



SURVEY OF MEDICINAL PTERIDOPHYTES PLANT DIVERSITY AND THEIR USES IN HUMAN DISEASES

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ABSTRACT

Pteridophytes consist of non-flowering primitive vascular plants. There are about 1200 species in 305 genera, of which 191 genera are found in India. The traditional systems of medicine have often been used for various historical, cultural and ecological reasons. The medicinal value of Pteridophytes against bacteria, fungi, viruses, cancer rheumatism, diabetes, inflammation, infertility, diuretics, pesticides, hepatoprotective and sedatives had been reported, which yield appreciable quality and quantity of polysaccharides, steroids, terpenoids, flavonoids, alkaloids and antibiotics are extracted out in form of drugs for many ailments/diseases and they are reservoirs of many organic compounds that are useful as medicines and continuously used in herbal medicine in many countries. Medicinal Pteridophytes plant species have been considered an excellent source of medicine since ancient times and remain underexplored in ethnobotanical aspects when compared to other vascular plants. The medicinally important pteridophytes used by different ethnic minorities and local people in India. We have surveyed and studied the different plant parts such as root, rhizome, young fronds, mature leaves, lamina, rachis & shoots and their crude extracts that have been used in the Indian traditional system of medicine and have clinical activity. In the present investigation, we have studied and collected information about the uses of some fern medicinal plant species for different treatments. Our study has reported the nineteen numbers of medicinal pteridophytes plant species belonging to different families. Therefore, it is suggested that our study on the medicinal fern plant species could be helpful & useful in the different human diseases.

Keywords: Fern, human diseases, pharmacological activity, alternative medicine, organic compounds.

INTRODUCTION

Pteridophytes (ferns and fern allies) are non-flowering primitive vascular plants. There are about 1200 species in 305 genera of pteridophytes, of which 191 genera are found in India as was noted by Dixit (1984). Caius (1935) initiated the work on the medicinal importance of pteridophytes in India. Chowdhury (1973) exposed the knowledge of ethnobotanical and medicinal uses of pteridophytes. These traditional systems of medicine have often been used for various historical, cultural and

ecological reasons noted by Kunwar *et al.*, (2010). The medicinal value of Pteridophytes against bacteria, fungi, viruses, cancer rheumatism, diabetes, inflammation, consultant, fertility, diuretics, pesticides, hepatoprotective and sedatives had been reported. *Azolla*, *Salvinia*, *Marsilea*, *Ceratopteris*, etc. can be utilized to produce life saving drugs because they are reservoirs of very many organic compounds that are useful as medicines. Several fern species have been reported in traditional pharmacopoeias and are continuously used in herbal medicine in many countries. For more than 2000 years,

ferns have been known for their medicinal values and ferns may be particularly important in the Chinese system of medicine as was reported by Chang *et al.* (2011) and other indigenous systems of medicine were noted by Pan *et al.*, (2014). Many compounds especially phenol and phenolic glycosides such as tannins, coumarins, glycosides, quinones, flavonoids, alkaloids, terpenoids and steroids have been isolated from fern species and they are a rich resources for the discovery of novel drugs was noted by Winter & Amoroso (2003). The medicinally important pteridophytes used by different ethnic minorities and local people in India. Pteridophytes are also used by physicians in the Unani system of medicine (Uddin *et al.*, 1998). Some bioactive flavones such as amentoflavone, robustaflavone, biapigenin and ginkgetin in *Selaginella* species were reported to have antioxidant, antiviral and anti-cancer activity.

Medicinal pteridophytes plants are with potential capacity for the treatment of various diseases and used by people from ancient times as was reported by Rawat *et al.*, (1998). They have fewer side effects so demand for herbal remedies is increasing day by day. The ferns had an important role in folklore medicine. These plants have been successfully used in different systems of medicine like Ayurvedic, Unani, Homeopathic and other systems of medicines. Kirtikar *et al.*, (1935) have included 44 species of Pteridophytes having medicinal importance and Nayar (1959) recorded 29 medicinal ferns. The antimicrobial potential of some ferns has been studied by Kumar and Kaushik, (1999); Parihar and Bohra (2002a) & 2003b). In India, 170 species are used as food, flavor, dye, medicine, bio-fertilizers, oil, fiber and bio-gas production as was noted by Manickam and Irudayaraj (1992). The tribal communities have been utilizing their plant parts like rhizome, stem, fronds, pinnae and spore in various ways for the treatment of various ailments since ancient times.

Ferns have been known for their medicinal values and various European, American, Asian and African cultures have made use of ferns in their traditional medicines as reported by Benniamin (2011). Almost all parts of ferns, including the stems, rhizomes, leaves, young fronds and shoots can be used in some way, for example as a source of food and beverages as fertilizer, ornament, materials for crafts or buildings and not least as medicines reported by Mannan *et al.*, (2008) & Winter & Amoroso (2003). Documentation of indigenous knowledge through ethnobotanical studies is important for the conservation and utilization of biological research. The tribal community solely depends on the forest products, not only

this; they have their herbal health care system and these people use various plants and their products to combat many human diseases. There is no doubt that the plant has several important medicinal properties and has been worshipped among local people as a magical herb owing to its medicinal properties noted by Sah (2008). The Pteridophytes are widely used by the local people of the Kumauni Himalaya for ethnomedicinal purposes reported by Upreti *et al.*, (2009). Ethno medicinal importance of some medicinal pteridophytes of Rajasthan and their active constituent would help treat various kinds of diseases as was observed by Parihar (2006). In the present research work, the tribal of the study area are found to use some common pteridophytes in their routine health care system to treat diseases like colds, sciatica, fever, gonorrhoea, rickets, cardiac problems, rheumatism, skin diseases, mental disorders, stomach ulcer and acidity, abdominal and respiratory disorders, eczema and sexual problems, home decoration and we have surveyed and listed the 19 medicinal pteridophytes against different human diseases.

MATERIALS AND METHODS

The present investigation was a study on the different medicinal pteridophytes plant diversity used against different human diseases. The information on the medicinal pteridophytes plant properties and their qualities have also been obtained from the local inhabitants, College Library of Uttarkashi, and Forest Research Institute (F.R.I.) and Botanical survey of India (B.S.I) Dehradun.

Study area:

The study site is located in the different villages of Uttarkashi District, Uttarakhand State. The present analysis has been carried out to study the medicinal pteridophytes plant species of the Uttarkashi region such as N.I.M Forest, Ladari village, Joshiyara sera village, Gyanshu, Tiloth, Ujeli, Gangori village, Tekhla, Kansain, Daang, Meadow, Pokhri village, Sangamchatti and Nachiketa Taal.

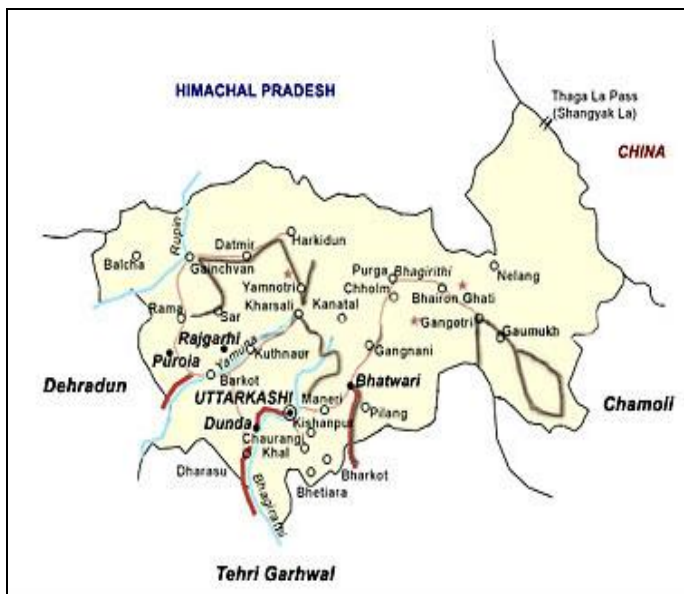


Fig. 1: Location map of Uttarkashi district

The present study was based on field-level information with people of different villages of Uttarkashi District, where we find out the medicinal pteridophytes plant species and their ethnomedicinal uses against different human diseases.

Aims and objectives of present work: The following aims and objectives were chosen and applied for the proposed research work:

- ✓ An extensive survey in the study area of different villages of Uttarkashi district.
- ✓ Described the different medicinal plant species of pteridophytes with their botanical name, local name, family and ethnomedicinal uses against different diseases.
- ✓ Collected literature work with the help of local people, the library of a college campus, FRI and BSI, etc.
- ✓ We find out the medicinal pteridophyte plants which are over-exploited and conclude remark & suggest a strategy for the conservation and management.
- ✓ Analysis of different plant parts prone to specified diseases. The different plant parts which have been analyzed for the different medicinal properties against different human diseases include:

1. Root
2. Rhizome
3. Young fronds.
4. Mature leaves
5. Lamina
6. Rachis
7. Shoots.

OBSERVATIONS AND RESULTS:

The present investigation has been carried out to survey the medicinal pteridophytes plants and describe the different plant parts such as root, rhizome, young fronds, mature leaves, lamina, rachis and shoots and their mode of application against different human illnesses. A total of thirty medicinal pteridophytes plant species belonging to the different families were found to be used against different diseases of the people, and almost all the plant parts and plant-extracts were found to be prepared and used. Plant parts used more frequently such as root, rhizome, young fronds, mature leaves lamina, rachis and shoots, etc. used for the treatment of different diseases described that medicinal pteridophytes with their common name, botanical name, common name, family and ethnomedicinal uses are listed below:

1. The scientific name of *Ophioglossum* is *Ophioglossum vulgatum*, common name, adder's-tongue and family Ophioglossaceae. Habit is a perennial herb, small, fleshy, generally glabrous; roots glabrous with bulblets or plantlets or not. Leaf is also used in the preparation of tonic used as a vulnerary and as a remedy for wounds. A tea made from the leaves and also used as a traditional European folk remedy for internal bleeding and vomiting (fig.1).



Fig.1: *Ophioglossum vulgatum*

2. The scientific name of *Osmunda* is *Osmunda japonica*, common name is Asian royal fern and Family *Osmundaceae*. Habit is tall, deciduous and usually occurs on moist bluffs and ledges and along streams. It is useful in the treatment of jaundice and in removing obstructions of the viscera. The fronds are used to make compresses for external application to wounds and rheumatic joints which proposes they are fairly effective (fig.2).



Fig.2 *Osmunda japonica*

3. The scientific name of *Polystichum* is *Polystichum munitum*, the common name is Christmas fern and the family Dennstaedtiaceae. Habit terrestrial or rock-dwelling ferns of warm-temperate and tropical regions and the rhizomes of various shield fern species have been used as a cure for intestinal worms (fig.3).



Fig. 3: *Polystichum munitum*

4. The Scientific name of *Pleopeltis* is *Pleopeltis polypodioides*, common name *scaly polypody* and *resurrection fern* and family Dryopteridaceae. Habit is epiphyte or air plant and humid or sub-humid climate areas and its uses treat to unspecified medicinal disorders and as a poison and a medicine (fig.4).



Fig. 4: *Pleopeltis polypodioides*

5. The scientific name of *Pteris* (brake) is *Pteris vittata*, family Pteridaceae and decoction of the rhizome and fronds has been given in chronic disorder and leaves used in the worship at the time of illness. Fronds are largely

used as cushions for cattle sheds and young fronds are steamed and eaten as a flavoring material. Decoction is given in dysentery and applied to glandular swelling (fig.5).



Fig. 5: *Pteris vittata*

6. The scientific name of *Selaginella* is *Selaginella kraussiana*, common name *tarry spike-moss* and family Selaginellaceae. It is growing in tropical rain forests and it is used as a diuretic and in gonorrhoea and dried fronds are used as a substitute for tea leaves (fig.6).



Fig. 6: *Selaginella kraussiana*

7. The scientific name of *Thelypteris* is *Thelypteris palustris*, the common name is *marsh fern* or *eastern marsh fern*, family Thelypteridaceae and from a rhizome that is up to 1 cm thick and 50 cm in length and plants paste applied in wound and cut (fig.7).



Fig. 7: *Thelypteris palustris*

8. It is an *Adiantum* sp. and its common name is *maidenhair fern*; family Pteridaceae and habit is a deciduous, clumping fern with drooping habit and its uses in the cough, menstrual cramps (Dysmenorrheal), wound healing and in hair loss (fig.8).



Fig.8 *Adiantum sp.*

9. The scientific name of *Asplenium* is *Asplenium nidus*, common name bird's nest fern, family *spleniaceae* and can survive either as an epiphyte or terrestrial plant, but typically grows on organic matter and its lotion can be extracted from the leaves which is used to treat fever or infusion of leaves to treat labour pain and also a decoction is used to ease labour in childbirth (**fig.9**).



Fig. 9: *Asplenium nidus*

10. The scientific name of *Athyrium* is *Athyrium filix-femina*, common name lady-fern, family *Athyriaceae* and found growing in meadows, open thickets, moist woods and occasionally in swamps and found in the understory of cedars, firs and hemlock woodlands and its uses in the cough, rheumatic pain, sores, burns and scalds, intestinal fever, pain, specifically breast pain during child birth to increase milk flow (**fig.10**).



Fig. 10: *Athyrium filix-femina*

11. The scientific name of *Diplazium* is *Diplazium esculentum*, common name is Fiddlehead Fern, family *Athyriaceae* and it is used for the prevention or treatment of several diseases such as diabetes, smallpox, asthma, diarrhea, rheumatism, dysentery, headache, fever, wounds, pain, measles, hypertension, constipation, oligospermia, bone fracture and glandular swellings (**fig.11**).



Fig. 11. *Diplazium esculentum*

12. The scientific name of *Woodwardia* is *Woodwardia virginica (L.) Smith*, common name netted chain fern and family *Blechnaceae*. Habit is large fern with an arching growth habit, able to grow up to 1- 1.5 m tall. Stout rhizome, dark brown and densely scaly. The decoction of rhizome and fronds is internally administrated in dysentery, dried rhizome used as purgative, fronds used in skin diseases and for fertility (**fig.12**).

13.



Fig. 12: Woodwardia virginica

14. The scientific name of Coniogramme is *Coniogramme emeiensis*, common name Striped Bamboo fern and family Pteridaceae. Habit an exotic looking evergreen fern with a slow spreading clump forming habit and it is used in the treatment of mastitis and other kinds of ulcers (fig.13).



Fig. 13: Coniogramme emeiensis

15. The scientific name of *Onychium* is *Onychium japonicum*, common name is Carrot fern and family Pteridaceae. Habit deciduous, perennial fern and use of *Onychium* extract in preparing the medicines for preventing and curing cardiovascular and cerebrovascular diseases. Its advantages are high curative effect, high safety and high selectivity (fig.14).



Fig. 14: Onychium japonicum

16. The scientific name of *Cyrtomium* is *Cyrtomium falcatum*, common name is House holly-fern and Japanese holly fern and family Dryopteridaceae and plants for a future cannot take any responsibility for any adverse effects from the use of plants. Always seek advice from a professional before using a plant medicinally (fig.15).



Fig. 15: Cyrtomium falcatum

17. The scientific name of *Dryopteris* is *Dryopteris filix*, common name is wood ferns, male ferns or buckler ferns and family Dryopteridaceae. They prefer moist, rich, well-drained woodland soil and its uses in the treatment of inflammation, rheumatoid arthritis, wounds and ulcers (fig.16).



Fig.16: Dryopteris filix

18. It is a *Hypodematum sp.* and its common name is *Bigfoot fern*; family Hypodematiaceae and Habit is terrestrial. Its leaves are used to induce conception in women and the whole plant is used by exorcists for fumigation (fig.17).



Fig.17: *Hypodematum* sp.

19. The scientific name of the *Equisetum* is *Equisetum arvense*, common name is Horsetail and family Equisetaceae. The rhizome is perennial, branched and creeping in nature and it uses as stop bleeding, ulcers, wounds and treat tuberculosis and kidney problems (fig.18).



Fig.18: *Equisetum arvense*

20. The scientific name of *Drynaria* is *Aglaomorpha quercifolia*, common name oak leaf fern or oak leaf basket fern and family Polypodiaceae. Habit is mass-forming basket-fern and traditionally is used in the treatment of hectic fever, dyspepsia, cough, antihelminthic, and anti-arthritic etc (fig.19).

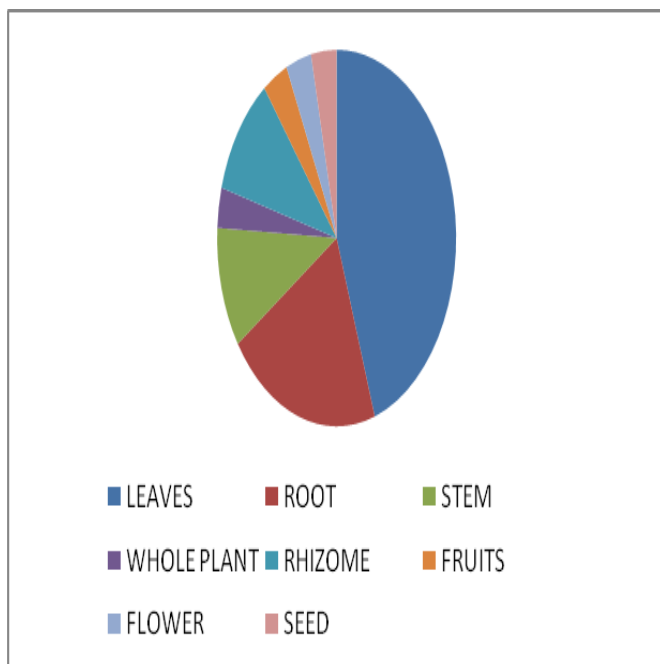


Fig. 19: *Aglaomorpha quercifolia*

Table: 1. Represented maximum number of plant parts used against various human diseases.

S.N.	NAME OF PLANT PART	MAXIMUM NUMBER OF PLANT PART USED	PERCENTAGE OF PLANT PART USED
1.	LEAVES	13	44.8%
2.	ROOT	6	20.6%
3.	STEM	3	10.34%
4.	WHOLE PLANT	1	3.44%
5.	RHIZOME	3	10.34%
6.	FRUITS	1	3.44%
7.	FLOWER	1	3.44%
8.	SEED	1	3.44%

Fig. 1: The following pie chart represents the different parts of various plant used against human diseases and leaves showed the maximum uses of different plant parts against different diseases.



DISCUSSION

The present analysis has been carried out to study the medicinal pteridophytes plant diversity and describes their different plant parts such as root, rhizome, young fronds, mature leaves, lamina, rachis and shoots & mode of application against different diseases. The leaf and root decoction of commonly occurring *Adiantum lunulatum* (*Adiantum philippense*) is very effective in the treatment of chest complaints as was noted by Rout *et al.*, (2009). The fresh fronds of *Blechnum orientale* are used for the treatment of intestinal worms; bladder complaints noted by Dixit and Vohra (1984). The rhizome and roots of *Cheilanthes tenuifolia* are used by the tribal's as general tonic. The rhizome of *Dicranopteris linearis* is used as anthelmintic, while the fronds are used for asthma. The rhizome of *Drynaria quercifolia* is bitter and is used as antibacterial, anti-inflammatory for the treatment of constipation, diarrhea and ulcers & decoction of the plant is used in typhoid fever and fronds are useful in the treatment of swelling noted by Dixit and Vohra (1984) and Warriar *et al.*, (1996). The young shoots of *Lygodium flexosum* are used as vegetables, whereas the rhizome of the plant is boiled with mustard oil and applied in rheumatism, sprains, scabies, ulcers and eczema by local people as was noted by Dixit and Vohra (1984).

Pteridium revolutum rhizome of the plant is useful in diarrhea, inflammation of gastric and intestinal mucous membranes. The decoction of rhizome and fronds is given in chronic disorders of viscera and spleen. In times of scarcity of food, the rhizome are eaten boiled or roasted.

The rhizomes mixed with malt are used for brewing a kind of beer and is also employed as feed for livestock, especially pigs. *Diplazium eschuentum* and *Diplazium maximum* were found to have antioxidant activity. It is extensively consumed in tribal areas of Himalayas as reported by Wali *et al.* (2016). Besides all these wonderful properties, the pteridophytes are also used as ornamentals.

CONCLUSION

In the present work we have been concluded that humankind has a close relationship with the nature because; they are fully dependent on it for food, cloth, shelter, fodder and medicines. All surveyed plants have medicinal value and used to cure various diseases of human. Based on these results it can be concluded that the selected area is very rich diversity of medicinal pteridophytes. During field visits it was also noticed that there were serious threats of extinction to the medicinal plants in the area due to anthropogenic activities. These studies have demonstrated that the medicinal importance of ferns and their antioxidant, anti-diabetic, anti-cancer, antiviral, anti-inflammatory, wound healing, antimicrobial and anti-Alzheimer activity. Our study might be encouraging for the use of pteridophytes plant species medicinally apart from the ornamental use. In the present study the leaves of different plants of the medicinal pteridophytes were observed the maximum uses against different diseases and their maximum percentage was recorded as 44.8% (Table.1 & fig.1). Local people are extensively using these plants in food and medicinal uses because these are easily available and less expensive. However, they are not aware of the conservation strategy. The present situation of traditional knowledge is gradually declining and disappearing due to deforestation and also due to climate change. So for that to make proper policies and should implement these strictly to conserve the plants. For the conservation of medicinal pteridophytes to some extent, we should be aware of the people by research articles, newspapers, seminars, workshops and short term trainings at District, State, National and international levels.

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