Lesson 2: Classification of Plants

Continued study and research have increased our knowledge of plants. There are over 500,000 different plant species. A method of classification is needed to help researchers identify different species. This lesson is about methods of plant classification. By classifying plants, a better understanding of the plant world can be achieved.

Classification

Since as far back as recorded history, humans have depended on plants for food and shelter. Plants have been studied, and crude methods of classification were developed. The crude means by which plants were grouped together was successful until the world population grew and became inhabited by people of many languages. A method of classification was needed that could cross cultural and language barriers.

In 1753, Carolus Linnaeus, a Swedish naturalist and botanist, established the method of classifying plants that is used today. The Linnaeus method of classifying plants divided each plant's name into two parts. The first part is for the genus (group); the second part is for the species (kind). Linnaeus was a botanist, which is a person who specializes in the study of plants. The method used by Linnaeus and botanists today is referred to as the botanical method of classification. This method classifies plants regardless of their agricultural importance. The genus and species names given to plants are usually of Latin origin.

Another method of classification is known as descriptive classification. Descriptive classification is used mostly by plant scientists, agronomists, and farmers. This method deals mainly with crop plants. This classification is descriptive of the plants use by humans rather than its botanical classification. Descriptive classification can help identify plants' cultural needs, growth patterns, limitations, and requirements for optimum production or growth.

Botanical Classification

As research and study of plants increased throughout history, the need to share discoveries became more apparent. For example, scientists working in Germany needed to share their findings with scientists in South America working on the same problem; therefore, the language barrier needed to be solved. As early as the Middle Ages, Latin was the recognized language used throughout the world by scholars and educated individuals. Latin was the basis of most European languages, including English. It was taught throughout the world regardless of a country's native tongue. Since Latin is considered an unchanging language, it is suitable for universal communication. Therefore, botanical classification uses Latin to identify the genus and species of plants.

Botanical classification places plants into discrete categories called taxa (plural for taxon). The naming of organisms is termed nomenclature, and the grouping of organisms is termed classification. These two processes belong to a specialized field known as taxonomy. Taxonomists are scientists who classify and name plants.

The botanical classification system is important because it clearly identifies plant species. Botanical classification attempts to group plants according to their similarities. In the botanical system, there are eight levels of classification for each species. The "kingdom" is the broadest category of classification. The "species" is the most specific category. Using the acronym "KDCSOFGS" May help people remember the levels of the classification system.

1. Kingdom
2. Division or phylum
3. Class
4. Subclass
5. Order
6. Family
7. Genus
8. Species

Each of the eight levels is used to classify an individual plant species. Botanical classification also helps to identify how plant species differ from other plants. Table 2.1 is an example of botanical classification.

Table 2.1 – Wheat vs. Barley Classification

	Wheat	Barley
1. Kingdom	Plantae (plant, distinct from animal)	Plantae (plant, distinct from animal)
2. Division	Spermatophyta (or seed plants)	Spermatophyta (or seed plants)
3. Class	Angiosperma (or plants with their seeds in a fruit)	Angiosperma (or plants with their seeds in a fruit)
4. Subclass	Monocotyledonae (seed with single seed leaf)	Monocotyledonae (seed with single seed leaf)
5. Order	Graminales (grass-like families)	Graminales (grass-like families)
6. Family	Graminae or Graminaceae (the grasses)	Graminae or Graminaceae (the grasses)
7. Genus	Triticum (the wheats)	Hordeum (the barleys)
8. Species	aestinum (bread wheat)	Vulgare (barley)

By comparing the two species, one can see the similarities between the two species from kingdom to family. However, the two plants differ at the genus and species levels. This system is used to correctly identify specific species, especially when there are several different species in a particular genus.

Monocots and Dicots

Agricultural plants can be divided into monocotyledonous plants and dicotyledonous plants. Monocotyledonous plants, frequently called monocots, have seeds with a single cotyledon (first leaf). See Figure 2.1.

Dicotyledonous plants, which are frequently called dicots, have seeds with two cotyledons (first leaves). The differences in these two major classes of plants can be clearly seen by comparing their seeds, root systems, stems, leaves, and flowers. Seeds of monocots contain the embryo, endosperm, and one cotyledon. See Figure 2.2.

Monocots have an embryonic root, which develops from the seed. This embryonic root dies soon after the seed germinates. The whole root system of monocots is composed of adventitious roots. Figure 2.3 shows the location of the adventitious roots of the monocots. Monocots have many roots that are all about the same size.

Figure 2.1 – First Leaves of Monocots and Dicots

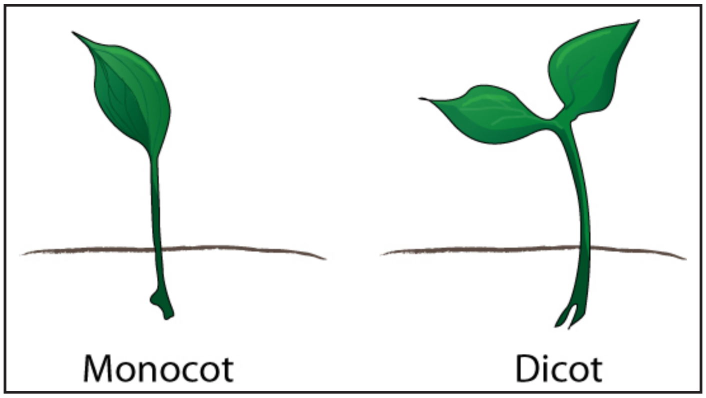


Figure 2.2 – Monocot Seed

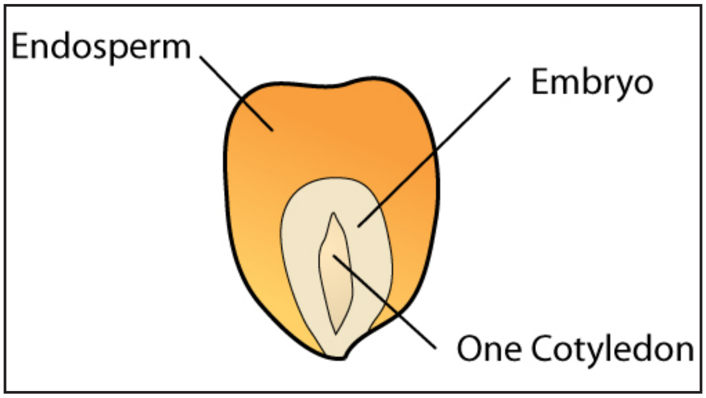


Figure 2.3 – Monocot Root System

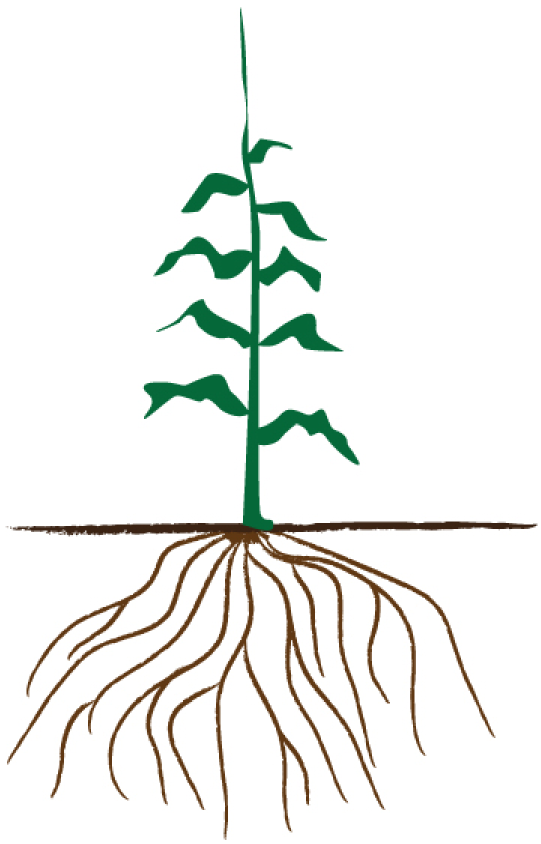
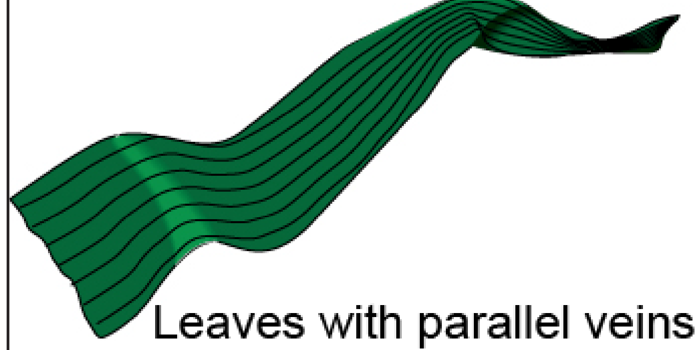


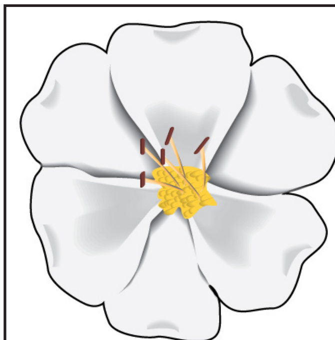
Figure 2.5 – Monocot Leaf



Monocot leaves are long and narrow with parallel veins. In the leaf's epidermis, the cells are long and run in the same direction as the leaf length. See Figure 2.5.

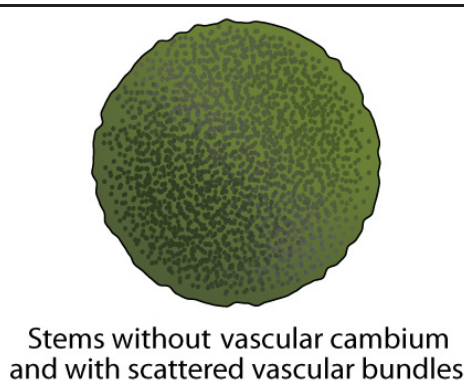
The flower of monocots contains three parts or multiples of three. See Figure 2.6.

Figure 2.6 – Monocot Flower



Monocots usually have 10 vascular bundles scattered throughout the stem. These vascular bundles contain xylem and phloem tissues, not vascular cambium tissues. See Figure 2.4.

Figure 2.4 – Monocot Stem



Seeds of dicots contain an embryo, seed coat, and two cotyledons. See Figure 2.7.

Figure 2.7 – Dicot Seed

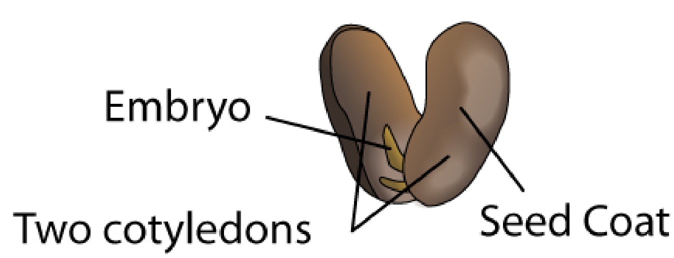


Figure 2.8 – Dicot Root System

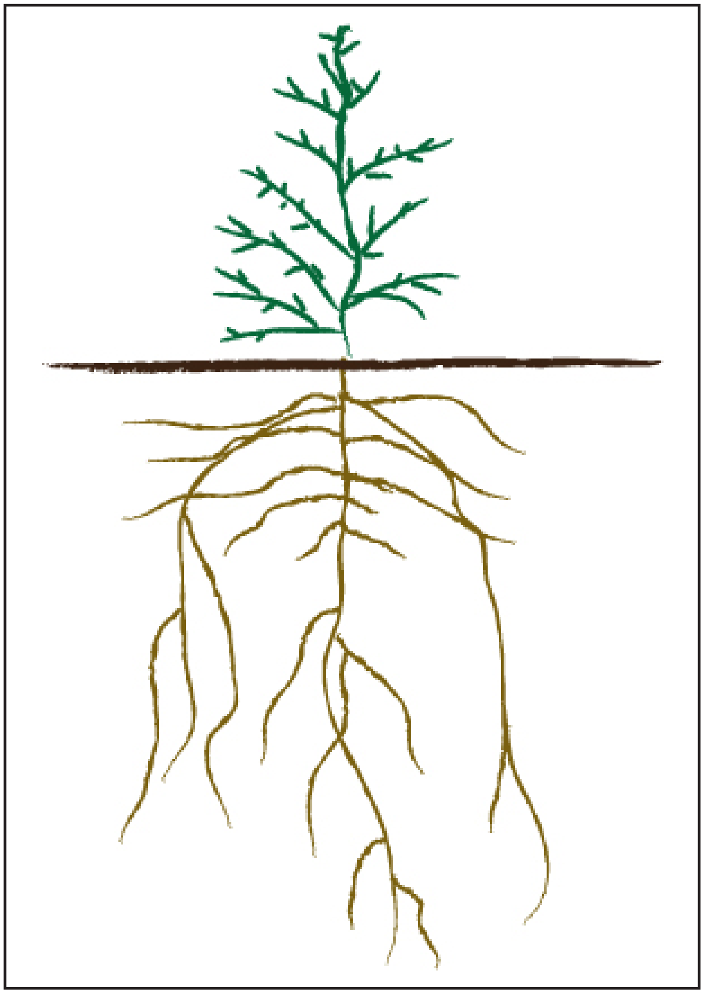


Figure 2.9 – Dicot Stem

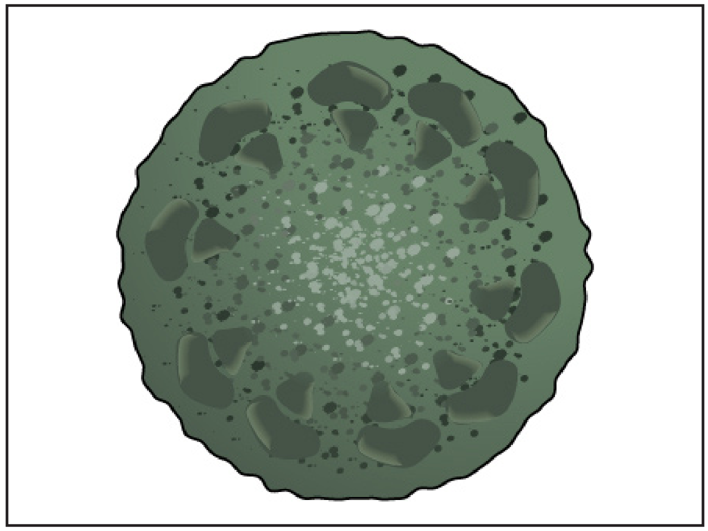


Figure 2.10 – Dicot Leaf

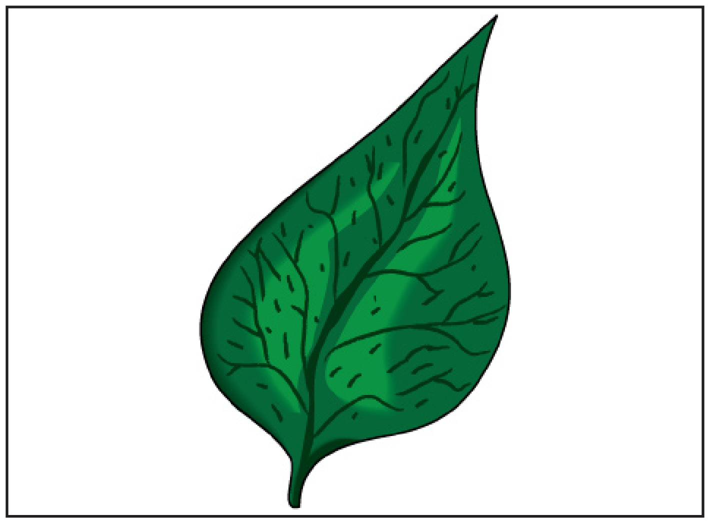
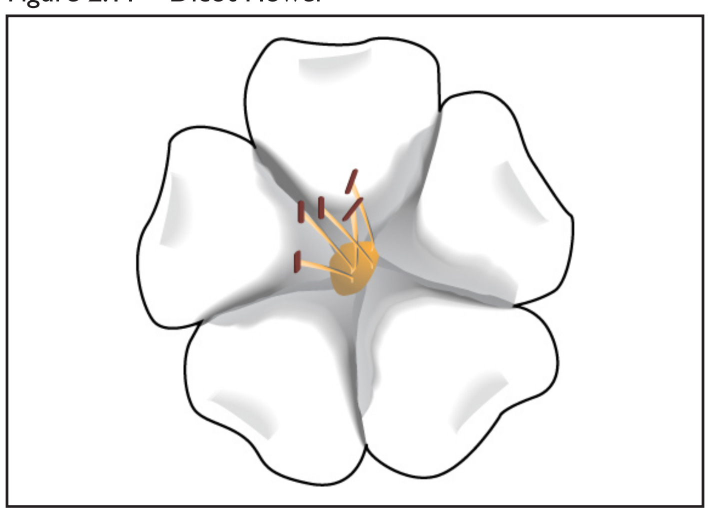


Figure 2.11 – Dicot Flower

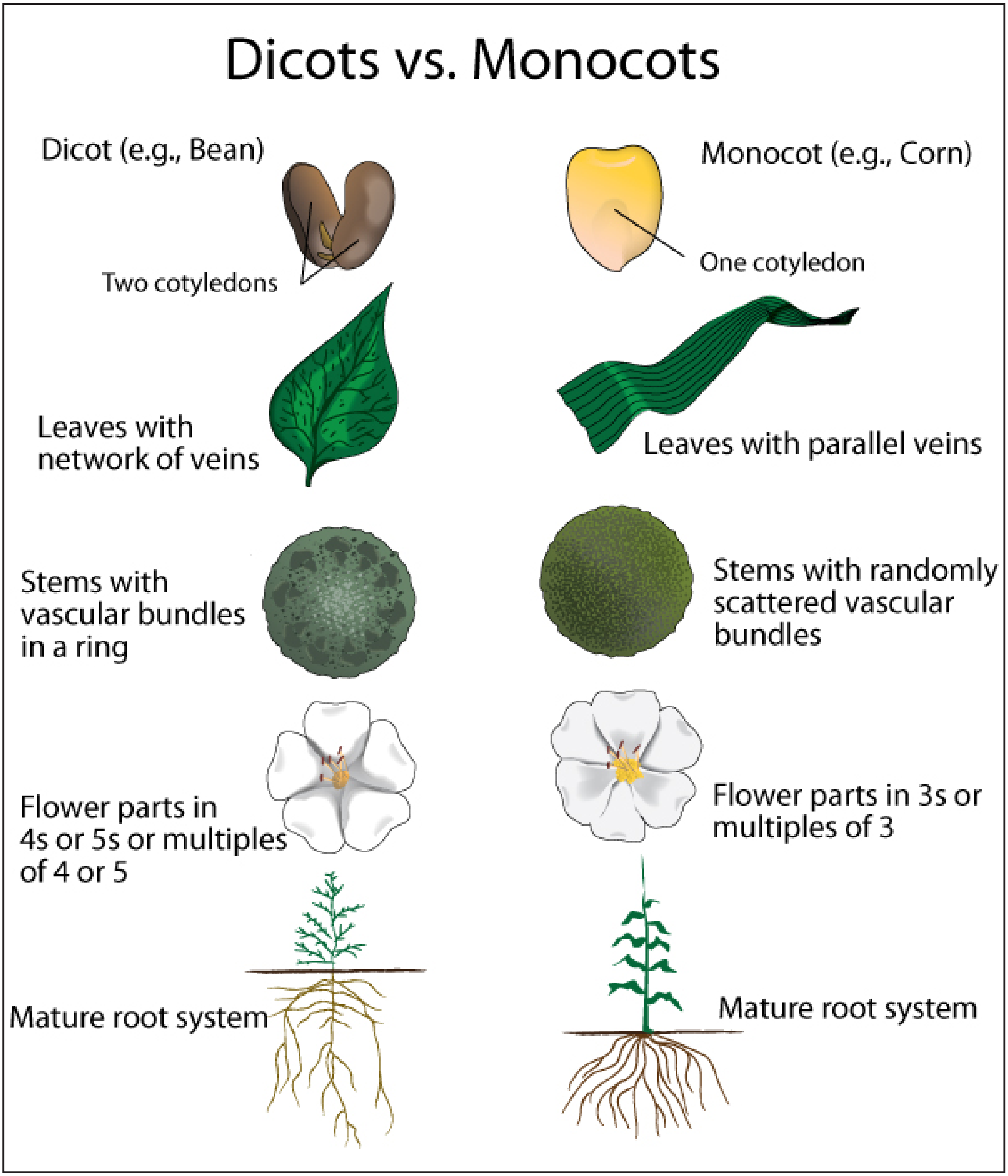


Dicots have roots with numerous root hairs that have a very short life span, often only a few days. As the plant continues to grow, new roots and root hairs grow on a continuous basis. The primary root will begin to thicken and develop secondary growth at about the same time as the stem. See Figure 2.8.

The stem of dicots contains four or five vascular bundles that form a ring around the outside of the stem. Each vascular bundle contains phloem, cambium, and xylem tissues. See Figure 2.9.

Unlike monocots, leaves of dicots have a network of veins. The veins in dicots do not run parallel with the length of the leaf. See Figure 2.10. The flower of dicots contains four or five parts or multiples of four or five. See Figure 2.11. Figure 2.12 provides a comparison of dicots and monocots.

Figure 2.12 – Dicots vs. Monocots



Legumes

Legumes (Leguminosae) are a unique family of plants in the plant kingdom. Legumes are named for the type of fruit, also called a pod, which is characteristic of plants in this family. Some examples of legumes are:

1. Soybeans
2. Peanuts
3. Beans: lentils, lima, black, black-eyed, kidney, pinto, white, scarlet runner, string, and shell
4. Peas: chick-pea and green pea

Legumes commonly used for livestock feed include:

1. Alfalfa
2. Clovers: red, white, alsike, and crimson; others less used: hop, Persian, sub, and strawberry
3. Birdsfoot trefoil
4. Vetch: common, hairy, purple, and Hungarian
5. Lespedeza: Korean, common, and perennial sericea

Legumes are also produced for their oil content. Some countries grow legume seeds primarily for their oil and use the protein as a by-product. For example, soybean oil is used in processed foods such as margarine, salad oils, and shortenings. Industrial oils from legume seeds are used in paints, varnishes, inks, and many other products.

Legumes are unique in their ability to obtain certain nutrients. All plants need nutrients for proper growth and development. The three primary nutrients needed are nitrogen, phosphorous, and potassium, all of which can be applied as fertilizers.

Some legumes have a unique capability known as symbiotic nitrogen fixation. They can take nitrogen from the air. Through a symbiotic relationship with rhizobia bacterium, legumes produce nitrogen in a form that plants can use.

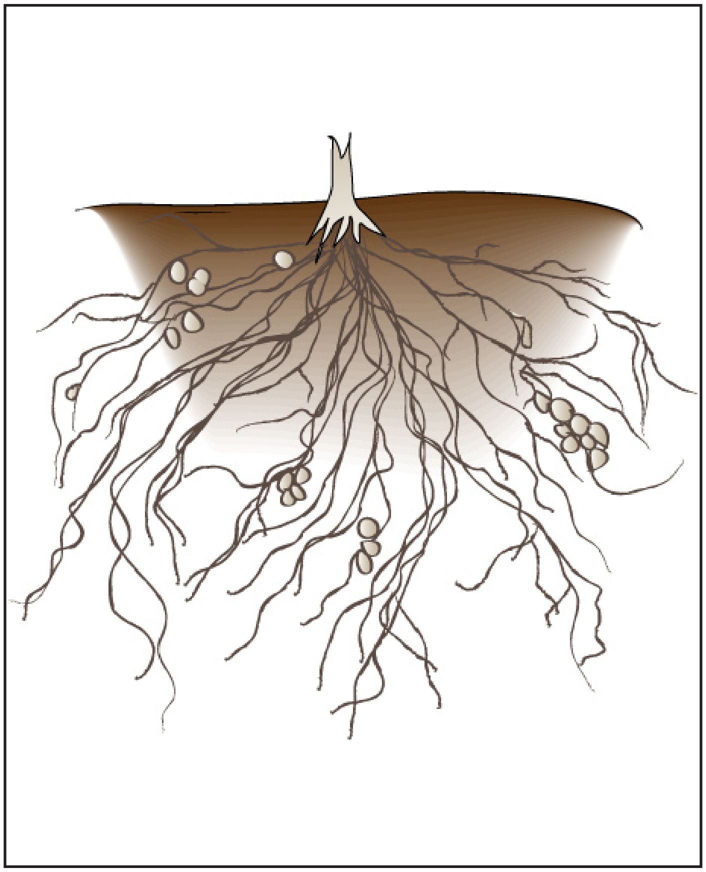
When the rhizobia bacterium enters the plant's roots, nodules form. These nodules work like small factories producing nitrogen that helps plants grow, thus reducing the need to apply commercial nitrogen fertilizers. This bacterium is not always naturally present in the soil. By placing a culture containing the bacterium on seeds before planting, it will increase the amount of nitrogen produced in the roots. Adding this bacterium to the seeds is called inoculation. See Figure 2.13.

In addition to reducing the need for nitrogen fertilizers, reducing cost, and increasing crop yields, nitrogen fixation enriches the soil. Some legumes are used as cover crops that are plowed into the soil. This increases soil nitrogen levels and benefits the next crop planted.

Life Cycles

Each plant grows in stages which, from beginning to end, are its life cycle. In descriptive classification, a plant's life cycle is important because it relates to the plant's productivity. The life cycle covers all stages of the plant's life from the seed through growth of the plant to the formation of another seed.

Figure 2.13 – Nodules on Legume Roots



Farmers and agricultural scientists study the life cycle of plants. This study increases the understanding of plants' reproductive cycles. Life cycles can be divided into three categories: annuals, biennials, and perennials. Annual plants complete their life cycles within one year or growing season. Many flowers purchased in the spring are annuals. They die off at the first frost and will not grow again the next year unless planted again.

Annuals can be subdivided into summer and winter annuals. Summer annuals are plants that are seeded in the spring and harvested in the fall. Corn is an example of a summer annual. A winter annual is a type of plant that is seeded in late summer or early fall and harvested the following summer. Winter wheat is an example of a winter annual.

Biennial plants require two years to complete their life cycles. Generally in the first year after planting, the plant produces mainly vegetative growth including leaves, stems, and roots. The second year the plant produces flowers, fruits, and seeds. At the end of the second year, the biennial dies. Sugar beets, carrots, and onions are examples of biennials.

Perennial plants live year after year. Perennials continue through their life cycle each year and produce flowers, fruits and seeds. After they produce seed, they appear to die back, but actually they go into a resting period called dormancy. This process is more noticeable in regions that have cold winter seasons. The perennial may completely stop growing for the winter. However, when spring comes, its pattern of growth begins again. During the dormant period, the perennial slows down all its natural processes. Dormancy is a means by which plants protect themselves from the colder temperatures. Many forage (animal feed) and pasture crops are perennials. Trees, shrubs, and some flowers used in landscaping are perennials also. Most lawn grass species are perennial plants.

Summary

Because plants are vital to human survival, knowledge and understanding of the plant kingdom are beneficial. Both botanical and descriptive classifications provide a means for communication. Research will continue to provide ways to meet the growing demand for food and plant products.

Credits

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