

Plant Tissues

As for all animals, your body is made of four types of tissue: epidermal, muscle, nerve, and connective tissues. Plants, too, are built of tissues, but not surprisingly, their very different lifestyles derive from different kinds of tissues. All three types of plant cells are found in most plant tissues.

Three major types of plant tissues are dermal, ground, and vascular tissues.

Dermal Tissue

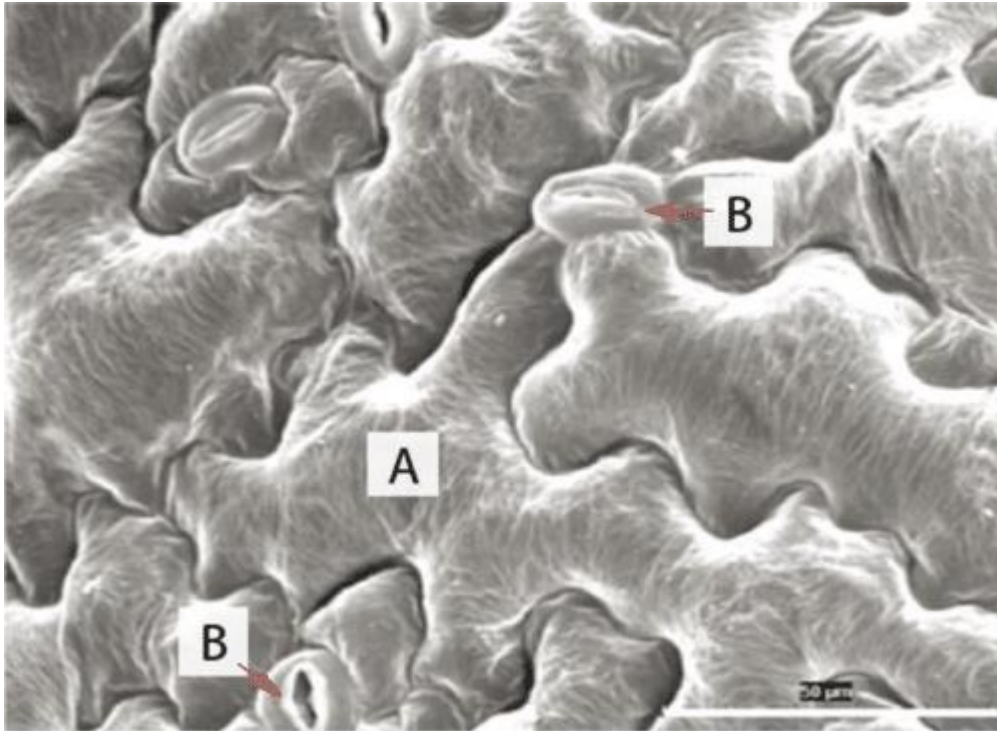
Dermal tissue covers the outside of a plant in a single layer of cells called the **epidermis**. You can think of the epidermis as the plant's skin. It mediates most of the interactions between a plant and its environment. Epidermal cells secrete a waxy substance called **cuticle**, which coats, waterproofs, and protects the above-ground parts of plants. Cuticle helps prevent water loss, abrasions, infections, and damage from toxins.

This tissue includes several types of specialized cells. Pavement cells, large, irregularly shaped parenchymal cells which lack chloroplasts, make up the majority of the epidermis. Within the epidermis, thousands of pairs of bean-shaped sclerenchymal **guard cells** swell and shrink by osmosis to open and close **stomata**, tiny pores which control the exchange of oxygen and carbon dioxide gases and the release of water vapor. The lower surfaces of some leaves contain as many as 100,000 stomata per square centimeter.

Epidermis - the exchange of matter between the plant and the environment.

a) the epidermis on above ground organs (leaves and stems) is involved with gas exchange

b) the epidermis on below ground organs (roots) is involved with water and ion uptake



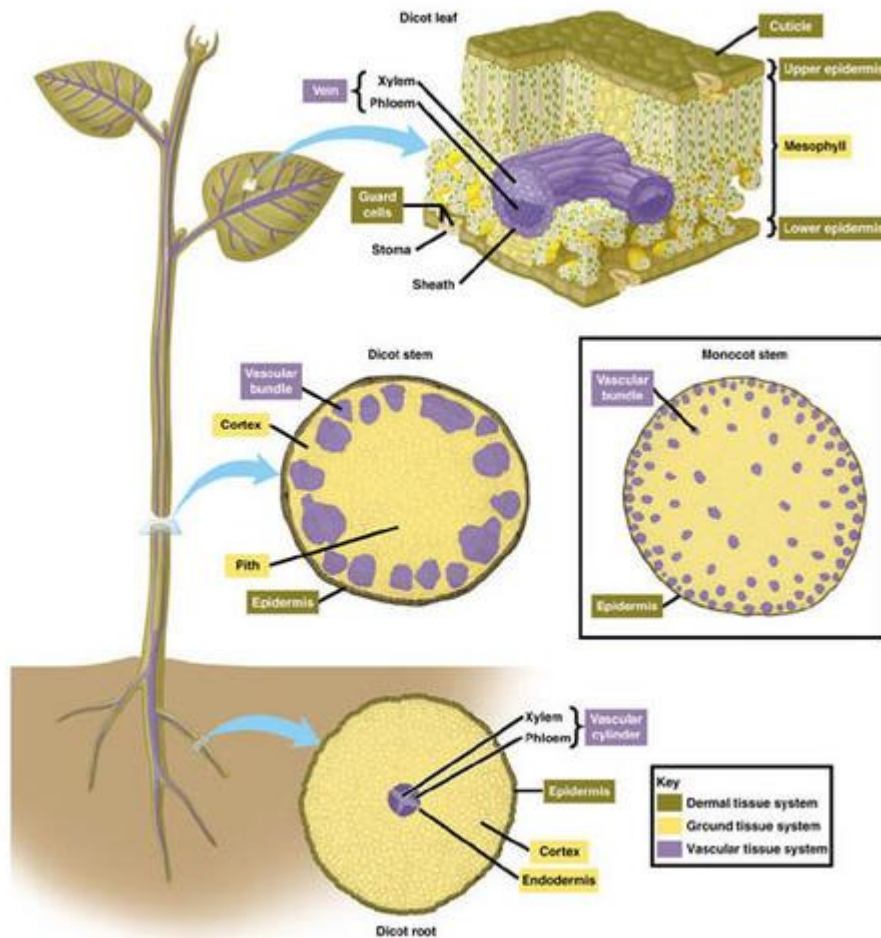
The epidermis of *Arabidopsis* shows both pavement cells (A) and stomata made of sclerenchymal **guard cells** (B), which control water loss and gas exchange.

Ground Tissue

Ground tissue makes up much of the interior of a plant and carries out basic metabolic functions. Ground tissue in stems provides support and may store food or water. Ground tissues in roots may also store food.

Ground tissues - metabolism, storage, and support activities

- a) The ground tissue of the leaf (called mesophyll) uses the energy in sunlight to synthesize sugars in a process known as photosynthesis
- b) The ground tissue of the stem (called pith and cortex) develops support cells to hold the young plant upright
- c) The ground tissue of the root (also called cortex) often stores energy- rich carbohydrates



The three tissue types of plants.

Vascular Tissue

Vascular tissue runs through the ground tissue inside a plant. Your body was able to grow from a single cell to perhaps 100 trillion cells because, 21 days after fertilization, a tiny heart began to pump blood throughout your tiny self – and it hasn't stopped since. The blood it pumps carries water, oxygen and nutrients to each one of your trillions of cells, and removes CO₂ and other wastes. Of course plants don't have hearts, but they do have vessels that transport water, minerals, and nutrients through the plant. These vessels are the vascular tissue, and consist of **xylem** and **phloem**. Xylem and phloem are packaged together in bundles, as shown in figure below.

Vascular tissues - the transport of water and dissolved substances inside the plant

- a) The xylem carries water and dissolved ions from the roots to stems and leaves
- b) The phloem carries dissolved sugars from the leaves to all other parts of the plant



Bundles of xylem and phloem run through the ground tissue inside this stalk of celery. What function do these tissues serve?

Summary

- The three types of plant cells are found in each of the major types of plant tissues: dermal, ground, and vascular tissues.
- Dermal tissue covers the outside of a plant in a single layer of cells called the epidermis. It mediates most of the interactions between a plant and its environment.
- Ground tissue makes up most of the interior of a plant. It carries out basic metabolic functions and stores food and water.
- Vascular tissue runs through the ground tissue inside a plant. It consists of bundles of xylem and phloem, which transport food, water and minerals throughout the plant.

Review

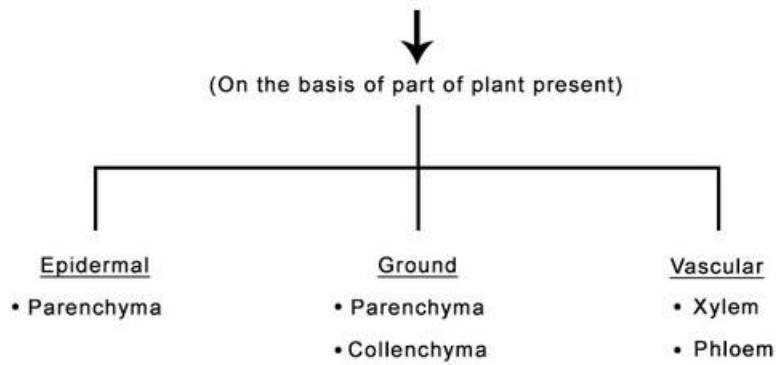
1. Compare and contrast dermal, ground, and vascular tissues of plants.
2. What is cuticle? What is its role?
3. What are guard cells and stomata?
4. An important concept in biology is that form follows function. In other words, the structure of an organism, or part of an organism, depends on its function. Apply this concept to plants, and explain why plants have different types of cells and tissues.

Types of Plant Tissues

Plant Tissues can be classified by following ways.

- I. On the basis of the part of plant they are present.

I. Types of Plant Tissues



II. On the basis of kind of cells they contain

