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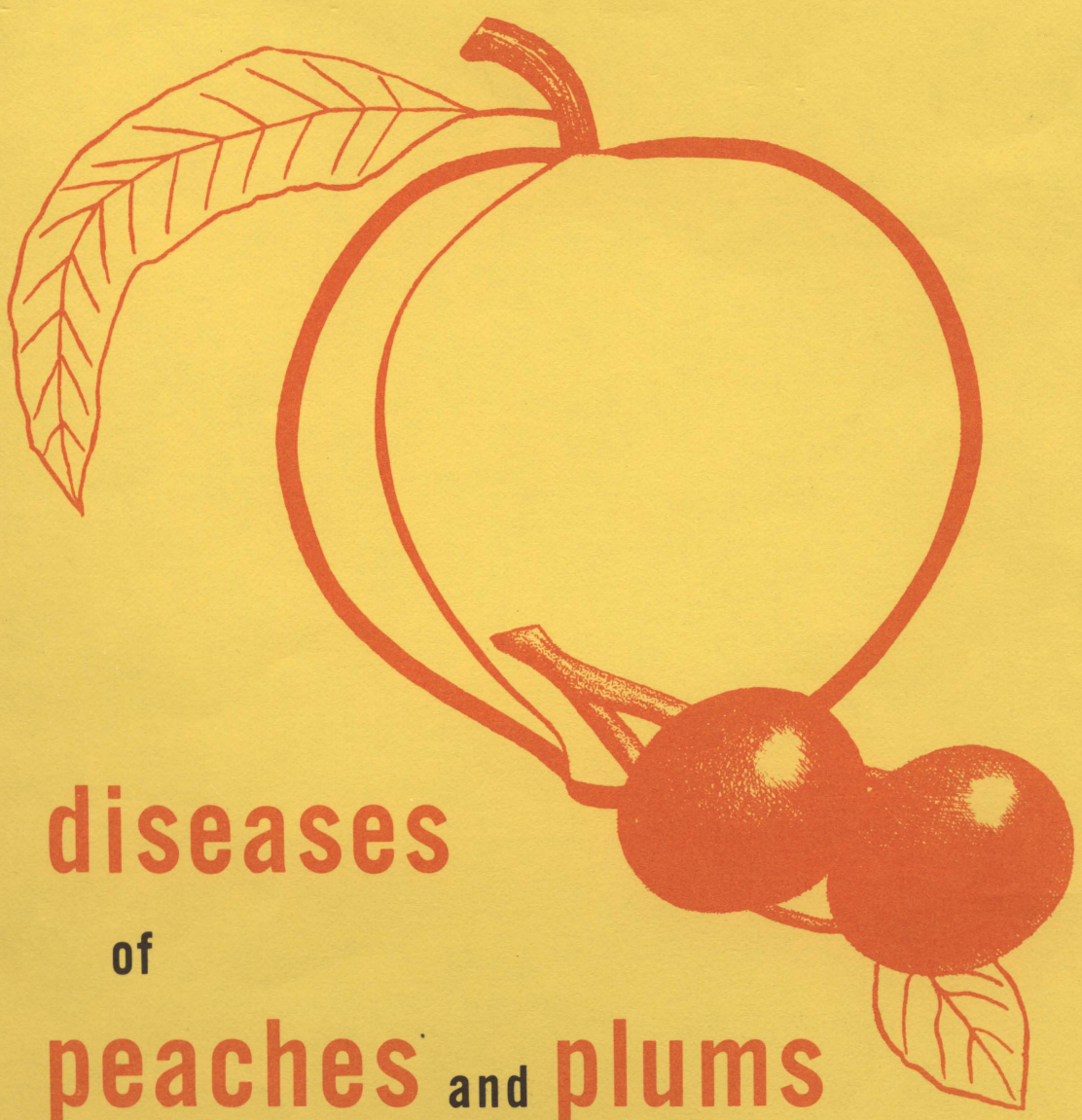

diseases of peaches and plums

TEXAS AGRICULTURAL EXTENSION SERVICE
THE TEXAS A&M UNIVERSITY SYSTEM
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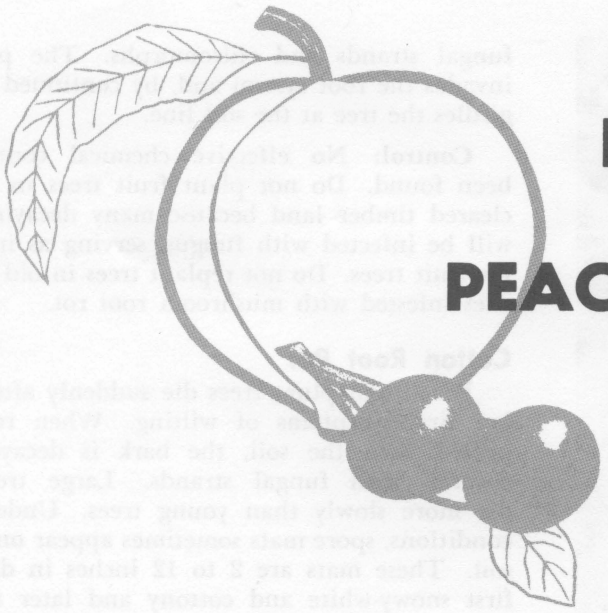

DISEASES OF PEACHES AND PLUMS

Jerral D. Johnson*

Each year diseases destroy a large portion of the potential fruit crop in Texas. This loss begins in the orchard and continues until the fruit is consumed. Complete lack of production on improperly sprayed trees is common.

Because fruit disease control is a preventive program, fungicide application must begin early in the season and continue until harvest. Producers must understand the nature of the disease-causing organism to plan an effective control program.

Use this publication and L-1329, *Suggestions for Controlling Insects and Diseases on Commercial Peaches and Plums,* to develop a well-planned control program for fruit diseases.

Factors Affecting Fruit Disease

Most fruit diseases vary in severity from one season and location to another. Variation depends on the pathogen, weather, soil conditions and plant resistance.

If all factors are optimum for disease development, serious fruit losses occur. However, if any factor is less than optimum the severity will be less.

Pathogens

Bacteria are small life forms, generally microscopic in size and able to reproduce rapidly. They enter the plant through natural openings or wounds. Rainfall is especially important in bacterial disease dissemination as the bacteria are motile in water.

Fungi are small life forms which can enter through natural openings, wounds or by direct penetration into the host. Fungal diseases represent the largest group of fruit diseases. They attack roots, stems, leaves and fruit.

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Virus particles are complex protein molecules with certain physical and biological properties similar to other life forms. They may enter plants through wounds made by insects or by mechanical means. Virus disease symptoms vary.

Nematodes are small, worm-like pathogens living in soil and feeding on roots, causing reduced root growth, lesions or galls. Above-ground symptoms of nematode damage may resemble drouth or mineral deficiency. Nematodes can carry virus disease.

Weather's Role in Fruit Disease Development

Weather influences the occurrence and severity of plant diseases and frequently determines their geographical distribution and importance. Yet it is not the primary cause of plant disease. Occasionally, certain weather conditions are directly responsible for a disease being unusually destructive. It is normally recognized that cool, wet spring weather promotes development of many common plant diseases. Not only is weather important in early season diseases, but also during harvest when excess moisture causes several harvest rot diseases.

Crown Gall

Crown gall is a bacterial disease of fruit trees. It has a host range of at least 63 different plant genera and is distributed widely throughout Texas fruit-producing areas.

The disease causes tumor-like malformations on the roots, ¼ to 4 inches in diameter. The gall has a rough, darkened outward appearance, and may develop for several years. Infected tissue is hard and resistant to decay.

Disease cycle: Bacteria enter the plant through wounds and grow in the intercellular spaces. Host

Crown gall on peach.

tissue forms a gall around the diseased area, pushing bacteria to the outside. Soil water then washes bacteria to other roots where later infection will occur.

Control: Buy plants from a reliable nursery. Avoid replanting old orchard sites. Reduce the possibility of root injury during cultivation as much as possible.

Mushroom Root Rot

Mushroom root rot is a fungal disease commonly known as "post oak root rot," "shoestring root rot" or "mushroom root rot." It attacks peach, pear, plum, apple and many other fruit plants. The disease is distributed widely throughout fruit-growing areas and causes extensive damage in most orchards. It is typified by scattered premature tree death. Damage losses increase where old orchards are replanted to peach or on land recently cleared of timber.

Soon after attack the young trees are killed or reduced in vigor. Dead areas are formed on the trunk and larger roots just beneath the soil surface. When the bark is peeled, a white fungal growth is visible over the wood surface.

Disease cycle: Fungus can survive for several years in soil on decaying roots and can penetrate healthy roots directly. It spreads through soil in fungal strands and rhizomorphs. The pathogen invades the root system and, by continued growth girdles the tree at the soil line.

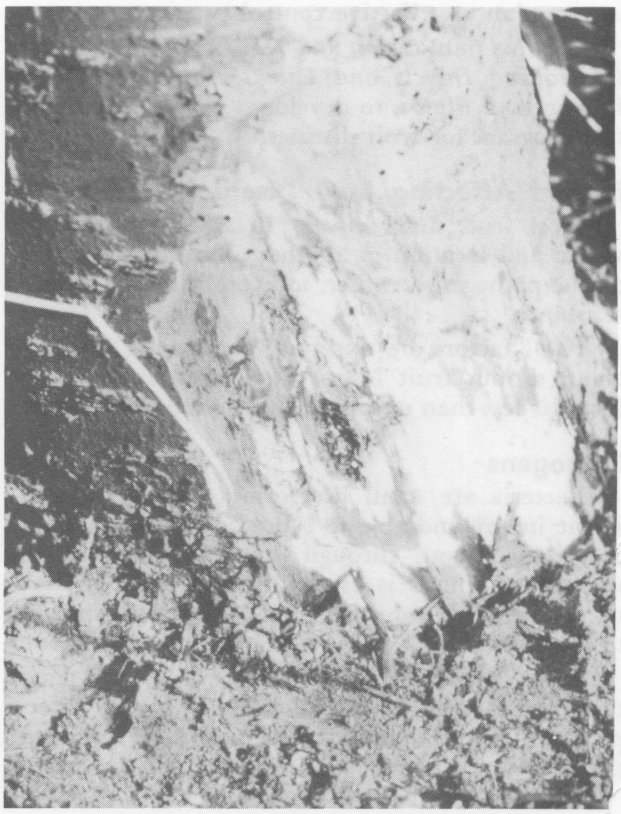
Control: No effective chemical control has been found. Do not plant fruit trees in recently cleared timber land because many decaying roots will be infected with fungus, serving as inoculum for fruit trees. Do not replant trees in old orchard sites infested with mushroom root rot.

Cotton Root Rot

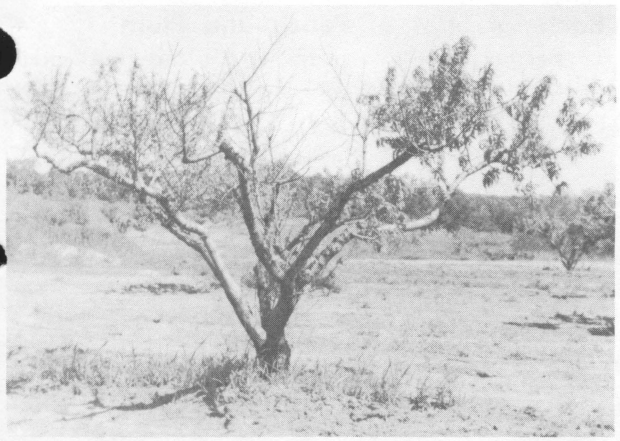
Peach and plum trees die suddenly after showing first symptoms of wilting. When roots are pulled from the soil, the bark is decayed, and covered with fungal strands. Large trees may die more slowly than young trees. Under moist conditions, spore mats sometimes appear on surface soil. These mats are 2 to 12 inches in diameter, first snowy-white and cottony and later tan and powdery.

Control: Select land free of cotton root rot fungus. To assure the absence of fungus, plant an indicator crop of okra or alfalfa and observe for root rot for one season before setting peach and plum trees.

No resistant peach or plum rootstocks are known. Chemical control has proven ineffective.



Mushroom root rot on peach.



Mushroom root rot-damaged tree.

Root Knot Nematode

Meloidogyne sp., Goeldi, 1892, commonly are called root knot nematodes, and they occur in all Texas fruit-growing areas. They are small, worm-like parasites which must complete their life cycle on living plants.

Root knot nematodes cause stunted, chlorotic trees susceptible to adverse weather conditions such as drouth. Nematode symptoms often are similar to fertilizer deficiency. Premature defoliation is common on infected trees. Galls are formed on feeder roots. Compared to crown gall, root knot galls are much smaller and not as rough.

Disease cycle: Eggs are laid in a gelatinous matrix formed by the adult female. As eggs hatch, larvae locate a root and enter near the tip. Larvae develop within the root, causing plant cells to undergo massive cell division around the nematode. Adult females, when teased from the root, are white and about the size of a pinhead. The life cycle from egg to egg under optimum soil conditions is from 24 to 30 days.

Control: Use resistant peach rootstock for new plantings. Nemaguard and Okinawa are suggested for Texas.

Chemical control can be used on established trees and new plantings. Nematicides containing 1,3 dichloropropene-1,2 dichloropropane, 1-3 dichloropropene, or methyl bromide are suggested as a preplant application.

Bacterial Canker

Bacterial canker first was observed in 1850 when it attacked plum trees. Workers in Germany later established that a bacterium was one cause of gum flow in fruit trees. The bacterium later was named *Pseudomonas syringae* Van Hall. In 1968 it attacked peach trees in two Texas counties; since then it has occurred in other areas where fruit is grown commercially.

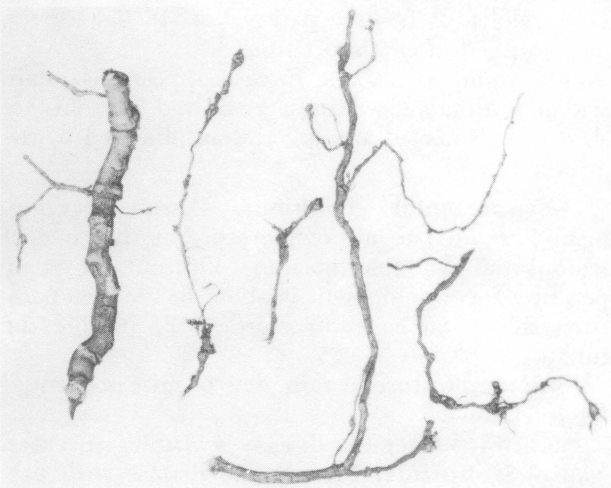
The organism is known to attack a large number of plants, particularly stone fruits of various types. Peach, cherry, plum and apricot trees are excellent hosts for bacterium. It has been reported on stone fruits in the British Isles, Denmark, France, Germany, Holland, New Zealand and the United States.

Symptoms: Cankers usually develop at the base of an infected bud and move up and down the trunk. Cankers usually spread much more rapidly above the point of infection than below and relatively slower to the sides, resulting in a long, narrow canker. Cankers usually develop during the fall and winter and are first noticed in late winter and early spring. Damaged areas are slightly sunken and somewhat darker in color than the surrounding bark. At both the upper and lower margins of the canker, narrow brown streaks extend into the normal tissue. As the trees break dormancy in the spring, gum is formed by the surrounding tissue and may exert enough pressure to break through the bark and flow down the outside of a tree limb. Cankers will have a sour smell similar to that following a freeze.

Although leaf spotting has been reported, it does not always occur. In Texas, leaf spotting has not been a problem nor has the fruit been infected.

On plum fruit, the young lesions are slightly raised, circular and olive green in color. The older lesions are depressed, irregular, sometimes cracked, dark brown to black in the center and have a green watersoaked margin.

Disease development: Cankers start developing in the fall at the base of a bud or at a wound. The infected areas increase in size during the winter, and cankers become visible in early spring. If infection takes place too early in the fall, the



Root knot on peach.

area is walled off by callus tissue and cankers are not produced. The bacterium is a rather weak pathogen and causes serious damage when a tree is dormant or weakened due to unfavorable growing conditions.

The bacterium is spread by wind and rain. The organism is washed from the gum to nearby buds, leaf scars and other wounded areas.

It is felt that much of the spread is through diseased nursery stock.

Cultural control: Selection of clean nursery stock helps reduce inoculum from being introduced into an area.

Avoid using high fertilizer rates in the late spring or early summer. Use summer irrigations only when possible bud failure may result from drouth. This allows a tree to enter dormancy normally rather than encouraging late fall growth, which is more easily infected at abscission time.

Prune when the trees are fully dormant (January and February). Trees pruned early in the year prior to dormancy possibly can be infected with the bacterium carried on the pruning shears. Trees showing signs of bacterial canker should be pruned after all other trees. Early pruning also may encourage late fall growth of trees which are more susceptible to the bacterium because climatic conditions are optimum for disease development.

Chemical control: Use a Bordeaux mixture about the middle of October or when the first leaves are shed in the fall. A preventive program should be used because once a tree is infected, control is impossible.

Peach Leaf Curl

This is a fungal disease of peaches found in all areas. It affects leaves, flowers, tender shoots and fruits of the peach. Young, developing leaves are characterized by puckering, thickening and curling. Diseased leaves become pale yellow to light green and are shed after a short time.

On young twigs, the disease appears as small, seldom-noticeable swellings. Fruit and blossoms are shed when infected and are seldom observed by the grower.

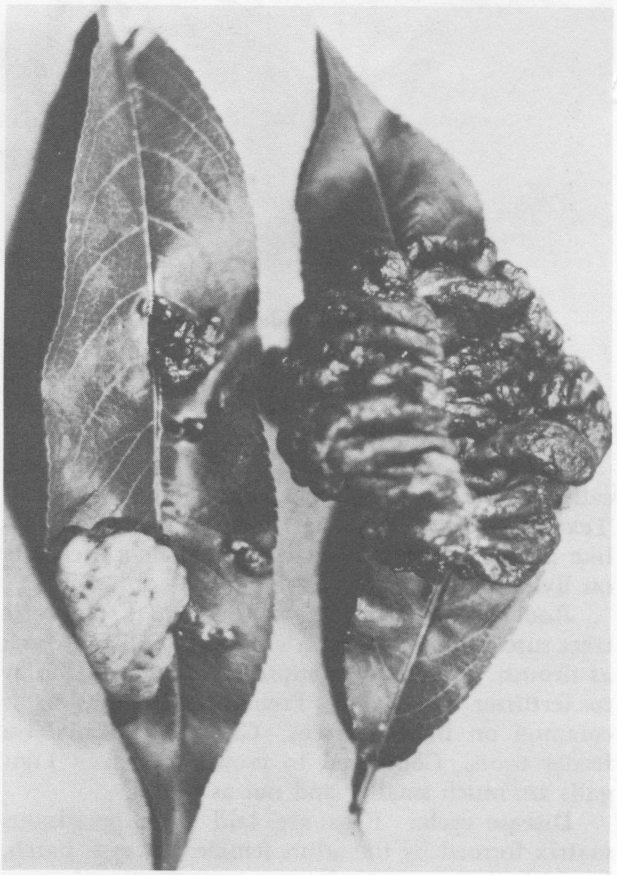
Environmental conditions: Disease development is related to air temperature at the time of leafout and available moisture. Optimum air temperature for development is about 68°F. Temperatures above 86°F. and below 40°F. inhibit the fungus.

Surface moisture in rain, dew or mist is essential for infection.

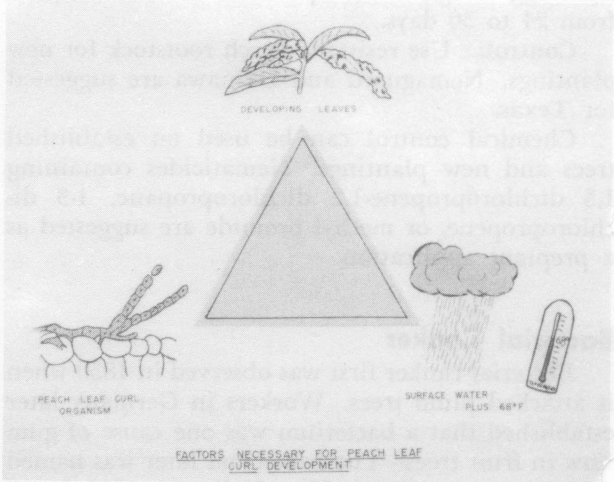
Control: After the disease is visible on leaves, control is difficult. Prevent the disease with dormant sprays. Chemical sprays are very satisfactory when applied just after leaves are shed.

Bacterial Spot of Peach and Plum

Bacterial spot of peach and plum is a widel distributed fruit disease. It annually reduces expected returns from peaches by several thousand



Peach leaves damaged by leaf curl.



Environmental factors necessary for peach leaf curl development.

bushels. In years of high disease incidence, losses will be 90 to 100 percent on susceptible varieties. The devastating effect of this disease is not restricted to fruit loss, but will cause defoliation resulting in shortened tree life.

Symptoms are observed first as small circular or irregularly shaped lesions, pale green in contrast to the surrounding dark green tissue on infected leaves. In early development, lesions almost always are visible on the lower leaf surface. In advanced stages, angular lesions are formed and surrounded by a halo of lighter colored tissue. The inner portion of the lesion turns black and falls out after a time, giving the leaf a "ragged" or "shot hole" appearance. Leaves heavily infested with bacterial spot will turn yellow and eventually fall.

Disease first appears as a small, olive brown circular spot on the fruit surface. However, as the disease develops, the spots become slightly darker and depressed. Lesions are scattered over the fruit surface.

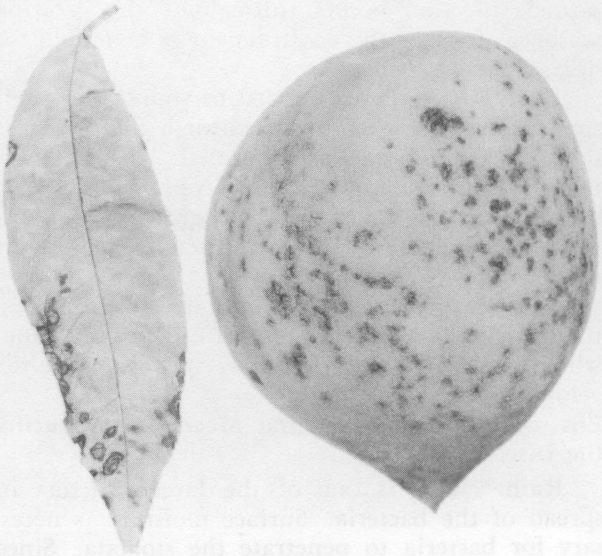
The most conspicuous phase in advanced stages of fruit infection is "pitting" and "cracking." "Pitting" results when bacteria kill cells in the lesion and, as surrounding healthy tissue grows, a "pit" is formed. This pit serves as an entry for other diseases such as brown rot. In high humidity, a "gum flow" results from the lesion and further disfigures the fruit. The area below the pit or crack is corky and unpalatable. Fruit infected with bacterial spot is unsuitable for sale other than as culls.

Twigs are damaged by two distinct types of lesions. "Spring cankers," those which develop on young succulent twigs of the previous summer's growth, appear as watersoaked, slightly darkened blisters about the same time as first leaves appear. As the season progresses, the epidermis over the lesion ruptures and releases bacteria. The lesion then heals and becomes inactive.

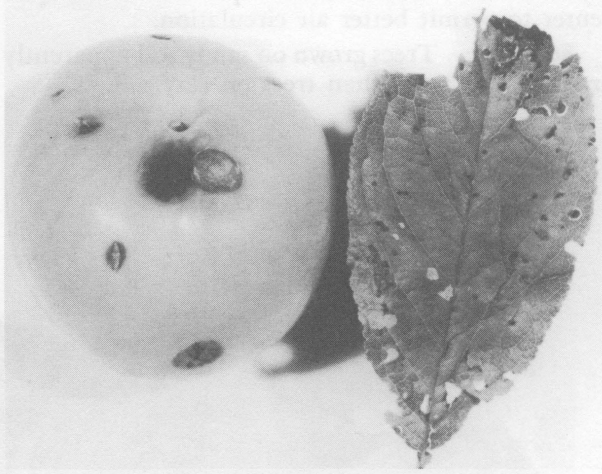
"Summer cankers" develop later in summer. When the lesions are first visible, they are brown to purple, slightly sunken and varied in shape. Summer cankers are restricted in size with definite margins unlike spring cankers, which are generally larger with indefinite margins.

Bacteria overwinter in twigs infected late in the season at about the same time leaves are shed. These "fall cankers" are invisible as were the summer cankers. Spring cankers result the next year from late twig cankers. Spring cankers apparently are related directly to the amount of foliar infection occuring the previous year.

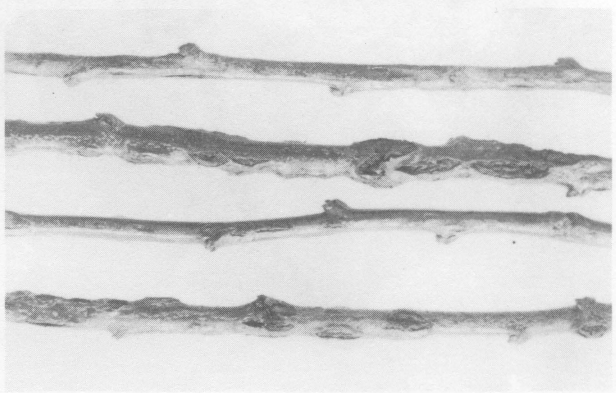
Disease cycle: Initial infection each spring comes from overwintering twig cankers. These are spring cankers formed during the previous fall. Bacteria are released from cankers and carried to healthy leaves and fruits by insects or rain. Infection may occur on leaves through the stomata (pores).



Bacterial spot on peach.



Bacterial spot on plum.



Bacterial spot cankers on plum.

Bacteria develop in leaves and serve as inoculum for later infections of fruit, leaves and stems. Repeated infection occurs throughout the growing season as long as the environment is favorable for disease development.

In fall, bacteria are carried to young, succulent stems where infection occurs through the pores. If the trees have stopped active growth, bacteria enter the host and undergo limited development. However, if the trees are still actively growing, the host plant responds by walling off bacteria, causing it to die.

Next spring, cankers partially developed during the fall, not yet showing signs of canker formation, will serve as inoculum for early spring disease development.

Environmental and Cultural Means for Reducing the Disease:

Rain: Rain is one of the largest factors in spread of the bacteria. Surface moisture is necessary for bacteria to penetrate the stomata. Since surface moisture is essential for bacteria penetration, dew also plays a large role. The period of time that leaves remain wet partially determines severity of the disease. Trees should be pruned to an open center to permit better air circulation.

Soil type: Trees grown on sandy soil apparently are damaged more than trees on clay soil.

Fertilization: The weakening effect of the disease can be somewhat reduced by adequate amounts of complete fertilizer. However, excess foliage prevents rapid drying of leaves and fruit.

Cultivation: Proper cultivation helps maintain the tree's vigorous growth. Weed control underneath the tree aids in air circulation.

Pruning: Pruning increases the tree's vigor. Pruning also reduces the level of inoculum by removing late fall twig cankers and providing better air circulation within the tree. Spray coverage is improved on well-pruned trees.

More tolerant varieties: Use tolerant varieties if possible because they will remain disease-free during normal years. However, some damage may result if there is excessive spring rainfall. Tolerant varieties include Dixired, Ranger, Loring, Redskin, Jefferson, and Sentinel.

Chemical control: Chemical control is effective. Dormant sprays are also somewhat effective, if the number of overwintering cankers is not too high and the spray is timed to protect stems during the fall infection period.

Peach Scab

Peach scab is a fungal disease resulting in reduced attractiveness of the fruit and spotting of the foliage. The casual organism is found wherever

Peach scab.

fruit is grown. It is most apparent on late season varieties and on peaches where good orchard sanitation is not practiced.

Peach scab often is called "freckles" or "black spot." Damage resulting from peach scab is not limited to loss in appearance, but provides entrance for other organisms causing secondary decay. Defoliation may occur if the year is unusually wet and cool.

On the peach the disease is distinguished by irregularly defined olive-colored spots. Lesions normally occur around the stem. Host cells are killed. Because they are unable to expand with the developing healthy cells, small cracks are formed.

Lesions formed on young twigs serve as a means of overwintering by the fungus.

Small, ill-defined lesions form on the underside of the leaf. If the midrib is infected, then long, narrow, dark brown lesions develop.

Disease cycles: Primary infection arises from spores, produced in twig cankers formed the previous year, which are spread mainly by wind and rain. Fruit infection normally occurs after shuck split. Once spores have entered the host, 40 to 70 days may pass before the disease is visible.

Control: Attain chemical control by repeated applications of an approved fungicide. Refer to L-1329, *Suggestions for Controlling Insects and Diseases on Commercial Peaches and Plums* or L-1140, *Homeowner's Fruit and Nut Spray Schedule* for specific materials, rates and timing. Coverage is most important in preventing this disease.

Coryneum Blight of Stone Fruit

This disease affects improperly maintained orchards. It is seldom a problem in orchards where an established spray program is followed.

It sometimes is called "shot hole," "California peach blight," "fruit spot," "winter blight" or "pustular spot." Nearly all portions of the plant are susceptible to this disease.

Blight lesions on fruit are small, circular, deep-purple spots which, in advanced stages, have a light center surrounded by a purple halo.

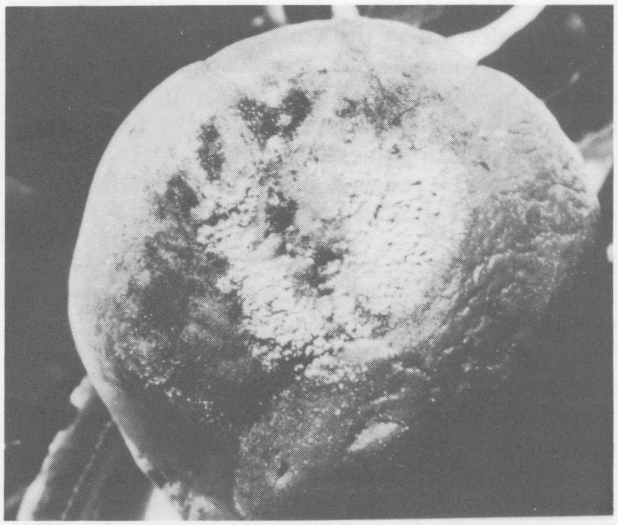
Leaves have dark brown or red scattered lesions which enlarge rapidly and may involve considerable leaf area. Lesions fall out, giving the leaf a ragged appearance. However, defoliation normally occurs only if infection affects the petiole.

Cankers formed on twigs serve as inoculum the next spring. Severly infected twigs die, and twig blight results.

Control: For most effective disease control, apply dormant sprays immediately after leaves are shed.

Brown Rot

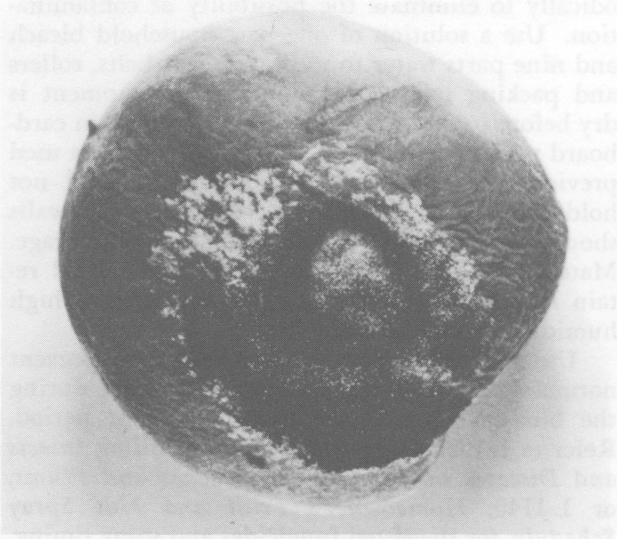
This fungal disease of peaches and plums attacks fruit in the blossom stage, again as fruit approaches maturity and during storage. Surface moisture and moderately warm temperatures encourage its development. Fruit damaged by wind, hail, insects or mechanical means is more susceptible to this organism.



Brown rot on peach.

Blossom blight is the stage where blossoms are killed by the disease-causing organism. Infected blossoms become brown and watersoaked. Fungus grows down the pedicel into the stem, resulting in dark brown sunken areas. These areas can completely girdle the stem, which may cause twig die-back or formation of a sunken canker on the stem.

During high humidity, diseased blossoms and stems may become covered with "tufts" of gray spore



Rhizopus rot on peach

masses. These spore masses serve as inoculum for further infection as the fruit matures.

As fruit matures, the fungus enters it through natural openings or wounds and rapidly develops a brown, watersoaked lesion. Healthy fruit touching diseased fruit quickly decays.

The disease-causing organism overwinters in mummies and stem cankers.

Rhizopus Rot

This also is a fungal disease encouraged by warm, humid weather. Fruit infection results in a "black whiskered" appearance caused by fungal strands which produce an abundance of black spores. This is the same organism which causes black mold on bread.

Unlike brown rot, rhizopus rot normally does not attack peaches and plums in the blossom stage. Damage results from rhizopus rot on peaches after they are harvested and stored.

Appearance of the rotten fruit often is confused with brown rot-infected fruit. However, the black "whiskers" quickly characterize it as rhizopus rot.

Control: Control for brown rot and rhizopus rot are similar. Disease prevention is based on orchard sanitation, use of fungicides and refrigeration.

Remove decayed fruit from the orchard or disk it under the surface. Remove mummies hanging in the tree after havest.

Containers should be such that the fruit receives a minimum of handling. Picking boxes have proven inexpensive and can reduce fruit losses significantly. Boxes should hold about a half bushel.

Equipment should assure minimum mechanical damage. Pad any area where fruit will drop onto a grader belt or roller. *Never use stiff brushes* where ripe fruit is being graded.

Clean grading and packing equipment periodically to eliminate the possibility of contamination. Use a solution of one part household bleach and nine parts water to wash conveyor belts, rollers and packing tables. Make sure all equipment is dry before using. After grading, place fruit in cardboard packing containers which have not been used previously to store fruit. Containers should not hold more than a half bushel. Container walls should be strong enough to be stacked in storage. Material used in fabricating containers should retain its strength after continued exposure to high humidity in cold storage.

Use a well-planned spray schedule to prevent normal loss. Protect fruit with fungicides during the blossom blight stage and pre-harvest period. Refer to L-1329, *Suggestions for Controlling Insects and Diseases on Commercial Peaches and Plums,* or L-1140, *Homeowner's Fruit and Nut Spray Schedule,* for suggested fungicides and spray timing. Additional sprays may be required during periods of high rainfall. Repeat sprays if rain occurs within 24 hours after application.

If the bloom period is more than seven days, a full bloom spray, using only an approved fungicide, is suggested. Even though a pink bud spray is used, as the blossoms open, unsprayed areas susceptible to brown rot will be exposed.

Growers who intend to store fruit for a time must use refrigeration. Cooler fruit temperatures obtained with refrigeration inhibit development of disease-causing organisms so that fruit can be stored for extended periods. Results indicate that growers who normally store fruit for five days can increase their income by $88 an acre with refrigeration. This increase results from reduced disease losses and may be even greater if one considers the market advantage.

Homeowners should adopt the commercial grower's techniques. Preventive sprays are very important. Always remove decayed fruit as it appears on the tree.

Since brown rot is more severe on damaged fruit, it is especially important that homeowners include an insecticide with fungicidal sprays.

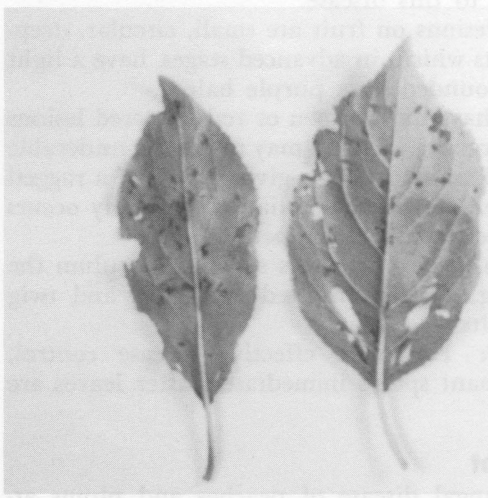
Prune trees to allow better spray penetration and prevent stagnant air within the tree. Through fungicidal coverage of the fruit and leaves necessary for adequate disease control.

Drain surface water from around trees to reduce humidity build-up within the trees.

Leaf Spot on Plums

This disease causes serious defoliation if not controlled. It is found in all areas of Texas and is known by several common names, including "shothole disease," "yellow leaf" and "cherry leaf spot."

The disease attacks leaves, petioles, fruit and pedicels. First symptoms are small purple spots on the upper leaf surface. As the season progresses,



Leaf spot on plum.

Plum pockets.

lesions enlarge slightly. The center of the spot falls out, giving a "shot-hole" appearance.

Control: Sanitation is important because removal of diseased leaves reduces some spores which would cause infection later in the year.

Fungicidal sprays have proven useful as protectants during the growing periods.

Plum Pockets

The disease occurs only on plum trees. Fruit becomes hollow and irregularly shaped and drops early. Apply winter spray as recommended for the control of peach leaf curl.

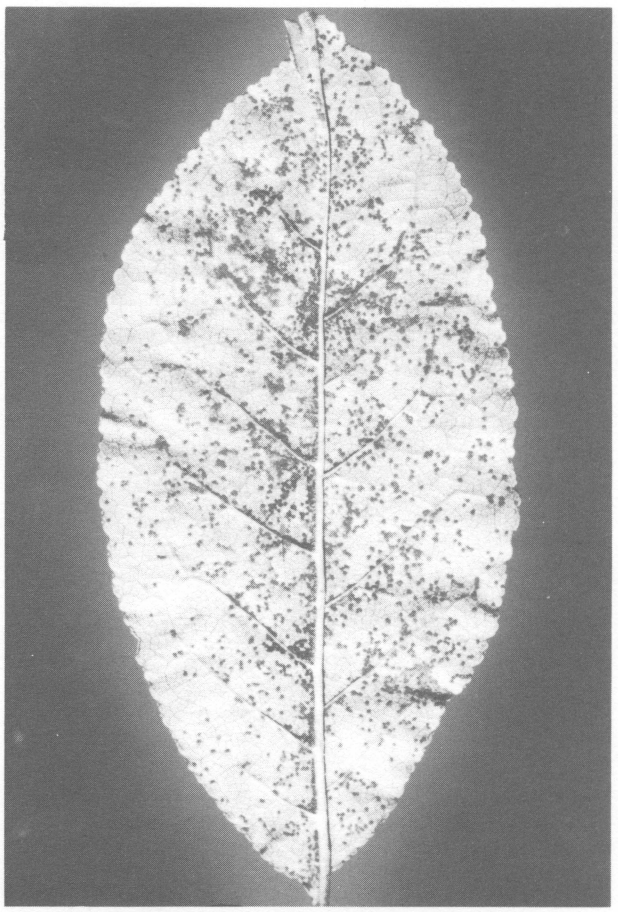
Rust

Rust occurs both on peach and plum trees. During recent years, it has been one of the more serious plum diseases. Reddish pustules occur on the lower leaf surface, marked by a yellowish spot on the upper surface. The disease also attacks the fruit. It may cause leaves to drop prematurely lowering tree vigor and making it more susceptible to damage.

Rust occurs when the regular spray schedule is not followed, during absence of a crop or during excessive rainfall. Include sulfur in all regular sprays. When rust appears after harvest, apply wettable sulfur or other suitable fungicide to prevent early defoliation. Repeated applications are required.

Black Knot

The disease occurs only on plum trees. Large, rough, black swellings, frequently several inches long, occur on branches. The portion of the branch beyond the swelling may die. Prune and burn dis-



Rust on plum.

Black knot on plum.

eased branches during fall or winter, making the cut at least four inches below the visible infection. It may be necessary to destroy badly infected trees. See the regular spray schedule in L-1329.

Phony Peach

This is a virus disease of peaches which does not cause rapid death of the tree but results in marked dwarfing of new growth and fruit. Trees infected before bearing-age normally will not produce a profitable fruit crop.

Diseased trees have shortened internodes, increased lateral branching and flattened leaves. The general appearance is a dwarfed, compact growth with dark green foliage. After a few years, the wood is brittle and terminal die-back is common. Infected trees leaf out first in the spring and hold their foliage later in the fall. Fruit ripens somewhat earlier on diseased trees.

The disease is spread by root grafting and leafhoppers.

Control: Remove all trees showing symptoms of phony peach and destroy wild plums growing near the orchard. Buy trees from a reputable nurseryman.

Peach Yellows

The disease has been observed in Texas and is caused by a mycoplasm. Fruits on diseased trees ripen from a few days to three weeks prematurely, have a bitter taste and are dwarfed. Varieties which normally have red skin are abnormally bright.

Leaves are chlorotic, fold upward and tend to droop. Trees leaf out prematurely.

The disease is spread by budding and feeding by the plum leafhopper, *Macropsis trimuculata* (Fitch). After infection, it may be 40 days to three years before disease symptoms are visible.

Control: Use only healthy bud wood and destroy any trees which show disease symptoms. Destroy wild plums near the orchard because they may serve as an inoculum for healthy trees.

Peach Mosaic

This is a virus disease which affects peach and plum trees. General symptoms are delayed foliation with small, narrow, crinkled, deformed, mottled, yellow leaves. Internodes are shortened and lateral buds break, giving a rosette appearance. Fruit is deformed, resulting in bumpy, misshapen fruit.

Spread is by grafting and insects.

Control: Plant only virus-free plants and select trees from reputable nurserymen. Remove all virus-infected trees as soon as they are discovered.

Peach mosaic.

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