

CRYPTOGAM DIVERSITY AND ECONOMIC UTILITY OF NILAMBUR, MALAPPURAM, KERALA

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ABSTRACT

The present study resulted in recording of 22 species of Pteridophytes belonging to 14 families from Nilambur. Plants were collected from 35 sites of the study area Selaginellaceae, Pteridaceae and Thelypteridaceae are the common families in this area. Selaginellaceae consist of 3 species. Pteridaceae are with 5 species and Thelypteridaceae with 2 species. Selaginella, Pteris and Christella are the dominant genera of the area. Selaginella, Pityrogramma, Pteris, Athyrium, Christella and Tectaria are more common in the study area. Alsophila gigantea, Adiantum philippense, Anisocampium cummingianum, Macrothelypteris torresiana, Bolbitis terminans and Drynaria quercifolia were the rare species of the study area. The distribution pattern varies from site to site.

Keywords: Nilambur, Pteridophytes, Survey

1 INTRODUCTION

1.1 EVOLUTION OF PTERIDOPHYTES

Plants have a crucial role in the existence of other forms of life also. They are the primary producers in the living world there can be flowering or no flowering plants. Pteridophytes are non-flowering, spore bearing vascular cryptogams. The word Pteridophyte is derived from two Greek words “pteron” meaning feather and “phyton” meaning plant and were formed about 400 million years ago (Chunxiang & Xiaoyan 2007).

First report on Pteridophytes of South India were found in Van Rheed's (1678-1703) monumental work 'Hortus Malabaricus. In the 12th volume of this book, 15 Pteridophytes were mentioned. Earliest comprehensive work on Ferns of Southern India is by R. H. Beddome. He listed 240 species in 'Ferns of Southern India (1863-1865). Pteridophytes of Cumbum valley and Pachakumatchi hills of Tamil Nadu and recorded 50 species(Subramanian *et al.* 1960).

Pteridophytes include two groups. They are ferns and fern allies. Ferns have a wide range of distribution. Leaves of ferns are large. Circinate vernation is present. Sporangium is produced on the underside of the sporophyll. Leaves of fern allies are small and they lack circinate vernation, Sporangia is produced on the upper side of leaf forming strobilus.

Plant body of Pteridophytes is sporophytic and it is differentiated into root, stem and leaves. Roots are adventitious in nature with monopodial and dichotomous branching. Stems are usually branched. The branching can be monopodial or dichotomous. In many Pteridophytes, the stem is represented by a rhizome. Leaves can be small, sessile or large. In stem and root, vascular tissues are present. They consist of tracheids and phloem consists of sieve tubes. Three types of steles are present in pteridophytes. They are protostele, siphonostele and dictyostele.

Most of the living pteridophytes are terrestrial and they grow in cold, shady, and moist places. Some members are aquatic, xerophytic and epiphytic. Usually pteridophytes are herbaceous but few are perennial and tree-like (Bir *et al.*, 1982).

1.2 ECONOMIC IMPORTANCE

- The Pteridophytes are economically important. They are used for various purposes such as, garden plants, medicinal, ecological indicators, etc. They have a major role in ecological richness of the forest ecosystem as a part of biogeochemical cycling of minerals. A brief account on the economic significance of Pteridophytes is given below under major headings such as medicinal importance, biofertilizer, horticulture, etc
- *Pteridophytes and its ornamental values*
- Ferns were used to increase the beauty of the landscape. The characteristic structures of ferns make them important plants in gardens and greenhouses. *Nephrolepis cordifolia* (Sword fern) is one of the most common ornamental fern species. *Blechnum orientale* (Hard fern), *Pityrogramma calomelanos* (Silver fern), *Lygodium flexuosum* (Climbing fern), *Azolla pinnata* (Water fern), *Adiantum*, etc are some of the most popular ferns widely cultivated in India (Vasudeva, 1999). *Osmunda regalis* and *O. cinnamomea* are grown in most gardens. Other ferns like *Asplenium*, *Selaginella*, *Lygodium*, etc are grown in gardens (Vasudeva, 1999).
- *Pteridophytes as Food*
- Pteridophytes are used as a source of food in many regions. *Osmunda cinnamomea* (Cinnamon fern), *Matteuccia struthiopteris* (Ostrich fern), *Pteridium aquilinum* (Bracken fern), etc are cooked and eaten in many parts of the world. Pith of *Cyathea* and rhizome of *Blechnum orientale* are used as food items (Vasudeva, 1999). *Pteridium*, *Ceratopteris*, *Angiopteris*, etc are used as edible ferns in China (Liu *et al.*, 2012). *Ophioglossum reticulatum* is used as a vegetable in Central India. Tubers of *Nephrolepis auriculata* are

eaten by shepherds and cowboys of Kumaon to quench the thirst during summer season (Kholia and Punetha, 2005).

- *Medicinal importance of some Pteridophytes*
- Medicinal qualities of ferns are mentioned as early as 300 B.C. by the Greek philosopher Theophrastus (Corne, 1924) and his Indian contemporaries Sushrut and Charak. The fronds of *Osmunda* are used as a tonic, styptic and also for the treatment of rickets, rheumatism and for intestinal gripping (Nayar, 1959). The rhizome of *Dicranopteris linearis* is used as anthelmintic in Assam and its fronds are used for asthma in Madagascar (Manickam and Irudayaraj, 1992). The decoction of *Drynaria* is used in typhoid fever and frond is used for treating swellings (Dixit and Vohra, 1984). Root extracts of *Lygodium flexuosum* boiled with mustard oil are used as local application externally in rheumatism, scabies, ulcers, cut wounds, etc (Vasudeva, 1999). The young fronds of *Blechnum orientale* are used as a poultice for boils in Malaya, as a cure for intestinal worms (Dixit and Vohra, 1984). *Adiantum* is important and popularly known as "Hansraj" in the Ayurvedic system of medicine. It has been used in cold tumors of the spleen, liver and other viscera, skin diseases. It is also considered as tonic and diuretic (Singh et al., 2008).
- *Pteridophytes as Biofertilizer*
- *Azolla* is a water fern and commonly used as a biofertilizer in paddy fields. It contains Cyanobacterium, *Anabaena azollae* in the cavity of its leaf. *Azolla* is also used for the biogas production and also used as an ingredient in soap production (Ahluwalia et al., 2002). *Azollamicrophylla* was found to be growing better in Kerala, providing more nitrogen and biomass (Sevichan and Madhusoodanan, 1992).
- *Pteridophytes in Bioremediation.*
- Ferns have an important role in bioremediation of wastewater. Ma et al (2001) found that the *Pteris vittata* (Bracken fern) is a hyperaccumulator of the toxic metal Arsenic. Tu et al. (2002) suggested that *Pteris vittata* could be an excellent model to study Arsenic uptake and for phytoremediation of Arsenic contaminated soil and water.
- *Few of the Pteridophytic Weeds*
- *Salvinia*, a water fern, is one of the dangerous weeds in water reservoirs, propagating easily and blocking the flow of water. The terrestrial ferns *Pteridium*, *Christella*, *Nephrolepis*, *Lygodium*, *Cyclosorus*, etc. are considered as weeds. *Salvinia molesta* is usually referred to as the worst weed of the world (Abbasi and Nipanay, 1986).

2 MATERIALS AND METHODS

STUDY AREA

Nilambur is a city, in the Malappuram quarter of Kerala. It is located near to the Nilgiris range of the Western Ghats on the banks of the Chaliyar River. It is composed of 21 villages. Utmost of the places of Nilambur is the jungle and hilly area.

PLATE 1-STUDY AREA MAP, NILAMBUR, MALAPPURAM

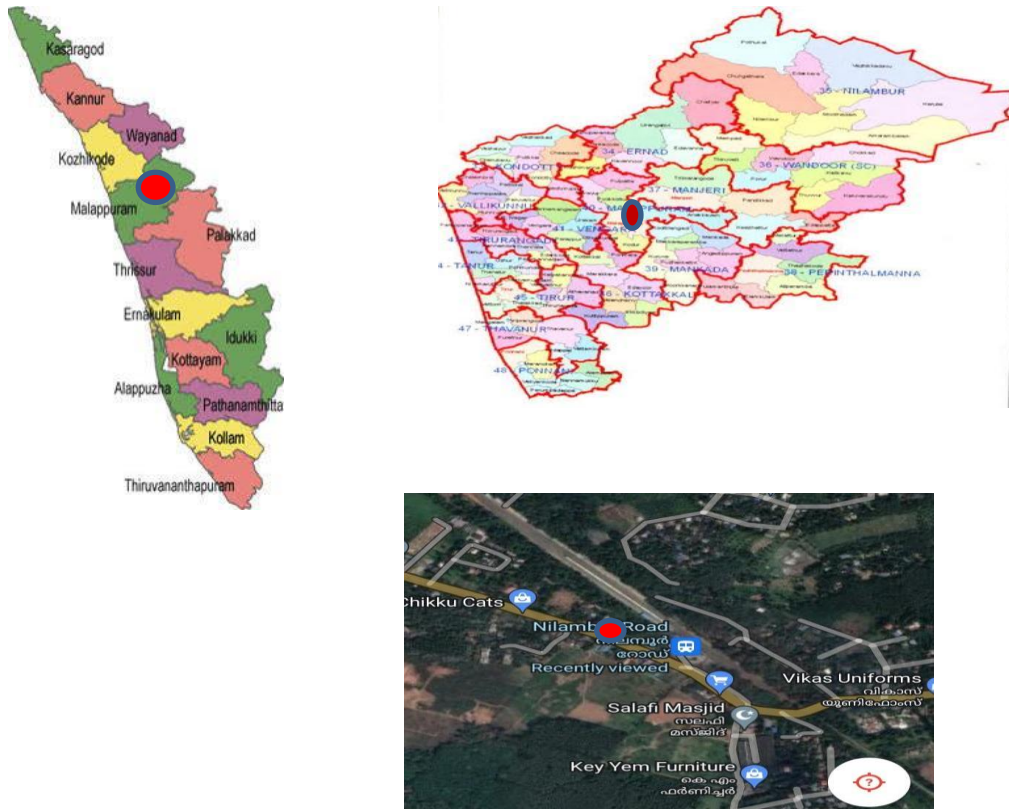


PLATE 2 - STUDY AREA



PLANT COLLECTION

The collection of Pteridophytes was made from various localities of the study area, the Nilambur by frequently visiting the area.

FIELD STUDY

The necessary tools such as knives, scissors, blotters (newspapers), , field books, etc. were taken to the field for the collection of plants. Soon after collection, specimens were tagged and the details regarding the locality and field characters were recorded in the field book. . They were kept separately in between newspapers.

It was taken collect with rhizomes, as far as possible. In the case of large plants, exact size was recorded and then the plants were cut into pieces, then they were used to prepare the herbarium.

PREPARATION OF PLANT MATERIAL

Herbarium preparation

The plants were collected from the study area and preserved properly in polythene bags to make herbariums. To avoid infections the specimen have to be poisoned immediately after Collection. They were later pressed in between sheets of blotting paper. After drying, specimens are mounted on sheets of standard size and they are labelled

RESULTS

TABLE :1

LIST OF PTERIDOPHYTES AND THEIR ECONOMIC AND MEDICINAL USES

Sl. No	Binomial Name	Family	Habitat	Economic Importance	Medicinal Application /Uses
1	<i>Adiantum concinnum</i> Humb. & Bonpl. ex Wild.	Pteridaceae	Terrestrial	Medicinal	It is used to treat unspecified medicinal disorders, as a medicinal and has environmental uses.
2	<i>Adiantum philippense</i> L.	Pteridaceae	Terrestrial	Medicinal, ornamental	Used for blood disorders.
3	<i>Adiantum raddianum</i> Presl	Pteridaceae	Terrestrial	Medicinal, Ornamental	Whole plant is used in cough, asthma, fever, leprosy and hair

					falling. Potential ornamental plant due to its attractive fronds.
4	<i>Alsophila gigantea</i> Wall. ex Hook	Cyatheaceae	Terrestrial	Medicinal	It is as an antimicrobial agent. Also used in cuts and wound infections.
5	<i>Angiopteris helferiana</i> Presl	Marattiaceae	Terrestrial	Medicinal, Ornamental, edible.	Leaf extract is used in the treatment of dysentery. Spores are effective in the treatment of leprosy and other skin diseases. Rhizomes are used against scabies. It is also cultivated as ornamental.
6	<i>Anisocampium cumingianum</i> C. Presl	Athyriaceae	Terrestrial	Medicinal	Fronds are used as poultice in skin complaints.
7	<i>Athyrium hoheneckarium</i> (Kunze) T. Moore	Athyriaceae	Terrestrial	Not known	Not known
8	<i>Blechnum orientale</i> L.	Blechnaceae	Terrestrial	Medicinal, Ornamental	Fresh fronds are used as poultice for boils in Malaya; Used for urinary bladder complaints in India and polynesia. Cultivated as ornamental in gardens.
9	<i>Bolbitis terminans</i> (Wall.) Gandhi & Fraser - Jenk	Lomariopsidaceae	Terrestrial	Not Known	Not known
10	<i>Christella parastica</i> (L.) H. Lev.	Thelypteridaceae	Terrestrial	Medicinal	Antibacterial activity and also toxic effect against mosquito larvae.

11	<i>Dicranopteris linearis</i> (Burm. f.) Underw.	Gleichenaceae	Terrestrial	Medicinal	Fronds used for Asthma. Fluid extracted from the fronds show antibacterial properties.
12	<i>Drynaria quercifolia</i> (L.) J. Sm.	Polypodiaceae	Lithophyte	Medicinal, Ornamental	Rhizome is bitter, it is used as antibacterial, constipation, anti-inflammatory, tonic, in the treatment of typhoid, fever, cough, diarrhea, ulcers.
13	<i>Lycodium flexuosum</i> (L.) Sw.	Lygodiaceae	Terrestrial	Medicinal	A traditional folkloric medicine for a variety of ailments particularly useful for inflammation, ulcer, various respiratory diseases and muscle sprains.
14	<i>Macrothelypteris torresiana</i> (Gaud.) Ching	Thelypteridaceae	Terrestrial	Medicinal	In vitro and in vivo antitumor activity. The aerial parts are used for treatment of fever, pain, granulation, healing and reducing odour in chronic skin ulcer and inflammation.
15	<i>Odontosoria chinensis</i> (L.) J. Sm.	Lindsaeceae	Terrestrial	Medicinal, Ornamental	Leaves are used internally for chronic enteritis in Mauritius. This is a beautiful ornamental fern with thin fronds, suitable for hanging baskets.
16	<i>Pityrogramma calomelanos</i> (L.) Link	Pteridaceae	Terrestrial	Ornamental	Commonly known as "Golden fern". This beautiful fern can be

					grown as a potted plant in indoors.
17	<i>Pteridium revolutum</i> (Blume) Nakai	Dennstaedtiaceae	Terrestrial	Not known	Not known
18	<i>Pteris confusa</i> T. G. Walker	Pteridaceae	Terrestrial	Medicinal	Anti oxidant, antimicrobial, antiviral.
19	<i>Selaginella chysorrhizos</i> Spring	Selaginelliaceae	Lithophyte	Not known	Not known
20	<i>Selaginella delicatula</i> (Desv. ex Poir.)	Selaginelliaceae	Terrestrial	Medicinal, Ornamental	Plant juice is antibacterial and is used for healing off wounds by the tribals. Potential ornamental plant for its attractive fronds.
21	<i>Selaginella tenera</i> (Hook. & Grev.) Spring	Selaginelliaceae	Lithophyte	Medicinal.	Diuretic and used in gonorrhoea diseases.
22	<i>Tectaria wightii</i> (C. B. Clarke) Ching	Tectariaceae	Terrestrial	Medicinal	Anti bacterial.

TABLE :2

FAMILY WISE DISTRIBUTION OF PTERIDOPHYTES

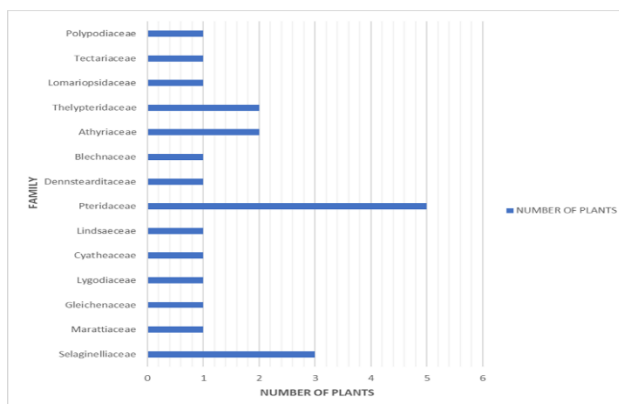


TABLE :3

ANALYSIS OF PLANT PART USED FOR PREPARING MEDICINES

SL. NO	NAME OF THE SPECIES	PLANT PART USED
1	<i>Selaginella chysorrhizos</i>	Whole plant
2	<i>Selaginella delicatula</i>	Leaves
3	<i>Selaginella tenera</i>	Leaves
4	<i>Angiopteris helferiana</i>	Leaf, Rhizomes
5	<i>Dicranopteris linearis</i>	Fronds
6	<i>Lycodium flexuosum</i>	Fresh roots
7	<i>Alsophila gigantea</i>	Fronds, Rhizome
8	<i>Odontosoria chinensis</i>	Leaves
9	<i>Adiantum concinnum</i>	Whole plant
10	<i>Adiantum philippense</i>	Whole plant
11	<i>Adiantum raddianum</i>	Whole plant
12	<i>Pityrogramma calomelanos</i>	Whole plant
13	<i>Pteris confusa</i>	Fronds
14	<i>Pteridium revolutum</i>	Fronds
15	<i>Blechnum occidentale</i>	Fresh fronds
16	<i>Anisocampium cumingianum</i>	Whole plant
17	<i>Athyrium hoheneckarium</i>	Rhizome
18	<i>Christella parastica</i>	Fronds
19	<i>Macrothelypteris multiflora</i>	Fronds
20	<i>Bolbitis terminans</i>	Whole plant
21	<i>Tectaria coadunata</i>	Fronds
22	<i>Drynaria quercifolia</i>	Rhizome



Plate 3. A-D. *Selaginella chrysorrhizos* Spring - A & B Habit, C. Rhizome, D. Strobil, E-H *Selaginella delicatula* (Desv) Alston-E&F Habit, G Rhizome, H. Strobili I-M. *Selaginella tenera* (Hook & Grex) Spring-1&J, Habit, K. Rhizome, L&M. Views of leaves and strobili.



Plate 4 A-E. *Angiopteris helferiana* Presl-A&B. Habit, Rhizome, D. Frond, E. Sporophyll F-L *Dicranopteris linearis* (Burm.f.) Underwood F & G. Habit, H. Rhizome, L. Lamina

Plate 5. AC *Lygodium flexuosum* (L.) Sw. A & B. Habit, C. Rhizome: D-F. *Alsophila gigantea*(Wall. ex Hook)



Holt-D. Habit, E Frond. E. Sporophyll, G&J *Odontosoria chinensis* (L.) J. Sm- G&H. Habit, I. Rhizome, J. Sporophyll.



Plate 6 A-D. *Adiantum concinnum* Wild - A and B Habit, C. Rhizome, D. Sporophyll E-H *Adiantum philippense* L-E and F Habit, G. Rhizome, H. Sporophyll; I-L *Adiantum raddianum* Presl – I&J Habit, K. Rhizome, L. Sporophyll.



Plate 7, A-D. *Pityrogramma calomelanes* (L.) Link - A & B. Habit, C Rhizome, D. Sporophyll; E-H. *Pteris confusa* T . G. Walker-E&F Habit, G. Rhizome, H. Sporophyll.



Plate 8 A-L. *Pteris pellucida* Presl A&B. Habit, C. Rhizome, D. Frond. E. Sporophyll, F-H *Pteridium revolutum* (Blume) Nakai – F. Habit, G. Frond, H. Sporophyll.

CONCLUSION

The present study resulted in recording of 22 species of Pteridophytes belonging to 14 families from Nilambur. Plants were collected from 35 sites of the study area Selaginellaceae, Pteridaceae and Thelypteridaceae are the common families in this area. Selaginellaceae consist of 3 species. Pteridaceae are with 5 species and Thelypteridaceae with 2 species. *Selaginella*, *Pteris* and *Christella* are the dominant genera of the area. *Selaginella*, *Pityrogramma*, *Pteris*, *Athyrium*, *Christella* and *Tectaria* are more common in the study area. *Alsophila gigantea*, *Adiantum philippense*, *Anisocampium cummingianum*, *Macrothelypteris torresiana*, *Bolbitis terminans* and *Drynaria quercifolia* were the rare species of the study area.

Among 22 species of Pteridophytes; *Selaginella chrysoorrhizos*, *S.tenera* and were found growing on thin soil covering rocks. *Drynaria quercifolia* was found as lithophyte. All other species are terrestrial. The largest fern recorded from this area is *Alsophila gigantea*. The presence of species reported as rare such as of *Anisocampium cummingianum*, *Bolbitis terminans* (Chadra *et al*, 2008) is noteworthy. Land cuttings and moist places are the most favourable habitats of Pteridophytes in the study area.

The distribution pattern varies from site to site. Among the 35 sites of study area, the site 22 has the highest number of distributions of Pteridophytes with 10 species. Sites 2 and 11 have the lowest number of Pteridophytes with 2 species each. Pteridophytes are absent in site 9. Heavy rainfall and land sliding of August 2019 had adversely affected the richness of plants, including Pteridophytes of Nilambur. Species such as *Lygodium flexuosum* and *Adiantum philippense* were severely affected due to the landslides. The present work is the first of its kind to attempt to document the diversity of Pteridophytes in Nilambur. This documentation is presented here with the hope that it would be useful to the researchers or any others interested in Pteridophytes of this area. It would also be helpful in the better documentation of the biodiversity of Nilambur.

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