**PLANT CLASSIFICATION**

***by Bentham and Hooker***

**Introduction:**

George Bentham (1800-1884) and Joseph Dalton Hooker (1817-1911), the two English Botanists, associated with the Royal Botanic Garden, Kew, England presented their natural system of classification in their book “The Genera Plantarum”. The first volume of this book appeared in Latin and was published in July, 1862 and the second volume of the Genera Plantarum and the rest was written by Hooker.

The Bentham and Hooker system shows many similarities with the classificatory systems of Bessey and Hutchinson and is based on de Candolle’s and Jussieu’s system.

Bentham and Hooker took great pains to define and to delimit various taxa. They examined each and every species in the Kew botanic gardens. Further, Bentham and Hooker provided first hand descriptions of the families and genera of seed plants then known. Hence, this system was considered to be the best taxonomic work ever produced in the United Kingdom.

In the Genera Plantarum they named, described and classified 97,205 species of flowering plants. They grouped these species into 202 orders (now called as families). Every genus was described with the help of herbaria. So they provided all the information about all genera known at that time. In the classification system key characters have been listed for each of the families. These key characters enable the students of taxonomy to easily identify and assign any angiosperm plant to its family.



Bentham and Hooker’s scheme of classification:

They divided the plants into two sub-kingdoms:

1. **Cryptogamia- non seed bearing**
2. **Phanerogamia- seed bearing**

Cryptogamia reproduce mainly by spores, which are unicellular. Cryptogamia are further divided into three groups.

* Thallophyta
* Bryophyta and
* Pteridophyta.

The Phanerogams are seed producing plants. These were further sub-divided into three groups.

-Group I: Dicotyledons (Exogenes)

-Group II: Gymnosperms

-Group III: Monocotyledons (Endogenes)

**Group I:- Dicotyledons (Exogenes)**

1. Herbs, shrubs or trees of different habits.
2. Floral parts free or united, usually five or multiples of this number.
3. Ovules enclosed in an ovary.
4. Embryo with two cotyledons.
5. Radical forms the primary root.

**Group II:- Gymnospermae**

1. Shrubs or trees.
2. Leaves needle like or scaly.
3. Flowers in cones, spikes or clusters and unisexual.
4. Perianth absent.
5. Ovules naked and not enclosed in ovary.

**Group III:- Monocotyledons (Endogenes)**

1. Herbs, more rarely shrubs or arborus as in palms and bamboos.
2. Leaves large, parallel-veined.
3. Perianth generally trimerous free or united.
4. Embryo with one cotyledon.
5. Radical short-lived and is replaced by adventitious roots.

**DICOTYLEDONS (Group I)**

**Division (Sub-classes):**

**I : Polypetalae:** Flowers bear perianth **(**Calyx and Corolla) in two whoris. Petals free, stamens are not united with petals.

They are further sub-divided into three series:

Seies I: Thalamiflorae

Series II: Disciflorae

Series III: Calyciflorae

**Series I: Thalamiflorae:**

1. Flowers hypogynous.
2. Perianth lobes in several whorls.
3. Stamens and carpels are usually indefinite and inserted on the receptacle.
4. Carpels most frequently free.

This series includes 6 Cohorts (orders) and 34 orders (families):

Cohort I- Ranales (it includes 8 families or orders)

Cohort II- Parietales (it includes 9 families or orders)

Cohort III- Polygalinae (it includes 4 families or orders)

Cohort IV- Caryophyllineae (it includes 4 orders or families)

Cohort V- Guttiferales (it includes 6 orders or families)

Cohort VI- Malvales (it includes 3 orders or families)

**Series II: Disciflorae:**

1. Flowers hypogynous.
2. Perianth lobes definite in number.
3. Stamens usually definite and arranged within or upon receptacle(disk).
4. Ovaries free or embedded in the disc.

This series includes 3 cohorts and 19 orders(families) in addition to 2 anomalous orders:

Cohort VII- Geraniales(it includes 11 orders)

Cohort VIII- Olacales(it includes 3 orders)

Cohort IX- Celastrales(it includes 3 orders in addition to 2 anomalous orders)

**Series III: Calyciflorae:**

1. Flowers are perigynous or epigynous with enlarged saucer, cup or urn shaped thalamus which surrounds ovary and perianth leaves.
2. Calyx tubes usually surrounding ovary or adnate to it .
3. Stamens definite or numerous, arranged along margins of thalamus.

This series includes 5 cohorts and 27 orders( families):

Cohort X- Rosales (it includes 9 orders)

Cohort XI- Myrtales (it includes 6 orders)

Cohort XII- Passiflorale (it includes 2 orders)

Cohort XIV- Umbellales (iut includes 3 orders)

**II. (Sub-class): Gamopetalae:**

Flowers epigynous with inferior ovary.It includes 3 cohorts and 9 orders(families).

Cohort I- Rubiales (it includes 2 orders)

Cohort II- Asterales (it includes 4 orders)

Cohort III- Companulales (it includes 3 orders)

**III.(Sub-class): Monochlamydeae:**

(Incompletae or Apetalae)

1. Flowers bisexual, rarely unisexual.
2. Petals lacking.
3. There are no cohorts but divided into 8 series.

Series I- Curvembryae (it includes 7 orders)

Series II- Multiovulatae aquaticae (it includes 1 orders)

Series III- Multiovulatae terrestrae (it includes 3 orders)

Series IV- Microembryae (it includes 4 orders)

Series V- Daphnales (it includes 5 orders)

Series VI- Achlamydosporae (it includes 3 orders)

Series VII- Unisexmales (it includes 9 orders

Series VIII- Ordines anomoli [Anomalous orders] (it includes 4 orders)

**GYMNOSPERMAE(Group 2):**

Shrubs or trees, leaves needle like or scaly, flowers in cones, spikes or clusters, unisexual, perianth absent. Ovules naked, not enclosed in ovary. Pollination through direct contact of the pollen grain with ovules due to thye absence of stigma and style. It includes 3 orders (families).

**MONOCOTYLEDONS [Endogenes] (Group 3):**

Herbs, more rarely shrubs, or arboreous as in palms. Leaves are large, parallel- veined, perianth generally trimerous, free or united. Embryo with one cotyledon. Adventitious root system present. It is divided into 7 series and 34 orders.

Series I- Microspermae (it includes 3 orders)

Series II- Epigynae (it includes 7 orders)

Series III- Coronarieae (it includes 8 orders)

Series IV- Calycineae (it includes 3 orders)

Series V- Nudiflorae (it includes 5 orders)

Series VI- Apocarpae (it includes 3 orders)

Series VII- Glumaceae (it includes 5 orders)

**Merits and demerits of Bentham and Hooker's classification of plants**

**Merits**

1. Bentham and Hooker's classification of plants act as natural system with practical utility and based on the study of actual specimens.

2. Popularly being adopted in several herbaria.

3. Recognition of Gymnosperms as a separate group.

4. Placing the highly evolved Monocotyledons at the end.

5. Placing Gamopetalae after Polypetalae.

6. Creating a new series Disciflorae.

7. Arranging the polypetalous families in an evolutionary sequence from hypogynous condition to epigynons condition.

8. Treating the primitive Ranales as the first order in Dicotyledons.

9. Placing the unisexual families after the bisexual families in Monochlamydeae and Monocotyledons.

10. Best system for easy identification of plants.

**Demerits**

1. Anomolous position of Gymnosperms in between dicots and monocots.
2. Artificial grouping of Monochlamydeae based on a single character.
3. Monochlamydeae and Monocotyledons are not divided upto order level.
4. Improper placement of highly advanced families like Asteraceae and orchidaceae.
5. In the group Gamopetalae placing the series Inferae in which the families contain epigynous flowers, before the series Heteromerae and Bicarpellatae in which the families contain hypogynous flowers.