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Review Article

A Review on Phytochemical & Pharmacological Profile of *Pergularia Daemia* linn.

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ABSTRACT

Many indigenous Indian medicinal plants have been found to be successfully used to manage diabetes and some of them have been tested and active principles isolated. However, search for new antidiabetic drugs for effective treatment is on. The vast majority of people on this planet still rely on their traditional material medica (medicinal plants and other materials) for their everyday health care needs. It is also a fact that one quarter of all medical prescriptions are formulations based on substances derived from plants or plant-derived synthetic analogs. The herbal drug from tribal region is selected for the study which is used for diabetes and liver diseases. *Pergularia daemia* (Asclepiadaceae) is a perennial herb growing widely along the road sides of India. It has been used in folk medicine for the treatment of Diabetes mellitus & liver disorders. It is widely distributed in the tropical and sub tropical regions of the world. Various phytochemical including terpenoid, flavonoids, sterols and cardenolids have been isolated and identified from the various parts of the plant (leaves, stems, shoots, roots, seeds and fruits whole plant). *P. daemia* widely used by various tribal communities in Western Ghats of India for the treatment of variety of ailments, while predominantly the roots of the plant have been used to treat liver disease and jaundice. The present review article aims towards medicinal Pharmacological potential, Bioactive remedies, Phytochemical profile and other important aspects of *P. daemia*.

Keywords: Ethnobotanical uses, *Pergularia daemia*, Pharmacological Profile, Phytochemical Profile

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Introduction

The plant drug research appears to be complementary to the ongoing synthetic research. World Health Organization in its technical report appears to be on promotion for development of traditional system of medicine¹. The greatest disadvantage in the presently available potent synthetic drug lies in their side effect, toxicity and reappearance of symptoms after discontinuation. *Pergularia daemia* (Forsk.) Chiov (Apocyanaceae), commonly known as utaran (Hindi), Dustapuchettu (Telugu), Uttamarani (Sanskrit) is a slender, hispid, fetid smelling laticiferous twiner found in the plains throughout the hot parts of India. *P. daemia* is said to have more magical application than medical application as it possesses diverse healing potential for a wide range of illnesses. Some of the Folklore people use this plant to treat jaundice, as laxative, anti-pyretic, expectorants and also in infantile diarrhoea. The leaf latex is locally used as pain killer and for relief from toothache the sap expressed from the leaves are held to cure sore eyes in Ghana. 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. Both plants are widely distributed to the Southern parts of India. *P.daemia* (Asclepiadaceae) is known as "Veliparuthi." in Tamil, "Uttaravaruni" in Sanskrit and "Utranajutuka" in Hindi. *C.carandas* belonging to the family of Apocynaceae is commonly known as Christ's thorn or Bengal Currant, 'Kalakke' in Tamil¹. Traditionally the plant *P.daemia* is used as anthelmintic, laxative, antipyretic and expectorant, and is also used to treat infantile diarrhoea and malarial intermittent fevers²⁻⁴. Latex of this plant is used for toothache⁵. Stem bark of this plant is remedy for cold⁶ and fever⁷. Aerial parts of this plant are reported to have various pharmacological activities like hepatoprotective⁸, antifertility, anti-diabetic, analgesic, antipyretic and anti-inflammatory⁹⁻¹¹. Phytochemically the plant has been investigated for cardenolides, alkaloid and saponins and it

has been found that contains various triterpenes and steroidal compounds¹².

Plant Taxonomy: -*Pergularia Daemia* Linn

A slender, hispid, fetid- smelling perennial climber. Leaves opposite, membranous, 3-9 cm long and about as wide, broadly ovate, orbicular or deeply cordate, acute or short-acuminate at apex, ubescent beneath, petioles 2-9 cm long. Flowers greenish-yellow or dull white tinged with purple, borne in axillary, long-peduncled, drooping clusters. Fruits (follicles) lanceolate, long-pointed, about 5 cm 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 forests, the stems typically die down in February and reappear with the onset of the rainy season¹³⁻¹⁴.

Habitat :-

A widely distributed in the tropical and sub-tropical area. In India it is very commonly found in hedges through out most of cenfry to an altitude about 1000m in Himalayas and 900m in Southern India¹⁴.

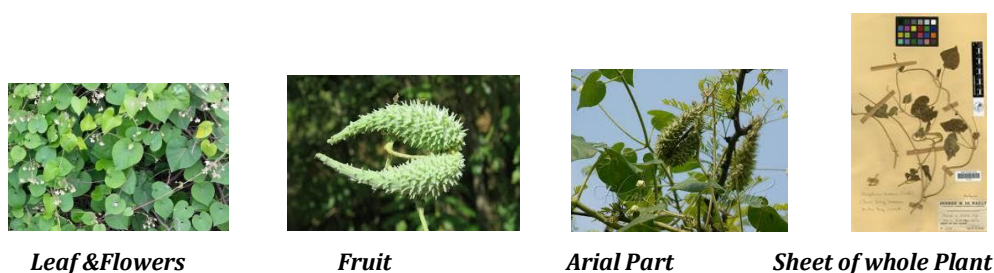


Figure 1: Various parts of *Pergularia Daemia* Linn)

Vernacular Names:-

P.daemia (Forsk) Chiv or *P.extensa* N.E.Br or *Daemia extensa* R.Br¹⁵

Bengali: Chagulbanti, Changulbati

Guajarati: Amaradudheli, Chamardudhel

Hindi: Utranajutuka, Utran, Dudhi, Dudhibel

Kannada : Haalu koratige, Hala koratige

Malayalam : Veliparatti, Veliparuti

Marathi : Utaranavel, Uturhi

Oriya : Juktiruhi, Uttruri, Uturdi

Sanskrit : Uttaravaruni, Kurutakah, Yugaphala,

Tami : Beliparti, Nandamani, Uthamani, Veliparuthi

Taxonomy classification¹⁶

Kingdom : Plantae

Subkingdom : Tracheobionta

Super division: Spermatophyta

Division : Magnoliophyta

Class : Magnoliopsida

Subclass : Asteridae

Order : Gentianales

Family : Asclepiadaceae

Genus : Pergularia

Species : *P. daemia* (Forsk) Chiv.

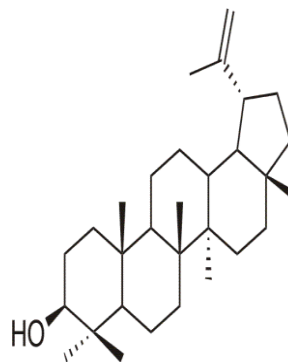
Ethnomedical Information

Aerial parts & Whole Plant is used for snake bite, in diabetes mellitus¹⁷. Entire plant used as an anthelmintic, emmenagogue, emetic, antiseptic, emetic, expectorant¹⁸⁻²⁰

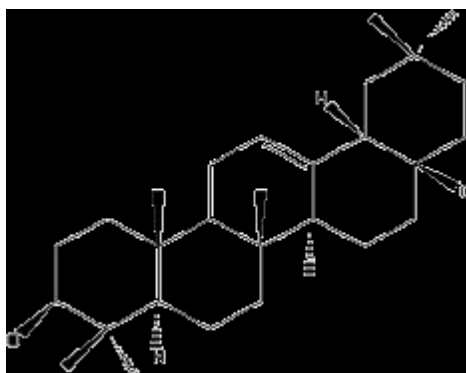
and antivenin and used to facilitate parturition²¹, while used in Ayurvedic medicine for delayed childbirth, amenorrhea, asthma, snakebite, rheumatic swellings²² and used to treat post-partum hemorrhage. Latex of this plant used for boils and sores²³. Dried leaf used as an emetic, antirheumatic and used for bronchitis, amenorrhea, dysmenorrhea, asthma²⁴⁻²⁵, 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, dysmenorrhea, catarrhal infections, infantile diarrhea²⁶⁻²⁷ and used to reduce the body pain. Whole plant used as in treatment of diabetes mellitus²⁸. Dried root used as an abortifacient, emetic, bronchitis and used for cough, asthma and constipation²⁹, while fresh root used as an abortifacient and used to treat gonorrhea³⁰⁻³¹. Shoots used to treat whooping cough³². Stem bark has been used to treat malaria and twig used as an antipyretic and appetizer³³.

Phytochemical Profile³⁴⁻³⁸:-

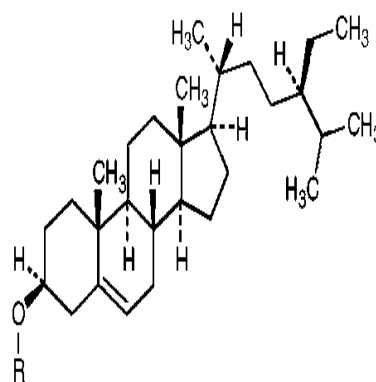
Phytochemicals :- reported to contain β -sitosterol, lupeol, lupeol acetate, α , β -amyrin and its acetate in entire plant and root.



Isolated lupeol-3-beta trans crotonate and oleanolic acid acetate from dried whole plant.

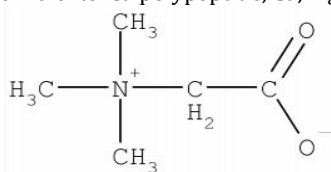


Daucosterol

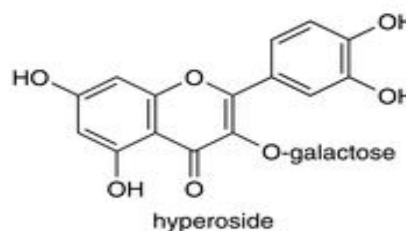


Oleanolic acid

Betaine, hentriacontane and pentacosanoic acid from entire plant, while reported to contain magnesium and potassium carbonate, daemia extensa polypeptide, Ca, Mg and K oxalate

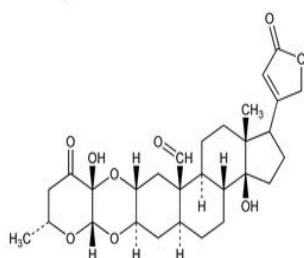


Hentriacontane

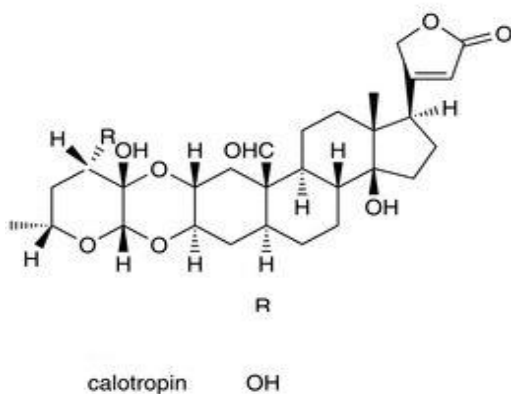


hyperoside

Various cardenolide such as calotoxin, calotropagenin, dihydro calotropagenin, calotropin and uscharidin in seed, while coroglaucigenin, corotoxigenin, uscharidin and uzarigenin in stem .



Uscharidin reported to contain calactin, calotropin, corotoxigenin, daucosterol and sucrose in root reported to contain various cardenolide such as calotoxin, calotropagenin, dihydro calotropagenin, calotropin and uscharidin in seed, while coroglaucigenin, corotoxigenin, uscharidin and uzarigenin in stem . Uscharindaemia extensa polypeptide, daemia extensa glucoside, Inorganic salts such as KCl and KNO₃ in entire plant. hyperoside (flavonol) in dried stem, while flavonoids and saponins in fresh shoots and flowers³⁴.



calotropin OH

Inhibitory Potential of Important Phytochemicals:- Study Of b-sitosterol, b-amyrin, a-amyrin and lupeol were identified in the leaf by GC-MS. Molecular docking studies were performed to evaluate their activities on phospholipase A2 (PLA2) and L-amino acid oxidase enzymes which constituted a rich source in snake venoms (*Naja naja*). Snake venom Phospholipase A2 with PDB code 1A3D devoid of co-crystallized ligand was extracted from Protein Data Bank. Using Molegro Virtual Docker two cavities are formed by cocrystallization. L-Amino acid oxidase (PDB code 4E0V) was a receptor model with a co-crystallized ligand FAD. Among the phytochemicals analysed, b-sitosterol displayed high affinity of binding to the active site regions of phospholipase A2 and L-amino acid oxidase, respectively³⁵.

Phytochemical screening & GC-MS Analysis :- This study was implement to actuate the chemical components of *pergularia daemia* linn using perkinelmer gas chromatography mass spectrometry our results of GC - compounds in the extracts was relevant to the national institute of standard & technology (NIST) library. GC-MS Analysis of ethanolic extract leaves confeses the presence of hexadecoinic acid, methyl ester pentadecoinic acid 14-methyl-methyl ester ethyl 9-12-15-octodecotriolate & 4-chlorobenzoyl-1-cyclohexoyl-5-tosylamino-1, H-123 zole. qualitative phytochemical screening of ethanolic extract shows the presence of many compounds flavonoids, tannins, alkaloids, phenols, sterols. this study result will make a way for the production of herbal medicine for various elements by using *pergularia daemia* leaves³⁶

Larvicidal activity of silver nanoparticles synthesized :- The bioactivity of latex-producing plant *Pergularia daemia* as well as synthesized silver nanoparticles (AgNPs) against the larval instars . The range of concentrations of plant latex (1,000, 500, 250, 125, 62.25, and 31.25 ppm) and AgNPs (10, 5, 2.5, 1.25, 0.625, and 0.3125 ppm) were prepared. The LC₅₀ and LC₉₀ values for first, second, third, and fourth instars of synthesized AgNPs-treated first, second, third, and fourth instars *egypti* (LC₅₀ = 4.39, 5.12, 5.66, 6.18; LC₉₀ = 9.90, 11.13, 12.40, 12.95 ppm) and *A. stephensi* (LC₅₀ = 4.41, 5.35, 5.91, 6.47; LC₉₀ = 10.10, 12.04, 13.05, 14.08 ppm) were found many fold lower than crude latex-treated *A. aegypti* (LC₅₀ = 55.13, 58.81, 75.66, 94.31;

LC₉₀ = 113.00, 118.25, 156.95, 175.71 ppm) and *A. stephensi* (LC₅₀ = 81.47, 92.09, 96.07, 101.31; LC₉₀ = 159.51, 175.97, 180.67, 190.42 ppm). The UV-visible analysis shows absorbance for AgNPs at 520 nm. TEM reveals spherical shape of synthesized AgNPs. Particle size analysis revealed that the size of particles ranges from 44 to 255 nm with average size of 123.50 nm. AgNPs were clearly negatively charged (zeta potential -27.4 mV). This is the first report on mosquito larvicidal activity *P. daemia*-synthesized AgNPs³⁷.

Qualitative & Quantitative analysis of stem bark of *P. Daemia*: Medicinal plants are a pride of our nature. It is estimated that there are more than 45,000 species of medicinal plant present in India. One such traditionally used ethanomedicinal plant is *Pergularia daemia*. It is a hispid perennial twinning herb distributed in the roadsides of tropical and sub tropical regions. The whole plant possess more medicinal values and traditionally used in the treatment of various ailments. The present study involves to determine the qualitative and quantitative analysis of stem of *Pergularia daemia* in different solvents like thanol, ethanol, chloroform, petroleum ether and aqueous. The results of which showed the presence of alkaloids, steroids, terpenoids, flavanoids, saponins, phenols, tannins, aminoacids, cardiac glycosides, carbohydrates and proteins. The quantification of the compounds like alkaloids, flavanoids and phenols were estimated. The result confirms that the stem of *Pergularia daemia* possess significant phytocomponents as mentioned in traditional claims and highlights it as the source of many pharmacological studies and a curative for various ailments.³⁸

Phytochemical Studies on the Leaves :- *Pergularia daemia* is a fetid smelling, perennial twinning herb, widely distributed in the roadsides of tropical and subtropical areas. It is used as an important medicinal plant since ancient times. The present study deals with the qualitative and quantitative analysis of the leaves of *Pergularia daemia* in different solvents and also this study deals with the separation of compounds present in crude methanolic extract of *Pergularia daemia* leaves by High Performance Liquid Chromatography. The qualitative analysis of the leaves showed the presence of alkaloids, steroids, terpenoids, flavanoids, saponins, phenols, tannins, aminoacids, cardiac glycosides, carbohydrates and proteins. The quantification of the compounds like alkaloids, flavanoids and phenols were done. HPLC shows the presence of two major peaks and exhibited the presence of two major components in the methanolic extract of the leaves. The results suggested that *Pergularia daemia* has significant phytocomponents and can be used as a source for many pharmacological studies and a curative for various ailments³⁹⁻⁴⁰.

Pharmacological Profile⁴¹⁻⁴⁷ :-

As a Phytomedicine:- The plant *Pergularia daemia* has been traditionally used as anthelmintic, laxative, antipyretic expectorant and also used to treat infantile diarrhea and malarial intermittent fevers. It is widely distributed in the tropical and sub-tropical regions of the world. Various phytochemical including terpenoid, flavonoids, sterols and cardenolids have been isolated and identified from the various parts of the plant (leaves, stems, shoots, roots, seeds and fruits). *P. daemia* widely used by varioustribal communities in Western Ghats of India for the treatment of variety of ailments, while predominantly the roots of the plant have been used to treat liver disease and jaundice. The present review article aims towards medicinal properties, chemical constituents and other important aspects of *P. daemia*⁴¹.

Antifertility activity of Alkaloidal Fraction

The ethanolic extract of *pergularia daemia* its steroidal fraction is reported to have antifertility activity. In this work we studied the alkaloidal fraction of ethanolic extract to observe its antifertility activity. Oral administration of ethanolic fraction of alkaloidal extract 200 mg/kg of body weight shows significant activity in preimplantation of stage of female mice⁴².

Amelioratory effect of flavonoids: -The whole-plant, *Pergularia daemia* (Family: Asclepiaceae), extract (50% alcohol) was investigated for its antiuro lithiatic 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 medicine⁴³.

Anti-inflammatory, Analgesic and Antipyretic activity:- Crude ethanol extract of *Pergularia daemia* leaves was successively fractionated with petroleum ether, solvent ether, ethyl acetate, butanol and butanone. The ethanolic extract and various fractions were investigated for anti-inflammatory activity in rats at a dose of 100 mg kg⁻¹ via intraperitoneally. **Ethanol extract** and its butanol fraction exhibited significant anti-inflammatory activity when compared with respective controls and were comparable with that of standard drug aspirin. Another study was also demonstrated on the anti-inflammatory activity of *Pergularia daemia* by using various solvent extracts. In the result they found that alcohol extract of *P. daemia* showed significant reduction in swelling of paw at a dose of 300 mg kg⁻¹ b.wt. which was equivalent to diclofenac sodium as a standard in a dose of 15 mg kg⁻¹ b.wt. The anti-inflammatory activity of *Pergularia daemia* extract could be attributed due to the presence of steroids. 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 analyzed statistically by Tukey Kramer Multiple Comparison Test. Antipyretic activity was also reported from the aerial parts of *Pergularia daemia* extract.⁴⁴

Central nervous system depressant activity: The roots of *P. 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 *P. daemia* showed significant central nervous system depressant activity and was compared with that of control and drug treated groups. Their results concluded that both alcohol and aqueous extract showed central nervous system depressant activity and this activity is mainly due to the presence of glycosides present in *P. daemia* roots⁴⁵.

Hepatoprotective activity: *Pergularia daemia* is traditionally used as a folk medicine for treating jaundice. A preliminary investigation on the aerial parts of *Pergularia daemia* showed significant hepatoprotective

activity at a fixed dose level of 200 mg kg⁻¹. Furthermore, extended their study to identify the active compounds of *P. 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 result suggests that presence of flavonoids in *P. daemia* could be responsible for hepatoprotection. In addition, an *in vitro* evaluation hepatoprotective activity of *Pergularia daemia* was also investigated. **Iethanolic extract**. The result of this study also justify that flavonoids are responsible for hepatoprotective activity. Thus, it is evident from these studies that flavonoids like quercetin, kaempferol and isorhamnetic glycosides could be liable for various liver disorders⁴⁶.

Antioxidant activity:- *In vitro* screening of **antioxidant activity** on *P. daemia* root extract. In their preliminary phytochemical test, both aqueous and ethanolic extract indicated the presence of alkaloid, glycoside, steroid, flavonoid, saponin, terpenoid, 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 phytochemical constituents. This may be used in preventing oxidant stress related degenerated diseases⁴⁷.

Anticancer activity:- Anticancer activity of *Pergularia daemia* was screened against sixty human cancer cell lines and was organized into sub panels representing leukemia, melanoma and cancer of the lung, colon, kidney, ovary and central nervous system. In their result, it was found that α -amyrin exhibited anticancer activity in low potency. 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 cancer⁴⁸.

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 extract⁴⁹.

Antibacterial activity: The promising **antibacterial activity** was observed in ethyl acetate and ethanol extracts of *Pergularia daemia* which showed significant **antibacterial activity** against *S. aureus*, *P. aeruginosa*, *A. hydrophila*, *E. coli* and *S. typhi*. Similarly, have reported that the ethanol extract of *P. daemia* exhibited **antibacterial activity**. In addition, recent report also showed the antibacterial activity of *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*⁵⁰.

Antiuro lithiatic Activity:- The whole-plant, *Pergularia daemia* (Family: Asclepiadaceae), extract (50% alcohol) was investigated for its antiuro lithiatic 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. Supplementation with extract significantly ($P < 0.001$) lowered the urinary excretion and kidney retention levels of oxalate, calcium and phosphate. Furthermore, high serum levels of urea nitrogen, creatinine and uric acid were significantly ($P < 0.001$) reduced by 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 medicine⁵¹.

Pharmacognostic and Phytochemical Investigation:-

Pharmacognostic and phytochemical studies of stem of *Pergularia daemia*. Microscopical characters were determined by performing transverse section of stem and powder microscopy. Standardization of whole plant was done with the help of ash value (total ash, acid insoluble ash and water soluble ash), water soluble extractive and alcohol soluble extractive value. Fluorescence analysis was also carried out ultraviolet chamber. Alcoholic and aqueous extracts were prepared and preliminary phytochemical analysis was carried out. Alcoholic extract shows the presence of carbohydrates, alkaloids, flavonoids whereas aqueous extract shows presence of steroids and tannins. Thin layer chromatography of alcoholic extract shows the eight numbers of spot having Rf value 0.12, 0.8, 0.38, 0.45, 0.58, 0.74, 0.87 and 0.93 respectively. Conclusion: Pharmacognostic and phytochemical investigation of powdered stem of *Pergularia daemia* describing its morphological evaluation, microscopical characterization, powder analysis, physicochemical evaluation, fluorescence analysis, preliminary phytochemical screening and TLC profiling has been studied in detail so as to develop a reference for academic and commercial purpose. Further, it can be used for the standardization and Pharmacopoeial parameters development⁵².

Conclusion

As seen throughout this review, we have focused on botanical description, ethnomedicinal uses, Phytochemistry and pharmacological profile of *Pergularia daemia*. Various phytochemicals such as flavonoid, alkaloid, terpenoid, tannin and steroid have been reported to be present in this plant. The plant also exhibits several pharmacological properties such as antiinflammation, analgesic, antipyretic, antioxidant, anticancer, antidiabetic, hepatoprotective, antibacterial, antifungal and central nervous system depressant activity. It is believed that detailed information presented in this review would help the researchers to get aware of this plant and extensive research should be undertaken on *P. daemia* for establishing new therapeutic drugs for mankind.

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