

Your Questions Answered!

Quick Summary of the Rules of Botany

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Summary of the Rules of Botany

It seems to me a principle of life that if two people do the same thing, they will do it slightly differently. In the history of science, that has led to acrimonious debate and eventually, professional associations to mediate and create standards. Consequently there are international rules for creating and writing the names of plants.

The conventions for writing about plants aren't particularly obvious because they lie at the intersection of science, language rules and everyday speech. These frequently mystify and frustrate people who otherwise love plants. This booklet explains the most important of those rules.



1. **What is a Plant's Real Name:** Most plants have several names—minimally one English common name and a scientific name, but possibly several English common names and a common name in each of a dozen languages. Thus, the same plant is called: dandelion (English common name), *Taraxacum officinale* (scientific name), *dent-de-lion*, (French common name), *achicoria silvestre* (Spanish common name) and *maskros* (Swedish common name). Of course it also has a Dutch, Flemish, German, Italian—you get the picture—common name as well. In addition, many languages have more than one common name for dandelions. Plant books in English might mention blowball, cankerwort, wild endive and piss-i-beds, and a Spanish source might give you *amargon*, *diente de leon*, and *taraxacon*. I'd say all of those are the plant's real name: if, when you use a name, the person to whom you are speaking recognizes it, then that's the whole point.

That said, there are international committees that regulate plant scientific names and no rules at all about what common (English, local, colloquial) name a plant has, so the scientific name is the clearest.

2: Rules for Writing Plant Common (English) Names: modern English doesn't capitalize common names of plants (or animals, although specialty bird publications sometimes do capitalize bird common names). The plant common name does have to conform to the rules of English. This means that if there's a proper noun in the common name, it must be capitalized. Thus, we have rigid goldenrod but Missouri goldenrod, azure penstemon but California penstemon and Torrey's penstemon (John Torrey was a noted 19th century American botanist). Likewise, the rules for sentences apply: capitalize the common name at the beginning of a sentence or in a title.

If you are reading something quite old, the author may have capitalized plant common names. In my library are flower books by Edith Clements, wife of the famous ecologist Frederick Clements. Between 1914 and 1926 she published a series of wild flower books. In *Flowers of Mountain and Plain*, a very pretty collection of the showy wildflowers of Colorado and adjacent regions, she capitalized the common names. For example, she wrote "The crimson blossoms of the Poppy Mallow are abundant on prairies and plains at 3000-6000 ft." (p. 11) That is no longer correct. In contrast, in 1991, Schofield and Freeman wrote "Purple poppy mallow is an attractive, spreading perennial herb..." (p. 105). Common names are not capitalized today.



purple poppy mallow

3. Rules for Writing Scientific Plant Names: Scientific names are considered to be in Latin. In English text, foreign words are italicized. Thus, scientific names are italicized. Consequently I write "I have *Rosa alba*, *Iris germanica*, and *Taraxacum officinale* in my garden." This rule applies to words from any language, not just Latin, when they occur in English writing: properly we write *pohuehue* (Hawaiian), *dent-de-lion* (French), *buenos dias* (Spanish), or *bu yao* (Chinese).

The italics can be helpful in telling you which is the scientific name: Kinnikinnick (*Archtostryphos*) is an important and attractive woody shrub occurring across much of the Northern Hemisphere.

The Lincoln, Nebraska, newspaper didn't italicize scientific names. I gave them a call and told them they should. They replied something like "it isn't in our rules." So apparently there are subsets of English where standard practice does not apply.

4. Scientific Names as Common (English) Names: Many plants do not have common names. When talking about them, people often use the scientific name, and soon the scientific name is turned into a common name. How do you know it a common name and no longer a scientific name? Because Latin doesn't make plurals by adding s. So if I say "see those asters," it is not the scientific name *Aster* any more. When we've turned the scientific name into an English word, English name rules apply: no capital, add s as needed. The common name of *Penstemon* is beardtongue, but nurseries make penstemon a common name when they offer many penstemons for sale. Other plants where the common name is an English version of the scientific name that leap to mind are weigela, jacaranda, wisteria and acacia. Central North American examples would be bigflower coreopsis which is *Coreopsis grandiflora*, palespike lobelia, *Lobelia spikata*, and Dakota verbena, *Verbena bipinnata*.

5. Underlining Scientific Names: A now-obscure tradition for writing scientific names was underlining. Before personal computers, most botanists worked with pens or at typewriters. Italics is difficult handwritten and not available on typewriters. However, the printer's mark telling the typesetter (in old book printing) to put something in italics was to underline it. Underlining meant: "set in italics." Consequently, scientific names were underlined wherever italics was unavailable. When the word processor arrived on our desks, we quickly converted to directly italicizing the scientific names. Today you rarely see the underlining. Yet for at least 300 years, except when the book was finally printed, underlining scientific names was the norm.

6. Scientific Names, Genus and Species: As every basic biology class explains, scientific names were created to organize communication about plants and animals. In the 1500s and 1600s, Europeans spread out over the globe and brought back all kinds of unknown organisms. By the early 18th century, they had chaos--lots of organisms and no system of organization.

Below are plants that look like yarrow from Boulder, Colorado (left) and Narvik, Norway (right). Are they the same or different? Should both have the same name?



Carolus Linnaeus set up a hierarchical system: groups are made of subgroups made of more subgroups. It was logical and mostly it worked. His hierarchy called the groups, in descending order, kingdom, phylum for animals/ division for plants, class, order, family, genus and species.



Part of making a workable system was deciding what to call the most basic unit, the organism. Linnaeus decided each distinct kind of plant (or animal) would be known by two names that designate genus and species, apple *Malus domestica*, carrot *Daucus carota*, dandelion *Taraxacum officinale*, and so on.



In the 1750s, educated Europeans communicated in Latin. When the Roman Empire dominated Europe, Latin was the international language and people who read and wrote, read and wrote Latin. During the Middle Ages, education was mainly through the Catholic Church and they used Latin, partly for historical reasons and partly because a single language within the church facilitated communication. By Linnaeus' time (mid-1700s) more and more was being written in local languages, but most educated people still learned Latin. Consequently, Linnaeus wasn't being difficult but, rather, cosmopolitan in setting up the scientific names as Latin names. His native language was Swedish.

Scientific names are written in italics in an English text because they are treated as being in Latin, a foreign language to English. (See above).

The first name, the genus, is the larger category. It is always capitalized. It can stand alone. In contrast, the second name indicates a particular kind (species) of plant and is never used by itself. No two different plants have identical two-part (binomial) names, but the various members of a genus share the generic name, as in *Helianthus annuus*, *Helianthus grosseserratus*, and *Helianthus petiolaris*, the common sunflower, the sawtooth sunflower and the prairie sunflower, respectively. Likewise different plants can have the same second word in the species name: *Salix nigra*, black willow, *Juglans nigra* black walnut and *Fraxinus nigra*, black ash. Since *nigra* means black in Latin, it can't stand alone: "the black what?" The genus name, for example, *Juglans*, refers to a number of walnut species so "the fruits of all *Juglans* are more or less edible" does make sense. Or, I can say "the plant in the picture is a *Helianthus*" without specifying which one. (See row of 3 pictures, next page)

The second word, called the "specific epithet" (the awkward jargon reinforces the idea that it never stands alone) is treated as modifying the genus. In English we add an adjective to indicate which sunflower: "the common sunflower not the sawtooth sunflower." The two words of the plant's scientific name function the same way: which *Helianthus*? *Helianthus annuus* (literally, the annual sunflower, which it is). *Helianthus grosseserratus* is called the sawtooth sunflower in the USDA plants list: *grosseserratus* means large serrations. Serrations on a leaf can be called

teeth, and so big-tooth or sawtooth sunflower. I don't have picture that shows the leaves well, but the leaves have even bigger "teeth" than dandelion leaves. For *Helianthus petiolaris*, the Latin name draws attention to the long petiole (stem on the leaf). It is a common plant, so it has a better English name, one that refers to its distribution, the prairie sunflower.



Left to right: sawtooth sunflower, *Helianthus grosseserratus*, common sunflower, *Helianthus annuus* and the prairie sunflower, *Helianthus petiolaris*.

Note how the adjective form of genus, generic, means a category in English and the adjective of species, specific, means a particular one.

Both of the words genus and species form their plurals in English the way they did in Latin: 1 genus, 2 genera; 1 species, 2 species. Economists use specie as the singular, biologists do not.

7. Where Scientific Names Came From: Frequently Linnaeus took the name you'd find in a Latin dictionary for the plant and made that the genus name. For example *Hordeum* for barley, *Rosmarinus* for rosemary, and *Avena* for oats. For plants not known in Rome, often botanists Latinized a common name, for example *Nelumbo* from Ceylonese and *Cakile* from Arabic. Some other names are intended to be descriptive: *Symphoricarpos* from Greek *symphorein* "to bear together" and *carpos* "fruit," describing the clustered berries, and *Campanula* from Latin "little bell."

Scientific names don't have to be multisyllable horrors—they just tend to be. There are some short ones: *Rhus* is the genus of sumac, *Rhus glabra* is smooth sumac, *Acer* is maple, *Acer nigrum* black maple, *Zea mays* is corn. Perhaps the long names are because we have over 300,000 plant species and therefore over 300,000 scientific names, with no duplication.

8. The Grammar of the Scientific Name: The scientific name is so thoroughly in Latin that endings on the specific epithet change with the gender of the genus name. So *Cyperus*

niger, *Juglans nigra* and *Piper nigrum*, black flatsedge, black walnut, and black pepper, masculine, feminine and neuter, respectively.

9. The Meaning of the Words: Some often-used words used for specific epithets are obvious adjectives: *alba* white, *azurea* blue, *orientale* eastern, *minima*, small, etc. Another set refer to the origin of the plant: *japonica*, *floridana*, *californica*. Adding *-ensis* is another way of doing that: *jamaicensis*, *nebraskensis*. Another large group of plants were named after a person, usually as an honor: *parryi* from Parry, *gerardii* from Gerard. These can be very awkward because the proper spelling in Latin for word ending in a consonant used as a possessive (genitive) is with two i's, so *Andropogon gerardii*, Gerard's bluestem, *Andropogon hallii* Hall's bluestem. (These two have easier common names, big bluestem and sand bluestem).



Piper nigrum, black pepper

10. Capitals in Scientific Names. The genus name is always capitalized. Modern scientific usage never capitalizes the specific epithet, no matter what. In the past a variety of species epithets were capitalized but not today—which is nice, because it isn't easy to recognize which ones were capitalized and which were not.

11. Abbreviating Scientific Names: To save writing so many letters, you can abbreviate the genus name, for example *C. serrulata* for *Cleome serrulata* (Rocky Mountain bee plant). To do that, it has to be clear what the *C.* refers to. Usually one looks for the genus starting with that letter most recently mentioned in the text. So I can't abbreviate *Chamaecrista fasciculata*, partridge pea, until until I've written it



Rocky Mountain bee plant,
Cleome serrulata

out once, making it clear that the *C.* in *C. fasciculata* doesn't stand for *Cleome*.



Chamaecrista fasciculata
partridge pea

In the published literature you see abuses of this, where, especially in graphs, the scientific names were too long so they abbreviated the genus and then nobody checked whether the genus was written out somewhere else. That's fine if you know that *C. fasciculata* in a paper on *Senna* is likely to be *Chamaecrista*, but that's an assumption the authors and editors shouldn't make. It doesn't assist the busy reader to have to search to find out what the abbreviation refers to.

You can never abbreviate the species epithet in a scientific name.

Another common shortcut is writing sp. for species or spp. or more than one species, after the genus name. If I write *Populus* sp., I am saying, “an aspen but I don’t know which one.” In contrast, *Populus* spp. would be “several species of aspen.” The abbreviations sp. and spp. are considered to be English and are not italicized.

12. Pronouncing scientific names: Latin has no native speakers, so you can pronounce it as you like. If the people you are talking to understand, that’s the goal. Americans put an American English accent on the names, Argentines an Argentine Spanish accent. No problem. The Argentine said “shiz a KEER i um” (run together as a mouthful), where I’d been saying “Shis ACK ri um” (dragged out like a good Midwesterner) for the name spelled *Schizachyrium*. So we both got a good laugh. Same plant, same name, different accents.



Schizachyrium scoparium,
little bluestem
grass family, Poaceae

13. Why do Botanists Always Tell You the Plant Family?

People writing about plants are forever sticking the plant family into the discussion. For example, the picture caption says its little bluestem and that little bluestem is in the grass family. That is intended to be helpful. There are at least 300,000 species of plants.

Nobody knows all 300,000. They are organized into classes made of orders, made of families, made of genera and species. Most of the land plants, about 280,000 species, are flowering plants (angiosperms) and are in the same class. Angiosperms are divided into approximately 60 orders, 400 families and 12,000 genera. Orders are so big that they contain very diverse plants. For example the order Asparagales includes orchids, onions and century plants (agaves). Families are enough smaller that willows and cottonwoods (family Salicaceae) are clearly more like each other than like little bluestem and crabgrass (family Poaceae). Writers include the plant family in hopes that you’ll know one plant in the family mentioned and it’ll give you a decent guess what the plant described is like.

Descriptions of a Few Plant Families: Here are capsule descriptions of a few major plant families, not intended to describe their characteristics as much as to prod your memory of them. Plants differ and botanists group them based on those characteristics, so plants in the same family share important characteristics while those in different families seem, and are, different.



rose, *Rosa* sp., rose family, Rosaceae

Rose Family: Members of the rose family have a ring of five petals around a center and usually produce a fleshy fruit

with a few hard seeds inside. Lots of them are shrubs or small trees. In addition to roses, apples, plums, apricots and pears are members of the rose family.

Morning Glory Family: In contrast, the morning glories are in the family Convolvulaceae. They are mostly vines, with just a few species that are shrubs, small trees or nonviny herbs. The flowers are tubular and tend to be open only for a few hours on a single day. One to several small dark seeds develop inside a thin-walled capsule that dries out when the seeds are ripe. If you don't know morning glories or sweet potatoes (genus *Ipomoea*) you might know bindweed (genus *Convolvulus*).



A morning glory, *Ipomoea* sp., Convolvulaceae, morning glory family

Oak Family: The oak family, Fagaceae, contains mainly tall trees. Most of the familiar north temperate ones are called

oaks, genus *Quercus*. The family also includes chestnuts, *Castanea*, southern beeches of the Southern Hemisphere, *Nothofagus*, and some tropical species. The flowers are small, wind-pollinated in temperate regions, sometimes insect-pollinated in the tropics. The fruit with the distinctive acorn cap is shared in the whole family



California oak in flower, *Quercus* sp., Fagaceae, oak family

Grass Family: The grasses, grass family, Poaceae, are herbs, with a few unusual members such as bamboo. These are lawn grasses like Kentucky bluegrass (*Poa praetensis*) and crabgrass (*Digitaria* spp.), and relatives all over the world. Grass leaves grow

from a meristem (growing point) close to or under ground (not up at the stem tips as in, for example, roses). The flowers are

Various grasses, but in the foreground big bluestem, *Andropogon gerardii*, Poaceae, grass



usually on a linear stalk and inconspicuous because they are wind-pollinated. Seeds are the individual grains as in wheat, rye and corn.

Sunflower Family: Sunflowers, daisies, dandelions, yarrow and asters (and some 1,616 other genera, and over 23,500 species) are in the family Asteraceae, characterized by a "flower" that is



Aster sp., asters, sunflower family Asteraceae

actually made up of a lot of smaller flowers in a tight cluster. Most of the plants are herbs, though they can grow to 6' (2 m).(picture next page)

This was just a glimpse of the diversity of the families, since there are more than 400 plant families.

However, it lets me demonstrate the reason for mentioning the family when mentioning the plant. The picture to the right is service berry, *Amelanchier*. It is in the rose family, Rosaceae. So you can correctly imagine them as similar to roses and cherries--in plant and twig shape, flowers and fruit--and certainly not similar to morning glories, oaks, grasses or sunflowers. That's how it works.



service berry, *Amelanchier*,
rose family, Rosaceae

14. Recognizing the Plant Family Name: In the hierarchical system started by Linnaeus, plant families are named for a genus in that family, with “-ceae” stuck on the end. The rose family is named using *Rosa*, the genus of roses, as Rosaceae. Poaceae, the grasses, are named for the genus *Poa*, Poaceae. Kentucky bluegrass is *Poa praetensis*. The morning glory family is named for *Convolvulus*, the bindweeds, as Convolvulaceae.

The plant families turn into jaw-breaking words, but the system is coherent. When encountering one, just break it into syllables: Ros ay cee ee, Po ay cee ee, Con vol vu lay cee ee (in my accent).

These family names are capitalized but not italicized. I'm not capitalizing English descriptions--rose family, grass family--because as explained below, choosing which plant to mention is descriptive, not assigned.



field bindweed, *Convolvulus arvensis*, Convolvulaceae, morning

15. Whose Family is It? Describing the Asteraceae as the sunflower family is not at all required. We often do that because sunflowers are big conspicuous plants that many people know. It is totally valid to say the Asteraceae is the chamomile family, but how many people are sure what chamomile plants look like? Refer to a familiar plant, and that may change depending on the audience.



Left: sunflowers, Asteraceae,
chamomile family

Right: chamomile,
Asteraceae,
sunflower family



There are, of course, families whose members are so obscure that naming one doesn't help many people. Madder, *Rubia tinctoria*, lady's bedstraw (*Galium verum*) and sweet woodruff (*Galium odoratum*) are in the same family, Rubiaceae. However, I don't believe any of those plants are familiar to most people, so citing the family doesn't help you visualize the plant I'm talking about, whether I call it the madder family, bedstraw family or woodruff family. I'm so glad we live in the era of digital photography!



Galium odoratum sweet woodruff
madder family, Rubiaceae

16. Revision Happens. The number of orders, families, genera and species of plants and which plants are included in each is under continual revision. See "Stevens, P. F. (2001 onwards). Angiosperm Phylogeny Website. Version 12, July 2012 [and more or less continuously updated since]." <http://www.mobot.org/MOBOT/research/APweb/> for a widely-used technical source. Wikipedia has been good about keeping its entries up-to-date with the changes.

Contact me with questions: kathy@awanderingbotanist.com

Want to see these rules in action? I'd be happy to give you a talk about familiar or exotic plants or a walk through a natural area, pointing out interesting plants. <http://awanderingbotanist.com>

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