

# Morphology of Flowering Plants

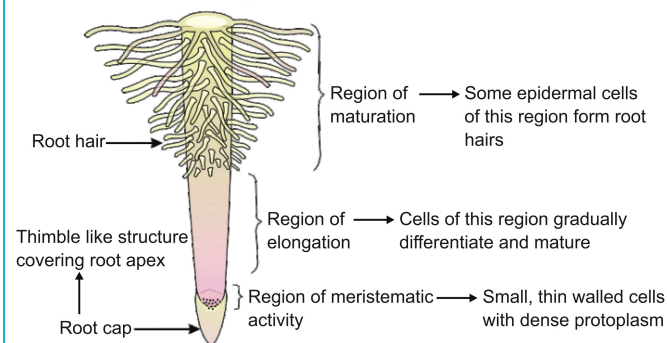
## 1 INTRODUCTION

- Angiosperms show a large diversity in morphology. Possibly the variation in different parts are due to the adaptations to various habitats.
- A plant has root system and shoot system

## 2 THE ROOT

- Elongation of radicle form primary root
- Primary root bears lateral roots of several orders that are referred to as secondary, tertiary etc. roots.
- Types of roots
- Tap root system** : Includes primary root and its branches
  - Seen mainly in dicots eg. Mustard
- Fibrous root system** : In monocots, primary root is short lived and replaced by a large number of roots originate from the base of the stem.
- Adventitious roots** : Roots that arise from parts of plants other than radicle eg. grass, *Monstera* and banyan tree.
- Functions of roots** :
  - Absorption of water and minerals from soil.
  - Provide anchorage to plant parts.
  - Storage of reserve food materials.
  - Synthesis of plant growth regulators (PGRs)

## 3 REGIONS OF ROOT



## 4 MODIFICATIONS OF ROOT

### Storage of food

- Tap root – Carrot, turnip

- Adventitious root – Sweet potato

### Prop root

- Arise from branches to support them

- eg. Banyan

### Stilt root

- Supporting root coming out from lower nodes

- eg. Maize sugarcane

### Pneumatophore

- Root growing vertically upward for oxygen in plants of swampy area

- eg. *Rhizophora*

## 5 THE STEM

- Develops from plumule

- Bears nodes, internodes, buds (terminal or axillary).

### Functions :

- Spread out branches bearing leaves, flowers, fruits.
- Conducts water, minerals and photosynthates

### MODIFICATIONS OF STEM

- Underground stem**: For storage of food, also act as organ of perennation to tide over conditions unfavourable for growth.

eg. potato, ginger, turmeric, *Colocasia*, Zaminkand

- Tendrils**: Axillary bud may modify into tendril, help plants to climb.

eg. Grapevines and Gourds (Cucumber, Pumpkin, Watermelon).

- Thorn**: Axillary buds modify into woody pointed thorn eg. *Bougainvillea*, *Citrus*

- Flat or cylindrical photosynthetic stem**: eg. *Opuntia* (flattened), *Euphorbia* (cylindrical)

### SOME OTHER MODIFICATIONS OF STEM

- In mint and jasmine a slender lateral branch arise from base of the main axis and after growing aurally arch downward and touch the ground.
- Aquatic plants like *Pistia* and *Eichhornia* have lateral branch with short internodes and each node bear rosette of leaves and tuft of roots.
- In banana, pineapple and *Chrysanthemum* lateral branches arise from basal and underground stem, grow horizontally and then come out obliquely upward to form leafy shoots.
- Underground stem of grass and strawberry spread to new niches and when older part dies new plants are formed. Underground storage stem also acts as organ of perennation

## 6 THE LEAF

### TYPES OF LEAVES

- Lateral generally flat structure, develops at node and bear a bud in its axil.

- Arise from shoot apical meristem and arranged in acropetal order.

- Consist of 3 parts, Leaf base, Petiole and Lamina

- Two lateral small leaf like structures at leaf base, are called stipules.

- Leaf base may expand into sheath like structure covering stem partially or wholly in monocots.

- Leaf base may become swollen in leguminous plants called **pulvinus**.

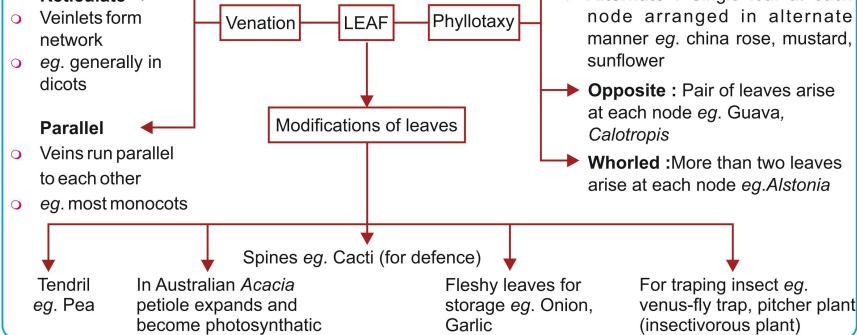
- SIMPLE LEAF** : Lamina is entire or when incised, incision do not reach midrib

- COMPOUND LEAF** : Incision of lamina reaches up to the midrib breaking it into leaflets. It is of two types

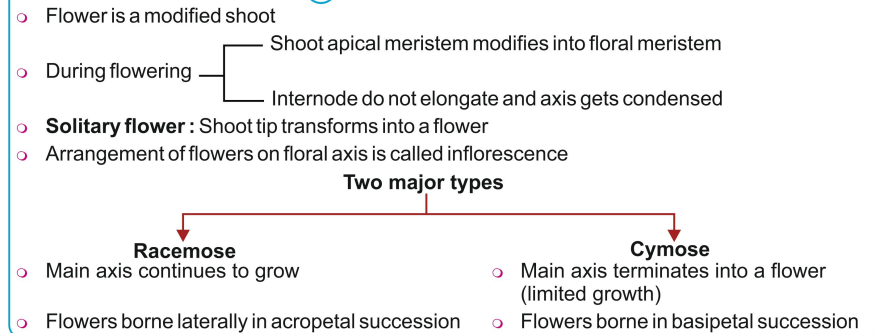
- (i) Pinnately compound-leaflets are present on a common axis, the rachis. eg. Neem

- (ii) Palmately compound-leaflets are attached at a common point i.e. at the tip of petiole. eg. silk cotton

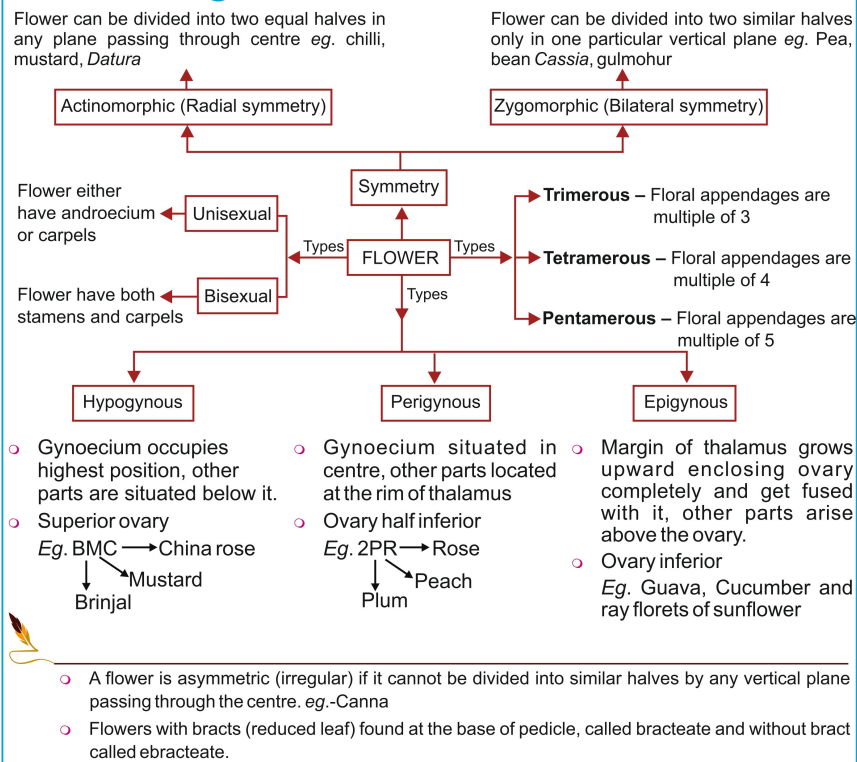
## 7



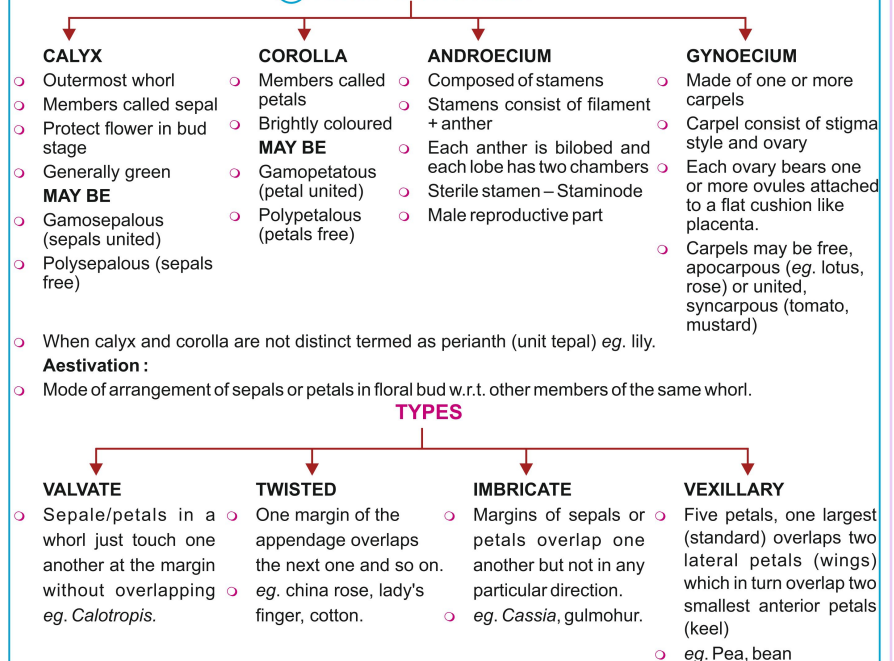
## 8 THE INFLORESCENCE



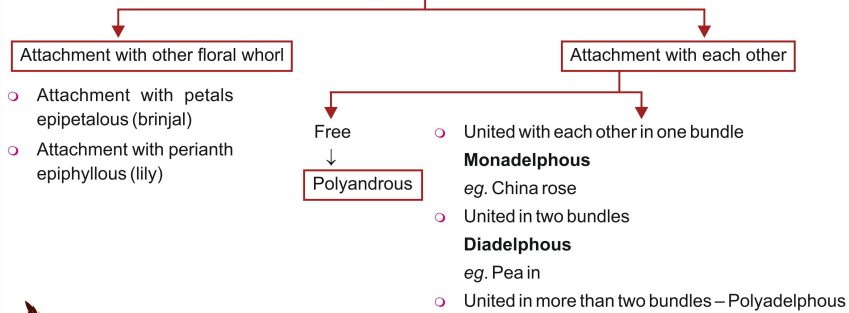
## 9 THE FLOWER (REPRODUCTIVE UNIT)



## 10 PARTS OF A FLOWER



### 11 STAMEN

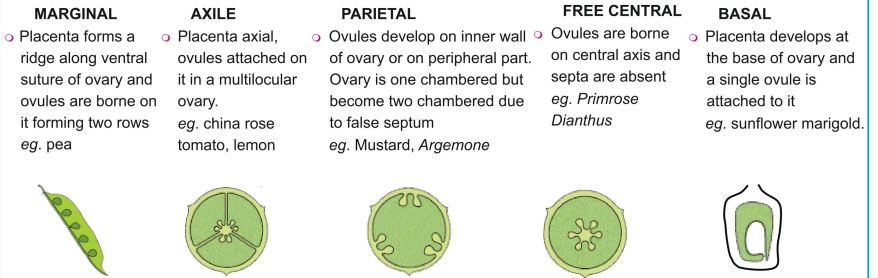


There may be a variation in the length of filaments within a flower as in *Salvia* and mustard.

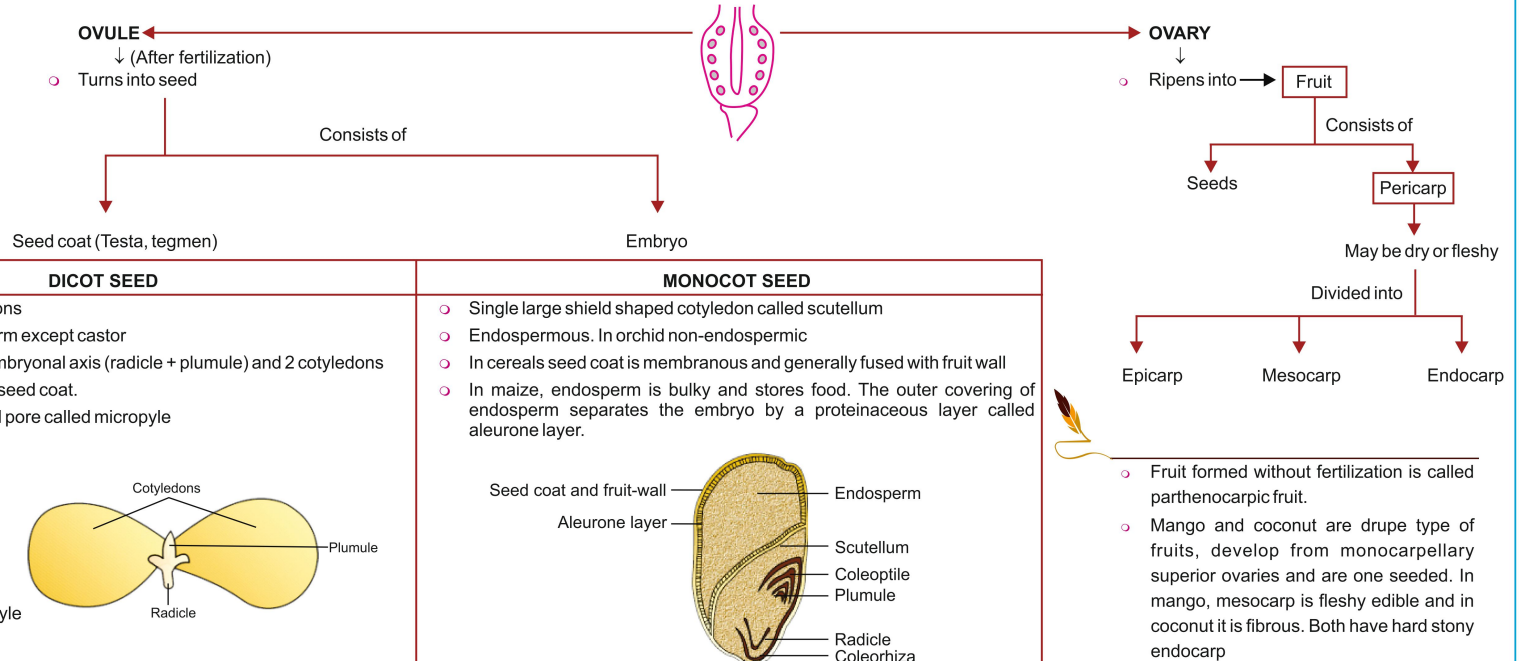
### 12 PLACENTATION

- Arrangement of ovules within the ovary




#### TYPES



### 13 THE FRUIT AND SEED



## 15 DESCRIPTION OF SOME IMPORTANT FAMILIES

Character/feature	Fabaceae	Solanaceae	Liliaceae
	Earlier called Papilionoideae, subfamily of Leguminosae	Commonly called potato family	A monocotyledonous family also called lily family
Stem	Erect or climber	Herbaceous, rarely woody solid/hollow, hairy/glabrous, underground as in potato	Underground bulbs/corms/rhizome
Leaves	Alternate, pinnately compound pulvinate, stipulate, venation reticulate	Alternate, simple, rarely pinnate, reticulate venation	Mostly basal, alternate, linear, exstipulate, parallel venation
Inflorescence	Racemose	Solitary, axillary or cymose as in <i>Solanum</i>	Solitary/cymose, often umbellate clusters
Flower	Bisexual, zygomorphic	Bisexual, actinomorphic	Bisexual, actinomorphic
Calyx	5, gamosepalous, valvate/imbricate aestivation	5, gamosepalous, persistent, valvate aestivation	<b>Perianth:</b> Tepal 6(3 + 3), often united in tube, valvate aestivation
Corolla	5, polypetalous, papilionaceous corolla, vexillary aestivation	5, gamopetalous, valvate aestivation	
Androecium	10, diadelphous, anther dithecous	5, epipetalous	6(3 + 3), epitepalous
Gynoecium	Superior ovary, monocarpellary, unilocular, many ovules, marginal placentation	Bicarpellary, obliquely placed, syncarpous, superior, bilocular, placenta swollen, axile placentation, many ovules	Tricarpellary, syncarpous, superior ovary, trilocular, axile placentation, many ovules
Fruit and seed	Legume, non-endospermic seed	Berry/capsule, endospermous seed	Capsule rarely berry, endospermous seeds
Floral formula	$\% \overline{\text{P}} \text{K}_{(5)} \text{C}_{1+2+(2)} \text{A}_{(9)+1} \underline{\text{G}}_1$	$\oplus \overline{\text{P}} \text{K}_{(5)} \text{C}_{(5)} \text{A}_5 \underline{\text{G}}_{(2)}$	$\text{Br} \oplus \overline{\text{P}} \text{P}_{(3+3)} \text{A}_{3+3} \underline{\text{G}}_{(3)}$
Floral diagram			

## ECONOMIC IMPORTANCES

Fabaceae	Solanaceae	Liliaceae
<ul style="list-style-type: none"> <li><b>Pulses</b> (gram, arhar, sem, moong, soyabean)</li> <li><b>Edible oil</b> (Soyabean Groundnut)</li> <li><b>Dye</b> (<i>Indigofera</i>)</li> <li><b>Fibres</b> (Sunhemp)</li> <li><b>Fodder</b> (<i>Sesbania Trifolium</i>)</li> <li><b>Ornamental</b> (Lupin, sweet pea)</li> <li><b>Medicine</b> (muliathi)</li> </ul>	<ul style="list-style-type: none"> <li><b>Food</b> – (Tomato, potato, brinjal)</li> <li><b>Spice</b> – (Chilli)</li> <li><b>Medicine</b> – (Belladonna, Ashwagandha)</li> <li><b>Fumigatory</b> – Tabacco</li> <li><b>Ornamental</b> – <i>Petunia</i></li> </ul>	<ul style="list-style-type: none"> <li><b>Vegetable</b> – (<i>Asparagus</i>)</li> <li><b>Medicine</b> – (<i>Aloe</i>)</li> <li><b>Ornamental</b> (Tulip, <i>Gloriosa</i>)</li> <li><b>Colchicine</b> (<i>Colchicum autumnale</i>)</li> </ul>

## 14 Semi technical description of a typical flowering plant

A. Symbols used in floral formula :

Calyx – K

Corolla – C

Perianth – P

Androecium – A

Gynoecium – G

Superior ovary –  $\underline{\text{G}}$

Inferior ovary –  $\overline{\text{G}}$

Male flower – ♂

Female flower – ♀

Bisexual flower – ♂♀

Actinomorphic flower –  $\oplus$

Zygomorphic flower – %

Floral formula of mustard

$\oplus \overline{\text{P}} \text{K}_{2+2} \text{C}_4 \text{A}_{2+4} \underline{\text{G}}_{(2)}$

Floral diagram of mustard

