

Ecological Studies of Pteridophytic Flora of Ajmer Division, Rajasthan

Meenakshi ChoudharyResearch Scholar Botany
S.P.C. Government College,
Ajmer**Dr. Dilip Gena**Assoc. Professor Botany
S.P.C. Government College,
Ajmer**Dr. Anshu Karel**Assoc. Professor Botany
S.P.C. Government College,
Ajmer

ABSTRACT

As per the climatic norms of Rajasthan, ferns in general have to tolerate higher temperatures and solar radiations for most of the year. The average temperature during the rainy period, which is the most congenial for the growth of these plants, is on an average 30°C during day which is much higher compared to Himalayan as well as south Indian pteridophytic habitats. In spite of this good number of pteridophytes grow in various parts of central Rajasthan.

The Fern species of Rajasthan can be arranged in respect of their heat resistance on the basis of the data starting from *Actiniopteris Cheilanthes farinosa* which is maximally heat resistant followed by *radiata* and then *Adiantum incisum* in successively decreasing order of heat resistance. Further, maximum damage to cell permeability as represented by abrupt maximal increase in percentage of sugars and proteins in leachates was observed in *A. incisum* at all the temperature treatment. The data relating to cell membrane permeability suggest the sequential succumbing to increasing temperatures starting from *A. radiata* through *A. Incisum* being the least resistant and *C. farinosa* being maximally resistant to heat.

Observations relating to the ecological parameters like moisture content and total bound water have also been recorded the percent moisture content was highest in *C. farinosa* and least in *A. radiata* with *A. Incisum*, ranging between these two extremes. However, total bound water was highest in *A. incisum* and least in *C. farinosa*. Thus with least percentage of total bound water *C. farinosa* is least resistant to heat and drought and *A. incisum* with the highest percentage of total bound water happens to be the most resistant species from this point of view.

Key words: Ecological Studies, Pteridophytic

INTRODUCTION

The first colonists of land were archegoniates and several of these became recognizable as pteridophytes with an antiquity dating back to well over 400 million years. These pteridophytes consisting of the non-seed-bearing vascular plants dominated the earth during the carboniferous period. They are survived today by many species and most numerous (more than 90%) of which are the homosporous ferns. Over

the years the phylogenetic relationships among major groups of living and extinct vascular plants have witnessed a revolution in our concepts, so much so the commonly inclusive term 'pteridophytes' tends to be no longer favoured. Nevertheless, the term 'pteridophytes' does remain useful in conveying a fairly clear idea of the plants to which it refers.

In spite of unfavourable and hostile climatic conditions, till date 62 species belonging to 28 genera of pteridophytes have been reported from Rajasthan. In-depth studies of these species of pteridophytes occurring in Rajasthan will be important in understanding the evolutionary trends and reproductive biology of these ancient plants under present day environmental conditions.

Objectives

The main objectives of the present investigation are as follows:-

1. Screening and categorization of pteridophytic flora on the basis of present and past distributional pattern and population density to evaluate the threatened status of fern species.

ECOLOGY

Details of habitat, soil and commonly associated species have been observed during the collections. Soil texture has been determined by shaking a known quantity of soil kept into the top most mesh of a soil sieve and weighing each fraction separately. The percentage of each fraction was calculated and soil type being designated according to the International system of soil classification. For soil pH determination, 5 gm sample of oven dried soil was shaken in 100 ml of distilled water and the solution was filtered after 8 hours. pH was noted on Digital Systronics 335 pH meter.

On the basis of habitat preference, pteridophytes have been classified into following 10 categories by Mehra & Bir (1964) and Bir & Vasudeva (1972):

- i. Shady and dark forest species
- ii. Forest floor species
- iii. Species inhabiting exposed rocks, boulders or gravelly soil
- iv. Species inhabiting grassy areas
- v. Thickest forming species
- vi. Lithosphytes
- vii. Ravine ferns
- viii. Climbers
- ix. Epiphytes
- x. Hydrophytic species

As the fern localities of Ajmer division are comparatively at a low altitudinal range, no climbing pteridophytes occur in this area. Ravine and thickest forming species of ferns also do not occur in this part of Rajasthan. Pteridophytes of Ajmer division fall into following five categories in term of their habitat preferences:

i. **Species inhabiting forest floor** : *Adiantum philippense* is the fern species of this category found in central Rajasthan.

ii. **Ferns growing on exposed rocks, boulders or gravelly soil under extremely xerophytic conditions**: *Adiantum incism*, *Cheilanthes farinosa* and *Actiniopteris radiata* are such ferns widely found in walls of houses, forts and foot hill rocks which are mostly exposed and dry. These taxa are well adapted to drought conditions.

iii. **Lithopytes: Species inhabiting rock crevices**: In Ajmer division, ferns growing in rock crevices, walls and embankments near water channels or waterfalls is *Adiantum capillus-veneris*.

iv. **Species inhabiting grassy areas**: *Ophioglossum petioatum* usually grows in grassy plains with rocky substratum in many localities of Ajmer division.

v **Hydrophytic species**:

(a) Marshy species : *Marsilea* species are found growing in marshy fields, shallow water areas or along pond margins or water channels and canals at various localities in Ajmer division

(b) Free floating species: *Azolla pinnata* is the only free floating fern species of Ajmer division..

Previous work done on these aspects of pteridophytes of Rajasthan has been extensively reviewed. Work on distribution, phytogeography, eco-physiology, phytochemistry etc. has been dealt with in details.

A brief description of topography, geology, physiography, climate and vegetation of Rajasthan and the pteridophytic distribution in central Rajasthan has been recorded.

So far as formation of spores is concerned these taxa can classified into 3 types viz. taxa with spore formation twice a year. Besides the normal sexual reproduction perennating rhizome seems to be the only mode of propagation because of the topographical situations of the fern localities of Ajmer division of Rajasthan.

Distribution of pteridophytes in Rajasthan has been discussed with reference to a percentage decline in the pteridophytic flora of this state and the possible causes thereof have been recorded. It has been pointed out that Rajasthan State serves as the connecting link between pteridophytes flora of Himalayas and south India.

In the ecological aspects of the pteridophytic flora of Ajmer division it is noted that certain ferns placed in comparatively favorable conditions possess an uninterrupted growth throughout the whereas others dry up after October and this also observed in garden cultivation of these ferns.

One of the novel aspects taken up during the present investigation is quantitative estimation of minerals in the fronds of three selected species of ferns. The amounts of different minerals have been found to be variables in different species and their leaf litter upon decomposition liberates variables quantities of these minerals. The availability of these minerals around the fern habitats results in the growth of specific angiospermic associates with these populations under natural habitats..

Observations relating to moisture contents and total bound water contents of the selected ferns have indicated that percent moisture content is highest in *Marsilea minuta* and lowest in *Actiniopteris radiata* with *Adiantum incisum* ranging between these two extremes. However, total bound water is found to be highest in *A. incisum* and lowest in *M. minuta*.

Among various metabolic changes underlying the mechanism of heat and drought tolerance of the three selected fern species, effect of hyperthermia on total chlorophylls and carotenoids and cell membrane permeability has been studied during the present investigation. This study has made it..

CONCLUSION

The notable feature of the pteridophytes which makes them so outstanding amongst all land plants is their undoubted antiquity. Besides antiquity, the pteridophytes are getting into prominence to answer several questions in the biology of reproduction and survival because of their life cycle which is unique in the plant kingdom. A better comprehension of their life-cycle attributes is important for the whole of plant science, not merely for pteridology. Evolutionarily speaking, the 'sporophyte' would be at the mercy of their 'gametophytes' to the extent that the latter express any portion of the genomes. Taxonomists, morphologists and anatomists have long looked upon the ferns as representing an evolutionary grade of interest in tracing the origins of land flora.

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