MORPHOLOGY OF FLOWERING PLANTS

ROOT SYSTEM, MODIFICATION OF ROOTS

Morphology of Flowering Plants

Root System

Morphology

Morphology : The study of various external features, forms and relative position of different organs of the organism is known as morphology.

It may be further divided into internal and external morphology.

External Morphology :
It deals with external forms like shape, size, colour, structure and relative position of different organs.

Internal Morphology :
It is further divided into anatomy and histology.

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Anatomy :

It deals with the study of internal structure exposed after dissection and opening of various parts of an organ.

Histology :

The study of tissues, their composition and structure.

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Root

The radicle of embryo develops into primary root which grows inside the soil.

It bears lateral roots of several orders that are referred to as secondary and tertiary roots.

The primary roots and its branches form the tap root system, as seen in the mustard plant

In monocotyledonous plants, the primary root is short lived and is replaced by a cluster of roots.

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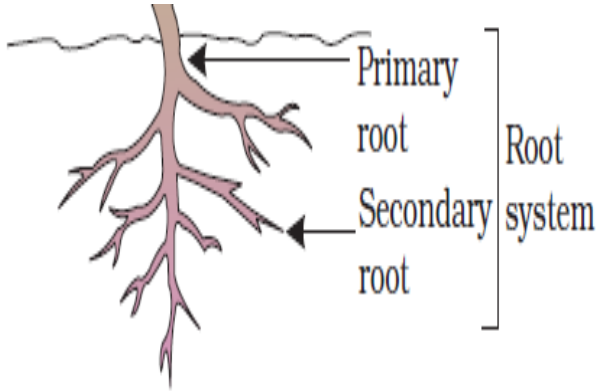
These roots originate from the base of the stem and form the fibrous root system, as seen in the wheat plant

In some plants, like grass, Monstera and the banyan tree, roots arise from parts of the plant other than the radicle and are called adventitious roots.



Characteristics and Functions of Roots

Characteristics of Roots:

Roots lack chlorophyll, nodes, internodes, leaves and buds;

They are positively geotropic and hydrotropic and negatively phototropic.

The main functions of the root system are;

- They absorb of water and minerals from the soil.
- They provide a proper anchorage to the plant parts.
- They store reserve food material.
- They synthesize plant growth regulators.

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Regions of Roots

Root Cap:

The root is covered at the apex by a thimble-like structure called the **root cap**.

It protects the tender apex of the root as it makes its way through the soil.

Region of meristematic activity:

A few millimetres above the root cap, is the region of meristematic activity.

The cells of this region are very small, thin-walled and with dense protoplasm. They divide repeatedly.

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Region of Elongation:

The cells of this region undergo rapid **elongation** and **enlargement** and are responsible for the growth of the root in length. This region is called the region of elongation.

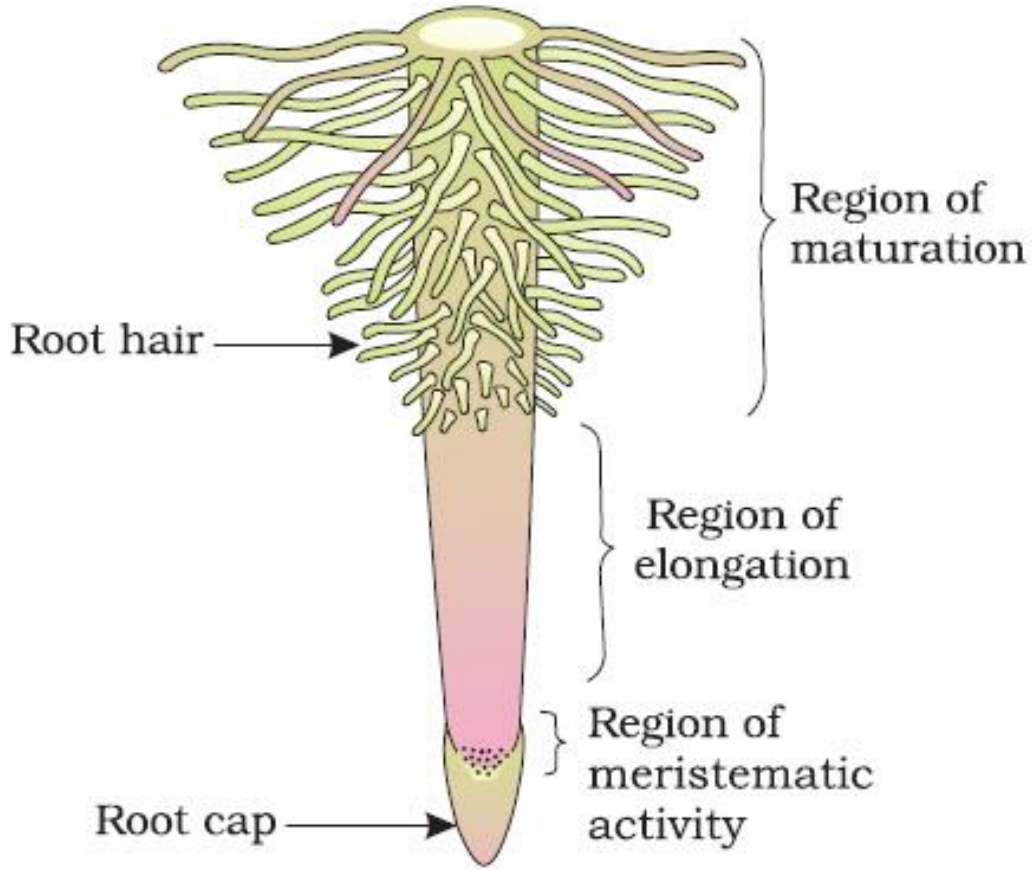
Region of maturation:

The cells of this region gradually **differentiate and mature**. Hence, this zone is called the region of maturation.

Some of the epidermal cells of this region form **very fine and delicate, thread-like** structures called root hairs.

These **root hairs** absorb water and minerals from the soil.

Regions of Roots



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Modifications of Roots

Prop roots:

The banyan tree has pillar-like adventitious roots arising from the aerial part of the stem. These roots grow towards the ground and provide support to the tree. Such roots are called prop roots.

Stilt roots:

The stems of maize and sugarcane have supporting roots coming out of the **lower nodes of the stem**. These are called **stilt roots**.

Pneumatophores:

In some plants such as **Rhizophora** growing in swampy areas, many roots come out of the ground and grow vertically upwards. Such roots, called **pneumatophores**, help to get oxygen for respiration.

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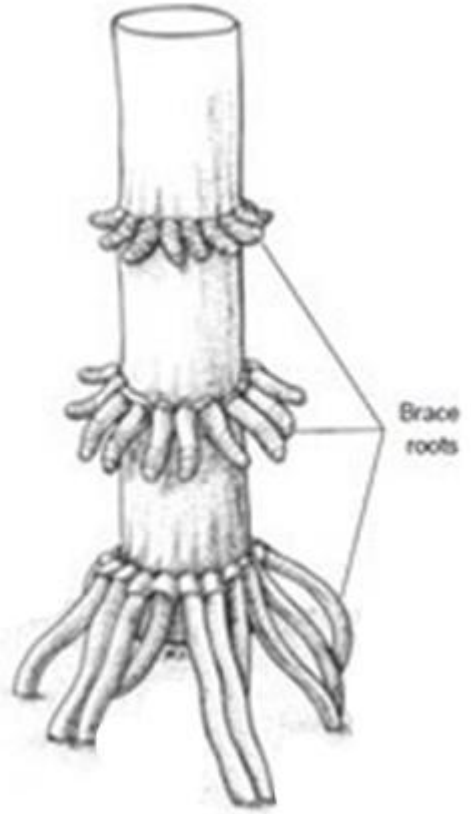
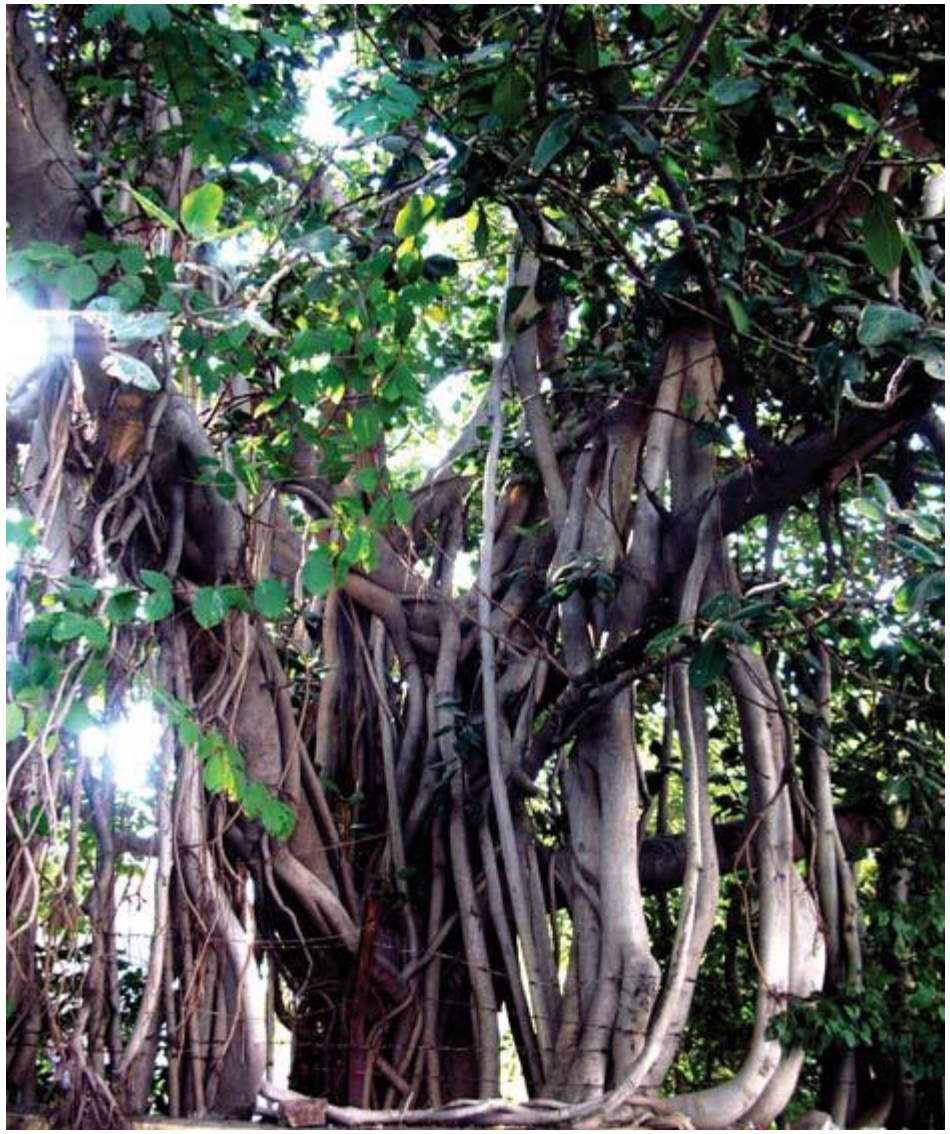
Modifications of Roots

Adventitious Roots

Stilt Roots

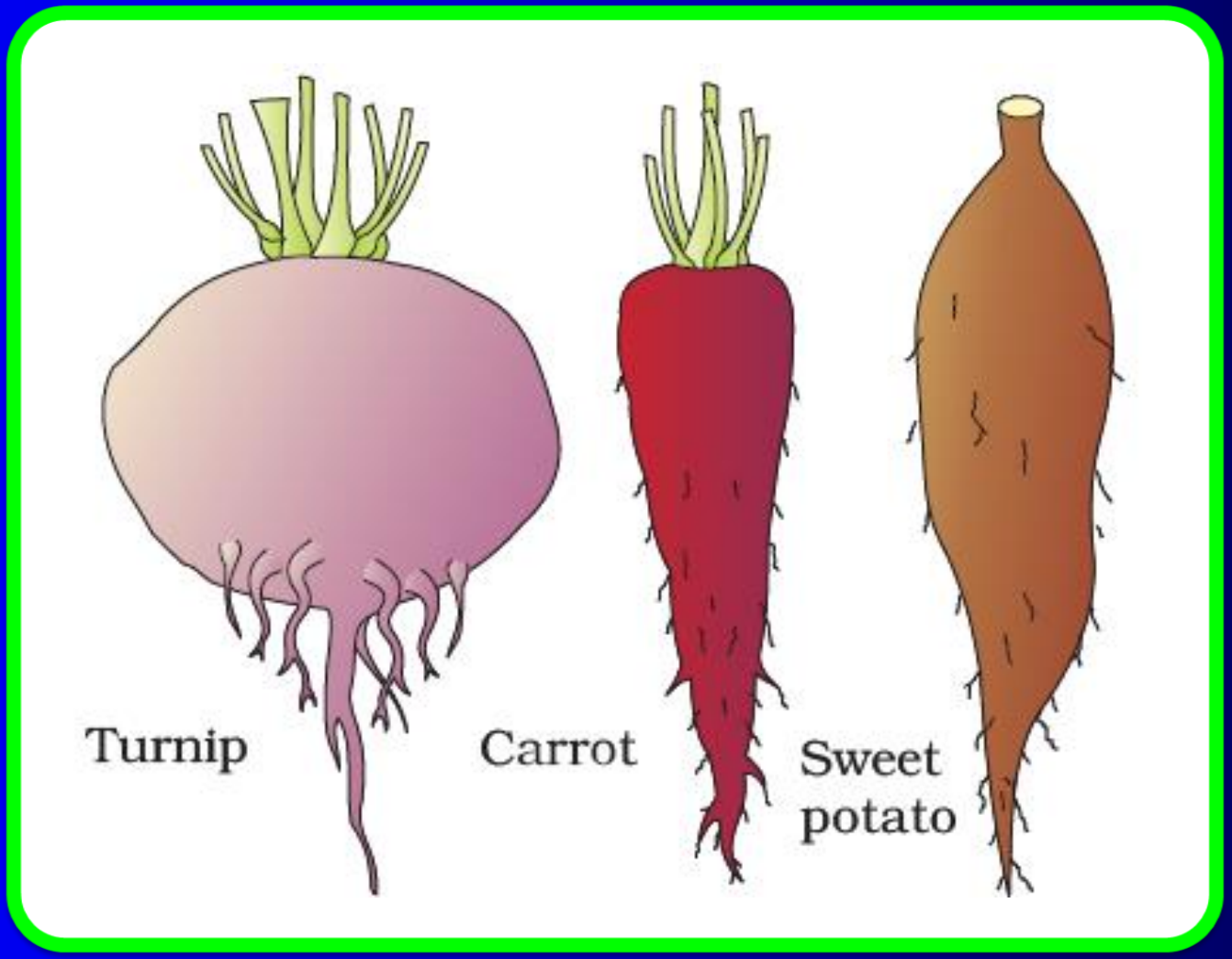


Prop Roots of Banyan



Pneumatophores of Rhizophora

Modification of Roots for Storage



MORPHOLOGY OF FLOWERING PLANTS

SHOOT SYSTEM, MODIFICATIONS OF STEMS

ROOTS

Shoot System

Stem

The stem is the ascending part of the axis bearing branches, leaves, flowers and fruits.

It develops from the plumule of the embryo of a germinating seed.

The stem bears **nodes** and **internodes**.

The regions of the stem where leaves are born are called nodes while internodes are the portions between two nodes.

The stem bears buds, which maybe terminal or axillary.

Stem is green when it is young and becomes woody and dark brown later.

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Functions of Stem

The main function of the stem is spreading out branches bearing leaves, flowers and fruits.

It conducts water, minerals and food.

Some stems perform the function of storage of food, support, protection and of vegetative propagation.

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Modifications of Stems

Storage of Food:

They are modified to perform different functions. Underground stems of potato, ginger, turmeric, zaminkand, Colocasia are modified to store food in them.

They also act as organs of perenation to tide over conditions unfavourable for growth.

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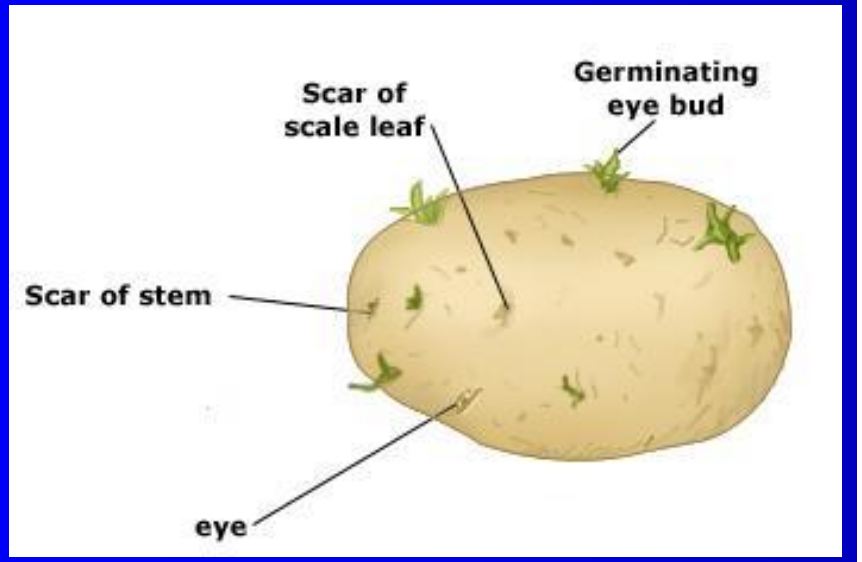
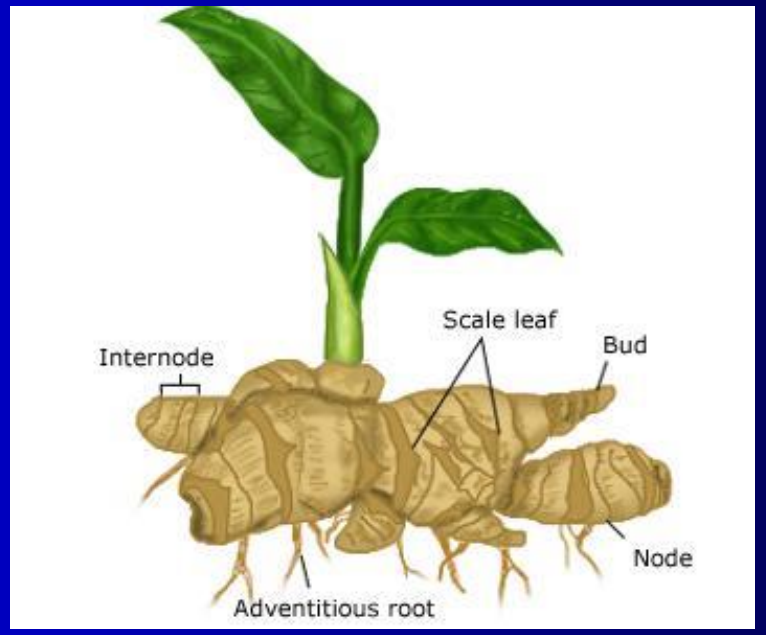
Modifications of Stems

Tuber of Potato



Rhizome of Ginger



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Turmeric

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Yam

Corm of Colocasia

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Support:

Stem tendrils which develop from axillary buds, are slender and spirally coiled and help plants to climb such as in gourds (cucumber, pumpkins, watermelon) and grape vines.

Stem tendril of Pumpkin

Protection:

Axillary buds of stems may also get modified into woody, straight and pointed **thorns.**

Thorns are found in many plants such as Citrus, Bougainvillea.

They protect plants from browsing animals.

Thorn of bougainvillea

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Photosynthesis:

Some plants of arid regions modify their stems into flattened (Opuntia), or fleshy cylindrical structures (Euphorbia).

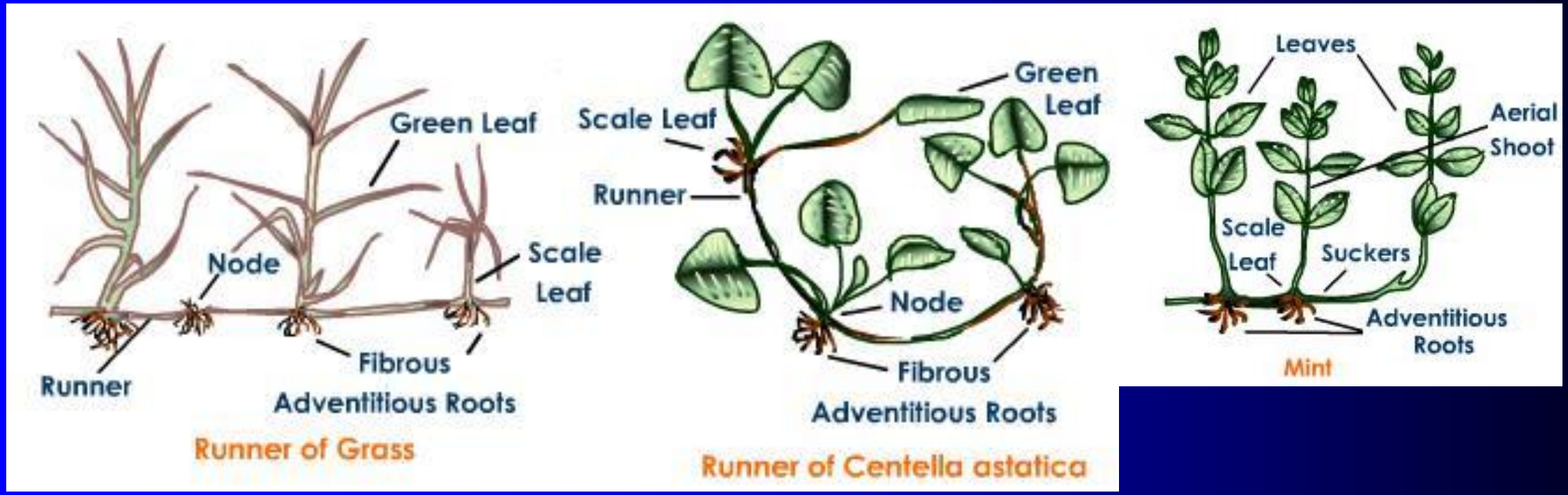
They contain chlorophyll and perform photosynthesis.

Opuntia

Euphorbia

Runners:

Underground stems of some plants such as grass and strawberry, etc., spread to new niches and when older parts die new plants are formed.



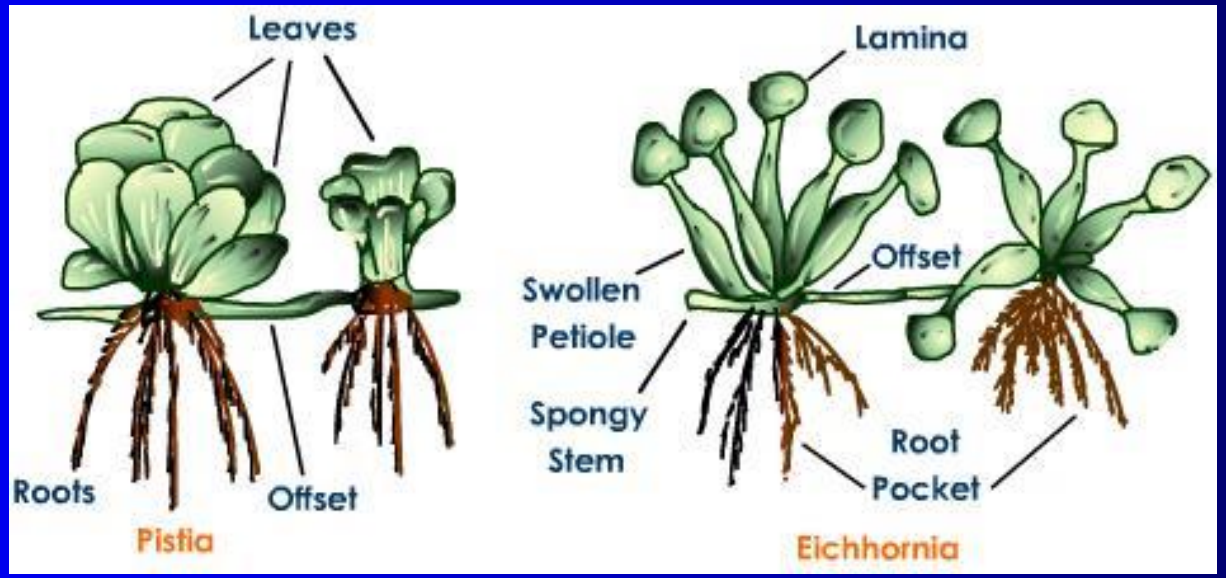
Stolon:

In plants like **mint** and **jasmine** a slender lateral branch arises from the base of the main axis and after growing aerially for some time arch downwards to touch the ground.

Modifications of Stems

Offset:

A lateral branch with short internodes and each node bearing a rosette of leaves and a tuft of roots is found in aquatic plants like Pistia and Eichhornia.



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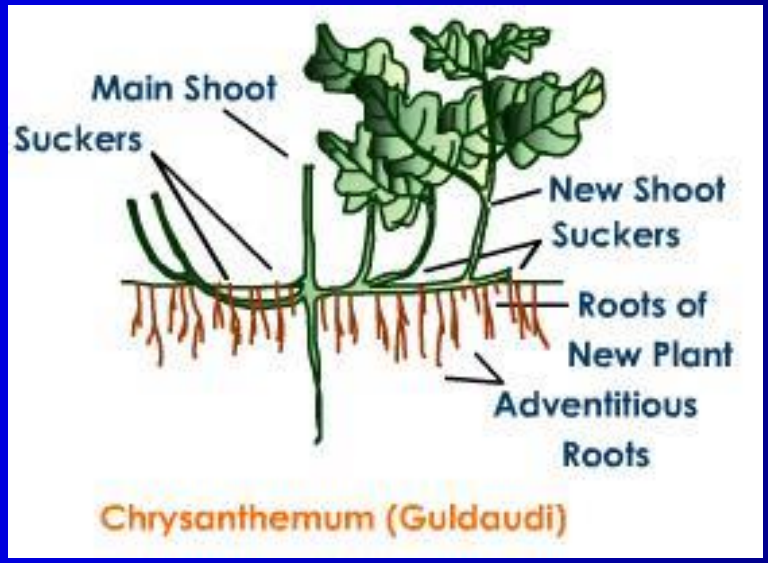
Sucker:

In banana, pineapple and Chrysanthemum, the lateral branches originate from the basal and underground portion of the main stem, grow horizontally beneath the soil and then come out obliquely upward giving rise to leafy shoots.



MORPHOLOGY OF FLOWERING PLANTS

LEAVES AND MODIFICATIONS OF LEAVES

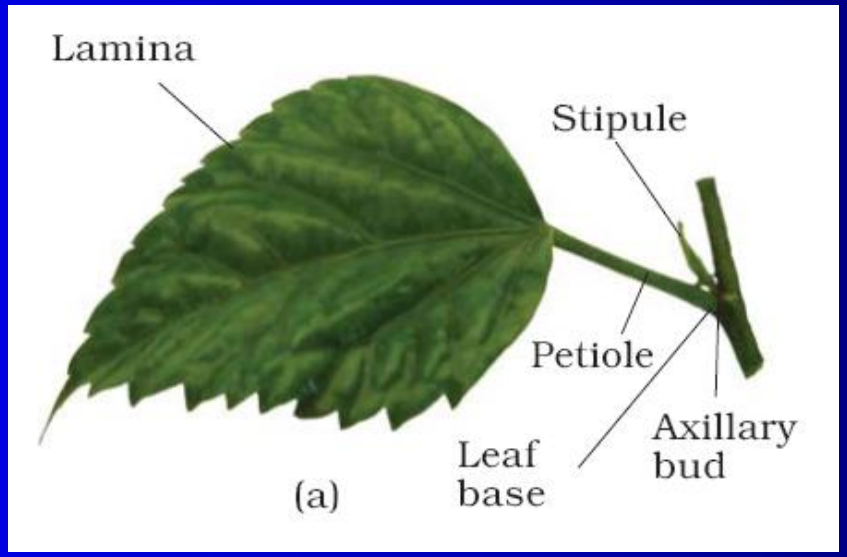
Leaves

Leaf

The leaf is a lateral, flattened structure borne on the stem. It develops at the node and bears a bud in its axil.

A typical leaf consists of three main parts: **leaf base, petiole and lamina.**

Leaves originate from shoot apical meristems and are arranged in an acropetal order.



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The leaf is attached to the stem by the **leaf base** and may bear two lateral small leaf-like structures called stipules.

In monocotyledons, the leaf base expands into a sheath covering the stem partially or wholly.

In some leguminous plants the leaf base may become swollen, which is called the **pulvinus**.

The **petiole** helps to hold the blade to light.

Long thin flexible petioles allow leaf blades to flutter in wind, thereby cooling the leaf and bringing fresh air to leaf surface.

The **lamina** or the **leaf blade** is the green expanded part of the leaf with veins and veinlets.

There is, usually, a middle prominent vein, which is known as the midrib.

Veins provide rigidity to the leaf blade and act as channels of transport for water, minerals and food materials.

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Venation

The arrangement of veins and the veinlets in the lamina of leaf is termed as **venation.**

When the veinlets form a network, the venation is termed as **reticulate**.
Eg., Dicot leaves

When the veins run parallel to each other within a lamina, the venation is termed as **parallel.**
Eg., Monocot leaves

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Venation

Reticulate Venation

Parallel Venation

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Types of Leaves

Pinnately Compound Leaf:

In a **pinnately compound leaf** a number of leaflets are present on a common axis, the **rachis,** which represents the midrib of the leaf as in **neem.**

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Types of Leaves

Palmately Compound Leaf:

In **palmately compound leaves**, the leaflets are attached at a common point, i.e., at the tip of petiole, as in silk cotton.

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Phyllotaxy

Phyllotaxy is the pattern of arrangement of leaves on the stem or branch. This is usually of three types -alternate, opposite and whorled.

Alternate Phyllotaxy:

In **alternate** type of phyllotaxy, a single leaf arises at each node in alternate manner.

Eg. China rose, mustard and sun flower plants.

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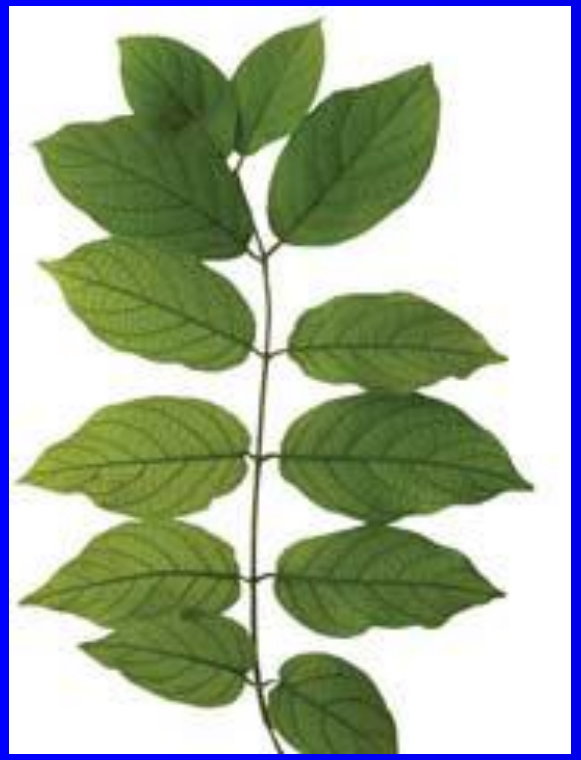
Phyllotaxy



Opposite Phyllotaxy:

In **opposite** type, a pair of leaves arise at each node and lie opposite to each other.
Eg. Calotropis and guava plants.

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Phyllotaxy

Whorled Phllotaxy:

If more than two leaves arise at a node and form a whorl, it is called **whorled**.

Eg. Alstonia.

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Modifications of Leaves

	Name of the plant	Modification of leaf	Function
1	Peas	Tendrils	Climbing
2	Cacti	Spines	Defence
3	Onion and garlic	Fleshy leaves	Store food
4	Australian acacia	Petioles expands and becomes green	Synthesise food
5	Pitcher plant and Venus-fly trap	Pitcher or Fly trap	Captures insect

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Inflorescence

Inflorescence

The arrangement of flowers on the floral axis is termed as **inflorescence.**

There are two major types of inflorescences - racemose and cymose depending on whether the apex of floral axis gets converted into a flower or continues to grow.

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Racemose Inflorescence

The inflorescence in which the main floral axis continues to grow and produce only lateral flowers is known as racemose inflorescence.

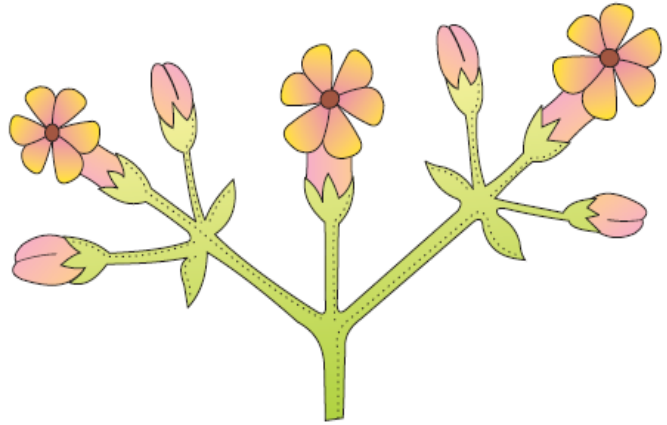
Racemose inflorescence has unlimited growth.

The flowers are arranged in a acropetal order.

Eg. Neem, Gulmohar, Mustard.

Acropetal order is the arrangement of **new flowers and buds at the apex** of the pedicel and **older flowers** at the **base** of the pedicel.

Cymose Inflorescence



The inflorescence in which the main floral axis terminates into an apical flower is known as cymose inflorescence.

Cymose inflorescence has limited growth.

The flowers are arranged in a basipetal order. Eg. Clerodendrum and Jasmine.

Basipetal order is the arrangement of new flowers and buds at the base of the pedicel and older flowers at the apex of the pedicel.

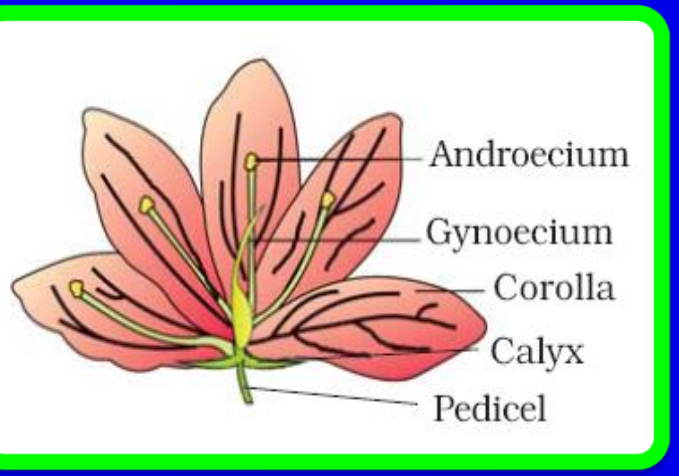
Difference between racemose and cymose Inflorescences

Racemose inflorescence	Cymose inflorescence
The inflorescence in which the main floral axis continues to grow and produce only lateral flowers is known as racemose inflorescence	The inflorescence in which the main floral axis terminates into an apical flower is known as cymose inflorescence.
Racemose inflorescence has unlimited growth.	Cymose inflorescence has limited growth.
The flowers are arranged in a acropetal order. Eg. Neem, Gulmohar, Mustard.	The flowers are arranged in a basipetal order. Eg. Clerodendrum and Jasmine.

Flower

Flower

A flower is a modified shoot where the shoot apical meristem changes to floral meristem.



Types of whorls of a flower:

A typical flower has four different kinds of whorls arranged successively on the swollen end of the pedicel, called thalamus or receptacle. They are calyx, corolla, androecium and gynoecium.

Accessory Organs or Non Essential Whorls:

Calyx and corolla are accessory organs or non essential whorls.

Reproductive organs or Essential Whorls:

Androecium and gynoecium are reproductive organs or essential whorls

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Calyx

The calyx is the outermost whorl of the flower and the members are called sepals. Sepals are green, leaf like structures which protect the flower in the bud stage.

The calyx may be **gamosepalous** (sepals united) or **polysepalous** (sepals free).

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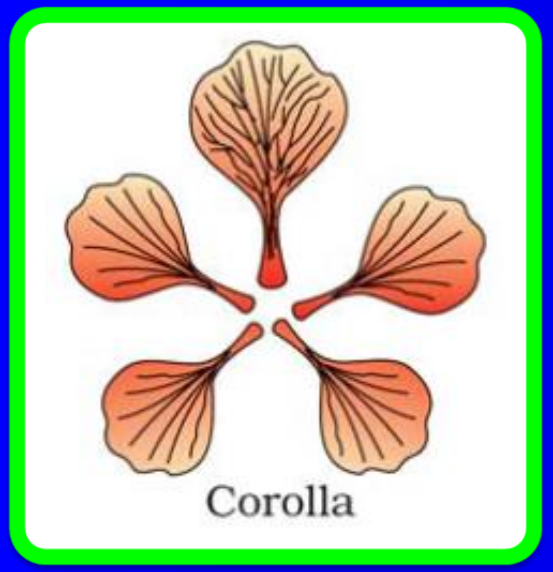
Corolla



Corolla is composed of petals. Petals are brightly coloured to attract insects for pollination.

Corolla may be Gamopetalous or Polypetalous.

The shape and colour of corolla vary greatly in plants.

Corolla maybe tubular, bell-shaped, funnel-shaped or wheel-shaped.

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Androecium

Androecium is composed of stamens which represent the male reproductive organs .

Each stamen consists of filament and anther.

Each anther is bibbed and each lobe has two chambers, the pollen-sacs.

The pollen-sacs consist of pollengrains. A sterile stamen is called **staminode.**

Stamens may be united among themselves or with petals.

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Epipetalous Stamens:

The stamens which are attached to the petals are known as **epipetalous** stamens. Eg., brinjal,

Epiphyllous Stamens:

The stamens which are attached to the perianth are known as **epiphyllous** stamens. Eg., Lily.

Polyandrous Stamens:

The stamens which remain free are known as polyandrous stamens.

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Monoadelphous Stamens:

The stamens which are united into one bundle are known as monoadelphous stamens. Eg., China rose.

Diadelphous Stamens:

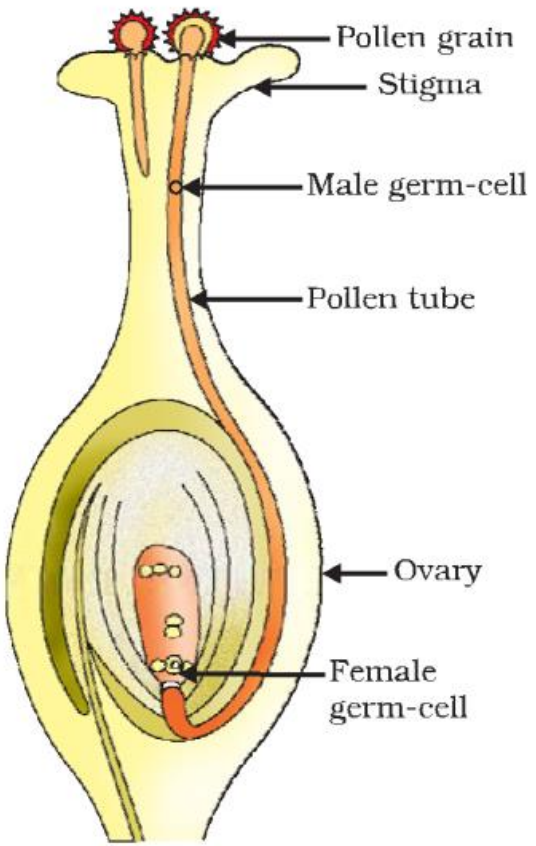
The stamens which are united into two bundles are known as diadelphous stamens. Eg., Pea.

Polyadelphous Stamens:

The stamens which are united into more than two bundles are known as polyadelphous stamens. Eg.,Citrus.

Gynoecium

Pistil



Gynoecium is the female reproductive part of the flower and is made up of one or more carpels.

A carpel consists of three parts namely stigma, style and ovary.

The tip of the carpel which receives pollen grains is known as **stigma.**

The slender middle part which connects the stigma and ovary is known as **style.**

The basal swollen part of the carpel is called **Ovary**.

Each ovary consists of one or more ovules attached to a flattened, cushion-like structure called **placenta.**

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Carpels

Apocarpous Ovary:
The ovary in which the carpels are free as in lotus and rose, is called **apocarpous ovary.**

Syncarpous Ovary:
The ovary in which the carpels are fused as in mustard and tomato, is called syncarpous ovary.

The ovules develop into seeds and the ovary matures into a fruit after fertilization.

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Description of Flower based on the number of floral segments and bracts

The flowers with three floral appendages are called **trimerous** flowers.
The flowers with four floral appendages are called **tetramerous** flowers.
The flowers with five floral appendages are called **pentamerous flowers**.

Bracteate Flowers:
The flowers which have bracts (reduced leaf) at the base of the pedicel, are called **bracteate flowers.**

Ebracteate Flowers:
The flowers without bracts are called **ebracteate flowers.**

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Types of Flowers

Perianth (Lily)

Monochlamydeous Flower:

A flower having either calyx or corolla is called monochlamydeous flower. The outer accessory whorl is termed as perianth. Eg., Lily

Bisexual (Hibiscus)

Bisexual flower:

A flower having both androecium and gynoecium is a **bisexual flower**. Eg., Hibiscus rosa-sinensis. (China Rose)

Unisexual (Pumpkin)

Unisexual flower

A flower having either stamens or carpels is a **unisexual flower.** Eg., Cucurbita pepo. (Pumpkin)

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Symmetry

Actinomorphic Flower

A flower which can be divided into two equal halves in **any radial plane** passing through the centre, is known as actinomorphic flower.
e.g., Datura, Chilli, Mustard.

Datura metal (Datura)

Capsicum annum (Chilli)

Brassica rapa (Mustard)

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Zygomorphic Flower

A flower which can be divided into two similar halves **only in one particular vertical plane**, is called zygomorphic flower. e.g., pea, gulmohar, bean, Cassia.

Delonix regia
(Gulmohar)

Cassia fistula
(Cassia)

Pisum sativum
(Pea)

Phaseolus vulgaris
(Bean)

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Asymmetric Flower

A flower which cannot be divided into two similar halves by any vertical plane passing through the centre, is called asymmetric flower. e.g., Canna.

Canna indica
(Canna)

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Description of Flower based on the position of floral parts

Based on the position of calyx, corolla and androecium in respect to the ovary on thalamus, the flowers are described as hypogynous, perigynous and epigynous.

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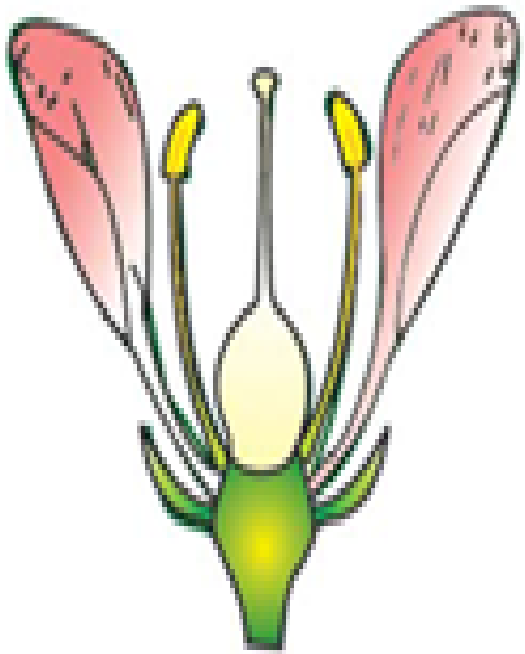
Hypogynous Flower



The flower in which the floral parts arise from the base of ovary is called **hypogynous** flower.

The ovary is superior. e.g., Mustard, china rose and brinjal.

Brassica rapa (Mustard)

Hibiscus Rosa-sinensis (China Rose)

Solanum melongena (Brinjal)

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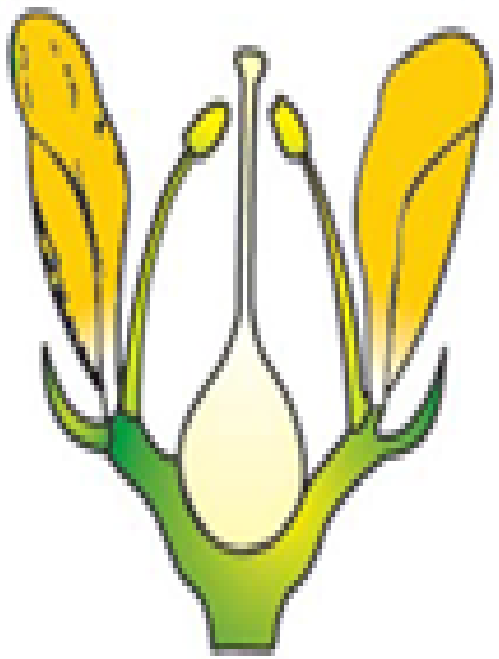
Perigynous Flower



The flower in which the floral parts arise almost from the centre of the ovary is called **perigynous** flower.
The ovary is half inferior or half superior in such flowers. e.g., Plum, rose, peach.

Prunus domestica (Plum)

Rosa damescena (Rose)

Prunus persica (Peach)

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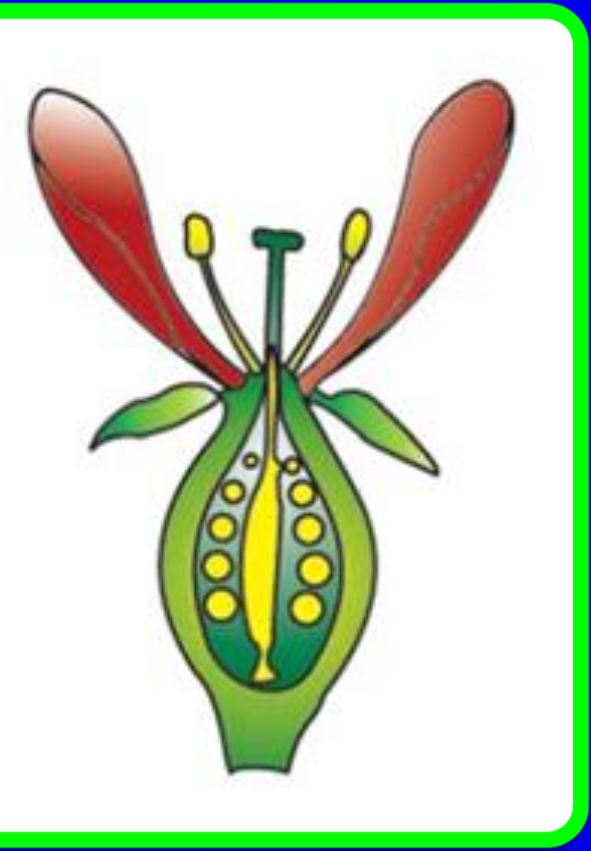
Epigynous Flower



The flower in which the floral parts arise from above the ovary is called **epigynous** flower.

The ovary is inferior in such flowers. In epigynous flower, the thalamus grows upward enclosing the ovary completely and getting fused with it. So the floral parts arise above the ovary.

Eg., guava and Cucumber, and Ray florets of sunflower.

Psidium guajava (Guava)

Cucumis sativus (Cucumber)

Helianthus annusn (Sunflower)

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Aestivation

Aestivation

The mode of arrangement of sepals or petals in floral bud with respect to the other members of the same whorl is known as aestivation.

The main types of aestivation are valvate, twisted, imbricate and vexillary

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Valvate Aestivation

When sepals or petals in a whorl just touch each other at the margin, without overlapping, is known as **valvate aestivation.** Eg. Calotropis procera, Datura metal.

Calotropis procera

Datura metal (Datura)

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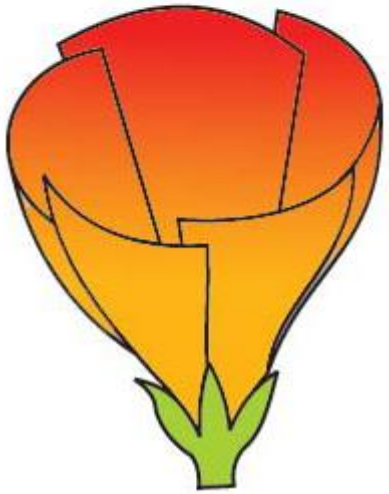
Twisted Aestivation



When there is a regular overlapping of sepals or petals, it is known as twisted aestivation.

i.e.., one margin of the sepal or petal overlaps the other in a specific direction , Eg. China rose, Lady's finger and Cotton.

Abelmoschus esculentus (Lady's finger)

Hibiscus rosa-sinensis (China Rose)

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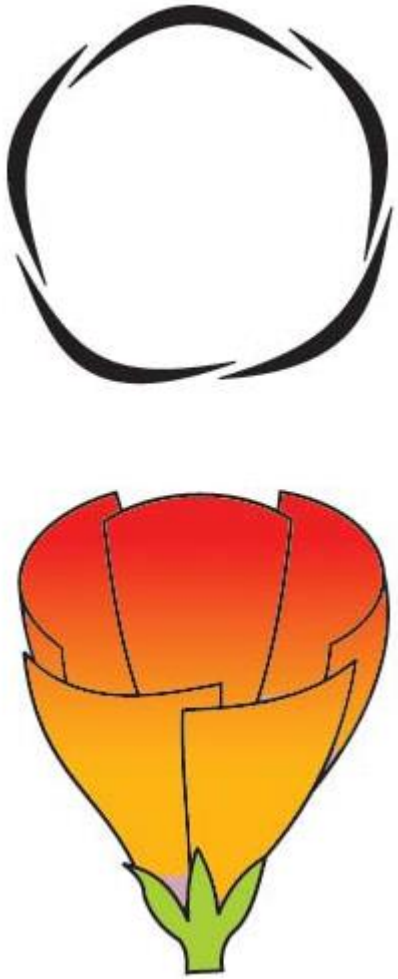
Imbricate Aestivation



When there is irregular overlapping of sepals or petals, it is known as imbricate aestivation. i.e.., the margins of sepals or petals overlap one another but not in a particular direction, Eg. Cassia and Delonix.

Cassia fistula (Cassia)

Delonix regia(China (Gulmohar)

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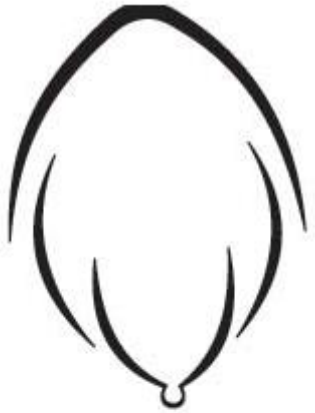
Vexillary Aestivation



In pea and bean flowers, there are five petals, the largest standard overlaps two lateral wing petals which in turn overlap two smallest and anterior keel petals.

This type of aestivation is known as **vexillary** aestivation.

Pisum sativum (Pea)

Phaseolus vulgaris (Bean)

Clitoria ternatea (Blue pea)

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Placentation

Placentation

The arrangement of ovules within the ovary is known as placentation.

The placentations are of different types namely, marginal, axile, parietal, basal, central and free central

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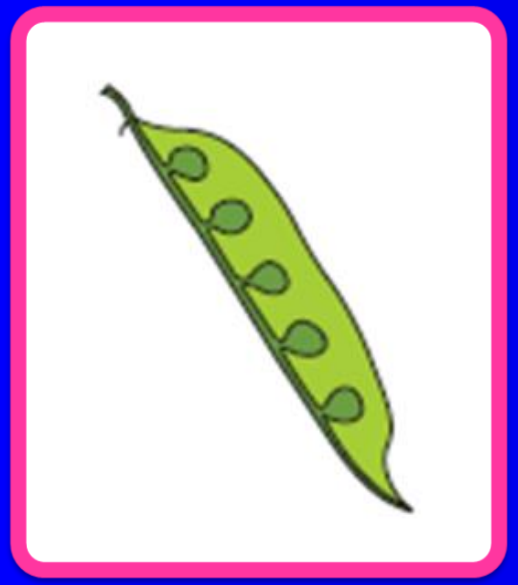
Marginal and Axile Placentations



Marginal Placentation:

When the ovules are attached to the **margin of the fused carpel**, it is known as marginal placentation. It is a monocarpellary unilocular, syncarpous ovary. Eg. Pea.

Axile Placentation:

When the ovules are attached to the **central axis** of the ovary, it is known as axile placentation. It is a multicarpellary, multilocular syncarpous ovary. Eg. China rose, Tomato and Lemon.

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Parietal and Free central Placentations

Parietal Placentation:

When the ovules are attached **at the junction of carpels** on the inner wall of the ovary, it is known as parietal placentation. It is a multicarpellary, unilocular, syncarpous ovary. The unilocular ovary becomes bilocular due to the formation of a false septum. E.g., Mustard and Argemone.

Free Central Placentation:

When the ovules are attached on the **central axis of the ovary** without septa, it is known as free central placentation. The ovary is multicarpellary, unilocular, syncarpous ovary.

Eg., Dianthus and Primrose.

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Basal Placentation

When a single ovule is attached at the base of the ovary, it is known as basal placentation.

The ovary is monocarpellary, unilocular, syncarpous ovary with a single ovule.

Eg., Sunflower, marigold.

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Fruit

Fruit

The formation of fruit is a characteristic feature of the Aniosperms.

Fruit is a mature or ripened ovary, developed after fertilisation.

The fruits formed without fertilisation of the ovary are called **parthenocarpic** fruits.

The fruits formed from ovary after fertilisation are called **true** fruits.

The fruit consists of **pericarp** and seeds.

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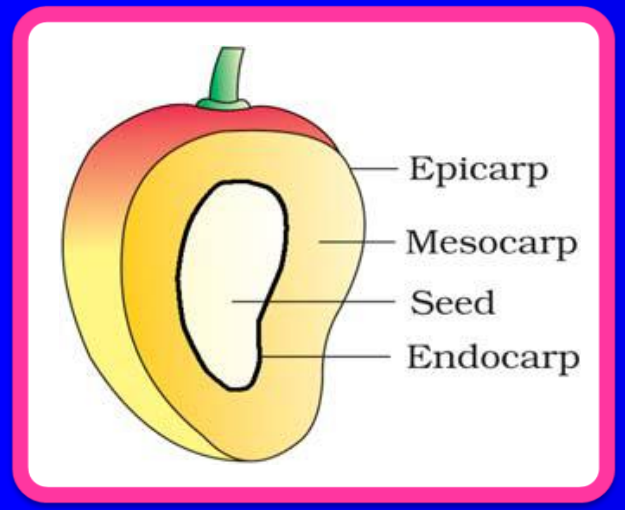
The pericarp may be dry or fleshy. When the pericarp is thick and fleshy, it is differentiated into the outer **epicarp**, the middle **mesocarp** and the inner **endocarp.**



In mango and coconut, the fruit is known as a drupe.
They develop from monocarpellary superior ovaries and are one seeded.

In mango the pericarp is well differentiated into an outer thin epicarp, a middle fleshy edible mesocarp and an inner stony hard endocarp.

In coconut which is also a drupe, the mesocarp is fibrous.

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Seed

Seed

The ovules after fertilisation, develop into seeds.

A seed is made up of seed coat and embryo.

The embryo is made up of an embryonal axis, a radicle, plumule and one or two cotyledons.

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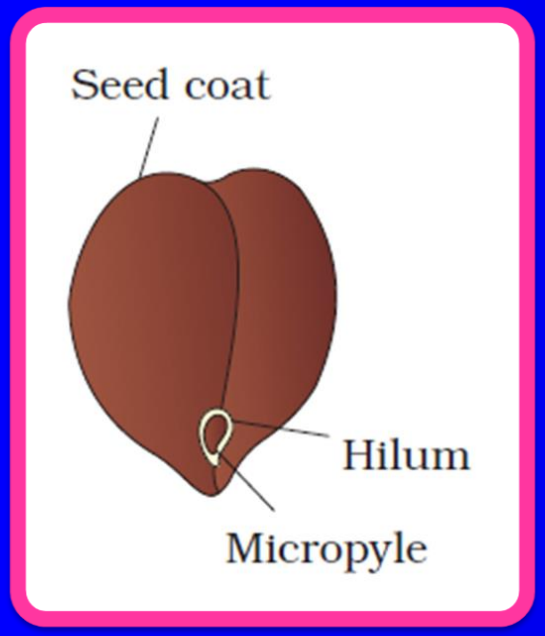
Dicot Seed

Dicot Seed



The outermost covering of a seed is the seed coat.

The seed coat has two layers, the outer **testa** and the inner **tegmen.**

The **hilum** is a scar on the seed coat through which the developing seeds are attached to the fruit.

Above the hilum is a small pore called the **micropyle**.

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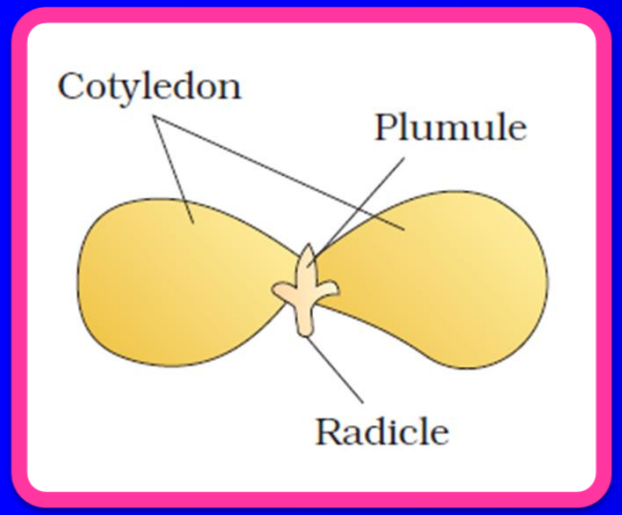


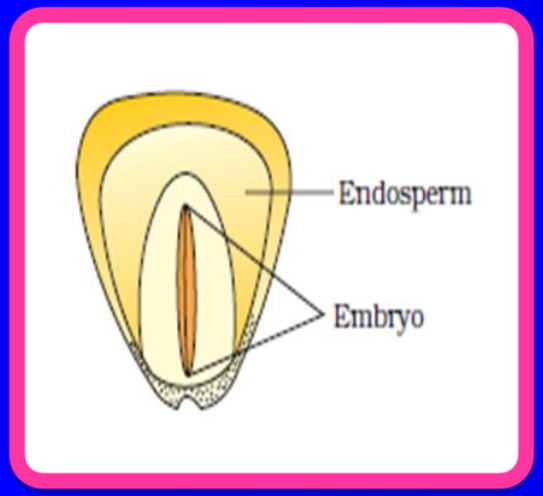
The embryo consists of an embryonal axis and two cotyledons.

The cotyledons are fleshy and full of reserve food materials.

The radicle and plumule are present at both the ends of the embryonal axis. Eg., **Gram and Pea.**

Monocot Seed

Monocot Seed



Monocot seeds are **mostly endospermic** but some are non-endospermic as in orchids.

In cereals such as maize the seed coat is membranous and fused with the fruit wall.

The endosperm is bulky and stores food.

The outer covering of endosperm separates the embryo by a proteinous layer called **aleurone layer.**

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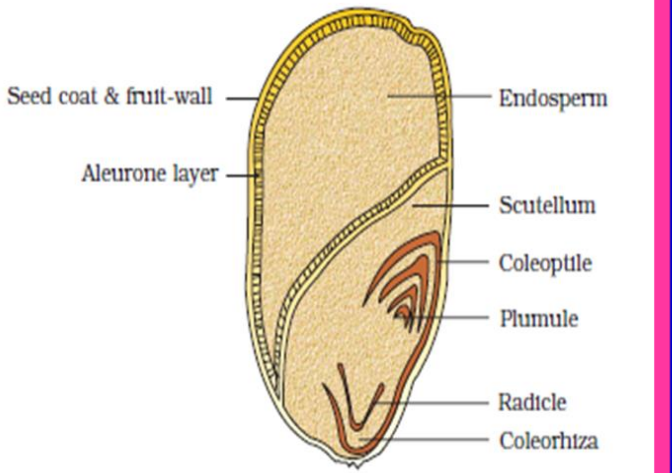

The embryo is small and situated in a groove at one end of the endosperm.

It consists of a large and shield shaped cotyledon known as **scutellum** and a short axis with a **plumule** and a **radicle**.

The plumule and radicle are enclosed by sheaths which are called **coleoptile** and **coleorhiza** respectively. Eg., **Wheat, Maize.**

MORPHOLOGY OF FLOWERING PLANTS

FLORAL DESCRIPTION, FAMILY- SOLANACEAE

Floral Description

NO	Symbol	Description
1	⊕	Actinomorphic Flower
2	%	Zygomorphic Flower
3	**Br**	Bracteate Flower
4	**Ebr**	Ebracteate Flower
5	♂	Male Flower
6	♀	Female Flower
7	⚥	Bisexual Flower

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NO	Symbol	Description
8	**K**	Calyx
9	**K_5**	Sepals 5, Polysepalous
10	**$K_{(5)}$**	Sepals 5, Gamosepalous
11	**C**	Corolla
12	**C_5**	Petals 5, Polypetalous
13	**$C_{(5)}$**	Petals 5, Gamopetalous

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NO	Symbol	Description
14	**A**	Androecium
15	$\mathbf{A_5}$	5 Polyandrous Stamens (free stamens)
16	$\mathbf{A_{(5)}}$	5 Stamens (5 fused stamens)
17	**C** ⌐¬ **A**	Epipetalous stamen
18	**G**	Gynoecium
19	$\mathbf{G_5}$	Pentacarpellary Apocarpous Ovary
20	$\mathbf{G_{(5)}}$	Pentacarpellary Syncarpous Ovary

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NO	Symbol	Description
21	$\underline{G}$	Superior Ovary, Hypogynous flower
22	$\overline{G}$	Inferior Ovary, Epigynous flower
23	$G\!\!-$	Half inferior Ovary, Perigynous flower
24	**P**	Perianth
25	P_{3+3}	Perianth has 6 Tepals in two whorls of 3 each

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Solanaceae

Classification	
Kingdom	Plantae
Division	Spermatophyta
Sub-Division	Angiospermae
Class	Dicotyledonae
Order	Solanales
Family	Solanaceae
Genus	*Solanum*
Species	*tuberosum*

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Solanaceae

Datura metel (Datura)

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Solanaceae

Solanaceae is a large family, commonly known as the ‘potato family’. It is widely distributed in tropics, subtropics and even temperate zones.

Vegetative Characters

Herbs, shrubs and small trees

Stem:

Herbaceous, rarely woody, aerial, erect, cylindrical, branched, solid or hollow, hairy or glabrous (Smooth).

Underground stem as in potato (*Solanum tuberosum*)

Leaves:

Alternate, simple, rarely pinnately compound, exstipulate, venation is reticulate.

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Solanaceae Floral Characters

Inflorescence:
Solitary, axillary or cymose as in Solanum

Flower:
Bisexual and actinomorphic.

Calyx:
Sepals five, gamosepelous, persistent and valvate aestivation.

Corolla:
Petals five, gamopetelous and valvate aestivation.

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Androecium:
Stamens five and epipetalous.

Gynoecium:
Bicarpellary, bilocular, syncarpous, superior ovary with many ovules on axile placentation with swollen placenta.

Fruits:
Berry or Capsule

Seeds:
Many, Endospermic.

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Solanaceae Floral Diagram and Floral Formula

Floral Diagram

Floral Formula: $Br \oplus$ ⚥ $K_{(5)} \overbrace{C_{(5)} A_{(5)}} \underline{G}_{(2)}$

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Solanum lycopersicum

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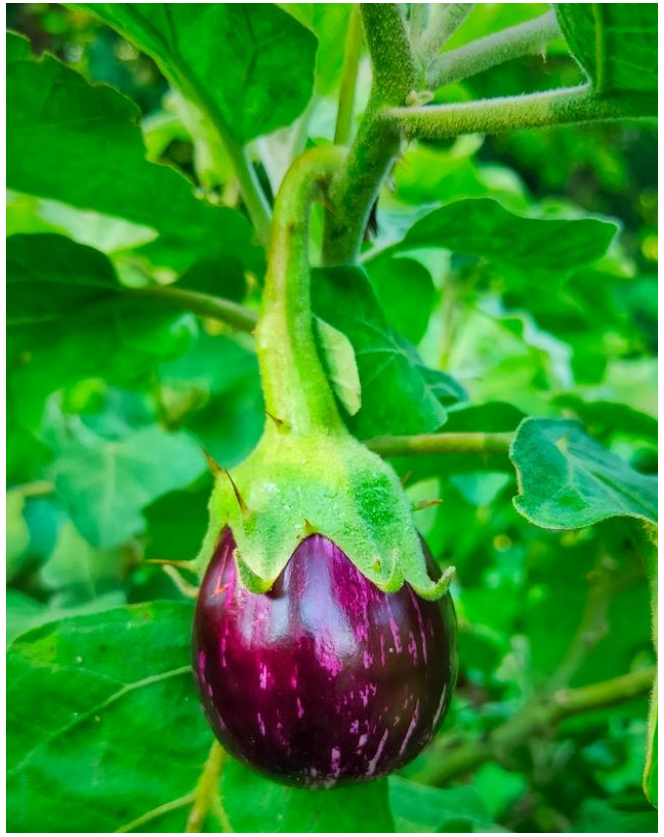
Solanum tuberosum

B. John Ebenezer

Solanum melongena



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Capsicum annum

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Atropa belladona

Medicinal Plant
Atropine
medicine is
Obtained from
this plant.

But all parts of
the plant are
poisonous.

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Petunia alba

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Fabaceae

Fabaceae

This family was earlier called Papilonoideae, a subfamily of family Leguminosae.

It is distributed all over the world.

Vegetative Characters

Herbs, shrubs, and Trees. Roots with root nodules.

Stem:

Erect or climber

Leaves:

Alternate, pinnately compound or simple; leaf base, pulvinate; stipulate; venation reticulate.

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Fabaceae

Inflorescence:
Racemose

Flower: bisexual, zygomorphic

Calyx:
Sepals five, gamosepalous; imbricate aestivation.

Corolla:
Petals five, polypetalous, papilionaceous, consisting of a posterior Standard petal, two lateral Wing petals and two anterior Keel petals (enclosing stamens and pistil). Aestivation is vexillary.

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Fabaceae

Androecium:
Stamens 10, Diadelphous, Anther dithecous.

Gynoecium:
Ovary is monocarpellary, unilocular, syncarpous, superior ovary with many ovules on marginal placentation. Style single.

Fruit:
Legume, seed one to many, non-endospermic.

Floral Formula:

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Economic Importance of Fabaceae

	Common Name	Botanical Name	Common Name	Botanical Name
Pulses	Gram	*Cicer arietinum*	Redgram	*Cajanus cajan*
Edible oil	Soyabean	*Glycine max*	Groundnut	*Arachis hypogaea*
Dye	Indigo	*Indigofera tinctoria*	Logwood	*Haematoxylum campechianum*
Fibres	Sunhemp	*Crotalaria juncea*		
Fodder	Sesbania	*Sesbania grandiflora*	Clover	*Trifolium repens*
Ornamentals	lupin	*Lupinus polyphyllus*	Sweet pea	*Lathyrus odoratus*
Medicine	Mulethi	*Glycyrrhiza glabra*		

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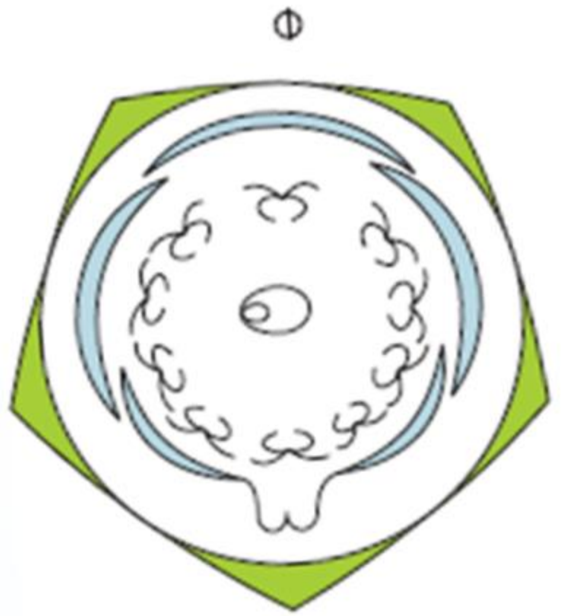
Fabaceae

Floral Diagram



Floral Formula

% ⚥ ⊕ $K_{(5)}\ C_{1+2+(2)}\ A_{(9)+1}\ \underline{G}_{1}$

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MORPHOLOGY OF FLOWERING PLANTS

DESCRIPTIONS OF THE FAMILY LILIACEAE

Liliaceae

Classification	
Kingdom	**Plantae**
Division	**Spermatophyta**
Sub-Division	**Angiospermae**
Class	**Monocotyledonae**
Order	**Liliales**
Family	**Liliaceae**
Genus	***Lilium***
Species	***lancifolium***

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Liliaceae

Liliaceae is a monocot family and commonly known as the ‘Lily family’.

This family is distributed world wide.

Vegetative characters:
Perennial herbs with underground bulbs, corms, rhizomes

Leaves:
Basal, alternate, linear, exstipulate with parallel venation.

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Inflorescence:
Solitary cyme or Umbellate clusters

Flower:
Bisexual and actinomorphic.

Perianth:
Tepals six in two whorls of three each (3+3). Mostly perianth is united into a tube, valvate aestivation.

Androecium:
Stamen six in two whorls of three each (3+3).

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Umbellate cluster of onion flower

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Gynoecium:
Tricarpellary, trilocular, syncarpous, superior ovary with many ovules on axile placentation.

Fruit:
Mostly Capsule, Rarely Berry

Seed:
Endospermic.

Economic Importance of Liliaceae

Type	Common Name	Botanical Name
Ornamentals	Tulip	*Tulipa gesneriana*
Ornamentals	Flame Lily	*Gloriosa superba*
Medicine	Aloe vera	*Aloe vera*
Vegetables	Asparagus	*Asparagus officinalis*
Alkaloid	Colchicine	*Colchicum autumnale*

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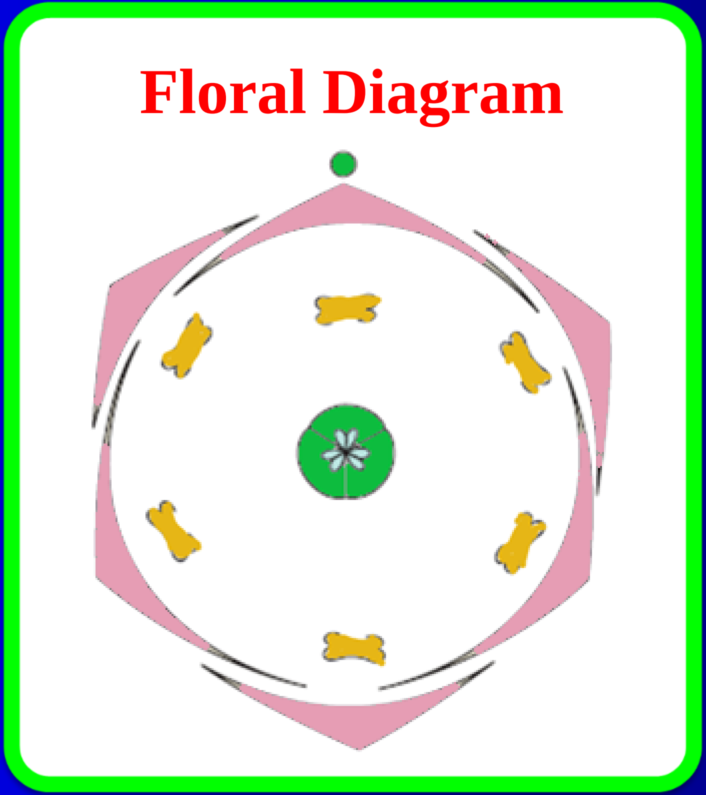
Liliaceae Floral Diagram and Floral Formula



Floral Formula: $\oplus$ ⚥ $P_{3+3}\ A_{3+3}\ \underline{G}_{(3)}$

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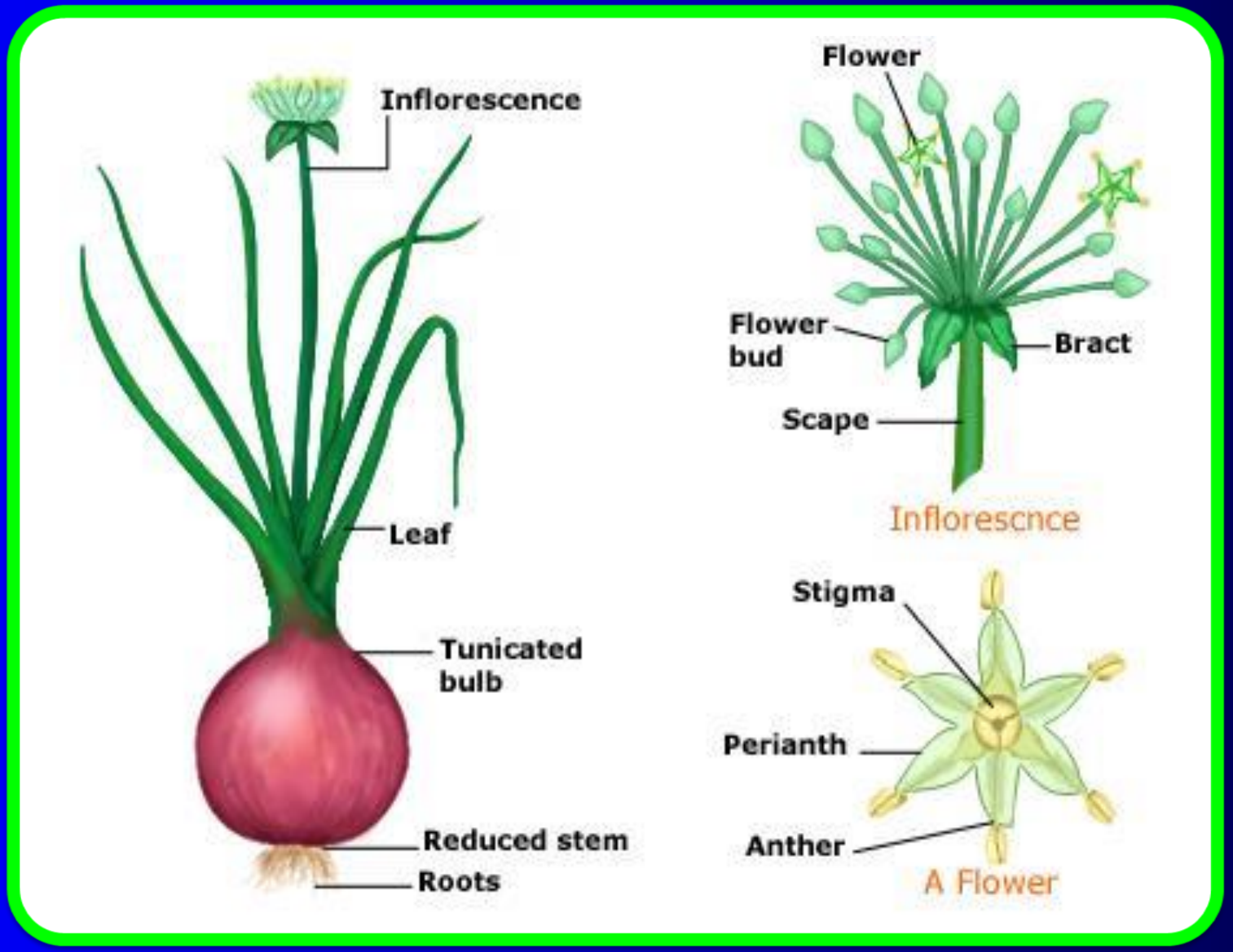
Liliaceae



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Lilium lancifolium - Tiger Lily

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Tulipa gesneriana - Tulip

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Tulipa gesneriana - Tulip

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Gloriosa superba - Flame Lily

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Aloe vera

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Asparagus officinalis - Asparagus

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Colchichum autumnale - Autumn Crocus

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Allium cepa - Onion

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Allium sativum - Garlic

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God Bless You!