

The Kingdom Fungi

Fungi

1. Eucaryotic, single cells (usually colonial), sessile heterotrophs
2. Monera are procaryotic
3. Protista are autotrophic and motile heterotrophs
4. Plants and animals have tissues (multicellular)
5. Reclassified from four classes in plant kingdom to seven phyla in kingdom fungi.
6. Naming and classification still going through changes.
7. A gram of soil can contain a network of over one million fungi hyphae.
8. Some organisms, such as the ghost orchid and species of ants, live on fungi.
9. Leaf cutter ants grow fungi for food.
10. One fungus turns an ant species into zombies to perpetuate the fungus life cycle.
11. Some truffle varieties are the most expensive food in the world.
12. The Razor-strop fungus was used to sharpen blades and polish mechanical watch parts.
13. Most important role is its vital participation in the detritus cycle.
14. One of the first organisms to have its genome decoded was a fungus by the name of *Saccharomyces cerevisiae*, commonly known baker's yeast, in 1997. It has about 6,000 genes.

Beneficial fungi

1. For food: truffles, puff balls, cheese (blue cheese, limburger, cheddar, Swiss), yeasts for leavening bread and cinnamon rolls.
2. For medicine: penicillin, Ergot of Rye (blood vessel constriction)
3. For detritus cycle: decomposition of organic waste
4. For pollution control: absorption of oil, pesticides, and industrial waste.

Destructive fungi

1. Human disease: Athlete's foot, ring worm, Ergot of Rye (St. Anthony's Fire)
2. Plant disease: Chestnut blight fungus (destroyed all chestnut trees in America), Dutch Elm disease, late blight of potato
3. Household destruction: Dry rot
4. Illegal drugs: LSD (hallucinogen). LSD is manufactured from the lysergic acid, which is naturally produced by the ergot of rye fungus.
5. Some fungi can be controlled with fungicides.
6. Mold in houses can produce toxic gases and cause 'sick building syndrome'.

Anatomy

1. Hyphae: 1) Long slender filaments of cells, 2) Septate and nonseptate. 3) The basic unit of colonial forms, 4) Specialize functions but not tissues
2. Cell walls: Chitin
3. Mycelia: Mass of intertwined hyphae (e.g., mold on bread or mushroom). The colonial "body" of hyphae.
4. Rhizoids: Root like structures embedded in material
5. Aerial hyphae: exposed to the air, in contrast to rhizoids
6. Stolons: produce new filaments
7. Sporophores: produce spores
8. Haustoria: Hyphae penetrating into living cells

Reproduction

1. Usually reproduce asexually by means of spores, but also from stolons, fragmentation, and budding.
2. Sexual reproduction: haploid hyphae combine to produce diploid hyphae, which in turn, immediately produce haploid spores.
 - a. Zygosporangium: diploid spore often formed under harsh conditions; and undergo meiosis in better conditions to produce haploid spores.
 - b. Fruiting body: a large mycelia colony of underground hyphae.

Classification of Fungi

1. Classification of fungi has no standard, and different names are used.
2. Two major divisions: Eumycophyta and Myxomycophyta
3. Eumycophyta: the true fungi and lichens
4. Myxomycophyta: slime molds

Division Eumycophyta

1. True fungi and lichen
2. Colonial
3. Motility: sessile
4. Nutrition: heterotrophic (saprophytic and parasitic), external digestion and absorption
5. Respiration: Mostly aerobic, but many can ferment

Phylum Ascomycota

1. 'Sac fungi'.
2. Forms sexual spores (ascospores) in sacs.
3. Forms asexual spores without an enclosing sac (conidia)
4. Includes the white and green mold *Penicillium* often found on rinds of fruit
5. Also includes: Roquefort cheese, Red bread mold
6. Powdery mildews: cobweb-like mycelia
7. Morel (conical shaped sponge fungi): extensive fruiting body, ascospores
8. Cup fungi:
9. Yeasts
 - a. Egg-shaped, unicellular, saprophytic fungi
 - b. Most are in class ascomycetes, many in deuteromycetes
 - c. Asexual reproduction involves budding: divide nucleus, one migrates to pouch in cell wall and is pinched off
 - d. Beneficial yeast: produce B-vitamins, Baker's yeast, brewer's yeast
 - e. Pathogenic yeast: Skin and respiratory diseases

Phylum Basidiomycota

1. Club fungi
2. Produces spores on a club-shaped spore case called basidium.
3. Forms fruiting bodies
 - a. The mushroom fruiting body: cap and stipe (stalk)
 - b. The basidia in mushrooms line the gills under the cap
4. Mushrooms, puffballs, earthstars, shelf fungi, rusts, smuts
5. Most are edible
6. Toadstools are colorful mushrooms.
7. *Mycena* species is bioluminescent.

8. Usually saprophytic, some are parasitic
9. Fairy rings form as hyphae of old food areas are used up. Largest known ring in France reaching up to half a mile in diameter.
10. Amanita: genus of 600 species including a pure white mushroom called the destroying angel and the death cap. Some of the most poisonous though some are edible. 95% of mushroom fatalities due to amanita mushrooms.
11. Rusts: parasites, complex life cycle having alternate hosts
12. Smuts: cause enlargement of infected part and form sooty spores

Phylum Deuteromycota

1. Fungi Imperfecti because sexual life cycle that is either unknown or absent.
2. Hyphae with asexual spores, called conidiophores, are similar to those of the sac fungi and club fungi.
3. Cause ringworm, athlete's foot, thrush (infects membrane of mouth) and other rare diseases of body organs; and many vegetable diseases

Division Myxomycophyta (Phylum Zygomycota)

1. Zygote forming fungi. But asexual reproduction is most common
2. Spores are formed in round shaped cases called sporangia
3. Usually the molds, includes the bread mold *Rhizopus*
4. Slime Mold
 - a. Plasmodium is reproduced when two gametes combine to form a fusion body
 - b. Plasmodium: The visible structure
 - c. Moist habitats
 - d. A multinucleated mass of protoplasm lacking a cell wall
 - e. Feeds on bacteria and organic particles

Lichens

1. A mutual symbiosis of two organisms
2. Fungus and algae (two different kingdoms)
3. Algae captures sunlight and manufactures food
4. Fungus provides support and protection
5. Able to thrive and survive in difficult environments (e.g., on rocks, in the tundra)
6. Classified based on appearance
 - a. Crustose: flat, crusty appearance
 - b. Foliose: small, crinkled leaves
 - c. Fruticose: form stalks with fruiting bodies at the ends
7. Reproduce primarily by releasing dustlike pieces (soredia)
 - a. Forms asexual spores without an enclosing sac (conidia)
 - b. Forms sexual spores (ascospores)