Diseases of Fruit

and

Fruit Trees

Extension Service
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Diseases of Peach

Mosaic.—The most serious disease of peach in Colorado is mosaic, a virus disease, which at one time threatened the entire peach-growing industry in the State.

The symptoms of peach mosaic vary among the different horticultural varieties. In general, however, identification of the disease is based upon the following characteristics: (1) The presence of streaks and splashes of pink, demarked either by fainter pink, or white lines in the petals of the large flowering varieties. (2) There is a definite retardation of the foliage growth in the spring, which is accompanied by various mottlings and deformations of the leaves. (3) Rosetting of the leaves is quite common, because of the stunting of twig growth. (4) The diseased fruits are bumpy. (5) The extreme exception to the above characteristics is the masking of the symptoms of mosaic by certain odd varieties, such as Carman, Salwey, Rochester, etc.

The only satisfactory control to date is that of eradicating all mosaic-infected peach trees, as well as other hosts, such as nectarine peach and the flowering peach. The eradication of infected trees eliminates the source of inoculum (virus) for natural transmission. (United States Department of Agriculture Circular 427, 1937.)

Golden-Net.—This is a virus disease of peach which is of minor importance. It causes marginal yellowing of the leaf veins, and irregular areas of yellow in the leaf blades. The affected fruit appears normal. (Colorado Farm Bulletin 4:2, 1942.)

X-Disease.—This virus disease of peach causes considerable loss to peach growers in the United States. It has occurred in Colorado since 1940. The leaves appear normal in the spring, but later, yellow patches and red spots of various sizes and shapes are formed. These spots die and fall out thus giving the leaves a ragged and shot-hole appearance. The older leaves drop prematurely, except for tufts at the tips of twigs. Either a part, or all of the tree may be affected. The fruits shrivel and either mummify on the diseased portions of the trees, or fall off after the leaves appear. Use the same host-eradication method as given for peach mosaic in this circular. (Colorado Farm Bulletin 4:2, 1942.)

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Coryneum Blight.—Peach growers in Colorado suffer much loss from this disease which causes gumming and death of buds in the early spring. Splitting of the bark on branches of current season growth is quite common. The affected twigs become spotted, exude a gum, and finally die. Young leaves may show circular, brownish spots with dark-red margins. The dead tissues of the spots fall away, thus causing a shot-hole appearance of the affected leaves. The lesions on the fruit are small and purplish red, with light-colored areas in the center of the larger spots. Later the affected fruits develop cracks which are usually filled with gum.

To control this blight, apply to trees a dormant lime-sulfur spray (48 pounds dry lime-sulfur, or 12 gallons of 32° Baume, liquid lime-sulfur per 100 gallons of water) in the early spring, and either yellow cuprocide (1½ pounds to 100 gallons of water), or bordeaux mixture (5-5-50) spray shortly after harvesting the fruit.

Powdery Mildew.—This disease is of little consequence in the peach districts of Colorado. However, in seasons when there is excessive rain it may cause serious damage. When this disease is prevalent it causes injury to the fruits in the State, and may affect the leaves and twigs. It appears on the fruits when they are small and immature, often causing them to fall prematurely. At first the disease causes a dusty or frost-like patch on the fruits. Later, the spots become almost white with the mold growth. The skin takes on a dull-brownish color, and the flesh under the spots becomes hard. When mildew attacks the leaves it generally is found on the under surface as irregular, white spots. The leaves crinkle and curl, and the young ones near the tip often fall off the twigs. In severe cases the leaf tissue dies, and the leaves fold upward along the midrib. The diseased twigs are quite conspicuously blotched with the white mold growth. The bark under the mold spots becomes dry, brownish in color, and may shrivel. Only the twigs' current seasonal growth is attacked. The affected twigs tend to curl at the tips.

Powdery mildew can be controlled by spraying the trees either with lime-sulfur (8 pounds of dry lime-sulfur, or 2 gallons of 32° Baume lime-sulfur per 100 gallons of water), or wettable sulfur (8 pounds per 100 gallons water), when the disease first appears. It may be necessary to make 2 to 3 applications at 3-week intervals to obtain complete control. Either of the sprays should be applied under 250 to 300 pounds pressure, with a power sprayer.

Crown-Gall.—See crown-gall of apple.

Diseases of Cherry

Black Knot.—This disease of cherry causes overgrowths on branches, which range from slight swellings to large, black, rough or crusty galls that are several inches in length. It causes similar effect on plum.

Black knot of cherry can be controlled by employing the following methods: (1) Prune out all diseased branches either in the fall, or early spring. Be certain that all the branches showing slight swellings are removed. (2) Diseased branches should be cut off at least 4 inches back of the knots. The prunings should be destroyed, otherwise the disease will spread from them to nearby trees. Repeat the pruning operation for about 2 or 3 successive years to effect complete control of the disease. (3) The same treatment should be given to any diseased wild plum and wild cherry trees in the neighborhood of the cultivated cherry orchards. (4) Spray the trees with wettable sulfur (6 pounds per 100 gallons water) when the petals are fading in the case of cherries, and when the shucks are splitting in the event of plums.

Rasp Leaf.—A new virus disease of cherry, the rasp leaf, is occurring on the Western Slope of Colorado. The disease is characterized by teeth-like projections on the underside of the leaves. These projections may vary from elongated protuberances to raised leaf-like growths, which usually have a gland at the tips. These growths usually extend outwardly from the midrib and between the veins. The upper surfaces of diseased leaves show depressed areas that are lighter in color than the normal green color of the leaf. Severely affected leaves are small, distorted, narrow, and often are folded inward. The growth of infected trees is retarded. The Royal Ann variety has a high degree of susceptibility.

For control of the rasp-leaf disease employ the same methods as given for the mosaic disease of peach. (Colorado Farm Bulletin 4:2, 1942.)

Wood Rot.—Cherry and apple trees have been severely affected by this disease in the Loveland, Fort Collins, and Canon City areas of Colorado. The outstanding characteristics of wood rot are the production of conks (fruiting bodies) on twigs, limbs, and trunks of infected trees. The fungus organism which causes the disease gains entrance into the host tissues through wounds caused by hail, cultivating tools, etc. When once a twig or limb becomes infected, the disease advances downward through the larger limbs into the trunk, finally causing the death of the tree.

In nearly all orchards where this wood-rot disease was found, the trees had not been given proper care for several years.

The control methods are: (1) Avoid mechanical injury by tools, etc. (2) Prune out all diseased limbs. The limbs should be cut off about 6 to 8 inches below any visible signs of the disease. (3) All prunings should be burned. (4) Cover all wounds with bordeaux paint. (5) When the trunk of the tree becomes infected the tree should be removed.

Powdery Mildew.—See powdery mildew of apple.

Diseases of Apple

Crown-Gall.—This bacterial disease usually starts in nurseries a short time after the plants have been grafted. The symptoms are easily detected by either hard or soft, irregular gall formations, near or in the graft union of seedlings, later, however, these galls may be found on roots and limbs.

Nurserymen should use strict sanitary measures in the grafting operations. They should employ only workmen who are capable, and can be depended upon to match the graft unions, and to wrap carefully all unions. They should thoroughly inspect, and discard all nursery stock that shows any evidence of the crown-gall disease.

County pest inspectors offer a valuable service in checking over nursery stock for crown-gall and other infectious diseases, and reject contaminated lots. The orchardist should also check over all nursery stock that he plants, as an additional precaution against planting infected trees.

Fire Blight.—This is one of the most serious diseases of apple and pear trees in Colorado. It may also cause slight damage to apricot, cherry, and plum trees.

The severity and destructiveness of fire blight may vary from year to year, depending upon climatic conditions. The outstanding symptoms of the disease are: (1) Blossom blight, (2) twig blight, and (3) cankers. The diseased blossoms wither, become a brownish-to black-color, and die. Twig blight usually follows the blossom blight. At this stage of the disease the leaves turn a scorched-brown color and die, but they remain on the tree throughout the current season. The bark of infected twigs shrivels, becomes nearly black, and the twigs die. Any young fruit that may have developed on affected twigs, turns black, and becomes shriveled and mummified. Small amber-colored droplets of bacterial ooze may come from the affected parts. Often the blighted leaves and twigs are so

numerous that it appears as though the whole crown of the tree had been scorched by fire, hence the name "fire blight." Canker formation on the body and larger limbs may follow twig blight. At this stage of the disease either a few limbs, or the body of the tree may become girdled by the cankerous growth and die. The cankers are either circular, or elongated. The dead bark of the cankers is light brown and sunken, as compared to the surrounding healthy bark. The bacterial organism which causes fire blight overwinters in such cankers, and in the spring or early summer they are carried to healthy trees by insects, pruning tools, and rain.

The fire-blight diseases can be controlled only by careful inspection of orchards, and by practicing the following methods: All blighted branches should be pruned out either in the fall or winter. Cut off the branches about 4 to 6 inches below any visible signs of the disease. Remove all suckers and water sprouts. The pruning tools should be disinfected by dipping them in a formaldehyde solution (1 pint to 3 gallons of water) before cutting off each twig or limb. The pruning wounds should be coated over with a standard wound dressing such as bordeaux paint. This product is available at nearly all seed stores. In such instances where large limbs and the trunk have become too much involved by the cankers, remove the trees, and replant. It has been found that spraying young trees with (1-3-50) bordeaux mixture, when the blossoms are three-fourths open to full bloom will greatly reduce the amount of infection.

Sucking insects such as aphids, leafhoppers, and the tarnished plant bug are important in the spread of fire blight and should be controlled. (See Colorado Extension Circular D-4.)

Powdery Mildew.—Ordinarily this disease does not occur on apple trees in the State. However, once in about 10 years it causes considerable damage in the Canon City apple-growing district. The symptoms are easily detected by the grayish-to-white, irregular blotches of mold on the lower surface of leaves, and sometimes on the upper surface. It may attack the blossoms thus causing deformation and death of the flowers, and prohibit setting of fruit. The disease often produces a russeting effect upon fruit.

The Jonathan, Newton, Black Ben Davis, Grimes Golden, Esopus Spitzenburg, Fameuse (Snow), and the Stayman varieties are very susceptible. None of the varieties is immune, but among the least susceptible are Winesap and White Pearmain.

Powdery mildew can be controlled by spraying the trees with either a summer strength of lime-sulfur (8 pounds of dry lime-sul-

fur, or 2 gallons of 32° Baume liquid lime-sulfur per 100 gallons water), or wettable sulfur (8 pounds to 100 gallons water) when the first signs of the disease appear. It may be necessary to make 2 or 3 applications at 3-week intervals for complete control. Apply the spray with a power sprayer, and use a pressure of 200 to 350 pounds.

Wood Rot.—See wood rot of cherry.

Storage-Rot Diseases.—There are at least four important storage rots of apples occurring in Colorado. They are blue mold, Alternaria rot, scald, and jonathan spot.

Blue Mold.—This is a common and destructive storage rot. It may occur on all varieties of apples. The initial stage of the disease is characterized by a soft, watery, light-brown to pale straw-colored spot. These spots are shallow at first, but extend quite rapidly into the fruit tissue as their diameters increase on the surface of the fruit. By the time the rot invasion has reached the core, it may involve one-third or more of the entire apple. Small tufts of mold growth, fruiting bodies, and spores (mold seeds) appear on the surface of the diseased portion of the apples. At first this mold is white, but later it becomes a bluish-green color. When decay is well advanced a musty odor can be detected.

A relatively small growth of blue mold is capable of producing millions of spores (seeds). These spores drift with the air currents, and great numbers of them may become lodged on the surface of fruit, on storage-room walls, floors, shelves, and packing crates. In dry and cool conditions these mold spores remain alive, but inactive for long periods. However, when conditions in the storage room become relatively warm and moist, the mold spores germinate, and those on the fruit may cause infection. Although the point of attack is normally in wounds, blue mold may penetrate the fruit through the small natural openings in the skin.

Investigations conducted by the United States Department of Agriculture and various State Agricultural Experiment Stations show that control of blue mold, as well as other storage rots, requires a combination of methods. (1) The orchard should be kept free from weeds. (2) Packing sheds and storage rooms should be kept free from rotting apples and other debris, to avoid unnecessary harboring of storage-rot molds. (3) Wounds caused by codling moth, sprays, and mechanical injuries should be avoided. (4) Apples should be picked in a mature, hard-ripe condition. (5) The fruits should be handled with considerable care during picking, and

packing operations to avoid bruising and breaking the skins. Such injuries are ideal places for storage rots to start invasion of the fruit. (6) Sorting should be done by workers who are capable and dependable. All wounded or diseased apples should be discarded in order to reduce the chances of rots developing in storage. In fact, the thoroughness of sorting is a major factor in the control of storage-rot diseases.

At the Washington Agricultural Experiment Station it was found that treating the fruit in a solution of sodium-hypochloride (chlorox or chlorosan) containing 0.4 percent available chlorine, will destroy the storage-rot mold spores carried on the surface of the apples. This treatment is commonly used in that state, following the sodium-silicate bath employed to remove lead-arsenate residues from the fruit. (7) As an additional and valuable precaution against blue mold and other storage rots, the Washington station advocates the disinfection of walls, floors, and shelves of storage rooms, as well as all packing crates, by either spraying, or fumigating with formaldehyde. For spraying, use 1 gallon of formaldehyde in 49 gallons water. This is a disagreeable task and should be done as quickly as possible with a power sprayer. Where the fumigation or dry method is used, add 17 ounces of either the crystals, or powder of potassium permanganate to 20 ounces of commercial formaldehyde, for each 1000 cubic feet of room space. In either case the room should be tightly closed for at least 10 to 12 hours, in order to hold the fumes inside. The packing crates may be placed in the storage room when the fumigation method is used. These treatments will kill and prevent storage-rot mold spores from germinating in the storage room and on the packing crates. (Washington Agricultural Experiment Station Bulletin 304.)

Alternaria Rot.—This rot often causes serious trouble in the storage of apples. It is most frequently found following scald, codling-moth injury, and arsenical injury to the calyx.

Alternaria rot is characterized by three distinct types of symptoms. The first is a rather small, firm, slightly sunken area, which appears brown around the edge, when not covered by a rough, black crust The second type has a firm, slightly sunken rot area that is commonly dark brown to black, but may occasionally be light-yellowish brown to almost gray. In the third type, black rot areas appear on the skin of apples which have been weakened by scald, or jonathan spot.

The Alternaria fungus, which causes storage-rot disease and

may also rot the ripe fruit in orchards, is found on plant debris. Like the blue-mold organism, it produces spores (seed) profusely. These spores drift with the air, and are found on the floor, walls, and racks of storage rooms and packing containers. They respond to temperature and moisture conditions in the same manner as the blue-mold organism, so that dry and cold storage rooms greatly retard the development of Alternaria rot.

Alternaria spores gain entrance into the apples through wounds made by mechanical means, small breaks in the skin, injuries caused by codling moth, and dead areas in the skin caused by scald, jonathan-spot disease, spray injury, and hail. For this rot use the same control methods as given for the blue-mold disease.

Scald.—This disease is caused by abnormal physiological conditions in the fruit. Most investigators attribute its true cause to the accumulation within the apples of certain gases which are produced by the fruits themselves. Experimental evidence and good commercial practices show that scald is worse where heavy irrigation is used, than when moderate applications of water are made.

Scald is chiefly a rot that affects the skin of apples and is confined largely to the green colored side. The bright-red areas of the fruit are rarely affected. In mild cases this rot appears as a browning of the skin, and in severe cases the skin layer often breaks down and separates from the underlying tissue. In the late stage of the disease, the fleshy tissue becomes dead and brown to a depth of about one-fourth inch, and has the appearance of a true rot. However, true rots usually spread into the fruit flesh in a conical shape, while scald rot diffuses into the tissue without definite shape. When the skin becomes broken on the scald spots, it affords an ideal place for the true rots, caused by molds, to become established.

Where diseases, such as scald, are not a factor in storage, and such diseases as blue-mold rot, Alternaria rot, and jonathan spot are important, then packing should be done in such a manner as to give the apples plenty of aeration. However, where scald rot is involved, the methods used in packing should be revised. In the latter case, the apples should be packed either in oiled paper wraps, or shredded oiled paper scattered among the apples in barrels, hampers, and baskets. Approximately one-half pound of the shredded oiled paper should be used for each barrel of apples and it should be distributed in the package so that practically every ap-

ple is in contact with the paper. The paper should contain 15 to 20 percent of light, odorless, and tasteless mineral oil.

The apples should be picked in a mature, hard-ripe condition. This is especially important where apple scald is a factor in storage-rot losses.

Jonathan Spot.—Jonathan spot is another type of non-parasitic or abnormal physiological condition that is commonly associated with dry seasons. Certain investigators believe that it is the manifestation of a heritable drought susceptible characteristic in certain varieties of apples. It is occasionally found on ripe fruit, prior to picking, but usually it is found on apples in storage and in transit. This is especially true where ventilation is poor and the temperature and moisture conditions are high.

Some of the susceptible varieties are: Jonathan, Wealthy, Wolf River, Ortley, Grimes Golden, Esopus Spitzenburg.

The disease is confined to the skin of the fruit, and produces blackish, circular spots which vary in size from a pin point to three-eighths inch in diameter. The typical jonathan spot is abruptly but only slightly sunken. Often the spots run together and form an irregular, dark blotch over a considerable portion of the surface of the fruits. When affected apples are removed from storage, the blackish spots fade to a light-brown color.

For control of scald and jonathan spot it is very important that the fruit be stored **promptly after picking,** and not be allowed to remain in the sun.

The most satisfactory conditions in storage of apples to prevent the development of storage rots is a temperature of 34° to 36° Fahrenheit, and dry. Do not open the storage rooms on warm autumn days, but take advantage of cool mornings when placing the fruit in storage.

Diseases of Apricots

Coryneum Blight.—This disease often causes severe loss in apricot production. It is characterized by scattered, brown spots appearing on the leaves. The affected areas soon fall away, thus leaving a frayed or shot-hole effect of the leaves. Fruit buds are sometimes killed by the disease. Small, reddish spots may be found on the fruits. At first these spots have light-colored centers which soon become dark-green to black in color.

This disease can be controlled by making a fall application of bordeaux mixture (4-4-50) soon after all the leaves have fallen.

Ring Spot.—This disease is caused by a virus. The leaves, especially of new growth, show a marked clearing of veins, and irregular ring spots. Later the discolored areas of infected leaves die, and crumble away, thus causing a frayed and ragged appearance. The infected fruit appears normal until approximately 2 weeks prior to ripening, then they become bumpy. As the fruit ripens they fill out, thus tending to eliminate the bumpiness, however, brown blotches, or ring spots appear which extend from one-sixteenth to one-eighth inch into the fruit tissue.

The control for ring spot of apricot is one that requires the removal of all infected trees as a matter of eliminating the source of the virus. All apricot orchards should be inspected during the latter part of June, when symptoms are detectable on the fruits. The diseased trees must be removed as soon as possible. (Colorado Farm Bulletin 4:2, 1942.)

Golden Net Virus.—This virus disease of apricot causes mottling, distortion, and often abnormal crinkling of the leaves. It produces a shortening of the internodes of new stem growth. After the stones have hardened, the fruits become misshapen and bumpy. Employ the same control method as given for the ring-spot disease of apricot. (Colorado Farm Bulletin 4:2, 1942.)

Winter Injury

Winter injury is a term generally applied to all types of injurious effects to trees, which are either directly or indirectly associated with low temperatures. The different types of winter injury are:

(1) **Frost injury** is caused by low temperatures late in the spring. In such instances the new succulent leaves wilt, die, and turn brown, and the blossoms are killed. Injury by frost is usually most severe on southern slopes, and in poorly drained low places known as "frost pockets." The only control which may be practiced is that of good soil drainage, and the avoidance of frost pockets in the orchard location.

(2) **Freezing to death** of either a part, or all of the tree is quite common in areas where very low temperatures are reached. Usually there is no evidence of freezing injury until after thawing, then the affected tissues become water-soaked and brown in color. The freezing may kill a part or the entire tree.

(3) **Winter drying** is one of the most common types of winter injury in Colorado. Quite often during **dry cold** weather, when the soil moisture is frozen, trees are unable to obtain sufficient water to compensate for their natural transpiration. In such instances the tissues of the tree structure are robbed of their water content, thus causing permanent injury to the affected tissues. Either a part, or the entire tree may die the following spring, or it may leaf out, and then die later in the growing season. In the latter case the leaves become dry, turn a greenish-brown color, and die.

There is not any practical method that can always be depended upon to prevent freezing to death and winter drying. However, there are certain practices that will be of much benefit in avoiding these troubles. (a) Applying irrigation water should be discontinued early enough in the fall to allow the trees sufficient time to go into dormancy before freezing weather conditions start. (b) Good windbreaks are highly recommended, since wind is an important factor in most types of winter injury. (c) It is good practice to mulch the soil around small trees.

Drought Injury and Sun Scorch

This type of tree summer injury is quite common in those sections of the State where the supply of irrigation water is limited. In general, drought injury is similar to winter drying. The effects and symptoms are the same, and the cause similar. In drought injury, as in the case of winter drying, the leaves of affected trees give off a greater amount of water than can be replaced, either because of the dry condition of the soil, or diseased condition of the root system. The nature of sun scorch is identical to that of drought injury, except it does not involve as great a portion of the tree. Sun scorch injury normally appears on the side of the tree which is exposed to the sun, and usually follows periods of hot dry winds. The affected bark turns a light-brown color, and usually dies. The leaves may either have brownish dead areas between the veins, or the entire leaf may die. Trees which are affected by winter and drought injuries offer but little resistance to wood-rotting organisms and other diseases.

Very little can be done to prevent sun scorch injury in districts where drought is common and the supply of irrigation water is limited. The old practice either of painting the sides of tree trunks which are exposed to the direct rays of the sun, or the use of any other method of shading is beneficial. In districts where irrigation water is plentiful, this type of injury can be prevented by making applications of water before the soil becomes too dry.