

Classifying Ornamental Plants

ASK FOUR different people what the common name is for *Liriodendron tulipifera*, and you could possibly get four different answers. Naming organisms can get very confusing. Over many years, scientists have created logical systems to classify and name plants.



Objectives:



1. Discuss the classification of plants.
2. Explain the naming of plants.

Key Terms:



angiosperms	deciduous	morphology
annuals	dicots	perennials
biennials	evergreen	species
binomial nomenclature	ferns	taxonomy
bryophytes	genus	tracheophytes
conifers	gymnosperms	variety
cotyledon	herbaceous	vascular plants
cultivar	monocots	

Classifying Plants

The branch of biology that deals with identifying and naming organisms is **taxonomy**. Plants are classified based on the similarities of their characteristics. Plant taxonomists compare flowering patterns, stem and leaf structures, life cycles, genetic similarities, and many other characteristics in deciding which plants are the most closely related. The study of the form or shape of organisms or parts of an organism is **morphology**.

Taxonomists use categories to group plants. The categories, from general to specific, are:

- ◆ Kingdom
- ◆ Division (Phylum)
- ◆ Class
- ◆ Order
- ◆ Family
- ◆ Genus
- ◆ Species
- ◆ Variety
- ◆ Cultivar



FIGURE 1. Taxonomists use categories to group plants.

All plants are in the Kingdom Plantae. **Vascular plants**, plants with tissue specialized for conducting materials, are in the Division (Phylum) Tracheophyta. There are many classes, orders, and families of plants.

Different scientists have different ideas about how plants should be classified. As a result, more than one classification system has been proposed. Sorting out the classification systems can become confusing. A modern system that has gained acceptance is one presented by Robert Whittaker.

Two major divisions within Kingdom Plantae are Bryophyta and Tracheophyta. Those are further subdivided.

BRYOPHYTA

Nonvascular plants, such as mosses, liverworts, and hornworts, are classified in Phylum Bryophyta. **Bryophytes** tend to live in damp places and are very limited in size because of the lack of conducting tissue. They are sometimes referred to as lower plants.



FIGURE 2. Nonvascular plants, such as mosses, liverworts, and hornworts, are classified in Phylum Bryophyta.

TRACHEOPHYTA

Plants with vascular systems consisting of xylem and phloem

are placed in Phylum Tracheophyta. **Tracheophytes** may be seedless or seed-producing plants. Plants in Tracheophyta that reproduce without seeds are classified as pterophytes. Seed-producing tracheophytes are classified as gymnosperms or angiosperms.

Pterophytes

Pterophyta is a class that includes the **ferns**. Ferns are vascular plants that reproduce by spores rather than seed. Some people call them the amphibians of the plant world because they are dependent on water for their sperm to swim through during reproduction. Ferns have no true leaves but have fronds. Fronds have the double purpose of food production and spore formation. They tend to unfold from the center of a plant, causing the newest fronds to be called “fiddlehead.”



FIGURE 3. Spores on the bottom of a fern frond.

Gymnosperms

Gymnosperms are plants whose seeds are not enclosed in an ovary. Most gymnosperms reproduce using a structure called a cone. Conifers, ginkgo, and cycads are considered gymnosperms. **Conifers** are gymnosperms that produce cones. Examples are pines, spruces, and cedars. Conifer leaves are usually needles or scales. Most conifers are **evergreen**, holding their leaves all year round. However, some are **deciduous**, dropping their leaves in the winter. Two examples of a deciduous conifer are the larch and the baldcypress.



FIGURE 4. The larch is a deciduous conifer.

Angiosperms

Angiosperms are plants with flowers. They produce seeds that develop within an ovary. There are two subclasses of angiosperms, Monocotyledonae and Dicotyledonae.

Monocotyledonae, or **monocots**, are plants that have a single cotyledon. A **cotyledon** is a seed leaf that stores food as starch and protein for use by the



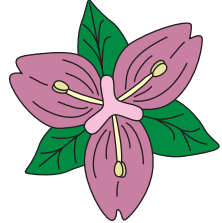
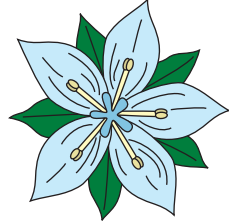
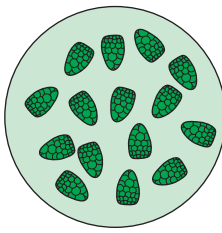
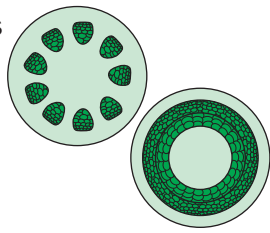
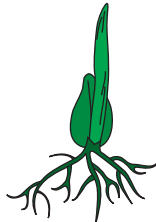
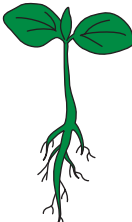
	MONOCOT	DICOT
Leaves:	Long, narrow blades with parallel veins 	Broad to narrow leaves with netted veins 
Flowers:	Flower parts in multiples of three 	Flower parts in multiples of four or five 
Stems:	Vascular bundles scattered 	Vascular bundles arranged in circle 
Seedlings	One seed leaf (cotyledon) 	Two seed leaves (cotyledons) 

FIGURE 5. Comparison of monocots and dicots.

embryo. Monocots have flower parts in multiples of three, parallel venation on narrow leaves, and stems with scattered vascular bundles. Examples are grasses, sweet corn, and lilies.

Dicotyledonae, or **dicots**, are plants with two cotyledons in their seeds. They have flower parts in multiples of four or five, netted veins, and stems with vascular bundles organized in a ring pattern. They have broad leaves and include roses, petunias, and geraniums.

LIFE CYCLES

Plants are often classified based on their life cycles. Gymnosperms and angiosperms reproduce by seed, but they use different strategies for passing on that seed to future generations of plants.

Annuals

Plants that complete their life cycles within one year or one growing season are called **annuals**. Seeds of annuals germinate, and the plants produce leaves and roots, flower, produce seed, and then die, all in less than a year. Many crops and garden plants are annuals. Corn, soybeans, rice, wheat, potatoes, and tomatoes are examples of annual food crops. Petunias, impatiens, marigolds, and zinnias are examples of annual garden plants. Many plants considered weeds, such as ragweed, pigweed, lamb's-quarter, and crabgrass, are annuals, too.



FIGURE 6. Impatiens are annual garden plants.

Biennials

Biennials are plants that normally require two growing seasons to produce flowers and seed before dying. In the first growing season, biennials grow vegetatively. In the fall, they go dormant and rest until the following spring. During the winter months, they receive a required cold treatment. Growth is resumed in the spring of the second season. The plants bolt, flower, produce seed, and die. This group of plants is fewer in number than the other two groups classified by their life cycles. Some examples include hollyhock, sweet William, parsley, beets, and carrots.



FIGURE 7. Hollyhocks are biennials.

Perennials

Technically, **perennials** are plants that have life cycles of more than two growing seasons. Perennial plants may take a few years to many



FIGURE 8. Almonds are woody perennial plants.

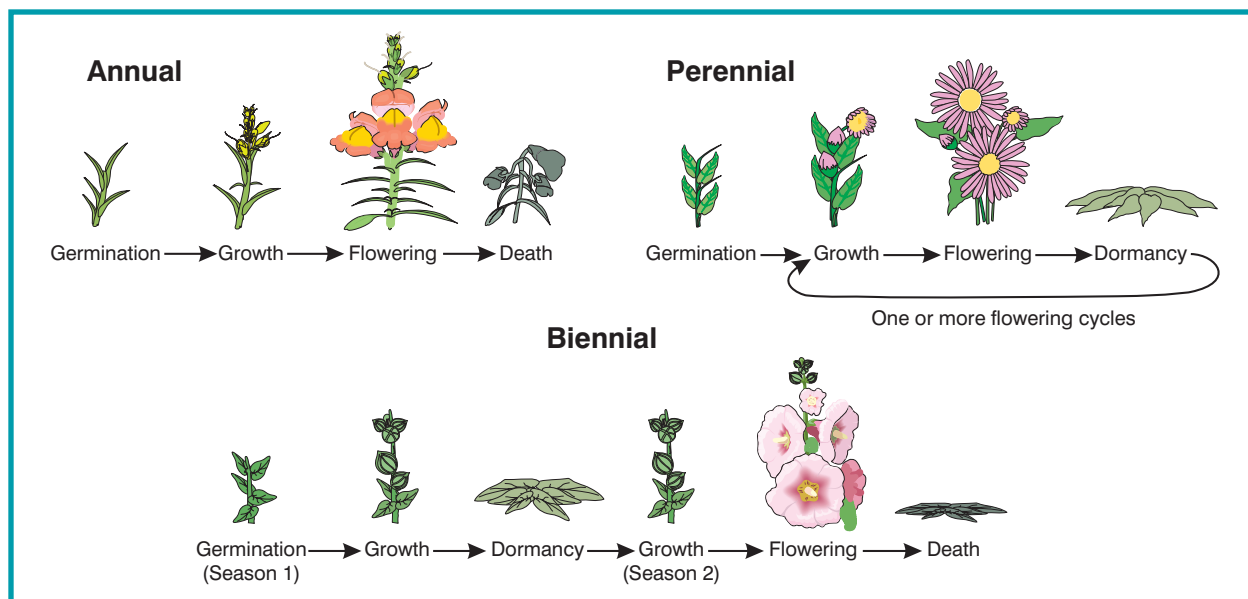


FIGURE 9. Annual, biennial, and perennial life cycles.

years to reach reproductive maturity. They may be woody, like trees and shrubs, or herbaceous. **Herbaceous** plants have soft, nonwoody stems.

Woody perennials may flower and produce seeds every year for many years. Woody perennial plants produce secondary growth that persists year after year. Secondary growth gives the plants the ability to grow in girth and height. During the winter months, they go dormant, or stop any growth. Plant growth resumes in the spring as vegetative buds on the stems sprout. Examples of woody perennial plants are apples, maples, oaks, almonds, and oranges.

The shoots of herbaceous perennials typically die back to the ground each winter. The roots and crowns of herbaceous perennial plants survive and send up new shoots in the spring. Strawberries and asparagus are herbaceous perennials.

Naming Plants

Plants are named using a system called **binomial nomenclature**. This classification system was developed by Carolus Linnaeus and uses Latin terms as scientific names for plants. A plant is commonly referred to by its genus name, which is always capitalized, and its species name, which is always left lowercase (e.g., *Liriodendron tulipifera*). Both names are italicized or underlined. A **genus** is a group of plants that are very similar to each other. A **species** is a group of plants that have characteristics distinguishable from others within a genus and are so similar that they usually breed freely with each other in the wild.

Plants are also called by common names. The common names for plants can vary from one region of the country to another. For example, *Acer saccharum* is known in different parts of the United States as sugar maple, rock maple, and hard maple. Scientific names are specific and remain the same throughout the world. Although the sugar maple may be called a different

common name in different parts of the country, the plant is recognized as *Acer saccharum* everywhere on Earth.

Sometimes cultivated plants within a species show a significant difference from other plants in the species. These plants are called a **variety**. The difference is inherited from the previous generation through sexual reproduction. The variety is written in lowercase, italicized or underlined, and follows the specific epithet. A variety of sugar maple that has a dense conical growth habit is written as *Acer saccharum* var. *conicum* or *Acer saccharum conicum*.

Another group important to the horticulture industry is cultivar. A **cultivar** has distinguishing characteristics from the other plants in the species but does not transfer those characteristics to its offspring through sexual reproduction. Cultivars are propagated by selective hybridization or asexual means. A cultivar of sugar maple is written as *Acer saccharum* 'Green Mountain'.

Summary:



The branch of biology that deals with identifying and naming organisms is taxonomy. The study of the form or shape of organisms or parts of an organism is morphology. Taxonomists group plants into categories: kingdom, division (phylum), class, order, family, genus, species, variety, and cultivar.

Nonvascular plants, such as mosses, liverworts, and hornworts, are classified in Phylum Bryophyta. Plants with vascular systems consisting of xylem and phloem are placed in Phylum Tracheophyta. Plants in Tracheophyta that reproduce without seeds are classified as pterophytes. Seed-producing tracheophytes are classified as gymnosperms or angiosperms.

Pterophyta includes the ferns, which reproduce by spores. Gymnosperms are plants whose seeds are not enclosed in an ovary. Angiosperms are plants with flowers. Monocots are angiosperms that have a single cotyledon. Dicots are angiosperms with two cotyledons in their seeds.

Plants are often classified based on their life cycles. They may be annuals, biennials, or perennials.

Plants are named using a system called binomial nomenclature. Every plant is given a two-part scientific name made up of its genus and its species. Cultivated plants often receive variety or cultivar names as well.

Checking Your Knowledge:



1. What categories are used in plant classification?
2. What characteristics do plants classified as pterophytes, gymnosperms, and angiosperms possess?

3. What are the three life cycles of plants?
4. How are plants named?
5. How does a variety differ from a cultivar?

Expanding Your Knowledge:



Identify some common plants in your neighborhood by their common names. Then, use resources to determine the scientific names for your plants. Conduct further research in plant classification. Find out how your plants are classified from kingdom to cultivar.

Web Links:



Introduction to Plantae

<http://www.ucmp.berkeley.edu/plants/plantae.html>

Classification of Plants—Whittaker Five Kingdom System (1978)

<http://home.manhattan.edu/%7Efrances.cardillo/plants/intro/test.html>