



BASIC WOODY PLANT BIOLOGY – Part 1

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Learning objectives— The arborist will be able to

- explain the functions of the parts of a plant cell
- describe how woody plants increase in size
- describe the basic structures and functions of stems, leaves and roots
- explain the concept of the mortality spiral and give examples

The purpose of this chapter is to impress upon plant health care (PHC) practitioners the importance of knowing about the “patient.” Using the human health care analogy, we wouldn’t want someone who doesn’t have a basic understanding of human anatomy and physiology to perform open heart surgery on our loved ones. In the same vein, we as PHC practitioners must have a basic understanding of woody plant anatomy and physiology before we can contemplate what maintenance or management practices must be incorporated into a PHC program. We must know our patients taxonomically before we can even assess their physiological requirements. Identification of the plant is required for diagnosing plant problems.

In this article, the basic parts of woody plants are detailed to help arborists understand tree function. Additional references on basic woody plant biology and identification are listed at the end of the article.

Nuts and Bolts of a Plant

The cell is the basic building block of a plant. Found within the cell are organelles with specialized functions. The organelles are the nucleus, chloroplasts and the mitochondria (Figure 1). The nucleus contains the genetic information that determines the form and function of the organism.

Chloroplasts, found primarily in leaf tissues, contain the pigment chlorophyll that the plant uses to harvest light energy during photosynthesis. The mitochondria contain the machinery required for respiration so they can derive energy from sugar and starch. In respiration, oxygen is consumed and carbon dioxide is released. Mitochondria are immersed in a material called cytoplasm which is surrounded by a cellular membrane that regulates the movement of water, ions and molecules into and out of the cell. The cell wall (not found in animal cells), just outside the cellular membrane, is made up of interwoven and cross-linked molecules of cellulose, embedded in lignin. This is the feature that gives woody plants the structural integrity to stand up and enables them to move water and nutrients over such large distances.

Cell division is necessary for plant growth. During a process called mitosis, cells divide into identical daughter cells, each one taking with it a copy of the genetic information found in the nucleus of the dividing cell. Mitosis occurs in tissues called meristems which are found at the very tips of the shoot and root (apical meristems) and under the bark (vascular cambium). As cells mature, they specialize into groups of cells called tissues that work together to perform special functions in the plant. Cells produced by the vascular cambium develop into xylem and phloem that specialize in transport of water and nutrients. Cells formed in the shoot apical meristem may develop into epidermal tissue that protects the leaves and stem or into a tissue such as the palisade parenchyma in

the leaf that specializes in photosynthesis.

Considering the thousands of coordinated activities occurring in plant cells and tissues, it is not surprising that problems such as water stress and insufficient light may have drastic effects on plant growth and development. The job of the PHC practitioner is to provide the care necessary to keep all systems functioning well, ensuring healthy, long-lived trees and shrubs.

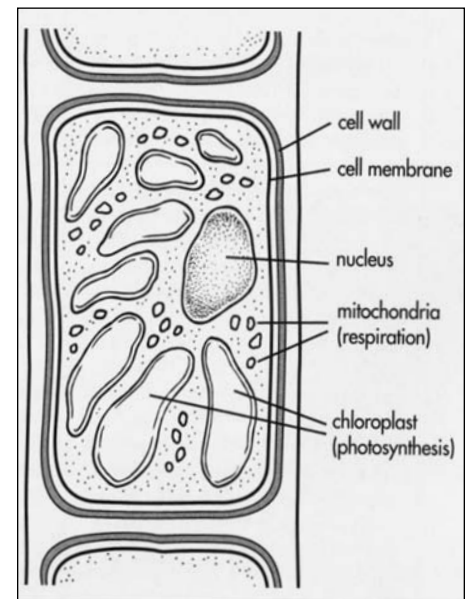


Figure 1. The cell is the basic building block of a plant and contains organelles with special functions.

Corresponding test questions for this article are available in the ISA compendium entitled “Tree Biology.” The compendium is a collection of Arborist News CEU articles with corresponding test questions worth a total of 9 CEU credits. ISA compendiums are available to purchase from the ISA online at www.isa-arbor.com or by phone at 888-472-8733.

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