WHY CHERRY TREES DIE

Black Canker

Verticillium Wilt

San Jose Scale

Bacterial Gummosis

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WHY CHERRY TREES DIE

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INTRODUCTION

Cherry growing in the Pacific Northwest is not only an interesting and sometimes profitable endeavor but one attended by many problems. This bulletin discusses several factors that lead directly or indirectly to the untimely death of cherry trees. It is likely that there may be other factors that have not yet been recognized. Nevertheless, the presently known problems are numerous and many are serious.

The Sweet Cherry

The early literature on cherries came from the writings of Theophrastus in Greece about 300 B.C. It is believed, however, that cherries were cultivated even before this period. Propagation by grafting has been known since very early times. Perhaps one reason for the early recognition of the cherry, even more important than the use of its fruit, is the value of the trees as wood.

The presently cultivated sweet cherry is known as *Prunus avium* L. Its wild ancestor, also *P. avium*, is now known commonly as Mazzard. At present this is one of the two favored rootstocks. The other is Mahaleb (*Prunus mahaleb* L.) a small, black (sometimes red) fruited kind which originated in about the same region and now grows wild over most of Europe. Both Mazzard and Mahaleb are native and abundant in the Black and Caspian Sea regions and occur in great numbers and variations in northern Turkey and eastern Europe.

Until comparatively recent times sweet cherries were grown mostly in back yards, on estates, and in small semi-commercial plantings. Their culture now extends over the world in temperate climates. The sweet cherry is one of the most delicious of fresh fruits.

The domestication of the sweet cherry over the centuries has brought great changes in varieties and culture and in its use in a rapidly expanding commerce. Development in Oregon the last hundred years has seen three seedlings become popular and important varieties: Black Republican, Lambert, and the standard black cherry, Bing. Natural mutations of sweet cherry which develop into varieties are rare. Rainbow Stripe is one example. The mutations giving rise to the undesirable kinds such as crinkle and deep suture are fairly common in Bing and Black Tartarian.

The compact Lambert of Summerland, British Columbia, Canada, and a compact Bing of Prosser, Washington, are said to be recent mutations produced by irradiation.

With very rare exceptions sweet cherry varieties are self sterile and this gives rise to cross pollination problems.

The sweet cherry has become one of the favorite orchard trees of the West. Large plantings in favored locations are found in Washington, Oregon, Utah, Idaho, Montana, British Columbia, and California. Although cherry growing is beset with many uncertainties, attractive returns in some years have maintained grower interest in the crop, and in recent years plantings have greatly increased. Part of this has been on a renewal or replacement basis, such as after the 1955 freeze which killed or severely damaged thousands of trees. Many large, new orchards have been planted in Washington—not only in the Yakima Valley but near Wenatchee and especially in the Columbia Basin.

While the sweet cherry is characteristically a large, strong-growing, long-lived tree, it does have problems. With domestication and concentration of orchards this tree is subject to a long list of ailments or weaknesses, some of them perplexing as well as serious. Complaints from both new and experienced growers about trees dying or declining have been more frequent the last few years. It recalls to mind the philosophy of an orchardist friend in Idaho years ago who remarked “Sweet cherry trees just can't wait to die.”

The following discussions may be helpful in determining the causes and possible control of some of these ailments of sweet cherry trees.
NURSERY STOCK AND CULTURAL PRACTICES

Nursery Stock
One of the most important items in growing cherries is the quality of the nursery stock. A Nursery Improvement Program has been in operation in Washington for over 30 years and has upgraded the stock materially. And, since 1962, a Certification Program has made available stock that is true to name and essentially free from all known virus and virus-like diseases.

By using certified stock, an orchardist can avoid the risk of planting a new orchard with poor trees. The best is none too good and certified trees are better than any others.

Practices used in growing, handling, and storing nursery stock have improved during the past few years. Most trees are in good condition when they leave the nursery. They should be transported under good conditions and planted promptly. If this cannot be done, they should be kept from freezing or drying out.

Time of Planting
Trees should be planted as early in the spring as the ground can be worked. Chances of tree survival (and good growth) diminish rapidly if hot weather arrives before the active root system is re-established.

Poor Planting
Holes should be large (18 to 24 inches across) so the roots can be spread out evenly and deep enough so the bud union can be set 1 to 2 inches below the soil line. The soil should be firmly packed around the roots and, if moisture is low, the trees should be watered.

Lack of Pruning
Unless trees are pruned back at planting time, they have little chance to do well. The newly planted root system will not be able to support the original top.

Approximately half the top should be pruned away at planting time (Fig. 1). If a lower-headed tree is desired, even more of the top can be removed.

Heat Canker
Any trees, especially those that are slow in starting or are planted late, may develop heat canker. This is a brown, dead area near the soil line caused by heat injury to the bark from exposure to the sun.

Heat canker can be prevented by placing a large chunk of sod against the south side of the
trunk at planting time (Fig. 2). This will provide shade. A shingle or a short board is also effective.

**Mechanical Injury**

Many young cherry trees are injured, disfigured, or killed during cultural operations (Fig. 3). Sometimes weed growth is so thick and tall that the young trees are not easily visible. Most of the damage from mechanical equipment can be prevented.

**Fertilizer Injury**

Generally fertilizers should not be applied to cherry trees the first year. Under good cultural conditions trees may not need applications of nitrogen until they start to bear.

Putting too much fertilizer too close to the trunks and roots has damaged or killed many young trees. Leaf yellowing and scorching and shoot die-back are characteristic symptoms.

**Lack of Sufficient Water**

Young cherry trees are vulnerable to lack of water and to competition from weeds, especially during the first two seasons (Fig. 4). This is particularly true of replants. Poor or indifferent orchard care accounts for weak growth or death of many cherry trees. Replants in established orchards need special care and more frequent watering.

**Too Much Water**

Cherry trees usually do poorly or die outright in heavy soils with poor drainage. A high water table, standing water, or excessive water will normally kill them (Fig. 5). They cannot tolerate such conditions.

This problem can be controlled by selection of proper sites, care in irrigation, and construction of drainage systems, if needed. Since trees on Mazzard rootstocks are more shallow rooted, they usually do better in heavy, wet soils than those on Mahaleb rootstocks.
Viruses and Mycoplasmas

A number of virus or mycoplasma diseases affect cherry trees. Some kill or weaken the trees.

Prunus necrotic ring spot virus has reduced cherry bud stands in the nursery and weakened tree growth. It has caused trees of the Seneca variety to die.

Lambert mottle, which causes leaf yellowing, dead spots on leaves, and twig die-back, can kill trees in one to three years. This disease is present in Washington and several other western states. Affected trees should be promptly removed.

Twisted leaf, which causes severe twisting and malformation of leaves, reduced growth, deformed fruit, and late ripening of Bing, may result in decline and eventual death of the trees. It has ruined several Washington orchards and continues to be a severe problem in others. Prompt identification and removal of affected trees will help in control.

Albino cherry has completely eliminated commercial cherry orchards in one district of the Pacific Northwest by killing the trees.

Rasp leaf reduces tree vigor and eventually forces removal of trees.

Black canker, while not common, causes extensive cankering on the scaffold branches and decline of Bing and Royal Ann trees (Fig. 6).

Western X mycoplasma causes Western X little cherry disease. Twenty to 25 years ago, this was a serious threat to Washington orchards, but it is now a problem in only a few locations. Tree removal, insect vector control, and certified nursery stock have helped reduce the disease. However, it is still a severe problem in one area of Oregon and in some Utah orchards. In Utah, a sudden, complete wilt and death of mature trees on Mahaleb rootstock is characteristic and losses have been severe.

Kootenai little cherry virus does not kill trees, but may make them uneconomic and force their removal. In recent years, this disease has appeared in the Okanagan area of British Columbia and is causing a great loss of trees in an eradication program to control it.

Spur cherry virus, present in some Bing trees, causes dwarfed growth. In Van, the virus causes decline and death of the trees (Fig. 7).

Verticillium Wilt

Verticillium wilt is caused by the fungus Verticillium albo-atrum. Its first symptom is the wilting of leaves and killing of spurs along the main

Fig. 6—Sweet cherry tree infected with black canker. The galls are larger and more localized than the swollen, rough areas caused by San Jose scale.

Fig. 7—Spur cherry virus kills Van. All trees are Van topworked on F 12/1 roots. The trees at right were inoculated with virus and F 12/1 suckers were removed.
branches of young, vigorous trees. Further evidence may be wilting and die-back of current shoots on one or more branches.

The disease clogs the water-conducting tissues in the branches, resulting in leaf wilt and twig die-back. When affected branches are cut to expose the woody vascular system, dark streaks or bands are often found (Fig. 8).

Usually only one branch on one side of a tree is affected (Fig. 9). The rest of the tree is perfectly normal.

Any part of the tree, or the entire top, may be affected (Fig. 10). The leaves may fall from the diseased branches or they may stay attached longer than normal, a symptom also found in San Jose scale. Normally there is no gumming, suckering, or cankerking.

Affected branches and trees may die over the winter or slowly recover over several years.

Verticillium wilt commonly occurs in the Yakima Valley and has also been found in the Columbia Basin. Currently it is one of the most common and devastating diseases in cherry orchards. Once infection occurs, no satisfactory control is known.

Cherry trees should not be planted on land that has been in potatoes, tomatoes, or other crops that are susceptible to Verticillium. Soil fumigation will kill the fungus, but is very expensive. Manure from feedlots where potatoes have been fed should not be used as fertilizer, because this may spread the fungus.

Trees should not be forced into excessive growth. Severely weakened branches and trees should be removed as soon as there is good evidence they will not recover. Early and very severe heading back has apparently helped some affected trees survive.
Bacterial Gummosis or Canker

This disease, caused by *Pseudomonas syringae*, is widely distributed and occurs on many kinds of plants. It is also called lilac blight. It attacks vigorous young cherry trees. Cankers develop on the trunk or scaffold branches and great quantities of gum form around the enlarging cankers (Fig. 11). The diseased bark becomes dark, looks water soaked, and the area sinks, leaving a definite margin between diseased and healthy tissue.

If cankers girdle the branches or trunk, the leaves above the canker roll and turn yellow (Fig. 12). Growth stops and the branch or tree eventually dies. In some areas of the West, a “dead bud condition” is another phase of the same disease.

Normally the cankers do not extend below the soil line and the tree may send up suckers—a characteristic symptom (Fig. 13). Sometimes a new tree can be grown from a healthy sucker if it comes from the trunk above the union.

This disease has increased in Washington and several other states and has been very troublesome in some orchards. Trees 2 to 12 years old are most susceptible. Nursery trees may develop trunk cankers that make them unfit for planting.

Young cankers should be cut out as soon as they are recognized and the area treated with a fixed copper material in water.

Trees may be protected with a Bordeaux spray (4-4-50) on the trunks and lower branches. The area around the base of young trees should be kept free of weeds and trash. This helps keep the trunk and crown dry.

Since nursery infections occur in the fall or during mild winters, spraying young cherry trees with Bordeaux before digging will help provide control. In Oregon, F 12/1, a clonally propagated Mazzard is said to be resistant to the disease when used as a root and trunk stock. This combination has not gained favor in Washington.

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Fig. 11—Extensive gumming is characteristic of bacterial gummosis. Gumming may occur on trunks or main scaffold branches. Gumming alone is not a sure sign of bacterial gummosis. There must also be a canker with dead bark.

Fig. 12—This tree has rolled, reddish-yellow leaves and looks much like a tree girdled by gophers. Close examination revealed bacterial gummosis cankers girdling the trunk.

Fig. 13—Cankers seldom extend below the soil line. A side shoot or sucker frequently arises below the canker and can be developed into a new tree if it originates above the bud union.
The variety Hardy Giant frequently shows severe bark killing along with extensive gumming on branches and smaller twigs. Tree decline follows and if the disease is not controlled, affected trees may die. Severe leaf spotting, yellowing, and leaf fall accompany the bark symptoms. Apparently Hardy Giant is particularly susceptible. Copper sprays have given good control.

In several of the most severe cases of bacterial gummosis the orchards are sprinkler irrigated.

**Crotch Gummosis**

Crotch gummosis is a condition that is often confused with bacterial gummosis. It is common and has caused many cherry growers concern. In the winter season (November to March) during rainy periods, large amounts of gum may form in narrow crotches, on the trunks and branches, and near large pruning wounds or branches that have been topped (Fig. 14). The gum often forms large masses and drips to the ground.

This is not bacterial gummosis and when warmer spring weather arrives the gum dries up. Some growers become alarmed by tree crotch gumming but there is no real problem as long as cankers or dead areas do not develop. Wide angle crotches seldom form gum, so early tree shaping is desirable.

**Crown Gall**

Crown gall, caused by the bacterium *Agrobacterium tumefaciens*, is characterized by swellings or galls on roots. If the galls are numerous or severe, they can cause tree decline and death, especially if they are on the crown or main roots of young trees (Figs. 15 and 16). Many young trees in some orchards have aerial galls which also cause severe decline (Fig. 17). Crown gall is widespread and during some seasons has a high...
incidence in nursery stock. Mazzard roots are much more susceptible than Mahaleb. Only healthy, clean stock should be accepted for planting.

**Crown Rot**

Crown rot is caused by the water mold *Phytophthora cactorum*, which attacks other plants besides cherry. Apple is a common host. The fungus infects young, vigorous trees and destroys the bark near the crown, including the main root system (Fig. 18). Normally, tissues above ground are not affected. Diseased trees first show an off color, and then yellowing or bronzing of the leaves, and eventually die. Suckering does not usually occur.

Control is difficult because the crown is usually too far gone by the time symptoms in the top are noticed. Preventing excessive moisture around the crown area is desirable and Bordeaux or other copper materials applied to the crown and lower trunk may help prevent infection. Since the fungus spores may be present in irrigation water, sources of water should be considered. Shallow ponds or drainage reservoirs are often sources of heavy contamination. Planting cherry trees on a slight ridge may help keep the crowns dry.

**Cytospora Canker**

Under certain conditions, the fungus *Cytospora* may attack even mature cherry trees, causing trunk or scaffold cankers which extend rapidly, girdle the tree, and kill it (Fig. 19). The fungus produces small “pimples” on the affected bark, from which great masses of spores exude. To help prevent infection, keep the trees in good vigor and remove weak or dead wood.

**Armillaria Root Rot**

This fungus disease is not common in most Washington cherry areas, but may cause heavy damage where it occurs. The disease organism produces a mat of white, felt-like growth between the bark and wood of the roots and trunk. It causes the trees to die as if they were girdled. Large black threads of fungus tissue, resembling shoestrings, may be present on affected tissue and in the soil (Fig. 20). The disease is most serious in previously wooded areas, especially where oak trees are native.

Control is difficult and fumigation is very expensive.
Fig. 21—Bark on the crown and roots of this young cherry tree has been eaten by the Polyphylla beetle larvae shown near the crown. The above-ground symptoms are those of girdling.

Insects

Root grubs. Large grubs (larvae) of Polyphylla, Pleocoma, and other genera may eat and girdle cherry roots, causing death of young trees (Fig. 21). While not common, this type of damage is serious when it occurs. Above-ground symptoms are similar to those caused by girdling (for example, by gophers). The whole root system may be consumed, leaving only stubs.

San Jose scale, Aspidiotus perniciosus, infests cherry, particularly Bing, with such severity that twigs, branches, and whole trees may be killed. Live scale appears as a rough, grayish covering on the bark, which becomes moist when rubbed. Dead leaves that hang on trees over winter are usually a sign of scale-infested trees (Fig. 22). Affected twigs and branches may develop cankers with abundant gummosis (Fig. 23). Because of this, San Jose scale has sometimes been erroneously diagnosed as bacterial canker or as Coryneum blight. Suitable dormant sprays will help control scale.

Shot hole borer. Weak and dead cherry wood is a favorite place for the shot hole borer, Scoleytus rugulosus. The small black beetles attack branches weakened by Verticillium wilt, winter injury, or other causes and kill the tissue (Fig. 24). The shot hole borer also attacks healthy, vigorous trees, but generally not in large enough numbers to become a serious problem unless infested prunings or wood piles are left nearby.

Sanitation and the use of sprays at the proper time will give some control of this insect.
Winter Injury

Sweet cherry can be injured by freezes at temperatures even above 0°F, although well-hardened trees may withstand temperatures of -20°F or below.

Typical winter injury symptoms are splitting and killing of bark on trunks and branches (Fig. 25) and discoloration of woody tissue in twigs and spurs. Dark brown areas or streaks are apparent in the damaged wood when the tissues are cut for examination. A high percentage of flower buds may be killed. Extremely low temperatures with little or no snow cover can result in extensive root damage. Wood rotting fungi may enter through winter-injured tissues and cause additional damage.

Whole orchards have been severely damaged by sudden, severe freezes or unusually early cold spells. There were reports of tree damage from low temperatures in 1924. A very early, severe cold spell in November 1935, extremely low temperatures in 1948-49, another severe freeze in November 1955, and sharp freezes in December 1964, 1968, and 1972 have all taken their toll in dead and damaged cherry trees and in loss of fruit buds.

Winter injury is difficult to prevent. Damage can be reduced by preventing excessive late growth of young trees and by protecting their trunks with white paint or shading boards to prevent sun scald. Orchard heating in the winter may be feasible in some circumstances.

Mahaleb rootstocks seem to be more winter hardy than Mazzard. Use of hardy sour cherry interstocks such as Montmorency, Kansas Sweet, and North Star may reduce trunk injury.

Rodent Injury

Cherry trees of all ages may be partly or totally girdled near the ground line by mice (the short tailed meadow mouse) and gophers or the main root system and the lower trunk may be damaged (Figs. 26 and 27).

Gophers may eat the bark or the whole root system of young trees, leaving just short stubs of the main roots. Trees affected this way may fall over or be easily pulled from the ground. In older trees, rodent injury is often hard to discover without considerable digging. Pocket gophers have probably killed more cherry trees in the West than any other single cause. They have killed trees as large as 12 to 24 inches in
diameter. Severe gumming of trunks and scaffold branches often accompanies root injury and partial girdling. There are no cankers in this type of gum formation.

Mice usually eat only the bark and often girdle the crown completely, causing the tree to die sometime after bloom. If a few roots are left, the trees go into a severe, slow decline. Tree symptoms such as leaf yellowing, reduced growth, and eventual collapse are similar, whether the damage is caused by mice, by gophers, or by crown rot. In cases of crown rot, the bark is present, but dead, instead of being eaten away. Careful inspection is sometimes necessary to determine if rodents have caused the damage.

Although either Mazzard or Mahaleb rootstock may be attacked, gophers seem to prefer Mahaleb roots. Mice and gophers may be successfully controlled by using machines which place poisoned bait in artificial burrows and trails. Certain orchard sprays or treated baits have been used for mouse control. Trapping gophers is effective if done before tree injury occurs. Clear away all trash and grass for a distance of 3 feet around the trunks at all times. This will normally reduce mouse injury and will make it easier to observe the presence of gophers.

Rabbits may damage young trees by eating the bark and twigs. The most effective control is to put up a rabbit fence.

**Deer Damage**

In some areas young cherry trees are severely injured or killed by leaf feeding, twig browsing, and tree breakage caused by deer (Fig. 28). Whole orchards may be destroyed or replants may be eliminated. Even slight feeding causes severe delay and reduction in growth. Late maturity of the new shoots leads to winter injury. In an orchard near Sunnyside, Washington, many young trees died in the spring the year after severe defoliation by deer.

Certain repellents are helpful, but the best solution is a deer fence. State funds may be available to partially defray construction costs. Consult your local game protector.

**Incompatibility**

As used here, the term incompatibility means that the stock and scion “do not get along” well. This involves genetic factors or inherent incompatibilities, such as when pear is budded to apple.

In some cases a virus or mycoplasma may be involved and the term then used is “induced incompatibility.” This situation occurs in some citrus diseases, in pear decline, and possibly in some cherry problems.

After several years of investigation it was found that the Van variety did not do well on Mahaleb rootstock. Many trees declined and died. Symptoms were much like girdling, although the decline was not so rapid. Growth slowed and stopped, extreme fruit set occurred, and tops died back. The root system was very poorly developed and continued to decline (Fig. 29). One Mazzard line (Mz-570) used by nurserymen also is incompatible on Mahaleb. Viruses, so far as is known, are not involved in either case. With both Van and Mazzard-570, the decline is not uniform and some trees maintain good growth, at least for many years.

The use of Mahaleb rootstocks for Van is now discouraged and the problem is being solved in new plantings. In the few cases tried, the inarching of Mazzard seedlings to affected trees on Mahaleb was successful.

In several plantings where dwarfing of sweet cherry has been done with a Mahaleb root and a Montmorency trunk or framework, there has been severe (but variable) tree decline and death. In one case, the Chinook variety showed extensive...
gumming of the main branches accompanied by tree decline. These cases seem to be degrees of incompatibility. Better tree vigor has been noted when Mazzard rootstock has been used in these scion-root combinations, although Montmorency on Mahaleb has long been considered standard.

**Herbicide Damage**

The use of certain weed killers has weakened, and in severe cases, killed trees. Usually the leaves become yellow, perhaps deformed, and virus-like symptoms may appear. Care should be taken to apply the right materials at recommended rates and to avoid drift or contamination. Soil types may cause wide variations in the extent of damage.

**Arsenic Residues**

From about 1920 to 1950, large quantities of lead arsenate were used over much of the Northwest to control the codling moth in apples. When some of these orchards were removed and other crops were planted, the arsenic residues persisted in the soil and seriously affected plant growth.

In peaches, apricots, prunes, and cherries, arsenic residue causes systemic arsenic toxicity. Symptoms consist of leaf yellowing, interveinal necrosis, lace leaf condition, and defoliation. The older leaves are affected first. Young apple trees grow poorly in “arsenic soils.” Cherries are probably the least affected. The addition of organic materials and growing sweet clover on affected soil will eventually improve it. The use of virgin soil in setting out trees is helpful.

**Fire Damage**

Sweet cherry bark is quite sensitive to fire injury. In some cases, trash around trees has accidentally been set on fire from weed burning. Less common, but just as serious, are cases where trash is ignited around orchard heaters.

If severely damaged by fire, the trees may start to grow but early in the summer the leaves turn yellow and later red and finally brown and die. Extensive gum occurs on the injured trunk and scaffold branches (Fig. 30). If the damage is severe, the trees die about mid- or late summer.

**Heating Oil Damage**

Young cherry trees or branches of old trees may be killed by seepage or leaks from oil heating pots placed near the tree trunks during the summer or winter. The leaves of affected trees turn a bronzed yellow and finally brown as the tree or branch dies. Heating oil in the soil is very toxic to cherry trees.

**Spray Oil Damage**

Cherry trees of any age can be severely damaged or killed by poorly mixed oil spray combinations or excessive application in the delayed dormant stage. Dieback and wood injury or bud killing may occur.
This bulletin represents the ideas, experiences, and counsel of many people including county agents, cherry growers, and colleagues. Special thanks are extended to Murit D. Aichele.