

FERNS AND FERN-ALLIES (PTERIDOPHYTES) OF PERADENIYA UNIVERSITY PARK

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Abstract

A survey was conducted on the Pteridophytic flora of the Peradeniya University Park. Twenty sites representing almost all the possible and accessible areas of the University park were selected for the study. 55 species of ferns and fern-allies belonging to 39 genera and 18 families were recorded. Out of the 55 species, 10 are introduced aliens and there are no endemic species. Some possible threats to further survival of these are identified and highlighted. Suitable remedies are suggested and immediate action recommended for their *in-situ* conservation.

Introduction

Most of the woody perennial angiosperm species of the Peradeniya University Park (PUP) are known adequately. However, little or no attention has been directed towards lower plant groups such as algae, fungi, lichens, bryophytes and the ferns, as well as herbaceous angiosperm species. This is true not only of the Peradeniya University Park, but also of the entire island. Jayasekera & Wijesundara (1993) and Jayasekera *et al.* (1996) reported that the Pteridophyta are one of the least studied groups of plants in Sri Lanka.

Studies on the Pteridophytes of Peradeniya University Park and adjacent areas are limited to two, the first on the "Ferns of Peradeniya Campus" by Sirisena & Theivendirarajah (1978) and the second on an "Ecological Study of Riverine Ferns of Hantana" by Jayasekera *et al.* (1994). The present study was done to fill the gap in the knowledge of Pteridophytic flora of the Peradeniya University Park with the following specific objectives:

- To survey the ferns and fern-allies found in the Peradeniya University Park,
- To prepare a check-list of ferns and fern-allies found in Peradeniya University Park,
- To prepare a user friendly key for their easy identification,
- To prepare a fern herbaria for future reference, and
- To identify possible threats to this group.

Materials and Methods

Brief Description of the Study Site - Peradeniya University Park

The area under the administration of the University of Peradeniya covers about 687 ha (1700 acres) including a considerable part of Hantana Range. Its geographical coordinates are approximately 7°15' N and 8°36' E. The tropical climate with high humidity, evenly distributed rainfall (2131mm mean annual) throughout the year (excepting the dry spell during January to March), moderate temperature (24.1°C mean annual) and soil type (reddish brown latosol) provide an ideal habitat with suitable conditions for the luxuriant growth of ferns. The landscape diversity of the Peradeniya University Park provides an additional feature (i.e. microhabitats) for growth of a variety of ferns and facilitates the survival of a rich diversity.

Method

To conduct the survey of ferns and fern-allies, twenty sites were selected to represent almost all the possible and accessible areas of the University-park. Four plots (1 m x 1 m) were sampled from each of these sites in a random manner and a total of 80 plots sampled. The suitable quadrat size to study the pteridophytic flora was selected according to the determination of minimal area described by Shimwell (1971). Representative samples of the fern species found within the 1 m x 1 m plots were collected and preserved as herbarium specimens for identification. Preserved specimens were identified and identification

confirmed using the reference collection at the National Herbarium, Peradeniya. Epiphytic ferns, aquatic ferns and ferns found on walls (i.e. those that were not found within the plots but were present within the sites) were also sampled (by random picking) and identified. This survey of ferns was conducted in 1998 and 1999.

During the survey, possible threats to this group were also identified and recorded. Damage and destruction were considered as major threats. Interviews in an informal manner with visitors to the Lower Hantana area and the University Park were held to get an idea of collection of ferns by them. Exhibitions held during the study period at the Peradeniya University and surrounding schools, as well as schools in Kandy Municipal Area were visited and informal discussions were held with students and with school teachers to gather information on collection and places of collection. Threats to ferns at the Peradeniya University Park were examined in a period of two years from July 1998 to June 2000.

Results

Floristic Richness of Ferns and Fern-allies

Fifty-five species of ferns and fern-allies were recorded during the survey, belonging to 39 genera and 18 families. Of the 55 species, 10 were naturalized species (i.e. occur as weeds in cultivations or as introduced aliens). Others (i.e. 45 species) were indigenous to Sri Lanka. Endemic species were not recorded during the survey.

Check-list of Ferns and Fern-Allies of the Peradeniya University Park

The following detailed check-list of ferns and fern-allies recorded during this study was prepared according to the classification and arrangement of species within genera and genera within families followed by Sledge (1982).

Psilotales

1. Psilotaceae

1. *Psilotum* Sw.
1. *Psilotum nudum* (L.) Beauv.

Lycopodiales

2. Lycopodiaceae

2. *Lycopodium* L.
2. *Lycopodium cernuum* L.

3. Sellaginellaceae

3. *Sellaginella* Beauv.
3. *Sellaginella* sp.1
4. *Sellaginella* sp. 2

Ophioglossales

4. Ophioglossaceae

4. *Ophioglossum* L.
5. *Ophioglossum reticulatum* L.

Marattiales

5. Marattiaceae

5. *Angiopteris* Hoffm.
6. *Angiopteris evecta* (G. Forster) Hoffm.

Filicales

6. Schizaeaceae

6. *Schizaea* Smith
7. *Schizaea digitata* (L.) Sw.

- 7. *Lygodium* Sw.
- 8. *Lygodium* sp.
- 8. *Anemia* Sw.
- 9. *Anemia phyllitidis* (L.) Sw.*

7. Gleicheniaceae

- 9. *Dicranopteris* Bernh.
- 10. *Dicranopteris linearis* (Burm. fil) Underw.

8. Cyatheaceae

- 10. *Cyathea* Smith
- 11. *Cyathea* sp.

9. Adiantaceae

Subfamily - Adiantoideae

- 11. *Actiniopteris* Link
- 12. *Actiniopteris radiata* (Sw.) Link
- 12. *Cheilanthes* Swartz
- 13. *Cheilanthes tenuifolia* (Burm.) Sw.
- 13. *Pellaea* Link
- 14. *Pellaea* sp.
- 14. *Pityrogramma* Link.
- 15. *Pityrogramma calomelanos* (L.) Link*
- 16. *Pityrogramma dealbata* (C. Presl) Tryon*
- 15. *Hemionitis* L.
- 17. *Hemionitis arifolia* (Burm.) T. Moore
- 16. *Gymnopteris* Bernh.
- 18. *Gymnopteris tomentosa* (Lam.) Underw.*
- 17. *Adiantum* L.
- 19. *Adiantum caudatum* L.
- 20. *Adiantum zollingeri* Mett. Ex Kuhn
- 21. *Adiantum diaphanum* Blume*
- 22. *Adiantum trapeziforme* L.*
- 23. *Adiantum latifolium* Lam.*
- 24. *Adiantum raddianum* C. Presl*
- 25. *Adiantum* sp 1
- 26. *Adiantum* sp 2

Subfamily - Pteridoideae

- 18. *Pteris* L.
- 27. *Pteris vittata* L.
- 28. *Pteris ensiformis* Burm.
- 29. *Pteris multiaurita* Agardh
- 30. *Pteris reptans* T.G. Walker
- 31. *Pteris biaurita* L.
- 19. *Idiopteris* T.G. Walker
- 32. *Idiopteris hookeriana* (Agardh) T.G. Walker

10. Dennstaedtiaceae

- 20. *Microlepia* C. Presl
- 33. *Microlepia speluncae* (L.) T. Moore
- 21. *Pteridium* Gleditsch ex Scop.
- 34. *Pteridium aquilinum* (L.) Kuhn
- 22. *Lindsaea* Dryander ex Smith
- 35. *Lindsaea* sp.

11. Aspleniaceae

- 23. *Asplenium* L.
- 36. *Asplenium* sp.

12. Thelypteridaceae

- 24. *Macrothelypteris* Ching
- 37. *Macrothelypteris torresiana* (Gaud.) Ching
- 25. *Cyclosorus* Link
- 38. *Cyclosorus* sp 1
- 26. *Trigonospora* Holttum
- 39. *Trigonospora caudipinna* (Ching) Sledge
- 27. *Christella* Leveille
- 40. *Christella dentata* (Forsskal) Brownsey & Jermy

13. Dryopteridaceae

Subfamily - Athyrioideae

- 28. *Athyrium* Roth
- 41. *Athyrium* sp.

Subfamily - Tectarioideae

- 29. *Tectaria* Cavanilles
- 42. *Tectaria zeilanica* (Houtt.) Sledge = *Quercifilix zeylanica*

Subfamily - Dryopteridoideae

- 30. *Arachniodes* Blume
- 43. *Arachniodes aristata* (G. Forster) Tindale

14. Davalliaceae

Subfamily - Davallioideae

- 31. *Davallia* Smith
- 44. *Davallia* sp.

Subfamily - Oleandroideae

- 32. *Nephrolepis* Schott
- 45. *Nephrolepis biserrata* (Sw.) Schott
- 46. *Nephrolepis* sp.

15. Polypodiaceae

- 33. *Drynaria* (Bory) J. Smith
- 47. *Drynaria quercifolia* (L.) J. Smith
- 34. *Drymoglossum* C. Presl
- 48. *Drymoglossum heterophyllum* (L.) Trimen
- 35. *Pyrrosia* Mirbel
- 49. *Pyrrosia* sp.
- 36. *Microsorium* Link
- 50. *Microsorium scolopendria* (Burm. fil.) Copel.
- 51. *Microsorium nigrescens* (Blume) Copel.

16. Blechnaceae

- 37. *Blechnum* L.
- 52. *Blechnum orientale* L.
- 53. *Blechnum occidentale* L.*

17. Salviniaceae

- 38. *Salvinia* Seguiet
- 54. *Salvinia molesta* Mitch.*

18. Azollaceae39. *Azolla* Lam.55. *Azolla pinnata* R. Br.

[* - Introduced Species.]

Key to Genera and Species of Ferns and Fern-allies of the Peradeniya University Park

A user-friendly key for easy identification of genera and species of ferns and fern-allies of the Peradeniya University Park is being prepared.

Herbarium Collection of Ferns and Fern-allies of the Peradeniya University Park

Herbarium specimens prepared are being kept at the Department of Botany, University of Peradeniya for future reference and to be used in the preparation of the key.

Threats to Ferns and Fern-allies

A number of possible threats were identified during the survey, viz. collection by visitors and the university community, road construction, landscape activities and fire. Collections were mainly for ornamental purposes (e.g. as pot plants, for decorations), for medicinal purposes and for exhibitions and flower shows by local school children as well as by University students. Due to road construction, clearing of roadsides and due to excavation for telecommunication and electrical purposes most of the ferns found along the roadside were damaged and destroyed and disappeared. Due to landscape management activities and University maintenance activities, most of the ferns found on the walls of the University Quarters, along the roadside and stream banks were frequently damaged and it was noted that this is somewhat of a cyclic nature. During the dry spell, fire can be seen at the upper parts of the University Park. Almost all the fires are anthropogenic in origin (i.e. man-made) and for several purposes. A considerable amount of ferns were destroyed due to these annual fire activities. We observed that ferns in some home gardens were also destroyed during burning of leaf litter.

Discussion

Sledge (1982) reported 314 indigenous Pteridophytes species (289 ferns and 25 fern-allies) and 18 naturalized fern species to occur as weeds of cultivation or as introduced aliens in Sri Lanka. In addition to these 332 fern species, he reports the occurrence of 8 hybrids in the country. These pteridophytes were classified under 6 taxonomic orders, viz. Psilotales, Lycopodiales, Equisetales, Ophioglossales, Marattiales and Filicales. The majority of the well known ferns belonging to the order Filicales. Members of the orders Ophioglossales and Marattiales are also considered as ferns. Pteridophytes belonging to the orders Psilotales, Lycopodiales and Equisetales are considered as fern-allies.

The present study reports the occurrence of 55 ferns and fern-allies within the Peradeniya University Park (16.6% of the total Pteridophyte species recorded in Sri Lanka). The number of Pteridophyte families and genera recorded in Sri Lanka are 27 and 103 respectively (Sledge, 1982). The corresponding figures for the Peradeniya University Park are 18 and 29 (i.e. 66.7% of the families and 28.2% of the genera of Sri Lankan Pteridophytes were recorded from the present study). Of the 55 species of ferns and fern-allies recorded from the University Park, 10 were identified as introduced species and there were no species endemic to Sri Lanka.

Sirisena and Theivendirarajah (1978) listed 36 species of ferns belonging to 25 genera and 13 (or 14) families within the Peradeniya Campus. The present study updates this list. Further comparison of the composition of taxa in Sirisena and Theivendirarajah (1978) list with the present study was not done, because the classification system they had followed was not mentioned. Table 1 gives a simple numeric comparison of families, genera and

species composition among Sri Lankan Pteridophytes (Sledge, 1982), the previous study on ferns of Peradeniya Campus (Sirisena and Theivendirarajah, 1978) and the present study.

Table 1. Number of Pteridophyte Families, Genera and Species Recorded in Sledge (1982), Sirisena and Theivendirarajah, (1978) and the Present Study

Taxa	Sledge (1982)	Sirisena and Theivendirarajah (1978)	Present Study
Families	27	13 (or 14)	18
Genera	103	25	39
Species	332 ^a (57 ^b , 18 ^c)	36	55 ^a (0 ^b , 10 ^c)
a–Total number of species introduced			b–Number of endemic species
			c– Number of (naturalized) species

In the present study, the recorded number of species, genera and families was higher compared to the study of Sirisena and Theivendirarajah (1978). This could be due to the larger extent of the area of study.(study sites or extent has not been mentioned in previous work). Also after a 22-year time period there may be addition of new species from Hantana hills, home gardens in and around the University Park or from the Royal Botanic Gardens close by.

Climatic and edaphic conditions of the Peradeniya University Park are favourable for the luxuriant growth of ferns. Landscape diversity of the University Park provides an additional feature for the better growth of this plant community; as it provides different microhabitats suitable for different types of fern species that require different microenvironmental conditions. This additional feature may be the reason for the relatively high diversity of this group within the Peradeniya University Park.

As stated earlier, a user-friendly key for easy identification of genera and species of the ferns and fern-allies of the Peradeniya University Park is being prepared. We hope to extend this study to the Upper Hantana area and prepare a complete key to the Pteridophytes of the University Park and Upper Hantana area under University administration.

A survey of possible threats to the Pteridophytes of Peradeniya University Park has revealed that the threats have increased manifold. The main threat identified during the study is over collection of ferns by visitors, for several purposes, particularly ornamental purposes such as for potted plants and for exhibitions. Most of these ferns are very eye-catching ones (e.g. *Actiniopteris radiata*, *Adiantum* spp. *Angiopteris evecta*, *Blechnum orientale*, *Cyathea* sp., *Drynaria quercifolia*, *Lycopodium cernuum*, and *Pityrogramma* spp.), and the collectors know that some of these species could very easily be propagated. Damage and destruction increased also with the increase of construction works, maintenance activities, improper landscape practices and unplanned waste disposal by the University as well as the outside community (especially illegal waste disposal). Due to illicit garbage dumping, most of the ferns along the Maha Oya (a tributary of river Mahaweli flowing through the University Park) below the Sarasavi Seya (University Buddhist Temple) have been destroyed during the past two years.

Therefore, the possible threats to this eco-sensitive group are clear enough. Therefore our responsibility is to conserve what remains, minimize the damage already done and prevent further destruction. To achieve this goal, first, the construction workers, landscape workers and health workers should be educated to carry out their activities without damage to this plant community as well as to the other flora. Illegal garbage dumping should be stopped and fern collection should be minimized. Fire should be controlled. The University Administration and student societies such as the Botanical Society, Hantana Conservation Society and Explorers' Club are bodies that have the capacity to curb these activities, in order to protect these Pteridophytes. We need to conserve not only the ferns and fern-allies of the Peradeniya University Park, but the entire biodiversity.

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