

Pharmacological and Therapeutic Insights into *Sheetraj* (*Plumbago zeylanica* Linn): A Classical Review in Unani Perspective

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ABSTRACT

Background: *Plumbago zeylanica* Linn., commonly known as *Sheetraj* in Unani medicine, is a perennial erect shrub belonging to the family Plumbaginaceae. Its dried mature roots are highly valued for diverse medicinal properties. The plant holds significant pharmacological and therapeutic importance and is traditionally used in Ayurveda, Unani, and Siddha for treating various dermatological, digestive, neurological, and reproductive disorders. **Methods:** This review compiles information from classical Unani literature, ethnomedicinal sources, and modern scientific studies. A comprehensive analysis was carried out to explore the phytochemical composition, pharmacological actions, therapeutic relevance, dosage, adverse effects, and corrective measures of *Sheetraj*. **Results:** The plant roots are pharmacologically active and rich in naphthoquinones, particularly plumbagin most notably plumbagin. Plumbagin and related constituents demonstrate anti-inflammatory, antimicrobial, wound-healing, anticancer, and anti-ulcer effects. These pharmacological properties substantiate the traditional uses of *Sheetraj* and demonstrate its therapeutic potential across multiple systems of the body. **Conclusion:** Although extensive traditional and preliminary pharmacological evidence supports the medicinal importance of *Sheetraj*, however, standardized extracts, safety profiling, and controlled clinical trials are required to establish clinical efficacy within Unani practice.

Keywords: *Plumbago zeylanica*; *Sheetraj*; Unani medicine; Plumbagin; Anti-inflammatory

1. INTRODUCTION

The Unani system of medicine is based on the humoral theory, which attributes health and disease to the balance of four humours *Dam*, *Balgham*, *Safra*, and *Sawda*. This concept guides diagnosis and treatment in Unani practice. Herbal medicines form the therapeutic core of the system, valued for their natural origin, safety, and holistic action in restoring humoral balance and strengthening the vital faculties (*Quwa*).¹

Plumbago zeylanica Linn., commonly known as *Sheetraj* in Unani medicine, belongs to the family Plumbaginaceae. Its name is derived from the Latin word *plumbum*, meaning lead, indicating its characteristic lead-blue coloured flowers and the lead-like stain produced upon contact with the skin.^{2,3}

In Unani system of medicine *Sheetraj* has been prescribed for the treatment of skin disorders such as vitiligo (*Baras*), pityriasis versicolor (*Bahaq*), ringworm, scabies, and other infectious and inflammatory skin diseases. It is also used to alleviate digestive disturbances, neurological conditions, reproductive disorders, and as an aphrodisiac in Unani formulations.^{4,5,6}

Modern scientific studies have begun to validate many of the therapeutic claims attributed to *Sheetraj* by demonstrating its anti-inflammatory, antimicrobial, anticancer, wound healing, and anti-ulcer potentials through experimental and pharmacological research. Despite considerable ethnomedicinal use and preliminary pharmacological evidence, comprehensive scientific reviews integrating classical Unani perspectives with contemporary research findings remain limited.^{1,7}

This review article aims to bridge this gap by systematically compiling classical Unani descriptions, botanical details, phytochemical constituents, pharmacological properties, and therapeutic applications of *Plumbago zeylanica*. Additionally, it highlights its dose considerations, adverse effects, and corrective measures as documented in traditional sources to substantiate its relevance and encourage further clinical and pharmacological investigations.

2.Methods

A comprehensive literature review was conducted to compile all available data on *Plumbago zeylanica* Linn. (Sheetraj) pertaining to its classical Unani description, ethnobotanical context, phytochemical profile, and pharmacological activities. The search strategy involved primary and secondary sources across multiple databases. The search terms used were “*Plumbago zeylanica*,” “Sheetraj,” “phytochemical composition,” “pharmacological activities,” and “Unani medicine.” To integrate Unani knowledge, foundational Classical Unani texts, UPI (Unani Pharmacopoeia of India), and current pharmacognostic manuscripts were meticulously reviewed.

Following inclusion criteria English or Urdu articles discussing pharmacological effects, therapeutic uses, or phytochemical composition a total of 68 publications were initially identified. After screening for duplication, incomplete access, and relevance, 30 sources were selected for detailed review and critical analysis.

3. Description and ethnobotanical uses

3.1 Vernacular names⁷

Plumbago zeylanica is known by various names in different languages and regions, reflecting its widespread traditional use:

Table No.1 Vernacular names of Sheetraj

| | |
|-----------|---|
| Unani | : Sheetraj Hindi, labediyoon ^{6,8} |
| English | : Lead wort, Ceylon lead wort, white lead wort ^{8,9} |
| Kannada | : Chitramula, Chitaparu, Krisanu ⁹ |
| Hindi | : Chitra, Chitraka, Chita |
| Urdu | : Sheetraj Hindi, Cheeta lakdi, Cheeta ¹⁰ |
| Arabic | : Sheetraj ⁶ |
| Telugu | : Chitramulam, Agnimata, Chitramulamu |
| Tamil | : Chitramulam, Kodiveli, Adigarvadi |
| Malayalam | : Vellakoduveli, Tumbakoduvveli |
| Sanskrit | : Agnimata, Chitraka ⁵ |
| Marathi | : Chitraka, Chitramula, ⁷ Chitrak ⁵ |
| Bengali | : Chita, Sufaid, Chitruke ^{5,7} |
| Gujarat | : Chitrakmula, Chitraq, Chitrak ^{5,7} |
| Punjabi | : Chitra, Chitrak ^{5,7} |

3.2 Botanical Description

Taxonomic Classification³

Plumbago zeylanica Linn. is classified under the kingdom *Plantae*, subkingdom *Tracheophytes* and is a member of the family *Plumbaginaceae*. Its taxonomic hierarchy is as follows:

Table No.2 Taxonomic classification of Sheetraj⁸

| | |
|--------------|--------------------------------------|
| Kingdom | : Plantae |
| Subkingdom | : Tracheophytes |
| Division | : Magnoliophyta |
| Sub division | : Angiosperm |
| Class | : Dicotyledonae |
| Subclass | : Gamopetalae |
| Order | : Caryophyllales |
| Family | : <i>Plumbaginaceae</i> ⁸ |
| Genus | : <i>Plumbago</i> ⁸ |
| Species | : <i>P. zeylanica</i> ³ |

3.3 Morphology

Sheetraj is a perennial, robust, sub-scandent, and erect undershrub that grows up to 0.5 to 1.5 meters in height. Its stem is woody and glabrous with thin bark. The leaves are dark green with hairy margins, ovate to lanceolate in shape. The plant produces white, bisexual flowers, approximately 8 to 20 cm long, arranged in both axillary and terminal spikes.¹⁰ The flowers are odourless and lead-blue in color, corresponding to the etymology of its name.

The fruits of *Sheetraj* are oblong, single-seeded capsules, measuring 7.5 to 8 mm in length, reddish-brown to dark brown.³ The root system is notably medicinal, consisting of uniform, cylindrical, woody roots longer than 30 cm and more than 6 mm in diameter. These roots possess a characteristic reddish to deep brown color, emitting a pungent odor, and acrid taste, which contribute to their therapeutic significance.^{7,8}



Figure No. 1: Root of Sheetraj Courtesy Google



Figure No. 2: Sheetraj plant Courtesy Google

3.4 Habitat and Distribution

Plumbago zeylanica is native to Southeast Asia and distributed widely across tropical and subtropical regions at altitudes up to 2000 meters.² The plant is commonly found growing naturally in the undergrowth of forests, on hilly slopes, and near water courses. It is extensively cultivated across India in gardens and is considered indigenous or wild in regions such as the Sikkim and Khasi Hills. Its adaptability to diverse ecological zones underpins its widespread ethnomedicinal use.¹¹

4. Mizāj (Temperament)

In Unani medicine, *Plumbago zeylanica* (Sheetraj) is characterized by a strong hot and dry temperament, classified as *Garm-o-Khushk 3rd degree* (Hot 3rd degree and Dry 3rd degree).^{4,5,6,12}

5. Part Used

The primary medicinal part employed is the root,¹³ noted for its robust pharmacological potency. Additionally, the whole plant, root bark, and leaves are also used in various regional traditional remedies.^{9,12,14}

6. Actions (*Afa'āl*)

Sheetraj exhibits various classical Unani actions, many of which correspond closely to modern pharmacological properties. The prominent actions include:

| | |
|---------------------------------------|--|
| Nervous System | <i>Muharrīk-i-Asāb</i> (nerve stimulant) ⁷ |
| Digestive System | <i>Mufattīh-i-Sudād</i> (deobstruent), <i>Mushtahī</i> (appetizer), <i>Hādīm</i> (digestive) ⁵ |
| Respiratory System | <i>Mushil-i-Balgham</i> (purgative of phlegm), <i>Munaffīth-i-Balgham</i> (expectorant) ¹⁵ |
| Hematological | <i>Muṣaffīt-i-Dam</i> (blood purifier) ¹⁵ |
| Reproductive System | <i>Muqawwī-i-Bāh</i> (aphrodisiac), ⁵ <i>Mukhrij-e-Janeen</i> , ¹¹ <i>Muharrīk-e-Bāh</i> (aphrodisiac stimulant) ¹⁶ |
| Skin and External Applications | <i>Jālī</i> (detergent) ^{5,15,16} <i>Muhallīl</i> (anti-inflammatory/resolvent of swelling) ^{7,18} <i>Muharrīk</i> (stimulant), <i>Mukharre Jild</i> (counter-irritant for skin), <i>Mushil</i> (general purgative), <i>Abla</i> (vesicant, blister-causing agent) ¹⁵ <i>Muqarrih</i> (ulcerative drug), <i>Munaqqīt-e-Qaroor</i> (cleanser of ulcers), <i>Muhammir</i> (rubefacient, redness-inducing) ¹⁶ |

7. Istemal (Uses)

| | |
|--|--|
| Musculoskeletal and Nervous | <i>Waja ' al-Mafāsil</i> (arthritis) ⁴ , <i>Waja ' al-Warik</i> (pain of hip joint) ⁵ <i>Fālij</i> (paralysis), <i>Laqwa</i> (facial palsy), <i>Zof-e-Asab</i> (nervous debility) ⁷ , <i>Irq al-Nasā</i> (sciatica) ^{5,6} <i>Da 'e Amrād-i-A 'shāb</i> (diseases of head and nervous system) ^{4,16} |
| Digestive System | <i>Hādim</i> (drug aiding in digestion), <i>Mushtahī</i> (appetite promoter), <i>Kāsir-i-Riyāh</i> (carminative, expels gases), ^{4,16} <i>Aklate Lazjiya</i> (removes sticky matter), <i>Didān al-Am 'ā</i> (intestinal worms) ⁵ Useful in dyspepsia, anasarca and diarrhoea relief ¹⁰ |
| Dermatological System (Skin and Hair) | <i>Baraṣ</i> (vitiligo), ^{4,6,15,17} <i>BahaqAbyad</i> (pityriasisalba), <i>Kharish</i> (itching/pruritus), ^{5,6,15} <i>Dad/Da 'd</i> (ringworm/tinea) ^{5,15} <i>Taqashshur al-Jild</i> (scaling of skin), ⁴ <i>Jarab</i> (scabies) ^{4,10} <i>Jild bushi</i> (skin peeling), <i>Sheetraj</i> with sirkha used in <i>Bahaq</i> (vitiligo) ⁶ <i>Judhām</i> (leprosy), <i>Nabāt al-Sha 'r</i> (stimulation of hair growth) ⁵ Roots useful in skin diseases and ulcers ¹⁰ |
| Dental and Ear Disorders | <i>Waja ' al-Asnān</i> (odontalgia, toothache), <i>Waja ' al-Udhun</i> (otalgia, earache) ⁴ |
| Reproductive System | <i>Haml</i> (pregnancy), <i>Hiqat / Isqāt</i> (abortion) ⁵ Used in Birth Control, Sexual debility treatment ^{9,14} |
| Respiratory and Cardiac | Chest pain relief ^{9,14} |
| Anorectal Diseases | <i>Bawāsīr</i> (haemorrhoids/piles) ^{5,10} |
| Splenic Disorders | Beneficial for <i>Tihāl</i> (spleen disorders), <i>Al-Salāba fi 'l-Tihāl</i> (hardening of spleen), ⁵ <i>Waram-i-Tihāl</i> (inflammation of spleen) ¹⁵ |

8. Dosage (*Miqdār-e-Khurāk*)

The classical Unani dose of dried Sheetraj root ranges between 1.5 to 3 grams daily, which corresponds to approximately 3 to 7 masha.^{4,5}

1-2 masha, 3 ½ masha¹⁵

9. Adverse Effects (*Muzir*)

Excessive or prolonged use of Sheetraj may cause adverse effects predominantly affecting the lungs (*Pepde*) and liver (*Jigar*) due to its strong hot and dry temperament and irritant properties. Symptoms may include respiratory distress or hepatic discomfort.⁶

11. Correctives (*Musleh*)

To mitigate adverse effects and restore the body's balance, classical corrective agents are recommended alongside Sheetraj:

- For lung-related side effects: *Samag-e-Arbi*, *Mastagi*, *Babool ka gond*.^{4,5,12}
- For liver protection: *Gul Surkh*, *Sandal Safed*, *Keera*, *Gulab*.^{5,18}
- For spleen disorders: *Moonga*, *Karel ki jad*⁵
- For general organ support: equal parts of *Majeet*, *Jarawand*, or *Narkachoor*.⁵
- It is locally vesicant and should be used with caution to prevent skin irritation or blistering.^{4,5,12}

12. Substitutes (*Badal*)

In Unani practice, Sheetraj can be substituted with herbs possessing similar temperament and actions, including *Moonga*, *Majeet*, and *Narkachoor*.^{4,15}

13. Compound Formulations (*Murakkabāt*)

Sheetraj is a vital constituent of several classical Unani compound formulations used for treating diverse systemic ailments. Notable formulations containing *Sheetraj* include: *Majoon e Flasifa*, *Itrifal e Kabir*, *Majoone Jograj Gugal*, *Raughan e Baladur*, *Jawarish e Narmushk*, *Jawarish e Fanjosh*.⁷

14. Phytochemical Properties

Plumbago zeylanica contains a diverse spectrum of bioactive phytochemicals that contribute to its pharmacological properties:

Major Chemical Constituents^{11,16}

2-hydroxy-1,4-naphthoquinone (lawsone), 5,7-dihydroxy-8-methoxy-2-methyl-1,4-naphthoquinone (plumbagin), Biplumbagin (chitranon), Chloroplumbagin, Maritinone, Elliptinone, Lapachol, Plumbic acid.^{8,19}

Coumarins and Other Compounds

5-methoxyseselin, seselin, suberosin, xanthyletin, and xanthoxyletin, which contribute to the medicinal effects.

Essential fatty acids and organic acids are also present, including:⁸

Oleic acid (approximately 19.95%), β -asarone (14.08%), Naphtho(2,3- β)furan-2(3H)-one (7.68%), Ethyl p-methoxycinnamate (4.58%), n-Hexadecanoic acid (2.18%).⁸

The plant contains other phytoconstituents such as:

Sitosterol, Glycosides, Tannins, Flavonoids, Terpenoids, Saponins, Enzymes like invertase and protease. Sugars such as fructose and glucose.^{8,11}

15. Pharmacological Activities:

Plumbago zeylanica Linn. demonstrates a wide range of pharmacological activities that provide scientific validation for its traditional uses.

Anti-inflammatory Activity

In in vivo models, acetone extracts of *Plumbago zeylanica* (Pz) at 200 and 400 mg/kg significantly inhibited carrageenan-induced inflammation in rats ($p < 0.01$), likely via suppression of prostaglandin synthesis.^{3,21-23}

Methanolic root extracts showed dose-dependent inhibition of acute inflammation. The anti-inflammatory effect corresponds to inhibition of the prostaglandin-mediated phase of carrageenan-induced oedema.^{1,8}

Antimicrobial Activity

Antimicrobial studies on *Plumbago zeylanica* (Pz) demonstrate broad-spectrum antibacterial, antifungal, and antimycobacterial activity. Aqueous leaf extracts showed superior efficacy against Gram-positive, Gram-negative bacteria, and fungi, supporting traditional use.^{3,20}

Pz constituents, particularly plumbagin, exhibited strong synergistic antimycobacterial activity with isoniazid, markedly reducing MIC values and inhibiting resistant *Mycobacterium tuberculosis*. Organic solvent extracts (ethanol, ethyl acetate, acetone) showed potent activity against *Helicobacter pylori*, MRSA, ES β L-producing, and other multidrug-resistant bacteria. Isolated root compounds and methanolic extracts demonstrated low MIC values and efficacy comparable to standard antibiotics, indicating a wide antimicrobial spectrum.^{8,24}

Wound Healing Activity

Kodati DR and colleagues assessed the wound healing potential of methanolic root extract in Wistar albino rats. The extract enhanced tissue repair significantly by promoting collagen synthesis, granulation tissue formation, and epithelialization, likely due to the presence of terpenoids, alkaloids, flavonoids, and saponins.^{1,24}

Anticancer Activity

Xue HK et al. and colleagues reported that plumbagin, a naphthoquinone derived from the roots of *Plumbago zeylanica*, possesses significant anticancer and antibacterial properties. Their study demonstrated the effects of plumbagin on human promyelocytic leukemia cells (NB4), highlighting its role in activating the mitochondrial pathway involved in plumbagin-induced apoptosis. In vivo experiments showed that mice treated with intraperitoneal injections of plumbagin (2 mg/kg body weight daily for three weeks), alongside doxorubicin (1 mg/kg thrice weekly) or control therapy, exhibited a 64.49% reduction in tumour volume. The findings suggested that plumbagin holds strong potential as a therapeutic agent for myeloid leukemia.^{1,25}

Anti-ulcer Activity

Falang KD et al. investigated the anti-ulcer potential of the aqueous root extract of *Sheetraj* (*Plumbago zeylanica Linn.*) in albino rats subjected to acute gastric ulceration induced by aspirin and indomethacin. Results indicated that the extract demonstrated notable anti-ulcer activity, with doses of 25, 50, and 100 ml/kg producing significant protection against aspirin-induced gastric mucosal injury, while doses of 50 and 100 mg/kg showed statistically significant protection against indomethacin-induced ulcers.¹

Macrophage Bactericidal Activity

Abdul KM et al. examined the impact of plumbagin on macrophage bactericidal activity in BALB/c mice. The study found that plumbagin at 25 µg/kg body weight demonstrated consistent bactericidal activity, while a higher dose of 50 µg/kg initially enhanced the activity for about six weeks, but a subsequent decline was noted after two weeks compared to the lower dose.¹

Antifungal Activity

The antifungal activity of the *Chitraka* plant was assessed against *Candida albicans* and dermatophytes such as *Epidermophyton floccosum*, *Microsporum gypseum*, and *Trichophyton rubrum*. The alcoholic extract of *Chitraka* exhibited significant inhibitory effects on both yeast and dermatophytic species.^{3,20,23,26}

Antidiabetic activity

Plumbago zeylanica root extracts exhibit significant in vitro antidiabetic activity by inhibiting α -amylase and α -glucosidase enzymes, key in carbohydrate digestion and glucose absorption. The assay, using the dinitrosalicylic acid (DNS) method, quantifies maltose released from starch hydrolysis, with inhibition reducing postprandial blood glucose spikes. Phytochemical analysis revealed active constituents like naphthoquinones, flavonoids, and alkaloids contributing to this effect. Tablet formulations of these fractions showed good uniformity, flow properties, and optimal dissolution, supporting their therapeutic potential. Overall, *P. zeylanica* root's enzyme inhibitory action supports its role in managing diabetes by moderating carbohydrate metabolism and glycemic control.^{24,27}

Antioxidant activity

Plumbago zeylanica root extracts exhibit strong antioxidant activity with a concentration-dependent increase in free radical scavenging. The n-butanol fraction showed up to 79.59% inhibition in DPPH assay and 82.24% in hydrogen peroxide scavenging at 700 µg/ml. The IC₅₀ values for these assays were 370.83 µg/ml for DPPH and 474.33 µg/ml for hydrogen peroxide radicals, respectively, compared to standard Butylated hydroxytoluene with IC₅₀ values of 64.51 µg/ml and 194.92 µg/ml. Phytochemicals like plumbagin, flavonoids, and alkaloids contribute to this antioxidant potential.^{1,24,28}

Antihyperlipidemic activity

Plumbago zeylanica root aqueous extract demonstrated significant antihyperlipidemic activity in rats with diet-induced hyperlipidemia. Oral administration at doses of 20, 40, and 80 mg/kg effectively lowered serum cholesterol and triglyceride levels, comparable to standard drugs fenofibrate and atorvastatin. Additionally, the extract significantly reduced total lipid content in the liver, indicating its potential to improve lipid metabolism and manage hyperlipidemic conditions effectively.^{1,24}

Nephroprotective action

The hydroalcoholic extract significantly reversed cisplatin-induced renal changes at 400 mg/kg body weight. This protective effect was confirmed through key biochemical parameters. Such findings highlight the extract's potential nephroprotective role in integrative therapeutics.²⁹

Discussion

The Unani system uses a holistic, personalized method for Sheetraj (*Plumbago zeylanica* Linn.), based on patient age, sex, temperament, disease severity, and humoral balance. Classical scholars specified internal/external uses, stressing adherence for best results now backed by modern pharmacology showing climate/geography/temperament impacts on efficacy/safety. Validated traditional roles cover skin issues (vitiligo, pityriasis, psoriasis, eczema, scabies), digestive, neurological, and musculoskeletal conditions, driven by plumbagin, naphthoquinones, flavonoids, alkaloids, glycosides, saponins, and terpenoids. Studies affirm anti-inflammatory (prostaglandin inhibition), wound-healing, antioxidant, anticancer, anti-ulcer, and antimicrobial effects; plumbagin triggers cancer cell apoptosis and curbs tumor growth *in vivo*, with saponins boosting healing/antimicrobial action.

More trials following classical protocols are needed for skin and other disorders; Indian ethnopharmacology of whole plant/roots/leaves/bark supports versatility for drug development and integrative medicine, bridging traditional-modern evidence for safety and efficacy.

Conclusion

Plumbago zeylanica Linn. (*Sheetraj*), a key Unani herb, features plumbagin rich roots with proven anti-inflammatory, antimicrobial, wound-healing, anticancer, and anti-ulcer effects. Most evidence is preclinical; hence, standardized extracts, dose optimization, and safety studies are essential before routine clinical adoption. Future research should prioritize standardized preparations, toxicological evaluation, and randomized controlled trials to establish clinical efficacy.

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