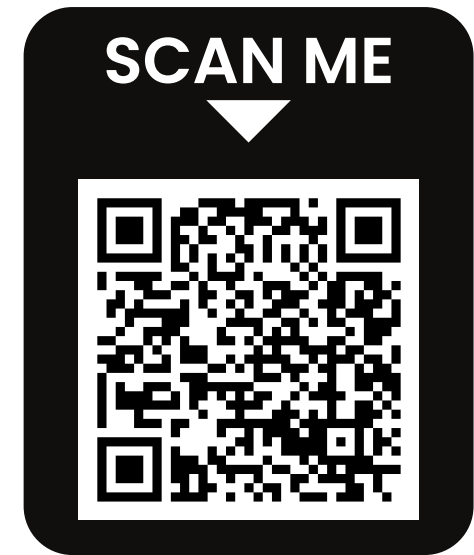


Healing Harvest

Food Forest Care Plan

For the most up-to-date care plan information for the Food Forest at Touro University, please check out this webpage.



Species	Bears Fruit	Watering	Pruning
Persimmon, Fuyu	Fall	Avoid overwatering	Aesthetically as needed (avoid in Summer)
Pomegranate, Eversweet*	Fall	Irregularly, deep (7 - 10 days)	Prune years 1 - 3 for maximum harvest
Anna, Apple	Late-summer	/	After established, 2+ years
Asparagus	Spring	Keep well irrigated	/
Fig, Mission*	Spring, Summer	/	Aesthetically as needed (avoid in Summer)
Lemon, Eureka	Spring, Summer, Winter	/	Late winter
Cherry, Lapins	Summer	Avoid overwatering	Do not prune after august
Mandarin, Owari	Winter	/	/

* = Drought tolerant



Sustainable Solano



FIGS

Linda Robertson, UC Master Gardener

The fig (*Ficus carica*) is native to Western Asia and the eastern Mediterranean region. Cultivated for thousands of years, figs were first planted in California at the San Diego Mission in 1769.

Fig Facts

- Figs are not technically fruit but are flask-shaped modified stems encasing numerous tiny flowers.
- There are hundreds of fig varieties which are classified into 4 types: Caprifig, Smyrna, San Pedro and Common.
- Smyrna and San Pedro types require pollination to produce edible fruits; Caprifig type is solely used as a pollinator tree. Common type does not require pollination.
- Fig pollination is a complex enterprise. It requires a caprifig type fig tree which serves to produce pollen. A fig wasp (*Blastophaga*) lives part of its life cycle in a caprifig and carries the pollen to other fig trees.
- Commercial fig growers plant caprifigs in their orchards to promote pollination.
- Figs from caprifigs are small, dry, nonedible fruit. Caprifigs can be found in the wild or in an urban setting, transported by a passing bird.
- Home gardeners typically grow the common type of fig tree, the type most commercially available.
- Some fig trees can produce two crops a year. A breba crop, in early summer, on previous years wood requires no pollination. All types produce a main crop, in late summer to early fall, on current season wood.



Fig Types

1. Caprifig: For pollination only.
2. Smyrna: Requires pollination, no breba crop. Considered among the best for eating and drying. The cultivar most commonly grown here is Calimyrna.
3. San Pedro: Requires pollination for main crop. May have a breba crop which does not require pollination. The common cultivars in California are King (Desert King), Lampeira, and San Pedro.
4. Common: No pollination required and is most common type found in the home garden. Depending on the cultivar, may have a breba crop.

Common type fig varieties for San Luis Obispo County: Adriatic, Black Mission, Brown Turkey, Celeste, Flanders, Italian Everbearing, Osborn's Prolific, Violette de Bordeaux, White Genoa.

Culture

- Things to consider: Figs are large trees, 10-30 feet tall and wide. Grow where there is space but growth can be limited by pruning. They are deciduous going dormant in the winter, tolerating temperatures down to 12-15 degrees. To produce the best crop, figs require prolonged summer heat.
- Planting choices: in coastal areas consider planting next to a south facing, light-colored wall for increased heat. Figs can be espaliered against a wall or fence or grown in a large container such as a half wine barrel or 15-gallon container. White Genoa variety is a good choice for cool coastal climates with fruit ripening through Fall.
- Plant when trees are dormant. In locations without hard freezes, trees can be planted from Fall to early Spring. Plant in full sun and the warmest location in your yard. Figs will tolerate most soil types from sand to clay.
- Fig trees are not grafted on a rootstock so plant as usual for a tree at same depth as in container.
- Figs are easily grown from cuttings which are planted once rooted.
- Irrigation: Figs generally don't need a lot of water but consistent irrigation is important for young trees. For established trees, water every 1-2 weeks, in the summer, depending on soil type and temperature. Water every about every three days for potted figs. Apply mulch to retain moisture. Figs will drop their leaves if kept too dry.
- Fertilizing: Necessary only with sandy soil or potted trees. Excess nitrogen promotes excess leaf growth and causes delayed ripening and poor fruit quality. Can lightly fertilize dormant trees once in the spring.

Pruning

- Fig trees are productive with or without pruning.
- Pruning can be done to control the size and shape of the tree and for improved air circulation. Modified central leader shape is typical.
- Pruning should be done in the dormant winter season. Trees will secrete an irritating sap if pruned in the summer.
- Fig tree bark is very sensitive to sunburn. Protect young trees or heavily pruned trees with exposed bark by painting the main limb and trunk with 1:1 mix of indoor latex paint and water.
- Overall, figs do not need to be pruned to thin canopy as a thick canopy protects the bark from sunburn.
- For trees that produce a breba crop which is borne on last season's wood, avoid heavy winter pruning and prune just after main crop harvested.
- Unlike most fruit trees, thinning out fruit is not necessary as it will not affect fruit size or flavor. Thinning fruit may help with crop production in cooler climates.

Harvesting

- Figs don't ripen after they're picked.

- Clues to ripe figs: Figs increase in size and change in fruit color. Green figs will get paler and dark figs darker. The figs will droop on their stems and be slightly soft.
- Figs will keep 2-3 days in the refrigerator.

Pests-Disease-Problems

Gophers: Gophers love fig tree roots; they can kill a half-grown tree. Consider planting in containers or plant a tree in the ground with a gopher wire cage and basket extending 2-3 inches above ground.

Birds: Use bird netting for young trees. For large established tree, get used to sharing.

Fig beetles: Scrape holes in figs and feed on fruit. A problem in Southern California. Trees can be protected with 1/4 inch netting. Bird netting will not work.

Fig mosaic virus: A non-fatal, non-curable disease that causes leaf mottling, leaf and fruit drop with reduction in fruiting. Avoid buying plants with deformed or yellow mottled leaves.

Fig rust: Causes leaves to turn yellow-brown with rusty spots on undersides. The leaves drop in late summer and Fall. Early infections treated with Neem oil. Prevent by removing fallen leaves from ground.

Split figs: Heavy rain during fruit development can cause figs to split.

Pest and disease management is primarily through prevention: choosing healthy fig plants, monitoring tree for damage and pests, and orchard sanitation including removal of mummified and fallen figs and leaves.

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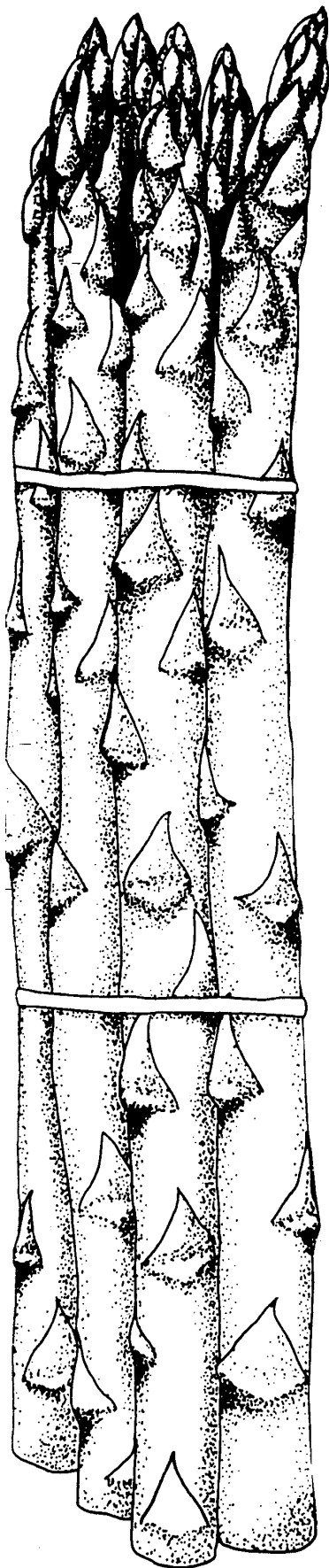


Website: <https://ucanr.edu/sites/mgslo/>

Availability	on VMS > News/Docs > Documents/Presentations > INFO DOCS > Figs	
History	Original: 8/6/19	Revised: month/year:

Cultural Information – Agastache
(ah-gas-TAH-kee)

<u>Light:</u>	Full sun, a southern exposure.
<u>Temperature:</u>	Most will tolerate temperature down to freezing and lower. Some are hardy to zone 5.
<u>Humidity:</u>	Not an issue as it will tolerate wide swings in relative humidity.
<u>Watering:</u>	They are a freely transpiring herb and as a potted plant need attention to soil moisture levels during their growing season. Water when the soil becomes visually dry or plant is showing wilt then thoroughly saturate until some water trickles from the bottom of the pot. Growing in a clay pot will help ensure a healthy root system.
<u>Fertilizer:</u>	Moderate to heavy feeder. Feed with a balanced fertilizer such as a soluble liquid or a granular organic topdressing no higher than 15-15-15.
<u>Pruning:</u>	Plants can be cut back anytime they are getting out of hand. Most are summer bloomers so late winter or early spring pruning is best.
<u>Insects and Disease:</u>	Outdoors they can have problems with aphids while spider mites and white fly can be an issue in indoor culture. Some varieties have moderate susceptibility to root diseases if kept cool and wet during the winter.
<u>Comments</u>	Agastache are great plant for the summer gardens with their showy blooms and aromatic foliage. As garden plants, they are mostly trouble free just needing some attention to watering and fertilizer.



Growing ASPARAGUS in the Garden

The authors are William L. Sims and Ronald E. Voss,
Extension Vegetable Specialists,
Cooperative Extension, Davis

POINTS TO REMEMBER

- Asparagus is a perennial vegetable.
- Soil that is well prepared at planting time will increase the yield of the plant through its years of production.
- Asparagus is usually planted by using roots (also called crowns) from 1-year-old plants or seedling transplants that are 8 to 10 weeks old. Planting from roots makes harvesting possible 1 year earlier than if plants are established from seed.
- The edible asparagus stalks are actually shoots that develop into fernlike leaves during summer. The plant continues to develop new shoots until the warm weather, when ferny growth develops from unharvested shoots. Irrigate and fertilize the plants during the fern season, when the plant is manufacturing food that will be stored by the roots for the next year's shoots.
- The ferns will turn brown in the fall, indicating that they have transferred their manufactured food to the roots. Cut back the ferns after they turn brown to allow the plants to go through a period of winter dormancy. In the spring, new shoots will appear, starting the cycle again.

PLANTING CALENDAR

North Coast (Monterey County-north): January through March
South Coast (San Luis Obispo County-south): January through April
Imperial and Coachella Valleys: October through March
San Joaquin and Sacramento Valleys: January through March

VARIETIES

Plant varieties with a high degree of tolerance to the *Fusarium* disease, such as UC 157 hybrid.

SOIL PREPARATION AND FERTILIZATION

Asparagus planted in properly prepared soil will produce in the home garden for as long as 15 years with minimal care.

Work the soil a foot or more deep, mixing in large amounts of manure, compost, peat moss, or similar organic material.

Mix 15 to 20 pounds of 5-10-10 or 5-10-5 fertilizer per 100 feet of row at the bottom of the trench or row. (The numbers refer to the percentages of nitrogen, phosphorus, and potassium, respectively, in the fertilizer.) Cover the fertilizer with 1 or 2 inches of soil before placing the roots in the trench or row.

When harvest is over and the plants begin to fern out, apply 3 to 5 pounds of ammonium nitrate, or 4 to 6 pounds of ammonium sulfate (21-0-0) in a band to the side of the row. To apply fertilizer in a band, dig a furrow several inches deep along the side of the planting row, sprinkle the fertilizer evenly along the furrow, and cover with soil. Irrigate.

PLANTING

Do not let roots dry out before planting.

Planting methods vary according to climate and soil. For a warm climate and well-drained soil, dig trenches 8 inches deep and 12 inches wide, spread compost or manure in the

bottom of the trench, and cover with 1 or 2 inches of garden soil. Set roots or seedling transplants 18 inches apart in the row and cover them with 2 inches of soil. As the new shoots come up, gradually fill in the trench with additional soil.

To plant in rainy climates or in heavy soil where there is danger of the roots rotting, place the roots so that the tops are 1 or 2 inches below the surface of the well-prepared soil. In the fall, cover the roots with 2 more inches of soil. The following year, cover the surface with 1 or 2 more inches of soil. The roots will then be covered with 5 or 6 inches of soil. Ultimately, you will have a raised bed and may have to put boards along the rows or gently slope the soil to maintain plant coverage.

Asparagus roots spread widely, so plant them in rows 4 to 6 feet apart. If you have limited space, plant the roots in with other landscape plants. Asparagus is often used as a border plant next to the house.

Whatever planting method is used, irrigation, fertilization, and cut-back care remain the same.

IRRIGATION AND CULTIVATION

Asparagus should be irrigated mostly during the fern season, not the harvest season. However, supplemental irrigation during the harvest season may be necessary on sandy soils in dry areas.

During the first year, irrigation should closely follow planting. Asparagus should be well-irrigated throughout the first year.

Keep down weeds in the asparagus plantings. If you weed with a hoe, avoid wounding the root or the soon-to-emerge spears.

DISEASES AND INSECTS

Fusarium wilt, the most common asparagus disease, can be minimized by planting tolerant varieties. Occasionally, asparagus rust is a problem.

Fusarium *Fusarium* species are prevalent throughout the state in asparagus plantations. Studies in progress indicate that the presence of *Fusarium* is more critical in younger plants than in older roots. It is believed that older roots become somewhat more tolerant to the disease.

The studies also indicate that extending the harvest period too long, thereby weakening the roots, contributes greatly to the plant's susceptibility to *Fusarium* species.

Rust Rust is more prevalent in coastal California than in drier inland areas. High humidity with warm temperatures is conducive to infestations of rust. This disease causes brown rusty spots to appear on spears and fern branches. When the infestation is severe, the entire plant appears to have a brown rusty color. (NOTE: By field experience and evaluation, UC 157 is *not* resistant to asparagus rust.)

In general, asparagus is relatively free from insect pests in California. However, there are a few:

Asparagus aphid Recently, the European asparagus aphid (*Brahycolus asparagi*) has been found on asparagus plants in California. In other states where this pest has increased to high population levels, spear production losses have been heavy. When feeding on the plant, the aphid injects a toxin that causes seedlings to shrivel and die. Infected older plants become dwarfed, prematurely release their spear buds, and may die. Chemical control of this insect is possible. Consult your local farm advisor for the most recent recommendation.

Asparagus beetle Although the asparagus beetle is found wherever asparagus is grown, it is usually not a serious pest in California. Some local infestations do occur, however, and control measures are required to prevent serious injury to the plantation. Usually the infestation and resulting injury are more prevalent on younger plantings than on older established plantings.

Cicada Some cicada infestations continue to occur, especially in the Coachella and Imperial valleys. Several studies of cicadas have been conducted, but neither the extent of their damage to asparagus nor adequate measures to control them have been determined, to date.

Garden centipede In the past, the garden centipede was a major pest on white asparagus. The importance of this pest has declined recently.

HARVEST, CARE, AND NUTRITIVE VALUE

Cut asparagus at ground level. An especially manufactured asparagus knife is helpful in cutting spears properly. The knife resembles a large "dandelion digger," and can also serve as a suitable harvesting tool. Asparagus should not be washed before storing it in the refrigerator, where it will keep for 3 to 4 weeks. For longer storage, consult a food freezing guide on proper preparation and conditions.

A 1/2-cup serving of asparagus spears contains only about 18 calories, and about one-fourth the adult recommended daily allowance (RDA) for vitamin C, according to 1974 National Research Council figures. Asparagus is also a significant source of vitamin A, iron, and other essential trace nutrients. White asparagus (blanched by mounding the soil around the growing spear) contains only about one-tenth the vitamin A value of green asparagus.

Additional information on asparagus:

"Asparagus Production in California," bulletin 1882

"Establishing the Commercial Asparagus Plantation," leaflet 21165

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Butterfly Bushes - Buddleia

Everyone enjoys seeing beautiful butterflies fluttering around their garden during the summer months. One of the easiest ways to attract butterflies to your garden is by planting a shrub known as Butterfly Bush (*Buddleia davidii*). Many species of butterflies feed on the nectar in the blooms and it is even possible that a hummingbird might visit. Butterfly bush blooms are pink, purple, white, red, yellow or blue depending on the cultivar you choose to plant. The 6-18" spikes bloom from July into September providing you with countless hours of enjoyment watching the butterflies feed on the flowers.

Growing Butterfly Bushes

Butterfly bushes thrive in areas of full sun and a moist, well-drained soil. They can grow to a height of 7'-8' tall, but also can be easily maintained at 4'-5' in height with a 3'-4' spread. By pruning the bush to about 12" above the ground in late fall or early spring, you will see it rapidly grow to 3'-4' tall by blooming time. This method of pruning encourages shorter, denser growth and more blooms than by not pruning. Because butterfly bushes bloom on the current season's growth, they should not be pruned after growth has started in the spring. Additionally, dead flower spikes should be pruned off during the blooming period. This will encourage the development of side shoots with more blooms and will help extend the blooming period into September.

Plants should be fertilized in April and again in October with a 5-10-10 or 5-10-5 granular fertilizer. By following these steps, you are guaranteed to have butterflies visiting your garden.

Stauffers' Best Buddleias

- Adonis Blue - Large, deep blue flowers, compact bushy habit.
- Black Knight - Prolific heavy bloomer; dark purple flower spikes.
- Lochinch - Soft lavender-blue flowers and superb silver foliage.
- Nanho Blue - Blue flowers above silvery foliage, compact habit.
- Nanho Purple - Purple flowers above silvery foliage, compact habit.
- Peacock Pink - Brilliant pink blossoms, compact habit.
- Pink Delight - Large pink flower trusses all summer.
- Purple Emperor - Mauve/purple flowers and narrow foliage, very compact habit.
- White Profusion - Pure white flower spikes all summer, nice compact habit.

Planting Instructions

- Dig hole 2 times larger than diameter of pot and as deep as the pot.
- Prepare planting mixture: 1/3 topsoil and 2/3 Stauffers Premium Planting Mix.
- Fill extra depth of hole with soil mixture and tamp firmly to eliminate settling after the bush is planted.
- Remove the plant from the container. “Scoring” the root ball with your fingers or a sharp tool will loosen the fine roots.
- Place plant in the hole with top of root ball level or 1” above ground level. Fill hole 1/2 full with soil mix and tamp firmly to prevent air pockets.
- Soak thoroughly several times. After water soaks away, finish back filling to soil level with soil mix. (shrubs planted too deep will result in death)
- Spread a fine layer of mulch around the shrub being sure not to cover-up branches or pile against stems. Create a small basin with mulch around the edge of the hole to retain water.
- Fill basin with water several times, soaking plant thoroughly.
- Apply a root stimulator to the base of the plant as per the manufacturer’s recommendations. Apply monthly during the growing season to encourage a healthy deep root system.
- Water newly installed plants every 2-4 days for the first month, by placing a hose at the base of the plant, letting it trickle slowly until saturated. This is preferable over shallow watering every day. (Be careful of over watering when planting in heavy clay soils!) Deep roots are developed by deep watering. Continue deep watering every 1-2 weeks, depending on rainfall amounts, for the first year until the ground freezes for the winter. (Remember if a plant looks like it needs water, it is often too late!)



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CITRUS FOR THE HOME GARDEN

March 2008

By Vincent Lazaneo

Horticulture Advisor

Plant or Pest Questions?

Call Master Gardener Volunteers

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Citrus are excellent trees for a home garden. They have shiny green foliage, fragrant white blossoms, and colorful, edible fruit. Citrus are evergreen trees that grow to a height of 6 to 30 feet depending on the variety and rootstock selected. Most varieties are self-fruitful and do not require another variety for cross-pollination.

Selecting Varieties

It's important to consider the climatic conditions of your area when you select citrus. Young trees can be injured or killed when winter temperatures drop below 29°F. Mature trees generally tolerate a few more degrees of cold than young trees. The cold hardiness of citrus trees varies from most tender to most hardy as follows: Mexican lime (28°F.), grapefruit, true lemon, tangelo, Tangor, Bearss lime, sweet orange, most Mandarin oranges, Meyer lemon, kumquat, and calamondin (20°F.). Fruit can also be damaged when temperatures drop below 29°F. Citrus varieties also differ in the amount of heat required to mature their fruit. Lemons and limes need the least amount of heat and will produce good fruit near the coast. Valencia oranges have a higher heat requirement. They produce good fruit in coastal and inland areas but are not adapted to the desert. Navel oranges require more heat and produce their best fruit in inland valleys. Mandarin oranges, tangelos, blood oranges, and grapefruit need even more heat to produce top quality fruit.

Root Stocks

Citrus varieties are grafted onto several rootstocks that vary in their resistance to certain soil diseases. Some rootstocks also have a dwarfing effect on the grafted variety. A standard navel orange can grow 30 feet tall and nearly as wide. The same variety grafted on trifoliolate orange rootstock will produce a mature tree 20 feet tall. Trees grafted on "Flying Dragon" rootstock will grow slowly and reach a height of about 6 to 8 feet.

Buying a Nursery Tree

Wholesale nurseries bud citrus varieties onto a selected rootstock and grow the trees for one or two years before they are sold. Young trees are preferred for planting because of their

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vigor and lower purchase price. Older trees, especially those that are root-bound, do not establish as quickly when they are planted. Healthy, vigorous trees should have leaves that are large with a uniform green color. A good one-year-old tree normally has leaves along the entire length of its trunk. The tree's bark should be bright and clean, and without wounds or other defects. The bud union (where the rootstock joins the scion) should be well healed and at least six inches above the ground.

Where, When and How to Plant

Citrus trees should be planted where they will receive full sun most of the day. In areas that have cool summers, plant against a south-facing wall for extra heat. Citrus should not be planted in a lawn because the watering requirements of the two plants are not compatible. Grass also competes with the trees for nutrients. Citrus trees prefer well-drained loam or sandy loam soils, but with proper irrigation they can be grown in clayey soils. In poorly drained soils, plant above the level of the native soil in raised beds or on gently sloping mounds of soil.

Before you plant a tree, conduct a drainage test to find out how fast water drains through the soil. Dig a hole at least one foot deep and fill it with water. Wait for the water to drain out of the hole, then fill it with water again. All of the water should drain out of the hole by next day. If water stands in the hole for a day or longer, select another planting site or plant on a raised bed.

The best time of year to plant citrus is in the spring after the danger of frost has passed. Trees planted in the spring will have more time to grow and will withstand the cold weather of their first winter better than trees planted later in the year. Early planting is especially desirable in inland areas where hot summer weather can damage trees that are not well established.

Trees should be planted so the top of the root ball is about an inch above the level of the native soil. Gummosis, a fungus disease, often attacks the bark of trees that are planted too deep. Dig the planting hole just deep enough to accommodate the depth of the root ball and at least twice its diameter. The root ball will settle later if it is placed on loose soil, and this will damage the tree. Manure or soluble fertilizer should not be placed in the planting hole because it can injure roots. Be careful not to break the ball of soil that surrounds the roots when the tree is being planted. Check if the top of the root ball is at the correct height, then fill soil in around the root ball, and tamp it lightly.

After the tree is planted, create a watering basin by building a ridge of soil around the tree just beyond the root ball. Water the tree thoroughly several times so the soil will settle and make good contact with the root ball. A layer of coarse organic mulch can be placed on top of the soil to conserve water.

The sun's heat can damage the bark of young trees if it is not shaded by foliage. To protect trees from sunburn, paint the trunk with whitewash or a white, flat (not enamel) interior latex paint mixed with an equal amount of water. A commercial tree wrap will also protect the trunk from sunburn and rodent damage.

Care of Young Trees

Proper irrigation is the most important cultural practice to help young trees become established. Care must be taken to keep the soil moist but not waterlogged. The root ball of a newly planted tree must be kept moist to supply the tree with water until its roots grow into the native soil. During the first year, apply water at the tree's trunk so water will wet the root ball. Place one drip emitter on each side of the trunk or build an irrigation basin and fill with water. After the first year, water a larger area around the tree as it grows. If micro sprinklers are used, place a half-circle head on each side of the trunk and direct the spray away from the trunk. Newly planted trees need to be watered every three to seven days, depending on weather conditions and soil type. Check the tree's root ball every few days, and water when the soil begins to dry out a few inches below the surface. After trees become established, water thoroughly but less often, (about every seven to fourteen days). On sandy soil or in hot weather, irrigation should be more frequent than on clay soil and in cool weather.

Trees should be fertilized lightly during the first year. Use a fertilizer containing nitrogen; a high concentration of phosphorus and potassium is not needed. During the first year, give trees about one tablespoon of chemical fertilizer such as ammonium sulfate (21% nitrogen) monthly during the spring and summer. Scatter the fertilizer uniformly in the irrigation basin, then water thoroughly. After the first year, fertilize trees every four to six weeks beginning in February. Nitrogen fertilizer should not be applied after late summer since this stimulates new growth and makes trees more susceptible to frost injury. Stop applying nitrogen fertilizer if citrus leaf miner severely damages new foliage growth in late summer.

Increase the amount of fertilizer applied as trees grow larger. If you use a commercial fertilizer labeled for citrus, follow the manufacturer's directions for the amount to apply. If a fertilizer containing only nitrogen is used, use the chart below as a guide for the proper amount to apply. For dwarf trees, use half the recommended amount of fertilizer. Nitrogen can be supplied with various fertilizers. The quantity of fertilizer needed will depend on the amount of nitrogen it contains.

<u>Year</u>	<u>Pounds of Actual Nitrogen Annually</u>	<u>Cups of Ammonium Sulfate Per Application*</u>
2	0.2	.5
3	0.4	1.0
4	0.7	2.0
5	1.0	2.5
10	1.5	4.0

*Make a total of four applications during spring and summer (four to six weeks apart).

Scatter fertilizer evenly over the tree's entire root area which extends somewhat beyond the spread of the tree's branches. Do not place fertilizer in piles near the trunk, as this can severely damage the tree.

Maintaining a layer of loose organic mulch on the soil under citrus trees is beneficial. Apply a two or three inch deep layer of wood chips or compost under a tree and allow dead leaves to accumulate. Young trees should be pruned as little as possible. The removal of green leaves retards growth and increases the amount of time required for trees to begin to produce fruit.

Keep mulch at least a foot away from the trunk of mature trees so the bark will remain dry. Young trees can be damaged by frost and should be protected during the first two or three winters. To do this, build a framework around the tree and cover it with a cloth tarp (plastic does not retain as much heat) when frost is predicted. For extra protection in cold areas the trunk can be wrapped with a four-inch thick sheet of fiberglass building insulation, or other suitable material.

Care of Mature Trees

Trees require moisture for growth and fruit production. In arid regions, trees must be irrigated periodically; however, excessive irrigation can exclude oxygen and cause root decay, especially if soil drainage is poor. Citrus roots normally extend well beyond the area covered by foliage. A circle 1-1/2 times the diameter of the tree's canopy will contain most of the roots. All of this area should be irrigated, with the exception of soil close to the tree's trunk, which should be kept dry to discourage bark diseases like Gummosis. Apply enough water at each irrigation to wet the soil three feet deep. This requires three to six inches of water depending on the type of soil. Water can be applied with sprinklers or by flooding a large basin. During dry weather, trees should be irrigated every two to six weeks depending on weather conditions and soil type. A layer of organic mulch will help retain soil moisture and permits feeder roots to grow close to the surface. Mulch should not be placed close to the trunk of a mature tree.

Mature citrus trees are given fertilizer to maintain their growth and fruit production. Nitrogen is the chief nutrient required by citrus and should be applied each year. Smaller quantities of phosphorus and potassium are required. These nutrients are held in the soil much longer than nitrogen.

A mature citrus tree requires 1 to 1-1/2 pounds of actual nitrogen each year. To calculate the number of pounds of fertilizer to apply, divide the pounds of nitrogen desired by the percentage of nitrogen in a fertilizer product. For example, it would take about five pounds of ammonium sulfate (21% nitrogen) to supply one pound of actual nitrogen. (One pound of actual nitrogen desired divided by 21% nitrogen in ammonium sulfate then multiply by 100). Split the amount of fertilizer into four lots. Apply the first lot in February and the remaining lots at four to six-week intervals. Scatter the fertilizer evenly over the tree's entire root area except near the trunk, then irrigate thoroughly to dissolve the fertilizer and carry it into the root zone.

Citrus may occasionally suffer from a deficiency of zinc or iron. When these nutrients are deficient, the tissue between leaf veins turns yellow, but the veins remain green, at least initially. Foliar sprays containing chelated zinc or iron can be used to correct these deficiencies. Iron deficiency can also be caused by excessively wet soil or by very alkaline soil (pH above 7).

Citrus is ready to harvest when the fruit has colored and is mature. The fruit of most varieties color in the fall, but may not be sweet enough to harvest for several months. Fruit should be left on the tree until it attains a satisfactory sweetness. Navel oranges usually mature in late winter, Valencia oranges in mid-Summer, and Mandarins from early winter to spring, depending on variety. Grapefruit require at least 18 months to mature in coastal areas. Mature fruit should be carefully harvested. Any break in the rind will promote decay. Use sharp

clippers to cut the stem close to the fruit. Fruit can be stored on the tree several weeks to several months, depending on variety, after it is mature. Fruit left on the tree too long will become overripe and can reduce the size of the following year's crop.

POPULAR CITRUS VARIETIES

ORANGE		
WASHINGTON NAVEL	Jan – May	Good to eat fresh. Easy to peel. Seedless
VALENCIA	May – Oct	Best for juice. Hard to peel. Few seeds
BLOOD ORANGE: MORO	Feb – May	Burgundy flesh. Juicy. Aromatic
MANDARIN		
CLEMENTINE	Feb – Apr	Few to many seeds. Juicy
DANCY	March – Apr	Seedy. Moderately juicy. Tangy
GOLD NUGGET	March – July	Juicy. Fair to peel. Seedless
SATSUMA	Dec – Apr	Seedless. Juicy. Mild
LEMON		
EUREKA	Almost all year	Few seeds. Acid
LISBON	Almost all year	Few seeds. Acid. More thorny than Eureka.
IMPROVED MEYER	Almost all year	Few to many seeds. Less acid than lemons. (Not a true lemon)
GRAPEFRUIT		
STAR RUBY	May – Oct	Needs less heat than Marsh. Few seeds. Pinkish flesh.
ORO BLANCO HYBRID	March – July	Few seeds. Juicy. Heavy membrane on segments. Good along the coast.
LIME		
BEARSS	Aug – March	Rind turn yellow when fruit ages
TANGELO		
MINNEOLA	Feb - Apr	Juicy. Tart
KUMQUAT		
MEIWA	Jan – Mar	Few seeds. Sweet rind
NAGAMI	Dec – Mar	Slightly tart rind

CITRUS PESTS AND PROBLEMS IN THE HOME GARDEN

PESTS that attack citrus include insects, mites, snails and rodents. Trees should be checked regularly to detect pests before serious injury occurs. Treatments for some common citrus pests are described below.

Biological Control

Naturally occurring predators and parasites control many insect pests of citrus. Gardeners can do several things to help beneficial insects. Trees should be washed off periodically with a forceful spray of water. Dust that accumulates on leaves dries out beneficial insects and makes it more difficult for them to find their prey. Trees should not be sprayed with insecticides that leave a toxic residue on the foliage unless severe pest injury would otherwise occur. Long lasting insecticides kill beneficial insects for days or weeks after trees are sprayed. Sprays containing insecticidal soap or horticultural oil kill pests by suffocation and are less harmful to beneficial insects. Ants should be kept off citrus trees because they drive off and kill beneficial insects.

Ants

Aphids, whiteflies, mealybugs, and soft scale insects feed on plant sap and excrete a sugary liquid called honeydew. Ants feed on deposits of honeydew and they protect pests from beneficial insects. Ants can be prevented from climbing up citrus trees by applying a sticky barrier like Tanglefoot around a tree's trunk. Tanglefoot may damage trees if it is applied directly to the bark. First wrap a strip of heavy paper or other protective material around the trunk and then apply Tanglefoot to the outside surface. Periodically check the sticky barrier and refresh it when needed. In order for the barrier to be effective branches must be pruned so that they do not touch the ground or other structures. Ants can also be controlled with toxic baits that they take back to their nest and feed to other ants in the colony. Baits take time to work and must be replaced periodically.

Aphids

Aphids are small insects with soft, pear-shaped bodies and long legs. Their color varies from green to black. They remove sap from succulent foliage and excrete honeydew. Young leaves that are injured become distorted as they grow. Older trees are not seriously injured. Heavy infestations may slow the growth of young trees. Dislodge aphids with a forceful spray of water, or spray with insecticidal soap or oil. Keep ants off trees.

Whiteflies

Adults are small insects with powdery white wings and bodies. Larvae feed on the undersides of leaves. They are immobile, with round and flattened scale-like bodies. Some whitefly larvae produce waxy filaments and have a cottony appearance. Larvae feed on plant sap and excrete honeydew. Heavy infestations cause leaves to yellow and drop prematurely. Beneficial insects usually control whiteflies if ants are kept off trees and foliage is washed periodically to remove dust. Spray with insecticidal soap or oil to reduce severe infestation.

Scale Insects

Scale are small insects which are covered by a shell one-eighth to one-quarter inch across. They are found on leaves, stems and fruit. Eggs are laid under a protective shell and hatch into mobile crawlers. After a few days, crawlers settle and insert their mouth parts into the plant tissue. They produce a protective covering and remain in the same location for the rest of their lives. Scale insects feed on plant sap. Some species produce honeydew and some produce toxins that damage plant tissues. Heavy infestations stunt plants, cause leaf drop and branch die back. To control scale, apply horticultural oil. If soil is dry, irrigate a day or two before treatment. Crawlers can also be controlled with insecticidal soap, but several applications are required to control successive generations.

Mites

Mites are very tiny and difficult to see without magnification. They have piercing mouth parts and feed on plant sap. Spider mites cause leaves to yellow and drop prematurely. Citrus rust mites cause the skin of citrus fruit to dry out and discolor. Oranges turn brown to black. Lemons and grapefruit turn gray. Periodically washing foliage off with a forceful spray of water helps control spider mites. Apply sulfur to control rust mites.

Citrus Leafminer

Tiny moths lay eggs on new leaves less than ½ inch long. The larvae feed inside developing leaves and leave a whitish trail. Mature trees produce healthy foliage in spring and tolerate leaf damage later in the year. Growth of young trees (less than five years old) may be stunted (see IPM Pest Note on Citrus Leafminer at www.ipm.ucdavis.edu for more information).

Snails

The European garden snail may cause considerable damage to citrus. It feeds on both the foliage and fruit. A four-inch wide band of copper sheeting wrapped around a tree's trunk can keep snails from climbing up the trunk. Decollate snails are a natural predator. Bait containing iron phosphate is toxic to pest and beneficial snails.

Gophers

Pocket gophers can kill citrus trees. They feed on the bark below the soil surface, and the damage is not initially apparent. Keep gophers under control with traps or poison baits.

Splitting of Oranges

Navel oranges often split during the fall. The split usually starts at the navel end of the fruit, which is the weakest point of the rind. Valencia oranges may also split in some years. Studies indicate that changes in temperature and relative humidity are mainly responsible for fruit splitting. Damage to fruit can be reduced by maintaining adequate soil moisture.

Reference

For more information on Citrus Pests, see UC publication #3303, [IPM for Citrus](#).

BLUE OAK

Quercus douglasii Hook. & Arn.

Plant Symbol = QUDO

Contributed by: USDA NRCS National Plant Data Center



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Uses

Ethnobotanic: Blue oaks had and continue to have significant meaning to native cultures. The most significant use of blue oak was for its highly desirable acorns for food. Acorns were shelled, dried, pounded into flour, sifted for fineness, leached of bitter tannins, and mixed with other acorn types such as black oak (*Quercus kelloggii*) and prepared as mush, soup, paddies, or bread. Called "acorn" by contemporary gatherers, this food is still relished for ceremonies, festivals, dances, and family gatherings.

California's blue oak provided many resources to California Indian people including medicine, dyes, utensils, games, toys, and construction materials. The inner bark of the blue oak was boiled and the brew drank for relief of arthritis by the Kawaiisu. Acorns served as bait in traps and snares to catch pigeons, flickers, quail, and jays by the Gabriolino, Sierra Miwok and other tribes. California blue oaks grow new sprouts vigorously after a fire and these young shoots exhibit highly desirable qualities for manufacturing products. These characteristics include flexibility, length, no lateral branching, easily split, and straightness. These shoots were used for

basketry and oak sprouts were reputed to have great strength. Types of baskets included Miwok, Pomo, and Maidu cradleboards with frameworks of oak shoots, and Kawaiisu twined work-baskets made with rims of blue oak branches. The Salinan along the central coast made seed-beaters with a looped stick of oak. The Yana used an oak paddle in cooking and the Achomawi made spoons of oak. The Kawaiisu made a ladle about a foot long that was carved from the wood of blue oak. Forked oak sticks, darkened by charring, were used as fake antlers on deer masks of the Sierra Miwok for hunting purposes. The Maidu of Chico Rancheria constructed their houses with posts of oak. The Western Mono also used young oak switches as construction materials for certain structures such as acorn granary frameworks. Digging sticks were made of blue oak by the Western Mono for roasting yucca bulbs, blue oak was preferred as firewood by the Kawaiisu and the pith of the oak was used for starting fires. Fallen oak limbs make excellent firewood, because the coals retain heat and the Shasta, Sierra Miwok, and many other tribes used the wood. Acorns were utilized by many tribes in the manufacture of toys including acorn buzzers and acorn tops. Split acorns often formed dice, which could be rolled upon a flat, coiled basketry tray. The Miwok, the Western Mono, Pomo, Sinkyone, and other cultural groups used these.

Wildlife: It is well known that bears (*Ursus americanus*), ground squirrels (*Spermophilus scrofa*), jays (*Cyanocitta stelleri*), band-tailed pigeons (*Columba fasciata*), acorn woodpeckers (*Melanerpes formicivorus*), pocket gophers (*Thomomys bottae*), deer mice (*Peromyscus* spp.) and black-tailed deer (*Odocoileus hemionus*), among many other animals find acorns a favorite food source.

Status

Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status, such as, state noxious status and wetland indicator values.

Description

General: Oak Family (Fagaceae). Blue oak is a deciduous tree that is endemic to California. It has a rounded crown and grows from 6-20 m. high. The gray bark is shallowly checked into small thin scales. The leaves are shallowly lobed and blue-green above.

The acorns mature in one year, are oval, and have slightly tubercled scales.

Distribution

For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.



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Establishment

Adaptation: Blue oak woodlands cover 3 million acres in California, one-half of all oak covered lands. It is the most abundant hardwood forest type in the state. Blue oak may occur in near pure stands in dense woodland or savanna. It may also occur as a dominant in mixed stands that include foothill pine (*Pinus sabiniana*), interior live oak (*Quercus wislizenii*), valley oak (*Quercus lobata*), and/or coast live oak (*Quercus agrifolia*), or as a minor component in mixed stands of oaks and other hardwoods.

If possible, gather acorns from many different trees locally, to maintain genetic diversity of blue oak and to ensure that the plants are adapted to the site. The seeds of most oaks are short-lived and must be sown or refrigerated quickly, otherwise they lose their ability to germinate. They are best gathered directly from the tree or from the ground within a short time of their dropping, usually within several days. To test their ripeness, select an acorn that is still in its cap and twist it lightly. If it pops out of the cap, the acorn is ripe. Store the seeds without their caps in a grocery sack until ready to plant. The seeds can be sown in autumn outdoors (see under direct seeding), or if the seeds are started in pots in the greenhouse in the early spring, they should be stratified for one and one-half months between 33 and 40 degrees in a refrigerator in a mix.

Fill a gallon Ziploc™ bag about half full with acorns, and then add about a cup of dry perlite and a little bit

of vermiculite (3:1 mixture). Shake the bag to distribute the perlite around the acorns, label the bag, and place it in the refrigerator. Check the bag weekly and discard moldy acorns. Any acorns that have germinated need to be taken out of the bag and sown. Plant the seeds on their sides directly in long, deep pots (2 in. in diameter by 10 inches long) with potting soil and a slow release fertilizer. Water the tubes and place them in diffused light in the nursery or outside, making sure to keep each tube suspended off the ground or bench so the large air holes at the bottom of the tube are exposed. When the tree roots hit the air, they'll stop growing. Water the pots when the surface of the soil is dry to the touch. Do not over-water.

Plant the seedlings the following winter in a sunny location and water the transplants to ensure sufficient moisture and eliminate air pockets. Be careful to keep the soil from falling off of the roots. Place the seedlings in the ground such that the top of the soil from the container is even with the ground line. Use a pick mattock for planting, which has a pick on one surface and a triangular wedge on the other surface. Break up the soil, which will foster root growth. Protect the seedlings from weeds, drying winds, grasshoppers, and small and large mammals that might feed on the roots, leaves, or trunks. Also, water the seedlings deeply the first summer. A good seedling protector is essential and can be a simple wire window screen mesh and wooden stake. Bend the mesh into a cylinder that is about 6-8 inches in diameter and 3 feet tall. Attach the mesh cylinder onto the wooden stake with staples or carpet tacks. Place the tube over the seedling and pound the stake into the ground. Seedlings should be kept free of vegetation for 2 to 3 feet surrounding each seedling.

Direct Seeding: Pick acorns without insect exit holes or diseases. Store acorns for one and one half months in a sealed plastic bag in the refrigerator. Dig a hole with the trowel, shovel, or hoe and be sure to break up the soil much deeper (one to two feet) than the acorn is planted and backfill with loosened soil to accommodate the growing of roots. Plant the acorns on their sides, one to two inches deep in the fall of the year. Plant several acorns in each hole and thin multiple seedlings down to a single most vigorous plant. Water the acorns deeply the first summer. Weed several feet around each seedling for several years. Protect the seedlings from animals until well established.

Management

Keep lawns and plants that require a lot of moisture away from the oaks. Blue oak should not be irrigated

accept in years of unusually low rainfall. If a drought year, supplemental watering can take place in the spring to complement natural rainfall. Water the soil from halfway between the trunk and the drip line to 10-15 feet beyond, allowing water to penetrate the soil to a depth of 18 to 24 inches. It may be necessary to water for 4 to 6 hours to get water to this depth. Keep water at least 10 feet away from the trunk. Native plants that are drought-tolerant and shade-tolerant and require no summer water can be planted under the oaks, such as California brome (*Bromus carinatus*), deergrass (*Muhlenbergia rigens*), sego lily (*Calochortus* spp.), and bluedicks (*Dichelostemma* spp.), among others. Light pruning can be done in the winter on mature oaks to remove weak, diseased, and dead branches, but never top oaks.

Once established, blue oak is quite fire-tolerant. Many tribes in California set frequent light-surface fires in areas of blue oak to ensure continual yields of high-quality acorn. Major reasons for their burning included the following: 1) facilitating acorn collection; (2) increasing the quality and quantity of acorn production through decreasing diseases; (3) increasing the quality and quantity of acorn production through decreasing acorn pests; 4) stimulating the production of straight shoots (epicormic) for the making of cultural items; 5) decreasing the likelihood of major conflagrations that would destroy the oaks; 6) burning for mushrooms; and 7) increasing edible grasses and other seed-bearing herbaceous plants under the oaks and within the surrounding woodlands.

Cultivars, Improved and Selected Materials (and area of origin)

Readily available from most native plant nurseries within its range. Contact your local Natural Resources Conservation Service (formerly Soil Conservation Service) office for more information. Look in the phone book under "United States Government." The Natural Resources Conservation Service will be listed under the subheading "Department of Agriculture."

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Crop Profile for Figs in California

Prepared: December, 1999

General Production Information

- California ranks first in the nation in fig production, accounting for nearly 100% of all figs produced nationally (1). California ranks second, after Turkey, in the worldwide production of figs (2).
- In 1998, 16,276 acres produced 1.05 tons of dried figs per acre at a price of \$586 per ton (9).
- The value of California's fig crop in 1998 was \$9,662,554 (9).
- In 1998, the variety Calimyrna was produced on approximately 45% of the acreage. The varieties Adriatic, Mission and Kadota were produced on 25%, 23% and 7% of the acreage, respectively (9).

Production Regions

Fig-producing regions typically have mild winters and hot, dry summers. The fig tree can withstand some frost and are drought-tolerant. Figs can be grown on a wide range of soils, but the soil should be well-drained (3). The San Joaquin Valley is the predominate fig-producing area in California with Madera, Merced, and Fresno counties leading in production (1).

Production Practices

Franciscan missionaries planted the first figs in California in 1769. There are two types of figs grown in California: Smyrna and common figs. Smyrna figs require pollination by a fig wasp, *Blastophaga psenes*, whereas, common figs produce fruit without pollination. Some common fig cultivars grown in California are Kadota, Mission, Conadria, and White Adriatic. The Smyrna-type fig cultivar grown in California is Calimyrna (2, 3). Figs that require wasp-pollination consist of two groups of trees, the caprifig and the edible fig. The caprifig produces an inedible false-fruit that is necessary for the pollination of edible figs because they provide the habitat for the wasp. Since it has been discovered that spores of *Fusarium moniliforme* were transmitted from caprifigs to the edible fig, caprifigs are no longer planted in rows among the edible fig. Instead separate plantings are established and caprifigs are picked just before the wasps begin to emerge. Disease-free caprifigs are then placed in wire baskets or paper bags hung in the trees of edible figs (6).

Young figs are grown from rooted cuttings. The trees are planted approximately 12 feet apart with 20-28 feet between rows. Fig trees will bear sufficient fruit for commercial harvest after 2-3 years. Irrigation

systems include furrow, flooding, sprinklers and drip. Nitrogen is the only nutrient applied regularly at 20 – 40 lb/acre (2, 3).

A small percent of figs are hand picked for fresh market. Most figs semi-dry on the tree and are allowed to fall to the ground to be mechanically collected. Harvests occur at 1-2 week intervals during the harvest season from June 10 – October 15 (1, 2).

Pesticide Data:

Label rates, re-entry intervals and pre-harvest intervals for all chemicals listed in this document are from labels. Many of the labels are contained in the Crop Protection Reference (4) or at <http://www.cdms.net/manuf/manufac.asp>. Percent of acres treated, average number of applications, median application rate, and total lb a.i. applied are from the California Department of Pesticide Regulation (5).

Insect Pests

Driedfruit Beetles

Driedfruit beetle: *Carpophilus hemipterus*

Freeman sap beetle: *Carpophilus freemani*

Confused sap beetle: *Carpophilus mutilatus*

Driedfruit beetles, also known as sap beetles, belong to the family Nitidulidae. Driedfruit beetle, *Carpophilus hemipterus*, is the most common species, but the Freeman sap beetle, *C. freemani*, and the confused sap beetle, *C. mutilatus*, are also common and can be the most abundant in some orchards. Adults are small brown or black beetles with or without lighter spots on the wings, depending on the species. They range in size from 0.1 to 0.2 inch long. Larvae are white and 0.1 to 0.2 inch long when mature. They have tan head capsules, three pairs of true legs, and two hornlike structures on the posterior. Driedfruit beetles have a wide host range and will infest any ripe or fermenting fruit.

Driedfruit beetles can be very damaging to figs. Their presence in the fruit results in downgrading or rejection of the fruit. They transmit spoilage organisms that cause fruit souring. They also increase the attractiveness of the fruit to other pests such as vinegar flies and navel orangeworm.

All commercial varieties of figs are susceptible to infestation by driedfruit beetles. However, varieties that have small eyes, such as Missions, are usually less affected. Calimyrna has a large eye that renders it easily infested.

Since driedfruit beetles feed on moldy, mummified fruit, growers attempt to remove all fruit from the orchards to reduce the overwintering population. Early, rapid harvesting and fumigation with methyl bromide or aluminum phosphide are used to avoid subsequent emergence and infestation of the later maturing portion of the crop.

Growers monitor driedfruit beetles by baiting traps with cull fruit, water, and yeast (7).

Control

Non-Chemical:

Fig orchards are located as far as possible from other host orchards such as stone fruits and citrus since driedfruit beetles can fly several miles to find a suitable host. Bait trapping of driedfruit beetles in large containers baited with cull fruit, water, and yeast may be effective in reducing the population if done before the fruit ripens and becomes attractive (7).

Chemical:

A dormant treatment may be useful in reducing overwintering populations in isolated orchards that have experienced severe problems with this pest.

- Aluminum Phosphide - In 1997, 452.55 lb a.i. were applied to 120 acres, 3,491.5 tons, and 2,859,100 cubic feet of figs and fig facilities in California.

Fig Scale

Lepidosaphes conchiformis

Overwintering fig scale adults are dark brown with a greasy appearing wax coating. Summer broods and younger scales are lighter in color. Eggs are laid in spring and crawlers hatch when leaves are unfolding. First generation scales settle on leaves, but later generations settle on leaves, twigs, or fruit. Adult female scales are oystershell shaped, about 0.1 inch long and overwinter on 1- to 2-year old wood. There are usually three to four generations per year. Scale feeding causes a callous tissue to form on the skin giving the fruit a warty appearance. Fruit with scale damage is downgraded and is no longer suitable for use in a consumer packages. The fruit is instead used in manufacturing products (7).

Control

Non-Chemical:

A wasp parasite (*Aphytis* sp.) generally gives excellent control of the fig scale. If the scale parasite has been disrupted for some reason, chemical control may be necessary (7).

Chemical:

Dormant season treatments will usually control the scale and will have the least disruptive effect on the parasites. Narrow range oils are used when needed, but were not used in 1996 and 1997.

Navel Orangeworm

Amyelois transitella

The adult navel orangeworm is a secondary pest of fig. The adult moth is grayish-brown, approximately 0.6 inch long and has short snoutlike projections from the front of the head. Larvae are caterpillars that are white to deep pink and are up to 0.8 inch in length when mature. Eggs are laid in fissures on the ripening fruit or under the scales around the eye and are white, turning pink within a few days of being laid. Navel orangeworms have a wide host range and overwinter in mummified fruits hanging on trees. Navel orangeworm caused damage when feeding on the fruit (7).

Control

Non-Chemical:

Growers harvest rapidly and early and remove and destroy leftover cull fruit. Surrounding hosts such as almonds are also cleaned up. An introduced parasite, *Goniozus legneri*, has been released with some success in almond orchards for control of navel orangeworm. No data has been developed for the efficacy of the wasp in fig orchards (7).

Chemical:

Chemicals applied for the control of driedfruit beetles may partially control navel orangeworm populations. No chemical control guidelines have been developed for navel orangeworm in figs (7).

Vinegar Flies

Drosophila spp., principally *D. melanogaster*

Drosophila adults are small, tan to amber-colored flies with red eyes, about 0.12 inch long. Larvae are small, white, legless maggots up to 0.2 inch long. Vinegar flies cause damage similar to the driedfruit beetle in that the presence of vinegar flies in the fruit causes downgrading or rejection of the fruit. They can also transmit spoilage organisms to sound fruit. Late ripening varieties are especially susceptible to damage. Vinegar flies breed in fermenting or decaying fruit (7).

Control

Non-Chemical:

Fermenting or decaying fruit is disced under or shredded to reduce the population. A rapid and early harvest will reduce exposure of fruit to infestation (7).

Chemical:

Chemicals applied for driedfruit beetle control will partially reduce vinegar fly populations.

- Piperonyl Butoxide/Pyrethrins – Label has a rate of 0.075-0.6 lb piperonyl butoxide/acre and 0.0075-0.06 lb pyrethrins/acre. 12-hour REI. In 1997, 16 lb piperonyl butoxide were applied to

0.11% of the fig acreage in California 1 time at a median rate of 0.15 lb a.i./acre. In 1997, 2 lb pyrethrins were applied to 0.11% of the fig acreage in California 1 time at a median rate of 0.02 lb a.i./acre.

Webspinning Spider Mites

Pacific spider mite: *Tetranychus pacificus*

Twospotted spider mite: *Tetranychus urticae*

The twospotted spider mite is most common in the Sacramento Valley and the Pacific spider mite in the San Joaquin Valley. Abundant webbing on both sides of the leaves is evidence of an infestation. The two mites are not easily distinguished and they overwinter as adult females under bark and in weeds. Eggs are laid on the underleaf surface and there are many overlapping generations each summer. Spider mites feed by sucking the contents out of leaf cells which reduces tree vitality. Heavy feeding causes browning of leaves and defoliation. Vigorously growing trees are much more tolerant to mite attack than trees under stress (7).

Control

Non-Chemical:

Naturally-occurring predaceous mites, *Metaseiulus* spp., and sixspotted thrips, *Scolothrips sexmaculatus*, feed heavily on webspinning mites and may give complete control in the orchard. The western flower thrips, *Frankliniella occidentalis*, feeds on mite eggs and may prevent a mite population from increasing (7).

Chemical:

- Narrow Range Oil - In 1997, narrow range oil was used on 0.13% of the fig acreage. Narrow range oil is acceptable for use on organically grown produce.
- Diazinon – In 1997, 53 lb a.i. were applied to 0.36 % of the fig acreage in California 1 time at a median rate of 0.5 lb a.i./acre. Currently labeled for figs under SLN registration for fruit fly quarantine treatment only.
- Sulfur – Label has a rate of 3.2-4.8 lb a.i./acre as a dilute application or 12-24 lb a.i./acre as an air or concentrate application. 24-hour REI. In 1997, 9,434 lb a.i. were applied to 4.21% of the fig acreage in California 1.5 times at a median rate of 1.35 lb a.i./acre.

Insects that either do not require chemical treatment or that no chemical control guidelines have been developed for include; Green June Beetle, Darkling Ground Beetle and Carpenter Worm.

Weeds

In addition to problems at harvest, weeds can cause a multitude of other problems in fig orchards by reducing the growth of young trees because they compete for water, nutrients, and space. Weeds also increase water use, cause vertebrate and invertebrate and other pest problems, and may enhance the potential for disease such as crown rot. Most orchards are no-till requiring the use of herbicides and/or mowing to control weeds. The increasing use of more efficient low-volume irrigation systems has increased the need for selective pre-emergence herbicide use in drip, microsprinkler, and sprinkler-irrigated orchards. Pre-emergent herbicides are generally used only in the tree row. This reduces the total amount of herbicides and prevents the surface roots in the tree row from being damaged by cultivation equipment. By treating the tree row only, 25% to 33% of the total acreage is treated. Pre-emergence and post-emergence, or combinations of pre- and post-emergent herbicides are often used between tree rows. Soil characteristics have an effect on the weed spectrum (often 15-30 species per orchard), the number of cultivations and irrigations required, and the residual activity of herbicides. Irrigation methods and the amount of irrigation or rainfall affects herbicide selection and the residual control achieved.

Fig orchards may benefit from plants on the orchard floor if they are carefully managed. These plants in a well-maintained ground cover, can help increase water infiltration, reduce soil compaction, maintain soil organic matter content, cool the orchard, and provide habitat for beneficial insects (8). **Monitoring:** Treatment decisions and herbicide selections are based on dormant and early summer weed surveys.

Control

Chemical:

- Glyphosate – Label has a rate of 1-5 lb a.i./acre and a 14-day PHI. 12-hour REI. In 1997, 17,024 lb a.i. were applied to 72.24% of the fig acreage in California 2 times at a median rate of 0.52 lb a.i./acre.
- Oryzalin – Oryzalin is a pre-emergence herbicide and has a label rate of 2-6 lb a.i./acre. 12-hour REI. In 1997, 3,098 lb a.i. were applied to 13.96% of the fig acreage in California 1 time at a median rate of 2.65 lb a.i./acre.
- Oxyfluorfen – Oxyfluorfen is a pre-emergence or early post-emergence herbicide and has a label rate of 0.5-2.0 lb a.i./acre post-emergence and 1.25-2 lb a.i./acre pre-emergence. 24-hour REI. In 1997, 2,317 lb a.i. were applied to 41.28% of the fig acreage in California 1 time at a median rate of 0.72 lb a.i./acre.
- Paraquat Dichloride – Label has a rate of 0.63-0.94 lb a.i./acre and a 13-day PHI. 12-hour REI. In 1997, 219 lb a.i. were applied to 2.55% of the fig acreage in California 1 time at a median rate of 0.76 lb a.i./acre.

Diseases

Fig Endosepsis

Fusarium moniliforme

Fusarium solani

Fusarium dimerum (= *F. episphaeria*)

Fig endosepsis is also called internal rot, brown rot, eye-end rot, pink rot and soft rot. Infected caprifigs or edible figs have internal brown streaks and discolored areas at the base of flowers. Occasionally entire flowers are brown. The brown streaks eventually become yellow-brown spots affecting many flowers within the fig. In early infection, no external symptoms are noticeable. Eventually a water-soaked circular area of skin, usually beginning around the eye, appears. This area eventually extends down the sides to the neck and turns purple in color. A clear or amber-colored syrupy liquid may exude from the eye of the fig. Infection of the pulp causes off-flavor of the fruit.

Fusarium moniliforme and other species of *Fusarium* cause endosepsis (12). *Fusarium* spp. overwinter in the summer crop of the caprifig. Spores are produced in the spring and are transferred by the fig wasp when it emerges from the fruit to "pollinate" the spring caprifig crop. Wasps enter the Calimyrna figs when they are still green to lay eggs. The wasp dies inside the fruit and the fungus develops on its body. Since the fungus is unable to invade unripe fig tissue, infection occurs when the fruit begins to ripen. Both caprifigs and Calimyrna figs are affected by endosepsis as are other varieties that are pollinated by the wasp. Parthenocarpic cultivars occasionally develop fig endosepsis (7).

Control

Non-Chemical:

It is important that the unharvested mamme (winter) crop in the orchard be eliminated before disease-free mammes are reintroduced (6). Avoid overcaprification by cutting down any caprifig trees present in a Calimyrna orchard (10, 11).

Chemical:

The inedible, mamme caprifigs are split in half, using care to not harm the wasp, and any with internal discoloration are discarded. Healthy fruit is treated with benomyl to ensure that the *Fusarium* spores do not contaminate emerging wasps. The treated fruit is then placed in a paper bag or a basket and hung in the edible fig orchard to pollinate the edible fig (6).

A mixture of benomyl, chlorothalonil, and dicloran and the addition of small amounts of dish soap (or naconnol, a surfactant) provide the best reduction of endosepsis in the winter crop. However, there were no uses of these materials in 1997.

Diseases of fig that either do not require chemical treatment or no chemical controls are available include; Alternaria Rot, Smut, Sour Rot, Botrytis Limb Blight, and Fig Mosaic Virus.

Nematodes

Lesion nematode: *Pratylenchus vulnus*

Root knot nematode: *Meloidogyne incognita* and *M. javanica*

Dagger nematode: *Xiphinema index*

Nematodes are microscopic roundworms that live in soil and plant tissues and feed on plants by puncturing and sucking the cell contents with a spear-like mouthpart called a stylet. Lesion, root knot, and dagger nematodes are known to cause reduction in growth and yield. Fig trees are likely to be more susceptible to temperature and water stress. Lesion nematode infested trees may appear stunted with very few feeder roots. Roots may have reddish brown lesions that eventually turn dark. Root knot nematode infested trees are also likely to have reduced growth and appear stunted. The roots have distinctive swellings, called galls. Dagger nematode causes gall formation on root tips. These symptoms are indicative of a nematode problem, but are not diagnostic as they could result from other causes as well. If no other cause is evident, the orchard should be sampled to determine if plant parasitic nematodes are present. Since nematode problems on fig in California have not been extensively studied, there are no specific treatment recommendations. However, trees planted in soil fumigated with 1, 3-dichloropropene and metam sodium are known to grow considerably better than trees planted in non-fumigated soil (7). There were no fumigation treatments for nematodes in 1997.

Vertebrate Pests

Ground squirrels and gophers are pests in fig orchards. Birds are also a problem and are especially damaging in remote orchards where their high concentration can result in significant economic losses. A bird pecked fig is unsuitable for consumer packages and must be used for manufacturing products at a financial loss to growers.

Control

Chemical:

- Strychnine - In 1997, 0.2 lb a.i. were applied to 480 of California's fig acres.
- Diphacinone – In 1997, 0.7 lb a.i. were applied to 1,570 of California's fig acres.

FACILITIES AND STORAGE

Storage pests of figs include several species of insects. Dried figs are generally fumigated to control these pests.

- Methyl Bromide - In 1997, 8,299.13 lb a.i. were applied 7,121,048.8 cubic feet and 26 tons of figs and fig facilities in California.
- Chloropicrin - In 1997, 555.06 lb a.i. were applied 1,682,000 cubic feet of fig facilities in California.
- Aluminum Phosphide - In 1997, 452.55 lb a.i. were applied to 120 acres, 3,491.5 tons, and 2,859,100 cubic feet of figs and fig facilities in California.

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Database and web development by the [NSF Center for Integrated Pest Managment](#) located at North Carolina State University. All materials may be used freely with credit to the USDA.

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Pepper tree (California pepper tree)—*Schinus molle** Family Anacardiaceae (Sumac family)

Plant identification

Pepper trees are informal evergreen trees that grow 25 to 40 feet tall. They tend to have aggressive roots and drop tree litter.

*May be considered an [invasive weed](#).

Optimum conditions for growth

Pepper trees can grow in several climatic zones. They prefer full sun and well-drained soils. They need little water once established. Provide adequate training when young. Prune to allow for high branching to walk under. Pepper trees need room to spread.



California pepper tree

Pests and disorders of *Schinus molle*

Invertebrates

- [Armored scales](#)
 - Greedy scale
 - Oleander scale
- [Foliage-feeding caterpillars](#)
 - Omnivorous looper
- [Psyllids](#)
 - Peppertree psyllid
- [Soft scales](#)
 - Barnacle scale
 - Black scale
 - Green shield scale
 - Hemispherical scale
 - Wax scales
- [Thrips](#)
 - Citrus thrips

Diseases

- [Armillaria root rot](#)
- [Verticillium wilt](#)
- [Wood decay](#)

Environmental disorders

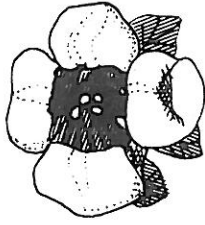
- [Frost](#)
- [Leaf burn or scorch](#)
- [Mineral deficiencies](#)
- [Nutrient and mineral excesses](#)
- [Poor water management](#)

Weeds

Vertebrates



Pepper tree leaves and berries



GROWING PERSIMMONS



Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

LEAFLET 21277

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COOPERATIVE EXTENSION
UNIVERSITY OF CALIFORNIA
MERCED, CALIFORNIA

GROWING PERSIMMONS IN CALIFORNIA

INTRODUCTION

Oriental persimmons can be grown in many areas of California. At one time they were widely grown commercially in southern California, but commercial production is now largely confined to the the San Joaquin and Sacramento Valleys. As an ornamental or yard tree the Oriental persimmon is prized for its fruit, which matures in October and November, and its freedom from pests and diseases.

The Oriental or Japanese persimmon (*Diospyros kaki*) has been grown widely in China and Japan for centuries. A member of the Ebenaceae family, it is related to other persimmon species including *D. lotus* and *D. virginiana* (native American persimmon) which are used for rootstocks. Certain species in tropical Asia and Africa furnish ebony wood.

The best Japanese and a few Chinese varieties were introduced as grafted nursery trees between 1870 and 1920 by the United States Department of Agriculture, the University of California, and commercial growers. Out of more than 500 introductions only a few varieties are presently marketed.

Virtually all persimmon fruit sold in the U.S. is grown in California. In 1981, there

were about 700 acres in California, although the average in the 1930's and 1940's reached 2,000 acres. Statewide yields average about 5 tons per acre and individual trees have been known to produce up to 400 pounds of marketable fruit.

With satisfactory cultural conditions, a persimmon orchard may come into commercial production by the fifth or sixth year. Full production is seldom attained until the tenth year. Development costs may be amortized by the end of the tenth year if cultural conditions are favorable.

The characteristic astringency of unripe persimmons is caused by soluble tannin in the flesh. This astringency disappears in most varieties when the fruit ripens and softens; in others it disappears when the flower is pollinated and the fruit becomes seedy. In Fuyu and a few other nonastringent varieties, the flesh is edible when mature and firm.

Hachiya variety, a seedless astringent type, is picked when mature and firm, but must be allowed to soften before astringency disappears, after which the fruit may be eaten.

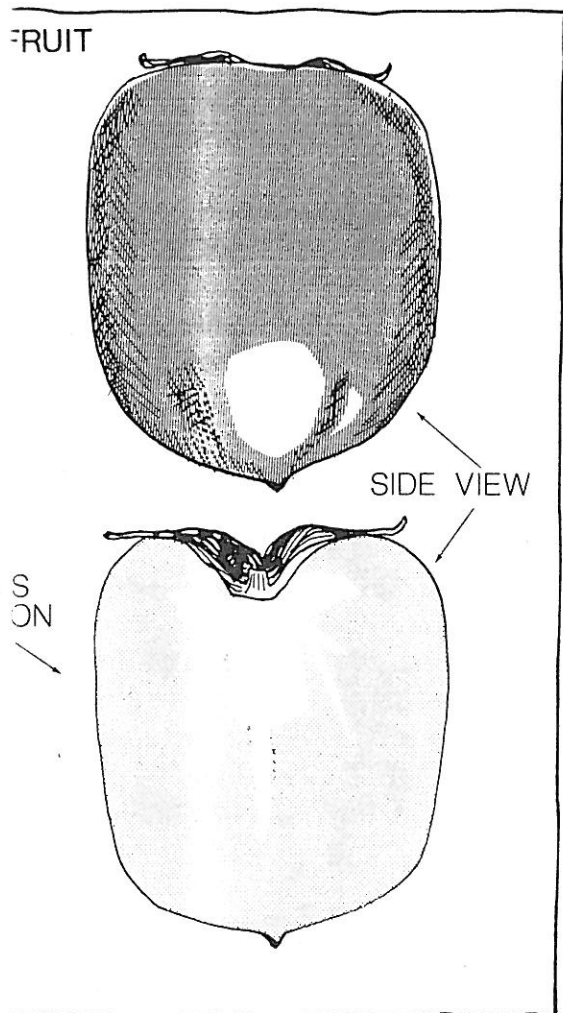
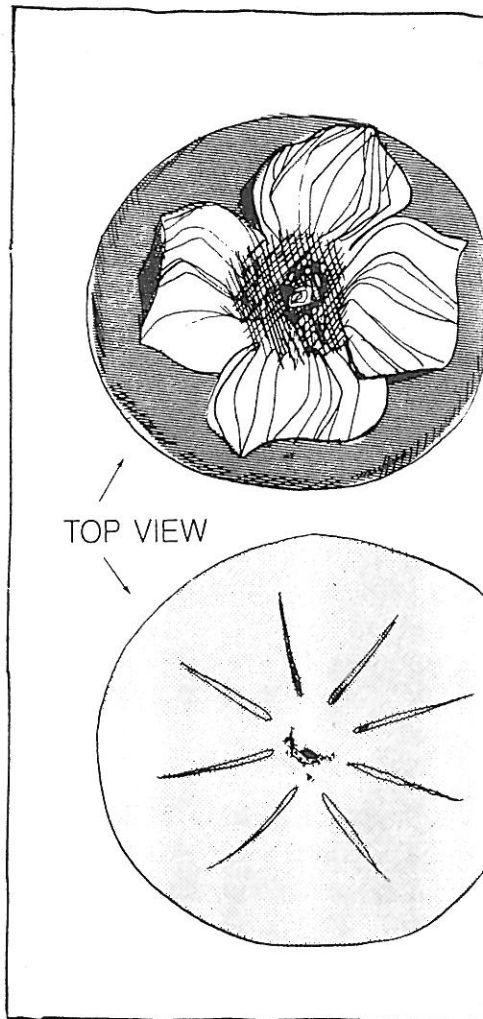
COMMERCIAL VARIETIES

Hachiya is by far the most desirable popular variety grown in California. It accounts for about 90 percent of the total growing acreage. Most of the remaining acreage is made up of nonastringent Fuyu. There are also some specimen plantings of several other varieties.

Hachiya fruit is large, oblong, and acorn shaped, and deep orange. Properly handled it ripens uniformly. It is usually seedless with an attractive golden orange flesh. It brings the best prices on the fresh-fruit market.

Hachiya trees may produce light crops in some areas, especially when young. When pollinated, black areas appear in the flesh around the seed. As this gives the fruit an undesirable appearance, the Hachiya variety should be planted in solid blocks without pollinators. The flowers will generally set good crops parthenocarpically (without pollination) and produce seedless fruit.

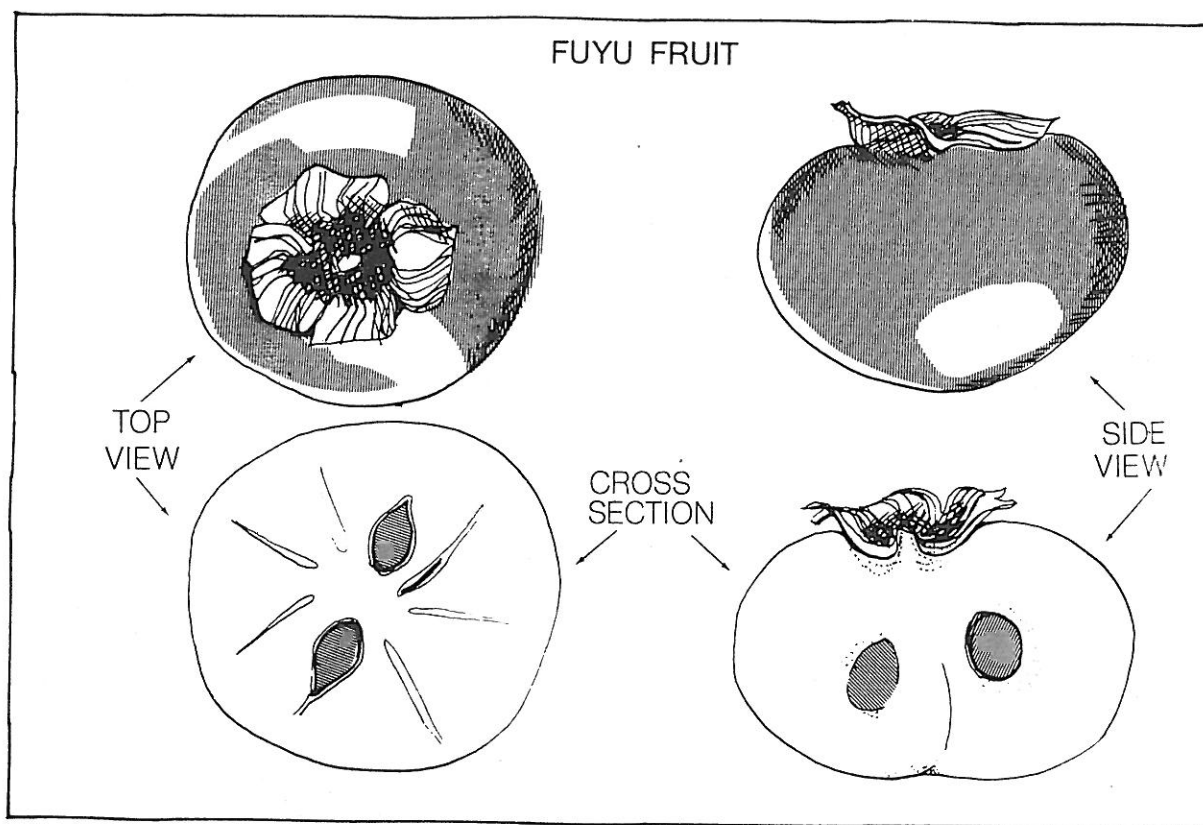
The Hachiya tree is the best growing of the major commercial varieties. With careful training it develops a structurally strong top capable of bearing a tremendous load of fruit.



Fuyu fruit is flat and nearly round with an orange-red color. The flesh is firm and nonastringent with a pleasing flavor. Fuyu produces only female flowers fruiting without pollination. If another variety producing male flowers is present some of the fruit will be seedy. Leaves of the Fuyu tree are a distinctive yellow color in the spring.

Fruit of the Giant Fuyu tends to be larger than the older selection of Fuyu. The tree is a good bearer and has an upright, vigorous growth habit making it easy to train and maintain.

Other varieties are of interest but not important commercially. Hyakume is an orange colored, medium size, late maturing fruit and generally has chocolate or cinnamon colored flesh resulting from pollination. Maru includes several cultivated varieties that produce round orange-colored fruits which have sweet chocolate-colored flesh. Tamopan is a large, astringent, thick skinned, orange colored, late ripening persimmon with a characteristic constriction around the center of the fruit. Tanenashi is a large orange colored fruit resembling the Hachiya but with inferior flavor and mealy texture.



CLIMATE

The Oriental persimmon grows and produces well in both subtropical and temperate areas of California including southern California, the Central Valley and the San Francisco Bay area. It produces well in the hot Sacramento and San Joaquin Valleys and adjacent foothills as well as in the milder, more humid coastal sections of central and southern California.

The persimmon does not require the winter chilling needed by most deciduous fruits, and blooms late enough in April to miss spring frosts in most areas. Large mature trees can tolerate winter temperatures as low as 10° F.

SOILS AND IRRIGATION

Persimmons grow well on a wide range of soils. Although they grow better on heavy clay soils than most other fruit trees, they grow and produce best on deep, fertile, medium textured, well drained soils. Persimmons are about as sensitive as walnuts to excess salinity and boron.

Although persimmon trees withstand considerable drought, fruit size and yield suffer if there is insufficient moisture during the growing season. Satisfactory fruit set and adequate early shoot growth require that ample moisture be present in the soil before spring growth. For maximum fruit size, continued tree growth, and ample foliage development, adequate soil moisture must be maintained by irrigation throughout the entire growing season. A total of 36 to 48 inches of irrigation water in addition to rainfall is needed to produce a good persimmon crop.

Root injury may result if the soil remains

saturated during the growing season. When grown on *D. lotus* rootstock, persimmons tolerate excessive soil moisture better than most other deciduous fruit trees. Persimmons tolerate hard-pan soils better than most trees but crop and tree size will be limited.

ROOTSTOCKS

The three *Diospyros* species grown in California have also been used as rootstocks for the Oriental persimmon varieties.

D. lotus is now the most widely used persimmon rootstock in California. It produces uniform seedlings and rarely produces suckers. Trees grown on *D. lotus* are thrifty and adaptable to a wide range of soil conditions. It is compatible with most commercial varieties.

D. kaki seedlings produce long taproots with few fibrous laterals and the oldest orchards in California are propagated on this species. Seed taken from seedy varieties known to produce uniform vigorous seedlings provide the most desirable source for rootstock propagation.

Seedlings of *D. virginiana* have good fibrous root systems that tolerate both drought and excess moisture. Unfortunately, trees propagated on this stock have not been uniform in size and vigor, and the rootstock suckers badly.

PROPAGATION

Seedlings may be grown from fresh seed although it is advisable to sow in the fall or stratify at 45° to 50° F for 60 to 90 days. After stratification they can be ger-

minated in boxes in a greenhouse held at about 70° F. Germination of seeds is not high, with 25 to 35 percent germination being common. The seedlings are then lined out in the nursery row during spring, when soil temperature is 55° F or higher. Care must be taken to prevent loss of roots from drying or rough handling. Transplanted seedlings must be shaded until they become well established.

Seeds may be planted directly in the nursery row, but by using seed beds and transplanting when plants are 6 to 8 inches high a better lateral root system develops. Plants are set from 8 to 12 inches apart in the row, with rows spaced 3 to 3½ feet apart.

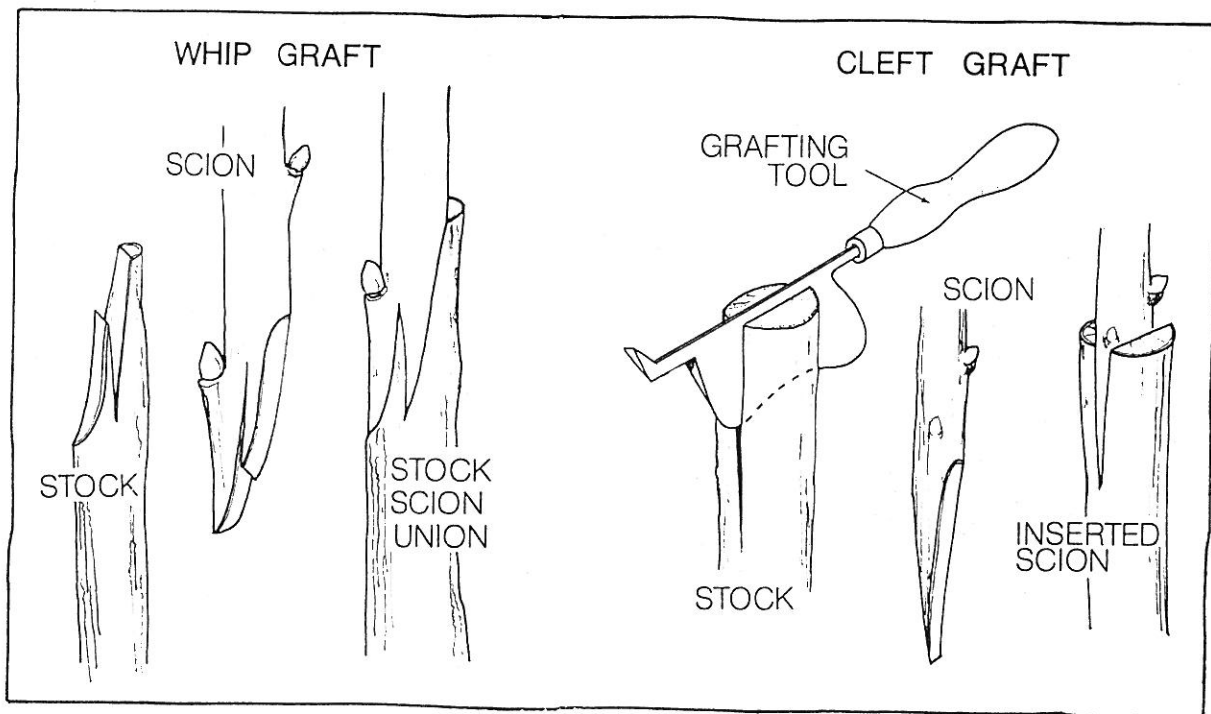
Seedlings usually attain sufficient size for budding or grafting at the end of a season's growth. Grafting is done when stock and scion are dormant. Scions taken from vigorous shoots of the previous season's growth should be ¼ to ⅜ inch in diameter and 3 to 5 inches long with 2 to 4 buds.

Whip grafting of small trees and cleft grafting of large ones give best results in topworking persimmon seedlings and trees. Some propagators have had good results bark grafting using stored scion wood. Budding gives variable results and is seldom done.

ORCHARD SPACING AND PLANTING

In shallow, less fertile soils, lower-vigor varieties such as Fuyu can be spaced as closely as 12 by 16 feet to obtain good yields without serious tree crowding. In deeper, well-drained soils Fuyu is best planted 15 to 18 feet apart. In contrast, the vigorous Hachiya is best at 24 by 24 feet to avoid crowding on deep soils, and 20 by 20 feet apart on shallow soils.

Because the persimmon tree has fragile roots it must be transplanted with care. Trees should be set in the field at the same depth they grew in the nursery row.



Roots must be protected against drying at all times. To insure good root contact with moist soil, trees should be irrigated immediately after planting.

FERTILIZATION

Persimmons respond to nitrogen fertilization. Mature trees require about 1 pound of nitrogen per year depending on the inherent fertility of the soil.

Phosphorus and potassium requirements are not high and most California soils are amply supplied with these macronutrients. Micronutrient deficiencies such as zinc may be corrected by foliar sprays in a manner similar to that used for stone fruits.

TRAINING AND PRUNING

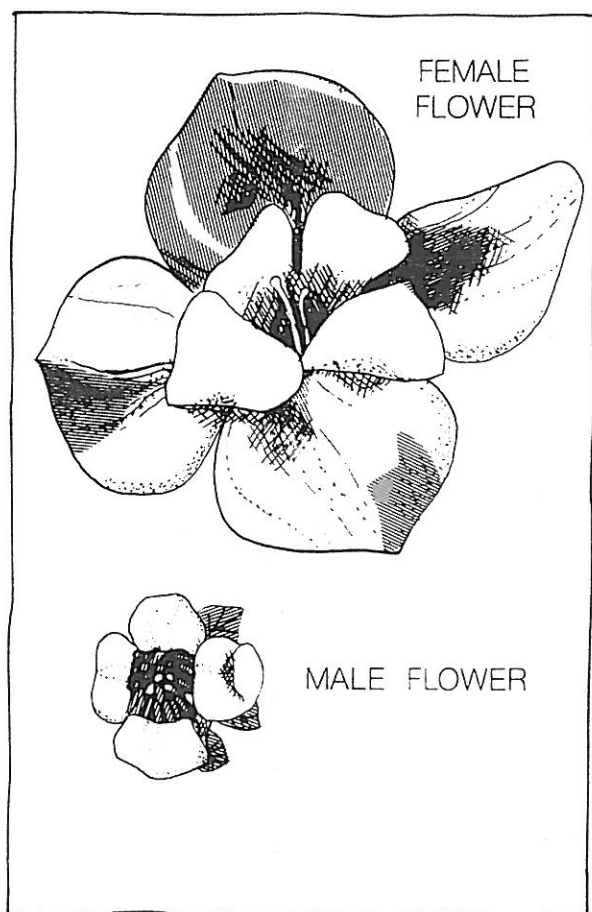
Young trees are trained to develop a modified leader system with well spaced lateral branches. To establish an upright, structurally strong tree, especially in areas where there is wind or strong prevailing breezes, stake it with a stout 4- to 5-foot stake for the first 2 or 3 years. Develop 3 to 5 main limbs at about 1-foot intervals with the first limb about 3 to 4 feet above the ground. Pinching off (heading) vigorous shoot growth during the first and second growing seasons helps force the growth into the proper framework branches.

The pruning of mature trees should be light and confined mostly to small cuts to thin out weak shaded branches, or to head back excessively vigorous growth. If large saw cuts are needed, it usually indicates that training has been neglected. Cross-over, diseased, and broken limbs are removed during the annual winter pruning. Low branches in danger of breaking from

the weight of fruit should be pruned back or propping and tying may be necessary to prevent breakage.

Because flowers of *D. kaki* are borne on wood of the current season's growth, moderate pruning every year or two is desirable to stimulate moderate new growth. Vigorously growing young trees shed more fruit than do older ones with moderate growth, and heavy pruning causes long shoots that break when heavily cropped in future years. On the other hand, weak growing, lightly pruned trees do not mature good crops of acceptable market-sized fruit. Moderate annual pruning helps keep trees fruitful and structurally strong to support heavy crops.





PESTS AND DISEASES

The persimmon is relatively free from serious pests and diseases. Citrus mealybug, *Panococcus citri*, largely controlled by natural enemies, may at times be troublesome in southern California. Orange tortrix, *Argyrotaenia citrana*, occasionally attacks persimmon fruit in southern California but is of little consequence in the San Joaquin Valley. Sporadic infestations of the red-humped caterpillar, *Schizura concinna*, may defoliate persimmon trees. Olive scale, *Parlatoria oleae*, has also been found on persimmons but this pest is normally controlled by parasitic wasps.

Root-knot nematode is not a serious pest of persimmons. Citrus and other nematode species have been found on persimmon roots but apparently cause little

damage. Crown gall, caused by *Bacterium tumefaciens*, is the most troublesome disease of persimmon. Infections may be avoided by using disease-free nursery stock and preventing injuries to trunk or crown roots that may permit entrance of the bacteria. *Stem pitting* disease, probably of virus nature, has been observed on trees planted on *D. kaki* but not on *D. lotus*.

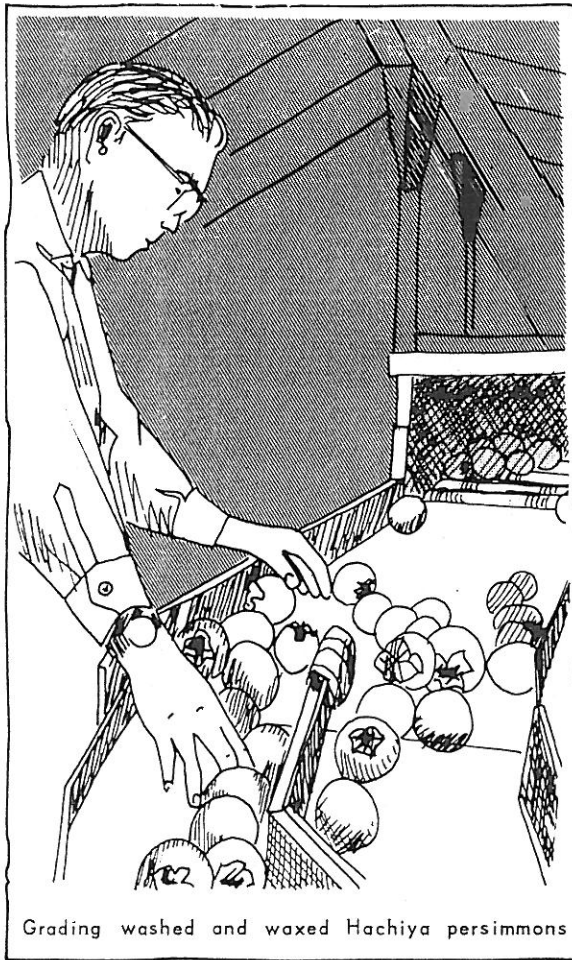
HARVESTING

Persimmons picked for the fresh-fruit market should be well matured and of characteristic color. Standards set by the California Agricultural Code require persimmons to attain a specified color before being marketed. Experience shows that firm fruit allowed to remain on the tree until they develop good color command the best prices and provide maximum consumer satisfaction. Fruit picked when still immature does not soften evenly and may remain partly astringent.

To harvest, the fruit is clipped leaving the calyx and a short stem attached to the fruit. Persimmons may be snapped, but this takes some skill and may cause fruit injury.

Careful handling minimizes bruising. Bruising causes brown spots which lower the grade. Using rigid containers such as picking buckets reduces fruit injury (as compared to picking in picking bags). Because of their pointed apex, Hachiya must receive special handling care. Field boxes or bins are used for transporting fruits from orchard to packinghouse.

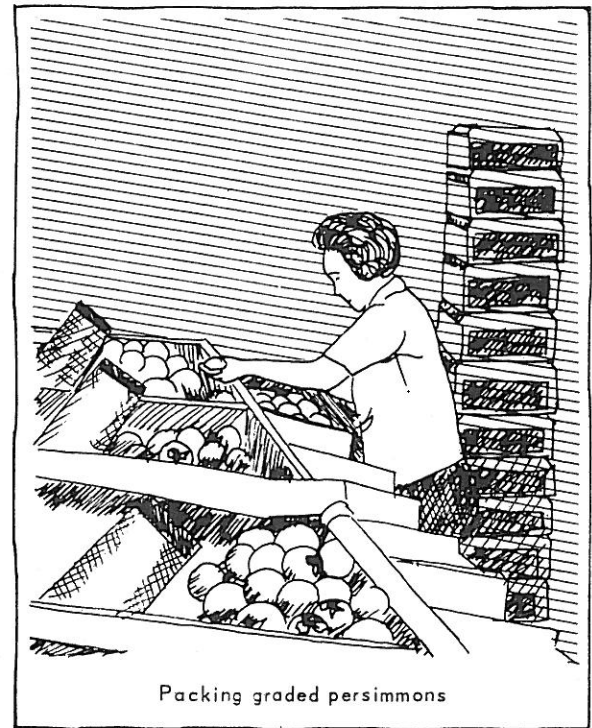
Harvesting of early-maturing varieties starts about September 25 and, with later varieties, continues to approximately December 10. The most active period is from October 10 to November 15.



PACKING

Persimmons are picked and packed when ripe but still firm. Care must be taken during the entire process to prevent bruising. Most persimmons are commonly packed in 1-layer lugs, although 2-layer lugs are sometimes used. Plastic tray packs are also used in both 1- and 2-layer boxes. Packers must conform to size and maturity standards adopted by the industry and stated in the Agricultural Code.

Markets usually require each box to show the name and address of the grower or packer, and the variety and count size.



MARKETING

About half of California's persimmon crop is shipped to local California markets, principally San Francisco and Los Angeles. The rest usually goes to eastern markets—New York, Philadelphia, and Chicago; a small portion goes to Hawaii. Many areas in the U.S. remain untapped potential markets for this delicious fruit.

UTILIZATION

Cold storage facilities enable growers to harvest Hachiya fruits at optimum maturity and hold them for orderly marketing. Consumers can keep persimmons in a cool place for a considerable time before use. They can also be frozen and held for a year or longer—before freezing they may be peeled, pureed and then frozen in tight containers. They also can be frozen whole in plastic bags and then thawed as needed.

When put in cold storage persimmons hold best at 32° F.

Besides being used fresh in salads, the persimmon may also be eaten as a dessert. Persimmons are widely utilized in cookies, breads, cakes, pies, ice cream, jams, and jellies.

Dried persimmons are commonly used in the Oriental diet. Fruits used for drying are harvested when ripe and firm. After being peeled and sun dried, they are stored at about 65° F and in a relative humidity of 50 to 60 percent. During storage or slow drying a surface covering of sugar crystals gradually appears, and this improves the appearance of the product. Dried persimmons contain a large amount of dextrose and are comparable to dried peaches in food value.

REMOVING ASTRINGENCY

When persimmons are picked ripe but still firm, they are sometimes slow to soften and lose astringency. This process may take 2 to 3 weeks at 70° F but can be speeded up by placing the fruit in a freezer for about 24 hours. When the persimmons are removed and thawed, they are both soft and free of astringency, and may be eaten fresh immediately or cooked.

Firm, ripe persimmons may be placed with an apple in a plastic bag or fruit-ripening bowl. Ethylene gas released by the apple speeds up the process of softening and astringency loss in persimmons.

Persimmons for California

Kay Ryugo □ Charles A. Schroeder □ Akira Sugiura □ Keizo Yonemori

Oriental persimmons were probably introduced into Europe from Japan by early silk and tea traders. Europeans, especially the Italians, refer to the persimmon, *Diospyros kaki* L. (Ebenaceae family), by the Japanese name kaki. This is because the name persimmon is strictly American, of Algonquian origin. In 1856, Commodore Matthew C. Perry obtained persimmon seeds when the American naval fleet visited Japan. He had them planted on the grounds of the Naval Observatory, near Washington, D.C., but none of the seedlings survived.

Later, the U.S. Department of Agriculture (USDA) imported from the Orient a large number of cultivars as well as the species *D. lotus*, which is commonly used as a rootstock for *D. kaki* cultivars. These and other cultivars brought over by Japanese and Chinese immigrants before 1919 were propagated at the USDA Plant Introduction Garden then in Chico, California. The USDA station at Beltsville, Maryland, also assembled many cultivars, which were distributed primarily to the southern states.

In 1919, a quarantine was imposed on the importation of persimmons to prevent introduction of diseases and insect pests. Many cultivars from the Chico Plant Introduction Garden were repropagated on the University of California campus at Los Angeles and at the UC Wolfskill Experimental Orchards in Winters. Part of the UCLA collection was moved to the UC South Coast Field Station in Santa Ana in 1960.

The distribution of cultivars from these sites, nurseries, and individual growers provided the nucleus of the persimmon industry in California. Some cultivars assembled at the Chico Plant Introduction Garden were subsequently discovered to have been mislabeled, misspelled, or carried under the provincial names of their points of origin in China, Korea, or Japan when they were introduced. Researchers in California, Italy, and Israel noticed that a cultivar presumed to be Fuyu that was distributed from Chico occasionally bore male flowers, whereas other Fuyu trees did not. Male flowers have never been reported on the original Fuyu trees in Japan. In Italy and Israel, the cultivar that bears male flowers is referred to as the California Fuyu, because the cultivar was initially sent to these countries from California.

Although the fruits of Fuyu and California Fuyu or Cal-Fuyu are indistinguishable in shape, size, and color, the two clones should be marketed as separate cultivars. During our attempt to clear up the confusion in names and identification of other persim-

mon cultivars, we found these two clones to be genetically different. Leaves sampled from trees growing in the two campus collections were analyzed for isozyme patterns using starch gel electrophoresis (as described by Tao and Sugiura, *HortScience* 22:932-35, 1987). Cal-Fuyu and Fuyu differ from one another in their GPI (glucose-phosphate isomerase) patterns but are nearly alike in their PGM (phosphoglucosomutase) patterns (fig. 1). GPI patterns of Fuyu and Jiro are indistinguishable, but the

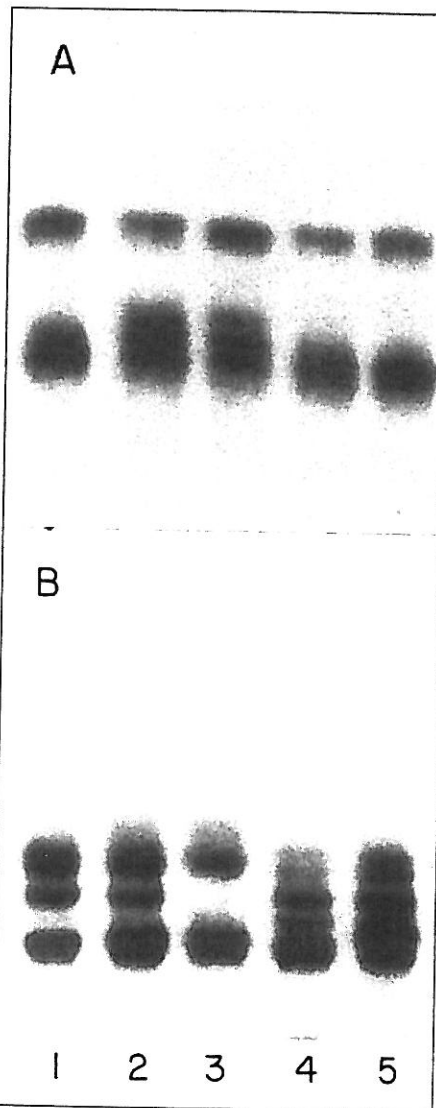
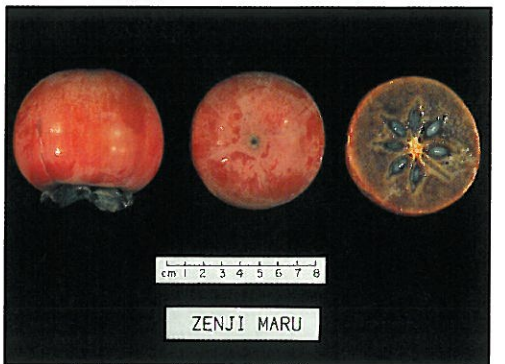
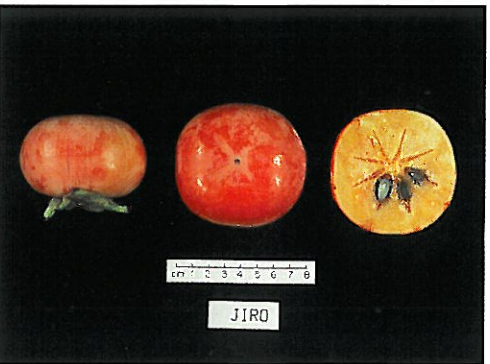
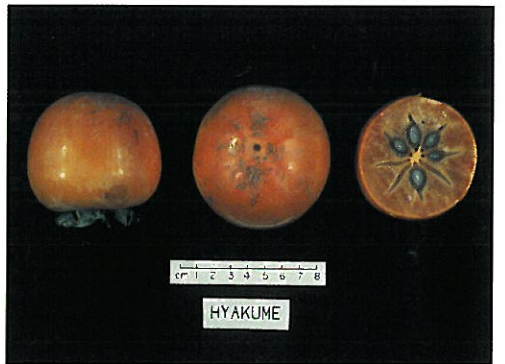
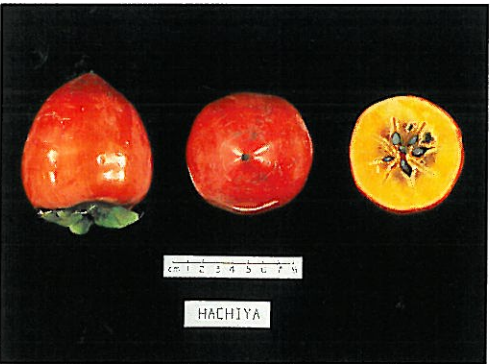
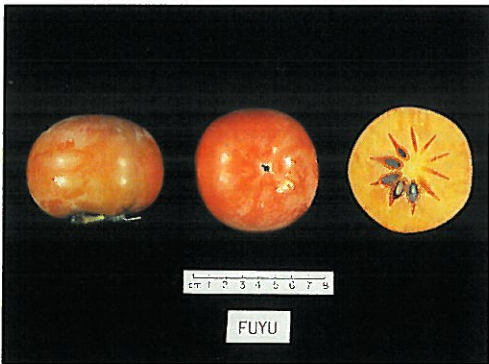
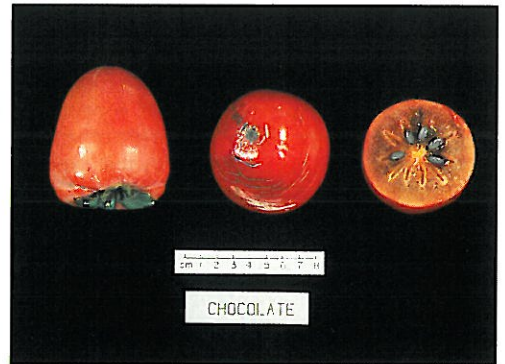
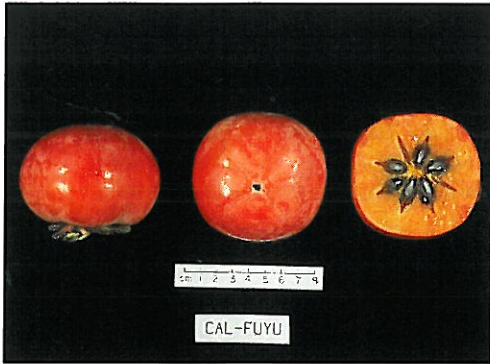


Fig. 1. Genetic differences and similarities in persimmon cultivars are apparent in leaf isozyme patterns of glucose-phosphate isomerase (A) and phosphoglucosomutase (B) for California Fuyu (1), Fuyu (2), Jiro (3), Hana Fuyu (4), and Goshō (5).

Although the name 'persimmon' is American, of Algonquian origin, the major cultivars grown commercially in California belong to a species first brought to the United States from Japan in the 1800s. Most of these cultivars have distinct differences in fruit size, shape, and color.



PGM isozyme patterns of these two cultivars are distinctly different. The differences and similarities in isozyme patterns among Fuyu, Jiro, and Goshō are the same as gel patterns obtained from the persimmon collection at Kyoto University, Kyoto, Japan.

Classifications

Asian persimmons are classified as either pollination-constant or pollination-variant (table 1). The flesh of pollination-constant fruits, such as Fuyu and Cal-Fuyu, remains orange-yellow even though they have seeds. The flesh of pollination-variant types, such as Chocolate, turns brown around the seed.

Each group is further divided into astringent and nonastringent types, based on their flavor at maturity. Japanese horticulturists have subdivided the pollination-variant group into the two types according to the degree of browning of the flesh. By this classification, which is subjective, Zenji Maru is nonastringent and Hachiya is astringent. The classification is also arbitrary, because nonastringent cultivars, such as Fuyu, tend to be slightly astringent if they are grown where summers are short and cool, as in northern Japan. The astringency cannot be removed from fruits grown in these districts by treatment with ethanol fumes or ethylene as it can be with other astringent cultivars.

Persimmons are also classified as (1) pistillate-constant if only female flowers are borne; (2) staminate-constant if male flowers are produced consistently; or (3) staminate-sporadic if the clone bears male flowers in some seasons and not in others. Of the cultivars listed in table 1, Chocolate, Goshō, Hana Goshō, and Zenji Maru are staminate-constant; Cal-Fuyu is staminate-sporadic; the others are pistillate-constant. Seedlings that produce only male or mostly male flowers may exist in the wild, but they are not cultivated.

Cultivar information

California Fuyu or Cal-Fuyu. This cultivar was introduced as Fuyugaki syn. Fuyu

kaki and labeled PI 26491 on the map of the former USDA Plant Introduction Gardens at Chico, California. Unlike Fuyu, some Cal-Fuyu trees bear male flowers sporadically on isolated branches. Cal-Fuyu has been marketed as Fuyu because of their similarity.

California Maru. This cultivar was introduced as PI 83790 but mislabeled as Jiro. Jiro is pollination-constant, has entirely different fruit characteristics, and differs genetically (as indicated by isozyme patterns) from California Maru. It is being renamed California Maru, because its origin cannot be traced. Currently there is no other cultivated persimmon with its eating quality. The ripe fruit is juicy and has a crisp texture, unlike that of Zenji Maru or Hyakume, which tend to be more buttery. Seeded fruits of California Maru have the shape of Zenji Maru; the skin color of California Maru is orange, while that of Zenji Maru is more reddish.

Chocolate. The size, shape, and coloration of this cultivar match those of Tsuru-no-ko. Chocolate produces many male flowers, however, while Tsuru-no-ko is reported to be pistillate-constant. Chocolate should be an excellent pollenizer for the pollination-variant cultivars, California Maru, Hyakume, and Zenji Maru, which require seed formation for the flesh to turn brown.

Fuji. This cultivar is considered the same as Hachiya in Japan, because fruits and leaf isozymes appear identical. Fruits of Fuji frequently produce the browning reaction around the seeds, as do those of Hachiya. Fuji trees grown at the Wolfskill Experimental Orchard always set a better crop than do Hachiya trees.

Fuyu. The leaf isozyme patterns and fruit size and eating quality indicate that this cultivar is identical to the original cultivar Fuyu, widely grown in Japan. Trees tend to bear in alternate years, producing large quantities of small fruit in the "on" year and a modest crop of large fruit in the "off" year. In Japan, the crop is thinned early in the on year to obtain large fruit at harvest.

Goshō or Goshō-gaki. Even seedless fruits of Goshō size well and have a reasonably good storage life, but the seeded fruits with slightly darker flesh color develop better flavor.

Hachiya. This cultivar was the basis of the persimmon industry in California until recently, when nonastringent types like Fuyu and Jiro became more popular. Hachiya fruits frequently produce brown flecking around the seeds in some seasons and areas but not in others; as a result, it has been reclassified as pollination-variant. Hachiya is eaten fresh, frozen, or as a dried product, and is used in puddings and cookies.

Hana Fuyu. Labeled Jumbu at Wolfskill, Hana Fuyu is marketed as Giant Fuyu in California. The fruit is large but it softens very soon after harvest and lacks flavor, being almost insipid.

Hyakume. The light yellow skin of Hyakume forms concentric cracks around the apex at maturity. When seeded, the brown flesh has a spicy flavor and a firm nonmelting texture.

Jiro. This cultivar has also been propagated and sold as Fuyu in California. Jiro fruits are more truncated and squarish in cross-section than those of Fuyu. Leaves of Jiro trees, more so than Fuyu leaves, appear chlorotic in the early spring, especially after a cold, wet winter.

Saijo. Fruits are small and are a dull yellow when mature. The flavor of a ripe Saijo fruit is ranked among the best by gourmets. The mature fruits are attractive when dried, especially if they are treated with sulfur dioxide before dehydration to prevent browning.

Zenji Maru. A Japanese Buddhist monk introduced Zenji Maru in about 800 AD to provide dessert fruit for the poor. The cultivar is an alternate bearer. The fruits develop a deep red color but tend to become soft and juicy when fully ripe. If harvested in prime condition, the brown flesh of the seeded fruits has an excellent flavor and texture.

The cultivars Hana Goshō, Hiratanenashi, Izu, Maekawa Wase Jiro, Matsumoto Wase Fuyu, and Suruga (table 1) have been imported by nurseries and private growers. These cultivars are established under quarantine in the National Germplasm Repository on the UC Davis campus and will not be available for distribution until January 1989.

TABLE 1. Classification of Asian persimmons by flesh color and astringency

Pollination-constant		Pollination-variant	
Astringent	Nonastringent	Astringent	Nonastringent
Saijo	California Fuyu	Fuji	Chocolate
Tamopan	Fuyu	Hachiya	California Maru
Tanenashi	Hana Fuyu (syn.	Hiratanenashi	(PI 83790)
Tsuru	Yotsudani,		Hyakume (syn.
	Jumbu, Giant		Ama-hyakume)
	Fuyu)		Zenji Maru
	Goshō		
	Hana Goshō		
	Izu		
	Jiro		
	Maekawa Wase Jiro		
	Matsumoto Wase Fuyu		
	O-Goshō		
	Suruga		

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CALIFORNIA SAGEBRUSH

Artemisia californica Less.

Plant Symbol = ARCA11

Common Names: Coastal sagebrush, Coast sagebrush, California sagewort.

Scientific Names (The Plant List, 2013; USDA-NRCS, 2020):
Artemisia californica var. *californica* Less. (2011); *Artemisia californica* var. *insularis* (Rydb.) Munz (1935).

Description

General: Aster Family (Asteraceae). California sagebrush is an aromatic, native, perennial shrub that can reach 5 to 8 feet in height. It has a generally rounded growth habit, with slender, flexible stems branching from the base of the plant. Leaves are more or less hairy, light green to gray in color, usually 0.8 to 4.0 inches in length, with 2 to 4 thread-like lobes that are less than 0.04 inches wide, with the margins curled under. California sagebrush blooms in the later summer to autumn/winter (depending on locale), and inflorescences are long, narrow, leafy and sparse, generally exceeding the leaves, with heads less than 0.2 inches in diameter that nod when in fruit (Hickman, 1993).

Distribution: California sagebrush is found in coastal sage scrub communities from southwestern coastal Oregon, along the California coast and foothills, south into northern Baja California, Mexico (Figure 2) (Hickman, 1993). It also occurs on the coastal islands of California and Baja, generally below 3300 feet elevation, but may extend inland (and over 4920 feet in elevation) from the coastal zone.

Habitat Adaptation

This shrub is a dominant component of the coastal sage scrub, and an important member of some chaparral, coastal dune and dry foothill plant communities, especially near the coast (Hickman, 1993). Typical landforms include coastal terraces, low to middle slopes, valley bottoms, coastal bluffs, rock outcrops, and areas of disturbance on moderate to steeper slopes (Holland, 1986; Munz and Keck, 1949). Soils vary from coarse gravels to clays, but typically only support plant-available moisture with winter and spring rains. It grows best on shallow, well-drained soils in hardiness zones 7-9 and 14-24 (Norris-Brenzel, 2001).

California sagebrush is a native, dominant component of central and southern coastal sage scrub that generally occurs where the coastal (marine) effect of the Pacific Ocean moderates summer drought. The climate is seasonally wet, with most precipitation falling as rain between November and April. Other associated diagnostic shrub and half-shrub species in this association include; Coyotebrush, *Baccharis pilularis*; Blueblossom, *Ceanothus thyrsiflorus*; Bush sunflower, *Encelia californica*; California yerba santa, *Eriodictyon californicum*; Coastal buckwheat, *Eriogonum cinereum*; California buckwheat, *Eriogonum fasciculatum*; seaside woolly sunflower, *Eriophyllum stoechadifolium*; salal, *Gaultheria shallon*; goldenbush, *Isocoma menziesii*; deerweed, *Lotus scoparius*; Lupine spp. *Lupinus* spp.; chaparral bush mallow, *Malacothamnus fasciculatus*; Fremont's bush mallow, *Malacothamnus fremontii*; coastal prickly pear, *Opuntia littoralis*; California blackberry, *Rubus ursinus*; white sage, *Salvia apiana*; purple sage, *Salvia leucophylla*; black sage, *Salvia mellifera*; poison oak, *Toxicodendron diversilobum*, and California huckleberry, *Vaccinium ovatum* (Rundel, 2007; Sawyer et al., 2009;

Southern coastal scrub occurs below 1000 m (3300 feet) elevation and extends inland from the maritime zone in hotter, drier conditions than northern (less fog-drenched) shrublands (e.g., areas with 10-60 cm of annual precipitation) (Rundel, 2007). The more northern scrub extends inland in California in the vicinity of San Francisco Bay, the margins of the Sacramento-San Joaquin delta and up the Sierra Nevada foothills and North Coast Range and Klamath Range foothills to over 1500 m (4900 feet). Some of the inland extension follows coastal fog or cool marine air pushed inland by prevailing winds (Ford and Hays, 2007).

California sagebrush is adapted to summer heat and drought, dropping its leaves only under periods of extreme drought stress (Perry, 1981). The root system is shallow and fibrous, allowing the plant to take advantage of early season rains for rapid



Figure 1 California Sagebrush. James L. Reveal, USDA-NRCS PLANTS Database

growth (Hauser, 2006). The leaves produce soluble and volatile terpene compounds that are thought to inhibit germination and growth of some plants, resulting in relatively bare patches of soil under and around the shrub (Hauser, 2006). Early seral stands may form on disturbed sites such as roadsides, levees, and sites of recent landslides.

This plant is moderately adapted to fire, resprouting from the root crown about 25% of the time, or germinating from seed, especially in the second year after a fire (Keeley, 1998). Foliage contains substantial amounts of oil, making it highly flammable during the summer (Perry, 1981). Generally, coastal shrublands including California sagebrush as a dominant component become established following fire, but do not necessarily require fire for regeneration.

Uses

Landscaping and erosion control: Landscape use is usually restricted to slope plantings, especially road scars, and revegetation of disturbed areas for erosion control (Perry, 1981).

Wildlife: Late-successional California sagebrush communities provide foraging and nesting habitat for many birds, including critical habitat for the federally threatened California gnatcatcher and the endemic Bell's sage sparrow, a state-listed species of special concern (Hauser, 2006). These communities also support a number of amphibians, reptiles and small mammals, such as dusky-footed and desert woodrats who preferentially feed on California sagebrush (Meserve, 1974).

Ethnobotany

Native Americans in California used the leaves of California sagebrush for a number of medicinal treatments, including as a poultice for tooth aches or wounds, or applied to the back to treat asthma; as a decoction taken for menstrual problems, to ease childbirth, to ease menopausal symptoms, and for newborns to flush out their systems; and as a decoction used as a bath for colds, rheumatism and coughs (Bean and Saubel, 1972; Bocek, 1984; Foster and Hobbs, 2002).

The leaves are also reported to have been chewed fresh, or dried and used for smoking, mixed with tobacco and other dried leaves (Bean and Saubel, 1972). The Luiseno Indians reportedly burned the bushes with white sage in ceremonial fires before hunting (Sparkman 1908). Early Spanish Californians knew the plant as "Romerillo", and regarded it as a panacea, using it in tea for bronchial troubles, or as a wash for wounds and swellings (Dale, 1986). It was also used by early miners in sprays to drive fleas from their beds (Dale, 1986).

Status

Global rank for the species is G4 (Apparently Secure).

California state rank for the species is not currently assessed (as of 21 Apr 2020), but has been ranked in the past as S5 (Secure - common, widespread, and abundant in the state). However, California sagebrush is often a dominant component of two plant communities within the California Coastal Scrub association that are designated sensitive natural communities within California (The California Biologist's Handbook, 2020). These communities – Diegan and Venturan Coastal Sage Scrub – carry a global ranking of G3 ('Vulnerable -- at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors), and California state ranking of S3.1 ('Vulnerable' – vulnerable in the state due to a restricted range, relatively few populations [often 80 or fewer], recent and widespread declines, or other factors making it vulnerable to extirpation from the state).

No special federal legal status.

Wetland Indicator Status: Upland.

Ranking and status values may change over time. Please consult the PLANTS Web site (<http://plants.usda.gov/>) and your state's Department of Natural Resources for this plant's current status (e.g., threatened or endangered species, state noxious status, and wetland indicator values).

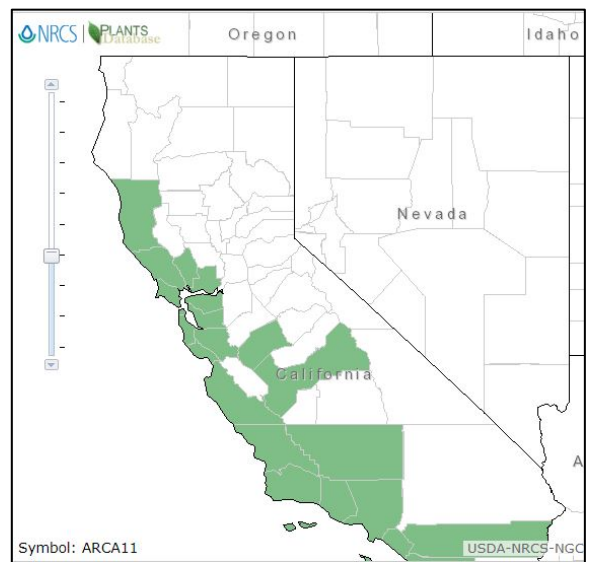


Figure 2 California county level distribution map of California sagebrush. Image from PLANTS database (2020).

Planting / Seeding Guidelines

California sagebrush can be established from container stock or by direct seeding. Shallow seeding methods should be used, such as hydroseeding or broadcasting followed by seed imprinting or surface harrowing or dragging, as seeds have a light requirement for germination. For restoration projects, especially on steeper slopes, either seeding method can be followed by blowing a thin layer of straw at a rate of approximately 1,500 lbs/acre, with a hydromulch slurry of water, wood fiber at 300 lbs/acre, and tackifier (soil stabilizer) at 120 lbs/acre sprayed over the straw (Montalvo et al., 2002).

Management

For ornamental use, shrubs should be pruned or pinched back each year to maintain their form. In rangeland and other grazing applications, most classes of livestock generally avoid California sagebrush due to the pungent aroma and bitter taste. Domestic goats, however, will browse the shrub year-round (Hauser, 2006).

The species withstands cooler natural fires and controlled

burns and will typically sprout from surviving crowns. California sagebrush can be top killed by hotter fire regimes, but appears to recover within a few years. It can sprout from surviving root crowns as early as the next growing season. Coverage of California sagebrush may be slightly reduced from pre-fire levels for several years after fire, then typically returns to pre-fire levels (Keeley, 1998). It is sometimes seeded after fire to help stabilize denuded soil.

Pests and Potential Problems

There are no known pests or diseases of concern. However, the plant is sensitive to sulphur dioxide and ozone air pollution, which reduce foliar cover and may result in plant death (Preston, 1988; Westman, 1985). Elevated nitrogen deposition levels in the Los Angeles air basin also pose a threat to stand longevity, as exotic annual grasses tend to out-compete the shrub under such conditions (Hauser, 2006).

Environmental Concerns

California sagebrush is native shrub, and spreads primarily by seed distribution. Seed may remain viable in the soil for several years. In general, this species is well documented as having beneficial qualities, with no or negligible negative impacts on wild or domestic animals. There are no known environmental concerns associated with California sagebrush.

It is not normally considered "weedy", but could slowly spread into adjoining vegetative communities under ideal climatic and environmental conditions in some regions or habitats. Please consult with your local NRCS Field Office, Cooperative Extension Service office, or state natural resource or agriculture department regarding its status and use. Weed information is also available from the PLANTS Web site at www.plants.usda.gov.

Control

Effective control of California sagebrush requires careful attention to growth stage of the plant and proper timing of applications. Use labeled rates that will consistently achieve desired results, and include responsible rotation of methods and materials to manage the undesirable plant. Herbicides differ considerably in their non-target vegetation impact, volatility and residual carryover. California sagebrush can be reduced or suppressed by manual or mechanical mowing and grubbing, and has been shown to be controlled with the herbicides glyphosate and 2,4-D (Hauser, 2006).

Please contact your local agricultural extension specialist or county weed specialist to learn what works best in your area and how to use it safely. Always read label and safety instructions for each control method. Trade names and control measures appear in this document only to provide specific information. USDA-NRCS does not guarantee or warranty the products and control methods named, and other products may be equally effective.

Seeds and Plant Production

There are approximately 5,500,000 seeds/lb (USDA-NRCS, 2009; S & S Seeds, 2009). Seed is collected from October to February from mature (brown) inflorescences. Seed is light to dark brown when mature, and achenes should be pulled from the seed head at time of collection to check for maturity (they should not be green) (Young, 2001).

Germination occurs in 21–30 days at 73.4°F (23°C) in light, and no seed treatment is required. Germination rates are generally



Figure 3. Flower structures and inflorescence form on California sagebrush, *Artemisia californica*. © 2008 Keir Morse, Calphotos

60–75% in controlled environments, but as low as 10–30% when broadcast (Keeley, 1987; Perry, 1981; Young, 2001). Stratification at 41°F for 15 days is reported to produce more rapid and uniform germination in other species of *Artemisia* (Long, 1986), and stratification for three months at 41°F is used to improve germination of California sagebrush in commercial nurseries (personal communication, California Flora Nursery, 5 November 2009).

Young (2001) recommends surface sowing seed in flats, then transplanting seedlings to individual tubes (2" dia. x 7" deep Deepot 16) 21 days after germination (transplant survival rate of 70%), and maintaining seedlings in a shadehouse for at least five weeks to develop further before being planted out. Alternately, seed can be sown directly in individual containers (1.5" dia. x 8.25" deep Supercell), with thinning required one and two months after sowing to leave only a single plant per container (Long, 1986).

Shrubs can also be propagated by semi-hard new-wood cuttings in the spring. Cuttings are treated with rooting hormone and maintained in flats with bottom heat and mist until rooted (personal communication, California Flora Nursery, 5 November 2009).

Cultivars, Improved, and Selected Materials (and area of origin)

Seed and transplants are generally available in the commercial market. Sources derived from specified local, natural origins should be favored. Cultivated varieties are also available for use in certain regions of the West Coast. More information about USDA-NRCS plant releases may be found in the release notice available from your local NRCS office. Contact your local NRCS office for more information. Look in the phone book under United States Government. The Natural Resources Conservation Service will be listed under the subheading "Department of Agriculture."

'**Canyon Gray**,' also called trailing sagebrush, is a prostrate cultivar that spreads along the ground, reaching 3 ft (0.9 m) high and 6 ft wide. It prefers sunny locations, is drought tolerant, and deer resistant (Yerba Buena Nursery, 2009). 'Montara' was selected by Roger Raiche at Montara Ridge in San Mateo County, CA. This cultivar forms a mound of finely-cut, fragrant foliage to around 2-3 ft tall by 3 ft wide. The plant requires full sun with decent drainage and is drought tolerant once established, but occasional summer water helps retain fresh look. 'Montara' thrives in coastal environments, and is deer resistant (California Flora Nursery, 2009).

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Pomegranate, Fruit of the Desert



Origin and Adaptation

The region of the world from Iran to northern India is known as the origin of the pomegranate. Pomegranates were also cultivated in Greece as Greek writers made reference to them several hundred years B.C. before the almond, peach, or apricot. It is thought that Spanish missionaries first brought pomegranates to the New World around 1521, with early settlers introducing them to California in 1769 (Morton, 1987).

Its present scientific name *Punica granatum* is derived from "pomuni granatum" (meaning seeded apple). Pomegranates prefer a semi-arid to subtropical climate (hot summers and mild winters). Pomegranates are suited to USDA Zones 8-11. Plants will harden off when exposed to cold gradually, but will generally suffer damage below 12 degrees F. They are successfully grown in dry areas (low rainfall and low humidity) of the southwestern United States such as the deserts of California, Nevada, Utah, Arizona and New Mexico.

Description

Pomegranates grow naturally as a bushy shrub, but may be trained as a small tree growing 12 to 15 feet high (LaRue, 1980). Although vigor declines after 15 years or so, suckers readily grow from the base, and plants have been known to survive for more than 200 years. Branches are stiff and spiny with glossy, lance shaped leaves. Flowers may be scarlet, white or variegated with 5 to 8 crumpled petals and a red, fleshy, tubular calyx. Pomegranates are self-pollinating, but bees and other insects such as beetles do visit the flowers and likely play a role in pollen transfer.

Cultivation

Pomegranates prefer full sun and although they will grow in part-shade the sun is needed to produce sugars and reach full flavor. Plants thrive in well drained loamy soil, but don't require a specific soil type and do quite well in alkaline conditions. Annual applications of nitrogen are suggested to help maintain vigor. Young plants will benefit from 6 to 8 ounces of ammonium sulfate per tree, annually, for the first 3 to 4 years. After that, 3 to 4 ounces is usually sufficient to maintain new growth each year. Pomegranates do not seem to benefit from the addition of phosphorus or potassium. If zinc or iron deficiency symptoms appear it is best to apply chelated forms of each as needed. (LaRue, 1980)

Once established, the plants are very tolerant of drought. To produce quality fruit however, regular irrigation is required. A deep thorough watering every 7 to 10 days is suggested. Like most fruits, pomegranates may be raised from seeds but will not be "true to type." Vegetative propagation is easily done by using one year old cuttings about 10 to 12 inches long and ¼ to ½ inch in diameter taken in late winter. Remove leaves and treat cut area with rooting hormone. Place bottom third of stem in warm rooting media. Or, in early spring, cuttings may be placed outside if soil has begun to warm. Plants are usually not disturbed for a full season while rooting takes place. The following spring, plants may be moved to pots for sale or directly to the field for orchard culture. A suggested spacing for home growing is 10 to 12 feet between plants with 14 to 16 feet between rows. Commercial plantings should be on the order of 12 to 14 feet in the row with 18 to 20 feet between rows. This allows an appropriate amount of room for harvesting, as well as, moving trucks, etc., in and out of orchard rows to remove harvested fruit. Home growers often keep pomegranates short and bushy. Commercial orchards generally train pomegranates into trees. The latter generally produces less pomegranates but larger, higher quality fruit.

Pruning and Fruiting Habit

For bush culture, prune tips of shoots the first 2 to 3 years to encourage more new shoots to form. Leave tips unpruned from then on to promote fruiting. Fruits are generally borne on the tips of branches out in full sun. Short spurs on 2 to 3 year old wood are the most productive. After 5 years or so, the wood may lose its fruiting habit. At that point, remove oldest shoots all the way to the ground (thinning cut). For tree culture, prune young plants at 24-30 inches. As more shoots come, remove lower branches to encourage a single main stem.

From there, allow main branches to develop like a central leader fruit tree. Light annual pruning is recommended to renew fruit wood. Severe pruning will reduce yields.

Fruits are 2 ½ to 5 inches wide and have a prominent calyx which persists even after harvest. The leathery skin turns from green to pink as it ripens and becomes deep red on some varieties. Harvest before overripe (even a little early) to avoid splitting. Rain will contribute to splitting especially when rain occurs near ripening. Fruits may store for 6-7 months. Highest quality will be realized if fruits are stored between 32 and 41 degrees F. Shrinking and spoilage are reduced if humidity can be maintained around 80%. Flavor often improves in storage if conditions are right.

Pomegranates are one of the highest rated fruits in terms of antioxidants (Adhami, Khan, Mukhtar, 2009). These are the chemicals which occur naturally in a number of fruits and vegetables that are thought to prevent or reduce the incidence of cancer. Recent research indicates that pomegranate extract may selectively inhibit the growth of cancer cells in the, prostate, colon, breasts, and lungs. Research will, no doubt, continue to investigate the possible reduction of cancer cells due to antioxidants found in pomegranates, as well as other dark skinned fruits including grapes, blueberries, blackberries and raspberries.

Pests

Few diseases have been found on pomegranates; however when they are, it is generally associated with cracked fruits. Insects such as whiteflies, thrips, mealybugs and scale have been identified but none are considered serious. The Leaf-footed plant bug has been found in home grown fruit in Nevada (Crites, Robison, Mills, 2004) and Utah. These do not seem to penetrate the rind but are associated with cracked, overripe fruit. Commercial growing areas of California have reported a half dozen or so pests but only a couple that may require treatment. Fruit cracking is often reported in home culture. The best way to prevent cracking is to provide regular irrigation. Pomegranates will take up water rapidly when available, especially after periods of drought. The rapid uptake will frequently split the rind exposing the soft seeds (arils). This makes them vulnerable to fungal spores and insects looking to feed on the juices and lay eggs inside the fruit. Late summer and early fall rains will encourage cracking. It may become severe the closer rains occur to harvest.

Cultivars

Balegal

Originated in San Diego, CA. Selected by Paul H. Thomson. Large, roundish fruit, 3 inches in diameter. Somewhat larger than Fleshman. Skin pale pink, lighter than Fleshman. Flesh slightly darker than Fleshman, very sweet.

Cloud

From the University of California, Davis, pomegranate collection. Medium-sized fruit with a green-red color. Juice sweet and white.

Crab

From the University of California, Davis, pomegranate collection. Large fruit have red juice that is tart but with a rich flavor. A heavy bearing tree.

Early Wonderful

Large, deep-red, thin-skinned, delicious fruit. Ripens about 2 weeks ahead of Wonderful. Medium-sized bush with large, orange-red fertile flowers. Blooms late, very productive.

Fleshman

Originated in Fallbrook, CA. Selected by Paul H. Thomson. Large, roundish fruit, about 3 inches in diameter, pink outside and in. Very sweet flavor, seeds relatively soft, quality very good.

Francis

Originated in Jamaica via Florida. Large, sweet, split-resistant fruit. Prolific producer.

Granada

Originated in Lindsay, CA. Introduced in 1966. Bud mutation of Wonderful. Fruit resembles Wonderful, but displays a red crown while in the green state, darker red in color and less tart. Ripens 1 month earlier than Wonderful. Flowers also deeper red. Tree identical to Wonderful.

Green Globe

Originated in Camarillo, CA. Selected by John Chater. Large, sweet, aromatic, green-skinned fruit. Excellent quality.

Home

From the University of California, Davis, pomegranate collection. The fruit is variable yellow-red in color, with light pink juice that is sweet and of rich flavor. Some bitterness.

King

From the University of California, Davis, pomegranate collection. Medium to large fruit, somewhat smaller than Balegal and Fleshman. Skin darker pink to red. Flavor very sweet. Has a tendency to split. Bush somewhat of a shy bearer.

Phoenicia (Fenecia)

Originated in Camarillo, CA. Selected by John Chater. Large fruit, 4 to 5 inches in diameter, mottled red-green skin. Flavor sweet, seeds relatively hard.

Sweet

Fruit is lighter in color than Wonderful, remains slightly greenish with a red blush when ripe. Pink juice, flavor much sweeter than other cultivars. Excellent in fruit punch. Trees highly ornamental, bears at an early age, productive.

Utah Sweet

(Also known as Dixie Sweet) Very sweet, good quality fruit. Pink skin and pulp. Seeds notably softer than those of Wonderful and other standard cultivars. Attractive pinkish-orange flowers.

Wonderful

Originated in Florida. First propagated in California in 1896. Large, deep purple-red fruit. Rind medium thick, tough. Flesh deep crimson in color, juicy and of a delicious vinous flavor. Seeds not very hard. Better for juicing than for eating out of hand. Plant is vigorous and productive. Leading commercial variety in California.

How to Peel and Cook with a Pomegranate

<https://www.youtube.com/embed/Mwrfmu9WbfM560314allowfullscreen>
<https://www.youtube.com/embed/cl9iEvMa4Zs560314allowfullscreen>
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(function() { document.querySelectorAll('.carousel-control[data-slide="prev"]').forEach(function(prevControl) { prevControl.setAttribute('aria-label', 'Previous'); }); document.querySelectorAll('.carousel-control[data-slide="next"]').forEach(function(nextControl) { nextControl.setAttribute('aria-label', 'Next'); }); document.addEventListener('DOMContentLoaded', function() { // Query all images within the carousel const images = document.querySelectorAll('.columnCarousel .img-fluid'); images.forEach(img => { // If the image alt attribute is empty if (img.getAttribute('alt') === "") { // Attempt to find an h3 element within the same .col-lg-3 container const h3Text = img.closest('.col-
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lg-3').querySelector('h3')?.textContent.trim(); // If an h3  
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(h3Text) { img.setAttribute('alt', h3Text); } } });
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CALIFORNIA REDBUD

Cercis orbiculata Greene

Plant Symbol = CEOR9

Contributed by: USDA NRCS National Plant Data Center



Brother Alfred Brousseau
© Brother Eric Vogel, St. Mary's College
@ CalPhotos

Alternate Names

Cercis canadensis L. var. *orbiculata* (Greene) Barneby, *Cercis occidentalis* Torr. ex Gray var. *orbiculata* (Greene) Tidestrom, western redbud

Uses

California redbud is a good soil stabilizer along streams, and can withstand periodic flooding. The flowers provide nectar to bees and the young shoots, leaves, and seedpods are browsed by goats, and to a limited extent by deer, sheep, and cattle. The browse rating for sheep and cattle is poor. Horticulturists have planted redbud in informal and formal gardens and landscapes since 1886 and it has been called one of California's most attractive flowering shrubs in gardeners' manuals and horticultural guides. California redbud is highly valued by native American basket weavers for their young, wine-red branches, harvested and used in the designs of baskets.

Status

Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status (e.g. threatened or endangered species, state noxious status, and wetland indicator values).

Description

California redbud, is a leguminous shrub that grows from 7 to 20 feet tall with a dense rounded crown that almost reaches the ground. California redbud, also known as western redbud, is currently recognized as *Cercis orbiculata* Greene. The leaves are simple, thick, and rounded or heart-shaped, and have from 7 to 9 prominent veins. They are deciduous; their autumn display of yellow turning to red and brown rivals that of some eastern hardwoods. The striking sweetpea-like flowers appear before the leaves, in small clusters along the branches. Each flower has 5 petals that range in color from magenta pink to reddish purple. Pollination is by bumble bees (*Bombus* sp.) and orchard mason bees (*Osmia lignaria*). Although the pink sprays can be seen from February through April, any one shrub will remain in flower only about 2 weeks. In autumn the branches often bear many clusters of pointed, flat, very thin pods, the upper suture with a conspicuous winged margin. In ripening, the pods are first purple and then russet-brown, each containing an average of 7 hard, bean-like seeds. The mature pods persist into the next winter.

Adaptation and Distribution

Native to California, Arizona, and Utah, redbud is found in at least five plant communities including oak woodland, chaparral, mixed conifer forest, riparian woodland, and closed cone forest. It grows

at elevations of 4,000 feet or less, in canyons and on rather steep slopes, in gravelly and rocky soils along streams where it is never flooded. It also grows in the bottom of ephemeral streambeds in little pockets, benches, or crannies of boulder outcroppings. The plant is drought tolerant, sun-loving, and grows in a wide variety of soils, but it is usually found in rather harsh environments with coarse, nutrient-poor soils that are well-drained. It grows mostly singly, but sometimes, in sheltered situations, in shrubby clumps.

For a current distribution map, please consult the Plant Profile page for this species on the PLANTS Website.

Establishment

If possible, gather the seed from local sources, to maintain genetic diversity of redbud. The seedpods can be collected from September to November from redbud branches. Redbud seeds are adapted to prolonged periods of dryness and cold and they require special pretreatment to germinate, owing to an impervious seed coat plus a dormant embryo. One method is to place the seeds into a container and pour boiling water over them and let the seeds soak overnight. They can then be covered with damp peat moss and refrigerated for two months or they can be planted right away. The germination of redbud seed in the wild is favored by fire, which cracks the seed coat and generates the heat needed to stimulate germination.

Plant the treated seed in the fall in flats, spacing the seeds approximately 1 to 2 inches apart. Use a slow-release fertilizer in the planting mix. Cover with about 1/4 inch of soil (approximately 3 to 4 times the width of the seed). To reduce the possibility of damping off, keep the flats outdoors in a protected area with partial shade and little wind. Water the flats through the winter and then let the plants grow 1 full year before planting them out. The seedlings will be about 3 inches to 1 foot tall by the following fall. Plant the seedlings in a sunny location with good drainage. If gophers are a problem, plant redbud seedlings in cages. Watering is not necessary until the following summer, in a normal rainfall year. Give the young plants summer water for the first 3 years in the ground. This amounts to once every 2 weeks in a hot climate and less in a coastal climate. Do not overwater, as redbud will not tolerate summer water in the root crown area (at the soil level) and will suffer crown rot (*Phytophthora* sp.) if watered too frequently. When redbud leaves first emerge in the spring, use a liquid fertilizer to boost its growth.

Management

Pruning: Periodic pruning of redbud, after it has reached the minimum age of 5 years, can be accomplished to remove dead or dying branches that might harbor diseases or insects. Pruning should take place in the fall, winter, or early spring, after leaf drop and during the dormant period. Contemporary Native American weavers practice two types of pruning. One technique is coppicing, where the whole plant is cut to within several inches of the ground. Redbud vigorously resprouts from the coppice stool, sending up young straight shoots with a beautiful red pigment. This can bring added color to gardens and also these shoots are highly valued for basket weaving. Coppicing, however, should only be done on mature shrubs--at least a decade old. Flowering will be lost, until the young sprouts are two to three years old and shed the red pigment and form true bark. The other technique is selective pruning within the canopy to direct the growth of the plant. This pruning leaves some older flowering branches, important for bees and butterflies.

Burning: Before Euro-American settlement of California, Native Americans conducted purposeful burning of hillsides in the fall of the year, after redbud has shed its leaves, to encourage the growth of young, straight shoots used extensively in basketry. Redbud also resprouts vigorously after fires.

Pests and Potential Problems

A pathogen that infects redbud leaves is *Alternaria* sp. and *Botrytis* sp. is a gray mold that causes foliage or flower blight. Two fungi that cause root rot in redbud include *Fusarium solani* and *Verticillium dahliae*. A fungus that infects old seedpods is *Didymella leguminis-cytisis*. Most of these diseases will debilitate but not kill redbud. Fire is an effective tool to use to eliminate the above-ground pathogens inhabiting redbud.

Cultivars, Improved, and Selected Materials (and area of origin)

While there are no cultivars recommended at this time, plants are available from nurseries.

Prepared By & Species Coordinator:

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c/o Plant Science Department, University of California, Davis, California

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Planting and Establishment



Whether to grow milkweed from seed (l), transplants, or rhizomes may depend on the species and the location. Milkweeds are a necessary plant to support monarch caterpillars (c), and provide a rich nectar source for adult monarchs (r) and many other flower-visiting insects. (Photos: L – John Anderson, Hedgerow Farms, Inc.; C, R – Xerces Society / Stephanie McKnight.)

Native Milkweed Planting and Establishment in California

Monarch butterflies are an iconic species in California. The western monarch population, which generally breeds west of the Rocky Mountains and overwinters along the California coast, has declined 99.4% since the 1980s. In 2018, the western monarch population reached an all-time low, with only 28,429 butterflies counted.

Because monarch caterpillars can only grow to adulthood when feeding on milkweeds (*Asclepias* spp.), planting native milkweed is a critical component of supporting monarchs and helping their numbers recover. However, native milkweeds can be difficult to grow in the West. The Xerces Society has partnered with local native plant nurseries and USDA-Natural Resources Conservation Service Plant Materials Centers to find best practices for growing narrow-leaved and showy milkweed (*A. fascicularis* and *A. speciosa*), because these are the most widespread milkweeds in California and both species are commercially available. While these efforts are ongoing, this factsheet contains our best information to date on getting milkweeds to flourish.

Western Monarch Call to Action

Faced with these alarming numbers, the Xerces Society worked with monarch scientists at institutions across the West to develop the **Western Monarch Call to Action**, a five-point rapid-response action plan to rescue the western population of the monarch butterfly. PLanting milkweeds is one of the essential steps we need to take. To read the call to action and find out more about what you can do to help monarchs in western states, visit savewesternmonarchs.org.

Where should you plant milkweed?

We recommend against planting milkweeds along the coast within 5 miles of monarch overwintering grounds, and in other areas (such as high elevation forests) where milkweed did not historically occur to avoid disrupting monarchs' natural behavior. If you live near overwintering sites, consider planting early spring, late-fall, and winter-blooming nectar plants instead of

milkweed, as nectar is critical for fueling monarchs during their migration and overwintering. For most other parts of California, planting milkweed is recommended as a key strategy for helping monarchs. Planting milkweeds may be especially beneficial in the Central Valley, where milkweeds were historically more abundant than they are now.

What kind of milkweed should you plant?

We recommend planting native milkweeds only. California is home to 15 species of milkweed. Two of these species, showy milkweed (*Asclepias speciosa*) and narrow-leaved milkweed (*A. fascicularis*), are widely available from plant suppliers. Some other species, including woollypod milkweed (*A. eriocarpa*) and heartleaf milkweed (*A. cordifolia*), may sometimes be available commercially, but are less common. These latter two species break dormancy earlier in the spring than showy and narrow-leaved milkweeds, and may therefore be especially beneficial to monarchs leaving their overwintering grounds along the California coast. We strongly recommend against planting nonnative milkweeds, including tropical milkweed (*A. curassavica*); see box for more information.

The Problem With Tropical Milkweed

Tropical milkweed (*Asclepias curassavica*) does not die back in winter, especially in warmer climates like southern California. This creates two problems. First, it allows pathogens such as the widespread protozoan parasite *Ophryocystis elektroscirrha* (OE) to build up to very high levels, which is then transmitted to butterflies visiting the plants. Research finds that OE rates are much higher in areas with tropical milkweed and can harm or even kill monarchs. Second, because the tropical milkweed doesn't die back, it can cause monarchs to break diapause, disrupting their migration. The Xerces Society recommends that you replace existing tropical milkweed with native milkweed and/or nectar plants, if feasible. At a minimum, cut it back in the fall (Oct/Nov) and repeatedly throughout the winter to mimic the phenology of native milkweed and break the buildup of OE.

Establishing milkweed: the importance of site preparation and management

Site preparation and follow-up management to remove weeds and competing plants is key to getting milkweeds to establish, especially when planting from seed. Although milkweed can be quite vigorous once established, it can be slow to establish and easily outcompeted initially. Also, milkweed breaks dormancy late in the spring, so it can be vulnerable to encroachment from other earlier-germinating species. Site preparation methods include solarization, burning, grazing, frequent mowing, or herbicide use. After planting or seeding, mowing early in the spring before milkweed has germinated is one simple and effective technique for reducing weed competition.

The Xerces Society has researched organic site preparation techniques and published detailed information about site preparation. This is available at <https://xerces.org/guidelines-organic-site-preparation/>

Establishing milkweed from seed

If irrigation is not available, planting from seed is generally the best option, but site preparation must be very thorough. Because of the tendency for showy and narrow-leaf milkweeds to be outcompeted, we recommend seeding milkweed alone or with other nonaggressive species, rather than in a seed mix with commonly grown nectar plants. Solarizing the soil or using an alternative site-preparation method for a minimum of one year prior to planting is highly recommended. Seed should be sown in the fall, once the rains start at a seeding rate of approximately 15 pure live seed/ft². After spreading seeds onto a prepared seedbed, incorporate them into the soil immediately using a rake, harrow, ring-roller, or gentle over-head irrigation. Narrow-leaved milkweed in particular seems to do well from seed when planted in the fall.

Establishing milkweed from transplants

In general, habitat established from transplants is more successful and easier to maintain than projects sown with seeds, and is the recommended method when irrigation is available. Milkweed transplants tend to do best when planted in the fall before the milkweed goes dormant (e.g., October). Thoroughly water both plugs and container plants immediately after planting and continue to provide irrigation as needed during the dry season for the first several years until the plants are established. Most milkweed species are fairly drought-tolerant, so even during the establishment phase, irrigating every 10–14 days is usually sufficient. For milkweeds, as with most native plants,

water requirements are minimal after they become established. Using a top-mulch around transplants will help conserve moisture and reduce weed competition.

Establishing milkweed from rhizomes

Although not currently commercially available, rhizomes may be the most effective way to establish some species of milkweed, especially showy milkweed. Rhizomes can be harvested in the fall from existing stands as plants begin to go dormant. They can be planted immediately, or stored for up to a month in a cool, dry location before planting. Individual rhizomes can be cut into 2-inch-long pieces and planted at any depth from just below the surface to 8 inches down. Rhizomes that are deep-planted are slower to reach the surface, but potentially require less supplemental irrigation, as soil moisture is usually higher at depths of 6 to 8 inches. We find that showy milkweed establishes successfully and quickly from rhizomes when planted in the fall and given at least occasional irrigation (approximately 3 times per year) when planted just below the surface. The efficacy of using rhizomes for other milkweed species is not yet known, but narrow-leaved milkweed does not appear to do well from rhizomes.

Additional resources

Xerces' Milkweed Seed Finder lists nurseries that sell native milkweed seeds and plugs:
xerces.org/milkweed-seed-finder

For more information on **native milkweeds of California**, including distribution maps:
xerces.org/wp-content/uploads/2011/03/xerces-nrcs-california-milkweed-guide.pdf

Find more information about milkweeds and submit your observations of milkweeds and monarchs in the western states, visit the **Western Monarch Milkweed Mapper**:
monarchmilkweedmapper.org

For more in-depth information on **milkweeds, propagating seed, and using them in restoration projects**:
xerces.org/milkweeds-a-conservation-practitioners-guide

For suggestions for **monarch nectar plants to include in your monarch habitat**, see Xerces' monarch plant lists
Inland California: xerces.org/monarch-nectar-plant-guide-inland-california
Coastal California: xerces.org/monarch-nectar-plant-guide-california-coast

For information on **site preparation**:
xerces.org/guidelines-organic-site-preparation

For more information about the **biology and management of western monarchs**:
xerces.org/managing-monarchs-in-the-west

Acknowledgments

Written by Angela Laws and Jessa Kay Cruz of the Xerces Society. We are grateful for partnerships and discussions with the USDA-NRCS Plant Materials Centers in Lockeford, CA, and Aberdeen, ID, and Hedgerow Farms in Winters, CA, for helping us learn more about milkweed establishment.

Cherries: Calendar of Operations for Home Gardeners

Pamela M. Geisel is UC Cooperative Extension Farm Advisor in Environmental Horticulture for Fresno County; Carolyn L. Unruh is UCCE staff writer for Fresno County; and Paul Vossen is UCCE Farm Advisor in Fruits, Vegetables, and Marketing for Sonoma and Marin Counties.

Cherry trees are best suited to moderate climate regions in California, and most varieties require at least 600 hours of winter chilling (below 45°F) for normal flowering and consistent production. High summer temperatures contribute to fruit deformities such as doubling or spurring of the fruit, although some varieties are more tolerant of high temperatures. In foggy or very cool climates, fruit disease problems make production of quality fruit difficult. Generally speaking, sour cherries are more likely than sweet cherries to produce good-quality fruit in the warmer climate zones of California.

Cherries need well-drained soil because they are quite prone to root and crown rots, especially in heavier-textured soils. They generally do not do well when planted in lawns: frequent irrigations promote root diseases to which cherries are susceptible. Many cherries are not self-fruitful and so require a pollinizer to ensure a good crop. A second compatible variety has to be planted nearby or grafted onto one major limb of the cherry tree.

Winter Dormant Season

1. If scale insects, aphids, or mites are recurring problems, apply dormant oil sprays (follow label instructions) to help control these pests.
2. Prune out about 10 percent of last year's growth on mature trees to let light into the tree. Remove broken and diseased branches.
3. Cherry trees sunburn easily. In hot regions, apply a 1:1 mixture of white interior latex paint and water for protection from sunburn and subsequent borer infestation. Apply the paint mixture from two inches below the soil surface up the entire trunk and on southwest-exposed scaffold branches.
4. Plant new trees during the dormant season in areas that have good soil texture and good drainage. Avoid planting in heavy or compacted soils.

Spring Bloom Season

1. You may need to apply fungicide to control brown rot. Apply bordeaux or fixed copper at the *popcorn* stage of bud development (when the unopened flower buds have matured and the petal color is discernible, so they resemble partially popped corn kernels). Apply again at the full-bloom stage, following label instructions.
2. Keep the trunk and the soil at the base of the tree dry during irrigation. Apply water out toward the drip line to reduce crown rot problems.

Spring Harvest Season

1. If you use drip irrigation, apply just the amount of water needed to replace what is used by the tree and lost from the soil through evaporation. If you use sprinkler or flood irrigation, water about every two to three weeks and provide enough water to wet the soil to a depth of 18 to 24 inches. During summer, young, small trees will need about 4 to 12 gallons of water per day, and large trees up to 250 gallons per week, although water requirements will vary depending on environmental conditions and your soil type.
2. Cover trees with netting to protect the fruit from birds.
3. Harvest cherries when fully ripe, and avoid damaging the fruit spurs as the fruit is picked. Keep the stems attached to the cherries to keep tearing of the flesh to a minimum. Cherries may be stored for several days under refrigeration. They may be sun-dried, canned, or frozen for longer storage.
4. Apply nitrogen fertilizer after harvest. Water the fertilizer in immediately to avoid loss of nitrogen. For mature trees, use about 4 pounds of ammonium sulfate annually.

Summer and Autumn

1. Continue regular irrigation until fall rains and cold weather arrive.
2. Avoid excessive cultivation around the tree as it may damage shallow roots and expose them to disease organisms.



For More Information

Consult these UC IPM Pest Notes online at <http://www.ipm.ucdavis.edu>:

Aphids
Bordeaux Mixture
Scales
Spider Mites

You'll also find detailed information on many aspects of fruit and nut tree care in these titles and in other publications, slides sets, and videos from UC ANR:

California Master Gardener Handbook, publication 3382
Drip Irrigation in the Home Landscape, publication 21579
Pests of the Garden and Small Farm, publication 3332
Pruning Fruit and Nut Trees, publication 21171
Sweet Cherries for the Home Grounds, publication 2951
The UC Guide to Solving Garden and Landscape Problems, CD-ROM 3400

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WARNING ON THE USE OF CHEMICALS

Carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in their original labeled containers in a locked cabinet or shed, away from foods or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits and/or vegetables ready to be picked.

Mix and apply only the amount of pesticide you will need to complete the application. spray all the material according to label directions. Do not dispose of unused material by pouring down the drain or toilet. Do not pour on ground: soil or underground water supplies may be contaminated. follow label directions for disposing of container. Never burn pesticide containers.

PHYTOTOXICITY: Certain chemicals may cause plant injury if used at the wrong stage of plant development or when temperatures are too high. Injury may also result from excessive amounts or the wrong formulation or from mixing incompatible materials. Inert ingredients, such as wetters, spreaders, emulsifiers, diluents, and solvents, can cause plant injury. Since formulations are often changed by manufacturers, it is possible that plant injury may occur, even though no injury was noted in previous seasons.

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