BSCS Biology An Ecological Approach

Chapter 18 The Flowering Plant: Form and Function

Plants are the young of the world, vessels of health and vigor; but they grope ever upward towards consciousness; the trees are imperfect men, and seem to bemoan their imprisonment, rooted in the ground.

-Ralph Waldo Emerson

Introduction

Most plants are adapted for living in two entirely different environments at the same time. There are the leaves and stems above ground and exposed to wind, heat, cold, sunlight, and drying conditions. In the soil are the roots which give support and take in water and nutrients. In order for a plant to live and reproduce, specific adaptations have developed. There is a great deal of variability among individual plants.

Leaves

Leaves have developed to produce **food**. They do this with specialized shapes and cell structures to maximize **photosynthesis** or food production. The flat **blade** of the leaf is connected to a plant stem by a **petiole**. Within each individual leaf, specialized cells carry out various functions such as food production, oxygen and carbon dioxide exchange, water transportation, and maintenance of pressure (**turgor**). Specialized **guard cells** are found surrounding the little openings (**stomates**) in the blade of a leaf to help control water loss through **transpiration**. Some leaves have evolved to serve functions other than making food for the plant. For example, cactus spines are specialized leaves adapted for protection, while in many **succulent** plants, photosynthesis occurs in their fleshy stems.

Stems

The stems of plants serve to support leaves and other above-ground parts of the plant. Stems also carry **water** and **nutrients** from the roots up to the leaves through the **xylem** and sugars manufactured in the leaves to other parts of the plant through the **phloem**. Xylem is a **vascular tissue** that conducts the fluids up from the roots while phloem distributes the food (sugars) through the plants, including back down to the roots. **Transpiration** is the process in which water moves up and through the plant and eventually out into the air through the leaves.

Roots

Roots serve to **anchor** plants in the soil while also functioning to **absorb water** and **nutrients**. There are two kinds of root systems: **fibrous** (like a net) and **tap root** (one primary root going down). Most nutrients are absorbed through tiny **root hairs**. Roots and root hairs constitute a huge surface area of the plant.

Plant Growth

Flowering plants begin life as **seeds**. Each seed contains a tiny **embryo** or miniature plant. During seed **germination**, the first structure to emerge is the **root**. Next, rapid growth continues through the division of **meristems** which are unspecialized rapidly growing cells. As plants grow in size, the stems increase in diameter. The **cambium** is the growing origin of the stem or trunk in trees producing **xylem** cells on the inside and **phloem** cells on the side facing outward. The growth of xylem is much more rapid during summer when the plant is conducting the maximum amount of liquids. The difference in growth between summer (rapid) and winter (slow or dormant) produces the characteristic tree **rings**. Tree age can be calculated in years by counting these rings.