

## Some Economic Aspects of Ferns and Fern-Allies of Seijosa Forest Area of Pakke-Kessang District, Arunachal Pradesh

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**Abstract:** The present work is based on the study of Pteridophytes of Seijosa forest area, Pakke-Kessang district of Arunachal Pradesh lying between the foothills of Seijosa at an elevation of 300-550 m. Studies were carried out to collect, identify and document its ethnobotanical as well as other medicinal and economic uses. During the study period (2018-2019), seasonal field visits were carried out and a total of 43 ferns and fern-allies of different families were documented. The dominant families present were Pteridaceae, Polypodiaceae and Aspleniaceae. The study revealed different uses of ferns and fern-allies as food, fodder, in treatment of various diseases and as ornamental plants. This study may further help students and researchers of plant conservation, biodiversity, ethnobotany, pharmacology, etc.

**Keywords:** Arunachal Pradesh, Economic Aspects, Ferns and Fern-Allies, Medicinal Uses, Seijosa.

### 1. INTRODUCTION

Pteridophytes are known to humankind since the beginning of civilization as a source of green vegetables and medicinal plants. Caraka (3rd century BC) and Susruta (6th century BC) described uses of various pteridophytes in their Samhitas. Theophrastus (327-287 BC) and Dioscorides (50 AD) had also referred to the medicinal attributes of certain ferns. They were identified to have various ethnobotanical uses which could either be for food consumption, medicine and aesthetic value [1]. They also provide food, fibre, crafts, building material, abrasives and of course decoration materials [2]. The pteridophytic flora of Indian region is very rich due to remarkable altitudinal variations ranging from coastal level to high mountain ranges [3]. In India about 67 families, 191 genera and more than 1000 species of ferns and fern-allies are present [4]. Maximum number of diversity is found in Himalayas, Eastern and Western Ghats. The entire North East India comes under Himalayan zone, and diversity of Pteridophytes is expected to be very high.

The present study encompasses around a list of about 43 ferns and fern-allies collected in Seijosa forest area, Pakke-Kessang district of Arunachal Pradesh during the 2018 survey, with their recent nomenclature and different uses. The medicinal as well as other economic aspects of ferns and fern-allies are studied by different workers in India including North Eastern India [5-24].

Presently, due to deforestation and fire forest a number of taxa of ferns and fern-allies have been eradicated or lost [25]. In the present paper, an attempt is made to assess the economic aspects of ferns and fern-allies of Seijosa Forest Area of Pakke-Kessang district, Arunachal Pradesh with their great potential as vegetables, medicine and various other economical uses.

### 2. MATERIALS AND METHODS

The present study was conducted in Seijosa forest area in Pakke-Kessang district of Arunachal Pradesh at an elevation of 300-550 m asl during 2018-2019. During this study authors have collected

more than 460 plant specimens belonging to 72 species of pteridophytes. Out of this, 43 species were used by natives as food, fodder, medicinal, ornamental and in ceremonial functions. Semi-structured questionnaire was adopted for data collection related to ethnobotany and compared with published literature representing different uses of pteridophytes throughout India. Identification of the plants were made as per available literature on various fern floras, research papers and through matching of the voucher specimens with the authentic records available on the Herbarium sheets of Kew, New York was done. Voucher specimens were deposited at Patanjali Research Foundation Herbarium (Acronym PRFH) Haridwar (Uttarakhand).

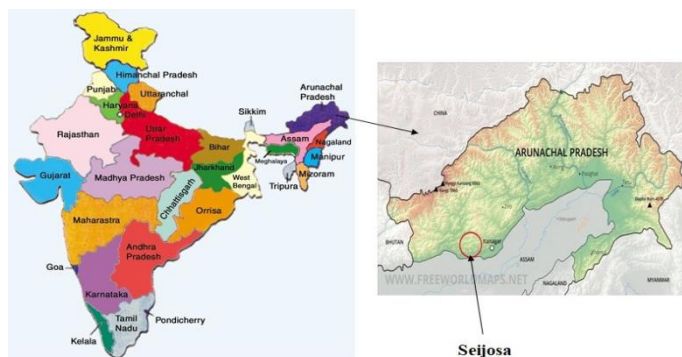


Fig1. Map of Seijosa of Pakke-Kessang district, Arunachal Pradesh

### 3. RESULTS AND DISCUSSION

The present study has been designed to assess the medicinal and other economical aspects of 43 species belonging to 17 families are described in this paper. Pteridaceae is dominant family with 07 plants followed by Polypodiaceae (05), Aspleniaceae (04) and Thelypteridaceae (04) (figure 1). 43 ferns and fern-allies are used medicinally. The data collected show that majority of drugs are taken orally. *Angiopteris helferiana* C. Presl, *Asplenium nidus* L., *Blechnum orientale* L., *Equisetum ramosissimum* subsp. *debile* (Roxb. ex Vaucher) Hauke, *Lycopodiella cernua* (L.) Pic. Serm., *Microsorium punctatum* (L.) Copel., *Nephrolepis cordifolia* (L.) C. Presl, *Pteris vittata* L., *Pyrrosia piloselloides* (L.) M.G. Price and *Thelypteris dentata* (Forssk.) E.P. St. John are used in the treatment of various ailments such as skin disease, jaundice, malaria, bone fracture, urinary disorders, constipation, earache, cough & cold, sexual disorders, dysentery and rheumatism. People use these plants in different forms such as juice, extract, decoction, paste, etc. Also 27 species of ferns and fern-allies are used as food, fodder, ornamental and in ceremonial function. The ferns and fern-allies used commonly as ornamental plants are *Angiopteris helferiana* C. Presl, *Asplenium finlaysonianum* Wall. ex Hook., *Asplenium nidus* L., *Asplenium nitidum* Sw., *Asplenium phyllitidis* D. Don, *Bolbitis heteroclita* (C. Presl) Ching, *Leptochilus pteropus* (Blume) Fraser-Jenk. And *Microlepia rhomboidea* (Wall. ex Kunze) Prantl. The common ferns and fern-allies used as vegetables are *Ceratopteris thalictroides* (L.) Brongn., *Diplazium dilatatum* Blume, *Diplazium esculentum* (Retz.) Sw., *Microsorium punctatum* (L.) Copel. and *Tectaria fuscipes* (Wall.) C. Chr.. Rachis used for making mats, chairs, seats, baskets, belts, fishing trap. *Lycopodiella cernua* (L.) Pic. Serm. after drying used for filling pillows stuffing. After extensive survey various literatures pertaining to the different uses of pteridophytes was studied and has been presented in Table 1 along with their respective families, sources, parts used, medicinal and other economic uses. All the species are arranged alphabetically.

In present study, maximum number of plant (35 plants) likes *Asplenium nidus* L., *Lycopodiella cernua* (L.) Pic. Serm., *Diplazium esculentum* (Retz.) Sw., *Leptochilus pteropus* (Blume) Fraser-Jenk., *Nephrolepis cordifolia* (L.) C. Presl, *Macrothelypteris torresiana* (Gaudich.) Ching, *Odontosoria chinensis* (L.) J. Sm., *Pityrogramma calomelanos* (L.) Link, *Pteris biaurita* L., *Pteris vittata* L., *Pyrrosia lanceolata* (L.) Farw., *Thelypteris dentata* (Forssk.) E.P. St. John, are used in general disorders (like cut & wounds, bacterial infection, burns, inflammation, fever, etc.). Out of 43 plants 24 plants like *Angiopteris helferiana* C. Presl, *Asplenium finlaysonianum* Wall. ex Hook., *Equisetum diffusum* D. Dond, *Microsorium punctatum* (L.) Copel., *Odontosoria chinensis* (L.) J. Sm., *Pteris vittata* L., *Pityrogramma calomelanos* (L.) Link, *Stenochlaena palustris* (Burm. f.) Bedd., etc are used in gastrointestinal disorders (diarrhoea, dysentery, acidity, gastric disorder, intestine infection & stomachache, etc). *Alsophila gigantea* Wall. ex Hook., *Ceratopteris thalictroides* (L.) Brongn., *Diplazium esculentum* (Retz.) Sw., *Lycopodiella cernua* (L.) Pic. Serm., *Onychium siliculosum*

(Desv.) C. Chr., *Pteris ensiformis* Burm. f., *Pityrogramma calomelanos* (L.) Link are used to cure snake bite, piles, malaria, nervous problem, hair problem, menstruation and cancer respectively. *Pityrogramma calomelanos* (L.) Link, *Pyrrosia lanceolata* (L.) Farw., *Diplazium esculentum* (Retz.) Sw., *Lycopodiella cernua* (L.) Pic. Serm., etc are used in respiratory related problems (like asthma, cough & cold, etc). A total of 33 species are used medicinally as well as economically. *Angiopteris helferiana* C. Presl, *Asplenium nidus* L., *Asplenium phyllitidis* D. Don, *Bolbitis heteroclita* (C. Presl) Ching, *Leptochilus pteropus* (Blume) Fraser-Jenk., *Microsorium punctatum* (L.) Copel., *Nephrolepis cordifolia* (L.) C. Presl, are used in medicinally as well as ornamental purposes in the garden and aquarium. Some plants like *Alsophila gigantea* Wall. ex Hook., *Angiopteris crassipes* Wall. ex C. Presl, *Ceratopteris thalictroides* (L.) Brongn., *Lycopodiella cernua* (L.) Pic. Serm., *Pteris vittata* L., *Stenochlaena palustris* (Burm. f.) Bedd., *Tectaria fuscipes* (Wall.) C. Chr. are used as avenue plant, vegetable, filling of pillows, bioremediation. *Diplazium esculentum* (Retz.) Sw. is very common plant which is used as vegetable and also wrapping material. Because of very attractive appearance, especially due to the metallic blue iridescent *Selaginella uncinata* (Desv. ex Poir.) Spring is widely use as ornamental plant.

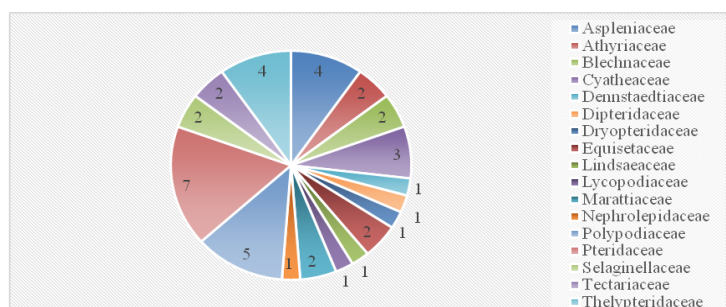


Fig2. Graphical representaton of economically important families

Table1. List of number of plant species used for the treatment of various disease.

S. No.	Disease name	Number of plants
1	Blood Disorder	2
2	Cardiac Disorders	2
3	Gastrointestinal Disorders	24
4	General Disorders	35
5	Gynecological Disorders	2
6	Hair Problems	2
7	Hepatic Disorders	4
8	Join Pain & Fracture	4
9	Malaria	1
10	Nervous System Disorders	1
11	Oral & Teeth Complains	2
12	Respiratory Disorders	11
13	Sexual Disorders	1
14	Skin Disorders	7
15	Snake Bite	1
16	Urinary Disorders	10

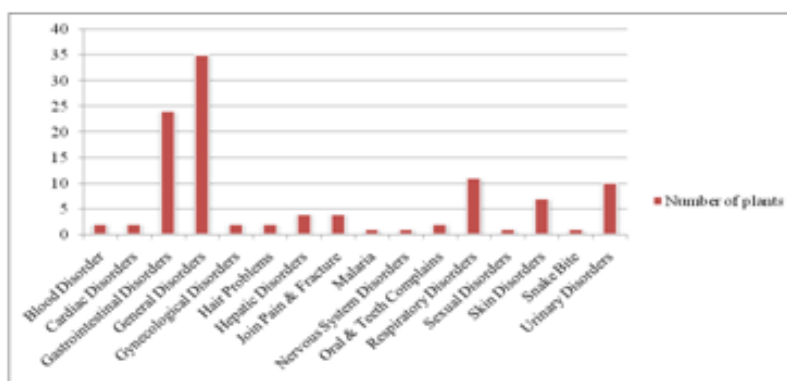


Fig3. Graphical representaton of number of plant species used for the treatment of various disease.

**Some Economic Aspects of Ferns and Fern-Allies of Sejosa Forest Area of Pakke-Kessang District, Arunachal Pradesh**

**Table2.** *Economic Aspect of Some Ferns and Fern-Allies*

S. No.	Plant Species	Family	Plant Parts Used	Medicinal Use	Other Uses
1	<b>Alsophila gigantea</b> Wall. ex Hook.	Cyatheaceae	FronDS, Rhizome	Inflammation, leucorrhoea and used against snake bite and in leucorrhoea.	Used as an avenue plant. Stem pith is used as food. Plant also used as ornamental.
2	<b>Alsophila henryi</b> Baker	Cyatheaceae	Whole Plant	*	Ornamental
3	<b>Angiopteris crassipes</b> Wall. ex C. Presl	Marattiaceae	Stem, FronDS	Leucoderma	Edible, Alcoholic drink prepared from stipules
4	<b>Angiopteris helferiana</b> C. Presl	Marattiaceae	Whole Plant	Indigestion, dysentery and hair loss. Also in bowels related problems of cattle & goats.	Ornamental
5	<b>Asplenium finlaysonianum</b> Wall. ex Hook.	Aspleniaceae	Roots	Dysentery	*
6	<b>Asplenium nidus</b> L.	Aspleniaceae	Whole plant	Skin disease, jaundice, malaria, fever, bone fracture and urinary disorders.	Ornamental
7	<b>Asplenium nitidum</b> Sw.	Aspleniaceae	Whole Plant	*	Ornamental
8	<b>Asplenium phyllitidis</b> D. Don	Aspleniaceae	FronDS	Jaundice and fever	Ornamental
9	<b>Blechnum orientale</b> L.	Blechnaceae	FronDS, Rhizome	Urinary bladder complaints, worm infection and diaphoretic, also used as aperitif.	*
10	<b>Bolbitis heteroclita</b> (C. Presl) Ching	Dryopteridaceae	Whole Plant	*	Ornamental for aquarium.
11	<b>Ceratopteris thalictroides</b> (L.) Brongn.	Pteridaceae	FronDS	Skin diseases, wounds, stomachache and piles	FronDS used as vegetable curry and aquarium as an ornamental.
12	<b>Cibotium barometz</b> (L.) J.Sm.	Cyatheaceae	Whole Plant	Health tonic & lumbago	*
13	<b>Diplazium dilatatum</b> Blume	Athyriaceae	FronDS	Diuretic	Young fronds are edible
14	<b>Diplazium esculentum</b> (Retz.) Sw.	Athyriaceae	Rhizome, FronDS	Blood disorders, gout, constipation, earache, malaria fever, cough & cold	Young fronds used as vegetable.
15	<b>Dipteris wallichii</b> (R. Br.) T. Moore	Dipteridaceae	Whole plant	Stomachache, jaundice	*
16	<b>Equisetum diffusum</b> D. Don	Equisetaceae	Whole plant	Urinary problems, haemostatic, acidity, dyspepsia, bone fracture and hydrophobia	*
17	<b>Equisetum ramosissimum</b> subsp. <i>debile</i> (Roxb. ex Vaucher) Hauke	Equisetaceae	Stem, Rhizome, Cones	Diuretic, bleeding, gonorrhoea, joint pain, fungal infection and kidney disorders	*

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18	<b>Leptochilus pteropus</b> (Blume) Fraser-Jenk.	Polypodiaceae	Whole Plant	Cut and wounds	Ornamental
19	<b>Lycopodiella cernua</b> (L.) Pic. Serm.	Lycopodiaceae	Rhizome	Nervous disorders, rheumatism, itching, cough & cold, leucorrhoea, fever and dropsy	Plant after drying used for filling pillows and ceremonial function.
20	<b>Macrothelypteris torresiana</b> (Gaudich.) Ching	Thelypteridaceae	Frond	Inflammation, pain, fever	*
21	<b>Microlepia rhomboidea</b> (Wall. ex Kunze) Prantl	Dennstaedtiaceae	Whole plant	*	Ornamental
22	<b>Microsorium punctatum</b> (L.) Copel.	Polypodiaceae	Fronds	Constipation, urinary disorders, snakebite, dysentery and for healing wounds	Food (Vegetable); Ornamental
23	<b>Nephrolepis cordifolia</b> (L.) C. Presl	Nephrolepidaceae	Rhizome, Fronds	Bacterial infection, cough & cold, fungal infection, jaundice, rheumatism, liver and skin disorders	Food (Vegetable); Ornamental
24	<b>Odontosoria chinensis</b> (L.) J. Sm.	Lindsaeaceae	Fronds	Intestine infection, urinary problems, cut & wounds	*
25	<b>Onychium siliculosum</b> (Desv.) C. Chr.	Pteridaceae	Whole Plant	Dysentery, hair fall, dysentery, skin diseases	*
26	<b>Pityrogramma calomelanos</b> (L.) Link	Pteridaceae	Whole plant	Kidney trouble, body insects, fever, hypertension, cough, measles, boils in mouth & nose, wounds, gastric disorders, fever, cold, asthma, anthelmintic, cancer	*
27	<b>Pseudodrynaria coronans</b> (Wall. ex Mett.) Ching	Polypodiaceae	Rhizomes	Herpes	*
28	<b>Pteris biaurita</b> L.	Pteridaceae	Fronds	Sores & wounds, body pain, dysentery, body pain	*
29	<b>Pteris ensiformis</b> Burm. f.	Pteridaceae	Rhizome, young fronds	Dysentery, bone fracture, glandular swelling of neck and menstruation	*
30	<b>Pteris vittata</b> L.	Pteridaceae	Whole plant, Rhizome	High blood pressure, diarrhoea & dysentery, fever	Bioremediation of Arsenic, Ornamental
31	<b>Pyrrosia lanceolata</b> (L.) Farw.	Polypodiaceae	Fronds	Cough & cold and sore throats	*
32	<b>Pyrrosia piloselloides</b> (L.) M.G. Price	Polypodiaceae	Leaves	Bone fracture; fronds pounded with Gypsum is applied to irritating rashes and poultice for headaches	*



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33	<b>Selaginella uncinata</b> (Des v. ex Poir.) Spring	Selaginellaceae	Whole Plant	Bacterial infection, liver infection, Brain tumor	It has very attractive appearance, especially due to the metallic blue iridescent caused by thin-film refraction.
34	<b>Selaginella wallichii</b> (Hook. & Grev.) Spring	Selaginellaceae	Whole plant	Protective medicine after child birth and cough	*
35	<b>Sphaeropteris brunoniana</b> (Wall. ex Hook.) R.M. Tryon	Cyatheaceae	Whole Plant	Pus	*
36	<b>Stenochlaena palustris</b> (Burm. f.) Bedd.	Blechnaceae	Fronds	Burns, ulcer & body cooling, fever, skin diseases, throat infection & gastric ulcer, fever, stomach ache	Food (young fronds are used as vegetable soup like Kang-soi)
37	<b>Tectaria fuscipes</b> (Wall.) C. Chr.	Tectariaceae	Fronds	*	Food (young fronds are edible)
38	<b>Tectaria polymorpha</b> (Wall. ex Hook.) Copel.	Tectariaceae	Whole plant	Eczema & scabies, fever, worm infection	*
39	<b>Thelypteris arida</b> (D. Don) Morton	Thelypteridaceae	Whole Plant	Wounds & cuts	*
40	<b>Thelypteris dentata</b> (Forssk.) E.P. St. John	Thelypteridaceae	Fronds	Swellings, rheumatism, blood vomiting, urinary disorders, insect repellent, wounds & cuts	*
41	<b>Thelypteris nudata</b> (Roxb.) C.V. Morton	Thelypteridaceae	Whole Plant	Tooth trouble	*
42	<b>Thelypteris procera</b> (D. Don) Fraser-Jenk.	Thelypteridaceae	Whole Plant	Skin diseases	*
43	<b>Vittaria elongata</b> Sw.	Pteridaceae	Whole Plant	Knee pain, therapeutic pain, cuts, wounds, rheumatism & joint pains	*

#### 4. CONCLUSION

The present study is useful for ethnobotanist, phytochemists and pharmacologist working on medicinal ferns and fern-allies. Also economic aspect of this paper may increase the rural economy. Also medicinal uses of these plants may be utilized as an alternative source of drugs for the benefit of mankind without affecting the natural ecosystem. Conservation and cultivation of these ferns and fern-allies will help to maintain the ecological balance, traditional knowledge as well as livelihood security of local inhabitants. Hope this study will be helpful for natives and ethnobotanists for further critical investigation of medicinal and other economical uses of plants present in this area.

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