FUNGI

1. **What do you mean by fungi?**

Fungi (singular: fungus) are a kingdom of usually multicellular eukaryotic organisms that are heterotrophs (cannot make their own food) and have important roles in nutrient cycling in an ecosystem. Fungi include the yeasts, rusts, smuts, mildews, molds, and mushrooms. There are also many funguslike organisms, including slime molds and oomycetes (water molds) that do not belong to kingdom Fungi but are often called fungi. Many of these funguslike organisms are included in the kingdom Chromista. Fungi are among the most widely distributed organisms on Earth and are of great environmental and medical importance. Many fungi are free-living in soil or water; others form parasitic or symbiotic relationships with plants or animals. Fungi reproduce both sexually and asexually and they are also responsible for some diseases in plants and animals. The study of fungi is known as mycology.

2. **Write about the characteristics feature of fungi.**

- Fungi are eukaryotic, non-vascular, non-motile and heterotrophic organisms.
- They may be unicellular or filamentous.
- They reproduce by means of spores.
- Fungi exhibit the phenomenon of alternation of generation.
- Fungi lack chlorophyll and hence cannot perform photosynthesis.
- Fungi store their food in the form of starch.
- Biosynthesis of chitin occurs in fungi.
- The nuclei of the fungi are very small.

- The fungi have no embryonic stage. They develop from the spores.
- The mode of reproduction is sexual or asexual.
- Some fungi are parasitic and can infect the host.
- Fungi produce a chemical called pheromone which leads to sexual reproduction in fungi.
- Examples include mushrooms, moulds, yeast.

3. Discuss the ecological distribution of fungi.

Although often inconspicuous, fungi occur in every environment on Earth and play very important roles in most ecosystems. Along with bacteria, fungi are the major decomposers in most terrestrial (and some aquatic) ecosystems, and therefore play a critical role in biogeochemical cycles and in many food webs. As decomposers, they play an essential role in nutrient cycling, especially as saprotrophs and symbionts, degrading organic matter to inorganic molecules, which can then re-enter anabolic metabolic pathways in plants or other organisms.

Symbiosis

Many fungi have important symbiotic relationships with organisms from most if not all kingdoms. These interactions can be mutualistic or antagonistic in nature, or in the case of commensal fungi are of no apparent benefit or detriment to the host.

With plants

Mycorrhizal symbiosis between plants and fungi is one of the most well-known plant–fungus associations and is of significant importance for plant growth and persistence in many

ecosystems; over 90% of all plant species engage in mycorrhizal relationships with fungi and are dependent upon this relationship for survival.

The mycorrhizal symbiosis is ancient, dating back to at least 400 million years. It often increases the plant's uptake of inorganic compounds, such as nitrate and phosphate from soils having low concentrations of these key plant nutrients. The fungal partners may also mediate plant-to-plant transfer of carbohydrates and other nutrients. Such mycorrhizal communities are called "common mycorrhizal networks". A special case of mycorrhiza is myco-heterotrophy, whereby the plant parasitizes the fungus, obtaining all of its nutrients from its fungal symbiont. Some fungal species inhabit the tissues inside roots, stems, and leaves, in which case they are called endophytes. Similar to mycorrhiza, endophytic colonization by fungi may benefit both symbionts; for example, endophytes of grasses impart to their host increased resistance to herbivores and other environmental stresses and receive food and shelter from the plant in return.

With algae and cyano bacteria

Lichens are a symbiotic relationship between fungi and photosynthetic algae or cyanobacteria. The photosynthetic partner in the relationship is referred to in lichen terminology as a "photobiont". The fungal part of the relationship is composed mostly of various species of ascomycetes and a few basidiomycetes. Lichens occur in every ecosystem on all continents, play a key role in soil formation and the initiation of biological succession, and are prominent in some extreme environments, including polar, alpine, and semiarid desert regions. They are able to grow on inhospitable surfaces, including bare soil, rocks, tree bark, wood, shells, barnacles and leaves. As in mycorrhizas, the photobiont provides sugars and other

carbohydrates via photosynthesis to the fungus, while the fungus provides minerals and water to the photobiont. The functions of both symbiotic organisms are so closely intertwined that they function almost as a single organism; in most cases the resulting organism differs greatly from the individual components. Lichenization is a common mode of nutrition for fungi; around 27% of known fungi—more than 19,400 species—are lichenized. Characteristics common to most lichens include obtaining organic carbon by photosynthesis, slow growth, small size, long life, long-lasting (seasonal) vegetative reproductive structures, mineral nutrition obtained largely from airborne sources, and greater tolerance of desiccation than most other photosynthetic organisms in the same habitat.

With insects

Many insects also engage in mutualistic relationships with fungi. Several groups of ants cultivate fungi in the order Agaricales as their primary food source, while ambrosia beetles cultivate various species of fungi in the bark of trees that they infest. Likewise, females of several wood wasp species (genus *Sirex*) inject their eggs together with spores of the wood-rotting fungus *Amylostereum areolatum* into the sapwood of pine trees; the growth of the fungus provides ideal nutritional conditions for the development of the wasp larvae. At least one species of stingless bee has a relationship with a fungus in the genus *Monascus*, where the larvae consume and depend on fungus transferred from old to new nests. Termites on the African savannah are also known to cultivate fungi, and yeasts of the genera *Candida* and *Lachancea* inhabit the gut of a wide range of insects, including neuropterans, beetles, and cockroaches; it is not known whether these fungi benefit their hosts. Fungi ingrowing dead woods are essential for xylophagous insects (e.g. woodboring

beetles). They deliver nutrients needed by xylophages to nutritionally scarce dead wood. Thanks to this nutritional enrichment the larvae of woodboring insect is able to grow and develop to adulthood. The larvae of many families of fungicolous flies, particularly those within the superfamily Sciaroidea such as the Mycetophilidae and some Keroplatidae feed on fungal fruiting bodies and sterile mycorrhizae.

As pathogens and parasites

Many fungi are parasites on plants, animals (including humans), and other fungi. Serious pathogens of many cultivated plants causing extensive damage and losses to agriculture and forestry include the rice blast fungus *Magnaporthe oryzae*, tree pathogens such as *Ophiostoma ulmi* and *Ophiostoma novo-ulmi* causing Dutch elm disease and *Cryphonectria parasitica* responsible for chestnut blight and plant pathogens in the genera *Fusarium*, *Ustilago*, *Alternaria*, and *Cochliobolus*. Some carnivorous fungi, like *Paecilomyces lilacinus*, are predators of nematodes, which they capture using an array of specialized structures such as constricting rings or adhesive nets. Many fungi that are plant pathogens, such as *Magnaporthe oryzae*, can switch from being biotrophic (parasitic on living plants) to being necrotrophic (feeding on the dead tissues of plants they have killed). This same principle is applied to fungi-feeding parasites, including *Asterotremella albida*, which feeds on the fruit bodies of other fungi both while they are living and after they are dead.

Some fungi can cause serious diseases in humans, several of which may be fatal if untreated. These include aspergillosis, candidiasis, coccidioidomycosis, cryptococcosis, histoplasmosis, mycetomas, and paracoccidioidomycosis. Furthermore, persons with immuno-deficiencies are particularly susceptible to disease by genera such as *Aspergillus*, *Candida*, *Cryptoccocus*,

Histoplasma, and *Pneumocystis*. Other fungi can attack eyes, nails, hair, and especially skin, the so-called dermatophytic and keratinophilic fungi, and cause local infections such as ringworm and athlete's foot. Fungal spores are also a cause of allergies, and fungi from different taxonomic groups can evoke allergic reactions.

As targets of mycoparasites

The organisms which parasitize fungi are known as mycoparasitic organisms. Certain species of the genus *Pythium*, which are oomycetes, have potential as biocontrol agents against certain fungi. Fungi can also act as mycoparasites or antagonists of other fungi, such as *Hypomyces chrysospermus*, which grows on bolete mushrooms. Fungi can also become the target of infection by mycoviruses.

References:

1. https://biologydictionary.net/fungi/
2. https://www.britannica.com/science/fungus
3. https://byjus.com/biology/kingdom-fungi/
4. https://en.wikipedia.org/wiki/Fungus#:~:text=A%20fungus%20(plural%3A%20fungi%20or,kingdoms%20of%20plants%20and%20animals.

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