine. They are effective in treating catarrhal infections, infantile diarrhea, stomach pain, tetanus, nasobronchial disease, cough, chest pain, leprosy, haemorrhoids, headache, and alopecia. Leaf juice is used to relieve body pain, and in conditions such as amenorrhea and dysmenorrhea. Dried leaves act as an emetic, antirheumatic, and are used for bronchitis, healing cuts and wounds, and whooping cough. Fresh leaves are traditionally used as fish poison, while the milky sap from leaves is applied to treat sore eyes, rheumatism, oedema, and kidney pain (Chandak and Dighe 2019; Sowmiya et al. 2024).

Roots: Root decoction is traditionally consumed to treat venereal diseases, arthritis, muscular pains, asthma, and rheumatism. Dried roots are employed as abortifacients, emetics, and for treating bronchitis, asthma, constipation, and cough. Fresh roots are also used in the management of gonorrhea (Chandak and Dighe 2019; Raut et al. 2024).

Latex: The Latex of *P. daemia* plays a crucial role in traditional remedies. It is applied externally for boils, sores, and toothache, and is noted for its use as fish poison. The latex also contributes to the treatment of arthritis, muscular pain, asthma, and venereal diseases (Hebbbar et al. 2004; Raut et al. 2024).

Stem and Stem Bark: Stem bark has been used to alleviate cold, fever, and malarial infections, particularly in infants. The stem, generally, is utilized in treating malaria and diarrhea (Bhat et al. 2024).

Fruits: Fruits are consumed for their digestive properties. They aid in digestion and help in stimulating metabolism (Bhaskar and Balakrishnan 2009).

Aerial Parts: The aerial parts of the plant are reported to have hepatoprotective, antidiabetic, analgesic, antipyretic, and anti-inflammatory properties (Bhaskar and Balakrishnan 2009).

BIOACTIVE COMPOUNDS

Qualitative phytochemical screening of *P. daemia* extracts has revealed the presence of diverse bioactive groups including alkaloids, flavonoids, terpenoids, tannins, steroids, glucosides, carbohydrates, proteins, amino acids, saponins, fixed oils, gums, and mucilage (Bhat et al. 2024). These secondary metabolites are key to the plant's therapeutic efficacy (Table 1). The extraction of such bioactive compounds forms the first and crucial step in the formulation of dietary supplements, pharmaceuticals, and herbal products (Ananth et al. 2021). Extensive literature review indicates that *P. daemia* contains a variety of pharmacologically significant phytoconstituents. Identified compounds include glucosides, terpenoids, sterols (e.g., α -amyirin, β -amyirin, α -amyirin acetate, β -sitosterol), lupeol acetate, hentriacontane, betaine, and various polypeptides (Bhaskar and Balakrishnan 2009; Sridevi et al. 2015). Shoots and flowers are particularly rich in hyperoside (a flavonol), flavonoids, and saponins. Additionally, inorganic compounds such as potassium chloride (KCl) and potassium nitrate (KNO_3) have been reported in the whole plant. Studies have isolated novel sterols like 5 β -stigmast-7(8)-en-3a-ol and 5 β -stigmast-8(14)-en-3a-ol. Cardenolides are also found in *P. daemia*, known for their cardiotoxic properties, in significant quantities (Nithyatharani and Kavitha 2018). The leaves and roots contain alkaloids like daemine, uzarogenin, and coroglaucigenin, while the seeds are rich in calotropin, calactin, corotoxigenin, calotoxin, calotropagenin, uscharin, dihydrocalotropagenin, uacharidin, and protouscharin (Chandak and Dighe 2019; Nyam et al. 2024). These seed components are known for their cardiotoxic and uterotonic effects.

PHARMACOLOGICAL IMPORTANCE

Hepatoprotective Activity

P. daemia has demonstrated significant hepatoprotective effects in experimental models. Studies using ethanolic extracts of the leaves have shown protection against liver damage induced by carbon tetrachloride (CCl_4) in rats. The extract was able to significantly lower elevated liver enzymes such as SGOT, SGPT, and ALP, which are biomarkers of liver injury. The hepatoprotective activity is likely due to the presence of antioxidant compounds such as flavonoids and phenolic compounds (Sureshkumar and Mishra 2006).

Antioxidant Activity

Methanolic and ethyl acetate extracts of *P. daemia* showed significant free radical scavenging abilities. This antioxidant property is attributed to its high content of polyphenols, flavonoids, and other phytochemicals that can neutralize reactive oxygen species (Vaithiyanathan and Mirunalini 2015).

Antidiabetic Activity

P. daemia has shown promising antidiabetic effects in animal models. In studies involving streptozotocin-induced diabetic rats, ethanolic extracts of the plant were able to significantly lower blood glucose levels. This hypoglycemic effect is believed to result from the action of phytosterols, flavonoids, saponins, and alkaloids present in the extract, which may enhance insulin secretion or sensitivity (Sarkodie et al. 2016).

Diuretic Activity

The diuretic effect of *P. daemia* has been confirmed in studies using ethanolic, ethyl acetate, and n-butanol extracts. When administered to rats, these extracts significantly increased the volume of urine output as well as the excretion of sodium and potassium ions. The ethanolic extract, in particular, exhibited a diuretic effect comparable to that of the standard drug furosemide. This suggests that *P. daemia* may help in managing conditions like hypertension and fluid retention (Bhavin et al. 2011).

Antiarthritic Activity

Antiarthritic properties of *P. daemia* have been studied in animal models of arthritis. Both petroleum ether and methanolic leaf extracts were effective in reducing joint inflammation, paw swelling, and other symptoms of arthritis. The methanolic extract showed greater potency, likely due to its higher content of bioactive compounds such as flavonoids, tannins, phenolics, and glycosides (Iffath and Caroline 2018).

Antimicrobial Activity

Extracts of *P. daemia* found to be effective against a broad spectrum of bacterial strains including *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Bacillus subtilis*. The antimicrobial properties are likely due to phytochemicals such as alkaloids, phenolics, and saponins that disrupt microbial cell membranes or inhibit bacterial enzymes. This supports

its traditional use in treating skin infections, wounds, and gastrointestinal disturbances caused by microbes (Sarkodie et al. 2016).

Antifertility Activity

P. daemia also exhibits antifertility properties, particularly in female mice. Ethanolic extracts of the plant were shown to interfere with reproductive functions, including the prevention of implantation and early embryonic development. These effects occurred without any observable toxicity, suggesting selective action on the reproductive system. The antifertility activity is believed to be due to the presence of steroidal constituents and other compounds that may influence hormonal balance or uterine function (Londonkar et al. 2009).

Anthelmintic Activity

The plant has been shown to possess significant anthelmintic activity. Ethanolic extracts of *P. daemia* leaves caused paralysis and death in various types of helminths, including earthworms (*Pheretima posthuma*), roundworms, and tapeworms. The efficacy was found to be comparable to standard anthelmintic drugs like albendazole (Kumar et al. 2014).

Table 1: Major phytochemicals in *P. daemia* and their pharmacological activities

Plant Part	Major Phytochemicals	Pharmacological Activities
Leaves	Flavonoids (luteolin, quercetin), alkaloids, terpenoids, tannins, saponins, steroids, carbohydrates	Antioxidant, anti-inflammatory, antimicrobial, expectorant, antirheumatic, antidiarrheal
Roots	Daemine, uzarogenin, coroglaucigenin, steroids	Gonorrhea treatment, respiratory issues, abortifacient, emetic
Seeds	Uzarigenin, coroglaucigenin, calactin, calotropin, pergularin, cardenolides	Cardiotonic, uterotonic, similar to pituitrin activity, not inhibited by progesterone

Flowers	Hyperoside, flavonoids, saponins	Antioxidant, wound healing, anti-inflammatory
Whole Plant	Alkaloids, flavonoids, terpenoids, tannins, steroids, glucosides, proteins, amino acids, gums, mucilage	Anthelmintic, expectorant, anti-inflammatory, hepatoprotective, analgesic, antimicrobial, antidiabetic
Latex	Proteins, alkaloids	Toothache relief, wound healing, anti-inflammatory, fish poison, boils, sores
Stem Bark	Alkaloids and tannins	Cold, fever, malaria treatment

CONCLUSION

Pergularia daemia holds immense ethnomedicinal importance and demonstrates a rich pharmacological profile. Each part of the plant contributes to specific therapeutic actions, like cough, fever, diarrhea, rheumatism, gonorrhea etc. Its validated activities such as hepatoprotective, anthelmintic, antidiabetic effects etc. shows it as a significant medicinal plant for drug development. Continued pharmacological investigations, and clinical trials are essential to evaluate the therapeutic potential of this plant and ensure its safe and effective use in future healthcare applications.

REFERENCES

- Ananth D, Garlapati D, Vijayaraghavan M and Bharathi V. (2021). Active status on phytochemistry and pharmacology of *Pergularia daemia* Forsk. (Trellis-vine): a review. Clinical Phytoscience. 7. 10.1186/s40816-021-00295-Z.
- Bhaskar VH and Balakrishnan N. (2009). Veliparuthi (*Pergularia daemia* (Forsk.)- as a phytomedicine: a review. International Journal of PharmTech Research. 1(4): 1305-1313.
- Bhat SS, Tallur PN, Prameela HC, Thakur S, Singh B, Chauhan J, Kumar S and Singh R. (2024). Medicinal, Phytochemical Screening and Cytotoxicity of *Pergularia daemia* (Forssk.) Chiov. African Journal of Biological Sciences. 6(Si4): 5867- 5874.

- Bhavin V, Ruchi V and Dd S. (2011). Diuretic Potential of Whole Plant Extracts of *Pergularia daemia* (Forsk.). Iranian Journal of Pharmaceutical Research. 10(4):795-798.
- Bhusari SS, Bhokare SG, Nikam KD, Chaudhary AN and Wakte PS. (2018). Pharmacognostic and Phytochemical investigation of stems of *Pergularia daemia*. Asian Journal of Pharmacy and Pharmacology. 4(4): 500-504.
- Chandak RR and Dighe NS. (2019). A Review on Phytochemical & Pharmacological Profile of *Pergularia daemia* linn., Journal of Drug Delivery and Therapeutics. 9(4-s):809-814.
- Hase V and Nasreen S. (2016). Pharmacognostical aspects of *Pergularia daemia* leaves. International Journal of Applied Research. 2:296-300.
- Hebbar SS, Harsha VH, Shripathi V and Hedge GR. (2004). Ethnomedicine of Dharward district in Karnataka, India-plants used in oral healthcare. Journal of Ethnopharmacology. 94: 261-266.
- Iffath HM and Caroline RJ. (2018). *In Vitro* Anti-Inflammatory and Antiarthritic Activity of *Pergularia daemia* Leaves and Roots. International Journal of Drug Development and Research. 10:10-13
- Karthishwaran K and Mrinalini S. (2010). Therapeutic potential of *Pergularia daemia*- an ayurvedic wonder. International Journal of Pharmacology. 6(6):836-843.
- Kumar KV, Kumar SP and Venkatachalam T. (2014). Investigation of anthelmintic activity of *Pergularia daemia* leaves. Pharmacophore. 5 (1). 44-48.
- Londonkar RL, Patil SJ and Patil SB. (2009). Analysis of antifertility activity and phytochemical studies of *Pergularia daemia* leaves in male albino rats. Natural Products. 5(2): 68-73.
- Nithyatharani R and Kavitha US. (2018). *Pergularia daemia*- as an excellent phytomedicine. International Journal of Creative Research Thoughts. 6(1): 411-415.
- Nyam MA, Sila MD, Datiri MI, Datiri MI, Papi DY and Ajang DI. (2024). Effect of *Pergularia daemia* (Forssk) and *Momordica charantia* L. (bitter gourd) leaf extracts on some enteric bacterial species. MOJ Food Process Technol. 12(1):116–122.

Omobuwajo OR, Alade GO and Sowemimo A. (2008). Indigenous Knowledge and practices of women herb sellers of Southwestern Nigeria. *Indian Journal of Traditional Knowledge*. 7: 505-510.

Raut VM, Swami NB and Sanap GS. (2024). Exploring herbal synergies: the efficacy of *Pergularia daemia* and co-herbs in reducing pain, swelling and inflammation. *World Journal of Biology Pharmacy and Health Sciences*. 19(1): 1 -17.

Sarkodie JA, Squire SA, Oppong Bekoe E, Fosu Domozoro CY, Kretchy IA, Ahiagbe MK, Frimpong-Manso S, Oboba Kwakyi NA, Edoh DA, Sakyiama M, Lamptey VK, Affedzi-Obresi S, Duncan JL, Debrah P, N'guessa BB, Asiedu-Gyekye JI and Kwadwo Nyarko A. (2016). Antioxidant and antimicrobial capacities of ethanolic extract of *Pergularia daemia* leaves: a possible substitute in diabetic management. *Journal of Complementary and Integrative Medicine*. 13(3):239-245. doi: 10.1515/jcim-2015-0069.

Sowmiya K, Sasikumar E, Diviyabarathi M, Samundeswari P and Nivetha G. (2024). Veliparuthi (*Pergularia daemia*) Medicinal Uses in Siddha and Varma Maruthuvam. *International Journal of Pharmaceutical Sciences Review and Research*. 84(9): 162-164.

Sridevi G, Sembulingam P, Sembulingam K, Srividya S and Ibrahim M. (2015). Evaluation of in vivo anti-inflammatory activity of *Pergularia daemia*. *World Journal of Pharmaceutical Research*. 4(8): 1747-1756.

Sureshkumar SV and Mishra SH. (2006). Hepatoprotective effect of extracts from *Pergularia daemia* Forsk. *Journal of Ethnopharmacology*. 107(2):164-8. doi: 10.1016/j.jep.2006.02.019.

Vaithiyanathan V and Mirunalini S. (2015). Assessment of Antioxidant Potential and Acute Toxicity Studies of Whole Plant Extract of *Pergularia daemia* (Forsk). *Toxicology International*. 22(1):54-60. doi: 10.4103/0971-6580.172257.