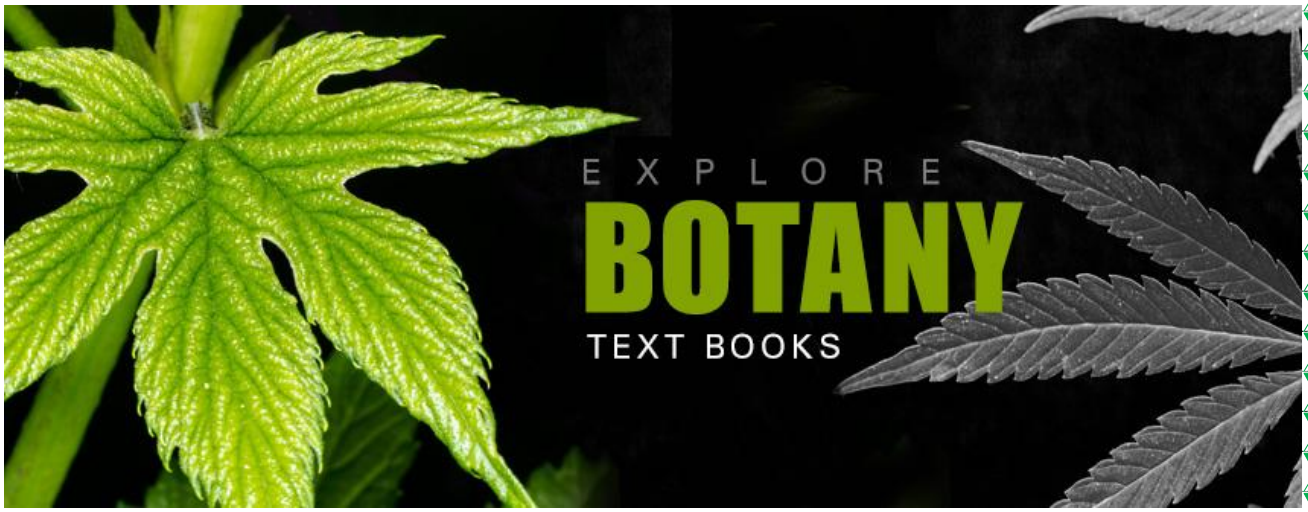
TEACHER'S CARE ACADEMY

KANCHIPURAM

BOTANY

(UNIT –I)

(Viruses, Bacteria, Thallaophytes and Lichens)



COMPETITIVE EXAM

FOR

PG TRB 2019-20

VIRUSES

GENERAL CHARACTERS:

Virology is a branch of science that deals with the study of viruses.

1. Viruses are non-living characters, they are not cells.
2. They do not have a cytoplasm or any kind of cellular organelles to carry out any kind of metabolism.
3. Viruses are able to infect all living forms including plants, animals, human beings and even micro-organism.
4. Viruses are Obligate intracellular parasites they require a living cell or organism for its multiplication.
5. Viruses can be observed only under the electron microscope.
6. They are 10 to 100 times smaller than bacteria and its size ranges from 20 to 300 nm so these viruses can pass easily through bacteriological filters. They are filterable.
7. Size of viruses is measure with the help Ultrafiltration, ultracentrifugation and electron microscopy.
8. Viruses do not have any kind of cellular organisation.
9. Viruses have spikes which help the virus to attach on the host cell.
10. It contains either DNA or RNA as a nuclear material.
11. As we know viruses are an obligate intracellular parasite and lack the essential enzyme for protein and nucleic acid synthesis. These viruses depend on the host cell for its replication and multiplication.
12. Viruses are unaffected by antibiotics, there are many differences between micro-organism and viruses in spite of that viruses are considered as micro-organism especially in the field of medical microbiology.
13. Viruses are of great concern in the field of medical microbiology because they are responsible for various human diseases.
14. Examples of diseases caused by viruses are Rabies, AIDS, Mumps, Hepatitis, Influenza, Dengue, common cold and many more diseases are caused due to viruses. Viruses are responsible for cancer in human beings, birds and animals.
15. Viron is an extracellular infectious particle of the virus. Viron contains essential nucleic acid which is protected by the protein coat called as the capsid.
16. The function of the capsid is to protect nucleic acid from nucleases and other environmental factors. The capsid is made up of polypeptide molecules.
17. Capsid shows two types of symmetry that are cubical or icosahedral symmetry and helical symmetry. Icosahedral symmetry shows 12 vertices and 20 sides.

18. The icosahedral contains two types of capsomers Pentons at the vertices and hexons at the Facets or sides
19. Different viruses have different shapes, most of the animal viruses are roughly spherical in shape as well as pox virus is brick shape, TMV is rod shape etc.
20. Viruses may be enveloped or non – enveloped.
21. Envelop is made up of lipoproteins and is derived from host cell membrane.
22. Viruses require a living media like the embryonic egg, cell culture or bacterial cells.
23. There are two types of viruses that are DNA viruses and RNA viruses.

All viruses contain the following two components:

1) a **nucleic acid genome** and

2) a **protein capsid** that covers the genome.

Together this is called the **nucleocapsid**. In addition, many animal viruses contain a 3) **lipid envelope**. The entire intact virus is called the **virion**. The structure and composition of these components can vary widely.

A: Viral Genomes: While the genomes of all known cells are comprised of double stranded DNA, the genomes of viruses can be comprised of single or double stranded DNA or RNA. They can vary greatly in size, from approximately 5-10 kb (*Papovaviridae, Parvoviridae*, etc.) to greater than 100-200 kb (*Herpesviridae, Poxviridae*). The known structures of viral genomes are summarized below.

DNA: Double Stranded - linear or circular

Single Stranded - linear or circular

Other Structures - gapped circles

RNA: Double Stranded - linear

Single Stranded - linear : These single stranded genomes can be either + sense, - sense, or ambisense The sense strand is the one that can serve directly as mRNA and code for protein, so for these viruses, the viral RNA is infectious. The viral mRNA from - strand viruses is not infectious, since it needs to be copied into the + strand before it can be translated. In an ambisense virus, part of the genome is the sense strand, and part is the antisense.

The genome of some RNA viruses is segmented, meaning that a virus particle contains several different molecules of RNA, like different chromosomes.

B:ProteinCapsid

Viral genomes are surrounded by protein shells known as capsids. One interesting question is how capsid proteins recognize viral, but not cellular RNA or DNA. The answer is that there is often some type of "packaging" signal (sequence) on the viral genome that is recognized by the capsid proteins.

TEACHER'S CARE ACADEMY

KANCHIPURAM

BOTANY

(UNIT -II)

Plant Pathology, Microbiology

COMPETITIVE EXAM

FOR

PG TRB 2019-20

PLANT PATHOLOGY

Plant pathology is a branch of botany. It deals with the diseases of plants, helps to maintain good health of plants, and also take proper steps to increase the productivity. Plant diseases caused disasters like famine in Ireland (1845- 1846) and Bengal (1943) by late blight disease of potato (C.O. Phytophthora infestans) and brown spot of rice (C. O. Helminthosporium oryzae) respectively.

To overcome such problems, it is essential to carry out research on development of disease-tolerant varieties or on production of more effective pesticides in comparatively low cost or in inducing plant's own defense mechanism. Thus, plant pathologists are the plant doctors, responsible to maintain the good health of plants.

Heinrich Anton de Bary (26 January 1831 – 19 January 1888) was a German surgeon, botanist, microbiologist, and mycologist (fungal systematics and physiology). He is considered a founding father of plant pathology (phytopathology) as well as the founder of modern mycology.

Plant pathology (Gr. pathos — suffering; logos— knowledge) is a branch of botany which deals with the study of the nature, development and control of plant diseases or the study of the suffering plants.

It is very difficult to distinguish between a healthy and a diseased plant with some abnormality. The disease of a plant may be caused by environmental factor or factors, called non-parasitic disease (Freezing injury of potato, water core of apple – due to high temperature) or it may be caused by microorganisms such as fungi (Helminthosporium oryzae — brown spot of rice), bacteria (Xanthomonas campestris pv. oryzae- Bacterial leaf blight of rice), plasmodiophorales (Plasmodiophora brassicae — club root of crucifer), nematodes (Heterodera rostochiensis — golden-nematode disease of potato) etc. — called parasitic disease.

For a parasitic disease two organisms are required, one is host, on which disease takes place and the other one is pathogen, which causes disease.

Roughly, we can classify the hosts into three categories:

i. Resistant,
ii. Moderate resistant, and
iii. Susceptible.

Normally a disease takes place in a susceptible host with maximum intensity. Resistant hosts are those which are able to withstand, resist or overcome the attack of a pathogen completely or at a maximum degree. Moderate resistant hosts are able to resist the pathogen attack at a moderate level and, lastly, the susceptible plants, which are not able to resist the attack of the pathogen, produce maximum disease.

The tendency of plants to escape from disease is called klenducity. In some cases, a variety of a plant may escape from disease, not for their resistance but for early- maturity, thus they escape from natural disease incidence, called disease escape and the variety is called disease escaping variety.

Similarly, one can classify the pathogen into three categories:

i. Virulent,

ii. Moderate virulent, and

iii. Avirulent.

The efficiency of a pathogen to produce disease is called virulence and the pathogen with maximum efficiency is called virulent pathogen. Moderate virulent pathogen has the efficiency at moderate level and the avirulent pathogen is inefficient in the production of disease.

classification of plant diseases.

A. Classification on the basis of main causal agent:

Plant Diseases

Non-infectious disease
Or non-parasitic disease
(can't be transmitted)

Disease caused by:

1. Low temperature
2. High Temperature
3. Unfavourable pH
4. Unfavourable Soil Moisture
5. Unfavourable Oxygen relations
6. Presence of toxicoses
7. Mineral deficiencies

Infectious disease
(can be transmitted
to healthy plants)

Parasitic

Disease caused by animal Parasites:

1. Protozoa
2. Insects
3. Nematodes
4. Birds
5. Rodents

Viruses

Disease caused by Plant Parasites:

1. Bacteria
2. Slime moulds
3. Fungi
4. Algae
5. Phanerogames

(i) Diseases classified in relation to their occurrence:

Study of plant diseases in relation to their occurrence (interaction of populations of plants, pathogens and environment) is known as epidemiology. There may be infectious disease and contagious disease. A disease which spreads slowly and is incited by a transmissible pathogen is referred as infectious disease, and that which spreads rapidly is a contagious disease.

Endemic, epidemic or epiphytotic, and sporadic.

A disease which constantly occurs from year to year in moderate to severe form is an endemic disease. Greeneria fruit rot of grape (Vitis vinifera) is an endemic disease in India caused by Greeneria uvicola. But an epidemic disease or epiphytotic disease is the one whose incidence is periodical in wide areas spreading very fast. The term epiphytotic is rather used in case of plant disease.

TEACHER'S CARE ACADEMY

KANCHIPURAM

BOTANY

(UNIT -III)

COMPETITIVE EXAM

FOR

PG TRB 2019-20

BRYOPHYTES

- Bryophytes are "Avascular Archegoniate Cryptogams" which constitute a large group of highly diversified plants.
- Braun (1864) for the first time introduced the name 'Bryophyta' but at that time Algae, Fungi, Lichen and mosses were also included in this group. Schimper (1879) placed Bryophyta at the level of division and since then it occupies the same rank till date.
- Bryophytes are a group of plants that include mosses, liverworts and hornworts.
- Bryophytes are plants that are found growing in moist and shady places.
- Something unique about these plants is that they can survive on bare rocks and soil.
- They play an important role in plant succession on bare rocks.
- They show alternation of generations and have a unique nickname. So they are called the amphibians of the plant kingdom.
- Though they grow in a terrestrial environment, they are dependent on water for the reproduction process.

Mosses:

- Mosses may be small, but they may also be as complex as flowering plants.
- They have stems with leaves, and there is just about as much variation in the form and size of these plants as there is in the flowering plants.
- The 20,000 species range from being microscopic to over a metre; they may be upright, or creeping and much branched.
- They may grow in streams or deserts, on mountain tops or in sea spray, from the antarctic through tropical rain forests to the arctic, and in fact just about anywhere except in the sea itself.

Liverworts

- It may be leafy and very similar to mosses (although the fruit looks quite different). Or they may form flat plates of apparently leafless tissue, in which case they are called thallose.

Hornworts

- It looks like thallose liverworts, but have fruit that is unlike that of either mosses or liverworts.
- It is probable that mosses, liverworts and hornworts are not at all closely related, being united only by sharing their peculiar life-cycle.
- Mosses and Liverworts have been called up-side-down or role-reversal plants.
- The green and often leafy part underneath that we would think of as the moss or liverwort itself, is equivalent to tiny parts within a flower, or to a small, rarely seen part of the fern.

- The part that is equivalent to all of the flowering plant or fern that we normally see is the fruit of the moss or liverwort.
- As in all plants, and indeed animals, these two parts, or generations, alternate with each other in the life-cycle. The spores produced by the moss fruit will germinate into green leafy plants.
- These plants produce gametes, or eggs and sperm, and the resulting embryos grow up into new fruits. But what makes bryophytes different from all other plants, is that the fruit or spore-bearing generation remains semi-parasitically attached to the green gamete-bearing generation, and never becomes independent.
- The truth about this strange life cycle was not finally established until 1851
- The gamete-bearing generation is the green plant that most people think of as the main plant. This is the part that traps light energy and converts it into food for both generations.

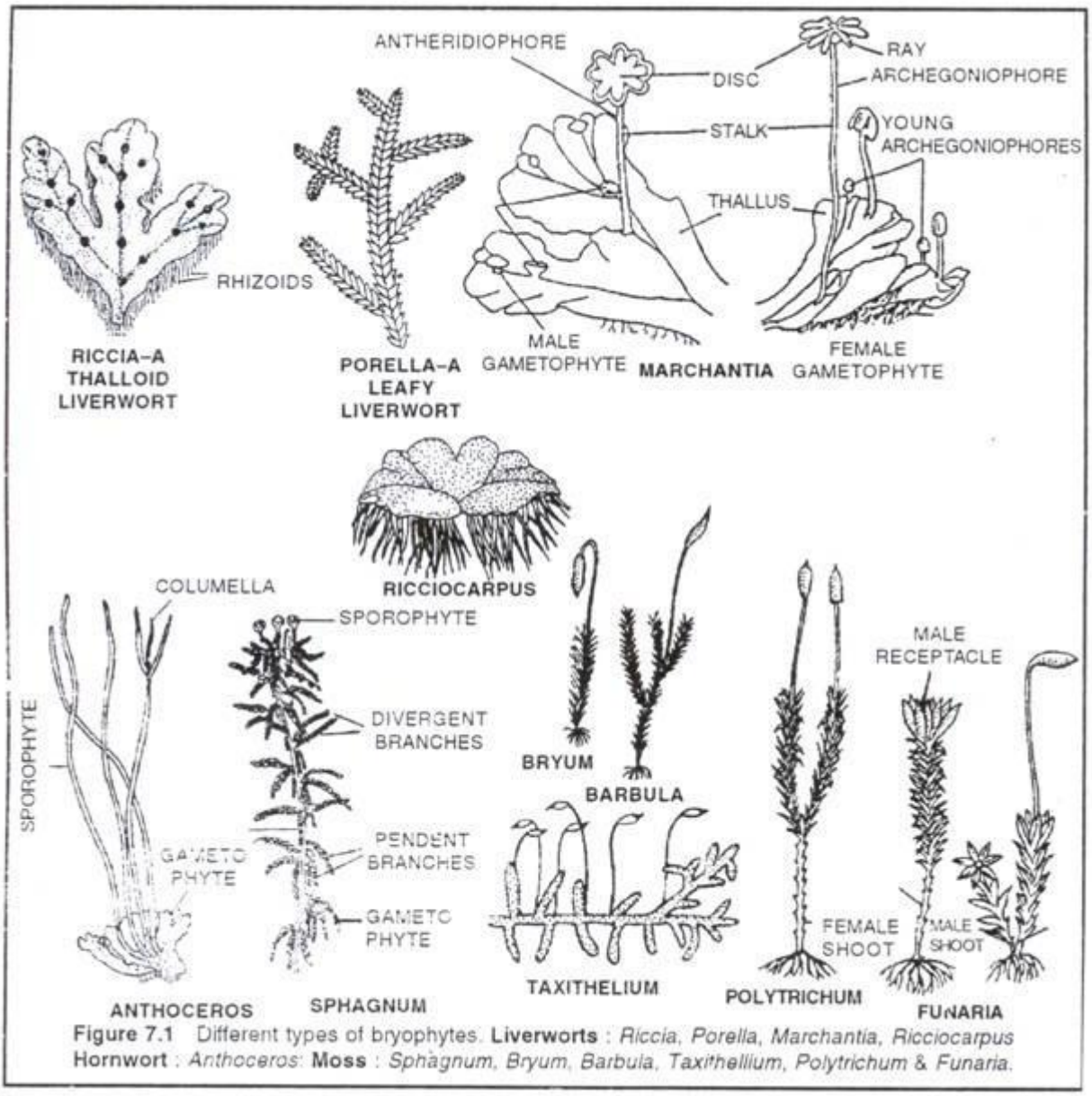


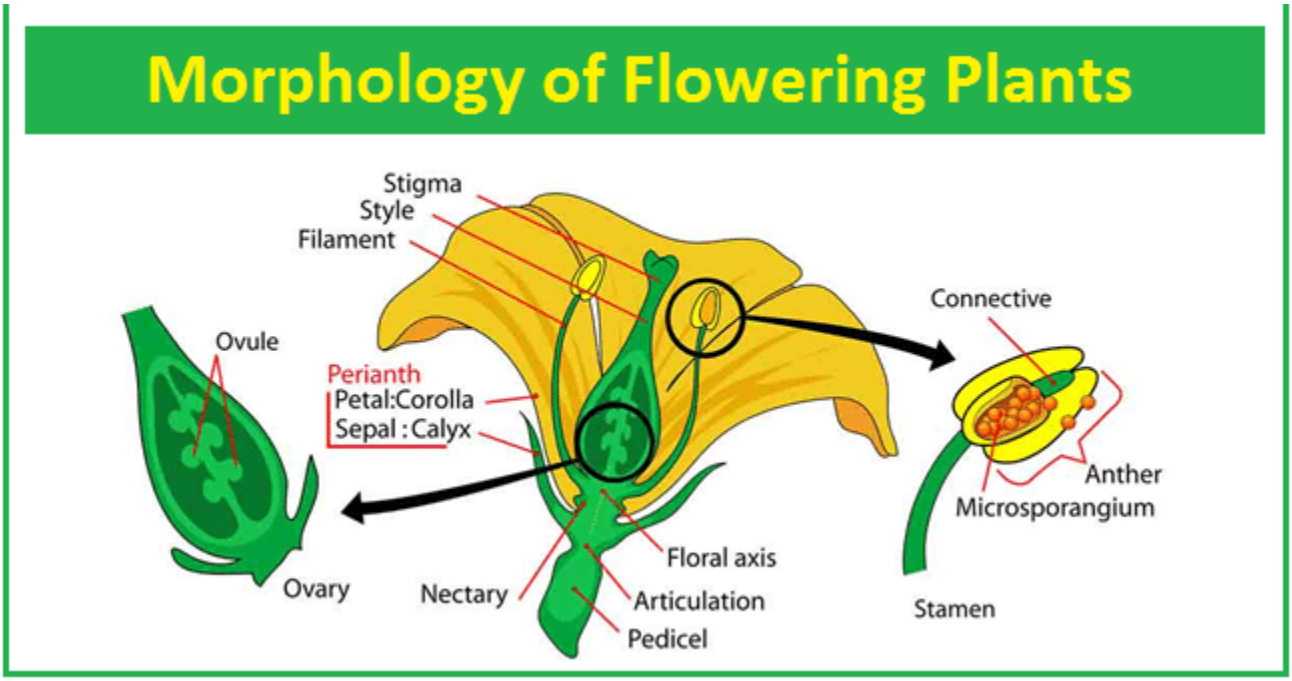
Figure 7.1 Different types of bryophytes. **Liverworts** : *Riccia, Porella, Marchantia, Ricciocarpus* **Hornwort** : *Anthoceros* **Moss** : *Sphagnum, Bryum, Barbula, Taxithellium, Polytrichum & Funaria.*

TEACHER'S CARE ACADEMY

KANCHIPURAM

BOTANY

(UNIT -IV)



COMPETITIVE EXAM

FOR

PG TRB 2019-20

PLANT MORPHOLOGY

- Roots are the important underground part of all vascular plants. This part of the plant is mainly responsible for anchoring it down into the ground and absorbing the essential mineral elements**,** nutrients, and water from the soil. It is also used to store food. However, all plants have their roots underground, but some plants have their roots growing above the ground and are termed as the aerial roots.
- **Types of roots**
    1) **Tap-root system:** Taproots have a main central root upon which, small, lateral roots called root hairs are attached. **Mustard, Carrot, Beetroot, Parsley, China rose and all Dicotyledons are examples of Taproots system.**
    2) **Fibrous root system:** Fibrous roots, on the other hand, are bushy roots in which thin, moderately branching roots grow from the stem. **Rice, Wheat, Maize, Marigold, Banana** and all Monocotyledons are some examples of Fibrous system.

Functions of the Roots

- Roots perform various functions that are necessary for the survival of the plants. They are an Integral or Integrated system that helps the plant in:
- **Anchoring**: Roots are the reason plants remain attached to the ground. **Absorption**: Primary function of roots is to absorb water and dissolved minerals from the soil.
- **Storage**: Plants prepares food and store in the form of starch in the leaves, shoots and roots. **Prominent examples include carrots, radish, beetroot, etc**.
- **Reproduction:** Even though roots are not the reproductive part of plants, they are vegetative parts. In some plants, roots are a means of reproduction. For instance, new plants arise from creeping horizontal stems called **runners (stolons) in jasmine, grass, etc. This type of reproduction is called vegetative propagation**.
- **Ecological Function:** They check soil erosion, provide sustenance and also habitat to various organisms.
- **Adventitious Root System:**Roots that grow from any part of plant other than the radicle or its branches are called adventitious roots (L. adventitious— extraordinary
- **Fibrous Roots:**They are underground roots which arise in groups from the nodes of an horizontal stem **(e.g., Grass).** The main roots are of equal length.

Modifications of Adventitious Roots:

Storage of Food:

Fleshy Adventitious Roots:

- The adventitious roots become thick and fleshy due to the storage of food.

Tuberous Root or Single Root Tubers:

- The swollen roots do not assume a definite shape. They occur singly, e.g., Sweet potato.

(ii) Fasciculated Fleshy Roots: The swollen roots or root tubers occur in clusters. In Dahlia they lie at the base of the stem **Eg.Asparagus**

(iii) Palmate Roots:

The fleshy roots are thickened like the palm of human hand. They similarly possess finger-like outgrowths, e.g., Orchids

iv) Nodulose Roots:

- In nodulose roots the swellings occur only near the tips, e.g., Curcuma amada (Mango Ginger, Turmeric.)

(v) Moniliform or Beaded Roots:

- The roots are swollen at regular intervals like beads of a necklace, e.g., Basella (Portulaca) rubra), Momordica some grasses

vi) Annulated Roots:

- These thickened roots possess a series of ring-like outgrowths or swellings, e.g., Cephaelis or Psychotria

Prop or pillar (Fig. 5.13):

- They are thick pillar-like adventitious roots which grow from and support heavy horizontal branches of Banyan tree

Stilt Roots (Brace Roots):

- They are short but thick supporting roots which develop obliquely from the basal nodes of the stem. In Sugarcane, Maize, Pennisetum and Sorghum

Clinging or Climbing Roots:

- These are non-absorptive adventitious roots which are found in climbers. They may arise from the nodes (e.g., Tecoma, Betel), internodes (Ficus pumila) or both

Assimilatory Roots:

- They are green roots which are capable of photosynthesis. In Trapa (Water Chestnut, vern. Sanghara) the green assimilatory roots are submerged like other roots.

Haustorial or Parasitic Roots:

- The roots occur in parasites for absorbing nourishment from the host. Hence, they are also called sucking roots or suckers. Cuscuta

Epiphytic or Aerial Roots (Hygroscopic Roots

- The roots occur in epiphytes (plants living on the surface of other plants for shelter and space only; hence also called space parasites).

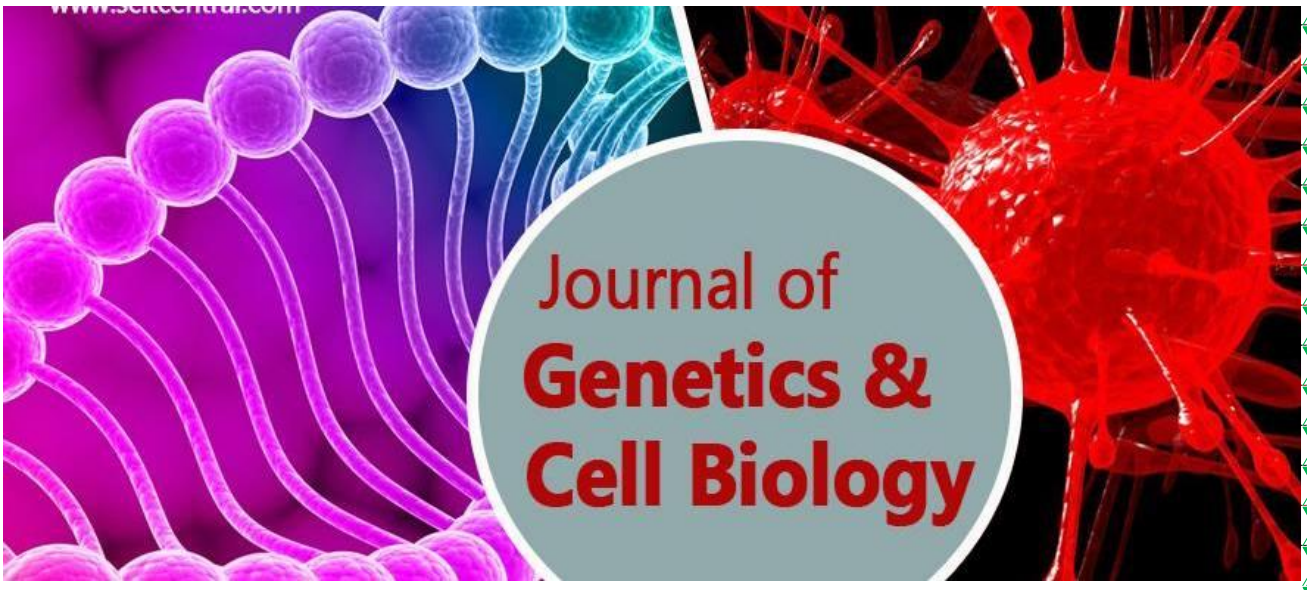
TEACHER'S CARE ACADEMY

KANCHIPURAM

BOTANY

(UNIT -V)

Cell Biology and Genetics



COMPETITIVE EXAM

FOR

PG TRB 2019-20

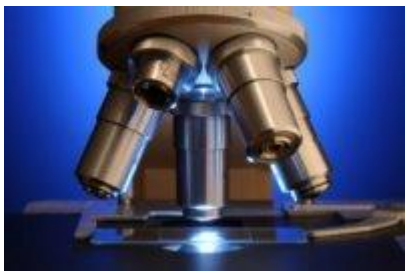
CYTOLOGICAL METHODS

MICROSCOPES

- There are several **different types of microscopes** used in light microscopy, and the four most popular types are Compound, Stereo, Digital and the Pocket or handheld microscopes.
- Some types are best suited for biological applications, where others are best for classroom or personal hobby use.
- Outside of light microscopy are the exciting developments with electron microscopes and in scanning probe microscopy.
- Below is a brief introduction of the different types available.
- For further information and guidance in your search and to find microscope reviews please continue reading about each type by following the corresponding links.

The Compound Light Microscope

- Commonly binocular (two eyepieces), the **compound light microscope**, combines the power of lenses and light to enlarge the subject being viewed.
- Eyepiece itself allows for 10X or 15X magnification and when combined with the three or four objective lenses, which can be rotated into the field of view, produce higher magnification to a maximum of around 1000X generally.
- The compound light microscope is popular among botanists for studying plant cells, in biology to view bacteria and parasites as well as a variety of human/animal cells.



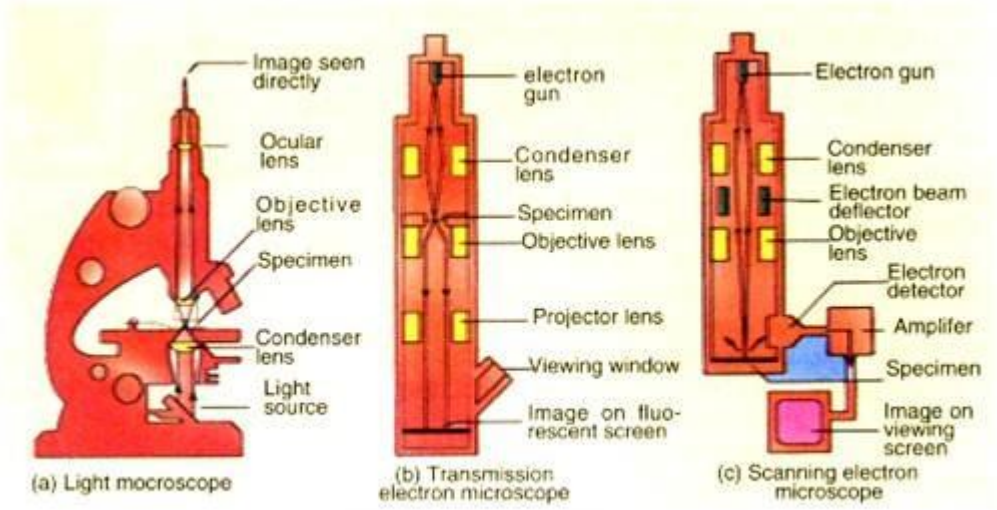
- It is a useful microscope in forensic labs for identifying drug structures.
- Compound light microscopes are one of the most familiar of the different types of microscopes as they are most often found in science and biology classrooms.
- For this reason, simple models are readily available and are inexpensive.
- As well, several microscopy imaging techniques benefit scientists and researchers using the compound microscope and are worth exploring.

Compound Microscope:

- A microscope is an instrument which makes enlarged image of minute objects near the objective lens.
- The compound microscope has two set lenses. One is known as objective and the other eye piece. These are mounted in a holder commonly known as body tube. The lens

system nearest to the specimen is called objective which magnifies the specimen to a definite number of times.

- The second lens system is called eye piece which is the nearest to eye. It further magnifies the image formed by the objective. Accurate focusing is attained by a special screw appliance called as fine adjustment.



Types of Microscopes.

Type # ***2. Bright Field Microscopy:***

- In bright-field microscopy, the microscope field (the area observed) is bright and the microorganisms appear dark because they absorb some of the light. Normally, microorganisms do not absorb much light, but staining them with dye greatly increases their absorbing ability.
- Generally microscope of this type produces useful magnification of about X1000 to X2000. At magnification greater than X2000, the image appears fuzzy. It is also called microscopy by transmitted light Fig. 35.3).

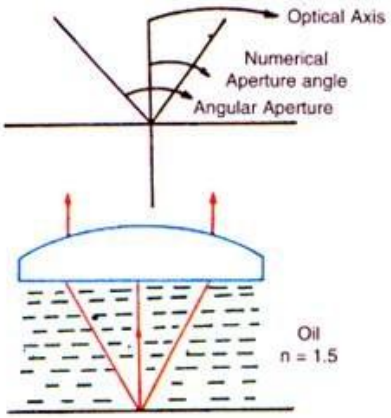


Fig. 35.3 : Schematic representation of the compound bright field microscope.

Type # ***3. Dark Field Microscopy:***

In this type of microscopy, a dark back ground is produced against which objects are brilliantly illuminated. For this purpose the light microscope is equipped with a special kind of condenser that transmits a hollow core of light from the source of illumination. Thus, if the aperture of condenser is allowed to open completely, and a dark field stop inserted below the condenser, the light rays reach the objects form a hollow core.

Any object within this beam of light will reflect some light into the objective and will be visible. This method of illuminating an object where the object appears self-illuminous against a dark field, called dark-field illustration.

TEACHER'S CARE ACADEMY

KANCHIPURAM

BOTANY

(UNIT -VI)

Anatomy and Embryology

COMPETITIVE EXAM

FOR

PG TRB 2019-20

Unit - VI - Anatomy, Microtomy and Embryology

i) ANATOMY

Introduction

- The study of internal structure and organization of plant is called "**plant anatomy"** (*Gk = Ana* - as under; *temnein* - to cut).
- In plants cells are the **basic unit**.
- Father of Plant Anatomy - **Nehemiah Grew.**
- Cells organized into **tissues** and tissues organized into **organs**.

MERISTEMS - GENERAL ACCOUNT, CLASSIFICATION, VARIOUS CONCEPTS OF APICAL ORGANIZATION OF SHOOTS AND ROOT APICES.

The Tissues

- A tissue is a group of cells that are alike in origin, structure and function.
- The study of tissue is called **"Histology"**.
- A plant is made up of different types of tissues.
- There are two principal groups;

1. Meristem (or) Meristematic tissue

2. Permanent tissue

1. GENERAL ACCOUNT ON MERISTEM (or) MERISTEMATIC TISSUE

(*Gr = Meristos* - Divisible)

- ✓ The term meristem was coined by **C. Nageli (1858).**
- ✓ Growth in plants is restricted to specific regions with active cell division called **"meristems".**
- ✓ The meristems are also called **"formative tissue"**.
- ✓ They are normally **isodiametric**, **spherical, oval or polygonal** in shape.
- ✓ They are compactly arranged and **lack intercellular spaces**.
- ✓ They have **thin**, **homogenous** and **cellulosic** cell wall and rich in **cytoplasm** with **prominent nucleus**.
- ✓ A meristem formed of such cells is known as **"eumeristem"**.
- ✓ The most important character or these cells is their **capacity to divide**.

CLASSIFICATION OF MERISTEMS

- Meristems are normally classified on basis of their **Origin, Position Function** and **Plane of division.**

I. Classification based on Origin and Development

- ✓ On the basis of origin and development of initiating cells, **three categories** are recognized.
    1. **Promeristem or Primordial Meristem**
    2. **Primary Meristem**
    3. **Secondary Meristem**

1. Promeristem or Primordial Meristem

- The term promeristem is used to refer to a group of earliest and youngest meristematic cells of a **growing organ**.
- It is the early embryonic meristem from which other **advanced meristems** are derived.
- The portion of a primary meristem that contains actively dividing, **undifferentiated, isodiametric**.
- Cell are **thin-walled** and their most recent **derivatives**.
- Promeristem further divides and forms **primary meristem**.
  e.g. **Plumule, radical, bud primordia** and **leaf primordia.**

2. Primary Meristem

- These are derived from promeristem and found at the tips of **root, stem and appendages.**
- The cells divide in all possible planes and form the **fundamental part** or primary structure of a plant.
- It is derived from **embryonic stages** and differentiated into primary permanent tissues.
  e.g. **Primary Xylem** and **Primary Phloem.**

3. Secondary Meristem

- It is derived from primary permanent tissues which have the capacity of division.
- It is derived during **later stage** of development of the plant body.
- It produces **cork cambium** and **interfasicular cambium**.
  e.g. **Cork cambium.**

II. Classification on Basis of Position

- ✓ On the basis of their position in the plant body, three categories are recognized
    1. **Apical Meristem**
    2. **Intercalary Meristem**
    3. **Lateral Meristem**

1. Apical Meristem

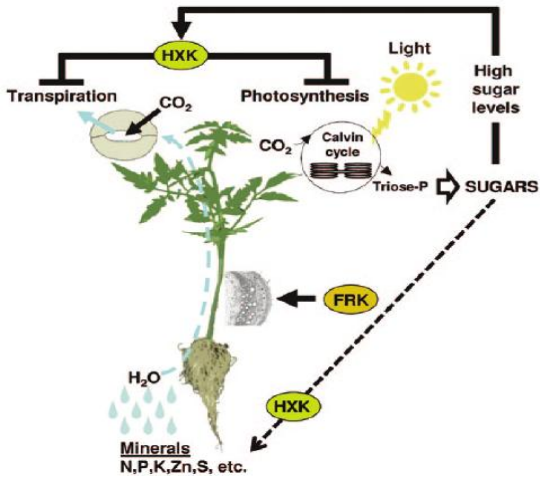
- These are found at the apices or **growing points of root** and **shoot**.
- It is responsible for increase in the **length of the plant.**
- It includes both **promeristem** as well as **primary meristem**.
- The apical meristematic tissues divide and **gradually attain the shape of permanent tissues.**

TEACHER'S CARE ACADEMY

KANCHIPURAM

BOTANY - Unit - VII

Plant Physiology & Bio Chemistry



COMPETITIVE EXAM

FOR

PG-TRB 2019 – 20

PLANT PHYSIOLOGY:

➢ WATER RELATED PLANTS - MECHANISM OF ABSORPTION OF WATER:

The mechanism of water absorption is of following two types

Active absorption:

- When roots are involved actively in water absorption and water absorbing forces in plants are developed primarily in roots. Such type of absorption is called active absorption.
- It is found in those plants where transpiration is less and water is present in sufficient amounts.
- Active absorption requires ATP released during respiration. It is also of two types:

(i) Osmotic absorption:

✓ In this type of absorption the root act like an osmometer and water is absorbed according to osmogradient.

✓ The cell wall of root hairs is permeable and it does not create any hindrance in the entry and exit of the liquids in the cell.

✓ Plasma membrane is semipermeable and it allows only the diffusion of water and important dissolved salts into the cytoplasm.

✓ The cell wall of root hairs being hydrophilic in nature first absorbs soil water through imbibition.

✓ The cytoplasm of root hair is usually concentrated through capillary water of soil. So osmotic pressure of cell sap of root is also greater than the osmotic pressure of capillary water of soil.

✓ Thus, the Diffusion Pressure dedict (DPD) and Suction Pressure (SP) become more in root hairs resulting in osmotic diffusion or endosomosis of water and its dissolved substances into the root hairs.

✓ *Pathway of water into root*: Root hairs→ Epidermal cell→ Various successive cortex cell→ Endodermal cell (passage cell)→ Cells of pericycle→ Xylem cell→ xylem duct→ upward movement of water.

✓ *Root pressure:* When the water enters from the turgid pericycle cells into xylem vessels, a pressure is created in the xylem of roots due to which the water rises to a certain height in the xylem .This pressure is called root pressure.

(ii) Non – osmotic active absorption:

✓ Sometimes the water absorption also takes place when the osmotic pressure of soil water, is greater than that of OP of cytoplasm of root hairs.

- ✓ Such type of water absorption is called non-osmotic active absorption and it requires ATP produced during respiration of root cells.

Passive Absorption:

- It takes place mainly due to transpiration.
- In passive absorption, the roots remain inactive and the water absorbing forces are first produced in the cells of leaves.
- When DPD increases in the cells of leaves due to transpiration, the water diffuses from the xylem cells of leaves to all mesophyll cells.
- When the transpiration is high, a tension is created in the water column of xylem which increases the DPD of water.
- This tension is like negative pressure and it moves from leaves to roots. In this stage, the DPD in roots increases from xylem cells to epidermal root hairs.
- The rate of passive water absorption is directly proportional to the rate of transpiration and it requires sufficient amount of water in the soil.

Active Absorption	Passive Absorption
It requires energy or ATP	Doesn't require
Create root-pressure	No Root pressure
Requires oxygen	Doesn't requires oxygen
The movement of water takes place from the solution of higher concentration to the solution of lower concentration.ie againt the concentration gradient.	The movement of water takes place from the solution of lower concentration to the solution of higher concentration.ie according to the osmotic gradient.

FACTORS AFFECTING THE RATE OF WATER ABSORPTION

Factors	Mechanism
Available soil water	* If the amount of water is increased than the field capacity, it creates a bad effect on soil aeration and thus reduces the water absorption.
Soil aeration	* The rate of water absorption is decreased in the absence of oxygen. * The reduction in rate of water absorption is due to lack of O_2 and accumulation of CO_2 which affects the plants in following manner. i) CO_2 reduces metabolic activities and respiration rate. ii) It reduces the size and growth of roots.
Soil Temperature	* Generally, the rate of water absorption is maximum between 20°-30° C. * At very low temperature of 0° C, the rate of water absorption is almost stopped and its rate becomes zero.
Root system	* Hairy root system shows higher rate of water absorption

TEACHER'S CARE ACADEMY

KANCHIPURAM

BOTANY

(UNIT -VIII)

COMPETITIVE EXAM

FOR

PG TRB 2019-20

I.PLANT BREEDING

Methods of improvement of crops

Crop Improvement : Breeding Methods in Crop Plants

Plant breeding is a method of altering the genetic pattern of plants to increase their value and utility for human welfare. It is a purposeful manipulation of plants to create desired plant types that are better suited for cultivation, give better yield and are disease resistant. Plant breeding is done for the following objectives –

- Increase the crop yield
- Improve the quality of the crop
- Increase tolerance to environmental conditions like salinity. extreme temperatures and drought
- Develop a resistance to pathogens
- Increase tolerance to the insect pest

Classification of crop plants based on mode of pollination and mode of reproduction

Mode of pollination and reproduction	Examples of crop plants
Self Pollinated Crops	Rice, Wheat, Barley, Oats, Chickpea, Pea, Cowpea, Lentil, Green gram, Black gram, Soybean, Common bean, Moth bean, Linseed, Sesame, Khesari, Sunhemp, Chillies, Brinjal,
Cross Pollinated Crops	Tomato, Okra, Peanut, Potato, *etc.*
Often Cross Pollinated Crops	Corn, Pearlmillet, Rye, Alfalfa, Radish, Cabbage, Sunflower, Sugarbeet, Castor, Red clover, White clover, Safflower, Spinach, Onion, Garlic, Turnip, Squash, Muskmelon, Watermelon, Cucumber, Pumpkin, Kenaf, Oilpalm, Carrot, Coconut, Papaya, Sugarcane, Coffee, Cocoa, Tea, Apple, Pears, Peaches, Cherries, grapes, Almond Strawberries, Pine apple, Banana, Cashew, Irish, Cassava, Taro, Rubber, *etc.* Sorghum, Cotton, Triticale, Pigeonpea, Tobacco.

BREEDING METHODS IN CROP PLANTS

SELF POLLINATED CROPS

Mass selection

- In mass selection, seeds are collected from (usually a few dozen to a few hundred) desirable appearing individuals in a population, and the next generation is sown from the stock of mixed seed.

- This procedure, sometimes referred to as phenotypic selection, is based on how each individual looks. Mass selection has been used widely to improve old "land" varieties, varieties that have been passed down from one generation of farmers to the next over long periods.
- An alternative approach that has no doubt been practiced for thousands of years is simply to eliminate undesirable types by destroying them in the field. The results are similar whether superior plants are saved or inferior plants are eliminated: seeds of the better plants become the planting stock for the next season.
- A modern refinement of mass selection is to harvest the best plants separately and to grow and compare their progenies.
- The poorer progenies are destroyed and the seeds of the remainder are harvested. It should be noted that selection is now based not solely on the appearance of the parent plants but also on the appearance and performance of their progeny.
- Progeny selection is usually more effective than phenotypic selection when dealing with quantitative characters of low heritability. It should be noted, however, that progeny testing requires an extra generation; hence gain per cycle of selection must be double that of simple phenotypic selection to achieve the same rate of gain per unit time.
- Mass selection, with or without progeny test, is perhaps the simplest and least expensive of plant-breeding procedures. It finds wide use in the breeding of certain forage species, which are not important enough economically to justify more detailed attention.

Pure-line selection

- Pure-line selection generally involves three more or less distinct steps:

  (1) numerous superior appearing plants are selected from a genetically variable population;

  (2) progenies of the individual plant selections are grown and evaluated by simple observation, frequently over a period of several years; and

  (3) when selection can no longer be made on the basis of observation alone, extensive trials are undertaken, involving careful measurements to determine whether the remaining selections are superior in yielding ability and other aspects of performance.
- Any progeny superior to an existing variety is then released as a new "pure-line" variety. Much of the success of this method during the early 1900s depended on the existence of genetically variable land varieties that were waiting to be exploited.
- They provided a rich source of superior pure-line varieties, some of which are still represented among commercial varieties. In recent years the pure-line method as outlined above has decreased in importance in the breeding of major cultivated species; however, the method is still widely used with the less important species that have not yet been heavily selected.

TEACHER'S CARE ACADEMY

KANCHIPURAM

BOTANY

(UNIT -IX)

Ecology and Phytogeography

COMPETITIVE EXAM

FOR

PG TRB 2019-20

ECOLOGY

IMPORTANCE OF ECOLOGY

Ecology is defined as the scientific study of interactions of organisms (both biotic and abiotic) with one another within the physical and chemical environment. Ecology involves use of scientific methodology via lab experiments to understands how the different organisms grow, populate, how they interact with other organisms either as parasites, predators, how the organisms die out as well as how they evolve or adapt to changing climatic and environmental situations.

Importance of Ecology

The study of ecology is important in ensuring people understand the impact of their actions on the life of the planet as well as on each other. **Here are the reasons why ecology is important**:

1. It helps in environmental conservation

Ecology allows us to understand the effects our actions have on our environment. With this information, it helps guide conservation efforts by first showing the primary means by which the problems we experience within our environment begin and by following this identification process, it shows us where our efforts would have the biggest effect.

Ecology also shows individuals the extent of the damage we cause to the environment and provides predictive models on how bad the damage can get. These indicators instil a sense of urgency among the population, pushing people to actively take part in conservation efforts and ensure the longevity of the planet.

2. Ensures proper resource allocation

Ecology equally allows us to see the purpose of each organism in the web of connectivity that makes up the ecosystem. With this knowledge, we are able to ascertain which resources are essential for the survival of the different organisms. This is very fundamental when it comes to assessing the needs of human beings who have the biggest effect on the ecosystem.

An example is human dependency on fossil fuels that has led to the increase of carbon footprint in the ecosystem. It is ecology that allows humans to see these problems which then calls for the need to make informed decisions on how to adjust our resource demands to ensure that we do not burden the environment with demands that are unsustainable.

3. Enhances energy conservation

Energy conservation and ecology is connected in that, it aids in understanding the demands different energy sources have on the environment. Consequently, it is good for decision making in terms of deciding resources for use as well as how to efficiently convert them into energy.

Without proper understanding of energy facts through ecology, humans can be wasteful in their use of allotted resources such as indiscriminate burning of fuels or the excessive cutting down of trees. Staying informed about the ecological costs allows people to be more frugal with their energy demands and adopt practices that promote conservation such as switching of lights during the day and investing in renewable energy.

4. Promotes eco-friendliness

With all the information and research obtained from ecology, it ultimately promotes eco-friendliness. It makes people aware of their environment and encourages the adoption of a lifestyle that protects the ecology of life owing to the understanding they have about it.

This means that in the long-term, people tend to live less selfishly and make strides towards protecting the interest of all living things with the realization that survival and quality life depends on environment sustainability. Hence, it fosters a harmonious lifestyle and assures longevity for all organisms.

5. Aids in disease and pest control

A great number of diseases are spread by vectors. The study of ecology offers the world novel ways of understanding how pests and vectors behave thereby equipping humans with knowledge and techniques on how to manage pests and diseases.

For example, malaria which is one of the leading killer diseases is spread by the female *Anopheles* mosquito. In a bid to control malaria, humans must first understand how the insect interacts with its environment in terms of competition, sex, and breeding preferences. The same applies to other diseases and pests. By understanding the life cycles and preferred methods of propagation of different organisms in the ecosystem, it has created impressive ways to device controls measures.

ECOLOGICAL FACTORS THEIR CLASSIFICATION AND INTERACTION

Some of the major ecological factors that constitute the environment of an organism are as follows:

1. Climatic Factors
2. Edaphic Factors
3. Topographic Factors
4. Biotic Factors
5. Limiting Factors.

In any eco-system, a living organism is influenced by a number of factors and forces. These environmental factors are known as eco- factors or ecological factors which include light, temperature, soil, water etc.

These factors may be biotic (living) and abiotic (nonliving). The sum total of all these factors constitutes the environment of an organism.

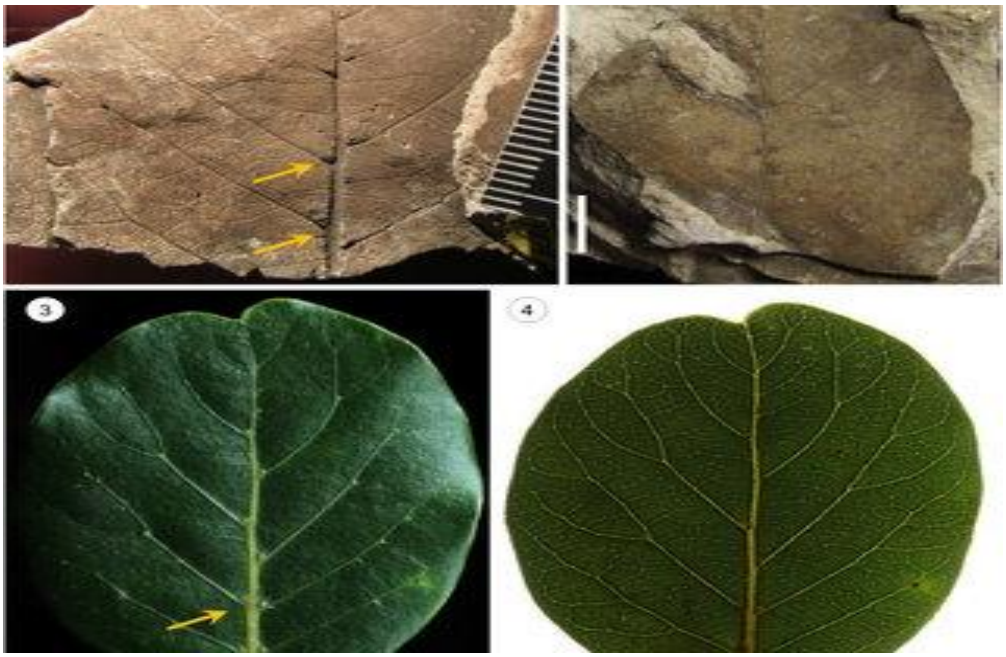
TEACHER'S CARE ACADEMY

KANCHIPURAM

BOTANY

(UNIT -X)

Palaeo Botany and General Principles



COMPETITIVE EXAM

FOR

PG TRB 2019-20

PALAEOBOTANY

Paleobotany is a field of paleontology that studies plants throughout geologic history, and is primarily concerned with the fossil record and evolutionary history of plants.

Objectives of paleobotany

- The major aim is to reconstruct entire fossil plants
- To assign extinct plants to particular taxonomic groups
- To understand evolution of extinct (fossil) plants

Geological Time Scale

Geological time scale is a record of earth's history based on the organisms that lived at different times.

The geological time scale is a system of chronological measurement that related stratigraphy (the study of rock strata, especially the distribution, deposition and age of sedimentary rocks) to time, and is used by the geologists, palentologists and other earth scientists to describe the time and relationship between the events that have occurred throughout earth's history.

The first geological time scale was proposed in 1913 by the British geologist Arthur Holmes (1890-1965). This was soon after the discovery of the radioactivity and using it Holmes estimated that the earth was about 4 billion years old (evidence from radioactive dating indicates that earth is about 4.5 million years old). This was much greater than previously believed.

The geological time scale is divided into five main eras: Coenozoic, Mesozoic, paleozoic, Proterozoic and Archezoic. Each era is divided into periods and each period is divided into epochs.

1. **Meaning of Geological Time Scale**
2. **Major Divisions and Subdivisions of Geological Time Scale**
3. **Major Events.**

Meaning of Geological Time Scale:

Geological time scale is a table showing the sequence of geological periods in the history of earth. It also shows the lengths of time different geological periods are assumed to have occupied It is measured in millions of years. It has been constructed by studying rock strata, where these have been exposed by excavations or mining or where rivers have cut deeply into the earth's crust.

Scientists have proved that lower the rock layer the older it is and the more ancient are the fossils it contains. With a knowledge of rates of erosion and deposition, the intervals occupied by different periods can be estimated roughly by measuring the relative thicknesses of the rock strata.

By the technique of radiometric dating (i.e. by measuring the rates of decay of radioactive materials in the rocks) more accurate dating can now be provided. In the table of geological time scale, the results of all such works are summarized.

Table also shows the types of plants that have been found during different periods. The earth has been estimated to be about 4600 million years old. Life is believed to have originated about 3000-3500 million years ago on the earth.

Major Divisions and Subdivisions of Geological Time Scale:

Geological time has been divided into some major divisions called eras (Table 25.1). Each era has been divided into periods, which are then subdivided into epochs.

Different periods are recognized mainly on the basis of:

(i) Changes in composition of fossils, and

(ii) The occurrence of major geological events (e.g. episodes of mountain building or major changes in level of seas).

The earliest era is Precambrian, which began about 4600 million years ago. It has few fossils. Abundant fossils have been reported in the succeeding eras viz. Palaeozoic, Mesozoic and Cenozoic.

Geological Eras:

A geological era is a very long division of geological time, lasting tens of millions of years. Its beginning and end are recognized by major changes in layers of rocks and fossils in the earth. As mentioned above, the earliest era is Precambrian It began about 4600 millions of years ago. Its duration has been 4030 millions of years.

Palaeozoic era began about 570 millions of years ago. Mesozoic era began about 225 millions of years ago. Cenozoic is the most recent era. It began about 65 million years ago, after the Mesozoic era, and it is still continuing.

Eras are divided into periods and epochs.

Geological Periods:

A geological era is divided further into several subdivisions called periods (Table 25.1). So a period is a major subdivision of a geological era. Major periods of Palaeozoic era are Permian, Carboniferous, Devonian, Silurian, Ordovician and Cambrian. Mesozoic era is divided into three periods viz. Cretaceous, Jurassic and Triassic.

Similarly Cenozoic era is divided into two periods viz. Quarternary and Tertiary. The oldest known period of geological time scale is Cambrian (began about 570 million years ago) while the most recent period is Quaternary (began about 2.5 million years ago).

Periods are divided into epochs.

To Receive our meterial through Courier,
Please make an online payment.

The Material includes:

- All Unit Notes
- Education Methodology
- Psychology
- General Knowledge
- Question Bank