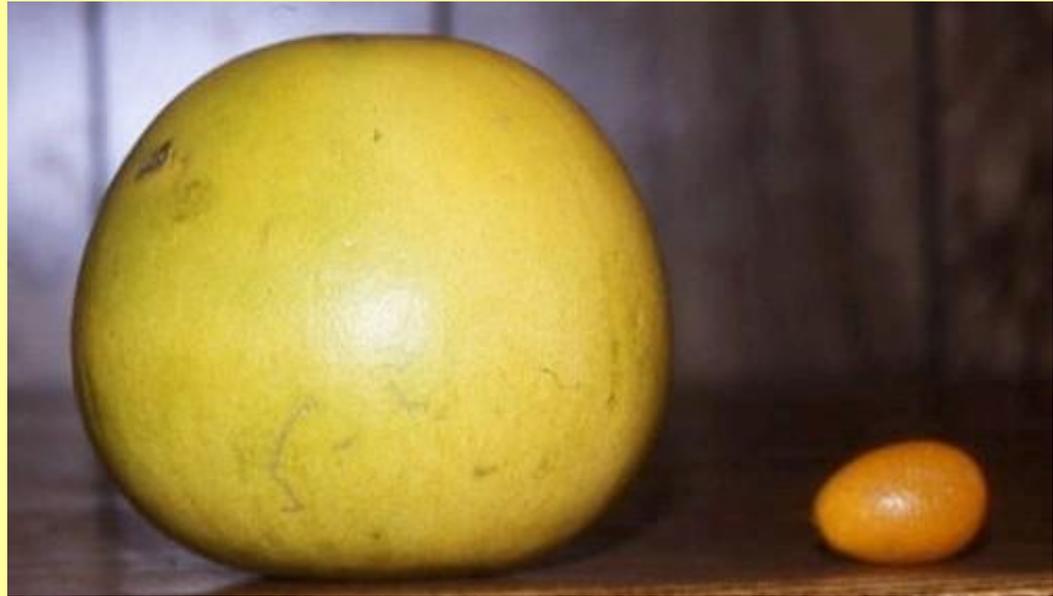


An Introduction to Citrus

Varieties – Pests and Diseases





CITRUS



Ornamental features include:

- **fragrant flowers**



Ornamental features include:

- variegated and non-variegated foliage
- leaves of varied size and texture



Ornamental features include:

- colorful fruit of many different shapes and sizes



Tree Shapes

- Citrus trees are generally pruned to a central leader or a modified central leader shape.
- A full canopy of leaves should be maintained in order to protect the bark of the trunk and scaffold branches from direct sun and potential sunburn.



- Trees can have branches close to the ground (have a full skirt) or can have the lower branches pruned off to expose the trunk.
- When the lower branches have been removed, the tree is said to be skirted or standardized.

Tree Shapes

- Citrus can also be pruned or shaped into hedges or espaliers.



Multiple Planting

- Multiple trees are sometimes planted together in one hole to produce what appears to be a single tree with multiple trunks.
- Although each individual tree will produce less fruit, multiple plantings will result in a greater variety of fruit or in an extended period of fruit harvest in the space of a single tree.



- The tree trunks are planted close together and are angled outward at a 30 degree angle from vertical.
- Trees should be selected on rootstocks which will produce trees of similar size and vigor so that one tree does not dominate the planting and overgrow the other trees.

Tree Size

- The size of a citrus tree is dependant on the citrus variety, on the rootstock and on how the tree is pruned.
- Trees are available on standard, dwarf (semi-dwarf), and true dwarf (flying dragon) rootstocks.
- Standard citrus trees will reach an average mature height of 18-30 feet.
- Dwarf (semi-dwarf) citrus trees will reach an average mature height of 8-15 feet.
- True dwarf (on flying dragon rootstock) citrus trees will reach an average mature height of 4-8 feet.
- A few citrus varieties are genetically small trees such as the Improved Meyer Lemon, the Mexican Lime, the Owari Satsuma Mandarin and several kumquat and kumquat hybrids.
- Pruning can reduce the mature height and width of a citrus tree by an average of 15-40%

Sunscald or Sunburn

- Citrus trees will sometimes defoliate due to cold or hot weather, due to over watering or under watering, or just before a growth flush of flowers or foliage.
- Pruning can also remove foliage so that the bark of the tree is exposed to direct sunlight.



Sunscald or Sunburn

- The thin bark of citrus trees is easily damaged or killed when it is exposed to strong or hot direct sunlight.



- This sun damage may take years to heal over and damaged trees may never fully recover to develop into strong, healthy trees.
- Sunburn can potentially kill young citrus trees.

Sunscald or Sunburn

- In order to prevent potential sunburn from occurring, it is recommended to whitewash any exposed bark, especially during the hotter months or in areas with high temperatures.

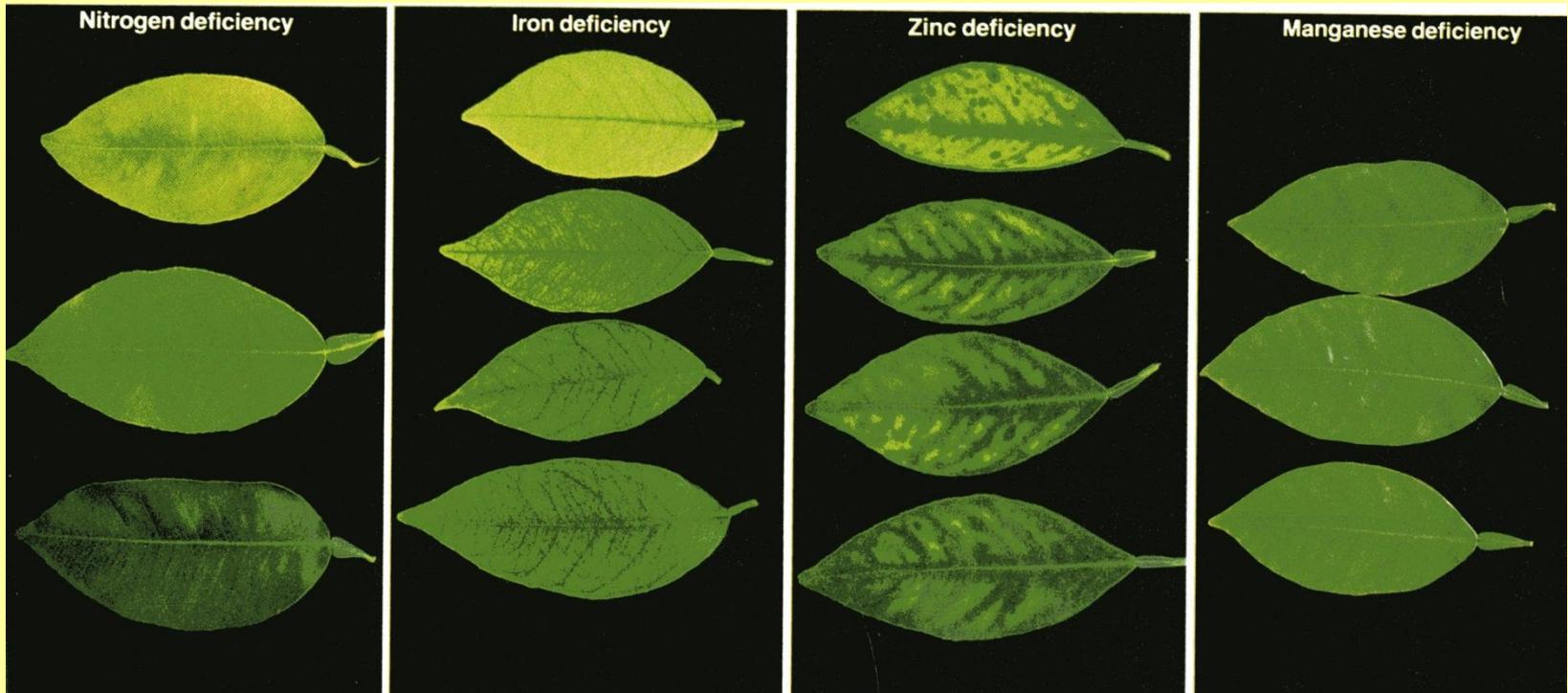


- To whitewash the bark, use white or a light colored water-based interior latex paint which has been thinned with 50% water. This will act as a sunscreen and will protect the bark from sun damage.
- New growth can grow through this whitewash without difficulty.

Citrus Pruning

- Citrus trees should be pruned for health, for structural strength, to reduced pest problems, to direct or redirect growth, for shape, for fruit production and to control size.
- Most citrus trees benefit from being pruned every two to 5 years.
- Pruning is best done in the early spring or in the early fall. Sufficient time should be given after pruning to allow new growth to develop before the occurrence of very hot or very cold weather which could result in injury to the tree.
- Pruning should be limited to the removal of no more than 15-20% of the foliage at any one time in order to reduce the effects of stress to the tree.
- If sufficient foliage is removed so that the bark of the tree is exposed to direct sunlight, the bark should be whitewashed in order to prevent sunscald or sunburn.

Nutrient Requirements and Nutrient Deficiencies

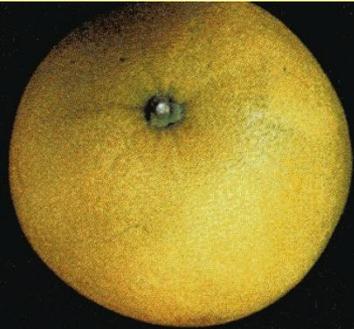


Cold Hardiness



From left to right, citrus fruit are lined up in order of increasing foliage hardiness.

Citrus Species and Varieties



'Chandler'
Pummelo



'Reinking'
Pummelo



'Marsh'
Grapefruit



'Red Blush'
Grapefruit



'Etrog'
Citron



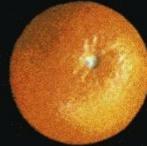
'Trovita'
Orange



'Washington'
Navel



'Shamouti'
Orange



'Robertson'
Navel



'Tarocco'
Blood Orange



'Marrs'
Orange



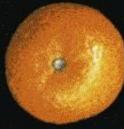
'Valencia'
Orange



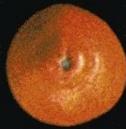
'Skaggs Bonanza'
Orange



'Sanguinelli'
Blood Orange



'Chinotto'
Orange



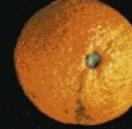
'Minneola'
Tangelo



'Orlando'
Tangelo



'Fortune'
Mandarin



'Satsuma'
Mandarin



'Fremont'
Mandarin



'Kara'
Mandarin



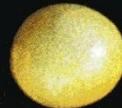
'Lisbon'
Lemon



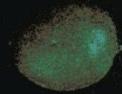
'Eureka'
Lemon



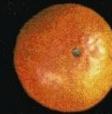
'Meyer'
Lemon



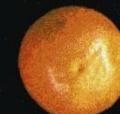
'Bearss'
Lime



'Mexican'
Lime



'Clementine'
Mandarin



'Fairchild'
Mandarin



'Page'
Mandarin



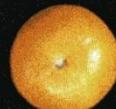
'Dancy'
Tangerine



'Encore'
Mandarin



'Pixie'
Mandarin



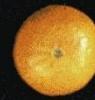
'Kinnow'
Mandarin



'Rangpur'
Lime



'Wilking'
Mandarin



'Honey'
Mandarin



Calamondin



'Nagami'
Kumquat



'Meiwa'
Kumquat



Limequat

CITRON

Citrus medica

- The citron is believed to be one of the original kinds of citrus.
- Trees are small and shrubby with an open growth habit. The new growth and flowers are flushed with purple and the trees are sensitive to frost.
- Ethrog or Etrog citron is a variety of citron commonly used in the Jewish Feast of Tabernacles. The flesh is pale yellow and acidic, but not very juicy. The fruits hold well on the tree. The aromatic fruit is considerably larger than a lemon. The yellow rind is glossy, thick and bumpy. Citron rind is traditionally candied for use in holiday fruitcake.
- Buddha's Hand or Fingered citron is a unique citrus grown mainly as a curiosity. The six to twelve inch fruits are apically split into a varying number of segments that are reminiscent of a human hand. The rind is yellow and highly fragrant at maturity. The interior of the fruit is solid rind with no flesh or seeds. Fingered citron fruits usually mature in late fall to early winter and hold moderately well on the tree, but not as well as other citron varieties.



Ethrog or Etrog citron



Buddha's Hand or Fingered citron

***SWEET ORANGE**

Citrus sinensis

- NAVEL ORANGE
- COMMON ORANGE
- BLOOD ORANGE / BURGUNDY ORANGE

*SWEET ORANGE

Citrus sinensis

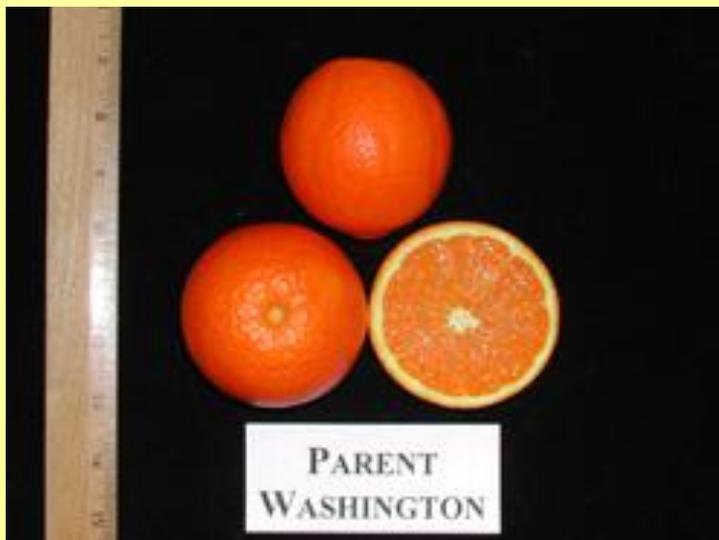


Sweet orange leaves are average size, with rather narrow petiole wings. They can be a bit wider than the ones shown, but are always much narrower than those of grapefruit.

NAVAL ORANGE Citrus sinensis

Parent Washington navel orange

- Washington navel orange was imported into the United States in 1870. These exceptionally delicious, seedless, easy-peeling fruits are the most widely planted variety in the area.
- The flowers lack viable pollen so the Washington navel orange will not pollinate other citrus trees. Because of the lack of functional pollen and viable ovules, the Washington navel orange produces seedless fruits.
- These large round fruits have a slightly pebbled orange rind that is easily peeled, and the navel, really a small secondary fruit, sometimes protrudes from the apex of the fruit.
- The Washington navel orange is at its best in the late fall to winter months, but will hold on the tree for several months beyond maturity and stores well.



NAVAL ORANGE Citrus sinensis



- Navel orange trees, in general, are not very vigorous trees.



- Fruit are easier to peel than other sweet oranges and the flavor generally has a higher sugar to acid ratio than other oranges.



- Fruit may or may not have a typical “naval”.



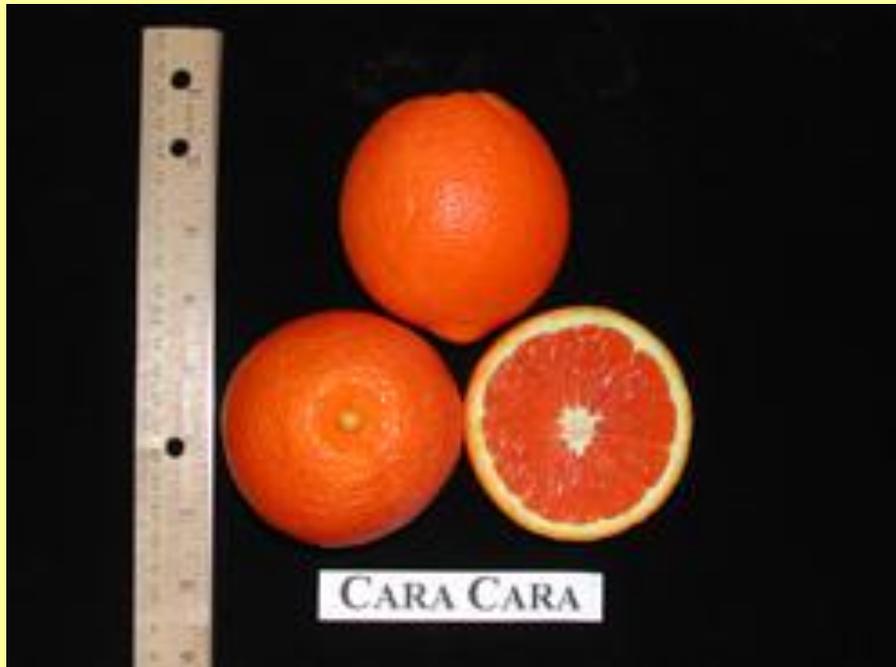
- Many naval-type oranges were derived from the original parent naval.

Lane Late

NAVAL ORANGE Citrus sinensis

Cara Cara navel orange

- Most tree and fruit characteristics reflect its Washington navel orange ancestry, but the flesh is deep pink, similar to the darkest of the red grapefruit varieties.



COMMON ORANGE Citrus sinensis

- Fruit have a thinner skin and are more difficult to peel than naval-type oranges.
- Flavor of common oranges have a higher acid to sugar ratio than naval-type oranges and generally are considered to have a more flavorful juice.
- Seediness varies by variety.



Seedless Valencia



Valencia



Midnight Valencia

COMMON ORANGE Citrus sinensis

Variegated Valencia orange



- Striped immature fruit turns solid orange when ripe.



- Mature fruit has distinct ridges. Flavor and seediness similar to a standard Valencia orange.

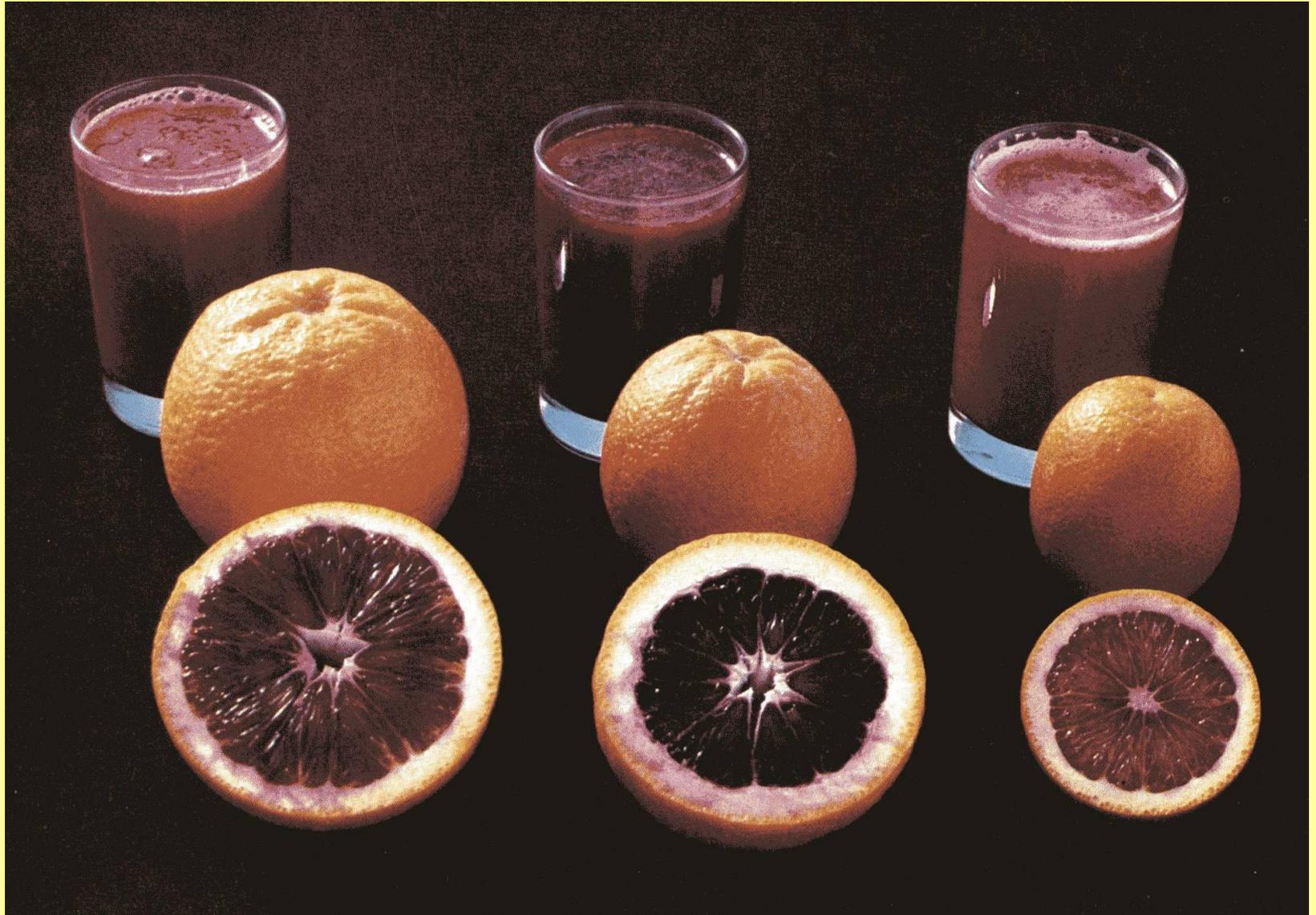


COMMON ORANGE Citrus sinensis Smith Red "Valencia" orange

- The fruit is of good size and flavor and is very low-seeded.
- The rind frequently carries a heavy red blush and the flesh is heavily pigmented with anthocyanin.
- Although the fruit is mature in late winter, it holds well into late spring, well past the season for conventional blood oranges.



BLOOD ORANGE Citrus sinensis



Tarocco

Moro

Sanguinelli

BLOOD ORANGE Citrus sinensis

- Flavor is usually tart-sweet to tart. Ripening season is December – March.
- Moro is also the earliest ripening of the blood oranges. The fruit is usually low-seeded with a flesh that can become very dark red late in the season.
- Sanguinelli is a late midseason blood orange. External red pigmentation rarely equalled by other blood oranges and excelled by none.
- Tarocco is one of the most delicious blood orange varieties. The distinctive color requires a chilly winter to develop properly.



SOUR ORANGE / BITTER ORANGE

Citrus aurantium



- Sour Orange leaves are a bit larger than those of sweet orange, and they have large petiole wings. Notice that the top of the wing is generally flatter than those of grapefruit or pummelo, which tend to be rounded on top.

SOUR ORANGE / BITTER ORANGE

Citrus aurantium

- Seville sour orange is the variety of sour orange traditionally used to make orange marmalade. Seville fruits mature in winter and are seedy, bitter, and acidic.
- Bouquet de Fleurs is a sour orange variety planted primarily as an ornamental. The low-seeded fruits mature in winter and hold very well on the tree. Bouquet de Fleurs fruits are bitter and acidic and typically are not consumed.



SOUR ORANGE / BITTER ORANGE

Citrus aurantium

- Chinotto sour orange is sometimes referred to as the Myrtle-leaf orange. The tree grows very slowly and has a dwarf compact habit. The leaves are small usually under two inches in length.
- These fruits mature in winter and are moderately tart and seedy. The fruits hang on the tree for most of the year, making the tree highly ornamental.



'Owari' Satsuma mandarin
(*Citrus reticulata* of Swingle, or
C. deliciosa of Tanaka)



* TANGERINE / MANDARIN Citrus reticulata

'Dancy' tangerine
(*Citrus reticulata*)



'Dancy' is typical of *C. reticulata*, and 'Owari' is typical of the Satsuma types of mandarins.

Virtually no petiole wing, but there is a bit of a ridge there (unlike lemon, which has none at all)

*Tangerines/Mandarins Citrus reticulata

- Mandarins are a category of easy-to-peel citrus, including tangerines, that originated in Southeast Asia.
- Varieties of tangerine and mandarin fruit can vary in season, size, flavor, color, seediness, ability to hold on the tree, need for a pollinizer, alternate bearing tendencies, heat requirements and ease of peeling.
- Varieties may ripen as early as December. Late varieties may be harvested as late as August or September.



*Tangerines/Mandarins Citrus reticulata



*MANDARIN

Citrus reticulata

- **Owari Satsuma is the most common of the many Satsuma mandarin selections grown in the United States. Because of its many fine qualities, Satsuma has been the focus of extensive efforts to extend its season of availability.**
- **Owari Satsuma trees are cold-hardy, productive, and vigorous-growing, but mature to a small size with a spreading and somewhat drooping character.**
- **The fruit varies in shape depending upon the conditions where it is grown, but it is most commonly oblate with a smooth and thin orange rind that is easily peeled. The flesh is bright orange, tender and juicy, seedless, and mild in flavor.**
- **The Owari Satsuma is considered to be a mid-season fruit, with its season of harvest being December to January in most areas of California. The fruit itself does not hold well on the tree, but it stores well after harvest.**



*MANDARIN

Citrus reticulata

- The clementines consist of a distinctive type of mandarin widely grown in the Mediterranean basin. The 'Clementine' is the original selection.
- "Climatically, the distinctive features of the Clementine variety are its low total heat requirements for fruit maturity and the sensitivity of the seedless fruit to unfavorable conditions during the flowering and fruit-setting period. In regions of high total heat, the Clementine matures very early -- only slightly later than the satsuma mandarins.
- Flesh color deep orange; tender and melting; juicy; flavor sweet; subacid and aromatic. Seeds very few to medium in number (depending on cross-pollination). Early in maturity. While the rind puffs somewhat after maturity, on some rootstocks fruit holds on tree for several months with little loss in quality.



* TANGERINE / MANDARIN Citrus reticulata

- The fruit of Dancy is usually medium in size with a tendency to alternate-bearing. The thin, smooth rind is reddish-orange at maturity and easily peeled. The flesh is a deep orange color, with a rich flavor. The fruits usually contain a moderate number of seeds. Dancy fruits mature midseason and do not hold well on the tree although the fruits themselves store quite well after harvest.
- The fruit of the Encore mandarin is medium in size with a thin, yellow-orange rind. Encore fruits hold well on the tree without much puffing of the rind, excellent flavor. Encore tend to be alternate bearing. Can be held on tree as late as September.
- **Kinnow has a strong tendency to alternate bearing. The fruit has a smooth orange rind that does not peel especially well for a mandarin. The flesh is orange, seedy, and has a rich distinctive flavor. Kinnow is mid-season in maturity and holds well on the tree.**

Dancy



Encore



Kinnow

*MANDARIN

Citrus reticulata

- **Gold Nugget** fruits are usually medium in size with a somewhat bumpy orange rind. The rind is moderately easy to peel. The flesh is bright orange, finely-textured, and seedless. The flavor is rich and sweet. The fruit usually matures by early March, but holds exceptionally well on the tree, with summer-harvested fruit still being of good quality.
- **Pixie** mandarins have a rind that is yellow-orange with a slightly pebbled texture that is easy to peel. The flesh is seedless, orange colored, and juicy. The flavor is mild and sweet. Pixie matures in late winter and holds exceptionally late on the tree; in certain mild locations, the fruit is known to hold well into summer.
- **Kishu** is a very small seedless mandarin that peels & sections well. The flesh is firm, meaty, and pleasantly sweet in flavor. Fruit maturity occurs in early midseason.



Kishu

*MANDARIN Citrus reticulata

TANGO

- Tango, a nearly seedless mandarin developed at UC Riverside, It is the most promising mandarin the university has ever produced. The interest in it is worldwide. This is a variety that is going to be in high-volume planting. There will be well over a million trees planted in California in the next three to four years.
- The Tango tastes good and has a smooth, deep orange rind that is easily peeled.
- Tango matures in late-January at most locations in California and good fruit quality can be maintained on the tree for 3-4 months past maturity.



*MANDARIN Citrus reticulata

Rangpur Lime

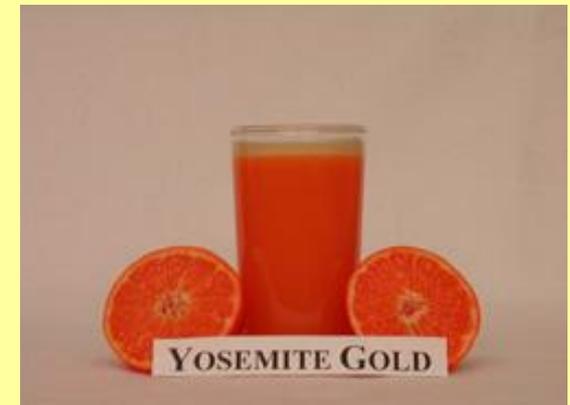
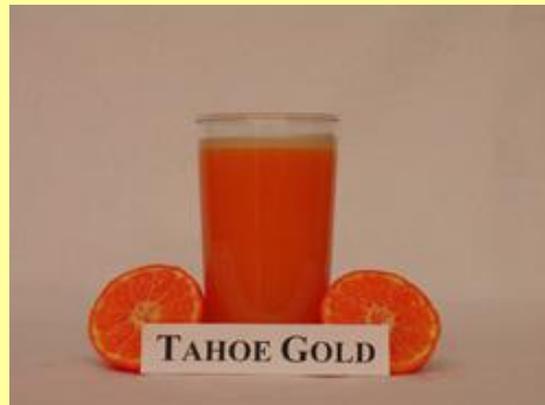
- The name lime in connection with this fruit is often misleading because there are very little similarities between the Rangpur and true limes. However, Rangpurs are highly acid and can be used as a substitute for commercial limes.



*MANDARINS - The TDE Hybrids

Temple tangor, and Dancy and Encore mandarin Hybrids

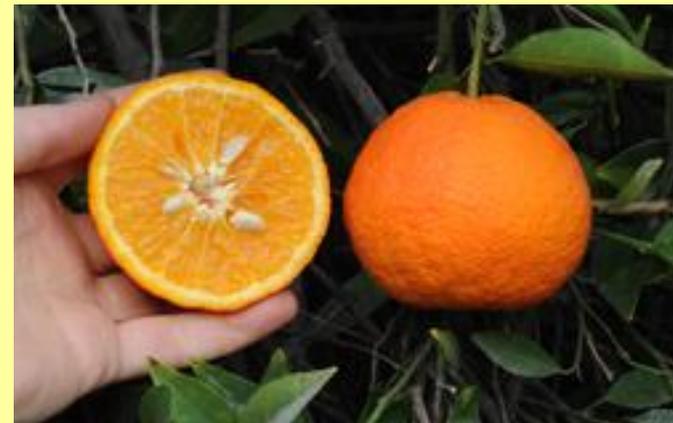
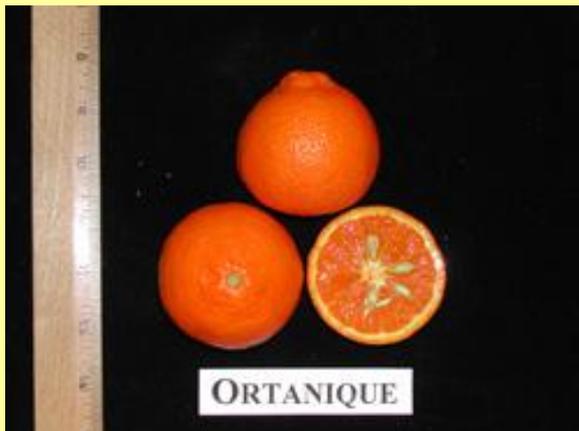
- Shasta Gold has a tendency to alternate bearing. The large fruits have a relatively thin rind. The flesh is seedless, bright orange, and juicy. The flavor is rich and sweet when mature. The season mid-February to mid-March and the fruits hold well on the tree into April or May.
- The season for Tahoe Gold is mid-January to mid-February. The fruit does not hold well on the tree. The rind is of medium thickness and moderately easy to peel when fruit are mature. Production is excellent.
- Yosemite Gold produces large fruits that have a relatively thin rind and has a tendency to alternate bearing. The flesh is seedless, bright orange, finely-textured and juicy. The flavor is rich and sweet. The season is January to mid-March and the fruits hold well on the tree into April.



TANGOR

Citrus reticulata X C. sinensis

- Ortanique is a natural tangor that was discovered in Jamaica. The name is a combination of “or” for orange, “tan” for tangerine, and “ique” for unique.
- The fruit is medium in size, obovate in shape, and has a pebbled, dark orange rind. The flesh is orange-colored, tender, and exceptionally juicy. When cross-pollinated, the fruit is seedy. The flavor is rich and sweet. Ortanique is usually late in maturity, and the fruit holds very well on the tree.
- Temple is a natural tangor that was discovered in 1896 in Jamaica. The fruit develops a satisfactory sugar to acid ratio only when grown in the warmest interior valleys.



TEMPLE

TANGELO

Citrus x paradisi X C. reticulata

- Minneola is a tangelo, a hybrid of Duncan grapefruit and Dancy mandarin. The fruit is round with a pronounced neck and smooth red-orange rind that can be peeled. The flavor is rich and juicy, with a touch of its grapefruit parent's tartness. Minneola should be harvested late in the season to ensure the fruit reaches a desirable sugar to acid ratio. Minneola blossoms are self-incompatible and must be cross-pollinated by a suitable pollinator to assure good fruit set. Most mandarin-types are suitable pollinators, with the exception of Satsumas and Minneola's siblings, Orlando and Seminole. Unfortunately, when cross-pollinated, Minneola's fruits tend to be seedy.



Minneola

between Minneola tangelo and Clementine



TANGELO HYBRIDS

Citrus x paradisi X C.

reticulata X C. Spp.

- Page is a cross between Minneola tangelo and Clementine mandarin. Its parentage is three-fourths mandarin and one-fourth grapefruit.
- Rind is medium-thin, leathery, moderately adherent but easily peelable, reddish-orange at maturity. Flesh color deep orange; tender and juicy; flavor rich and sweet. Seeds moderately numerous. Early in maturity.
- Wekiwa is reported to be a hybrid of a grapefruit and Sampson tangelo and, therefore, is in reality a tangelolo.
- Fruit medium-small, spherical to obovate or pyriform; color pale yellow; seeds comparatively few. Rind medium-thick, smooth, and fairly adherent. Flesh tender, juicy; flavor sweet and mildly acid, becoming unpleasant when overripe. Under favorable conditions rind pink-blushed and flesh amber-pink. Early in maturity.



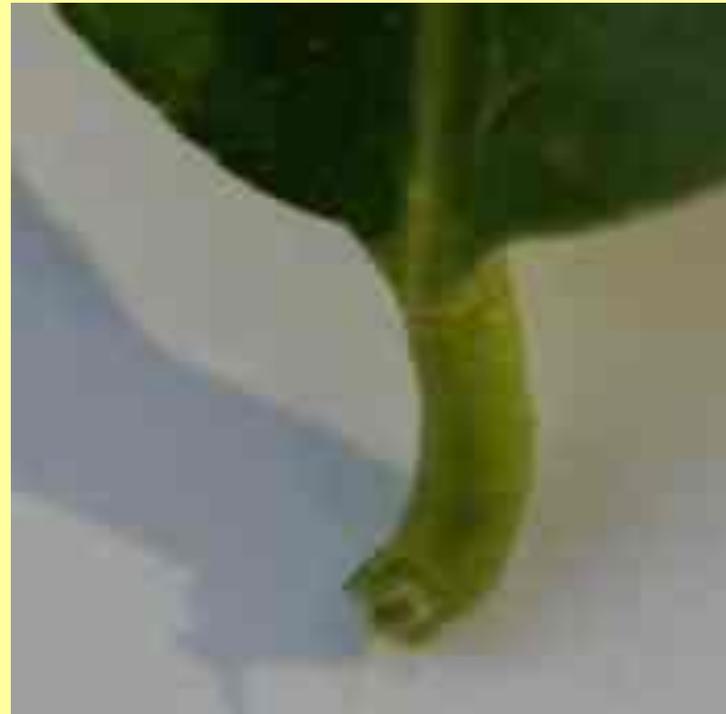
Wekiwa Tangelolo

Limes and Lemons



*LEMON

Citrus limon



True lemon foliage is very large. Petioles have no hint of a wing. New foliage is often bronzy or even purple in color.

*LEMON

Citrus limon

- The Eureka variety originated in Los Angeles, California, the seed of which is said to have been planted in 1858.
- Because of its precocity, thornlessness, and everbearing nature, it soon rivaled the Lisbon variety. Eureka ranks as a major variety in most important lemon-growing countries except Italy, Spain, and a few other Mediterranean areas.
- Eureka's seed content is variable but usually few to none. Fruit color yellow at maturity. Rind medium-thick. Flesh color greenish-yellow; fine-grained, tender, juicy; flavor highly acid. Crop well distributed throughout year, but mainly in late winter, spring, and early summer.
- Variegated Eureka lemon has both foliage and young fruit attractively variegated but fruit variegation fades with maturity and mature fruit could easily masquerade as an ordinary Eureka.
- Variegated Pink-fleshed Eureka lemon is sometimes sold under the name Pink Lemonade and is a sport of the conventional Eureka lemon. The leaves are variegated green and white, making the tree quite ornamental. The rind is striped green and cream and is sometimes rougher than conventional Eureka. When fully ripe, the stripes fade, and the rind turns yellow. The flesh is light pink at full maturity, low-seeded, and very acidic.



Eureka



Variegated Eureka



Variegated Pink Fleshed Eureka lemon



*LEMON

Citrus limon

- Lisbon lemon is one of the most widely-grown lemons in California and is planted extensively throughout the citrus-growing regions of the world.
- Lisbon lemon trees grow vigorously into large, thorny, upright but spreading trees. It is the most vigorous of lemon varieties grown in California and most resistant to adverse conditions such as frost, heat, wind, and neglect.
- The vigor, hardiness, and high productivity of Lisbon combined to establish its early and enduring popularity, particularly in the California interior districts. Eureka has been its only rival, principally in the coastal districts. Although not as widely grown as Eureka in most other lemon-producing countries, Lisbon is unquestionably one of the major varieties.
- Lisbon trees produce several crops per year, but the main crop is winter and early spring.
- The rind is slightly textured and yellow at full maturity. The flesh is pale greenish-yellow, low-seeded, and very acidic. There are many named selections of Lisbon lemon, with individual characteristics that distinguish them from the original clone.



LEMON HYBRIDS

- Meyer lemon is believed to be a hybrid of lemon and orange parentage. The tree is relatively small in size at maturity. Meyer lemon flowers intermittently throughout the year, but the main season is in the spring.
- The Meyer lemon compares favorably with the sweet orange for both cold and heat resistance and thus has a much wider range of climatic adaptation than either the common lemon or lime.
- The fruit is medium-sized, short-elliptical, with a smooth, thin, yellow-orange rind. The flesh is light orange-yellow, moderately seedy, juicy, and acidic. The aroma and flavor of Meyer lemon is distinctive and many find it especially desirable.
- The original Meyer lemon introductions were symptom less carriers of the tristeza virus, but the Improved Meyer lemon trees now available are virus-free.
- The Ponderosa lemon is possibly a hybrid between a citron and a lemon. Ponderosa lemon is a large fruit with a thick and bumpy rind. Flesh color pale green; juicy; flavor acid. Fruits mature throughout year. Ponderosa makes a nice ornamental with its purple-tinged flowers and new growth, however it is sensitive to cold and very thorny.



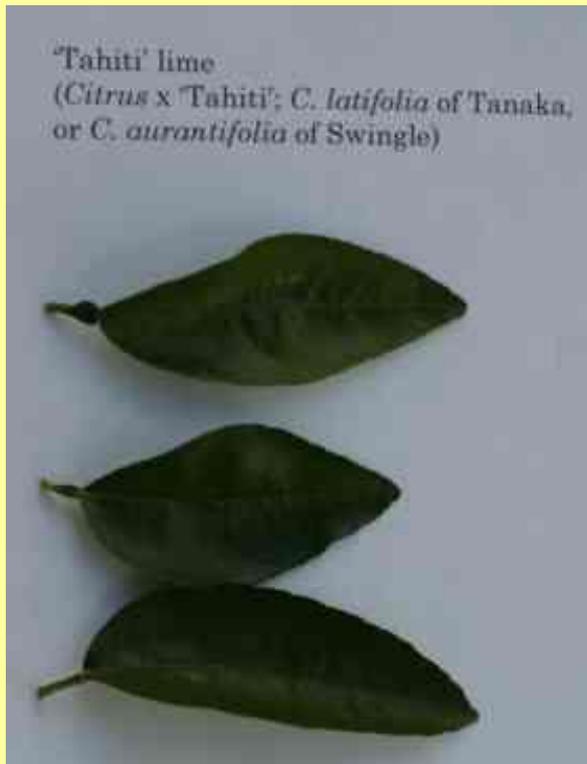
Improved Meyer lemon



Ponderosa Lemon

*LIME

Citrus aurantifolia



Lime leaves are average to large in size, with a highly variable petiole wing, but the wing will generally be shorter and (on average) wider than that of a sweet orange. The top center petiole in the picture on the right is characteristic of 'Tahiti'. Leaves are much larger than those of 'Key' lime, but smaller than those of a lemon.

*LIME

Citrus aurantifolia



'Key' lime (a.k.a. Mexican lime, Indian lime) has very small foliage compared to other varieties, and the petioles have just a very small wing.

*LIME

Citrus aurantifolia

- Key lime is also known as Bartender's lime, and West Indian lime. The trees are moderately-sized and bushy, almost shrub-like, and the leaves are distinctively aromatic when crushed. Some selections are quite thorny, while other selections are thornless. Mexican lime trees are sensitive to cold.
- The fruits are small, approximately one and one-half inches in diameter, and almost round, with a thin, smooth, greenish-yellow rind at maturity that is especially fragrant. The flesh is greenish-yellow, seedy, and highly acidic, with a fine texture.
- Bearss lime is also known as Tahitian lime and Persian lime. The fruits of Persian lime are larger than Mexican limes, approximately 2-2 ½ inches in diameter, and have a thin, smooth, light yellow rind at full maturity. The seedless flesh is pale greenish-yellow, acidic, juicy and finely-textured.
- Bearss lime fruit frequently develop end rot as they become overly mature.



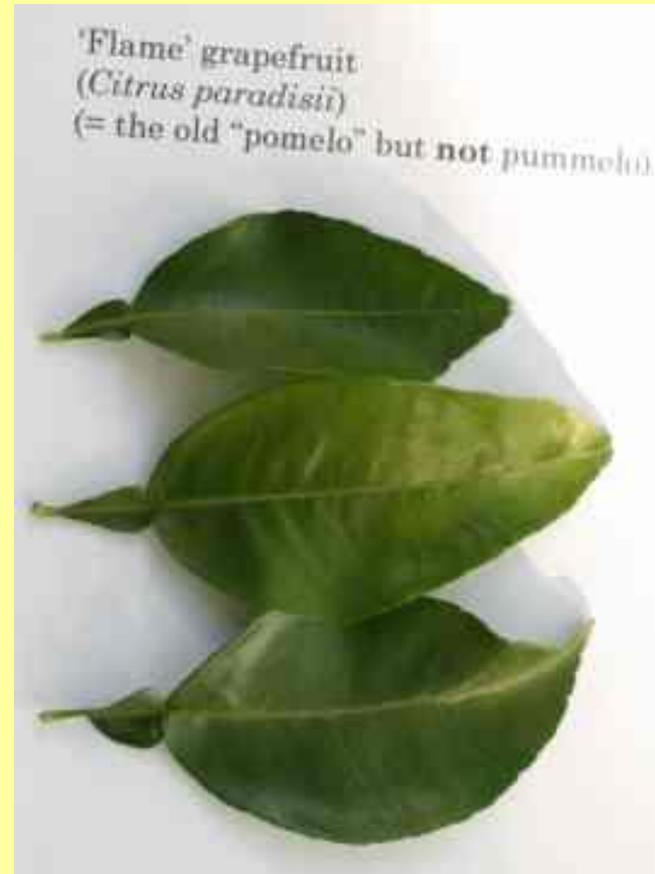
Grapefruit and Grapefruit-like Fruit

- These types of citrus do best in climates with long, hot summers to develop their best flavor and full fruit size. Many will not develop flesh color, size, or good flavor in much of San Diego's climate. Some varieties may take 18-24 months to ripen in cooler climates and will produce VERY tart fruit.



*GRAPEFRUIT

Citrus x paradisi (C. sinensis X C. grandis)



Grapefruit leaves tend to be larger than orange leaves, with much broader petiole wings.

*GRAPEFRUIT

Citrus x paradisi (C. sinensis X C.grandis)

- To achieve acceptable quality grapefruit must be grown in locations that satisfy their high heat requirement.
- Marsh grapefruit flesh is pale yellow, juicy, and tender, with a good flavor. The fruit is late maturing and holds well on the tree.
- Rio Red flesh is juicy and well-pigmented. It is mid to late-season in maturity.
- Compared to other grapefruit varieties, Star Ruby is more difficult to grow well. It has exhibited greater susceptibility to phytophthora, nutrient deficiencies, cold temperatures, and pest problems. The flesh is very darkly-pigmented, juicy, and low-seeded or seedless. Star Ruby's season of maturity is mid to late-season, and the fruit holds well on the tree with some loss of flesh color as the season progresses.



GRAPEFRUIT HYBRIDS

- **Oroblanco is a hybrid of Siamese Sweet pummelo and a white tetraploid grapefruit. The fruit has a smooth greenish-yellow rind at maturity. The rind is thicker than the typical grapefruit and both the rind and membranes exhibit the bitterness characteristic of Oroblanco's pummelo parentage.**
- **The flesh is very pale yellow and seedless. The flavor is mild and sweet. Oroblanco is early in its maturity and holds very well on the tree.**
- **Melogold is a hybrid of Siamese Sweet pummelo, an acidless pummelo, and a white tetraploid grapefruit. The rind is smooth and medium to dark yellow at maturity and thinner than Oroblanco for a similarly-sized fruit.**
- **The large fruits typically average one pound in weight. The flesh is pale yellow in color, seedless, tender, and juicy. The flavor is mild, sweet and reminiscent more of pummelo than of grapefruit. Melogold is early in its maturity and holds well on the tree.**



*PUMMELO

Citrus grandis



Pummelo leaves are usually quite large, with very large petiole wings (larger than those of grapefruit). Immature leaves and twigs are often pubescent (fuzzy), unlike grapefruit.

*PUMMELO

Citrus grandis

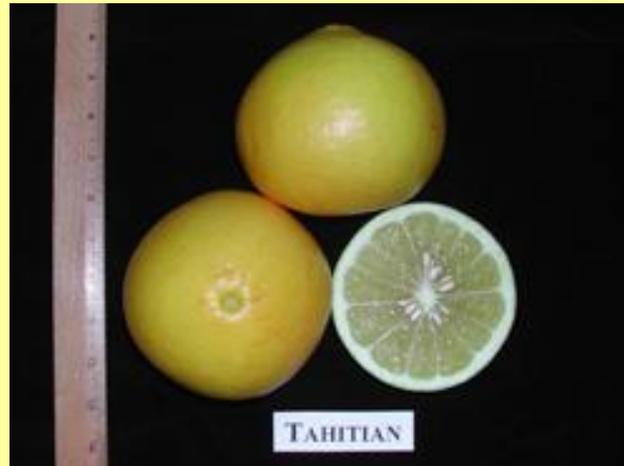
- Chandler pummelo fruit is large to very large and almost round with a thick yellow rind that is occasionally blushed with pink. The fruits mature early and the flavor is pleasant and sweet.
- The flesh varies in color from light pink to very dark pink depending upon where it is grown. The flesh texture is somewhat ricey but still juicy for a pummelo. Chandler fruits are seedy when cross-pollinated by citrus fruits with viable pollen and seedless when grown in a solid block or in proximity to citrus fruits that are pollen sterile, such as navel oranges and Satsuma mandarin.
- Reinking pummelo fruit is large and pear-shaped with a slightly flattened bottom and has a slightly pebbled, thick, yellow rind. The flesh is light yellow, ricey in texture but juicy. The flavor is good, but the fruits are seedy. Reinking fruits mature early and holds fairly well on the tree.



*PUMMELO

Citrus grandis

- Sarawak pummelo is sometimes referred to as Tahitian pummelo. The fruit is round with a flattened bottom and has a greenish-yellow rind that is thinner than the typically thick pummelo rind.
- The flesh is greenish, juicy, and sweet with a flavor some refer to as melon-like or even lime-like. It is early to mid-season in maturity and holds well on the tree.

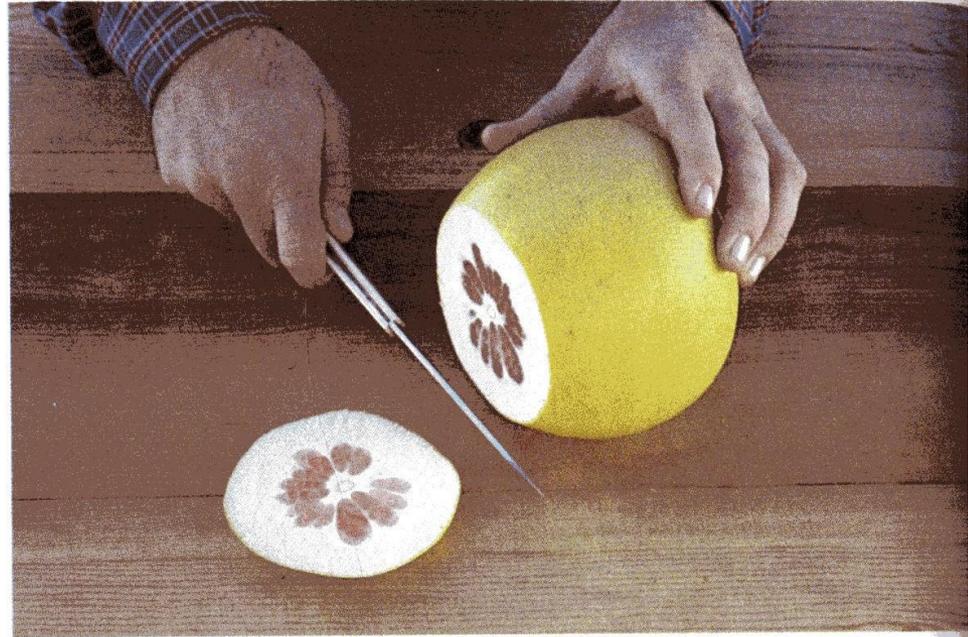


*PUMMELO

Citrus grandis

- Pummelos have a very thick rind and the membrane which surrounds the fruit segments is tough and bitter. For this reason, the fruit is often peeled and segmented.

First, simply slice off either end.



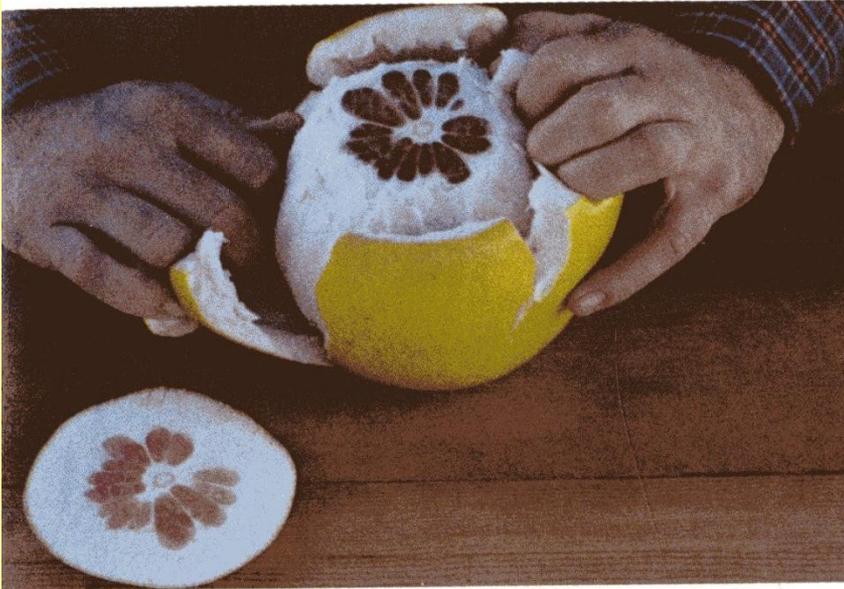
Here the inner portion of the membrane or pith is cut away.



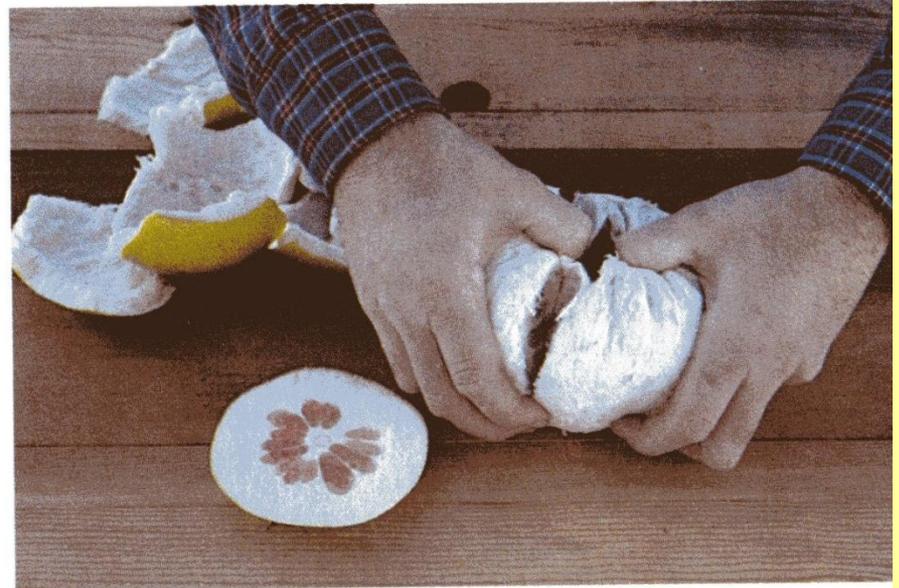
*PUMMELO

Citrus grandis

With top sliced away, the rest of the peel is easily pulled free.



Peel is removed and fruit is opened like an orange.



Outer membrane can be peeled away by hand or knife.



Now, fruit is sectioned easily.



PUMMELO HYBRID Citrus grandis X C. reticulata

Cocktail Grapefruit

- Cocktail is actually a hybrid of Siamese Sweet pummelo and Frua mandarin. The fruit can vary from the size of an orange to the size of a grapefruit. It has a thin, smooth, yellow rind.
- The flesh is seedy, yellow-orange in color, and exceptionally juicy. The flavor is pleasantly sub-acid.
- Cocktail matures in early winter and the fruits hold well on the tree, puffing when they become very old, but not desiccating.



ORANGELO Citrus x paradisi X C. sinensis

- An **orangelo** is a hybrid citrus fruit believed to have originated in Puerto Rico. The fruit, a cross between a grapefruit and an orange.
- Chironja orangelos are often eaten in the same manner as grapefruit but are sweeter and brighter in color than grapefruit, as well as being easier to peel. The rind can be candied successfully.

*KUMQUAT

Fortunella spp.



- Kumquat foliage is about as long as orange leaves, but considerably narrower. The petioles do not have wings.
- Kumquat trees are small to medium in size with a dense and somewhat fine texture. The trees are remarkably cold-hardy due to their tendency to become semi-dormant from late fall to early spring. Kumquat trees are especially susceptible to zinc deficiency, which can cause small leaves and reduced internode distance.
- The fruit of kumquats and the kumquat hybrids are eaten skin and all, commonly with the skin being sweeter than the flesh of the fruit.

*KUMQUAT Fortunella spp.

- Nagami kumquat, Fortunella margarita, is the most commonly grown type of kumquat. The fruits mature in late winter, holding well on the tree. The fruit is oval in shape. The orange rind is sweet and the light orange flesh is acidic. Each fruit contains about five or six seeds.
- Meiwa, Fortunella crassifolia, fruits are orange at maturity and almost round. The sweet rind is thicker than the rind of Nagami, making it seem sweeter than Nagami. The flesh is light orange, contains a few seeds, and is acidic but sweeter than Nagami.



Nagami

Meiwa

*KUMQUAT Fortunella spp.

- The fruit of Nordmann Seedless, *Fortunella margarita*, is teardrop shape with sweet yellow-orange rind. The pulp is tart, fairly juicy and seedless. Flavor is similar to Nagami.
- Changshou kumquat, *Fortunella obovata*, is also called the Fukushu kumquat in Japan. Changshou is oval with a depressed apex. The rind is orange and thinner than Nagami or Meiwa. The flesh is orange, acidic, and contains a few seeds. The flavor is sweeter than Nagami, but more acid than Meiwa.



Nordmann Seedless



Changshou (Fukushu)

KUMQUAT HYBRIDS

LIMEQUAT

- All of the limequats are more cold-resistant than the lime parent but considerably less so than the kumquat.
- All are characterized by fruits that closely resemble the West Indian lime in size, form, and composition.
- Eustis is a hybrid of the West Indian lime and the round kumquat (*Fortunella japonica*). Tavares is a similar hybrid with the oval kumquat (*Fortunella margarita*).



Eustis



Tavares



KUMQUAT HYBRIDS CALOMONDIN

- Calamondin, *Citrus madurensis*, is an acid fruit that is most commonly grown in the Philippine Islands. It is believed to be a natural hybrid, with kumquat in the parentage. In the Philippines it is sometimes called calamonding or calamansi.
- Calamondin is cold-resistant and the leaves are small and dense giving the tree a fine textural appearance. The fruits are very small, round, and orange at full maturity. The orange flesh is acidic, juicy, and contains a few seeds. Calamondin trees flower and set fruit intermittently throughout the year.
- A variegated form, with marbled leaves and faintly-striped fruit is sometimes marketed under the name Peters. Fruit is variegated only when immature. Attractive light green & variegated foliage- consider for ornamental usage.



KUMQUAT HYBRIDS

- Lemonquat fruits are orange yellow when ripe. The interior of the fruit is lemon like, has a pleasant acidity, and becomes sweeter in March and April. These fruit are actually hybrids of kumquat and mandarin making these mandarinquats.



Rio Grande Valley lemonquat



Sunquat Lemonquat



Indio mandarinquat



- **Nippon Orangequat:** Nippon orangequat is a hybrid of the satsuma mandarin orange and kumquat. Trees are very cold hardy and are prolific bearers. The fruits have a sweet orange taste and ripen in late fall. Hardy to around 10 F .
- **Citranglequats** are very prolific bearers and the immature fruits make great lime substitutes. Fruit ripens in late fall and has a kumquat/orange flavor. Hardy to around 5 F.

ACIDLESS CITRUS

Citrus X limetta, C. X limettioides, C. sinensis

Vaniglia Sanguigno Citrus sinensis

Vaniglia Sanguigno is an acidless, seedy sweet orange with a pink flesh. Fruit season is November to March. The fruit is very juicy and is especially prized by Middle Eastern people.

- **Palestine sweet lime** *C. limettioides*, is also known as Indian sweet lime. At maturity, the rind is pale green to orange-yellow. The flesh is pale yellow, tender and juicy, with some seeds. The flavor is insipid due to the lack of acidity in the fruit but is appealing to some.



Citrus used for Flavoring

- In addition to several more common types of citrus fruit such as citron, lemon and bitter oranges, there are several citrus which are used for flavoring food or juices.
- Some of these include the Kaiffer Lime (*Citrus hystrix*), the Australian Finger Lime (*Citrus australasica*), the Saduchi (*Citrus ichangensis* X *C. reticulata* var. *austere*), and the Yuzu (*Citrus ichangensis* X *C. reticulata* var. *austere*).

Kaiffer
Lime



Australian Finger Lime



Saduchi



Yuzu

Kaffir lime, Kuffre lime Citrus hystrix

- Tree is small and shrubby with distinctive leaves that have a petiole almost as large and wide as the leaf blade. It is these pungent leaves and not the fruit of this species that is commonly used in Thai and Indonesian cooking.
- When the fruit reaches full maturity in late winter to early spring, the rind turns yellow and the fruit falls from the tree. In some places the fruit is used to make a shampoo that is insect repelling.
- Leaves of Kaffir Lime that have been imported to California for seasoning have been found to be infected with Citrus Canker Virus.

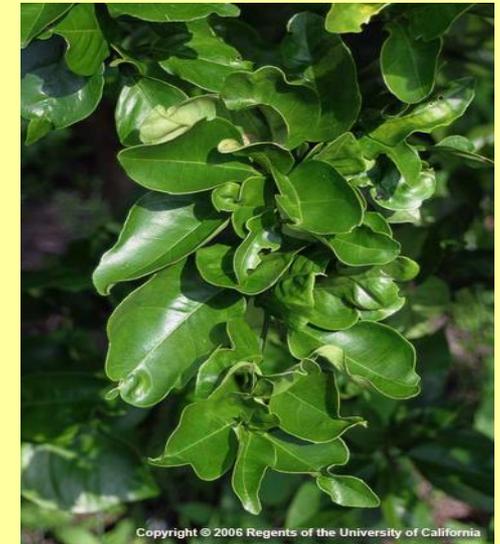


Asian Citrus Psyllid

- The Asian citrus psyllid, is a tiny (1/8 inch in length) mottled brown insect that is about the size of an aphid.
- Because of its small size, the psyllid can easily get caught in wind, potentially traveling for miles.
- It attacks citrus and very closely related ornamental plants in the family Rutaceae (mock orange, Indian curry leaf, orange jasmine and other *Murraya* species).
- The disease-carrying Asian Citrus Psyllid has already caused devastation in Asia, India, parts of the Middle East, and South and Central America. It has even been found in Mexico, Hawaii, Texas, Louisiana and Florida.
- Asian citrus psyllid arrived from Mexico and was detected in San Diego on September 2nd 2008 near the South Bay Terrace area of San Diego.



Asian Citrus Psyllid



- Adults feed with their heads down, almost touching the surface of the leaf. Because of the shape of their heads, their bodies are lifted to approximately a 45-degree angle.
- The adults attack new citrus leaf growth and, because of the salivary toxin that it injects, causes the new leaf tips to twist or burn back.
- Nymphs are dull orange, have red eyes and produce waxy tubules that direct honeydew away from their bodies. They can be difficult to see because they are small and flatten themselves against twigs and leaves.
- Nymphs are slow, do not fly or jump and the honeydew they produce causes sooty mold to grow.
- The more serious damage that this insect causes is in carrying and transmitting the bacteria that cause Huanglongbing (HLB or citrus greening) disease. This bacterial disease is transmitted to healthy trees by the psyllid after it feeds on infected plant tissue.
- **Huanglongbing has now been detected in Hacienda Heights, California.**

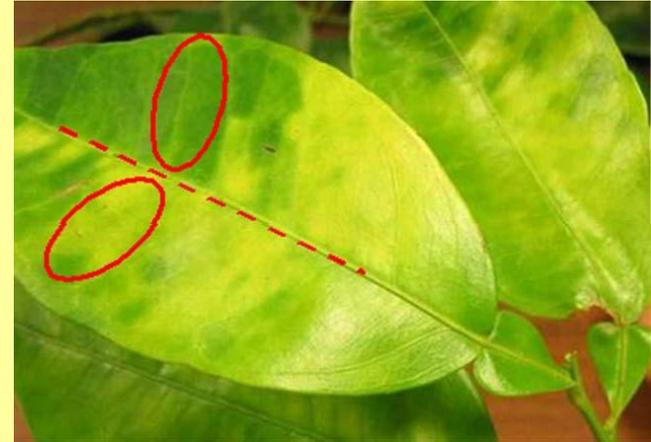
Huanglongbing (HLB) or Citrus Greening Disease.

- HLB is considered the most devastating citrus diseases in the world and poses a huge threat to citrus trees in California.
- HLB has already destroyed citrus fruit production in various parts of the world, including domestically, in Florida, where the industry is now in rapid decline.
- In Florida, the psyllid and HLB are ravaging the citrus industry, with all 32 counties containing commercial citrus production having HLB.
- Pesticides can reduce the number of psyllids, but an adult psyllid carries the bacteria its entire life and can transmit the disease faster than some pesticides will kill it.
- Florida citrus growers are now treating up to 8 times per year with broad-spectrum pesticides to reduce Asian citrus psyllid and slow the spread of the disease.



Huanglongbing (HLB) or Citrus Greening Disease.

- Detection of HLB can be difficult, as the symptoms may not show up for more than a year and the leaf symptoms can resemble other diseases and nutritional deficiencies.
- HLB leaf symptoms are unique in that the yellow mottling caused by HLB is not the same on both sides of the leaf.
- Later symptoms of HLB-infected trees include yellow shoots, lopsided small fruit with bitter juice, and premature and excessive fruit drop.
- As HLB progresses, leaves and whole branches fall off the tree and eventually the entire tree dies. The disease can kill a citrus tree within 3 to 5 years.
- **There is no known cure for the disease.** Trees must be destroyed as quickly as possible to prevent spread of the disease.



Asian Citrus Psyllid

- In an effort to prevent the spread of the Asian citrus psyllid in California, the California Department of Food and Agriculture (CDFA) and the United States Department of Agriculture (USDA) have placed part of southern San Diego County under a quarantine that regulates the movement of citrus and closely-related plants.
- The quarantine area includes 1,953 square-miles and extends from the international border with Mexico up the coast to Highway 78, east to Ramona, and south along local roads and highways to the international border at Tecate, Mexico. The county's major citrus-producing region lies to the north of the boundary and is not included in the quarantine, which is designed to protect California's citrus-producing regions from the pest.
- All harvested citrus in the quarantine area must be commercially cleaned and packed before it can be moved out of the area.
- Nursery host plants may not be moved out of the quarantined area and all citrus trees sold in this area must have a certificate of compliance tag which states the trees have been treated with the accepted pesticides.
- Movement of cut greens, green waste and citrus fruit will be regulated and enforced by federal, state and county quarantine officials.
- Residents are urged to consume back yard citrus fruit at home and to refrain from transporting their back yard citrus, as well as citrus plants, out of the area.

Asian Citrus Psyllid

- Treatment activities for areas with Asian citrus psyllid infestations is to apply the insecticide Tempo to the foliage of citrus trees and the systemic treatment Merit to the soil beneath those trees.
- Residents within and near the infested portions of El Cajon, Jamul, Dulzura, Tecate, South Bay Terraces, Ocotillo, Calexico, Imperial and Seeley will have their trees treated by the CDFA. Treatment programs are currently underway.
- Currently, treatments that are applied to California citrus trees in the quarantine zone are designed to disinfest trees and thus minimize the risk of moving Asian citrus psyllid on harvested fruit or cut greens and to limit the natural spread of Asian citrus psyllid throughout California.
- **If you see the Asian citrus psyllid, please contact the CDFA Exotic Pest Hotline at 1-800-491-1899.**
- **Personnel from CDFA will inspect plants for the presence of this psyllid and send any specimens to diagnostic laboratories for identification and determination of the presence of Huanglongbing.**
- More information on the Asiatic citrus psyllid can be found at www.californiacitrusthreat.org.

Diaprepes (Citrus Root Weevil)

- The Diaprepes root weevil is a large, colorful weevil, 3/8 to 3/4 inch (10-19 mm) long, with numerous forms or morphs, ranging from gray to yellow to orange and black.
- This weevil is native to the Caribbean region and was accidentally introduced into Florida in the 1960s. The beetle was found in San Diego County in 2006.
- More than 200 species of fruit and ornamental plants, trees and shrubs are commonly attacked.



Diaprepes (Citrus Root Weevil)

- The Diaprepes root weevil damages both the leaves and the roots of plants.
- The adult weevils damage leaves by chewing semi-circular areas out of the leaf margin.
- There may also be frass or weevil droppings near the areas that have been fed upon.
- The grub-like larva feeds upon the roots of a plant weakening or killing a plant.



Diaprepes (Citrus Root Weevil)

- In leaves that are folded and glued together, an adult female weevil lays clusters of eggs .04 inch (1mm) long.
- The eggs hatch in 7-10 days, and the newly emerged larvae drop to the soil.
- The larvae enter the soil and feed upon the roots of plants for several months. Full grown larvae are C-shaped and whitish, and can reach 1 inch (25mm) in length. The larvae then pupate in the soil.
- After the appropriate amount of time, adults will emerge and the life cycle begins again.



Cities with Diaprepes Quarantine Zones

Los Angeles County Orange County and San Diego County

Since the initial finds the weevil has been found in additional areas in Los Angeles, Orange, and San Diego Counties. To control this pest and prevent it from spreading the California Department of Food and Agriculture has established quarantine zones in the following cities:

parts of:

- La Mirada
- Long Beach

parts of:

- Costa Mesa
- Huntington Beach
- Newport Beach
- Yorba Linda

parts of:

- **Carlsbad**
- **Carmel Valley**
- **Del Mar**
- **Encinitas**
- **Fairbanks Ranch**
- **La Jolla**
- **Oceanside**
- **Rancho Santa Fe**
- **Solana Beach**
- **Sorrento Valley**

Leaf Miner / Foliage Miner

Citrus Leafminer



UC Statewide IPM Program
© 2005 Regents, University of California

UC Statewide IPM Program
© 2005 Regents, University of California

- The citrus leafminer is native to Asia. In the 1940s, it was first noted as a pest in Australia, and in the 1970s it showed up in other major citrus growing areas of the world. It arrived in Florida in 1993 and began making its way westward, invading northern Mexico in the mid-1990s and finally California.
- Citrus leafminer, *Phyllocnistis citrella*, was not found in California until 2000 when it was first detected in Imperial County.
- Citrus leafminer now infests most of southern California, the coast as far north as San Luis Obispo County, and the San Joaquin Valley.
- Citrus leafminer larvae feed by creating shallow tunnels, or mines, in young leaves of citrus trees.
- In its last stage the larva emerges from the mine and moves to the edge of the leaf. It rolls the leaf around itself and pupates in preparation for adulthood, creating a rolled and distorted leaf.

Leaf Miner / Foliage Miner

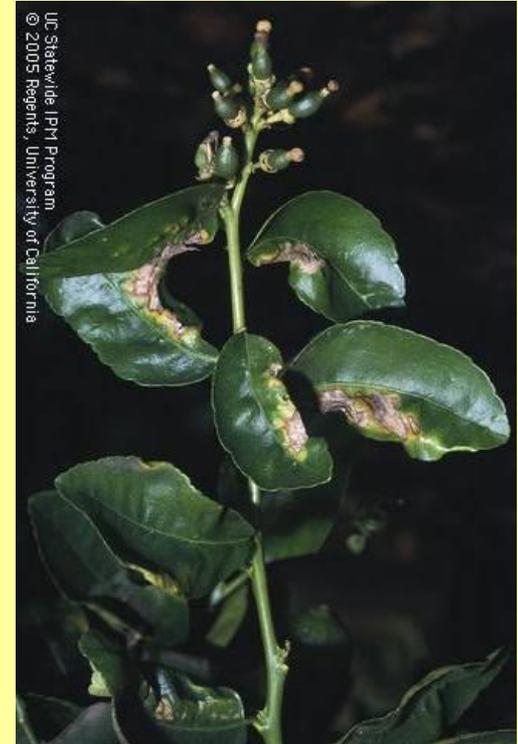
Citrus Leafminer

- Citrus leafminer has four life stages: egg, larva, pupa, and the adult moth. Adults do not damage plants and live only 1 to 2 weeks.
- Adult moths are most active in the morning and the evening.
- The female lays single eggs on the underside of host leaves. The newly emerged leaflets of flush growth, particularly along the midvein, are the preferred egg-laying sites.
- After hatching, larvae immediately begin feeding in the leaf and initially produce tiny, nearly invisible, mines. As the larva grows, its serpentine path of mines becomes more noticeable.
- The larvae molt 4 times over a 2 to 3 week period as they develop. The larva emerges from the mine as a prepupa and rolls the edge of the leaf over causing a curling of the leaf. Inside that curled leaf edge the leafminer becomes a pupa.
- The entire life cycle of the insect takes 3 to 7 weeks to complete.
- Citrus leafminer develops best at temperatures between 70° to 85°F and greater than 60% relative humidity, but will readily adapt to most California conditions.

Leaf Miner / Foliage Miner

Citrus Leafminer

- Citrus leafminer can survive as a larva only in the tender, young, shiny leaf flush of citrus and closely related species. Older leaves that have hardened off are not susceptible unless extremely high populations are present.
- Mature trees that have a dense canopy of older foliage to sustain them can tolerate damage on new leaves with negligible effect on tree growth and fruit yield.
- Very young trees do not have much mature foliage and they produce more flush year-round, thereby supporting larger citrus leafminer populations.
- Young trees may experience a reduction in growth. However, even young trees with heavy leafminer populations are unlikely to die.
- Summer heat in the inland areas of California seems to suppress leafminer populations, but in cooler coastal areas, the insect population may remain high from summer through fall.
- The flush growth of citrus trees attacked by leafminer will look unsightly, but the best course of action is to leave it alone and let the natural enemies of the citrus leafminer feed on and parasitize the larvae in the mines.



UC Statewide IPM Program
© 2005 Regents, University of California

UC Statewide IPM Program
© 2005 Regents, University of California

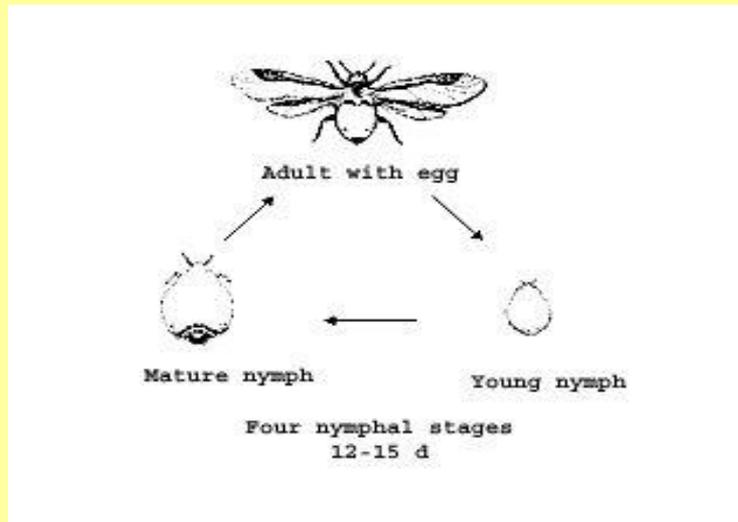
Aphids

- Large populations of aphids cause curling, yellowing, and distortion of leaves and stunting of shoots.
- Aphids can also produce large quantities of a sticky exudate known as honeydew, which often turns black with the growth of a sooty mold fungus. Some aphid species inject a toxin into plants, which further distorts growth.



Aphids

- Aphids have many generations a year. When the weather is warm, many species of aphids can develop from newborn nymph to reproducing adult in 7 to 8 days. Because each adult aphid can produce up to 80 offspring in a matter of a week, aphid populations can increase with great speed.
- Aphids have been known to have what is called telescoping generations. The parthenogenetic, viviparous female aphid will have a daughter within her who is already parthenogenetically producing its own daughter at the same time.



- **High levels of nitrogen fertilizer favor aphid reproduction.**

Mealybugs

- Mealybug females feed on plant sap, normally in roots or other crevices. They attach themselves to the plant and secrete a powdery wax layer (therefore the name **mealybug**) used for protection while they suck the plant juices.
- Some species of mealybug lay their eggs in the same waxy layer used for protection in quantities of 50–100; other species are born directly from the female.



Figure II. Reddish orange fluid excreted by grape mealybug (photo: JKC).

Figure III. Clear fluid excreted by obscure mealybug (photo: Kent M. Daane).

Figure IV. Vine mealybug colony in the axils of the petiole and cane (photo: Mark Battany).

Giant Whitefly

- Giant whitefly gets its name from its large size (adults can be up to 3/16 inch long) relative to many other whitefly species in North America.
- Giant whiteflies exhibit a strong tendency to feed in groups. After adults emerge, the majority will remain on the same plant to feed and lay eggs.



Giant Whitefly

- This species can also be identified by the spirals of wax that are deposited by adults as they walk on leaves. When populations of giant whitefly reach high levels, the whiteflies and their waxy deposits occur on both upper and lower leaf surfaces. Eggs are often laid among the wax deposits.
- The most common and annoying problems associated with giant whiteflies are the waxy, hairlike filaments and growth of unsightly sooty mold. During feeding, whiteflies excrete a sticky, sugary solution called honeydew that accumulates on leaves and fosters the growth of the black sooty mold fungus.

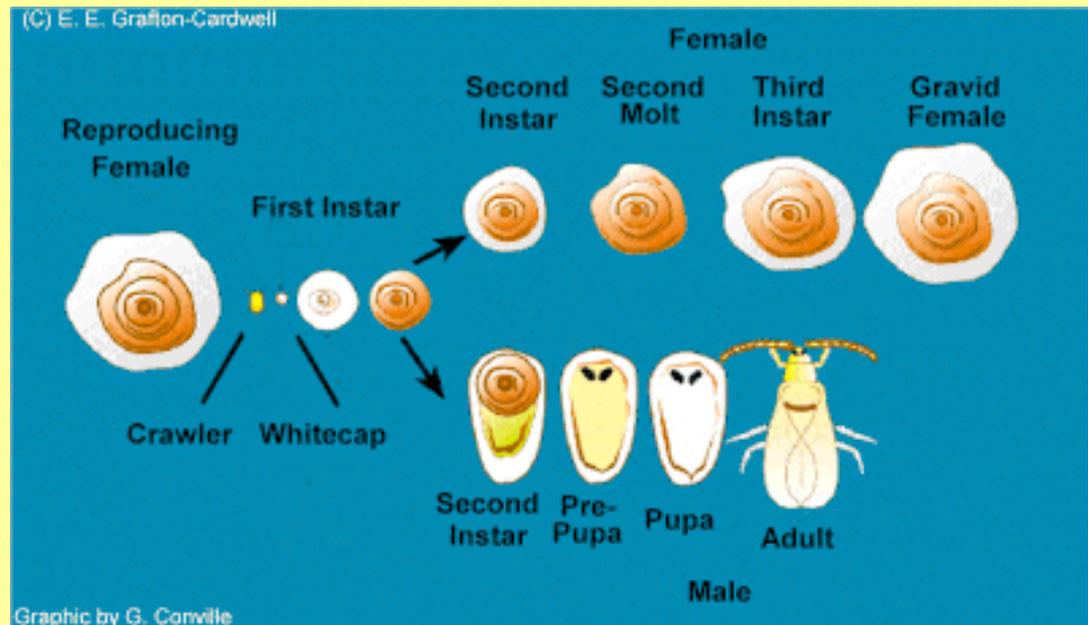


Woolly Whitefly



Scale Insects

- Adult female scales are almost always immobile and are permanently attached to the plant they have parasitized. They secrete a waxy coating for defense.
- Females of many scale species reproduce without mating (there are no males). At maturity, adult females produce eggs that are usually hidden under her body or cover.



Scale Insects

- Eggs hatch into tiny crawlers (mobile first-instar nymphs), which are yellow to orangish in most species.
- Crawlers walk over the plant surface, are blown by wind to other plants, or can be inadvertently moved by people or birds. They settle down and begin feeding within a day or two after emergence.
- Settled nymphs may spend their entire life in the same spot without moving as they mature into adults. Nymphs of other species can move slowly but rarely do, such as when species that feed on deciduous hosts move from foliage to bark in the fall before leaves drop.
- For species with multiple generations, all scale life stages may be present throughout the year in areas with mild winters.



Red Scale

- Red scale has a thin, circular, leathery covering over the soft, flattened, shield shaped, creamy-yellow insect. The reddish-brown scale cover of the adult female is about 2 mm across.
- Several generations are produced in a year. Red scale is an armored scale and does not produce honeydew.



Soft Scale

- Soft scales can be smooth, cottony, or waxy and are 1/4 inch long or less. They are usually larger and more rounded and convex than armored scales.
- Soft scales feed in the fluid-conducting phloem tissue of the plant and excrete abundant honeydew, which is sugary water that drips from their bodies.
- Most soft scales have one generation each year and overwinter as second-instar nymphs. The multi-generational brown soft scale is an important exception. Brown soft scale females and nymphs of various size can be present throughout the year.
- Soft scales infest leaves and twigs but rarely feed on fruit.



Black Scale



Brown Scale

Ants

- Some species of ants "farm" aphids, mealybug, soft scale, whitefly or other honeydew producing insects. The ants eat the honeydew that these insects secrete. At the same time, they protect these insects from natural enemies. This is a mutualistic relationship. Honeydew is rich in carbohydrates.



Ants

- When numerous ants are found on plants, they are probably attracted by honeydew-producing insects. These ants can be kept out by banding tree trunks with sticky substances such as Tanglefoot.
- Trim branches to keep them from touching structures or plants so that ants are forced to climb up the trunk to reach the foliage.
- Protect young or sensitive trees from possible injury by wrapping the trunk with a collar of heavy paper, duct tape, or fabric tree wrap and coating this with the sticky material.
- Check the sticky material every 1 or 2 weeks and stir it with a stick to prevent the material from getting clogged with debris and dead ants, which will allow ants to cross.



Mites

- The Citrus rust mite is known as the rust mite on oranges and the silver mite on lemons it occurs primarily in the southern coastal areas of California.
- The rust mite feeds on the outside exposed surface of fruit that is 0.5 inch or larger. Feeding destroys rind cells and the surface becomes silvery on lemons, rust brown on mature oranges, or black on green oranges. This damage does not hurt the quality of the fruit inside. Most damage occurs from late spring to late summer.
- Citrus bud mites feed inside the buds, killing them or causing a rosettelike growth of the subsequent foliage and distortion of flowers and fruit, which may or may not reduce yield. They are a problem especially on lemons along the coast



Citrus Thrips

- These are fruit-scarring pests; mostly on young leaves and under calyxes of small fruit.
- Adults and larvae very active and are barely visible with hand lens

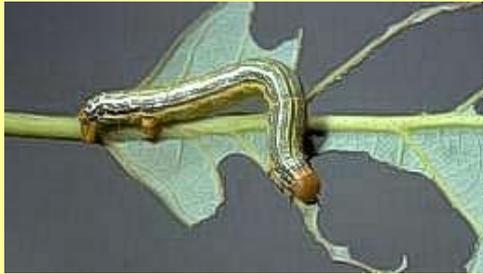


Caterpillars

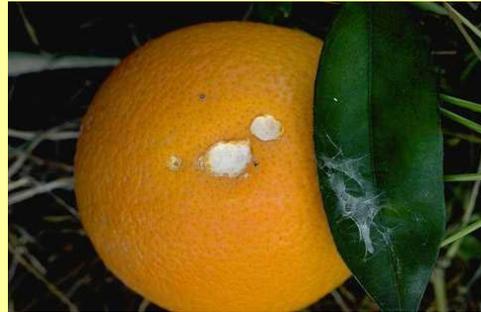
- Citrus cutworms may be pale green in the young larvae or pinkish and brown in mature ones, but there is always a white stripe on each side of the body on older larvae. When older larvae are disturbed, they curl up and drop to the ground. Adult moths are gray.
- Larvae feed on leaves, blossoms, or fruit. Young larvae feed mostly on the edges of tender leaves; older larvae eat holes through leaves and blossoms and into fruit.



Citrus cutworms



Omnivorous Looper



UC Statewide IPM Project
© 2000 Regents, University of California

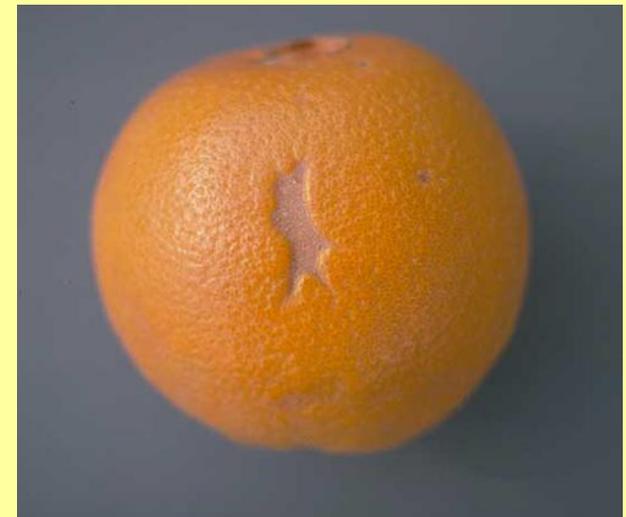


Orange tortrix



UC Statewide IPM Project
© 2000 Regents, University of California

Leaf Rollers



Snails and Slugs

- Snails and slugs are among the most bothersome pests in many garden and landscape situations.
- Both snails and slugs are members of the mollusk phylum and are similar in structure and biology, except slugs lack the snail's external spiral shell.
- During cold weather, snails and slugs hibernate in the topsoil.
- During hot, dry periods or when it is cold, snails seal themselves off with a parchment like membrane and often attach themselves to tree trunks, fences, or walls.



Snails and Slugs

- Slugs and snails are hermaphrodites, so all have the potential to lay eggs. Adult brown garden snails lay about 80 spherical, pearly white eggs at a time into a hole in the topsoil.
- On plants they chew irregular holes with smooth edges in leaves and flowers and can clip succulent plant parts.
- They can also chew young plant bark.
- Snails and slugs are serious pests of ripening fruits.
- Look for the silvery mucous trails to confirm damage was caused by slugs or snails and not earwigs, caterpillars, or other chewing insects.
- Snails are excellent climbers and often damage foliage and fruit high up in the canopy of the tree.



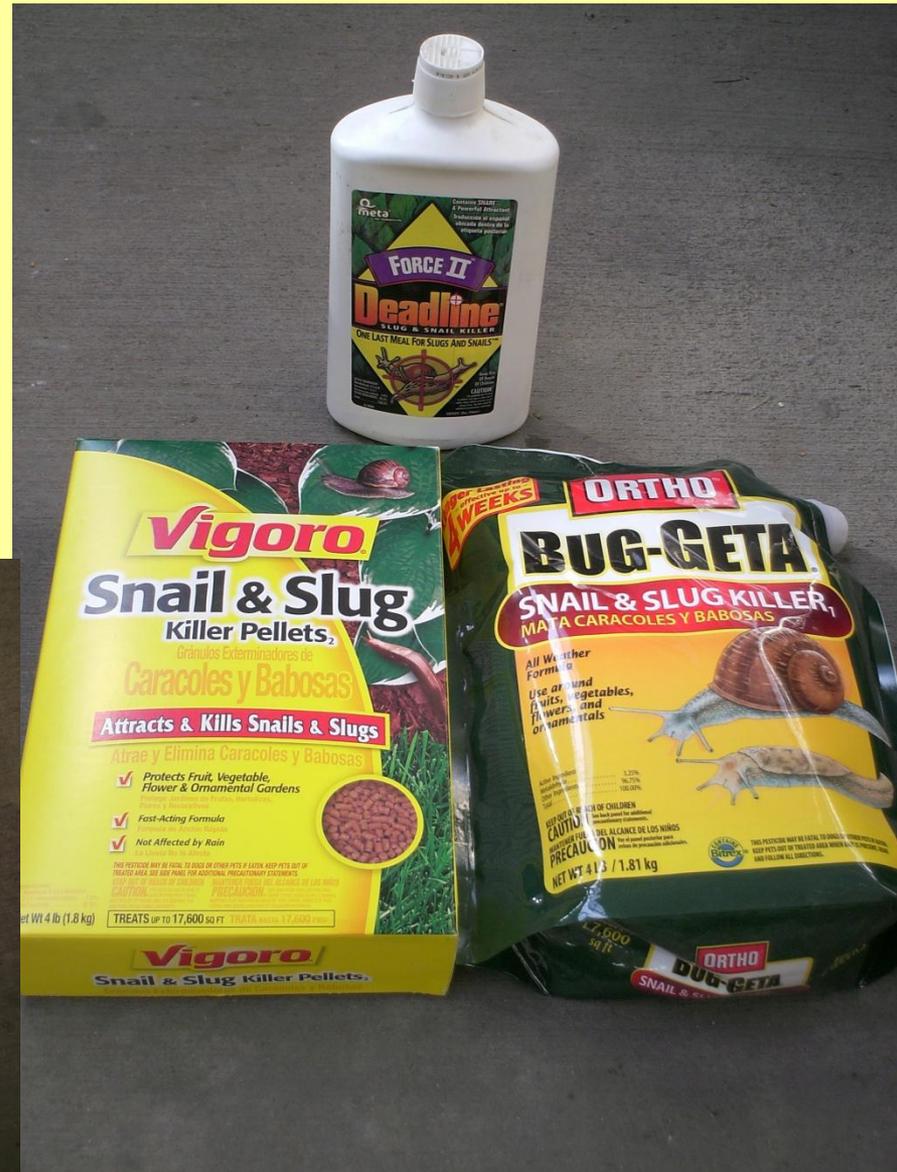
Snails and Slugs

- Snails may lay eggs up to six times a year. It takes about 2 years for snails to mature.
- The brown garden snail (*Helix aspersa*) is the most common snail causing problems in California gardens; it was introduced from France during the 1850s for use as food.
- The white garden snail, *Theba pisana* (Mueller), is the worst potential agricultural pest of the helicid snails introduced to North America
- The snails were found and identified in August 1985 in San Diego, California, at several localities in about a 10 square mile area



Snail and Slug Baits

- Most snail and slug baits have metoldehyde as the main active ingredient.
- Metoldehyde is very toxic to mollusks as well as dogs, cats, wildlife, fish and people.



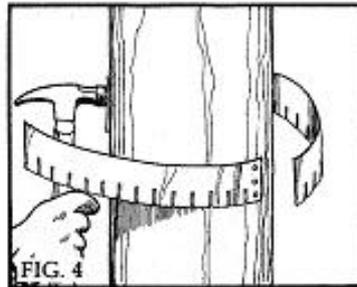
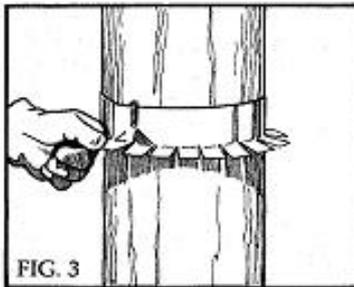
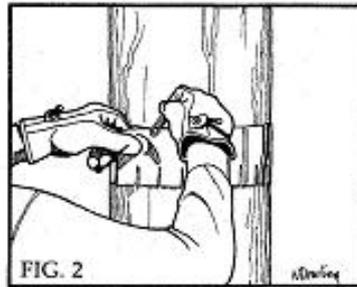
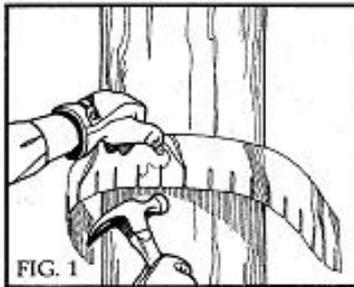
Snail and Slug Baits

- Baits containing Iron Phosphate kill snails and slugs but are of very low risk to dogs, cats, wildlife and people. They are also less toxic to fish than conventional snail baits.
- As these baits break down they become plant nutrients in the form of iron and phosphorous.



Snail and Slug Control

- Snails and slugs cannot crawl over copper.



Tree Rats / Roof Rats

•Roof rats are especially fond of avocados and citrus and often eat fruit that is still on the tree. When feeding on a mature orange, they make a small hole through which they completely remove the contents of the fruit, leaving only the hollowed out rind hanging on the tree. The rind of a lemon is often eaten, leaving the flesh of the sour fruit still hanging.



UC Statewide IPM Project
© 2000 Regents, University of California

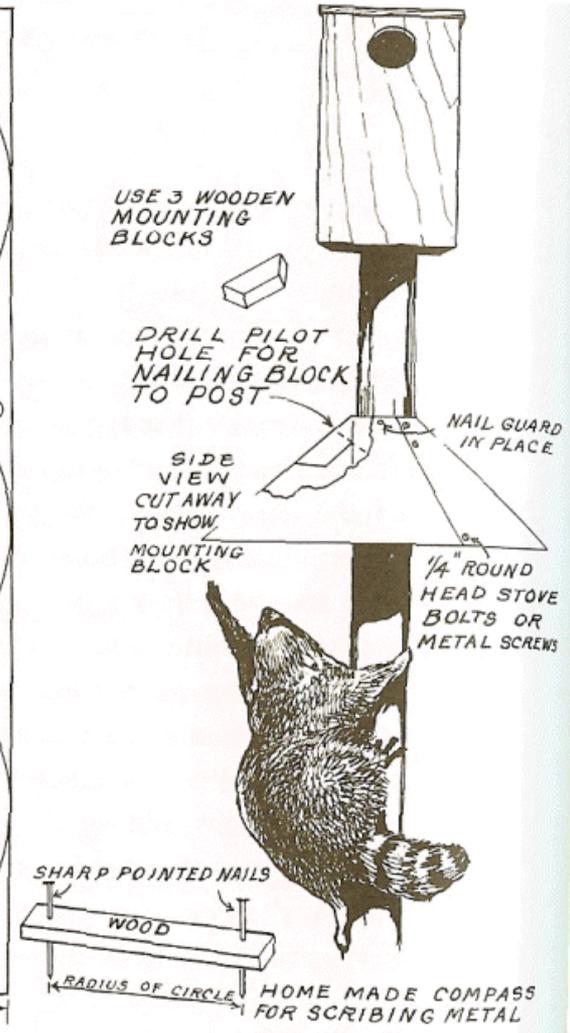
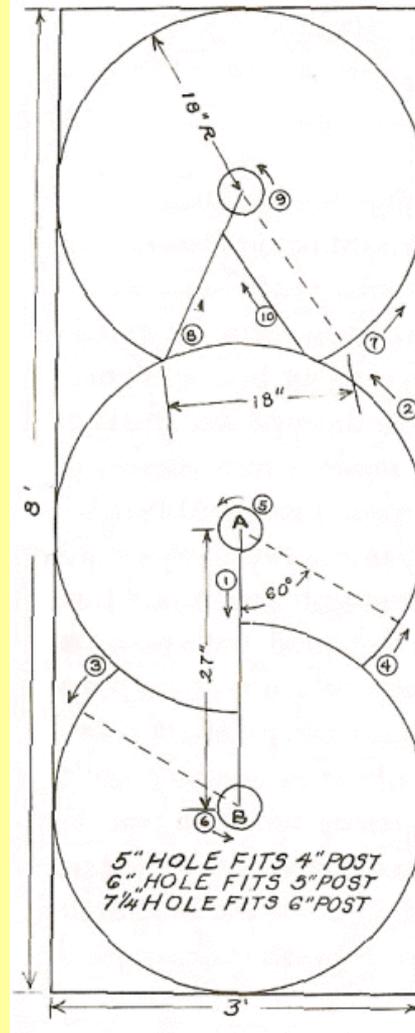
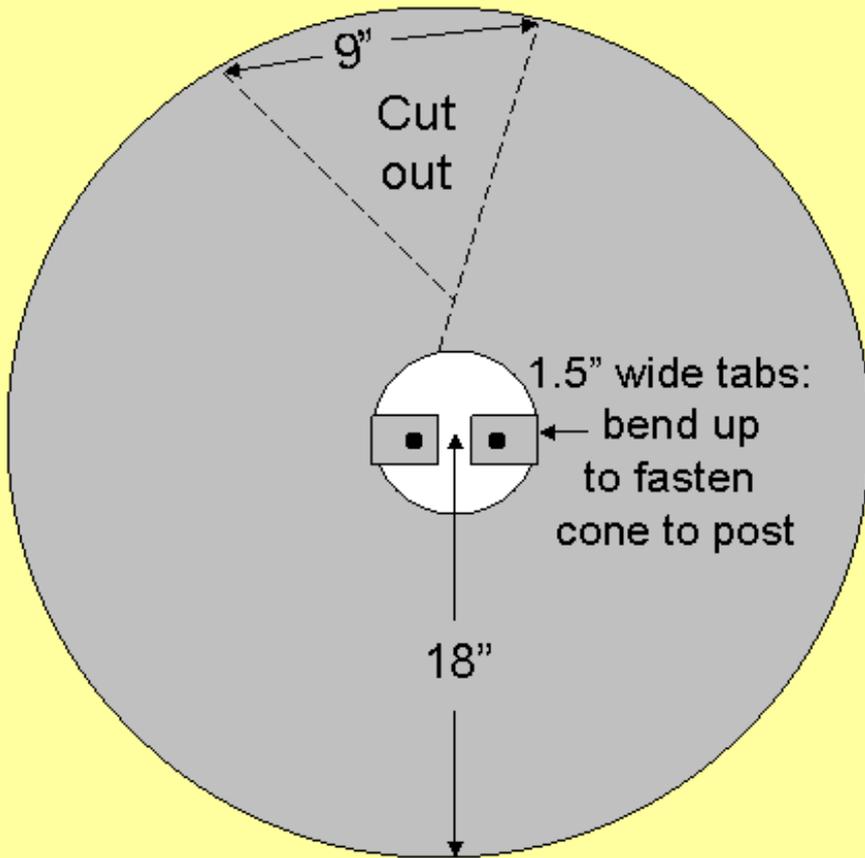


Rat Guards

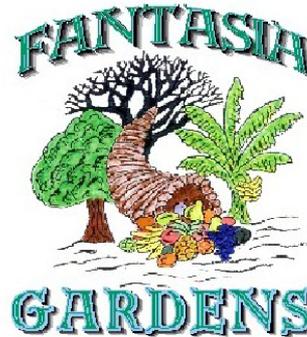
- Cone baffles can exclude rats and other climbing pests from getting into your trees.
- Baffles can be made out of a variety of materials.
- Lower branches must be pruned away and tree must not touch anything that would allow pests to gain access into the tree.



How to Make a Conical Baffle



An Introduction to Citrus



Specializing in Edibles

for over 30 years

- * Fruit Tree Pruning
- * Landscape and Orchard Consultations
- * Home Orchard Management
- * Seminars, Lectures & Classes

Tom Del Hotal
(619) 454-2628

ISA Certified Arborist
CA State Qualified Pesticide Applicator
CA State Advanced Certified Nurseryman
email: fantasiagardens@gmail.com