

## ETHNOMEDICINAL REVIEW OF *ADIANTUM LUNULATUM* (HANSPADI)

### Abstract

*Adiantum lunulatum* commonly known as Hanspadi is used traditionally for treatment of diarrhoea, dysentery, cough, bronchial asthma. *Adiantum lunulatum* is a fern constituting phytoconstituents such as terpenoids, flavonoids, steroids. This plant has been under scrutiny of various pharmacological investigation and revealed to be having antimicrobial, antifungal, antifertility, anti-inflammatory, and antiulcer activity. This review has been carried out to gather pharmacognostic and pharmacological research importance of the plant.

**Keywords:** *Adiantum lunulatum*; hanspadi; medicinal plant, fern.

### Authors

#### **Pearl Dighe**

Department of Pharmaceutics  
PES Rajaram and Tarabai Bandekar  
College of Pharmacy  
Farmagudi, Ponda Goa, India.

#### **Mangirish N. Deshpande**

Department of Pharmacology  
PES Rajaram and Tarabai Bandekar  
College of Pharmacy  
Farmagudi, Ponda Goa, India.

## I. INTRODUCTION

*Adiantum lunulatum* commonly known in ancient literature as Hanspadi, is a fern which grown perennially during monsoon rains in geographical area having rainfall of (1) around 250mm to 2700mm. *Adiantum lunulatum* grows during rainy season specifically from June till October. It is a classified as fern which grows mainly on stoney walls, uphill, hilly slopes or often on rocks (2). It can survive at altitude ranging from 150m to 1400m. It prefers wet fertile soil rich in humus. It is not cultivated and propagated but mostly found in deep evergreen forest and deciduous woodland.

**Taxonomy:** *Adiantum lunulatum* Burm. F.(3)

**Kingdom** Plantae-Plants

**Subkingdom** Viridiplantae-green plant

**Superdivision** Embryophyta

**Infrakingdom** Stereophyta- land plants

**Division** Tracheophyta – Vascular plants

**Class** Polypodiopsida-leptosporangiate ferns

**Subclass** Polypodiidae

**Order** Polypodiales

**Family** Pteridaceae-maidenhairferns (Adiantaceae)

**Genus** *Adiantum* L maidenhair fern.

**Species** *Adiantum lunulatum* Burm F.

**Subfamily:** Adiantoideae

**Tribe:** Adiantae

**Category:** Fern, subtropical

**Vernacular names:** (4)

English: Maiden hair fern, walking maiden hair fern

Hindi: Hansraja

Sanskrit: Triparnika

Guajarati: Hanspadi, Mubarkinipalo

Marathi: Ghodkhuri

Bengali: Kalijhant

Kannada: Hamsapadi, Nayalad

Malayalam: Nayalad

Tamil: Hamsapadamu, Nayalod

Telugu: Seruppadai

Nepalese: Tripadi

- 1. Geographical Distribution:** *Adiantum lunulatum* is native to tropical areas and is found mainly in India, Bangladesh, Srilanka, Combdia, and Thailand. It grows in African continent, Central and south America and Australia. In Indian subcontinent it is found mainly in Western Ghats, Rajasthan Gujarat and Madhya Pradesh(5) (6)
- 2. Plant Description:** The plant is described as fern which grows in creeping or sub erect position. Fern is small, rhizomatous glabrous and smooth (7). Rhizome is short of about 3mm long, dark brown in colour and is and tapers from the base to form a short tip. Its fronds are tufted, arched monomorphic, simply pinnate, dark brown wiry stipe. They are 30-40 cm long tufted, wiry often elongated and scaly at the base and budding at the tip(8).

Lamina simple pinnate, lanceolate and 12-30cm long. Pinnae are 25X 25mm dark green in colour, lunulate (half-moon shape) in shape exist in alternate pairs, fan shaped and are up to 15. They are abridged in sized. Each lobe bears elongated sorus when fertile (9) . Pinna-stalklets are 2mm to 25mm long, dark brown to black in colour and are hairless. Petioles are 5-12mm long with herbaceous texture (8). *Sori* is 2mm to 25mm wide, hairless narrowly oblong and crescent shaped.(10).

## II. THNOMEDICAL (TRADITIONAL) USES

*Adiantum lunulatum* is traditionally used for treatment of different type of pathological conditions. Decoction of the whole plant is used as antidiarrheal and antidyseric(10). Decoction of the leaves of the fern is used as expectorant for treatment of wet cough(11). Extract of the rhizome is given to the children for throat infection and used for treatment of filaria(12). Roots of *Adiantum lunulatum* combined with stem bark of *Terminalia bellirica* for management of bronchial asthma(13). *Syrup De Capillaire* is the syrup made in France from the leaf and rhizome of *Adiantum lunulatum* and is used for symptomatic relief in whooping cough and also used as analgesics to relive muscle pain, sprain, rheumatic conditions and for rapid healing of bone fractures. Roots are used as diuretic also have proved beneficial in kidney stones (14). Paste of the plant is also applied on pimples and considered beneficial in preventing hair loss(14). It is also used in indigestion and serves as a good carminative(15). Paste of the whole plant is applied with turmeric on infected burns and wounds(15) . Decoction of the fresh leaves is used as remedy for irregular menstrual cycle(16) . Leaf juice is used for the relief from ulcers (17). In Ayurveda system of medicine *Adiantum lunulatum* is component of the herbal dosage form *Manasamitra vataka* which is prescribed for the treatment of mental disorders (18) and as antidote for rabid dogs bite and for snake bite(19). Plant is also used in generalised symptoms as analgesic and antipyretic(20). Among Normadian tribes of India plant is used for treatment of epileptic fits, erysipelas atrophy (21). Tribal people of soliga of Mysore district in Karnataka it is used for birth control(22)(23).

## III. PHYTOCHEMICAL REPORTS

Several phytoconstituents have been isolated and reported from the *Adiantum lunulatum*. Flavonoids and terpenoids are the dominant within the plant.

### 1. Terpenoids

- **Melos JLR et al., and Pan et al.,** reported presence of hopane-type triterpenoids Hydroxyphane (=Hopanol)(24).
- **Bramhachari G et al.,2003** reported presence of terpenoid 6 $\alpha$ - Acetoxy-16  $\beta$ , 22-dihydroxy-3-ketoisophane(1).
- **Mukherjee KS et al.,2003** isolated hopane type triterpenoids 3 $\beta$ -Acetoxy-6 $\alpha$ -hydroxy-hop-15, 17(21)-diene from the petroleum ether extract of the whole plant of *Adiantum lunulatum* (25).

- **Reddy VL et al.,2001** isolated triterpenoids 22,29 $\xi$ -epoxy-30-norphane-13  $\beta$ -ol, fern-9(11)-en-6  $\alpha$ -ol, fern-9(11)-ene, fern-9(11)-en-25-oic acid, fern-9(11)-en-28-ol, filicenol-B, adiantone (16).
- **Agarwal RG et al.,** reported presence of phytoconstituents like ketoisophane(26).

## 2. Flavonoids

- **Agarwal RG et al.,1989** reported presence of flavonoids kaempferol-3-glucoside,kaempferol-3-glucuronide, isoquercetin, isoquercitrin, astragalin, nicoiflorin, rutin and querciturone(27).

## 3. Steroids

- **Marino A et al.,1989** and **Gupta M et al., 1990** and isolated steroids  $\beta$ -Sitosterol, daucosterol, stigmasterol, and campesterol from *Adiantum* species(28) .

## 4. Phenyl propanoids

- **Cooper-Driver GC et al.,1976** have reported presence of coumarins methyl *p*-coumarate psoralen, and daphnoretin in different species of *Adiantum*(29).

## IV. PHARMACOLOGICAL ACTIVITIES

### 1. Antimicrobial Activity

- **Jenat et al.,2018** studied antimicrobial activity of *Adiantum lunulatum*. It was found that methanolic extract,ethanolic extract petroleum ether extract and chloroform extract exhibited significant activity against microorganism *K. pneumonia*, *E. coli*, and *S. marcesens* and *P. vulgaris* (30).
- **Pradeep et al., 2010** reported aqueous and alcoholic extract inhibited growth of *E. coli* and *S. typhi*(31).
- **Kannaiyan Moorthy et al.,2014** evaluated antimicrobial activity of *Adiantum lunulatum* were results revealed that aqueous extract of the plant inhibits microbial strains *C. neoformans* whereas alcoholic extract was effective against *S. epidermidis* and *S. paratyphi*. (32).

### 2. Antifungal Activity

- **Guha et al.,2005** reported antifungal activity of aqueous extract of whole plant against fungal strains *Aspergillus niger* and *Rhizopus stolonifer*. It was observed that gametophytes were more susceptible then sporophytes(33).
- **Rai et al.,1989** reported that aqueous extract of the plant exhibited antifungal activity against *Microsporum nanum* where it supresses the growth of fungus significantly(34).

### 3. Antifertility Activity

- **Bhatia DK et al., 2010** observed antifertility effect of alcoholic and aqueous extract of *Adiantum lunulatum* Burm on albino rats. It was observed that extract caused the deformation in germ cells of testis leydigs cell and somniferous tubules were free of spermatozoa (35).

### 4. Antioxidant Activity

- **Swant O et al., 2009 and Suresh SN et al.,2018** evaluated antioxidant activity of ethanolic extract of the plant by using DPPH assay, reducing power assay Hydrogen peroxide radical scavenging assay and by determining total phenolic content, hydroxyl radical scavenging activity, nitric oxide radical scavenging activity and total antioxidant activity. Results clearly signify antioxidant properties of the plant(36).

- **Anti-Inflammatory Activity**

**De Souza MM et al., 2009** assessed anti-inflammatory activity of the *Adiantum* species using carrageen induced paw edema method where 71.15% inhibition of inflammation was achieved at a dose of 100mg/kg of plant extract(37).

- **Analgesic Activity**

**Hussain MM et al., 2008** analysed and reported analgesic activity of the plant belonging to genus *Adiantum* using pain models in mice – writhing test (38).

#### 4.7 Antiulcer Activity

- **Deshpande MN and Balekar NS** carried out the screening of antiulcer activity of ethanolic extract of *Adiantum lunulatum* using various ulcer producing model like ethanol induced ulcer,pylorus ligated induced ulcer, Aspirin induced ulcer and Cold stress restrain induced model and found that extract of *Adiantum lunulatum* reduces the ulceration exerting gastroprotective action. (39).

## V. CONCLUSION

Scientific review of the *Adiantum lunulatum* reveals that plant has medicinal importance and can be explored for new leads as plants contains phytoconstituents such as terpenoids and flavonoids.

**Competing Interest:** Authors declares no competing interests.

## REFERENCES

- [1] Brahmachari G, Mondal S, Chatterjee D, Brahmachari AK. Phytochemicals and biological activities of *Adiantum* species. J Sci Ind Res (India). 2003;62(12):1119–30.
- [2] Shaikh SD, Dongare M. Substrate Analysis of *Adiantum Lunulatum* Burm . From Varied Habitats of Sindhudurg District ( Maharashtra ). The Eco Scan An International Bi Annual Journal Of Environmental Sciences. 2008;2(2):173–6.
- [3] USDA. National plant data team, Greensboro,NC 27401-4901 USA. 2018 [cited 2018 Jul 15]. NRCS.2020 The plant database. Available from: <https://plants.usda.gov/core/profile?symbol=ADIAN>

- [4] Pallavi G, Gupta VKL, Chate VA. An Ethno-Pharmaco-Botanical Review of Hamsapadi – *Adiantum lunulatum* Burm. F. (A. Philippense Linn.). Int J of Pharmaceutical & Biological Archives. 2011;2(6):1668–76.
- [5] Kirtikar K, Basu B. Indian Medicinal Plants. Basu L, editor. Allahabad; 1989. 2375–2376 p.
- [6] Bhattacharjee S. Handbook of Medicinal Plants. Jaipur: Pointer Publisher; 1998. 16 p.
- [7] Hyde MA, Wursten BT, Ballings P, Coates Palgrave M. Petra Ballings and Meg Coates Palgrave. 2020 [cited 2018 Aug 23]. Flora of Zimbabwe: Species information: *Adiantum lunulatum*. Available from: [https://www.zimbabweflora.co.zw/speciesdata/species.php?species\\_id=101010](https://www.zimbabweflora.co.zw/speciesdata/species.php?species_id=101010)
- [8] Singh S, Khatoon S, Singh H, Behera SK, Khare PB, Rawat AKS. A report on pharmacognostical evaluation of four *Adiantum* species, Pteridophyta, for their authentication and quality control. Brazilian Journal of Pharmacognosy. 2013;23(2):207–16.
- [9] Singh MP, Panda H. Medicinal Herbs with their formulations. 1st ed. Trinagar New Delhi: Daya Publishing House; 2005. 56 p.
- [10] Chatterjee A, Pakrashi S. The Treatise on Indian Medicinal Plants. 1st ed. New Delhi: Publications and Information Director, CSIR; 1994. 9 p.
- [11] Anand RK, Srivastava RB. Ethnopharmacological study of *Adiantum lunulatum* Burn F. Indian Fern J. 1994;11:137–41.
- [12] Anis M, Sharma MP, Iqbal M. Herbal Ethnomedicine Of The Gwalior Forest Division In Madhya Pradesh, India. Pharm Biol [Internet]. 2000 Oct 10;38(4):241–53. Available from: <http://www.tandfonline.com/doi/full/10.1076/1388-0209%28200009%293841-AFT241>
- [13] Reddy KN, Reddy CS, Trimurthulu G. Ethnobotanical survey on respiratory disorders in Eastern Ghats of Andhra Pradesh, India. Ethnobotanical leaflets. 2006;10(1):139–48.
- [14] Karthik V, Raju K, Ayyanar M, Gowrishankar K, Sekar T. Ethnomedicinal Uses of Pteridophytes in Kolli Hills , Eastern Ghats of Tamil Nadu , India. J Nat Prod Plant Resour. 2011;1(2):50–5.
- [15] Rout SD, Panda T, Mishra N. Ethnomedicinal studies on some pteridophytes of Similipal Biosphere Reserve, Orissa, India. International Journal of Medicine and Medical Sciences. 2009;1(5):192–7.
- [16] Niranjana Reddy VL, Ravikanth V, Prabhakar Rao T, Diwan PV, Venkateswarlu Y. A new triterpenoid from the fern *Adiantum lunulatum* and evaluation of antibacterial activity. Phytochemistry [Internet]. 2001 Jan;56(2):173–5. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0031942200003344>
- [17] Kumari P, Govindaparyi, Arman Mahmoud i otaghwari H, Bahuguna YM. Some ethno-medicinally important pteridophytes of India. Int J of Medicinal and Aromatic plants. 2011;1(1):18–22.
- [18] Khare CP. Indian Herbal Remedies, Rational Western Therapy, Ayurvedic and other Traditional Usage, Botany. Frank Krabbes, editor. Heidelberg; Germany Springer-Verlag; 2004. 25 p.
- [19] Kaushik P, Dhiman A. Common medicinal pteridophytes. Indian Fern J. 1995;12:139–45.
- [20] Nadkarni A, Nadkarni K. Indian Materia Medica. 1st ed. Bombay: Popular Prakashan; 1976. 44 p.
- [21] Asolkar L, Kakkar K, Chakre O. Second supplement to glossary of Indian medicinal plants. New Delhi: PID CSIR; 1992. 24 p.
- [22] Pan C, Chen YG, Ma XY, Jiang JH, He F, Zhang Y. Phytochemical constituents and pharmacological activities of plants from the genus *Adiantum*: A review. Tropical Journal of Pharmaceutical Research. 2011;10(5):681–92.
- [23] Puri G, Arora R. Some medicinal ferns from Western India. Ind Forester. 1961;8:179–83.
- [24] Melos J, Silva L, Peres M, Mapeli A, Faccenda O, Anjos H, et al. Chemical composition and evaluation of allelopathic potentials of *Adiantum tetraphyllum* Humb. & Bonpl. ex. willd (Pteridaceae). Quim Nova. 2007;30(2):292–7.
- [25] Mukherjee K, Mondal S, Sohel S, Mukherjee P, Chatterjee, D, Brahmachari G. A new triterpene from *Adiantum lunulatum* Burm. Indian Journal of Chemistry Section B. 2003;42(B):2665–7.
- [26] Agarwal T, Tiwari JS. A note on the flavanoid and other constituents of *Phyllanthus* genus. J Indian Chem Soc. 1991;68:479–80.
- [27] Agrawal R, Pant P, Tewani L, Singh J. Preliminary phytochemical screening of medicinal plants of hilly districts. Bull Med Ethnobot Res. 1989;10:176.
- [28] Marino A, Elberti MG, Cataldo A. Phytochemical analysis of *Adiantum capillus-veneris*. Bollettino. Bollettino. 1989;65:461–3.
- [29] Cooper-Driver G, Swain T. Sulfate esters of caffeyl- and p-coumarylglucose in fern. Phytochemistry. 1976;14:2506–7.

- [30] Jenat PJ, Suresh S. Phytochemical analysis and antimicrobial activity of fern *Adiantum lunulatum* burm .f. *World J Pharm Res.* 2018;7(3):640–8.
- [31] Parihar P, Parihar L, Bohra A. In vitro antibacterial activity of fronds (leaves) of some important pteridophytes. *J Microbiol Antimicrob.* 2010;2:19–22.
- [32] Moorthy K, Vinodhini R, Senthilkumar B, Punitha T, Senbagam D, Thajuddin N. Phytochemical analysis, in-vitro anti-microbial activity of Indian medicinal ferns *Adiantum lunulatum* and *Hemionitis arifolia*. *J Pharm Res.* 2014;8(11):1671–6.
- [33] Ghosh PG, Mukhopadhyay R, Gupta K. Antifungal activity of the crude extracts and extracted phenols from gametophytes and sporophytes of two species of *Adiantum*. *Taiwania.* 2005;50(4):272–83.
- [34] Rai M. In vitro sensitivity of *Microsporum nanum* of some plant extract. *Indian Drugs.* 1989;25:581.
- [35] Bhatia DK, Sharma AK, Pathania PC, Khanduri NC. Antifertility effects of crude different of *Adiantum lunulatum* Burm . on Reproductive Organs of male albino rats . *Biological Forum.* 2010;2(2):88–93.
- [36] Sawant O, Kadam VJ, Ghosh R. In vitro free radical scavenging and antioxidant activity of *Adiantum lunulatum*. *Journal of Herbal Medicine and Toxicology.* 2009;3(2):39–44.
- [37] De Souza M, Pereira M, Ardenghi J, Mora T. Filicene obtained from *Adiantum cuneatum* interacts with the cholinergic, dopaminergic, glutamatergic, GABAergic, and tachykinergic systems to exert antinociceptive effect in mice. *Pharmacol Biochem Be.* 2009;93:40–6.
- [38] Hussain, MM, Muthuprasanna, P Srinivasarao T. Analgesic and antiinflammatory activity of *Adiantum venustum*. *Res Rev Biosci.* 2008;2:102–4.
- [39] Deshpande MN, Balekar N. Gastroprotective and ulcer healing activity of ethanolic extract of *Adiantum lunulatum*. *Indian Drugs.* 2019;56(3):68–73.