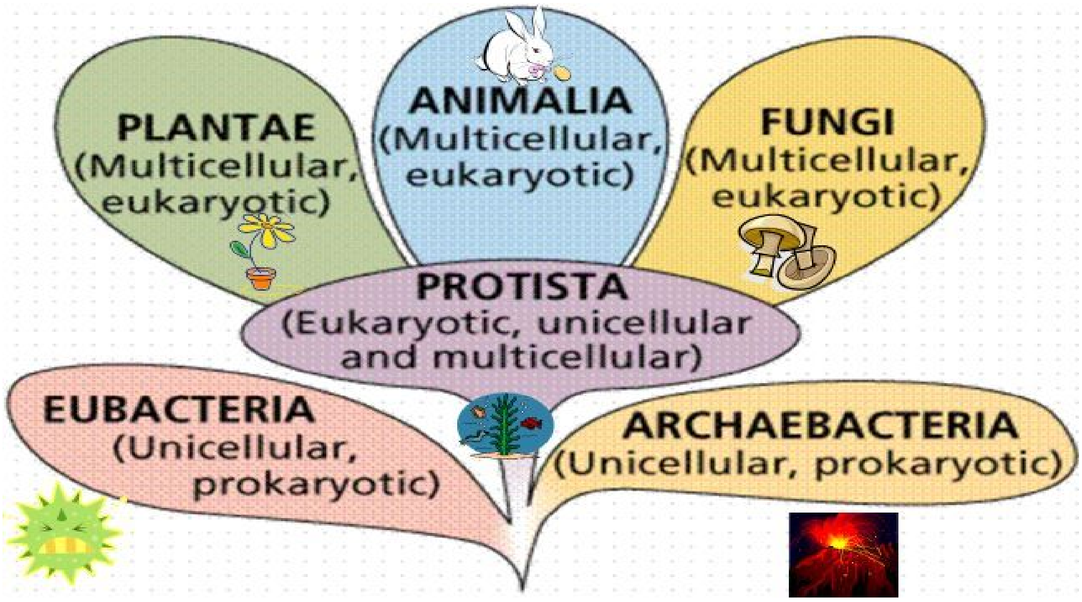

Based on their lifestyle, fungi may be circumscribed by the following set of characteristics

1. Nutrition. Heterotrophic (lacking photosynthesis), feeding by absorption rather than ingestion.
2. Vegetative state. On or in the substratum, typically as a non-motile mycelium of hyphae showing internal protoplasmic streaming. Motile reproductive states may occur.
3. Cell wall. Typically present, usually based on glucans and chitin, rarely on glucans and cellulose (Oomycota).
4. Nuclear status. Eukaryotic, uni- or multinucleate, the thallus being homo- or heterokaryotic, haploid, dikaryotic or diploid, the latter usually of short duration (but exceptions are known from several taxonomic groups).
5. Life cycle. Simple or, more usually, complex.
6. Reproduction. The following reproductive events may occur: sexual (i.e. nuclear fusion and meiosis) and/or parasexual (i.e. involving nuclear fusion followed by gradual de-diploidization) and/or asexual (i.e. purely mitotic nuclear division).
7. Propagules. These are typically microscopically small spores produced in high numbers. Motile spores are confined to certain groups.
8. Sporocarps. Microscopic or macroscopic and showing characteristic shapes but only limited tissue differentiation.
9. Habitat. Ubiquitous in terrestrial and freshwater habitats, less so in the marine environment.
10. Ecology. Important ecological roles as saprotrophs, mutualistic symbionts, parasites, or hyperparasites.
11. Distribution. Cosmopolitan

Introduction to Fungal Physiology

Fungal physiology refers to the nutrition, metabolism, growth, reproduction and death of fungal cells. It also generally relates to interaction of fungi with their biotic and a biotic environment, including cellular responses to stress.

The physiology of fungal cells impacts significantly on the environment, industrial processes and human health. In relation to ecological aspects, the biogeochemical cycling of carbon in nature would not be possible without the participation of fungi acting as primary decomposers of organic material. Furthermore, in agricultural operations, fungi play important roles as mutualistic symbionts, pathogens and saprophytes, where they mobilize nutrients and affect the physico-chemical environment.

Fungal metabolism is also responsible for the detoxification of organic pollutants and for bio remediating heavy metals in the environment. The production of many economically important industrial commodities relies on the exploitation of yeast and fungal metabolism, and these include such diverse products as whole foods, food additives, fermented beverages, antibiotics, pro biotic, pigments, pharmaceuticals, bio fuels, enzymes, vitamins, organic and fatty acids and sterols. In terms of human health, some yeasts and fungi represent major opportunistic life-threatening pathogens, whilst others are life-savers, as they provide antimicrobial and chemotherapeutic agents.

Why study physiology of fungal?
In fact, fungi are easy tools as are search materials, for fundamental physiological ,biochemistry and genetics studies

1- The physiology studies on fungal metabolism have helped in improving the industrial production of various substance such as citric acid and other organic acid by *Aspergillus niger* alchohols by yeast , antibiotic like penicillin by *Penicillium notatum* and P. chrysogenum , alkaloids of medicinal value by *claviceps purpurea* .

Some other fungal products have been suggested for industrial exploitation such as fats by *Penicillium javanicum ,Pestalotia palmarum Microxyphiella hibscifolia and Botryodiplodia theobromae* . gibberellins by *Fusarium moniliforme* glycerol by Saccharomyces cerevisiae , compler steroids like progesterone by *Rhizopus arrhizus*, nematoxin by *Nematoctonus haptocladus* .

2- The physiology studies have also played significant role in the industrid production of vitamins

Some strain of yeasts belonging to the genus *Rhodotorula* can synthesize significant quantities of β- carotene . the concentration is too small to be economically important.

3- The physiology studies have an important bearing in agricultures as pathogens and strong agents in recycling process by bringing about decay of plant (and animal) .remains to release nutrients essential for plant growth. The important of microbial activities is so strong that no one even thought of manuring aland occupied by forest. The important of mycorrhizd fungi has also been much emphasized in agriculture in recent past.
4- The study of fungal metabolism has suggested some of them as tests organisms for various such as vitamins , amino acid , macro and micro nutrient elements.

The rate of growth is often directly proportional to the quantity of thiamine supplied in glucose-aspargine medium. Employing a suitable range of concentration.

5- The physiology studies are academically important is systematic mycology to gain the knowledge of structure , ultra structure development , growth and reproduction and numerous factors affecting them in pure culture.
6- Nutritional studies play a very important in understanding the close association between two species of un related fungi

The physiological as well as biochemical studies have played an important role in the field now known as " Single Cell P protein SCP".

Morphology of Yeasts and Fungi

Most fungi are filamentous, many grow as unicellular yeasts and some primitive fungi, such as the chytridomycetes, grow as individual rounded cells or dichotomous branched chains of cells with root-like rhizoids for attachment to a nutrient resource

1 -Filamentous Fungi

The morphologies of **macro** fungi and **micro** fungi are very diverse . For example, we can easily recognize a variety of mushrooms and toadstools, the sexual fruiting bodies of certain macro fungi (the higher fungi Asomycotina and Basidiomycotina and related forms), during a walk through pasture or woodland.

Micro fungi (the moulds) are also diverse and are often observed on decaying foods and detritus, whereas many, including the coloured rusts, smuts and mildews, are common plant pathogens. Closer inspection of these visible structures, however, reveals that all are composed of aggregated long, branching threads termed hyphae (singular: hypha), organized to support spores for reproduction and dissemination. The hyphae of these aerial structures extend and branch within the supporting substratum as a network, termed a mycelium, from which the apically growing hyphae seek out, exploit and trans locate available nutrients.

Apically growing hyphae usually have a relatively constant diameter ranging from 1 to 30 µm or more, depending on fungal species and growth conditions. Filamentous fungi may be cultivated within the laboratory on a variety of different liquid or solid media. On agar, the radially expanding colonial growth form of the fungal mycelium is most evident, extending from an inoculum, on, within and sometimes above the substrate, forming a near spherical three-dimensional colony.

2 - Yeasts

Yeasts are unicellular (mostly Ascomycete, Basidiomycete or Deuteromycete) fungi that divide asexually by budding or fission and whose individual cell size can vary widely from 2 to 3 µm to 20–50 µm in length and 1–10 µm in width. *S. cerevisiae*(commonly referred to as brewer's or baker's yeast), is generally ellipsoid in shape with a large diameter of 5–10 µm and a small diameter of 1–7 µm .

The morphology of agar-grown yeasts shows great diversity in terms of colour, texture and geometry (peripheries, contours) of giant colonies. Severa (e.g. *Geotrichum candidum*); black (e.g. *Aureobasidium pullulans*); pink (e.g. *Phaffiar hodozyma*); red (e.g. *Rhodotorula rubra*); orange (e.g. *Rhodosporidium* spp.); and yellow (e.g. *Cryptococcus laurentii*).l yeasts are pigmented, and the following colours may be visualized in surface-grown colonies: cream (e.g. *S. cerevisiae*); white (Table 1)

Table 1 Diversity of yeast cell shapes

Cell shape	Description	Examples of yeast genera
Ellipsoid	Ovoid shaped cells	*Saccharomyces*
Cylindrical	Elongated cells with hemispherical ends	*Schizosaccharomyces*
Apiculate	Lemon shaped	*Hanseniaspora*, *Saccharomycodes*
Ogival	Elongated cell rounded at one end and pointed at other	*Dekkera*, *Brettanomyces*
Flask-shaped	Cells dividing by bud-fission	*Pityrosporum*
Miscellaneous shapes	Triangular Curved Spherical Stalked	*Trigonopsis* *Cryptococcus* (e.g. *Cryptococcus cereanus*) *Debaryomyces* *Sterigmatomyces*
Pseudohyphal	Chains of budding yeast cells which have elongated without detachment	*Candida albicans*
Hyphal	Branched or unbranched filamentous cells which form from germ tubes. Septa may be laid down by the continuously	*Candida albicans*

	extending hyphal tip. Hyphae may give rise to blastospores	
Dimorphic	Yeasts that grow vegetatively in either yeast or filamentous (hyphal or pseudohyphal) form	*Candida albicans* *Saccharomycopsis fibuligera* *Kluyveromyces marxianus* *Malassezia furfur* *Yarrowia lipolytica* *Histoplasma capsulatum*

Dimorphic

Mold-Yeast Dimorphism

- Some fungi have the ability to alternate between a mold form and a that of a yeast form -

dimorphic fungi

- Several pathogens of humans exhibit dimorphism

Candida albicans
Histoplasma capsulatum

- Dimorphism occurs in response to environmental factors, of which no one common factor

e.g., *Histoplasma capsulatum* - mold at 25°C, yeast at 37°C
e.g., *Mucor rouxii* - mold with oxygen, yeast in the absence of oxygen