

Citrus - Rutaceae family

In Mission Garden



CITRUS BLOSSOMS

the Seville oranges stand stalwart and tall, their dense dark foliage offering welcoming patches of deep shade for humans, as well as inviting shelter for paper wasps and white-winged doves.



SOUR ORANGES

It is an unmistakable sign of spring when clouds of citrus blossom perfume waft through the orchard, where buzzing bees and other pollinating insects dance around the flowers. The abundant fruit of the Garden's numerous signature Mexican sweet lime trees afford most visitors their first taste of this uniquely aromatic and sweet variety of lime. West of the Spanish vegetable garden,



SWEET LIMES

Although the sweet limes and sour oranges are most numerous and prolific in the Garden, there are also three productive Valencia orange trees, one Meyer lemon tree that produces an abundance of fruit, and other varieties that are still getting established (another Meyer lemon, three tangerines, one pummelo, two Key limes, and three grapefruit trees).



Mexican sweet lime (*Citrus x limetta*)

Spanish: *Lima chichona*

Cultivar collected from the house of the late Adelina Aros, in the Menlo Park neighborhood of Tucson.

The common name in Spanish derives from the characteristic nipple, ringed by a circular furrow, on the flattened ends of this spherical medium-sized fruit.

Although the origin of this variety is uncertain, it was purportedly represented in the Medici citrus collections during the 17th century. It is a cross between citron (*Citrus medica*) and bitter orange (*Citrus × aurantium*). Widespread and very popular in backyard gardens throughout northern Sonora, it can also be found in the homes of some Hispanic Arizonans with roots in that region.

Sour orange, bitter orange, Seville orange (*Citrus × aurantium*)

Spanish: *Naranja agria*

Cultivar grown from seed collected at the University of Arizona Arboretum, east of the Arizona State Museum.

Equal cross between mandarin (*Citrus reticulata*) and pomelo (*Citrus maxima*), two of the three most ancient species of citrus. In many places around the world, the bitter orange was once very popular as a culinary ingredient. It is still the preferred culinary sour citrus among several Middle Eastern cultures. Widely cultivated by the Moors, it was among the earliest citrus species to arrive in Europe, where its popularity declined with the rise of the sweet orange.



COVERDELL FELLOW REBECCA JOHNSTON HARVESTING SOUR ORANGES



Valencia Orange (*Citrus x senensis* var. Valencia)

Spanish: *Naranja Valencia*

Cultivar collected by horticulturalist Alfredo González in the heritage orchard of the now-disappeared Benedictine Monastery in Tucson. Mr. González helped Friends of Tucson's Birthplace establish the initial fruit trees orchard in Mission Garden. He grafted the three orange trees from the monastery, and donated them to the Garden.

Sweet oranges are back-crosses between mandarins and pomelos, a second-generation hybrid with more mandarin than pomelo. The Portuguese are thought to have introduced them to Europe when Vasco da Gama discovered the sea route around the Cape of Good Hope in 1498. For the next 400 years oranges were known all over Europe as 'portugals.' Valencia oranges were first grown in Arizona in the late 1800s.

Meyer lemon (*Citrus x meyeri*)

The Meyer lemon is a cross between the citron and a mandarin/pomelo hybrid.

The cultivar in the Spanish Orchard was grown from seed by the late Adelina Aros.

The cultivar in the Statehood Garden was propagated from a tree in a backyard garden in Tucson, and donated to Mission Garden by the late volunteer, Janys Neil.



MEYER LEMONS



Pomelo, pummelo (*Citrus maxima*)

Spanish Mexico: *Cidra*; Spain: *Pomelo chino*

Cultivars from Frances Wong's garden at BKW Farms in Marana, and from a New Mexico homestead.

One of the three wild ancestors of all citrus, the pummelo is native to Malaysia and the Malay archipelago, and grows wild in Fiji.

Pomelos have the largest leaves, flowers and fruit of all citrus. They look like grapefruits, but they are somewhat oblong and with flatter tops. The seeds are clustered around the center, the rind is thick and easy to peel, and the flesh is sweet.

Pomelos are very popular among Mexican and Chinese communities in Tucson.



POMELOS FROM FRANCES WONG'S TREE

Grapefruit (*Citrus x paradisi*)

Spanish: *Toronja* (Mexico), *pomelo* (Spain)

Grapefruits are a cross between pummelo and sweet orange.

The Mission Garden cultivar was propagated from a tree planted in the patio of St. Mary's Hospital in 1932, and transplanted in 1969 to the current location in front of the hospital facade.

Grapefruits were not brought to the Americas by the Spanish colonists, but originated by cross-pollination on the Caribbean Island of Barbados in the 1750s.

Key lime (*Citrus x aurantiifolia*)

Spanish: *Limón* (Mexico), *lima* (Spain)

Key limes are hybrids between *Citrus micrantha* and *Citrus medica* (citron). The cultivar in the Spanish Orchard was grown from seed by the late Adelina Aros, in the Menlo Park neighborhood of Tucson.

The cultivar in the Mexican Garden was donated by former Mission Garden gardener, cook and facilities coordinator José Gastelum. The Key lime may have originated along the coasts of the Malay archipelago. Mexico has become the world's largest producer of this variety.



Tangerine (*Citrus reticulata*)

Spanish: *Mandarina*

Tangerines emerged in China in the early 1800s, as a hybrid of the mandarin, which is among the original wild species.



IRENE AND JOHN WARFIELD IN FRONT OF THEIR TANGERINE TREE

The cultivar in the Territorial/Statehood garden was collected in Phoenix from an heirloom tree on the property—formerly a citrus grove—of John D. Warfield. The mother tree was over 100 years old when it died around 2015. Mission Garden volunteer Joan Warfield wrote about her father for his obituary that he continued “to climb, prune and harvest his beloved citrus trees into his 90s”. And for many years John donated to the Community Food Bank “great quantities of fresh citrus he harvested from his yard and the whole neighborhood.”

In Your Garden

There are twenty-eight genera of citrus. Varieties cross within genera as well as species. Hybrids are often fertile, too. Citrus can be both self-pollinating and “parthenocarpic” (able to produce fruit and fertile seed without sexual mixing). New varieties often appear as chance mutants, as well. Citrus is not ‘true to seed’ so vegetative propagation or grafting is necessary to breed specific varieties.



Citrus are evergreen trees, with white or pinkish white flowers. Apart from delicious fruit that provides vitamin C right when the weather gets cold and it is most needed, they are revered for their shade and decorative form, beautiful flowers, and delicious aromas.

Our native desert soil is alkaline, with a PH of about 8, and citrus thrives in soils with a PH closer to 6.5. To increase its acidity, many local gardeners top-dress the soil under the canopies with spent coffee grounds.

Watering too frequently is a common problem for local gardeners growing citrus trees. It's best to let the soil around the root systems "dry out" between irrigations. For established citrus trees, regular deep irrigation at weekly intervals in summer, and monthly intervals in winter is preferable to frequent superficial irrigation.

Most citrus produce abundant fruit towards the lower edges of the "skirt" of the canopies, especially when frosts occur at bloom time (the lower blooms are more protected). Therefore, pruning to raise the foliage to create more space at ground level and/or a shady space underneath necessarily reduces the amount of fruit. To be sure, as always, except for removal of dead, crossing, or diseased branches, the "right" pruning depends on a gardener's priorities.

Sweet limes are slightly frost tender for our winters, especially when young. Indeed, during the prolonged hard freeze in the winter of 2013, the young sweet lime trees in the orchard froze back to the ground. In the spring, we cut back the "burnt" branches and the trees all grew from the ground with multiple new shoots. This can be overcome if young trees are covered with frost cloth—and even warmed with heat lamps—during deep freezes. Sweet limes are very productive, and ripe fruit persists on the tree for months.



SOUR ORANGES

Sour oranges are vigorous fast-growing tall trees with dark leaves and strong root systems. They can adapt to different soils, withstand deep freezes (temperatures as low as 8 degrees F for short periods), wet and cold conditions, and all forms of neglect. They are disease resistant and can live up to 600 years. It is no wonder they are customarily used as rootstock by horticulturists who need a hardy variety on which to graft a more delicate type of citrus.



Valencia oranges have hard skin that enables good shelf life. They are large, disease-resistant trees that produce heavy crops. Valencia fruit need to be exposed to high heat to mature. Here in the Sonoran desert, since that requirement is met just a few weeks before bloom, there are only 11 months from bloom to maturity, whereas in colder climates it can take several months longer for Valencia oranges to reach maturity.

Meyer lemons are somewhat frost sensitive. Mature trees are around 6 to 10 ft tall, and exceedingly productive.

Pummelo seeds are true to type. They are somewhat frost hardy, and relatively salt-tolerant, which is ideal in Tucson, since our soils tend to be salty.

Grapefruits are among the most successful citrus varieties in Tucson, producing tall robust trees and prolific crops.

Key limes are cold sensitive, but once they get established and grow to a mature size, they do well in the Tucson Basin.

Tangerines are slightly frost tender when the trees are small, but can thrive once they are well established.

Harvest

The yellow and orange pigments of citrus, called carotenoids, do not develop until the temperature drops below 55 degrees F for several hours. Citrus generally ripens in the winter, although fruits can remain unharvested on the trees for many months.

Sweet limes begin to ripen as early as October, when still green, and they remain juicy until February, when they have turned yellow. The peels are especially fragrant, but the oils irritate some people's skin, so it is best to peel them with a knife. Traditionally, they are eaten fresh, right off the tree. Don't let the lime in the name fool you; sweet limes have a very distinct sweet taste, an acquired taste. Try them; you may not like them at first because they are not what you are expecting, but you will eventually grow fond of this unique heritage fruit. They are also delicious when juiced, and make a fine natural sweetener for lemonade. At Mission Garden we often mix sweet lime juice with the juice of sour orange to make refreshing orangeade. (The juice can be frozen for use in summer).

Sour oranges have come to be known locally as "ornamental" plants despite the fact that their fruit is quite edible. In fact, many people of Middle Eastern cultures prefer the tart oranges to lemons. They can be used in any recipe that calls for lemons. They are commonly used in marinades, chutneys, relishes, sauces, liqueurs, marmalades and candy. Moreover, since antiquity, their dried blossoms (*flor de azahar*) have been steeped to make calming medicinal teas.





FRANCES WONG IN FRONT OF THE ORANGE TREE HER MOTHER PLANTED AT BKW FARMS. SHE HAS DONATED SEEDS, SEEDLINGS AND CUTTINGS FOR THE CHINESE GARDEN AT MG

Valencia oranges are from February to May. The fruit holds well on the tree, and becomes sweeter later into the season. Valencia fruit is medium in size with few seeds, from zero to six.

Meyer lemons produce abundant crops. They begin ripening in November and can be harvested through March and beyond.

Pummelos begin to ripen in November, and they can be harvested through to late spring. They are usually eaten fresh.

Key limes ripen August through October. They are an integral part of traditional Mexican cuisine, used at virtually every meal. They are preferred over lemons, despite the fact that fresh lime juice has only half the vitamin C content of lemon juice.

Tangerines ripen around Christmas, and are typically eaten fresh off the tree.

Grapefruits also ripen during the winter months and can last on the tree for many months.



Origins

Stemming from Asia, from eastern India to Indonesia and China, there are only three wild ancestors of all citrus: the mandarin (*Citrus reticulata*), native to south China; the pomelo or pummelo (*Citrus maxima*), from Malaysia and the Malay archipelago; and the citron (*Citrus medica*), from the Himalayas in northern India. When these trees were brought together by migration or trade they cross pollinated, giving rise to many new varieties. Although most plants only cross with like species, citrus is an exception to this rule; different species can cross pollinate and produce viable seed. New fruits can also arise by way of mutation, wherein single branches bear mutant fruits. These branches can be reproduced by grafting to obtain new varieties. Hence, for example, there are 4,000 varieties of oranges alone.



ORANGES, SWEET LIMES, TANGERINES

The Chinese were most likely the first to domesticate citrus in the third or fourth millennium B.C.E. Indeed, the first known documents on the grafting of fruit trees were references to citrus trees in China. Although Alexander the Great's campaigns in Iran and northern India, around 330 B.C., are widely believed to have led to the introduction of the citron to the Mediterranean, citron seeds were found in an archaeological site dating to 1200 B.C. in Cyprus. In any case, by Roman imperial times they were grown throughout the entire Mediterranean region, and as Islam expanded in the 600s C.E., oranges, lemons, limes, pomelos, and mandarins were planted throughout the Islamic empire.

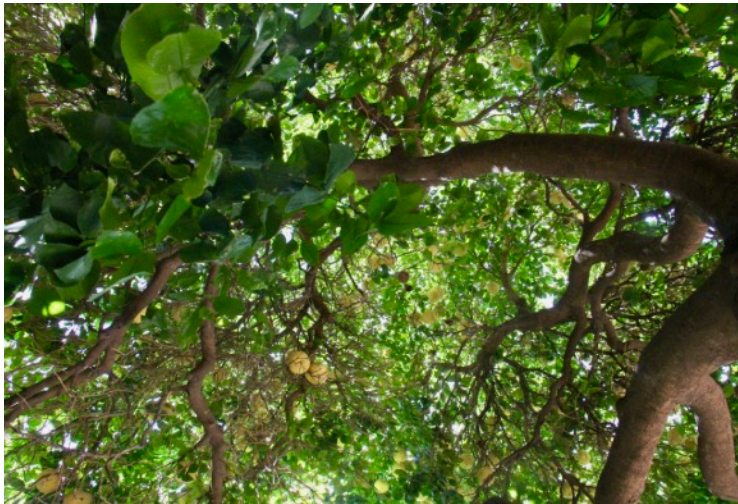
On his second voyage to America in 1493 Columbus took with him from Gomera in the Canary Islands orange, lemon, citron, and likely also lime seeds, which he planted in Haiti. By the 1700s it was known that consuming citrus juice could protect sea voyagers from scurvy, whereby the fruit preserved in seawater became an essential staple on vessels sailing to and from the "New World." Citrus could be found throughout the northern frontier of the Spanish colonial empire wherever winters were mild. By the mid-1700s citron, lemon, lime, and sweet and sour oranges had been introduced into the Pimeria Alta. Sweet oranges, sour oranges, lemons, and limes abounded in the gardens of the early Jesuit missions in the warm valleys of Sonora.

Beginning in the 1870s in Phoenix's Salt River Valley and extending westward towards Yuma, the citrus industry became a major economic driver in Arizona—one of the iconic 5 Cs, along with cotton, cattle, copper and climate. The stock for Arizona's citrus groves was often sourced



from the Franciscan missions of southern California. By the industry's peak in 1970 there were 80,000 acres of citrus groves, including grapefruits, oranges, lemons, and tangerines. According to the Arizona Department of Agriculture, in 2017 citrus fruit accounted for \$55.5 million of the \$23.3 billion dollar agricultural contribution to the state's economy.

The Tucson Basin can be hit by hard winter freezes, making it unsuitable for commercial citrus production. However, there are isolated thermal pockets, such as the one in what is now the Casas Adobes area between Ina and Orange Grove roads. Yes, the latter got its name from a former grove of oranges, grapefruits, and date palms planted in the 1930s by Maurice Reid, whose son Gene developed Reid Park. Maurice had salvaged trees that were being cut down to make way for housing developments in Phoenix; his trees would eventually suffer the same fate.



TOWERING GRAPEFRUIT TREE AT ST. MARY'S HOSPITAL, WHOSE PLANTING IN 1932 WAS FACILITATED BY GENE REID

Quote

Thomas Hum is an immigrant from China who has been farming in Marana since he was an adolescent. In the 1980s, he planted a large citrus grove comprised of several different species. He relates, "Some scientists from the university came and told me the different varieties would not cross, but they were wrong." He has witnessed how, over time, the fruits on the different trees tend to resemble each other more and more.

Further Reading

The Land Where Lemons Grow. The Story of Italy and Its Citrus Fruit, Helena Attlee, 2014; <https://www.arizonahighways.com/for-kids/history/citrus-arizona>; *Arizona – A History*, Thomas E. Sheridan, 2012; <https://extension.arizona.edu/citrus-resources>; *The Origins of Fruit & Vegetables*, Jonathan Roberts, 2001; *Gardens of New Spain, How Mediterranean Plants and Foods Changed America*, Dunmire

