College of Sciences

Department of Botany and Microbiology

General Mycology

Section 1. introduction

General mycology is a branch of biology that focuses on the study of fungi, which are a diverse group of eukaryotic microorganisms. Fungi play crucial roles in various ecosystems, serving as decomposers, plant symbionts, pathogens, and sources of food and medicine. Here is an introduction to general mycology:

1. Diversity of Fungi:
Fungi encompass a vast diversity of organisms, including molds, yeasts, mushrooms, and lichens. They are found in nearly every habitat on Earth, from soil and water to air and even within the bodies of plants and animals.

2. Morphology and Structure:
Fungi exhibit a range of morphologies, from unicellular yeast cells to complex multicellular structures like mushroom fruiting bodies. They typically possess cell walls composed of chitin and can reproduce both sexually and asexually.

3. Nutritional Modes:
Fungi are heterotrophic organisms that obtain nutrients by absorbing organic matter from their environment. They play essential roles as decomposers, breaking down complex organic compounds into simpler forms that can be recycled in ecosystems.

4. Ecological Roles:
Fungi form symbiotic relationships with plants as mycorrhizae, aiding in nutrient uptake, and with algae as lichens, contributing to ecological successions. Some fungi are plant pathogens, causing diseases that impact agriculture and forestry.

5. Importance in Industry:
Fungi have significant economic importance in various industries. They are used in food production (e.g., fermentation of bread, cheese, and beverages), pharmaceuticals (e.g., antibiotics and immunosuppressants), and bioremediation (e.g., cleaning up pollutants).

6. Medical Relevance:
Certain fungi can cause infections in humans and animals, ranging from superficial skin infections to life-threatening systemic diseases. Understanding the biology and pathogenicity of these fungi is crucial for medical mycology and patient care.

7. Research and Biotechnology:
Research in mycology is essential for understanding fungal biology, genetics, and ecology. Fungi are also valuable sources of enzymes, bioactive compounds, and biodegradable materials that have applications in biotechnology and bioprocessing.

8. Conservation and Biodiversity:
Conserving fungal biodiversity is vital for maintaining healthy ecosystems and preserving species with potential benefits for human welfare. Efforts to study and protect fungi contribute to overall biodiversity conservation efforts.

In conclusion, general mycology provides a comprehensive understanding of the biology, ecology, and significance of fungi in nature and human society. Studying fungi not only enhances our knowledge of microbial diversity but also reveals the intricate roles these organisms play in shaping ecosystems and influencing various aspects of life on Earth.

The fungal lifestyle
Fungi in everyday life in everyday life we meet fungi and fungal products everywhere. Whenever you go to a shop to buy a food and other things for your household you will come home with a range of products of fungal origin or are results of fungal activities. In Table 1 you find a list of common products:
Champignons : Fungal fruit body (biomass)
Bread :Yeast (carbon dioxide, taste)
Wine: Yeast (alcohol, taste, preservation)
Beer: Yeast (alcohol, carbon dioxide, taste)
Cheese: Moulds (ripening by enzymes, taste)
Soft drinks: Moulds (citric acid)
Washing powder: Enzymes
Vegetables (onions): Mycorrhiza
Wood: Mycorrhiza

True fungi divide into four taxonomic groups, Chytridiomycota, Zygomycota, Basidiomycota and Ascomycota (Fig 1.3). These divisions are based on their genetic relatedness and fits with the different modes of producing sexual spores. Some fungi do not produce sexual spores. Most of them seem to be from Ascomycota based on genetic similarities. Traditionally, all fungi that produce asexual spores and where no sexual stage is known are place in the order Deuteromycota. There is also a group of plants that are seen as fungi from historical reason, the Oomycota. The closest relatives to Oomycota are Brown algae and their cell wall contains cellulose as in plants. Oomycota could be seen as plants with a fungal growth habit that lacks chloroplasts.

Distinctive features of the true fungi (Kingdom Mycota) The true fungi share several features that clearly distinguish them from all other organisms, showing that they are a 'natural' (monophyletic) group of organisms. These features are important in practice because they can provide targets for the actions of antifungal agents. In the list below we see that some of the most powerful drugs for treatment of fungal infections of humans, and the fungicides used for plant disease control, are targeted at the unique biochemical or structural features of fungi.
1. Chitin is a major component of fungal walls (but also found in insects, etc.). The enzyme that synthesizes chitin (chitin synthase) is a target for the polyoxin antibiotics.
2. Fungi are haploid, whereas the other major groups of eukaryotes are diploid.
3. Fungal cell membranes contain ergosterol, whereas animals have cholesterol and plants have sitosterol and other 'phytosterols'. Several antifungal drugs (e.g. ketoconazole) used in human therapy act by blocking ergosterol synthesis. The antifungal antibiotics (e.g. nystatin,

amphotericin B) combine with ergosterol in fungal membranes. And several fungicides used for plant disease control act by disrupting specific steps in the ergosterol synthesis pathway.
4. Fungi synthesise the amino acid lysine by a unique pathway, different from that of other organisms. 5. Fungi have characteristic soluble carbohydrates (the disaccharide trehalose and polyhydric alcohols like mannitol and arabitol) and storage compounds (e.g. glycogen), differing from those of most plants and animals.
6. Fungi have several characteristic ultrastructural features, such as plate-like cristae in the mitochondria (like animals), and tubular unstacked Golgi cisternae (unlike animals or plants).
7. The microtubules of fungi have unique binding affinity for anti-tubulin agents. In particular, fungal tubulins bind to the antibiotic griseofulvin (used to treat some fungal infections of humans) and to the benzimidazole fungicides (used widely for control of fungal pathogens of plants).
8. Finally, fungi differ from other organisms in a range of biochemical and molecular features such as the regulation of some enzymes, some aspects of mitochondrial codon usage, etc.
Isolation of fungi.

Section 2: Classification of Fungi

Many scientists have developed many classifications for fungi such as "Saccardo" 1931, "Martin" 1961, "Hawker" 1967, "Alexopoulous & Mims" 1979

Perhaps the most important and widespread of these classifications is the classification of: Alexopoulous and Mims 1979, which was developed based on the presence of the following characteristics:

1. The presence or absence of the moving stages "plasmodium" in the life cycle of the fungus.
2. The presence or absence of swimming asexual spores "spores"
3. The shape of swimming asexual spores "spores."
4. The formation and type of sexual spores (i.e. whether they are zygotic, ovoid, ascomycete or basidiomycete).

Accordingly, fungi are divided into three categories, and the classification is as follows:

Eukaryota (Mycetae- Fungi)

If it contains motile stages (plasmodium) during its life cycle.	It does not contain motile stages (plasmodium), but it contains swimming asexual spores.	It does not contain any motile stages (plasmodium) or contains floating asexual spores.
الفطريات العارية Division: Gymnomycota وتقسم طبقا لتكوينها لبلازموديوم حقيقي اوكاذب الي : 1- الفطريات اللزجية الخلوية Acrasiogymnomycotina 2- الفطريات اللزجة الحقيقيه Plasmodiogymnomycotina	الفطريات السوطية Division: Mastigomycota وتقسم طبقا لعدد الاسواط الموجودة بالابواغ اللاجنسية الي : 1- فطريات ثنائية السوط Diplomastigomycotina Class, Oomycetes 2- فطريات احادية السوط Haplomastigomycotina Class, Plasmodiophoromycetes	الفطريات اللاسوطية Division: Amastigomycota وتقسم طبقا لتكوين ونوع الابواغ الجنسية الي : 1- فطريات بازيدية Basidiomycetes 2- فطريات اسكية Ascomycetes 3- فطريات زيجوية Zygomycetes 4- فطريات ناقصة Deutromycetes

ينتهي بـــــ	لاسم
mycota	Division(قسم)
mycotina	Sub Division(قسيم)
mycetes	Class(طائفة)
mycetidae	Sub Class(طويئفة)
ales	Order(رتبـة)
aceae	Family(فصيلة)
-----	Genus(جنس)

مثال على تسمية الفطريات تصنفيا:

Superkingdom: *Eukaryota*

Kingdom: *Mycetae* (Fungi)

Division: *Amatigomycota*

Subdivision: *Ascomycotina*

Class: *Ascomycetes*

Sub-Class: *Hemiascomycetidae*

Order: *Endomycetales*

Family: *Sacchromycetaceae*

Genus: *Sacchromyces* **sp.**

Experiment no.: 1
Exp. title: Isolation of microorganisms

Microorganisms are found everywhere in the environment: in the air and water; on the surface of our clothes, walls, furniture; in soil and dust; and on and in our own bodies (skins, hair, and mucous membranes). Many of the soil organisms for example, play important roles in processing vital elements such as phosphorus and nitrogen, making them available to other living organisms. On the other hand, there are organisms that are harmful. To study any microorganism, it should firstly be isolated from its own environment. There are many isolation methods for recovering fungi and bacteria and the results may be differed according to used method and isolation media.

Isolation of fungi from soil: -

Aim of the Experiment:

The aim of the experiment on the simple plating technique for direct isolation of fungi from soil is to:

1. **Isolate Fungal Species:** The primary objective is to isolate, and culture fungal species present in a soil sample to study their diversity and abundance.
2. **Characterize Fungal Communities:** By isolating fungi using this technique, students aim to characterize the fungal communities present in the soil ecosystem.
3. **Obtain Pure Cultures:** The experiment aims to obtain pure cultures of individual fungal species for further analysis and identification.
4. **Study Fungal Morphology:** Through this experiment, Students can observe and document the morphology and growth characteristics of isolated fungal colonies.
5. **Conduct Species Identification:** The experiment serves the purpose of identifying the isolated fungal species through morphological, biochemical, and potentially molecular methods.
6. **Assess Fungal Distribution:** By isolating fungi directly from soil samples, students aim to assess the distribution and abundance of different fungal species in the sampled environment.

By achieving these aims, the experiment provides valuable insights into the fungal populations present in soil environments, their roles in nutrient cycling, plant health, and ecosystem functioning, and their potential applications in various fields such as agriculture, bioremediation, and biotechnology.

Materials, Methods & Equipment

Materials Needed:

- Sterile petri dishes
- Sterile water or saline solution

- Soil sample
- Sterile spreader or inoculation loop
- Fungal growth media (e.g., Sabouraud agar, Potato Dextrose Agar)

Procedure:

1. **Preparation:**
    - Sterilize all necessary equipment, including spreaders, and media, using appropriate methods (e.g., autoclaving), 121^{o}C, 20 min. and 15 pounds per square inch.
    - Prepare the fungal growth media according to the manufacturer's instructions and pour it into sterile petri dishes to solidify.
2. **Soil Sample Collection:**
    - Collect a soil sample from the desired location using a sterile scoop or spoon. Ensure that the sample is representative of the area being studied.
3. **Plating:**
    - Transfer a small amount (0.005–0.015 gm) of soil to a sterilized Petri dish.
    - Added 8–10 ml. of semi-cooled (45°C) nutrient medium and shake the plate to let the soil particles dispersed throughout the thin layer of agar medium before it solidify.
    - If the soil is very dry, or contains a high proportion of clay, it is preferable to mix the particles with a drop of sterile water in the plate, before adding the medium.
    - Incubate treated plates at 20-30°C, investigate the colonies appearance after 48 and record the results.
4. **Incubation:**
    - Seal the petri dish with parafilm or tape to prevent contamination and incubate it at the appropriate temperature for fungal growth (usually around 25-30°C).
    - Incubate the plates for several days to allow fungal colonies to develop. Check the plates regularly for any signs of fungal growth.
5. **Isolation and Subculturing:**
    - Once fungal colonies appear on the agar surface, use a sterile inoculation loop to pick individual colonies for further isolation.
    - Streak the isolated colonies onto fresh agar plates to obtain pure cultures for subsequent analysis and identification.
6. **Identification and Analysis:**
    - Examine the morphology of the isolated colonies, including color, texture, and shape, under a microscope.
    - Perform additional tests such as microscopic examination, biochemical assays, and molecular techniques for accurate identification of the isolated fungi.

By following this simple plating technique for direct isolation of fungi from soil samples, researchers can successfully culture and study fungal species present in the soil environment. This method allows for the selective growth of fungi on agar plates, facilitating their isolation, characterization, and further analysis.

Experiment no.: 2
Title of Experiment: Dilution (Plate) methods: -

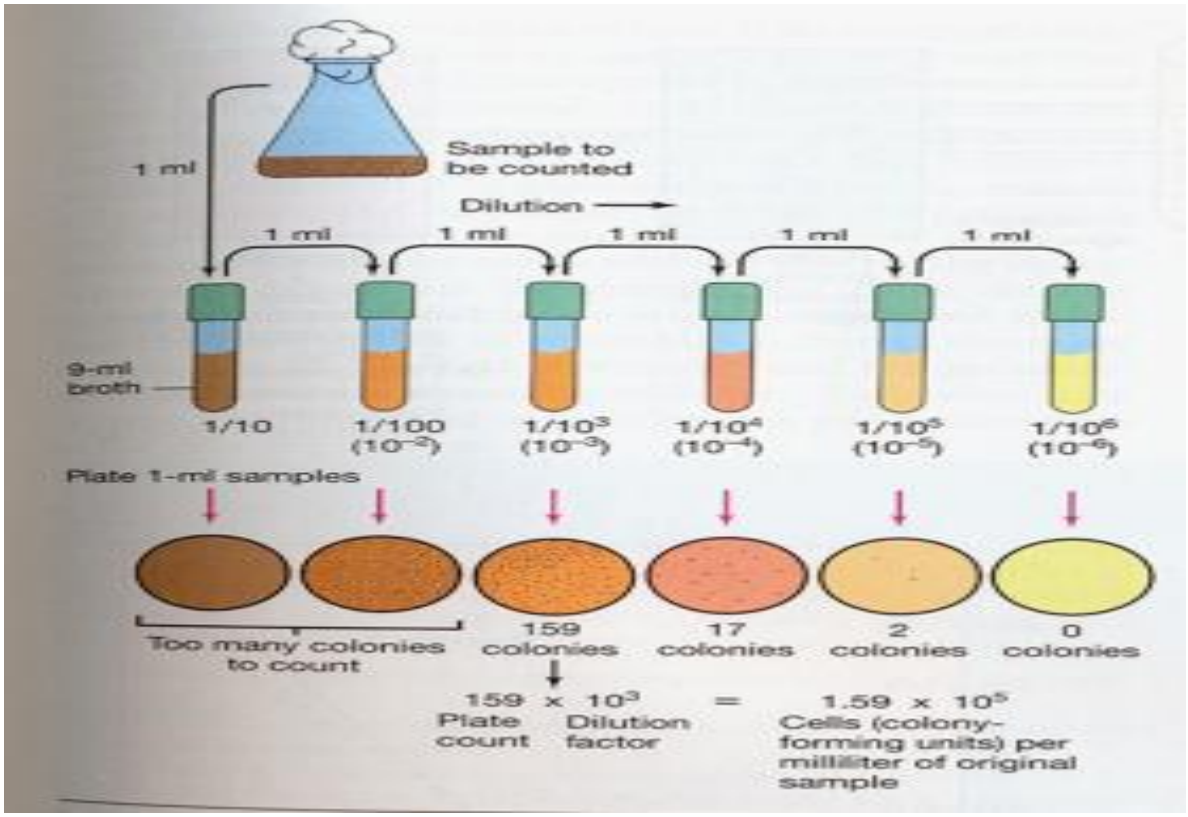
The dilution plate method is a common technique used in microbiology to isolate and enumerate fungi present in a sample. This method involves diluting the sample to reduce the microbial load and then plating aliquots of the dilutions onto agar plates for colony formation. Here's how the dilution plate method can be applied for isolating bacteria or fungi:

Materials Needed:

- Sterile diluent (e.g., saline solution, distilled water)
- Sterile test tubes
- Petri dishes containing appropriate growth media
- Pipettes
- Incubator

Procedure:

1. **Serial Dilution:**
   a. Take a known volume (e.g., 1 mL) of the sample and transfer it to a sterile test tube containing a known volume of sterile diluent.
   b. Mix the sample and diluent thoroughly to ensure uniform distribution.
   c. Transfer a small volume (e.g., 1 mL) of this diluted sample to another tube containing fresh diluent and repeat the process to create a series of dilutions.



2. **Plating:**
   a. Label the bottom of sterile agar plates with sample information and dilution factors.

b. Using a sterile pipette, spread a small volume of each dilution onto separate agar plates, spreading the sample evenly using a sterile spreader.
c. Incubate the plates at an appropriate temperature for the growth of bacteria or fungi.

3. **Colonies Counting and Identification:**
   a. After incubation, count the number of visible colonies on the plates with a manageable number of colonies.
   b. Select plates with 30-300 colonies for counting to ensure accuracy.
   c. Based on the colony morphology (color, shape, size), select representative colonies for further identification or sub culturing.
4. **Calculating Colony Forming Units (CFU):**
   a. Determine the number of colonies on the plates and account for the dilution factor to calculate the CFU/mL or CFU/g of the original sample.
   b. CFU = (Number of colonies counted) x (Dilution factor) / (Volume plated)
5. **Sub culturing and Further Analysis:**
   a. Subculture individual colonies to obtain pure cultures for further analysis.
   b. Perform additional tests such as biochemical assays, molecular techniques, or microscopy for species identification.

Significance:

- The dilution plate method helps in obtaining isolated colonies for further study.
- It allows for the quantification of viable microorganisms in a sample.
- The method aids in the identification and characterization of microbial species present in the sample.

By following the dilution plate method, student can effectively isolate and study bacterial or fungal populations in environmental samples, providing valuable insights into microbial diversity and abundance.

Experiment no.: 3

The title of Experiment: Method of Isolation of Fungi from Diseased Plant Parts:

Isolating fungi from diseased plant parts is crucial for identifying the causal agents of plant diseases. Here is a method commonly used for isolating fungi from diseased plant tissues:

Materials Needed:

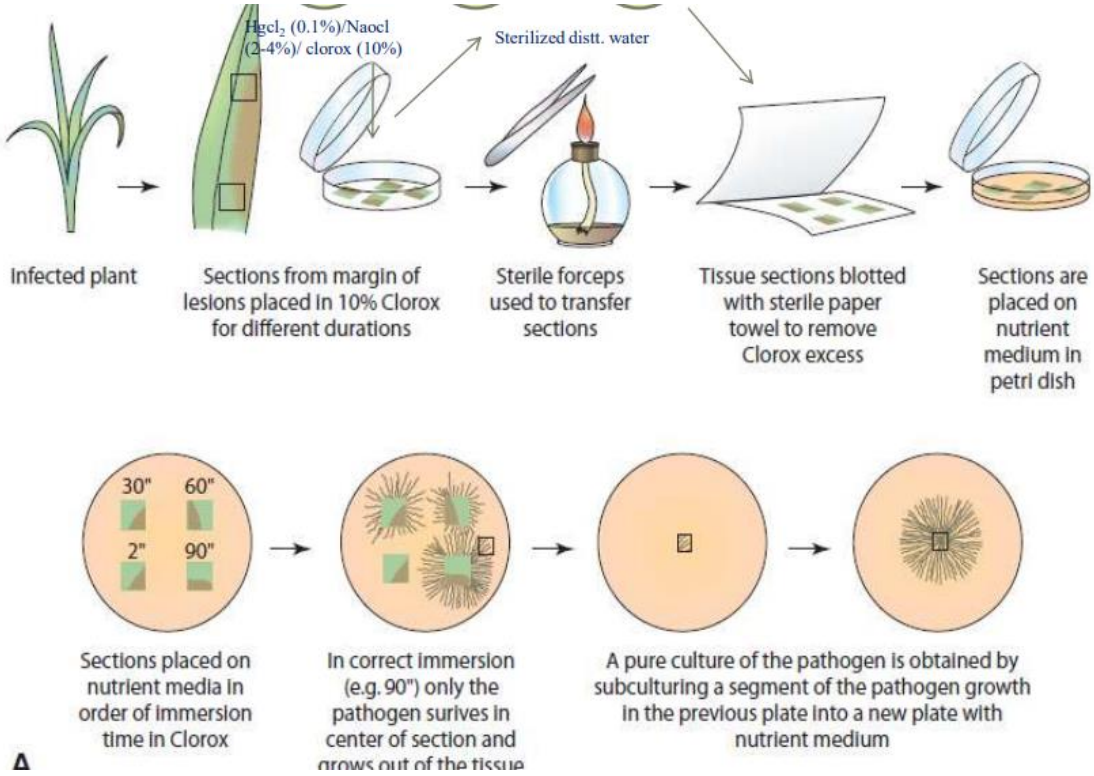
- Diseased plant parts
- Sterile distilled water or saline solution
- Sterile petri dishes
- Fungal growth media (e.g., Potato Dextrose Agar, Sabouraud Dextrose Agar)
- Scalpel or sterile blade
- Incubator

Procedure:

1. **Sample Collection:**
    - Select diseased plant parts showing characteristic symptoms such as lesions, discoloration, or wilting.
    - Use a sterilized blade or scalpel to cut out small sections (1-2 cm) from the diseased area. Ensure the instrument is sterilized between samples.
2. **Surface Sterilization:**
    - Dip the collected plant parts in 70% ethanol for a few seconds to sterilize the surface.
    - Rinse the plant parts in sterile distilled water to remove any residual ethanol.
3. **Tissue Dissection:**
    - Using a sterile blade, cut the surface-sterilized plant parts into smaller sections, ensuring to include both healthy and diseased tissue.
4. **Plating:**
    - Place the dissected plant tissue sections onto the surface of fungal growth media in sterile petri dishes.
    - Ensure that the tissue sections are in contact with the agar but do not overlap.
5. **Incubation:**
    - Seal the petri dishes with parafilm or tape and incubate them at the appropriate temperature for fungal growth (typically 25-30°C).
    - Check the plates regularly for fungal growth, which may appear as mycelial growth or spore formation.
6. **Isolation and Subculturing:**
    - Once fungal growth is observed, carefully isolate individual fungal colonies using a sterile inoculation loop.
    - Streak the isolated colonies onto fresh agar plates to obtain pure cultures for further analysis.
7. **Identification and Characterization:**
    - Examine the morphology of the isolated fungi, including color, texture, and spore structures, under a microscope.

- Conduct additional tests such as molecular analysis, biochemical assays, or pathogenicity tests to identify the fungal species.

8. **Record Keeping:**
   - Maintain detailed records of the isolated fungal species, including their morphological characteristics, growth patterns, and any relevant observations.



By following this method, researchers can effectively isolate and identify fungal pathogens from diseased plant tissues, aiding in the diagnosis, management, and control of plant diseases. This process is essential for understanding the etiology of plant diseases and developing strategies for disease management and prevention.

Experiment no.: 4

The title of Experiment: Methods of Isolation of Fungi from Skin:

Isolating fungi from skin samples is important in diagnosing fungal skin infections. Here is a general method commonly used for isolating fungi from skin:

Materials Needed:

- Skin swab or scraping tool
- Sterile saline solution or distilled water
- Fungal growth media (e.g., Sabouraud Dextrose Agar)
- Sterile cotton swabs
- Incubator

Procedure:

1. **Sample Collection:**
    - Collect skin samples from the affected area using a skin swab or scraping tool. Ensure the instrument is sterile.
    - Avoid sampling areas that are visibly contaminated with dirt or debris.
2. **Sample Processing:**
    - Place the collected skin sample in a sterile container with a small amount of saline solution or distilled water to prevent drying and ensure sample viability.
3. **Direct Streaking:**
    - Using a sterile cotton swab, streak the skin sample directly onto the surface of fungal growth media in a petri dish.
    - Ensure to streak the sample evenly to promote the growth of individual fungal colonies.
4. **Incubation:**
    - Seal the petri dish with parafilm or tape and incubate it at an appropriate temperature for fungal growth (typically around 25-30°C).
    - Check the plate regularly for fungal growth, which may appear as characteristic fungal colonies or mycelial growth.
5. **Isolation and Subculturing:**
    - Once fungal growth is observed, carefully isolate individual fungal colonies using a sterile inoculation loop.
    - Streak the isolated colonies onto fresh agar plates to obtain pure cultures for further analysis.
6. **Identification and Characterization:**
    - Examine the morphology of the isolated fungi, including color, texture, and spore structures, under a microscope.
    - Perform additional tests such as molecular analysis, biochemical assays, or antifungal susceptibility testing to identify the fungal species.

By following this method, healthcare professionals can isolate and identify the causative agents of fungal skin infections, leading to accurate diagnosis and appropriate treatment. This

process is essential for managing fungal skin infections effectively and preventing their spread to other individuals.

Section 5: How to prepare fungal slides and examine them under a microscope

Preparing fungal slides for examination under a microscope is a fundamental process in mycology that allows for the observation of fungal structures and characteristics. Here is a general guide on how to prepare fungal slides and examine them under a microscope:

Materials Needed:

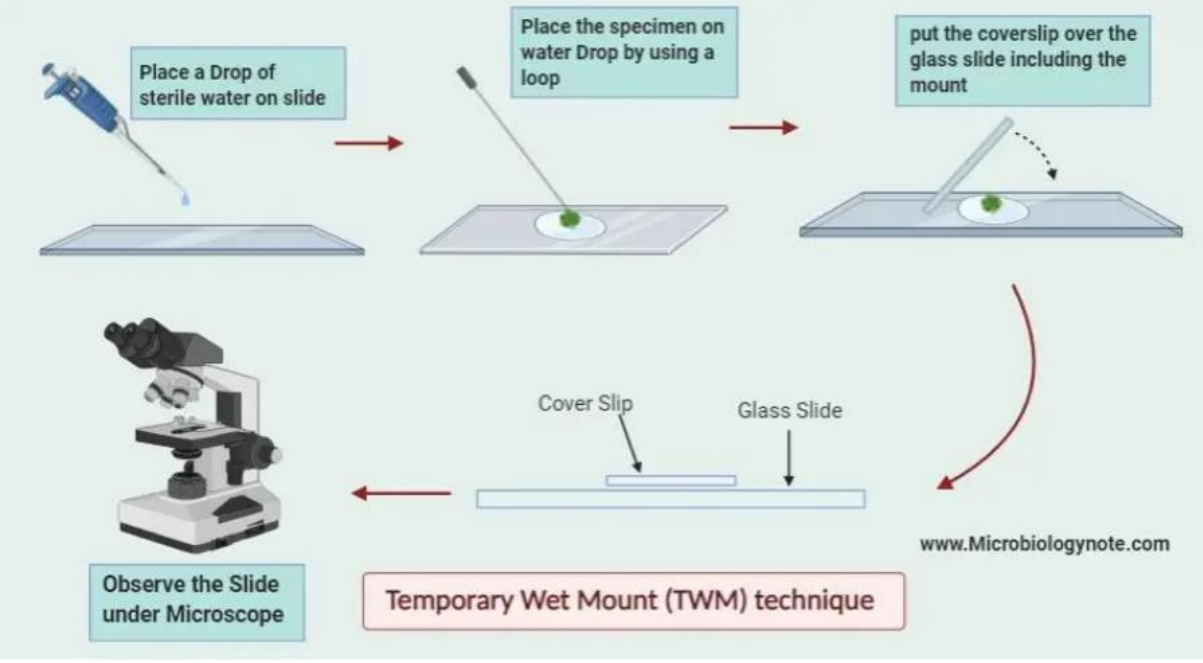
- Microscope slides
- Cover slips
- Microscope
- Staining reagents (e.g., lactophenol cotton blue)
- Sterile water or saline solution
- Scalpel or sterile blade
- Fungal cultures or samples

Procedure:

1. **Sample Collection:**
    - Collect a fungal culture or sample from the source using a sterile technique. This can be obtained from a culture plate, infected plant material, or skin scraping.
2. **Mounting the Sample:**
    - Place a small drop of sterile water or saline solution on a clean microscope slide.
    - Take a small piece of the fungal material using a sterile blade or scalpel and place it in the drop of water on the slide.
3. **Adding the Cover Slip:**
    - Gently place a cover slip over the fungal material on the slide. Take care to avoid trapping air bubbles under the cover slip.
4. **Staining (Optional):**
    - If necessary, stain the fungal material to enhance visualization. Lactophenol cotton blue is a commonly used stain for fungal structures.
5. **Examining Under the Microscope:**
    - Place the prepared slide on the stage of the microscope.
    - Start with a low magnification objective (e.g., 10x) to locate the fungi on the slide.
    - Gradually increase the magnification to observe fungal structures in detail. Common structures to look for include hyphae, spores, conidia, and reproductive structures.
6. **Observation and Identification:**
    - Observe the fungal structures under different magnifications.
    - Note the morphology of hyphae, presence of septa, conidiophores, spores, and any other characteristic features.
    - Compare the observed structures with reference materials or guides to aid in the identification of the fungal species.
7. **Recording Observations:**

- Record your observations, including the size, shape, color, and any distinctive features of the fungal structures.
- Take pictures if necessary for documentation or further analysis.

8. **Cleaning and Storage:**
   - After examination, properly clean the microscope slide and cover slip for future use.
   - Store the prepared slides in a dry, secure location for reference or additional analysis.



Section 6

Classification and microscopic examination of some members of Gymnomycota (*Stemonitis* sp.) and Haplomastigomycotina (*Plamodiophora* sp. and *Synchytrium* sp.)

Division: ***Gymnomycota (Myxomycota)***

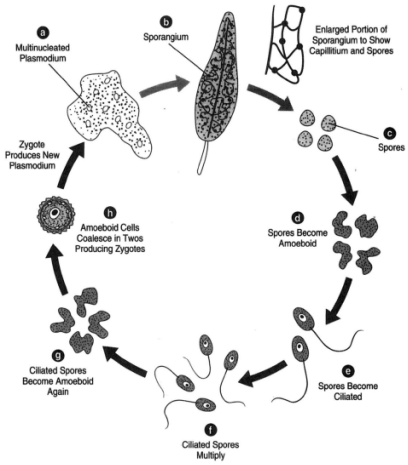
Sub-division: ***Plamodiogymnomycotina***

Class: ***Myxomycetes***

Order: ***Stemonitales***

Family: ***Stemonitaceae***

Genus: ***Stemonitis* sp.**



Division: ***Mastigomycota***

Sub-division: ***Haplomastigomycotina***

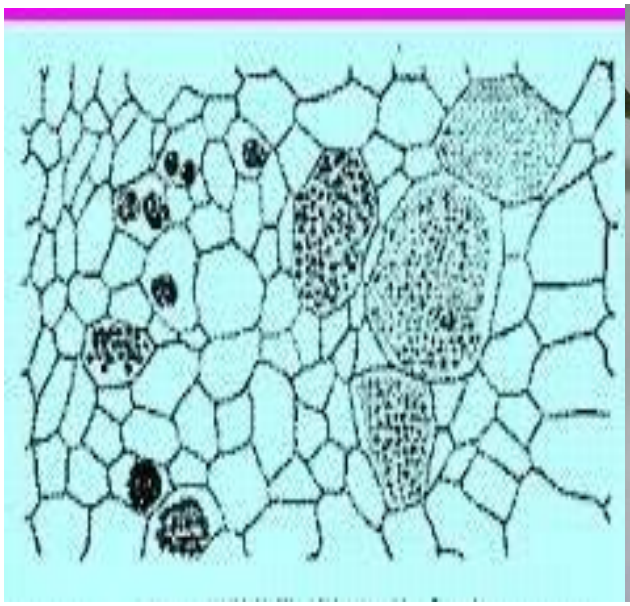
Class: ***Plasmodiophoromycetes***

Order: ***Plasmodiophorales***

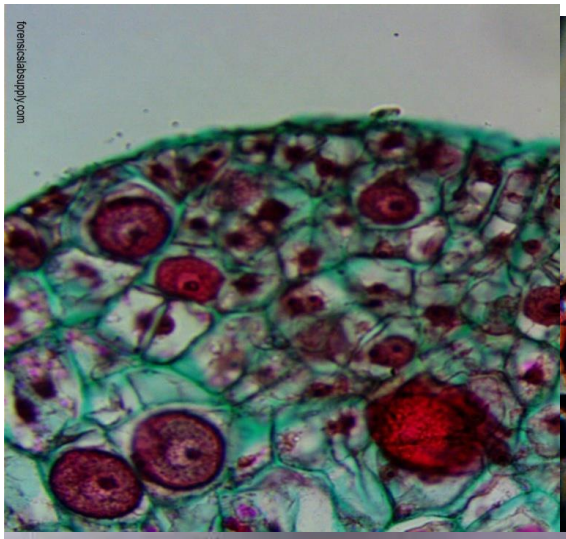
Family: ***Plasmodiophoraceae***

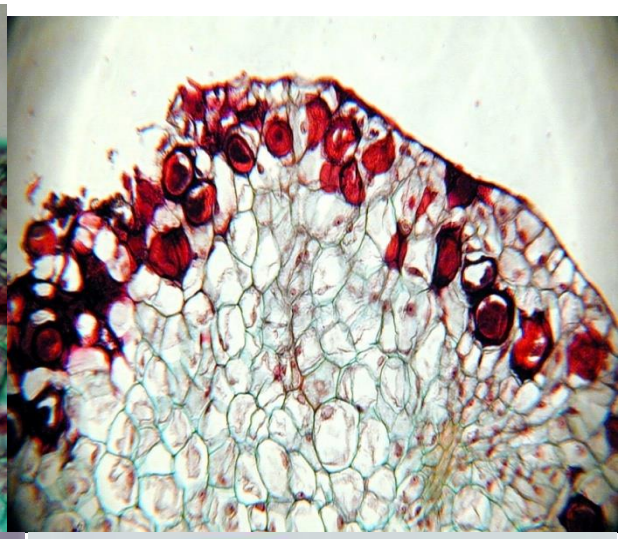
Genus: ***Plamodiophora brassica***

the causal agent of clubroot disease of cruciferous plants



Division: ***Mastigomycota***
Sub-division: ***Haplomastigomycotina***
Class: ***Chytridiomycetes***
Order: ***Chytridiales***
Family: ***Synchytriaceae***
Genus: ***Synchytrium endobioticum***
the causal agent of causes the potato wart disease



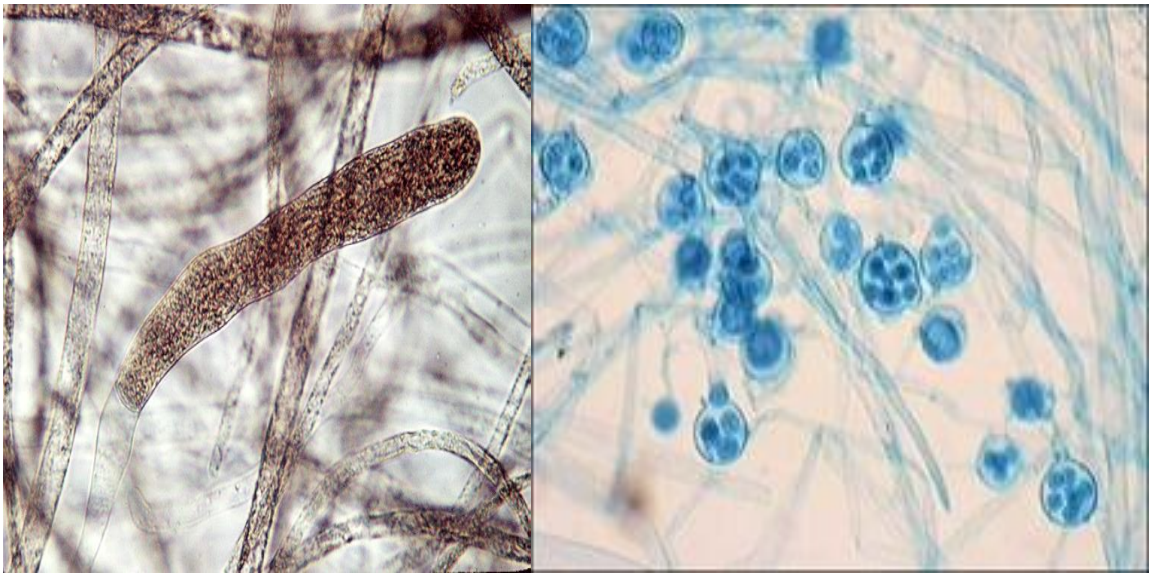


Section 7.

Classification and microscopic examination of some members of Diplomastigomycotina (*Saprolegnia, Peronospora, plasmopara* and *Albugo* sp.)

Division: ***Mastigomycota***
Sub-division: ***Diplomastigomycotina***
Class: ***Oomycetes***
Order: ***Saprolegniales***
Family: ***Saprolegniaceae***
Genus: ***Saprolegnia* sp.**

fish pathogens



Division: ***Mastigomycota***

Sub-division: ***Diplomastigomycotina***

Class: ***Oomycetes***

Order: ***Peronosporales***

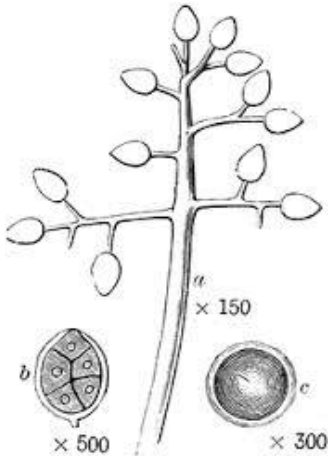
Family: ***Peronosporaceae***

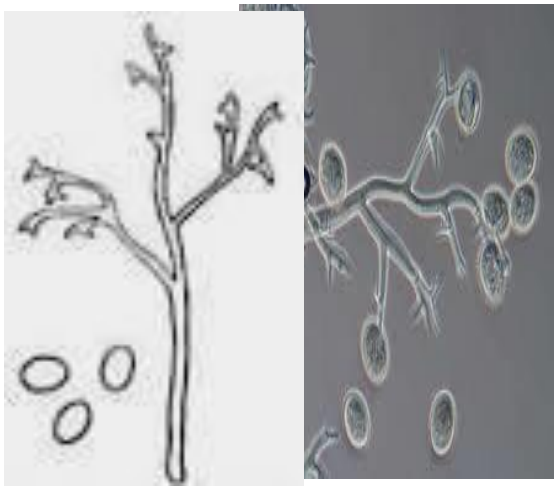
Genus 1: ***Peronospora* sp.**

Genus 2: ***Plasmopara*.**

Genus 1: ***Peronospora* sp.** ***Plasmopara viticola***

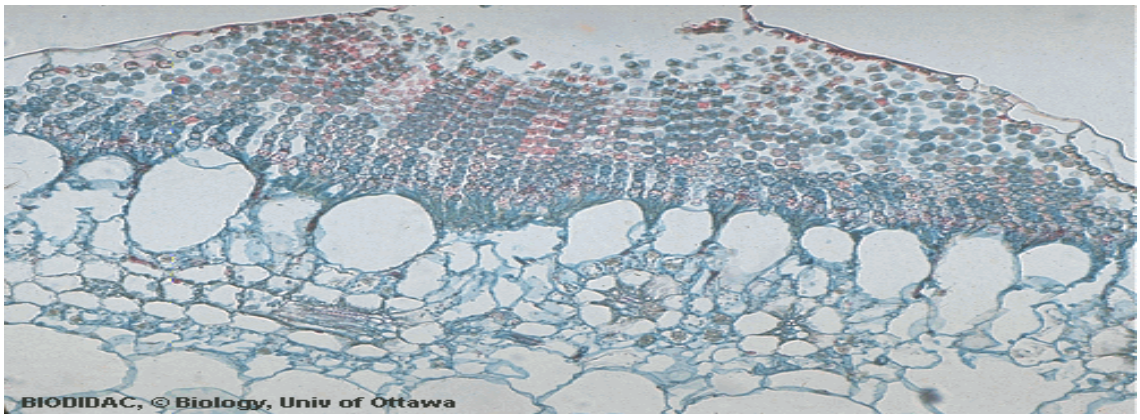
grape downy mildew





Division: ***Mastigomycota***
Sub-division: ***Diplomastigomycotina***
Class: ***Oomycetes***
Order: ***Peronosporales***
Family: ***Albuginaceae***
Genus: ***Albugo sp.***

white rust in Brassicaceae



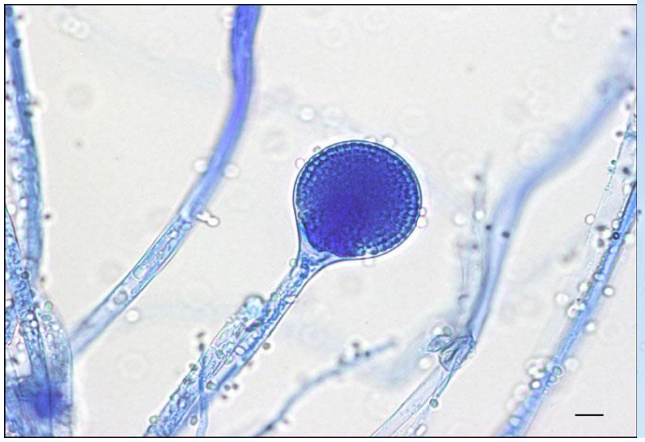
Section 8.

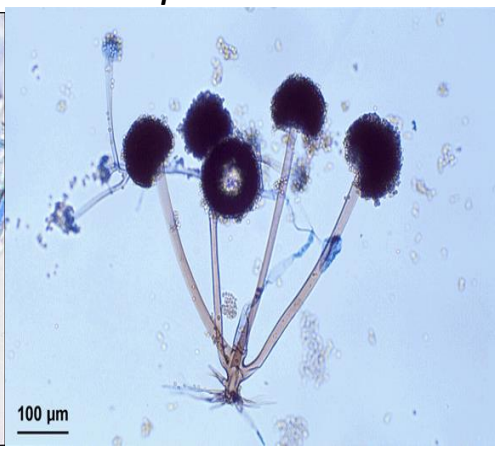
Classification and microscopic examination of some members of Amastigomycota – Zygomycetes (as *Rhizopus* and *Mucor* sp.) and Ascomyctes –Hemiascomycetales (as *Taphrina* sp. and *Saccharomyces* sp.)

Division: ***Amastigomycota***
Sub-division: ***Zygomycotina***
Class: ***Zygomycetes***
Order: ***Mucorales***
Family: ***Mucoraceae***
Genus$_1$: ***Rhizopus sp***
Genus$_2$: ***Mucor sp***

Rhizopus rot on peach fruits
Mucor rot on pear fruits

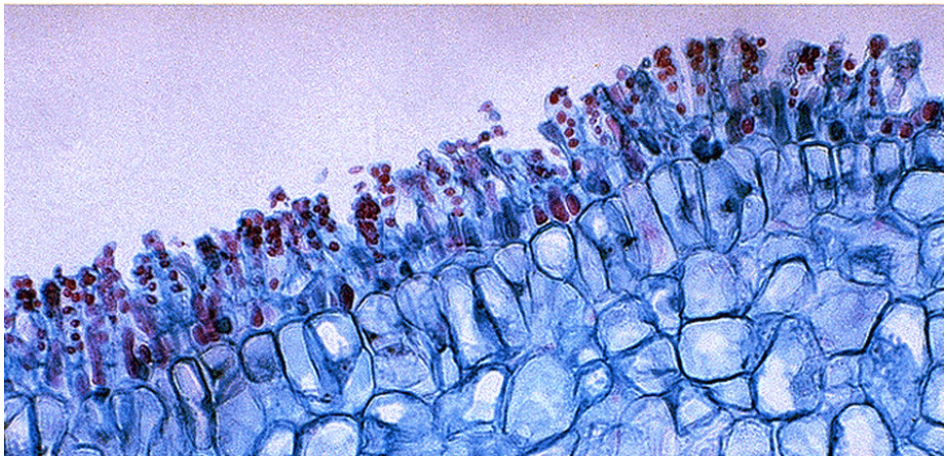
Rhizopus sp ***Mucor sp***



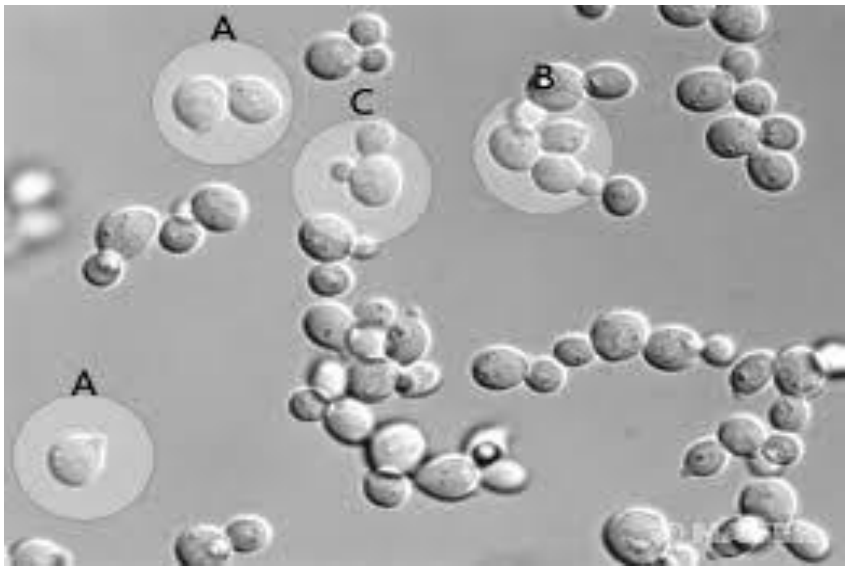


Division: ***Amastigomycota***
Sub-division: ***Ascomycotina***
Class: ***Ascomycetes***
Order: ***Taphrinales***
Family: ***Taphrinaceae***
Genus$_1$: ***Taphrina sp.***

Peach leaf curl disease

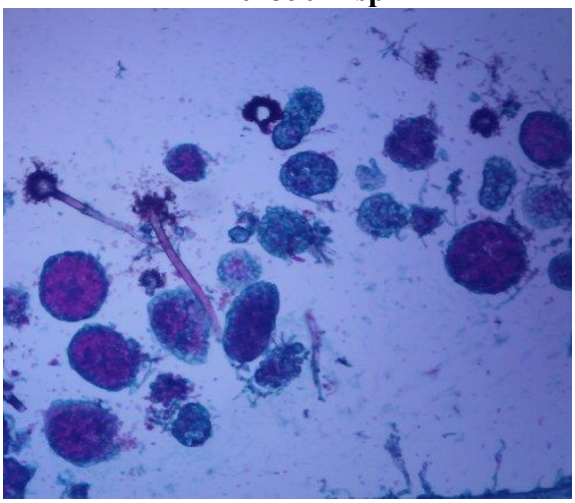
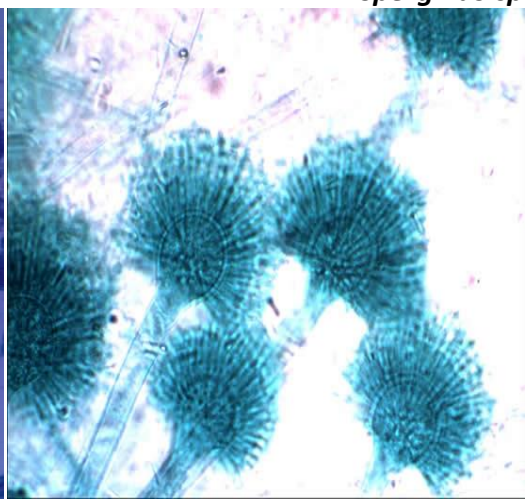


Division: *Amastigomycota*
Sub-division: *Ascomycotina*
Class: *Ascomycetes*
Order: *Endomycetales*
Family: *Saccharomycetaceae*
Genus[1]: *Saccharomyces sp*



Division: ***Amastigomycota***
Sub-division: ***Ascomycotina***
Class: ***Ascomycetes***
Order: ***Eurotiales***
Family: ***Eurotiaceae***
Genus1: ***Aspergillus sp*** **(** ***Eurotium*** **sp.)**
Genus2: ***Penicillium*** **sp** **(*Talaromyces* sp.)**

Eurotium **sp** ***Aspergillus sp***

Division: ***Amastigomycota***
Sub-division: ***Ascomycotina***
Class: ***Ascomycetes***
Order: ***Erysiphales***
Family: ***Erysiphaceae***
Genus 1: ***Erysiphe*** **sp. (Or)** ***Sphaerotheca*** **sp.**
Genus 2: ***Microsphaera*** **sp. (Or)** ***Podosphaera*** **sp.**
Genus 3: ***Uncinula*** **sp.**
Genus 4: ***Phyllactinia*** **sp.**

ويمكن تعريف أجناس فطريات البياض الدقيقي على أساس:

(1) عدد الأكياس الأسكية الموجود بداخل الجسم الثمري

(2) الزوائد الموجود على الجسم الثمري.

الجسم الثمري مغلق وبداخله كيس أسكي واحد والزوائد تشبه الخيوط spp *Sphaerotheca*، الجسم الثمري مغلق وبداخله كيس أسكي واحد والزوائد ثنائية التفرع spp *Podosphaera*

الجسم الثمر مغلق وبداخله أكثر من كيس أسكي واحد والزوائد:

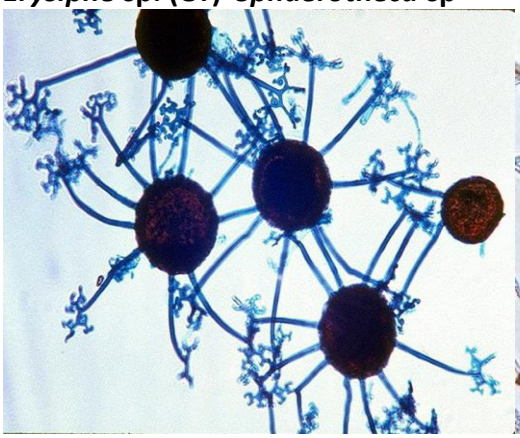
تشبه الخيوط *Erysiphe* spp

ذات نهايات ثنائية التفرع *Microsphaera* spp

ذات قواعد بصيلية (منتفخة) *Phyllactinia* spp

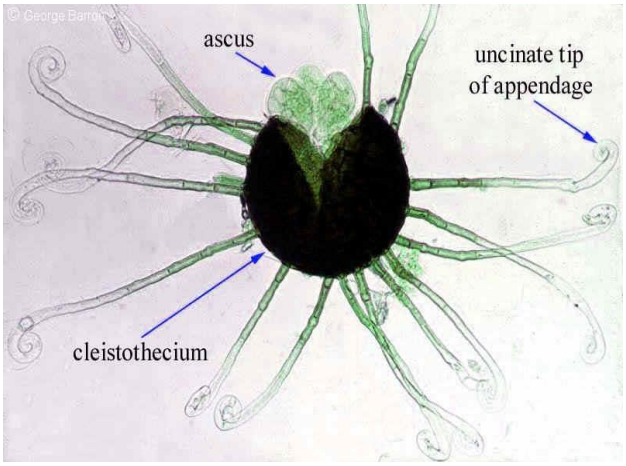
ذات نهايات خطافيه *Unciniula* spp

***Erysiphe* sp. (Or) *Sphaerotheca* sp**

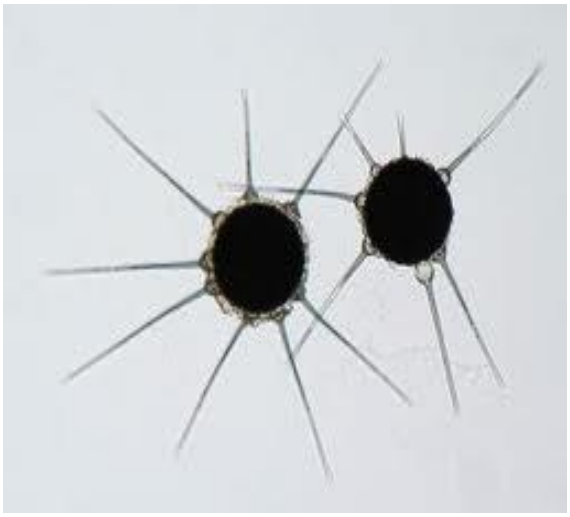


***Microsphaera* sp. (Or) *Podosphaera* sp.**

***Uncinula* sp**



***Phyllactinia* sp.**

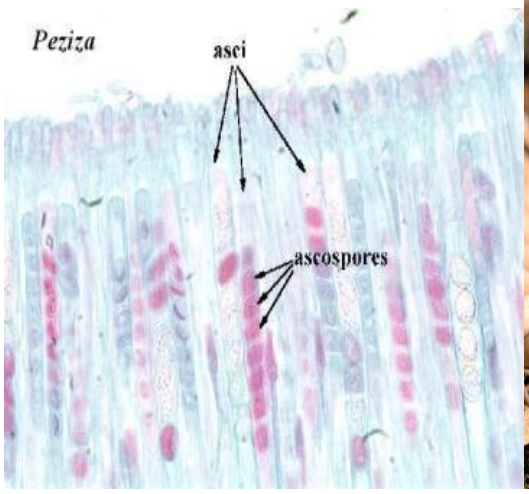


Section 9.

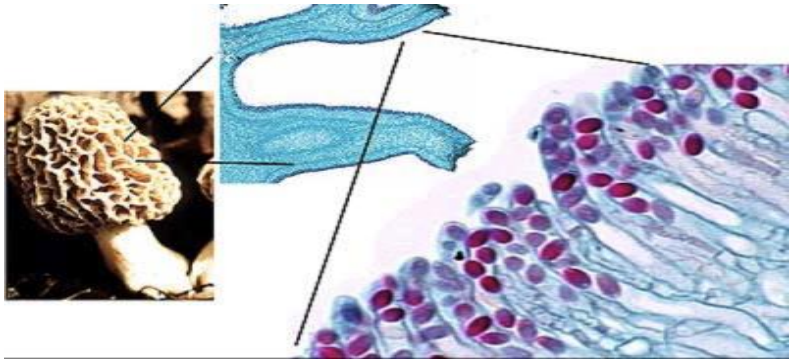
Classification and microscopic examination of some members of – Epigean Discomycetes as (*Peziza sp.* and *Morchella sp.)* and *Hypogean* as *Terfezia , Tuber*)

Division: ***Amastigomycota***
Sub-division: ***Ascomycotina***
Class: ***Ascomycetes***
Order: ***Pezizales***
Family: ***Pezizaceae***
Genus1: ***Peziza sp.***

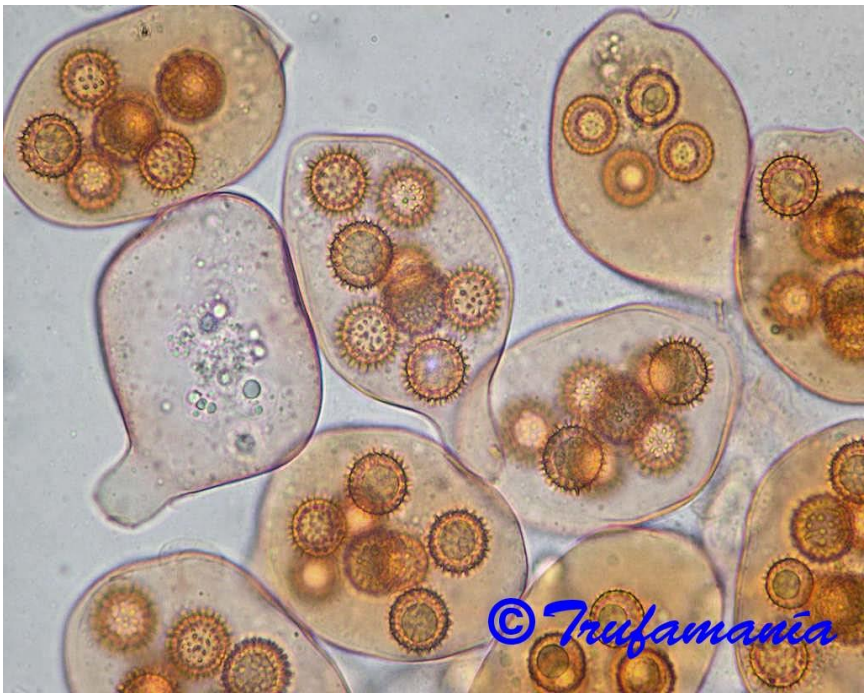
It is a plant-loving fungus that grows on manure, decaying forests, and humus-rich soil. Some species even grow on charred and burnt wood and is a harmful fungus.



Division: ***Amastigomycota***
Sub-division: ***Ascomycotina***
Class: ***Ascomycetes***
Order: ***Pezizales***
Family: ***Morchellaceae***
Genus1: ***Morchella sp.***



Division: ***Amastigomycota***
Sub-division: ***Ascomycotina***
Class: ***Ascomycetes***
Order: ***Tuberales***
Family: ***Terfeziaceae***
Genus[1]: ***Terfezia*** **sp**



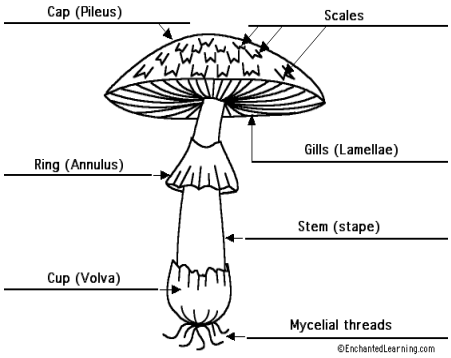
Section 10.

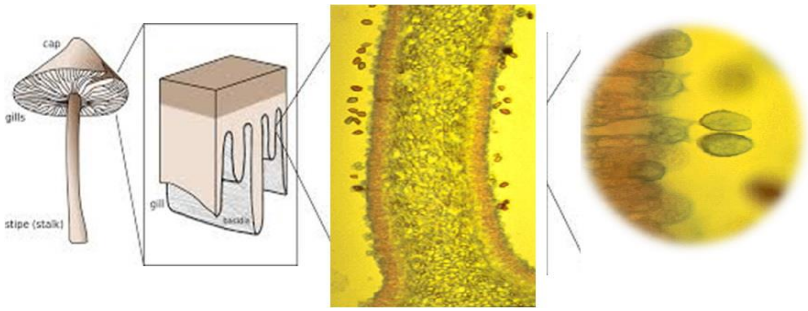
Classification and microscopic examiantion of some members of Basidiomycetes

(*Agricus bisporus*, *Amanita muscaria* and *Podaxis* sp.)

Division: ***Amastigomycota***
Sub-division: ***Basidiomycotina***
Class: ***Basidiomycetes***
Order: ***Agaricales***
Family: ***Agaricaceae***
Genus: ***Agaricus***

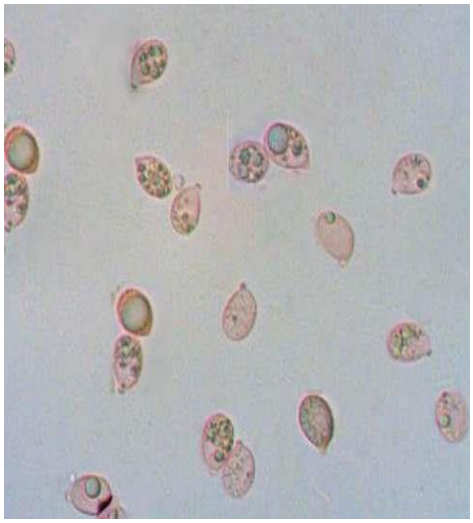
Species: ***A. bisporus***



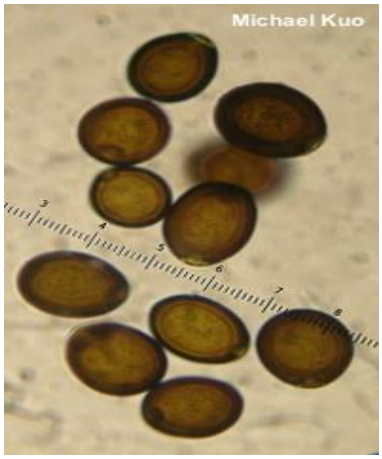


Division: ***Amastigomycota***
Sub-division: ***Basidiomycotina***
Class: ***Basidiomycetes***
Order: ***Agaricales***
Family: ***Amanitaceae***
Genus: ***Amanita***

Species: ***A. muscaria***



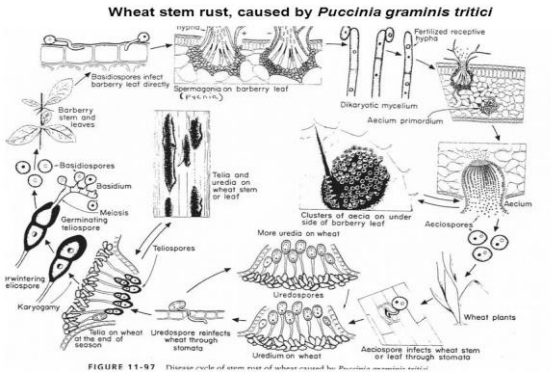
Division: ***Amastigomycota***
Sub-division: ***Basidiomycotina***
Class: ***Basidiomycetes***
Order: ***Agaricales***
Family: ***Agaricaceae***
Genus: ***Podaxis***

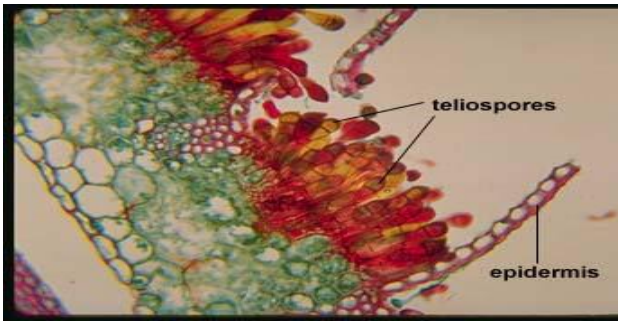


Section 11.

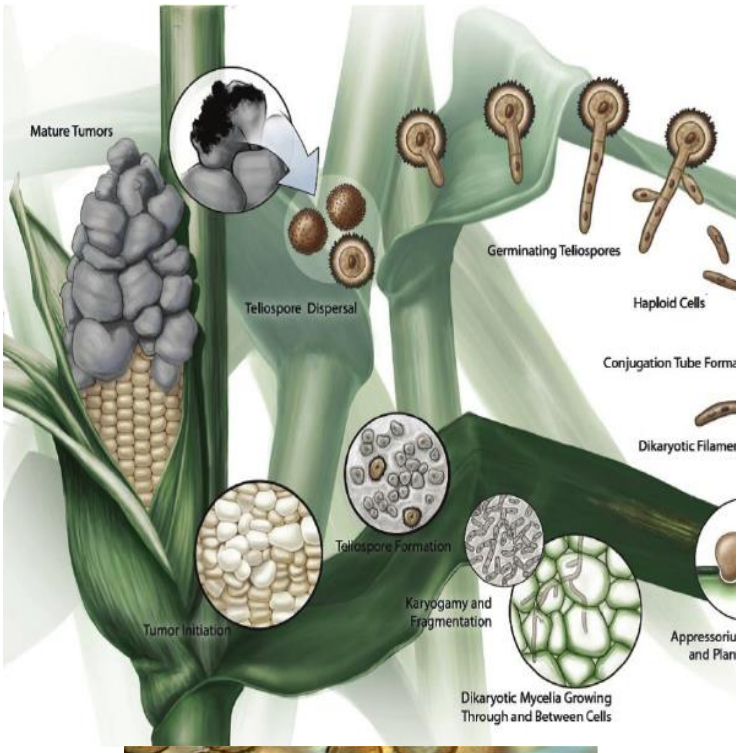
Classification and microscopic examination of some members of Basidiomycetes - Rust fungi (*Puccina graminis*) and Smut fungi as (*Ustilago* sp.)

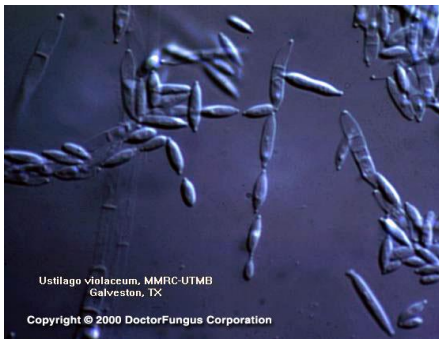
Division: ***Amastigomycota***
Sub-division: ***Basidiomycotina***
Class: ***Basidiomycetes***
Order: ***Uredinales***
Family: ***Pucciniaceae***
Genus: ***Puccinia***
Species: ***P. graminis***





Division: ***Amastigomycota***
Sub-division: ***Basidiomycotina***
Class: ***Basidiomycetes***
Order: ***Ustilaginales***
Family: ***Ustilaginaceae***
Genus: ***Ustilago sp.***


Mature Tumors
Teliospore Dispersal
Germinating Teliospores
Haploid Cells
Conjugation Tube Forma
Dikaryotic Filamer
Teliospore Formation
Karyogamy and
Fragmentation
Tumor Initiation
Appressoriu
and Plan
Dikaryotic Mycelia Growing
Through and Between Cells


Ustilago violaceum, MMRC-UTMB
Galveston, TX
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