

# **Subject- Botany**

**Credit – II**

**Chap 5- Angiosperms**

**Paper I- Plant Life and Utilization II**

**Term II, Sem – II**

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**By**

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# Learning Objects

- General characters
- Outline of classification of Bentham and Hooker's system up to series,
- comparative account of monocotyledons and dicotyledons.

# General characters

- Angiosperms are the most diverse group of land plants, with 64 orders, 416 families, approximately 13,000 known genera and 300,000 known species.
- All plants have flowers at some stage in their life. The flowers are the reproductive organs for the plant, providing them with a means of exchanging genetic information.
- The sporophyte is differentiated into stems, roots, and leaves.
- The vascular system has true vessels in the xylem and companion cells in the phloem.
- The stamens (microsporophyll) and the carpels (megasporophyll) are organized into a structure called the flower.
- Each microsporophyll has four microsporangia.
- The ovules are enclosed in the ovary at the base of the megasporophyll.
- Angiosperms are heterosporous, i.e., produce two kinds of spores, microspore (pollen grains) and megaspores.
- A single functional megaspore is permanently retained within the nucellus.

•The pollen grains transfer from the anther to stigma and reproduction takes place by pollination. They are responsible for the transfer of genetic information from one flower to the other. The pollen grains are much smaller than the gametophytes or reproductive cells present in the non-flowering plants.

•The sporophytes are diploid.

•The root system is very complex and consists of cortex, xylem, phloem, and epidermis.

•The flowers undergo double and triple fusion which leads to the formation of a diploid zygote and triploid endosperm.

•Angiosperms can survive in a variety of habitats, including marine habitats.

•The process of fertilization is quicker in angiosperms. The seeds are also produced quickly due to the smaller female reproductive parts.

•All angiosperms are comprised of stamens which are the reproductive structures of the flowers. They produce the pollen grains that carry the hereditary information.

•The carpels enclose developing seeds that may turn into a fruit.

•The production of the endosperm is one of the greatest advantages of angiosperms. The endosperm is formed after fertilization and is a source of food for the developing seed and

**•Additional characteristics of angiosperms relate to vascular tissue, seeds, and dispersal.**

•Most angiosperms' xylem contains vessel elements, which transport water more efficiently.

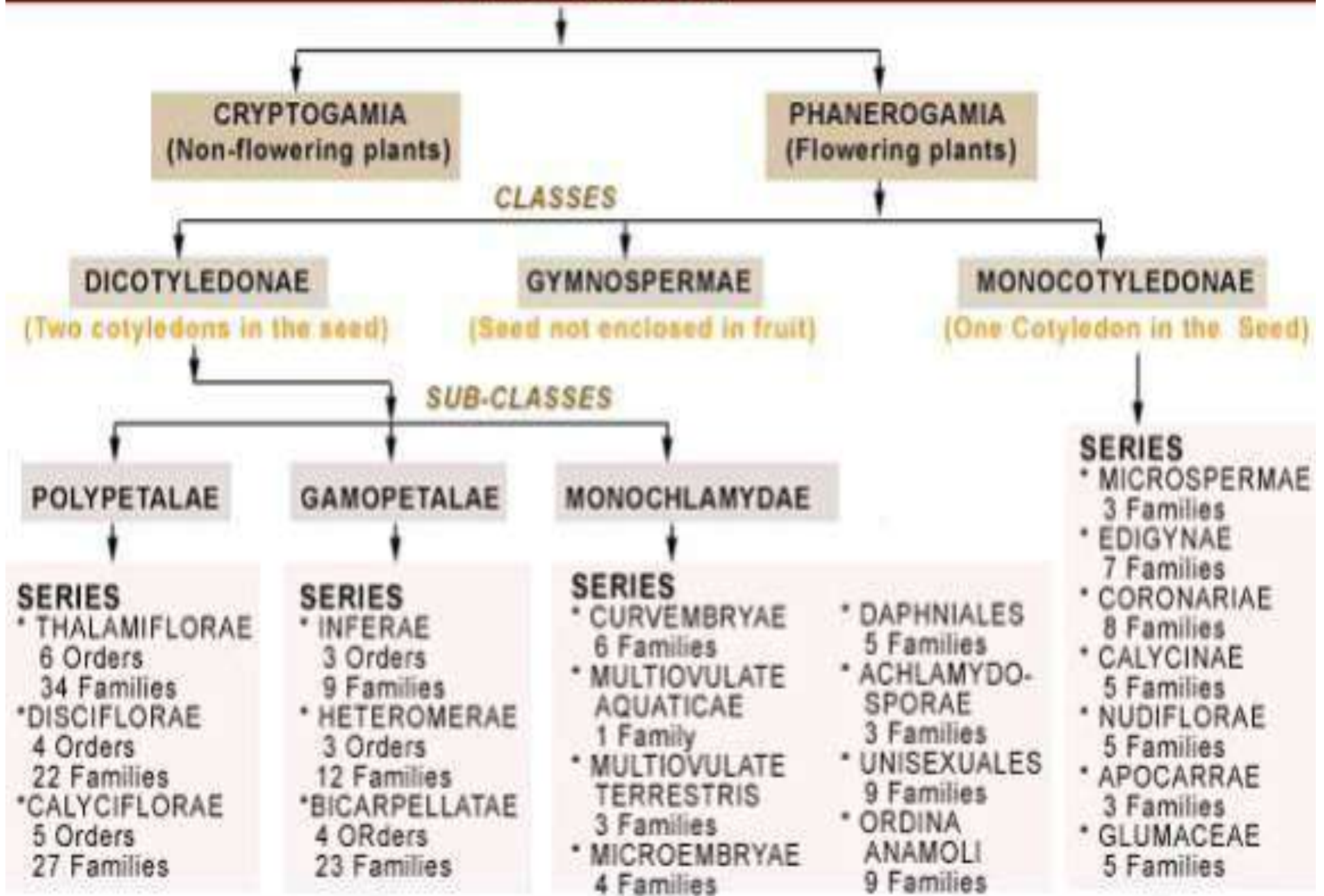
•Angiosperm seeds contain stored food endosperm, formed from polar and sperm nuclei.

•Angiosperm ovaries ripen to form fruits, which aid dispersal.

# •Outline of classification of Bentham and Hooker's system up to series,

- The system of classification of seed plants was proposed by Bentham and Hooker.
- It's the most well developed natural classification system , it was published in 3 volume work Genera plantarum (1862-83).
- They described 97,205 species of seed plants belonging to 7,569 genera of 202 families starting from Ranunculaceae up to Gramineae.
- The system divided all the seed plants into three classes
- 1.Dicotyledons** (165 families)-3 sub class:
  - Polypetalae
  - Gamopetalae
  - Monochlamydeae
- 2.Gymnosperms** (3 families) and
- 3.Monocotyledons** (34 families).

# PLANT KINGDOM



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

**SERIES**  
 \* INFERAE  
 3 Orders  
 9 Families  
 \* HETEROMERAE  
 3 Orders  
 12 Families  
 \* BICARPELLATAE  
 4 Orders  
 23 Families

**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

# Class 1: Dicotyledons

- Seed with 2 cotyledons
- Flowers with pentamerous or tetramerous
- Reticulate venation
- Subclass 1: Polypetalae
- 1.Polypetalae**: sepals and petals distinct, petals free (14 series, 25 orders and 165 families)
  - **Thalamiflorae**: flowers hypogynous, stamens many, disc absent
    - 6 Orders: Ranales, Parietales, Polygalineae, Caryophyllineae, Guttiferales and Malvales
  - **Disciflorae**: flowers hypogynous, disc present below the ovary
    - 4 Orders: Geraniales, Olacales, Celastrales and Sapindales
  - **Calyciflorae**: flowers perigynous or epigynous
    - 5 Orders: Rosales, Myrtales, Passiflorales, Ficoidales and Umbellales



## **.Subclass 2: Gamopetalae**

- .Gamopetalae:** Sepals and petals distinct, petals fused
  - **Inferae:** ovary inferior
    - 3 orders: Rubiales, Asterales and Campanales
  - **Heteromerae:** Ovary superior, stamens in one or two whorls, carpels more than 2
    - 3 orders: Ericales, Primulales and Ebenales
  - **Bicarpellatae:** Ovary superior, stamens in one whorls, carpels 2
    - 4 orders: Gentianales, Polemoniales, Personales and Lamiales
- .Monochlamydeae:** flowers apetalous, perianth lacking or if present not differentiated into sepals and petals
  - **Curvembryeae:** embryo coiled, ovule usually 1
  - **Multiovulate aquatica:** aquatic plants, ovules many
  - **Multiovulate terrestres:** terrestrial plants, ovules many

- Microembryeae: embryo minute
- Daphnales : carpel 1, ovule 1
- Achlamydosporae: ovary inferior, unilocular, ovules 1-3
- Unisexuales: flowers unisexual
- Ordines anomali: relationship uncertain

## **•Class 2: Gymnospermae**

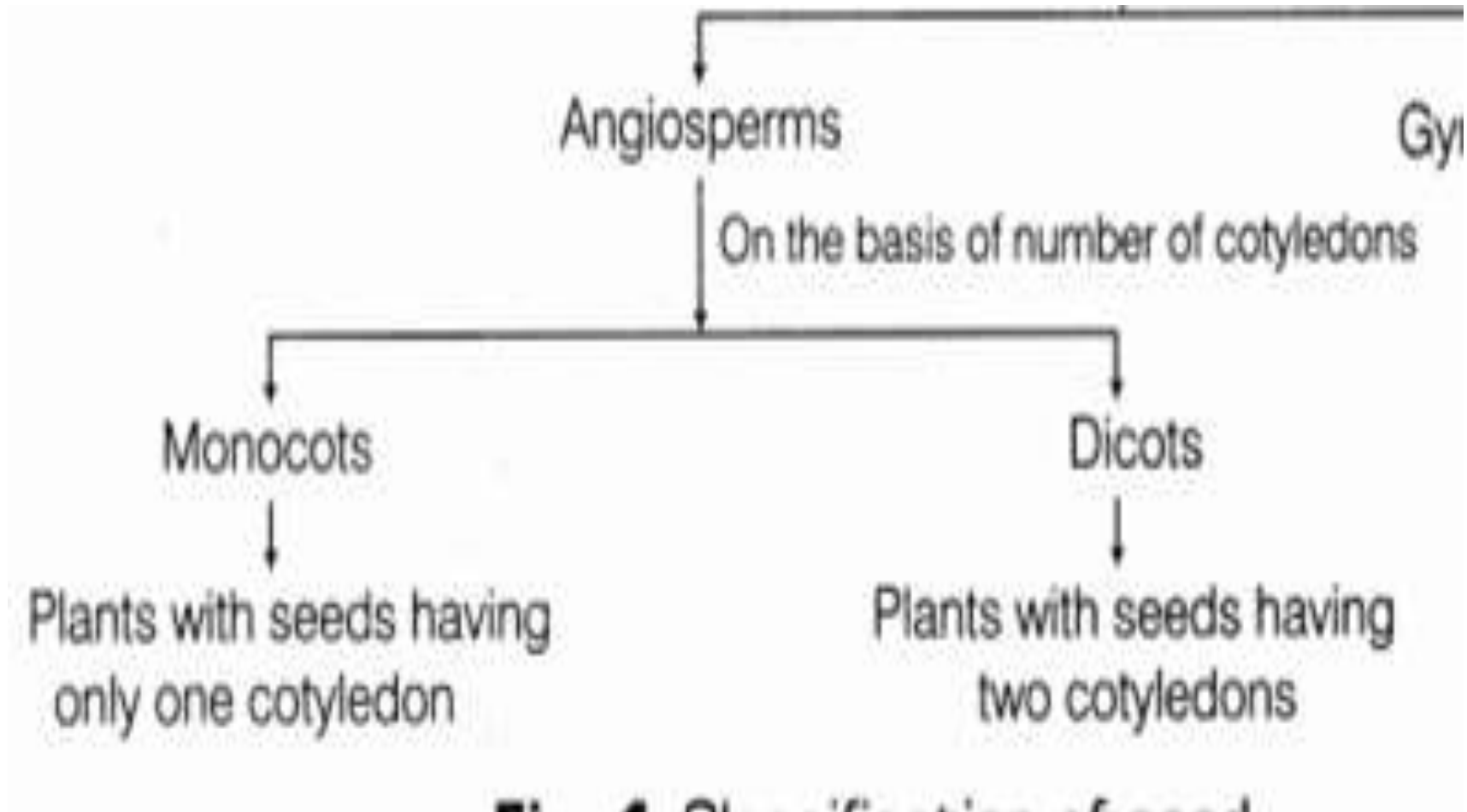
**• Ovules naked**

**•– 3 families**

# Class 3: Monocotyledons

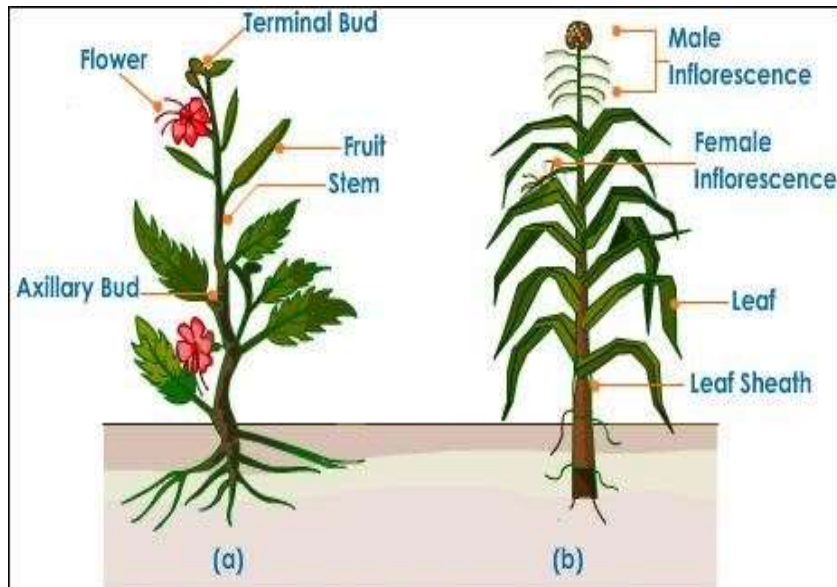
- Flowers trimerous, venation parallel
- – Microspermae : ovary inferior, seeds minute
- – Epigynae: ovary inferior, seeds large
- – Coronarieae : ovary superior, carpels united, perianth colored
- – Calycinae: ovary superior, carpels united, perianth green
- – Nudiflorae: ovary superior, perianth absent
- – Apocarpae: ovary superior, carpels more than 1, free
- – Glumaceae : ovary superior, perianth reduced, flowers enclosed in glumes

# Comparative account of monocotyledons and dicotyledons.



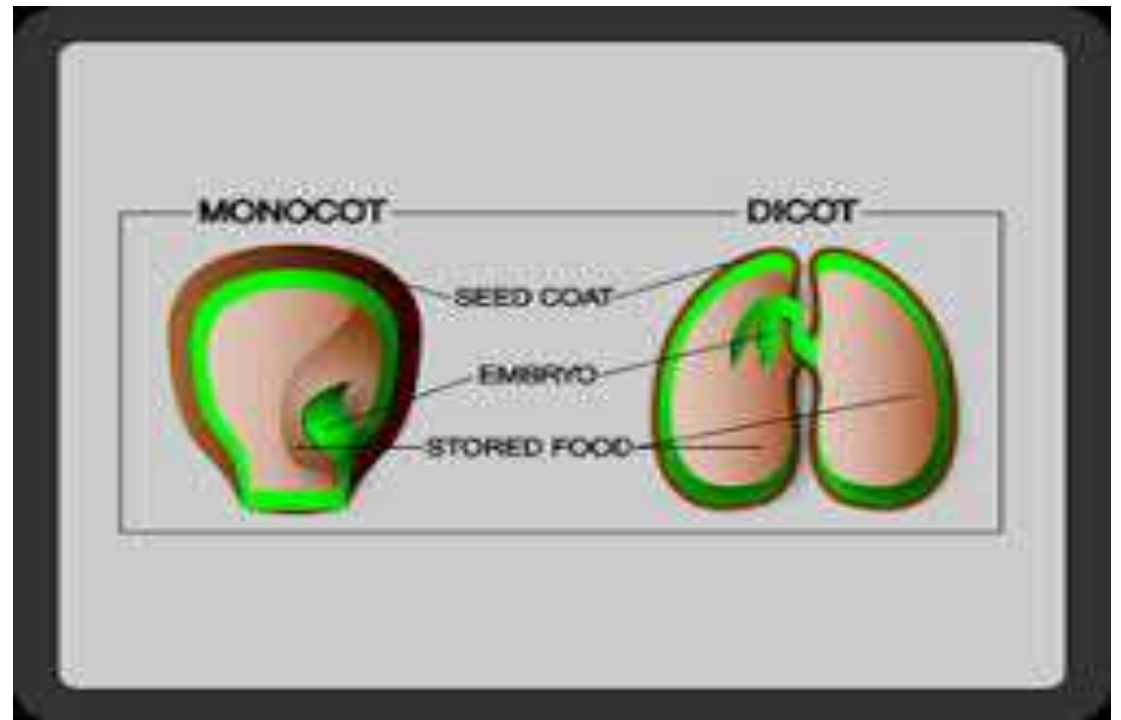
# Key Differences (Monocotyledons vs Dicotyledons)

Sr No.	Basis for Comparin	Monocotyledons (Monocots)	Dicotyledons (Dicots)
1	Species	75000	175000
2.	Defination	Monocotyledons are flowering plants or angiosperms bearing seeds with a single cotyledon or embryonic leaf.	Dicotyledons are flowering plants or angiosperms bearing seeds with two cotyledons or embryonic leaves.



a) A Dicot Plant (*Brassica Campestris* - Mustard)

b) A Monocot Plant (*Zea Mays* - Maize)



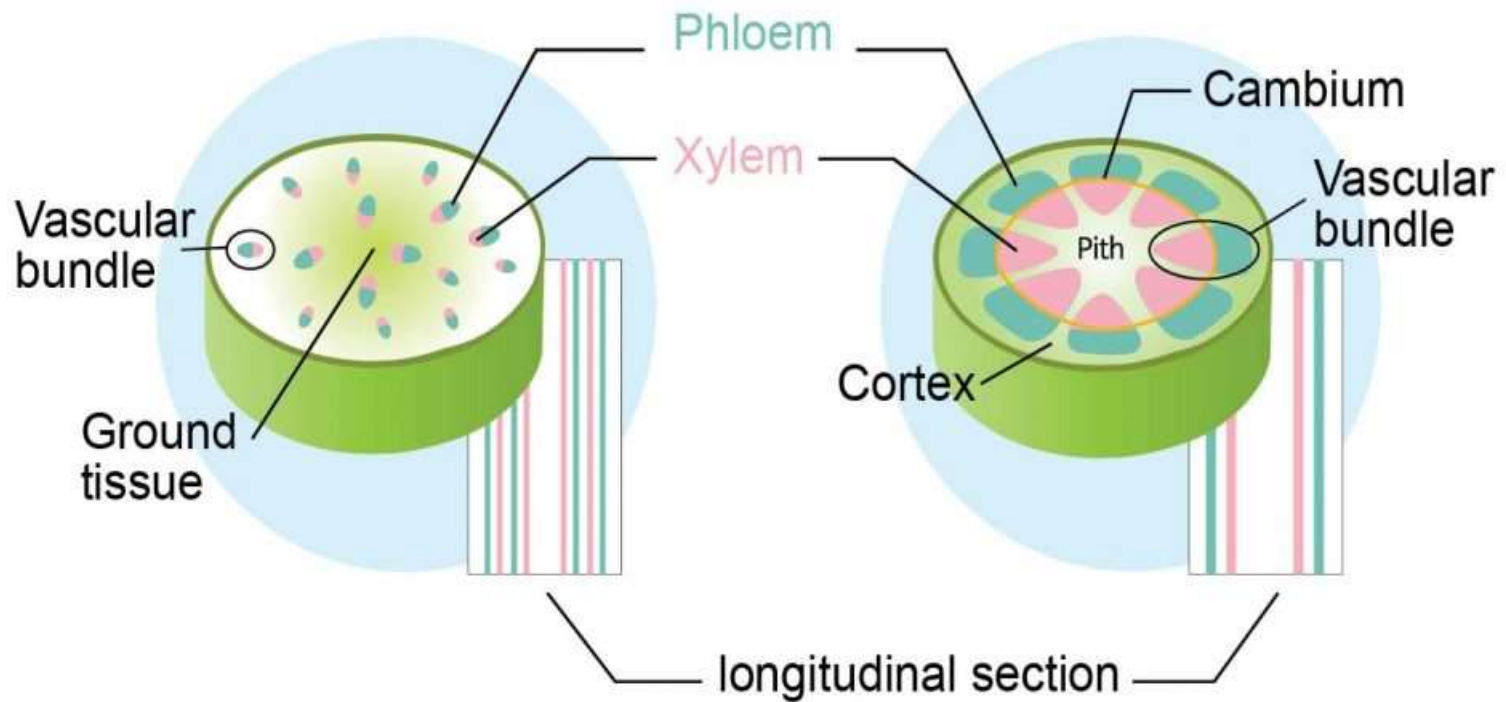
Sr No.	Basis for Comparin	Monocotyledons (Monocots)	Dicotyledons (Dicots)
4	Stem	<ul style="list-style-type: none"> <li>•The stem in most monocots is herbaceous. But, some plants might have arboraceous stems.</li> <li>•The Monocot stem is unbranched and fleshy.</li> <li>•Within the stem of monocots, the vascular bundles are scattered in no particular pattern.</li> <li>•Most monocot stems lack a lateral meristem or cambium.</li> <li>•Cambium, if present, is not differentiated into cortex or stellar regions.</li> <li>•Epidermal hairs are absent.</li> </ul>	<ul style="list-style-type: none"> <li>•The stems in dicots are either herbaceous or arboraceous.</li> <li>•Dicot stem is branched and hard.</li> <li>•Within the stem of dicots, the vascular bundles are arranged in concentric circles.</li> <li>•A lateral meristem or cambium is present in the stems of dicot plants.</li> <li>•The cambium is differentiated into the cortex and stellar regions.</li> <li>•Epidermal hairs are present.</li> </ul>

# Stem

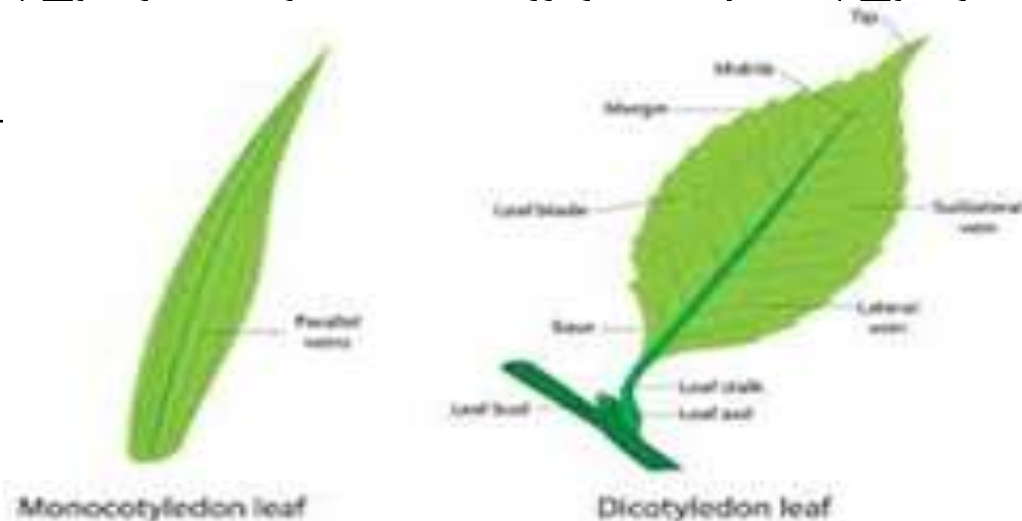
## Monocot



## Dicot



Sr No.	Basis for Comparison	Monocotyledons (Monocots)	Dicotyledons (Dicots)
5	Leaves	<ul style="list-style-type: none"> <li>•The leaf in monocots is isobilateral in symmetry.</li> <li>•Monocots usually have long, narrow, and slender leaves.</li> <li>•Monocot leaves have stomata on both upper and lower surfaces and thus are termed amphistomatous.</li> </ul>	<ul style="list-style-type: none"> <li>•The leaf in dicots is dorsoventrally flattened.</li> <li>•Dicots usually have broad leaves, but the shape and size of the leaves might vary according to the species.</li> <li>•Dicot leaves have stomata only on one of the surfaces of the leaf and thus, are termed epistomatous.</li> </ul>
6	<b>Venation</b>		have a reticulate system.





Sr No.	Basis for Comparin	Monocotyledons (Monocots)	Dicotyledons (Dicots)
7	Flower	<p>•Monocot flowers are usually trimerous, meaning the number of parts of the flowers is either three or it's multiple.</p> <p>•In some monocot plants, calyx and corolla are undifferentiated, and a perianth is present instead of them.</p> <p>•The flowers in monocots are usually wind-pollinated.</p>	<p>•The calyx and corolla in dicot plants are differentiated completely.</p> <p>•The flowers in dicot plants are usually insect-pollinated.</p> <p>•Dicot flowers are usually tetramerous or pentamerous, meaning the number of the flower parts is either five or four or their multiple.</p>

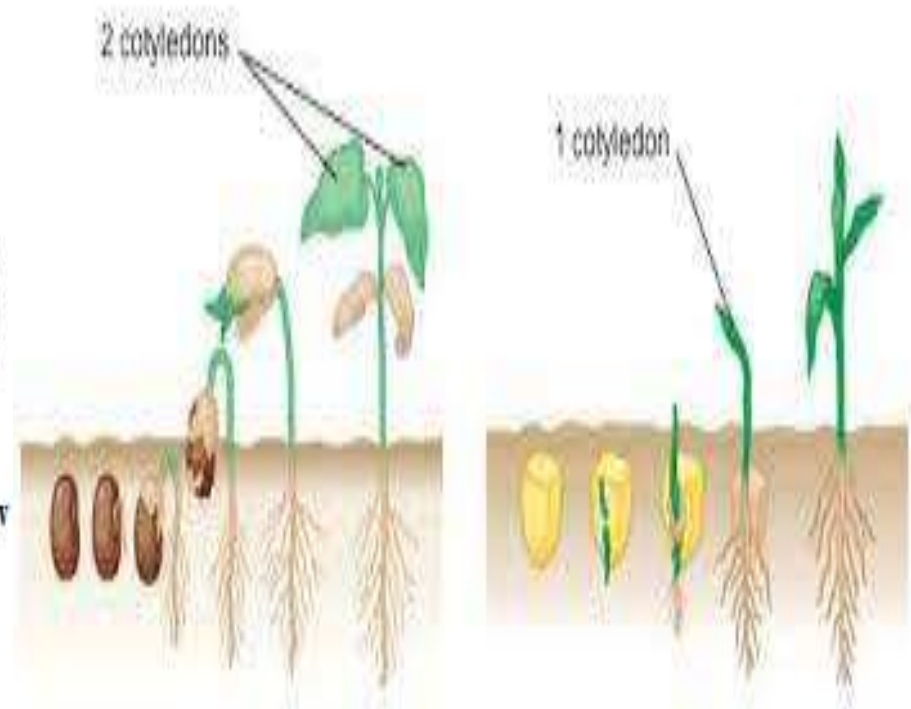
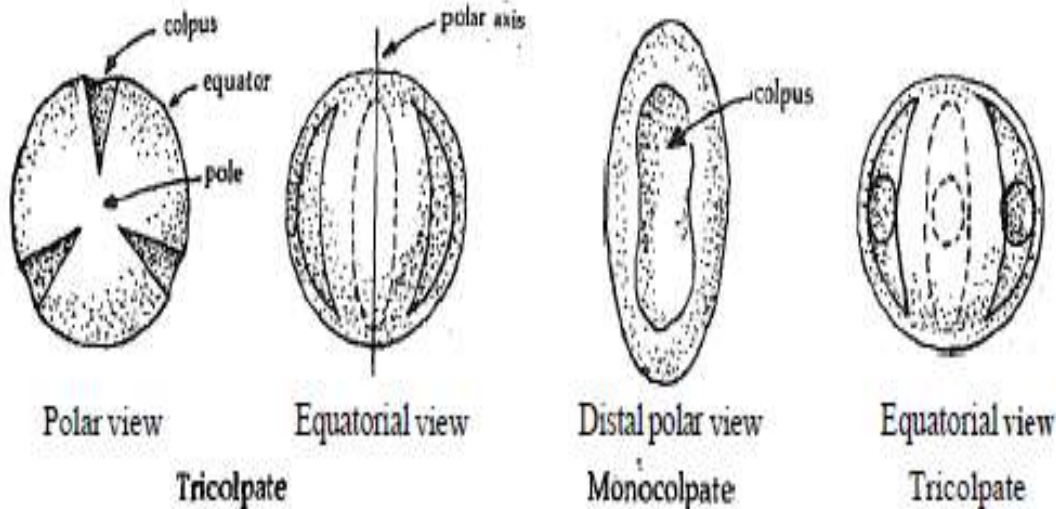


**Monocots**  
Parts in 3s

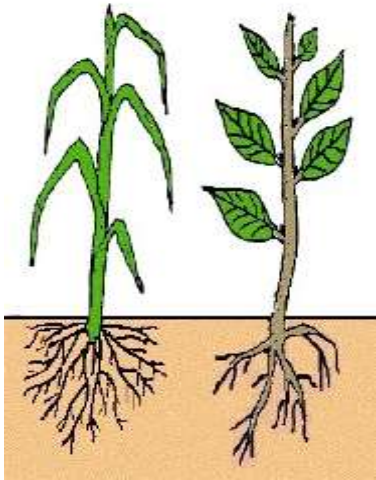


**Dicots**  
Parts in 4s or 5s

Sr No.	Basis for Comparin	Monocotyledons (Monocots)	Dicotyledons (Dicots)
8	Pollen grain	The pollen grain is monocolpate with a single furrow or ridge on the pollen tube.	The pollen grain is tricolpate with three or more furrows or ridges on the pollen tube.
9	Seed germination	The seed germination in the monocot embryo is hypogeal.	The seed germination in the dicot embryo is either hypogeal or epigeal.



Sr No.	Basis for Comparin	Monocotyledons (Monocots)	Dicotyledons (Dicots)
10	Examples	Bamboos, bananas, asparagus, ginger, tulips, lilies, palms are some examples of monocots.	Roses, oak trees, daisies, peas, beans, cactus are some examples of dicots.



# Reference

- <https://byjus.com/biology/angiosperms/#:~:text=All%20angiosperms%20are%20comprised%20of,the%20greatest%20advantages%20of%20angiosperms.>
- <https://www.ck12.org/book/ck-12-biology-advanced-concepts/section/13.16/>
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