GARDENING SERIES

DISEASES

Fire Blight

no. 2.907

by J.E. Boyd and W.R. Jacobi [1]

Quick Facts...

Fire blight is a bacterial disease.

Fire blight is especially destructive to apple, pear, quince and crabapple.

Symptoms include water-soaked blossoms, light brown to blackened leaves, discolored bark, black "shepherd's crook" twigs, and dried fruits.

Fire blight bacteria can be spread by insects, rain splash or contaminated pruning tools.

Controls include resistant varieties, cultural practices, pruning and preventive sprays.

Fire blight is a bacterial disease that affects certain species in the rose family. It is especially destructive to apple, pear, quince and crabapple. The disease also can occur on hawthorn, mountain ash, serviceberry, pyracantha, cotoneaster, blackberry and raspberry.

Disease Cycle

Fire blight is caused by the bacterium *Erwinia amylovora*. The bacteria overwinter in blighted branches and at the edge of cankers (areas of bark killed by bacteria) (Figure 1). In spring, when temperatures reach 65 degrees F and frequent rain occurs, bacteria resume activity and multiply rapidly.

Masses of bacteria are forced through cracks and bark pores to the bark surface, where they form a sweet, gummy exudate called bacterial ooze. Insects such as bees, ants, flies, aphids and beetles are attracted to this ooze, pick up the bacteria on their bodies, and inadvertently carry the bacteria to opening blossoms. Bacterial ooze splashed by rain also can spread the pathogen.

Once in the blossom, bacteria multiply rapidly in the nectar and eventually enter the flower tissue. From the flower, the bacteria move into the branch. All flowers, leaves and fruit above the point of infection die.

Young branch tips can be infected through stomata (air openings on leaves), lenticels (air openings on branches), or, more commonly, through wounds created by pruning, insects or hail storms. Droplets of ooze can form on these infected twigs within three days. Fruit may be infected through insect wounds. Cankers eventually develop from branch or blossom infections.

Diagnosis

Symptoms of blossom blight are first seen about the time of petal fall. Infected blossoms appear water-soaked and wilt rapidly before turning dark brown. Leaves wilt, darken and remain attached to the tree (Figure 2). This gives the tree a fire-scorched appearance, thus the name "fire blight."

Infected twigs exude creamy bacterial ooze in droplets or fine, hair-like strands. Tips of twigs turn black and curl over when dry, causing a "shepherd's crook" appearance. Infected fruits also exude bacterial ooze. They eventually dry and remain attached to the branch.

Cankers on branches or stems appear as dark, slightly sunken places with a small callus ridge at the edge (Figure 3). The inner bark turns from green to brown, but the appearance varies depending on plant variety. Droplets of bacterial ooze may appear on the canker.

Colorado State University® Cooperative Extension

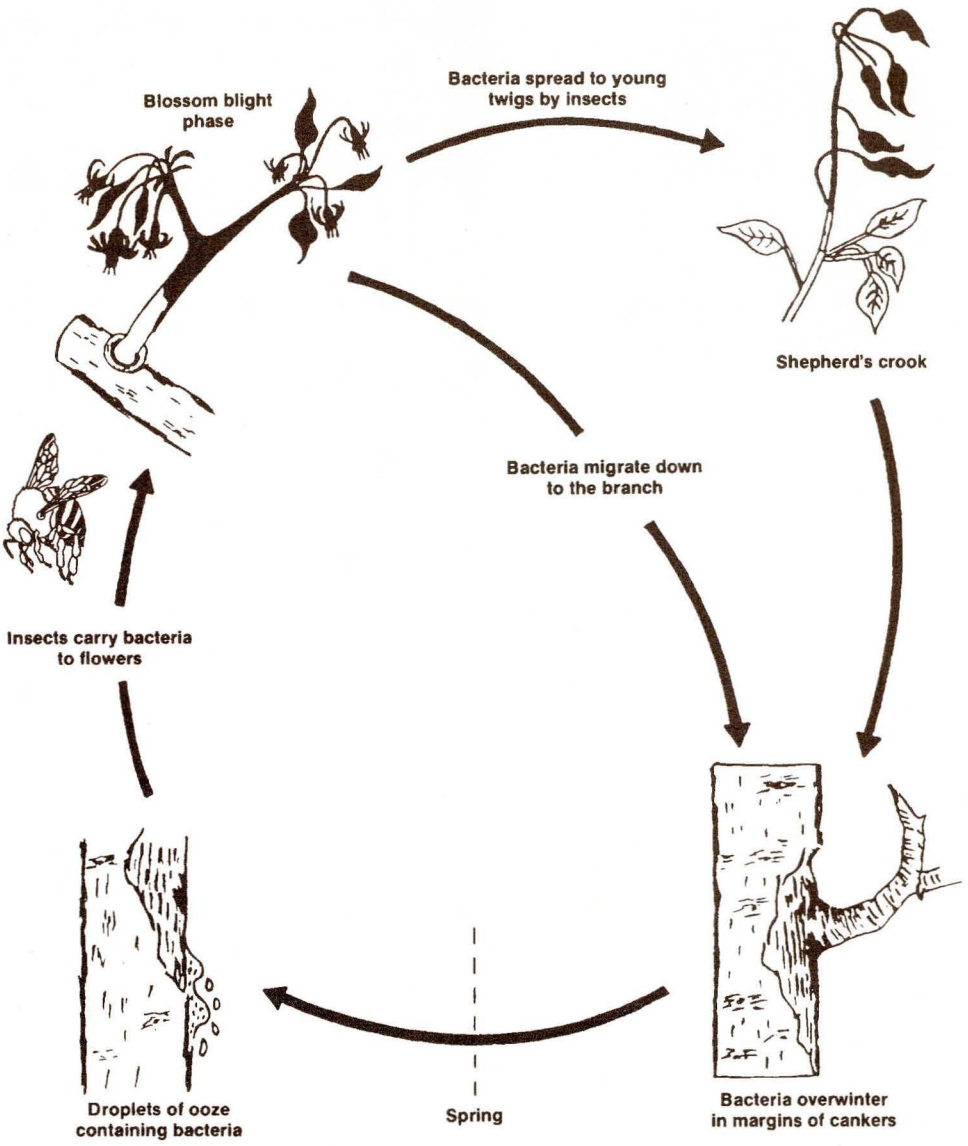

Figure 1: Fire blight life cycle.

Disease Management

There is no cure for this disease, so prevention is the best solution. Fire blight control methods include use of resistant varieties, cultural practices, pruning and spraying. Using resistant varieties is the most effective prevention method.

Resistant Plant Selection

The most effective method for preventing fire blight is to plant resistant varieties.

Different varieties of pear, apple and crabapple have different degrees of susceptibility. No variety is immune when conditions are favorable and the pathogen is abundant. To prevent stress that may predispose the tree to other disease-causing agents, select varieties adapted to the growing area. Local weather conditions from year to year also affect the amount of fire blight found in a variety. Table 1 lists varieties and their relative degrees of susceptibility.

Cultural Practices

The structure and mineral content of the soil are important in managing fire blight. Trees planted in poorly drained soil are more susceptible. Because fire blight development is favored by young, succulent tissue, avoid heavy application of nitrogen fertilizers or manure. Drip irrigation can reduce the high humidity associated with overhead irrigation and thus reduce disease severity.

Table 1: Varietal susceptibility to fire blight.

	Degree of Susceptibility		
Host	**Extreme**	**Moderate**	**Resistant**
Apple	Braeburn Fuji Gala Jonathan Lodi Rome Beauty Yellow Transparent	Early McIntosh Granny Smith Grimes Golden Golden Delicious Jonafree Jonagold Missouri Pippin Sharon	Red Delicious Winesap Haralson Liberty Prima Priscilla Redfree
Pear	Aurora Bartlett Bosc Clapp's Favorite Comice Max-Red Bartlett Starkrimson Winter Nallis	Anjou Dawn Douglas Kieffer Seckel Sparklett	Harrow Delight Magness Moonglow Starking Delicious (Maxine)
Crabapple	Bechtel Hyslop Mary Potter Old Hope Ormiston Roy Prairie Fire Red Barron Red Jade Royalty Snowdrift Strathmore Transcendent	Brandywine Dolgo Hopa Indian Magic Kelsey Red Splendor Snow Cloud Spring Snow	Centurion Coralburst David Indian Summer Profusion Radiant Red Vein Russian Thundercloud Vanguard White Cascade

Pruning

Remove and destroy newly infected young twigs as soon as possible. Do this when no rain is predicted for at least two weeks. It may be best to leave pruning until winter when the bacteria are not active. This reduces infection on the tree and the number of bacteria available to infect healthy blossoms and shoots.

In young twigs, make cuts at least 12 inches below the visible edge of infection. Remove all blighted twigs and cankered branches. Prune limbs about 6 to 12 inches below the edge of visible infection.

To remove a canker on large stems, first make a cut through the bark down to the wood 1 to 2 inches outside the canker margin. The cut should not have any sharp angles. Next, cut and scrape away all infected bark down to the wood. Treat exposed wounds with a disinfectant such as household bleach (1 part bleach to 4 parts water) or a 70 percent alcohol solution.

CAUTION! After each cut, surface sterilize all tools used in pruning. Dip tools in household bleach or ethyl alcohol, or use household spray disinfectants.

During pruning, take care to avoid unnecessary wounds to the tree. When climbing trees, wear soft-soled shoes to prevent bark injuries. To decrease the chance of new infections, promptly remove from the site and destroy all infected branches.

Spraying

Use sprays as preventive treatments; they have little effect on existing infection. Expect blossom infections if temperatures remain between 65 and 86 degrees for a day or more during flower bloom and there is at least a trace of

Table 2: Bordeaux mixtures.

For 2-6-100 Bordeaux mixture:
- 4 tsp copper sulfate crystals
- 12 tsp hydrated lime
- 1 gal water
- 2 Tbsp spray oil

For 3-3-100 Bordeaux mixture
- 6 tsp copper sulfate crystals
- 6 tsp hydrated lime
- 1 gal water
- 2 Tbsp spray oil

Dissolve copper sulfate crystals first. Mix in hydrated lime, constantly stirring. Finally, agitate the mixture as you add spray oil.

Figure 2: Blighted leaves on ornamental apple.

Figure 3: Sunken black canker on apple branch.

rainfall, or if the relative humidity remains above 65 percent for 24 hours. Apply antibiotic or chemical sprays if:

- the above weather conditions occur or are anticipated,
- there is abundant shoot growth, or
- there are fruit injuries from hail or other agents.

Antibiotic sprays are available under the brand names Agri-Mycin 17, Plantomycin (streptomycin) or Mycoshield (terramycin). Unfortunately, in many regions the bacteria are resistant to streptomycin, so its use should be minimized.

Aliette WDG is a chemical that can be used at 2.5 pounds per 100 gallons. Start Aliette sprays at prebloom and repeat every seven days until bloom ends.

Several forms of copper (copper sulfate with lime or Bordeaux mixture) are suitable for fire blight control. See Table 2. Copper sprays are best used during dormancy and bud break because they may damage leaves and fruit. Effectiveness can be enhanced by adding a wetting agent to the spray or making spray applications during early evening or at night. Do not apply sprays within 50 days of apple harvest or within 30 days of pear harvest. For updated spray rates and related information, consult your Colorado State University Cooperative Extension county office or Colorado State Forest Service district forester.

Biocontrol

It is now possible to use other bacteria to protect plants from the fire blight bacterium. Blight Ban is a *Pseudomonas* bacterium applied before and during bloom. It is available only in quantities for commercial application.

Orchard Managers

Apply sprays at 5 percent bloom, 50 percent bloom, full bloom, three days after full bloom, and at 50 percent petal fall. During full bloom, antibiotic sprays are most effective at a concentration of 75 to 100 parts per million (ppm).

After petal fall and during continued periods of high humidity, apply sprays of antibiotics at seven-day intervals to prevent fire blight from occurring on new shoots and fruit.

Concentrated spraying can be effective if at least 24 ounces of antibiotics are used per acre. When severe blight conditions exist, limit irrigation water to stop terminal growth and promote hardening.

Homeowners

For a homeowner with only a few trees, apply antibiotics starting at 5 percent bloom. Repeat this procedure twice at four- to five-day intervals. A mild Bordeaux mixture (2-6-100 or 3-3-100) can control blossom blight but under some weather conditions may damage leaves or cause fruit to turn a russet color.

Aliette WDG can be used at 2.5 pounds per 100 gallons. If the bloom period is long and high humidity persists, additional applications may be necessary. **Always follow label directions for any pesticide.**

[1]*J.E. Boyd, Colorado State University, former graduate student, and W.R. Jacobi, professor, bioagricultural sciences and pest management.*

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Milan A. Rewerts, Director of Cooperative Extension, Colorado State University, Fort Collins, Colorado. Cooperative Extension programs are available to all without discrimination. No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.