

**Review Article****Pharmacognostical, Phytochemical and Pharmacological screening of the Plant *Plumbago zeylanica*- A Review**

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**ABSTRACT**

Herbal medicines are used traditionally, mainly obtain from plant animals as well as marine source *Plumbago zeylanica* is an important medicinal plant is commonly known chitraka, belongs to family Plumbaginaceae. It is originated throughout the tropical and subtropical countries of the world. *Plumbago zeylanica* is widely used for its therapeutic value. In plant present several chemical constituents like, flavanoid, alkaloids, steroids, tri-terpenoids, tannins, glycosides, fixed oils, naphthoquinone, fats, proteins, etc. Plumbagin is most important bioactive compounds. It has wide range of pharmaceutical activities such as anti-cancer, anti-fertility, anti-diabetic, anti-malarial, anti-inflammatory, anti-microbial, etc. The plant *Plumbago zeylanica* traditionally used for the Cough, asthma, stimulant, digesting, expectorant, laxative, abortifacient etc. The review contains the Pharmacognostical, phytochemical as well as pharmacological screening of the plant *Plumbago zeylanica*.

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**Introduction**

Ayurveda is old science in which natural products used as a medicine for treating disease. Herbal medicine or natural products obtained from plant, animals and minerals. The *Plumbago zeylanica* is medicinal plant belongs to family Plumbaginaceae, these family consist of 10 genera and 280 species. The genus of

plant contains 3 species namely *P. capensis L.*, *P. zeylanica L.*, and *Plumbago indica L.* The *Plumbago zeylanica* plants are distributed throughout the tropical and subtropical countries. Plants grown as weed (Paiva, 2003). The phytochemical screening shows the presence of naphthoquinone, flavanoid, terpenoids and steroids, many chemicals

responsible for biological activity (Paiva, 2003). *Plumbago zeylanica* plant have been reported for the anti-bacterial, anti-tumor, hepatoprotective, activity, anti-inflammatory, anti-plasmodia anti-hyperglycemic, anti-fungal, anti-cancer, anti-atherosclerotic activity, central nervous system stimulatory etc (Kumar, 2009).

### Botanical Description

The plant *Plumbago zeylanica* grows throughout the India, mainly in Bengal, Uttar Pradesh, South India and Sri Lanka. It grows mainly in moist places. It is one of the flowering plant and flowers occur from September to November. The height of plant is up to 0.5-1.0 meters. The red flowering plants variety mainly grows in khasi hills (Satyavati, 1987).

### Classification

Botanical source- It consist of whole plant of *Plumbago Zeylanica* Linn.

Family- Plumbaginaceae.

Kingdom- Plantae

Order- Caryophyllales

Genus- Plumbago

Species- Zeylanica

Sanskrit Synonyms- Agni,

### Morphological Description

The *Plumbago zeylanica* plant have a different parts contains flower, leaves, fruit, seeds, stem, roots. The morphological characters includes,

Roots- the plant has a root has up to 30 cm or more in length, diameter is about 6 cm. the root is blackish red in color when it dry and light yellow in color when it fresh with cylindrical, friable. Roots of plant are slightly branched with or without secondary roots. The texture is uniform and smooth. Taste is bitter. The root bark is thin and brown in color. Stems- The stem of plant *Plumbago zeylanica* is woody, glabrous, striate and spreading. Leaves- The length of leaves of *Plumbago zeylanica* is 8cm and 3 cm broad. The shape is ovate or oblong. The leaves petiole is narrow, amplexicaul (Kapoor, 1990). Flowers- The color of flower is white up to 10-25 cm in long. The texture is axillaries and terminal elongated spikes, and bisexual. Corolla of flower is white, slender, and tubular having 5 stamens (Satyavati, 1987).

Inflorescence- the flower terminal raceme-type about 6-30 cm in length. Fruit- Fruit of the plant *Plumbago zeylanica* is an oblong and about 7.5–8 mm long five-furrowed capsule containing single seed. Each seed is oblong in structure, 5-6 mm. Calyx- The fruit calyx is about 1-1.3cm long, the shape of calyx is densely covered, narrowly tubular with stalked glands. Ovary- The fruit Ovary of plant *p. zeylanica* is always superior, ovule one, one celled basal and 5-gonous (Anilkumar, 2006 and Ahmad, 2006).

### Phytochemical Screening

The different part of plants contains variety of chemical constituents.

Roots- The root of plant contains plumbagin is a main chemical constituent. The other chemical constituents present in plant *Plumbago* is 3-chloroplumbagin, 3, naphthoquinone identify as 3', 6'- biplumbagin, 3- biplumbagin. Isozeylanone, zeylanone, elliptinone, and droserone 2, 3 are the other 4 pigments which identified from root. The glycoside present is 3'-o-beta-glucopyranosyl plumbagin acid and 3'-o-beta- glucopyranosyl plumbagic acid methyl ester as well as five naphthoquinone which are plumbagin, chitranone, maritinone, elliptinone and isoshinanone. The coumarins containseselin, methoxyseselin, suberosine, xanthyletin and xanthoxyletin all these chemical constituents present in root of plant *Plumbago zeylanica*. Stem- The Stem of plant *Plumbago zeylanica* contains sitosterol, stigmasterol, zeylanonecampesterol, isozeylanone, dihydroflavinolplumbaginol and plumbagin. Leaves- leaves of plant only presence of plumbagin, chitanone. Flower- The presence of plumbagin, zeylanone, and glucose in flower of plant. Fruit- The plant fruit consist of plumbagin, glucopyranoside and sitosterol chemicals. Seeds: Seeds consist of Plumbagin only (Lin, L.C., 2003).

### Bioactive Compounds

#### Plumbagin

IUPAC name- 2-methyl-5-hydroxy-1, 4-naphthoquinone.

Colour- yellow.

Nature- crystalline.

Extraction- by soxhlet apparatus (Navneet, 2010).

Isolation- silica gel column chromatography, Thin Layer Chromatography (Bothiraja, 2011).

Biological potential- Anticarcinogenic, cardio protective, antimicrobial, antifungal, antimalarial, anti HIV activity, antioxidant, modulate the effects of radiation in the treatment of tumor, anticancer and anti-proliferative activity (Kumar, 2013).

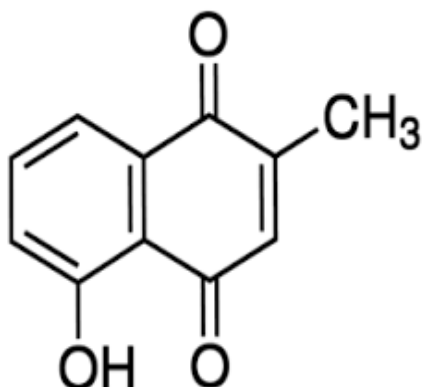


Fig.1: Structure of Plumbagin

### Seselin

IUPAC name- 2,2-Dimethyl-1,5-dioxaphenanthrene-6(2H)-one;8,8-Dimethyl-2H,8H-benzo[1,2-b:3,4-b']dipyrans-2-one

Biological potential- anti-nociceptive, antibacterial activity, anti-proliferative effects, leukemia and lymphoma cells, (Kumar.2013)

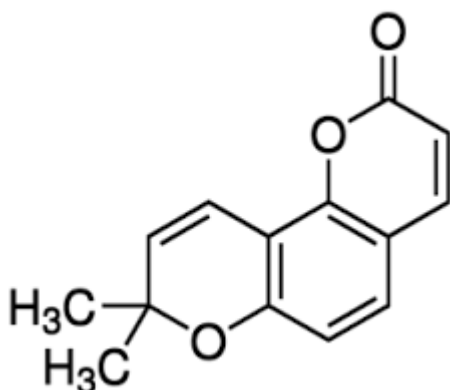


Fig.2: Structure of Seselin

### Toxicity Study

Different plant part reported for its toxicity limits. The *Plumbago zeylanica* root part

reported as a powerful poison when orally given and when it applies on ostimum uteri tropically it may cause abortion. (Azad, 1982; Premakumari, 1977) methanol root extract which shows limited toxicity not show any toxicity in skin (Dai, 2004). The acute oral toxicity of the plant *P. zeylanica* with three extract were tested o female rats single 2000 mg/kg oral dose was administered in overnight fasted animals and monitored for 6h. It found to be toxic at dose 2000 mg/kg (Paragouda, 2015).

### Traditional Uses

The *Plumbago zeylanica* plant has been traditionally used for many diseases. It is a popular medicinal plant. The root of plant used for the abortifacient, sudorifice, antiperiodic, filariasis as well as depigmentation of the skin and anasarca. The root of plant also used fortreatment of non-bleeding piles, colitis, acronarcotic poison, enlarged liver and spleen, chronic colds and cough, allergic skin rashes. The plant effectively used for enlarged liver and spleen, it is a bitter tonic orally used for the digestive disorders by augments the appetite and improves the digestion which relieves constipations. Flowers and fruit used as a digestant, and seeds use to reduce muscular pain (Satyavati, 1987 and Kapoor, 1990). Root mixed with vinegar, milk, water to treatment of influenza. The leaves of plant which crush with lemon juice for the treatment of counter irritant and vesicant. Leaves also used for the treatment of gonorrhoea, rheumatic pain, tuberculosis, syphilis, swellings, wounds healings. Chitrakra effective for the tumor-negating and anti-dyspeptic (Vishnukanta, 2010).

### Pharmacological Activities

**Antiviral activity-** Medicinal plant used for the treatment of viral activities. *Plumbago zeylanica* is one of them. Methanolic extracts (80%) of *Plumbago zeylanica* test against cox sickie virus, influenza A virus, simplex virus type1 KupkaHSV-1. The plant contains naphthoquinone derivatives like which are Plumbagin that may be responsible for antiviral activity (Marian, 2006).

**Anti-allergic activity-** The ethanolic extract (70%) of *Plumbago zeylanica* tested for anti-allergic activity on the mice and rats. The dose used for the study was 500, 1000 mg/kg, *p.o.* The significant difference observed at dose 1000mg/kg. The result found that *Plumbago zeylanica* shows significant mast cell immediate anti-allergic activity (Dai, 2004).

**Anticancer activity-** literature study indicate that Plumbagin which from *Plumbago zeylanica* shows anticancer activity. These studies indicate that mechanism of Plumbagin on the growth of human pancreatic carcinoma cells. The dose given for the study was 5micro or 10 micro results indicate that Plumbagin can potential against pancreatic cancer (Chen, 2009).

**Antidiabetic activity-** The root of *Plumbago zeylanica* investigated for the antidiabetic effects. The activity study on GLUT4 translocation in STZ-induced diabetic rats. The activity showed by Plumbagin isolated from *P. zeylanica*. 15 and 30 mg/kg b wt. dose used for the study by oral administration for 28 days in rats. On 21st day's glucose tolerance test was performed. The result showed that Plumbagin from *Plumbago zeylanica* reduce the level of glucose in blood. It could be used for drug to treat diabetes (Sunil, 2012).

**Anti fertility activity-** leaves of *Plumbago zeylanica* evaluated for the anti fertility activity. The petroleum ether, chloroform, acetone, ethanol and aqueous extracts of leaves were used for the overall study. The activity studied at two dose levels 200 and 400 mg/kg (Devarshi, 1991).

**Antihyperlipidemic Activity-** study was show antihyperlipidemic effect by the aqueous extract of *Plumbago zeylanica* Linn. The aqueous extract at the dose of 20, 40, and 80mg was give orally were found to ameliorate the hyperlipidemic condition they are reduce cholesterol and triglyceride levels. These results shows that *Plumbago zeylanica* roots (Aqueous extract) shows effect in ameliorating the hyperlipidemic condition leading to atherosclerosis (Sudha, 2009)

**Anti bacterial Activity-** The various extracts and its partition were effective against *Salmonella gallinarum*, *Proteus vulgaris*,

*Escherichia coli*, and *Klebsiella pneumoniae*. Aqueous and alcoholic extracts of *Plumbago zeylanica* roots exhibited activity against *Bacillus subtilis*, *Proteus vulgaris*, *Salmonella typhimurium*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Staphylococcus aureus* (Abdul, 1995)

### Conclusion

This article gives traditional knowledge, Pharmacognostical, phytochemical and pharmacological applications of *Plumbago zeylanica* plant. The information presented in these review has showed that *Plumbago zeylanica* has used greatly for the treatment of various diseases. The plant *Plumbago zeylanica* contain active constituent like Plumbagin, seselin etc which show potential for the many pharmacological activities like Anti bacterial, Antihyperlipidemic, Anti-allergic etc so that these plant extensively used in herbal formulations.

### Conflicts of Interests

Authors do not have any conflicts of interest with the publication of the manuscript.

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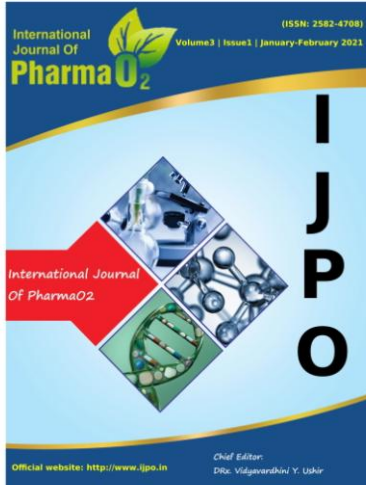
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