Comparing Monocots and Dicots

Pre-Lab Discussion

Angiosperms, or flowering plants, are divided into two subclasses: monocots and dicots. The simplest difference between monocots and dicots is the number of cotyledons, or first leaves developed by the embryo plant. Monocots, such as grasses, orchids, irises, lilies, and palms, have one cotyledon. Dicots, such as cacti, roses, maples, peas, and oaks, have two cotyledons. In addition to the number of cotyledons, monocots and dicots have several other differences in structure.

In this investigation, you will observe some of the characteristics of monocots and dicots.

Problem

What are some of the structural differences between monocots and dicots?

Materials (per group) Florists will often donate flowers that have lost their freshness and cannot be sold.

- 2 monocot flowers with leaves Lilies, irises, amaryllis, narcissus, and orchids make good monocot specimens.
- 2 dicot flowers with leaves Roses, violets, buttercups, daisies, larkspurs, apple blossoms, and strawberry blossoms make good dicot specimens.
- Prepared slide of a cross section of a monocot stem Available from biological supply houses.
- Prepared slide of a cross section of a dicot stem
- Microscope

Safety

Put on a laboratory apron if one is available. Always handle the microscope with extreme care. You are responsible for its proper care and use. Use caution when handling glass slides as they can break easily and cut you. Note all safety alert symbols next to the steps in the Procedure and review the meanings of each symbol by referring to the symbol guide on page 10.

Procedure

1. Examine the leaves of the monocot and dicot specimens and observe any differences in the pattern of veins on the leaves. In the appropriate place in Observations, sketch one monocot leaf and one dicot leaf. Be sure to include the vein patterns in the sketches.
2. Count the number of petals on each of the monocot flowers and the dicot flowers.

3. Carefully examine the center of each flower. The centrally located stalklike structure is called the pistil. The pistil is surrounded by several other stalklike structures called the stamens. Each stamen contains a pollen sac. Count the number of stamens in each monocot and dicot flower.

4. Examine the prepared slide of the monocot stem under the low power of the microscope. Notice that xylem and phloem tissues are gathered into vascular bundles. Observe the arrangement of the vascular bundles. In the appropriate place in Observations, sketch the monocot stem. Record the magnification of the microscope.

5. Repeat step 4 using the prepared slide of the dicot stem. In the appropriate place in Observations, sketch the dicot stem. Record the magnification of the microscope.

Observations

Monocot Leaf

Dicot Leaf

Magnification

Monocot Stem

Dicot Stem

Magnification
1. How do the veins in a monocot leaf differ from those in a dicot leaf?

2. Compare the number of petals on a monocot flower to the number on a dicot flower.

3. Compare the number of stamens on a monocot flower to the number on a dicot flower.

4. How does the arrangement of vascular bundles in a monocot stem differ from the arrangement in a dicot stem?

Analysis and Conclusions

1. What are two functions of the vascular bundles found in the stems of angiosperms?

2. What are three differences between monocots and dicots?
Critical Thinking and Application

1. A newly discovered fossil plant has 8 petals. Using this information, predict the type of venation (vein arrangement), the number of stamens, and whether the plant is a monocot or a dicot.

2. The lima bean is the seed of the lima bean plant. Each half of the bean is a cotyledon, or seed leaf. Based on this seed structure, is this plant a monocot or a dicot? Explain your answer.

3. What characteristics of angiosperms have made them so successful in a variety of environments?

Going Further

1. Start growing bean plants from seeds. Separate the seedlings into three groups. Allow one group of seedlings to remain undisturbed. Remove one cotyledon from each seedling in the second group. Remove both cotyledons from the seedlings in the third group. Compare the growth of each group of seedlings over a period of time. Construct a data table to present your results.

2. Make a collection of the different types of leaves found in your area. Examine each type of leaf and classify it as a monocot or a dicot. Use a reference book to determine how accurate your classifications are.