

Medicinally important Pteridophytic flora of Hamirpur district, Himachal Pradesh, India

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ABSTRACT

Pteridophytes are the first land vascular plants. They include true ferns and fern allies. This group of plants constitutes second major component of forest wealth after angiosperms. They occupy intermediate position between bryophytes and phanerogams. Medicinal uses of pteridophytes are known to man for more than 2000 years. The pteridophytes are used in homeopathic, ayurvedic, tribal and unani system of medicines. There is dearth of documentation of pteridophytes and their medicinal potential in reference to Hamirpur district. Hence, the present study was undertaken. During the present study 21 species of pteridophytes have been identified and documented as medicinally important for different ailments. This study was carried out between January 2019 to October 2023 in Hamirpur district, Himachal Pradesh, India. This study may be utilized for bioprospecting by pharmaceutical industry in future.

Key words: *Pteridophytes, Documentation, Medicinal potential, Bioprospecting, Pharmaceutical industry.*

Introduction

Plants have been used for the treatment of several ailments since earliest times. All over the world people have practiced the use of botanicals as a source of medicines for millenia. Over 25 percent approved drugs in industrialized countries are obtained directly or indirectly from plants (Newman *et al.*, 2000). In modern times, the search for phytochemicals with antioxidant, antimicrobial or anti-inflammatory properties is rising owing to their potential as a remedy for the cure of several chronic and infectious diseases (Halliwell, 1996). Therapeutic plants may be a better source of antimicrobial agents due to less side effects than synthetic antibiotics (Berahou *et al.*, 2007). Plant extracts contain several secondary metabolites like phenolics that enhance biological activity. Due to antimicrobial and antioxidant properties plant secondary metabo-

lites, some of them are considered to be safe substances (Proestos *et al.*, 2005). Pteridophytes comprise of fern and their allies. There are about 12,000 species spread among 250 different genera all over the world (Chang *et al.*, 2011). In India, about 1,107 species of pteridophytes have been reported (Fraser-Jenkins *et al.*, 2017). The pteridophytes are suggested as a source of medicines in Ayurvedic, Unani and Homeopathic systems of medicine (Uddin *et al.*, 1998). Several ferns are recommended by the native doctors of traditional Chinese system of medicine (Kimura and Noro, 1965). Recently, ethnobotanical and pharmacological studies have been carried out on ferns and their allies by several workers (Dhiman, 1998; Vasudeva, 1999; Reddy *et al.*, 2001; Singh *et al.*, 2001; Gogoi, 2002; Chen *et al.*, 2005; Parihar and Parihar, 2006; Benjamin and Manickam, 2007; Singh *et al.*, 2008a, 2008b; Perumal, 2010; Singh and Upadhyay, 2014; Agnihotri, 2016;

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Suraj *et al.*, 2020; Das and Patra, 2021; Giri *et al.*, 2021 Ojaha and Devkota, 2021; Bandyopadhyay and Dey, 2022). There is dearth of documentation of pteridophytes and their medicinal potential in reference to Hamirpur district of Himachal Pradesh, India. Hence, the present study was undertaken with the objective to document diversity and potential medicinal uses of fern and their allies of Hamirpur district of Himachal Pradesh, India.

Materials and Methods

The present study was carried out between January 2019 to October 2023 in different seasons from various parts of Hamirpur district of Himachal Pradesh. It was based on field study, collection of fern and fern allies with a critical study in different seasons from various parts of district Hamirpur, Himachal Pradesh, India. In majority of pteridophytes, new fronds start appearing from June to July and sori appear from late August. Hence, collections were

made from mid of September onwards. During field collections important features of rhizomes, scales, hair, branching system of fronds and structure of sori were recorded along with photography. The collected specimens were dried and preserved in herbarium sheets according to Jain and Rao (1976). The specimens were identified with the help of standard literature and various published works (Khullar, 2000; Ghosh *et al.*, 2004; Singh and Panigrahi, 2005; Fraser- Jenkins, 2008) and medicinal uses were documented by interacting with local people and consulting the standard literature.

Results and Discussion

The present study revealed 21 species of potential medicinal pteridophytes belonging to 17 genera and 15 families for the treatment of various human diseases. Hamirpur district is rich in biodiversity and to harness medicinal potential of fern and their allies need further study. The present exploration may be



Adiantum capillus veneris L.



Adiantum caudatum Forssk.



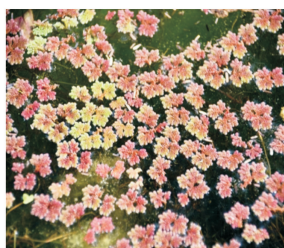
Adiantum philippense L.



Aleuriteopteris bicolor (Roxb.) Fraser-Jenk.



Asplenium dalhousiae Hook.



Azolla pinnata R. Br.

Plate-1



Ceratopteris thalictroides (L.) Brongn.



Diplazium esculantum (Retz.) Sw.



Dryopteris cochleata (D. Don) C. Chr.



Equisetum ramosissimum Desf.



Hypodematium crenatum (Forssk.) Kuhn



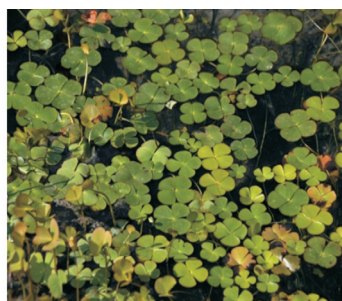
Lygodium flexuosum (L.) Sw.

Plate-2

Sr. No.	Botanical Name	Common Name	Family	Part Used	Medicinal Uses	References
1.	<i>Adiantum capillus veneris</i> L.	Maidenhair fern	Adiantaceae	Whole plant	Used as laxative, tonic, in cold and cough, snake bite, hair growth, fever and menstrual irregularities	Joshi & Joshi, 2008; Kunwar <i>et al.</i> , 2008; Bhagat and Shrestha, 2010
2.	<i>Adiantum caudatum</i> Forssk.	Walking fern	Adiantaceae	Whole plant	Used in cough, fever, diabetes, skin diseases and gastric troubles	Manandhar, 1993, 2002; Joshi & Joshi, 2008
3.	<i>Adiantum philippense</i> L.	Walking maidenhair fern	Adiantaceae	Whole plant	Used as diuretic, asthma hair growth, menstrual irregularities, pyrexia and filariasis	Kirtikar <i>et al.</i> , 1935; Singh <i>et al.</i> , 2003, 2005, 2007, Singh & Upadhyay, 2010, 2012
4.	<i>Aleuritopteris bicolor</i> (Roxb.) Fraser-Jenk.	Silver fern	Pteridaceae	Whole plant	Used in fever, sinusitis, cuts, diarrhea, dysentery and gastritis	Luitel <i>et al.</i> , 2014; Tamang <i>et al.</i> , 2017; Adhikari <i>et al.</i> , 2019
5.	<i>Asplenium dalhousiae</i> Hook.	Spleenwort	Aspleniaceae	Fronds	Have Antifertility anticancerous and antibacterial properties	Singh, 2003; Abbas <i>et al.</i> , 2019; Al-Assar <i>et al.</i> , 2021
6.	<i>Azolla pinnata</i> R. Br.	Mosquito fern	Azollaceae	Leaves	Antibacterial and antioxidant	Jacob <i>et al.</i> , 2020
7.	<i>Ceratopteris thalictroides</i> (L.) Brongn.	Water sprite fern	Parkeriaceae	Leaves and roots	Used as poultice against skin ailments	Bhatt <i>et al.</i> , 2021
8.	<i>Diplazium esculantum</i> (Retz.) Sw.	Fiddlehead fern	Athyriaceae	Whole plant	Used in respiratory ailments, cough, urinary tract infection, gonorrhoea, topical dermatitis, headache, antibacterial, antifungal, immunomodulator, antioxidant, anti-inflammatory, antidiabetic and overcoming hematuria and dyspepsia	Roy <i>et al.</i> , 2013; Balangcod & Balangcod, 2018; Halimatussakdiah <i>et al.</i> , 2018, 2020; Nikmatullah <i>et al.</i> , 2020; Roy & Chaudhuri, 2020; Semwal <i>et al.</i> , 2021; Sirichai <i>et al.</i> , 2022
9.	<i>Dryopteris cochleata</i> (D. Don) C. Chr.	Buckler fern	Dryopteridaceae	Frond and rhizome	Used in eczema, muscle pain, leprosy rheumatism, epilepsy, diarrhoea, gonorrhoea, snake bite, antibacterial and anthelmintic	Nayar, 1959; Shah & Singh, 1990; Manandhar, 1996; Singh, 1999; Vasudeva, 1999
10.	<i>Equisetum ramosissimum</i> Desf.	Branched horsetail	Equisetaceae	Whole plant	Used in tuberculosis, kidney diseases, rheumatism, bone fracture, diuretic, haemostatic, haemorpritic, antirheumatic,	Kapur & Sarin, 1977; May, 1978; Dass, 1997; Vasudeva, 1999; Singh <i>et al.</i> , 2003,

Sr. No.	Botanical Name	Common Name	Family	Part Used	Medicinal Uses	References
					antifungal, antiviral, improvement of fertility in women, cure itches, scabies and skin infections	2005,2007
11.	<i>Hypodematum crenatum</i> (Forssk.) Kuhn	Crenate shield fern	Hypodematiaceae	Fronds and rhizome	Facilitate conception in women, antibacterial	Vasudeva,1999; Nwosu, 2002; Singh <i>et al.</i> , 2003; Benjamin & Manickam, 2007
12.	<i>Lygodium flexuosum</i> (L.) Sw.	Climbing fern	Lygodiaceae	Whole plant	Used in jaundice, wound healing, expectorant, rheumatism, sprain, scabies, ulcer, cough, piles, gonorrhoea, fever, antiovolatory, dysmenorrhoea, female infertility and eczema	Dixit & Vohra, 1984; Singh <i>et al.</i> , 1989; Manandhar, 1996; Nwosu, 2002; Rout <i>et al.</i> , 2009; Singh & Upadhyay, 2012; Srivastava <i>et al.</i> , 2015; Bhatara, 2020
13.	<i>Marsilea minuta</i> L.	Water clover	Marsileaceae	Whole plant	Used in cough, fever, leprosy, diuretic, emollient, anodyne, ophthalmic, aphrodisiac, febrifuge, dyspepsia, muscle spasm, insomnia, indigestion and diarrhoea	Dixit, 1974; Singh & Upadhyay, 2012; Srivastava <i>et al.</i> , 2015
14.	<i>Onychium contiguum</i> Wall. ex C. Hope	Washfield cat's claw fern	Cryptogrammaaceae	Fronds	Used in urinary tract infections	Bandyopadhyay & Dey, 2022
15.	<i>Pronephrium penangianum</i> (Hook.) Holtt.	Chinese peng fern	Thelypteridaceae	Rhizome	Used to relax muscles and tendons, promote blood circulation, stop bleeding and pain reliever	Zhou <i>et al.</i> , 2019
16.	<i>Pteris cretica</i> L.	Ribbon fern	Pteridaceae	Fronds	Used in wound healing and has antibacterial properties	Singh, 1999
17.	<i>Pteris vittata</i> L.	Chinese ladder brake fern	Pteridaceae	Whole plant	Used in tongue sore, burns, anticancerous, antioxidant, antiviral, antibacterial, demulcent, hypotensive and tonic	Singh, 1999; Lai & Lim, 2011; Singh & Upadhyay, 2012;
18.	<i>Selaginella chrysocaulos</i> (Hook. & Grev.)	Christmas clubmoss	Selaginellaceae	Whole plant & spores	Antibacterial	Singh, 1999
19.	<i>Tectaria coadunata</i> (J. Sm.) C. Chr.	Halberd fern	Tectariaceae	Fronds & rhizome	Used in asthma, insect bites, diarrhoea, bronchitis, gastrointestinal disorders, eradication of worms in children,	Dixit & Vohra, 1984; Sharma & Vyas, 1985; Manandhar, 1995a, 1996; Singh, 1999;

Sr. No.	Botanical Name	Common Name	Family	Part Used	Medicinal Uses	References
					anthelmintic, stomach pain and dysentery	Upreti <i>et al.</i> , 2009; Dubal <i>et al.</i> , 2013; Adhikari <i>et al.</i> , 2019
20.	<i>Thelypteris dentata</i> (Forssk.) St. John	Downy maiden fern	Thelypterida-ceae	Rhizome	Used against female infertility and antibacterial	Nayar, 1959
21	<i>Thelypteris prolifera</i> (Retz.) C. F. Reed	Scrambling fern	Thelypterida-ceae	Fronde	Used in Crohn's disease, ulcerative colitis, irritable bowel syndrome and anticancerous	Sarker <i>et al.</i> , 2011

*Marsilea minuta* L.*Onychium contiguum*
Wall. ex C. Hope*Tectaria coadunata*
(J. Sm.) C. Chr.*Thelypteris dentata*
(Forssk.) St. John*Pronephrium penangianum* (Hook.) Holtt.*Pteris cretica* L.*Thelypteris prolifera* (Retz.) C. F. Reed**Plate-4***Pteris vittata* L.
(Hook. & Grev.)*Selaginella chrysochaulos***Plate-3**

utilized for bioprospecting by pharmaceutical industry. The list of medicinally important pteridophytes (Table 1).

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Conflict of Interests

There is no conflict of interests regarding research, authorship and publication of this research article.

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