FS 916

Fire blight

of apples, pears, and other species

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Fire blight is an important disease of apples, pears (Fig. 1), and other fruit and ornamental species including crabapples, cotoneaster (Fig. 2), mountain ash, and hawthorn. Occasionally it may cause disease on cherries, plums, amelanchier (service berry or Saskatoon) and raspberry. This bacterial disease, caused by *Erwinia amylovora,* can damage blossoms, fruit, leaves, shoots, and branches. If it is not controlled, fire blight may kill the entire tree or shrub.

Symptoms

The term fire blight best describes the most obvious symptom of the disease. Leaves, shoots, and other affected plant parts appear as if scorched or burned by fire (Fig. 3). Infected blossoms initially appear discolored and water-soaked before scorching and collapsing. Infection of new, vegetative shoots often produces die back from the branch tip with a curling called a shepherd's crook or crozier symptom (Fig. 4) that is associated with rapid tissue death. Infected fruits or fruits produced on diseased branches may be small and shriveled. As many branch tips become diseased, the ornamental value of the tree can be severely diminished.

Production of a watery ooze often is associated with infected tissue. Spread of the fire blight pathogen into woody tissue can result in dead branches with an obvious canker symptom—areas of sunken, discolored bark, often cracked and oozing.

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Disease Development & Spread

The bacteria that cause fire blight over-winter in plant tissue in the margin of cankers from the previous years' infections. Early in the season, bacteria multiply in these margins and produce a yellow- to orange-colored ooze that contains the bacterial pathogen, the inoculum, for new infections.

Bacteria are spread to new fire blight infection sites primarily by splashing rain and insects. The pathogen also can be spread early in the season by high winds. As the bacterial ooze emerges from canker margins before the trees leaf out, the gooey bacteria can break off in ropey strands. If the ropes of bacteria contact a wound, infections can result.

Pollinating insects, such as bees, can be extremely important in pathogen spread, with blossoms serving as a major site of infection in some species. Shoot blighting (Fig. 5) often results from infection of attached blossoms. Wounding from insects, hail, wind or other factors is generally necessary for direct infection of shoots and fruits.

Fire blight cankers from previous seasons can continue to develop and spread, frequently girdling and killing individual branches and eventually moving into major scaffold branches and the trunk. These cankers are sometimes called "progressive" fire blight cankers (Fig. 6), because they may survive in a tree for some time, progressing down the branch each year. In a normal South Dakota winter, the pathogen may not survive in cankers on branches smaller than 1/4 inch in diameter, but if bacteria have moved into adjacent larger branches, damage from the disease may resume the following year. Damage can be significant in young orchards (Fig. 7).

Fire blight may only occur sporadically. It is influenced by a number of environmental factors involving the bacteria that cause the disease, the host plant, and vectors (the organisms that spread the bacteria, such as an insect). Plentiful moisture and moderate to warm temperatures favor infection by the fire blight pathogen and disease development.

Management

Sanitation is the best way to limit damage from fire blight. Begin by inspecting planting stock, whether fruit trees or ornamentals, to ensure that material is free from fire blight. Avoid selecting trees or shrubs with dead branches or discolored, damaged bark.

Pruning

In established plantings, remove and destroy dead or cankered branches. This limits spread within an individual tree or shrub and reduces the amount of inoculum available for new infections. Make cuts at least several inches below the last sign of visible damage on an infected branch.

The bacteria that cause fire blight can be found up to 12 inches below a visible canker in very susceptible species. The canker may be dark and sunken, but the bacteria may be present beyond the margin of the canker.

Symptoms of the bacteria may appear as a reddish discoloration below the bark in the phloem tissue (the actively growing tissue right beneath the bark). Stripping back the bark below the canker can often reveal this discoloration symptom. If the discoloration is present, make the pruning cut several inches below the margin of the discolored tissue.

Figure 1. A branch tip of a pear tree dying back from fire blight. (Credit: Martin A. Draper)

Figure 2. Fire blight cankered branches on cotoneaster. Heavy pruning may be needed to adequately remove infected tissue. (Credit: Martin A. Draper)

Figure 3. Note the black discoloration associated with fire blight. This discoloration may be less obvious on partially resistant varieties. (credit: David Graper)

Figure 4. Dead branch tips are a common symptom of fire blight. Curled, blackened branch tips, called a crozier or shepherd's crook, are a common symptom of fire blight. (credit: Martin A. Draper)

Pruning is often recommended during the dormant season; however, in the case of fire blight damage, careful pruning during the growing season is a sound approach to limiting the spread of the disease.

If major portions of a particular tree or shrub are infected, removal of the entire plant may be the best option. Often, with cotoneaster and other shrub species, major pruning of top growth is necessary to rejuvenate the planting as well as to remove fire blight inoculum.

Disinfect pruning tools between cuts to prevent spreading bacteria from infected trees or branches to healthy ones. A 10% solution of household bleach is the best disinfectant, but denatured alcohol is also a suitable disinfectant. Cutting tools should remain in contact with the disinfectant for 30 seconds to 3 minutes for best efficacy.

Alternating two pruning tools, with one always soaking in disinfectant, is one way to address this issue. When finished with pruning and disinfecting your tools, it is a good practice to oil your pruning tools to minimize rust that can occur from exposure to the corrosive disinfectants.

Fertility

Reducing fertility levels may be beneficial in some situations where persistent fire blight problems exist. Succulent growth, resulting from excess nitrogen fertilization, generally is more susceptible to infection. Suckers and water sprouts are very easily infected through natural openings—stomates and hydathodes—in the leaves.

Chemical treatment

Treating fire blight infection with chemical sprays generally is limited to situations where fruit production is involved. When sprays are properly timed at blossom, streptomycin can effectively reduce infection in apples and pears. Bordeaux mixture and other copper fungicides can be applied

Figure 5. Shoot blighting may be associated with blossom spurs. Note the dead branch beyond the young fruit. The pruning cut on this branch should be made near the left edge of the picture (see arrow). (Credit: David Graper)

as a late dormant spray to reduce disease potential. Pesticide labels vary, but typically streptomycin sprays can only be applied to fruit trees, rather than on ornamental species. Disinfectant sprays, such as household bleach or quaternary ammonium products applied to the tree, are relatively ineffective in reducing or preventing fire blight.

Insect control

Control of insects before and after bloom can reduce wounding from the insects and the transfer and inoculation of the fire blight bacteria. Avoid using insecticide during bloom to prevent harm to pollinating insects.

Mechanical injury

Limit mechanical injury to plants when possible. Rubbing branches and hail injury may increase risk of fire blight.

Susceptibility

Most apple varieties have some susceptibility to fire blight, but some are more sensitive than others. Avoid planting very susceptible varieties, such as Beacon, Honeygold, Wealthy, Prairie Spy, and Regent apple or Almey, Hopa, Strathmore, Purple Wave, Flame, Snowdrift, Whitney, Royalty, and Calocarpa (aka: Zumi or Redbud) crabapples, or isolate them in plantings away from other trees. Mountain ash and most pear varieties are particularly susceptible to fire blight, so isolate plantings of these species from apples.

Crabapple varieties Spring Snow and Red Splendor are intermediate in their resistance to fire blight, but in years that favor fire blight, damage can be severe on these varieties.

Resistance

Fire blight-resistant apple varieties include Dakota, Dakota Gold, Haralson, Hazen, Haralred, Mandan, Northern Lights, Red Baron, Red Duchess, Sweet Sixteen, State Fair, and Wodarz.

Resistant crabapple varieties are Dolgo, Red River, Centennial, Centurion, Jack (or Korean), Siberian, Manchurian, Prairiefire, White Candle, and Thunderchild.

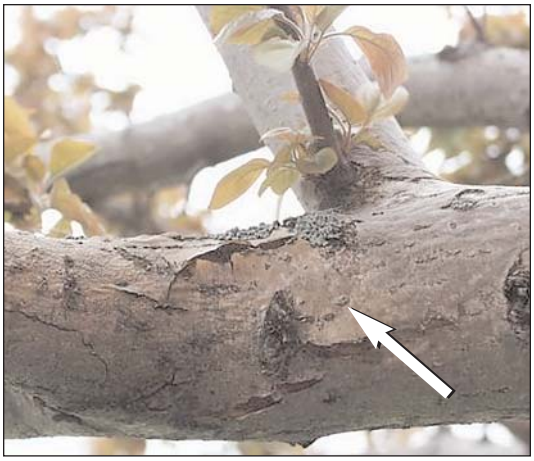

Figure 6. Progressive fire blight cankers can serve as a source of inoculum for many years. They are a risk to the tree they occur on and nearby trees, as well. Note the arrow at the margin of the sunken canker. (Credit: David Graper)

Figure 7. Fire blight can be very damaging in young orchards. (credit: Martin A. Draper)

Photo credits

Figures 1, 5, and 6 — David Graper, Extension horticulturist
Figures 2, 3, 4, and 7 — Martin A. Draper, Extension plant pathologist

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