

Rayat Shikshan Santha's

**D. P. Bhosale College, Koregaon**

## **Department of Botany**

**Wall Paper on the occasion of**

### **World Mushroom Day**

**15<sup>th</sup> October, 2022**

<b>President:</b>	<b>Hon. Prin. Dr. V. S. Sawant</b>
<b>Chief</b>	<b>Dr. N. V. Pawar</b>
<b>Guest:</b>	<b>Co-ordinator IQAC, The New College, Kolhapur</b>
<b>Head of the Department:</b>	<b>Dr. S. M. Deshpande</b>
<b>Members:</b>	<b>Dr. R. B. Patil</b> <b>Dr. S. B. Zimare</b> <b>Dr. P. S. Kakade</b> <b>Dr. P. P. Kamble</b>
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## What is a fungus?

A fungus is a eukaryote that digests food externally and absorbs nutrients directly through its cell walls. Most fungi reproduce by spores and have a body (thallus) composed of microscopic tubular cells called hyphae. Fungi are heterotrophs and, like animals, obtain their carbon and energy from other organisms. Some fungi obtain their nutrients from a living host (plant or animal) and are called biotrophs; others obtain their nutrients from dead plants or animals and are called saprotrophs (saprophytes, saprobes).

Some fungi infect a living host, but kill host cells in order to obtain their nutrients; these are called ‘**necrotrophs**.’ Fungi were once considered to be primitive members of the plant kingdom, just slightly more advanced than bacteria. We now know that fungi are not primitive at all. In fact, recent taxonomic treatments such as the ‘**Tree of Life**’ Project show that fungi and animals both belong to the group Opisthokonta. Fungi may not be our next of kin, but they are more closely related to animals than they are to plants. We also recognize that organisms traditionally studied as ‘**fungi**’ belong to three very different unrelated groups: the true fungi in Kingdom Fungi (Eumycota), the Oomycetes, and the slime molds.

## How old are fungi?

Fungi are an ancient group—not as old as bacteria, which fossil evidence suggests may be 3.5 billion years old—but the earliest fungal fossils are from the Ordovician, 460 to 455 million years old. Based on fossil evidence, the earliest vascular land plants didn't appear until approximately 425 million years ago, and some scientists believe that fungi may have played an essential role in the colonization of land by these early plants.

Mushrooms exquisitely preserved in amber from the Late Cretaceous (94 million years ago) tell us that there were mushroom-forming fungi remarkably

similar to those that exist today when dinosaurs were roaming the planet. However, the fungal fossil record is incomplete and provides only a minimum time estimate for when different groups of fungi evolved. Molecular data suggest that fungi are much older than indicated by the fossil record, and may have arisen more than one billion years ago.

Let's briefly consider the major groups in Kingdom Fungi—they will be described in greater detail later. Open most introductory mycology books and you'll see that there are four main groups (phyla) of true fungi—Ascomycota, Basidiomycota, Chytridiomycota and Zygomycota. Recent studies have provided support for the recognition of additional phyla, such as Glomeromycota, a group of fungi once placed in Zygomycota that form an association with the roots of most plants.

### **How many fungi are there?**

No one knows for sure how many species of fungi there are on our planet at this point in time, but what is known is that at least 99,000 species of fungi have been described, and new species are described at the rate of approximately 1200. A conservative estimate of the total number of fungal species thought to exist is 1.5 million.

### **What do fungi do?**

Fungi are involved in wide range of activities—some fungi are decomposers, parasites or pathogens of other organisms, and others are beneficial partners in symbiosis with animals, plants or algae.

### **Fungi associated with animals:**

Fungi have the ability to grow on and in both invertebrate and vertebrate animals. Many fungi can attack insects and nematodes, and may play an important role in keeping populations of these animals under control. Insect-attacking fungi, called as 'entomopathogens' include a wide range of fungi in phyla Ascomycota, Zygomycota and Chytridiomycota. Some of the best-known

and most spectacular entomopathogens belong in the Ascomycota genus *Ophiocordyceps* and related genera.

These fungi infect and consume insects such as caterpillars and ants, and then form conspicuous **stromata** that emerge from their victim's body in a most dramatic manner. These fungi can also alter the insect's behavior. Paradoxically, humans have been using one of these entomopathogens, *Ophiocordyceps sinensis*, for thousands of years to treat a wide range of ailments. This fungus is an important component of traditional Asian medicine and is commonly called 'winter worm' or 'summer grass'. Entomopathogens such as *Beauveria bassiana* are so effective in killing insects that they are used as **biological control agents** for insect pests. One group of fungi called Entomophthorales ("insect killers") includes a number of highly specialized entomopathogens. A common example is *Entomophthora musae*, which is often observed forming a ring of white spores discharged around the body of a parasitized fly on panes of glass. Some fungi are specialized parasites of nematodes, rotifers, and other microscopic animals in the soil. A common nematode predator is *Arthrobotrys oligospora*, a fungus that has evolved sticky networks of hyphae for trapping nematodes. Once the nematode is immobilized, the fungus invades and consumes its body.

## **Fungi and Plants:**

The association of fungi and plants is ancient and involves many different fungi. Fungi are an important group of plant pathogens—most plant diseases are caused by fungi—but fewer than 10% of all known fungi can colonize living plants. Plant pathogenic fungi represent a relatively small subset of those fungi that are associated with plants. Most fungi are decomposers, utilizing the remains of plants and other organisms as their food source. Other types of associations include the role of fungi as decomposers, as beneficial symbionts, and as cryptic plant colonizers called 'endophytes'. An important group of fungi associated with plants is mycorrhizal fungi. Mycorrhiza means 'fungus root', and it refers to a mutually beneficial association (a type of symbiosis) between fungi and plant

roots. There are seven major types of mycorrhizal associations, the most common of which is the arbuscular mycorrhizae, involving members of phylum Glomeromycota associated with roots of most major groups of plants.

**Lichens** are examples of a symbiotic association involving a fungus and green algae or less frequently Cyanobacteria. The lichen thallus is composed mostly of fungal hyphae, usually with the alga or cyanobacterium confined to discrete areas of the thallus. In lichens, reproductive structures of the fungus are often conspicuous, for example disc- or cup-like structures called apothecia.

### **Edible and Non-Edible Fungi:**

Edible mushrooms are the fleshy and edible fruit bodies of several species of macrofungi (fungi which bear fruiting structures that are large enough to be seen with the naked eye). They can appear either below ground (hypogeous) or above ground (epigeous) where they may be picked by hand. Edibility may be defined by criteria that include absence of poisonous effects on humans and desirable taste and aroma. Edible mushrooms are consumed for their nutritional and culinary value. Mushrooms, especially dried shiitake, are sources of umami flavor.

Edible mushrooms include many fungal species that are either harvested, wild or cultivated. Easily cultivated and common wild mushrooms are often available in markets, and those that are more difficult to obtain (such as the prized truffle, matsutake and morel) may be collected on a smaller scale by private gatherers. Some preparations may render certain poisonous mushrooms fit for consumption.

Before assuming that any wild mushroom is edible, it should be identified. Accurate determination and proper identification of a species is the only safe way to ensure edibility, and the only safeguard against possible accident. Some mushrooms that are edible for most people can cause allergic reactions in some individuals, and old or improperly stored specimens can cause food poisoning.

Great care should therefore be taken when eating any fungus for the first time, and only small quantities should be consumed in case of individual allergies. Deadly poisonous mushrooms that are frequently confused with edible mushrooms and responsible for many fatal poisonings include several species of the genus *Amanita*, particularly *Amanita phalloides*, the 'death cap'. Even normally edible species of mushrooms may be dangerous, as mushrooms growing in polluted locations can accumulate pollutants, such as heavy metals.



## EDIBLE FUNGI



Button Mushroom: *Agaricus bisporus*



*Pleurotus*



*Morchella*



*Amanita caesarea*



Cauliflower Fungi: *Sparassis crispa*



Charcoal Burner Mushroom



**NON-EDIBLE FUNGI**



***Polyporus***



**Giant Puff Balls**



***Amanita muscaria***



**Bird's Nest Fungi: *Cyathus***



***Xylaria polymorpha***



***Xylaria hypoxylon***





***Ganoderma***



**Coral Fungi: *Clavaria vermicularis***



***Macrosporus affinis***



**Coral Fungi: *Calocera***



**Earth Star Mushroom: *Geastrum***



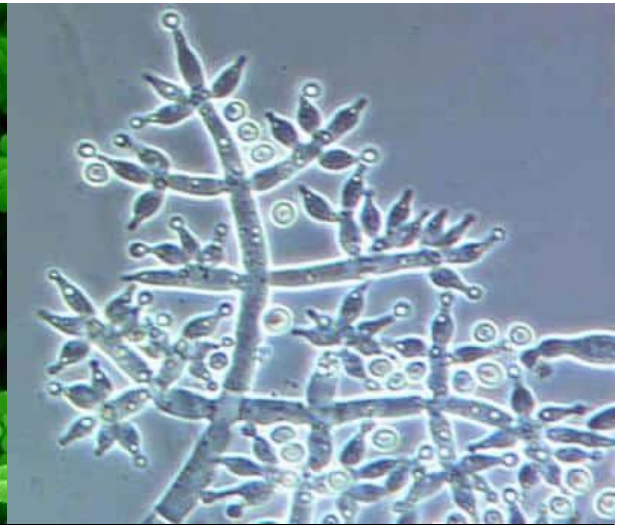
**Orange Peel Fungus: *Aleuria aurantia***



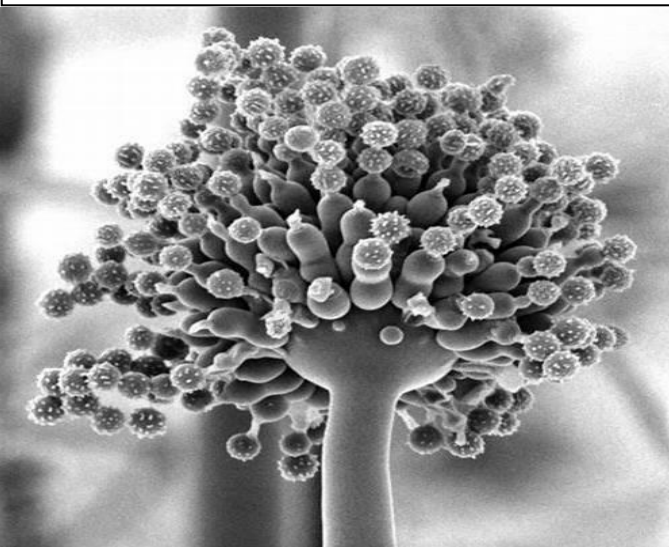
**INDUSTRIALLY IMPORTANT FUNGI:**



*Penicillium*



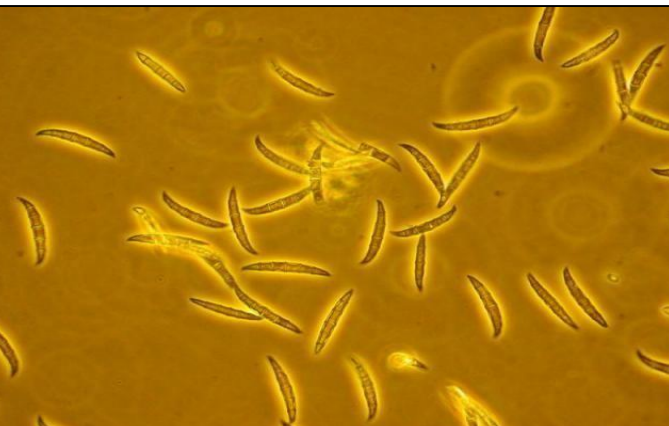
*Trichoderma*



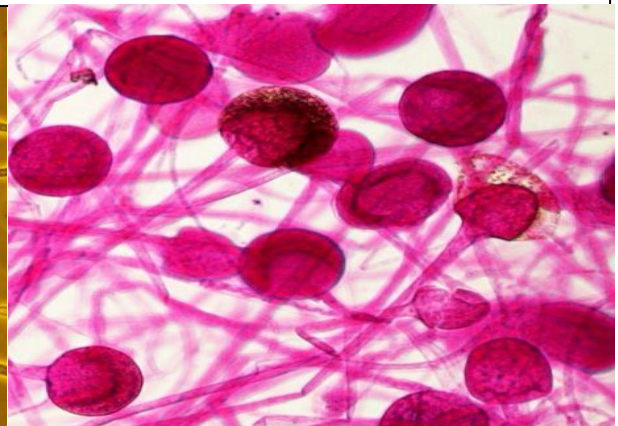
*Aspergillus niger*



Yeast: *Saccharomyces*



*Gibberella fujikuroi*



*Rhizopus*



## **Mushrooms:**

Mushrooms are the fleshy fruiting bodies of certain fungus, some of which are edible, but a minority of them are toxic. Every year, a large number of people die from eating poisonous mushrooms. It is useful to identify whether a mushroom is poisonous according to the appearance features of the mushroom. The automatic recognition of mushroom toxicity has important social and application value in effectively preventing food poisoning.

Current methods of recognizing poisonous mushrooms can be roughly divided into four categories: chemical determination, animal experimentation, fungal classification, and folk experience. At present, the research of poisonous mushrooms based on these methods not only has been imperfect but also has left much to be desired.

The classification of poisonous mushrooms has evolved from the biological level to the molecular level. Therefore, the application of chemical determination methods to detect poisonous mushrooms is becoming increasingly popular. However, there are strict requirements for the experimental conditions, which are often limited to the laboratory. Due to the great number of unstable toxins, the method of toxic chemical detection cannot be used to distinguish edible mushrooms from poisonous ones. This approach requires professional knowledge and is, therefore, not suitable for the average person.

Generally, mushrooms with intact cells, bright colours, and the lack of birds and insects interacting with them are likely to be poisonous, particularly if they are found in places where animals are foraging. To investigate the above situation empirically, the animal acute toxicity test is commonly used to classify poisonous mushrooms. Although the methods involved are simple, they carry some limitations, such as low efficiency, material and dosage concerns, and the varying sensitivities of different animals. Therefore, special institutions or facilities are needed to facilitate the application of these methods.

## **Mushrooms and Health:**

Edible mushrooms like maitake and shiitake have also been used as medicine throughout history. Other mushrooms that are too tough to eat have been used solely for medicinal purposes such as **reishi**. Plant chemicals and components in mushrooms may



exert anti-oxidant, anti-inflammatory and anti-cancer effects, but the exact mechanism is still unclear and an area of active research. Animal and cell studies show that mushrooms can stimulate the activity of immune cells, macrophages, and free radicals that can stop the growth and spread of **tumor cells** and cause existing tumor cells to die. Various polysaccharides in mushrooms including **beta-glucans** are believed to exert these cancer-fighting properties.

The common button mushroom (*Agaricus bisporus*) is the most common. It is the mildest-tasting mushroom and can be eaten raw or cooked. Other types of include:

**Chanterelle:** the cap is a wavy golden trumpet-like shape

**Cremini (baby bella):** a young Portobello mushroom that is dark and firm

**Enoki:** long, thin white stems with small white caps that are eaten raw or cooked

**Maitake:** a head that resembles flowering leaves

**Morel:** the cap is a spongy dimpled oblong shape

**Oyster:** a fan-shaped delicate cap

**Porcini:** a reddish-brown rounded cap with a thick cylindrical stem

**Portobello:** a large brown thick cap with rich juicy flavor that work well as a meat substitute

**Shiitake:** a dark brown umbrella cap with a thin cream-colored stem

Mushrooms that have been specially treated with UV light may carry a label on the front of the package that says "UV-treated" or "rich in vitamin D," or display the exact amount of vitamin D they contain.

# **National Mushroom Day:**

## **History of National Mushroom Day:**

Mushrooms offer a delicious flavor when eaten on their own or added to various dishes. They are also one of the most sustainably produced foods on the planet. Mushrooms are low in calories and contain a wide variety of nutritious substances that are part of a healthy and balanced diet for humans.

Originating in Australia, National Mushroom Day is particularly meant for **mushroom farmers, restaurants, cafes** and **health professionals** to enjoy and celebrate everything related to growing and eating mushrooms.

## **How to Celebrate National Mushroom Day:**

The celebration and enjoyment of National Mushroom Day comes along with eating them and raising awareness for the benefits to the people as well as to the earth. Consider implementing some of these interesting ideas in making plans to celebrate the day:

### **Enjoy Eating Mushrooms**

In honor of National Mushroom Day, the first order of business is to buy and eat some mushrooms! Add them to a salad, make them into a creamy soup, saute them, put them on a burger, steam them in the microwave, or stuff the caps of larger mushrooms. The options are almost endless when it comes to different ways to prepare and enjoy eating mushrooms!

### **Get a Health Boost with Mushrooms**

Mushrooms are chock full of healthy nutrients that can build into an already balanced diet. Depending on the type of mushrooms, they can bring a variety of different benefits to the diet, including:

- Mushrooms contain important **minerals**. Containing amounts of **selenium, copper, magnesium, phosphorus, zinc and thiamine**, mushrooms offer a rich source of healthy, necessary minerals for the diet.
- Mushrooms are **low in calories**. Enjoying a handful of mushrooms is no problem, even for those who are trying to count their calories. Of course, it depends on the particular variety, but one cup of **crimini mushrooms** contains only **15 calories**, which is hardly even noticeable in the grand scheme of things!
- Mushrooms are **anti-inflammatory**. Because mushrooms have been shown to help the body fight off inflammation, these little gems are believed to be helpful in promoting a strong and effective immune system. In fact, researchers have shown that, when people eat mushrooms, microphages are stimulated which help reduce susceptibility to various illnesses.
- Mushrooms can help **lower the blood pressure**. As a source of **potassium**, mushrooms offer the capacity to keep the cardiovascular system healthier. Potassium is known to reduce blood vessel tension and therefore lower the blood pressure.

### **Learn Fun Facts About Mushrooms:**

In honor of **National Mushroom Day**, celebrate by learning a few bits of information about this little food and share it with someone else to raise awareness for the day. Start with some of these fun facts:

- Even though mushrooms don't need light to grow and are very capable of growing in the dark, they do produce **Vitamin D** when they are exposed to ultraviolet light during the growing process.
- Because they are grown indoors, mushrooms have a growing cycle that is year-round. And because they are not affected by the weather, mushrooms can be grown in all over the world.
- Some mushrooms can **glow in the dark!** At least **eighty** different species of mushrooms are able to glow in the dark, and some are so bright that they have earned the nickname "**electric mushrooms**".



- Mushrooms can help people stay young. With high amounts of certain types of **antioxidants** (ergothioneine and glutathione), mushrooms fight off free radicals and arm the body with the ability to reduce the occurrence of age-related diseases and illnesses, such as Alzheimer's disease.

### **Cook With Mushrooms:**

In general, mushrooms are affordable, healthy and low in calories. Plus, they can be a super versatile way to get creative with cooking meals. Consider some of these ideas when it comes to adding mushrooms to various styles of cooking:

- Put chopped fresh mushrooms on pizza as a delicious topping. Choose meatless pizza with dairy-free cheese to make the meal more vegetarian and vegan-friendly.
- Add mushrooms to stir-fry. One delicious way to eat mushrooms, especially for kids who might not be ready for their strong flavor or texture, is to combine them with a variety of other vegetables in a Chinese style stir fry meal. Include with carrots, celery, snap peas, broccoli and tofu with some delicious soy sauce.
- Eat mushrooms for breakfast. Mushrooms make a delicious addition to breakfast food. Saute some to serve with scrambled eggs, or chop some fresh mushrooms and put them into an omelette.
- Mushrooms can be made into a delicious cream sauce that can be used in all sorts of ways. Try using it as the centre of a ravioli. Pour it over rigatoni pasta. Make it into a mushroom soup. Serve it with steak and potatoes, and more.

# MUSHROOMS:





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***Pleurotus***



***Morchella***



***Amanita caesarea***

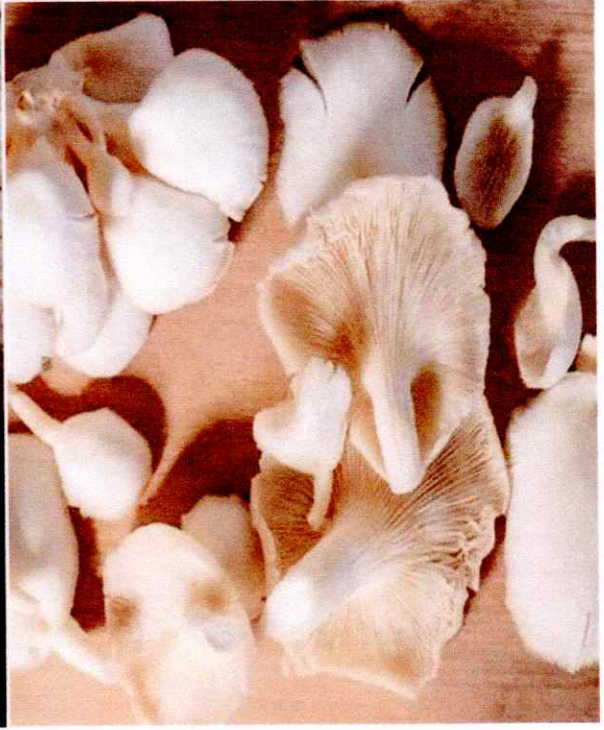
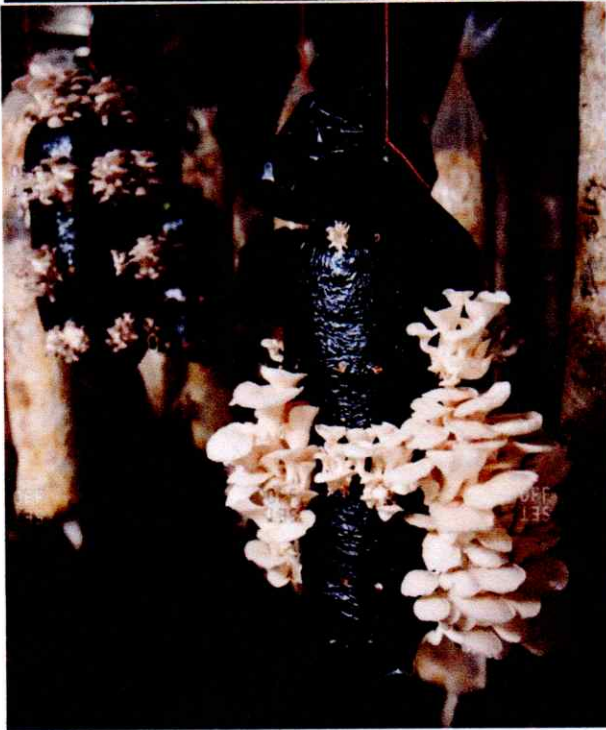


**Cauliflower Fungi: *Sparassis crispa***



**Charcoal Burner Mushroom**



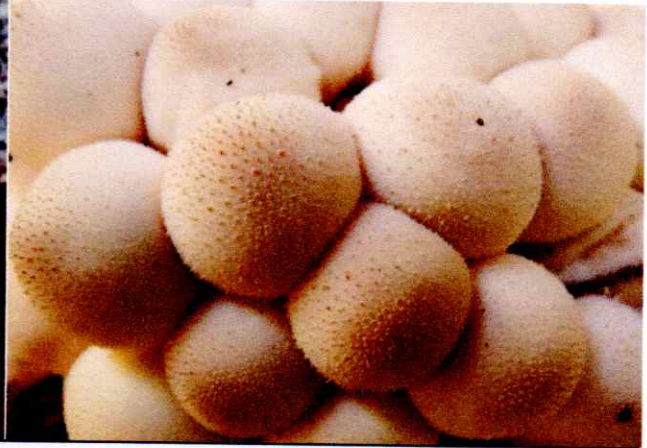




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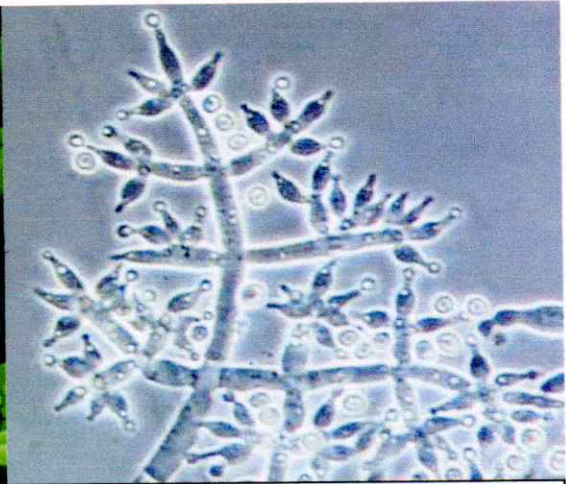
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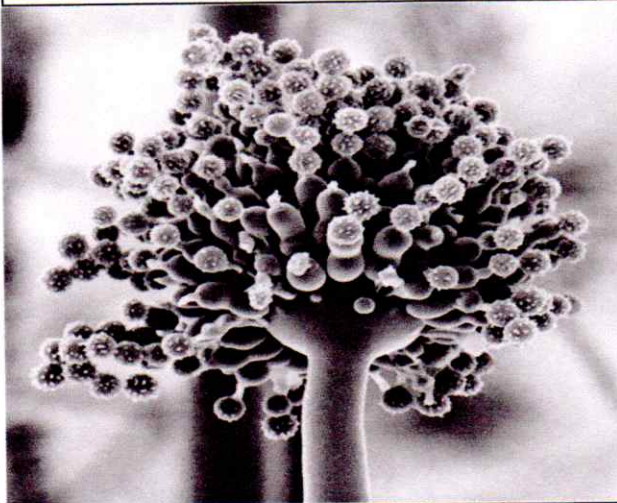
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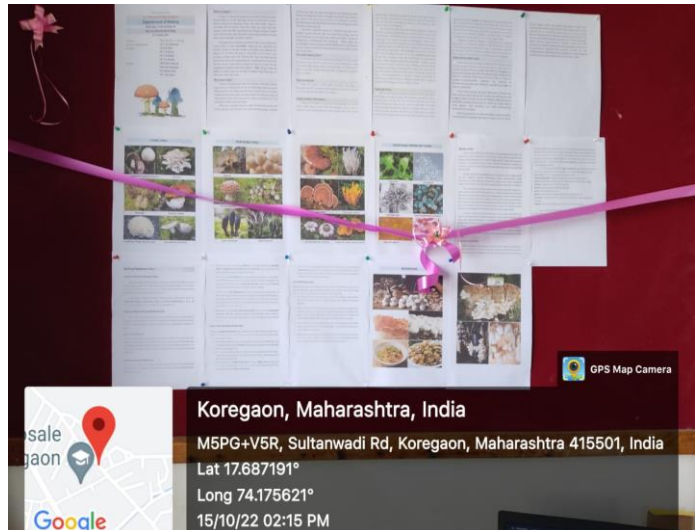


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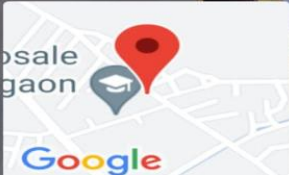
**Department of Botany**

**World Mushroom Day**

**15<sup>th</sup> October, 2022**







**Koregaon, Maharashtra, India**

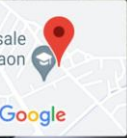
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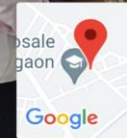
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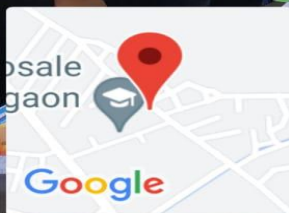
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