

FIRE BLIGHT

Integrated Pest Management for Home Gardeners and Landscape Professionals

Fire blight, caused by the bacterium *Erwinia amylovora*, is a common and frequently destructive disease of pome fruit trees and related plants. Pear (*Pyrus* species) and quince (*Cydonia*) are extremely susceptible. Apple, crabapple (*Malus* species), and firethorns (*Pyracantha* species) also are frequently damaged. Fire blight is less common on hawthorn (*Crataegus* species), *Spiraea*, *Cotoneaster*, toyon (*Photinia* species), juneberry or serviceberry (*Amelanchier* species), loquat (*Eriobotria*), mountain ash (*Sorbus* species), and other related plants. The disease can destroy limbs and even entire shrubs or trees.

IDENTIFICATION AND DAMAGE

In spring, branch and trunk canker symptoms can appear as soon as trees begin active growth. The first sign is a watery, light tan bacterial ooze that exudes from cankers (small to large areas of dead bark that the pathogen killed during previous seasons) (Fig. 1) on branches, twigs, or trunks. The ooze turns dark after exposure to air, leaving streaks on branches or trunks. However, most cankers are small and inconspicuous; thus infections might not be noticed until later in spring when flowers, shoots, and/or young fruit shrivel and blacken (Fig. 2). The amount of fruit loss depends upon the extent and severity of the disease.

Open flowers are the most common infection sites (Fig. 3) and remain susceptible until petal fall. Infected flowers and flower stems wilt and turn black on pear trees and brown on apple trees. Fire blight infections might be localized, affecting only the flowers or flower clusters, or they might extend into the twigs and branches, causing small shoots to wilt (Fig. 4) and form a crook at the end of each infected shoot. Succulent tissues of shoots and water sprouts (root suckers) also are subject to infection. Dead, blackened leaves and fruit cling to branches throughout the sea-



Figure 1. Bacterial ooze on a twig with fire blight infection.



Figure 2. Blackened fruit is typical of fire blight infection.



Figure 3. Flower clusters infected with fire blight bacteria.

son, giving the tree a scorched appearance, hence the name "fire blight." Infections can extend into scaffold limbs, trunks, or root systems and can kill highly susceptible hosts. Less susceptible varieties might be severely disfigured. Once infected, the plant will harbor the pathogen indefinitely.

When the pathogen spreads from blossoms into wood, the newly infected wood underneath the bark has pink to orange-red streaks (Fig. 5). The bacteria also spread



Figure 4. Branches infected with fire blight.



Figure 5. Red-streaked wood underneath the bark in a fire blight canker.



Figure 6. Brown cracked bark covers an overwintering fire blight canker.

into the wood surrounding overwintered cankers that have become active in spring. If the bark is cut away from the edge of an active canker, reddish flecking can be seen in the wood adjacent to the canker margin. This flecking represents new infections the bacteria cause as they invade healthy wood. As the canker expands, the infected wood dies, turns brown, and dries out; areas of dead tissue become sunken, and cracks often develop in the bark at the edges of the canker (Fig. 6). The pathogen

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tends to move in trees from the infection site toward the roots. In fall, leaves on infected pear shoots often turn red and then black.

LIFE CYCLE

Fire blight bacteria overwinter in cankers on twigs, branches, or trunks of host trees (Fig. 7). In spring when the weather is sufficiently warm and moist and trees resume growth, a small percentage of the cankers become active as bacteria multiply and ooze from branch or twig surfaces in a light tan liquid. Splashing rain or insects transmit the bacteria to nearby blossoms or succulent growing shoots. Once blossoms are contaminated with the bacteria, honey bees become efficient carriers of the pathogen.

Injuries on tender young leaves and shoots, caused by wind, hail, or insect punctures, are easily invaded by the fire blight bacteria. Such infections lead to shoot blight. Ideal conditions for infection, disease development, and spread of the pathogen are rainy or humid weather with daytime temperatures from 75° to 85°F, especially when night temperatures stay above 55°F.

Fire blight bacteria generally don't move uniformly through the bark but invade healthy wood by moving in narrow paths up to 1 1/2 inches wide in the outer bark ahead of the main infection. These long, narrow infections can extend 2 to 3 feet beyond the edge of the main infection or canker. If you expose bark from an infected woody area, you will see that the diseased tissue closest to the main canker is brown. Farther out, the infection turns red and then appears as flecking. Just beyond the visible infection the tissue will look healthy.

Tree vigor has a major influence on the extent of fire blight damage. Once established, the distance the pathogen moves relates directly to the susceptibility of the tree and rate of tree growth. Vigorously growing shoots are the most severely affected; therefore, conditions such as high soil fertility and abundant

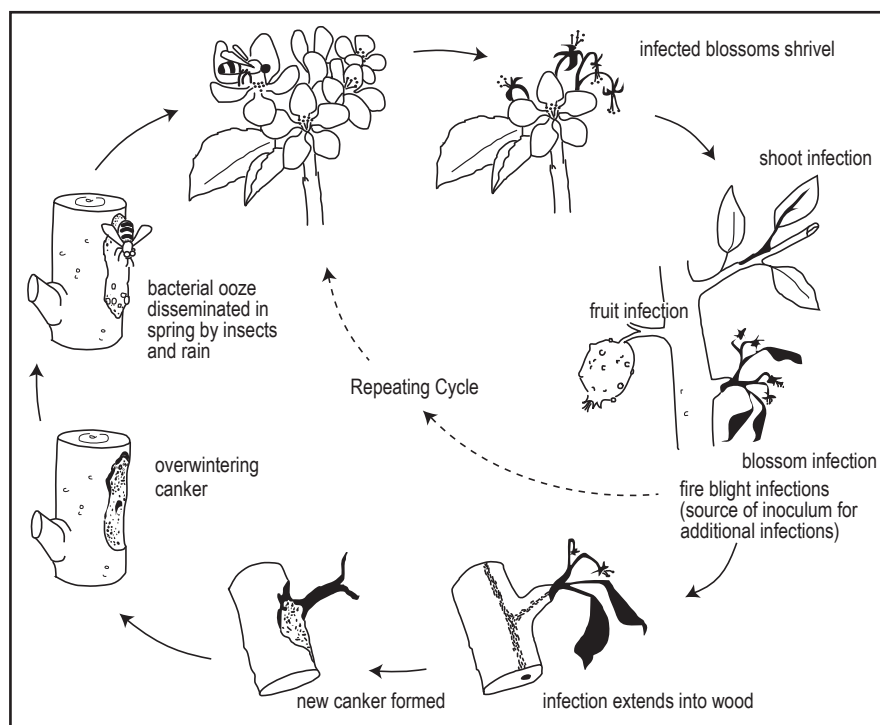


Figure 7. Disease cycle of fire blight.

soil moisture, which favor rapid shoot growth, increase the severity of damage to trees. In general, trees are more susceptible when young and suffer less damage as they age.

MANAGEMENT

Fire blight development is influenced primarily by seasonal weather. When temperatures of 75° to 85°F are accompanied by intermittent rain or hail, conditions are ideal for disease development. The succulent tissue of rapidly growing trees is especially vulnerable; thus excess nitrogen fertilization and heavy pruning, which promote such growth, should be avoided. Trees shouldn't be irrigated during bloom. Monitor trees regularly, and remove and destroy fire blight infections. (See Removing Diseased Wood.) If fire blight has been a problem in the past, apply blossom sprays. Sprays prevent new infections but won't eliminate wood infections; these must be pruned out. In years when weather conditions are very conducive to fire blight development, it can be difficult if not impossible to control the disease.

Choosing Tolerant Varieties

Most pear tree varieties, including Asian pears (with the exception of Shinko) and red pear varieties, are very susceptible to fire blight. Varieties of ornamental pear trees that are less susceptible to fire blight are Bradford, Capitol, and Red Spire; Aristocrat is highly susceptible. Among the more susceptible apple varieties are Fuji, Gala, Golden Delicious, Granny Smith, Gravenstein, Jonathan, Mutsu, Pink Lady, and Yellow Newtown. Wherever possible, plant varieties less prone to fire blight damage. Because most infections originate in the flowers, trees that bloom late or throughout the season (i.e., rat-tail bloom) often have severe fire blight damage.

Removing Diseased Wood

Successful removal of fire blight infections is done in summer or winter when the bacteria no longer are spreading through the tree. At these times infections have ceased enlarging, canker margins are clearly visible, and cleaning pruning shears is unnecessary. Rapidly advancing infections

on very susceptible trees (pear, Asian pear, and some apple varieties) should be removed as soon as they appear in spring. In these cases, dipping shears in 10% bleach between cuts might be wise. However, the location of the cut is far more important than the cleansing of tools. New infections that originate at pruning cuts haven't been observed on orchard trees; instead, the greater risk is "short cutting," wherein the cut isn't made far enough below the canker to remove all the infected tissue. To locate the correct cutting site, find the lower edge of the visible infection in the branch, trace that infected branch back to its point of attachment, and cut at the next branch juncture down without harming the branch collar (Fig. 8). This will remove the infected branch and the branch to which it is attached.

If a fire blight infection occurs on a trunk or major limb, the wood often can be saved by scraping off the bark down to the cambium layer in infected areas (i.e., removing both the outer and inner bark) (Fig. 9). When scraping, look for long, narrow infections that can extend beyond the margin of the canker or infection site. If any are detected, remove all discolored tissue plus 6 to 8 inches more beyond the infection. This procedure is best done in winter when trees are dormant and bacteria aren't active in the tree. Don't apply any dressing to the wound. If the limb has been girdled, scraping won't work, and the whole limb must be removed.

Chemical Control

Copper products are the only materials available to homeowners for fire blight control, and they often don't provide adequate control even with multiple applications. A very weak (about 0.5%) Bordeaux mixture or other copper product applied several times as blossoms open might reduce new infections but won't eliminate all new infections or those already existing in wood. The spray must be applied to open blossoms; thus the number of applications needed depends on the length of the bloom period. Once blossoms begin to

open, make the first application when the average temperature (average of the maximum and minimum temperatures for a 24-hour period) exceeds 60°F. Apply at four- to five-day intervals during periods of high humidity and until late bloom is over. For pear trees, this might mean five to 12 applications per season. Copper products also might cause russetting or scarring of the fruit surface. The risk of this damage begins during bloom and increases as fruits enlarge.

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Figure 8. Fire blight canker on apple shoot with bark cut away to show healthy tissues. This branch and the one to which it is attached should be removed.

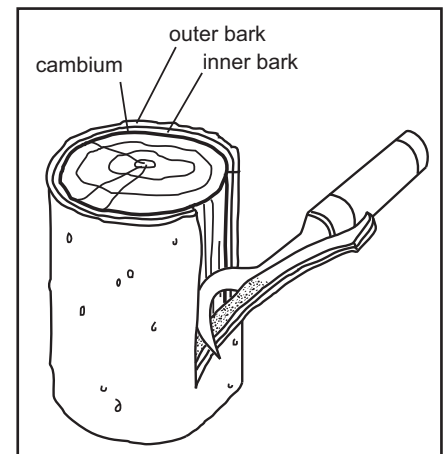


Figure 9. Remove diseased bark down to the cambium layer on major tree limbs.

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Pesticides applied in your home and landscape can move and contaminate creeks, rivers, and oceans. Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash or pour pesticides down the sink or toilet. Either use the pesticide according to the label, or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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