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Field Guide to

Sweet Cherry Diseases

in Washington

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Field Guide to **Sweet Cherry Diseases** in Washington

Contents

BACTERIAL CANKER

Symptoms

The classic symptom of this disease consists of elongated cankers on trunk or scaffold limbs—most conspicuous during late winter or early spring. Canker surface sunken, dark purple in color (Fig. 1). Inner tissue of canker is orange to brown; narrow, brown streaks extend into healthy tissue above and below canker. Gum is usually produced at canker margin (Fig. 2). Leaves droop, turn light green to yellow in color and may die during hot weather. Cankers may eventually girdle limbs or trunks. Limbs or entire tree may die. Dormant and semi-dormant buds may blast, or wither, causing infected trees to have a light bloom. Sometimes blossoms will wither suddenly, turn dark brown, and hang on the twig.

Cause

Rain or water splash, and pruning tools spread the bacterium, *Pseudomonas syringae*, which causes the disease. Bacteria over-winter in active cankers, in infected buds, and on the surface of infected and healthy trees and weeds.

Control

Prune off cankered limbs well below visible canker. Avoid pruning in early spring and fall when bacteria are most active. Sterilize pruning tools before pruning healthy trees.

Fig. 1. Surface of bacterial canker appears dark purple.

Fig. 2. Gum exudes from canker margins.

CROWN GALL

Symptoms

An abnormal vegetative growth, or gall, appears on the roots or trunk of the tree, generally below the soil surface (Fig. 3). Round galls vary in size from 1/4 inch to more than a foot in diameter. Larger rounded galls are somewhat irregular in shape. Young galls are soft and light tan, but become hard, woody, and almost black with age. The surface of old galls may appear cracked or covered with small valleys. Galls are commonly found on lateral roots where they do little damage. Galls on the below-ground portion of the trunk may cause stunting and general tree decline.

Cause

Agrobacterium tumefaciens, a bacterial agent, causes crown gall. The disease is spread by nursery stock and cultivator tools. The bacterium is common and persists in most agricultural soils.

Control

Use clean rootstocks. Avoid wounding the tree trunk or major roots at or below the soil surface.

Fig. 3. Stripped of soil, tree roots show rounded galls. L. W. Moore photo.

X-DISEASE

Symptoms

Light pink and dark red fruit can occur on the same spurs (Fig 4). Pink fruit tend to be small. Initially only a few spurs on one branch are affected. The infection eventually spreads throughout the tree. Terminals are slightly rosetted. Leaves of terminal may be slightly undersized and bronze or rusty green in color. Stipules may be enlarged (Fig. 5). Trees on Mahaleb rootstock may collapse and die within one or two seasons.

Cause

X-disease phytoplasma causes this disease, which is spread by leafhoppers, budding; and grafting. X-disease attacks peach, nectarine, sweet and sour cherries, and chokecherry. Symptomless hosts are flowering cherry and plum.

Control

Use disease-free rootstock and scion wood. Remove diseased trees. Destroy chokecherry stands near commercial orchards.

Fig. 4. Pink, small fruit develop on same spur as dark red fruit in X-disease.

Fig. 5. Leaf stipules may be enlarged.

BROWN ROT

Symptoms

Blossom blight: Blossoms suddenly wither and turn brown (Fig. 6). During moist weather, masses of buff-colored spores cover surface of dead blossoms (Fig. 7).

Fruit: Dark spots expand rapidly into a relatively firm rot of entire fruit. Tufts of gray to buff-colored spores may cover surface of collapsed fruit. Fruits mummify and may remain on tree.

Twigs: Fungus spreads from blighted blossoms and fruit to cause twig dieback and sunken brown cankers on small branches. May produce gum (Fig. .6).

Cause

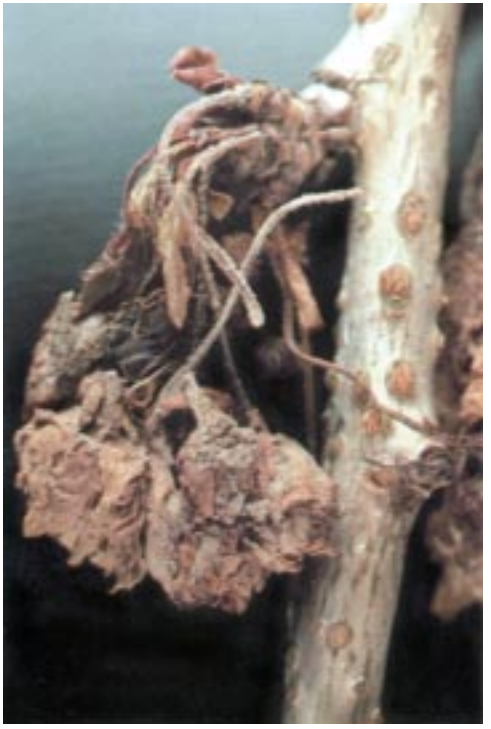
One of the most common disease problems on cherries in western Washington, brown rot is caused by fungi *Monilinia laxa* and *Monilinia fructicola*. Wind and water splash spread this disease.

Control

When feasible, remove and destroy mummified fruit in tree and on ground. Prune out infected twigs in early summer. Prune tree to improve air circulation. Avoid wounding fruit during harvest. Keep fruit cool.

Fig. 6. Brown rot blossoms wither suddenly; some produce gum.

Fig. 7. Spores cover dead blossom surface.



CHERRY LEAF CURL (witches'-broom)

Symptoms

Tufts of nonfruit-bearing branches develop, known as witches'-broom (Fig. 8). During blossom, these are leafy and lack blossoms. Leaves on affected branches are thickened, puckered, distorted, and will appear off-color. A white fungal growth appears on under-surfaces (Fig. 9). Diseased leaves may also occur on normal, nonbroomed branches.

Cause

Taphrina cerasi, a fungus, causes this disease, which is spread by wind or water splash. Once infected, a branch will produce infected leaves each year.

Control

Prune out witches'-broom 12 inches below the last visible symptom.

Fig. 8. Witches'-broom branches bear puckered, distorted leaves.

Fig. 9. White fungal growth appears on underside of leaf.

CHERRY LEAF SPOT

Symptoms
This disease is very rare in eastern Washington. Numerous small purple spots develop on upper leaf surface (Fig. 10). Tissue in the center of the spot dies and sometimes falls out, leaving a shothole appearance. In moist weather, on leaf under-surface, a small mass of cream-colored spores develop on these spots. Leaves turn prematurely yellow in the fall.

Cause
Coccomyces hiemalis, a fungus, causes this disease. Spores are spread by wind or water splash. This disease has not occurred in eastern Washington. Shothole symptoms resulting from this disease are uncommon in western Washington.

Control
Where feasible, rake up and destroy fallen leaves. Spray fungicide to protect new foliage at petal fall, shuck, and two weeks after shuck in wet areas. Because of continuing tree growth, nursery stock may need additional sprays.

SHOT HOLE (CORYNEUM BLIGHT)

Symptoms
Small areas of damage (lesions) on leaves are round or oval, and tan to purple in color(Fig. 11). These spots often fall from the leaf, leaving a shothole appearance. Some infected leaves yellow and drop from the tree. Sunken, dark brown to black areas develop on young fruit. Damage may vary from small spots to half or more of the fruit surface area (Fig. 11).

Cause
A fungus, *Wilsonomyces carpophilus*, spreads by wind, rain, and water from sprinklers to cause this disease.

Control
Prune and destroy dead buds and cankered twigs if present.

Fig. 10. Small purple spots cover upper leaf surface.

Fig. 11. Spots appear on leaves and fruit. Sunken areas may cover large portion of fruit.

PHYTOPHTHORA CROWN AND ROOT ROT

Symptoms

Initial symptoms of crown rot resemble those of mechanical girdling (also rodent damage, winter injury). Infected trees exhibit no terminal growth; leaves may be small and yellowed. These trees frequently blossom profusely. Death may occur during the year of initial infection or several years later. Smaller trees die more quickly. Usually confined to the rootstock, infected tissue also may be found on the main trunk. Production of a gummy substance often is associated with the disease when it appears on the trunk, making it difficult to distinguish the disease from bacterial canker. If the outer bark is removed, damaged areas marked with tan to black zones or bands may be seen (Fig. 12). These areas often expand vertically faster than laterally.

Cause

Several Phytophthora species cause this disease on cherries. The fungi are spread by irrigation water, on implements, and on nursery stock.

Control

All common rootstocks are susceptible to crown rot. Mahaleb is highly susceptible, and should be avoided in locations where the disease is present. Be sure to plant disease-free material.

Fig. 12. With bark removed, crown rot bands appear on trunk. S. Mircetich photo.

LEUCOSTOMA (CYTOSPORA) CANKER

Symptoms

Depressed areas on the bark of main leaders and branches indicate Cytospora canker (Fig. 13). Canker margins on bark and discolored wood are sharp and distinct. Cankers often are perennial; young cankers usually produce gum at the margin. The black, pimplelike fruiting structures found in Cytospora cankers of other crops seldom appear on cherry cankers.

Cause

Wind and rain spread the fungus *Leucostoma cinctum*, which causes this disease.

Control

No chemical control is available. Keep trees in good vigor. Avoid slow-healing wounds. Cut out cankered wood well below visibly discolored areas of bark. Avoid directing irrigation sprinklers toward cankers.

Fig. 13. Depressed areas occur on branches or leaders. A. W. Helton photo.

POWDERY MILDEW

Symptoms
Grayish white, powdery spots develop on the undersurface of leaves (Fig. 14). When infection is severe, leaves yellow and become distorted (Fig. 15). Symptoms first develop on leaves of young shoots where air circulation is poor. Powdery spots on fruit may become severe prior to any obvious leaf infections.

Cause
Windblown spores of the fungus *Podosphaera clandestina* cause this disease. Fruit symptoms frequently are brought on by rains just before harvest.

Control
Avoid high rates of nitrogen fertilizers.

Fig 14. Powdery mildew spots appear on underside of leaf.

Fig. 15. Severely affected leaves become distorted.

SILVER LEAF

Symptoms

Upper leaf surface appears silver in color. (See infected leaves of apricot, left, and healthy leaves, right, in Fig. 16.) Affected leaves first appear on one or two small branches, then spread to branches and limbs throughout the tree. Affected leaves curl slightly at the margins, and turn ashen in color, sometimes with a tinge of green. Branches lose vigor and eventually die. Thin, leathery fruiting bodies occur on dead branches and trunks, either flat against the host surface, or forming a small extended shelf. The upper portion of the fruiting body is brown to purple, and hairy; the under surface is purple to lilac and smooth in texture.

Cause

Wind and splashing water spread the disease-causing fungus *Stereum purpureum*. This fungus grows saprophytically in dead trees, prunings, stumps, and posts. It enters living tree tissues through surface wounds, such at those caused by pruning. Infected trees have recovered in areas with warm summer temperatures.

Control

Take care not to injure trees unnecessarily. Destroy all prunings. Where disease is present, prune out affected tree parts, and treat wounds and cut surfaces.

Fig. 16. Silvery colored affected leaves contrast with healthy green foliage.

VERTICILLIUM WILT

Symptoms

Leaves at the bottom of current season growth turn chrome yellow or reddish orange in mid-June to mid-July (Fig. 17). Leaf discoloration progresses up the shoot during midsummer. Leaf drop follows (Fig. 18). By fall, only upper leaves remain. Disease may affect only a branch or one side of a tree (Figs. 17, 18). Young trees usually are more severely affected. A brownish red discoloration occurs in woody vascular tissue of some affected branches.

Cause

The disease is caused by the fungus *Verticillium dahliae*, and spread through soil, surface and ground water, nursery stock, and infested potato feed lot manure. The fungus survives in the soil for many years, and may increase in soils infested with certain weed species.

Control

Avoid planting in soil where susceptible crops (potato, tomato, pepper, raspberry, strawberry, peach, apricot) have been grown. Control weeds in orchards (e.g., phlox, geranium, shepherds purse, lambs quarters, nightshade). Avoid excessive irrigation, high nitrogen fertilization, severe pruning, or other practices that promote succulent growth. Prune out dead branches; plant only healthy trees.

Fig. 17. Lower leaves of new growth turn color with Verticillium wilt.

Fig. 18. Leaf drop follows. Only part of a tree may be affected.

CHERRY DECLINE (CHERRY LEAF ROLL VIRUS)

Symptoms

Cherry leafroll virus (CLRV) alone causes delayed bloom and excessive leaf senescence 2 to 3 weeks pre-harvest. In the early stages, infected trees set abundant fruit but it is small and ripens late (3 to 14 day delay in years with cool springs) relative to uninfected trees. Over several seasons, fruit production declines dramatically and the canopy becomes open and sparse. When CLRV occurs in combination with either Prunus necrotic ringspot virus (PNRSV) or Prune dwarf virus (PDV), trees decline rapidly. Initially, only one or two scaffold limbs may show symptoms (Fig. 19), but the symptoms will spread to the remainder of the tree.

Cause

This form of cherry tree decline is caused by CLRV, alone or in combination with PNRSV or PDV. These viruses are spread by use of infected budwood, and through root grafting in the orchard. These viruses are also pollen-borne and may be transmitted by pollen.

Control

Remove affected trees. Herbicide treatment of freshly cut stump of symptomatic trees may help identify root-grafted neighboring trees. Test trees for virus before propagation.

Fig. 19. Die-back of fruit bearing shoots to the scaffold is evident in trees infected with CLRV. The rate of decline is accelerated if the tree is also infected with PNRSV or PDV. Symptoms may only appear in one limb initially.

Fig. 20. Abundant leaf drop before harvest and small, late-ripening fruit are indications that CLRV may be present.

Fig. 21. Whitish veins with dark green areas along the midrib on the lower surface and enlarged, yellow-green veins on the upper surface are evident on some leaves that emerged early in the season.

CHERRY MOTTLE LEAF

Symptoms

Irregular light green to yellow mottling appears on expanded leaves (Fig. 22), which become distorted and puckered (Fig. 23). Fruit set is reduced; fruit may be small, ripen late, and lack flavor. Lack of terminal growth and shortening of space between leaf nodes makes infected trees appear rosetted.

Cause

Cherry mottle leaf virus causes this disease, which is spread by budding or grafting, and by the microscopic scale mite, *Eriophyes inaequalis*. Trees on the orchard's edge usually are infected first. Cultivars Bing and Napoleon (Royal Ann) are severely affected. Black Tartarian, Van, Chinook, Lambert, Rainier, and Sam are symptomless carriers.

Control

Remove infected trees to prevent new infections. Destroy stands of wild cherry near commercial orchards. Use virus free nursery stock and scion wood.

Fig. 22. Irregular mottling on leaves.

Fig. 23. Cherry mottle leaf also causes distortion and puckering.

CHERRY RASP LEAF

Symptoms

Prominent lumps or outgrowths form on the underside of leaves between lateral veins and along the midrib (Fig. 24). Leaf narrowing, folding and distortion may occur; the upper leaf surface turns rough and pebbly in texture. Symptoms first appear on lower leaves in newly infected trees. Trees develop an open, bare appearance (Fig. 25) as spurs and lower branches die.

Cause

The dagger nematode, *Xiphenema americanum*, and grafting spread cherry rasp leaf virus, which causes this disease. Spread within a tree or orchard is usually slow. The virus does not affect pears, but causes flat apple on apple trees.

Control

Remove infected trees and other trees close by. Fumigate soil with a nematicide before planting cherry or apple trees. Use virus free nursery stock and scion wood.

Fig. 24. Outgrowths form on underside of leaf, between veins.

Fig. 25. As spurs and lower branches die, trees appear open and bare.

CHERRY TWISTED LEAF

Symptoms

Abrupt kink appears in leaf midrib or petiole (Fig. 26). Leaves twist, curling down and to the side; leaves remain small, or develop asymmetrically. Sections of tissue die on the underside of the midrib and lateral veins. Shortened areas between spur joints cause spurs to bunch together.

Cause

Cherry twisted leaf virus causes this disease, which is spread through budding and grafting in orchards. How disease spreads in fields is unknown. The cultivar, Bing, is the most severely affected. Napoleon, Rainier, and Van may also show symptoms, which can be severe. Most other cultivars do not show symptoms when infected.

Control

To prevent spread, remove infected trees as soon as symptoms appear. Destroy choke-cherry stands near commercial orchards.

Fig. 26. Affected by a kink in petiole or leaf midrib, leaves curl down and to one side.

LITTLE CHERRY

Symptoms

Delayed fruit ripening. Fruit on the same branch vary widely in maturity. At harvest, fruit are somewhat pointed or angular, small and medium red to pinkish red, and bitter in taste. Compare infected fruit, left, with healthy fruit, right, in Fig. 27. Some varieties develop reddish purple leaves in early fall (Fig. 28).

Cause

This disease is caused by either of two Little Cherry viruses. One of them can be transmitted by apple mealybug. Both are spread by budding and grafting. Several small fruited pollinating varieties, sour cherry, and ornamental flowering cherries can be symptomless carriers of the virus. Sweet cherry, sour cherry, and ornamental flowering cherries are hosts of the virus.

Control

Use virus free planting stock. Destroy infected trees and remove suckers from nearby ornamental flowering cherry trees.

Fig. 27. Affected fruit, at left, ripens slowly and is bitter to the taste.

Fig. 28. Leaves on some affected varieties turn red-purple in fall.

NECROTIC RUSTY MOTTLE

Symptoms

Angular spots or large areas of dead tissue appear on leaves 3 to 6 weeks after bloom (Fig. 29). Spotted leaves develop shotholes. Severely decayed leaves drop. Before harvest, remaining leaves turn mottled yellow, with green bands or islands. Buds on terminal shoots fail to open or swell; eventually they die. Leaves are earlier than normal. Bark symptoms consist of shallow areas of decay with gum blisters or deep gum pockets.

Cause

Necrotic rusty mottle virus causes this disease, which spreads through infected bud-wood. How it spreads in the orchard is unknown. Cool, late springs promote earlier and more severe symptoms. Leaf symptoms usually are not noticeable during summer and fall where temperatures remain high.

Control

Remove affected trees. Use virus free nursery stock and scion wood. Several pollinating cultivars are symptomless hosts. Test for virus before taking budwood for propagation.

Fig. 29. Spots on large areas of leaf tissue die about a month after bloom. H.R. Cameron photo.

RUGOSE MOSAIC

Symptoms

Acute infection: Brown dead tissue spots develop suddenly on leaves of one limb or one side of the tree in late April to mid-May. Dead tissues drop out, giving leaves a tattered or lacelike appearance (Fig. 30). Sometimes fruit symptoms do not appear the first year. Fruit may ripen unevenly.

Chronic infection: Leaves appear with twisted tips. Small outgrowths of dark green tissue may develop along the midrib on lower leaf surface (Fig. 31). Terminal growth and elongation between nodes or joints is often reduced. Severe strains cause uneven maturation of fruit (Fig. 32). Green fruit may be cylindrical.

Cause

Grafting, seed, or pollen from diseased trees spread strains of *Prunus* necrotic ringspot virus, which causes this disease. Mild forms show leaf symptoms, with little or no effect on fruit. Fruit ripening may be delayed 7 to 10 days with no leaf symptoms present. Severe forms exhibit blossom blast or withering, severe leaf deformity, pronounced leaf curl, reduced shoot growth, fruit ripening delayed 10 or more days, and reduced tree vigor (Fig. 33).

Control

Remove infected trees before bloom. Use virus free planting stock and scion wood. Use the serological test, ELISA, to detect symptomless, infected trees.

Fig. 32. Fruit matures unevenly.

Fig. 30. Leaves appear lacelike or tattered in May.

Fig. 31. Outgrowths of tissue grow along midrib.

Fig. 33. Tree at left of photo shows reduced vigor.

RUSTY MOTTLE

Symptoms

Older leaves turn a mottled yellow midway between blossom and harvest (Fig. 34). Leaves show variable yellow rings and patterns (Fig. 35). Affected leaves turn abruptly to yellow and red fall coloration (Fig. 35). Symptoms appear first and most intensely on leaves in the lower center of the tree. Two to three weeks before harvest, rusty-yellow colored leaves drop, taking 30 to 70 percent of a tree's leaves. Infected trees decline in vigor; main limbs die back. Fruit ripening may be delayed on severely affected trees.

Cause

Rusty mottle virus causes this disease, which is spread by infected budwood.

Control

Remove diseased orchard trees when they are first discovered. Plant virus free nursery trees.

Fig. 34. Older leaves turn a mottled yellow.

Fig. 35. Yellow rings and patterns are distinctive. Fall coloring appears early and abruptly.

PRUNE DWARF VIRUS

Symptoms

Sour cherry: The disease caused by Prune Dwarf Virus is called Sour Cherry Yellows. Leaves develop striking pale green to yellow areas 3 to 4 weeks after petal fall. Later, entire leaf turns yellow except for green along larger veins (Fig. 36). Leaves soon drop. Growth is willowy, and the number of fruit is reduced.

Sweet cherry: May show yellow rings, mottling or shotholes on leaves, or may show no symptoms at all. Many strains cause no acute effects, while others induce the formation of blindwood.

Symptom development requires warm days and cool nights. Infected trees may not show symptoms some years. Trees grown in warm climates may never show symptoms.

Cause

Prune dwarf virus is spread by budding, grafting, seeds, and pollen.

Control

Establish sour cherry orchards with virus free trees isolated from older orchards. Rogue out and replant sour cherry trees in orchards 1 to 5 years old. Rogue out and do not replant trees in orchards 6 to 10 years old. Older orchards do not benefit from rouging out trees.

Fig. 36. Pale green areas appear a few weeks after petal fall on sour cherries.

DEEP SUTURE

Symptoms

Pronounced depressions along fruit suture. Fruit apex is usually rounded. Leaves are often narrow, longer than normal, and appear pebbly on upper surface. Contrast affected fruit and leaf, left, with healthy specimens, right, in Fig. 37. Leaf margins have few or no serrations. A slight yellowing may occur between veins in late spring. Severity of symptoms may vary from year to year.

Cause

This disease is caused by a genetic abnormality. Affected limbs often develop on healthy trees. Trees propagated from trees with deep suture will be affected.

Control

Use budwood from healthy trees. Remove affected young trees or graft them over with healthy scions. Remove affected branches in older trees.

Fig. 37. Fruit indentation and distorted leaf of deep suture appear at left.

SWEET CHERRY CRINKLE LEAF

Symptoms

Distorted leaves have indented and abnormally serrated margins. Some leaf tips and bases accentuated. Light green to greenish-yellow mottling on dark green leaves (Fig. 38). Blossoms frequently defective and smaller than normal. Fruit is small, pointed, and may have raised suture (Fig. 39). A branch, a few branches, or the whole tree may show symptoms. Severity of symptoms varies from year to year.

Cause

Healthy trees often develop affected limbs from this genetic abnormality. It is not spread by any agent. Trees propagated from affected limbs will develop the disorder.

Control

Use budwood from healthy trees. Remove affected young trees or graft them over with healthy scions. Remove affected branches in older trees.

Fig. 38. Leaves abnormally serrated, with some mottling.

Fig. 39. Fruit is small and pointed, often with raised sutures.

SIMAZINE (Princep) INJURY

Symptoms
Yellowing of the leaf tissue between the veins is characteristic of simazine injury. In a severe injury, leaf dies from the tip and margins inward. These symptoms are typical of damage from other herbicides in the triazine family (Fig. 40).

Cause
Herbicide damage.

DICHLOBENIL (Casoron) INJURY

Symptoms
Yellowing of the leaf margin creates a characteristic halo effect. Yellowing develops between the veins as symptoms progress. Leaves die and tree is defoliated in severe cases (Fig. 41, symptoms on plum).

Cause
Herbicide damage.

Fig. 40. Characteristic tissue yellowing follows simazine injury.

Fig. 41. Halo effect yellowing produced by dichlobenil injury.

FASCIATION

Symptoms
Stem tissue joins side by side to form a flattened layer rather than a normal stem. The stem layer (Fig. 42) may curl and branch to form curious shapes. Normal growth may occur the following year, or fasciation may continue.

Cause
No cause is known for fasciation, which appears to be a noncontagious growth irregularity. Sub-lethal exposure to some herbicides and some bacteria are associated with this disorder.

Control
Prune out affected stems.

FRUIT DOUBLING (TWINNING)

Symptoms
Double pistils form in the flower, resulting in two attached fruits (Fig. 43), or an attached fruit and smaller spur.

Cause
High summer temperatures during flower bud differentiation cause this physiological abnormality the following year.

Control
Cultivars differ in their susceptibility to fruit doubling. Bing, Royal Ann, Early Burlat, and Van all have a high doubling potential. Select cultivars that do not have a high fruit doubling potential for warm locations.

Fig. 42. Stem tissue joins abnormally, curls to odd shapes.

Fig. 43. High temperatures as bud tissues develop will cause fruit doubling the following season. P.R. Fridlund photo.

GUMMOSIS

Symptoms
Clear-to-amber gum exudes from bark (Fig. 44) during the dormant season-November to March. Heavy flow may drip onto the ground. The clear gum is seldom associated with a disease problem. Bacterial canker is an exception. Crotch gummosis and other nondisease gum formations are often misdiagnosed as bacterial canker. When a disease is responsible for gum formation, dead tissue (sunken canker, brown cambium, dead twigs, etc.) is usually present.

Cause
Narrow-angle crotches or wounds from pruning, disease or insects cause formation of gum.

Control
None necessary unless disease is present. See bacterial canker, brown rot, Coryneum blight and necrotic rusty mottle.

Fig. 44. Without other symptoms present, dormant season gum flow does not indicate disease.

SHOT HOLE

Symptoms
Spots and blotches of varying sizes, shapes, and colors develop on leaves. Affected tissues turn brown, die, and fall out, leaving holes in the leaves (Fig. 45). Rely on other symptoms to diagnose disease or injury.

Cause
A number of viral diseases, fungus leaf spot, nutrient imbalance, chemical toxicity, and unknown physiological stresses can cause a shot hole appearance.

Control
See viral diseases and fungal leaf spot for recommendations. Try to determine exact cause before working on problem.

Fig. 45. A shot hole appearance occurs when dead tissue falls from leaves.

NORFLURAZON (Solicam) INJURY

Symptoms
A whitish-yellow discoloration along the veins with a faint pink to purple cast around the edge is characteristic. Bark on new growth may split and appear bleached (Fig. 46). Leaves die in severe cases.

Cause
Herbicide damage.

Fig. 46. Bark splits, appears bleached on new growth.

2,4-D (Various Trade Names) INJURY

Symptoms
Leaves deformed, may be cupped. New leaves may develop parallel veins. Symptoms appear first on leaves that were expanding at time of exposure to 2,4-D. See example of symptoms on apricot, Fig. 47.

Cause
Herbicide damage.

GLYPHOSATE (Roundup, Touchdown, Rascal) INJURY

Symptoms
New leaves do not expand and may appear tightly rolled (commonly referred to as needle leaf). See symptoms on apple (Fig. 48). Proliferation of buds and stunted shoots, producing a witches'-broom effect (Fig. 49, symptoms on apple). Internodes may be shortened on new growth.

Cause
Herbicide damage. Exposure to glyphosate sprayed the previous season, or very early before new growth starts for current season.

Fig. 47. Leaves expanding when 2,4-D was applied cup or appear deformed.

Fig. 48. New leaves roll tightly, fail to expand.

Fig. 49. Buds and stunted shoots produce broom on apple.

PARAQUAT (Gramoxone Max, Cyclone) INJURY

Symptoms

Yellow spots appear where spray droplets touched leaves, sometimes within hours of direct contact with herbicide. Yellowed tissue dies and may fall from leaf (Fig. 50).

Cause

Herbicide damage. Spray droplets contacting green tissue.

Fig. 50. Yellow spots appear on leaves within hours of direct contact with herbicide.

Some of the diseases in this bulletin have registered chemical controls. For homeowner chemical control recommendations please consult the Hortsense Website at: http://pep.wsu.edu/hortsense/. For commercial chemical control recommendations please consult the most recent Crop Protection Guide for Tree Fruits in Washington (EB0419). Hard copies can be obtained from your local county extension office, or through the WSU Bulletins office (phone 1-800-723-1763 or email bulletin@wsu.edu). Electronic copy is available at: http://cru84.cahe.wsu.edu/cgi-bin/pubs/EB0419.html.

Use pesticides with care. Apply them only to plants, animals or sites listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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