



DISEASES

Fire blight

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Introduction

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

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 rainfall

Quick Facts...

Fire blight is a bacterial disease.

Fire blight is especially destructive on 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, sanitation measures, and streptomycin or copper sprays.

Figure 1: Fire blight life cycle.

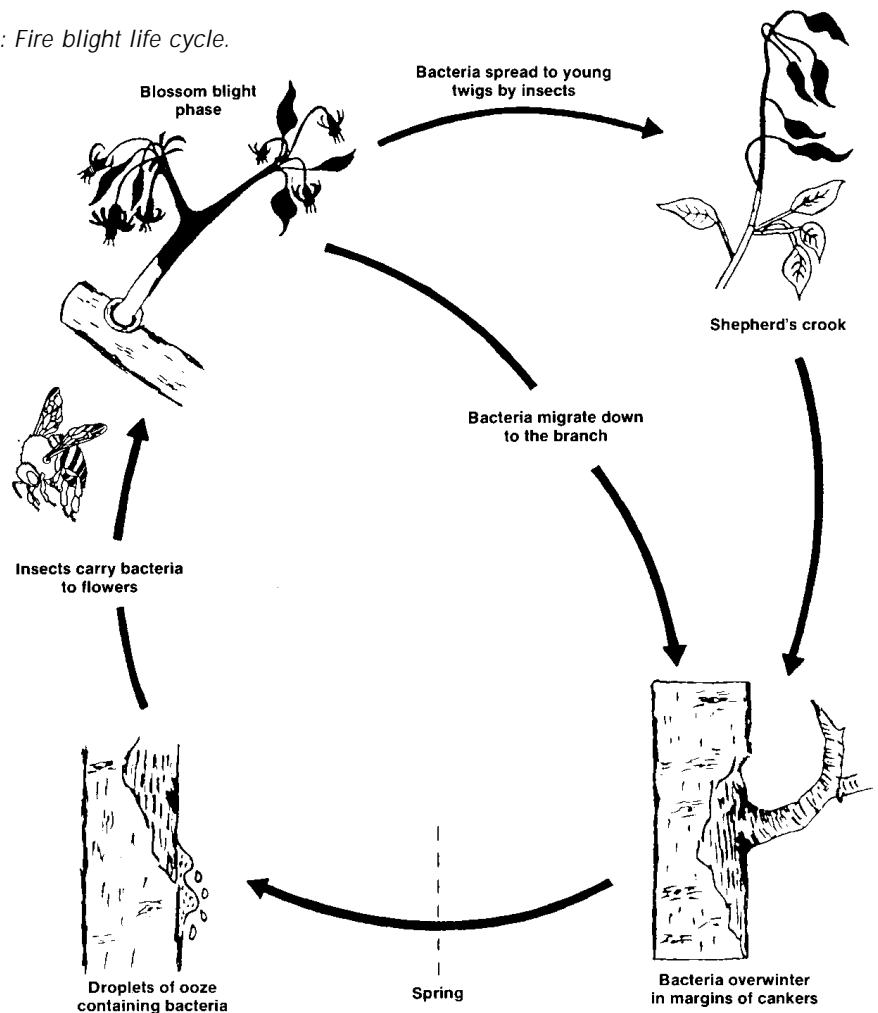




Figure 2: Blighted leaves on ornamental apple.

occurs, bacteria resume activity and multiply rapidly. They 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 may also 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 entry die.

Young branch tips can be infected through stomata (air openings on the leaves), lenticels (air opening on branch), 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 they 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 a white creamy ooze containing bacteria in droplets or fine, hair-like strands. Tips of twigs turn black and curl over when dry, causing the “shepherd’s crook” appearance. Infected fruits also exude a white ooze and they eventually dry and remain attached to the branch.

Cankers appear as dark, slightly sunken places on branches or the main stem in July or August (Figure 3). The inner bark turns from green to brown, but the appearance may vary with certain varieties. Droplets of bacterial ooze may appear on the canker.

Varietal Susceptibility

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. The amount of disease found in a variety from year to year is also affected by local weather conditions. Table 1 lists varieties and their relative degrees of susceptibility.

Control

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

Variety Selection. Carefully select cultivars that are less susceptible to fire blight. Varieties should also be selected for adaptability to the growing area to prevent stresses that may predispose the tree to other disease causing agents.

Cultural Practices. The structure and mineral content of your soil are important in the management of fire blight. Trees planted in poorly drained soil are more susceptible. Since fire blight development is favored by young succulent tissue, avoid heavy application of nitrogen fertilizers or manure. Only add enough nitrogen to achieve 12 to 18 inches of branch growth each year. Utilizing drip irrigation can reduce humidity associated with overhead irrigation and thus reduce disease severity.

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Table 1: Varietal susceptibility to fire blight.

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

Pruning. Remove newly infected young twigs as soon as possible in the spring. This reduces infection on the tree and the amount of bacteria available to infect healthy blossoms and shoots. In young twigs, make cuts at least 12 inches below the visible edge of infection.

On dry days during the winter, remove all blighted twigs, branches, and cankers. Prune limbs about 6 to 12 inches below the 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!!! Surface sterilize all tools used in pruning after each cut. Dipping tools in household bleach or ethyl alcohol, or using household spray disinfectants should be sufficient.



Figure 3: Sunken black canker on apple branch.

Prevention and Sanitation

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

Weather Conditions. Monitor temperatures, rainfall, and weather forecasts for conditions that are conducive to infection.

Spraying

Use sprays as preventative treatments since they have little effect on existing infection. Expect blossom infections if temperatures remain between 65 degrees F and 86 degrees F for a day or more during flower bloom and there is at least a trace of rainfall or the relative humidity remains above 65 percent for 24 hours. If these weather conditions occur, or are

anticipated, and/or occur with abundant shoot growth or there are fruit with injuries, apply streptomycin or copper sprays. Streptomycin sprays are available under the brand names of Agri-Strep and Agri-Mycin 17. Unfortunately, in many regions the bacteria are resistant to streptomycin, so its use should be minimized. Several forms of copper (copper sulfate with lime, copper hydroxide) that are suitable for fire blight control are available. Copper sprays are best used during dormancy and bud break since they may cause damage to leaves and fruit. Efficacy 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. Always consult your Colorado State University Cooperative Extension county agent or district forester for updated spray rates and related information.

Orchard Managers. Apply sprays at 5 percent bloom, 50 percent bloom, full bloom, 3 days after full bloom, and at 50 percent petal fall. During full bloom, streptomycin 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 streptomycin 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 streptomycin are used per acre (4,047 square meters). When severe blight conditions exist, limit irrigation water to stop terminal growth and promote hardening.

Homeowners. For a homeowner with only a few trees, use a simpler spraying approach. Apply streptomycin 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 may russet fruit and damage leaves under some weather conditions. If the bloom period is long and high humidity persists, additional applications may be necessary. Always follow label directions of any pesticide!

Table 2: Always follow label directions of any pesticide.

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
6 tsp hydrated
1 gal water
2 Tbsp spray oil

Dissolve copper sulfate crystals first, then mix in hydrated lime with constant stirring. Finally, add spray oil with agitation.

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