Unit 7:

Protists & Fungi

* Notes of Summative topics:-

1. The Remarkable diversity of protists.
2. Mutualism.
3. Edible Fungi.
4. Ecological Importance of Fungi.
5. Harmful Effects of Fungi or Photogenic role of fungi /Economic losses due to fungi .

THE REMARKABLE DIVERSITY OF PROTISTA:

Following are the basic characters of protista.

1. **Cell organization (Size):**

- All protists are **eukaryotic**. It is a unifying feature of protists.
- Unlike animals, fungi, and plants, even the multicellular protists have pretty simple body structures **without specialized tissues**.
- However the protists being eukaryotic, are clearly different from the members of the prokaryotic kingdom (Monera).
- The protists are
  - ✓ Unicellular,
  - ✓ colonial (a colony is a loose aggregation of cells), or
  - ✓ **coenocytic** (multinucleate but not multicellular i.e, have many nuclei in one cell),
  - ✓ simple multicellular organisms (without specialized tissues).

2. **Size:**

Protists range from **microscopic protozoa** to giant **kelps,** which are brown algae that can reach **60 meters** (almost 200 feet) in length.

3. **Mode of nutrition**

The protists have a variety of methods of obtaining food like:

i. **Autotrophic protists,** e.g. the algae have chlorophyll and photosynthesize as plants,
ii. **Heterotrophic protists,** i.e. the protozoa, water molds and slime molds resemble animals i.e. they ingest food derived from the bodies of other organisms.

4. **Habitat**

Protists are very adaptable and exhibit a wide range of habitat diversity.

- Most protists live in **water,** either in oceans or freshwater, and they are part of the plankton community.
- Protists can also live in damp soil, leaf litter, and decomposing organic matter, where the **presence of moisture supports** their survival and reproduction.
- Some protists are **Extremophiles**, and can live in extreme environments such as snow, hot springs and acidic ponds.

5. **Mode of life**

- Many protists are **free living**:
- Others form **symbiotic association** with different organisms e.g;
  - i. **Mutualism,** a more or less equal partnership in which both organisms benefit.
  - ii. **Parasitism** in which one organism lives on or in another and is metabolically dependent on it.

6. **Mode of Locomotion**

Most protists are motile at some stage of their life cycle and have various means of locomotion. Movement may be accomplished by

- **Amoeboid motion** i.e. extending cell protrusions,
- **Ciliary motion** by waving cilia or to create waves,
- **Flagellary motion** by propelling themselves with whip-like structures called flagella
- Many protists use a combination of 2 or more means of locomotion e.g. both flagellar and amoeboid motion.

7. **Mode of Reproduction**

All protists reproduce **asexually and many also reproduce sexually** with both ***meiosis and syngamy*** (the union of gametes).

8. **Lacking blastula or an embryo and Multicellular sex organs**

Unlike plants and animals, protists do not develop multicellular sex organs or form a blastula or an embryo.

9. **Classification**

There is **no universal acceptance among biologists** about what comprises a"protist." Many biologists interpret the protist kingdom broadly to include: **Heterotrophic Protists** (the protozoa, slime molds, and water molds) and **Autotrophic Protists** (the algae).

The kingdom protista contains **four major groups** of eukaryotic organisms.

i. Single celled protozoan.
ii. algae.
iii. Slime molds
iv. oomycotes.

Unit 7...!

Mutualism...

* Mutulism is the symbiotic relationship b/w two living organisms in which both get benefit from each other.

LICHENS

* Lichens is the Mutualistic association b/w a Fungus and (cynobacteria) green Alga.

* Heterotroph.
* Protect algae from sunlight and dryingout.

* Photoautotroph.
* Give nutrients & energy /food to fungi by photosynthesis.

* Fungus that mostly make Lichens (symbiotic relationship) with (cynobacteria) or green alga or algae are:-

1. Ascomycotes;(Produce sexual spores); (Sac like).
2. Imperfect fungi; (not form mushrooms);(e.g: green alga).
3. Bacidomycotes;(Produce sexual spores); (club-shaped)

* Importance :-

1. Lichens allow growth in harsh environments, e.g: High temperature etc

*(3) layers of Lichens :-

1. TOP LAYER

* Composed of resilient (strong, flexible) fungal hyphae (fungus threads or fibers) that are thin.

2. MIDDLE LAYER

* Fungal hyphae intertwine (combine, unite) with photo-synthetic cells; (that are light absorbing, make food etc. E.g; Algal cells).

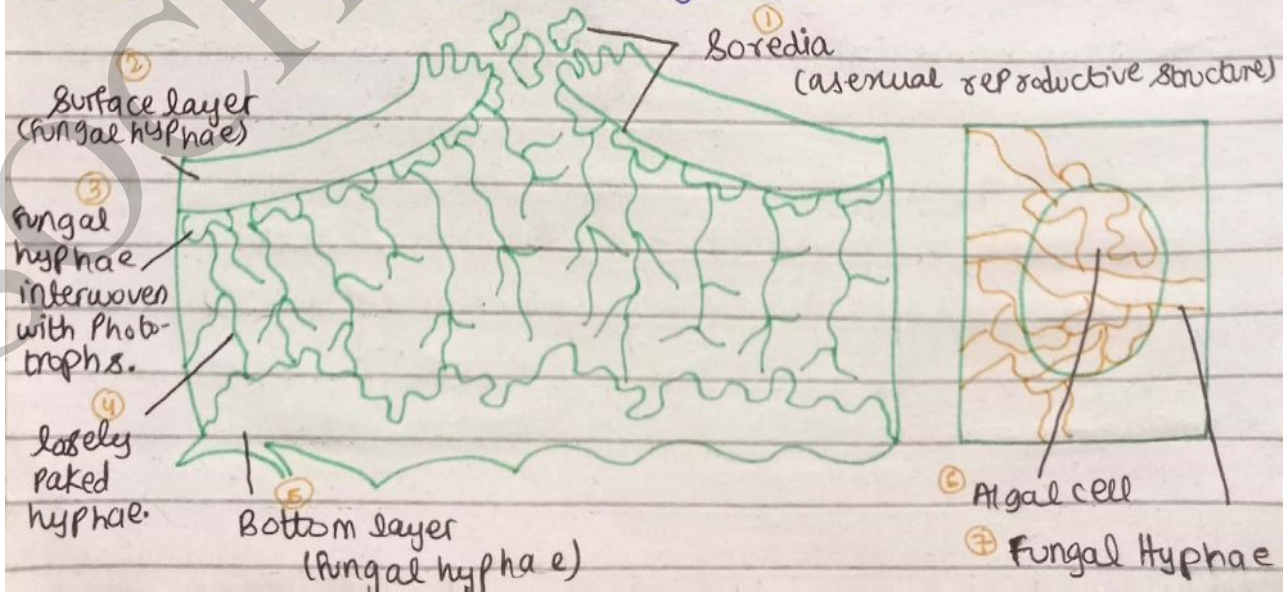
3. BOTTOM LAYER

* Consists of loosely packed fungal hyphae that play many imp roles :-

1. Nutrient transfer.
2. Fungal Growth.
3. Fungal development.
4. Facilitate interaction with other organisms.

* According to Recent researches :-

=> Fungi in lichens may manipulate (kabu kama) or take control over algae cells.



Mycorrhizae

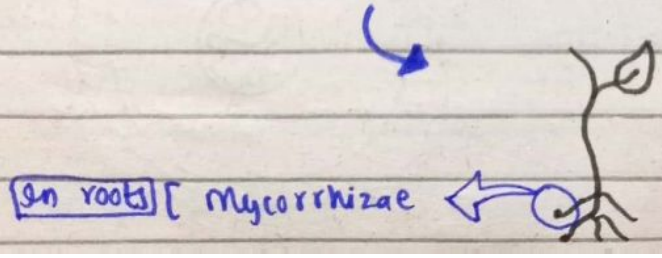
* Mycorrhizae refresents mutualistic relationship between soil fungi and roots of majority of plants.

* This partnership occurs in 95% of all families of higher plants.

Fungi

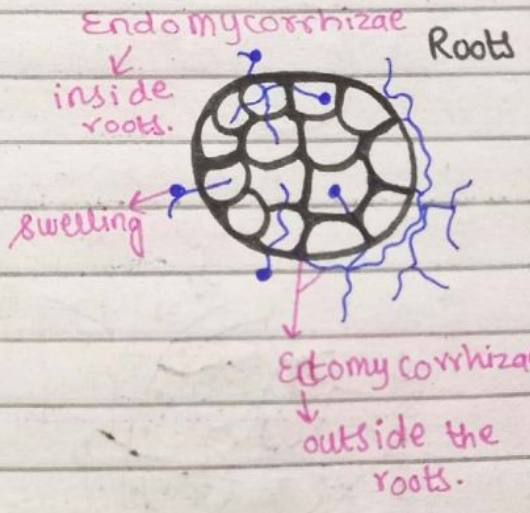
* Heterotrophs.
* Increases the amount of soil contact & total area for absorption.
* Help in more absorption of phosphorus, zinc, copper and other nutrients from the soil into the roots.

⇒ Such plants show better growth than those who are without this association.



Vascular Plant (Roots)

* Autotrophs.
* Provides Habitat to fungi.
* Supplies organic carbon to fungal hyphae.



* Types of Mycorhizae :-

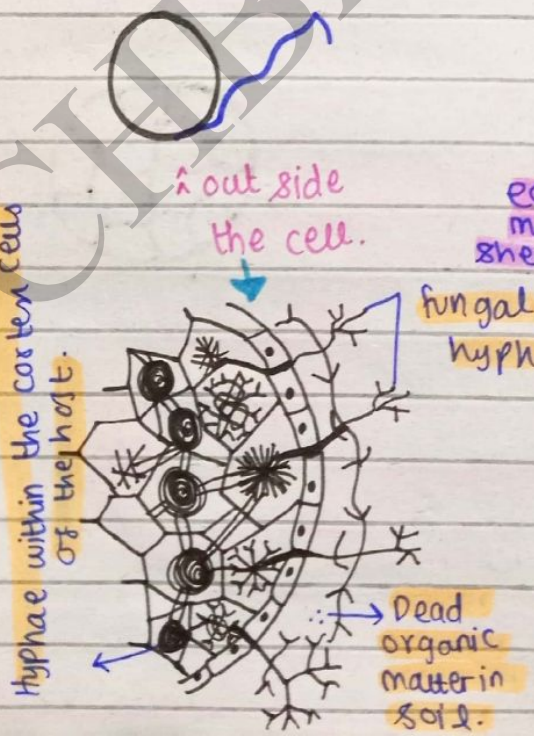
There are two main types of Mycorhizae.

Ectomycorhizae

* In which the fungal hyphae surrounds the cells of roots.

* Causes ;

1. Hyphae extends between the cells of roots.
2. Do not penetrate the cell wall of roots.
3. E.g: Most formed with Pines, firs etc.

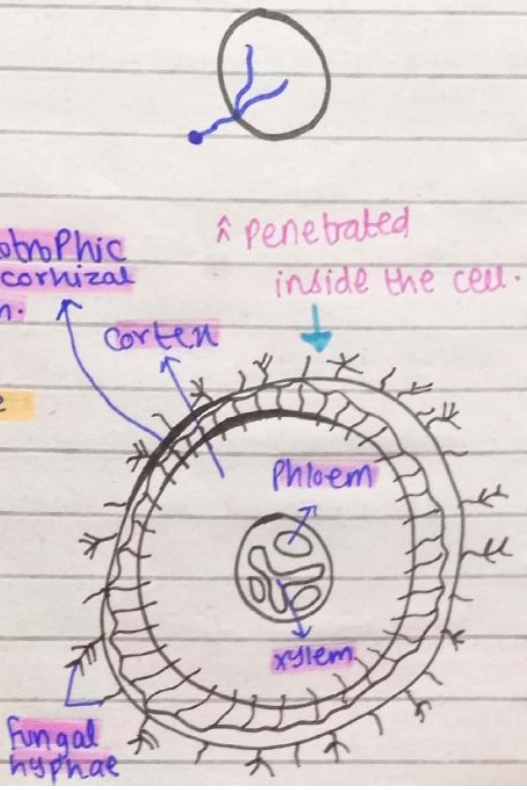


Endomycorrhizae

* In which the fungal hyphae penetrates in the outer cells of the plant roots.

* Causes;

1. Formation of coils.
2. Causes swelling.
3. Branching of hyphae occurs & these extend in surrounding.



Ectomycorrhizae

1) The fungal hyphae donot penetrate in the roots of cell walls.

2) The fungal hyphae simply grow around and extend b/w the cells.

3) Theses are mostly formed within the Pines, firs etc.

Endomycorrhizae

1) Fungal hyphae do penetrate the outer cell wall/cells of the plant root.

2) Fungal hyphae forms coils, swellings & minute branches.

3) These are mostly formed with angiosperms etc.

Edible fungi

1. Aspergillus tamarii:- In the orient aspergillus tamarii & other imperfect fungi are used in orient to produce soy sauce from the soybeans by using the fermentation method.

2. Toadstools:- Among Basidomycetes about 200 varties of edible mushrooms ; primarily, approximately 70 varities are the most Poisonous mushrooms known as toadstools or Agaricus.

3. Ascomycotes:- Many mushrooms are cultivated for commercially usage e.g: ① Morchella esculenta, ② Resembling mushrooms, ③ Truffles (underground fruiting Bodies.

4. Amanita:- ① Edible (consume-able) & Poisonous mushrooms can look very much alike & may even belong to same genus.

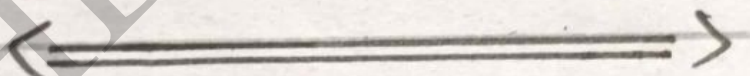
② Anyone can not differentiate in edible & Poisonous mushrooms ; They must be identified by the experts.

③ Some of the Deadliest mushrooms falls under the genus "Amanita". That are:-

(i) Aminita virosa : (Destroying Angle)

(ii) Aminita Phalloids : (Death cap).

(+) Consumption of even any one species of mushrooms written above → can be fatal; while some other mushrooms can cause (Intoxication) & (hallocination); when ingested.



ECOLOGICAL IMPORTANCE

Fungi have great ecological impact. Their role of Fungi in ecosystems maintains this natural world.

i. are ecological powerhouses,
ii. influence nutrient cycling,
iii. influence plant health,
iv. Increase soil formation,
v. maintains balance of predator-prey interactions.

i. Decomposers and Nutrient Cycling:

- Fungi serve as **Nature's Recyclers.**
- **Decomposers:** Fungi break down dead organic matter, such as fallen leaves and wood, that return vital nutrients to the ecosystem.
- This decomposition process **enriches soil and supports plant growth.**

ii. Mycorrhizal Partnerships:

- Mycorrhizal fungi form mutually beneficial relationships with plants,
- This relationship increase nutrients uptake and helping in ecosystem health.

iii. Predators and Soil Ecosystems:

Predatory Fungi

- regulate populations of microscopic organisms and
- compete with bacteria,
- hence shaping microbial communities in soils.

iv. Biotransformations and Pollutant Degradation:

Fungi play a role in biotransformation of compounds in the environment, including pollutant degradatio

v. Carbon Cycling and Humus Formation:

- Fungi **liberate carbon dioxide** during decomposition and
- contribute to **humus formation**, enriching soil structure and supporting diverse ecosystems.

vi. Pathogenic Role of Fungi:

Fungi are **causative gents** of many plant, animal and human diseases.

SHORT QUESTI

If a new deadly fungicide is made b scientists that destro all existing fungi, w would be the impa

(Ex. Sect-II,Q#

Pathogenic role (fungi).

→ Role of Fungi in Plant Diseases

=> Fungi are causative agents of many plants, animals & human diseases;

- Fungi are responsible for many serious plant diseases because they produce; several Enzymes that can breat down cellulose, lignin even cutin.
- So fungi can cause serious diseases in Plants including, Epidermic Diseases that can destroy complete crops.
- These tiny organisms threaten all crops & trees.

• Diseases Caused by Ascomycetes;

- Chestnut blight, • Dutch elm disease, • Ergot of rye,
- Red rot sugarcane, • Potato wilt, • Cotton root rot,
- Apple & carb, • Powdery mildews (on grabs, rose etc),
- Brown rot of Peaches, plums, apricots & cherries are orther common Plant diseases caused by fungi.

• Diseases Caused by Basidiomycetes;

- Smuts & Rusts that attack various Plants; e.g: wheat, corn, crops etc.

*Role of Fungi in Animal Diseases:

=> Fungal diseases in animals and humans, are diverse and can range from mild skin infections to severe systemic infections/illnesses.

=> However fungi causes mainly two types of infections / diseases in animals & humans:-

(i). Superfacial Infections.
(ii). Systemic Infections.

(i) Superfacial Infections :-

Superfacial infections are infections that are caused by the fungi and they only infect the nails, hairs, skin or some times also infect ears of animals or humans.

Examples:-

(1) Ringworm, (Microsporium audouni).
(2) Athlete's foot, (Tinea pedis).
(3) Candidiasis, caused by Candida yeast and can Produce infections in humans, such as oral thrush etc.

(ii) Systemic Infections :-

Systemic infections caused by fungi are those infections that infects the internal tissues

and organs and may spread throughout the Body.

Examples:-

(1) Histoplasmosis: * is a serious lungs infection.
* That is caused by inhaling spores of Histoplasma fungus.

(2) Aspergillosis: * is a respiratory fungal infection that is seen in Birds, particularly parrots, Ex it can also infect humans with weeked immune systems.
* Aspergillosis is caused by Aspergillus fumigatus.

(3) Aflatoxins: * They are cancer causing mycotoxins in improperly stored grains of peanut, corn etc.
* This is caused by Aspergillus flavus, or by some strains of Aspergillus flavus.

(4) Ergotism: * It causes, nervous spasm (involuntary muscle contraction), convulsion (uncontrolled shaking), Gangrene (death of tissues), Psychotic Delusion (psychology false Belief).

* It is caused by; eating Bread made from "purple ergot contaminated rye flour". This is really Poisonous.

(5) Pneumocystis Pneumonia: * (PCP) mainly affects individuals with weakened immune systems such as those with HIV/AIDS.

* It is caused by "Pneumocystis jirovecii".

:- Summary -:

(Role of Fungi in Animal Diseases)

SUPERFACIAL INFECTIONS

1) Ringworm (Minsporium audouni).
2) Athlete's foot (Tinae Pedis).
3) Candidiasis (caused by Candida Yeast).

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⤳ It Produces; infections in humans such as oral thrush etc.

↓

⤳ These superFacial Infections causes diseases in animals, humans like; mild skin infections, severe systemic illnesses, also causes ear infections.

SYSTEMIC IFECTIONS

1) Histoplasmosis: caused by (inhaling spores of "Histoplasma Fungus").

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⤳ It cause serious lungs infection.

2) Aspergillosis: caused by ("Aspergillus Fumigatus").

↓

⤳ It causes respiratory Fungal infection.

↓

⤳ It infects; birds, specially PARROTS, corn etc, but also humans with weak immune syste

-- Systemic infection --

3) Aflatoxin: causes, cancer in improperly stored grains of peanut, corn etc.

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» Produced by Aspergillus flavus.

4) Ergotism: causes, nervous spasm (involuntary muscle contraction), convulsion (uncontrolled shaking), psychotic delusion (psycology false disease), Gangrene (death of tissues).

↓

» caused by; Eating Bread made from "Purple ergot rye flour".

5) Pneumocystic Pneumonia: mainly affects to; individuals with weaked immune system like HIV/AIDS.

↓

» caused by; "Pneumocystis jirovecii".

Q. Economic losses due to fungi?
Q. Harmful effects due to fungi?
Q. What is Pathogenic role of fungi?
Q. Name diseases caused by fungi?

Questions.