



# Medicinal Pteridophytes of Madhya Pradesh

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**Abstract:** Around 80% of the world's population relies primarily on traditional medicines to treat primary health issues. Despite being regarded as a valuable component of healthcare for centuries, pteridophytes remain underexplored in ethnobotanical aspects in comparison to other vascular plants.

Man has been interacting with plants almost from the beginning of time. Plants have always met human needs like food, firewood, livestock feed, and wood throughout human history. There are approximately three million vascular plants in the world. Since ancient times, people on all continents have used medicinal plants to treat a variety of ailments. Plants are responsible for the production of nearly one-quarter of all pharmaceuticals approved by the drug administration boards, despite the fact that synthetic organic chemistry has grown significantly over the past century.

Pteridophytes are being studied for their pharmacological activity as an alternative medicine. Since pteridophytes were the first vascular plants, humans began investigating and utilizing species of plants from this lineage nearly two thousand years ago due to their beneficial properties. For their potential applications in the treatment of a variety of chronic diseases and infections, phytochemicals with antioxidant, antibacterial, or inflammation-fighting properties have become increasingly sought after.

There are a lot of pteridophytes in the Vindhya valley, some of which are even very common and frequently grow with angiosperms. The purpose of the study was to determine the prevalence of these pteridophytic members in the Kymore Hills of the Vindhyan region. They must be protected right away. This study primarily focuses on medicinal pteridophytes, which are widely used by rural and tribal Madhya Pradesh. This study presents a large number of pteridophyte plant species used in a variety of medical applications. The distribution, medicinal uses, and botanical name are provided. In this study, people were interviewed from the Satpura Hills, Amarkantak Hills, Asirgarh Hills, Jabalpur, Mandla, Chhindwara, Rewa region, Sidhi, and Sagar.

**Keywords:** Pteridophytes, Medicinal plants, Madhya Pradesh.

## INTRODUCTION

The state is home to a wide range of ecosystems, including flat plains, riparian areas, plateaus, ravines, ridges, and valleys. The Tiger state has one of the richest floral diversity in the country thanks to its nine National Parks, four major forest types, and 25 wildlife sanctuaries. The state's biological diversity, which includes approximately 5000 plant species and is home to six distinct tribes with distinct practices, customs, and cultures, supports livelihoods and ensures food security for two-fifths of the state's 66 million residents. In rural areas, indigenous health systems that are based on a wealth of traditional knowledge and are based on more than 1,000 different medicinal plants make a significant contribution to health security.

Pteridophytic flora are extinct members of plant families that tribals used as medicines. These plants have been used for food, medicine, and fodder, among other things. There are a lot of pteridophytes in the Vindhya valley, some of which are even very common and frequently grow with angiosperms. The purpose of the study was to determine the prevalence of these pteridophytic members in the Vindhyan region. They must be protected right away. The study would be very helpful in identifying the region's factors that contributed to the extinction of regional species. The area's dry climate, low nitrogen content, and lack of precipitation and humidity significantly harm the pteridophytic vegetation.

Despite the fact that the practice of inventorying dates back to prehistoric times, when humans became aware of food grains and cereal crops for the first time, several inventorying procedures have been carried out in India, particularly in Madhya Pradesh (Central India). Pteridophytes have, regrettably, been overlooked in research into the benefits of higher plants, particularly angiosperms, for business and medicine. The earth's vegetation was once dominated by pteridophytes. The Vindhya Range is a group of older, rounded mountains and hills that extend into northern India (the Indo-Gangetic plain) and southern India. It is in the Indian subcontinent's west central region. On the eastern side of the Gujrat peninsula, close to where it connects to the modern state of Rajasthan, is where the state of Gujrat's westernmost point is. A wonderful location with a lot of biodiversity is Madhya Pradesh. The tribal community has its own herbal health care system in addition to relying solely on forest products. In this, they treat a wide range of human ailments by utilizing a variety of plants and the products they produce.

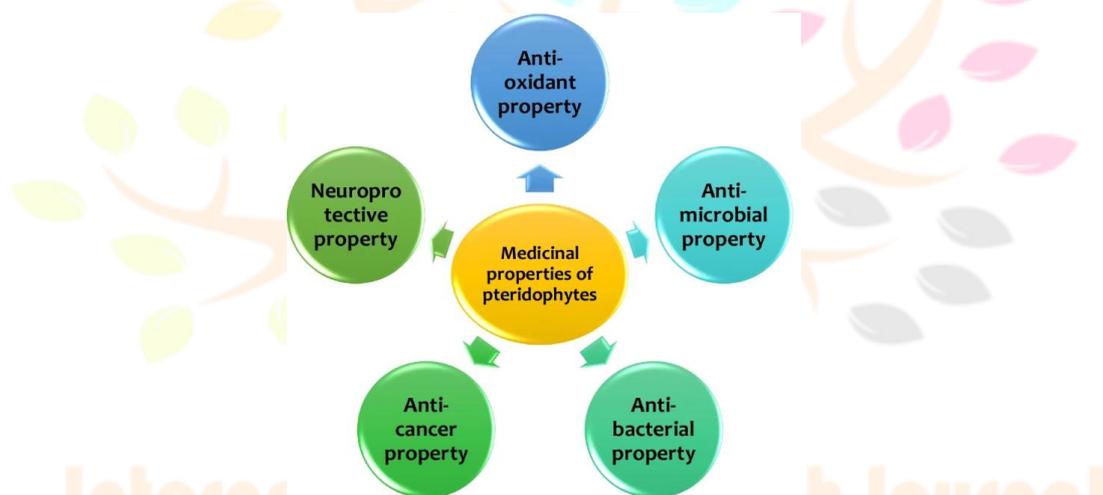
Pteridophytic flora of Pachmarhi Satpura Hills, Bhopal, Tamia Patalkot Mey pteridophyta kee lupt hoti durlabh Prajatiya, and Pachmarhi's plant diversity have all been described, ranging from lower (hepatic) taxa to higher (angiosperm) taxa. It has been noticed that the flora of the Pteridophyte group includes 46 genera, 18 families, and 94 species. According to the Pteridophytic Flora of Pachmarhi, there are 107 species in 18 families and 52 genera. Indigenous Herbal Medicines by Tribal Formulations and Traditional Herbal Practices, Medicinally Important Pteridophytes of Central India, Ethnomedicinal Uses of Pteridophytes of Amarkantak and in the Treatment of Various Diseases Pteridophytes have long been used by the baiga tribes of Amarkantak, Anuppur district.

These tribes have a distinct culture and way of life. It was observed that the majority of tribes followed the medical advice of their own community's Ojhas, Mukhias, or Patels. Everywhere, herbal medicine is readily available. These Ojhas were contacted through their mukhias, who were extremely helpful in getting to remote locations that would not have been possible otherwise. Data were gathered through inquiries, personal observations in their colonies, and conversations with the elderly. Interviewing a party was more reliable because it was simple to evaluate unanimous affirmations or deviations.

The ferns and their allies, or pteridophytes, are well-known for their potent medicinal properties. The significance of conserving pteridophytes has been emphasized by researchers. Pteridophytes' dominant sporophytic phase and true conducting system with xylem and phloem are significant evolutionary innovations. Due to their sturdy plant forms and long-lasting green foliage, pteridophytes are popular ornamental plants. They are utilized as bio-indicators of pollution, bio-fertilizers, and phytoremediators.

During the invasion of land habit, pteridophytes developed a number of morphological adaptations and secondary metabolites for tolerance and defense. It has been demonstrated that some of these compounds have biological activity against pathogens, indicating that they could be utilized in pharmaceuticals. The traditional medical system helps people in urban, rural, and tribal areas treat a wide range of illnesses without causing any side effects. Some of the ferns are mixed with cattle feed to protect the cattle from the bitter cold. These plants have enormous leaves. Pteridophytes' spread and development of local and traditional uses would prove to be valuable resources that ought to be safeguarded for human society's benefit.

## I MEDICINAL PROPERTIES OF PTERIDOPHYTES



### 1.1 Anti-Microbial Property

Currently, antibiotics such as chloramphenicol, tetracycline, erythromycin, penicillin G, ampicillin, cephalosporin, ciprofloxacin, kanamycin, gentamicin, neomycin, amoxycillin, nystatin, amphotericin-B, and ketaconazole are available for the treatment of a wide range of conditions. Several antibiotics are available to treat bacterial and fungal infections, but they may not always be effective against pathogens. In ancient Indian medicine, a number of ferns were used to treat a variety of ailments. Susruta and Charaka suggested that some ferns could be used for medicinal purposes.

Pteridophyte extracts and their solvents effectively inhibited microbial growth when present in high concentrations. Both ethanol and acetone-based extracts of *Lygodium altum* were effective against *B. cerus*. Only in its methanolic extract did *Salvinia molesta* exhibit significant *B. cerus* inhibition. Solvent extracts from *Helminthostachys zeylanica* and *Salvinia cuculata*, two plants with no antibacterial properties, do not produce such outcomes. Both gram-positive and gram-negative bacteria are protected by *Dryopteris filixmas*, which exhibits the strongest antimicrobial effects. Three fern species produce antimicrobial substances. The ferns are frequently used in folk medicine to treat skin wounds, tonsillitis, abscesses, blisters, and ulcers, as well as dermal infections.

### 1.2 Antibacterial Property

*A. tumefaciens* was not inhibited by either an alcoholic or aqueous extract of the leaves of *A. lunulatum*, *A. pectinatum*, *D. cochleata*, or *M. minuta*, nor by alcoholic or aqueous extracts of the leaves of *C. dentatus*, or *H. crenatum*. Aqueous extracts of *A. incisum* and *H. crenatum*, alcoholic extracts of *C. dentatus*, and water-soluble and alcoholic extracts of *A. pectinatum* were all effective against *E. coli*. Additionally, *M. minuta* leaf extracts, both alcoholic and water-soluble, were more effective than tetracycline in preventing the disease-causing strain of *E. coli*.

Additionally, *Salmonella arizonae* was not inhibited by water-soluble and alcoholic extracts of *A. incisum* and *D. cochleata*, aqueous extracts of *A. capillus-veneris* and *M. minuta*, or alcoholic extracts of the leaves of *C. albomarginata*, *C. dentatus*, and *H. crenatum*. However, only a few other extracts were shown to be effective against bacteria. Additionally, all of these extracts have been shown to inhibit *S. typhi*, with the exception of the alcoholic and aqueous extracts of *A. pectinatum* and the aqueous extract of *C. albomarginata* leaves. Aqueous extracts of *A. incisum* and *D. cochleata*, water-soluble and alcoholic extracts of *C. dentatus* and *D. cochleata*, and

alcoholic extracts of *C. dentatus* and *D. cochleata* were also found to be active, but neither of these compounds inhibited *S. aureus* growth.

### 1.3 Anti-Carcinogenic Properties

Natural sources of anticancer agents include microorganisms, marine organisms, and plants. The majority of cytostatic medications—paclitaxel, vinblastine, vincristine, topotecan, irinotecan, camptothecin derivatives, and etoposide—are derived from plants.

*Microsorium grossum* is said to be effective in treating liver cancer. *Pteris polyphylla* and *A. evecta* also have anticancer properties. *Gushuibu* is regarded as having anticancer and anti-inflammatory properties in Chinese traditional medicine. It is made from the rhizomes of a number of different ferns, including *D. fortunei* (Kze.), *J. Sm.*, *The P. coronans* (Ex. Met.) *D. divaricata* BL., *Ching*, *D. mariesii* Moore, *D. solida* (Forst.), formerly of *Bak Sw.*, likewise *H. griffithiana* C. Chr. *M. quadrifolia* is used in medicine to treat a variety of cancers, diabetes, and diseases that cause inflammation and dehydration. The bear paw fern, *Phlebodium decumanum*, has been used for centuries as an ulcer and cancer treatment. *H. arifolia* (Burm.) rootstocks and foliage The tribal communities of Tamil Nadu use Moore and complete specimens of *Adiantum capillus-veneris* L. to treat hypoglycemia and prevent cancer.

### 1.4 Neuroprotective Properties

To begin, phytochemicals' neuromodulatory potential is evaluated in light of their antioxidant and anti-inflammatory properties. Pteridaceae plants are one of the most widespread families of ferns. They can be found in tropical to temperate climates, on flat to hilly terrain, in arid and irrigated areas, along the coast, and in interior areas. In tribal medicine, the pharmacological uses of Pteridaceae members have been mentioned. Alkaloids, flavonoids, and derivatives of their glucosides, such as kaurene, kauroic acid, apigenin, caffeic acid, rutin, luteolin, ptaquiloside, and pterosine, have been isolated by researchers from the Pteridaceae family. Acetylcholinesterase inhibitors can alleviate Alzheimer's disease cognitive symptoms. Schizophrenia, strains, swellings, and contusions can all be treated with phytoextracts of *Huperzia*. *Huperzine A*, derived from *Huperzia* spp., is a notable bioactive found in ferns that has been found to prevent the activity of acetylcholinesterase (AChE). *Hyperzine A* is an acetylcholinesterase inhibitor (AChEI) that can be used to treat mild to moderate cognitive decline. Clinical trials have also looked at its safety, tolerability, and effectiveness.

### 1.5 Antioxidant Property

A growing body of evidence suggests that plants' phenolic compounds may have numerous health benefits. In plants, phenolic compounds are by far the most common secondary metabolite. Phenolic compounds are produced by plants when they are stressed. According to a recent study, the synthesis of flavonoids, particularly anthocyanins and flavones, is mediated by the signaling enzyme phenylalanine ammonia lyase (PAL), and the presence of phenolics shields DNA from UV-B damage, thereby preventing DNA dimerization and degradation. As a result, plants in high mountains must deal with issues like low temperatures, low oxygen partial pressure, high UV levels, and dry conditions that cause flavonoids to accumulate. The presence of these conditions in the locations where the ferns are found can partially account for the high total phenolic content (TPC). like *D. quercifolia*, *C. latebrosa*, *C. barometz*, *B. orientale*, and *D. linearis*. A number of fern species, including *A. penangiana*, *Braomea insignis*, *Cheilanthes anceps* Swartz, *Davallia divaricata*, *Davallia mariesii*, *Davallia solida*, *Dicranopteris linearis*, *Drynaria fortunei*, *Drynaria quercifolia*, *E. arvense*, *Equisetum sylvaticum*, *Humata griffithiana*, *Sp. selaginell*.

## II ETHNOMEDICINAL USES OF PTERIDOPHYTES

Pteridophytes, also known as ferns and their allies, are primitive vascular plants that do not produce flowers and are referred to as the reptile group of plants. They exhibit the high diversity found in the tropics and can be found in cool and humid regions. According to Dixit (1984), there are approximately 1200 species in 305 genera of pteridophytes, 191 of which are found in India. (Manickam and Rajkumar; 1992 Manickam and Irudayaraj; 2000 Chandra; Smith and other, 2008).

Pteridophytes are bio-indicators for pollution, phytoremediators, and some are used as bio fertilizers. They are also frequently used as ornamental plants. Pteridophytes have a lot of potential in the medical sciences because they have a wide range of secondary metabolites. They are utilized in the traditional medical systems. The traditional medical systems play a significant role in the treatment of a wide range of illnesses for people living in urban, rural, and tribal settings. The research into the medicinal value of pteridophytes in India was initiated by Caius (1935). The ethnobotanical and medicinal uses of pteridophytes were revealed by Chowdhury (1973), Vyas and Sharma (1998), and Padala (1988). It is known that the sporophyte's rhizome, stem, fronds, pinnae, and spores can be used to treat a variety of diseases.

Pteridophyte plant extracts had been found to be effective against a number of diseases. Dioscorides (50 AD) and Theophrastus (327-287 BC) both wrote about how a number of pteridophytes could be used in herbal remedies to treat diseases in humans. Additionally, Shushruta and Charak mentioned the applications of various ferns, such as *Marsilea minuta* and *Adiantum capillus-veneris*. According to reports, *Lycopodium clavatum* and *Selaginella bryopteris* are frequently prescribed by homeopaths for the treatment of neurological disorders and heat stroke symptoms. It has been discovered that patients with splinted bones can benefit from using *L. clavatum*. *Helminthostachys zeylanica* (Kamraj) is a stimulant and aphrodisiac that is used in herbal ayurvedic formulations to improve sexual performance. The marsiline extracted from *Marsilea minuta* is used for psychopathy, diarrhea, cough, skin diseases, dyspepsia, fever, and insomnia. It is also known to boost the immune system. A number of gastrointestinal bacterial strains have also been shown to be resistant to the antimicrobial properties of the bracken fern *Pteris vittata*. As a result, the biological resource that would be most beneficial to human society would be pteridophytes, which have a tremendous amount of medicinal value and significance. Ferns are frequently utilized as food and fodder in tropical nations. The dried fern biomass is sprayed in the cattle shed to provide additional fodder, shield the animals from extreme cold, and absorb urine.

### III CONCLUSION

Pteridophytes were used to treat a variety of illnesses in Indian tribal and rural communities, the focus of this review. Locals and tribal groups have always been a great source of ethnomedicinal use of plants because these people live close to plants and completely rely on plants for their daily needs. Pteridophytes are a group of plants with a lot of medicinal, economic, and environmental value that don't get enough attention. Extensive research will provide additional details regarding the medicinal uses that local communities make of pteridophytes. It has the potential to make people's lives better.

The phytochemical and pharmacological properties of pteridophytes as well as their medicinal applications are poorly understood by Indian minority groups. More reports on pteridophyte ethnobotany have been published in recent decades, and pteridophyte research has grown over time. Pteridophytes with medicinal significance will benefit from this review's categorization and baseline data. Pteridophytes have not been extensively studied in many mountainous regions, particularly the central Western Ghats and the seven sister states.

In order to preserve resources and knowledge of these practices before they are lost to subsequent generations, the preservation of traditional knowledge records should be a top priority. Pteridophytes are widely used in India, but very few studies have examined how they function in medicine. The scientific literature has not paid much attention to a class of pteridophytes that have been neglected, necessitating additional research. In order to experimentally validate existing traditional knowledge as a solution to issues related to healthcare, it is necessary to take into consideration the existence of the scientific steps that are discussed in this review. Based on the findings of this review, monographs and recommendations for Indian ethnomedicinally important pteridophytes could be created using the data presented here. Pteridophytes are a group of medicinal plants whose phytochemical and pharmacological properties can be studied to find active compounds that could be used to make new medicines. Pharmacology, phytochemistry, and pharmacognosy of pteridophytes are poorly understood.

Pteridophytes are thought to contain 13,000 species belonging to nearly 48 plant families; However, only a few species and 30 families have been investigated. Consequently, we urge pteridophyte researchers to investigate the plants' bioactive components and therapeutic potential. By studying *in vitro* culture, biochemical processes, the mechanism of action, and genetic modification, researchers could increase the effectiveness of biologically active substances with the assistance of biotechnology. From early tracheophytes and pteridophytes, multidrug therapies should be developed, and their biological processes, drug kinetics, and toxicity evaluations should be studied. Pteridophyte genetic relationships could be discovered with the assistance of a secondary metabolite analysis. Plants containing antimicrobial compounds have a lot of therapeutic potential because they don't have the side effects of synthetic antimicrobials. Plants appear to be bioactive antimicrobial agents with broad-spectrum activity after extensive research. The goal of future research will be to identify and describe the underlying mechanisms of bioactivity and bioefficacy.

It is absolutely necessary to encourage extensive scientific research on unexplored plant species in order to develop new drugs from underexplored plant groups in order to contribute to the ongoing search for low-cost alternative treatments in India. For both preclinical and clinical trials, a comprehensive toxicology investigation is necessary. The study suggests that ethnobotanical research is important to indigenous communities and that comprehensive research on available cryptogams is required, which could result in the development of novel pharmaceuticals. Therefore, if ethnobotanical research is combined with physiological or biochemical research, useful drugs might be discovered.

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