MORPHOLOGICAL DESCRIPTION OF PLANT:

DEFINITION:

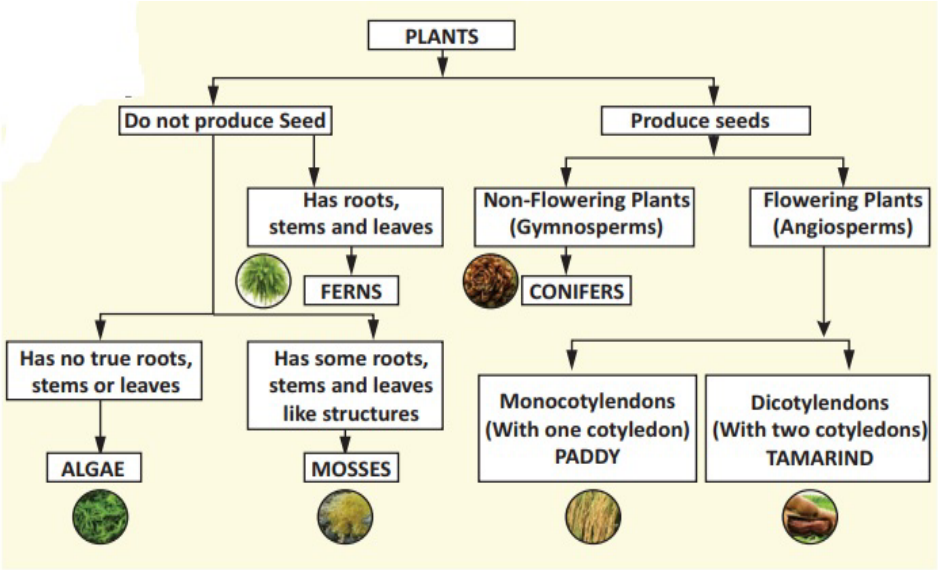
Plants are multicellular organisms in which plantae can use photosynthesis to make their own food.

CHARACTERISTICS OF PLANTS:

The plant kingdom has the following characteristic features:

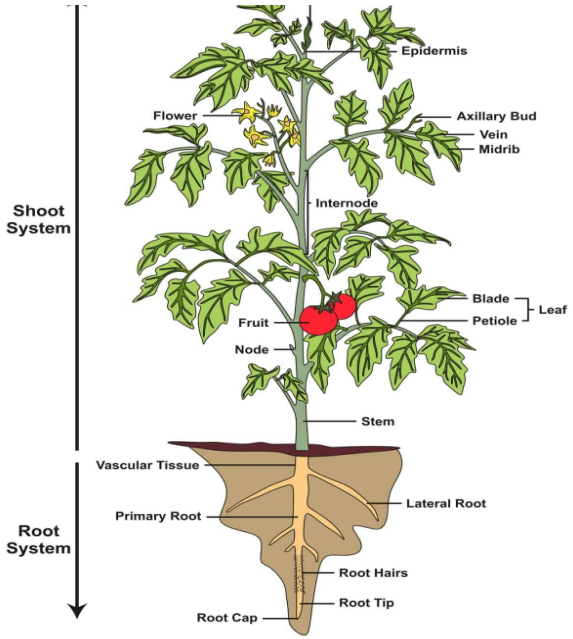
- They are non-motile.
- They make their own food and hence are called autotrophs.
- They reproduce asexually by vegetative propagation or sexually.
- These are multicellular eukaryotes. The plant cell contains the outer cell wall and a large central vacuole.
- Plants contain photosynthetic pigments called chlorophyll present in the plastids.
- They have different organelles for anchorage, reproduction, support and photosynthesis.
- They contains xylem & phloem

TYPES OF PLANT:



MORPHOLOGY & ANATOMY OF PLANT:

- Morphology and modifications is that branch of biology that deals with the anatomy of parts of plants like leaves, stems, roots, etc
- Plant anatomy is the study of the internal plant structure, mostly at the cellular/microscopic level.
- The study of plant anatomy helps us to understand the structural adaptations of plants with respect to diverse environmental conditions



THE ROOT:

The root is a brown, nongreen and underground part of a plant. their branches is collectively called a root system.

There are three types of the root system:

1. Tap Root
2. Fibrous Root
3. Adventitious Root

1. Taproot System:

- The taproot is mainly found in dicotyledonous plants
- It develops from the radicle of the germinating seed, along with its primary roots and branches, giving rise to the taproot system.
- Eg: Mustard seeds, mangoes, grams and banyan

2. Fibrous System:

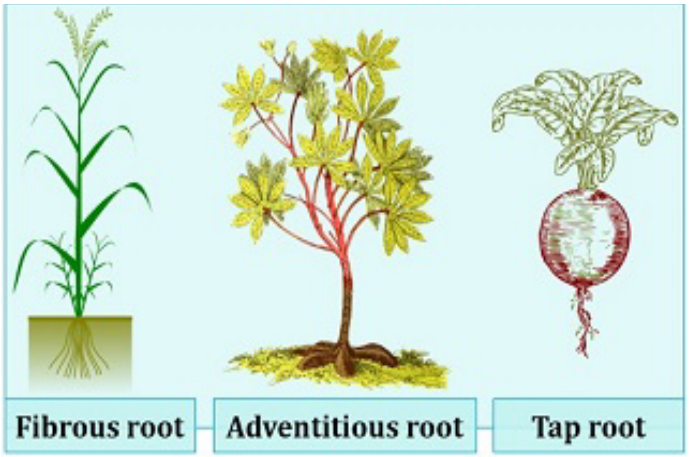
- The fibrous root is mainly found in ferns and in all monocotyledonous plants.
- This root develops from thin, moderately branching roots or primary roots, growing from the stem.
- The fibrous root system usually does not penetrate deep into the soil, therefore, on full maturity, these roots look like a mat or a carpet on the floor.
- Eg: Wheat, paddy, grass, carrots, onion, grass

3. Adventitous System

- The roots which originate from any part of plant body other than radicle is called adventitious root

system. This root system is mainly found in all monocotyledonous plants.

- In plants, the adventitious root system is used for various purposes, like mechanical support, vegetative propagation
- Eg:. Banyan tree, maize, oak trees, horsetails



Functions of Root

General functions of a root include:

- Storage.
- Anchorage.
- Absorption of water and minerals.

Regions of Root

The three regions of a root are-

- The Root Cap.
- The region of maturation.
- The region of Elongation.

Shoot System

- Another essential part of the plant is its stem.
- It is the ascending part of the plant axis which bears branches, leaves, flowers, fruits and helps in the conduction of water and minerals.
- It is the aerial part of the plant, developed from the plumule of an embryo or the germinating seeds.
- Young stems are usually green in colour and subsequently becomes woody and brown.
- The stem is modified into certain structures according to the function they perform.

THE STEMS:

Characteristics of Stem:

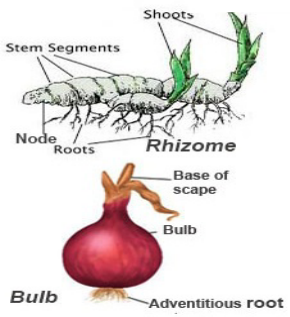
Some of the important characteristics of the stem are:

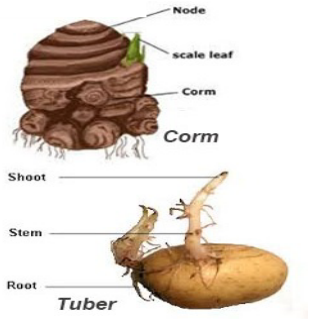
- The stem develops from the plumule and epicotyl of the embryo.
- The stem is erect and grows away from the soil towards the light.
- There is a terminal bud at the apex of the stem.
- In angiosperms, the shoot is differentiated into nodes and internodes.
- Young stems are green and photosynthetic.
- Multicellular hair is present.
- The stem and branches of mature plants bear fruits and flowers.

Different forms of Stem

The stem is modified into the following different form

I. Tubers
II. Runners.
III. Climbers.
IV. Tubers.
V. Rhizome.

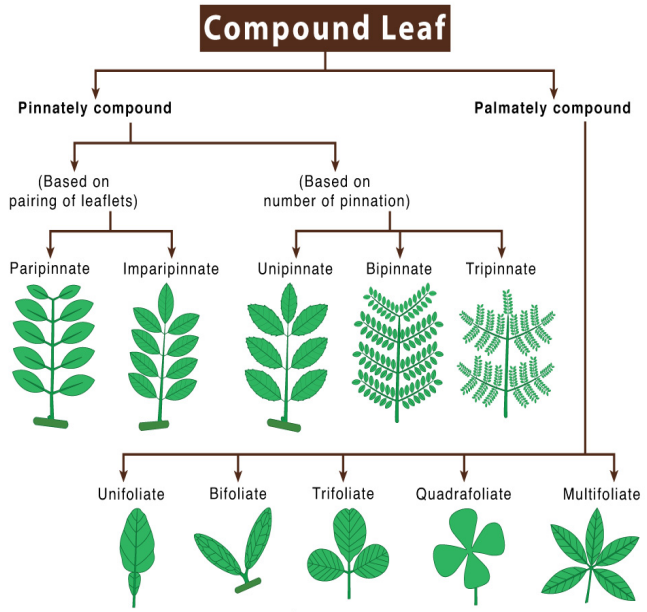




THE LEAF:

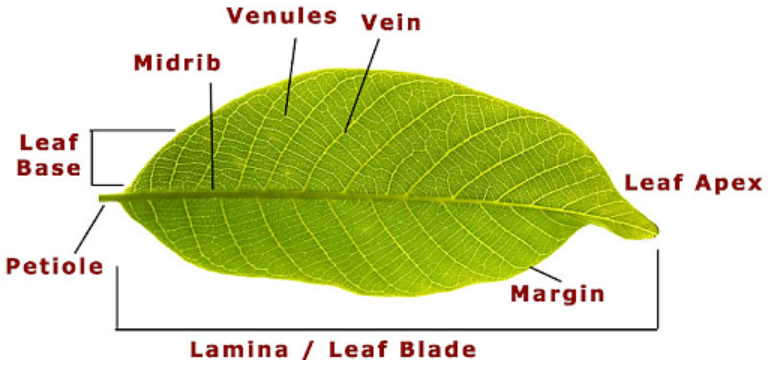
- The leaf is a laterally borne structure and usually flattened.
- It is the main photosynthetic part of the plants.
- It absorbs light and helps in the exchange of gases through the stomata.
- The main parts of the leaf include the leaf base, petiole, and lamina.
- They grow at the node and bear a bud at the axil. The arrangement of veins and veinlets in a leaf is called venation.
- The leaves are green because of the presence of the photosynthetic pigment called chlorophyll and have a tiny pore or opening called stomata, where the gaseous exchange takes place.

Classification:



Characteristics of Leaves

- The leaf arises from the node.
- It is exogenous in origin.
- It has a bud at its axis.
- The growth of the leaf is limited.
- The leaves do not bear an apical bud.



Functions of Leaves

Some of the important functions performed by leaves are:

- Photosynthesis.
- Transpiration.
- Storage.
- Guttation.
- Defence.

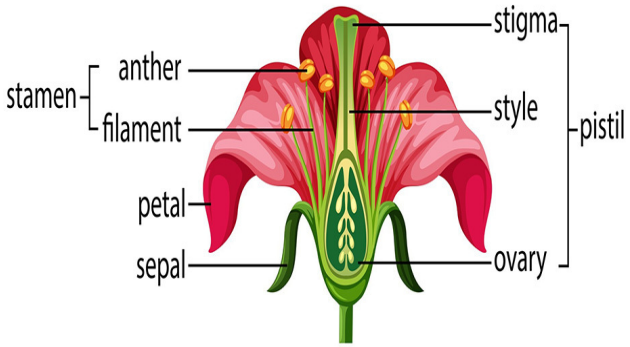
THE FLOWERS:

- The flowers are the reproductive part of the plant.
- The arrangement of flowers on the floral axis is called inflorescence

- which has two major parts called racemose which let the main axis continue to grow and cymose which terminates the main axis in a flow.

The flower consists of four different whorls:

- Calyx, the outermost.
- Corolla, composed of petals.
- Androecium, composed of stamens.
- Gynoecium, composed of one or more carpels.
- The reproduction in plants occurs by the process of pollination. It is the process of transfer of pollen from the anther to the stigma of the same or different plants.



Functions of Flowers

The flower performs the following important functions:

- They help in the process of reproduction.
- They produce diaspores without fertilization.
- The gametophytes develop inside the flower.
- The flowers attract insects and birds which then act as a medium to transfer the pollen from anther of one flower to the stigma of some other flower.
- The ovary of the flower develops into a fruit that contains seed.

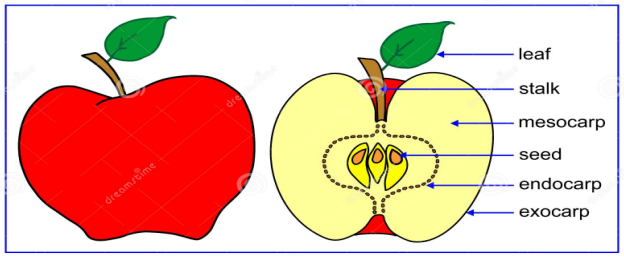
THE FRUITS:

- The fruit is the characteristic feature of flowering plants, which is a ripened or mature ovary and the seed is what the ovules develop into after fertilization.
- The fruit that develops without fertilization is known as parthenocarpic.

Types of Fruits

There are three different types of fruits and are classified mainly based on their mode of development.

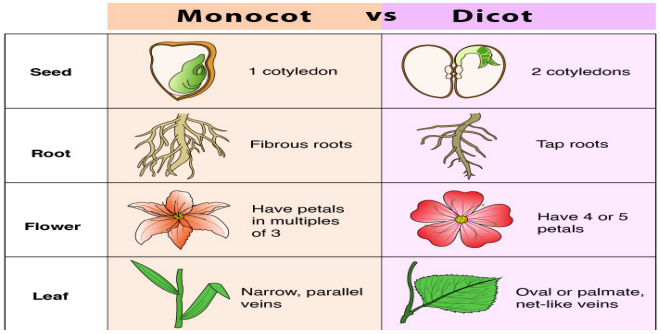
- Simple— Developed from the mono
- carpellary ovary or multicarpellary syncarpous ovary. Examples of simple fruits.
- Aggregate–Developed from the multicarpellary apocarpous ovary. Examples of aggregate fruits.
- Composite–These are false fruits, developed from the entire inflorescence rather than from single flower. Examples of composite fruits include blackberries, Raspberries strawberries, etc.



THE SEED:

- A seed is a basic part of a plant, which is found enclosed within the fruit.
- It is made up of a seed coat and an embryo.
- During the development of the fruit, the wall of the ovary becomes the pericarp.
- In some plants, the ovary wall dries out completely, while in some it remains fleshy.

Types of Seeds



Based on the number of cotyledons, seeds classified into two types- dicotyledonous and monocotyledonous seeds.

Dicot Seed	Monocot Seed
The seed coat is distinct from the fruit wall.	The seed coat is completely fused with the pericrap.
There are two cotylendons in the seeds.	There is a single cotylendon in the seed.
Endosperm is absent.	Endosperm is present.
There is no protective sheath for the plumule and radicle.	The plumule is protected by coleoptile and radicle by coleorhiza.

STUDY OF SECONDARY METABOLITES:

1.ALKALOIDS:

- Alkaloids are a class of basic, naturally occurring organic compounds that contain at least one nitrogen atom.

Drugs included in alkaloids:

★ **Opium**

Synonyms: common garden poppy

Biological Source: Opium or gum opium is the air dried milky exudates obtained by incising the unripe capsules of Papaver somniferum

Family:Papaveriaceae

★ **Ergot**

Synonym- Ergota, Ergot of rye. Rye ergot.

Biological source-Ergot is the dried sclerotium of a fungus- Claviceps purpurea belonging to the family-Clavicipitaceae developed on the ovary of Rye plant-Secale cerelae(Bajra),

Family :Gramineae

★ **Datura**

Synonym: Datura herb

Biological Source: It consists of the dried leaves & flowering tops of Datura metel

Family: Solanaceae.

★ **Belladonna**

Synonym: Deadly night shade leaf & belladonna leaf.

Biological Source: It consists of dried leaves and other aerial parts of Atropa belladonna.

Family:– Solanaceae

Vinca

Synonyms: Vinca rosea,Catharanthus, Madagascar periwinkle, Barmasi.

Biological Source: Vinca is the dried entire plant of Catharanthus roseus Linn.

Family:Apocynaceae.

Uses of Alkaloids:

Used as anaesthetics, cardioprotective, and anti-inflammatory agents.

GLYCOSIDES:

Glycosides are define as organic compound from plants and animal source, which on enzymatic hydrolysis gives one or more sugar moieties along with anon sugar moiety.

Drugs included in Glycosides

- **Liquorice roots**

Synonyms: Glycyrrhiza, mulethi, yasti, marathi-jestha madhu

Biological source: It consist dried,unpeeled roots and stolons of Glycyrrhiza glabra linn

Family: Leguminosae

- **Brahmi**

Synonym: Bacopa

Biological Source:it consist of fresh leaves and stems of plant Bacopa moniera linn.

Family:Scrophulariaceae

- **Digitalis**

Synonym-Digitalis leaves, foxglove leaves.

Biological source: It consists of dried leaves of the Digitalis purpurea.

Family: Scrophulariaceae

- **Dioscorea**

Synonym: yam, rheumatism root

Biological Source:it consist of dried tubers of plant Dioscorea deltoidea, D.composita, and other species of dioscorea.

Family:dioscoreaceae

- **Ginseng**

Synonyms:Panax, Energofit, Pannag, Ninjin.

Biological Source: Ginseng is the Dried root of different naturally occurring species of Panax, namely: Panax ginseng

Family: Araliaceae

Uses of Glycosides:

1. Demulcent and expectorant
2. Laxative.
3. Anti-inflammatory agent.
4. Cough and peptic ulcer.

FLAVONOIDS:

Flavonoids is a group of natural substances with variable phenolic structures.

Drugs included in Flavonoids:

- **Tea**

Synonyms: Camellia thea,

Biological Source: It consists of prepared leaves and leaf buds of Thea sinensis Linne,Theae viridis Folium (Green tea leaves), Theae Nigrae folium (black tea leaves)

Family: Theaceae (Ternstroemiaceae).

- **Ruta**

Synonyms: Rue

Biological Source:It consist of Dried herb of Ruta graveolens L.

Family: Rutaceae.

- **Lemon peel**

Synonym: Cortex limonis

Biological Source: Lemon peel is the outer part of the pericarp of the ripe (or) nearly ripe fruits of Citrus limonis Burm.

Family: Rutaceae

- **Orange peel**

Synonym:- Orange cortex, Seville orange, Sour orange, Bigarade orange, Marmalade orange

Biological source:- Orange peel is dried (or) fresh outer part of the pericarp of the ripe (or) nearly ripe fruits of Citrus aurantium Linn.

Family: Rutaceae

- **Podophyllum**

Synonym: Indian Podophyllum, Podophyllum radix.

Biological source: It consists of the dried rhizome and root of Podophyllum hexandrum Royle (Podopyllum emodi),

Family: Berberidaceae

Uses of Flavonoids:

I. anticancer agent
II. antioxidant agent
III. anti-inflammatory agent
IV. antiviral agent

TANNINS:

Tannins are naturally occurring non-nitrogenous compounds. They belong to water-soluble polyphenols with high molecular weight.

Drugs included in tannins:

- **Catechu**

Synonyms: Pale catechu, gambier, kattha

Biological source: It consists of the dried aqueous extract prepared from the leaves of uncaria gambier

Family: Rubiaceae

- **Nutgall**

Synonym: Turkey galls

Biological source: Galls are the pathological outgrowths formed on the twigs of the oak tree Quercus infectoria

Family:Fagaceae

- **Pterocarpus**

Synonyms:bijasal, Indian kino tree, Malbar kino

Biological source: it can consist dried juice obtained by making vertical incisions to the stem bark of the plant Pterocarpus marsupium.

Family: leguminosace.

- **Arjuna**

Synonym- Arjuna, White Murdh.

Biological source- Dried bark of plant Terminalia arjuna

Family -Combretaceae.

- **Tannic acid**

Synonyms: Acidum tannicum or Gallotannic acid.

Biological source: It is obtained from the nutgalls. Galls are vegetable outgrowths found on the young twigs of Quercus infectoria

Family: Fagaceae

Uses of Tannins:

It is used as tanning leather, dyeing fabric, and making ink and in various medical applications.

Tannins are used in the treatment of varicose ulcers, haemorrhoids, minor burns, frostbite, as well as inflammation of gums.

VOLATILE OIL:

Volatile oils are oils that are characterized by their volatility and failure to saponify

Drugs included in volatile oil:

- **Clove**

Synonym: Lavang

Biological source: It consists of the dried flower buds of Eugenia caryophyllus

Family: Myrtaceae

- **Nutmeg**

Synonym- Myristica, Nux moschata

BIOLOGICAL SOURCE-dried ripe kernels of fruit of Myristica Fragrans, houtt

Family- zingiberaceae

- **Cinnamon**

Synonym:kalmi-Dalchini,ceylon cinnamon

Biological source:dried inner bark of shoots of coppiced tree of Cinnamomum zeylanicum nees

Family: Lauraceae

Uses of Volatile Oil:

They are widely used in the cosmetics industry, perfumery, and also aromatherapy.

RESINS:

Resin are any natural or synthetic organic compound consisting of a noncrystalline or viscous liquid substance

Drugs included in Resins:

- **Colophony**

Synonyms:Chir, long needle pine

Biological source: Colophony is the solid residue obtained after distilling the oleo-resin from various species of pinus- pinus longifolia, pinus palustris, pinus maritima

Family: Pinaceae

- **ASAFOETIDA**

Synonyms - Heeng, hing, hingu

Biological source -It is the oleo-gum-resin obtained by incising theliving rhizomes and roots of Ferula foetida,Ferula asafoetida

Family - Umbelliferae

★ **Capsicum**

Synonym: Chillies

Biological Source: It consists of the dried ripe fruits of Capsicum frutescens or Capsicum annum or capsicum minimum.

Family:Solanaceae

Uses of Resin:

- Preparation of Zinc oxide, adhesive plaster, ointment much resin is artificially modified by hydrogenation or polymerization-products involving printing inks, rubber, linoleum, thermoplastic floor tiles and surface coating.
- The abietic acids shows antimicrobial, antiulcer and CVS activity.
- Stimulant and diuretic
- Adulterants: black resin or apic resin (confirmed by solubility)

REFERENCE:

- PHARMACOGNOSY AND PHYTOCHEMISTRY BY NIRALI PRAKSHAN
- BY PV PUBLICATION
- GOOGLE

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