Salahaddin University \Erbil
College of Agriculture
Field crop Department
3rd class

Field crop diseases\Practical

1st lab

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Outlines

- Laboratory Safety Rules
- What is a plant disease
- The major pathogen groups
- Equipment used in microbiology laboratory

Laboratory Safety Rules

1. Wearing a lab coat in lab.
2. No eating or drinking during lab.
3. Keep long or fluffy hair tied up and out of the way.
4. Always wear shoes in lab.
5. Thoroughly wash your hands with soap and water before and after lab.
6. Clean the lab bench with disinfectant before and after lab.

7. Keep the lab bench free of unnecessary materials.

8. Do not take cultures from the lab area.

9. Dispose of all contaminated materials in autoclave bags.

10. Label all the plates, tube, cultures properly before starting an exercise.

11. Read all assigned materials before the lab session.

12. Treat all microbial cultures as if they are pathogens. Better safe than sorry.

13. Always clean microscope stage, eyepiece, lenses and objectives, before and after use. All lenses must be wiped with the lenses paper.

What is a plant disease and what conditions are necessary for it to develop

A plant disease is a harmful alternation of the normal physiological and biochemical growth of the plant, or as a condition in which a plant differs from a normal (healthy) plant in appearance, structure, or function.

What is a plant disease

Symptoms: visible effects of disease on plants are called symptoms ,any detectable changes in color, shape and/or function of the plant in response to a pathogen or disease-causing agent is a symptom.

Signs of plant disease are physical evidence of the pathogen **for example** ; fungi fruiting bodies,

Bacterial ooze, or nematode cysts.

Signs also can help with plant disease identification.

How are plant diseases classified

- Plant diseases can be divided into two broad categories:
- **Biotic (infectious)** : living organisms (pathogens) that have the ability to infect plants and cause diseases.
- **Abiotic** (**non- infectious) :** disorders induced by non-living causes such as environmental conditions . e.g. (unfavorable conditions, too low\ high temperature, lack\excess soil moisture, air pollution, soil acidity\ alkalinity…..etc.)

Pathogens on the basis of mode of infection

- **Soil borne**: pathogen survive in soil or on infested plant debris lying in soil either as their resting spores or as mycelia.
- E.g. root rot , wilt, and seedling blight.
- **Air borne**: the microorganisms are spread through air and attack the plants causing disease. **e.g.** blight, rust, powdery mildew.
- **Seed borne**: the microorganisms are carried along with seeds.
- **E.g.** damping off.

On the basis of organ attack

- **Root** disease
- **Shoot** disease
- **Fruit** disease
- **Foliage** disease

On the basis of host plant

Cereal disease
Vegetable disease
Fruit disease
Forest disease
Ornamental disease

CONDITIONS NECESSARY FOR PATHOGENIC DISEASES

- In order for a pathogenic plant disease to occur, three conditions must be met:

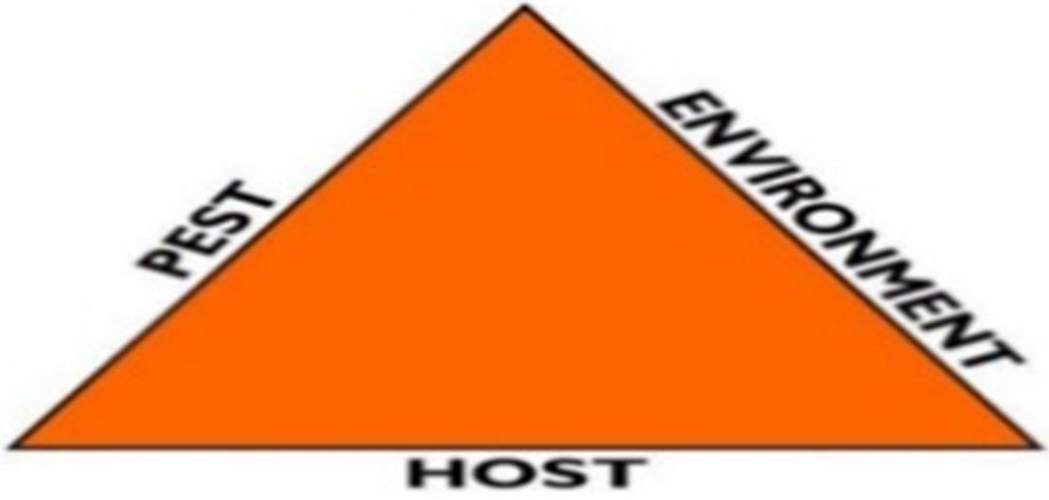
1. The host plant must be susceptible.
2. An active , living pathogen must be present.
3. The environment must be suitable or favourable for disease development.

- All three factors must occur simultaneously. If one factor is absent or unfavourable , disease does not occur.

Conditions which are necessary

Pest problems develop when three conditions are present:

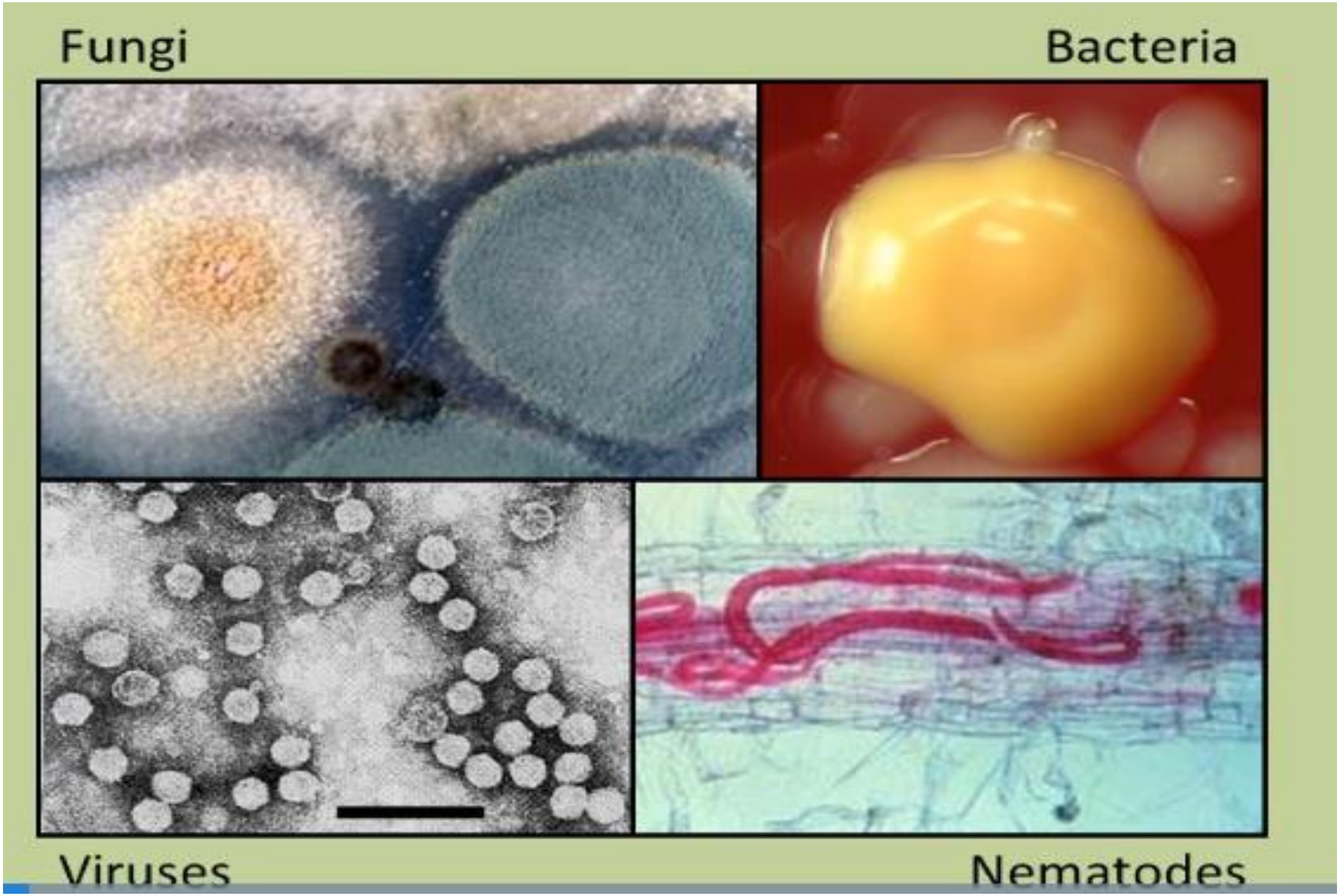
- **pest (insect, weed, disease, etc.)**
- **host (susceptible plant)**
- **favorable environment**



What causes plant disease

- Infectious plant disease are caused by living organisms that attack and obtain their nutrition from the plant they infect. The parasitic organism that causes a diseases is a **pathogen** numerous **fungi, bacteria**, **viruses**, and **nematodes** are pathogens.
- The plant invaded by the pathogen and serving as its food source is referred to as a **host**

Types of pathogens



The major pathogen groups

- **Fungi :** a filamentous organisms that cause the majority of plant diseases; commonly called ‘molds’ microscopic, but can occasionally be visible with naked eye.
- **Bacteria** single celled , microscopic organisms that are typically spread in water and cause far few diseases than fungi.
- **Viruses** : sub-microscopic (need specialized microscope to see the pathogen particles) obligate parasite (has to be associated with a plant host or vector) .
- **Nematodes** : microscopic ,non-segmented worms; obligate parasites.

Inoculum

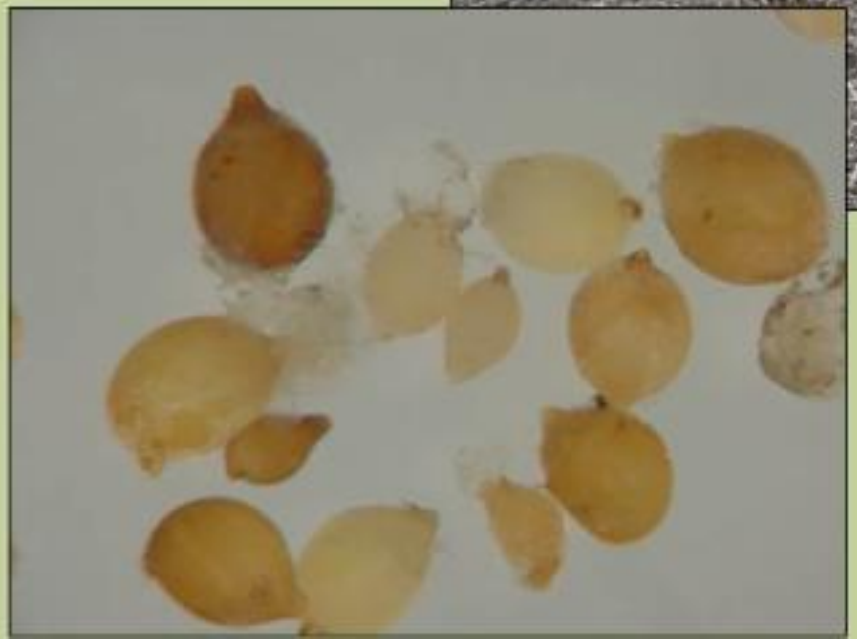
Source of inoculum varies for each disease

- May be produced on residues left in the field
- Present in the soil
- Present in weeds or other crops in the area
- Present in or on the seed
- Present in soil sticking to equipment or tools
- Carried by wind or water
- Carried by insect vectors
- Carried in by animals, birds, and people

Pathogen survival

Pathogens survive season to season in:

- Soil
- Crop residue
- Weed or noncrop hosts
- Seed or vegetative plant parts
- Insects
- Mild climates



List of Equipment used in microbiology laboratory

1-Autoclave
2-Oven
3-Refrigerator
4-Incubator
5-Biosafety Cabinet(Hood)
6- Shaker Incubator
7- Deep Freezer (-86 C)
8- Magnetic Stirrer and Vortex
9- Water bath
10- PH-meter
11- Shaker
12- Centrifuge
13- Distillation units
14- Balance
15- Microscope

1. Autoclave

- The main purpose of this device is to sterilize materials and media under pressure and steam.
- The temperature and the pressure required are 121°C and 15 bar for 15-20min.

2. Oven

An oven is used for both sterilization and drying. For example glassware's, soil, plant and animal materials .

3-Refrigerator

- The device is used for the storage of the stock solutions, chemicals, kits and nutrient media that should be maintained at certain temperatures.

4-Incubator

- Incubators are used for obtaining an appropriate temperature need for growing microorganisms, in general, the required temperature for growing fungi is 25°C and for bacteria is 37°C.

5-Biosafety Cabinet(Hood)

- It is used in microbial inoculation and isolation studies as well as sterile storage of materials. In addition, it is utilized for protection of user, samples and the environment from hazardous contamination

6- Shaker Incubator

- In the microbiology laboratories it is among the leading devices which are based on the principle of shaking at different temperatures according to the purpose and the work load of the laboratory. It is used in cultivating, multiplying and in the characterization tests of microorganisms. This device provides the heat necessary for the growth of microorganisms.

7- Deep Freezer (-86 C)

- It is used to store stock cultures in microbiology. It is a device used to store materials which should be kept at low temperatures (cells, tissues, enzymes, proteins, etc.)

8- Magnetic Stirrer and Vortex

- Magnetic stirrer is a device which provides mixing and keeping the chemical solutions and mixtures at a certain time and temperature by the help of a magnetic bar. Vortex agitates the solutions in the tube, flask and so on in certain speed and duration

9- Distillation unit

- It is used for production of distilled water. The distilled water used for many purposed in laboratories, like: preparing cultures, washing diseased plant particles, and diluting solutions.

10- PH-meter

- It is used for detects the acidity or alkalinity of solutions like culture.

12- Centrifuge

- Centrifuge are used for isolation purposes:

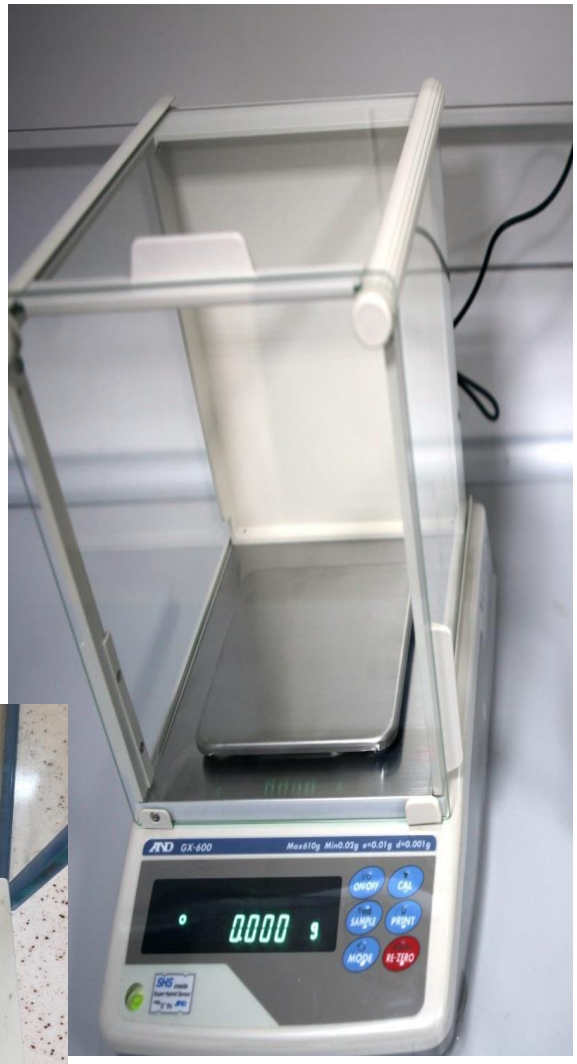
1. Isolation of solvent from solvent in solutions.
2. For isolation some microorganisms , like nematodes , from water solution.

13- Water bath

1. Used for many purposes, like indirect heating of some fastidious materials which can not bear direct heating .
2. Used for offering a constant temperature for some solutions required to remain in constant temperature.

14- Balance

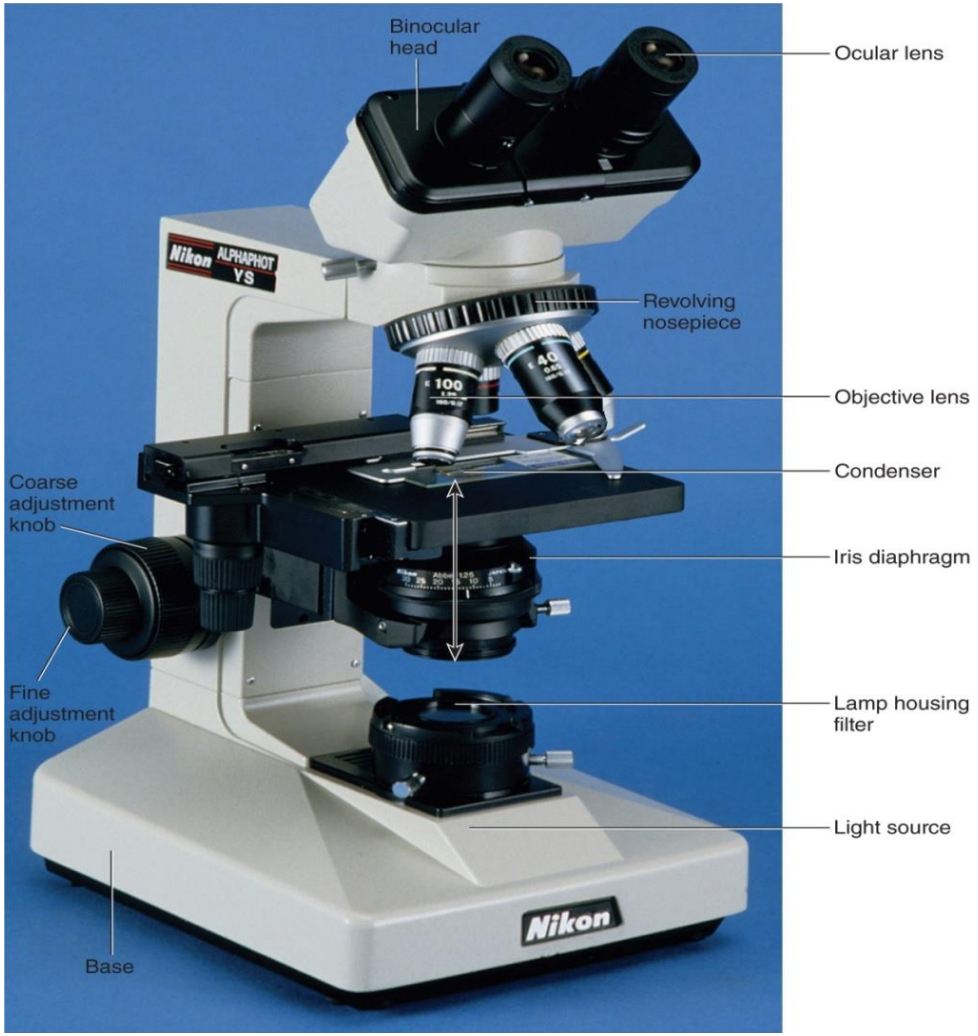
- They are used in precise weighing of small amounts (up to milligrams) of samples and chemicals used for preparing media and stock solutions.



15- Microscope

Key characteristics of a reliable microscope are:

- Magnification – ability to enlarge objects
- Resolving power – ability to show detail



Laboratory tools and materials

1. Transfer Needle
2. Inoculation Loop
3. Scissors
4. Tongs or forceps (ملقط)
5. Thermometers
6. Bunsen burner
7. Petri dishes

1. Cotton
2. Disinfectant (Alcohol)
3. Distilled water
4. Filter paper
5. Muslin / cheese cloth
6. Stains

➢ Glassware

1. Petri dishes
2. Conical flasks
3. Culture tubes without screw caps
4. Beakers
5. Funnels
6. Graduated cylinders
7. Graduated pipettes
8. Dropper bottle for staining reagents
9. Glass microscope slides
10. Glass cover slips