

GardenNotes #122

## Taxonomic Classification

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One of the most useful classification systems is utilizing plant taxonomy. Taxonomy is the science of systematically naming and organizing organisms into similar groups. Plant taxonomy is an old science that uses the gross morphology (physical characteristics, i.e., leaf shape, fruit form, etc.) of plants to separate them into similar groups. Quite often the characteristics that distinguished the plants become a part of their name. For example, *Quercus alba* is a white oak, named because the underside of the leaf is white.

The science of plant taxonomy is being absorbed into the new science of systematics. The development of more sophisticated microscopes and laboratory chemical analyses has made this new science possible. Systematics is based on the evolutionary similarities of plants such as chemical make-up and reproductive features.

It should be noted that plant taxonomic classification changes with continuing research, so inconsistencies in nomenclature will be found among different textbooks.

An overview of plant taxonomy helps the gardener understand the basis of many of our cultural practices. For example, fire blight is a disease of the Rose family, therefore it is helpful to recognize members of the Rose family to diagnosis this disease.

### Common Taxonomic Divisions

The scientific system of classification has all living things divided into groups called **taxa** (singular, **taxon**). Plants are in the Kingdom of **Plantae**. Other Kingdoms include **Fungi**, **Protista** (one-celled organisms including yeasts, bacteria, and protozoans), and **Animalia** (animals).

The plant kingdom is divided into two groups: **bryophytes** (including mosses and liverworts) and **vascular plants** (plants with a vascular system of xylem and phloem).

Vascular plants (sometimes called higher plants) are divided into two subgroups: seedless and seeded. These sub-groups divide into **Phyla** (plural of phylum). Phylum names end in “phyta”. The seedless phyla include the ***Pterophyta*** (ferns). Seeded phyla include ***Cycadophyta*** (cycads), ***Ginkgophyta*** (ginkgo tree), ***Coniferophyta*** (conifers), and ***Anthophyta*** (angiosperms).

Angiosperms are divided into two taxa, **monocotyledon** (monocots) and **dicotyledon** (dicots). Distinguishing between monocots and dicots is a common practice in landscape management as some of our common herbicides work at the monocot/dicot level. For example, lawn weed sprays (such as 2,4-D and Dicamba) kill dicots (broadleaf plants like dandelions) but not monocots (the grass). Other herbicides will kill monocots but not dicots, allowing the gardener to kill grass (a monocot) in the shrub or flowerbed (dicots).

Additional taxa in descending order include **class, order, family, genus** and **species**.

**Families** of higher plants are separated from one another by characteristics inherent in their reproductive structures (flowers, fruit, and seed). Families have primary importance in gardening as family members generally share comparable cultural requirements and similar insect and disease problems. Disease management and cultural techniques are often discussed at the family level.

**Genera** (plural of genus) are groupings whose members have more characteristics in common with each other than they do with other genera within the same family. Similarity of flowers and fruits is the most widely used feature, although roots, stems, buds, and leaves are also used.

Common names typically apply to genera. For example *Acer* is the genus of maples, *Fraxinus* is the ash, and *Juniperus* is the junipers.

**Species** generally refers to interbreeding sub-groups of genus or groupings of individual plants that adhere to essential identification characteristics but display sufficient variation so as not to be categorized as replicas of one another. The specific epithet name is always used in conjunction with the genus.

## **Plant Names in the Binomial System**

Plants are named using a binomial system. The Genus name comes first and is analogous to a person's LAST name ("family" name). The specific epithet name follows the genus name and is a more specific identifier. Many plants share the same specific epithet. It would be analogous to a person's first name.

<u>Genus</u>	<u>Species</u>
Smith	Frank
<i>Quercus</i>	<i>rubra</i>

Following the genus and species is the cultivar or variety name. This is an even more specific identifier, similar to a person's middle name.

<u>Genus</u>	<u>Species</u>	<u>Cultivar</u>
Smith	Frank	Joseph
<i>Quercus</i>	<i>rubra</i>	'Aurea'

When genus and specific epithet names are written, they should always be underlined or italicized to denote they are Latin words. However, cultivar and variety names are not italicized. The genus name is always capitalized, but the specific epithet name is not.

The singular and plural spelling of *species* is the same. In writing, the abbreviation “sp.” following the genus indicates a single unidentified species and “spp.” indicates multiple species. For example, “*Acer* sp.” would indicate an unidentified species of maple, and “*Acer* spp.” refers to multiple species in the maple genus. The “sp.” or “spp.” are not underlined or italicized.

Wild and naturally occurring plants are named under the rules of the *International Code of Botanical Nomenclature*. Cultivated plants are named according to the same principles found in the *International Code of Nomenclature of Cultivated Plants*.

Genus and specific epithet names are universal, being used worldwide. Since taxonomy classifies living organisms, there will be some inconsistencies between books.

On the other hand, common names are often local in use and many times don't clearly identify the specific plant. For example, *Liriodendron tulipifera* is known as the Tulip Tree in the north and as Yellow Poplar in the south. *Carpinus caroliniana* goes by American Hornbeam, Blue Beech, Musclewood, Water Beech, and Ironwood. The European White Lily, *Nymphaea alba*, has 15 English common names, 44 French common names, 105 German common names, and 81 Dutch common names.

### **Sub-Groupings of Genus and Specific Epithet**

**Variety** or **Subspecies** is a sub-grouping of species assigned to individuals displaying unique differences in natural populations. The differences are inheritable and reproduce true-to-type in each generation. Variety is denoted as var and subspecies is denoted as ssp.

For example cauliflower and cabbage are varieties of the same species *Brassica oleracea*. The thornless variety of honeylocust would be written *Gleditsia triacanthos* var. *inermis*.

**Cultivar** is a species sub-grouping of cultivated plants (“cultivated variety”) which display rather unique differences and, when reproduced by seeds or cuttings, retain its distinguishing characteristics.

For example, Early Girl and Big Boy are cultivars of tomatoes. In technical writing, the cultivar name follows the genus and specific epithet and is always capitalized and written inside single quotes but not italicized. For example, October Glory Red Maple is *Acer rubrum* ‘October Glory’.

It is possible to have a cultivar of a variety. For example, *Cornus florida* var. *rubra* ‘Cherokee Chief’.

Note: Cultivar names must be enclosed in single quotes when following a species name. Variety and subspecies names must be denoted with var. or ssp. when following a species name. For example, *Oenothera macrocarpa* ssp. *incana*. The use of trinomials *Gleditsia triacanthos inermis* is improper usage in scientific nomenclature.

**Strain** is a sub-group of cultivar with specific characteristics, like resistance to a disease or better color. For example “Early Girl VFN” tomato.

**Clone** is a sub-group of cultivar derived by asexual propagation (i.e., cuttings). The offspring have one parent and therefore are identical to the parent because no exchange of genetic materials has occurred.

**Line** is a sub-group of cultivar propagated by seed

**Form** is based on selection by growth habit, not reproducible by seed. For example, Columnar Norway Maple.

### Additional Information – CMG GardenNotes on How Plants Grow (Botany):

#121	Horticulture Classification	#136	Plant Structures: Fruit
#122	Taxonomy	#137	Plant Structures: Seeds
#131	Plant Structures: Cells, Tissues, and Structures	#141	Plant Growth: Photosynthesis, Respiration and Transpiration
#132	Plant Structures: Roots	#142	Plant Growth: Light
#133	Plant Structures: Stems	#143	Plant Growth: Temperature
#134	Plant Structures: Leaves	#144	Plant Growth: Water
#135	Plant Structures: Flowers	#145	Plant Growth: Hormones

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Authors: David Whiting, Colorado State University Cooperative Extension; Michael Roll and Larry Vickerman (former CSU employees). Line drawings by Scott Johnson

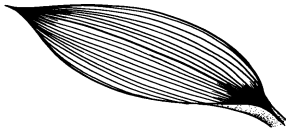
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# Monocots

# Dicot

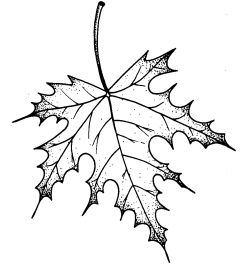


Parallel venation

## Leaf venation



Pinnate venation

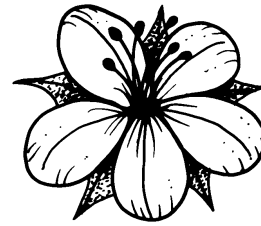


Palmate venation

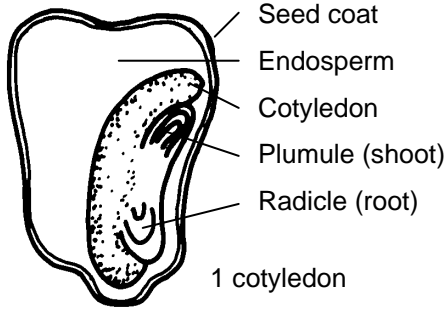


Flower parts in 3s

## Flower parts

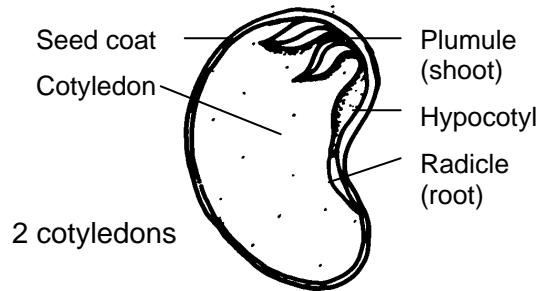


Flower parts in 4s or 5s

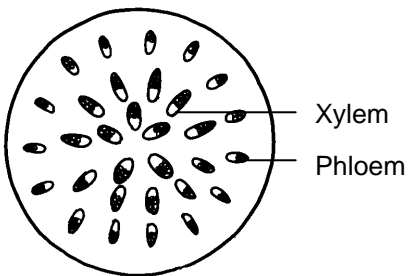


1 cotyledon

## Seed cotyledons

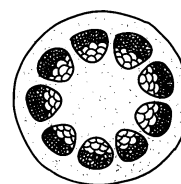
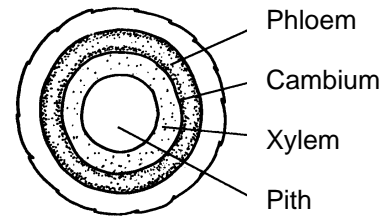


2 cotyledons

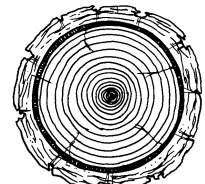


Xylem  
Phloem

## Vascular bundle arrangement



Cross section of herbaceous plant stem



Cross section of young woody plant stem

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## Examples of taxonomic classification

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### Vascular plants

