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An Investigation of Sporocarp Morphology Based On Phylogenetic Contest

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ABSTRACT

Plants have been the key to human welfare from the earliest drawn of human existence. Biodiversity define variety of life forms at all levels of organization from through species of higher taxonomic forms. It also includes the variety of ecosystems and habitats as well as the processes occurring in this phenomenon India has a rich and varied pteridophytic flora due to its diversified topography, variable climatic Conditions and its geographical position with several migration-flows of species of different phytogeographical elements meeting in different parts of the country.

Keywords – Biodiversity, Welfare, Topography, Flora, Plytogeographical

Introduction

All the pteridophytes are linked only by a common life history pattern : a regular heteromorphy alternation of generation that includes two distinctive and free-living phases. The first of there is typically large, long lived and contains internal well developed water transporting Vascular system. This is the dominant, free-sporing asexual, sporophytic generation the spores, which are produced into great abundance, germinate to grow into miniature, Vascular gametophytic generation plants, quite independent of sporophyte Plants These are mostly short-lived, highly reduced, simple structure and sex bearing plant which are noticeable only through great care and mostly seen in microscopic observations (Gifford and Foster 1989), Baishya and Rao (1983) studied the terrestrial lithophilic, and Epiphytic ferns. The pteridophytes comprised of 256 Species in 91 genera, a rich and diverse flora Muktesh Kumar (1998) documented 159 Species from munnar forest division Dudani *et.al.* (2009) stated that the major families of pteridophytes found in the western Ghats are Aspleniaceae, polypodiaceal, Thelypteridaceae, Selaginellaceae, Pteridaceae etc. Mukhopadhyay and Sen (1986) suggested that no one of these two groups could be ancestor of the other group, they are cognate to each other and developed from a common ancestor equivalent to the fossil *Selaginella, S. fraipontii* and a member of the Carboniferous period and evolved in different phyletic line *Selaginella selaginoides* as isophyllous species having actinostelic stem is considered the primitive most extant members and closely resembles *S. fraipontii*. More recently, Johnson (1986) established these new section with *marsilea* using characters such as sporocarp teeth, Sporocarp

attachment to the stalk, leaf venation and the position roots along the rhizome. The reproductive structure Marsilea, the sporocarps are borne on Stalks (also termed "peduncles", "Stipes", or "pedicels"). Marsilea sporocarps comprise a sclerified wall surrounding bisporangiate sori (Nagalingum *et. al.* 2006).

Materials and Methods -

The Western Ghats Himanchal Pradesh, Utarakhand and North Himalayas region (J.k.) are one of the well recognized hot spot of pteridophyte biodiversity in India. Pteridophytes are spread between 7.9^0-20°3' North and 72°6 East covering distance approximately 1650 km from Gujarat to Kannyakumari.

Pteridophytes from their natural occurrence had been collected by random selection basis considering three points spots per population, per species, per area. Plants were removed from surface/water gently and packed in polythene bags containing soil. Different specific status of plants has been indentified by well known professor of advanced study centre, department of Botany B.H.U. Species were authenticated with the help of published literature and herbarium (Kuller 1997, 2000, Foller, Jenkins 2008).

The present study of peridophytes biodiversity is based on field observation of terrestrial pteridophytes Marsilea.

1. Morphology of Sporocarp Marsilea quadrifolia

Locality: Himanchal Valley

Description : Bisporangiate, long & short stalked, attacked with pedicle

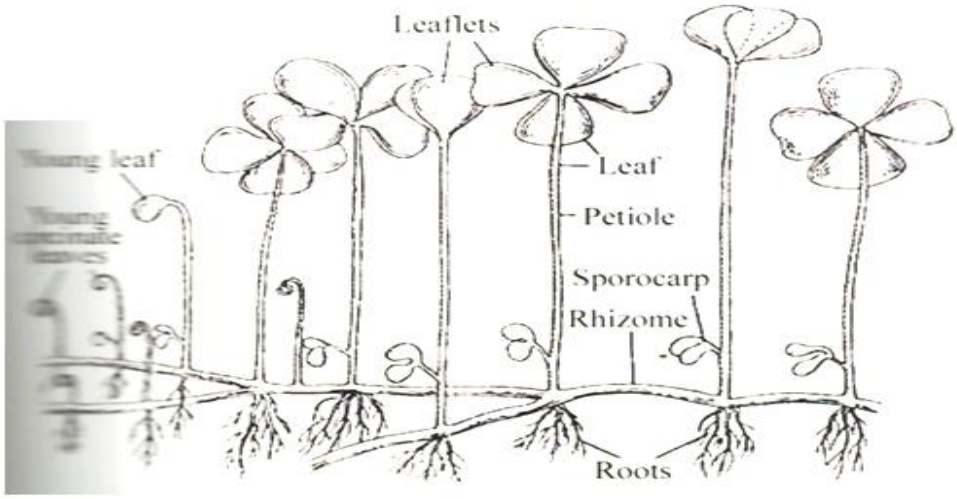
Table-1: Morphology of Sporocarp Marsilea quadrifolia

Locality : Himanchal Valley

Characters		Spot A		Spot B	
		Mega	Micro	Mega	Micro
No. of per sporangia		1	2	1	2
No. of per sorus		5	20	4	22
Shape		Bean shaped Triglonoid	Avoid nut like spherical	Less Triglonoid	Complete Spherical
Colour		Black	Dark brown	Black	Dark brown
Position in sporangia		Central on petiole	Basal on petiole	Central on petiole	Basal on petiole
Position in sporophy II		Inner Marginal	Marginal	Inner Marginal	Marginal
Range (µm)	Min. (L)	1840.25	998.50	1862.40	1004.56
	(B)	513.66	405.16	563.16	413.75

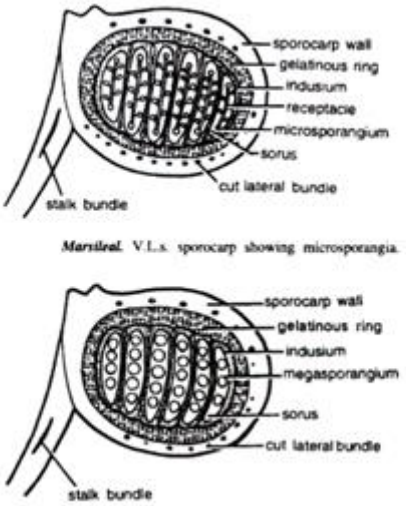
	Max. (L) (B)	2190.55 692.60	1540.10 862.10	2198.45 698.76	1525.25 854.10

Sorus are present, colour brown to black, sori overlap each other, mega sporangia short stalked & microsporangia long stalked arranged in regular rows, gelatinous ring present. 1-2 sori, mega sporangia, 4-5 in per sori where as micro sporangia 20-22 in No. mega sporocarp range in length 1840.25-2190.55 µm microsporangia range length 998.50-1540.10 and breadth 405.16-862.10 µm.



Marsilea quadrifolia

Marsilea minuta



Marsilea. V.L.s. sporocarp showing microsporangia.

Reproductive part Marsilea quadrifolia

2. Morphology of Sporocarp Marsilea quadrifolia

Locality: Doon Valley

Description : Bisporangiate with long (micro) short (mega) stalked, attacked with pedicle 2-3 sori are present per sporocarp, dark brown to black in colour, arranged outer side in rows, 2-gelatinous right present 4-6 mega sporangia are present in per sori, 18-20 microsporagnia size of mega sporangia range 1755.16-2085.00 µm in length range in breadth 519.62-690.45 µm microsporangia range in length 955.26-1694.21 and breadth µm 394.20-850.14 µm.

Table-2: Morphology of Sporocarp Marsilea quadrifolia

Locality : Doon Valley

Characters	Spot A		Spot B	
	Mega	Micro	Mega	Micro
No. of per sporangia	1	2	1	2
No. of per sorus	4	20	3	22
Shape	Triglonoid	Spherical	Less Triglonoid	Complete Spherical

Colour		Black	Dark brown	Black	Dark brown
Position in sporangia		Central on petiole	Basal on petiole	Central on petiole	Basal on petiole
Sori No.		1	2	1	2
Position in sporophy II		Inner Marginal	Marginal	Inner Marginal	Marginal
Range (µm)	Min. (L)	1755.16	955.26	1760.41	960.14
	(B)	519.62	394.20	52.40	395.72
	Max. (L)	2085.60	1694.21	2096.79	1687.35
	(B)	690.45	850.14	691.50	846.20

3. Morphology of Sporocarp Marsilea quadrifolia

Locality : Himalayan Valley (J&K)

Description: Bisporangiate with long & short stalked, general originate by 3- lets, attached with pedicle brown to black in colour, bean shaped, arranged in 2 or 3 rows, gelatinous ring present, 3-5 mega sporangia present in per sori & 15-18 micro sporangia present mega sporangia range 1690.40-1996.30 µm in length and range in breadth 506.26-670.82 µm, microsporangia range in 5.14-1590.22 breadth 375.67-801.32 µm.

Table 3: Morphology of Sporocarp Marsilea quadrifolia

Locality : Himalayan Valley (J&K)

Characters	Spot A		Spot B	
	Mega	Micro	Mega	Micro
No. of per sporangia	1	2	1	2
No. of per sorus	3	15	5	18
Shape	Triglonoid	Spherical	Less Triglonoid	Complete Spherical
Colour	Black	Dark brown	Black	Dark brown
Position in sporangia	Central on petiole	Basal on petiole	Central on petiole	Basal on petiole
Sori No.	1	2	1	2
Position in sporophy II	Inner Marginal	Marginal	Inner Marginal	Marginal

Range (μm)	Min. (L)	1690.40	945.14	1698.35	928.14
	(B)	506.26	375.67	513.30	359.22
	Max. (L)	1996.30	1590.22	2096.79	1569.34
	(B)	670.82	801.32	691.50	809.22

Marsilea Species

Marsilea biodiversity provides an independent hypothesis for investigating taxonomically important morphological characters, such as sporocarp teeth, raphe and place of maturation. Sporocarps are on stalks and in some species, a portion of the stalk fuses with the sporocarp body. fiming a structure called the raphe. In some cases, the distal portion of the alk does not fuse with sporocarp, instead it projects above the sporocamp body. This projection is regarded as the inferior tooth and is dependent on the presence of a raphe. Whereas the inferior tooth occurs at the tip of the stalk, the superior tooth occurs directly at the apex of the sporocarp body. The inferior and superior teeth are clearly not homologous, deriving from different components of the sporocarp and sometimes co-occurring. The teeth exhibit a high degree of variability within and among species, from completely absent to a shallow hump to a conspicuous projection. Gupta (1962) regarded the teeth as too inconsistent for systematic use, whereas Braun (1871) considered to be taxonomically important. Johnson (1986) noted that the inferior tooth was quite variable and could be present or absent within a species; however, he regarded the superior tooth as a more consistent character for species-level identification.

Our ancestral state reconstructions for the superior and inferior teeth indicate that the plesiomorphic condition for Marsilea is the absence of sporocarp teeth. On the basic distribution of Marsilea shows biodiversity at same places in different study sites. Marsilea Willd is a very rare species, reported at only two sites in Puglia which have yet to be studied in depth. As the population described here is 30 km away from the other, it would be interesting to study the mechanism of spore dispersal. Guppy (1906) suggested that Marsilea spp. might be dispersed by adhering to the external surface of birds. Brown et al. (1964) on the other hand, found that spores of some terrestrial ferns may be dispersed by wind. Both of these dispersal methods seem unlikely for Marsilea because of size and weight of the porocarps, although intact sporocarps have been found in the stomachs of Various birds (McAtee 1939).

Species diversity and distribution at different attitudinal zone were diverse based on their withstanding capacity to those conditions similarty, pteridophytic flora may be controlled by the environmental factors such as temperature, rainfall and humidity whereas the deep ravines, continously flowing streams, water channels, thick evergreen forests regulate the canopy of this attractive vegetation. Forests by visitors and locals for coma mental purpose, medicinal purposes and during excursions have also increased the pressure for survival on these plants. Such threats apart neverthless, the same region, one of the last bastions of pteridophytic wealth in the sites. However this proposal is kept in abeyance due to the agitation by local people and considering the ecological sensitiveness of the region. There is a dire need to identify and conserve such threatened ecosystems which consist of the germplasm of most humid tropical pteridophytes. Also, the sore lack of knowledge on pteridophytes among the public in general is a major issue to be addressed through awareness programmes for holistic habitat conservation.

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