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ADIANTUM LUNULATUM (HANSRAJ): A COMPREHENSIVE LOOK AT THIS VERSATILE FERN SPECIES

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ABSTRACT

Background: *Adiantum lunulatum Burm.* (syn. *Adiantum philippense*), commonly known as *Hansraj* or *Hamsapadi* in Ayurveda, is a medicinal pteridophyte traditionally used for the management of a wide range of disorders. Despite its long-standing therapeutic use in classical Ayurvedic literature and ethnomedicine, the plant remains comparatively underexplored in modern scientific research. **Objective:** This review aims to compile and summarize the available information on the taxonomy, pharmacognosy, classical Ayurvedic properties, phytochemistry, therapeutic applications, commercial aspects, and traditional formulations of *Adiantum lunulatum*. **Methods:** Information was compiled from classical Ayurvedic texts, the Ayurvedic Pharmacopoeia of India, published books, ethnobotanical literature and available phytochemical databases to provide an integrated overview of the medicinal importance of the plant. **Results:** The review highlights the botanical characteristics and pharmacognostic features of *A. lunulatum*, along with its *Rasapanchaka, Karma, Rogaghnata*, Therapeutic indications and Formulations described in Ayurveda. Reported phytochemical investigations have identified several triterpenoids, including adiantone, fernene, fern-9(11)-en-28-ol, fern-9(11)-en-25-oic acid, and fern-9(11)-en-6α-ol, which may contribute to the plant's reported pharmacological properties. Traditional literature describes its use in the management of wound healing, inflammatory skin disorders, respiratory

ailments, gastrointestinal disorders, blood disorders, and localized envenomation. However, scientific validation of many of these traditional claims remains limited. **Conclusion:** *Adiantum lunulatum* represents a promising medicinal pteridophyte with substantial traditional therapeutic relevance. Although preliminary phytochemical and pharmacological studies support some of its ethnomedicinal applications, comprehensive experimental investigations, safety evaluations, standardization studies and well-designed clinical research are required to establish its therapeutic potential and facilitate its evidence-based utilization.

KEYWORDS: *Adiantum lunulatum*, Pteridophytes, *Hamsapadi*, *Ayurveda*, Pharmacognosy, Phytochemistry, Ethnomedicine, Triterpenoids.

INTRODUCTION

Pteridophytes represent a diverse and evolutionarily significant group of vascular plants comprising the ferns and lycophytes, collectively distinguished from other plant lineages by their reproduction through spores rather than seeds. They make an important contribution to earth's plant diversity and form a significant dominant component of many plant communities especially in the tropical and temperate regions.[1]

Adiantum lunulatum, commonly known as *Hansraj* in the Indian subcontinent, is a delicate fern species belonging to the family *Polypodiaceae (Syn. Adiantaceae)*. This fern is easily recognized by its distinctive fan-shaped or half-moon (lunulate) pinnae, from which its species name is derived. In India it is found very commonly in the South in plains and lower slopes of the hills and in the North along the foot of the Himalayas from East to West at an altitude of 1000-3000 feet.[2]

Table 1: Taxonomical classification.[3]

Kingdom	*Plantae*
Phylum	*Pteridophyta*
Class	*Pteropsida*
Order	*Filicales*
Family	*Adiantaceae*
Genus	*Adiantum*
Species	*Adiantum lunulatum*

SYNONYMS[4,5,6,7]

Hamspadi, Raktapadi, Tripadika, Keetmata, Hamspaadi, Vishgranthi, Tripadi, Ghritamandalika, Hamspadika, Ghritamandika, Vishwagranthi, Vipadi, Keetamari,

Hempaadi, Madhusrava, Tamrapatri, Vikranta, Suvha, Brahmadani, Padangi, Sheetangi, Sutpaduka, Sancharini, Padika, Prahaladini, Keelpadika, Godhapadi, Hamsanghri, Dhartrashtrapadi.

Table 2: Vernacular names.[8]

Language	Vernacular names
Hindi	*Hansapadi, Hansapagi, Kalijhamp, Kalijhant, Paresiyavasan*
English	Maiden hair fern, Walking maiden hair fern
Bengali	Goyalelata, Kalijhant
Gujarati	Hanspadi, Hansraj, Mubarkha, Mubarakhinipalo
Marathi	Ghodkhuri, Hansraj, Kamsaraj, Rajhans
Telugu	Gatu Mandu
Bombay	Hansraj, Hansaraj, Mubarak, Rajhans
Canarese	Navalad
Ilocano	Dalipaco
Philippines	Culantrillo
Porebunder	Hansraj, Kalohansraj
Kumaon	Mubarka
Arab	Shair-ul-jin
Persian	Sir sia-peshane

DESCRIPTION[9,10]

1. Macroscopic

A small, rhizomatous sub erect graceful fern. Stipes 10-15 cm. long, tufted, wiry, naked, polished dark chest-nut brown; fronds 15-30 cm. long and 7.5 cm. broad, simply pinnate, often elongated and rooting at the apex; root very thin, fibrous, about 10-15 cm long, reddish-black in colour, soft and branched; pinnae subdimidiate, the lower edge nearly in a line or oblique with the petiole, the upper edge rounded and like the bluntly rounded sides usually more or less lobed; petioles of the lower ones spreading 6-13 mm. long, texture herbaceous; the rachis and both surfaces naked; sori in continuous lines along the edge; rhizome long, upto 2 mm thick, glabrous, prostrate or erect, dark reddish-brown or a black in colour.

2. Microscopic

Roots - Mature root shows single layered epidermis consisting of thin-walled, small and irregular cells, followed by 3-4 layers of large thick-walled, polygonal, parenchymatous cells of cortex; endodermis single layered composed of square or somewhat rounded cells; pericycle single layered composed of square shaped with a few elements of xylem and phloem.

Rhizome - Mature rhizome consists of thick walled, rectangular, small cells of epidermis, followed by 3-4 layers of sclerenchymatous cells of hypodermis, composed of thickwalled cells; cortex wide, made up of thin-walled, rounded or oval-shaped parenchymatous cells, enclosing an amphiphloic siphonostele; endodermis present; vascular bundle with xylem consisting protoxylem towards both ends and metaxylem in centre; phloem surrounds the xylem externally and also internally; tracheid with scalariform to reticulate thickening present; a central pith consists of thick-walled cells, and fibres, and is sclerenchymatous.

Frond

Petiole - Shows concave-convex outline; epidermis single layered; hypodermis consists of 2 or 3 layers, lignified, thick-walled, sclerenchymatous cells; ground tissue composed of oval to polygonal, thin-walled parenchymatous cells; stele single, slightly triangular in shape, located centrally and surrounded by peri cycle and endodermis.

Pinnule - Shows single layered epidermis on either surface; mesophyll round to oval in shape and not differentiated into palisade and spongy parenchyma; a few stomata present only on lower surface; a few sori also seen.

Powder- Dark reddish-brown in colour; shows dark reddish-brown pieces of sclerenchymatous cells and light-coloured crushed cells of cortex, a few tracheids having reticulate thickening, fibres and a few spores.

Figure no. 1.

Figure no. 2.

RASPANCHAKA[11,12]

Table No. 3

Rasa	*Tikta, Kashaya*
Guna	*Guru*
Veerya	*Sheeta*
Vipaka	*Katu*

Karma	*Vishaghana, Raktavikarhara*
Doshakarma	*Vatapittashamaka, Kaphaghna (Kaphanisaraka)*

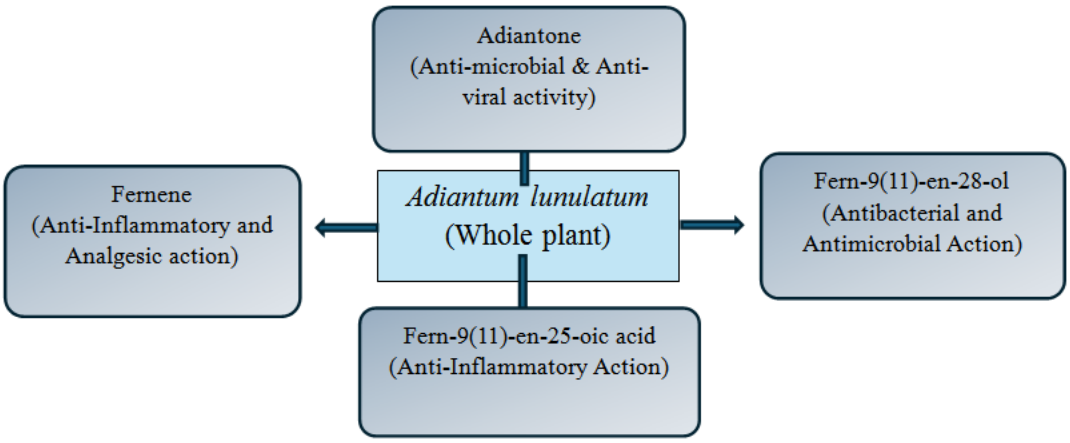
PART USED[13]

Whole plant.

THERAPEUTIC USES[14,15]

Hansraj is a highly valued herb in Ayurvedic medicine, celebrated for its broad spectrum of therapeutic benefits and profound cooling and detoxifying effects. The root is good for stangury and for fever due to elephantiasis. It is extensively used in the treatment of children for febrile affections. The leaves are rubbed with water and given with sugar. It is exceptionally effective in promoting wound healing (*vrana*) and tissue repair, which also makes it an excellent remedy for soothing severe, spreading inflammatory skin infections like erysipelas (*visarpa*). It is worked up with ochre and applied locally for erysipelatous inflammations. Beyond skin health, Hansraj serves as a potent systemic purifier that treats blood disorders (*rakta vikara*) by flushing out toxins and restoring internal balance. Its natural astringent qualities also extend to the digestive system, where it helps calm the gastrointestinal tract and alleviate diarrhoea (*atisara*). Furthermore, the herb is traditionally harnessed as a natural antidote to neutralize localized venoms, such as those from spider bites (*luta vish*). Rounding out its defensive capabilities, *Hansraj* possesses strong antimicrobial properties (*bhut graha*) that help shield the body against harmful pathogens and infectious diseases.

PHYTOCONSTITUENTS[16]



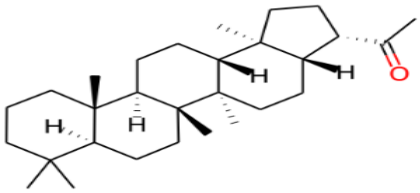


Figure no. 3 (Adiantone).

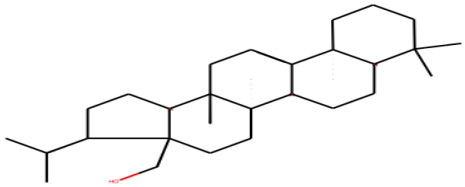


Figure no. 5 (Fern-9(11)-en-28-ol).

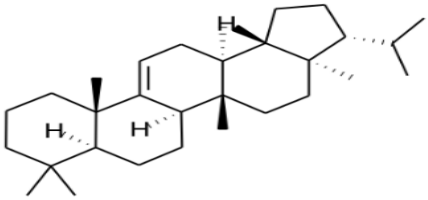


Figure no. 4 (Fernene).

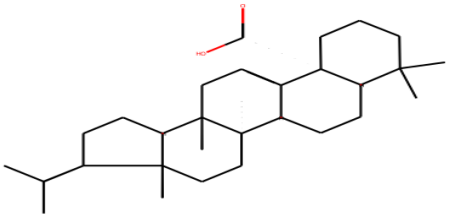


Figure no. 6 (Fern-9(11)-en-25-oic acid).

Table No. 4: Chemical classification of the phytoconstituents.[17]

Phytoconstituent	Class	Subclass	Biosynthetic pathway	Superclass
Adiantone	Steroids and steroid derivatives	Oxosteroids	Terpenoids	Triterpenoids
Fernene	Prenol lipids	Triterpenoids	Terpenoids	Triterpenoids
Fern-9(11)-en-28-ol	Prenol lipids	Triterpenoids	Terpenoids	Triterpenoids
Fern-9(11)-en-25-oic acid	Prenol lipids	Triterpenoids	Terpenoids	Triterpenoids

TRADE AND COMMERCE

Based on current commercial and agricultural listings in 2026, the retail price of *Adiantum lunulatum* (commonly known in Ayurveda as *Hansraj* or *Hamsapadi*) varies significantly depending on the form (fresh, dried, or powdered), quality and supplier.

Prices currently range from **₹160 per kg to ₹2,000 per kg** in the Indian market.

SUBSTITUTES AND ADULTERANTS

Adiantum capillus veneris Linn., A aethiopium Linn., A. pedatum Linn. and *A venustum G. Don*. are used as substitutes. In Kerala, *Desmodium triflorum* is used as *Tripadi* and *Hamsapadi*.

CLASSICAL CATEGORISATION[18,19,20]

Acharya Charak – Kanthya Mahakashaya, Madhur Skanda

Acharya Sushruta – Vidarigandhadi gana

PHARMACOLOGICAL ACTIVITIES[21,22,23]

Ethanolic extract of *Adiantum lunulatum* showed strong antioxidant activity by inhibiting DPPH, hydroxyl, hydrogen peroxide and nitric oxide radicals, and reducing power activities when compared with standard ascorbic acid. In addition, the Ethanolic extract of *Adiantum lunulatum* is found to contain a noticeable number of total phenols, which plays a major role in controlling antioxidant activity. The results of this study shows that the ethanolic extract of *Adiantum lunulatum* can be used as easily accessible source of natural antioxidant. However, the components responsible for the antioxidant activity of *Adiantum lunulatum* are currently unclear. Therefore, it is suggested that in vivo antioxidant activity should be performed. Alcohol extracts of *Adiantum lunulatum* are found effective against E. coli, S. typhi & S. aureus

Table No. 5: *KARMA*.[24]

S.NO	PROPERTY (SANSKRIT)	PROPERTY (ENGLISH TRANSLATION)
1.	*Kanthaya*	Beneficial for throat, vocal cord(voice)
2.	*Kashara*	Alleviates cough
3.	*Swasahara*	Alleviates Dyspnoea
4.	*Raktashodhaka*	Purifies Blood
5.	*Raktapittashamaka*	Pacifies Rakta and Pitta
6.	*Mootrala*	Diuretic
7.	*Balya*	Gives Strength
8.	*Dahaprashmana*	Pacifies Burning sensation
9.	*Vishaghana*	Antidote
10.	*Vranaropana*	Accelerates Wound healing
11.	*Krimighana*	Alleviates Worm Infestation
12.	*Bhutabadhahara-Rakshoghna*	Protects from Bad omens
13.	*Shothahara*	Alleviates Oedema
14.	*Stambhana*	Styptic

Table No. 6: *Rogaghnata*.[25,26,27]

S.NO	DISEASE	EQUIVALENT ENGLISH TERM
1.	*Kantha vikara-Swarabheda*	Throat ailments
2.	*Kasa*	Cough
3.	*Shwasa*	Dyspnoea
4.	*Pratishyaya*	Running nose
5.	*Mootrakrichchhra*	Dysurea
6.	*Atisara*	Diarrhoea
7.	*Galaganda*	Goitre
8.	*Raktapitta*	Bleeding diseases
9.	*Vatarakta*	Gout
10.	*Apasmara*	Epilepsy
11.	*Visarpa*	Erysipelas

12.	*Shotha*	Oedema
13.	*Gulma*	Tumours
14.	*Daha jwara*	Fever
15.	*Visha*	Poisoning
16.	*Vrana*	Wounds
17.	*Luta visha*	Spider Poison
18.	*Dourbalya*	Generalised weakness

DOSE[28,29]

Juice-10-20 ml

Decoction 50-100ml

Powder 1-4 gm

Table No. 7: Formulations.[30]

S.NO	TYPE OF DOSE FORM	NAME OF FORMULATION
1.	*Taila*	*Madhuyastyadi taila*
2.	*Vati and Gutika*	*Manasamitra vataka, Muktapanchamritarasa, Svarnabhupati rasa, Kalakuta rasa*

DISCUSSION

The therapeutic efficacy of *Adiantum lunulatum* (Hansraj) is deeply rooted in its unique pharmacodynamic profile (*Rasapanchaka*), which demonstrates a highly synergistic approach to balancing the *Doshas* and purifying the *Dhatus*. The presence of *Tikta* (bitter) and *Kashaya* (astringent) *rasas*, combined with *Sheeta* (cold) *veerya*, makes *Hansraj* an exceptional antagonist to vitiated *Pitta dosha*. These properties directly cool the system and scrape away metabolic toxins (*Ama*), which explains its primary action as *Raktavikarhara*. By neutralizing the *Ushna* (hot) and *Teekshna* (sharp) qualities of *Pitta* in the *Rakta dhatu* (blood tissue), it effectively resolves inflammatory and hemorrhagic disorders.

Its anti-poisonous action is a direct clinical extension of its *Tikta Rasa (Vayu and Akash Mahabhuta)* and *Sheeta Veerya*. Toxins (*Visha*) generally exhibit rapid, hot and penetrative qualities and it aggressively vitiates *Pitta dosha* and immediately corrupts the *Rakta dhatu*. Because poison is *Sukshma* (subtle), it bypasses normal barriers. The *Akash Mahabhuta* present in the *Tikta rasa* in Hansraj gives it the same subtle, expansive quality. It creates space, allowing the therapeutic essence of the herb to penetrate deeply into the cellular micro-channels (*Srotamarga*) where the xenobiotics have lodged. Poison creates pathological secretions and corrupted blood (*Kleda* and *Rakta dushti*). The *Vayu* element provides *Ruksha* (drying) and *Laghu* (light) qualities. It absorbs the toxic moisture, dries up the inflammatory

secretions, and stimulates the movement needed to expel the toxins from the body. Poison destroys tissues through its extreme *Ushna* (hot) quality. *Sheeta Veerya* (which is predominantly cooling and soothing) acts directly against this heat. It rapidly pacifies the aggravated *Pitta dosha* and relieves the burning sensation (*Dahaprashamana*).

While *Sheeta Veerya* and *Kashaya Rasa* typically aggravate *Vata*, the *Guru* (heavy) *guna* of *Hansraj* provides grounding stability. This heaviness counteracts the *Laghu* (light) and *Chala* (mobile) properties of vitiated *Vata*, resulting in its *Vatapittashamaka* (*Vata-Pitta* pacifying) action.

A fascinating contradiction in *Hansraj's* profile is its ability to expel *Kapha* despite its *Guru* and *Sheeta* attributes. This is elegantly resolved by its *Katu* (pungent) *vipaka* (post-digestive effect). The *Katu vipaka* paired with the drying/scraping nature of the *Kashaya Rasa*, cuts through thick, stagnant mucus in the *Pranavaha Srotas* (respiratory channel). Instead of drying the *Kapha* into a hard mass, it liquefies and expels it, validating its renowned efficacy as a *Kaphanisaraka* in respiratory conditions like chronic cough and asthma.

CONCLUSION

Despite representing one of the most ancient lineages of terrestrial flora, Pteridophytes—a diverse clade of vascular cryptogams—remain significantly underrepresented in contemporary pharmacognosy compared to angiosperms. Occupying a crucial evolutionary transition between lower cryptogams and higher vascular plants, these species possess a rich history of utilization in global ethnomedicine. Indigenous and folklore practitioners have historically employed various morphological structures, including rhizomes, stems, fronds, pinnae, and spores, to manage a wide array of pathologies.

Adiantum lunulatum Burm. recognized in Ayurveda as *Hansraj*, perfectly exemplifies this untapped medicinal potential. Although it possesses limited broader economic utility, its clinical efficacy rivals that of many prominent medicinal angiosperms. Traditional Ayurvedic texts document its extensive therapeutic application across multiple systemic conditions, including leprosy, erysipelas, elephantiasis, dysuria, pyrexia and asthma.

While current pharmacological investigations have begun to validate a subset of these traditional claims—demonstrating notable antibacterial, antifungal, hypotensive, and antioxidant activities—the comprehensive pharmacodynamics and pharmacokinetics of *A.*

lunulatum remain inadequately characterized. The stark disparity between its broad empirical applications in Ayurvedic medicine and the limited scope of modern *in vitro* and *in vivo* studies highlights a critical gap in the literature, presenting a compelling framework for future targeted ethnopharmacological research.

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