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A COMPREHENSIVE REVIEW ON THE PHARMACOGNOSTIC, PHYTOCHEMICAL AND PHARMACOLOGICAL PROFILE OF *PERGULARIA DAEMIA* (FORSK.) CHIOV.,

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ABSTRACT

Pergularia daemia (family: Apocynaceae) is a widely distributed twining herb traditionally used in Indian folk medicine. This review summarizes its profile, taxonomy, botanical characteristics, pharmacognostic features, phytochemical constituents, and major pharmacological activities. Pharmacognostic evaluation—including macroscopic and microscopic examinations, powder microscopy, and organoleptic analysis—provides essential diagnostic parameters for correct identification of the plant. Physicochemical standards such as total ash, water-soluble ash, acid-insoluble ash, sulphated ash, moisture content, and extractive values further support its quality assessment and standardization for herbal formulations. Phytochemical investigations reveal the presence of alkaloids, flavonoids, terpenoids, phenolics, steroids, tannins, saponins, and glycosides, which contribute to its therapeutic potential. The plant exhibits a broad spectrum of pharmacological activities. Studies report its effectiveness as a phytomedicine and demonstrate antifertility, CNS depressant, hepatoprotective, anticancer, antibacterial, anti-inflammatory, and wound-healing properties. These biological effects validate its traditional uses and highlight the significance of its bioactive metabolites. Overall, *P. daemia* represents a promising medicinal plant with multidimensional therapeutic value.

However, despite encouraging preclinical evidence, further research is required to isolate active compounds, clarify mechanisms of action, establish dosage safety, and conduct well-designed clinical studies. Strengthening scientific validation will support its potential inclusion in evidence-based herbal and pharmaceutical applications.

KEYWORDS: Pharmacognostic evaluation, phytochemical constituents, pharmacological activity, antifertility, hepatoprotective.

INTRODUCTION

Medicinal plants are important in herbal formulations because they contain natural bioactive compounds that provide therapeutic effects like antimicrobial, anti-inflammatory, and wound healing actions. They are safe, affordable, easily available, and have a long history of traditional use, making them reliable for developing effective and eco-friendly herbal products. The proportion of plant usage in the different Indian systems of medicine is Ayurveda (2000), Siddha (1300), Unani (1000), Homeopathy (800), Modern (200) and Folk (4500).[1] Almost 25,000 herbal based drug formulations are used in India particularly in traditional and folk medicine system.[2] These drug formulations are either directly derived from aerial part of the plant or derived from other specific parts like leaf, root, stem, bark, flower and seed. Some of the herbal drugs are derived from plant excretory products such as latex, resins and gum.[3] In general, plants secondary metabolites that are naturally synthesized from primary metabolites comprise an extensive range of bioactive constituents. Medicinal and aromatic plants are rich in bioactive secondary metabolites like phenolic acids, flavonoids, alkaloids, glycosides, phytosterols, terpenoids, tannins.

These secondary metabolites are known for their pharmacological properties.[4,5] *Pergularia daemia* Forsk., belongs to the family of Asclepiadaceae. It is a perennial twining herb, which grows wild along the road sides of India. The aerial parts of *P. daemia* are used as an anti-helminthic, antiseptic and anti-venom agent. It is also used in treating gastric ulcers, uterine and menstrual complaints. On the other hand, the leaves of this plant are also used as an effective medicine for anaemia, leprosy, arthritis, haemorrhoids, amenorrhea, dysmenorrhea, infantile diarrhoea, body pain, asthma, bronchitis and whooping cough.[6]

Pergularia daemia has been traditionally used for skin injuries and wound infections. Phytochemical studies reveal that its leaves and roots contain flavonoids, tannins, alkaloids and phenolic compounds — all of which support tissue repair, reduce inflammation and

combat microbial invasion. For example, a 2011 study found a *P. daemia* leaf‑extract ointment achieved ~97.2 % wound closure in rats by day 16, better than standard treatment.[7] The plant reduces the incidence of convulsion and asthma. It is used to regulate the menstrual cycle and intestinal functions. The root is useful in treating leprosy, mental disorders, anemia and piles. The roots of *Pergularia daemia* have been used to treat inflammation and pain and to reduce the fever by the folklore people of Salem, Dharmapuri and Coimbatore district, Tamilnadu state, India.[8] Based on this background study of *P. daemia*, we confer the existing status of phytochemistry and pharmacological activities of *P. daemia* in the present review.

PLANT PROFILE

Pergularia daemia (Forssk.) Chiov., is a perennial, twining herbaceous plant that is extensively found in tropical and subtropical regions of the Indian subcontinent. It is a member of the Asclepiadaceae family (Apocynaceae according to modern classifications). It is especially prevalent in disturbed areas like fallow land, open forests, and roadsides. The plant can be identified by its characteristic, paired, spiny follicles (fruit) that dehisce at maturation, pubescent branches, dull green to yellowish-white flowers placed in axillary cymes, and hispid (hairy) stems and leaves.[9]

SYSTEMATIC POSITION

Common names[9]

- English : Trellis-vine
- Tamil : Veliparuthi
- Hindi : Utaran
- Kannada : Juttuve
- Malayalam : Veliparatti
- Telugu : Jittupaku
- Bengali : Chagulbanti, Changulbati
- Guajarati : Amaradudheli, Chamardudhel
- Marathi : Utaranavel, Uturhi
- Oriya : Juktiruhi, Uttruri, Uturdi
- Sanskrit : Uttaravaruni, Kurutakah, Yugaphala

Taxonomy classification[10]

- Kingdom : Plantae
- Subkingdom : Tracheobionta
- Super division : Spermatophyta
- Division : Magnoliophyta
- Class : Magnoliopsida
- Subclass : Asteridae
- Order : Gentianales
- Family : Asclepiadaceae
- Genus : *Pergularia*
- Species : *P. daemia* (Forsk.) Chiv.,

Plant Taxonomy

A slender, hispid, fetid- smelling perennial climber. Leaves opposite, membranous, 3-9 cm long and approximately as wide, broadly oblong, orbicular or deeply cordate, acute or short acuminate at apex, ubescent beneath, petioles 2-9 cm long. Flowers greenish-yellow or dull white tinted with purple, borne in axillary, long-peduncled, drooping clusters. The seeds are pubescent and generally ovate, while the fruits (follicles) are lanceolate, long-pointed, about 5 cm long, and coated with soft spines. Flowering may occur each year between August and January in central India, with fruits developing from October to February. In central Indian deciduous woods, the stems normally fall down in February and regrow with the commencement of the rainy season.[11-12]

Botanical Description

P. daemia is found throughout tropical and subtropical climates, especially in sections of south-east Asia, India, Africa, Arabia, Malaya, Pakistan, and Afghanistan (Fig 1). It is frequently seen in hedges in India, where most centuries are cut to an elevation of roughly 1000 meters in the Himalaya and 900 meters in Southern India. *P. daemia* is a milky-sapped perennial twining herb. The soft-haired stems can reach a height of 4 meters or more. The thin, 5–10 by 3.8–9 cm long leaves are heart-shaped, roughly ovate, or glabrous, with ciliate, hairy, and cordate margins at the base. The pubescent petioles are 2–6.3 cm long. The blooms are arranged on long peduncles in axillary pseudo umbels. In the evening, Pendulous opens. Corella has long, fringed lobes and is creamy white or greenish, occasionally tinged with purple (Fig. 2).[13]

Habitat

A widely distributed in the tropical and sub-tropical area. In India it is very commonly found in hedges through cut most of centre to an altitude about 1000m in Himalayas and 900m in Southern India.[12]

PHYTOCHEMISTRY

The phytochemical and other chemical components of a plant typically determine its therapeutic usefulness. Flavonoids, alkaloids, tannins, saponins, and steroids are the most often detected phytochemicals from *P. daemia* leaves, as demonstrated in this study by a qualitative phytochemical examination of leaf extract.[13]

In *P. daemia* plant extract (whole plant, leaves, stem and root) consist of different chemical compounds. The main core compound present in *P. daemia* leaf extract containing wound healing properties are,[15]

- Quercetin (flavonoid)
- Kaempferol (flavonoid)
- Tannins
- β-sitosterol (phytosterol)
- Saponins
- Alkaloids
- Steroids

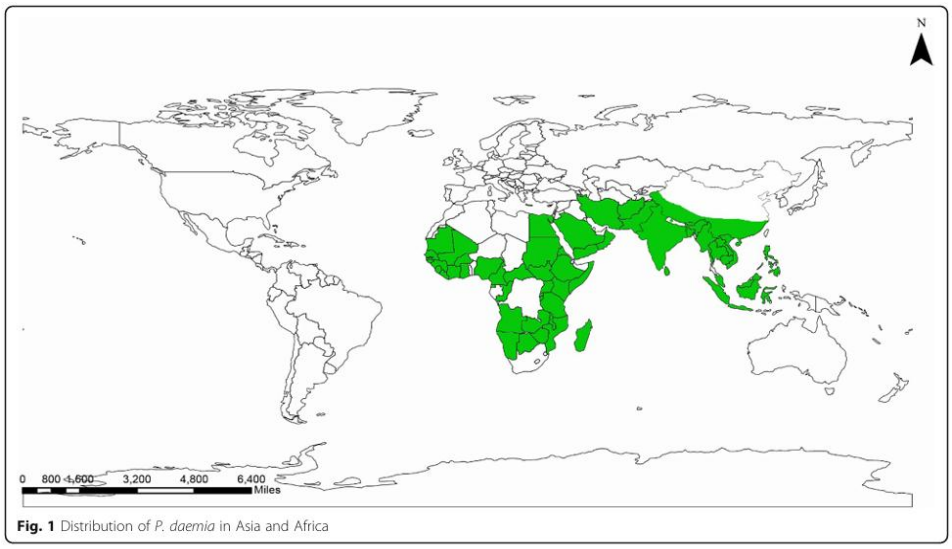

Fig. 1: Distribution of *P. daemia* in Asia and Africa.[13]

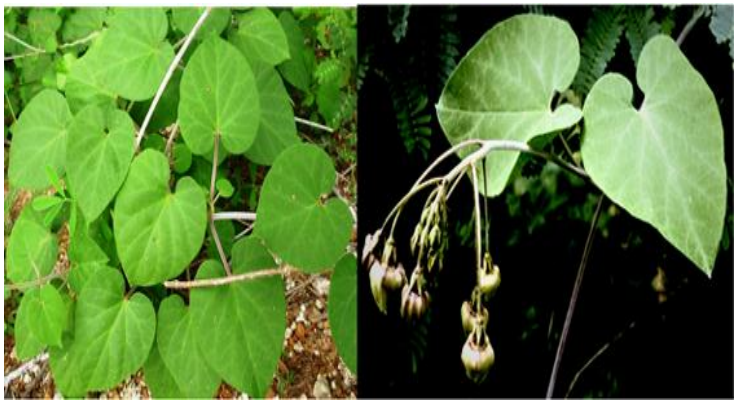

Figure 2: Leaves and flowers.[13]

Figure 3: Fruit.[14]

Figure 4: Aerial part.[14]

Ethnomedical Profile

Aerial parts & Whole Plant is used for snake bite, in diabetis mellitus. Entire plant used as an anthelmintic, emmenagogue, emetic, antiseptic, emetic, expectorant. and antivenin and used to facilitate parturition, while used in Ayurvedic medicine for delayed childbirth, amenorrhea, asthma, snakebite, rheumatic swellings and used to treat post-partum hemorrhage. Latex of this plant used for boils and sores. Dried leaf used as an emetic, antirheumatic and used for

bronchitis, amenorrhea, dysmenorrheal, asthma, healing cuts and wounds, while used to treat whooping cough and to facilitate parturition. Fresh leaf used as fish poison, while leaf juice used for amenorrhea, dysmenorrheal, catarrhal infections, infantile diarrhea and used reduce the body pain whole plant used as in treatment of dibetis mellitus. Dried root used as an abortifacient, emetic, bronchitis and used for cough, asthma and constipation, while fresh root used as an abortifacient and used to treat gonorrhea. Shoots used to treat whooping cough. Stem bark has been used to treat malaria and twig used as an antipyretic and appetizer.[16]

PHARMACOGNOSTIC STUDIES

Macroscopic characters (leaf, stem, root, latex)

- ✓ **Leaves:** Opposite, cordate (heart-shaped), 3–8 cm across, dark green above, paler beneath; surface slightly hispid (hairy) sometimes with minute hairs; bitter taste; faint fetid odour reported in herbarium notes[16]
- ✓ **Stem:** Slender, twining vine; young stems hispid (short stiff hairs), green turning brownish on older branches[16]
- ✓ **Root:** Taproot/tuberous portions used traditionally; external surface brownish, fracture short-fibrous.[17]
- ✓ **Latex:** Milky latex present in stems and other aerial parts.[13]

Microscopic characters — Transverse section (T.S.)

Leaf (T.S.)

- Epidermis: Single layered upper and lower epidermis; epidermal cells with thin cuticle.
- Trichomes: Multicellular unicellular or multicellular covering trichomes (simple, sometimes unicellular or multicellular uniseriate hairs) on surface and midrib.
- Mesophyll: Differentiated into 1–2 layers of columnar palisade parenchyma (adaxial) and 3–5 layers of spongy parenchyma (abaxial) with intercellular spaces.
- Vascular bundles: Collateral vascular bundles in midrib; xylem elements and phloem typical; presence of vascular bundle sheath.
- Stomata type: Reports indicate anisocytic or paracytic stomata depending on study/leaf surface (most leaf studies report anisocytic on lamina).[18]

Stem (T.S.)

- Epidermis: Single layered; trichomes present (simple covering hairs).

- Cortex: Several layers of parenchyma with abundant starch grains and calcium oxalate crystals (raphides or cluster crystals reported in root/stem cortex).[17]
- Vascular cylinder: Collateral vascular bundles arranged in ring or scattered (reports vary with stem age); secondary growth may show cambial activity in older stems.
- Latex canals: Laticiferous cells/canals (milky latex) reported in aerial parts — typical of family.[13]

Powder microscopy — diagnostic characters

- Leaf powder: fragments of epidermis with stomata (anisocytic/paracytic), palisade cell fragments, parenchyma, multicellular covering trichome fragments, fragments of vascular tissue.[19]
- Stem/root powder: vessel elements, tracheids, fibers, xylem parenchyma, abundant starch grains, calcium oxalate crystals, fragments of sclerenchyma/fibers.[17,19]

Organoleptic evaluation

- Appearance: Leaf — green, cordate; Stem — slender, brownish on drying; Powder — greenish to brownish green.
- Taste: Bitter, slightly astringent (leaves).
- Odour: Faint fetid or characteristic plant odor; latex has characteristic smell.[20]

PHARMACOLOGICAL PROFILE

As a Phytomedicine

Pergularia daemia is a plant that has long been used as an anthelmintic, laxative, antipyretic expectorant, and treatment for malarial intermittent fevers and infantile diarrhea. It is extensively found throughout the world's tropical and subtropical climates. Terpenoids, flavonoids, sterols, and cardenolids are just a few of the phytochemicals that have been extracted and identified from the plant's leaves, stems, shoots, roots, seeds, and fruits**.**[21]

Antifertility activity

According to reports, the ethanolic extract of *Pergularia daemia's* steroidal fraction has antifertility properties. In this study, we examined the antifertility activity of the alkaloidal component of ehtanolic extract. In the preimplantation stage of female mice, oral administration of the ethanolic fraction of alkaloidal extract at a dose of 200 mg/kg body weight exhibits notable activity.[22]

Amelioratory effect of flavonoids: The whole plant, *Pergularia daemia* (Family: Asclepediaceae), extract (50% alcohol) was investigated for its antiurolithiatic and diuretic activity. Ethylene glycol (0.75% in water) feeding resulted in hyperoxaluria as well as increased renal excretion of calcium and phosphate. Alcoholic extract (400 mg/kg) of *P. daemia* was given orally in curative and preventive regimens over a period of 28 days. The results were comparable with the standard drug, cystone (750 mg/kg). of the extract. The extract exhibited significant diuretic activity at dose of 400 mg/kg body weight as evidenced by increased total urine volume and the urine concentration of Na+, and K+. These findings affirm assertions made regarding the effectiveness of the extract of this plant against urinary pathologies in the Indian folk medicine.[23]

Central nervous system depressant activity

The central nervous system depressant action of *P. daemia* roots was assessed. In this study, pentobarbitone sodium and chloropromazine were used to induce sleep in Swiss albino mice. When compared to the control and medication-treated groups, the alcohol and aqueous root extract of *P. daemia* demonstrated notable central nervous system depressant action. According to their findings, alcohol and aqueous extract both exhibited central nervous system depressive activity, which is mostly caused by the glycosides found in *P. daemia* roots.[24]

Antioxidant activity: In vitro screening of antioxidant activity on *P. daemia* root extract. In their preliminary pytochemical test, both aquous and ethanolic extract indicated the presence of alkaloid, glycoside, steroid, flavonoid, saponin, terpinoid, tannin and phenolic compound. The result obtained from their study shows that *P. daemia* exhibited antioxidant activity which may be attributed to the presence of polyphenolic and other pytochemical constituents. This may be used in preventing oxidant stress related degenerated diseases.[25]

Hepatoprotective activity

A common folk remedy for jaundice is *pergularia daemia*. At a fixed dose level of 200 mg kg-1, a preliminary study on the aerial portions of *Pergularia daemia* revealed considerable hepatoprotective effects. Additionally, they expanded their investigation to find the *P. daemia* active chemicals that provide hepatoprotection. Triterpenoids and flavonoids were found in the ethanolic extract, according to their research on both aqueous and ethanolic extracts. Their findings imply that *P. daemia's* flavonoid content may be in charge of hepatoprotection. Additionally, *Pergularia daemia's* hepatoprotective effect was assessed in

vitro using an ethanolic extract. The findings of this investigation further support the notion that flavonoids are in charge of the hepatoprotective action.[26]

Antidiabetic activity: Ethanol and aqueous extract of *Pergularia daemia* plant was investigated against alloxan induced hyperglycemia. 200 mg kg-1 of the extract significantly reduced blood glucose levels to normal which proved hypoglycemic activity. The hypoglycemic activity of *P. daemia* extract is possibly be due to the presence of β-sitosterol and quercetin. *P. daemia* on blood glucose level status in streptozotocin induced diabetic rats. The results suggested that oral administration of *P. daemia* possesses significant antidiabetic potential. It was concluded that antidiabetic effect of *P. daemia* may due to its bioactive compounds responsible for antidiabetic activity present in the leaves extract.[27]

Antiurolithiatic Activity: The whole-plant, *Pergularia daemia* (Family: Asclepediaceae), extract (50% alcohol) was investigated for its antiurolithiatic and diuretic activity. Ethylene glycol (0.75% in water) feeding resulted in hyperoxaluria as well as increased renal excretion of calcium and phosphate. Alcoholic extract (400 mg/kg) of *P. daemia* was given orally in curative and preventive regimens.[28]

Anticancer activity

Pergularia daemia's anticancer activity was tested against sixty human cancer cell lines and divided into sub-panels that represented leukaemia, melanoma, lung, colon, kidney, ovary, and central nervous system cancers. They discovered that α-amyrin has low-potency anticancer action. Triterpenoids are essential anti-cancer drugs, and structural modification of this family of molecules may lead to the development of a novel cancer treatment.[29]

Antibacterial activity

Ethyl acetate and ethanol extracts of *Pergularia daemia* were found to have potential antibacterial activity against *S. aureus, P. aeruginosa, A. hydrophila, E. coli,* and *S. typhi.* According to similar reports, *P. daemia's* ethanol extract shown antibacterial action. Additionally, a recent study demonstrated that *Pergularia daemia* leaf extract's antibacterial activity was tested against *B. subtilis, S. aureus, E. coli,* and *P. vulgaris* using a variety of solvents, including hexane, chloroform, and ethyl acetate.[30]

CONCLUSION

Pergularia daemia is a traditionally valued medicinal plant that has gained scientific attention due to its rich phytochemical composition and diverse pharmacological activities. The pharmacognostic studies—including macroscopic, microscopic, powder characteristics, organoleptic features, and physicochemical parameters—provide reliable identification markers and support its standardization for herbal formulations. The plant contains bioactive constituents such as alkaloids, flavonoids, phenolics, terpenoids, tannins, and saponins, which contribute to its wide therapeutic potential. Phytochemical analyses have consistently linked these constituents to various pharmacological actions, including antifertility, CNS depressant, hepatoprotective, anticancer, antibacterial, anti-inflammatory, and wound-healing activities. These findings validate the traditional use of *P. daemia* as a phytomedicine and highlight its relevance in modern herbal drug development.

Overall, this review emphasizes the need for further detailed clinical studies, mechanism-based investigations, and formulation research to fully establish the safety, efficacy, and therapeutic applicability of *Pergularia daemia*. Strengthening scientific evidence will help integrate this promising plant into evidence-based phytotherapeutics.

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