

# ORIGIN AND EVOLUTION OF BRYOPHYTES

PAPER - I

Group - B

Introduction:

On account of scanty fossil records and palaeobotanical evidences, the origin of bryophytes is not definitely known.

There are two different schools of opinion to establish the possible ancestors that might have contributed to the origin of bryophytes. Algal hypothesis and Pteridophytean hypothesis are worth mentioning in this regard.

## 1. Algal Hypothesis:

(i) Adherents to the algal hypothesis include Lignier (1903), Bower (1908), Fritsch (1945), Smith (1955), etc.

(ii) By many prominent workers bryophytes are supposed to have originated from some heterotrichous green algae belonging to the Order - Chaetophorales (e.g., Frittschiella, Coleochaete, Drapenaldia).

(iii) Strain (1948) held the view that the pigments, chlorophylls and xanthophylls of Chlorophyceae are identical with those found in Bryophytes.

(iv) Previously it was thought that an oogamous green alga, after its migration from water to land, gave rise to the sexual plant (gametophyte) of a bryophyte, and the phenomenon of alternation of generations also appeared simultaneously.

But alternation of generations takes place independently in diverse groups of green algae, like Ulvariales, Chaetophorales and Cladophorales, a possibility was that ancestral algae might have been isogamous as well.

(v) The primitive form of the gametophyte in Bryophytes is itself controversial. Hence, it becomes uncertain what kind of gametophyte...

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could have evolved from the ancestral algae. (2)  
(vi) Davis (1903) put forth the hypothesis that both the sex organs (antheridia and archegonia) of bryophytes evolved from a multicellular gametangium of algae by gradual sterilization.

(vii) As to the origin of sporophytes in bryophytes, there are again two schools of opinion: Homologous (Modification) theory and Antithetic (Intercalation) theory.

(viii) Believers of homologous theory (Church, 1919); Zimmermann, 1932; Fritsch, 1945) held that sporophyte has evolved as a result of modification in the gametophyte. According to these workers, both the gametophytic and sporophytic generations of the primitive bryophytes were externally complex, isomorphic and free-living plant bodies. In course of time, the sporophyte got attached to the gametophyte and became a partial parasite. On the latter and structurally less complex.

(ix) Advocates of the intercalation theory (Anderson, 1923), however, believe that the sporophyte became gradually more and more complex from a simple one by progressive sterilization of the sporogenous tissue. They believe that the sporophyte is a completely new structure placed in between two successive sexual or gametophytic generations.

2. Pteridophycean Hypothesis  
(i) supported by Wettstein (1903), Scott (1911), Lang (1917), Kidston & Lang (1917-1921), Kashyap (1949), Takhtajan (1953), Mehra (1953), Christensen (1954), Proskauer (1960), Zimmermann (1966), etc.

(ii) This theory suggests that the bryophytes are the descendants of pteridophytes and evolved by the progressive degeneration of pteridophytes, i.e., regressive evolution of the simpler forms (liverworts) from the more complex mosses.

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(3)

(iii) The basis of this theory lies on the similarity between the earliest vascular plants, Psilophytopsida (or Rhyniopsida) of the Upper Silurian to Lower Devonian age, and the sporophytes of certain mosses (Andropogon, Funaria, Sphagnum, etc.) and members of hornworts (Anthoceros, Dendroceros, etc.).

### Evolution among the Bryophytes:

(i) Evolution appears to have taken place among bryophytes along three different lines — Hepaticae, Anthocerotae and Musci.

(ii) If the view of Campbell (1891, 1918, 1936) and Cavers (1910) be accepted that the gametophyte of the most primitive bryophyte was a simple thalloid body, then the simplest bryophytic gametophytes can be found among the family Sphaerocarpaceae of the liverworts (Hepaticae).

(iii) The simplest sporophyte, on the other hand, will be found among the family Ricciaceae belonging to the same class. For this reason, Lotsy (1909) suggested an imaginary genus Sphaero-riccia which was supposed to be the protobryophyte, the hypothetical ancestor of the present-day bryophytes.

(iv) Among the Hepaticae the Sphaerocarpaceae appear to be the most primitive, with which the Marchantiales are related to some extent.

(v) The Orders Tungetmanniales and Calobryales, which are considered both as advanced as well as the most primitive by different workers, are rather remotely connected with other groups of Hepaticae.

(vi) Some workers believe that the leafy

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hepatics (Jungermanniales and Calobryales) have given rise to the true mosses. But taking the question of ontogeny of sex organs and the early developmental stage of the embryos into consideration, it seems more likely that the true mosses appeared quite independently of the hepatics. Both the classes Hepaticae and Musci, however, appear to be blind side lines from the evolutionary standpoint.

(vii) On account of similarities in the structure of gametophytes as well as in the ontogeny of sex organs, it seems that the Anthocerotae might have originated and departed very early from some primitive Hepaticae. Further, due to indeterminate growth of its sporophyte, the Anthocerotae are supposed by some workers to have given rise to the Heridophytes.

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