LAB 2 - SEXUAL PROPAGATION OF PLANTS

A seed is formed when a pollen grain lands on the stigma of the flower, and sends down a pollen tube which releases a sperm cell into the ovule. This fertilization or joining of the sperm cell and ovule forms a cell called a zygote. The zygote then develops into an embryo. The **embryo along with the food storage organs,** cotyledons and/or endosperm, and the seed coat or testa make up **what is called the seed.**

The embryo is a diminutive plant and under the proper conditions it will grow into a plant. This new plant will have characteristics from both of its parents. The embryo has two basic parts: the radicle, which grows into the root or below ground portion of the plant and the plumule, which grows into the above ground portion of the plant. The seed also contains food stored as either starch (wheat), fats (sunflower), protein (beans), or a combination of all three. The food storage gives the growing embryo and developing seedling energy until its leaves can begin photosynthesizing.

The process of seed germination is much more complicated than it would appear. Germination is a biochemical process that involves the activation of many chemical reactions. This happens in three stages.

The first stage of seed germination involves the uptake of water. This is called imbibition. During imbibition the protein synthesizing systems are activated and various enzymes are synthesized. These enzymes catalyze reactions used in the second stage of germination.

The second stage of germination involves the breakdown of the stored energy rich compounds of the cotyledons and endosperm. The second stage is a period of readying the embryo for rapid growth during the third stage.

During the third stage of germination, cell division begins and the embryo grows into a seedling. The first growth occurs in the radicle, and the root system is established. This is followed by the emergence of the plumule. Once the seedling has formed leaves it becomes a self sufficient plant.

LECTURE OUTLINE

A. What is Sexual Propagation?

1. Definition

2. Advantages over asexual propagation

3. Disadvantages

B. Which Should You Use?

1. depends on:

a.

b.

c.

C. Uses

1.

2.

3.

D. Factors Affecting Germination

1. Seed viability

2. affected by:

a.

b.

3. Seed dormancy

4. Treatments to overcome dormancy

a. Scarification

1) Mechanical

2) Hot water

3) Acid

b. Stratification

1) Moist chilling

2) Warm moist followed by cold moist

5. Environmental conditions needed for germination

a. Moisture

b. Aeration

c. Light

d. Temperature

E. Words to Look for During the Time-lapse Video:

Tropism - [Greek for a turning] A response to an external stimulus in which the direction of the movement is usually determined by the direction from which the most intense stimulus comes.

1. Phototropism

2. Geotropism

3. Photolic response

4. Auxin

5. Thigmotropism

6. Nutation

7. Epigeous

8. Hypogeous

9. Cotyledons

10. Coleoptile

LAB EXERCISES

I. Objective

To learn seed structure, viability test, and treatments to overcome seed dormancy.

II. Materials

Bean seeds (old, new, water-soaked, TTC-treated), razor blades, petri dish, paper towels, sand a paper or file.

III. Procedures

1. ***Seed Anatomy***
   Cut through a soaked bean seed and observe the internal structure. Sketch and label the parts of the seed.

2. ***Seed Viability***
   Bean seeds have been soaked overnight in TTC (triphenyltetrazolium chloride). This changes living tissue to a red color. Uncolored spots will indicate poor viability. Cut open several seeds and sketch your observations. Based on your observations how would you describe their viability? Why?

3. ***Seed Germination Tests***
   Seed has been divided into "old" and "new" lots. Count out 10 seeds from each lot and plant according to instructor's directions. Record the number of seeds that germinated for each group and calculate corresponding germination percentages.

4. ***Seed Scarification***
   This exercise will evaluate scarification techniques and their effect on germination percentages. Select 10 seeds for each of the four treatments and plant in the four different containers provided.

   a. Treatment 1- Control (no scarification)

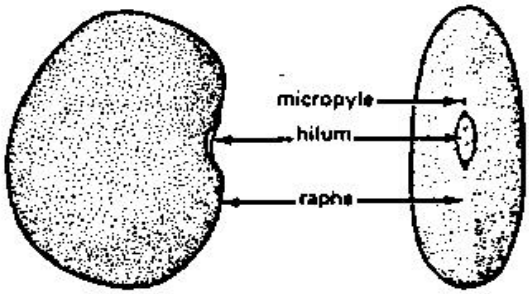
   b. Treatment 2- Seeds soaked in hot water

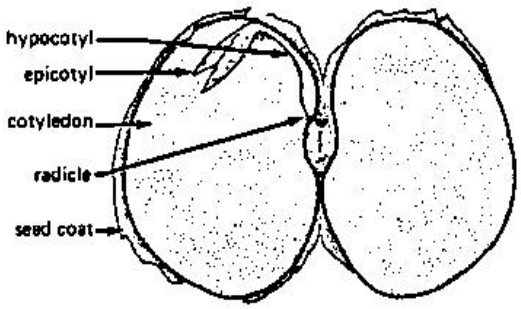
   c. Treatment 3- Seeds soaked in acid (sulfuric acid)

   d. Treatment 4- Mechanical scarification (use sandpaper, file, or clippers)

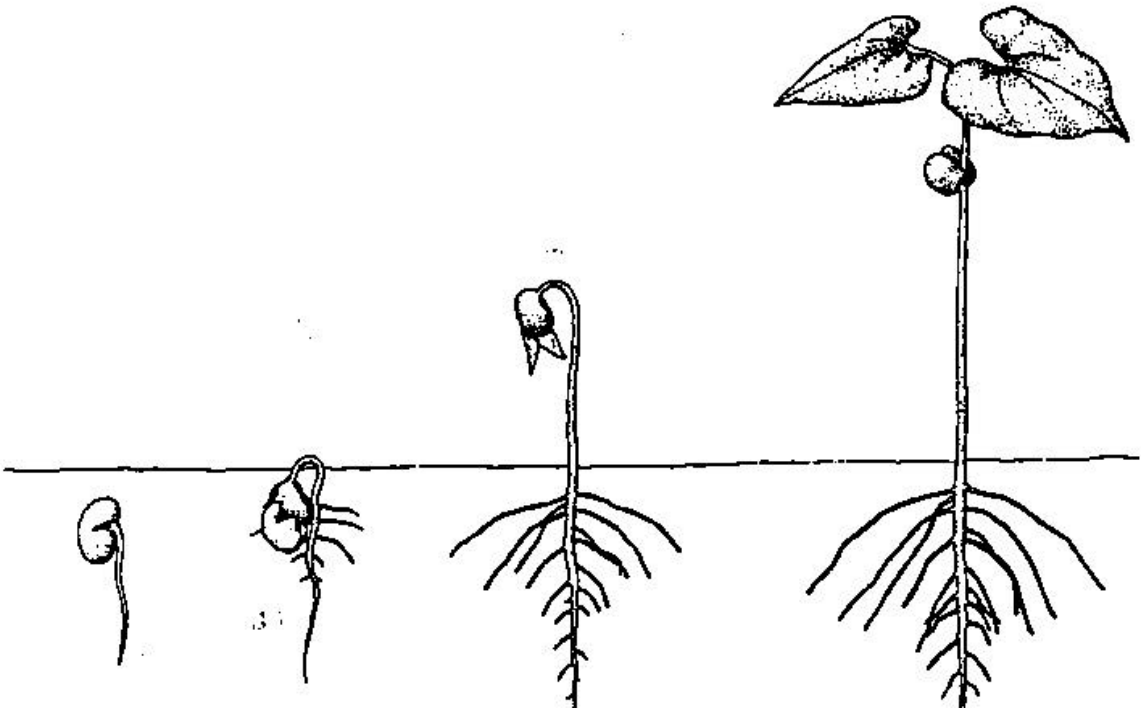
IV. Results

Obtain seed germination data for the steps 3 and 4 above for your group and the entire class. Use this information for your lab report.

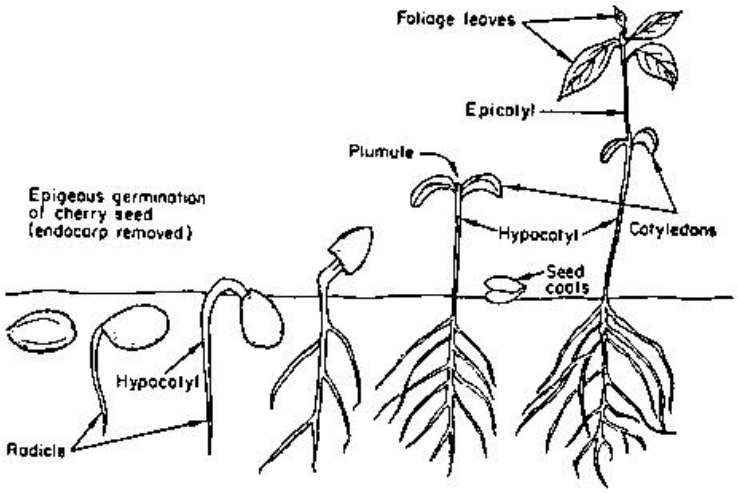


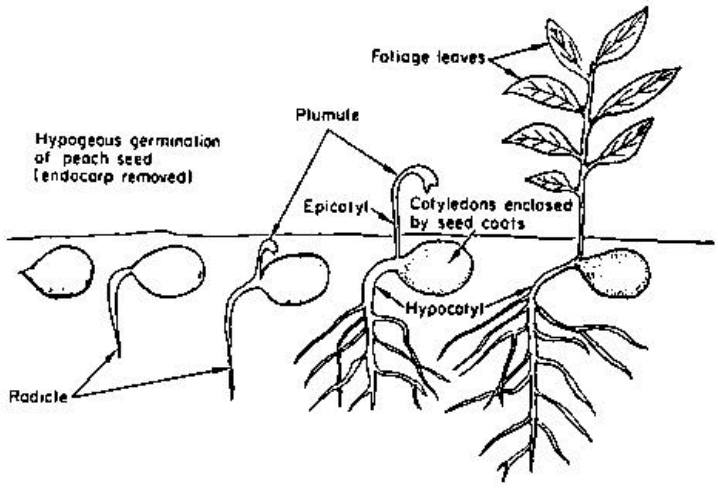


Bean Seed



Germination and seedling development of bean


Foliage leaves
Epicotyl
Plumule
Epigeous germination
of cherry seed
(endocarp removed)
Hypocotyl
Cotyledons
Seed
coats
Hypocotyl
Radicle


Foliage leaves
Plumule
Hypogeous germination
of peach seed
(endocarp removed)
Epicotyl
Cotyledons enclosed
by seed coats
Hypocotyl
Radicle

LAB 2 WORKSHEET

Name _____

1. Define seed stratification and scarification.

2. Summarize results of the seed scarification experiment (Procedure # 4).

Method	Total no. seeds	No. seeds germinated	%germination
a. Control	_____	_____	_____
b. Hot water	_____	_____	_____
c. Acid	_____	_____	_____
d. Mechanical	_____	_____	_____

Comments:

3. What is the function of the cotyledon in a bean seed and seedling?

4. Why is water necessary for seed germination?

5. Define seed viability. What are three factors that affect seed viability?