BENTHAM& HOOKER'S SYSTEM OF CLASSIFICATION

BOTANY (MINOR) SEM- 3 UNIT -2
TOPIC

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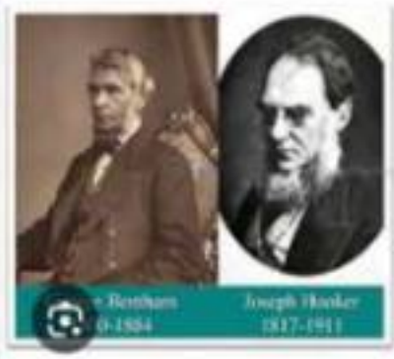
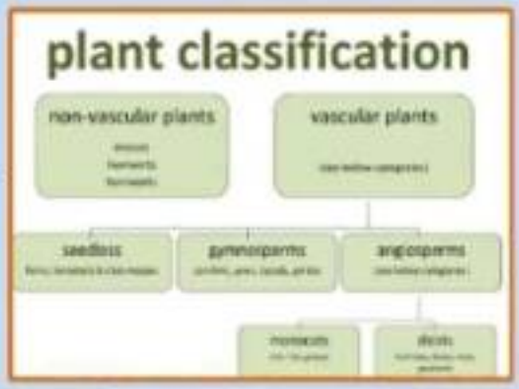
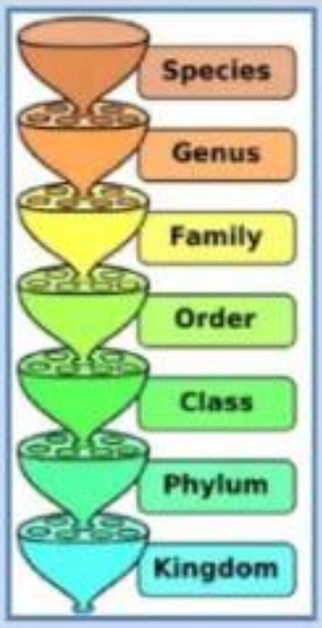


BENTHAM AND HOOKER'S CLASSIFICATION SYSTEM OF PLANTS

INTRODUCTION

- Classification denotes the arrangement of a single plant or group of plants an distinct category following a system of nomenclature, and in accordance with a particular and well established plan.
- Some of the earlier systems of classification of angiosperms were artificial systems, since they used only certain superficial characteristics as the basis.
- With more and more detailed study on the morphological, physiological and reproductive aspects of angiosperms, the artificial systems of classifications were replaced by the natural systems of classification.





- George Bentham and Joseph Dalton Hooker - Two English taxonomists who were closely associated with the Royal Botanical Garden at Kew, England have given a detailed classification of plant kingdom, particularly the angiosperms.
- They gave an outstanding system of classification of phanerogams in their Genera Plantarum which was published in three volumes between the years 1862 to 1883. It is a natural system of classification.
- They described 97,205 species of flowering plants grouped into 202 orders (now recognised as families).
- The system has the advantage of being the first great natural system of classification, which is very easy to follow.

George Bentham
1800-1884

Joseph Hooker
1817-1911

George Bentham

Jospeh Dalton Hooker

Salient Features of Bentham and Hooker's system

1. It is a classification of only the "seed plants" or phanerogams.
2. They described 97,205 species of seed plants belonging to 7,569 genera of202 families starting from *Ranunculaceae* up to *Gramineae*.
3. They classified all the seed plants into 3 groups or classes i.e. Dicotyledons (165 families), gymnosperms (3 families) and monocotyledons (34 families).
4. They included disputed orders among Ordines Anomali which they could not place satisfactorily.
5. Monocotyledons were described after the dicotyledons.

Salient Features of Bentham and Hooker's system

6. The dicotyledons were divided into 3 Divisions (Polypetalae, Gamopetalae and Monochlamydeae) and 14 series. Each series again divided into cohorts (modern orders) and cohorts into orders (modern families).
7. The authors did not mention anything about the origin of the angiosperms.
8. Creation of the Disciflorae, a taxon not described by the earlier taxonomists.
9. Among the Monochlamydeae, major taxa, like the series, were divided on the basis of terrestrial and aquatic habits.
10. Polypetalae carries 82 families, 2610 genera & 31,874 species. Gamopetalae carries 45 families 2619 genera & 34,556 species. Monochlamydae includes 36 families, 801 genera & 11,784 species. Similarly Monocotyledons consist 34 families, 1495 genera and 18,576 species.

PLANT KINGDOM

CRYPTOGAMIA
(Non-flowering plants)

PHANEROGAMIA

CLASSES

DICOTYLEDONAE
(Two cotyledons in the seed)

GYMNOSPERMAE
(Seed not enclosed in fruit)

MONOCOTYLEDONAE
(One Cotyledon in the Seed)

SUB-CLASSES

POLYPETALAE

SERIES
- THALAMIFLORAE
  6 Orders
  34 Families
- DISCIFLORAE
  4 Orders
  22 Families
- CALYCIFLORAE
  5 Orders
  27 Families

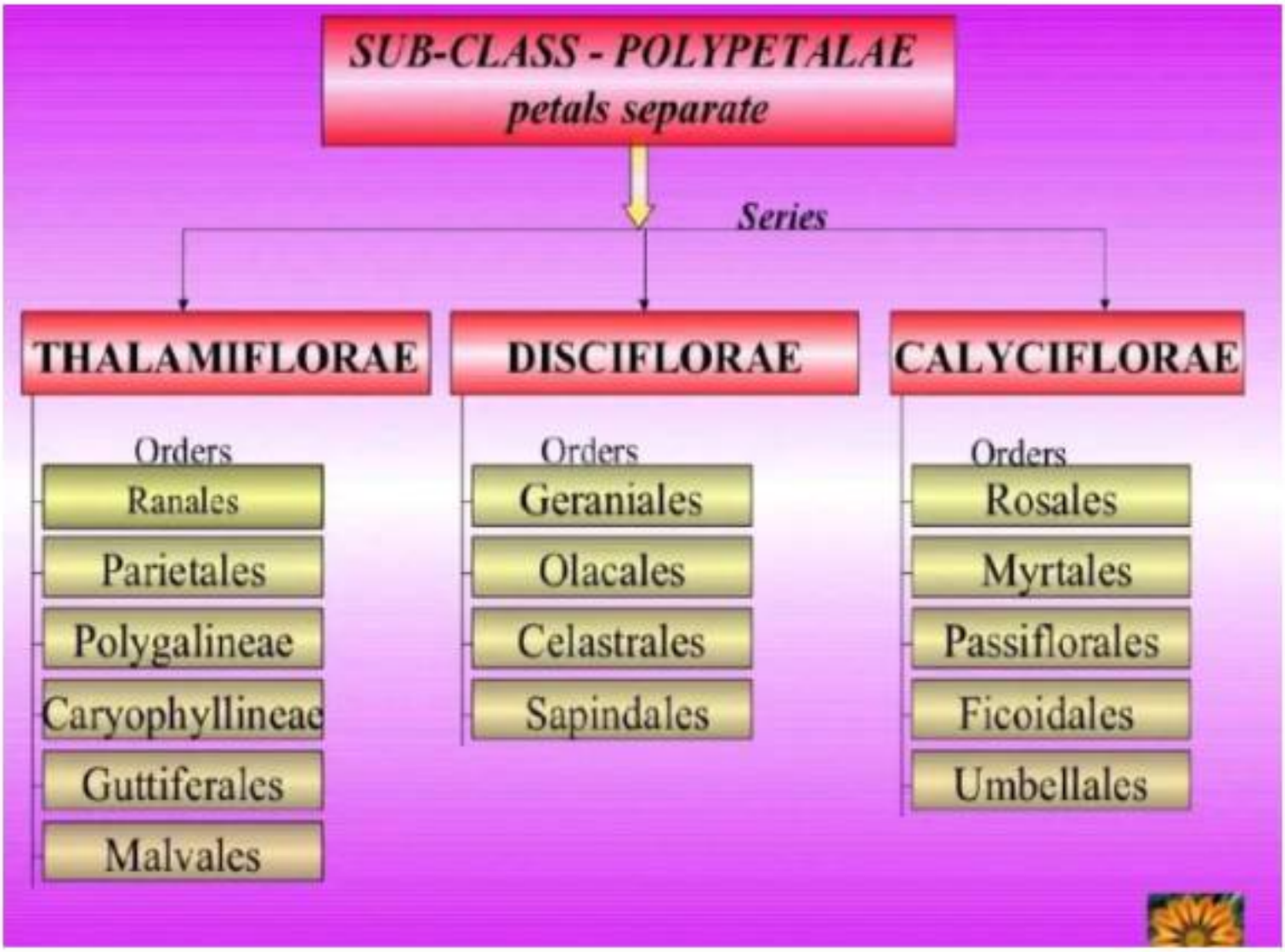
GAMOPETALAE

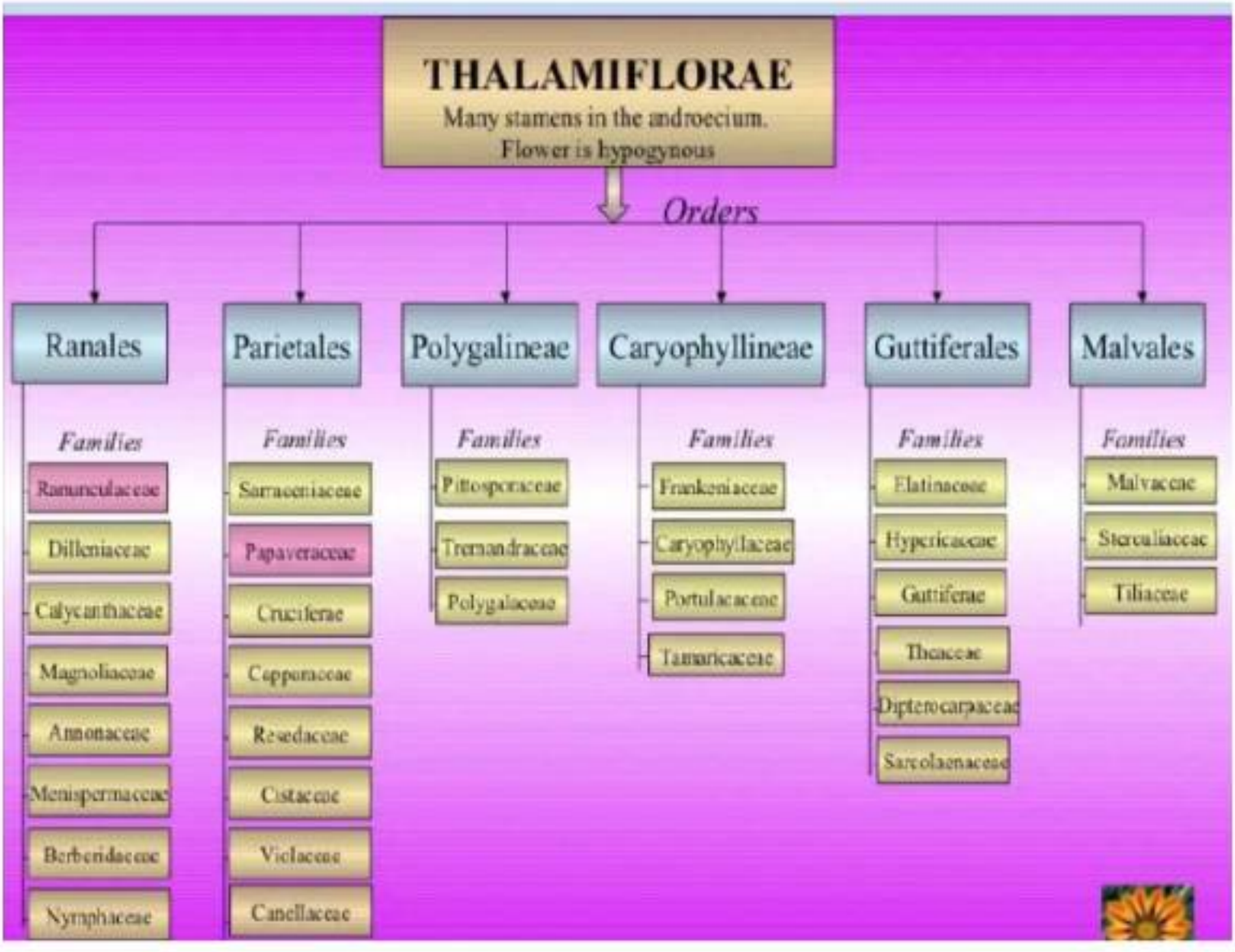
SERIES
- INFERAE
  3 Orders
  9 Families
- HETEROMERAE
  3 Orders
  12 Families
- BICARPELLATAE
  4 ORders
  23 Families

MONOCHLAMYDAE

SERIES
- CURVEMBRYAE
  6 Families
- MULTIOVULATE AQUATICAE
  1 Family
- MULTIOVULATE TERRESTRIS
  3 Families
- MICROEMBRYAE
  4 Families
- DAPHNIALES
  5 Families
- ACHLAMYDO-SPORAE
  3 Families
- UNISEXUALES
  9 Families
- ORDINA ANAMOLI
  9 Families

SERIES
- MICROSPERMAE
  3 Families
- EDIGYNAE
  7 Families
- CORONARIAE
  8 Families
- CALYCINAE
  5 Families
- NUDIFLORAE
  5 Families
- APOCARRAE
  3 Families
- GLUMACEAE
  5 Families


SUB-CLASS - POLYPETALAE
petals separate
Series
THALAMIFLORAE
DISCIFLORAE
CALYCIFLORAE
Orders
Ranales
Parietales
Polygalineae
Caryophyllineae
Guttiferales
Malvales
Orders
Geraniales
Olacales
Celastrales
Sapindales
Orders
Rosales
Myrtales
Passiflorales
Ficoidales
Umbellales


THALAMIFLORAE
Many stamens in the androecium.
Flower is hypogynous
Orders
Ranales
Families
Ranunculaceae
Dilleniaceae
Calycanthaceae
Magnoliaceae
Annonaceae
Menispermaceae
Berberidaceae
Nymphaceae
Parietales
Families
Sarraceniaceae
Papaveraceae
Cruciferae
Capparaceae
Resedaceae
Cistaceae
Violaceae
Canellaceae
Polygalineae
Families
Pittosporaceae
Tremandraceae
Polygalaceae
Caryophyllineae
Families
Frankeniaceae
Caryophyllaceae
Portulacaceae
Tamaricaceae
Guttiferales
Families
Elatinaceae
Hypericaceae
Guttiferae
Theaceae
Dipterocarpaceae
Sarcolaenaceae
Malvales
Families
Malvaceae
Sterculiaceae
Tiliaceae

DISCIFLORAE

Hypogynous flowers with a cushion-like disc around or below the ovary

Orders

Geraniales

Families

- Linaceae
- Humiriaceae
- Malpighiaceae
- Zygophyllaceae
- Geraniaceae
- Rutaceae
- Simaroubaceae
- Ochnaceae
- Burseraceae
- Meliaceae
- Dichapetalaceae

Olacales

Families

- Olacaceae
- Aquifoliaceae

Celastrales

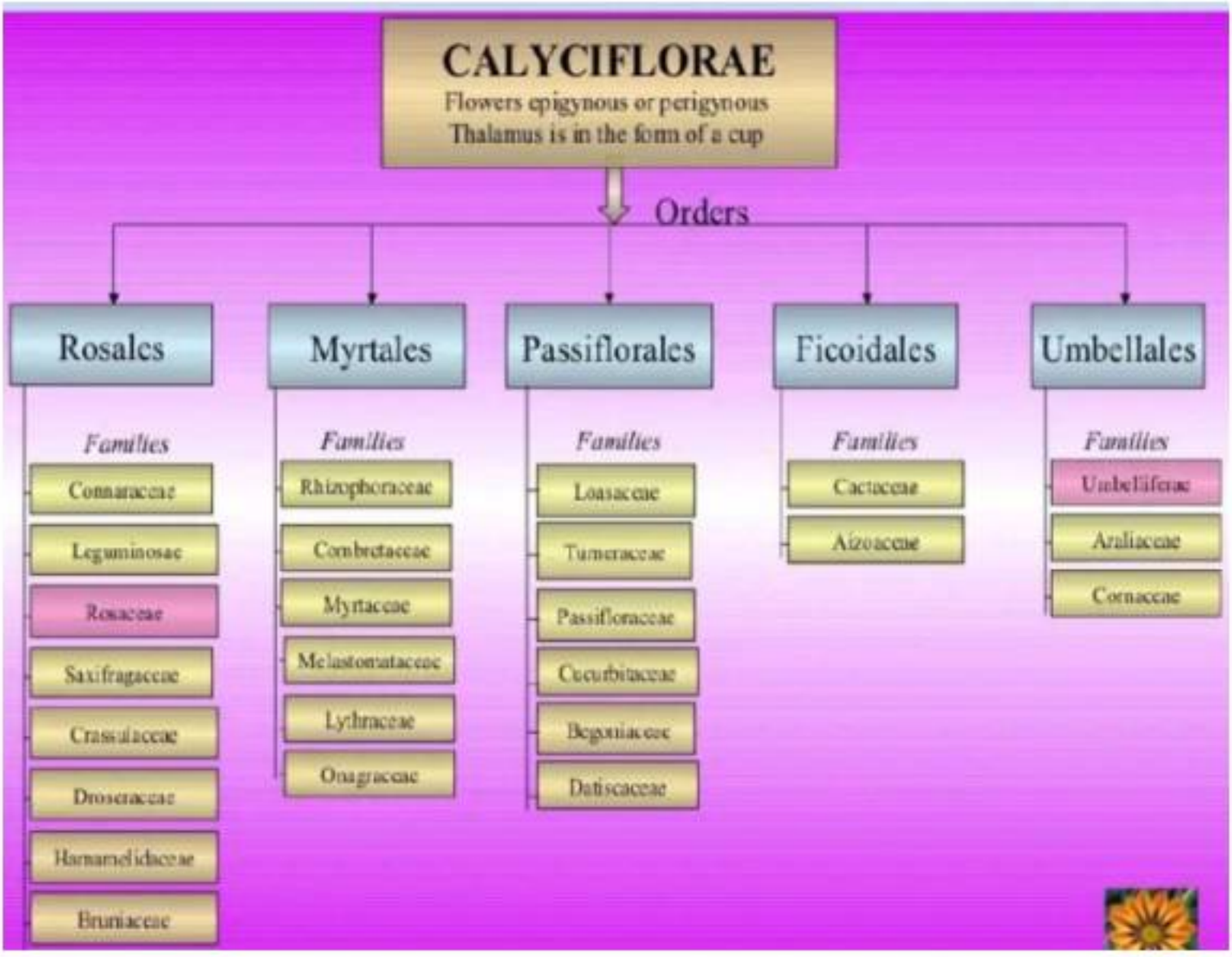
Families

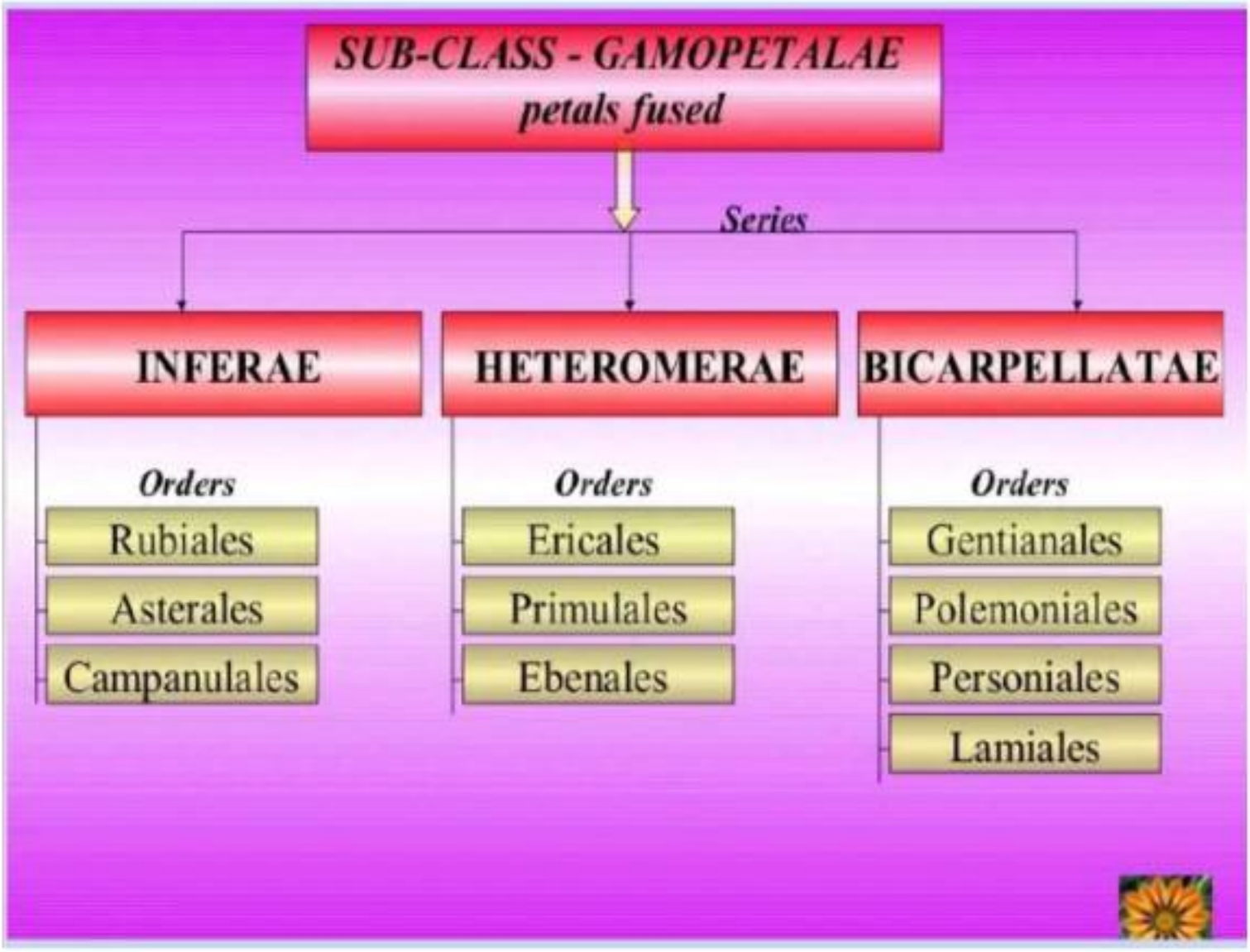
- Celastraceae
- Stackhousiaceae
- Rhamnaceae
- Vitaceae

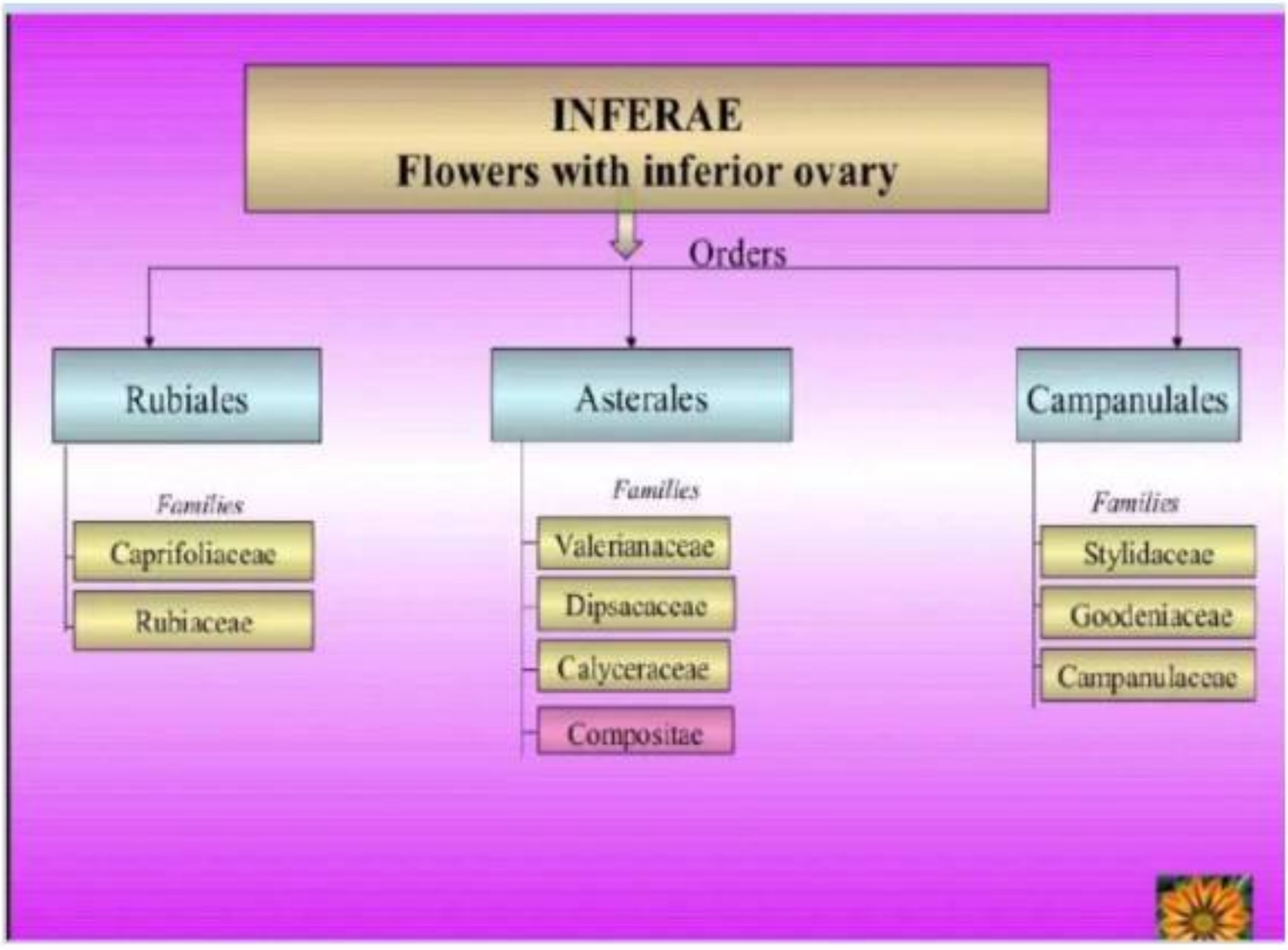
Sapindales

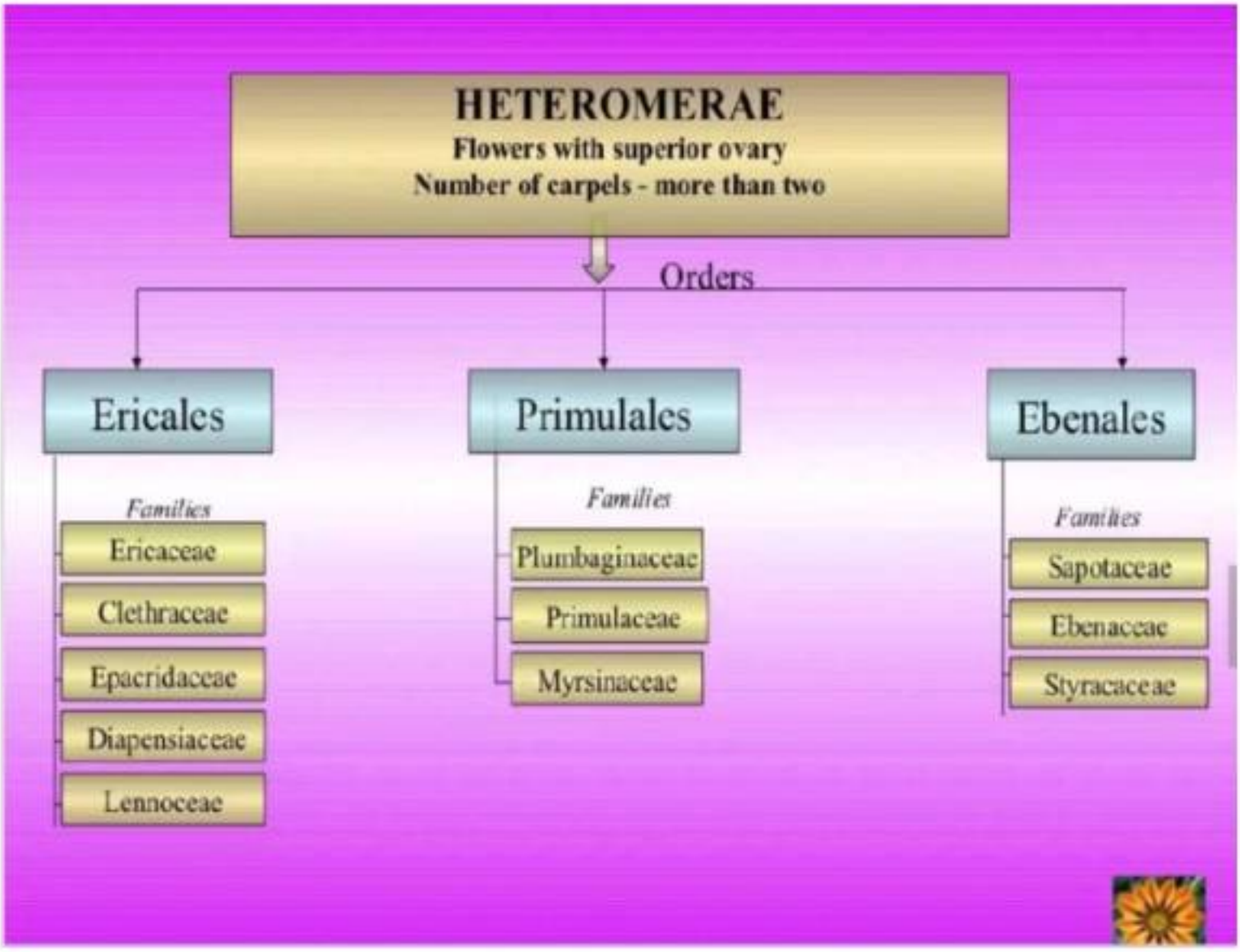
Families

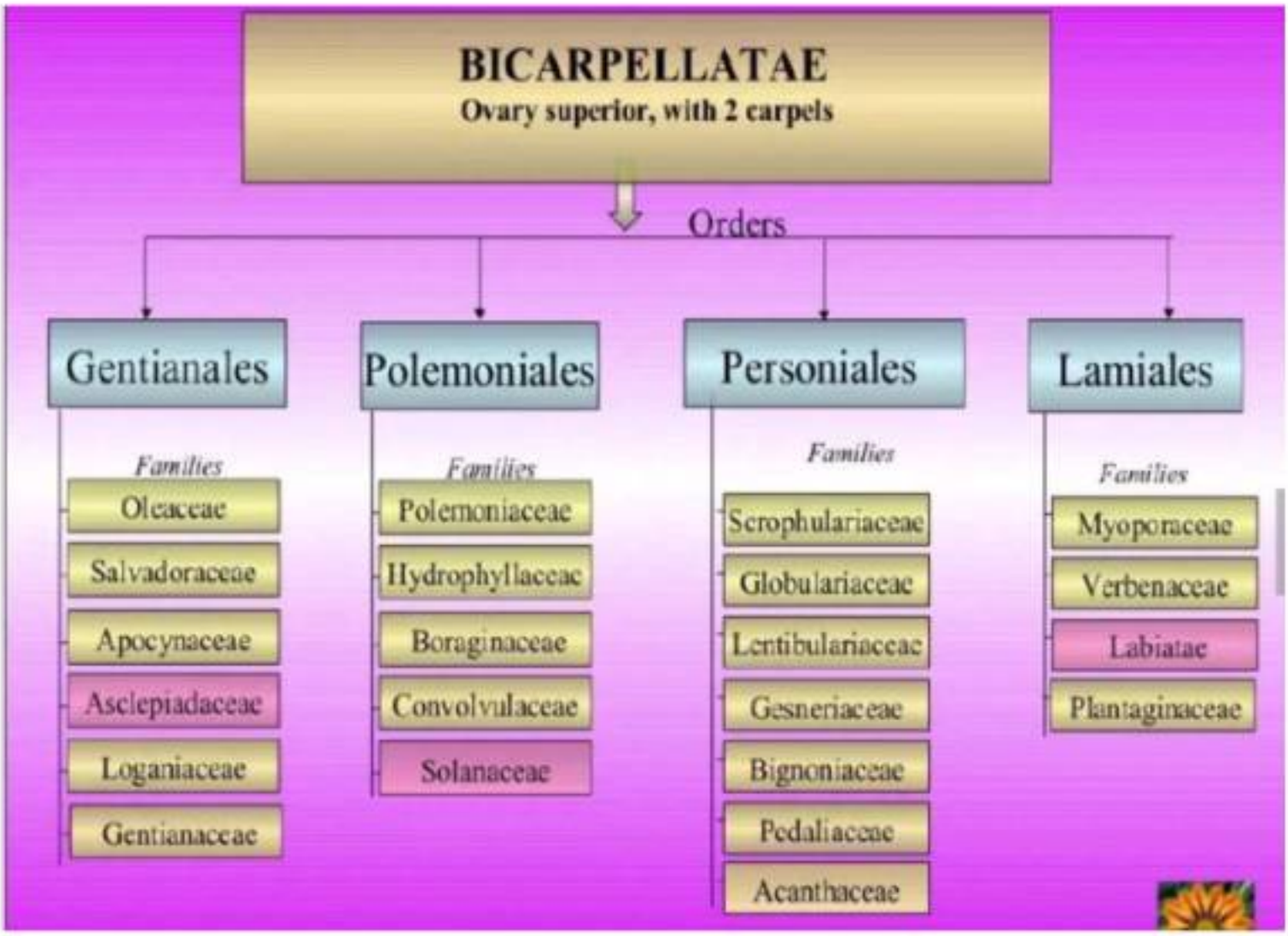
- Sapindaceae
- Meliosmaceae
- Anacardiaceae
- Coriariaceae
- Moringaceae

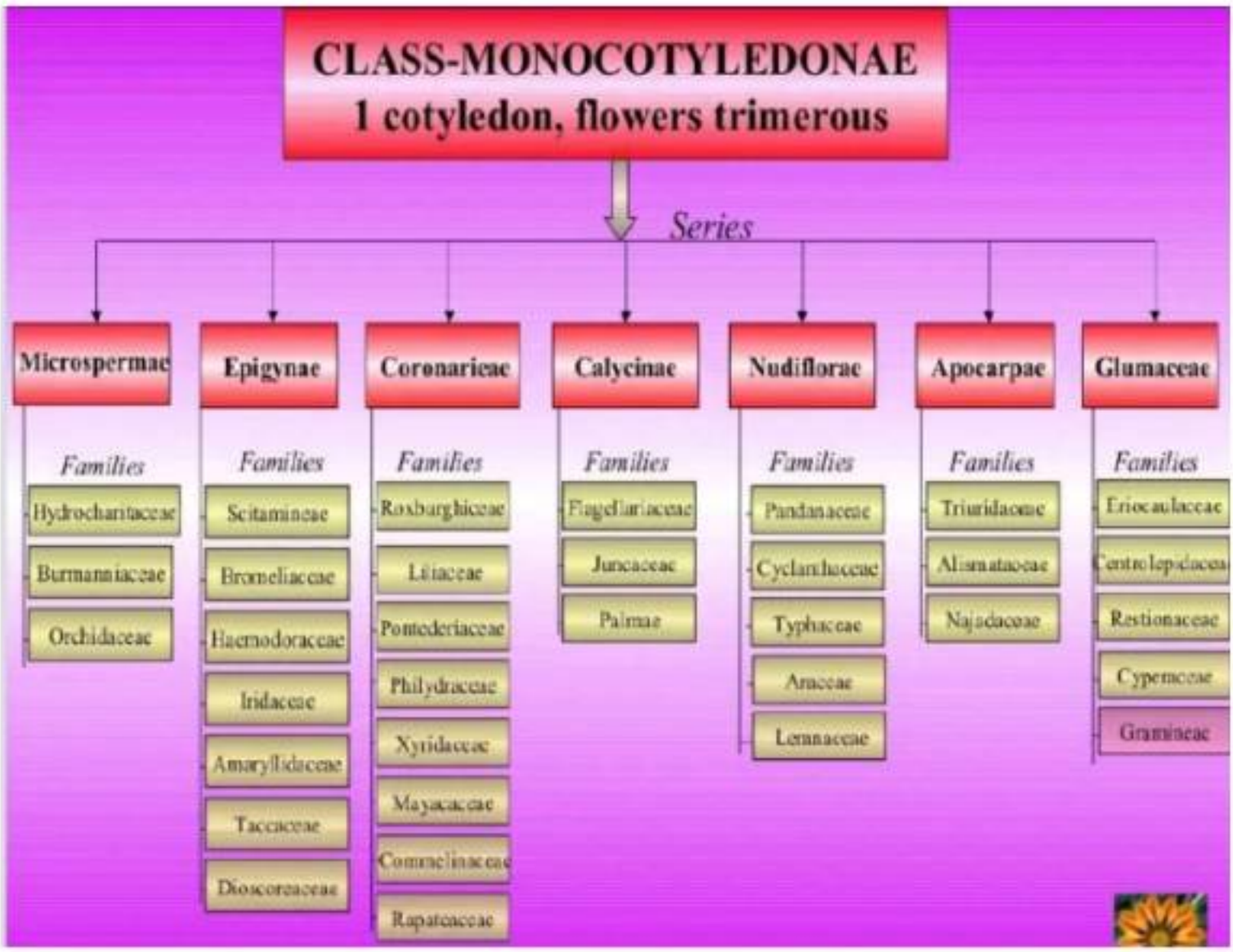

CALYCIFLORAE
Flowers epigynous or perigynous
Thalamus is in the form of a cup
Orders
Rosales
Myrtales
Passiflorales
Ficoidales
Umbellales
Families
Connaraceae
Leguminosae
Rosaceae
Saxifragaceae
Crassulaceae
Droseraceae
Hamamelidaceae
Bruniaceae
Families
Rhizophoraceae
Combretaceae
Myrtaceae
Melastomataceae
Lythraceae
Onagraceae
Families
Loasaceae
Turneraceae
Passifloraceae
Cucurbitaceae
Begoniaceae
Datiscaceae
Families
Cactaceae
Aizoaceae
Families
Umbelliferae
Araliaceae
Cornaceae


SUB-CLASS - GAMOPETALAE
petals fused
Series
INFERAE
HETEROMERAE
BICARPELLATAE
Orders
Rubiales
Asterales
Campanulales
Orders
Ericales
Primulales
Ebenales
Orders
Gentianales
Polemoniales
Personiales
Lamiales


INFERAE
Flowers with inferior ovary
Orders
Rubiales
Asterales
Campanulales
Families
Caprifoliaceae
Rubiaceae
Families
Valerianaceae
Dipsacaceae
Calyceraceae
Compositae
Families
Stylidaceae
Goodeniaceae
Campanulaceae


HETEROMERAE
Flowers with superior ovary
Number of carpels - more than two
Orders
Ericales
Families
Ericaceae
Clethraceae
Epacridaceae
Diapensiaceae
Lennoceae
Primulales
Families
Plumbaginaceae
Primulaceae
Myrsinaceae
Ebenales
Families
Sapotaceae
Ebenaceae
Styracaceae


BICARPELLATAE
Ovary superior, with 2 carpels
Orders
Gentianales
Families
Oleaceae
Salvadoraceae
Apocynaceae
Asclepiadaceae
Loganiaceae
Gentianaceae
Polemoniales
Families
Polemoniaceae
Hydrophyllaceae
Boraginaceae
Convolvulaceae
Solanaceae
Personiales
Families
Scrophulariaceae
Globulariaceae
Lentibulariaceae
Gesneriaceae
Bignoniaceae
Pedaliaceae
Acanthaceae
Lamiales
Families
Myoporaceae
Verbenaceae
Labiatae
Plantaginaceae


CLASS-MONOCOTYLEDONAE
1 cotyledon, flowers trimerous
Series
Microspermae
Epigynae
Coronarieae
Calycinae
Nudiflorae
Apocarpae
Glumaceae
Families
Hydrocharitaceae
Burmanniaceae
Orchidaceae
Families
Scitamineae
Bromeliaceae
Haemodoraceae
Iridaceae
Amaryllidaceae
Taccaceae
Dioscoreaceae
Families
Roxburghiceae
Liliaceae
Pontederiaceae
Philydraceae
Xyridaceae
Mayacaceae
Commelinaceae
Rapateaceae
Families
Flagellariaceae
Juncaceae
Palmae
Families
Pandanaceae
Cyclanthaceae
Typhaceae
Araceae
Lemnaceae
Families
Triuridaceae
Alismataceae
Najadaceae
Families
Eriocaulaceae
Centrolepidaceae
Restionaceae
Cyperaceae
Gramineae

Groups	*Divisions*	*Series*	*Characteristics*
Dicotyedons			Embryo with two cotyledons; reticulate venation in leaves; flowers usually pentamerous.
	1. Polypetalae		Petals free. It is divided into 3 series:
		Thalamiflorae	Thalamus dome-shaped: flowers hypogynous and ovary superior.
		Disciflorae	A disc is usually present below the ovary; flowers hypogynous and ovary superior.
		Calyciflorae	Thalamus cup-shaped; ovary inferior.
	2. Gamopetalae		Petal fused . it is divided into 3 series:
		Inferae	Ovary inferior; stamens usually as many as petals.
		Heteromerae	Ovary mostly superior; carpels more than two.
		Bicarpellatae	Ovary mostly superior; carpels not more than two
	3. Monochlamy-deae		Flowers usually with one whorl of perianth, commonly sepaloid or none. It is divided into 8 series:
		Curvembryeae	Embryo curved.
		Mutiovulatae Aquaticae	Aquatic herbs, Submerged
		Ultiovulatae Terrestres	Terrestrial plants
		Microembryeae	Embryo very minute.
		Daphnales	Ovary monocarpellary with a single ovule
		Achlamydosporae	Ovary unilocular with 13 ovules.
		Unisexuale	Unisexual flower
		Ordines anomaly	Anomalous orders.

Groups	*Divisions*	*Series*	*Characteristics*
Monocotyledons			Embryo with one cotyledon; parallel venation in leaves; flowers trimerous. It is divided into 7 series:
		Microspermae-	Ovary inferior; seeds minute, numerous.
		Epigynae	Inner whorl of perianth petaloid; ovary inferior.
		Coronarieae	Perianth petaloid; ovary superior.
		Calycineae	Perianth sepaloid; ovary superior.
		Nudiflorae-	Perianth absent; ovary superior
		Apocarpae	Carpels free (apocarpous).
		Glumaceae-	Flowers arranged in spikelets; perianth scaly or reduced to hairs.
Gymnospermae			Flowers in cones or clusters unisexual; ovules naked, not enclosed in ovary.

Merits

- The obvious advantage of the system of Bentham and Hooker's classification is that, it provides one with easy means and ways for identifying a plant.
- The description of families and genera is very accurate
- Each family has a synopsis in the beginning which is very useful in identification
- This classification is a great natural system of its own kind and to a great extent forms an ancestor of every recent system.
- Another importance of this system lies in the extempore study of the actual specimens by the authors and thus the classification of Bentham and Hooker represents the result of a careful comparative examination of known genera of all flowering plants.

Demerits

- The classification is based on the assumption of constancy of species. It establishes no phylogenetic relationship in different taxa of plants; hence many important evolutionary characters were neglected. So, closely related families were kept apart and many distant families of plants were put together e.g., in dicotyledons, Euphorbiaceae was placed in Monochlamydeae though related to Malvaceae; the retention of some natural orders *e:g.* Nyctaginaceae, Polygonaceae, Amaranthaceae, Chenopodiaceae etc. in the subclass Monochlamydeae is also unnatural because those orders are related to the orders having differentiated perianth. Similarly in monocotyledons Hydrocharitaceae and highly evolved Orchidaceae were put together under Microspermae due to their small seeds. Related families like Liliaceae and Amaryllidaceae were kept apart.
- The origin of angiosperms was not established.
- The position of gymnosperms is also anomalous i.e. in between dicotyledons and monocotyledons.
- The group Monochlamydeae is entirely artificial