



Growing Pomegranates in California

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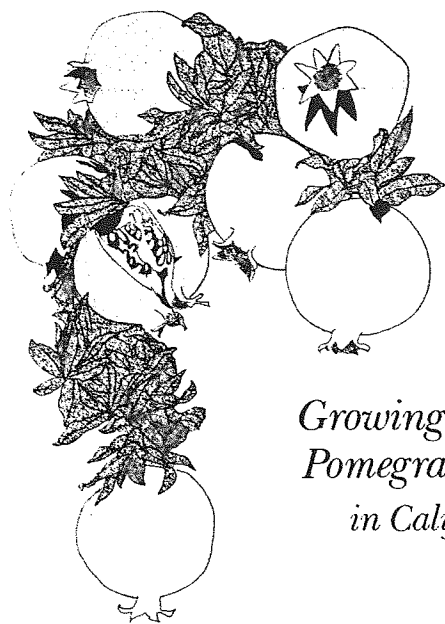
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Introduction

The pomegranate is associated with the most ancient civilizations in the Middle East. Judging by some of the earliest records, the pomegranate is native to Persia and the surrounding area. It was also cultivated in ancient Greece and referred to by Greek writers several hundred years B.C., even before the advent of the almond, peach or apricot.

The character of the fruit made it particularly agreeable to the inhabitant of hot, arid regions, and so it spread east to India and China, and west to countries encircling the Mediterranean (it flourished particularly well in Spain, and the city of Granada owes its name to the high-quality pomegranates grown in that area). The present scientific name, *Punica granatum*, was derived from the name "pomuni granatum" (seeded apple) given to the fruit in the Middle Ages.

Spanish missionaries brought the pomegranate to the New World soon after Cortez conquered Mexico in 1521. As the missions moved north to California, so did the fruits grown by the padres. For instance, an orchard containing pomegranates, apples, plums, figs, oranges, grapes, and peaches was described by a visitor to Mission San Buena Ventura in 1792. Most descriptions of early California fruit gardens mention pomegranates as being widely grown, and even today many California mission gardens contain pomegranate bushes, a few of which probably were originally planted by the padres.

In the U. S. pomegranates are grown where winters are mild, but only in California does the fruit reach the high quality necessary for successful commercial production. The pomegranate also serves as an ornamental shrub or tree, prized for its fruit, shiny foliage, and long flowering period during the spring and summer.

Acreage

In 1976 there were about 2,500 commercial acres of pomegranates in California mostly in Tulare and Fresno counties in the central San Joaquin Valley. There are also countless pomegranate shrubs and hedges along roadways and in backyards throughout the state.

There were 1,850 acres of pomegranates in California in 1927, but acreage steadily declined until there were only 522 acres in 1952. Plantings in the 1960's and 1970's slowly increased the state's acreage to the present level and recent plantings will soon further increase California's production. Further expansion beyond that required for limited consumer demand and by-product use could profoundly effect grower returns.

Description

Pomegranates grow naturally as a bushy shrub or as a small tree—if trained, they may grow 15 to 20 feet high. The tree is deciduous in interior and desert regions, but in coastal areas may lose only a portion of its leaves in winter. The tree is quite resistant to cold when dormant, withstanding temperatures down to 10° F. However, it is very sensitive to frost before it reaches full dormancy in late fall and after buds have begun to swell in early spring. The main trunk near the ground, particularly on the south and west sides of the tree, is sometimes damaged by frost during these periods. Bark damage may be reduced by painting trunks white to minimize temperature fluctuation during cold nights and warm days when the trunk is exposed to direct sunlight.

The brilliant orange-red flowers are axillary, solitary, or in small clusters, and borne toward the ends of the branchlets. In the San Joaquin Valley there are

generally two or three blooming and fruit-setting periods in spring. Fruit may be set at each bloom period. Earlier bloom set results in fruit of larger size at maturity.

In coastal or cooler areas, the bloom period may last from March until September or later. The fruit does not develop good color or size and is late maturing.

The pomegranate is long lived compared to many other fruit trees—some trees have been reported to be over 200 years old.

Where pomegranates may be planted

In North and South America the pomegranate is found growing from the southern United States to Chile and Argentina, probably reaching its highest quality in the arid regions of California, Arizona and northern Mexico. Throughout tropical America the plant is common in gardens and dooryards, and in many places it is grown more for ornamental value than for fruit. In humid climates the fruit is inferior in quality.

In California, the most satisfactory areas for growing pomegranates are in interior valleys where hot dry summers mature fruit with good color and flavor. The tree grows well in a wide range of climatic conditions. Although mild summers limit commercial fruit production, the pomegranate is well adapted as an ornamental shrub in cool coastal areas.

The pomegranate is more adaptable to a wider range of soils than are most fruit trees. It does best on deep loam, but satisfactory orchards grow on sandy as well as adobe-clay soils. The tree tolerates mild alkali conditions and areas of slow drainage, but yield, fruit quality and tree growth are unsatisfactory on soils having much alkali or poor drainage.

Varieties

Because of the wide fruit variation arising from seedlings, many pomegranate varieties have been selected and grown from cuttings through the centuries.

The pink or red-flowered type includes most of the common and all the desirable and commercial varieties of pomegranates. The trees are deciduous in the interior valleys and semideciduous along the coast. The fruit is round oblate or obovate in form with rind varying from thick to thin. Color of the outside and inside varies from off-white to purplish or

bright crimson. The seed may vary in size and hardness, some varieties seeming to be "seedless," others being almost inedible because of large, hard seeds. In general, varieties having whitish or pinkish fruit are usually sweeter than the dark crimson varieties.

Wonderful is by far the most widely planted commercial pomegranate variety in California. Its fruit, which ships well, is large and deep purple-red with a glossy appearance. The kernels and juice are deep crimson with good flavor; seeds are small and tender and the rind is of medium thickness. It is also a good dooryard tree for eating fresh and processing for juice. Wonderful was discovered about 1896 in Porterville in a quantity of pomegranate cuttings received from Florida. The fruit matures in late September and October.

Granada is a patented early-maturing variety widely grown in Tulare County. The deep crimson-colored fruit, which matures about the middle of August, is smaller than Wonderful, but because of its early maturity it commands a premium price on the market.

Ruby Red is another variety of very limited commercial importance. The fruit is about the same size as Wonderful, and while its crimson-purple color develops early, juice tests show that it matures at the same time as Wonderful. Ruby Red matures at the same time on the tree, thus allowing one picking which reduces the splitting problem. It does not store as well as Wonderful.

Foothill Early is a recent patented introduction planted in central California. The fruit is similar to Wonderful but matures 1 to 2 weeks earlier.

Spanish Sweet or Papershell is still grown to a limited extent as a dooryard tree, but is no longer a commercially marketed variety. The fruit is large and pale yellow, washed with pink. The kernels are pale pink with a sweet flavor.

A few other varieties, mostly early maturing, are grown for the commercial market. These named and unnamed selections are, for the most part, marketed before Wonderful matures.

A few ornamental varieties are grown primarily for dooryard use. These usually are double flowered or dwarf types with red, yellow, white or variegated blooms. Like the commercial varieties, they are most successfully grown in hot interior areas, but are also adapted to the coastal climate.

Propagation

The pomegranate may be propagated by means of hardwood or softwood cuttings, or by seed.

Seeds germinate easily without going through a rest period, but trees are not grown commercially from seed germination because seedlings do not come true to variety. Such seedlings produce fruit of widely varying characteristics: large to small, juicy to woody, dark-red or purple to almost white, and from sweet to sour.

Trees may be grown from softwood cuttings made late in the growing season and rooted in beds or greenhouses; however, this method is seldom used.

Hardwood cuttings are the easiest and most satisfactory method of growing pomegranates. Cuttings are made 8 to 10 inches long of wood $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter. These are cut in the winter from the previous season's shoot or sucker growth. The cuttings are planted in open ground 6 to 8 inches apart in nursery rows, with about 2 to 3 inches of the top exposed. It is not necessary to callus the cutting to insure rooting. The plant is allowed to grow for one season in the nursery and then transplanted bare root to the orchard the next winter or early spring.

Planting distances

Pomegranate trees do not come into good commercial production for 5 or 6 years and fruit produced on young trees tends to mature late. Although double setting or close planting may increase early production, this practice is questionable. The standard planting distance is 20 x 20 feet, with a few orchards planted at 18 x 18 feet or closer.

Planting closer than 18 x 18 feet is not normally recommended for commercial pomegranate production. Trees planted too closely make picking difficult as they begin to crowd, and fruit color develops more slowly when shaded in closely-planted or hedge-row plantings. As trees get older and denser, fruit scarring may increase. A few orchards are close planted at 12 to 14 feet within the row, rows being 18 to 20 feet apart. By maintaining a permanent weed free berm system of cultivation, close-planted orchards such as this can be maintained. Picking and pruning can be a problem under close-planted conditions because workers cannot move freely through the rows.

Where hedges or border rows are desired, trees can be planted as close as 6 to 10 feet apart and allowed to grow without training. They sucker readily and the resulting bushes form a dense hedge.

Irrigation

The pomegranate can withstand long periods of drought. Although not much fruit is produced under drought conditions, trees will survive for years; then, if properly irrigated, they grow vigorously and produce good crops. Trees will thrive and produce an abundance of fruit under high summer rainfall conditions but the fruit tends to be soft and has poor shipping and storage quality.

To produce large crops of good-quality fruit, pomegranates require about the same amount of water and frequency of application as citrus. Adequate soil moisture must be maintained throughout the growing season, particularly as harvest approaches in late summer and early fall, when it helps reduce the number of split fruit.

Most orchards are irrigated under the furrow system, but sprinkler and drip irrigation systems are satisfactory if properly designed. Orchards thrive under noncultivation and semi-noncultivation berm systems. Weed control is difficult because at present no pre-emergence herbicides are registered for use in pomegranate orchards.

Fertilization

Mature pomegranate trees require from $\frac{1}{2}$ to 1 pound of actual nitrogen per tree per year. This may be applied in one application in fall or winter. On light soils a split application may be desirable, one-half of the fertilizer being applied in late winter and the remainder in spring. Excessive or late applications of nitrogen may delay fruit maturity and color. Some evidence indicates that excessive nitrogen applications cause increased vegetative growth and reduce fruit production.

There is no evidence to show that phosphorous (P) or potassium (K) will improve growth or fruit quality when used to fertilize pomegranate orchards. Occasionally, zinc deficiency is evident in trees. This is corrected by applying zinc sprays during the dormant season or to the foliage in spring and early summer.

Insect pests

One widespread insect pest on pomegranates in the commercial producing areas of California is the flat mite, *Brevipalpus lewisi*. This small, light-reddish mite hibernates under flakes of bark on larger tree limbs in large numbers in winter. It appears on fruit and foliage in mid to late summer, causing a russeting and checking on mature fruit. In the San Joaquin Valley, one or two sulfur dustings in June or early July gives effective control.

Omnivorous leafroller, *Platynota stultana*, has recently become a serious pest in many pomegranate orchards in central California. The larvae of this insect are first observed in the tops of trees nesting in shoot terminals in June and July. As fruit begins to ripen, larvae enter in protected locations: under leaves, near the stem, or where two fruits are touching. Larvae also cause channels to appear in the rind where they feed under leaves. After entering the fruit they feed on kernels and pupate at the entry hole. The fruit usually rots just inside the entry location. Control is difficult because timing must be exact when larvae are first noticed nesting in the shoots. It is difficult to get good coverage because the larvae plaster leaves together or to fruit, and are thus well protected.

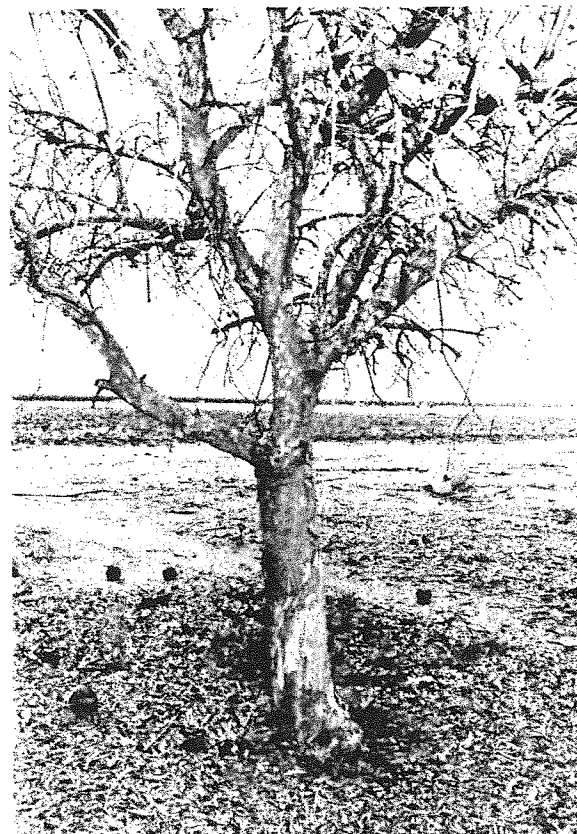
The western leaf-footed plant bug and grape and Comstock mealybug have caused damage to pomegranates in isolated areas of California with control occasionally being necessary. In addition citricola scale, black scale, California red scale, melon aphid, greenhouse whitefly, katydid and thrips (citrus greenhouse and flower) also attack the pomegranate but seldom, if ever, become serious pests.

Root-knot nematode has been identified in pomegranate roots. Not normally considered a serious pest, it may be responsible for a weakening effect on trees, particularly those planted in sandy areas or areas where the root-knot nematode population is very high.

Few insecticides or nematocides are registered for use in pomegranate orchards. Control measures for some of the foregoing pests must follow prescribed methods given under special permits through the local Agricultural Commissioner.

Diseases

Pomegranate trees are not affected by any serious disease. The fruit, however, is frequently damaged by heart rot, caused by *Alternaria* fungus.



Pomegranate tree trained to a single trunk.

Heart rot infection takes place in the bloom, and progresses to the interior of the fruit. The central cavity of the infected fruit is partially or totally decayed, yet the rind remains unaffected. Experienced pickers throw out most infected fruit, although infection is difficult to detect. At present, there is no known control. Removal of old fruit from the tree during pruning may eliminate a potential source of fungus as well as shoot dieback for the following season. The disease seems to affect more fruit if there is much rain in blooming season, thus suggesting that moisture in the bloom increases amount of infection.

Training young trees

Trees may be trained to a bush, single- or multiple-trunked tree. The bush form is satisfactory for backyards or hedgerows, but is undesirable for good commercial production.

Trees from the nursery are planted bare root in winter or early spring. The natural growth habit of the pomegranate is to produce many suckers from the



Pomegranate tree trained to a multiple trunk.

base of the tree. If a single trunk tree is desired, only one vigorous sucker or the trunk of the original nursery tree should be selected and branches grown from it. Basal suckers should be removed periodically to promote growth from the main trunk of the newly planted tree.

If the orchard trees are to be developed into a multiple-trunk system, five or six vigorous suckers should be selected around the base of the young tree and allowed to grow. Selection of the five or six suckers to be developed into permanent trunks may take two or three or more years until good trunks are correctly positioned to form a sturdy and symmetrical tree. All other suckers should be removed in summer and during dormant pruning.

Many growers prefer the multiple-trunk system. In case of frost injury, usually only one or two trunks are injured, leaving the others to continue bearing. New trunks can be trained from suckers and full production restored to the tree in 2 or 3 years. Single-trunked trees may be completely killed except for suckers coming from the ground. Trees trained to

a multiple trunk require less frequent care in pruning during the first few years and come into bearing sooner than trees having only one trunk.

Some pruning and tying with ropes for support may be needed for the first 3 or 4 years or until trunks are large and rigid enough to support the developing top.

Pruning

Pomegranate trees require a small amount of pruning each winter to maintain shape and good bearing surface. Even mature trees grow vigorously, sending up a large number of shoots and basal suckers that require removal each year.

The short spurs on 2- or 3-year-old wood growing mostly on the outer edge of the tree produce flowers. These spurs develop on slow growing, mature wood that bears fruit for several years, but as the tree increases in size the wood loses its fruiting habit. Light, annual pruning encourages growth of new fruit spurs and heavy pruning reduces yields. Care should therefore be taken to leave adequate fruit-bearing wood on the tree, while removing crossing over or interfering branches. In addition, some thinning out of crowded bearing areas helps produce larger fruit having fewer wind scars.

Should below-freezing temperatures occur in early winter before trees are fully dormant, or in early spring when trees are beginning to leaf out, severe damage can be done to tree trunks. Occasionally, entire trunks are girdled and killed by frost. Remove weak or dead limbs during the next growing season, and permit a vigorous sucker to develop from ground level to replace it.

Harvesting

Picking begins in August before fruit is fully mature. Early-maturing orchards are color picked, and two picks usually are made. Average production is 5 to 6 tons per acre.

Fruit must meet certain maturity standards for packing and shipping. The juice must pass a minimum color and acid test, and fruit must be free from rot, decay, sunburn, bruises, cuts and cracks.

As fruit approaches maturity on the tree it may split, some eventually turning almost inside out. For commercial handling, picking should be completed as soon as possible after fruit has reached maturity standards. Rain on maturing fruit will cause many to split before they can be picked.



Cluster of maturing pomegranates. Note split fruit in center of cluster

Pickers harvest fruit with clippers and bags like those used to pick oranges. For shipment, fruit is packed into 25- to 28-pound net Los Angeles lug boxes by size, and fruit may be waxed to enhance the appearance; it can be held in cold storage for several weeks without losing market quality. Fruit continues to develop to a darker skin color when held at room temperature, and may last several weeks in decorative arrangements.

Marketing and uses

Demand for pomegranates comes largely from eastern markets supplied from California by regular shipments from September to November.

The fruit is widely used for decorative purposes, but is also eaten fresh. Children especially enjoy breaking fruit open and eating the kernels. Housewives commonly use the kernels as a garnish for desserts and salads—for a real treat, kernels may be rolled in small cream cheese balls to be served as appetizers.

Juice is extracted by squeezing kernels in a cloth bag or by cutting fruit in half and using an orange reamer. Large extractors similar to grape crushers are used for greater amounts of juice. Two 2 x 4 or 2 x 6 boards about 4 feet long, hinged at one end and mounted on a sawhorse, make an effective squeezer for whole pomegranates.

The juice is used many ways in a variety of foods and beverages. Grenadine is made by mixing equal parts of pomegranate juice and sugar. Allow to stand for 3 days, bring to a boil and simmer for 3 minutes, strain into sterilized jars and seal. The resulting syrup is widely used as a flavoring in mixed drinks, as a topping for ice cream and desserts, or as a sweetener for grapefruit halves.

Pomegranate juice is also used to make wine, or as a refreshing punch base. Citrus fruit sections and slices of apples or pears marinated in pomegranate juice are attractive in salads and fruit cocktail. Occasionally, the juice is used in making gelatin desserts, icing for cakes and pudding sauces.

Perhaps the most popular use for extracted juice is in making pomegranate jelly:

- 4 cups pomegranate juice
- 7½ cups sugar
- Lemon juice (2 to 4 tablespoons, depending on the sweetness of the juice)
- 1 bottle liquid pectin

Measure juice, lemon juice, and sugar into a large saucepan and mix. Bring to boil over high heat and at once add liquid pectin, stirring constantly. Then bring to a full rolling boil and boil hard exactly ½ minute. Remove from heat, skim, pour quickly into hot, sterilized jars. Seal. If jelly glasses are used, pour paraffin on the hot jelly at once. Makes about 11 8-ounce glasses.