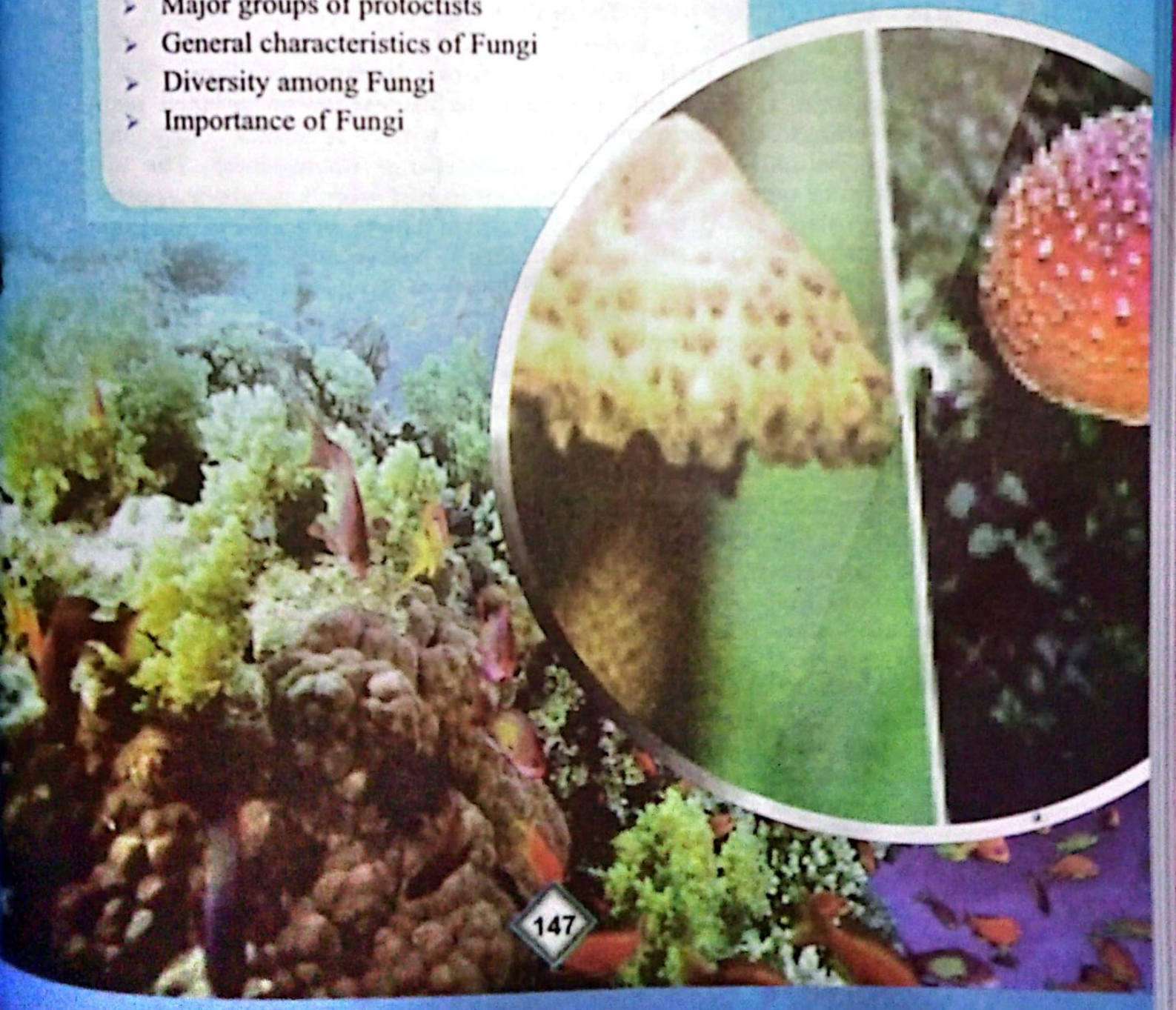
PROTOCTISTS AND FUNGI

Chapter 7

Major Concept

In this Unit you will learn:

- protoctists - The Evolutionary Relationships
- Major groups of protoctists
- General characteristics of Fungi
- Diversity among Fungi
- Importance of Fungi



Protoctists and Fungi

Kingdom Protoctista:

The kingdom protoctista is the most controversial and unnatural group. It includes an immense variety of organisms. It contains eukaryotes that are generally regarded as identical or similar to the ancestors of modern plants, animals and fungi. Protoctists are characterized by eukaryotic cell with simple body structure. Most protoctists are single celled, but there are number of important multicellular species also belong to this group. Protoctists may be photosynthetic, parasitic, predatory or absorptive. The Kingdom includes heterotrophic microorganisms, such as Amoeba and paramecium, and autotrophc form like algae, euglena, as well as, *Plasmodium* and *Trypanosoma,* the parasites which cause malaria and sleeping sickness respectively .

7.1 THE EVOLUTIONARY RELATIONSHIP:

Protista is not monophyletic group because it contains all the eukaryotic organisms which are not plants, animals or fungi but are generally regarded as identical or similar to ancestors of modern plants, animals and .fungi. It comprises organisms which resemble early plants (Algae), early animals (Protozoa) and early fungi (Oomycota) .The slime molds, a group of organisms which are motile but which produce spores in sporangia are also included in the protoctis. These organisms are linked between prokaryotic and the more modern eukaryotes like plants and animals. Therefore Biologists regard (Propetista) kingdom as a polyphletic group of organisms due to diversification.

7.1.1 Major groups of protoctista:

The Protoctista includes three groups which formerly had separate taxonomic status, and which are now containing organisms of a widely different origin to be placed in one kingdom. The three groups are.

i. Plant Like Protoctista ------ Algae
ii. Fungi like Protoctista------ Primitive Fungi.
iii. Animal like Protoctista----- Protozoa

Plant Like Protoctista ------ Algae:

Algae are photosynthetic protoctists with unicellular, colonial or simple multicellular structure. Most algae are aquatic while others may be found on moist soil, trees and rocks. However they differ from vascular plants by lacking true roots, stem and leaves but share the following plant like characteristics.

(i) The cell wall is present and have composition like plant cell wall.
(ii) Their cytoplasm usually contains one or more large vacuoles.
(iii) They contain photosynthetic pigments enclosed in plastids, of which chloroplasts are the commonest type.

(iv) Sexual reproduction is common and involves alternation of generation between haploid and diploid individuals in the life cycle of some algae.

These plant like characters of algae presumed close evolutionary link with plants.

Many different algal groups can be distinguished according to their structure, mode of life styles and by the presence of particular photosynthetic pigments or storage material. The scientific study of algae is called **Phycology**.

i. On the basis of photosynthetic pigment, algae are classified into following major groups

Group	Common name	Major pigments	Example
1. Chlorophyta	Green algae	Chlorophyll-a and b	Chlamydmones, ulva, volvox
2. phaeophyta	Brown algae	Chlorophyll-a, c, fucoxanthin	Fucus, Laminaria
3. Rhodophyta	Red algae	Chlorophyll-a, Phycobilin, Pigments, Phycocyanin and Phycoerythrin producing typical red coloured.	Porphyra

Ulva:

It is a marine alga commonly called "sea-lettuce". It is found growing along the sea coasts between high and low tides. It is found attached to rocky edge of Manora and Kemari areas of Karachi coast. The body called thallus is composed of elongated wrinkled blade about 30 cms. Long It is attached to rock and other objects, in the sea by means of hold fast , consisting of long thread like cells. The thallus is very thin only two layers of cells in thickness.

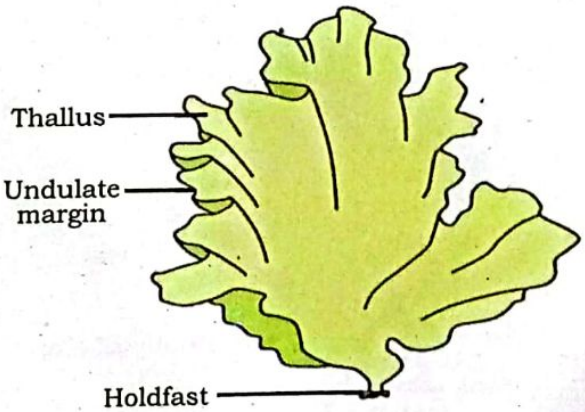


Fig: 7.1 Morphology of Ulva

Thallus in Ulva is of two types. The one with 26 chromosomes is called **sporophyte** and the other with 13 chromosomes is called **gametophyte**. Morphologically both gametophyte and sporophyte exactly alike hence called **isomorphic.**

Ulva reproduces asexually as well as sexually, alternatively.

Asexual reproduction:

Asexual reproduction takes place in asexual Ulva (Diploid sporophyte with 26 chromosomes or 2n) by producing quadri-flagellated zoospores . These spores are formed by meiosis in all cells of the body(thallus) except the basal cells.Eight to sixteen haploid zoospores are formed in a single parent cell. The zoospore production continues until all the cells are used and nothing remains of the thallus blade but a filmy mass of empty cell-walls liberation of zoospores usually takes place at the time when the plant is reflooded by an incoming tide. The liberated haploid zoospores after a period of swimming and rest lose their flagella and grow into gametophyte Ulva thalli.

Sexual Reproduction:

Sexual reproduction is **isogamous** the type of sexual reproduction takes place by the fusion of morphologically and physiologically similar gametes. The gametes are biflagellated and produced in sexual plant (haploid gametophytes with 13 chromosomes (n). These gametes are smaller than the zoospores. The fusion takes place only between two haploid gametes which are similar in structure produced by different thalli. The fusion results in the formation of quadriflagellated diploid zygote which, after a period of swimming and rest loses its flagella and secretes a wall and after repeated divisions it develops into another Ulva thallus (Sporophyte), which is similar to sexual thallus (Gametophyte) in morphology.

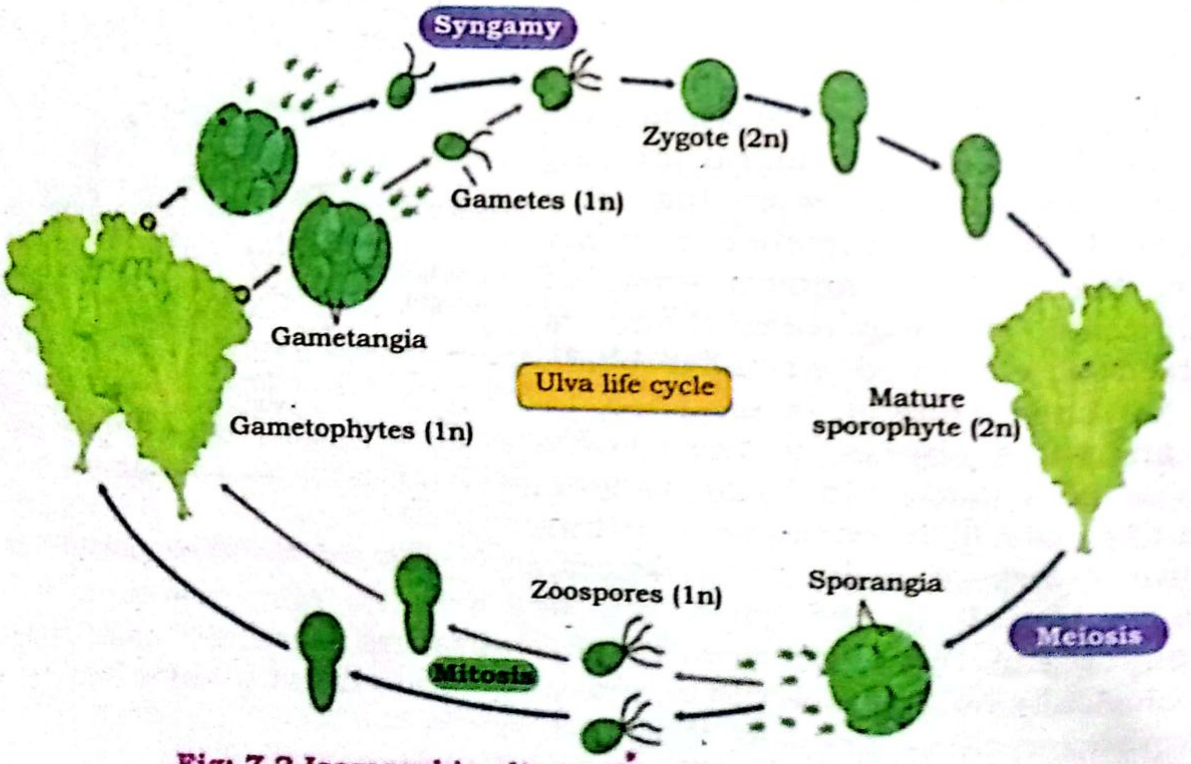


Fig: 7.2 Isomorphic alternation of generation in Ulva

Alternation of Generation in Ulva:

Alternation of generation means the type of life cycle where asexual reproduction alternate with sexual reproduction. It shows there is distinct and regular isomorphic alternation of generation. The haploid gametophyte alternates with diploid sporophyte which are similar in morphology but differ in chromosome numbers.

Green algae are a diverse group that have some of the same characteristics as plant. The haplontic life cycle is typical but Ulva has a life cycle that has 2 distinct generations, like that of plants.

7.1.2 Fungi like Protoctista:

These organisms superficially resemble to fungi. The body called **mycelium** consists of network of hyphae. Many of them have centrioles and cell wall having cellulose. They are heterotrophic absorptive feeders. They also reproduce by spores. Most of the members of this group are non motile but few develop movement at some stages in their lives.

Major groups of fungi like protoctista are slime molds and water molds.

Slime Mold:- (Myxomycota)

(Motile like animals and produce spores like fungi)

Slime molds are amoeboid protoctists that produce fruiting bodies, i.e. sorocarps as a part of their life history. They were often classified with fungi because they absorb nutrients directly from the environment.

The term slime mold refers to the habit of the most conspicuous part of life the cycle, which is a small slimy mass.

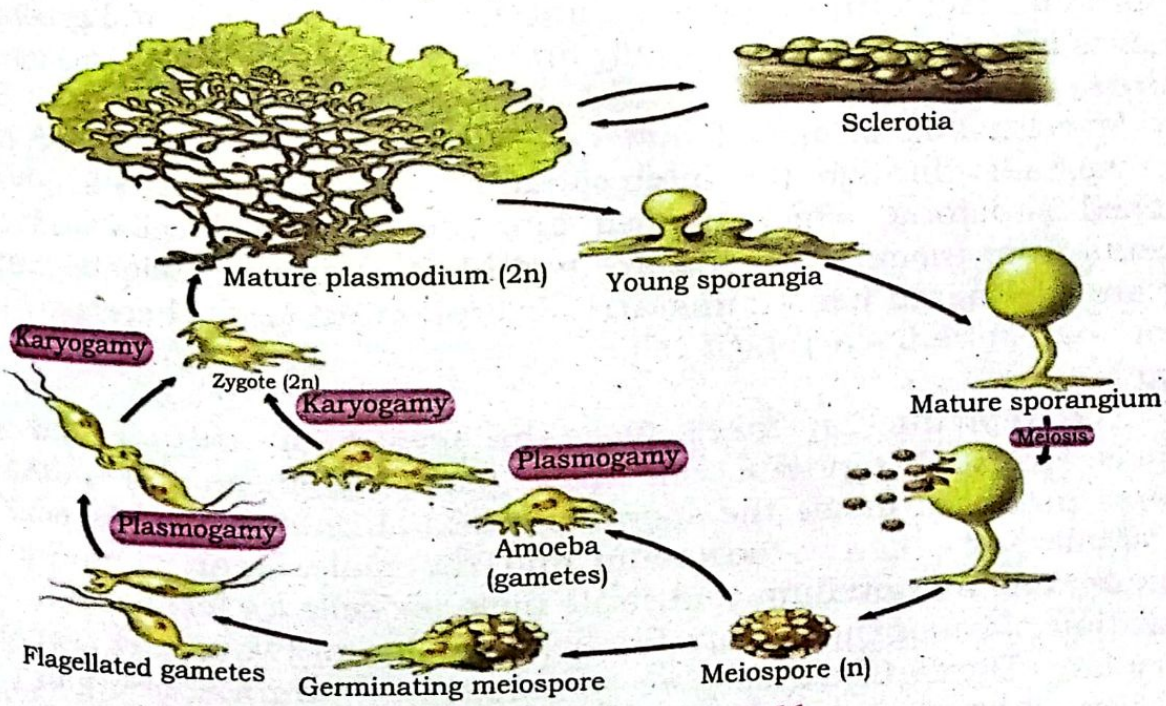
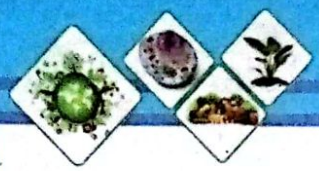


Fig: 7.3 Life cycle of slime mold



A slime mold is a strange and truly wonderful thing, its structure and behavior have raised many questions. At one stage in their life cycle, some species of slime molds are creeping masses of living substance. The movement of this living thing bring to mind a giant amoeba. This amoeboid stage of slime mold is called plasmodium. The Plasmodium consists of cytoplasm in which are embedded many nuclei, food vacuoles, and undigested food particles. Plasmodium move along the forest floor on to dead leaves absorbed sunlight. In this dry, often warm environment a miraculous metamorphosis takes place. In a matter of hours, the plasmodium changes into clusters of fruiting bodies called sporangia. Part of each sporangium called capsule produces a large number of microscopic, asexual reproductive cells called spores.

If we observe only the plasmodium we would certainly called slime mold an animal. If fruiting bodies and spores were the only the parts we could see, we would call the organism a plant.

Water Molds: (Oomycetes)

Oomycetes are so named for their distinctive oogonium, the female reproductive structure.

Oomycetes are close relatives of the fungi. Their hyphae are aseptate, coenocytic. Oomycetes are different from fungi, however, in that cell walls are cellulosic rather than chitinous.

Phytophthora infestans:

It is an example of water mold. It is a pathogenic organism causing late blight of potato and characterized by decay stem and potato tuber. The phytophthora mycelium stays over winters in potato tubers and grows up to the leaves in spring. Blight is usually first noticed in the leaves in August.

Structure of mycelium:

Mycelium is branched and consist of aseptate coenocytic hyphae which spreads through the intercellular spaces of the leaves, giving off branched haustoria, which pushed into the mesophyll cells and absorb nutrients from them. Haustoria are typical structure of obligate parasites. They are specialized penetrating and absorption devices. There may be one or more haustoria in each host cell.

Reproduction:

The reproduction takes place by means of asexual and sexual methods. Asexual reproduction takes place by means of biflagellated zoopores produced inside the sporangia. Sexual reproduction is oogamous. The female sex organ is oogonium and the male organ is antheridium. Oogonium and antheridium contribute their sex cells for fertilization. During fertilization plasmogamy occurs first while fusion of two nuclei (Karyogamy) is very late. The fertilized oospore germinates to form a sporangium at the tip of germ tube.

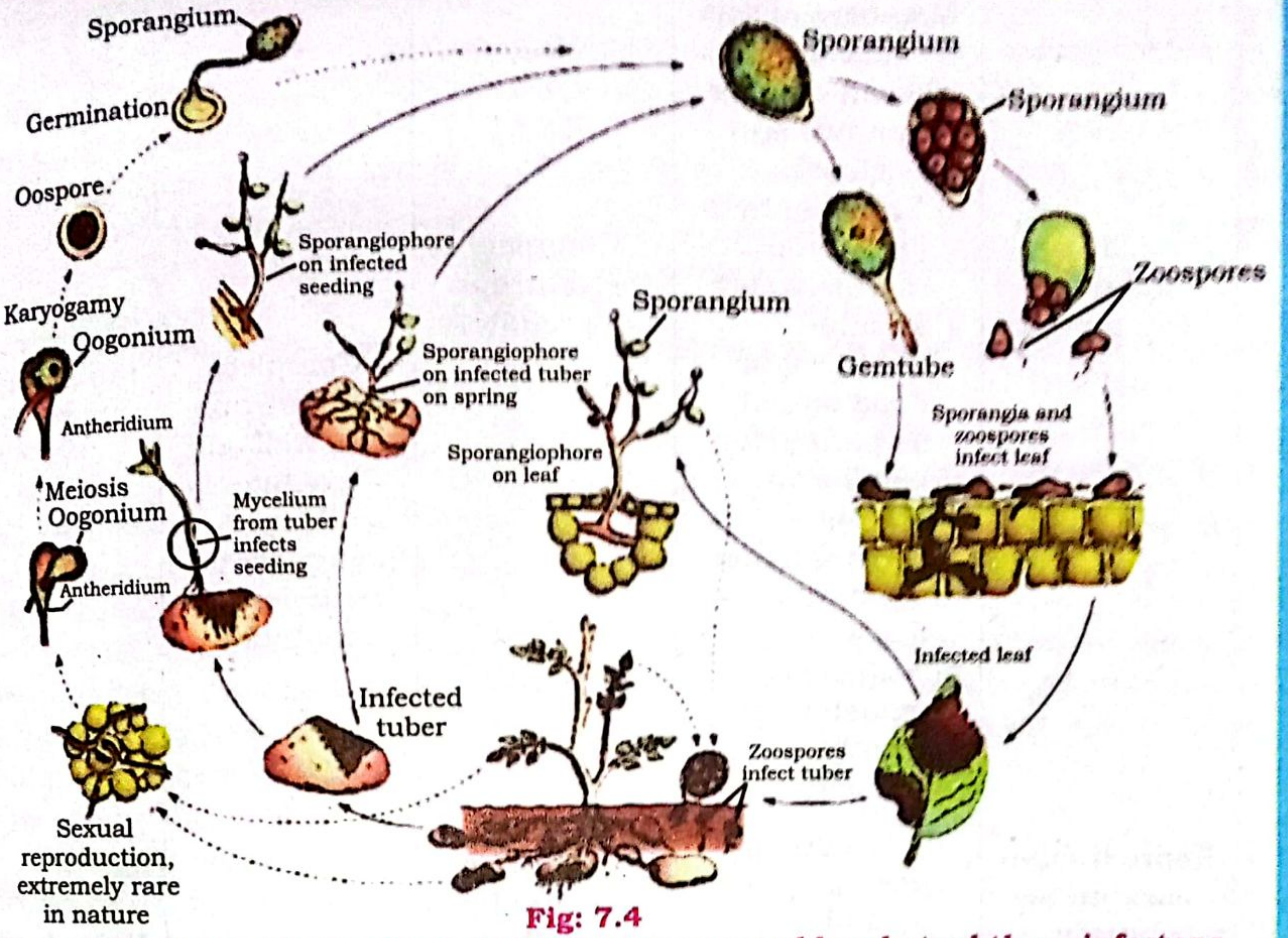


Fig: 7.4

Disease cycle of late blight of potato and tomato caused by phytophthora infestans

7.1.3 Animal like Protoctista ----- Protozoa:

Protozoans form a large group of protoctista. They are unicellular animal like organisms with ingestive heterotrophic nutrition. They are found in all environments where water is present .Most are free living and there are various methods of locomotion

Members of this group of protozoa are divided into five classes which differ in their means of locomotion.

i. Class Sarcodina (Rhizopoda)
ii. Class Flagellata (Mastigophora)
iii. Class Ciliata (Ciliophora)
iv. Class Suctoria
v. Class Sporozoa

Class Sarcodina (Rhizopoda)	Class Flagellata (Mastigophora)	Class Ciliata (Ciliophora)	Class Suctoria	Class Sporozoa
Have pseudopodia a locomotory structure	Member of this class have one or more flagella as locomotory structure.	Have cilia as locomotory structure	Have cilia at early stage of life but become sedenatory at adult stage	No locomotory structure at any stage of life

Parasite and holozoic cytoplasm	Members of this class may classify further into two sub classes a) Englenophyta Fresh and marine water Mainly phototrophs Food stored as paramylon (similar to starch) Reproduction-asexual e.g. Euglena. b) Sub class zoomastigonia Mostly parasite	Complete heterotroph i.e. predatory	Complete heterotroph as well as predator Have cytoplasmic tenticles for predation	Majority are intra cellular parasites
Reproduction asexual by binary fission Sexual by gametic fussion	Reproduction, asexual and sexual. e.g.	Reproduction asexual by binary fission Sexual by conjugation reproduction	Reproduction asexual by binary fission Sexual reproduction by conjugation	Reproduction asexual by spores and fission Sexual reproduction by syngamy
Have one nucleus	Member of flagellate contain one nucleus in their cell.	Have two nuclei i.e. macro and micronuclei	Have two nuclei like ciliates e.g. Acineta	Have one nucleus
Marine sarcodinian have exoskeleton which form layers in the bottom of sea called "Ooze" Amoeba	Trypanosoma cause African sleeping sickness diseases	Have flexible pellicle e.g. paramecium	Have flexible pellicle e.g. paramecium	Contractile vacuole are absent e.g. plasmodium, monocystist

7.1.4 Importance of Protoctista:

Protoctistans have great biological importance and significance to humans.

Pathogenic protoctista:

Many members of protoctista cause several diseases in man as well as in plants. i.e. *Plasmodium* cause malaria, *Entameoba histolytica* causes amoebic dysentery. *Trypanosomes* cause sleeping sickness and *Leishmania* causes. Leishmaniasis (an infection of white blood cells).

Phytophthora infestans is a plant pathogen causes a disease known as late blight of Potato.

Fertilizer:

Seeweed is sometimes used as fertilizer in various parts of world. Liquid extracts of brown see weeds are a valuable source of Potassium and trace elements and use for fertilizer in various region of the world.

Alternative source of food:

Chlorella is considered alternate source of energy. The world's of fisheries depend on algae production. The red sea weed is cooked and made laver bread in some parts of world. Brown algae is harvested for food in several parts of the world.

Environment's Friend:

During photosynthesis algae remove huge amount of carbon dioxide annually from the atmosphere and supply oxygen continuously to the atmosphere

Biotechnology:

An imprortant alga – *Dunaliella salina* accumulates large amount of an orange red cerotenoid , β,β carotene which is used to colour products such as margarine,noodles and soft drink and as a vitamin supplement beacause it is readily converted to vitamin A. β,β carotene may also help to prevent lung cancer.

Fuel deficiency will become great threat in future, green algae may also be a future source of alternative feuls. *Botryococus braunii* produces long chain hydrocarbon similar to crude oil.

7.3 FUNGI

The fungi are a large successful group of organisms more than hundred thousand species are found. They range in size from the unicellular yeast to the large toad stool, Puffballs and occupy a very wide range of habitate, both aquatic and terrestrial. Fungi grow best in moist habitate. The study of fungi is called **mycology**.

7.3.1 General Characterstics:

Fungi are multicellular (except yeast) eukeryotic, non chlorophyllous, absorptive heterotrophs. They may be saprotrophs , parasites , mutulists and predators.

The body of fungus is called **myeclium** generally grows as filamentous **hyphae**. Hyphae may be septate i.e having cross walls (septa) e.g Pencillium or aseptate i.e lacking cross walls, coenocytic e.g Mucor .Hyphae may packed together and organized to from complex reproductive structures in mushroom, puffballs, Morels etc.

They have rigid cell wall containing chitin as the fibrillar material. Most fungal cells are haploid and multinucleate. Multinucleate vegatative cells are called homokaryons if the nuclei are same and heterokaryons if the nuclei are different. Another unusual nuclear condition is common in fungi is dikaryon when karyogamy is delayed, sometimes indefinitely, forming a cell, containing a pair of sexually compatible nuclei.

Different group of fungi produce different types of haploid sexual spores such as **basidio-spore** and **asco spores** subsequent upon meiosis in zygote.

Diploid zygote nuclei forms during sexual reproduction. They have a characteristics mitosis called **nuclear mitosis** during which nuclear membrane does not break and spindle is formed within nuclei.

Fungi are absorptive heterotrophs. Digestion, if necessary is performed by the fungus secreting enzyme out of its body on to its food. They can be saprotrophs (decomposers), parasites, mutualists and predators. Saprotrophs obtain their food from dead organic matter by their modified hyphae called **rhizoids**. Parasitic fungi depend on living host for nutritional requirements. They obtain food from host through special hyphae called **haustoria**. Parasitic fungi may be facultative which can grow on their living host as well as on artificial media or may be obligates which can grow only on their living host. Some fungi are predators, trap other living host and use them as food. Mutualistic fungi live with other organisms.

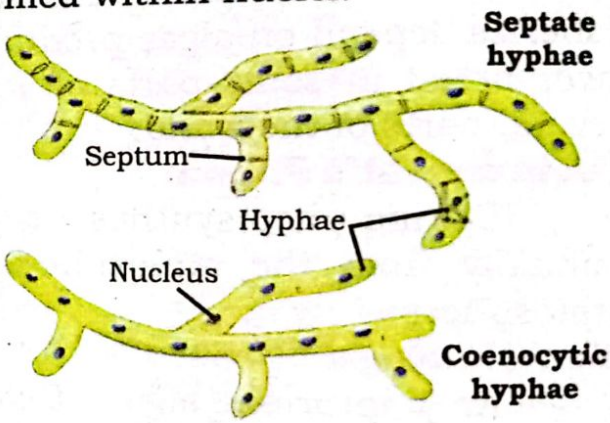


Fig: 7.5
Septate and Aseptate coenocytic mycelium

Most fungi can reproduce asexually as well as sexually (except imperfect fungi where sexual reproduction has not been observed)

Asexual reproduction takes place by spores, conidia fragmentation and budding. During sexual production fusion of haploid nuclei and meiosis are common in all fungi. If carbohydrate is stored, it is usually a glycogen not starch previously fungi were regarded as plants as they resemble plants in having cell-wall lacking centrioles and being non motile. But fungi resemble with animals also, they lack chlorophyll and feed hetrotrophically, lack cellulose in their cell wall and contain chitin. It means that fungi are neither complete plants nor animals. Their DNA studies also confirm that

they are different from other organisms, therefore fungi are classified in separate kingdom. Pencilium, Mucor and Rhizopus are known as mold.

The most widely accepted view is that the kingdom fungi represents a monophyletic lineage related to animals with which they shared a choanoflagellate like ancestor

Activity:-

- keep moist bread under a bell jar for four or five days at a moderate temperature the fungus appears and gradually spread.
- Observe hyphae under microscope. Collect different mushrooms from field and study their structures.

7.4 DIVERSITY AMONG FUNGI:

There are four major divisions of fungi on the basis of sexual reproduction or sexual spores.

1. Division Zygomycota
2. Division Basidiomycota
3. Division Ascomycota
4. Division Deuteromycota

First three groups are distinguished primarily by their sexual reproductive structures , while in deuteromycota the sexual stage has not been observed.

Division Zygomycota	Division Basidiomycota	Division Ascomycota	Division Deuteromycota
Commonly called zygote fungi	Commonly called club fungi	Commonly called sac fungi	Called fungi imperfecti
Produce sexual spores in zygospore	Produce sexual spores in basidium and spores are called basidospores	Produce sexual spores in ascus called ascospores	Fail to produce sexual spores therefore called fungi imperfecti.
Mycelium are made up non-septate hyphae i.e. Coenocytic	Septate hyphae	Septate hyphae	Either septate on non-septate hyphae
Asexual reproduction takes place by sporangiospores and fragmentation	Takes place by conidiospores and fragmentation	Takes place by conidiospores fragmentation and budding	Takes place by sporangiospores or conidiospores and fragmentation
Proper gametangia do not develop	Proper gametangia develop i.e. male gametangia are antheridia	Proper gametangia develops i.e. male gametangia antheridia Female gametangia	No gametangia

	While female gametangium are oogonia	ascogonia have beak like structure called trichogyne,	
Sexual reproduction takes place by conjugation	By plasmogamy and karyogamy	By plasmogamy and karyogamy	No
Secondary mycelium or fruiting body donot develop	After plasmogamy each dikaryotic cells divide to form a hyphae, which develop into secondary mycelium or fruiting called basidiocarp	After plasmogamy each dikaryotic cells divide to form a hyphae, which develop into fruiting body called Ascocarp	No
No fruiting body	Only one type of fruiting body	Three types of fruiting bodies are formed i.e. cleistothecium, apothecium and perithecium	No
As a result of karyogamy diploid zygotes are formed in a resistant body called zygospore which is formed as a result of conjugation	Some cells of fruiting body perform karyogamy and develops into diploid cells which enlarge to form basidium	Some cells of fruiting body perform karyogamy and develops into diploid cells, enlarge to form ascus	No
The dormaint zygospore develop into promycelium which contain sporangium	Each basidium produce four finger like protection called strigmeta produce four basidiospore, each basidium	Each ascus produce eight ascospore first meiotic than mitotic cell division occur.	Only gametic recombination can takes place as sexual reproduction i.e. parasexuality
e.g. poread mold mucor	e.g. mushroom, toad stool, bracket fungi, puff balls, button mushroom (*Agaricus compestris*)	e.g yeast, mildew, cup fungi, traffles, important cellulose degrades of ecosystem	e.g *Penicillium notatum* different sp: of *aspergillus*

7.4.5 Life Cycle of Mucor (zygomycota):

Occurrence and habitat:

Mucor is the commonest of saprophytic fungi, called "molds". Mucor is coprophilous and may be prepared by keeping damp cow or horse dung under a bell- jar for few days. Mucor is however, also very widely distributed in the humus of the soil. In nature, Mucor emits a "musty or moldy" smell.

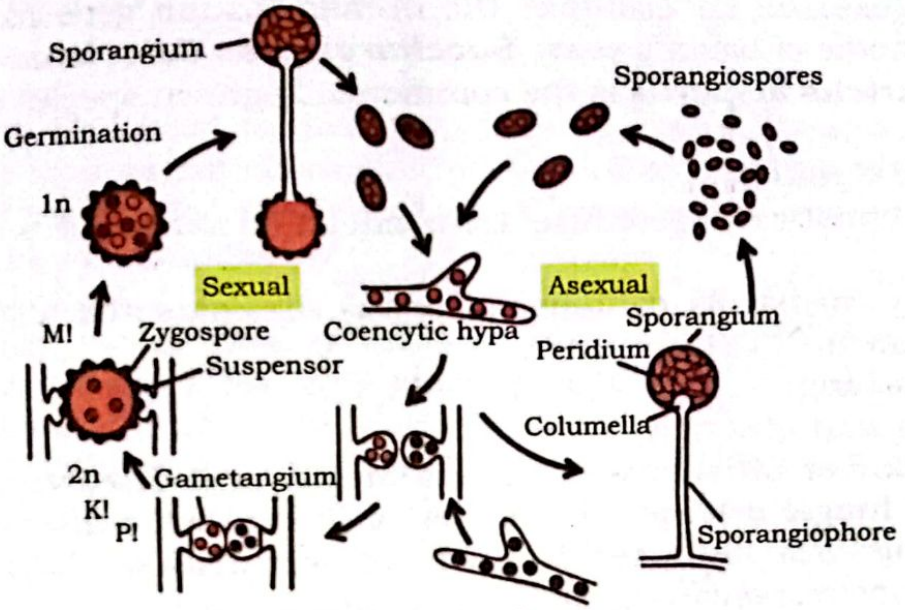


Fig: 7.6 Life cycle of mucor

Structure:

Mycelium

The mycelium of Mucor consists of long, aseptale coenocytic hyphae.

Types of hyphae:

The mycelium consists of three types of hyphae.

1. **Rhizoidal hyphae:**

Hyphae penetrate into the tissue of the substratum . They serve as the fixitive and absorptive which are essential for nourishment.

7.5 IMPOTANCE OF FUNGI:

Fungi are important to human as foods, decomposers, plant and animal pathogens, producing antibiotics, in biological control and in biotechnology.

> Because of lichen's efficiency in absorbing mineral, they are important contributors to nutrient cycle .This efficiency also makes them sensitive to pollution.

7.5.1 Eating and drinking fungi:

Edible mushrooms, are useful source of easily digestible proteins, vitamins and minerals e.g Agaricus bisporus ,padistren mushroom , oyster mushroom.

Fungi are vital for a whole range of fermentation industries. Soybeans are fermented by ***Aspergillus oryza*** to make soy sauce.

Fungi take part in the basic process of cheese making, the yeasts, ***Saccharomyces cerevisiae*** ferment sugars to alcohol and carbon dioxide and is exploited commercially in making wines, beer and bread.

Over the past few decades yeasts have become increasingly important in genetic research for example, the human insulin gene has been spliced into the genome of baker's yeast ***Saccharomyces Cerevisiae*** and insulin for use by ***Agaricus bisporus*** is the commercially grown species of mushroom.

7.5.2 Food Spoilage:

Saprophytic fungi cause tremendous amounts of spoilage of food stuff.

Many toadstools contain poisonous alkaloids the affect the human nervous system.

Pathogenic fungi

Human/Animal diseases:

A number of important human and animal diseases are caused by pathogenic fungal disease . The cause of the cosmetic diseases of the skin such as ringworm .Athlete's foot also an skin disease. Fungal spores may trigger allergic responses in sensitive people

Histoplasmotysis is a serious infection of lungs caused by inhaling spores of fungus.

A Few species are able to cause systemic infections of bone tissues and some anaerobic fungi cause fatal lung diseases

Candida albicans the cause of oral and vaginal thrush. Aspergillosis, (ear, lungs, disease), and moniliasis (Skin, mouth, gums disease) are also caused by fungus. Many toad stool contains poisonous alkaloid that affect the human nervous system.

Plant diseases:

Fungi are responsible of various plant diseases. Fungi destroy many agricultural crops, fruits, wheat e.g downy and powdery mildews etc. Apple, grapes, cherries and roses are affected by powdery mildews.
Most cereals crops like wheat and corn are susceptible to fungal diseases call smuts and rusts.

Decomposers:

Saprotrophic fungi act as decomposers in ecosystem. Many feed on dead organism and decaying material in the soil and help to recycle nutrients such as Phosphate and sulphates which taken up by plants.

Spoilage:

Many Fungi spoil leather, wool, books, timber, cotton etc.

Antibiotics:

Many important antibiotics are extracted from fungi. Fungi have explored a new field, in medicine by producing antibiotics like penicillin ,chloromycetin, neomycin terraymycin etc .Penicillin is effective against most types of bacteria which cause diphtheria, pneumonia, meningitis syphilis and gonorrhea.

Biological control:

Fungi are also used in the biological control of weeds and pests. Some soil fungi trap nematodes using sticky branches or rings of hyphae. The activity of these predatory fungi could reduce the severity of plant diseases caused by nematodes.

Fungi and biotechnology:

Fungi are model eukaryotes for biotechnological research and application. Being eukaryotes they have the potential to be engineered to produce large amount of useful biochemicals.

Many Fungi have the ability to convert low- value waste into useful compounds such as vitamins , hormones and antibiotics

Genetic Research:

Many fungi are used in genetic research. Neurospora commonly known as orange bread mold and yeasts are extensively used as an important organism for eukaryotic genetic research, including genetic recombination and gene regulation.

Fungal mutualism:

As heterotrophs, fungi depend for their existence on other organism, with which they have developed intimate often interdependent, relationships. The level of interdependence saprophytic decomposers involved in the nutrient recycling

Mycorhizae:

In mycorhizae , the fungal hyphae help in the direct absorption of phosphorus , zinc , copper, and other nutrients , from the soil into the roots of vascular plants. Such plants show better growth than those without this association.

Lichens:

It is a mutualistic symbiotic association between fungi and certain photoautotrophs either green algae or a cyanobacterium, or sometimes both. Most of the visible part of lichens consists of fungus while alga partner is present within the fungal hyphae. Fungus protects the algal partner from strong light and desiccation and itself gets food through the courtesy of algae. They are ecologically important as bioindicator of air pollution.

SUMMARY

- Protoctista are eukaryotic not belonging to the plants, animals or fungal kingdoms. The three main kingdoms of eukaryotes probably arose from Protoctista ancestors.
- Protoctista can be unicellular , colonial or muticellular.
- Due to diversification biologists regard Protista kingdom as polyphyletic group of organisms.
- The first eukaryotic organisms were probably similar to modern day Protoctista
- Plant like Protoctista are algae e.g Chlorella, Ulva. Fungi like Protoctista are slime mold and water mold oomycetes (Phytophthora). Phytophthora is a pathgenic organism causing late blight of potato
- Animal like Protoctista include all protozoans
- Plasmodium is the cause of maleria.
- Protoctista have great bilogical importance and significance to human
- Fungi include non-chlorophylous , multicellular (except yeast) organisms having chitinous cell wall.
- The body of fungi called mycelium grows as filaments called hyphae.
- Fungi are absorptive heterotrophs , secreting enzymes that digest their food externally.
- All fungal nuclei are haploid except transient diploid zygote that form during sexual reproduction.
- They have a characterstic mitosis called nuclear mitosis during which nuclear membrane does not break and spindle is formed within nucleus.
- There are four major divisions of fungi i-e, zygomycota, Basidiomycota, Ascomycota, Deuteromycota.
- Most fungi are reproduce asexually as well as sexually (except imperfect fungi in which sexual reproduction has not been observed)
- Asexual reproduction takes place by spores, conidia, fragmentation and budding.
- During sexual reproduction fusion of haploid nuclei and meiosis are common to all
- Mucor and Rhizopus are known as molds
- Fungi are important to human as food , decomposers, plant and animal pathogens , antibiotics some of some , in biological control and in biotechnology.

EXERCISE

1. Encircle the correct choice

(i) Which of the following is true about the Kingdom Protoctista
- (a) All organisms are prokaryotes
- (b) All organisms are eukaryotes
- (c) All organisms are autotrophic
- (d) All organisms are heterotrophic

(ii) All members of green algae have the pigment combination
- (a) Chlorophylls a and b
- (b) Chlorophylls a and c
- (c) Chlorophyll a and Phycobilins
- (d) Chlorophylls a , b and c

(iii) The major grouping of protozoa is based upon their
- (a) Feeding habits
- (b) Mode of reproduction
- (c) Mode of Nutrition
- (d) Mode of locomotion

(iv) Protoctista having isomorphic alternation of generation
- (a) Chlorella
- (b) Ulva
- (c) Euglena
- (d) Phytophthora

(v) The amoeboid stage of slime mold is
- (a) Plasmodium
- (b) Fruiting bodies
- (c) Euglena
- (d) Merozoites

(vi) Trypanosomes and Leishmanias are disease causing
- (a) Viruses
- (b) Bacteria
- (c) Protoctists
- (d) Fungi

(vii) Ulva is commonly called
- (a) Bacteria
- (b) Virus
- (c) Mushroom
- (d) Sea lettuce

(viii) The study of fungi is called
- (a) Zoology
- (b) Microbiology
- (c) Botany
- (d) Mycology

(ix) The most important cellulose degraders in ecosystem are
- (a) Ascomycota
- (b) Zygomycota
- (c) Basidiomycota
- (d) Deutromycota

2. Write short answers of the following questions:

1. Why is the kingdom Protoctista considered to be an artificial taxon?
2. Why we say that ulva has isomorphic alternation of generation?
3. Why asexual and sexual ulva plants are called as sporophyte and gametophyte?
4. Protoctista are the link between prokaryotes and the more modern eukaryotic like plants and animals explain why?
5. Name various classes of Protozoa and how each of their members move?
6. Describes some of the unusual features of nuclear behavior in fungi?
7. What features allow fungi to survive in all environment where life is possible?

3. Write detailed answers of the following questions:

1. Write down general characteristics of Protoctista and diversity among Protoctista?
2. Describe structure and reproduction in Ulva?
3. Give diagnostic features of four classes of fungi?
4. Write an essay on economic importance of fungi?