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# A Review on Anti-Inflammatory Activity of a Specific Secondary Metabolite Present In Pergularia Daemia

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**ABSTRACT**: The plant Pergularia daemia (Asclepiadaceae) is referred to as "Uttaravaruni" in Sanskrit, "Utranjutuka" in Hindi, "Uttarni" in Marathi, and "Veliparuthi" in Tamil. The herb Pergularia daemia has long been used as an expectorant, laxative, antipyretic, and anti-helminthic. It is also used to treat malarial intermittent fevers and infertile diarrhea.The plant has been examined phytochemically for cardenolides, alkaloids, and saponins, and it has been discovered to contain a variety of triterpenes and steroidal compounds.Through a variety of methods, including cytokine suppression, NF κB signaling inhibition, COX/LOX pathway modification, and antioxidant activity, bioactive secondary metabolites, such as lupeol, β sitosterol, flavonoids, tannins, and cardiac glycosides, have notable anti-inflammatory qualities.

**KEYWORDS:** Pergularia Daemia, Calactin, Betaine, Daucosterol.

## I. INTRODUCTION

The body uses inflammation, which includes vascular alterations and immune cellmigration, as a defense mechanism against damaging stimuli. Physical, chemical, biological, immunologic, or genetic variables may be the cause. Common diseases associated with inflammation include leprosy, TB, and syphilis. Chemical agents, infectious agents, immunologic illnesses, genetic/metabolic problems, and mechanical injuries are some of the causes.[1]

The ability of a chemical to lessen inflammation—a normal body reaction to damage or illness that manifests as redness, swelling, heat, and pain—is referred to as anti-inflammatory activity. Natural substances like those in fruits and spices, medications like NSAIDS, or even specific foods can all act as anti-inflammatory agents. They function by blocking the chemicals that trigger inflammation, such as certain cytokines and enzymes.[2]Numerous medicinal plants include different phytochemicals, such as polyphenols, flavonoids, and alkaloids, which provide them anti-inflammatory qualities. These phytochemicals may have therapeutic advantages because they can block inflammatory mediators, enzymes, and pathways. A vast range of phytochemical substances can be produced by plants as secondary metabolites.[3]

The plant Pergularia Daemia (Asclepiadaceae) is referred to as "Uttaravaruni" in Sanskrit, "Utranjutuka" in Hindi, "Uttarni" in Marathi, and "Veliparuthi" in Tamil. The herb Pergularia daemia has long been used as an expectorant, laxative, antipyretic, and anti-helminthic. It is also used to treat malarial intermittent fevers and infertile diarrhea. This plant's latex is used to treat toothaches. Aerial portions of this plant have a variety of pharmacological properties, including hepatoprotective, antifertility, anti-diabetic, analgesic, antipyretic, and anti-inflammatory properties. Stem bark is used as a cure for colds and fevers. The plant's phytochemistry has been

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examined for saponins and alkaloids. Numerous triterpenes and steroidal chemicals were discovered to be present in the plant.According to a review of the literature, the entire plant possesses analgesic properties, and no research has been done on the plant's analgesic properties to far. The herb lowers the prevalence of asthma and convulsions. It is used to control digestive processes and the menstrual cycle. The root can be used to cure piles, anemia, mental illnesses, and leprosy.[4]

**Fig 1: Plant of Pergularia Daemia**

## PLANT TAXONOMY

Pergularia Daemia Linn. a thin, fetid-smelling, hispid perennial climber.The leaves are opposite, membrane-bound, broadly oval, orbicular or deeply cordate, acute or short acuminate at the apex, ubescent below, and have petioles that are 2–9 cm long. Axillary, long-peduncled, drooping clusters of greenish-yellow or dull white flowers with a purple tint. The seeds are pubescent and broadly ovate, while the fruits (follicles) are lanceolate, long-pointed, and roughly 5 cm long. They are covered with soft spines.In central India, flowers may bloom every year from August to January, and fruits ripen between October and February. The stems of deciduous woods in central India usually die down in February and regrow after the rainy season begins.[5] In the tropical and sub-tropical regions, it is widely dispersed. In India, it is frequently found in hedges that have been cut most of the way up to an elevation of roughly 1000 meters in the Himalayas and 900 meters in South India. [6]

## SYNONYMS

- Daemia Extensa
- Pergularia Extensa [7]

## VERNACULAR NAMES[8]

| | |
|---|---|
| Tamil | Uttamani |
| English | Harinot plant |
| Malayalam | Veliparuthi |
| Hindi | Utaran,Aakasan |
| Sanskrit | Vismika, kurutakah |
| Bengali | Chagalbati |
| Marati | Utarn |
| Telugu | Jittupaku |
| Kannada | Juttuve |
| Punjab | Karial,Silai,Trotu |
| Gujarathi | Chamardudhi |
| Oriya | Utrali |

Table 1: vernacular names

## TAXONOMICAL CLASSIFICATION[9]

| | |
|---|---|
| Kingdom | Plantae |
| Division | Magnoliophyta |
| Class | Magnoliopsida |
| Order | Gentianales |
| Family | Asclepiadinae |
| Genus | Pergularia |
| Species | Daemia |

Table 2 : Taxonomical classification

## MICROSCOPICAL STUDIES

**Macroscopic characteristics of the root:**

The tap root is thick and soft, while the lateral roots are thin and wiry. The root is reddish brown in color, has no distinct taste or fragrance, and has a smooth or slightly cracked surface.

**Anatomical characteristics of the thick root:**

**Thick root:**The thick root has a thickness of 2.7 mm.

**Periderm:** The broad periderm has black, crushed epidermal remnants on its surface.

**Secondary phloem:**The secondary phloem surrounds the xylem and is broad and continuous.

**Secondary xylem:** The secondary xylem has an irregular shape, with narrow vessels in the center and wide, primarily solitary vessels in the outer zone.

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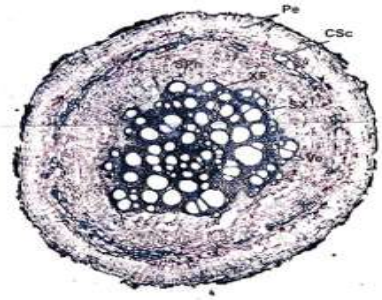


Fig 2 : Transverse section of thick root; periderm(pe),corticalsclereids(CSc), secondary phloem(SPh),Xylem Fibre(XF), Secondary Xylem(SX), Vessel Elements (VE).

**Anatomical characteristics of the thick tap root:**

**Periderm:** The taproot periderm is well developed and has wider, rectangular phellem cells.

**Cortex:** The cortex is about 500µm wide; it consists of radially compressed, tangentially elongated, compact parenchyma cells.

**Secondary phloem:** The taproot secondary phloem is broad and continuous. It consists of well differentiated phloem rays and phloem elements in radial blocks.

**Secondary xylem:** The shape of the secondary xylem is irregular. It's substantial and dense. It is made up of fibers, vessels, and masses of deeplyintruded parenchyma.

**Cell inclusions:** The cortical parenchyma masses, which are found inside the xylem, include calcium oxalate crystals and starch grains. The crystals are less common than the starch grains.

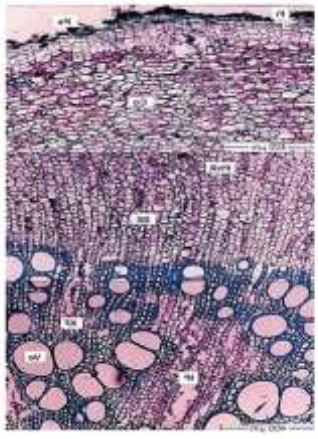

Fig 3: Tranverse section of thick taproot: Fissure(Fi), Co(cortex), Phloem ray(Phr), Sieve Element(SE), Xylem Fibres(XF), Vessel(Ve), Included Pholem(IP).

**Microscopic characteristics of the powdered root:**

The following components may be seen in the root's macerated and powdered preparation (Figures 4 and 5).

**Vesselelements:** The components of the vessel are either cylindrical and thin or broad, short, and drum-shaped.

**Tracheids:**Tracheids are cylindrical, long, and thin cells. They are 450 µm longer than the vessel'components.

**Fibre tracheids**: These elements resemble the fibres in length and width, and tracheids in the presence of well-developed dense lateral wall pits. Compared to fibers and vessels, their walls are thicker.

**Xylem parenchyma:**The cells that make up the xylem parenchyma are square in form, have thin walls, and contain protoplasts. They don't have pits. [10]

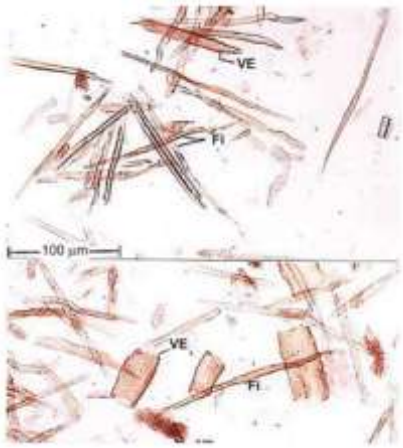


Fig 4: Powder microscopy of the root; Vessel Element(VE), Fibre(Fi).

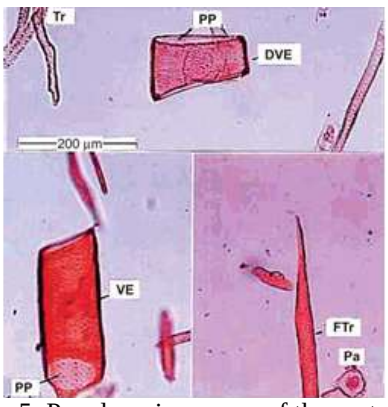


Fig 5: Powder microscopy of the root; Tracheid(Tr), Perforation Plate(PP), Drumshaped Vessel element(DVE), Vessel Element(VE), Fibre Tracheid(FTr), Parenchyma(Pa).

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## CHEMICAL CONSTITUENTS

Pergularia Daemiacontains alkaloids, cardenolides, triterpenes and steroidal compoundsexamined as major bioactive substances.The whole plant, leaves, and root include β-sitosterol, lupeol, lupeol acetate, α, and β-amyrin acetate,oleaolic acid,betaine, calotropin, calactin,daucosterol. [11,12,13]

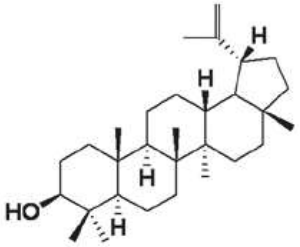


Fig 5: Lupeol

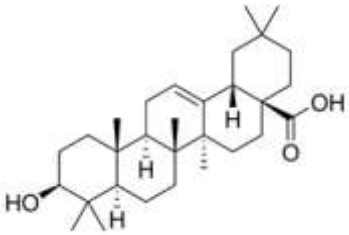


Fig 6: Oleanolic acid

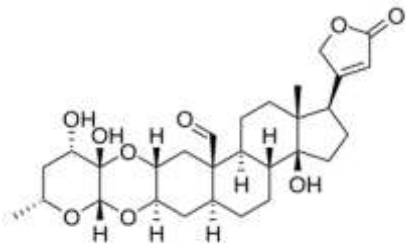


Fig 7: Calotropin

## ETHNOMEDICAL USES

Since ancient times, Pergularia daemia has been utilized as a medicinal herb. Snake bite, expectorant, emetic, anthelminthic, malaria, fever, diarrhea, rheumatism, and uterine and menstrual diseases are all treated using the whole plant. The leaves are used to cure a variety of conditions, including catarrhal infection, infantile diarrhea, tetanus, leprosy, hemorrhoids, nasopharyngeal illness, headache, cough, and chest discomfort. The roots' decoction is used to cure rheumatism, asthma, arthritis, and muscle aches.The plant's latex can function as fish poison and is used to treat rheumatism, arthritis, muscle aches, asthma, and snake bites. Toothaches are also treated with it. The leaves' milky sap is used to treat renal discomfort, rheumatism, oedema, and sore eyes. The roots are used to treat respiratory issues, gonorrhea, and ulcers. The stem's bark is used to treat fever and colds.[14]The fruits have thermogenic and digestive properties. Plant extract helps with menstruation and uterine issues as well as parturition.[15]

## THERAPEUTIC APPLICATION OF VARIOUS PARTS OF PERGULARIA DAEMIA

### Leaves

**Antioxidant activity:** Leaf extracts are rich in flavonoids and phenolic compounds, which have strong anti-free radical qualities.[16]

**Antidiabetic effects:** Ethanol and aqueous leaf extracts have been demonstrated to have significant hypoglycemic effects in rats with diabetes induced by streptozotocin. [17]

**Anti-inflammatory and analgesic effects:** The methanolic leaf extract dramatically decreased paw oedema caused by carrageenan and writhing caused by acetic acid in animal models.[18]

Fig 8: leaves

### Root

**Anti-helminthic activity:** Root extracts have demonstrated a potent ability to fight parasitic worms.[19]

**Antifertility and abortifacient properties:** Research confirms that it interferes with the oestrous cycle and implantation, which is why it has historically been used as a contraceptive and to induce abortion.[20]

**Antimicrobial effect:** Root extracts work against both gram-positive and gram-negativebacteria because they contain glycosides and alkaloids.[21]

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Fig 9: Root

**Stem and vine**

**Expectorant and anti-asthmatic activity:** Scientific studies have confirmed the stem's bronchodilatory properties, and its infusions have long been used to treat respiratory ailments.

**Antipyretic properties:** In animal experiments, stem extracts reduce fever by blocking prostaglandins.[22]

Fig 10: Stem

**ANTI-INFLAMMATORY ACTIVITY OF LUPEOL PRESENT IN PERGULARIA DAEMIA**

Lupeol has been extracted from Pergularia daemia aerial parts, including the leaves and stems. Lupeol is one naturally occurring compound that belongs to the triterpenoid class of phytochemicals. The aerial parts of Pergularia daemia, such as the leaves and stems, have successfully yielded this bioactive material for isolation and identification. The medicinal and anti-inflammatory properties of these plant components, which are commonly used in traditional medicine, are largely attributed to lupeol. The molecule was isolated using standard phytochemical extraction methods, such as solvent extraction and chromatography, and its isolation was confirmed using spectroscopic methods (like NMR or MS).[23]

**ISOLATION PROCESS OF LUPEOL FROM PERGULARIA DAEMIA**

Pergularia daemia aerial components are collected, dried, and then ground into a powder. After the plant material has been extracted using solvents such as petroleum ether or hexane, it is concentrated using a rotary evaporator.

**STUDTY FOCUSES ON THE ANTI-INFLAMMATORY PROPERTIES OF LUPEOL**

The plant material is collected and extracted using solvents, and the isolated component is validated using a range of techniques. Swiss albino mice and Wistar rats, for example, are housed under normal conditions and allowed to acclimate for seven days before research begins. In a carrageenan-induced paw oedema model, mice are given lupeol intraperitoneally or orally before receiving the carrageenan injection, and then the drug is injected subcutaneously into the paw. The data is examined using ANOVA, followed by either the t-test or Dunnett's test.

**MECHANISM OF ANTI- INFLAMMATORY ACTIVITY OF LUPEOL**

**Pro-inflammatory Cytokine Inhibition:** Lupeol prevents the production of significant pro-inflammatory cytokines, such as: TNF-α, IL-1β, or interleukin-1 beta

Interleukin-6, or IL-6

**NF-κB Pathway Blocking:**

NF-κB is one transcription factor that is critical for inflammation. By preventing NF κB activation, lupeol lowers the expression of inflammatory genes such as COX-2 and iNOS.

**COX and LOX Enzyme Suppression:** Lupeol preventsCyclooxygenase (COX-2) lowers the production of prostaglandins. Lipoxygenase (5-LOX) inhibits the production of leukotrienes.[24]

## II. CONCLUSION:

Pergularia daemia also known as veliparuthi belongs to the family Asclepiadaceae. It a traditionally valued medicinal plant, has been used in traditional medicine for various ailments, including pain relief, digestive health, skin diseases, and fever reduction. Its richphytochemical composition, includingalkaloids, saponins, cardenolides, triterpenes, and steroids, supports its therapeutic versatility.Pergularia daemia is a rich source of anti-inflammatory secondary metabolites especially lupeol with confirmed activity in preclinical models.Further pharmacological and clinical studies are needed to fully establish its therapeutic value and safety. It also contains other activities like antioxidant activity, antidiabetic activity, antibacterial activity, hepatoprotective activity, antipyretic activity, anti asthmatic activity, anti-helminthic activity, expectorant, antifertility activity, laxative action etc. The plant proved

indicating a vast potential for developing new therapeutic drugs for various diseases.

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