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Research Article

# Pteridohytic flora of eastern edge of the Western Ghats in Kosergode, Kerala

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## ABSTRACT

India boasts a rich diversity of pteridophyte flora, encompassing around 1200 species, a significant number of which are endemic. Key regions for pteridophyte diversity include the Himalayas, Eastern Ghats, and Western Ghats. These plants inhabit a range of environments, from sea level to mountainous areas, and are crucial to ecosystems while also possessing medicinal and economic significance. Pteridophytes constitute an essential part of the ecosystem, and since the majority of them reside in forests, they serve as effective indicators of issues such as deforestation and habitat loss. Numerous pteridophytes are included in the list of threatened species across various categories; however, effective solutions to address this global issue have yet to be explored. The objective of the current study was to investigate the pteridophytic diversity along the eastern edge of the Western Ghats in Kosergode, Kerala. The diversity assessment revealed that 87 species of pteridophytes were identified, belonging to 22 families as documented in this study.

**Keys:** Pteridophytes, diversity, Kasercode, Kerala, Western Ghats

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# 1. INTRODUCTION

The term “Pteridophyta” is originated from Greek word- “Pteron” which means feather and “phyton” means plants i.e. the plants having feather like fronds. The pteridophytes formed a dominant part of earth’s vegetation about 282-230 million years ago during the Palaeozoic era. Late Palaeozoic era can be clearly regarded as the age of pteridophytes because during this period, pteridophytes were the dominant land plants on earth. There are about 13,000 species of pteridophytes across the world and 1,500 species of pteridophytes at random from a global checklist and carefully assessed the IUCN Red List status of each species. About 9% world Pteridophytes occurs in India or only in 2.5% landmass of the world. Western Ghats supports 349 pteridophytic species out of 1100-1200 species of ferns and fern allies in India (Manickam and Irudayaraj,1992).

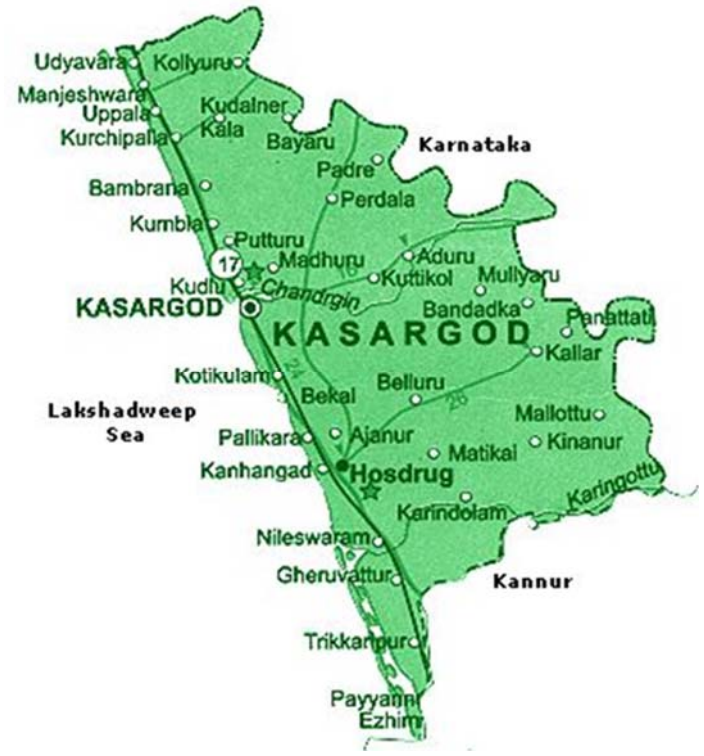
In India Pteridophytes are distributed in all the phytogeographical zones of India ranging from sea level to alpine Himalayas where they grow as Hydrophytes, Mesophytes, Lithophyte, Epiphyte, Hemiepiphyte, Climbers etc. They can be found in all ground habitats such as Ravine, Forest floor, on slopes, Grassland, on Rocks and crevices, on open walls and stone boulders and at certain places they form gregarious Thickets. As epiphytes different species of Pteridophytes also distributed on different part of tree as on base of tree, bole, branches, forking etc. Most of the pteridophytes diversity is observed in the Himalayas, Eastern and Western Ghats. Previous studies, worked on the pteridophytes of Western Ghats in detailed described in prominent publications are Ecological studies on the Fern Flora of Palni hills (Manickam, 1984), Fern Flora of Palni Hills, South India (Manickam, 1986), Cytology of the ferns of Western Ghats, South India (Manickam and Irudayaraj 1988) and Pteridophyte flora of Western Ghats, South India (Manickam and Irudayaraj, 1992).

Kasaragod district is situated on the eastern edge of the Western Ghats. The Western Ghats form an almost continuous mountain wall on the eastern side of the district, separating it from other areas outside of Kerala. Western Ghats in Kasaragod are home to various natural attractions, including the Kottancheri Hills, which are considered a trekker's paradise. The district also features the Ranipuram Wildlife Sanctuary, known for its diverse flora and fauna. The Mogral River originates in the lower foothills of the Western Ghats within Kasaragod. The Western Ghats in Kasaragod contribute to the district's rich biodiversity, with forests, hills, and rivers providing a habitat for various species of wildlife and plants. Aim of the present study was exploration of pteridophytic diversity of eastern edge of Western Ghats of Kosergode, Kerala from the period of 2022-2023.

# 2. Materials and Methods

### 2.1 Study area

Kasaragod district in Kerala is known for its close proximity to the Western Ghats, a major mountain range that runs along the Indian peninsula's western coast. The Western Ghats provide Kasaragod with a variety of natural attractions, including forests, hills, and rivers. The district itself is often referred to as the "Land of Gods" and "Sapta Bhasha Sangama Bhumi" (Land of Seven Languages), highlighting its natural beauty and diverse cultural heritage. Extensive fieldwork was conducted in Kasaragod district in Kerala (February 2023). During the field survey of pteridophyte species, the specimen population, habitat, morphological characteristics, and types of forest/ponds were documented. The collected pteridophytes were identified using various literature photographs and specifications (Manickam and Irudayaraj, 1992).



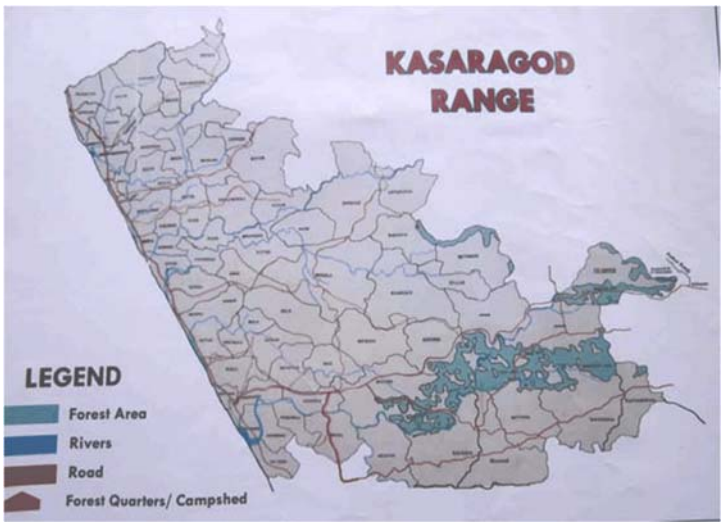




Fig.1: Map of Kasaragod district of the Western Ghats.

**Table-1:** Pteridophytic diversity of Kasarcode regions of Kerala State.

| Sl.No. | Species | Current Status | Family |
|---|---|---|---|
| 1 | Asplenium adiantum-nigrum L. | Common | Aspleniaceae |
| 2 | Asplenium nidus L. | Common | Aspleniaceae |
| 3 | Asplenium longissimum Blume | Common | Aspleniaceae |
| 4 | Asplenium scolopendrium L. | Common | Aspleniaceae |
| 5 | Athyrium filix-femina (L.) Roth | rare | Athyriaceae |
| 6 | Athyrium hohenackerianum (Kze.) Moore | Common | Athyriaceae |
| 7 | Athyrium asplenioides (Michx.) Desv., | | Athyriaceae |
| 8 | Blechnum orientale L. | rare | Blechnaceae |
| 9 | Blechnum cartilagineum Sw. | rare | Blechnaceae |
| 10 | Cyathea nilgirensis Holttum | endemic | Cyatheaceae |
| 11 | Cyathea spinulosa Wall ex Hook | endemic | Cyatheaceae |
| 12 | Bolbitis semicordata (Bak.) Ching | endemic | Dryopteridaceae |
| 13 | Arachniodes sledgei Fraser-Jenk. | Common | Dryopteridaceae |
| 14 | Diplazium acrostichoides (Sw.) Butters | Common | Dryopteridaceae |
| 15 | Rumohra adiantiformis (G. Forst.) Ching | Common | Dryopteridaceae |
| 16 | Cystopteris fragilis (L.) Bernh. | Common | Dryopteridaceae |
| 17 | Pteridium revolutum (Blume) Nakai | Common | Dennstaedtiaceae |
| 18 | Microlepia firma Mett. ex Kuhn | Common | Dennstaedtiaceae |
| 19 | Microlepia speluncae (L.) T. Moore | Common | Dennstaedtiaceae |
| 20 | Pteridium aquilinum subsp. wightianum (Wall. ex J. Agardh) ... | Common | Dennstaedtiaceae |
| 21 | Gleichenia dicarpa R.Br. | Common | Gleicheniaceae |
| 22 | Dicranopteris linearis (Burm. f.) Underw | | Gleicheniaceae |
| 23 | Trichomanes companulatum Roxb | Common | Hymenophyllaceae |
| 24 | Hymenophyllum denticulatum Sw. | Common | Hymenophyllaceae |
| 25 | Trichomanes christii Copel | Common | Hymenophyllaceae |
| 26 | Trichomanes lunulatum (Madhus. & C.A.Hameed) | Endemic | Hymenophyllaceae |
| 27 | *Trichomanes saxifragoides* C.Presl | Common | Hymenophyllaceae |
| 28 | Trichomanes christii Copel | Common | Hymenophyllaceae |
| 29 | Isoetes coromandeliana L. f | Common | Isoetaceae |
| 30 | Lindsaea malabarica (Bedd.) Baker ex Christ | endemic | Lindsaeaceae |
| 31 | Lindsaea ensifolia Sw. | Common | Lindsaeaceae |
| 32 | Lygodium microphyllum (Cav.) R.Br. | Common | Lygodiaceae |
| 33 | Lygodium flexuosum (L.) Sw. | common | Lygodiaceae |
| 34 | Marsilea quadrifolia L. | Common | Marsileaceae |
| 35 | Marsilea minuta L. | Common | Marsileaceae |
| 36 | Psilotum nudum (L.) P.Beauv. | endemic | Psilotaceae |
| 37 | Pyrrosia porosa var Porosa Hovenkamp | Common | Polypodiaceae |

| | | | |
|---|---|---|---|
| 38 | Pyrrosia lanceolata (L.) Farw. Synonyms: Acrostichum lanceolatum L. | Common | Polypodiaceae |
| 39 | Pyrrosia heterophylla (L.) M. G. Price | Common | Polypodiaceae |
| 40 | Drynaria quercifolia Linn. J. smith | Common | Polypodiaceae |
| 41 | Tectaria zeilanica (Houtt.) Sledge | endemic | Tectariaceae |
| 42 | Tectaria coadunata (Wall. ex Haines) Raizada & N.P. ... | Common | Tectariaceae |
| 43 | Thelypteris caudipinna Ching | Common | Thelypteridaceae |
| 44 | Macrothelypteris torresiana (Gaudich.) Ching | Common | Thelypteridaceae |
| 45 | Thelypteris dentata (Forssk.) E.P.St.John (Syn.) Christella dentata (Forssk.) Brownsey & Jermy | Common | Thelypteridaceae |
| 46 | Thelypteris trigonospora (Holttum) Fraser-Jenk.S | Common | Thelypteridaceae |
| 47 | Aleuritopteris rufa (D.Don) Ching - (Syn.) Cheilanthes rufa (D.Don) | endemic | Pteridaceae |
| 48 | Adiantum latifolium Lam. | Common | Pteridaceae |
| 49 | Adiantum incisum C.Presl. | Common | Pteridaceae |
| 50 | Adiantum tenerum Sw. | Common | Pteridaceae |
| 51 | Adiantum philippense L. | Common | Pteridaceae |
| 52 | Adiantum caudatum L. | Common | Pteridaceae |
| 53 | Adiantum abscissum Schrad. | Common | Pteridaceae |
| 54 | Adiantum capillus-veneris L. | Common | Pteridaceae |
| 55 | Acrostichum aureum L. | Common | Pteridaceae |
| 56 | Adiantum lunulatum Burm.fil. | Common | Pteridaceae |
| 57 | Adiantum raddianum Presl. | rare | Pteridaceae |
| 58 | Parahemionitis cordata (Roxb. ex Hook. & Grev.) Fraser-Jenk. | common | Pteridaceae |
| 59 | Pityrogramma calomelanos (L.) Link | Common | Pteridaceae |
| 60 | Pteris argyrea | Common | Pteridaceae |
| 61 | Pteris biaurita L. | Common | Pteridaceae |
| 62 | Peris pellucida C.Presl | Common | Pteridaceae |
| 63 | Pteris vittata L. | Common | Pteridaceae |
| 64 | Pteris ensiformis Burm.f. | Common | Pteridaceae |
| 65 | Pteris chilensis Desv. | Common | Pteridaceae |
| 66 | Ceratopteris thalictroides (L.) Brongn. | Common | Pteridaceae |
| 67 | Cheilanthes tenuifolia (Burm. f.) Sw. | rare | Pteridaceae |
| 68 | Actiniopteris radiata (Koenig ex Sw.) Link \| | Common | Pteridaceae |
| 69 | Salvinia herzogii | Common | Salviniaceae |
| 70 | Salvinia minima Baker | Common | Salviniaceae |
| 71 | Salvinia natans (L.) All. \| | Common | Salviniaceae |
| 72 | Salvinia rotundifolia Wild. | Common | Salviniaceae |
| 73 | Azolla *pinnata* R.Br. | Common | Salviniaceae |
| 74 | Nephrolepis exaltata (L.) Schott | Common | Nephrolepidaceae |
| 75 | Nephrolepis auriculata (L.) | Common | Nephrolepidaceae |
| 76 | Nephrolepis cordifolia (L.) C.Presl | Common | Nephrolepidaceae |

| | | | |
|---|---|---|---|
| 77 | Osmunda huegeliana C.Presl | rare | Osmundaceae |
| 78 | Osmunda regalis L. | Common | Osmundaceae |
| 79 | Ophioglossom reticulatum L. | rare | Ophioglossaceae |
| 80 | Ophioglossum madhusoodananii Sojan | rare | Ophioglossaceae |
| 81 | *Ophioglossum raphaelianum* Anto P.V. | Common | Ophioglossaceae |
| 82 | *Selaginella ciliaris* (Retz.) Spring | rare | Selaginellaceae |
| 83 | Selaginella involvens (Sw.) Spring | rare | Selaginellaceae |
| 84 | *Selaginella kraussiana* (Kunze) A.Braun | rare | Selaginellaceae |
| 85 | *Selaginella delicatula* (Desv.) Alston. | Common | Selaginellaceae |
| 86 | *Selaginella wildenovi* (Desv. ex Poir.) Baker | Common | Selaginellaceae |
| 87 | *Selaginella ciliaris* (Retz.) Spring | Common | Selaginellaceae |

Taable-2: Total number of Families and species of forest regions of Kasargode District,Kerala

| **Sl.No.** | **Family** | **No. of Species** |
|---|---|---|
| **1** | Aspleniaceae | **4** |
| **2** | Athyriaceae | **3** |
| **3** | Blechnaceae | **2** |
| **4** | Cyatheaceae | **2** |
| **5** | Dryopteridaceae | **5** |
| **6** | Dennstaedtiaceae | **4** |
| **7** | Gleicheniaceae | **2** |
| **8** | Hymenophyllaceae | **6** |
| **9** | Isoetaceae | **1** |
| **10** | Lindsaeaceae | **2** |
| **11** | Lygodiaceae | **2** |
| **12** | Marsileaceae | **2** |
| **13** | Psilotaceae | **1** |
| **14** | Polypodiaceae | **4** |
| **15** | Tectariaceae | **2** |
| **16** | Thelypteridaceae | **4** |
| **17** | Pteridaceae | **22** |
| **18** | Salviniaceae | **5** |
| **19** | Nephrolepidaceae | **3** |
| **20** | Osmundaceae | **2** |
| **21** | Ophioglossaceae | **3** |
| **22** | Selaginellaceae | **6** |

## 3. Results and Discussion

The current field study is a survey of Pteridophytes located at the eastern edge of the Western Ghats Forest region in Kasergode, conducted during the period from June 2022 to February 2023. The findings of this study indicate that 87 species were identified, belonging to 22 families, as recorded from the regions of Kasergode (see Table 1 and 2). The most of the Pteridophytes species were observed by terrestrial, epiphytic and lithophytic forms found this forest. I have observed the present study revealed that three endemic species identified such as *Cyathea nilgiriensis, Cyathea spinulosa* Wall ex Hook and *Bolbitis semicordata*Previous studies have included several reports of research articles focusing on the pteridophytic diversity in the eastern and western Ghats regions. Holttum (1976) documented 10 members of Thelypteridaceae in the "Flora of Hassan District." Yoganarsimhan et al. (1981) identified 12 species of ferns in their "Flora of Chikmagalur District" in Karnataka. According to Blatter and Almeida (1992), 90 species of ferns and fern allies were reported from the Uttara Kannada district. Ramachandra et al. (2010) recorded 54 pteridophyte species from the Gundia river basin in Hassan district. Previous research conducted by Subina et al. (2021) indicated that 16 families across 24 genera and 44 species were documented in Pampadum Shola National Park. In a separate study, Abhilaksha (2023) noted that a total of 152 species of pteridophytes, classified into 62 genera and 26 families, were identified across various states including Uttar Pradesh, Uttarakhand, Himachal Pradesh, and Jammu and Kashmir.

The current research identifies the predominant families of Pteridiaceae (22 species), Hymenophyllaceae (6 species), and Selaginellaceae (6 species) within the forest regions of Kasergode (Fig.1). According to Dixit (2000), an analysis of species diversity at the family level reveals that the highest diversity is found in the Aspleniaceae family, which includes 27 species, followed by Polypodiaceae (25 species), Athyriaceae (24 species), Thelypteridaceae (23 species), Selaginellaceae (20 species), Pteridaceae (17 species), Aspidaceae (13 species), among others. At the generic level, the greatest diversity is noted in the genera Selaginella (20 species), Pteris (17 species), and Diplazium (7 species). This study has confirmed that the dominant families are Pteridaceae, Hymenophyllaceae, and Selaginellaceae, along with the presence of rare and endemic species of pteridophytes. The lady fern genus *Athyrium* represents one of the most diversified lineages in Athyriaceae with about 160-220 known species (Ran Wei et al.,2018). I have identified three species of *Athyrium* sp in Kasergode forest in Kerala. Praveen Kumar and Udayan (2018) reported that Salvinia molesta and Marsilea minuta as their wide distribution as weeds in ponds and paddy fields Kerala forest regions. According to Iwatsuki (1990) reported that Hymenophyllaceae comprises more than 600 species of delicate ferns that are most abundant in humid tropical forests, but extend in humid shady habitats into temperate regions. I have detailed investigation of present study 6 species of Hymenophyllaceae famlily such as *Trichomanes companulatum* Roxb; *Hymenophyllum denticulatum* Sw.;*Trichomanes christii* Copel; *Trichomanes lunulatum* (Madhus. & C.A.Hameed) ;*Trichomanes saxifragoides* C.Presl; and Trichomanes christii Copel.

According to Dixit, (2000) reported that due to unplanned felling of trees in the forests the members of epiphytic pteridophytes belonging to the families Polypodiaceae, Davalliaceae, Aspleniaceae and Vittariaceae, have been reduced. Earlier studies, Sumesh Dudani et al., (2002) reported that serious threat to the several pteridophytes species like *Psilotum nudum*, *Tectaria zeylanica*, *Lindsaea malabarica*, and *Cheilanthes rufa*.

**Conclusion**

Conclusion of the present study was many rare and endangered ferns and fern-allies like Psilotum nudum, Tectaria zeylanica, *Lindsaea malabarica*, *Cheilanthes rufa*, and *Cyathea nilgiriensis*, etc. have been recorded from the Western Ghats and these species were need to urgent attention for conservation.

## 4. Conflicts of Interest

The author declare that they have no conflicts of interest.

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