CHAPTER 8

CHAPTER 8

THE FUNGI

LONG QUESTIONS

THE KINGDOM OF RECYCLERS

Q.1: "Fungi as kingdom of recyclers: explain how?

→ Give relation of fungi with plants and animals.

→ Discuss taxonomic status of fungi.

Ans. Introduction:

Approximately **100,000** species of organisms called 'fungi' are known and many more are estimated to be present. Study of fungi is called **mycology** and the scientist who studies fungi is called **mycologist**.

Variety among Fungi

This group includes a variety of different and variable members. Some are given below.

1) Pathogens

This includes notorious pathogens such as disastrous **rusts, smuts** of wheat and corn and **molds** found growing on important crops and foodstuff.

2) Edibles

This group also includes delicacies such as **mushrooms, morels and truffles.**

3) Commercially Important

Some other organisms are of commercial use such as;

- ***Penicillium***-the source of antibiotic Penicillin.
- **Yeats**-used in bakeries and breweries.

4) Decomposers

Ecological role of fungi as decomposers is paralleled only by bacteria.

> **Q. Discuss taxonomic status of fungi. (GUJ-GI-2014GI, 15GII)**
>
> **Q. Give an account of taxonomic position of fungi. (BWP-GI-2014, 15)**
>
> **Q. Explain Taxonomic status of fungi (LHR-GI-2015)**

Taxonomic Position of Fungi

Initially fungi were placed in 'plant kingdom' but then separated and placed in their own kingdom 'the kingdom Fungi', because they are distinct from plants, animals and protists in many ways.

Some of their relation with animals and plants are given below.

Relation with Plants

Some of the resemblances with plants are;

i) They have **cell wall**, being absorptive heterotrophs.

ii) They lack **centrioles**.

iii) They are **non-motile**.

> **Q. Give land adaptation of fungi. (DGK-G2)-16**

Relation with Animals

Some of the resemblances with animals are;

i) They are **heterotrophs**.

ii) They lack cellulose in their cell wall and contain chitin- the chemical found in external skeleton of arthropods.

> **Q. How fungi resemble with animal. (SWL-G1)-16**

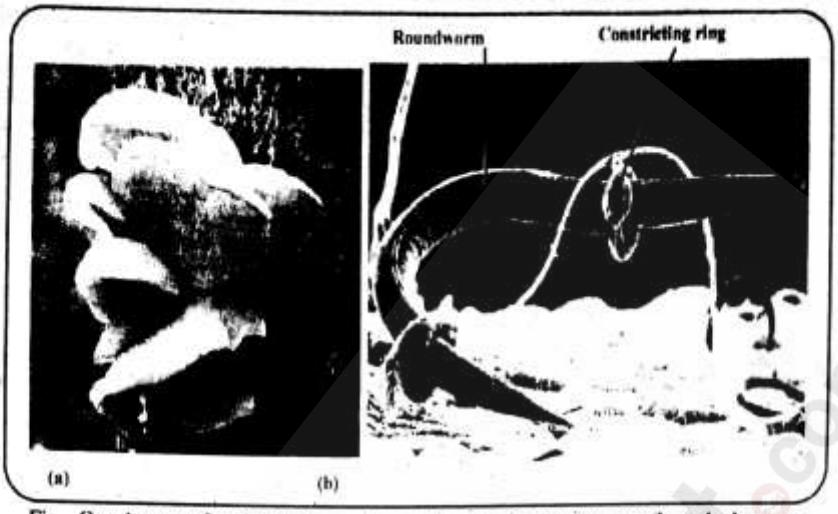

Fig. Carnivorous fungi (a) The osyter mushroom decomposes wood, and also uses nematodes as a source of nitrogen (b) A nematode is trapped in constricting ring of a soil – dwelling carnivorous fungus (*Arthrobotrys* sp.).

(3) PREDATORS

"These are fungi which capture and kill other organisms".

Q. What are the carnivores fungi. (SGD-G1)-16

- The **oyster mushroom***(Pleurotus ostreatus)* is a carnivorous (predatory) fungus. It paralyses the nematodes (that feed on this fungus) penetrate them and absorb their nutritional contents primarily to fulfill its nitrogen requirements; it fulfills its glucose requirements by breaking the wood.
- Some species of ***Arthrobotrys***trap soil nematodes by forming **constricting ring**, their hyphae invading and digesting the unlucky victim.
- **Other** predators have other adaptations such as secretion of sticky substances.

(4) MUTUALISTS

"These are the fungi which provide benefits to some other organisms and get some other benefits from them". Fungi form two key mutualistic symbiotic associations (associations of benefit to both partners). These are **lichens** and **mycorrhizae**.

(i) **Lichen** are mutualisitc and have symbiotic association between certain fungi (mostly Ascomycetes and imperfect fungi and few Basidiomycetes-about 20 out of 15000 species of lichens) and certain photoautotroph's either green algae or a cyanobacterium, or sometimes both.

Most of the visible part of lichen consists of fungus and algal components are present within the hyphae (fig). Fungus protects the algal partner from strong light and desiccation and itself gets food through the courtesy of alga.

Lichen can grow at such places where neither of the components can alone, even at harsh places such as bare rocks etc. They are ecologically very important as **bioindicators** of air pollution.

Lichens very in colour shape overall appearance and growth forms. For example

- **CrustoseLichen:** This grows tightly attached to rocks and tree trunks etc.
- **Foliose Lichen:** These are leaf-like.
- **Fruticose Lichen:** These are branching.

Q. What are lichens: (GUJ-G2)-14 (AJK-G1)(GUJ-G1,2)-15,(RWP-G1)-15 (DGK-G1)(LHR-G2)0-16, (LHR-G1)-17

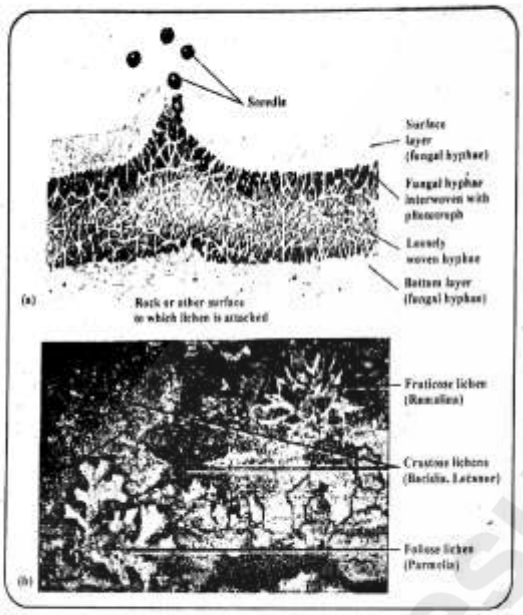

Fig. Lichens (a) Cross section of a typical lichen showing different layers. (b) Different types of lichens varying in size, colour and appearance. Three growth forms – crustose grow tightly attached to rocks, tree trunks etc; foliose are leaf – like, fruticose are branching.

(ii) **Mycorrhizae** are mutualistic association between certain fungi and roots of vascular plants (about 95% of all kinds of vascular plants).

Q. What is mycorrhizae. (SGD-G1) (DGK-G1)-15, (GUJ-G2)-16

Fungi increase the amount of soil contact and total surface area for absorption and help in direct absorption of phosphorous, zinc, copper and other nutrients from the soil into the roots. Such plants show better growth than those without this association. The plant, on the other hand supplies organic carbon to fungal hyphae.

There are two main types of mycorrhizae i.e. endomycorrhizae and ectomycorrhizae. Mycelium extends far out into the soil in both kinds of mycorrhizae.

Q. What are Endomycorrhizae. (MTN-G1)-16

- **Endomycorrhizae** in which the fungal hyphae penetrate the outer cells of the plant roots forming coils, swellings, and minute branches and also extend out into surrounding soil.
- **Ectomycorrhizae** in which the hyphae surround and extend between the cells but do not penetrate the cell walls of the roots. These mostly formed with pines, firs etc.

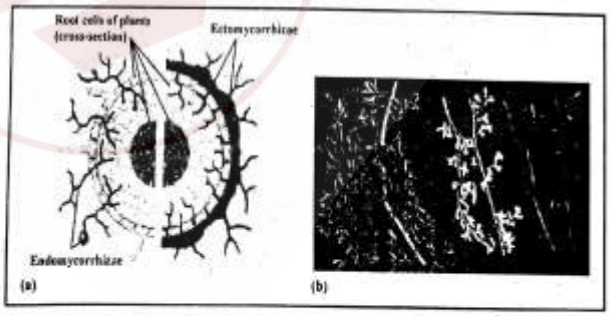

Fig. Endomycorrhizae and ectomycorrhize. (a) In endomycorrhiza (left side of figure), fungal hyphae penetrate and branch out in a root cells. In ectomycorrhiza (right side of figure), fungal hyphae simply grow around but do not penetrate the root cell (b) Ectomycorrhizae on roots of pines.

Q.4: Describe various modes of reproduction in fungi.

➔ Discuss different types of asexual reproduction in fungi.

Ans. Most fungi can reproduce asexually as well as sexually except imperfect fungi in which sexual reproduction has not been observed.

Q. How asexual reproduction occurs in fungi. (SGD-GI-2014, 15; FBD-GI-15; DGK-GI-16)

Q. Discuss different methods of asexual reproduction in fungi. (FBD-GI-2014; LHR-GI-16)

Q. Explain sexual reproduction in Fungi. (RWP-GI-2016; GUJ-GI-12)

Q. Describe Sexual Reproduction in Fungi. (MTN-GI-2010)

Q. Describe various methods of asexual reproduction in Fungi. (SWL-GI-2014)

Q. Name two method of asexual reproduction in fungi. (RWP-G1)-16

(I) ASEXUAL REPRODUCTION

"Such type of reproduction which takes place without fusion of genetic material is called asexual reproduction"

Types

Asexual reproduction takes place by spores conidia, fragmentation and budding

(i) Spore Formation

Spores are produced inside the reproductive structures called sporangia which are cut off from the hyphae by complete septa.

Spores may be produced by sexual or asexual process and are haploid, non-motile and not needing water for their dispersal, are small, produced in very large number and dispersed by wind to great distance and cause wide distribution of many kinds of fungi including many plant pathogens. When spores land in a suitable place, they germinate giving rise to new fungal hyphae. Spores may also be dispersed by insects and other small animals and by rain splashes. Spores are a common means of reproduction in fungi.

(ii) Conidia (singular conidium)

These are non-motile asexual spores which are cut off at the end of modified hyphae called **conidiophores** and not inside the sporangia usually in chains or clusters. These may be produced in a very large number, can survive for weeks and cause rapid colonization of new food.

Q. What are conidium. (FBD-G1)-14

(iii) Fragmentation

It is simple breaking of mycelium of some hyphal fungi, each broken filament giving rise to a new mycelium.

(iv) Budding

It is an asymmetric division in which tiny outgrowth or bud is produced which may separate and grow usually involving simple cell division e.g. unicellular yeast reproduce by budding.

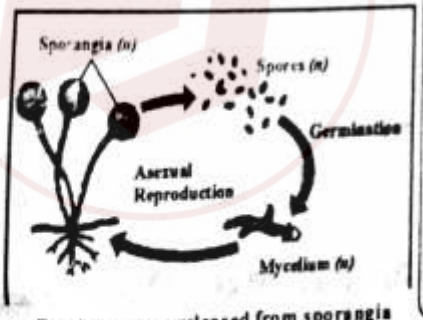

Fig. Spores are released from sporangia and germinate to produce new hyphae.

Fig. Conidia cut off at the tip of conidiophores in chain

Fig. Micrograph shows yeast (Saccharomyces cerevisiae) in various stages of budding.

(II) SEXUAL REPRDUCTION

Details of sexual reproduction very in different groups of fungi but fusion of haploid nuclei and meiosis are common to all.

Q. Write down sexual reproduction in mashroom. (DGK-G2)-15

When fungi reproduce sexually then two hyphae which are genetically different but compatible mating types come together their cytoplasm fuse followed by nuclear fusion. Fusion of nuclei is called **karyogamy** and meiosis are common to all.

In two of three main groups of fungi (Basidiomycetes and Ascomycetes) karyogamy dose not take place immediately after the fusion of cytoplasm **(plasmogamy)**. Instead the two genetic types of haploid nuclei from two individuals may coexist and divide in the same hyphae for most of the life of fungus. Such a fungal hypha/cell having two nuclei of different genetic types is called **dikaryotic** or **heterokaryotic** hypha/cell.

Q. What is nucleus mitosis. (LHR-G1)-14 (LHR-G2)-16

Different types of hyphae produce different types of haploid spores. Such as basidiopores and ascospores, subsequent upon meiosis in zygote. These spores may be produced by their characteristic structure/fruiting bodies such as **basidia/basidiocarps** and **asci /ascocarps**.

In fungi nuclear mitosis occur in which nuclear envelop does not break instead the mitotic spindle forms within the nucleus and the nuclear membrane cluster between two cluster of daughter chromosomes. Nuclear mitosis is known as Endomitosis.

CALSSIFICATION OF FUNGI

Q.5: Write a note on classification of fungi.

- **Discuss different groups of fungi.**
- **Explain ascomycota and give its sexual and a sexual spore.**
- **Explain basidiomycota in detail.**
- **Explain life cycle of loose smut of wheat.**

Ans. BASE OF CLASSIFICATION

Classification of fungi into four main groups is based primarily on the type of their sexual reproductive structures and methods of reproduction. However these groups also differ in the type of hyphae and some other characters.

Groups of Fungi

Different groups of fungi with their hyphae type, reproduction and examples are given below in table.

Phylum (group)	Typical Examples	Sexual Reproduction	Asexual Reproduction	Hyphae
Zygomycota (Zygomycetes)	*Rhizopus*, (Black bread mold), *Pilobolus* (spitting fungus)	Zygospores	Non-motile spores from in sporangia	Non- septate, multinucleate
Ascomycota (Ascomycetes or sac-fungi)	Yeasts, Morels, Truffles, Powdery mildews, molds	Ascospores inside sac-like asci	Conidia cut off from tips of condiophores	Septate, lengthy dikaryotic phase.
Basidiomycota (Basidiomycetes or club-fungi)	Mushrooms, rusts, smuts, puff balls, bracket fungi	Basidiospores borne on club shaped basidia	Uncommon	Septate, lengthy dikaryotic phase
Deuteromycota (Deuteromycetes/ Imperfect fungi)	*Aspergillus, penicillum, Alternaria*	Sexual phase has not been observed	Conidia	Varied

1 ZYGOMYCOTA (Zygomycetes or Conjugating Fungi)

Fungi present in this group are called as **zygomycetes or conjugating fungi**.

> Q. Describe and draw life cycle of Rhizopus. (DGK-GI-2015)
>
> Q. With the help of a diagram discuss the life cycle of Rhizopus. (FBD-2013)

Main Feature

During life cycle of these fungi a structure called zygospore is formed this is why they have been given the name zygomycetes.

Other Features

(i) Asexual reproduction by spores is common.

(ii) Hyphae are **coenocytic**.

Reproduction

During their sexual reproduction zygote formed directly by the fusion of hyphae forms temporary, dormant thick walled resistant structure called zygospore. Meiosis takes place when zygospore germinates and haploid spores are produced. Spores on germination produce new mycelium.

Example: *Rhizopus*, found growing on spoiling moist bread, fruit etc.

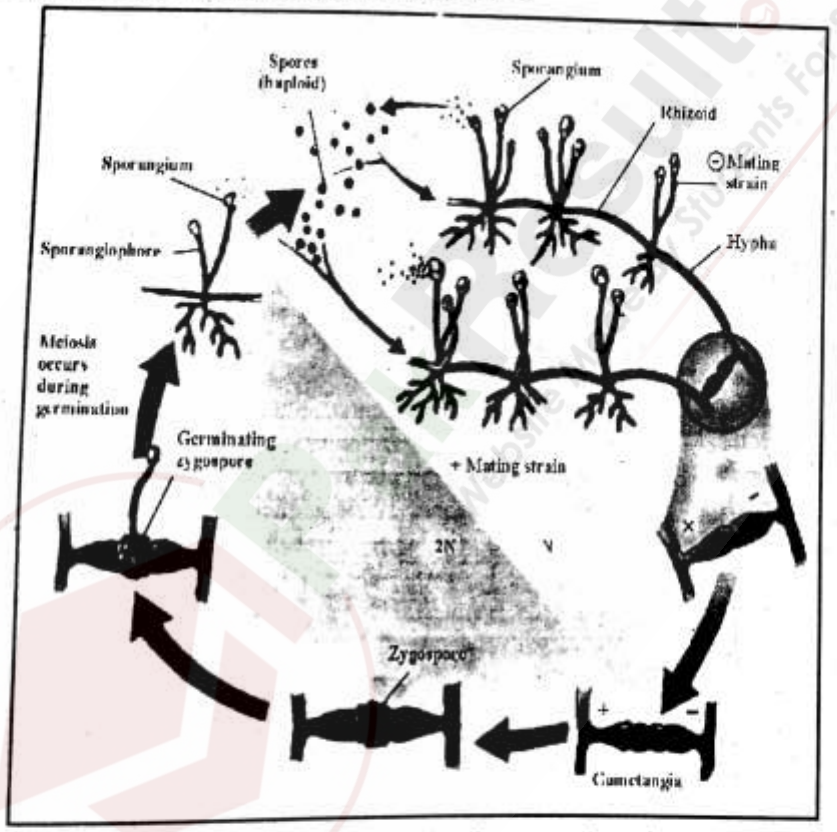

Fig. Life cycle of *Rhizopus* (black bread mold), a Zygomycete. Zygote formed by fusion of gametangia/gametes directly develops into a resting zygospore.

2 ASCOMYCOTA (Ascomycetes or Sac-fungi)

It is the largest group of fungi. Including over **60,000 species**, 50% or so occurring in lichen and some such as morels are mycorrhizal. Fungi present in this group are called Ascomycetes or **Sac-fungi**.

Main Feature

Their ascospores are produced in sac-like structures (ascus meaning sac) so called as Ascomycetes.

> **Q. Name the types of hypa and sexual spored in sac fungi.**
> **(LHR-G2)-16**
> **Q. Give an account of Ascomycetes.**
> **(MTN-GI-2016)**

Other Features

(i) Most are **terrestrial** though some are marine or fresh water.

(ii) Group shows **diversity** from unicellular yeasts to large cup fungi and morels.

(iii) Their hyphae are **septate**.

(iv) They have lengthy **dikaryotic phase** that forms ascocarps.

Reproduction

They reproduce asexually by conidia that are often dispersed by wing. During **Sexual** reproduction they produce haploid sexual spores called ascospores by meiosis inside their characteristic sac like structures **asci** (sing.ascus). Meiosis follows nuclear fusion inside the ascus, commonly 8 ascoospores are produced inside each ascus. Most sac-fungi have asci inside macroscopic fruiting bodies called ascocarps the visible morels etc.

Fig. Asci and ascospores. Each ascus contains eight haploid ascospores

Yeasts as Example

Yeasts are unicellular microscopic fungi derived from all the three different groups of fungi but mostly Ascomycetes. They reproduce mostly asexually by budding. They reproduce sexually by forming asci/ascospores or basidia/basidiocarps.

> **Q. Write important of yeast.**
> **(LHR-G1)-14**

They ferment carbohydrate (glucose) to ethanol and carbondioxide. Because of this feature and many other reasons, these are of great economic importance. ***Saccharomyces cerevisiae*** is the most commonly exploited yeast.

3 BASIDIOMYCOTA (Basidiomycetes or Club-fungi)

These are among the most familiar fungi; edible mushrooms, devastating plant pathogens rusts and smuts, puffballs and bracket/shelf fungi are all included in this group.

Main Feature

They produce club-shaped sexual reproductive structure, the basidium (plural **basidia**), called as Basidiomycetes or ***Club-fungi***.

Other Features

(i) During most part of their life cycle, the hyphae are **septate**.

(ii) **Cells** are uninucleate (monokaryotic) during one phase and binucleate (dikaryotic) during the remaining, lengthy phase.

(iii) Their characteristic **fruiting bodies** or visible mushrooms are formed entirely of dikaryotic mycelium.

Reproduction

Nuclear fusion in the basidium is followed by meiosis. Four haploid sexual spores, called the basidiospores, are born on, not inside, each basidium.

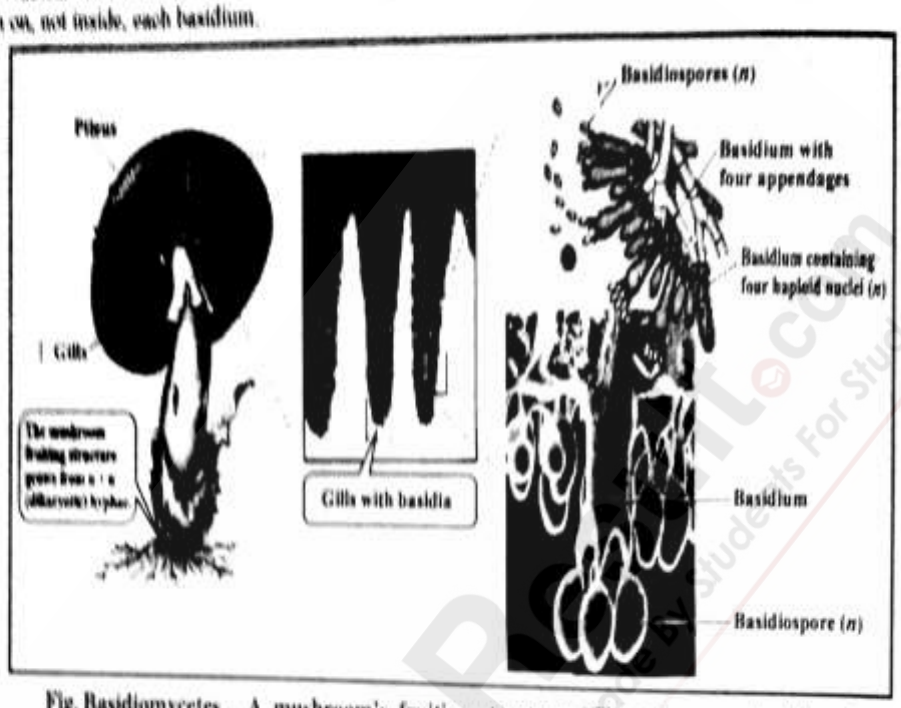

Fig. Basidiomycetes. A mushroom's fruiting structures. The gills on underside of mushroom's cap are lined with basidia, on which basidiospores are produced.

Examples

- ***Puccinia*** species are most common rust fungi
- ***Ustilago*** species are most common smut fungi.

(a) Rusts

Rusts are called so because of numerous rusty, orange yellow coloured disease spots on their host surface (mostly stem, leaves), later revealing brick rust-red spores of the fungus.

(b) Smuts

Smuts are called so because of their black, dusty spore masses that resembles soot or smut. These spore masses replace the grain kernels such as those of wheat, corn etc. Spores (teliospores) of *Ustilago tritici* (loose smut of wheat) are carried by wind from infected wheat ears to healthy flowers, where they germinate. The resulting hyphae penetrate flower ovaries. Inside the ovary mycelium spreads and becomes dormant and remains so in seed (grain).

When such infected seeds are sown next season, the hyphae also grow within the growing plant and form smut spores inside the kernel, thus destroying them completely. The covering of the grain breaks exposing the black spores mass, that may be dispersed by wind.

Q. Characterize Basidiomycota.
(MTN-GI-2014)

Q. Give the disease cycle of loose smut of wheat caused by *Ustilagotritici*. (No need of Diagram).
(DGJ-GII-2015)

Q. Give the disease cycle of loose smut of wheat. (LHR-2006)

Q. Describe life cycle of loose smut of wheat with the help of diagram.
(LHR-GI-2013)

Q. Describe disease cycle of loose

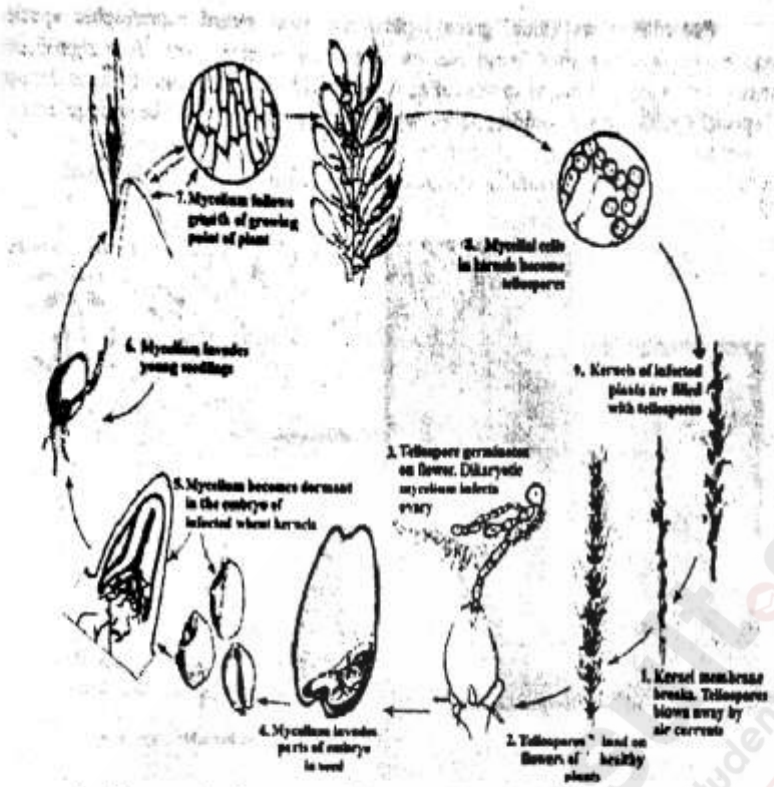

Fig. Disease cycle of loose smut of wheat caused by a club-fungus (Ustilago tritici)

4 DEUTEROMYCOTA (Deuteromycetes or Imperfect fungi)

This heterogenous group includes all such fungi in which sexual phase has not been observed.

Main Feature

Due to absence of sexual reproduction, these are also called as Deuteromycetes or **Imperfect fungi**.

> **Q. Write note on Deuteromycota and Basidiomycota. (LHR-2005)**

Relation with other Groups

Most of them are related to their sexually reproducing relatives of Ascomycetes. However some are related to other two phyla (Zygomycota and Basidiomycota) as well. If sexual structures are found on imperfect fungi, it is then reassigned to the appropriate phylum.

Biologist now can classify most imperfect fungi on the basis of DNA sequence, though sexual structures may not be found.

Reproduction

As described earlier, sexual reproduction is absent in them. Despite absence of sexual reproduction, imperfect fungi show special kind of genetic recombination, called **parasexuality**. In which portions of chromosomes of two nuclei lying in the same hypha are exchanged.

Examples

Penicillium (blue, green molds), *Aspergillus* (brown molds), *Alternaria, Fusarium, Helminthosporium* are some of the economically important genera of this group.

Penicillium as an Example

Penicillium species are wide spread saprotrophic species common on decaying fruits, bread etc. Its hyphae are septate.

It reproduces sexually by means of naked spores called conidia. These are found in chain at the tips of special hyphae called conidiophores, which are branched. Brush like arrangements of its conidia is characteristic of *penicillium*. These conidia give colour to the mycelial colony, which is circular. Mature conidia are easily and readily dispersed.

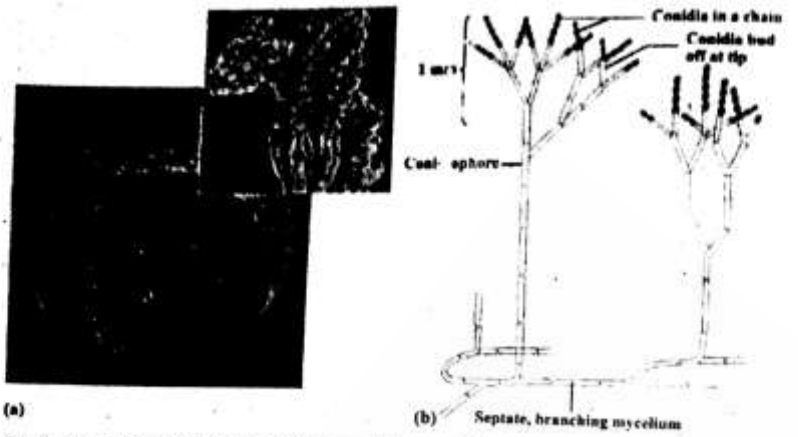

Fig. Penicillium (a) A moldy orange; the blue mold is caused by saprobic species of Penicillium. (b) Penicillium showing asexual reproduction, characteristics brush like arrangement of conidia.

LAND ADAPTATIONS OF FUNGI

Q.6: State various features of fungi that adapt them to terrestrial mode of life.

Ans. Introduction

Fungi although grow best in moist habitats, are found wherever organic matter is present. They are successful group of land organisms and possess several features in their body and reproduction that adapt them to their habitat and terrestrial mode of life.

Some Examples of Adaptations

(i) Fast Spreading Hyphae

Extensive system of fast-spreading hyphae penetrate the substrate and enormously increase the contact and surface area for absorption. Cytoplasmic flow throughout the hyphae is responsible for their rapid growth and spread.

(ii) Chitin in Cell Wall

Chitin in their thickened hyphal wall is more resistant to decay than are cellulose and lignin found in plant cell wall. They can even break down the lignin (in addition to cellulose) to obtain their nutrients.

(iii) Rhizoids-Anchorage and Absorption

In saprobes, certain modified hyphae called rhizoids anchor the fungus to the substrate and also digest and then absorb the food.

(iv) Changes in Reproductive Structures

They are very well adapted to live on land due to lack of flagellated cells, non-motile spores and conidia efficient dispersal by wind, thick-walled zygote and other resistant structures. Hyphae may be modified in such a way as to enable them to reproduce themselves without dependence on external water.

(v) Tolerance

Many fungi are more tolerant than are bacteria to damage in hyperosmotic surroundings. Many can tolerate temperature extremes (-5°C below freezing and 50°C or more). This is the reason that molds (e.g. *Penicillium*) can grow on oranges and jelly kept in a refrigerator, while generally bacteria cannot.

Q. Give the adaptations of fungi on land: (MTN-GI-2014: LHR-GII-15: BWP, FBD-GI-16)

Q. Describe adaptation of bryophytes for their life on land. (SWL-GII-2014)

Q. Discuss Land Adaptations of Fungi. (BWP-2013)

Q. Give land adaptations of fungi. (MTN-GII-2012)

Q. State various features of fungi that adapt them to terrestrial mode of life. (SGD-GI-2014)

Q. Describe land adaptations of fungi. (LHR-GI-2014)

IMPORTANCE OF FUNGI

Q.6: What is ecological importance of saprotrophic fungi, of lichen and mycorrhizae?

- **Write a detailed note on important of fungi.**
- **Some enzymes of fungi are useful on one hand and harmful on other hand Discuss.**
- **Name any four important fungal diseases of plants and four fungal diseases of humans and briefly describe any one of the plant diseases and any one of the diseases of humans.**
- **Describe, giving examples, different ways in which fungi are useful to humans.**

Ans. IMPORTANCE OF FUNGI

Ecological Importance

Fungi have great ecological impact. Some of their ecologically important aspects are described as below.

(i) Decomposers

Fungi along with saprobic bacteria play vital role in the recycling of inorganic nutrients in the ecosystem. Without their activity all the essential nutrients would soon become locked up in the mounds of dead animals, plants and would be unavailable for use by organisms and life would cease.

> **Q. Give four ecological uses of fungi. (BWP-GI-2014)**
>
> **Q. Discuss ecological importance of Fungi. (MTN-GI-2016)**
>
> **Q. What is "Ecological importance of Fungi"? (MTN-GI-2012)**

(ii) Symbionts

- **Mycorrhizal** fungi improve the growth of plants with which they are associated. 95% of all kinds of vascular plants have this association.
- **Lichen** growing on rocks break them, setting stage for other organisms during the course of ecological succession. Lichen are very good bioindicators of air quality as they are very sensitive to pollution. Some fungi are also used for bioremediation (degrading/removing environmental poisons/pollutants by organisms).

> **Q. Give the ecological importance of lichens. (BWP-G1)-16**
>
> **(SGD-G1)-17**

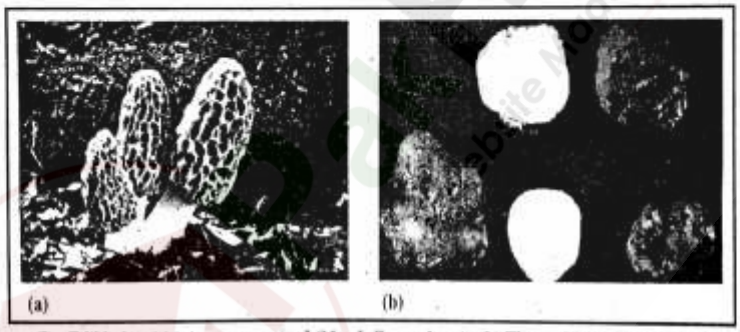

Fig. Edible fungi (a) A common morel (*Morchella esculenta*). (b) The truffles (*Tuber* species) are underground fruiting bodies that people find with the help of trained dogs or pigs.

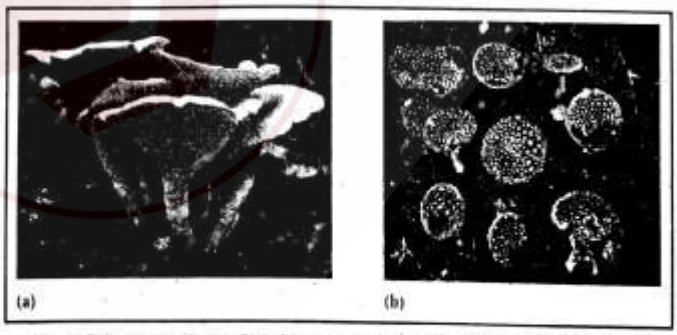

Fig. a: Poisonous mushroom Jack-O' lantern (*Omphalotus olearius*) whose gills glow in the dark. b: *Amanita*, another common poisonous mushroom.

COMMERCIAL IMPORTANCE

Fungi cause economic gains as well as losses.

Economic gains due to fungi

(i) Edible Fungi

Certain fungi are edible. About 200 species of **mushrooms** (*e.g. Agaricus sp*), **Morels** (*e.g. Morchella esculenta*), **truffles** (underground fruiting bodies of some Ascomycetes *e.g. Tuber sp*) are common edible fungi. Some mushrooms are also poisonous which are called as **toadstools** such as death cap/death angel (*Amanita*) and jack-O' latern mushroom.

Reindeer moss(lichen not a moss) is used as food for reindeers and some other large animals in arctic/sub arctic/boreal regions.

> **Q. Write any four economic gains due to fungi. (SWL-GI-2014; SGD-GI-16)**
> **Q. Describe four economic gains due to fungi. (SGD-GI-2014; DGK-GII-15; DGK-GII-16)**
> **Q. Discuss economic gains of fungi. (AJK-GI-2015; GUJ, MTN-GI-16)**
> **Q. Explain Economic gains due to fungi. (GUJ-GI-2015)**
> **Q. Write note on economic gains due to fungi. (LHR-2008; MTN-GII-14)**
> **Q. Narrate four points of Economic Gains due to Fungi. (MTN-GI-2013)**
> **Q. What are tool stools. (GUJ-G2)-14**

(ii) Use in Food Industry

- Certain fungi are used in food industry. Because of their fermenting ability, yeasts (*Saccharomyces cerevisiae*) are used in production of bread and liquor.
- *Penicillium* species are used for giving flavour, aroma and characteristic colour to some cheese.
- Some species of *Aspergillus* are used for fermenting/producing soya sauce and soya paste from soya bean. Citric acid is also obtained from some *Aspergillus* species.

(iii) Use in Medicine

Some fungi are source of antibiotics and some other drugs.

- **Penicillin,** first antibiotic discovered by A. Fleming in 1928 is obtained from *Penicillium notatum*.
- **Lovastatin** is used for lowering blood cholesterol.
- **Cyclosporin** obtained from a soil fungus is used in organ transplantation for preventing transplant rejection.
- **Ergotin** is used to relieve one kind of headache migraine.
- **Griseofulvin** is used to inhibit fungal growth.

(iv) Use in Fertile Industry

Some natural dyes obtained from lichens are used in textile industry.

(v) Use in Biological Research

> **Q. Give importance of pink bread mold. (SGD-G1)-16**

- **Yeasts** are heavily used in genetic/molecular biological research because of their rapid generation and rapidly increasing pool of genetic and biochemical information. Yeasts were the first eukaryotes to be used by genetic engineers. In 1983, a functional artificial chromosome was made in *Saccharomyces cervisiae*. The same yeast was the first eukaryote whose genomic sequence was completely studied in 1996. Pink bread mold *Neurospora* has also been used for genetic research.
- Yeasts are also being investigated for production of some hormones.

ECONOMIC LOSSES DUE TO FUNGI

(i) Plant Diseases

Fungi are responsible for many serious plant diseases because they produce several enzymes that can breakdown cellulose, lignin and even cutin. All plants are susceptible to them. Extensive damages due to rust and smut diseases of wheat, corn and rice prompted mass displacement and starvation to death of many people.

Some of the common plant diseases caused by fungi are **powdery mildews** (on grapes, rose, wheat etc), **ergot of rye**, **red rot of sugar cane**, **potato wilt**, **cotton root rot**, **apple scab** and **brown rot** of peaches, plums, apricots and cherries.

Q. Write a note on economic losses due to fungi with a reference to animal diseases only. (LHR-GI-2014)

Q. Explain economic losses due to fungi. (LHR-GII-2015)

Q. Write a note on economic losses due to fungi with reference to animal diseases only. (RWP-2014)

Q. Discuss economic losses due to Fungi. (MTN-GI-2011)

Q. Narrate the economic losses due to fungi (Animal diseases only). (SWL-GI-2013)

(ii) Animal Diseases

Fungi also cause certain animal diseases.

- **Ringworm** and **athlete's foot** are superficial fungal infections caused by certain imperfect fungi.
- ***Candida albicans***, yeast, causes oral and vaginal thrush (*candidiasis or candidosis*).
- **Histoplasmosis** is a serious infection of lungs caused by inhaling spores of a fungus, which is common in soil contaminated with birds' feces. If infection spreads into blood stream and then to other organs (which is very occasional), it can be serious and even fatal.
- ***Aspergillusfumigates*** causes **aspergillosis,** but only in persons with defective immune system such as AIDS, and may cause death.
- Some strains of *Aspergillus flavus* produce one of the most carcinogenic (cancer causing) mycotoxins (toxins produced by fungi), called **aflatoxins.***Aspergillus* contaminates improperly stored grains such as peanuts and corn etc. Milk, eggs and meat may also have small traces of aflatoxins.

Q. What is histoplasmosis?(DGK-G1)-15, (GUJ-G2)-16, (LHR-G2)-17

Q. What is ring worm? (MTN-G1)-16

Q. Write any two superficial by fungi. (SGD-G2)-16

Fig. Plant Pathogenic fungus. Corn smut on an ear of sweet corn is caused by *Ustilago maydis*.

- **Ergotism** is caused by eating bread made from purple ergot-contaminated rye flour. The poisonous material in the ergot causes nervous spasm, convulsion, Psychotic delusion and even gangrene.
- Any moldy human food and animal forage product should be discarded.

(iii) Damage to Food, Wood and Leather

Saprobic fungi are not only useful recyclers but also cause incalculable damage to food, wood, fiber and leather by decomposing them.

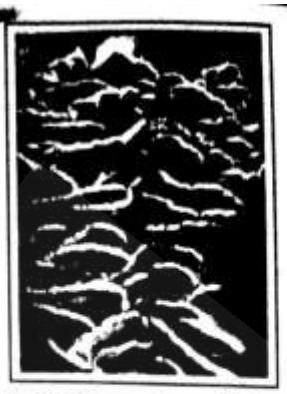

Fig. This shelf fungus is parasitizing a tree. These are important decomposers of wood.

- 15-50% of world's fruit is lost each year due to fungal attack.
- Wood-rotting fungi destroy not only living trees but also structural timber. Bracket/shelf fungi cause lot of damage to stored cut lumber as well as stands of timber of living trees.
- A pink yeast *Rhodotorula* grows on shower curtains and other moist surfaces.

Q. What is ergotism? How is caused? (GUJ-G1)-14, (FBG-G1)-16
Q. What is frodotorula? (SGD-G1)-14

DIFFERENCES

Rust	Smut
(LHR-GI-2009,14:MTN, BWP -GI-14:SGD-GII-15:FBD-GI-15) (GUJ-G1) (FBD-G1)-16	
Rusts are called so because of numerous rusty, orange yellow coloured disease spots on their host surface (mostly stem, leaves), later revealing brick/rust-red spores of the fungus. **Example:** *Puccinia* species are most common rust fungi.	Smuts are called so because of their black, dusty spore masses that resembles soot or smut. These spore masses replace the grain kernels such as those of wheat, corn etc. **Example:** *Ustilago* species are most common smut fungi.
Spore	**Conidia**
(AJK-GI-2016: LHR-10,13GI,16GII, FBD-10, 12: RWP-11) (GUJ-G1)-17	
• Spores are produced inside the reproductive structures called sporangia which are cut off from the hyphae by complete septa. • Spores may be produced by sexual or asexual process. • They are haploid, non-motile and not needing water for their dispersal, are small, produced in very large number and dispersed by wind to great distance and cause wide distribution of many kinds of fungi including many plant pathogens. • When spores land in a suitable place, they germinate giving rise to new fungal hyphae. • Spores may also be dispersed by insects and other small animals and by rain splashes. • Spores are a common means of reproduction in fungi.	• These are non-motile asexual spores which are cut off at the end of modified hyphae called conidiophores • Conidia (singular conidium) are non-motile, asexual spores. • They are naked spores (not inside the sporangia) • They are usually in chains or clusters. • These may be produced in a very large number. • They can survive for weeks and cause rapid colonization of new food.