

# Laboratory work 2

## FUNGI KINGDOM

Divisions Chytridiomycota

Divisions Zygomycota

Divisions Ascomycota

Division Basidiomycota

Lichens

## Material:

Divisions Chytridiomycota

Class Chytridiomycetes

Order Chytridiales

*Olpidium brassicae*

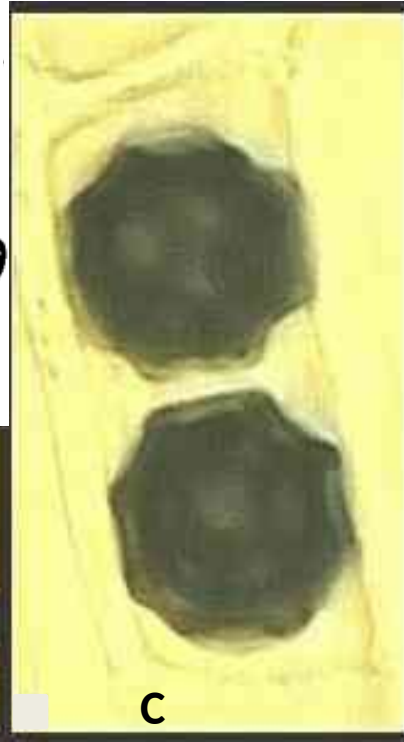
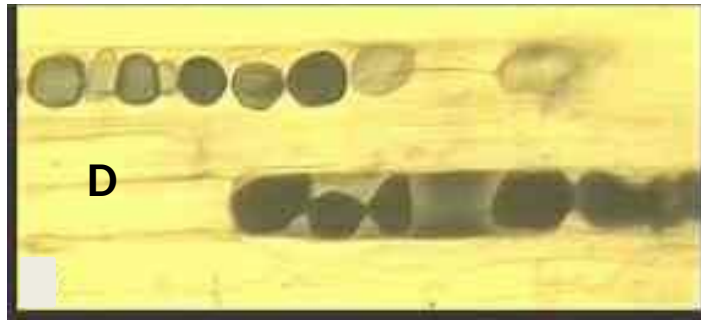
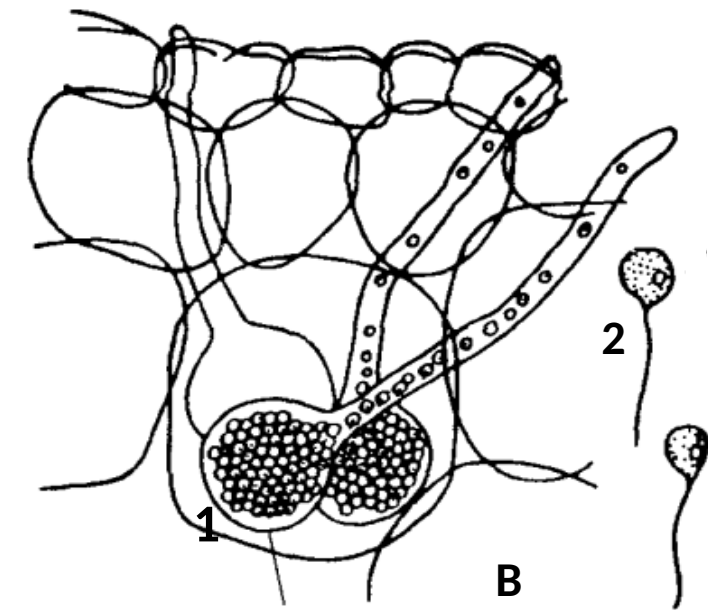
## Objective:

To investigate the structural features of *Olpidium brassicae*.

*Olpidium brassicae* is a plant pathogen, it is a fungal obligate parasite. English names : *Olpidium seedling blight, root burn disease*

## Tasks of work:

Draw a cell with plasmodium, zoosporangium and zoospore.



A

## Seedling diseases: cabbage *Oplidium brassica*

*Oplidium brassicae*: A - affected seedlings; 1B - zoosporangium in the cells; 2B - zoospores; C - cell with plasmodium of fungi; D - the formation of zoospores .

## **Material:**

**Divisions Zygomycota**

**Class Zygomycetes**

**Order Mucorales**

***Mucor sp.***

mycelium, sporangiophores and sporangia of *Mucor* (live material).

## **Objective:**

examine the structure and development of Zygomycetes

## **Tasks of work:**

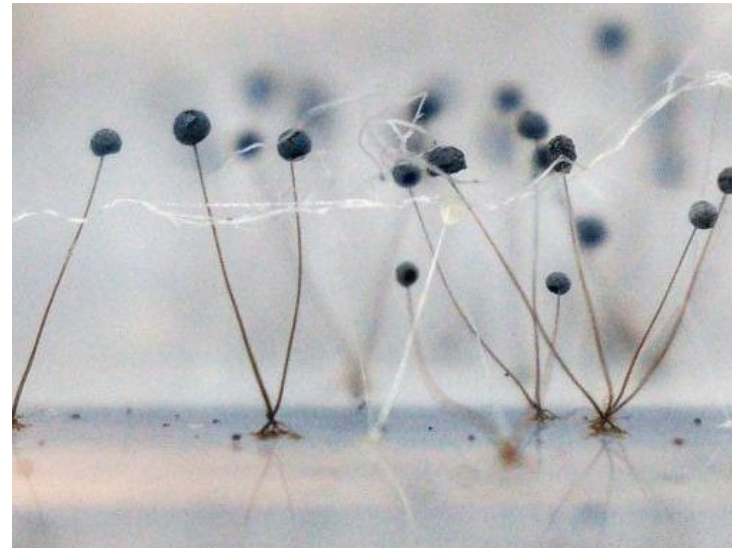
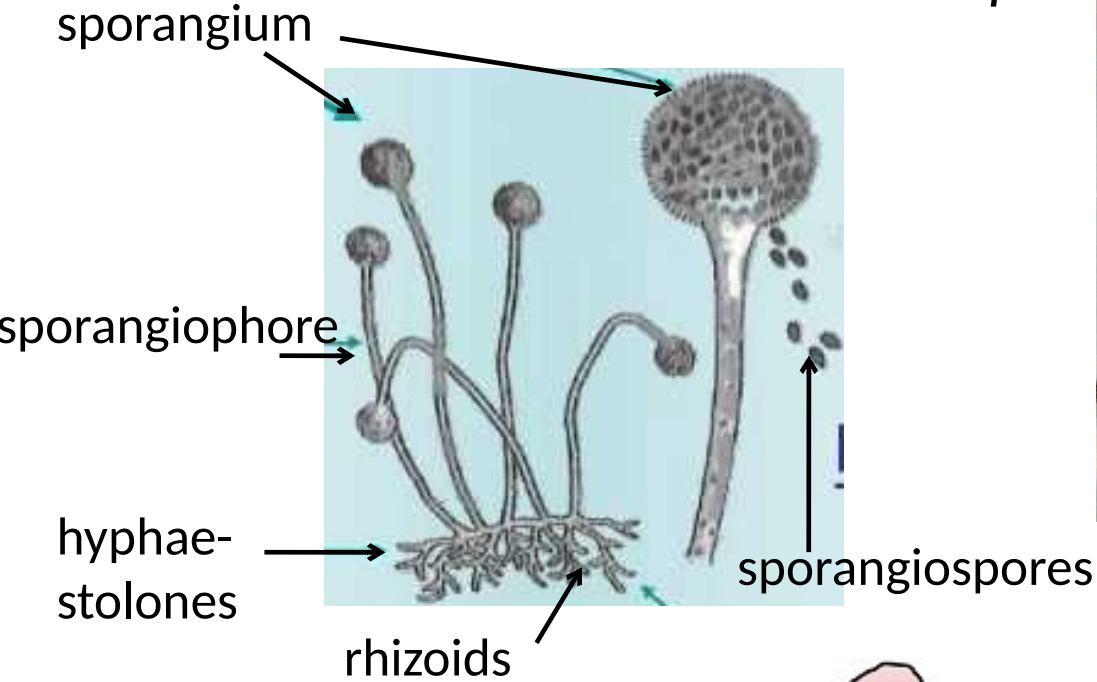
Draw the appearance of the mycelium of *mucor*.

## **Order of work**

Under the binocular consider the colony of *mucor* with sporangiophores and sporangia. Prepare a temporary mount of non-septate mycelium, sporangiophores with immature and mature sporangia. Consider and draw the fragment of mycelium, denote sporangiophores with sporangia.

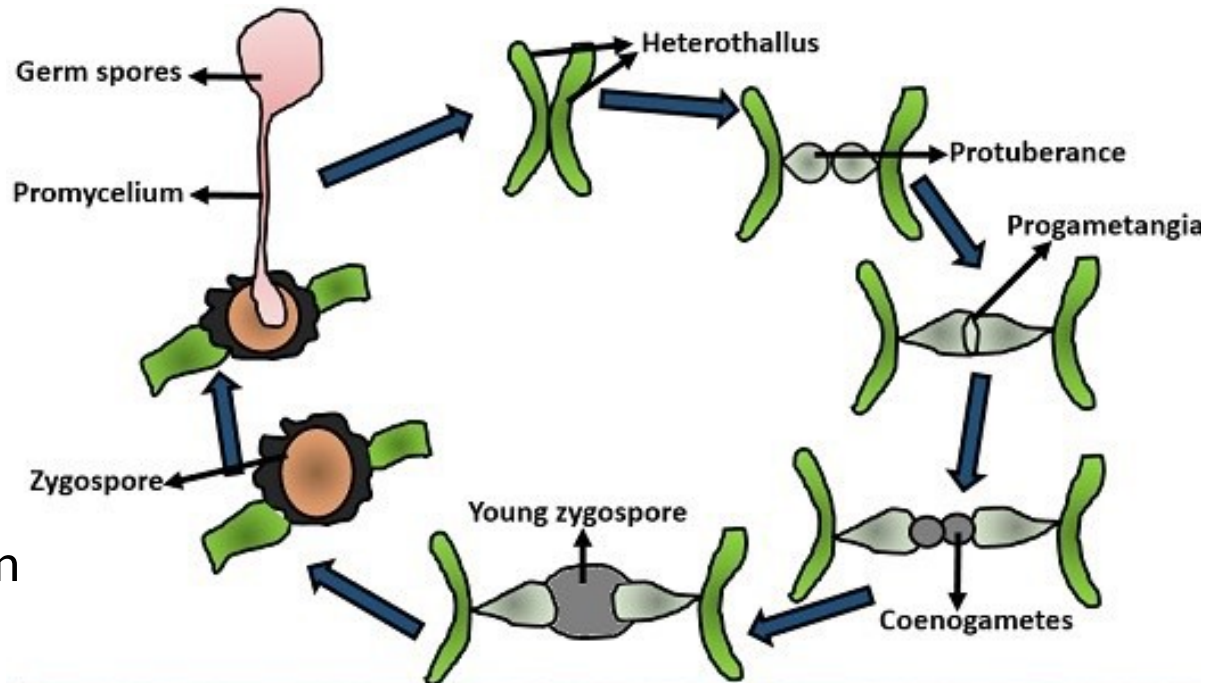
Draw the Process of Conjugation.

*Mucor* sp.



Colonies of this fungal genus

Process of Conjugation  
in genus *Mucor*



## **Material:**

**Divisions** Ascomycota

**Class** Hemiascomycetes

**Order** Saccharomycetales

**Genus** *Saccharomyces*

*Saccharomyces cerevisiae* (baker's yeast cells)

## **Objective:**

examine the structure of baker's yeast cells.

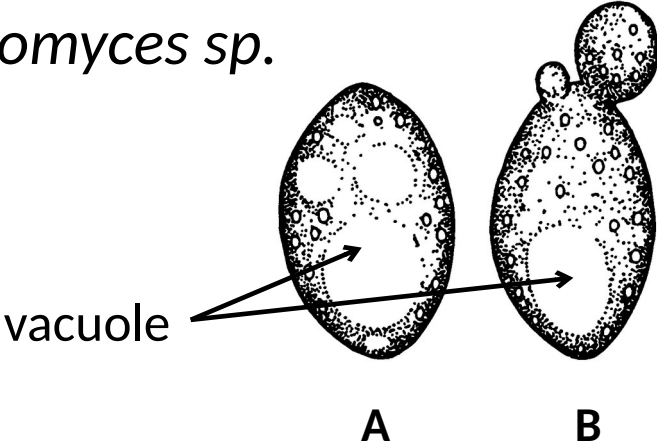
## **Tasks of work:**

Draw the budding of baker's yeast cells

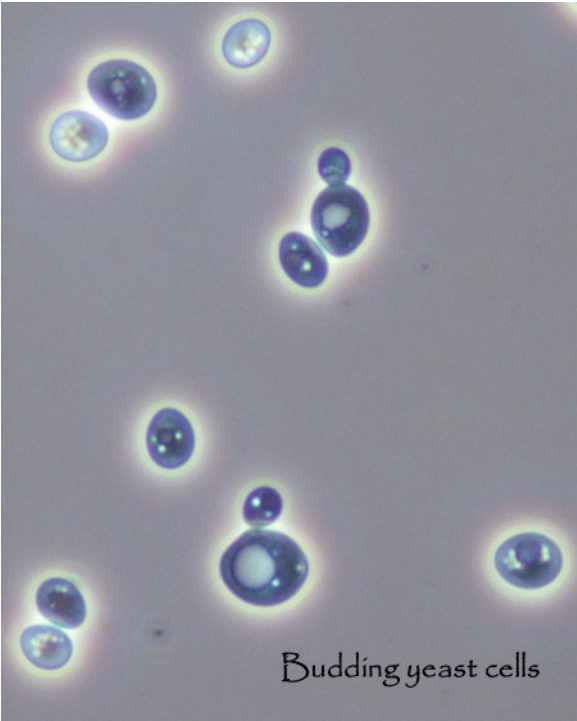
## **Order of work**

Prepare a temporary mount and examine baker's yeast cells. Find budding cells.

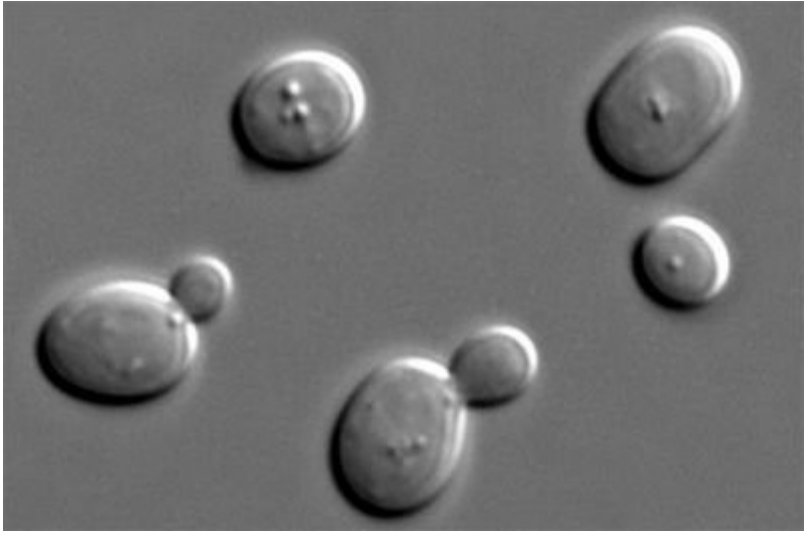
*Saccharomyces sp.*



A - vegetative cell; B - budding cell of *Saccharomyces sp.*



**Budding yeas**



## **Material:**

**Divisions** Ascomycota

**Class** Plectomycetes

**Order** Eurotiales (Plectascales, Aspergillales)

*Penicillium*, *Aspergillus*

## **Objective:**

Examine the structure of *Penicillium* and *Aspergillus*

## **Tasks of work:**

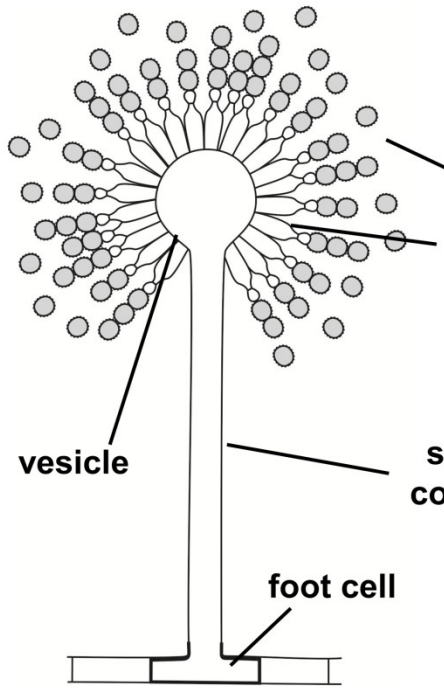
draw the appearance of *Aspergillus* and *Penicillium* with conidiophores.

## **Order of work**

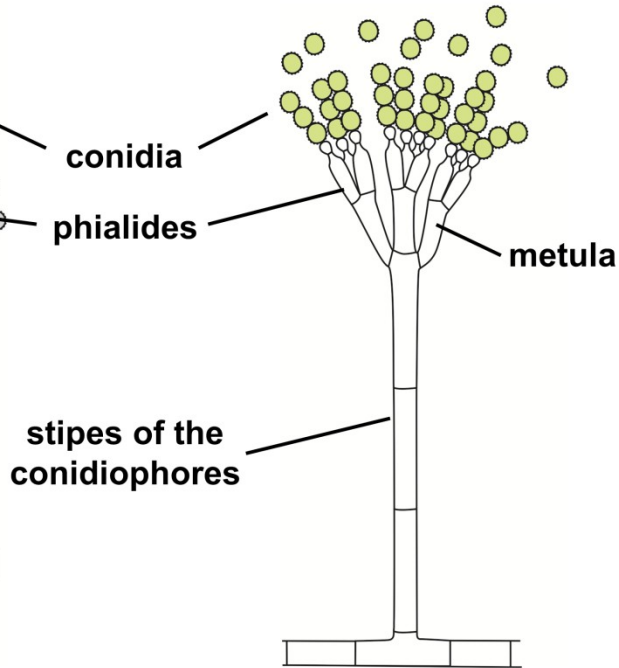
Prepare temporary mount, consider and draw conidiophores



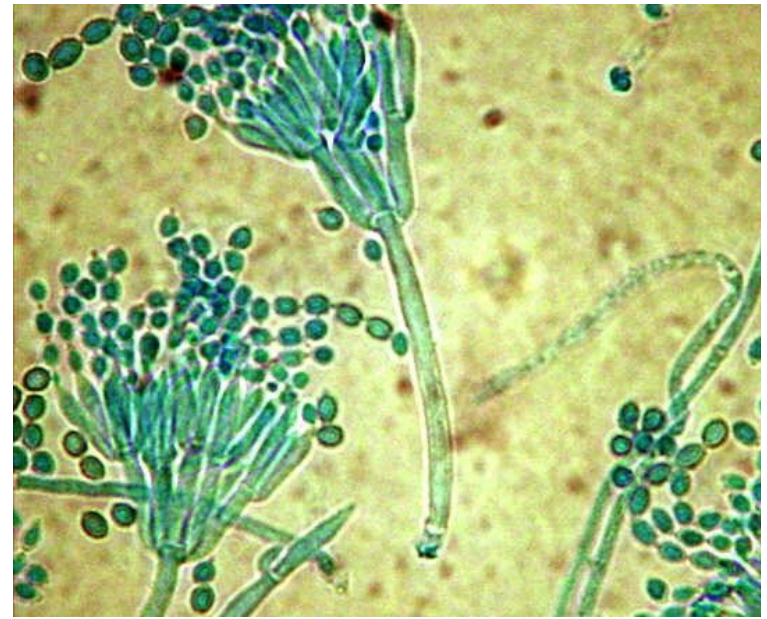
*Aspergillus sp.*



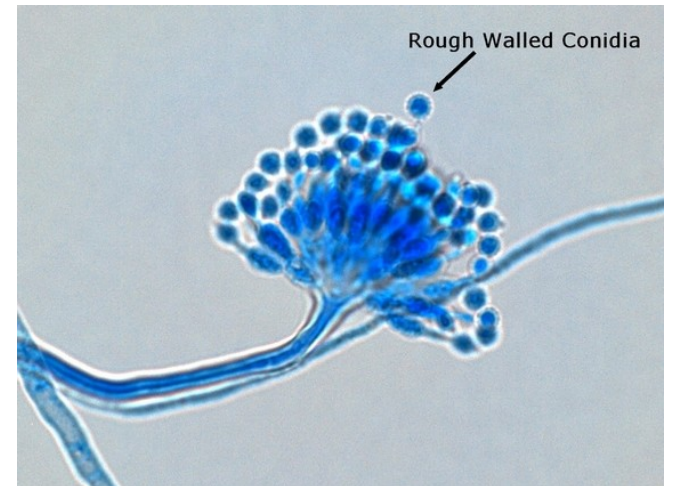
*Penicillium sp.*



Conidiophores



*Penicillium*



*Aspergillus*

## 1. *Penicillium*

The genus *Penicillium* is host to a wide variety of species found in practically all environmental niches. They have been given the name "green mold" or "blue mold", but many *Penicillium* species possess a variety of colors, textures, and morphological characteristics. The genus gained notoriety after their ability to produce antibiotics, namely penicillin, was discovered in 1941.

Classification in *Penicillium* is based solely upon conidiophore structure called the penicillus. The penicillus, or "brush", is the whorled structure which bears the single celled conidia.

## 2. *Aspergillus*

As with the genus *Penicillium*, *Aspergillus* is classified based on the morphology of the conidiophore. The conidiophores are borne on a hyphal cell termed a foot cell. The conidiophore stalk ends with an enlarged vesicle which bears a group of sterigmata. These, in turn, can bear secondary sterigmata called metulae which then bear the conidia in unbranched chains.

**Material:**

**Divisions Ascomycota**

**Class Pyrenomycetes**

**Order Hypocreales**

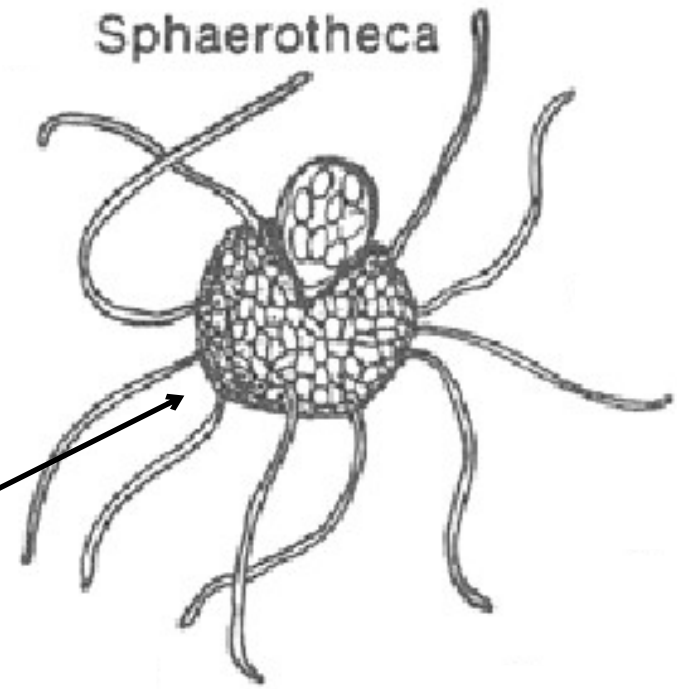
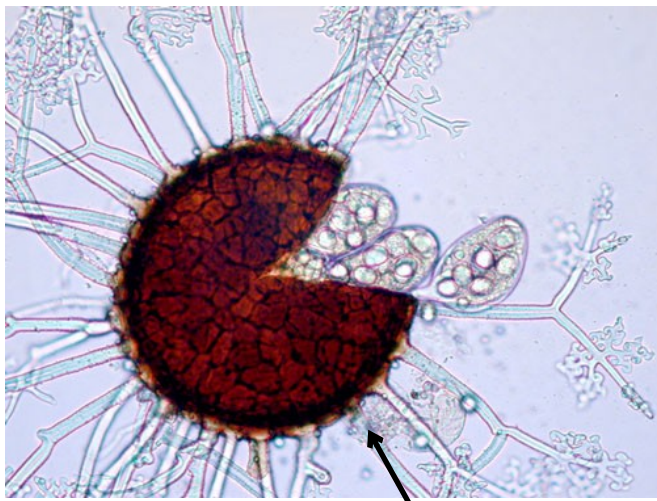
**Genus *Sphaerotheca* (powdery mildew)**

**Objective:**

Examine the structure of cleistothecia of “powdery mildew”

**Tasks of work:**

Prepare temporary mount and draw cleistothecia.



Cleistothecia of *Sphaerotheca* with appendages ("powdery mildew").



Obligatory parasites of higher plants, cause the disease - "**powdery mildew**". Erysiphales have superficial mycelium which extracts nourishment from the host plant through specialized hyphae that penetrate the epidermal cells of the host by means of absorbing organs called haustoria.

At the end of the growing season, powdery mildew fungi produce sexual spores, known as **ascospores**, in a sac-like **ascus** (pl. **asci**) enclosed in **a fruiting body called a chasmothecium** (pl. chasmothecia) (**cleistothecium** is a former term for this structure that is still widely used). The chasmothecium is generally spherical with no natural opening; asci with ascospores are released when a crack develops in the wall of the fruiting body. A variety of appendages may occur on the surface of the chasmothecia. These appendages are thought to act like the hooks of Velcro fastener, attaching the fruiting bodies to the host, particularly to the bark of woody plants, where they overwinter.

**Material:**

**Divisions Ascomycota**

**Class Euascomycetes**

**Order Hypocreales**

***Claviceps purpurea***

**Objective:**

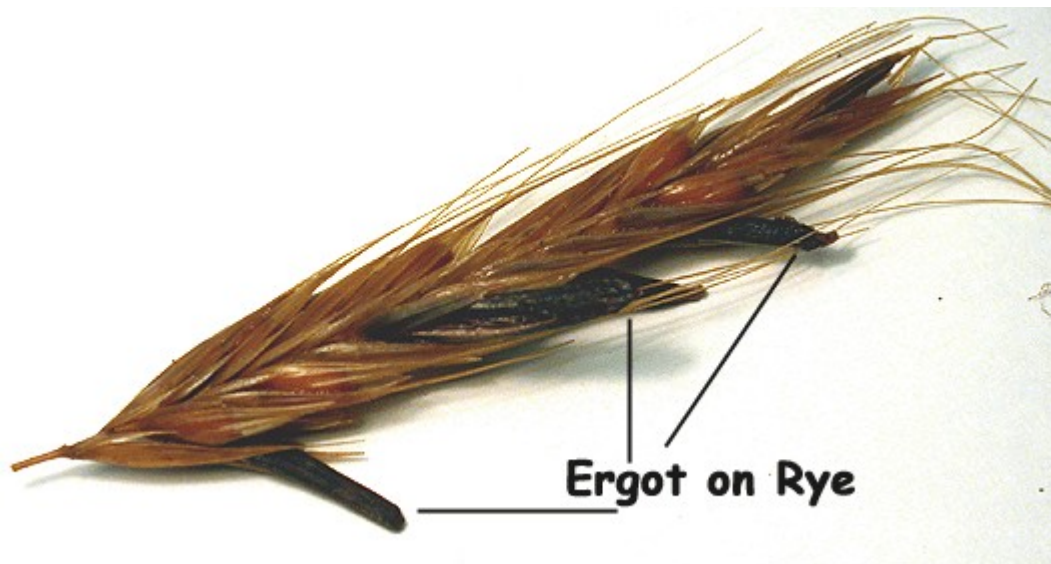
examine the features of the structure and development of

*Claviceps purpurea*

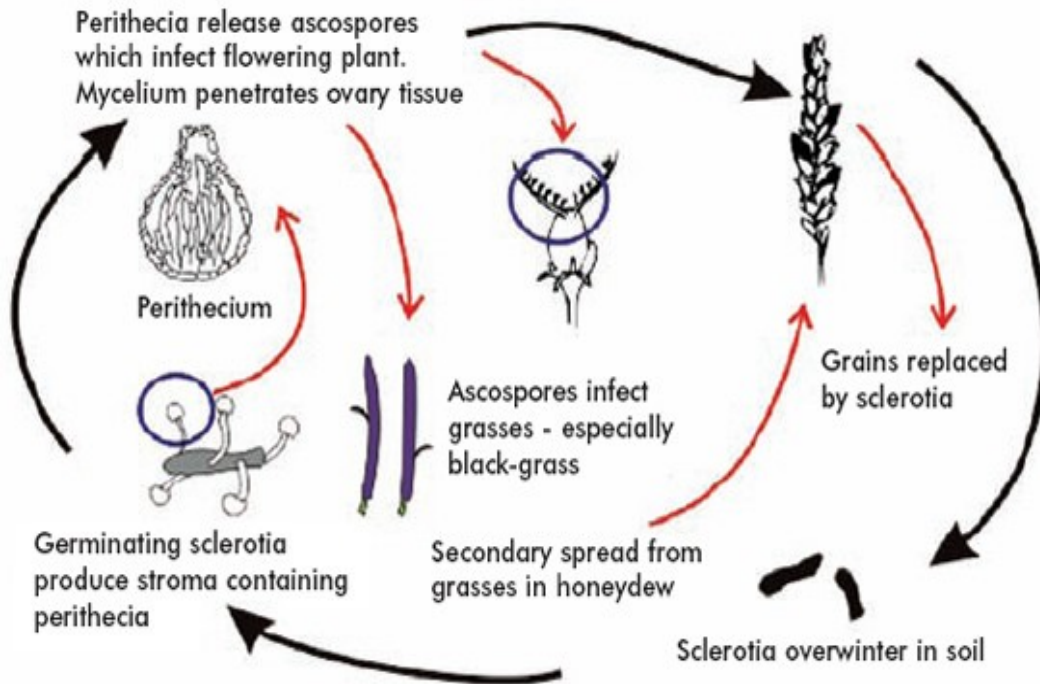
**Tasks of work:**

Draw the life cycle of ergot





*Claviceps purpurea* ("rye ergot fungus") grows on rye and related plants, and produces alkaloids that can cause ergotism in humans and other mammals who consume grains contaminated with its fruiting structure (called ergot sclerotium).



Life cycle of ergot

A *sclerotium* plural sclerotia is a compact mass of hardened fungal mycelium containing food reserves. One role of sclerotia is to survive environmental extremes. In some higher fungi such as ergot, sclerotia become detached and remain dormant until favorable growth conditions return.

## **Material:**

**Divisions Ascomycota**

**Class Discomycetes**

**Order Pezizales**

***Morchella conica*, *Gyromitra esculenta***

## **Objective:**

study the features of the structure of *Morchella conica* and *Gyromitra esculenta*

## **Tasks of work:**

Draw the appearance of the fruit body of the indicated representatives





Fruit body of *Morchella conica*

***Morchella***, the true morels, is a genus of edible sac fungi closely related to anatomically simpler cup fungi in the order Pezizales (division Ascomycota). These distinctive fungi have a honeycomb appearance due to the network of ridges with pits composing their cap. Morels are prized by gourmet cooks, particularly in French cuisine.



## Fruit body of *Gyromitra esculenta*

*Gyromitra esculenta* is an ascomycete fungus from the genus *Gyromitra*, widely distributed across Europe and North America. The fruiting body, or mushroom, is an irregular brain-shaped cap dark brown in colour that can reach 10 cm high and 15 cm wide, perched on a stout white stipe up to 6 cm high.

Although potentially fatal if eaten raw, *Gyromitra esculenta* is a popular delicacy in Scandinavia, Eastern Europe, and the upper Great Lakes region of North America.

**Material:**

**Divisions Basidiomycota**

**Class Basidiomycetes**

**Order Polyporales**

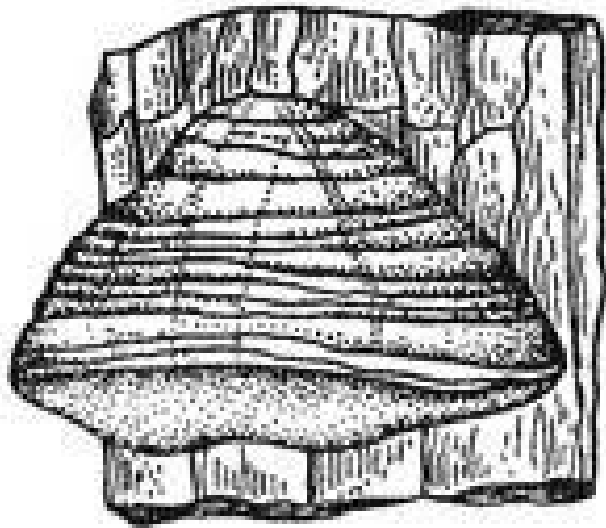
***Fomes fomentarius***

**Objective:**

Examine structure of *Fomes fomentarius*.

**Tasks of work:**

Draw the appearance of the fruit body of *Fomes fomentarius* on trunk of tree.



*Fomes fomentarius*

## **Material:**

**Divisions Basidiomycota**

**Class Holobasidiomycetes**

**Order Agaricales**

***Agaricus bisporus*.**

*Agaricus bisporus* is an edible basidiomycete mushroom native to grasslands in Europe and North America. It has two color states while immature—white and brown—both of which have various names. When mature, it is known as portobello mushroom. When immature and white, this mushroom may be known as common mushroom, button mushroom, cultivated mushroom, table mushroom, crimini mushroom and **champignon mushroom**.

## **Objective:**

study the features of the structure of *Agaricus bisporus*.

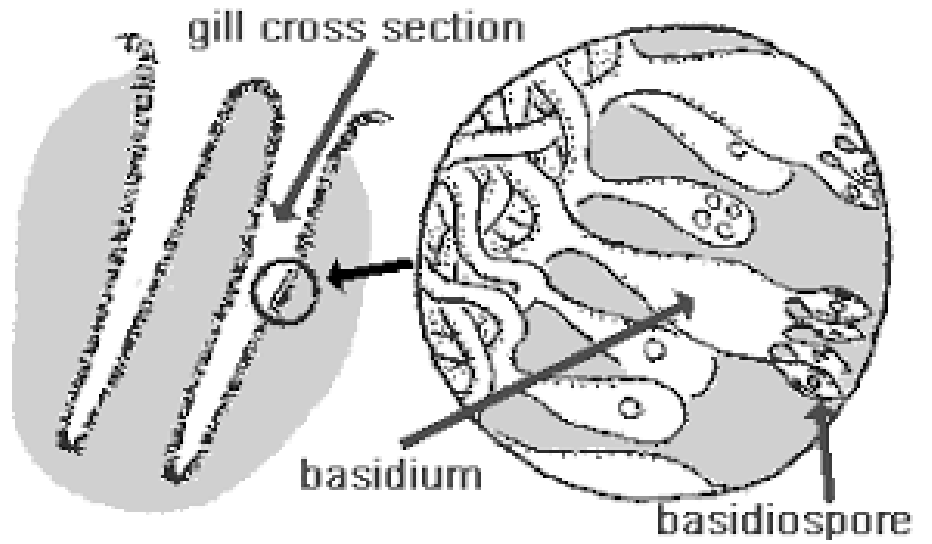
## **Tasks of work:**

Cut a mushroom to reveal the gills. Basidia and basidiospores form on the gills. View a cross section of the cap of a mushroom. Draw the appearance of the fruit body of the *Agaricus bisporus* and basidia and basidiospores on the gills.

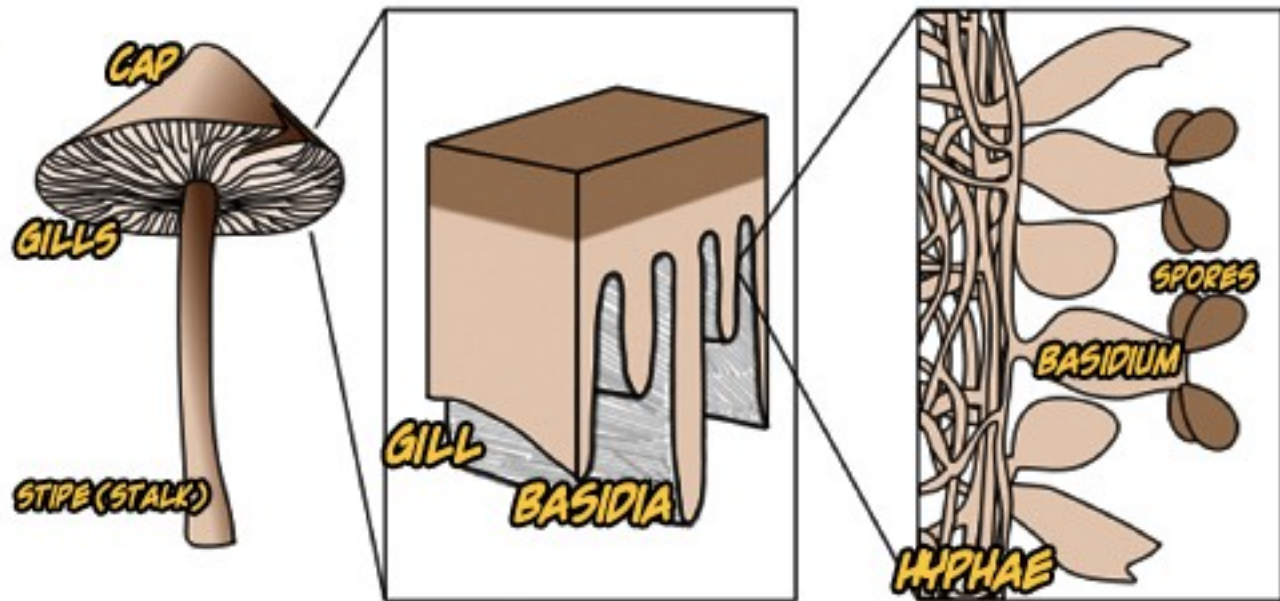
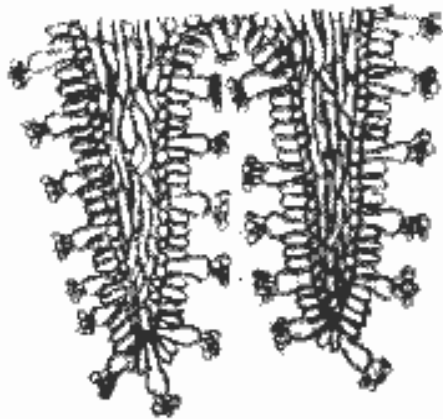




2. Champignon (*Agaricus campestris*).  
a. Jüngerer Exemplar, durchschnitten.



## Basidia and basidiospores on the gills



## **Material:**

**Divisions Basidiomycota**

**Class Teliobasidiomycetes**

**Order Uredinales**

***Puccinia graminis* (stem rust) .**

## **Objective:**

Study the morphology of stem rust (*Puccinia graminis*).

## **Tasks of work:**

Draw the appearance of the affected plants, the location of the sporophores of the fungus on it.

Draw the life cycle of *Puccinia graminis*.



Pycniospores in a sticky honeydew



Powdery aeciospores on the lower leaf surface



The aecial cups are yellow and sometimes elongate to extend up to 5 mm from the leaf surface



Uredinia of *Puccinia graminis*



The stem, black, and cereal rusts are caused by the fungus *Puccinia graminis* and are a significant disease affecting cereal crops. Crop species that are affected by the disease include bread wheat, durum wheat, barley and triticale. Different from most fungi, the rust variations have five spore stages and alternate between two hosts. Wheat is the primary host, and barberry is the alternate host.

In *Puccinia graminis* (Wheat Rust), the species that will be used as the representative for this order, there are five spore stages that are produced and two hosts are required in the completion of the life cycle. The five stages produced are:

**Stage 0: Spermogonium**

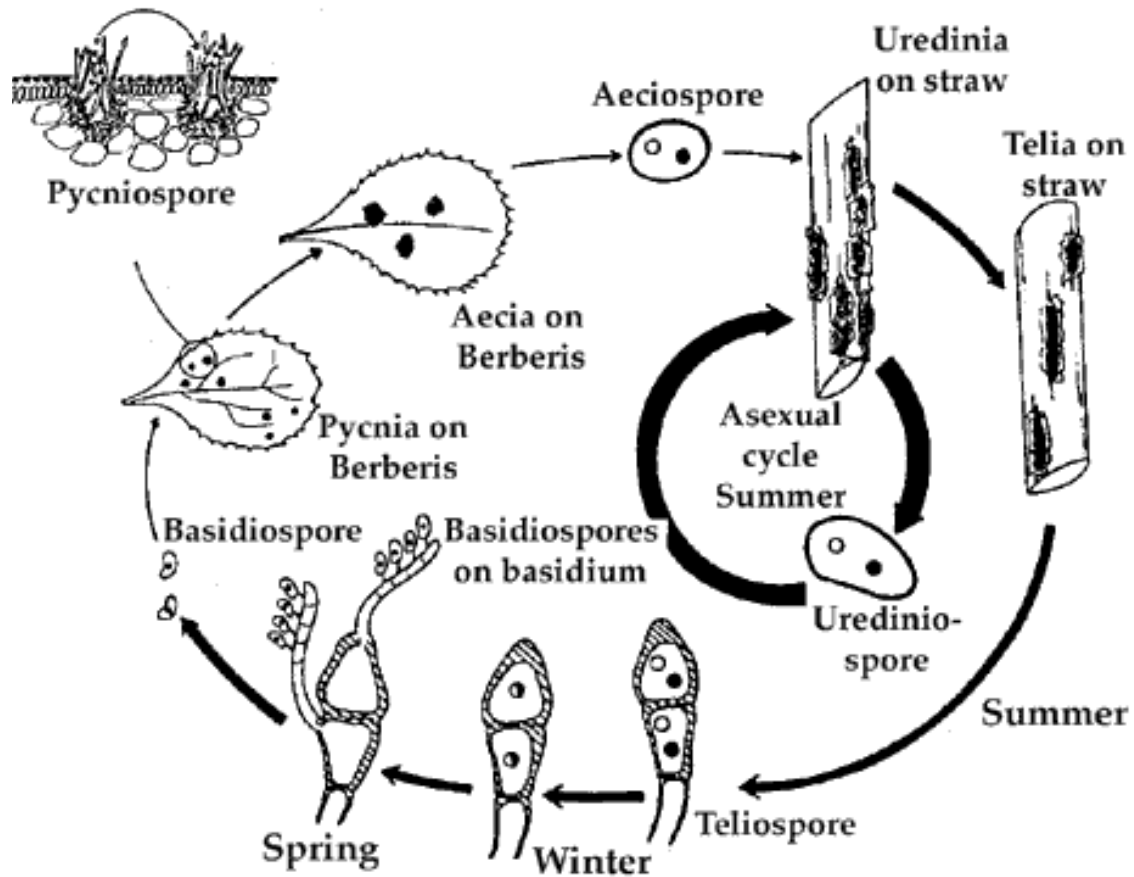
**Stage I: Aecium**

**Stage II: Uredium**

**Stage III: Telium**

**Stage IV: Basidium**

# Life Cycle of *Puccinia graminis*



**Material:**

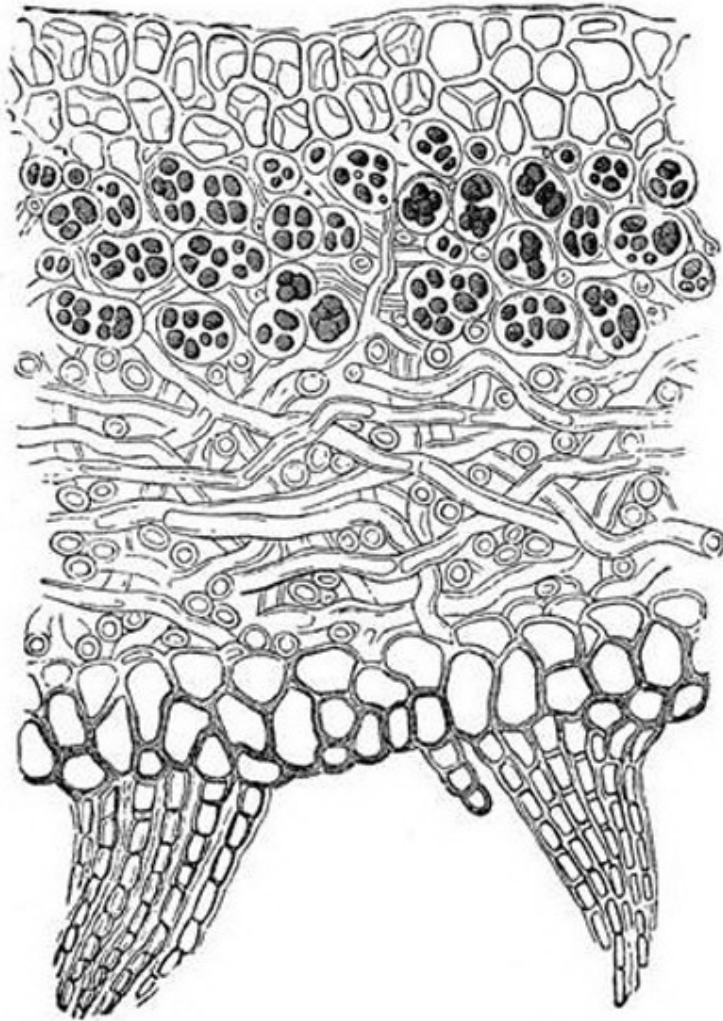
live specimens of the lichens

**Objective:**

Study the lichen's thallus and its cross-section.

**Tasks of work:**

Draw the different appearance of the lichen thallus, cross-section of lichen thallus and denote its parts.



- a upper cortex of fungal hyphae, which provides protection;
- b algal zone where photosynthesis occurs
- c medulla of fungal hyphae,
- d lower cortex, which also provides protection
- e rhizines to anchor the thallus to the substrate

**Thallus of lichen:** This cross-section of a lichen thallus



Squamulose lichens



Shrublike appearance (fruticose)





Crust-like appearance (crustose)



Leaflike (foliose) appearance