

PHYTOCHEMICAL AND PHARMACOLOGICAL POTENTIAL OF *PERGULARIA DAEMIA* (FORSK.): A REVIEW

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Abstract:

Pergularia daemia forsk (Asclepiadaceae) is a hispid perennial herb that grows widely along the road sides of India and other tropical and subtropical regions of the world. The whole plant contain high medicinal properties hence traditionally used in treating various ailments like jaundice, anthelmintic, laxative, antipyretic, expectorant, infantile diarrhoea etc.. Phytochemically the plant has been investigated for alkaloids, flavonoids, saponins and terpenes. The plant has been demonstrated to have various pharmacological activities such as anti inflammatory, hepatoprotective, anticancer, antidiabetic, antioxidant, antibacterial, antifungal, antiinfertility and analgesic central nervous system depressant activity. This review article deals with taxonomic, phytochemistry, pharmacological properties and other important aspects of *pergularia daemia*.

Keywords: phytochemistry, pharmacological activities, *pergularia daemia*, Ethnobotanical uses

Introduction:

The plant and plant products are being used for variety of purpose. Since ancient time's nature has been an important source of medicinal agents and large number of natural products have been identified and developed from Natural Sources based on their use in traditional medicine numerous medicinal plants are of Global interest today because of their therapeutic and economic significance. According to the World Health Organisation approximately 85 to 90% of world's population consumes traditional herbal medicines, while the herbal drug industry has been in high growth since the late 1990 due to the growing demand in developing and developed countries [1]. The plant Biodiversity in India has been served as a foundation for the development of many traditional system of medicine, including Ayurveda, Unani, Siddha and Tibetan [2]. The use of alternative medicinal therapy has increased the interest of pharmacologist over the past decades. Historically plants have provided a source of inspiration for Novel Drug components as plant-derived medicine have made large contribution to human health and well-being. In general, biological studies are very

much essential to substantiate therapeutic properties of medicinal plants. The potential of medicinal plants as a source of new drugs is still largely unexplored. Research in medicinal plants has gained a renewed focus recently. The efficacy and safety of herbal medicine have turned the major pharmaceutical population towards medicinal plant research and so there are considerable evidences of increase in demand of medicinal plants [3]. Plant based system of medicine being natural does not have this serious problems. *Pergularia daemia* belongs to the family Asclepiadaceae. Generally the family Asclepiadaceae includes more than 2000 species under 280 genera are distributed worldwide in the tropical and subtropical regions [4]. The purpose of the present study is to gather together the available published information on the constituents of the plant and its pharmacological and chemical properties.

Taxonomy classification [5]

Table-1 Taxonomic classification of *Pergularia daemia*

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

Vernacular Names [6]

P.daemia (Forsk) Chiv or *P.extensa* N.E.Br or *Daemia extensa* R.Br [7]

Bengali	:	Chagulbanti, Changulbat
Guajarati	:	Amaradudheli, Chamardudheli, Nagaladudhi, Nagaladhdheli

Hindi	:	Utranajutuka, Utran, Dudhi, Dudhibel, Jutuk, Sagovani
Kanada	:	Haalu koratige, Hala koratige, Juttuve balli, Kurudigana balli, Alavaarana balli, Talayarana balli
Malayalam	:	Veliparatti, Veliparuti,
Marathi	:	Utaranavel, Uturhi
Oriya	:	Juktiruhi, Uttruri, Uturdi
Sanskrit	:	Uttaravaruni, Kurutakah, Yugaphala, Yugmaphala
Tamil	:	Veliparuthi, Uthamani, Beliparti, Nandamani
Telugu	:	Dushtupatige, Gurtichettu, Guruti, Jittupaku

Description: [6]

A slender, hispid, foul-smelling perennial climber. Leaves are opposite membranous, 3-9 cm long and about as wide, broadly ovate, orbicular or deeply chordate, acute or short acuminate at apex, pubescent beneath, petioles 2-9cm long. Flowers are greenish, Yellow or dull white tinged with purple, borne in axillary, long peduncled, drooping clusters. Fruits (follicles) lanceolate, long pointed, about 5cm long, covered with soft spines and seeds are pubescent, broadly ovate. Flowering may occur each year between August and January in Central India, with fruits maturing from October to February. in Central Indian deciduous forest, the stems typically die down in February and reappear with the onset of the rainyseason.

Habitat: [6]

A widely distributed in the tropical and subtropical areas in India it is very commonly found in hedges through cut most of cenfry to an altitude about 1000m in Himalayas and 900m in Southern India.

Ethno medicinal uses:

Numerous medicinal uses have been reported for all parts of the plant throughout its distribution area. The Crushed leaves, or sometimes the crushed young fruits are applied externally to boils abscesses, subcutaneous worm infections and Eczema. Leafy twig infusions and decoctions are widely used as an appetitive, anthelmintic [8], expectorant, emetic [9], emmenagogue [10] and to treat diarrhoea [9], dysentery, colic rheumatism, painful joints and Limbs, cramps in the legs,

Malaria, appendicitis, amenorrhoea [8]. The latex is applied to sore eyes [11] and aching teeth and to treat rheumatism, asthma, Snake bite [12] and to remove Thorns from the skin. In Ghana Crusher leaves with capsicum peppers are given as an enema of a leaf in fusion is giving to facilitate childbirth [13]. Infusion of roots is taken against stomach ache, colic and cough and also as abortifacient [14]. Stem bark has been used to treat malaria [15]. Fresh leaf used as fish poison [16].

Pharmacological activity:

Pharmacological investigations have revealed that *pergularia daemia* exhibit a wide range of biological effects. However, the crude extract of the plant have been used as a traditional medicine for the treatment of various diseases some of which are very interesting for possible future development.

Antioxidant activity:

In vitro screening of antioxidant activity on *pergularia daemia* root extract was reported [17] in which preliminary phytochemical test both aqueous and ethanolic extract indicated the presence of alkaloid, glycoside, steroid, flavonoid, saponin, terpenoid and phenolic compound. The results obtained from their study shows that *Pergularia daemiae* exhibited antioxidant activity.

Anti diabetic activity:

Ethanol and aqueous extract of *pergularia daemia* plant was investigated against alloxan-induced hyperglycemia. 200mg/kg of the Extract significantly reduced blood sugar levels to normal which proved hypoglycemic activity [18] it is due to the presence of β -sitosterol and quercetin.

Anti bacterial activity:

The antibacterial activity was observed in ethyl acetate and ethanol extract of *pergularia daemia* which showed significant antibacterial activity against *S. aureus*, *P.aeruginosa*, *A.hydrophila*, *E.coli* and *S.typhi* [19]. In addition to recent report also showed the antibacterial activity of the *pergularia daemia* leaf extract was tested by using various solvents such as hexane, chloroform and ethyl acetate against *B.subtilis*, *S.aureus*, *E.coli* and *P.vulgaris*. Their experiment was determined by disc diffusion method and their results showed that ethyl acetate extract of *pergularia daemia* was found to be effective. they have also isolated a new bioactive compound, 6- (4,7- dihydroxy- heptyl) quinine, a novel agent which is proved to be responsible for antibacterial activity [20].

Antifungal activity:

The antifungal activity was reported [21] that sensitivity of the keratinophilic fungi in *Pergularia daemia* extracts by dry weight method. A recent study was investigated on *pergularia daemia* against antifungal activity. In their study, the sensitivity of the keratinophilic fungi and inhibition of mycelial growth were evaluated by dry weight method. The antifungal activity of *pergularia daemia* plant salts was shown against only one fungal pathogen *Aspergillus flavus* and does not showed any Inhibitory activity against the other test pathogen such as *Cryptococcus neoformans*, *Candida albicans* [22].

Anticancer activity:

Anticancer activity of *pergularia daemia* was screened against 60 human cancer cell lines and was organised into sub panels representing leukaemia, Melanoma and cancer of lungs, colon, kidney, ovary and central nervous system. In their results, it was found that α -amyrin exhibited anticancer activity [23]. Triterpenoids play a vital role as anticancer agents and structural modification of this class of compounds can result in the establishment of an innovative drug for the treatment of cancer.

Hepatoprotective activity:

Pergularia daemia is traditionally used as a folk medicine for treating jaundice. A preliminary Investigation on aerial parts of *pergularia daemia* showed significant hepatoprotective activity at a fixed dose level of 200 mg/kg [24] further the work was extended to identify the active compounds of *pergularia daemia* which are responsible for hepatoprotection. They investigated on both aqueous and ethanolic extract which showed the presence of triterpenoids and flavonoids in ethanolic extract. Their results suggest that presence of flavonoids in *pergularia daemia* could be responsible for hepatoprotection. In addition in vitro evaluation hepatoprotective activity of *pergularia daemia* was also investigated in this study, acetone and ethanolic extract obtained from total ethanolic extract was carried out using CCL4 induced toxicity in primary cultured rat hepatocytes. The result of the study also justify that flavonoids are responsible for hepatoprotective activity. Thus, it is evident from these studies that flavonoids like quercetin, kaempferol and isorhammetic glycosides could be liable for various liver diseases [25].

Central nervous system depressant Activity:

The roots of *pergularia daemia* were evaluated for central nervous system depressant activity. This study was investigated on swiss albino mice using chlorpromazine and pentobarbitone sodium induced sleeping time. Alcohol and aqueous root extract of *pergularia daemia* showed significant central nervous system depressant activity and was compared with that of control and drug treated

groups. The results concluded that both alcohol and aqueous extract showed central nervous system depressant activity is mainly due to the presence of glycosides present in *pergularia daemia* roots [26].

Antifertility activity:

The ethanol extract of *pergularia daemia* and its steroidal fraction are reported to have antifertility activity. In this study the alkaloid fraction of ethanol extract was observed for its antifertility activity. Oral administration of the alkaloid fraction at a dose of 200 mg kg b.w. showed a significant activity in preimplantation stage of female mice. The activity of the alkaloidal fraction, when compared with steroidal fraction and was found to be more pronounced since the former inhibition not only the fertility of female mice but also took short period to return the oestrous cycle to normal within 4 to 6 days of drug treatment while steroidal fraction treated mice returned to normal within 6 to 8 days [27].

Anti inflammatory Analgesic and Antipyretic activity:

Crude ethanol extract of *pergularia daemia* leaves was successfully fractionated with petroleum ether, solvent ether, ethyl acetate, butanol and butanone. The ethanol extract and various fractions were investigated for anti inflammatory activity in rats at a dose of 100 mg/kg via intraperitoneally. Ethanol extract and its butanol fraction exhibited significant anti-inflammatory activity compared with respective controls and comparable with that of standard drug Aspirin [28]. The anti inflammatory activity of *pergularia daemia* extract could be attributed due to the presence of steroids [29]. Analgesic effect of aqueous and ethanol extract of *pergularia daemia* was demonstrated in the experimental models using Eddy's hot plate and heat conduction method using thermal stimuli. Both extracts showed the analgesic activity when compared with control and analysed statistically by Tukey Kramer Multiple comparison test [26]. Antipyretic activity was also reported from the aerial parts of *pergularia daemia* extract [30].

Pergularia daemia has wide range of applications as folk medicine and even in ayurveda which have increase defence against various diseases. Some of them are discussed in the table – 2 [31].

Table 2: Some medicinal uses of *Pergularia daemia* as mentioned in ayurveda

Parts used	Medicinal uses	Reference
Leaves	Catarrhal infection and infantile diarrhea	Dalziel (1937), Oliver (1960), Watt and Breyer-Brandwijk (1962)
	Stomachache and tetanus	Irvine (1952)
	Leprosy and haemorrhoids	Thatoi <i>et al.</i> (2008)
	Nasobronchial disease	Chitravadivu <i>et al.</i> (2009)
	Stomach pain	Sandhya <i>et al.</i> (2006)
	Anthelmintic, expectorant	Ndukwu and Ben-Nwadiibia (2005)
	Headache	Omobuwajo <i>et al.</i> (2008)
	Cough and chest pain	Iganacimuthu <i>et al.</i> (2008)
	Alopecia	Kshirsagar and Singh (2001)
	Whole plant	Snake bite
Malaria, fever		Bruce (1998)
Catarrhal infection, infantile diarrhea, rheumatism, Uterine and menstrual disorders and facilitating parturition, gastric ulcers, expectorant, emetic, anthelmintic, leucoderma		Thatoi <i>et al.</i> (2008) Singh <i>et al.</i> (2002)
dysentery		Burkill (1985)
Root decoction	Veneral diseases, arthritis, muscular pain, asthma and rheumatism	Royen <i>et al.</i> (2001)
Latex	Veneral diseases, arthritis, muscular pains, asthma, rheumatism and snake- bites and Fish poison	Van Damme <i>et al.</i> (1922)
	Toothache	Hebbar <i>et al.</i> (2004)
Milky sap (from leaves)	Sore eyes	Irvine (1952)
	Rheumatism, oedema and kidney pains	Burkill (1985)
Root	Gonorrhoea	Haerdi (1964)
	Ulcer, Respiratory problem	Chitravadivu <i>et al.</i> (2009)
Stem bark	Cold	Dokosi (1998)
	Fever and diarrhea in infants	Ndukwu and Ben-Nwadiibia (2005)
Fruits	Digestive and thermogenic	Thatoi <i>et al.</i> (2008)

Phytochemistry:

Generally, medicinal values of the plants are dictated by their phytochemical and other chemical constituents. A number of phytochemical studies have demonstrated the presence of several classes of chemical compounds. It is not our intention in this review to cover all the many compounds reported for *pergularia daemia*, but to summarise the major components that have been implicated in the pharmacological activities of the crude drug. Most commonly found phytochemicals from the leaves of *pergularia daemia* are alkaloids, terpenoids, tannins, steroids and carbohydrates [31]. Phytochemical studies have shown the presence of cardenolides, alkaloids, terpenoids, saponins, steroids [32]. The seeds of *pergularia daemia* contain uzarigenin, coroglaucigenin, calaction, calotropin, other cardenolides and a bitter resin, Pergularin and have a cardiotoxic action [33]. It has been suggested that the plant seed action on the uterus is similar to that of pituitrin and is not inhibited by progesterone [34].

Conclusion:

As seen throughout this review, we have focused on Botanical description, ethno medicinal, phytochemistry and pharmacological properties of *pergularia daemia* various phytochemicals such as flavonoids, alkaloids, terpenoids, tannins and steroids have been reported to be present in this plant. The plant also exhibit several pharmacological properties such as anti inflammation, analgesic, antipyretic, antidiabetic, hepatoprotective, antibacterial, antifungal and central nervous system depressant activity. The plant *pergularia daemia* is an important source of various types of compounds with diverse chemical structures. However, very less work has been done on this plant and there is a wide scope for investigation. This review would help the researchers to get aware of this plant and extensive research should be undertaken on *pergularia daemia* for establishing new therapeutic drugs for mankind.



Aerial Parts of *P. daemia*

REFERENCES

1. Dinesh kumar C. Pharmacognosy can help minimize accidental misuse of herbal medicine 2007; *current science* 93:1356-1358.
2. Jadhav RB, Patil CR, Ganbote AJ. Plant biodiversity and its conservation 2003; *Indian J Pharm Edu* 37:162-165.
3. Bhagwati Uniyal. Utilization of Medicinal Plants by Rural Women of Kulu, Himachal Pradesh 2003; *Indian J.Trad. Knowledge*, 2(4):366-370.

4. Pankaj, O. Doomar or gular (ficus glomerata) as medicinal herbs in Chattishgar, India 2003;
http://botanical.com/site/column_poudhia/127_doomar.html
5. <http://plants.usda.gov>
6. Parrotta A John. Healing plants of peninsular India. Wallingford, U K: CABI Publishing; 2001. p. 131-132.
7. Rastogi RP and Mehrotra BN. Compendium of Indian medicinal plants. Vol2 (1970-1979). New Delhi, India: Central Drug Research, Lucknow and NISCAIR; 2006. p.521.
8. Dutta A, Ghosh S. Chemical examination of *Daemia extensa*. I. J Amer Pharm Ass Sci Ed 1947a; 36: 250-252.
9. Elango V, Ambujavalli L, Amala Basker E, Sulochana N. Pharmacological and microbiological studies on *Pergularia extensa*. Fitoterapia 1985; 56 (5): 300-302.
10. Berhault J. Flore illustree Du Senegal. I. Dicots (Acanthaceae-Avicenniaceae). Dakar; Govt Senegal: 1971.
11. Girach RD, Aminuddin, Siddioui PA, Khan SA. Traditional plant remedies among the Kondh of district Dhenkanal (Orissa). Int J Pharmacog 1994; 32(3):274-283.
12. Selvanayahgam ZE, Gnanevendhan SG, Balakrishna K, Rao RB. Anti-snake venom botanicals from ethnomedicine. J Herbs Spices Med Plants 1994; 2 (4): 45-100.
13. Gupta JC, Roy PK, Dutta A. Pharmacological action of an active constituent isolated from *Daemia extensa* (syn. *Pergularia extensa*). Indian J Med Res 1946; 34: 181.
14. Mittal OP, Tammz C, Reichstein T. Glycosides and aglycons. CCXXVII. The glycosides of *Pergularia extensa*. Helv Chim Acta 1962; 45: 907.
15. Kohler I, Jenett siems K, Kraft C, Siems K, Abbiw D, Bienzle U, Eich E. Herbal remedies traditionally used against malaria in Ghana: Bioassay-guided fractionation of *Microglossa pyridolia* (asteraceae). Z Nature Forsch Ser C 2002; 57C (11/12): 1022-1027.
16. Watt JM, Breyer-Brandwijk MG. The medicinal and poisonous plants of Southern and Eastern Africa. 2nd ed. London: E. + S. Livingstone, Ltd; 1962.
17. Bhaskar, H.V. and N.Balakrishnan. In vitro antioxidant property of laticiferous plant species from western ghats Tamil nadu, India 2009; Int.,J.Health Res.,2:163-170.
18. Wahi AK, Ravi J, Hemalatha S, Singh PN. Anti diabetic activity of *Daemia extensa*. J Nat Remed 2002; 2(1): 80-83.
19. Senthilkumar, M.,P.Gurumoorthi and K.Janardhanan. Antibacterial potential of some plants used by tribals in Maruthamalia hills, Tamil nadu 2005; Nat. Prod. Radiance, 4:27-34.
20. Perumal Samy R, Ignacimuthu S. Antibacterial activity of some folklore plants used by tribals in Western Ghats of India. J Ehanopharmacol 2000; 69: 63-71.

21. Qureshi S, Rai MK, Agrawal SC. In vitro evaluation of inhibitory nature of extracts of 18-plant species of Chhindwara against 3-keratinophilic fungi. Hindustan Antibiot Bull. 1997 Feb-Nov; 39(1-4): 56-60.
22. Suresh, M., P. K. Rath, A. Panneerselvam, D. Dhanasekaran and N. Thajuddin. Antifungal activity of selected Indian medicinal plant salts 2010; J. Global Pharma. Technol., 2:71-74.
23. Khorombi, T.E., G. Fouche and F.R. Van Heerden. Phytochemical investigation and the anticancer properties of *Pergularia daemia* and *phylica paniculata* 2006. CSIR. http://researchspace.csir.co.za/dspace/bitstream/10204/2804/1/khorombi_2006_D.pdf.
24. Suresh Kumar SV, Mishra SH. Hepatoprotective activity of extracts from *P. daemia* Forsk. Against carbon tetrachloride-induced toxicity in rats. Pharma Mag 2007; Vol 3(11): 187-191.
25. Suresh Kumar SV, Mishra SH. In-vitro evaluation of hepatoprotective activity of *P. daemia* Forsk. Pharma Mag 2008b; Vol 4(16)8: 298-302.
26. Lokesh, T.N. Analgesic activity of aqueous and alcoholic root extracts of *Pergularia daemia* (Forsk) Chiov 2009; Int. J. Pharma. Pharmaceut sci., 1:33-37.
27. Golam Sadik, Gafur MA, Shah Alam Bhuiyan M, Khurshid Alam AHM, Helal U Biswas M, Parvez Hassan, Abdul Mannan, Omar Faruk Khan M, Chowdhury AKA. Antifertility activity of *P. daemia*. The Sciences 2001a; 1(1): 22-24.
28. Hukkeri, V. I., M. B. Patil, S. S. Jabalpure and A. Ali. Anti-inflammatory activity of various extracts of *Pergularia extensa* N. E. BR (Asclepiadaceae) 2001; Indian J. Pharmaceutical Sci., 63: 429-431.
29. Sutar, N. G., Y. P. Sharma, P. N. Kendre, M. K. Panigrahi, T. A. Deshmukh and N. P. Jain. Anti-inflammatory activity of whole plant of *Pergularia daemia* linn. In Albino rats 2009; J. Herbal Med. Toxicol., 3:131-132.
30. Jain, S. C., R. Jain, N. Mascolo, F. Capasso, R. Vijavergia and R. A. Sharma. Ethnopharmacological evaluation of *Pergularia daemia* (Forsk) Chiov. 1998; Phytother. Res., 12: 378-380.
31. Karthishwaran, K., S. Mirunalini, G. Dhamodharan, M. Krishnaveni and V. Arulmozhi. Phytochemical investigation of methanolic extract of the leaves of *Pergularia daemia* 2010; J. Biol. Sci., 10: 242-246.
32. Anjaneyulu ASN, Raju DVSN, Srinivasa Rao S. Chemical evaluation of *P. daemia*. Indian J Chem 1998; 37B: 318-320.
33. Patel, M. S. and J. M. Rowson. Investigation of certain Nigerian medicinal plants. Part 1. Preliminary pharmacological and phytochemical screening for cardiac activity 1964; Planta Med., 12: 34-42.

34. Dutta A, Ghosh S. Chemical examination of *Daemia extensa*. I. J Amer Pharm Ass Sci Ed 1947a; 36: 250-252.