



Ethnobotany of ferns of Lakhimpur, Assam, India

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Abstract

Investigation on medicinal properties and nutritional values of edible higher plants were commonly reported but often neglected the lower vascular cryptogams. Despite the rich flora in and around Assam, study on their medicinal attributes were limited. The objective of the investigation is to document the available edibles and medicinal Pteridophytes used traditionally by the Ahom tribes of Assam, India through ethnobotanical field survey and taxonomic identification of the plants.

Keywords: Vascular plants, antidiabetic, wounds, asthma, ulcers.

Introduction

Pteridophytes are considered primitive among the tracheophytes (vascular plants). They are found scattered all over the globe as well as in India and many of them occur in northeastern part of India. Pteridophytes are an interesting group of lower plants with xylem vessels and are often representative of plant evolution occupying intermediate position between cryptogams and phanerogams. They represent the evolutionary evidence of the starting of seed habit and vascular system from the thallophytic bryophytes towards the phanerogams. Pteridophytes are cosmopolitan in distribution and often contributes majorly on global floral diversity representing itself as the second largest tracheophytes. However, the diversity of fern of the Eastern Himalaya's is under continuous threat to a several natural as well as man-made disasters viz. forest fire, deforestation, flood and landslides etc. Pteridophytes have been described as medicinal¹⁻³. Many pteridophytes were used as food, medicine, in ornamentation; and are good trappers of soil. Habitat destruction by man and more by natural calamities also affects the species richness and evenness at present, therefore, for maintaining the ecological harmony *in-situ* conservation of fern is the need of the hour. Conserving of the forest will not only help the conservation of the plants but will help the tribal people who depend largely on the forest products for their food, medicine and other needs. The present article tries to outline some the pteridophytes used as food and medicine by the local tribes of Lakhimpur, Assam.

Materials and methods

Study area: Assam, one of the northeastern state of India is situated at 24^o44'N to 27^o45'N latitude and 89^o41'E to 96^o02'E longitude. The state covers an area of 78,438sq.km which is 2.4% of the geographical area of the country. The average annual rainfall of the region is 211.76cm (in average) and ranges from 305cm maximum to 178cm minimum in summer

the mercury heat around 37^oC max. and 18^oC min. and during winter a maximum of 26^oC with a minimum of 7^oC, while an average humidity of 83.00% is experienced in the region⁴. The study site Lakhimpur is one of the district located between 26^o48'N to 27^o53'N latitude and 93^o42'E to 94^o20'E longitude covered area is 2277sq.km.

Data collection: The present work was focused on edible pteridophyte collection from the study area. The field study was carried out during 2016-17 at different sites of Lakhimpur with the help of local guide. The specimen was collected and later identified referring to literature. Voucher specimens were prepared following chemical sterilization and preserved. Information were collected through interaction using questionnaire on the edible pteridophytes and photographs were taken. Information regarding the uses and parts used of each of the plants by the local people were recorded on the space created in herbarium sheets.

Enumerations: The collected edible pteridophyte species are arranged alphabetically followed by their respective families, a brief ethnobotanical note on the food, medicinal and other uses are illustrated along with their field number for better and quicker understanding of the plant material and their properties. Reference to source of information of their ethnobotanical uses are given the end of each plants. As much as 25 different pteridophytes were encountered during the survey out of which 15 were known to be edible and enumerated.

Specimen Name: *Adiantum capillus-veneris*

Family: Polypodiaceae

Common name: Walking fern or Maidenhair fern

Description: Twenty-five species and two varieties of adiantum have been listed for India by Dixit⁵. Of these, nine species have been recorded from Assam including *Adiantum aethiopicum* L. Terrestrial or lithophytes. Rhizome erect, long or short

creeping, covered by narrow, blackish scales. Stipes slender, dark, glabrous or hairy; rachis grooved on the upper surface. Lamina simple pinnate to quadripinnate; leaflet fan shaped, margin entire; veins free, simple or forked; texture herbaceous.

Habitat: *Adiantum capillus-veneris* usually prefer humus, moist, well-drained habitats, ranging from bottomland soils to vertical rock walls. Several species are especially known for growing on rock walls around waterfalls and water seepage area.

Spores: Sori marginal, covered with a marginal reflexed indusium, sporangia large, spores tetrahedral.

Edibility: The fronds are used as a garnish on sweet dishes. The dried fronds are used to make a tea.

Medicinal Property: The plant use as antidiabetic (hypoglycemic) and anti-inflammatory⁶.

Collected from: Padumoni reserved forest, Lakhimpur, Assam

Month and year of collection: February, 2017

Sampling: Preserved in herbarium (AVSP17001)

Specimen Name: *Asplenium nidus* Linn.

Family: Aspleniaceae

Common Name: Bird's nest fern

Description: *A. nidus* produces large simple leaves visually similar to banana leaves, which grows to 50-150cm and 10-20cm broad. They are light green, with a black midrib and exhibit characteristic circinate vernation.

Habitat: They usually grows on organic matter. However, they can survive either as an epiphyte and as a terrestrial plant.

Spores: Spores develops in sori on the underside of the frond. These sori form long rows extending out from the midrib on the back of the outer part of the lamina.

Edibility: The sprouts of *A. nidus* are also eaten as a vegetable in Taiwan.

Medicinal Property: It has been locally used in folk medicine for asthma, sores, weakness and halitosis, cough and cold^{7,8}.

Collected from: Charaimaria gaon, Lakhimpur, Assam.

Month and year of collection: February, 2017

Sampling: Preserved in herbarium. (Figure-1) (AVSP17 002).

Specimen Name: *Azolla pinnata* R. Br.

Family: Salviniaceae

Habitat: Aquatic fern

Edibility: Use as chicken and cattle feed

Medicinal uses: Use to increase the fertility of rice field. They are antibacterial and insecticides⁹.

Collected from: Local ponds, Lakhimpur, Assam

Month and year of collection: April, 2017

Sampling: Preserved in herbarium (Figure-2) (AVSP17003)

Specimen Name: *Cyathea spinulosa* WALL. EX HOOK

Family: Cyatheaceae

Common name: Scaly tree fern.

Description: 191 speceis of *Cyathea* were recognised from Malaysia by Holtum¹⁰. Only 25 species of the genus were recognised from the whole Asia excluding Malaysia¹¹. He has divided the genus into many subgenera and sections. Eleven species of *Cyathea* for India were listed by Dixit⁵.

Tree ferns, with tall, massive, stout trunk. Stem usually unbranched, with persistent leaf bases; the trunk and bases of stipes more or less densely covered by scales; hairs present or absent Lamina large, bipinnate to tripinnatifid, spirally arranged at the apex of the stem; veins free, forked once or more; texture coriaceous.

Habitat: They distributed from tropical rain forests to the temperate woodlands.

Spores: Sori superficial, globose; indusia either complete, globose, at first covering the sorus, finally splitting into lobes, or vestigial or absent; sporangia small, shortly stalked, paraphyses present or not, annulus complete, oblique, with definite stomium. Spores tetrahedral, with perispore.

Edibility: Pith is edible, pith and leaves as fodder^{12,13}.

Medicinal property: *Cyathea spinulosa* is used as a general hair tonic and helps in preventing the loss of hair loss and graying of hair. Powdered fronds are useful as sudorific and aphrodisiac.

Collected from: Padumoni reserved forest, Lakhimpur, Assam

Month and year of collection: February, 2017

Sampling: Preserved in herbarium (AVSP17004)



Figure-1: *Asplenium nidus* Linn.



Figure-2: *Azolla pinnata* R. Br.

Specimen Name: *Dicranopteris linearis* (Burm. f.) Underw.

Family: Gleicheniaceae

Common name: Old world forked fern, Uluhe, Dilim

Description: *D. linearis* is a commonly occurred fern species. It is one of the most widely distributed ferns of the wet old world tropics and adjacent regions. This rhizomatous fern spreads via cloning, spreading along the ground and climbing on other vegetation. The stem grows from the rhizome, branches at a 45° angle, and forms leaves (fronds) that continue to form buds and branches. The size of the specimen ranging from 10-180cm tall, though they are more likely to be in the range 60-120cm the underside of the leaves is hairy and sometimes waxy.

Habitat: Forest periphery, open grounds, in poor soils, disturbed grounds or forest clearings, and usually preferring full sun.

Edibility: The roots are source of starch¹⁴.

Medicinal property: The leaves are antiasthmatic, febrifuge and poultice. Use in the treatment of asthma and fever. Mixture of young circinate leaves with cow's milk are treated continuously for a week against female sterility. Extracts of fronds has shown antibacterial and antioxidant activity and used as a poultice when treating wounds, cuts, boils, ulcers¹⁵.

Collected from: Padumoni reserved forest, Lakhimpur, Assam.

Month and year of collection: February, 2017

Sampling: Preserved in herbarium. (Figure-3) (AVSP17005).

Specimen Name: *Diplazium esculentum*

Family: Athyriaceae

Common name: Vegetable fern, Dhekia (Assamese)

Description: Large size perennial fern with ascending rhizome of about 20cm high and covered with short robust scales of about 1cm long. The plant is bi-pinnate with long brownish petioles, and the petiole base is black and covered with short scales. Habitat: River bank, open places in wet ground.

Edibility: Edible, the very young leaves are eaten as vegetable with rice or used in salad.

Medicinal value: A decoction of the leaves is used as a tonic for women after they have given birth and highly antioxidant¹⁶.

Collected from: Azad, Lakhimpur, Assam

Month and year of collection: March, 2017

Sampling: Preserved in herbarium (AVSP17006).

Specimen Name: *Drymoglossum piloselloides* (L.) C.Presl

Family: Polypodiaceae

Common name: Dragon scales

Description: Rhizome long creeping, ca 0.2cm thick, wiry, clothed with scales; scales ca 1×0.5cm, adpressed, diamond-shaped, acuminate, sometimes hair-pointed, peltate, lacinialed; lamina dimorphic, simple; sterile lamina, ca 1.5-3×1-1.5cm, sessile or shortly stalked, roundish or obovate, base cuneate, margin entire; texture thick and fleshy; when young covered by stellate hairs; stipe of fertile frond ca 1-1.5×0.2cm, scaly at base, grooved adaxially, straw-coloured; fertile lamina ca (5-10×0.5-0.8cm, linear to oblong, apex round, base decurrent, margin entire; veins indistinct, arcolces copious, with free, forked or simple veinlets; sori marginal, ca 0.2cm wide, linear, continuous along the tip of lamina.

Habitat: Common, on tree trunks in exposed places.

Spores: Sporangia oval, short stalked, with a few stellate paraphyses, dark-brown. Spores oval to elliptic, light-brown.

Edibility: Not known

Medicinal property: According to Giersen, the leaves are used to treat rashes, whilst a decoction is used for pain reliever, smallpox, ringworm, and used in a poultice for headaches^{17,18}.

Collected from: Padumoni reserved forest, Lakhimpur, Assam.

Month and year of collection: February, 2017

Sampling: Preserved in herbarium (Figure-4) (AVSP17007).

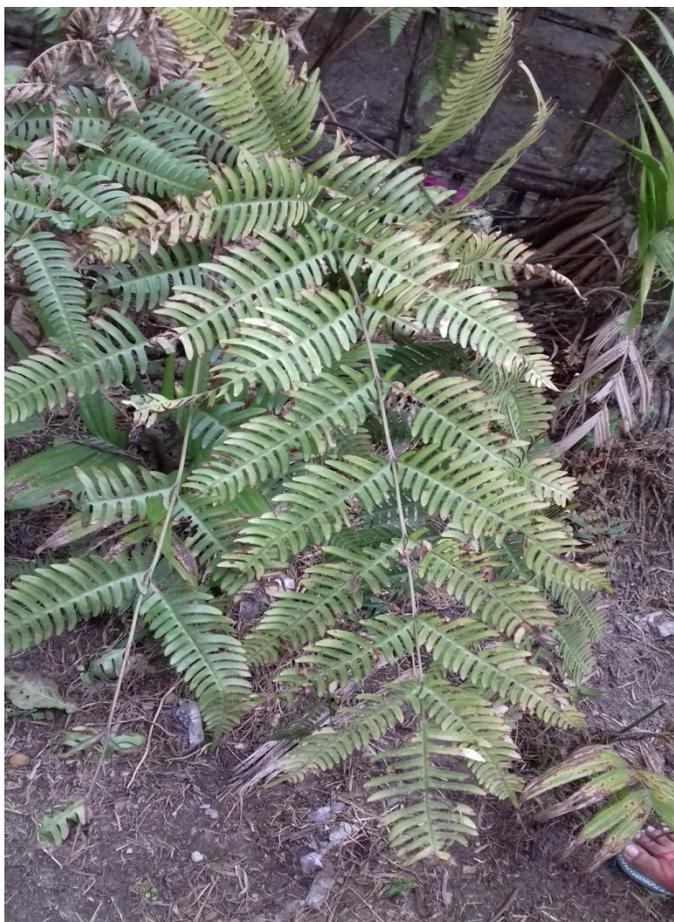


Figure-3: *Dicranopteris linearis* (Burm. f.) Underw.

Specimen Name: *Lygodium flexuosum* (L.) S.W

Family: *Lygodiaceae*

Common name: Chepti – dhekia (Assam)

Description: Rhizome creeping, short, ca 0.5cm thick covered by dark-brown, multicellular, uniseriate hairs. Stipes ca 40×0.3 cm, glabrous, abaxially rounded, adaxially flattened, dark-brown. Fronds wide-spreading, tripinnate, glabrous; primary pinnae alternate, 15cm apart, with ca 3mm long common stalk forked once and bearing a dormant bud on the forking axis, each forked branch ca 12-40×10-30cm, bears two to three pinnules alternately; pinnules ca 6-10×2.5cm, oblong-lanceolate, simple or terminal leaflets forked, basal leaflets often large, separate or lobed with 2-3 leaflets, apex acute or acuminate, base cuneate in simple pinnules, forked or lobed pinnules subtruncate or cordate, stalks ca 0.2-0.7cm long; sterile leaflets finely toothed; texture firm; rachis and costa densely or sparsely pubescent all over; veins distinct, 1-3 forked, free, reaching the margin; fertile leaflets a little narrower than the sterile ones.

Habitat: Common both in shady and open areas, often twining on bushes.

Spores: Sporangia arranged adaxially, sporangia large, short stalked. Spores small, trilete, yellowish-green.

Edibility: Edible. Young shoots are used as leafy vegetables.

Medicinal Property: Plants are used as expectorant. Rhizomes boiled with mustard oil and locally applied to carbuncles and in rheumatism, sprains, scabies, ulcers, eczema and cuts^{19,20}.

The aqueous extracts of the rhizome cure gonorrhoea. Rhizome paste is applied on piles²¹.

Leaves are used to prepare rice-beer cake by the Deoris and several other tribes of Assam.

Collected from: Azad, Lakhimpur, Assam

Month and year of collection: March, 2017

Sampling: Preserved in herbarium (AVSP17008).

Specimen Name: *Microsorium punctatum* (L.) Copel.

Family: *Polypodiaceae*

English Name: Fishtail strap-fern

Habitat: Epiphytic fern

Description: *Punctatum* refers to the minutely pitted or dotted nature of the lamina. Its rhizome is shortly creeping, 8mm thick. It mainly occurs in the Southeast Asia and from Southern China to India. It's mostly found in leaf litter and mosses on rocks in forks of trees. Of its leaf, purgative and enema juices are made. They are also used as a diuretic and to heal wounds.

Edibility: Use as chicken and cattle feed

Medicinal uses: Use to increase the fertility of rice field. They are antibacterial and insecticides⁹.

Collected from: Local ponds, Lakhimpur, Assam

Month and year of collection: April, 2017

Sampling: Preserved in herbarium (Figure-5) (AVSP17009).

Specimen Name: *Nephrolepis cordifolia* (L.) C.Presl

Family: *Nephrolepidaceae*

Common name: Similar to Boston fern or Sword fern

Description: Rhizome semi erect, ca 2cm thick, densely scaly with ca 3x1mm, ovate-lanceolate, apex acuminate, with brown, hairy margins. Petioles ca 10-15×0.5cm, tufted, rounded on lower surface, with grooved on upper surface, densely scaly base, with grey-brown at slightly above. Lamina ca 75×12cm, oblong-lanceolate, simple pinnate, apex short-acuminate; lateral pinnae up to 25 pairs, rather close, subopposite or alternate, sessile, largest one ca 6-10×1.5cm, oblong-lanceolate, apex acute, base broadly cuneate, auricled on the acroscopic base, margin entire or crenate, veins slightly distinct, free, forked once to thrice, not reaching the margin; texture subcoriaceous; lamina pale-green, glabrous or scaly when young.

Habitat: Common, on moist but exposed situations along forest margins.

Spores: Sori submarginal in two rows, reniform, at the tip of veins, one per two or three veinlets; indusia reniform. Spores reniform or planoconvex, exine granulose (PI. 209).

Edibility: Tubers are edible.

Medicinal property: This Plant is safe for cats to eat. It is known to be non-toxic²².

Collected from: Padumoni reserved forest, Lakhimpur, Assam

Month and year of collection: February, 2017

Sampling: Preserved in herbarium (Figure-6) (AVSP17010)



Figure-4: *Drymoglossum piloselloides* (L.) C. Presl.



Figure-5: *Microsorium punctatum* (L.) Copel.



Figure-6: *Nephrolepis cordifolia* (L.) C. Presl.

Specimen Name: *Oleandra wallichii* (Hook.) Presl.

Family: *Oleandraceae*

Common name: Nil

Description: Rhizome long creeping, ca 0.2-0.5cm thickness, densely covered by scales all over; scales ca 0.4×0.1cm, lanceolate, apex long-acuminate, hair tipped, subulate, ferruginous, light-brown. Stipes, ca 2-5×0.2-0.4cm, rounded on lower, grooved on upper surface, scaly at base, glabrous above, brown. Lamina ca 20-35×3-5cm, simple oblong, apex suddenly and sharply acuminate, base obtuse or rounded, margin entire, wavy; midrib distinctly raised above and below, grooved above rounded below, sparingly pubescent with lanceolate scales; veins free, forked once or twice near the base, parallel from midrib to margin, pubescent on the ventral surface; texture coriaceous; lamina dark-brown when dry.

Habitat: Rare; in moist, dense forest.

Spores: Sori are round, compact, in single row on either side of the midrib. Spores oval, hyaline, dark-brown.

Edibility: Rhizome eaten during sickness after boiling.

Medicinal property: Wallichinol, a triterpene monohydroxy alcohol, and its acetate and dihydroxy triterpene alcohol have been isolated as minor constituents from the fern *Oleandra wallichii*. Beta – Sitosterol and sucrose have also been obtained from it. *O. wallichii* (Hook.) C.Presl (Oleandraceae). Rhizome powder and spores mixed with milk taken as antidote against snake bite. Also, leaf is used for rejuvenation by aged person²⁰.

Collected from: Azad, Lakhimpur, Assam

Month and date of collection: February, 2017

Sampling: Preserved in herbarium (AVSP17011)

Specimen Name: *Pityrogramma calomelanos* (L.)

Family: Pteridaceae

Common name: Not known

Description: A new world fern, cultivated in gardens throughout the world. Plants are oblong, lanceolate, broad at base. Underside densely covered by white to yellowish farina. Rhizome rect or sub erect, scaly. Stipe purple black. Pinnae many pairs, oblique, basal pair largest, lanceolate pinnules 10 – 15 pairs.

Habitat: Mesophyte or lithophytes in open places.

Spores: Sori elongate, grows along veins, confluent, exindusiate.

Edibility: Not known

Medicinal Property: Leaves are used externally to heal wounds and stop bleeding. The root is bechic. An infusion is used to treat pulmonary condition. An infusion of leaves is used in the treatment of cold, cough, bronchitis and stomach ailments¹⁹.

Collected from: Padumoni reserved forest, Lakhimpur, Assam.

Month and year of collection: February, 2017

Sampling: Preserved in herbarium (AVSP17012).

Specimen Name: *Pronephrium lakhimpurenses* (Rosenst.)

Holt. Blumea

Family: Thelypteridaceae

Common name: Dhekia – loti (Assam)

Description: Rhizome long creeping, ca 2cm thick, scaly; scales ca 2×0.5mm, lanceolate, acuminate. Stipes ca 40-90×0.5-1cm, adaxially grooved, abaxially rounded, glabrous, pale-brown. Lamina ca 50-150×25-60cm, simple pinnate, lanceolate, with a long acuminate apical pinna similar to lateral ones; apical pinna larger than the distant lateral pinnae; lateral pinnae 9-12 pairs or more, alternate, sessile or slightly petiolate, largest pinnae ca 20×4cm, lanceolate, apex tapering and suddenly long acuminate, base caudate, margin entire or slightly undulate;

rachis similar to stipe; midrib distinctly raised below and rounded; costae slightly raised below, veins distinct, upto 20 pairs, all anastomosing, excurrent veins often free; texture subcoriaceous; lamina glabrous above and below, pale-green when fresh; become reddish-brown when dry.

Habitat: Not common, inside shady forest floor or epiphytic.

Spores: Sori small, superficial along veins, exindusiate; sporangia lacking setae.

Edibility: Not known

Medicinal property: According to Regional Unified Health Research Agenda (RUHRA), during illness as a belief god is worshipped with the offering of the following Species of The lypteridaceae family viz. *Abacopteris lakhimpurens* (Rosenst) Ching., *Dryopteris lakhimpurens* Rosenst and *Pronephrium lakhimpurens* (Rosenst) Holttum²³.

Collected from: Lakhimpur, Assam

Month and year of collection: February, 2017

Sampling: Preserved in herbarium (AVSP17013)

Specimen Name: *Pteris vittata* L.

Family: *Pteridaceae*

Common name: Brake ferns

Description: *Pteris* shows high diversity at the generic level. Though commonly found in tropical and subtropical regions, some of the genera are found distributed in the temperate regions. Mostly *Pteris* occur at altitudes near or below 2500m, with a few above 3500m like *Pteris coriacea* Desv. Some of the species especially the pale spotted frond *Pteris* is considered ornamental. Though a few species are cultivated worldwide yet some have become endangered. With 250-300 species, many of them have linear frond segments and some have sub – palmate division.

Habitat: *Pteris* is a cosmopolitan in distribution, terrestrial or lithophytic (growing on rocks) in forests, coastal areas and xeric niches.

Spores: *Pteris* is a homosporous fern. The sorus of *Pteris* is called coenosorus. The sporangia of *Pteris* form a continuous linear sorus along the margin; hence the individuality of sorus is lost.

Edibility: Not known

Uses: They are antibacterial and antiviral and in pollution control²⁴.

Collected from: Padumoni reserved forest, Lakhimpur, Assam

Month and year of collection: February, 2017

Sampling: Preserved in herbarium (AVSP17014)

Specimen Name: *Pteris wallichiana* J. Agardh

Family: *Pteridaceae*

Common name: Chinese ladder brake fern

Description: Large, perennial, evergreen, and growing congested. Leaves are compound, two types called sterile and fertile fronds. Both the sterile and fertile fronds are similar.

The petiole is vertical, smooth (without scales), and attains 130 cm height which is approximately 2/3 of the frond length.

Near the tip of the stalk the frond branches out in three directions. The outer branches divide once more forming two

forked branches. The center branch attains longest growth and doesn't divide further. It results in to a palmate blade forming a lopsided circle ranging from 60-80cm wide.

Habitat: Grows in moist, shaded places, avoid direct sunlight.

Spores: On the margins of the pinnules, sori are born and protected by false indusia (pinnule margins folding in and over the sori).

Edibility: Not known

Medicinal property: Leaves are used in cuts and wounds, fish poisoning²⁵.

Collected from: Padumoni reserved forest, Lakhimpur, Assam

Month and year of collection: February, 2017

Sampling: Preserved in herbarium (AVSP17015)

Specimen Name: *Salvinia cucullata* Roxb.

Family: *Salviniaceae*

Habitat: Giant aquatic fern

Edibility: Use as ingredient of certain recipe and also used as chicken and cattle feed

Medicinal uses: Use to increase the fertility of rice field. They are antibacterial and insecticides⁹.

Collected from: Local ponds, Lakhimpur, Assam

Month and year of collection: April, 2017

Sampling: Preserved in herbarium. (AVSP17016).

Conclusion

Pteridophytes make an important contribution to the earth's plant diversity. The present study had been designed to assess the food and medicinal uses of Pteridophytes used by the tribes of Lakhimpur, Assam. About 16 Pteridophyte species belongs to 12 families which are used as food and medicine that can cure different diseases are presented in this paper. The indigenous people use many of the Pteridophytic medicinal plants traditionally for treating their common ailments like body pain, cold, cough, hair loss, skin problems, etc. The data collected show that majority of the remedies are taken orally. People use these plants in different form such as juice, extract, decoction, paste, etc. Generally, the people of the study area still have a strong belief in the efficacy and success of herbal medicine. At present a number of taxa in ferns and fern allies species have been eradicated or lost due to deforestation and by setting fire in and around the forest. This information obtained could be used as a base for discovery of active principles for phytochemical, pharmacognostical, and clinical research. It is concluded that Lakhimpur, Assam is rich in wild Pteridophytes and the tribal communities in remote areas are still dependent on indigenous knowledge for health care. The existing deforestation and habitat fragmentation would pose a serious threat to the growth of wild plants. Efforts should be made to conserve them in nature so that they can be used for the benefit of human welfare.

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