

Citrus for the Home Garden in Contra Costa County
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Table of Contents

CITRUS IN CONTRA COSTA COUNTY	2
TREE SIZE FOR THE HOME GARDEN.....	2
FIGURE 1	2
CITRUS HEAT REQUIREMENTS	3
CITRUS VARIETIES	3
TABLE 1 - SELECTED CITRUS VARIETIES FOR PLANTING IN THE HOME GARDEN & LANDSCAPE	4
SELECTING AND BUYING CITRUS TREES.....	5
ROOTSTOCK VARIETIES	5
PLANTING	5
WHEN TO PLANT.....	5
SITE LOCATION – WHERE TO PLANT	6
HOW TO PLANT A CITRUS TREE (FIGURE 2)	6
FIRST YEAR CARE & ANNUAL GROWTH.....	7
ROOTS.....	7
LEAVES & LEAF DROP	7
FLOWERS, FRUIT & FRUIT DROP	7
FROST PROTECTION.....	8
WATERING	8
FIGURE 3 - AVERAGE MONTHLY WATERING REQUIREMENTS	9
MULCH.....	9
FERTILIZING.....	10
PRUNING	11
PESTS & DISEASE	11
TABLE 2 - DIAGNOSIS OF COMMON CITRUS PROBLEMS	11
CITRUS CALENDAR	13
TABLE 3 -CITRUS CALENDAR FOR THE HOME GARDEN AND LANDSCAPE.....	12
REFERENCES	14

Citrus in Contra Costa County

Citrus trees are sub-tropical, native to Asia. The evergreen trees provide nutritional fruit, fragrant flowers and foliage, and are desirable for their ornamental value. Most trees are cold tender, and fruit quality depends on the total amount of heat available through the fruit developing period, so selecting the proper citrus for a particular environment or location is the key to success. Citrus trees grow best between 70°F (21°C) and 90°F (32°C), between the latitudes of 35°N and 35°S. The maximum northern latitude at which citrus is commercially grown in California is 39°N, due to the modifying effect of the warm Japanese current. Fortunately, Contra Costa County lies at the northern tip of the citrus growing area (the latitude of Concord, California is 37°58'N).

Tree Size for the Home Garden

Mature tree size depends primarily on the fruiting variety (scion) and rootstock, but is also affected by growing conditions and cultural practices. Home gardeners in California can grow edible or ornamental citrus varieties as –

- *standard-sized trees*, which mature to 20 to 30 feet tall, and as wide
- *semi-dwarf trees*, which grow to 10 to 15 feet in height
- *dwarfs*, which grow slower than standards, reaching 5 to 10 feet tall in 13 years

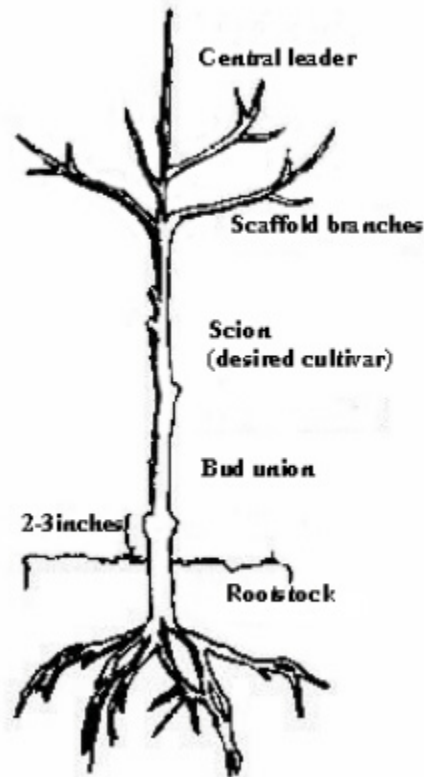


Figure 1

<http://www.extension.umn.edu/yardandgarden/YGLNews/images/scion&rootstock.jpg> (University of Minnesota Extension Service)

The fruit on all tree-types reach full size (dwarf trees do not have smaller fruit). Rootstocks are selected for improved disease resistance, cold hardiness, productivity (yield), soil conditions, favorable effects on fruit quality, and other desirable traits, such as dwarfing characteristics. Because the nursery industry is not regulated in using the term “dwarf” some trees that are labeled as “dwarf” may attain standard or semi-dwarf size at maturity. Ask which rootstock you are purchasing with the fruiting variety chosen. On Flying Dragon rootstock, mature trees grow to about half of standard size. The disadvantages of dwarf rootstocks are that there is an increase in susceptibility to suckering and drought.

Citrus Heat Requirements

Citrus needs high summer heat to develop sugar, and low winter temperatures to cause acid levels to drop. When homeowners who live in cooler areas grow citrus that requires high heat they should leave the fruit on the tree to increase sweetness. Letting the fruit hang on the tree allows the acid level to drop; thus the fruit seems sweeter because the ratio of percent sugar to percent acid goes up. Therefore, the longer a fruit hangs on the tree, the sweeter and less acidic it becomes (to a point).

Lemons and limes need less heat to ripen than sweeter varieties of citrus. Navel oranges have a high heat requirement to develop their sweetness. Grapefruit has a high heat requirement and is of the highest quality when grown in desert locations. Home gardeners can choose the pummelo x grapefruit hybrids Melogold and Oroblanco, which are naturally lower in acid therefore taste sweeter. The pummelo parentage has a lower heat requirement than is necessary to ripen most grapefruit. Gardeners in cooler regions, where grapefruit rarely reaches any level of sweetness, should be able to harvest good-quality fruit from February to April. The sweetest fruit will develop in warmer inland areas, ripening from late November into March. Oroblanco appears to be a good choice for the warmer spots around the San Francisco Bay Area. Foliage will usually be damaged if temperatures fall much below 28°F for extended periods.

Citrus grown in pots can be brought indoors to avoid exposure to freezing temperatures.

Citrus Varieties

If varieties are selected that ripen at different times, fresh citrus can be harvested almost year-round. The most important factor that determines when fruits ripen and are ready for harvest is total heat. Ripening periods vary from year to year and are influenced by microclimates. Varieties with lower heat requirements do best near the coast. Although frosts are infrequent in the winters near San Francisco Bay and in the thermal belts of many valleys in this region, low-lying inland areas can have temperatures below freezing. Site selection and winter protection are important factors.

Citrus varieties that are well adapted to our growing conditions in most parts of Contra Costa County are listed in **Table 1**:

Table 1 – Selected Citrus Varieties for Planting in the Home Garden & Landscape*

Note: Sour fruits for landscape-use have been omitted

Scion Variety (Citrus)	Cold Tolerance	Harvest Period	Notes
<u>Sweet Oranges (<i>Citrus sinensis</i>)</u> Robertson Navel Skaggs Bonanza Navel Trovita Valencia- <i>Delta, Midnight, Rhode Red</i> Washington Navel	Intermediate	. Dec-Apr Dec-Apr Feb-Jun Apr-Oct Dec-May	. More heat-resistant than WA Navel. Performs well on coast. Excellent flavor with less heat. Juice orange. Easy to peel & separate.
<u>Blood Oranges (<i>Citrus sinensis</i>)</u> Moro Sanguinelli Tarocco	Intermediate	. Feb-Apr Apr-Jun Mar-May	. Good color, flavor in coastal Northern CA. Adapted best to warm inland valleys. Adapted best to inland valleys.
<u>Lemons (<i>Citrus limon</i>)</u> Eureka Lisbon – Most cold hardy. Improved Meyer – Most cold hardy. Variegated Pink Eureka	Low	. All year All year All year All year	Do not need high heat to ripen. “Supermarket” lemon. Nearly thornless. “Supermarket” lemon. Thorny. Vigorous. Very juicy; few thorns; lemon/orange hybrid. Also known as Pink Lemonade.
<u>Grapefruit (<i>Citrus paradisi</i>)</u> Marsh Redblush Oroblanco – Low acid. Melogold – Low acid. Cocktail Grapefruit	Intermediate	. Apr-Nov Apr-Nov Jan-Apr Jan-Apr Dec-Apr	Requires high heat for best flavor. Commercial white-fleshed. Also known as Ruby & Ruby-Red. More frost tolerant, sweeter than Melogold. Larger, thinner rind than Oroblanco. Great for juice; Seedy.
<u>Limes (<i>Citrus aurantifolia</i>)</u> Bearss Mexican	Very low	. Aug-Mar Aug-Dec	Must be grown in frost-protected areas. “Supermarket” lime. In Florida, known as the Key lime.
<u>Mandarins (<i>Citrus reticulata</i>; <i>C.unshiu</i>; <i>C.deliciosa</i>; <i>C.nobilis</i>)</u> Clementine (<i>C.reticulata</i>) Dancy (<i>C.reticulata</i>) Satsuma (<i>C. unshiu</i>) - Most cold hardy Gold Nugget Jan-Apr Feb-Apr Dec-Apr	Also known as tangerines. Low heat requirement. Commercial variety; needs pollinizer; seedy Seedy. Needs high heat. Grows in areas too cold for most citrus. Very good; seedless.
<u>Mandarin Hybrids</u> Encore Honey Kinnow W.Murcott, aka Delite Page Pixie		. May-Aug Feb-Mar Apr-May Mar-May Feb-May Apr-Jul	. Sweet, juicy, seedy. Alternate bearer. Same as Encore, but seedy. Same as Honey. High-yielding, alternate bearer. Cross of Clementine & Minneola. Adapted to coastal region & inland valleys.
<u>Tangelo (<i>Citrus tangelo</i>)</u> Minneola (<i>C.reticulata x c.peridisi</i> “Minneola”)	Intermediate	. Mar-May	Cross of mandarin & grapefruit. Best in hot climates; needs pollinator.
<u>Kumquat (<i>Fortunella spp.</i>)</u> Meiwa Nagami	High	. Jan-Apr Jan-Apr	Very cold hardy; flowers in summer. Susceptible to zinc deficiency. Best variety for eating fresh. Most popular commercial variety in US.

<u>Limequat</u> Tavares Eustis	High	. Dec-Jul Dec-Jul	Lime substitute that is cold hardy. Fruit are yellow when ripe. Not grown commercially, but bear abundant fruit.
<u>Orangequat</u> Nippon	High	. Dec-Sep	Cross of Meiwa kumquat & Satsuma mandarin.
<u>Pummelo (<i>Citrus grandis</i>)</u> Chandler Reinking		. Apr-Jun Apr-Jun	Largest citrus fruit; needs pollinator. Yellow rind with pink flesh. Yellow rind with pale yellow flesh.

*Information taken from Table 18.1 of the California Master Gardener Handbook.

Selecting and Buying Citrus Trees

Purchase plants from a reputable nursery or supplier, and be sure that the label identifies the scion precisely. Find out which rootstock has been used. Younger specimens that have not begun to bear usually transplant more easily and are less expensive than larger trees. Choose a healthy-looking plant that has foliage with strong green, uniform color, no blemishes or nicks on the bark, a smooth bud union, fairly symmetrical branching, and no obvious pest damage. Inspect the undersides of the leaves, the shoots, the bark, the soil surface and the bud union. Make sure the bud union is located far enough above the soil level to prevent rot disease problems. A straight, strong trunk is preferred. Plants that have roots protruding from the container have been in the container too long and should not be purchased. Roots should be pliable and an intense orange color.

Rootstock Varieties

Citrus trees are sold on many different rootstocks. Labeling laws in California do not require the nursery to state the rootstock variety used. The bud union is the point where the scion joins the rootstock (refer to Figure 1). The rootstock influences fruit productivity, size and quality, overall tree vigor, resistance to soil-borne fungal diseases, nematodes, viruses, environmental stresses and cold-hardiness. It is therefore useful to know which rootstock variety you have purchased (ask your nursery person). The four dominant rootstock varieties commonly available are:

1. *Troyer and Carrizo Citranges* (sweet orange x trifoliolate orange hybrids)
2. *Trifoliolate Orange* (*Poncirus trifoliata*) (Rubidox and Pomeroy)
3. *Flying Dragon Trifoliolate Orange* – a natural dwarf that grows to about 10'-12'. Has a limited root system and must be watered carefully (will not withstand drought.) Does not like calcareous (soils containing lime) or high pH soils. Resistant to *Phytophthora* root rot.
4. *Alemow (*Citrus macrophylla*)* is the most popular rootstock for lemons grown along the coast.

Planting

When to Plant

Citrus can be planted any time of the year, but early spring or fall is preferred. Early spring planting gives the tree's roots time to become established before they are subjected to cold weather and frost danger. In areas that have very hot summers, fall planting is preferred because the tree will have time to get acclimated before the heat. Autumn planting is a good option in frost-free regions.

Site Location – Where to Plant

Citrus trees can be planted in the yard directly into the ground, in pots on the patio, or as espaliers along a fence or wall. Choose a site that gets at least six hours of full sun per day and is protected from the wind, preferably a south-facing exposure. Avoid cold air pockets, such as a fence at the base of a slope that can trap cold air. The south-facing side of a house typically gets the most consistent sun all day. It is the warmest location, especially in the winter. Heat demanding varieties, such as grapefruit, probably will do best in the hottest microclimate in your garden. Nighttime temperatures against a south-facing wall may be several degrees higher than in an open area. The west side is warm and sunny in the afternoon, and is the second warmest area of the yard.

Allow enough space for the tree to grow to its mature size, usually 6'-8' from buildings, driveways, and walkways. Its shallow roots may extend beyond the canopy, possibly twice as far as the canopy edge. Space should be available for a root system of this size, and water and fertilizer applications should include the area beyond the drip line. Do not plant citrus trees near plants with aggressive root systems that will compete for water and nutrients.

Dwarf trees need less space, but still have the same requirements for their roots, which may extend past their canopy edge. If space is very limited, consider espaliering the citrus tree (training them to grow flat against a wall or supporting structure). Many citrus varieties grow well for years in containers, but they require plenty of room around their roots, frequent watering and excellent drainage. Don't allow the pot to stand in water.

Planting a citrus tree in a lawn is not recommended. Lawn watering (except in sandy soil) is too frequent and too shallow for a citrus tree, increasing the risk of root rot. If the lawn is the only space available, remove the turf in a 3 to 5 foot circle surrounding the tree, to reduce competition from turf roots for water and nutrients. Removing the turf also eliminates the risk of a lawnmower nicking the tree's trunk. The tree's canopy will eventually shade out the turf under the tree.

How to Plant a Citrus Tree

- Dig a hole much wider than the ball of the tree. In general, the hole should be about as deep as the root ball and about twice its diameter.
- Adjust the depth of the hole so that the upper surface of the tree ball is about 1" above the surrounding ground when the tree is lowered into it.
- Gently tamp the loose soil around the ball immediately. Fill it to the top, but leave the upper surface of the original root ball exposed.
- Because citrus trees have many shallow roots, the soil around them should not be disturbed by cultivation. Control weeds by hand weeding and mulching.
- Water the tree immediately after planting and keep the root ball moist until roots grow out into the surrounding soil. The surface roots concentrated at the outside of the root ball will die if they dry out.



Figure 2. Dig the planting hole 1 inch less than the root ball depth.

<http://aggie-horticulture.tamu.edu/extension/homefruit/citrus/citrus.html>
(Texas A & M University)

First Year Care & Annual Growth

Roots

The first year that a citrus tree is in the ground is the most important for root development. Stresses caused by diseases, nematodes, weed competition, insufficient watering or over-watering can hinder root development and scion development. Citrus roots can extend up to twice as far as the drip line, which is that imaginary circle below the canopy edge. Gardeners should consider this when irrigating and fertilizing citrus.

Leaves & Leaf Drop

Leaves typically remain on the tree for 1 to 2 years. The leaves are replaced continually, although the heaviest loss occurs during flowering, which throughout most of Contra Costa County occurs in the spring. This leaf loss is normal. New leaf growth is the most vigorous at this time.

Environmental factors, such as high temperatures, wind, low soil moisture, low humidity, nutrient deficiencies, and high soil salinity can also cause premature leaf drop. Subtropicals, such as citrus, often have yellowish leaves during the cooler season of the year, and then naturally green up when the weather gets warmer. It may appear to be a deficiency problem, but it is a natural occurrence. Other causes of leaf drop are disease or pest problems and rootstock-scion incompatibility.

Citrus leaves store their maximum amount of food in late February or early March, just before the spring bloom and growth flush; thus, pruning should not be done at this time of year because leaf loss would reduce subsequent fruit yield.

Flowers, Fruit & Fruit Drop

Citrus flowers usually bloom abundantly, but under normal conditions, most of the flowers and considerable numbers of young, immature, and very small citrus fruits (less than 1" in diameter) may drop from trees in May, June & July. This fruit drop is a natural occurrence, a self-regulating thinning process that protects citrus trees from bearing too large of a crop. Excessive fruit drop can be due to nitrogen deficiency or excessive nitrogen fertilization, nutrient deficiencies, high temperatures from mid-May through mid-July, lack of water, heavy pruning, or infestations of thrips or mites.

Most citrus types are fertilized by their own pollen (self-pollinated) and can produce a crop even if a single tree is planted in isolation from other citrus trees. (Clementine and Minneola mandarins are not self-pollinating, which means that they cannot be fertilized by their own pollen, and must be pollinated by a compatible citrus variety planted nearby.) Navel orange and Satsuma mandarin do not have viable pollen, but they do not need pollination to set fruit.

Citrus fruits usually are edible 8 to 16 months after bloom, and have a variable harvest season of about 2 to 6 months. Many citrus types yield bland fruit for the first few years of production, but quality improves as trees mature. Off-bloom fruit (fruit that develop from flowers that bloom in off-season) of sweet orange, grapefruit, and tangelo are often inferior. Disease, rainfall, or a dry spell followed by irrigation can trigger irregular or off-bloom. The inferior fruit that result tend to be thick-skinned and puffy, and if it is grapefruit, it is also sheep-nosed.

During the first 3 or 4 years after planting a citrus tree, fruit production is light and this period is known as the nonbearing years. Major root growth occurs during this period and the framework of the tree is developing for fruit production. Bearing trees have a seasonal cycle that begins in the spring with the enlargement of flower buds that produce the current season's crop. Any weather conditions, pests, or diseases that lead to blossom injury will adversely affect the season's fruit production.

In California, citrus trees usually have several growth flushes in spring, summer, and fall. Each growth flush can produce flowers and set fruit, but in most varieties, the spring flush is the most productive. After pollination and fertilization of flowers that bloomed during the spring growth flush, the citrus tree typically yields a single crop of fruit as early as fall or as late as the following summer, depending on variety. Citrus types that are everbearing in California, such as lemons, can bloom and set fruit throughout the year, but they tend to bloom most abundantly in the spring.

Frost Protection

Citrus trees and fruits are at risk from freezes. Young citrus trees are very vulnerable to prolonged frost conditions, but precautions can protect the trunk and foliage and will often save a tree when a frost is predicted. Minimizing potential freeze damage is the biggest winter concern. Mulch should be pulled back so that the soil can warm up during the daylight hours. (Make sure that the mulch is replaced in the spring.) When frost is predicted, make sure trees are well watered ahead of time. Moist soils hold heat better than dry soil. Anti-transpirant sprays will provide a bit of protection in less threatening conditions. You can build a scaffold over the tree and cover the top and sides with a sheet or burlap, but do not totally enclose the tree (i.e. do not wrap tree in plastic, burlap or other material). Outdoor lights can be strung on the tree to provide warmth. If a heavy freeze is forecast, wrap the trunk of a young tree with a thermal wrap. This can be several layers of corrugated cardboard, several layers of newspapers, or a purchased wrap. Be sure to cover the trunk to an area above the bud union. If a very severe arctic freeze is forecast, try using an insulated sawdust collar. Make a collar 5"-6" in diameter and place it around the trunk/bud union. Fill this with sawdust. (Note: Beware of the possibility of vole damage to citrus bark; use screen to prevent damage.)

Watering

Because citrus trees are evergreen, citrus should be kept moist (but not wet) throughout the year. Disregard the dryness of the top inch of soil. As a rule of thumb, water when the top few inches of soil are dry. A mature tree with an extensive root system requires more water to wet the root zone than does a young tree with a smaller root mass, but the young tree's roots dry out faster. Young trees are usually watered every 5 to 10 days for a period of 6 to 10 weeks in June through September, but pay attention to the weather in case adjustments are needed. A young tree may need water more often than once a week in warm weather. Never allow the root system to completely dry out. Fluctuating soil moisture can cause fruit splitting, especially of navel oranges.

The chart below gives an illustration of average water requirements for citrus throughout the year, based on averages of the EvapoTranspiration (eT) rates from the CIMIS stations in Brentwood, Concord and Moraga from July 2005 to June 2006. A crop coefficient of 0.65 was used, with an area based on a 10'-diameter root zone.

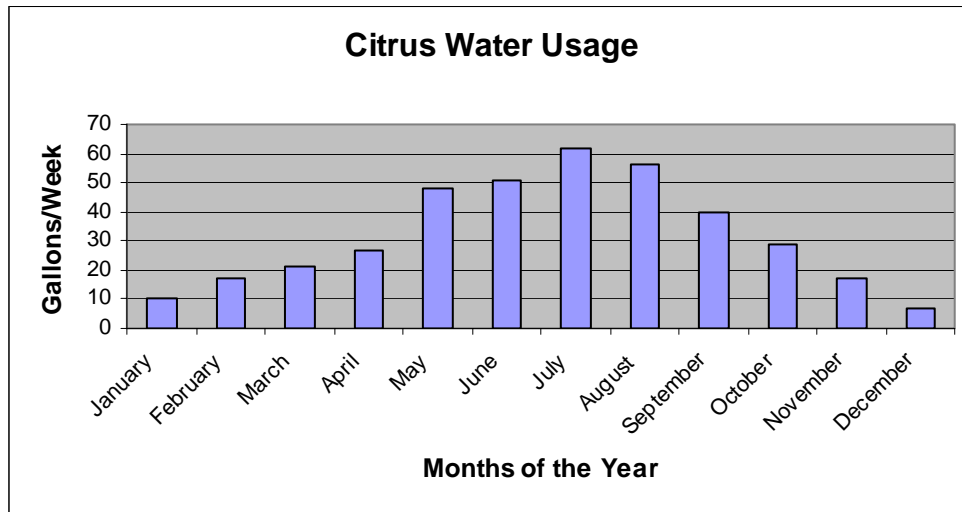


Figure 3
Average Monthly Watering Requirements

The most critical period is during hot spells. Always water long enough to moisten the entire root area, remembering that citrus root systems are usually several inches to 3' deep, depending on the soil-type. Keep water away from the tree trunk.

Over-watering is a common cause of poor performance of container citrus trees. Water only as needed. Generally, allow the upper inch of the soil-medium to become dry before watering. Then apply water slowly to fill the container, allowing the excess to drain from the bottom. The most critical period for irrigation is from the year's initial spring growth flush until the young fruit are at least 1-inch in diameter. The trunk and the bud union should remain dry.

Mulch, Don't Dig!

Citrus tend to have shallow roots, and the soil around them should not be disturbed by cultivation. Control weeds with hand weeding and/or mulches. Keep weeds pulled, as they steal nutrients and water. Adding a layer of mulch on top of the soil helps to keep roots cooler, and reduces moisture loss from the soil. Apply a 2 to 3 inch layer of compost or other organic amendment under the tree's canopy, keeping it 6" away from the trunk. Research has shown that yard waste (wood chips, grass clippings, and leaves) makes excellent citrus mulch. The best mulch in areas with high soil pH is pine needles or coffee grounds.

Fertilizing

Citrus require a pH between 6.0 and 7.5 (6.5 is ideal), and soil depth must be at least 1½ feet. Sandy to clay loams are the best soils. Once the weather has warmed, test your soil with a home pH kit, and amend the soil if needed. When the soil's pH is too high, it can be adjusted with additions of sulfur, which needs to be incorporated into the root zone of the soil. It may take several months for sulfur to lower the soil pH. Citrus require an adequate supply of essential nutrients. These include iron, zinc, manganese, and nitrogen, among others. If you have sandy soil, you may be low in most nutrients, as they tend to leach away with winter rains in that soil type. If your soil is one of the clay-loams found in much of Contra Costa County, your soil probably lacks only nitrogen, and possibly zinc. Nitrogen is highly water soluble, and after heavy winter rains many soils will have little available for plants. Citrus may start to look "pale" toward the end of winter. Nitrogen levels are critical for fruit set and retention in the spring. Nitrogen is available in many different forms, but apply only as needed, because highly soluble nitrogen fertilizers such as ammonium sulfate or ammonium nitrate are easily washed into creeks and ultimately the bay, creating water pollution.

To calculate the amount of nitrogen contained in various fertilizer forms, you must be aware that the first number in the parenthesis following the fertilizer name is the percent nitrogen in the fertilizer. For example, Ammonium Sulfate (21-0-0) contains 21% Nitrogen. Therefore, for every 5 pounds of ammonium sulfate applied, the tree receives 5 pounds times 21%, or 1.05 pounds of actual nitrogen.

Here is a list of fertilizer formulations and the amount needed:

- 5-10 lb. per tree of ammonium sulfate (21-0-0) = 1 to 2 pounds actual N
- 3-6 lb. of ammonium nitrate (33-0-0) = 1 to 2 pounds actual N
- 2-4 lb. urea (46-0-0) = 1 to 2 pounds actual N

A general guideline to fertilizing follows: Young trees less than 4 years of age need 2 tablespoons of nitrogen spread under the tree prior to irrigation 3-4 times a year. By the third year this amount should be doubled.

Large and fully mature citrus trees will need 2-3 pounds of actual nitrogen a year, scattered under the canopy and several feet outside of the drip-line.

Micronutrients might also be needed in addition to nitrogen. Manganese deficiency causes older leaves to turn yellow between the veins and drop. Lack of zinc is seen as small terminal leaves with yellow mottling between the large veins. Iron deficiency is suspected if leaves are yellow while veins remain green. Yellow leaves with green veins typically indicate a lack of iron absorption. Yellowing of leaves, called chlorosis, often indicates poor nutrition.

Fertilization is typically divided into three applications between April and August. Micronutrients may be applied effectively via one of the many available foliar sprays. Plants absorb nutrients very quickly through their leaves. Chelated iron usually supplies various nutrients in addition to iron, including zinc and manganese. It can lower pH levels. Talk to a nursery professional about products, and always read the instructions thoroughly.

Pruning

Prune citrus in late spring or summer to shape trees, only to remove twiggy growth, dead wood and weak branches, or any crossing, broken or shaded branches from the interior of the tree. In young plants, prune to nip back wild growth and balance the plant. Remove all thorny, fast-growing stems that appear below the graft union, which is the thickened part of the trunk low to the ground. Wait until May to prune out any frost-damaged wood, as it might revive.

Pests & Disease

Compared to other fruit trees grown in the home garden, citrus trees have relatively few pest and disease problems if they receive good care. Certain varieties are more susceptible to pests and diseases, but healthy trees that are irrigated and fertilized properly should have little pest damage.

Citrus is susceptible to whiteflies, citrus thrips and mites, rots, and fruit splitting. Snails and slugs will eat the flowers and fruit. Aphids, scale, or spider mites may infest a tree, especially if it's weak from poor growing conditions. Control ants, which "farm" sucking insects and protect them from natural predators. To control them, spray thoroughly (including cracks and crevices) with horticultural oil or insecticidal soap. Scale are most susceptible to pesticides at the crawler stage, in midspring and mid to late summer.

Over-watering may also cause chlorosis (yellowing of leaves). Wet soil limits the amount of oxygen available to roots and may hinder nutrient absorption. Deficiency symptoms sometimes appear during the winter if the trees are in waterlogged areas.

If you have a pest or disease problem, consult your local Master Gardener office.

The following Table 2 is from The Agriculture Program of the Texas A & M University System website:

<http://aggie-horticulture.tamu.edu/extension/homefruit/citrus/table2.html>

Table 2 - Diagnosis of Common Citrus Problems

Symptom	First noticeable	Primary cause	Occurs	Control and/or comments
Fruit				
1. Premature rind coloring	late summer	plant bugs	mid-summer	Rarely serious enough to control
2. Creases in rind	harvest	physiological	spring	Follow irrigation and fertilization recommendations
3. Necrotic spots on rind, lower part	2 or 3 weeks after spraying	spray burn	after spraying	Excess spray accumulates near bottom of fruit
4. Thick rind, puffy fruit, sheeppnose	harvest	excess vigor	since bloom	Follow good cultural practices, typical of off-bloom fruit
5. Rust colored or brown rind	anytime	citrus rust mite	since bloom	Does not affect eating quality, use miticide only if necessary

6. Silvery to tan irregular, smooth blemishes	harvest	wind scar	March-April	Not necessary, quality unaffected
7. Small, brown spots on rind, rough texture, may tearstreak	harvest	melanose fungus	March-April	Affects grapefruit only, remove dead twigs inside canopy
8. Removable, small, colored, raised spots on rind	summer to harvest	scale insects	summer	Spray only if problem is extensive on the bark
9. Cottony masses near fruit stem	summer to harvest	mealybug or cottony cushion scale	summer	Rarely serious, hard to control
10. Black, sooty covering	harvest	sooty mold	since bloom	Whiteflies, blackflies, mealybugs and other insects, usually gone before problem is noticed
11. Fruit drop	since bloom	physiological	since bloom	Read "Productivity and Maturity" section
12. Fruit splitting on-tree	September	physiological	summer	Dry weather followed by good rain, proper irrigation lessens the problem
Leaves and twigs				
1. Leaf cupping and curling	after new flush	aphids	during each flush	Not serious, check new growth as it emerges
2. Silvery, scratchy appearance to leaf	summer, fall	spider mites	spring to fall	Could cause excessive fall leaf drop, spray if necessary
3. Small, brown spots, sand-papery texture	spring-summer	melanose fungus	after growth flush	Affects grapefruit, usually after spring rains; remove dead twigs
4. Irregular, oily spots on foliage	summer to winter	greasy spot fungus	summer	Remove fallen leaves, particularly in summer
5. Raised, irregular tar-like spots under leaf	anytime	sunburn	anytime	Not serious
6. Removable, small, colored spots on leaves or bark	anytime	scale insects	summer	Spray only if infestation is extensive
7. Fish-scale-like scales under leaf, translucent; small, white, flying insects	spring to fall	whiteflies	spring to fall	Leads to sooty mold; rarely requires control
8. Spirals of eggs or small black insects under leaf	anytime	blackfly	anytime	Leads to sooty mold; insecticides do not work, parasites normally in control
9. Black sooty coverings on leaves	anytime	sooty mold	anytime	Control causal insects or wash off with soapy water
10. Leaf yellowing, drop and twig dieback	anytime	root damage	anytime	Usually too much water, poor drainage
11. Leaf yellowing, tipburn marginal necrosis, drop	anytime	salt burn	anytime	Leach soil, be careful with fertilizer
12. Leaf yellowing, yellow area confined to veins	anytime	foot rot, water damage	anytime	Determine cause and correct, if possible
13. Marginal necrosis, leaf cupping, curling	spring flush	wind burn	during spring flush	Usually not serious, windbreaks may help
Limbs, trunk or entire tree				
1. Tree looks sick, sparse, yellow-veined foliage, dead	anytime	foot rot	anytime	Remove dead tissues, disinfect and treat with pruning paint; follow recommended

bark on trunk near ground				cultural practices
2. Hardened gum exudate on bark of trunk or limbs	anytime	gummosis	anytime	Follow good cultural practices, no control, not usually life-threatening
3. Young tree seemingly loses all its leaves quickly, fruit hangs on	anytime	foot rot	anytime	Check for foot rot (dead bark) completely around trunk at and above the bud union

Citrus Calendar

Table 3 – Citrus Calendar for the Home Garden and Landscape**

January	Protect vulnerable plants from freeze/frost damage. Harvest fruit. Monitor for disease. Remove winter weeds; watch for snails.
February	Protect vulnerable plants from freeze/frost damage. If scale insects are present (appear as small bumps on twigs and a black sooty mold on the leaves), spray the tree with volk or superior oil. Thorough coverage is important. Before harvesting citrus, taste to see if it's sweet, since ripening time can vary from year to year, depending on the weather.
March	Protect vulnerable plants from freeze/frost damage.
April	Protect vulnerable plants from freeze/frost damage. Monitor for ants. Fertilize according to the age of the tree. Irrigate if necessary.
May	Pruning out any crossing, broken or shaded out branches from the interior of the tree. Prune out frost damage. Plant citrus after danger of frost. A natural thinning, fruit drop, occurs in late May-July. If the tree is not stressed from lack of water or nutrients, less drop will occur. Excessive moisture (wet feet) can also cause fruit drop and yellowing of leaves. Add a 2"-3" layer of mulch under trees.
June	June Drop, a natural thinning occurs. Be sure tree is well watered and not nutrient stressed. Irrigate regularly. Fertilize monthly. Monitor for scale insects.
July	If aphids or spider mites are a severe problem and causing leaves to yellow and drop, use insecticidal soap or plain water to wash them off. Repeated treatments are usually necessary. Irrigate regularly. Remove summer weeds.
August	Irrigate newly planted citrus twice a week (more frequently during hot spells); established citrus every other week or so. In clay soils, wait for top 4 to 6 inches of soil to dry between irrigations.
September	Continue to irrigate.
October	Spray to prevent Citrus Brown Rot.
November	Clean up under trees. Continue irrigation as necessary.
December	Protect vulnerable plants from freeze/frost damage.

**Information adapted from The California Backyard Orchard and UC Master Gardeners.

References

1. The California Master Gardener Handbook
University of California, Agriculture and Natural Resources
Publication 3382, Published 2002
2. Contra Costa Times Master Gardener's Column
Articles published March 24, 2001; February 2, 2002; January 10, 2004; May 1, 2004
3. The California Backyard Orchard
Fruits and Nuts: Citrus
Calendar of Backyard Gardening Operations for Citrus Fruits
4. CIMIS website for EvapoTranspiration data: www.cimis.water.ca.gov/cimis
5. Citrus Research Facility, U.C. Riverside
6. University of Minnesota Extension Service website:
<http://www.extension.umn.edu/yardandgarden/YGLNews/images/scion&rootstock.jpg>
7. The Agriculture Program of the Texas A & M University System website: <http://aggie-horticulture.tamu.edu/extension/homefruit/citrus/table2.html>
8. Citrus Research Facility U.C. Riverside
Web-sites 2007
<http://www.citrusresearch.org/frameset.html>
U.C. Citrus Entomology Laboratory at Kearney Agricultural Center
<http://www.uckac.edu/citrusent/>
CDFA Updates- Glassy-Winged Sharpshooter/Pierce's Disease
<http://plant.cdfa.ca.gov/gwss/>
CA Plant Protection and Quarantine (APHIS/PPQ)
<http://www.aphis.usda.gov/ppq/ppqca/index.html>
GWSS Kern County Project
<http://www.cdfa.ca.gov/phpps/pdcp/gwMaps/gwmgmtMaps.htm>
Alert re Diaprepes Root Weevil
<http://anrcatalog.ucdavis.edu/pdf/8131.pdf>
UC ANR publication 8131 issued 2004 Diaprepes Root Weevil - CDFA News Releases
<http://www.cdfa.ca.gov>
Citrus Psyllid - University of California brochure
http://citrusent.uckac.edu/asian_citrus_psyllid%20main.htm
Huanglongbing (Citrus Greening) - Public Citrus Greening Website
<http://www.citrusgreening.net/>
Citrus Health Response Plan
<http://www.doacs.state.fl.us/pi/chrp>
Diaprepes Root Weevil - University of California brochure
<http://anrcatalog.ucdavis.edu/pdf/8131.pdf>
Huanglongbing (Citrus Greening) - APHIS PPQ Emergency and Domestic Programs
http://www.aphis.usda.gov/ppq/ep/citrus_greening/index.html
Huanglongbing (Citrus Greening) - APHIS PPQ Program Updates
http://www.aphis.usda.gov/ppq/ep/citrus_greening/updates.html
Huanglongbing (Citrus Greening) - Florida Dept. of Agriculture
<http://www.doacs.state.fl.us/pi/chrp/greening/citrusgreening.html>
Citrus Bacterial Canker Disease and Huanglongbing - UC Publication 8218
<http://anrcatalog.ucdavis.edu/pdf/8218.pdf>

Growers of Fruit and Nursery Trees

- [Griffith Farms](#)
- [Four Winds Growers](#) - Mail Order Citrus Trees

- [Mulholland Citrus](#)
- [Paramount Citrus](#)
- [TreeSource Citrus Nursery](#) - *A Proud Sponsor of Citrus News*
- [Willits & Newcomb Inc.](#)
- [General Management Tools](#)
-  [Asian Citrus Psyllid](#) ANR Publication 8205
- [Crop Profile for Citrus in California](#) - USDA Pest Management Center
- [Citrus Flower Phenology Model Database](#) - UC IPM
- [Citrus Thrips Damage Estimator](#) - Testing Phase - UC IPM
- [Citrus Entomology](#) - UC ANR Kearney Agricultural Center
- Diaprepes Root Weevil
 -  [Diaprepes Root Weevil](#) - ANR publication 8131
 - [Invasive Root Weevil spreads to southern California](#) - UC ANR News
 - [Diaprepes Root Weevil](#) *Diaprepes abbreviatus* (L.) (Coleoptera: Curculionidae) - Citrus Entomology web site at UC Kearney Ag Center
 -  [Topics in Subtropics](#) Sept - Dec 2005
- [Mandarin](#) - Tous, J. and L. Ferguson. 1996. Mediterranean Fruits. p. 416-430. In: J. Janick (ed.), Progress in new crops. ASHS Press, Arlington, VA.
-  [Mysteries of Mandarins - Sex, Seedlessness, and New Varieties](#) - Tracy L. Kahn, C. Thomas Chao
- [Pests of Citrus](#) - UC Pest Management Guidelines, UC IPM
-  [Photographic Guide to Citrus Fruit Scarring](#) - UC ANR publication 8090 (free)
- [Produce Facts: Grapefruit, Lemon, Lime, Mandarin-Tangerine, Orange](#) - Recommendations for Maintaining Postharvest Quality, UC Postharvest Technology Research and Information Center
-  [Questions and Answers to Citrus Management](#) - Peggy A. Mauk and Tom Shea
- [Real-Time Crop ET](#) - Allan Fulton, UCCE Tehama Co.
-  [Texas Citrus Mite](#), a New Pest of San Joaquin Valley Citrus - David Haviland, Craig Kallsen
- [Texas citrus mite, a new pest of San Joaquin Valley citrus](#) - UCCE Kern Co.