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# MANAGING AND HARVESTING THE MATURE PRUNE ORCHARD

The cultural practices used on prune trees during the first few years in the orchard are aimed at developing strong, well-shaped, vigorous trees. The crop is less important than tree development during this period.

Beginning about the fifth to eighth summer in the orchard, the trees will bear enough fruit so that the crop becomes very important, and the amount of good fruit produced determines the value of the prune tree.

The following cultural practices are recommended to help establish and maintain satisfactory yield and quality in prune orchards.

## PRUNING

To prune bearing trees, simply thin them out—remove unwanted branches and cut back some others to side branches or laterals. This usually will result in a good distribution of healthy fruit spurs. Large cuts will be unnecessary if you carefully selected scaffold branches during the formative years and pruned regularly. The results of little or no pruning do not appear for several years. (See figure 1.) Eventually the fruiting wood in the center and lower portions of the tree becomes weak and may die out from lack of sunlight. This limits the bearing area to the outer edge of the tree which reduces the crop. The weight of fruit on the branch ends also may cause the limbs to break.

Figure 2 shows proper pruning. This vigorous old prune tree has ample fruiting wood to produce good crops. With regular pruning, older prune trees usually produce larger, more regular crops. However, in parts of the coastal counties the percentage of flowers that develop into fruit is comparatively low; in these areas, leave a little more fruiting wood than is illustrated.

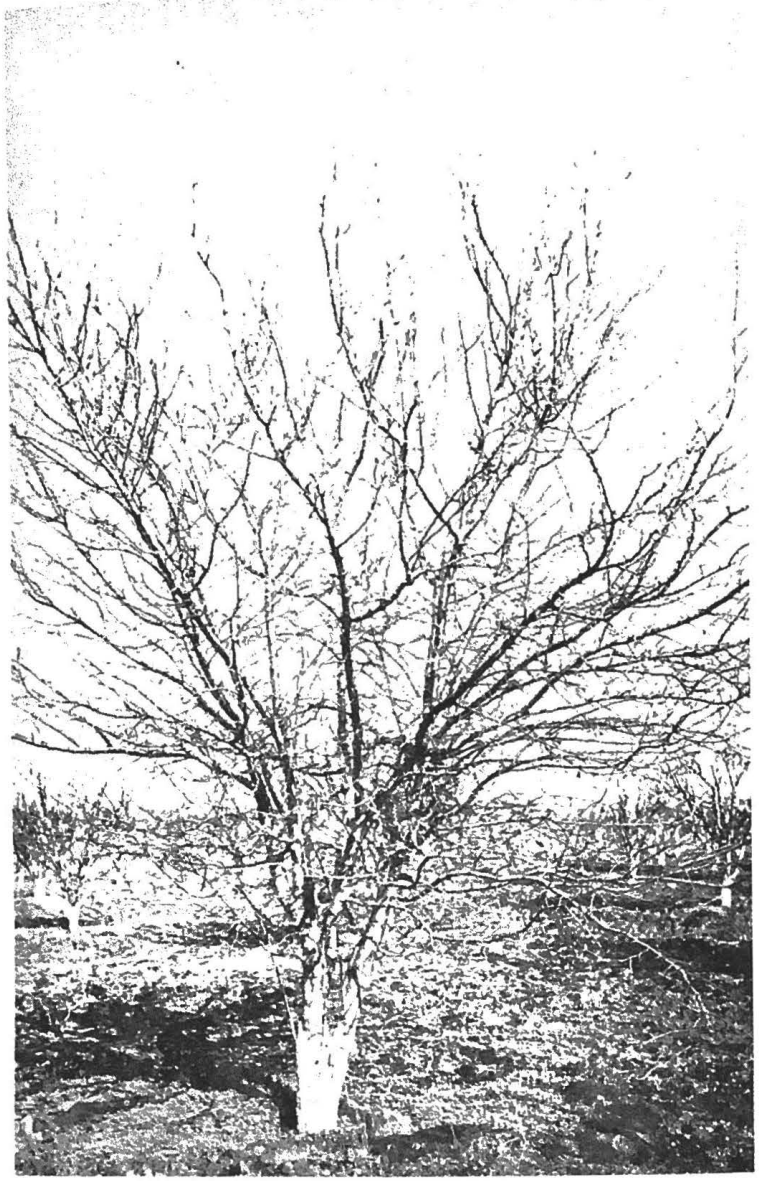

Figure 1. Little or no pruning



Figure 2. Proper pruning

The sugar prune, still grown in southern Santa Clara County, strongly tends to alternate bearing, and the brittle wood often breaks in the years when the crop is heavy. Heavy annual pruning on trees of this variety will help to even out the crop load and reduce limb breakage.

## CULTIVATION

Orchards usually are cultivated to remove noxious weeds and weed competition; to make it easier to irrigate, remove brush, harvest, and spray; to work cover crops and manure into the soil; to prepare a seedbed for cover crops; and to aid water penetration where the soil has been packed.

Deep cultivation will injure the roots; do not cultivate any deeper than is necessary to get the job done. Remember that orchard cultivation does not reduce water loss except by killing weeds. Unnecessary stirring of the soil, especially when it is wet, will increase your operating cost and may injure the soil by compacting it and causing a plow sole to form. For further details, see UC Circular 486, "Essentials of Irrigation and Cultivation of Orchards," available from your local farm advisor's office.

## COVER CROPS

Cover crops are used to reduce soil erosion, increase water penetration, fix nitrogen (with leguminous cover crops), and to improve the general physical condition of the soil. However, cover crops will not do all these things under all conditions. For example, leguminous cover crops with enough nitrogen-fixing bacteria will increase the total nitrogen in the soil in cool, humid areas, but not under hot, semiarid conditions.

The most widely grown leguminous cover crops include horse beans, the vetches, and burclover. In limited areas, fenugreek, lupine, and field peas have been successful. The most widely used nonleguminous cover crops are mustard, rye, oats, and barley. The nonlegumes provide better water penetration than the legumes. For further information on cover crops, see UC Circular 466, "Fertilization and Cover Crops for California Orchards." This is available from the office of your local farm advisor.



## IRRIGATION

Prunes require adequate irrigation for maximum production. The trees should have moisture available at all times. The number of required irrigations doesn't follow an exact rule. The frequency of irrigation depends on several factors. Most important are: climatic conditions, soil texture and depth, and distribution of the root system.

An effective irrigation should wet the soil to the full depth of rooting. As a rule, excess water that drains below the root zone is wasted and sometimes raises the water table which may injure the trees. One exception to this rule is that sometimes adding more water than the trees require will leach out excessive concentrations of salts, including chlorides, sulfates, and boron compounds.

Trees growing in the warm Sacramento Valley require a great deal more water than trees in the cooler coastal belt because of differences in summer temperature and humidity. Peak water use occurs during June, July, and August.

## FERTILIZATION AND NUTRITION

Prunes generally respond only to nitrogen fertilizer. In certain areas, prune trees require other nutrients, particularly potassium and zinc. Some areas may have excess nutrients (such as boron) which can be toxic to prune trees.

### Nitrogen

Mature prune trees normally require from 60 to 100 pounds of actual nitrogen per acre. The amount of commercial fertilizer to apply depends upon the percentage of nitrogen in the product. The label usually indicates the amount, which can vary from 15.5 to 82 per cent.

Some of the common nitrogenous fertilizers are ammonium sulfate, ammonium nitrate, calcium nitrate, anhydrous ammonia, aqua ammonia, and urea. All these materials may be applied on the soil, except aqua and anhydrous ammonia. These last two may be applied in the irrigation water or drilled into the soil.

The ammonium form of nitrogen (in ammonium sulfate, anhydrous ammonia, and others) tends to become fixed in the surface layers of most California soils. Nitrifying bacteria must convert the ammonia form of nitrogen to the nitrate form before it can be carried into the root zone. Allow at least a month for a substantial part of the added ammonia to be converted to nitrate. High soil temperatures will hasten the conversion. All the nitrogen in the nitrate fertilizers, such as calcium nitrate, can move with irrigation or rainwater and be available immediately in the root zone. However, about half the nitrogen in ammonium nitrate becomes fixed first in the surface soil. Therefore, apply the ammonia compounds earlier in the winter than nitrate compounds. Under most conditions, January is a good time to apply ammonia compounds, and February, a good time to apply nitrate compounds.

**Potassium**

Potassium deficiency in prunes usually has appeared in areas varying in size from a few trees to several acres. The Sacramento Valley and the Gilroy area of the Santa Clara Valley have had the most trouble. Trees that show no deficiency symptoms rarely respond to added potassium.

Potassium deficiency symptoms include leaf scorch, premature fruit drop, small fruit, and dieback (see figure 3). The leaf scorch usually appears on the leaf margin, but also may involve most of the leaf blade.

To correct a potassium deficiency in mature orchards with medium to heavy soils, you will need about 25 pounds per tree of sulfate



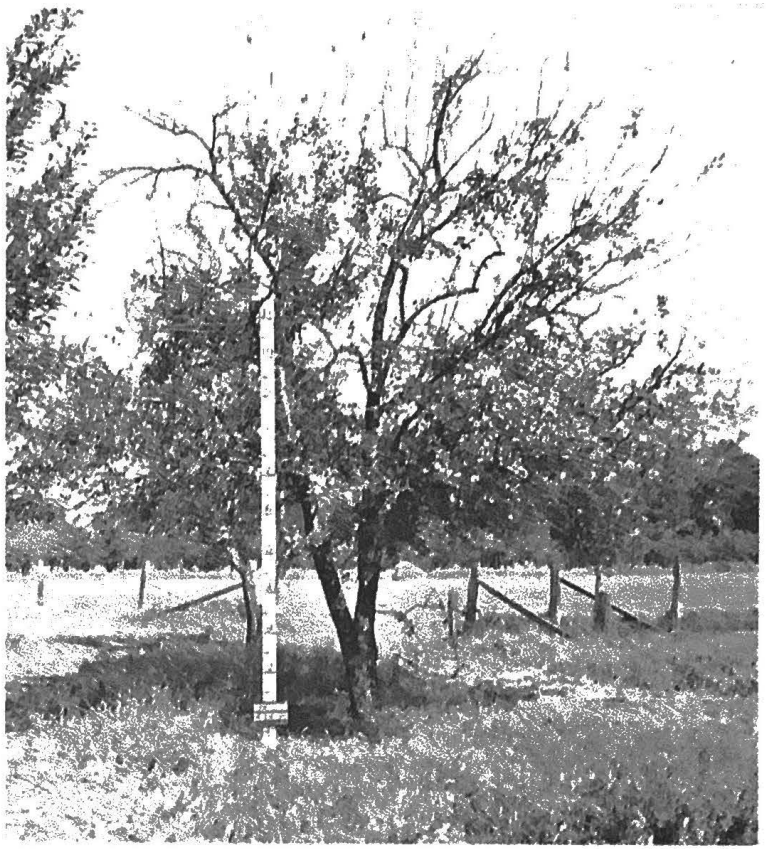

Figure 3. Potassium deficiency

of potash. Most soils strongly tend to hold potassium in the surface layers. To overcome this, drill the potassium into the soil to a depth of 6 to 8 inches. This will maintain an available supply for several seasons.

An impaired root system or overcropping also can reduce the potassium uptake by the tree roots, even when there is adequate potassium in the soil. The condition of the tree often may improve with the correction of these limiting factors.

### Phosphorous

Phosphate fertilizers have not affected prune trees in California, even those growing in soils where certain field and vegetable crops respond markedly to phosphate fertilizers. Cover crops (particularly legumes) have responded to a phosphate fertilizer in some cases. However, most prune orchards are growing in soils that produce good cover crops without added phosphate fertilizer.

### Zinc

Zinc deficiency may occur in prune orchards in all districts. Also known as "little leaf" (see figure 4), its common symptoms are small, yellowish leaves on occasional branches. These leaves generally appear as tufts or rosettes on young or vigorously growing trees. The symptoms are most apparent in the early growing season.

To correct zinc deficiency, spray the trees either in the dormant stage with zinc sulfate or early spring with zinc oxide or similar zinc materials. Foliar applications may cause defoliation or injury in some seasons. Consult your local farm advisor for specific recommendations before using zinc materials.

### Boron

**Boron deficiency** or "brushy branch" of prunes occurs chiefly in Sonoma County and in limited areas in other districts. Boron-deficient trees have little or no crop. The branches die back, push the lateral buds, and produce many side branches.

The usual treatment is to apply boron fertilizer to the surface of the soil every 3 to 5 years at the rate of 5.7 pounds of actual



Figure 4. Zinc deficiency

boron per acre. Fifty pounds of borax containing 11.36 per cent boron (36.5 per cent $B_2O_3$) will supply the required amount. Boron fertilizers often are stronger than borax, so less than 50 pounds will be needed. Calculate the exact amount from the formula on the container.

Late spring or summer sprays with boron materials also have given satisfactory results. Boron fertilizers that are more soluble than the materials used for soil treatments are available. Apply these annually at the rate of 1 pound per 100 gallons of water.

Consult your farm advisor before using boron materials.

**Excess boron** in the soil may injure trees. Boron may occur naturally in the soil or it may enter through the irrigation water. The tips of the shoots of the injured trees die back, and the bark becomes cracked and corky, especially in the axils of the leaves where the leaf stems, or petioles, join the twigs. Sometimes gum exudes from the injured parts. You also may find corky areas on the leaf petioles and on the large veins on the undersides of the leaves (see figure 5).

If other conditions for growth are normal, the lateral buds on injured shoots will start to grow, but will die back later. Many of the nodes will enlarge considerably by the end of the growing season.

These symptoms may be seen throughout young, vigorous trees, but on old trees they often are restricted to the watersprouts. Continued high concentrations of boron eventually will weaken the trees until they produce little or no fruit.

Because the soil and the amount of rainfall vary with location, we cannot say exactly how much boron in the water will result in injury. However, water with more than 1.5 parts per million of boron usually is dangerous to prune trees.

When irrigation water high in boron concentration is used, boron deposits accumulate in the soil. Where boron is a problem, you can leach boron out of the soil by using satisfactory irrigation water in excess of that needed to sustain the trees. This treatment will work well only on sufficiently porous soil with good drainage. Avoid planting in those isolated areas where boron occurs naturally in high concentrations in the soil.



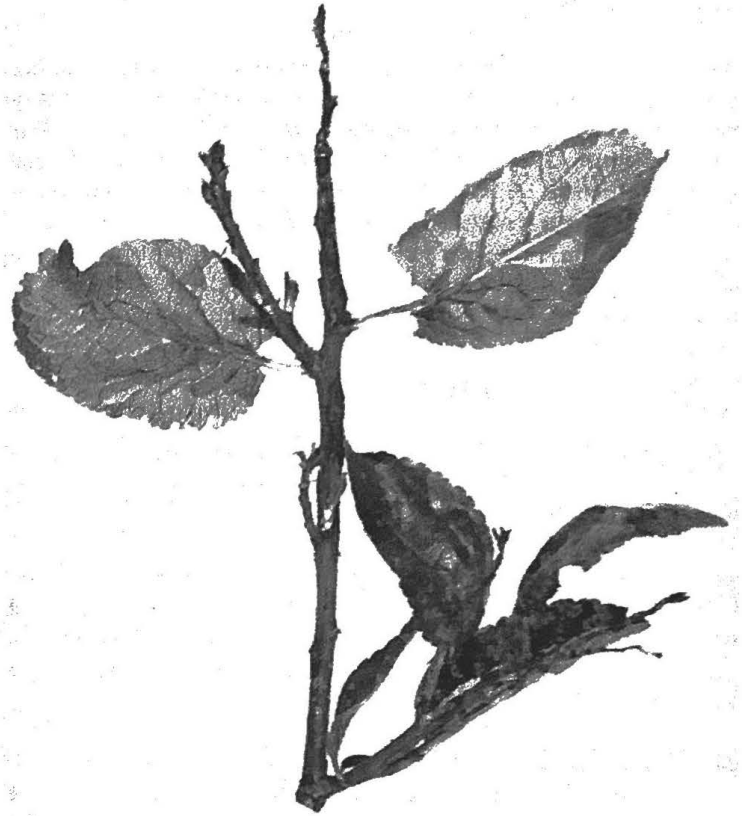

Figure 5. Boron excess

### Manganese

Manganese deficiency occurs to a limited extent in prune orchards. The leaves of deficient trees are yellowish with green bands along the veins. If symptoms are severe, treatment is necessary to prevent crop reduction.

To correct manganese deficiency, drill manganese sulfate (alone or with sulfur) into the soil to a depth of 6 to 8 inches. Early spring sprays of manganese compounds also may be used. For further information see UC Circular 466, "Fertilizers and Cover Crops for California Orchards," available from your farm advisor's office. Consult your farm advisor for specific recommendations.

## FRUIT THINNING

Thinning French prunes is not generally economical. However, a few growers have used hand rakes to thin fruit in years when the crop was excessive.

Hand thinning is common on the sugar prune, which must be rather large to bring a satisfactory return. Recently, blossom sprays of dinitro compounds were shown effective in reducing crop and increasing fruit size. Usually supplementary hand thinning also is needed for satisfactory results.

Imperial prunes also must be relatively large to bring good returns. However, spray thinning the blossoms is necessary only where the orchard tends to set heavy crops. Imperial prunes are self-sterile; when planted in solid blocks, fruit set usually is light due to inadequate cross pollination.

Spray thinning is a calculated risk; weather conditions during and prior to bloom period can effect the success of dinitro sprays. Dinitro sprays are likely to thin more severely during cool, humid weather than during warm, dry weather. If weather conditions also



restrict pollination, dinitro sprays may seriously overthin due to combined light set and increased spray effect. If you plan to spray-thin, experiment first on a small basis.

## BRACING

In some areas wooden props commonly are used to prevent heavily loaded branches from breaking. Place props only where necessary, since it is not economical to support all branches.

The last irrigation and cultivation before harvest often delay placing wooden props until after some breakage has occurred. This trouble can be avoided with permanent wire bracing, which remains in place and out of the way. In wire bracing, wires are run from a ring in the center of the tree and attached by staples or stirrups to the main branches. If you use stirrups, be sure they are large enough so that the branches won't be girdled. Wooden props generally are used to supplement wire bracing.

Some growers use metal straps to reduce breakage of main limbs and the amount of propping required. However, carelessly placed straps can injure the trees, particularly those with young, smooth-barked limbs. Damage may be reduced or nearly eliminated if you pad the points of contact with wooden blocks or heavy rubber.

Recently, rayon and plastic straps have appeared on the market. Although their use is not yet widespread, they are more easily adjusted and appear to be less damaging than metal straps on young, smooth-barked trees.

## HARVESTING

Unlike many other fruits, prunes are not handpicked from the trees, but are allowed to drop to the ground, or are shaken to the ground or onto sheets or onto catching frames.

### Coastal Area

Prune harvesting methods in the coastal valleys vary considerably from interior valley methods.

In the coastal valleys, the prunes usually drop easily when they are mature, and require only light shaking. Heavy shaking in the early season causes immature prunes to drop. The number of pickings varies from two to four; but usually, fewer than three pickings results in a mixture of overripe and underripe fruits. First picking normally is limited to fruit that has dropped naturally, and contains a relatively high number of defective prunes.

Generally, aluminum or wooden poles equipped with metal hooks are used for hand shaking. The prunes are picked up from the ground by hand and placed in picking pails. The pails are emptied into lug boxes or bulk bins conveniently distributed along orchard roadways.

In recent years, mechanical shakers and pickup machines have harvested some coastal valley prune orchards (see figure 6). This appears to be the best way to mechanize prune harvest in these areas. However, present harvest procedures will change little as long as sufficient labor is available at a reasonable cost.

### Interior Valleys

Interior valley harvesting methods differ from those of the coastal counties because the prunes in the interior valleys tend to hang on the trees after reaching the harvesting stage. Growers generally shake the trees and rarely make more than one picking.

Currently, approximately 90 per cent of the prunes in the Sacramento Valley are shaken mechanically. Probably 20 to 30 per cent of the crop is completely mechanized, using some type of catching unit in addition to the shaker. Several different shakers and catching frames are commercially available (see figure 7).



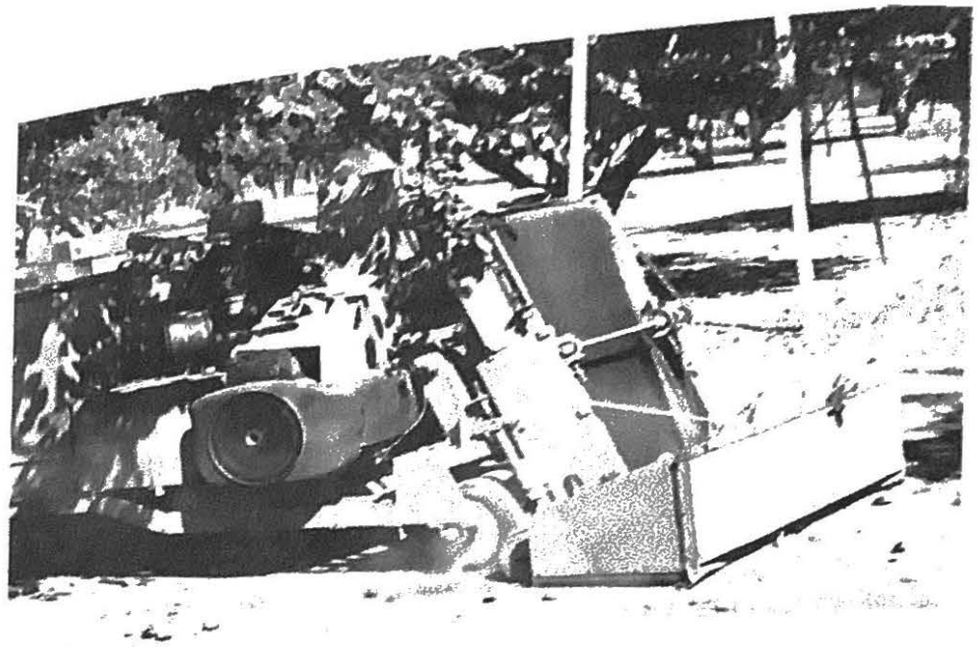

Figure 6. Ground pickup machine used in coastal area

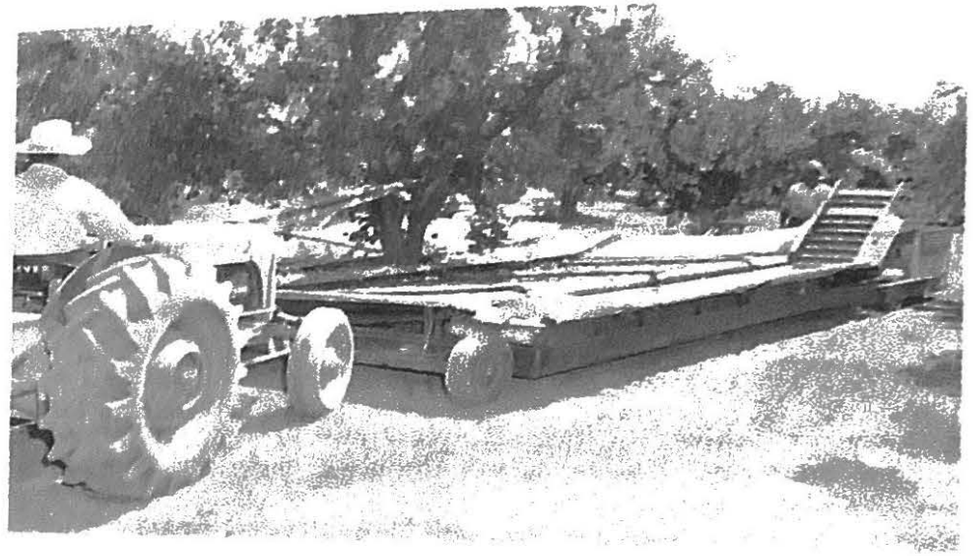

Figure 7. Catching frames used in Sacramento Valley

For complete harvest mechanization a grower will need sufficient acreage to keep down equipment investment costs per acre. Very large acreages may require more than one completely mechanized harvest unit. Smaller growers may choose less mechanization and more manpower, and invest less capital to complete harvest in the same length of time. Limiting the harvest season to about 3 weeks keeps fruit quality high and also helps to utilize family labor during school vacation. Another alternative is to hire a custom operator. For successful harvest mechanization, select a careful individual with good judgement to operate the harvest equipment.

### Mechanical Damage

Mechanical shakers can seriously damage trees in older orchards, but damage is more serious in orchards where trees have not yet developed a thick tough bark. The damage problem increases greatly when diseases such as ceratocystis canker appear in the wounds.

Ceratocystis canker is a fungus disease. It causes a canker which, if untreated, will girdle and kill major limbs or, occasionally, entire trees if the canker is located on the tree trunk. You can reduce the incidence of tree damage by carefully operating the shakers and by carefully cutting and cleaning the damaged areas on the limbs and trunks.

## DISEASES

The prune is subject to several infectious diseases caused by fungi and bacteria. Following are the more important prune diseases in California.

For control of these diseases see the "Pest and Disease Control Program for Prunes" issued each year by University of California.



### Brown Rot

Brown rot is the result of either of two related species of fungi: *Sclerotinia laxa*, which is very destructive to blossoms and twigs and sometimes rots fruit; and *S. fructicola*, which is much less destructive to blossoms, but more destructive to fruit.

Brown rot seldom affects green fruit. It will attack ripe fruit but is difficult to detect because of the dark-colored skin of the prune. The disease affects fruit on the trees, and also may develop in harvested fruit being held a few days before drying. There is evidence that the fungus cannot grow in the flesh of dried fruit, and therefore cannot spread through bins of dried prunes.

### Bacterial Canker

The parasitic bacterium *Pseudomonas syringae* causes bacterial canker (bacterial gummosis). Diseased trees have elongated, sunken cankers on the limbs and trunks. The cankers may extend rapidly through the bark and girdle the branch and kill it. Death of branches or entire trees is most common in the spring. The disease is inactive in the summer.

### Oak Root Fungus

Oak root fungus (Armillaria root rot) is caused by the soil fungus *Armillaria mellea*. The fungus survives in the soil on infected tree roots and invades healthy trees through root contact. The disease is common on native oak trees.

Infected trees weaken, and their leaves turn lighter than normal color and eventually die. A white, felty fungus growth is present between the wood and bark of the crown and roots.

Commonly, the disease appears in one or more trees in certain areas of an orchard. The areas gradually enlarge as fungi grow outward along the roots and contact roots of adjacent trees.

### Prune Rust

Prune rust, most prevalent in coastal areas, results from the fungus ***Tranzschelia punctata.*** The disease particularly affects the leaves, covering their undersides with dark brown to black spore pustules in the summer or fall. Although heavy leaf fall follows, usually the attack occurs so late in the year that it does little damage to the trees.

### Crown Gall

The bacterium ***Agrobacterium tumefaciens*** enters through bark cuts or wounds from discs, shovels, or hoes to cause crown gall. Inside the plant tissue the bacteria multiply rapidly to cause a gall or overgrowth, usually at the crown or at the roots. If allowed to develop, the galls weaken or stunt the tree; in severe cases, trees may be girdled and killed.

### Ceratocystis Canker

***Ceratocystis fimbriata*** is a fungus organism that enters through cracks in crushed bark and invades the tissues. The cankers produced on diseased bark appear depressed and water soaked. An amber to orange-colored gum oozes from the margins of the canker. Some cankers produce little or no gum. The diseased tissues show a characteristic red stain. A brownish-black stain extends in advance of the fungus infection and deeply penetrates the heartwood. The fungus is active the year round, but moves fastest in the summer months. Cankers eventually girdle and kill infected trunks or limbs.



### Cytospora

***Cytospora leucostoma*** is a fungus infecting bark tissues injured by heat or sun. It produces cankers similar to those caused by ***Ceratocystis.*** However, unlike ***Ceratocystis,*** small fungus fruiting bodies (pycnidia) are present in ***Cytospora.*** The small gray pustules, or pycnidia, are exposed when the outer bark layer is peeled back. Shot-hole borer insects feed on infected wood and move the ***Cytospora*** spores on their bodies, causing new ***Cytospora*** cankers to develop.

For detailed descriptions of canker diseases, see UC Circular 519, "Ceratocystis Canker of Prunes, Almonds, and Apricots."

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