



# MORPHOLOGY OF FLOWERING PLANTS

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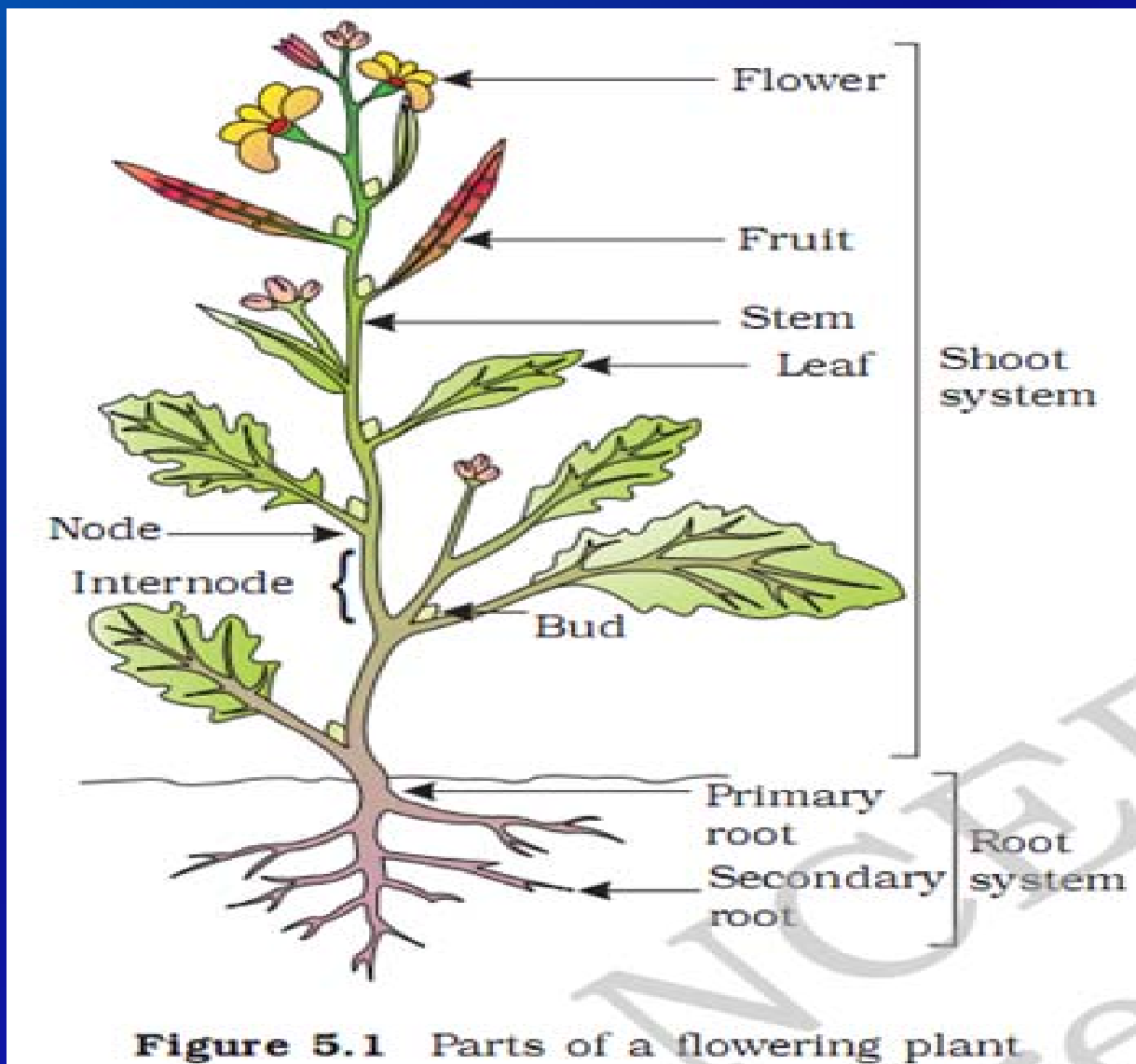


# INTRODUCTION

- Morphology deals with the study of shape , size and structure of the plant body.
- Flowering plants are called “Angiosperms” , it consist of an axis with an underground “Root system” and “Aerial Shoot system”.



- The root , shoot and leaf constitute the vegetative parts of the plant body.
- The Flower , Fruit and seed constitute the Reproductive parts of the plant body  
E.g., Mustard plant.





# THE ROOT

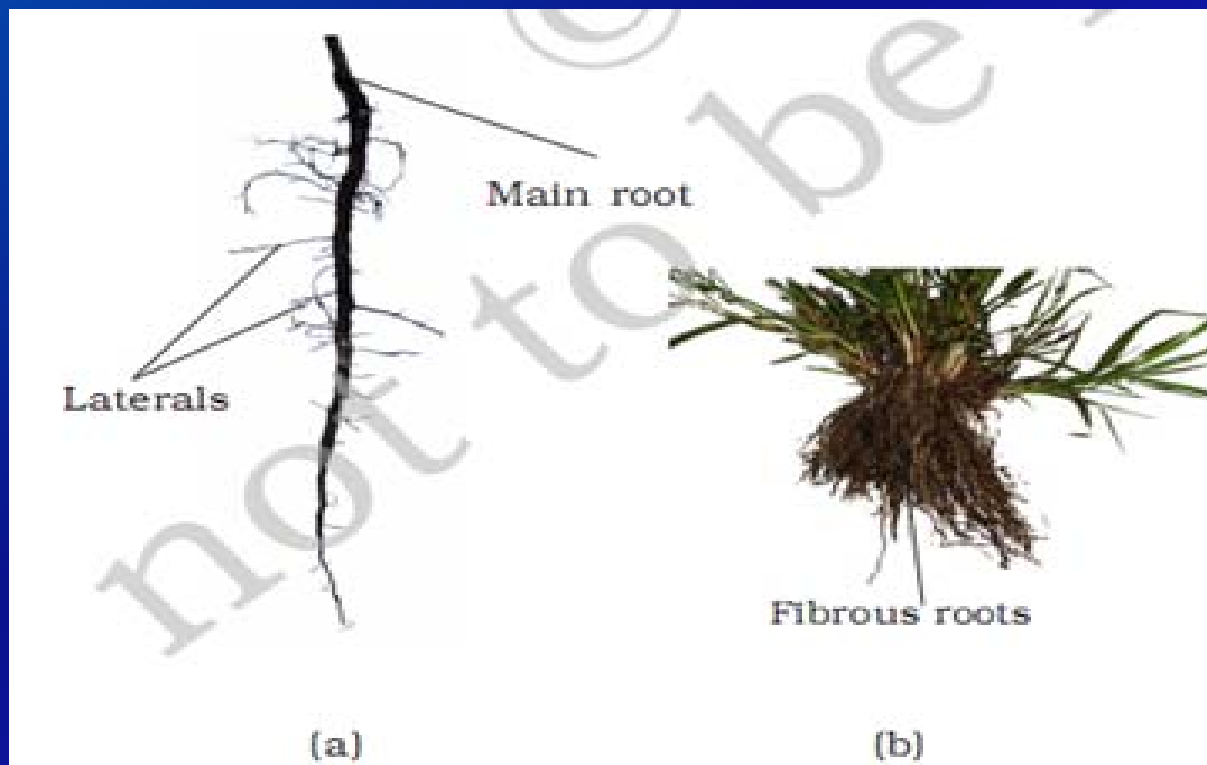
- It is the “Underground part of the plant “, originates from the radicle of the germinating seed .
- There are mainly two types of Root system
  1. Tap root system – seen in dicots
  2. Fibrous root system – seen in monocots



- Major functions of Root :
  - (a) Fixing a plant in soil .
  - (b) To hold soil particles.
  - ( c) Absorptions of water and mineral salts.



# The Root



**(a) TAP ROOT**

**(b) FIBROUS ROOT**



# MODIFICATIONS OF ROOT

The roots in some plants change their shape and structure and become modified for various functions.





1. Storage – The primary root becomes thick and fleshy due to food storage .

e.g., Radish, Beetroot, Carrot.

2. Support – Stilt root of Maize , Sugarcane  
Prop root of Banyan tree .

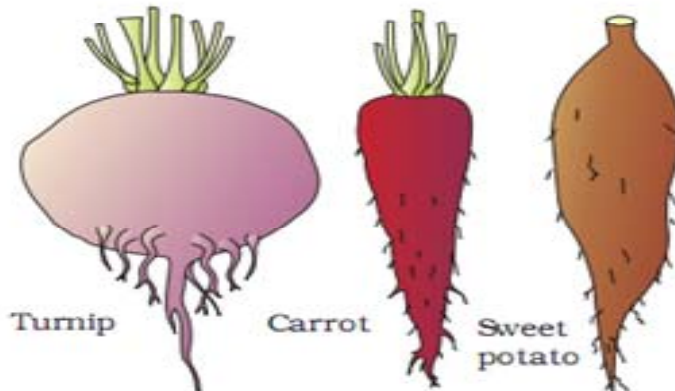
3. Respiration – They are also called pneumatophores , help to get oxygen for respiration.



# Modifications of root



Asparagus





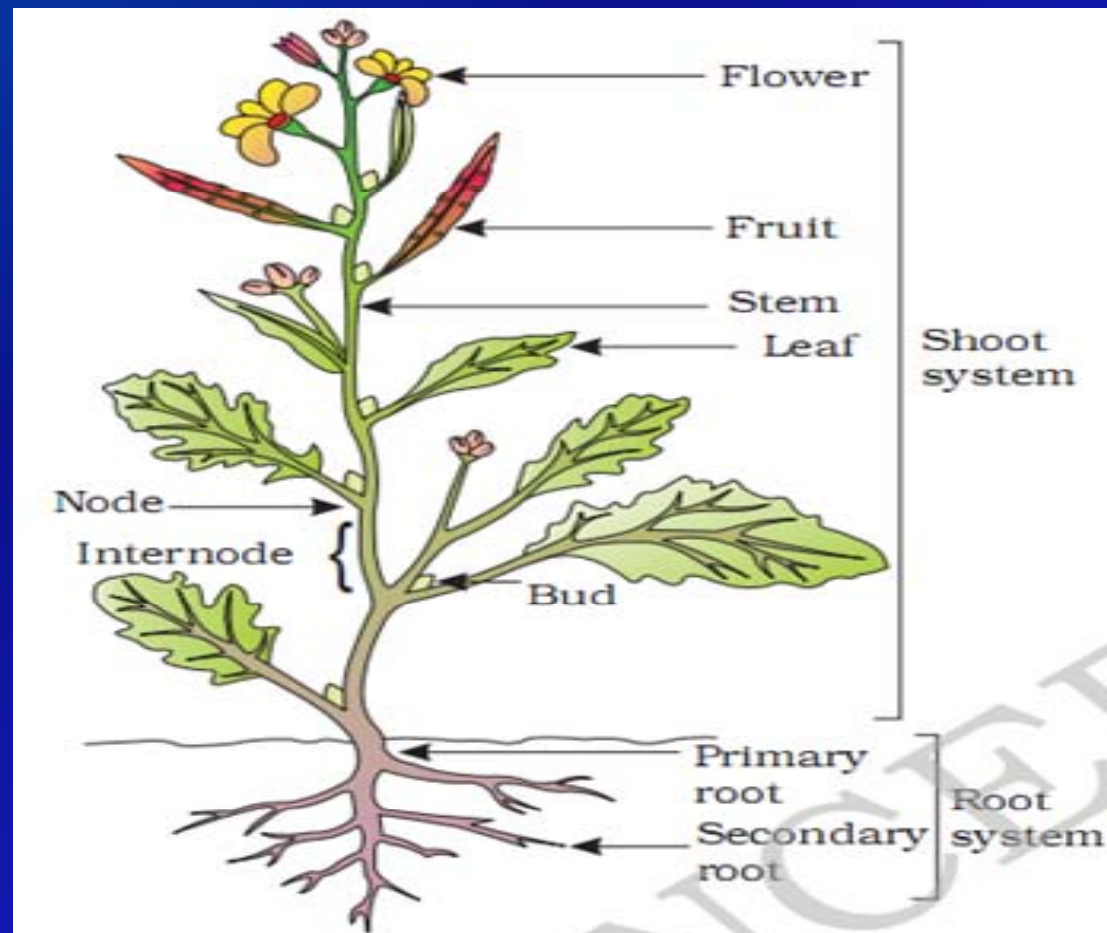
## THE STEM

- Stem is the aerial part of the plant body. It bears branches, leaves, flowers and fruit.
- The stem also bears 'nodes' and 'internodes'.



- The main function of the stem
  - (a) It conducts water , minerals and photosynthates .
  - (b) Some stems performs the function of storage of food , support , protection and vegetative propagation.

# THE STEM



**Figure 5.1** Parts of a flowering plant





## MODIFICATION OF STEM

- These may be of three types

### (i) Underground modification of stem :

#### a. Rhizome

e.g., Ginger ,Turmeric etc.,

b. Bulb e.g., Onion , Garlic .

c. Tuber e.g., Potato.



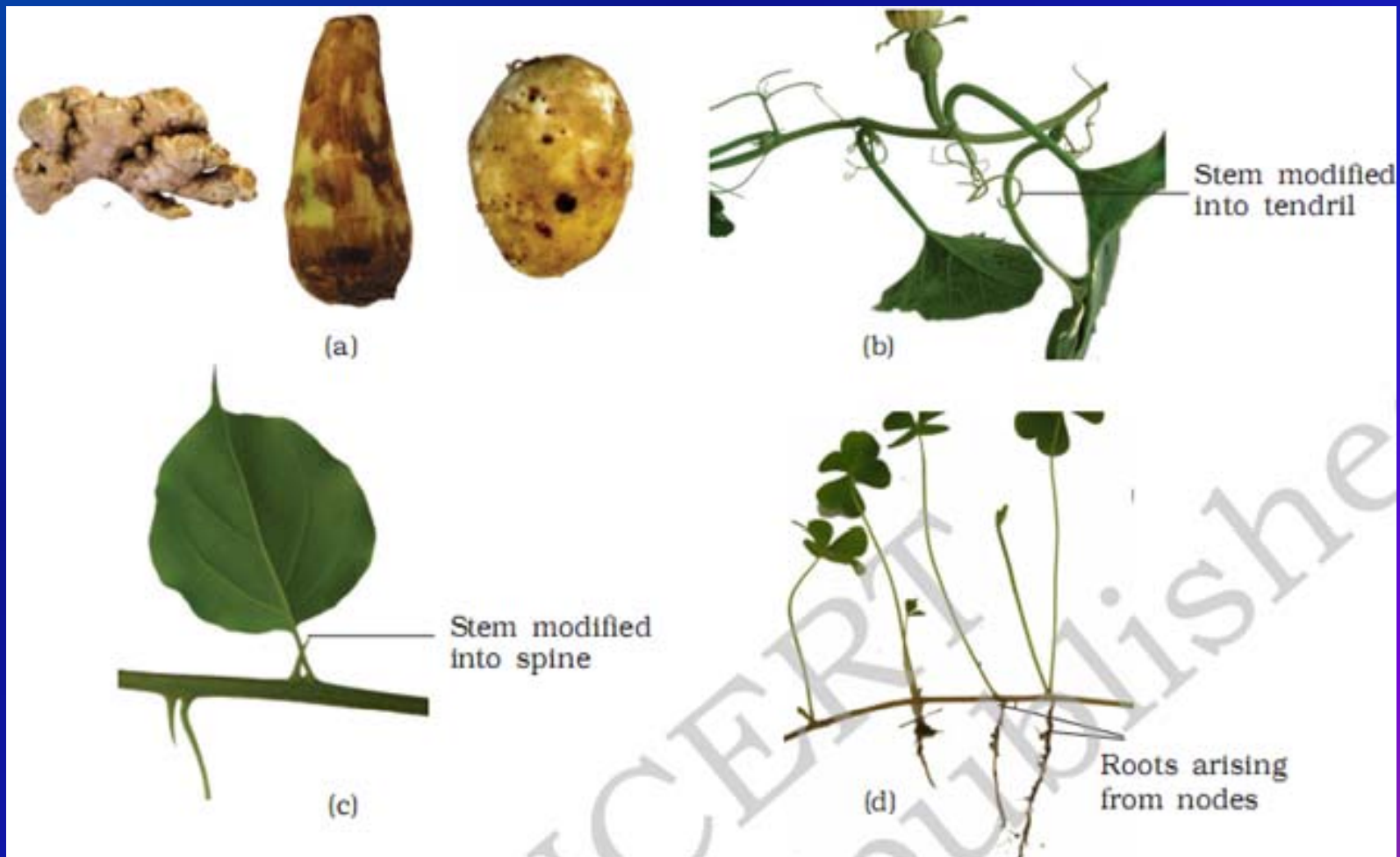
**(ii) Sub-aerial modification of stem :**

- a. Runner e.g., Oxalis
- b. Offset e.g., Pistia
- c. Sucker e.g., Banana , Pineapple

**(iii) Aerial modification of stem :**

- a. Stem Tendril e.g., Cucumber , Watermelon
- b. Thorn e.g., Citrus , Duranta
- c. Cladode e.g., Asparagus
- d. Phylloclade e.g., Opuntia , Euphorbia

# Modifications of stem







## THE LEAF

- The Leaf is a lateral ,flattened structure of plant , in most of the plants it is green in colour , because of the presence of chlorophyll .
- Parts of a leaf : Each leaf basically consist of three parts i.e. lamina , petiole and leaf base.

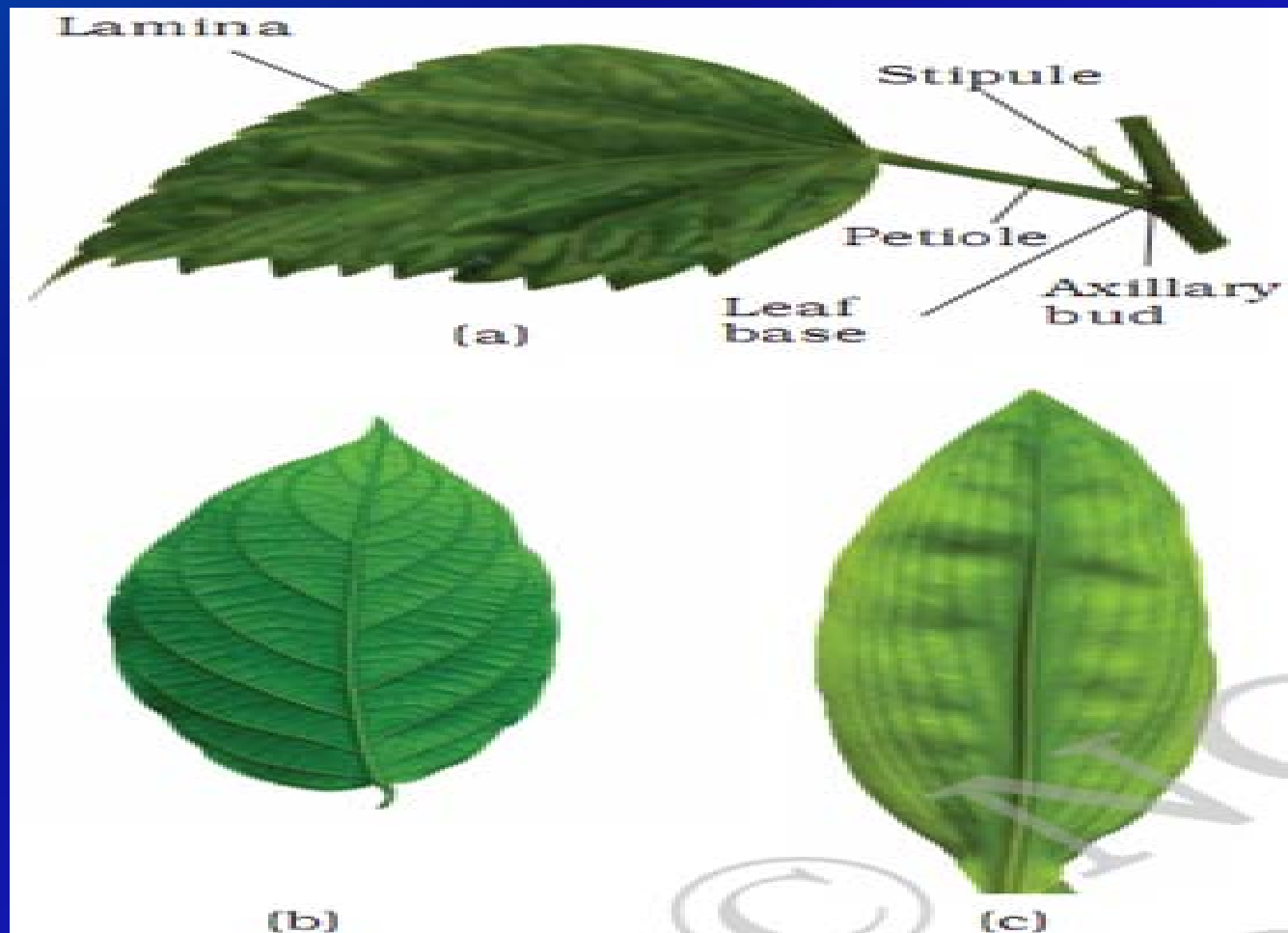


- Venation : It is the arrangement of veins and vein lets in the leaf. It is of two types
- (i) Reticulate Venation : Here vein lets make a network . E.g., Dicot plants.

Parallel Venation : Here Veins run parallel to each other on the lamina of the leaf.

E.g., Monocot leaves.

# THE LEAF





## TYPES OF LEAVES

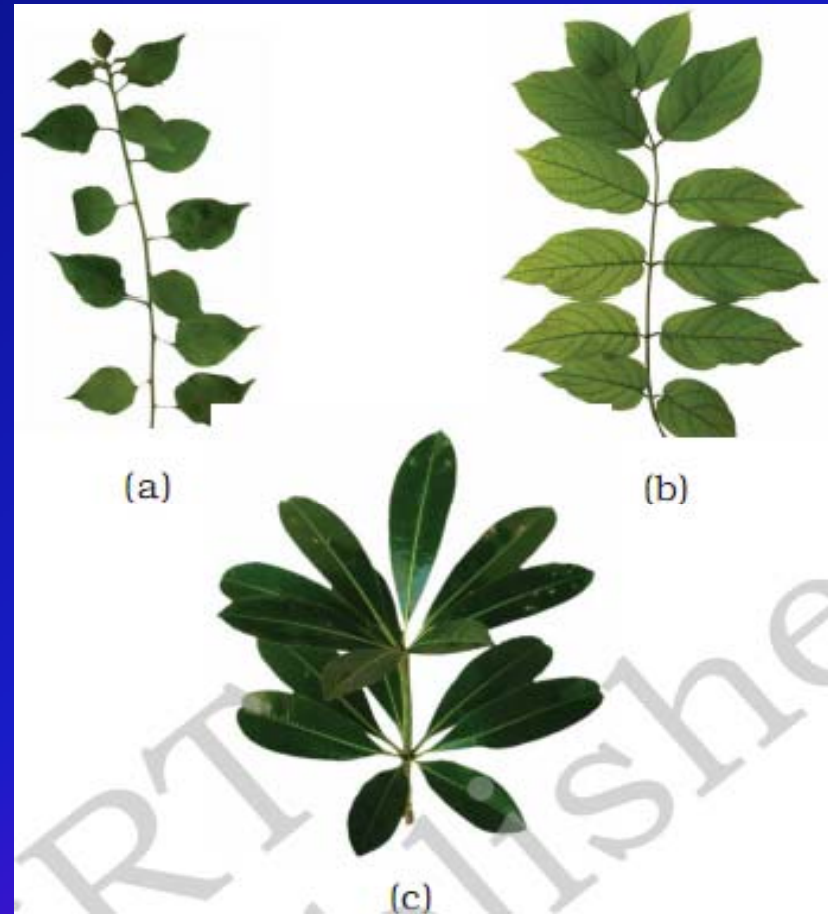
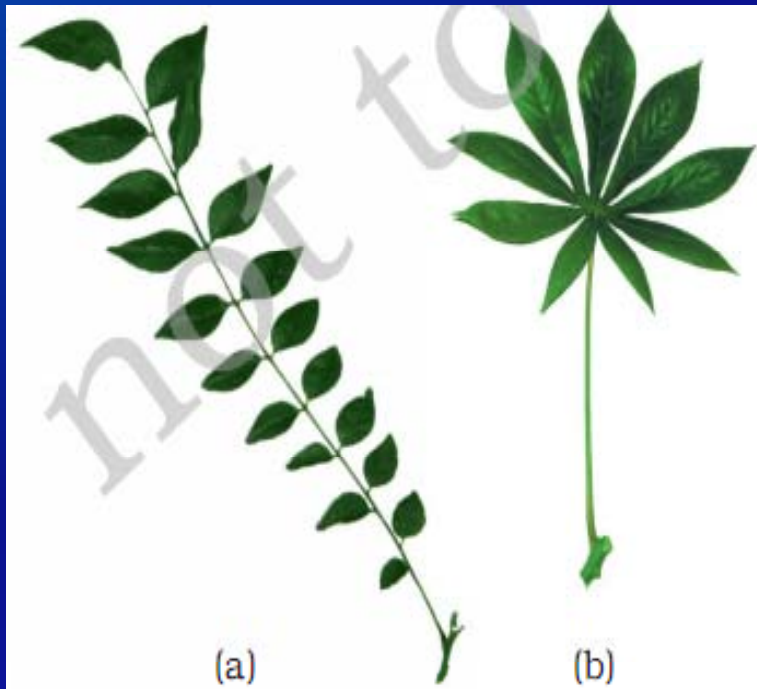
- There are mainly two types of leaves
- Simple Leaf : The lamina is single or undivided. E.g., Hibiscus
- Compound Leaf : The lamina is fully broken up into clear segments or leaflets . E.g., Neem.



- **Phyllotaxy** : It is the arrangement of leaves on branch or stem . It is of three types
  - (i) Alternate : A single leaf at a node  
E.g., Sunflower , Mustard.
  - (ii) Opposite : Two leaves at a node .  
E.g., Ocimum.
  - (iii) Whorled : More than two leaves in a whorl at a node E.g., Nerium .



# Types of leaves & Phyllotaxy

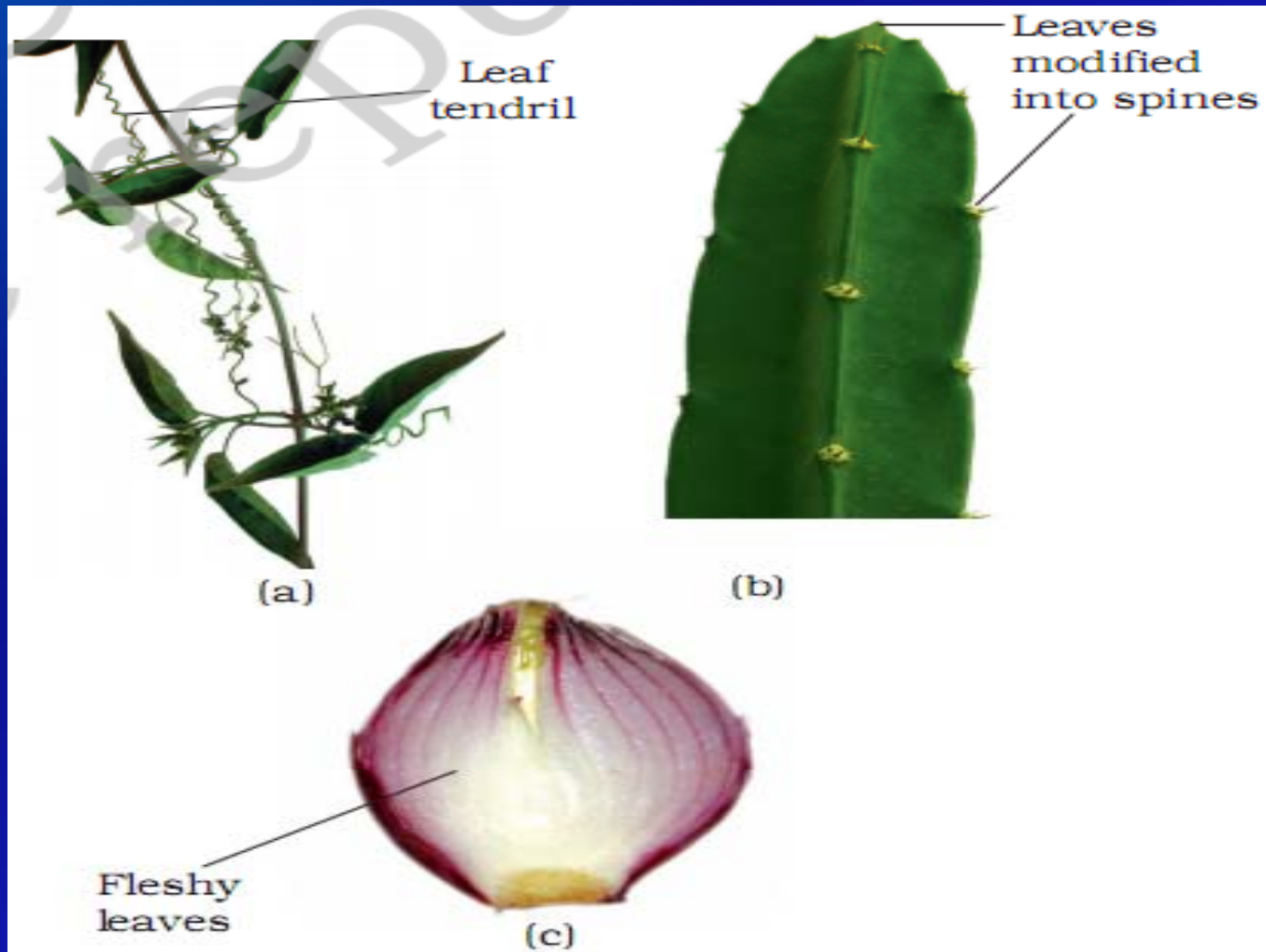




# MODIFICATIONS OF LEAVES

- Leaves are often modified to perform functions other than photosynthesis . They are
  - (i) Tendrils : for climbing e.g., Peas
  - (ii) Spines : for defence e.g., Opuntia (cactus)
  - (iii) Storage : the fleshy leaves of onion

# Modifications of leaves







# THE INFLORESCENCE

- It refers to the mode of arrangement of the flower on the floral axis .

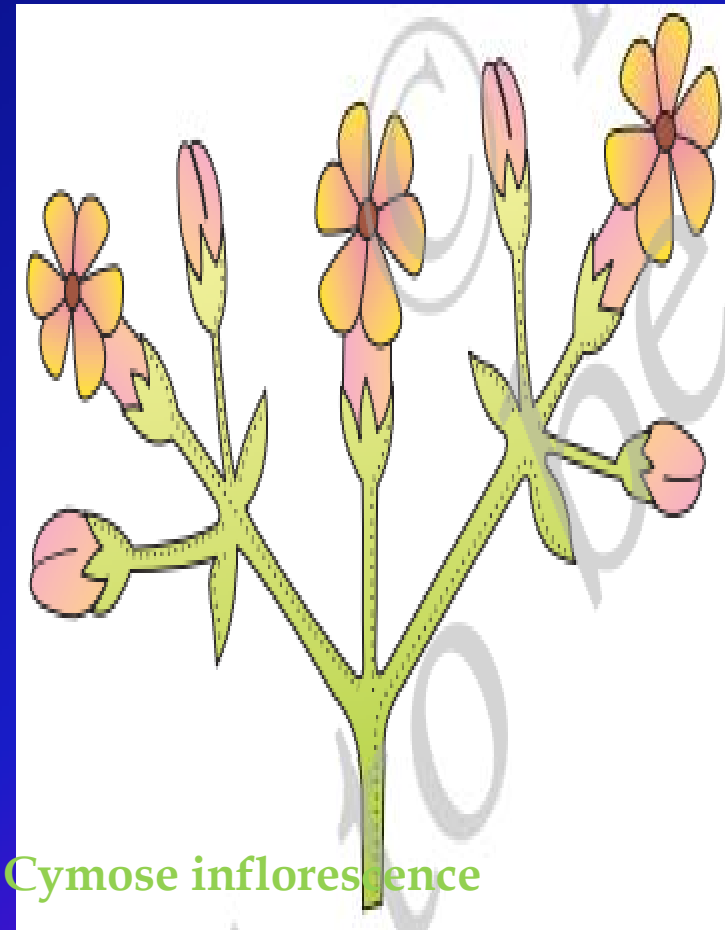


- The Inflorescence is of mainly two kinds
  - (i) **Racemose** : the main axis continues to grow and it is called indefinite inflorescence.
  - (ii) **Cymose** : The main axis terminates into a flower hence limited growth , it is a definite inflorescence .  
E.g., Hibiscus , Jasmine

# THE INFLORESCENCE



Racemose inflorescence



Cymose inflorescence



## THE FLOWER

- The flower is a modified shoot meant for the reproduction of the plant .
- The stalk of the flower is called pedicel and the swollen part is called thalamus .



- It is comprised of four whorls , which are arranged on thalamus , they are  
**(a) Calyx** – The outer most whorl composed of ‘ sepals’  
**(b) Corolla** – The second whorl consisting of ‘petals ‘  
**(c) Androecium** – The third whorl composed of ‘stamens’  
**(d) Gynoecium** – The innermost whorl made up of ‘carpels’



- Calyx and Corolla are called 'Accessory whorls', in some plants they are not differentiated from one another such case they are termed as 'Perianth'. Each part of Perianth is called 'tepal'.



# THE FLOWER

- Androecium and Gynoecium are called essential whorls .
- In most of the flowers all the four whorls are found , such flowers are called 'Complete ,bisexual flowers' .E.g.,Hibiscus
- In a flower out of four whorls any one essential whorl is absent it is called 'Incomplete, unisexual flower'.  
E.g., cucurbits.

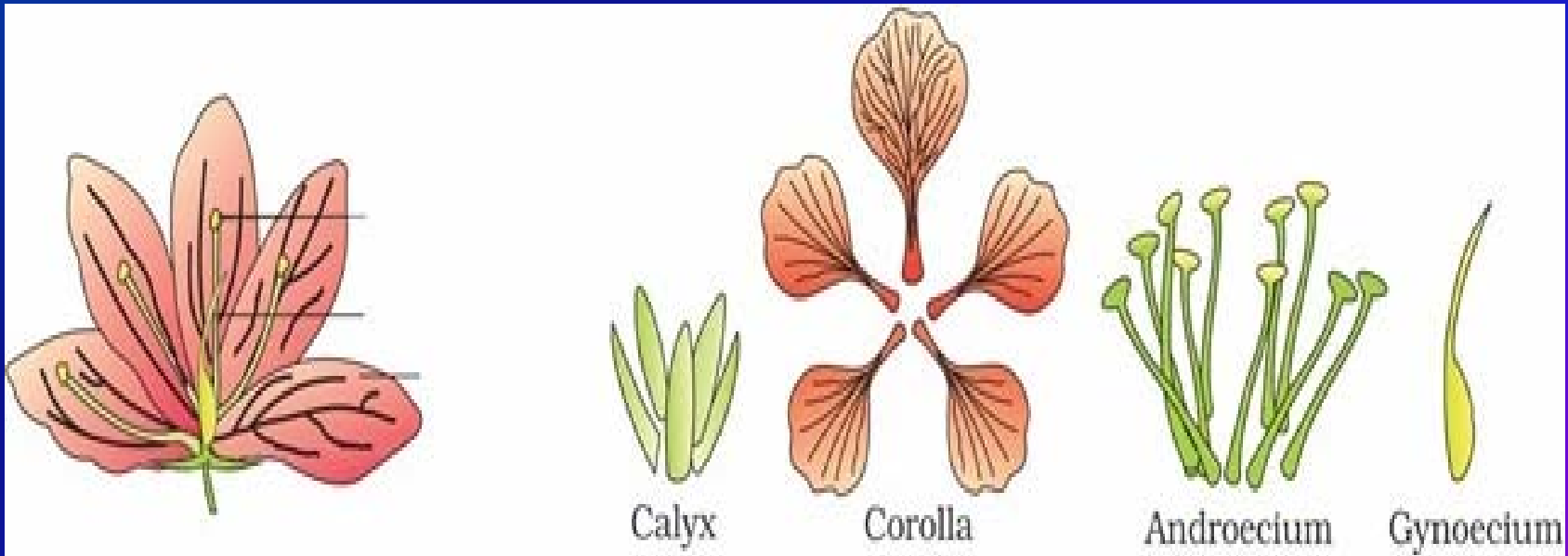


- On the basis of symmetry flower can be of the following types
  1. Actinomorphic : these flowers can be divided by any vertical plane into two equal and similar halves .  
E.g., Mustard , Brinjal .
  2. Zygomorphic : these flowers can be divided into two equal halves by only one vertical division .  
E.g., Pea , Ocimum





# THE FLOWER





# AESTIVATION

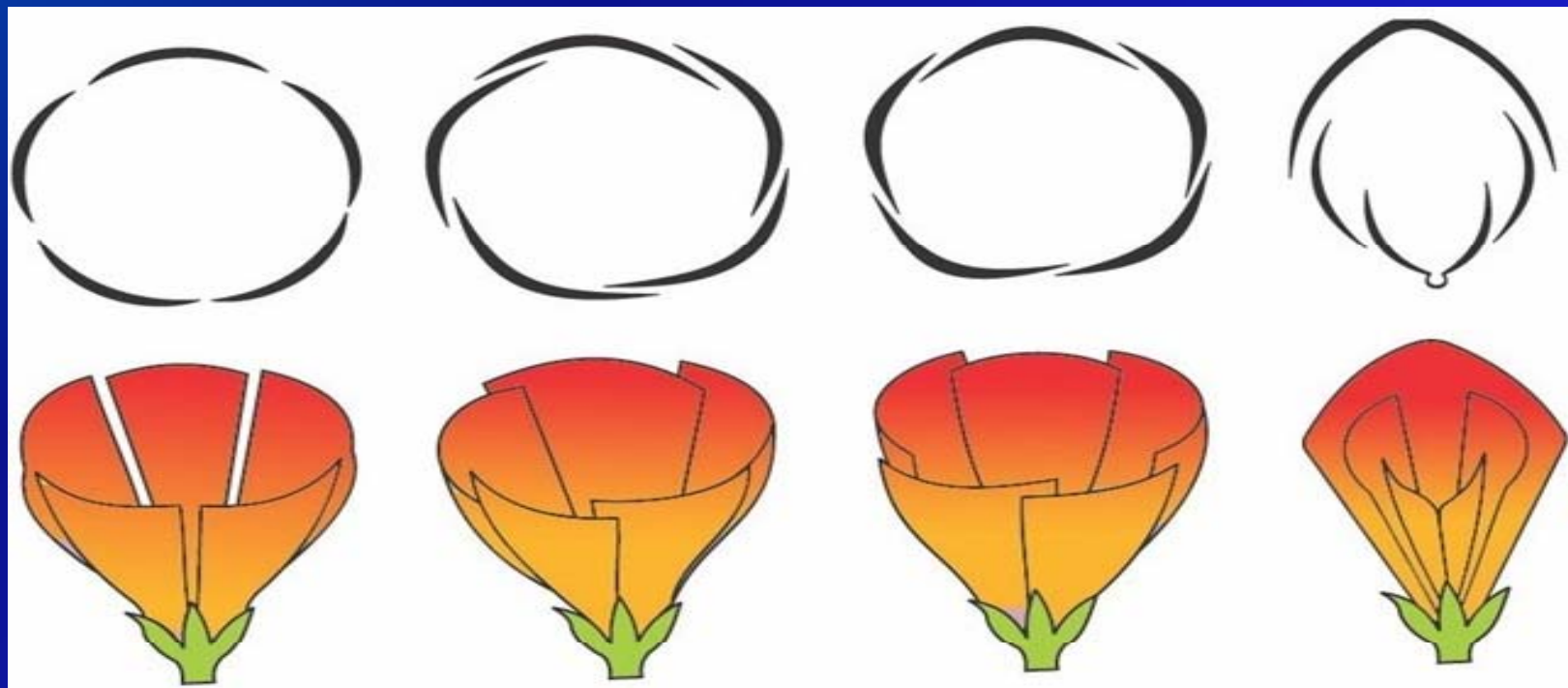
- The arrangement of sepals and petals with respect to one another in floral bud is called '**aestivation**' .
- Types of aestivation
  1. Valvate : the sepals and petals are arranged in a whorl which just touch one another at the margin they do not overlap. E.g., Calotropis
  2. Twisted : here one margin of the sepal or petal overlap on the next sepal or petal , and the next margin is overlapped by the proceeding one, resulting in a twisted appearance .  
E.g., Cotton ,Lady's finger.



3. **Imbricate** : here the margins of sepals and tepals overlap another but not in particular direction
4. **Vexillary** : here out of five petals the largest overlaps the two lateral petals which in turn overlap the two smallest petals      E.g., Pea .



# AESTIVATION



Valvate

Twisted

Imbricate

Vexillary



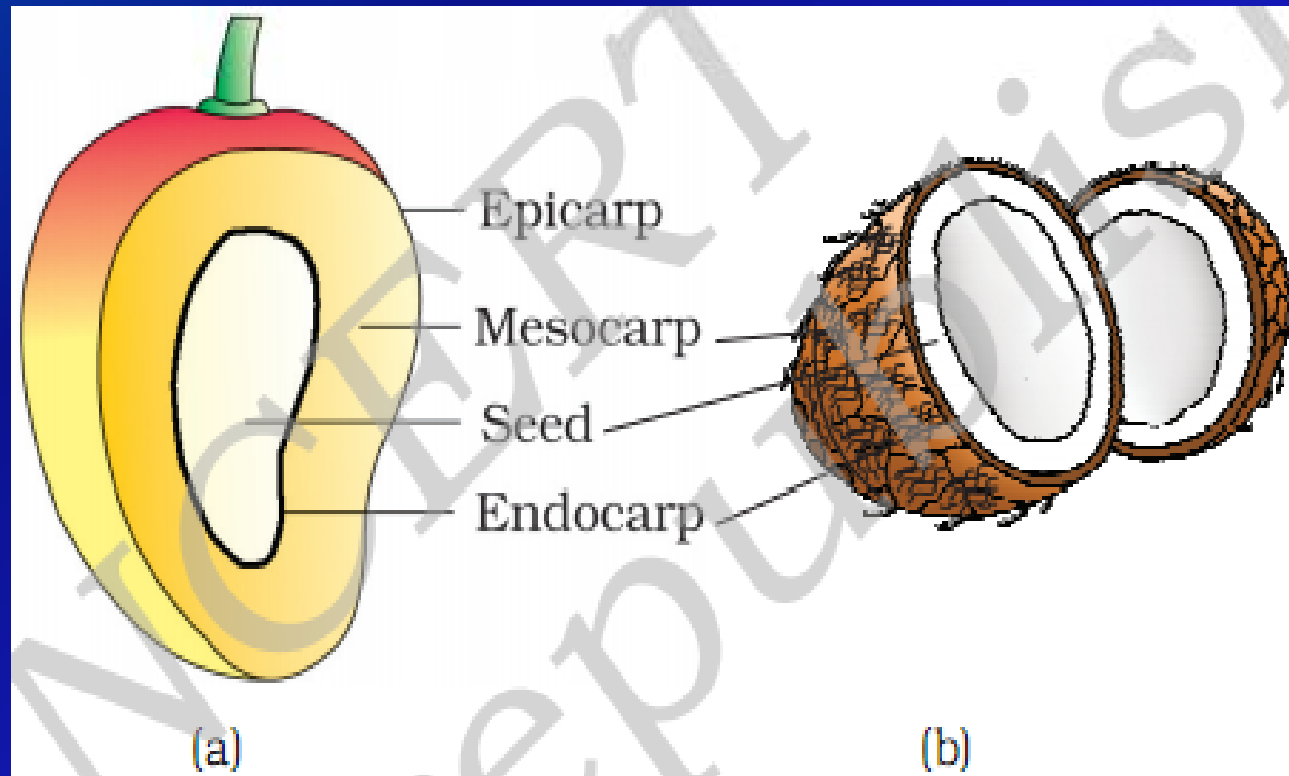
# THE FRUIT

- Fruit may be defined as a ripened ovary.
- The fruit wall is called 'Perecarp'



- Usually the three layers of pericarp are
    - > The outer most layer is known as the 'epicarp'
    - > Middle layer is known as the 'mesocarp'
    - > Inner most layer is known as the 'endocarp'
- E.g., Mango , Coconut

# THE FRUIT



(a) Mango (b) Coconut



# SUMMARY

- Flowering plants exhibit enormous variation in shape, size, structure, mode of nutrition, life span, habit and habitat.
- They have well developed root and shoot system





- Generally , dicotyledonous have tap root system and monocotyledonous have fibrous root system.
- The root in some plants get modified for storage of food , mechanical support , and respiration.



- The shoot system is differentiated into stem , leaves , flowers and fruits .
- Morphologically the stem shows nodes and inter nodes .
- Stems also get modified to perform diverse functions such as storage , vegetative propagation and protection under different conditions .



- Leaves are the lateral outgrowth of the stem , usually green in colour to perform the function of photosynthesis. They also get modified into other structures such as tendrils , spines for climbing and protection respectively.



- The flowers are arranged in different types of inflorescences.
- Flowers exhibit enormous variation in structure , symmetry , position of ovary and arrangement of sepals , petals , ovules.
- After fertilization the ovary is converted into fruits and the ovules into seeds .



## SOME IMPORTANT POINT TO REMEMBER

- Auxiliary bud : A bud that arises in the axil of leaf .
- Adventitious Roots : These roots arise from any part of the plant other than radicle e.g., rihizophora
- Bisexual: flowers having male and female reproductive parts



- Bract : it is a small leaf with relatively undeveloped blade in axil arises a flower or a branch of inflorescence.
- Bud: a compact under developed shoot which contains shortened stem and floral part.
- Cotyledeon: the first leaf of the embryo of the seed plant which is usually simpler in structure and have reserved food material.



- Compound leaf: lamina is fully broken up into clear segments.
- Coleorhiza: protective covering of the radical in the monocot leaf.
- Coleoptile: it refers to the protective sheath of the plumule in monocot seeds.



- Dicotyledons: the seeds having two cotyledons
- Dry fruit: A fruit possessing dry pericarp
- Epiphytes: The plant which grow on the other plants but do not get nourishment from them

Example, Orchids





- Epicalyx : the small green appendages below the sepals make a whorl, Example, Hibiscus
- Epicarp: Outer layer of the fruit
- Endospermic seed: Seed in which food is stored in the endosperm.
- Flower: modified shoot meant for sexual reproduction and bears fruits and seeds



- False fruit: A fruit in which any other part other than ovary takes part in its formation
- Herb: It refers to a small plant having soft stem
- Inflorescence: It is the arrangement of the flowers on the branch of the plant.



- Leaf : Flattened green structure which arises as a lateral appendages from the stem or branches from the node and bears a bud on its axil.
- Mesophytes: The plants that grow in habitats having moderate condition.
- Monocarpic: The plant which bears flower and fruits once in life



- Parthincarpic Fruit: A fruit which develops without fertilization,
- Perianth: The part of the flower where calyx and corolla are fused
- Placentation: The arrangement of ovules in the ovary



- Phyllotaxy: The arrangement on the branch of stem.
- Pollen: These are the microspores of seed plants produced in large numbers.
- Seeds: The structure that develops from the ovule following fertilization in angiosperms and gymnosperms .
- Shrub: Medium sized plants having branches which arise from the soil.



- Syncarpous ovary: It's a ovary having number of carpls fused,  
Example: Tomato
- Tendril: A slender but spirally coiled structure trhat helps the plants to climb.
- Apocarpus ovary: Ovary where the carpls are not fused .