ENGLER-AND-PRANTL'S-SYSTEM OF CLASSIFICATION

Adolf Engler (1844-1930) and **Karl Prantl** (1849-1893), the two German botanists published their classification in a monumental work called ***Die Natürlichen pflanzenfamilien*** in 23 volumes during 1887-1899. This system, often considered the beginning in phylogenetic schemes, was not strictly phylogenetic in the modern sense. It was an arrangement of linear sequence starting with the simplest groups and arranged in the order of progressing complexity. The system provided classification and description down to the genus level, incorporating information on morphology, anatomy and geography. American and European scientists were adopted Engler and Prantl's system but not British scientists. These were following Bentham and Hooker's system in the light of modifications produced by Bessey. It is based on Eicher's system.

THE SALIENT FEATURES OF ENGLER AND PRANTL CLASSIFICATION ARE

1. The most primitive plants are anemophily and most advanced plants are insect pollinated.
2. Unisexual plants are primitive and bisexual flowers are advanced flower and originated from the unisexual flower.
3. In advanced ones, numbers of sepals and petals are increased.
4. Achlamydeous flowers or monochlamydeous flowers were considered to be primitive and those with two-whorled perianth distinguished into sepals and petals as advanced.
5. Free condition of floral parts is primitive; where united is the sign of advanced.
6. Female flowers evolve from megasporophyll and male from microsporophyll of Gymnosperms.
7. Chalazogamy was considered to be a primitive character.
8. Zygomorphy was considered to be more advanced than actinomorphy.
9. Epigynous condition is more advanced than hypogynous condition.
10. Aporcarpy is regarded as a primitive character over syncarpy.
11. The evolution of Angiosperms is regarded as polyphyletic.

OUTLINE AND BASIS OF CLASSIFICATION

1. This system deals with all groups of Plant-Kingdom i.e., Bacteria, Algae, Fungi, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms.
2. The system provides modern taxonomic keys for the identification of each group of plants.
3. Plant Kingdom has been divided into 13 Divisions. Divisions 1 - 12 deal with Bacteria, Algae, Fungi, Bryophytes and Pteridophytes.
4. The 13th Division is named as **Embryophyta Siphonogamia** which includes all seed plants. It is divided into 2 sub-divisions
    i) **Gymnospermae** (naked ovules/seeds)
    ii) **Angiospermae** (enclosed ovules/seeds)
5. The sub-division Gymnospermae has been divided into 7 orders, from Cycadofilicales to Gnetales. They were considered to be primitive hence they were placed before Angiosperms. From various groups of gymnosperms, angiosperms are evolved into monocots and then dicots. It means that dicots are advanced whereas monocots are primitive.
6. The sub-division Angiospermae divided into two Classes
    i) Monocotyledonae
    ii) Dicotyledonae
7. Though the system is not phylogenetic in the complete sense, Angiosperms are arranged in an ascending series according to the increased complexity and elaboration of flowers.

8. They believed that Angiosperms are derived from a hypothetical group of plants called Protangiosperm related to an unknown taxon of extinct Gymnosperms.

Engler considered the monocot to be more primitive than dicot.

MONOCOTYLEDONEAE:

The monocotyledoneae includes **11 Orders and 45 Families**, commencing with First order **Pandanales** which possesses naked, unisexual flowers with **Typhaceae** as the beginning family and is considered to be most primitive.

It is followed by **Helobiae** which have naked unisexual flowers.

The Order **Liliflorae** includes both **Liliaceae** and **Amaryllidaceae** due to their close similarity although the former has hypogynous and the latter Epigynous flowers.

The family **Orchidaceae** is considered to be the most advanced one and it is placed at the end of the classification in the Order Microspermae.

The Order Glumaceae which includes Gramineae is the fourth Order and due recognition is not given to its advanced characters.

DICOTYLEDONEAE: The class Dicotyledoneae is divided into two sub-classes.

i) Archichlamydeae, and
ii) Sympetalae or Metachlamydeae

I. Archichlamydeae

Engler united polypetalae and monochlamydeae into a separate group called Archichlamydeae in which dicot plants with sepals and petals free are included.

In this, the first families are achlamydeaous or Monochlamydeous and the later ones are dichlamydeous and polypetalous.

Thus, Monochlamydeae or Bentham and Hooker's system is not recognized and the families of this group are placed in Archichlamydeae. It has 33 Orders and 206 Families.

The first order being Verticillatae and Casuarinaceae as the starting family.

The Cassurinaceae included in Verticillatae is considered to be primitive on account of Chalazogamy.

The last order being Umbelliflorae with Cornaceae as the last family.

The first Orders of Archichlamydeae are Verticillatae, Piperales, Salicales, Garryales, etc. which has naked unisexual, wind pollinated flowers in catkins or aments.

These families with aments of wind-pollinated flowers are referred to a homogenous group called Amentiferae.

The achlamydeous families are followed by the Monochlamydeous ones the Centrospermae is the last Order having families with one whorl of perianth.

The dichlamydeous polypetalous families start with Rannales in which the flowers are spirocyclic or cyclic and hypogynous.

The apocarpy is recognized to be primitive.

In Polypetalae, orders end with Myrtiflorae and Umbelliflorea, which have Epigynous families.

ii. Sympetalae or Metachlamydeae

The Sympetalae includes gamopetalous families. Sympetalae has 11 Orders with 52 Families.

The first Order being Ericales with Clethraceae as the starting family.

The last order is Campanulales with Asteraceae as the last family.

The Orders Contortae and Tubiflorae include families of Bicarpellate of Bentham and Hookers, system which are hypogynous.
The Rubiales having Rubiaceae, Cucurbitales with Cucurbitaceae and Campanulales with Compositae are placed at the end of this sub-class.
These three Orders are placed at the end in Sympetaleae on account of its gamopetalous corolla overlooking its relationship with Passifloraceae as Bentham and Hooker is placed.
The placing of Composite at the end of Sympetalae is justified on account of several advanced features like.

- ✓ The presence of a captiulum
- ✓ Zygomorphy of ray florets.
- ✓ Unisexuality of ray florets.
- ✓ Adaptation of pollination and Excellent means of dispersal of its fruits.

MERITS

1. It is a Phylogenetic system. Plant groups are arranged mostly according to evolutionary affinities (Primitive groups followed by advanced).
2. This system of classification is a development over Eichler in many respects.
3. The system deals with all groups of Plant-Kingdom - Bacteria, Algae, Fungi, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms.
4. It provides modern taxonomic keys for the identification of each group of plants.
5. Gymnosperms treated as a separate group and kept under separate sub-division. Its position before Angiosperms is very accurate and is in perfect accordance to the modem concept of evolution.
6. The position of Asteraceae (Compositae) as the last family of Dicot is very logical and accurate because it is the highest evolved family of Dicots.
7. The position of Orchidaceae at the end of Monocots is also very accurate and it is as the most evolved family of monocots.
8. Anatomical data were taken into consideration in this system of classification for the first time.
9. The large artificial group of Bentham and Hooker's system, monochlamydeae has been completely abolished, and its families have been distributed among the related forms with free petals in Archichlamydae series.

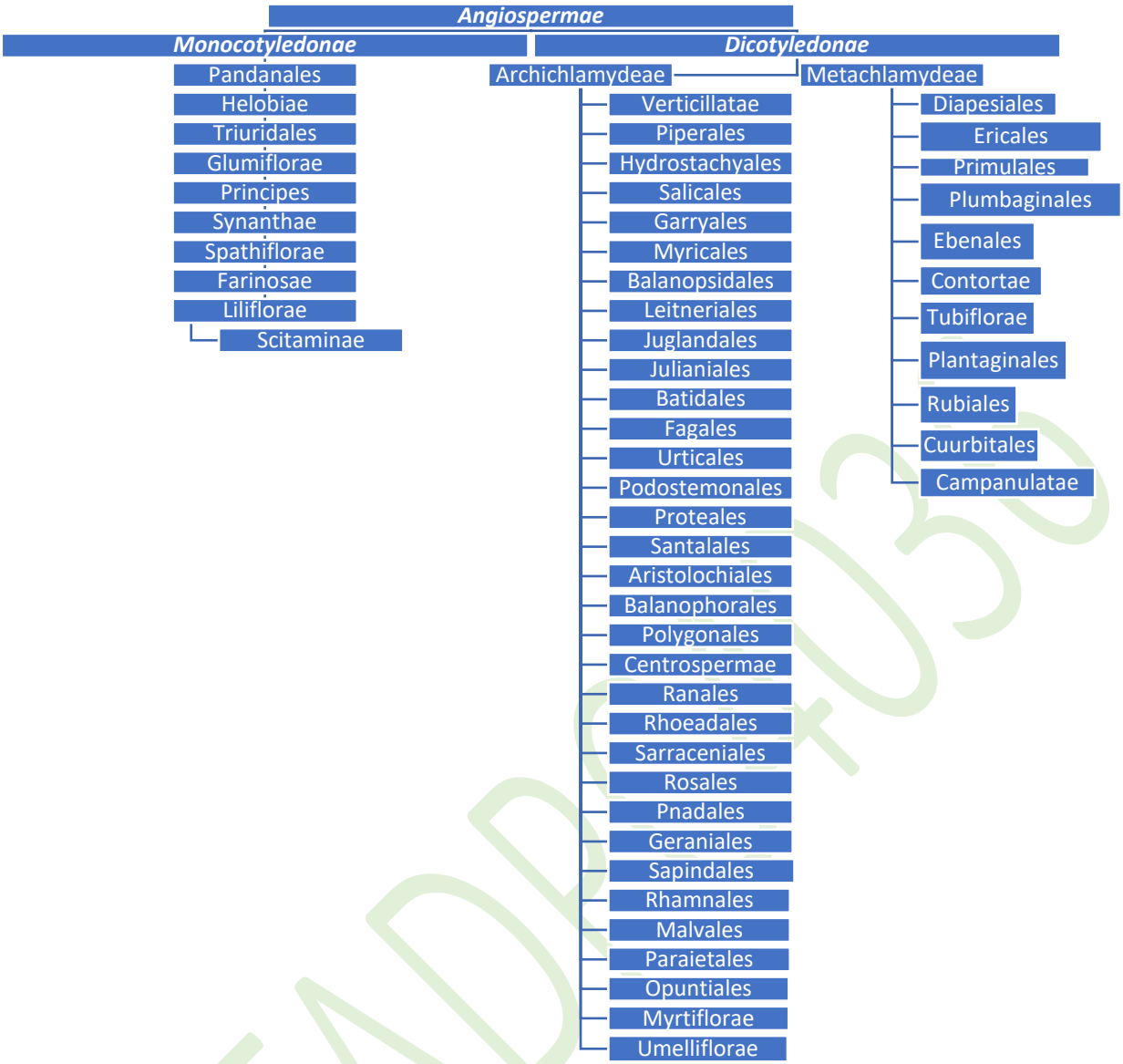
DEMERITS:

1. Monocots have been considered to be more primitive than dicots; which does not correspond to the modern evolutionary evidences.
2. The concept of primitive flower (unisexual, achlamydous) is against the modern concept of evolution.
3. Combining Achlamydeous families with Polypetalous families to form Archichlamydeae is not desirable as it has resulted in the formation of a very large group 33 Orders and 206 families.
4. The system is not of much practical utility.
5. Amentiferae and Centrospermae placed at the beginning of Ranales.
6. Helobae with naked flowers is placed in between Pandanales and Glumiflorae.
7. Derivation of bi-sexual flower from unisexual.
8. Parietal placenta is advanced over axile placentation.
9. Derivation of dichlamydeous flower (perianth in two series) from monochlamydeous ones (perianth in single series) is objectionable.
10. Derivation of entomophily from anemophily.

The system of Engler and Prantl is very much criticized on account of the following reasons:

1. Phylogenetically, it is not possible to envisage any relationship between the achlamydeous families of Angiosperms with any of the Gymnospermous stock that could be the ancestors.
2. Parkin and Hutchinson consider that Angiosperms have evolved in a monophyletic manner.
3. Chalazogamy is not a primitive character.
4. Evidence from floral anatomy shows that the naked flowers of amentiferous families are not primitively simple but simple due to reduction and disappearance of perianth.
5. The presence of vestigial traces shows that the perianth parts are suppressed.
6. Engler's system considers unisexual flowers as primitive.
7. But there is more conclusive evidence on the basis of floral anatomy to show that unisexual condition is derived from the bisexual one by suppression of either stamens or gynoecium.
8. The occurrence of vestigial vascular races, presence of staminodes in female flowers and pistillode in female flower support this view.
9. Wind-pollination in Angiosperms is not primitive and Parkin considers that it is secondarily derived from entemophilous condition due to reduction of perianth.
10. The evidence from anatomy, palynology, etc. is more convincing to conclude that Ranalian stock is primitive and that the flower of Magnolia represents a primitive Ranalian flower.

Kingdom	Plantae	
Divisions	*i) Schyzophyta* *ii) Myxomycetes* *iii) Flagellatae* *iv) Dinoflagellatae* *v) Heterocontae* *vi) Bacillariophyta* *vii) Conjugate* *viii) Chlorophyceae* *ix) Charophyta* *x) Phaeophyceae* *xi) Rhodophyeae* *xii) Eumycetes* *xiii) Archeogonatae* *Embryophyta Siphonogama*	
Subdivisions	*A. Gymnospermae*	*B. Angiospermae*
Class	*1. Cycadofilicales* *2. Cycadales* *3. Bennettitales* *4. Ginkgoales* *5. Cordaitales* *6. Coniferales* *7. Gnetales*	*1.Monocotyledonae* *2.Dicotyledonae*


Angiospermae
Monocotyledonae
Pandanales
Helobiae
Triuridales
Glumiflorae
Principes
Synanthae
Spathiflorae
Farinosae
Liliflorae
Scitaminae
Dicotyledonae
Archichlamydeae
Verticillatae
Piperales
Hydrostachyales
Salicales
Garryales
Myricales
Balanopsidales
Leitneriales
Juglandales
Julianiales
Batidales
Fagales
Urticales
Podostemonales
Proteales
Santalales
Aristolochiales
Balanophorales
Polygonales
Centrospermae
Ranales
Rhoeadales
Sarraceniales
Rosales
Pnadales
Geraniales
Sapindales
Rhamnales
Malvales
Paraietales
Opuntiales
Myrtiflorae
Umelliflorae
Metachlamydeae
Diapesiales
Ericales
Primulales
Plumbaginales
Ebenales
Contortae
Tubiflorae
Plantaginales
Rubiales
Cuurbitales
Campanulatae

Assignment

Q1. Give an account of Engler and Prantl system of classification.

Q2. Explain Merits and demerits of Engler and Prantl system of classification.

Q3. Differences between Bentham and Hooker and Engler and Prantl systems of classification.