Takhtajan's System of Classification of Angiospermic Plant

Salient Features -

- For the origin of angiosperms Takhtajan (1959) pleaded the phenomenon of Neoteny, defined as the attainment of reproductive stage at a juvenile stage.

- In his opinion, the transitional groups between gymnosperms and angiosperms existed as small populations where evolution took place at an accelerated rate. These populations provide the combination of genetic drift and selection, which are most effective in promoting rapid evolution.

- The evolution in the immediate ancestors of angiosperms must have been very rapid and facilitated the production of large adaptive modifications. Under such conditions, one of the ancient branches of gymnosperms must have initiated a more progressive group of seed plants that possessed high adaptability and plasticity. This group was unusually plastic, because it developed through neoteny.

- He considered angiosperms to be monophyletic which arose from some very ancient group of gymnosperms (like Bennettitales) and monocots to have originated from primitive dicots with apocarpous flowers presumably something like the present day Nymphaeales.
**Evolutionary Thoughts of Takhtajan**

While evaluating the evolutionary trends, he considered that:

1. **Woody plants are primitive than herbaceous ones.**
2. Simple pinnately net veined leaves are primitive than pinnately lobed, pinnatifid and pinnatisect leaves with palmate venation. Alternate leaf arrangement is primitive and opposite or whorled types are derived from it.
3. **Mesogenous and paracytic stomata are primitive than perigenous anomocytic ones.**
4. Tri-multilacunar nodes with a double trace at the median leaf gap are primitive, from which all other types have arisen.
5. **Primitive wood is vessel less and the tracheids have scalariform bordered pits.**
6. Solitary and terminal flowers are primitive and probably represent the surviving member of the reduced inflorescence.
7. The primitive flowers have a moderately elongated floral axis on which large number of distinct floral leaves are arranged spirally. The elongated axis shortened and there was gradual transition from spiral to cyclic arrangement of floral leaves in advanced taxa.
8. **Actinomorphic flowers are more primitive than zygomorphic ones.**
9. The primitive stamens are leaf like showing no differentiation of filament and connective and microsporangia are present on the abaxial or adaxial side of the microsporophyll.
10. **Monocolpate pollen grains are primitive and tricolpate and others are derived.**
11. **Bitegmic ovules are primitive from which unitegmic ovules arose; among various types, anatropous ovules are considered most primitive from which others are derived.**
12. **Primitive flowers are entomophilous. Anemoplily arose from entomophily.**
13. **Seeds of primitive angiosperms are large with abundant endosperm and undifferentiated embryo. In advanced taxa, the seeds are non-endospermic or with reduced endosperm and the embryo differentiated.**
14. Follicular fruits developing from multicarpellary apocarpous gynoecia are primitive.

Based on above evolutionary conceptions Takhtajan (1969) divided the angiosperms (Magnoliophyta) into two subclasses *viz.* Magnoliate (Dicots) and Liliatae (Monocots); the former being further divided into 7 subclasses; 15 superorders and 74 orders and the latter into 4 subclasses, 5 superorders and 20 orders.
Fig: Outline of System of Classification of Takhtajan
Critical Comments -

Merits -

1. Families Myristicaceae and Monimiaceae are kept under orders Magnoliales and Laurales.

2. Canellaceae which was placed among families of Parietales is shifted to Magnoliales.

3. Family Lauraceae is placed under Laurales which was formerly treated as member of Monochlamydeae.

4. Genera *Eupomatia* and *Lactoris* which were treated as members of families Annonaceae and Piperaceae respectively are given family rank and placed Magnoliales and Laurales.

5. Ceratophyllaceae, has been put amongst primitive aquatic families of Nymphaeales.

6. Families Illiciaceae and Schizandraceae which were formerly included in Magnoliaceae, are treated as separate families.

7. Urticales and constituent taxa of Amentifere e.g. Casuarinales, Fagales, Leitneriales etc. are treated as to be advanced and derived from Hamamelidales.

8. Cactaceae is included in Caryophyllales.

9. *Paeonia* has been separated from Ranunculaceae and placed in an unigeneric family Paeoniaceae.

10. Trapaceae is separated from Onagraceae, similarly Cuscutaceae is treated as separate family from Convolvulaceae.

11. Callitrichaceae is placed under Lamiales.

12. Compositae (Asteraceae) is placed at the top of the dicotyledons.

13. Alismatales are regarded as basal order of monocots.

14. Cyperaceae and Gramineae (Poaceae) are placed under separate orders.
Demerits -

1. The family Papaveraceae is kept far apart from Capparales comprising families Capparaceae, Brassicaceae etc. Serologically these families are closely allied and the Rhoeadales from a natural group. In this system, Papaverales are kept under Ranunculidae and the Capparales under Dillinidae.

2. In Malvales, ten families have been placed, But pollen structure and embryological characters show that the order can be conveniently split in to two orders. viz. Malvales and Tiliales (Hutchinson, 1959), the former comprising only of Malvaceae and latter of rest other families. Moreover, family Scytopetalaceae is more allied to Tiliales rather than to Malvales.

3. In Gentianales, among other families, Rubiaceae is included. This family is more allied to Dipsacales.

4. The Arecidae, have been kept in the last which are in no case, more evolved than Orchidaceae and Zingiberaceae.