



Your Florida Dooryard Citrus Guide - Appendices, Definitions and Glossary¹

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Appendix A. Scion Selection

Sweet Oranges

Oranges grown in Florida can be divided into three broad seasonal categories: Hamlin, Parson Brown, Ambersweet, and navels are considered early-season cultivars; Pineapple orange is a mid-season cultivar; Valencia is a late-season cultivar.

Early-Season Oranges

Hamlin orange

Harvest October to January

Trees of this early cultivar have a high degree of cold tolerance especially with early harvest before winter freezes. Fruit yield is high and juice has a light color. Fruit stores well on the tree but is susceptible to splitting and creasing. Seeds: 0-6 per fruit.

Parson Brown orange

Harvest October to January

Parson Brown is an early season orange that can be harvested slightly earlier than Hamlin. Its seediness and lower fruit yields make it less desirable than Hamlin for fresh fruit. Seeds: 0-30 per fruit.

Ambersweet orange

Harvest October to January

Trees are moderately cold hardy. Fruit can usually be harvested prior to damaging freezes. Fruit resembles navel orange, peels easily, has good fruit and juice color at maturity, but varies greatly in seediness. Trees on some rootstocks, especially Swingle citrumelo, grow slowly at first and appear to be quite susceptible to citrus rust mite. This is a new cultivar, so many questions remain about fruit production and fruit quality. Will probably be a very good early-season orange cultivar for either fresh fruit or juice. Seeds: 0-30 per fruit.

Navel orange

Harvest October to January

Navels differ from other oranges by having a rudimentary secondary fruit embedded at the blossom

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end of the fruit. Premature yellowing and rot of this secondary fruit often results in premature fruit drop. Fruit peels relatively easily, sections well. If juiced, drink within several hours before a bitter flavor develops. Tends to require more precise irrigation and nutrition management. Two periods of fruit drop, early- and late-summer, account for 15-20 percent of the crop in some years. Cara Cara navel is used for salads because of its near-crimson flesh. Seeds: 0-6 per fruit.

Mid-Season Oranges

Pineapple orange

Harvest December to February

This leading mid-season cultivar has good external color and internal quality but is the least cold hardy of orange varieties. It is subject to alternate bearing, pre-harvest fruit drop during heavy crop years, creasing and pitting. Seeds: 15-25 per fruit.

Sunstar orange

Harvest December to March

This variety has slightly darker juice color than Hamlin and about as much fruit. It is more cold hardy and subject to less pre-harvest fruit drop than Pineapple orange. It ripens about the same time as Pineapple.

Midsweet orange

Harvest January to March

Midsweet ripens later than Pineapple and holds well on the tree. Fruit yield and quality are about the same as Hamlin but juice color is deeper. Trees are cold hardier and less susceptible to pre-harvest drop than Pineapple orange.

Gardner orange

Harvest January to March

This midseason orange ripens around February 1, about the same time as Midsweet. Gardner is about as cold hardy as Sunstar and Midsweet.

Late-Season Oranges

Valencia orange

Harvest March to June

This cultivar carries two crops on the tree after bloom, the current seasons crop and the previous season's crop that takes about 15 months to mature. With its excellent internal fruit quality and juice color, the Valencia is the most important sweet orange variety. The tree tends towards alternate bearing. Fruit stores well on the tree and may regreen late in the season. Rhode Red "Valencia" orange has superior peel and flesh color. Seeds: 0-6 per fruit.

Grapefruit

Two basic types of grapefruit are grown in Florida, white-fleshed (Marsh and Duncan) and pink-fleshed or colored grapefruit (Redblush, Thompson, Flame and others).

Duncan grapefruit

Harvest December to May

Produces seedy, high quality fresh fruit with pale, yellow flesh. Popular for sectioning. Seeds: 30-70 per fruit.

Marsh grapefruit

Harvest November to May

This seedless fruit with pale yellow flesh and large, open cavity in center, is used commercially for juice. Seeds: 0-6 per fruit.

Redblush grapefruit

Harvest November to May

Widely grown ruby red grapefruit used for juice and cocktail products. The peel is a pink blush and the flesh pink to pale red. Seeds: 0-6 per fruit.

Star Ruby grapefruit

Harvest December to May

Peel has a dark-pink blush; flesh is deep red. Peel has a smoother texture than other grapefruit.

Trees are less cold hardy than other grapefruit cultivars and more susceptible to foot rot. Leaves often show blotchy chlorotic areas (a genetic trait).

Other grapefruit cultivars include Thompson, Ray Ruby, Flame, and Rio Red. Seeds: 0-6 per fruit.

Mandarin and Mandarin Types

Mandarins or tangerines include fruit of small- to medium-size; loose rind and fruit sections; distinctive flavor, color and aroma; and excellent eating out-of-hand qualities. Trees are usually very cold tolerant. The peel on some mandarins tears easily, so harvesting is done by cutting the stem with pruning shears. Seed numbers generally vary with the degree of cross-pollination.

Minneola tangelo

Harvest December to February

This seedy, well-sized fruit with characteristic flavor often exhibits a prominent neck at the stem end. Fruit production is enhanced by cross-pollination. Trees are extremely cold hardy, highly susceptible to *Alternaria* brown spot. Seeds: 7-12 per fruit.

Orlando tangelo

Harvest November to January

This early-season cultivar produces a large, cold-hardy tree with cup-shaped leaves. Trees must be fertilized more heavily and frequently than most other cultivars, especially with nitrogen, as foliage tends to turn yellow in the fall and late winter. Bears fruit within 3-4 years as a seedling tree, and is moderately susceptible to *Alternaria* brown spot. Seeds: 0-35 per fruit.

Nova

Harvest November to December

Cross-pollination required. Fruit tends to dry-out prematurely, particularly on lemon-type and Carrizo citrange rootstocks. Quite cold tolerant. Seeds: 1-30 per fruit.

Robinson

Harvest October to December

Cross-pollination required for this early tangerine of excellent eating quality. Fruit tends to dry-out early on vigorous rootstocks, is thin-skinned, and susceptible to splitting. Brittle wood and a tendency to bear fruit near limb ends can result in limb breakage and even tree collapse in heavy crop years. One of the more cold-hardy cultivars, but susceptible to twig and limb dieback. Scion is susceptible to *Phytophthora* foot rot. Seeds: 1-20 per fruit.

Sunburst

Harvest November to December

Cross-pollination required. Foliage and twigs are highly susceptible to environmental stress and rust mite damage. This thin-skinned fruit is also susceptible to splitting. Seeds: 1-20 per fruit.

Murcott (Honey tangerine)

Harvest January to March

Excellent eating-quality. Heavy alternate bearing sometimes results in limb breakage and tree collapse. Trees are normally cold hardy, but highly susceptible to cold damage when heavily laden with fruit, which is also susceptible to scab. Fruit is borne on the outside canopy, resulting in susceptibility to wind-scar and sunburn. Seeds: 10-20 per fruit.

Dancy

Harvest December to January

Produces large crops of small fruit, though highly susceptible to *Alternaria* brown spot. Limb breakage may occur with heavy crops. The fruit is excellent in quality and peels so easily it must be clipped to harvest. Seeds: 6-20 per fruit.

Temple (Temple orange)

Harvest January to March

An excellent eating-quality fruit with a pebbly rind that is easily peeled and susceptible to creasing.

Mature fresh fruit and juice are of superior flavor and color. Trees are very sensitive to citrus scab, cold temperatures and highly susceptible to aphids. Seeds: 15-20 per fruit.

Osceola

Harvest October to November

Cross-pollination required to produce this small, highly colored but seedy fruit. Tree is relatively cold hardy, but susceptible to scab. Clip fruit to harvest. Seeds: 15-25 per fruit.

Fallglow

Harvest October to November

Fruit is juicy, may have tart taste; usually larger than other citrus hybrids. The tree is not as cold hardy as most citrus hybrids and is highly susceptible to aphids. Young trees are susceptible to twig and limb dieback following planting. Seeds: 20-25 per fruit.

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Harvest October to February

Bears many small fruit of excellent eating quality. Tree is relatively cold hardy, but susceptible to scab. Seeds: 0-25 per fruit.

Owari (satsuma type, Kimbrough type)

Harvest September to November

Trees have a characteristic, open-growth habit with less foliage than other cultivars, and perform well on trifoliolate orange rootstock. Produces its best-quality fruit in northern areas of the state. Fruit achieves excellent eating quality before good external color appears, but does not store well on the tree; clip at harvest. Kimbrough, an Owari type released in 1990, produces larger fruit and may have 1-2°F more cold tolerance than satsuma, the major Owari type planted in Florida. Seeds: 0-6 per fruit.

Ponkan

Harvest December to January

One of the more tropical mandarins, Ponkan is regarded as a good dooryard variety. Tree tends towards alternate bearing and has a low-acid content. Seeds: 3-7 per fruit.

Acid Citrus Fruit

This group includes lemons, limes and citrons. They usually bloom more frequently than other cultivars and are highly cold-sensitive.

Tahiti or Persian lime

Harvest June to September

These thorny trees are highly susceptible to cold injury, limiting their culture to south Florida. Fruit is large, acid, harvested while green. Maturity is based on size and juice content since fruit is pale yellow when fully mature. Seeds: 0-1 per fruit.

Key or Mexican lime

Harvest year-round

The small fruit are prized for the lime flavor they give pies. Juice is also used as condiment. Cold susceptible, these trees can be grown outdoors only in south Florida, and should be container-grown and moved inside during cold weather in other areas. Key lime will produce flowers repeatedly, so fruit in various stages of development are found on the tree at the same time. Seeds: 3-8 per fruit.

Meyer lemon

Harvest November to March

This variety's cold-hardiness make it a popular selection for dooryard plantings. It has a low-spreading growth habit with few thorns. Fruit are relatively large with high juice content, a smooth skin, and lower acid levels than other lemon varieties. Seeds: 0-10 per fruit.

Bearss lime or Sicilian lemon

Harvest July to December

Trees are very vigorous, thorny, and sensitive to cold. Continuous growth makes it difficult to control tree size. Seeds: 1-6 per fruit.

Miscellaneous

Calamondin

Harvest November to April

This acid fruit flavors drinks, marmalades and jellies. Popular in landscapes and ornamental containers, rooted cuttings of this cultivar are also widely marketed as “miniature oranges” for use as a winter houseplant. While rooted cuttings grow like shrubs, budded trees can reach 15 – 20 feet and are cold-hardy. Seeds: 3-5 per fruit.

* Nagami kumquat

Harvest November to April

This oblong or egg-shaped fruit has an acid taste and bright-orange color. Cold-hardy trees are used in home and commercial landscaping. An ornamental, variegated Nagami kumquat, Centennial, is available. Seeds: 0-3 per fruit.

* Meiwa kumquat

Harvest November to April

The peel and pulp of these large, round fruit have a pleasant spicy-sweet taste, and are used for preserves and candied fruit. Tree is compact, foliage dark green. Trees are used in home and commercial landscaping and are quite cold-hardy. Seeds: 1-6 per fruit.

Limequat³

Harvest November to March

Eustis, Lakeland, and Tavares limequats, hybrids of kumquats and the West Indian or key lime, all resemble the key lime in size, form and composition and are commonly substituted for key lime. Eustis and Lakeland kumquats are similar in color to the key lime where as the Tavares limequat has more orange color. Eustis and Lakeland are sister hybrids of the West Indian or key lime and the round or Meiwa kumquat. Tavares is a hybrid of key lime with the oval or Nagami kumquat. All limequat are more cold resistant than key limes but less cold resistant than kumquats.

Promising New Cultivars

The University of Florida and other universities and research agencies have recently released a number of promising new cultivars. However, these new cultivars are still being tested in commercial groves and may not show up in garden stores for some time. Early and mid-season oranges include cultivars that mature earlier or later than Hamlin oranges, have better flesh color or flavor than Hamlin, with one selection, Jin Cheng, having egg-shaped rather than round fruit. A new Murcott and Clementine cultivar will also be available. Look for them in the future.

Appendix B. Rootstock Characteristics

Rough Lemon

Rough Lemon recommended for Valencias and other round oranges in warm areas

- adapted to deep, coarse sandy soils
- cold-sensitive, not recommended in chronically cold areas, but rootstock vigor promotes rapid
- recovery
- produces large, vigorous trees that may grow too large for dooryard sites
- produces high yields and large fruit with relatively thick peel and poor juice except perhaps Valencia orange

Milam Lemon

Milam Lemon recommended for Valencia orange in warm areas

- similar to rough lemon for tree growth, productivity, fruit characteristics, and cold tolerance
- adapted to deep, coarse sandy soils
- resistant to burrowing nematode
- additional care needed for young trees during first few years

- susceptible to *Phytophthora* foot rot
- susceptible to citrus blight

Rangpur

Rangpur recommended for Valencia orange

- similar to rough lemon in tree vigor, tree size, cold tolerance, high yields, large fruit size
- juice quality slightly better than rough lemon
- very salt tolerant
- susceptible to *Phytophthora* foot rot

Palestine Sweet Lime

Palestine sweet lime satisfactory for Valencia orange in warm areas

- well-adapted to deep, sandy soils
- equals rough lemon in cold tolerance, tree vigor and size, depth of rooting, fruit quality
- fruit size is unusually large
- possible use for self-incompatible mandarin hybrids such as Orlando tangelo that can set crops of parthenocarpic fruit and to induce maximum size in mandarin cultivars with small size

Volkamer Lemon

Volkamer lemon useful for warm sites with orange cultivars used for juice

- similar in behavior to rough lemon but juice quality superior
- adapted to a wide range of soils
- maximum productivity in short periods of time

Citrus Macrophylla

Citrus macrophylla used for Tahiti lime:

- maximum productivity in short periods of time

- large fruit size
- fruit does not store well on tree
- cold-susceptible
- resistant to *Phytophthora* foot rot
- salt tolerant
- poor juice quality
- susceptible to blight
- susceptible to tristeza

Cleopatra Mandarin

Cleopatra mandarin used for Hamlin and Pineapple oranges more than Valencia good for mandarin cultivars large enough to tolerate the reduction in fruit size.

- fruit quality is excellent and fruit stores well on tree
- a “lazy” rootstock, growing well but fruiting poorly until 10 to 15 years old
- produces moderate to large tree
- induces maximum cold-hardiness in the scion
- susceptible to blight
- susceptible to *Phytophthora* root rot in poorly drained sites
- highest salinity tolerance among commercial rootstocks

Sour Orange

Sour orange excellent for Hamlin, navel orange, and grapefruit

- produces tree of moderate vigor and size
- good yields on fertile soils
- produces good juice quality and good fresh fruit
- induces maximum cold-hardiness

- extremely susceptible to tristeza
- tolerant to *Phytophthora* foot rot but less so to root rot

Trifoliolate Orange

Trifoliolate orange used for satsuma tangerines, orange cultivars, and grapefruit:

- not used for mandarin hybrids because of bud union incompatibilities
- produces moderate-size trees on clay and loam soils; trees do not grow rapidly
- produces small fruit with some scions because of heavy fruit set
- fruit holds well on tree, except satsuma tangerines
- juice color excellent
- cold tolerant when maximum cold-hardiness is developed, but can be more susceptible to cold than sour orange or Cleopatra mandarin unless acclimatized to cold
- seedling tree, so thorny it can be used as a protective hedge; produces inedible seedy fruit
- deciduous as a seedling tree
- susceptible to blight + resistant to *Phytophthora* foot rot
- Flying Dragon is a trifoliolate orange selection, the stem of which has an interesting curving pattern, along with re-curved thorns.

Carrizo Citrange

Carrizo citrange used for sweet orange, grapefruit, and mandarin types:

- a hybrid of sweet orange and trifoliolate orange
- produces large, vigorous trees
- excellent growth in all soils except those with high calcium levels

- often displays symptoms of zinc, iron
- or manganese deficiency in spring flush

Swingle Citrumelo

Swingle citrumelo superior rootstock for grapefruit and navel orange:

- tree vigor and size vary according to scion
- cold tolerance equal to that of sour orange and Cleopatra mandarin
 - suitable for most soils except highly calcareous soils.

⁴ See footnote

Appendix C. Recommended Scion/Rootstock Combinations

See Table 1.

Appendix D. Florida Citrus Harvesting Periods

See Table 2.

Fruit Characteristics

Citrus fruit matures slowly and does not ripen after harvest, unlike peaches or pears. Changes in juice content, sugar, and acid levels determine fruit maturity, with the acid content decreasing and the sugar content increasing as fruit matures. Commercial growers take fruit samples for analysis to determine if legal maturity standards have been reached, but homeowners can taste fruit to determine fruit maturity.

Citrus fruit may be stored on the tree long after it reaches maturity. Fruit usually improves in taste until the flesh begins to dry and the fruit drops. However, severe rust mite damage may hasten fruit dehydration and seed may germinate within grapefruit held on the tree too long. Grapefruit from the same bloom can usually be harvested from October through May or later. Fruit of orange cultivars cannot be held on the tree as long; mandarin cultivars can be

held an even shorter time because they become puffy. Lemons and limes can be used whenever they have enough juice.

Ease of peel removal varies among cultivars.

Loose-skinned mandarin types are the most easily peeled. Navel, Ambersweet, and Temple cultivars peel more easily than oranges. Seed content varies from fruit to fruit on the same tree. However, fruit with 0-6 seeds are regarded as commercially seedless. The seed content of most cultivars is increased with cross-pollination.

Cold tolerance differs in the trees of various cultivars. Mandarin cultivars are the most cold tolerant, with the exception of Temple and Fallglo. Sweet oranges rank next in cold tolerance, closely followed by grapefruit. Lemons and limes are far less cold tolerant. In general, citrus trees are more cold tolerant after the crop has been harvested because the canopy is more compact and retains more heat during freezes. Cold tolerance of fruit differs from the cold of trees and is related to peel thickness and larger fruit, because of their greater mass, are usually more cold tolerant than smaller fruit. Grapefruit is usually the most cold tolerant because of its thick peel, followed by oranges, mandarins, lemons and limes. Most frozen fruit will drop within a few days after a freeze. Fruit remaining on the tree will dry out with time, with the degree of juice loss being related to cultivar, severity, and duration of freezing temperatures. If harvested within several days after a freeze, such fruit can still be salvaged for juice. Slightly damaged 'Valencia' fruit will often recover some juice content if the freeze occurs before the end of January.

Cool fall and winter temperatures intensify peel color, which is closely related to eating quality. Fruit sometimes will not develop the desired color in Florida and in tropical areas with mild climatic conditions. Mandarin cultivars vary widely in color, with some being dependent on low temperature for color development than others. Grapefruit develops an excellent peel color even in the hottest climates, but the green color changes to yellow earliest in cooler climates. Lemons are usually de-greened with ethylene to develop yellow color. Limes are not temperature dependent with regard to color. Flesh

color is similarly affected but to a lesser degree. Early-maturing cultivars generally are not as well colored as mid- and late-season ones, and the better-colored, late-maturing cultivars may actually re-green to some extent if held on the tree until late in the season. Fruit grown in cooler climates usually contains more acid.

Adapted from *Florida Citrus Varieties*, D.P.H. Tucker, C.J. Hearn, and C.O. Youtsey. Fla. Coop. Ext. Ser. Bul. SP 102.

Glossary

BUDDING Budding is a type of grafting where the scion consists of a single bud attached to a piece of bark with a thin sliver of wood underneath. The inverted T-bud and the chip bud are budding methods most commonly used in Florida.

CULTIVAR A cultivar is a horticultural variety that has originated and persisted under cultivation (not necessarily referable to a botanical species) and of botanical or horticultural importance, requiring a name. Single quotation marks are usually placed around the name of the cultivar as in 'Hamlin' oranges.

DOLOMITE A material used for liming soils in areas where magnesium as well as calcium are needed. Dolomite is made by grinding dolomitic limestone which contains both magnesium carbonate, $MgCO_3$ and calcium carbonate, $CaCO_3$. In strict chemical terminology, lime refers only to calcium oxide (CaO) but the term "lime" is commonly used to refer to all limestone-derived materials applied to neutralize acid soils.

GRAFTING Grafting is a specialized type of plant propagation wherein part of one plant (the scion) is inserted into another (the rootstock) so that they unite and grow as a single plant.

MANDARIN Sometimes used synonymously with "tangerines," are loose-skinned citrus of small to medium size. They have an open core in the fruit, a distinctive flavor and aroma, with considerable cold tolerance.

POTASH This term generally refers to potassium oxide (K_2O). Wood ashes are also a source of potassium.

PROPAGATION Plant propagation is the art and science of reproducing plants while preserving the unique characteristics of that plant from one generation to the next.

QUIESCENCE A period of non-apparent growth that citrus trees in northern and central Florida experience as cooler temperatures occur. In the warmer areas of southern Florida, in Central and South America, citrus trees seldom become completely quiescent.

Additional Notes:

3. Recommended reading: Florida Citrus Varieties, Bulletin SP102, by D.P.H. Tucker, C.J. Hearn, and C.O. Youtsey, University of Florida, Institute of Food and Agricultural Sciences.
4. For additional information, see Rootstocks for Florida Citrus, Bulletin SP42, by W.S. Castle, D.P.H. Tucker, A.H. Krezdorn, and C.O. Youtsey. University of Florida, Institute of Food and Agricultural Sciences.

Table 1. Recommended scion/rootstock combinations.

Location in Florida	Scion/Rootstock	Primary/Secondary Use
North	sweet orange/Cleopatra mandarin	juice/fruit
	mandarins/Cleopatra mandarin	fruit
	grapefruit/sour orange	fruit/juice
	navel orange/sour orange	fruit
	Hamlin orange/sour orange	juice/fruit
	satsuma tangerine/trifoliolate orange	fruit/juice
	sweet orange/trifoliolate orange	juice/fruit
	grapefruit/trifoliolate orange	fruit/juice
	grapefruit/Swingle citrumelo	fruit/juice
	navel orange/Swingle citrumelo	fruit
	Central	Valencia/rough lemon
Valencia/Milam lemon		juice/fruit
Valencia/Rangpur lime		juice/fruit
sweet orange/Cleopatra mandarin		juice/fruit
mandarin/Cleopatra mandarin		fruit
grapefruit/sour orange		fruit/juice
navel orange/sour orange		fruit
Hamlin orange/sour orange		juice/fruit
satsuma tangerine/trifoliolate orange		fruit/juice
sweet orange/trifoliolate orange		juice/fruit
grapefruit/trifoliolate orange		fruit/juice
sweet orange/Carrizo citrange		juice/fruit
grapefruit/Carrizo citrange		fruit/juice
mandarin, mandarin types/Carrizo citrange		fruit/juice
South		Valencia/Palestine sweet lime
	mandarin/Palestine sweet lime	fruit
	mandarin types/Palestine sweet lime	fruit
	sweet orange/Volkamer lemon	juice
	Tahiti lime / <i>Citrus macrophylla</i>	juice
	sweet orange/Cleopatra mandarin	juice/fruit

Table 2. Florida citrus harvesting periods.

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.
Sunburst		■	■									
Dancy			■	■								
Murcott (Honey tangerine)				■	■	■						
Temple (Temple orange)				■	■	■						
Osceola	■	■										
Fallglow	■	■										
Page	■	■	■	■	■							
Owari (satsuma)	■	■										
Ponkan			■	■								
Tahiti (Persian)									■	■	■	■
Key Lime (Mexican)	■	■	■	■	■	■	■	■	■	■	■	■
Meyer		■	■	■	■	■						
Bearss (Sicilian)	■	■	■							■	■	■
Calamondin		■	■	■	■	■	■					
Nagami kumquat		■	■	■	■	■	■					
Melwa kumquat		■	■	■	■	■	■					
Limequat		■	■	■	■	■						
Midsweet				■	■	■						
Sunstar			■	■	■	■						