



CMG GardenNotes #131

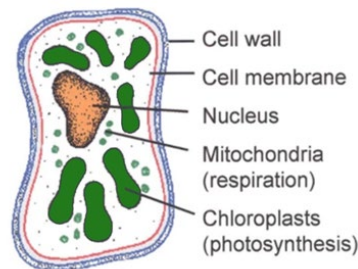
Plant Structures: Cells, Tissues, and Structures

Outline: Cells, page 1
Tissues, page 1
Organs, page 2
Plants, page 2

Plant bodies are structurally and functionally specialized. This specialization is effected by differentiation among types of cells and tissues. Plant **cells** are grouped into **tissues** based on function (e.g., protecting the plant, conducting water, etc.). Cells and tissues comprise distinct **organs**, or externally recognizable plant parts.

Cells are individual building blocks for life processes and growth. Common cells contain genetic matter (**deoxyribonucleic acid**, or **DNA**) and metabolic and storage organelles. Cells are the site of **photosynthesis** (sugar production). Photosynthesis, the process of converting light energy into stored carbohydrates, is conducted in organelles called **chloroplasts**. [Figure 1]

Figure 1. Plant Cell



Tissues are groups of cells that are similar in function. Categorizing plant cells in this way is in some sense artificial because structural features in plants not only vary and intermix with one another, but because they are capable of changing into one another. Tissues are typically divided by functional properties that are related to position within the plant body. Plant tissues are organized into three systems, the **dermal**, **ground** (or fundamental) and **vascular** systems.

The dermal system separates the plant from the outside world, the ground system forms the bulk of the plant body and carries out essential metabolic functions, and the vascular system conducts water and nutrients through the plant.

Some Plant Cell and Tissue Types:

Epidermis is the continuous surface layer of cells that protects the plant body. The outside

surface of the epidermis tissue is usually covered with a waxy substance called cutin, which reduces water loss and mechanically protects the plant. In addition to epidermal cells proper, stomatal guard cells, trichomes, root hairs, and secretory cells are all part of the epidermis.

Periderm is present in plants with secondary growth (wood) in stems and roots. When present, it replaces the epidermis and generates, among other things, bark.

Parenchyma cells form continuous tissues within the body of the plant. In stems and roots, for example, the parenchyma cells make up the cortex (storage tissues) and pith. In leaves, a layer of parenchyma cells called **mesophyll** under the epidermis is the primary site of photosynthesis. Parenchyma cells are active in wound healing and the production of secondary plant structures like adventitious roots.

Meristems are “immortal” cells that continuously divide to produce new cells at the growing points of plants.

Sclerenchyma tissue is made up of thick-walled support cells found throughout the plant, occurring both as continuous tissue, and as small, isolated groups.

Xylem is a structurally complex tissue that conducts water and nutrients throughout the plant, provides storage, and support. Several cell types are present in xylem. In woody plants, the xylem tissue becomes the wood.

Phloem tissue conducts food and metabolites from photosynthesis throughout the plant, including down to the roots, and like xylem, includes several different cell types.

Organs (structures) are externally recognizable plant parts (e.g., roots, stems, leaves). Flowers are typically viewed as an assemblage of organs (stamens, carpels, petal, and sepals).

Plants are made up of coordinated, highly specialized cells and tissues that form a single integrated organism.

Authors: David Whiting, CSU Extension, retired; Michael Roll, former CSU Extension employee; Larry Vickerman, former CSU Extension employee. Artwork by Scott Johnson and David Whiting. Used with permission. Revised July 2016 by Patti O'Neal, CSU Extension, retired; Roberta Tolan, CSU Extension, retired; and Mary Small, CSU Extension, retired. Reviewed March 2023 by John Murgel, CSU Extension and Sherie Shaffer, CSU Extension.

- Colorado Master Gardener GardenNotes are available online at <https://cmg.extension.colostate.edu/>.
- No endorsement is intended of products mentioned, nor is criticism implied of products not mentioned.
- Copyright Colorado State University Extension. All Rights Reserved. CMG GardenNotes may be reproduced, without change or additions, for nonprofit educational use with attribution.
- Colorado State University, U.S. Department of Agriculture, and cooperating Colorado counties.

Colorado State University Extension is an equal opportunity provider.

Colorado State University does not discriminate on the basis of disability and is committed to providing reasonable accommodations.

CSU's Office of Engagement and Extension ensures meaningful access and equal opportunities to participate to individuals whose first language is not English.

<https://col.st/OWMJJA>

Colorado State University Extension es un proveedor que ofrece igualdad de oportunidades.

Colorado State University no discrimina por motivos de discapacidad y se compromete a proporcionar adaptaciones razonables.

Office of Engagement and Extension de CSU garantiza acceso significativo e igualdad de oportunidades para participar a las personas quienes su primer idioma no es el inglés.

Reviewed March 2023