



Diversity, Ecology and Utilization of Tea Garden Pteridophytes at Duars in West Bengal, India

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Abstract

The article mainly focused on the diversity, ecology and utilization of recorded Pteridophytes species in various tea gardens in Duars of West Bengal. This area is located at the foot hills of Himalayan Biodiversity Hotspot as it shelters a good number of endemic and threatened species of flora and fauna. During survey, a total of 44 species of Pteridophytes representing 17 families were recorded from different tea gardens of the study area. The enlisted ferns and fern allies included some rare species such as *Helminthostachys zeylanica*, *Ophioglossum nudicaules* etc. signifies the importance of this region as a rich repository of Pteridophytic plant wealth. Ecological and distributional notes are given for all the species.

Keywords: Duars, Tea gardens, Pteridophyte, Ecology, Utilization.

Introduction

Duars, a land of unending beauty complies with unending tea gardens, lies at the foothills of sub-Himalayan regions of Jalpaiguri and Alipurduar districts of Northern part of the state of West Bengal. Duars lies between 26°16' to 27°0' N latitude and 88°4' to 89°53' E longitude with an average elevation of 180 m.a.s.l. The area is starting from the eastern bank of river Tista in the Jalpaiguri district and stretching up to the western bank of the river Sankosh in Alipurduar district and is spreading over a span of around 130 km of which 40 km area is running along with the Himalayan foothills. Duars are famous for its green chains of dense forest interrupted with various tea gardens that were established during the British period. For working in the gardens, they brought labours under various tribal communities from Nepal, Chota Nagpur (Jharkhand) and Santhal Pargana (Bihar) areas. The Oraons, Mundas, Kharia, Mahali, Lohara and Chik Baraik are the common tribal's who are working as tea garden workers in these areas.

This region is treated as a happy home of our biological diversity and well known to us for three 'T' i.e. Tea, Timber and Tourism. Among these, Tea is the most popular for us as beverage and tea is one of the important economical backbones of these areas. Numerous tea gardens has been established in these areas that along with wildlife and green dense forest of this region are attracting the tourist from the different parts of the world from last few decades. To execute this study following tea gardens have been selected (Table-1).

Pteridophytes are first vascular spore bearing non flowering plants including fern and fern allies and are mostly growing in

terrestrial and epiphytic condition. Fern and fern allies form a conspicuous element of the earth's vegetation and are important for its evolutionary point of view as they show the evolution of vascular system and reflect the emergence of seed habit among the plants¹. Pteridophytes are well adopted in diverse habitats and in all topographic conditions starting from tropical to sub-alpine climates. Pteridophytes are generally prefers shady and moist places and as the Tea gardens maintain shady nature, it houses a rich diversity of ferns and fern allies. In India majority species of the Pteridophytes are mostly concentrated in different elevation of Eastern Himalaya and North East India². About 1200 species of Pteridophytes are reported from India, out of which 17% are reported as endemic to India³. Certain species of *Diplazium*, *Dryopteris*, *Marsilea* and *Helminthostachys* are edible and species of *Selaginella*, *Lycopodium*, *Adiantum*, *Helminthostachys* and *Marsilea* exhibit high medicinal values⁴. A good number of fern species are known as useful and poisonous among the tribal communities of tea gardens and eight species of ferns like *Polystichum lentum*, *Polystichum sublentum*, *Tectaria dubia*, *Microlepia speluncae* and *Pronephrium clarkei* are recorded as endemic⁵. In tea gardens of Duars, it is first attempt that has been made to explore and understand the diversity, ecology of pteridophytic flora and their utilization.

Materials and Methods

The present study is the outcome of the two years of extensive field survey in the different tea gardens of Duars of West Bengal in various predominant seasons. All the specimens were collected in fertile stage and were processed through conventional herbarium⁶. Field records and voucher specimens were deposited in the NBU Herbarium, University of North

Bengal. Confirmed identification of specimens were done by matching with herbarium specimens of CAL and NBU herbarium and by using different floras of nearby areas⁷⁻¹⁰.

Table-1
List of Tea gardens that have been studied

Tea Gardens	Blocks	Area (Acre)
Anandapur	Mal	1550.34
Bagrakote	Mal	2003.29
Baintgoorie	Mal	2628.72
Damdin	Mal	824.61
Bundapani	Alipurduar	1269.72
Odlabari	Mal	1539.83
Baradighi	Mateli	2128.73
Chalsa	Mateli	1544.43
Mateli	Mateli	2436.07
Samsing	Mateli	1861.09
Bhagatpur	Nagrakata	2413.19
Chengmari	Nagrakata	4577.53
Jiti	Nagrakata	2308.12
Nagrakata	Nagrakata	2281.50
Banarhatt	Dhupguri	1407.50
Diana	Dhupguri	1113.67
Saraswtipur	Rajganj	914.46
Shikarpur	Rajganj	1358.97
Danguajhar	Jal. Sadar	615.97
Karala Valley	Jal. Sadar	3526.59

Results and Discussion

A total of 115 voucher specimens of Pteridophytes were collected from the tea gardens of Duars and were classified into 17 families, 29 genera and 44 species (Table 2) from various terrestrial conditions and as epiphytes on shade trees¹¹. Among

the 17 families, Pteridaceae shows the highest number of species (09 sp) followed by Polypodiaceae, Dryopteridaceae and Thelypteridaceae with 5 species each and are highly frequent.

Some of the notable Pteridophytic families of the study area are shown in Figure 1. The dominant families were Pteridaceae, Thelypteridaceae and Polypodiaceae with 4 genera each followed by Ophioglossaceae, Dryopteridaceae and Athyriaceae (2 genera from each). The most common and widely distributed species in the study area are: *Diplazium esculentum*, *Cheilanthes albomarginata*, *Christella dentate*, *Dryopteris filix-mas*, *Lygodium flexuosum*, *Lygodium microphyllum*, *Microsorium punctatum*, *Nephrolepis auriculata*, *Pteris biaurita*, *Pteris vittata* etc. Species composition and percentage of species of the genera like *Adiantum*, *Dryopteris* and *Pteris* (Figure-2) are observed very high. All the recorded 44 species growing in various habitats of tea garden of study areas and based on their habitat it can be classified in six categories (Figure-3).

Present work gives a broad outlook about the tea garden Pteridophytes of Duars under the foothills of Himalayan biodiversity hotspot. Though, lot of studies focusing on the medicinal properties of plants, especially angiosperms, have been taken place, unfortunately limited amount of studies have been done to explore the medicinal potentialities of the pteridophytes. Many tribal communities and rural populations who are working as tea garden workers are dependent heavily upon such natural resources obtained from the tea garden for treatment of various ailments and diseases. Tea garden workers are using various weeds along with fern species as medicinal, food, fodder and other multipurpose uses. The fronds of ferns are also used in bouquets and for decorating the stages, halls, etc. in various occasions.

The pteridophytic flora in different tea garden is not so noxious and also not reducing the tea leaf production. But huge use of pesticides, herbicides on tea gardens badly destroys the population of ferns and fern allies in tea garden areas. The Tea worker of Duars are working in tea gardens from several years back and by generation after generation on very low labour cost and they are very much dependent with various wild leafy vegetables and underground parts as daily foods and medicines.

Conclusion

Conservation of wild vegetation including pteridophytes in limited quantity within the waste areas or along with tea plantation can makes the life easier in crisis periods for tea garden workers and it is also favourable to support the ethnobotanical practices among the tribes in tea garden areas.

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Table-2
Pteridophytes species recorded from different tea gardens of Duars

Name with Family	Fertile period	Abundance	Habitat and Ecology
<i>Adiantum caudatum</i> L.; Pteridaceae	August – November	Common	Terrestrial or lithophytes, on seasonally on shady places, in rock crevices, at bolder bases of tea plantations.
<i>Adiantum incisum</i> Forssk.; Pteridaceae	August – December	Common	Terrestrial or lithophytes, on seasonally on shady places, in rock crevices, at bolder bases of tea plantations.
<i>Adiantum lunulatum</i> Burm. f.; Pteridaceae	August – November	Rare	Terrestrial or lithophytes, on seasonally in shady places, in rock crevices, at bolder bases of tea plantations.
<i>Allantodia sikkimensis</i> (C.B. Clarke) Ching; Athyriaceae	July – September	Rare	Terrestrial, growing under the shade of tea plant.
<i>Allantodia solenopteris</i> Kunze ; Athyriaceae	July – September	Common	Terrestrial, growing under the shade of tea plant.
<i>Asplenium ensiforme</i> Wall. ex Hook. and Grev.; Aspleniaceae	August – November	Rare	Epiphytes or Lithophytes, growing in tea plantation.
<i>Asplenium nidus</i> L. Aspleniaceae	August – November	Common	Epiphytes or terrestrial, growing in tea plantation under moist and shady places.
<i>Blechnum orientale</i> L.; Blechnaceae	September –January	Common	Terrestrial, growing on dry places of tea garden.
<i>Cheilanthes albomarginata</i> C.B. Clarke; Pteridaceae	November-January	Abundant	Terrestrial or lithophytes, grows in variant habitat of tea garden.
<i>Cheilanthes anceps</i> Blanf.; Pteridaceae	August – May	Less common	Terrestrial or lithophytes, on seasonally in shady places, in rock crevices, at bolder bases of tea plantations.
<i>Christella dentata</i> (Forssk.) Brownsey and Jermy; Thelypteridaceae	November – March	Abundant	Terrestrial, usually growing along the rows, on tea plantation margins. Very fast growing and suitable for cultivation in shady areas.
<i>Cyclosorus aridus</i> (D. Don) Tagawa; Thelypteridaceae	November – March	Common	Terrestrial, grows on clayey ground marshy places of tea plantation.
<i>Dicranopteris linearis</i> (Burm. f.) Underw.; Gleicheniaceae	July – September	Common	Terrestrial, extensively growing along the rows in shaded or open areas.
<i>Diplazium esculentum</i> (Retz.) Sw.; Athyriaceae	July – September	Abundant	Terrestrial ferns, growing as large colonies in canals and rows of tea garden.
<i>Drynaria quercifolia</i> (L.) J. Sm.; Polypodiaceae	May – July	Common	Epiphytic, grows on the bark of shade trees of tea plantation.
<i>Dryopteris filix-mas</i> (L.) Schott; Dryopteridaceae	July – December	Abundant	Terrestrial, grown on tea shade or the open places of tea plantation.

Name with Family	Fertile period	Abundance	Habitat and Ecology
<i>Dryopteris sikkimensis</i> (Bedd.) Kuntze; Dryopteridaceae	July – December	Rare	Terrestria, often grows in tea plantation under shade.
<i>Dryopteris sparsa</i> (D. Don) Kuntze	July – December	Common	Terrestrial, grown on tea shade or the open places of tea plantation.
<i>Helminthostachys zeylanica</i> (L.) Hook.; Dryopteridaceae	December – March	Rare	Terrestrial, grows on the floor of tea plantation.
<i>Hippochaete debilis</i> (Roxb. ex Vaucher) Ching; Equisetaceae	January – March	Rare	Terrestrial, grows on marshy or wet places or in sandy soil of tea garden.
<i>Lycopodiella cernua</i> (L.) Pic. Serm.; Lycopodiaceae	February – May	Rare	Terrestrial, grows in tea garden under shade.
<i>Lygodium flexuosum</i> (L.) Sw.; Lygodiaceae	March –December	Abundant	Terrestrial, growing as climbers on tea plant or shade trees of tea plantations.
<i>Lygodium microphyllum</i> (Cav.) R. Br.; Lygodiaceae	March –December	Abundant	Terrestrial, growing as climbers on tea plant or shade trees of tea plantations.
<i>Marsilea minuta</i> L.; Marsileaceae	January – April	Less common	Aquatic or semi-aquatic the canals or lowland of tea garden.
<i>Microlepia speluncae</i> (L.) T. Moore; Dennstaedtiaceae	July – September	Common	Terrestrial, grows on the floor of tea garden.
<i>Microsorium diversifolium</i> Copel.; Polypodiaceae	February – June	Rare	Epiphytes, along fully or partially shaded places of tea plantations.
<i>Microsorium punctatum</i> (L.) Copel.; Polypodiaceae	February – June	Abundant	Epiphytes, along fully or partially shaded places of tea plantations.
<i>Nephrolepis auriculata</i> Trimen; Nephrolepidiaceae	August – November	Abundant	Terrestrial or Lithophytes, grows in open places of tea garden.
<i>Onychium siliculosum</i> (Desv.) C. Chr.; Pteridaceae	August – December	Common	Terrestrial, grows on sandy or rocky loose soil of tea garden.
<i>Ophioglossum nudicaule</i> L. f.; Ophioglossaceae	March – June	Rare	Terrestrial, grows on a swampy, grassy spot in a tea plantation.
<i>Polystichum lentum</i> (D. Don) T. Moore; Dryopteridaceae	August –December	Common	Terrestrial or lithophytes, on seasonally in shady places, in rock crevices, at bolder bases of tea plantations.
<i>Polystichum subulatum</i> Ching ex L.B. Zhang; Dryopteridaceae	August – December	Rare	Terrestrial, growing in moist and shady places inside the tea plantation.
<i>Pronophrium clarkei</i> S. Singh and Panigrahi; Thelypteridaceae	August – December	Common	Terrestrial, grow on loose and muddy soil in tea plantation.
<i>Pteris biaurita</i> L.; Pteridaceae	July – January	Common	Terrestrial, usually seen along the rows of tea plantations

Name with Family	Fertile period	Abundance	Habitat and Ecology
<i>Pteris longifolia</i> L.; Pteridaceae	July – December	Less common	Terrestrial, usually seen along the rows of tea plantations
<i>Pteris vittata</i> L.; Pteridaceae	July – December	Abundant	Terrestrial, usually seen along the rows of tea plantations
<i>Pyrrhosia lanceolata</i> (L.) Farw.; Polypodiaceae	June – January	Abundant	Epiphytes, along fully or partially shaded places of tea plantations.
<i>Selaginella monospora</i> Spring; Selaginellaceae	October – January	Rare	Terrestrial or lithophytes, growing as climbers on tea plant.
<i>Selaginella tenera</i> Spring; Selaginellaceae	November – January	Rare	Terrestrial or lithophytes, growing as climbers on tea plant.
<i>Tectaria dubia</i> (Bedd.) Ching; Tectariaceae	June – October	Common	Terrestrial, grows in shady and moist places of tea garden.
<i>Tectaria gemmifera</i> (Fée) Alston; Tectariaceae	May – November	Rare	Terrestrial, grows in shady and moist places of tea garden.
<i>Thelypteris nudata</i> (Roxb.) C.V. Morton; Thelypteridaceae	August – November	Common	Terrestrial, grows along canals in moist and shady places of tea garden.
<i>Thelypteris rectangularis</i> (Zoll.) B.K. Nayar and S. Kaur; Thelypteridaceae	August – November	Abundant	Terrestrial, grows along the canals in moist places of tea garden.
<i>Tricholepidium superficiale</i> (Blume) Fraser-Jenk.; Polypodiaceae	July – October	Common	Terrestrial or Lithophytes to climbing on shade trees.

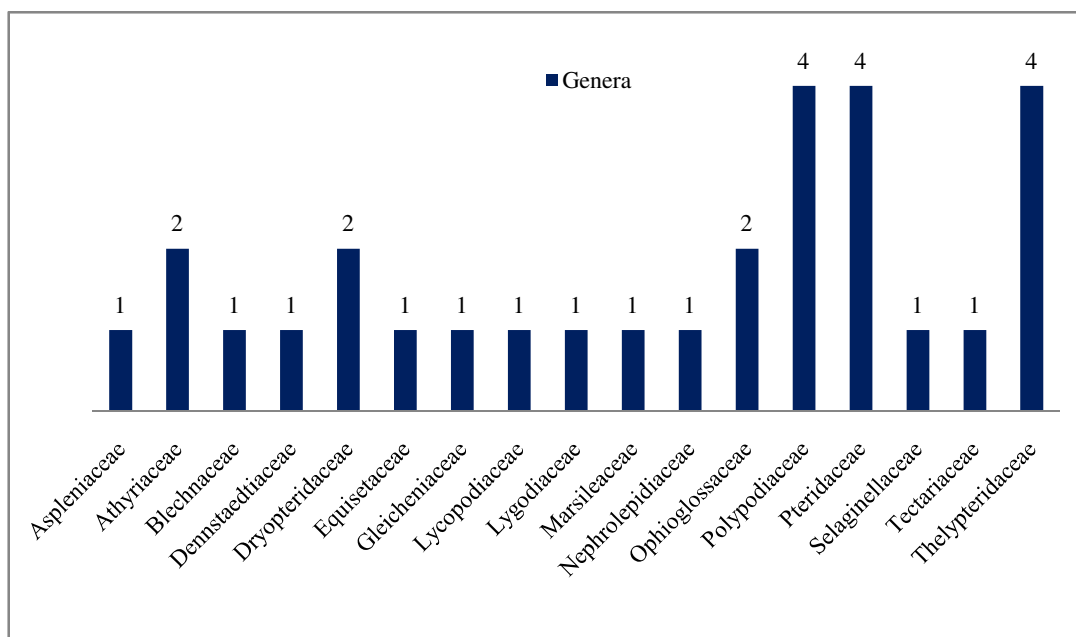


Figure-1
 Total number of Families with Genera

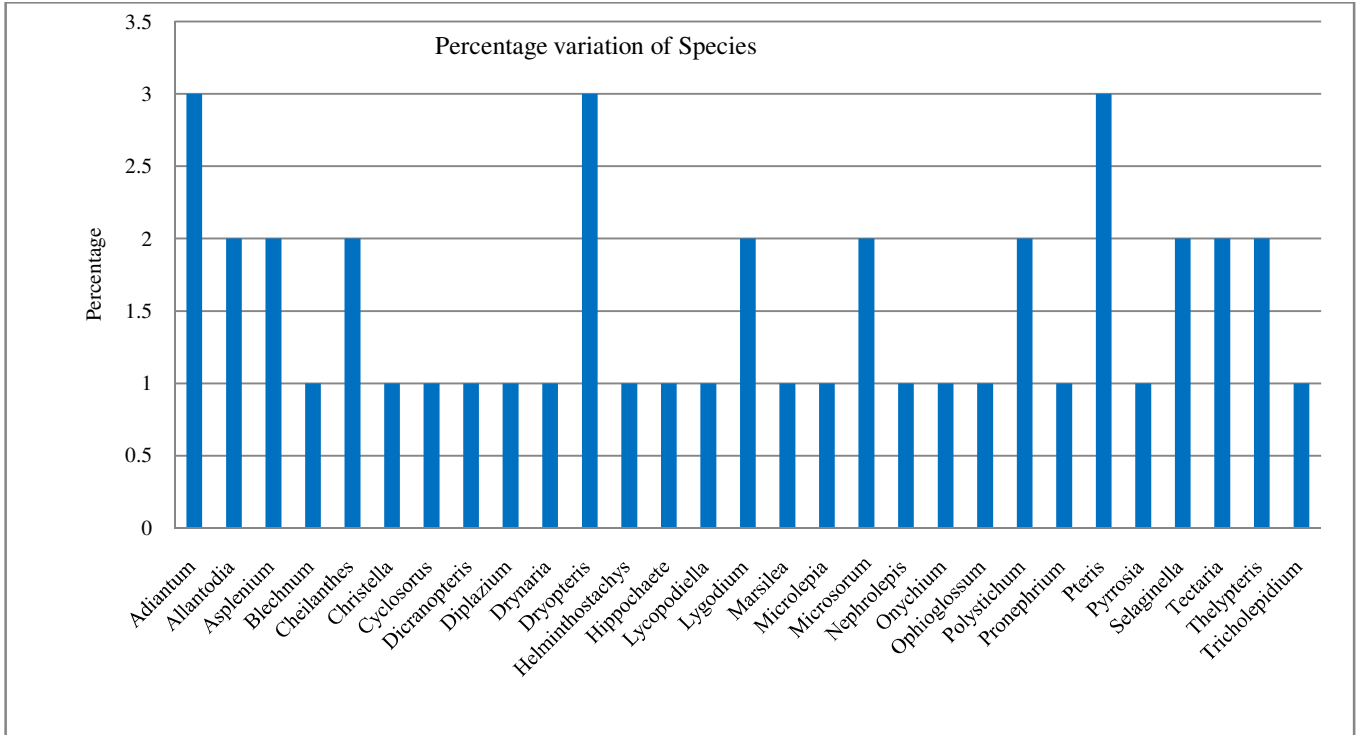


Figure-2
Percentage variation of Species

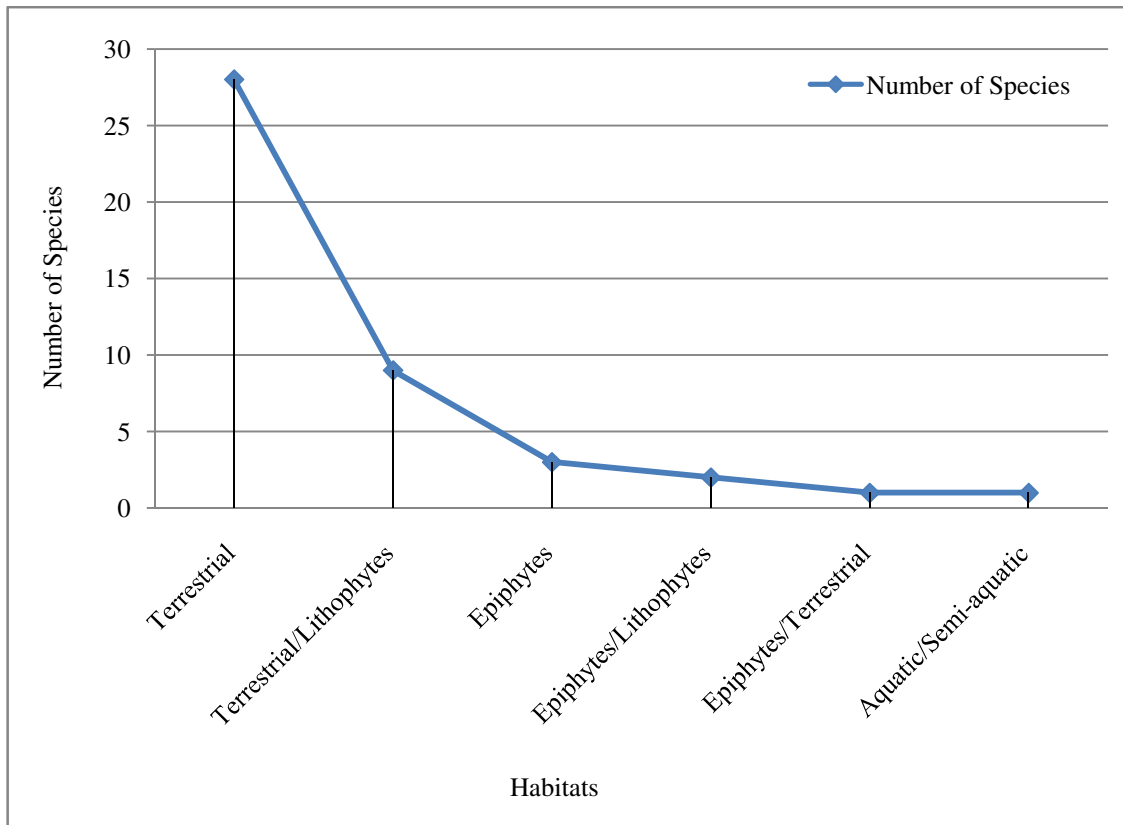


Figure-3
Diversity of Pteridophytes with regards to habitats

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