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Fern Diversity and Soil Characteristics in the Moist Temperate Deciduous Forest of Indian Central Himalaya

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INTRODUCTION & AIM

Ferns constitute an essential component of the vegetation in the Indian Central Himalaya (ICH) region. They serve critical ecological functions, acting as indicators of environmental health and enhancing biodiversity.

The interaction between fern and soil characteristics such as moisture, pH, and nutrient content, plays a critical role in determining their distribution and ecological success in this bio diverse region.

Understanding winter-specific fern diversity is crucial for revealing their adaptive strategies and guiding effective conservation efforts.

❖This study aims to evaluate fern diversity in relation to soil attributes within the moist temperate deciduous forest of the Indian Central Himalaya during winter season.

❖The findings will provide insights into the ecological dynamics and conservation status of ferns in this region.

METHOD

Floristic Survey and Data Collection

◉Study Period

A comprehensive survey was conducted across various habitats in ICH during November, 2023 to document fern diversity

◉Sampling Strategy

Stratified random sampling ensured coverage of multiple micro habitats

◉Specimen Collection and Identification

Voucher specimens were collected, including fronds with fertile pinnae & rhizomes for accurate identification. Specimens were pressed, dried, and mounted on herbarium sheets following standard procedures

No. of soil samples

A total of 15 soil samples beneath ferns from three sites

Soil Sampling

At a depth of 0-10 cm

Depth

Soil Parameters Analyzed

- Physical Parameters
  - Soil Moisture
- Chemical Parameters
  - Soil pH
  - Soil Electrical Conductivity
  - Nitrogen
  - Carbon
  - Hydrogen
  - Sulphur

Redundancy analysis was performed using R software for further analysis.

Coniogramme serrulata

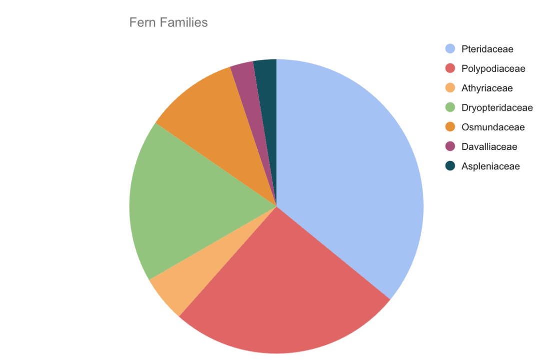
Onychium japonicum

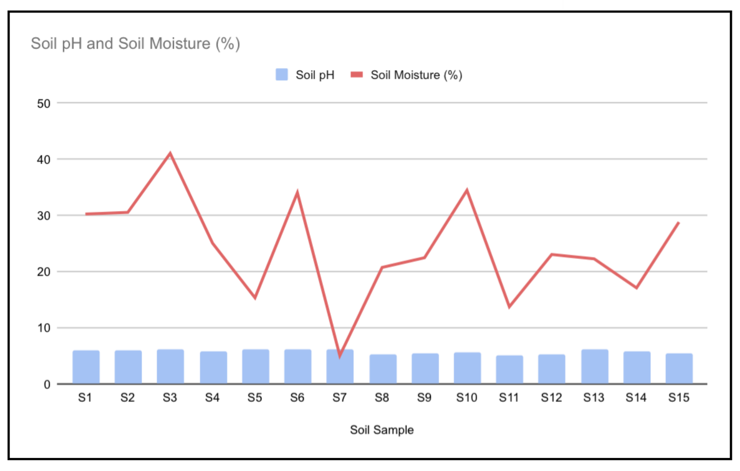
Osmunda japonica

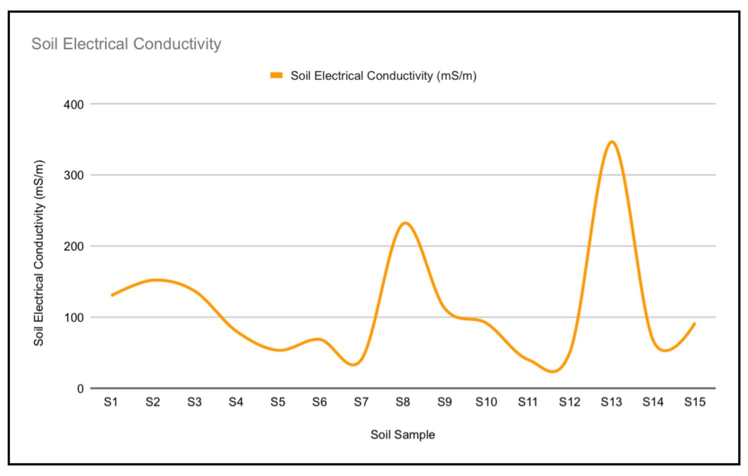
Polystichum squarrosum

Polystichum stimulans

RESULTS & DISCUSSION

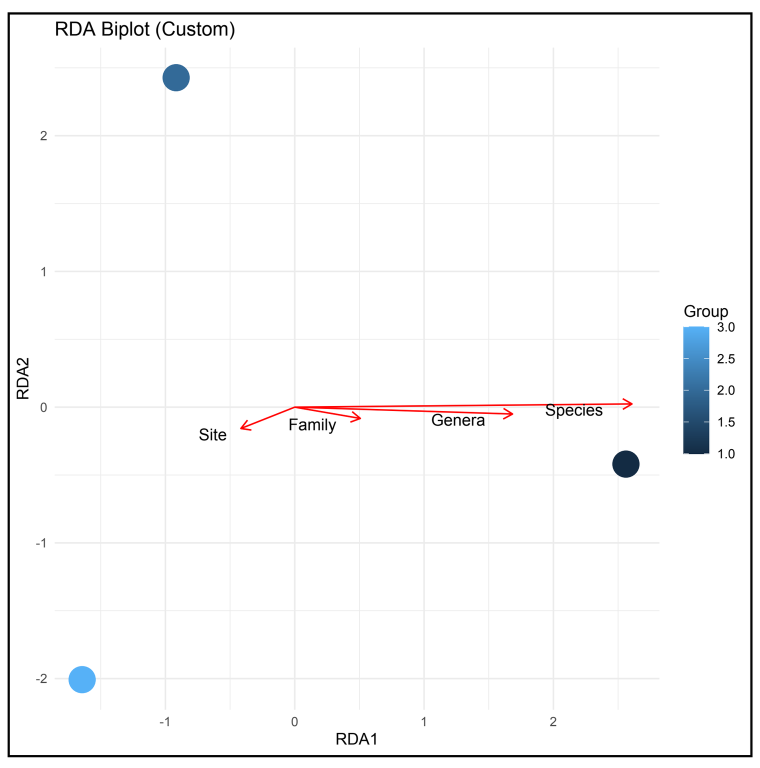






Result of Redundancy Analysis

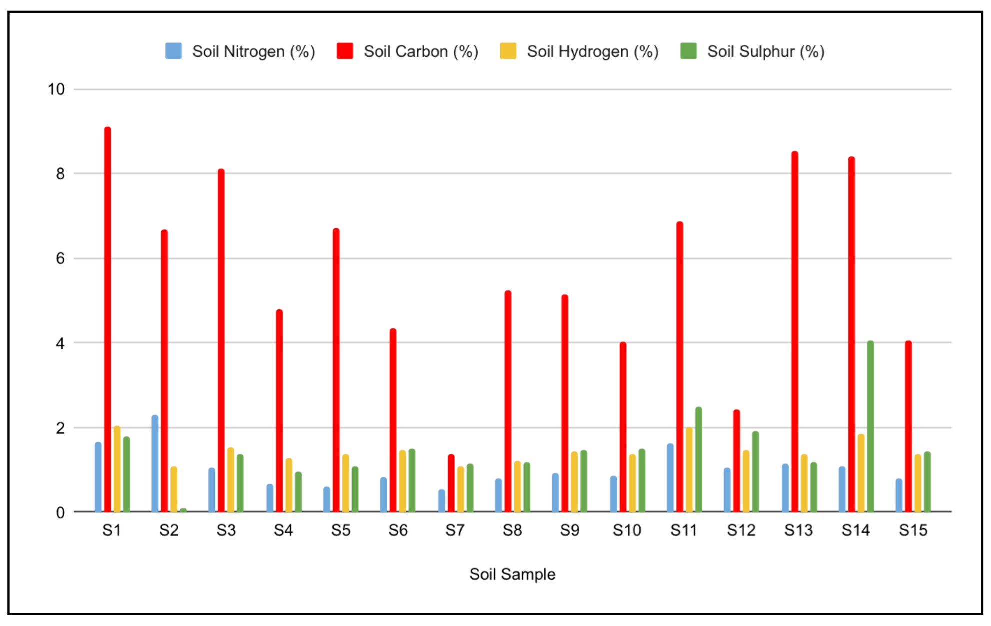
Axis	RDA1	RDA2
Eigen Value	50.8246	0.17544
Proportion Explained	0.9966	0.00344
Cumulative Proportion	0.9966	1.00000



List of Recorded Fern Genera and Species

S. No.	Genus	Species	Family	Elevation (m)
1	*Polystichum*	*stimulans*	Dryopteridaceae	2126
2	*Osmunda*	*claytoniana*	Osmundaceae	2131
3	*Drynaria*	*mollis*	Polypodiaceae	2132
4	*Coniogramme*	*caudata*	Pteridaceae	2143
5	*Dryopteris*	*redactopinnata*	Dryopteridaceae	2143
6	*Davallia*	*divaricata*	Davalliaceae	2147
7	*Pteris*	*multifida*	Pteridaceae	2150
8	*Polypodiodes*	*amoena*	Polypodiaceae	2151
9	*Hemionitis*	*farinosa*	Pteridaceae	2165
10	*Onychium*	*contiguum*	Pteridaceae	2165
11	*Lepisorus*	*scolopendrium*	Polypodiaceae	2176
12	*Athyrium*	*banajaoense*	Athyriaceae	2177
13	*Polystichum*	*neolobatum*	Dryopteridaceae	2188
14	*Deparia*	*japonica*	Aspleniaceae	2189
15	*Coniogramme*	*serrulata*	Pteridaceae	2194
16	*Polystichum*	*lentum*	Dryopteridaceae	2196
17	*Selliguea*	*capitellata*	Polypodiaceae	2198
18	*Pteris*	*cretica*	Pteridaceae	2209
19	*Onychium*	*fragile*	Pteridaceae	2210
20	*Onychium*	*japonicum*	Pteridaceae	2220
21	*Polystichum*	*squarrosum*	Dryopteridaceae	2272
22	*Cryptogramma*	*stelleri*	Pteridaceae	2312
23	*Pteris*	*wallichiana*	Pteridaceae	2318
24	*Diplazium*	*maximum*	Athyriaceae	2413
25	*Osmunda*	*japonica*	Osmundaceae	2415

Pteridaceae and Polypodiaceae were found to be the most dominant families.



The results showed that the soil environmental variables included in the model explain all the variation in the species data, suggesting a strong link between species distribution and soil environmental factors. Almost all the explained variance (99.66%) is concentrated in RDA1. The Redundancy Analysis biplot illustrates the relationships between various sites and fern diversity in response to soil attributes along the two primary axes, RDA1 and RDA2. Proximity of sites and species on the plot indicates comparable responses to soil characteristics.

CONCLUSION

❖This study highlights the resilience and adaptability of ferns in ICH during winter season.

❖The findings stress the importance of specific microhabitats and soil characteristics in supporting fern diversity under seasonal climatic constraints.

❖Conservation strategies should focus on these key habitats to preserve fern diversity.

FUTURE WORK

Further research is recommended to investigate the phenological and physiological adaptations of ferns across different seasons, contributing to a comprehensive understanding of their ecological dynamics.

ACKNOWLEDGEMENT

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