ORIGIN AND EVOLUTION OF PTERIDOPHYTES

PAPER-I

TDC Part-I (Hons.)
(2019-22)

Group-B

Introduction:

On account of a prominent gap existing in between the Pteridophytes and other plant groups occupying a lower rank in the scale of evolution, the subject of the origin of the present-day Pteridophytes is a highly debatable issue. Pteridophytes formed a dominant flora of the earth during palaeozoic and mesozoic periods, and majority of them became extinct subsequently. Only a limited number of extant forms are existing today. Three lines of evolution — Psilophytian, Lycopodian and Sphenopsida — have been explored by Pteridologists.

Origin of Pteridophytes:

There are two distinct schools of opinion regarding the origin of Pteridophytes, one proposing an origin from algae and the other from Bryophytes.

(A) Algal Origin:

(i) According to the advocates of an algal origin of Pteridophytes (Scott, 1900; Church, 1919; Eames, 1936; Arnold, 1947), the similarities observed between the bryophytes and pteridophytes are not due to any phylogenetic relationship existing in between the two groups, but these are the results of a parallel evolution.

(ii) While Scott (1900) and Eames (1936) do not suggest any particular group of algae as the supposed ancestors, other workers like Church (1919) and Arnold (1947) are of the opinion that the Pteridophytes originated from some complex marine algae transmigrating from the ocean to the land. Obviously their idea

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implies that the Pteridophytes evolved from the Phaeophyceae.

(iii) On the other hand, Bobkin (1901), Lotsy (1909) and Fritsch (1916) believe that this origin has taken place from some Chaetophora-like filamentous green algae. In a subsequent publication, Fritsch (1945) expressed this idea that the hypothetical ancestor was a green alga with an erect parenchymatous body possessing an isomorphic alternation of generations in its life cycle.

(B) Origin from Bryophytes:

(i) Leguier (1903), Bower (1935), and Zimmermann (1930, 1938) believe that the bryophytes and the pteridophytes are phylogenetically connected but divergently developing evolutionary lines, which have separated early from very primitive archegonia-bearing hypothetical land plants.

(ii) However, Campbell (1895, 1899, 1924) is of the opinion that the Pteridophytes have originated from the true bryophytes of the anthocerotean type.

This idea was opposed at first on the ground that wide differences exist between the sporophytes of the known Pteridophytes and that of the anthocerotean type. But when the rootless, non-leafy and dichotomously branched sporophytes of the psilophytales were discovered, this objection was rendered invalid.

(iii) Though nothing is known about the embryology of the members of Psilophytales, but a surprisingly superficial resemblance exists in between the embryos of the living Psilotales and the Anthocerotes.

Evolution among the Pteridophytes:

(i) Among the Pteridophytes, Psilophytales are very simple as well as very primitive,

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and they can be traced as far back as the Silurian. Their sporophytes were rootless and represented by either completely leafless branches or by branches having minute veinless leaves.

(ii) The sporangia were borne singly and terminally at the tip of a branch. From this Psilophytean stock probably there appeared early in different divergent directions all the present-day Pteridophytes.

(iii) It has, however, been suggested by many authors that the simplicity of the Psilophytales had resulted from reduction in response to some environmental stimulus, rather than being manifestation of genuine primitiveness.

The much supporting evidence for such a hypothesis is that the Silurian Baragwanthia, a lycopod, was already well-defined and strongly established prior to the appearance of most of the psilophytaceous plants, which are conceived as ancestral to all other forms.

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