Origin of Angiosperms

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More than one-hundred years ago, Darwin called the origin of angiosperms an "abominable mystery". Angiosperms appear rather suddenly in the fossil record, with no obvious ancestors for a period of about 80 to 90 million years prior to their appearance. Several theories suggest different pattern of origin in these group of plants.

Some of the widely accepted theories regarding the origin of angiosperms are as follows-

1. Isoetes-Monocotyledon Theory:

Isoetales, Lycopodales, ferns etc. have shown to possess many common characteristics with monocotyledons. Engler and his associates postulated that the monocotyledons have originated from various groups of Pteridophyte through a hypothetical herbaceous intermediate, the Proangiosperms.

Campbell suggested that though Isoetes shows similarity with monocotyledons like Najas flexilis with regard to habitat, anatomy of old sporophyte and resemblances in embryo, the differences in respect of simplest angiosperm flower and sporophylls of Isoetes need more evidence to support the hypothesis.

2. Conifer-Amentiferae Theory:

According to this theory, the higher gymnosperms like Conifers, Cordaites and others are considered as the probable ancestors of angiosperms. Engler (1882, 1892) and Rendle (1904, 1930) found the similarities of angiosperms with the conifers and considered the amentiferous group (Casuarinaceae, Fagaceae, Salicaceae etc.) as the most primitive dicotyledons.

3. Gnetales-Angiosperm Theory:

Richard von Wettstein (1901) emphasised the close relationship between Gnetales and angiosperms, after modifying the Engler's system as mentioned in Handbuch der Systematische Botanik. Later on, Markgraf (1930) and Fagerlind (1947) boldly supported the above view. Fagerlind demonstrated the homology among the

three genera of Gnetales (Ephedra, Welwitschia and Gnetum) and proposed that Gnetales and Pro-angiosperms evolved from a common ancestor.

4. Bennettitalean Theory:

According to Saporta and Marion (1885), and Arber and Parkin (1907), the Bennettitales of gymnosperm is the possible ancestor of angiosperms. They considered Benettitales as the possible ancestor of angiosperms due to similarities between the strobili of Cycadeoidea, a Mesozoic genus and the flower of Magnolia.

5. Caytonialean Theory:

The Caytonialean theory was proposed by H. Hamshaw Thomas (1925, 1936). His proposition was based on comparative studies of angiosperms with the certain member of Caytoniales (the fossil members of middle Jurassic period).

Some fossil members of Caytoniales had anthers developed singly or in groups on pinnately branched structures that are described as sporophylls (Fig. 4.34). The above structures can be compared with the branched stamens as found in plants like Ricinus (Euphorbiaceae), Calothamnus (Myrtaceae) and Hypericum (Clusiaceae). He also explained how angiosperms originate from Caytoniales. According to him, the carpel wall of angiospermic plants represents a pair of concrescent cupules and the probable origin of stigma should be judged in the light of these primitive forms.

6. Pteridosperm Theory:

The Pteridosperms are also known as Cycadofilicales or seed ferns. They are so called because the plants show fern-like leaves; some of them bears leaves associated with cycad-like stem showing difference in stem anatomy with ferns. They bear true seeds. They were reported abundantly from Upper Devonian to Permian of Paleozoic Age. Plants are often monoecious, but micro- and megasporophylls are not arranged in definite strobili. Based on the above characteristics of stem, leaf and seed, they are considered as the probable ancestors of Bennettitales.

The various evidences and interpretations discussed the possibility of Cycadales, Bennettitales or any other gymnosperms to be the ancestor of angiosperms. Therefore, emphasis was given to the Pteridosperms as the possible ancestor. Cronquist (1968) stated that “it is a long way, morphologically, from any known seed fern to an angiosperm, but each of the differences could logically be bridged in the course of evolution”.

7. Pentoxylales Theory:

The Pentoxylales is a group of fossil under Pteridosperms. Meeuse (1961) proposed that angiosperms have originated from Pentoxylales. He found several similarities between Pentoxylales and the living order Pandanales.