

Leaf and Seed Lab

Pre-lab Discussion

Leaves are the main photosynthetic organs of the plant. The flat part of the leaf is called the blade. In some plants, the blade is attached directly to the stem, in others; the blade is attached to the main stem by a thin stem or petiole.

A leaf is composed of three types of tissue: epidermis, mesophyll, and vascular tissue. Leaves have an upper and lower epidermis that protects the internal tissue. Covering the epidermis is a waxy cuticle that helps conserve water. Most of the photosynthesis of the plant takes place in the mesophyll. The xylem and phloem are found in vascular bundles in the veins of the leaf. They are continuous with xylem and phloem of the stem and roots

Seeds are important to plants because they aid in reproduction. When a seed is opened, you can usually find a miniature plant (embryo) inside that is surrounded by a food supply. If planted, the embryo grows into a new plant. Some seeds can easily split into equal halves or cotyledons (the stored food), while others cannot be split. Those seeds that can be split evenly are called dicotyledons (di means two), while those that cannot be split are called monocotyledons (mono means one).

Objectives

1. Study the tissues that make up the leaves of a plant.
2. Examine the structure of a stomata.
3. Observe and compare the parts of a lima bean seed.
4. Learn the names of functions of seed parts.

Materials

- Prepared slide of a lilac leaf
- Lettuce leaf
- Scalpel
- Forceps
- Beakers
- Pipette
- Slide
- Cover slip
- Microscope
- Dry lima bean
- Soaked lima bean

Part I: Leaf Tissue

A. Observe a prepared slide of a lilac leaf cross-section under low power. Focus on the upper epidermis, then on the lower epidermis. Switch to high power and examine the epidermal cells.

1. Do the epidermal cells contain chloroplasts? _____

Throughout the lower epidermis are tiny openings called stomata. Each stomata is surrounded by a pair of guard cells that regulate its opening and closing. The stomates allow water vapor, carbon dioxide, and oxygen to pass into and out of the leaf.

B. Switch to low power. Observe the stomates and their guard cells.

Most photosynthesis in the leaf occurs in the mesophyll. The mesophyll is made up of two layers. The upper layer, the palisade mesophyll, consists of tall, closely packed cells. The lower layer, the spongy mesophyll, consists of irregularly shaped, loosely packed cells. The spongy mesophyll layer contains many air spaces.

C. Focus on the mesophyll under low, then high, power. Identify the palisade cells and the spongy mesophyll cells.

2. What are the most numerous organelles in the palisade cells? _____

D. Draw what you see and include the following labels:

Cuticle

Mesophyll

Spongy mesophyll

Vein

Guard cells

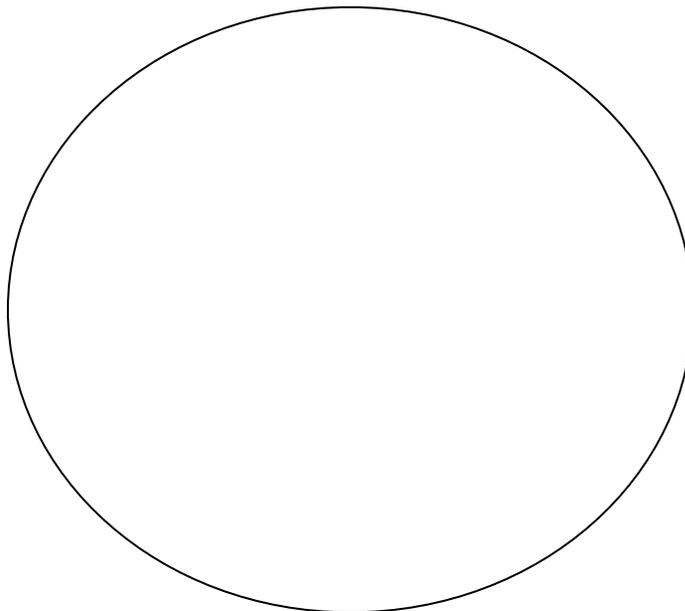
Palisade mesophyll

Stoma

Air space

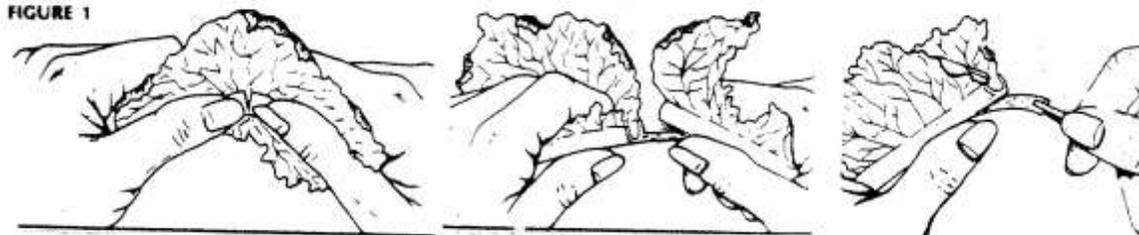
Lower epidermis

Upper epidermis



Part II: Stomata

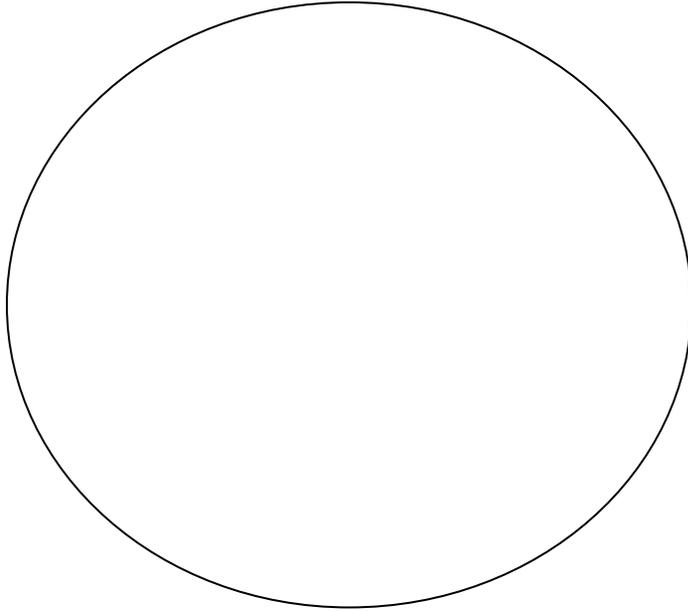
- A. Soak a lettuce leaf in a beaker of water for at least five minutes. The leaf will become stiff.
- B. Remove the leaf from the water when it has become stiff. Crack the leaf midrib as shown in Figure 1. With forceps, peel off a piece of the lower epidermis.



- C. Place the epidermis on a clean slide. Cut a small section of it with a scalpel. Place the section in the center of the slide and discard the rest of the epidermis. Add a drop of water and a cover slip.
- D. Examine the slide under low power. Adjust the light to provide the best contrast.
 1. Describe the shape and color of an epidermal cell.
- E. Focus on a stomate and switch to high power. Observe the stomate and the guard cells surrounding it.
 2. Describe the appearance of the stomate and the guard cells.
- F. Switch back to low power. Count the number of stomata you see in the field of the low power objective.
 3. Record the number of stomata in the low power field. _____

G. Draw and label the lettuce leaf. Include the following labels.

Guard cells
Epidermal cells
Stomata
Chloroplasts



Part III: Seeds

A. Compare the sizes and textures of a dry lima bean to a soaked lima bean.

1. How are the sizes and textures of the two lima beans different? What caused the difference?

B. Peel off the seed coat of the soaked lima bean. Carefully split the bean into two equal sections. Draw and label the following parts.

Embryo
Cotyledons

Questions

1. Explain the function of the cuticle.
2. Epidermal cells contain few, if any chloroplasts. How does this affect the amount of light reaching the mesophyll?
3. In which layer of the mesophyll does more photosynthesis occur. How can you determine this?
4. What is the function of the air spaces in the spongy mesophyll?
5. What tissues of the leaf are continuous with those in the stem and root, and what function do they serve?
6. What is the function of the seed coat?
7. What is the function of the cotyledons?
8. Why is it important for all seeds to have a food supply?
9. What might you expect to grow if seeds without an embryo were planted? Why?