



COOPERATIVE EXTENSION

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Fire Blight

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When apple or pear branch tips look scorched, with brown or black leaves hanging on them, a likely explanation is the disease "fire blight", caused by the bacterium *Erwinia amylovora*. This aptly named disease seriously damages plants in the Rose family, especially apples and pears, seldom stone fruits, and many ornamentals (Figure 1). In commercial orchards, economic losses can be severe. In backyards, limbs die back and fruit is lost. Small trees may die.



Figure 1. Fire blight symptoms on mountain ash

SYMPTOMS

Flowers and succulent shoots are usually affected first. Symptoms are a water-soaked appearance then a sudden wilting of succulent tips, followed by the shriveling of infested leaves, shoots, blossoms, and eventually fruit. Infected twigs typically form a "shepherd's crook" (Figure 2)



Figure 2. Typical shepherd's crook on apple branch.

The infection spreads from the flower to the fruiting spur, then to leaves, and ultimately to the woody tissue around the spur. Tips of limbs are infected and show symptoms first. The leaf stem (petiole) and midrib characteristically blacken and yellow bacterial ooze may occur on the leaf. Diseased apple leaves generally turn brown, while infected pear leaves turn black.

Cankers, can form on twigs and branches, eventually spreading into the trunk. Cankers are at first slightly sunken small brown to black areas. These may crack during the dormant season.

During the growing season the active edges of the cankers may appear raised or blistered and become more defined. The internal wood under and around the cankers becomes discolored with reddish brown streaks. These cankers may girdle the branch, killing it.

A tan-yellow bacterial slime is forced out of infected areas. The bacteria are then easily dispersed by insects and splashing water. This sugary bacterial ooze clogs the water carrying vessels of plants causing wilting.

Immature fruit can become infected with bacteria through natural openings in the skin, wounds, or infected fruiting spurs. Infected fruit first appears gray green, and water-soaked, then turns black. Sometimes a whitish to light tan fluid seeps out of the fruit. Eventually, fruit dries and shrivels on the tree.

Compared to its rate in flowers and fruit, the disease progresses more slowly in woody tissue, but once in the trunk, *Erwinia amylovora* can kill a tree.

DISEASE CYCLE

Bacteria over-winter in the tissue under the bark at the margins of cankers. As the weather warms in spring, bacteria become active and form a sticky bacterial flow.

DISSEMINATION

Bacteria may be spread in many ways. Birds, flies, pollinators and other insects crawl through or ingest this material and infect flowers, wounds, and natural leaf and twig openings. Insect vectors of the disease include ants, aphids, bees, houseflies, pear psylla, leafhoppers, and shothole borers among others. The host range includes over 200 species in nearly 40 genera.

Splashing water, either from rain or overhead irrigation, is another common way the disease is spread. Wind also carries bacteria.

Humans are often at fault for disseminating the inoculum by unsanitized pruning tools.

Blight symptoms appear within one to three weeks of infection, depending on temperature and moisture.

DISEASE DEVELOPMENT

Warm weather, 65 °F or higher in a 24-hour period and humidity of 65% or higher during bloom greatly favor disease development, although fire blight can grow over a much wider range of 39-90 °F. Epidemics often occur following rain or hail storms where twigs and branches have suffered injury. Precipitation promotes development and dissemination of the disease. Sprinkler irrigation, high nitrogen fertilizers, severe pruning, and other factors that favor succulent new growth can all stimulate the disease.

MANAGEMENT STRATEGIES

Cultural practices:

Buy only fire blight resistant varieties (Tables 1 and 3) and avoid susceptible plants (Table 2). This is the first priority in preventing or controlling fire blight.

Plant trees and shrubs in soil with good drainage to avoid stress that makes plants more susceptible to the disease.

- Carefully remove damaged twigs or branches (15 inches or more below the infected area and back to a branch or bud). This is best done during cold dry weather in late winter. New, succulent growth is most susceptible to fire blight. Frequent (annual) light pruning is desirable, since it is less stimulating of new growth than heavy pruning. Avoid pruning just before bloom. Cut root sprouts during the dormant season.
- Always disinfect tools after every cut with rubbing alcohol, Lysol® or a 10% bleach to water solution to avoid additional spread of the disease. Burn or bury all traces of blight-infected material. Disinfect everything that comes in contact with blighted tissue. The disease may also be spread on hands, clothing, shoes, and orchard equipment.
- If a serious infection is noticed in spring, cut out late bloom infections at least 12-15" past any visible discoloration on twigs or branches. After harvest in the fall, remove any infections previously missed, cutting back 5" past any visible discoloration.
- Remove late blooms during fruit thinning in June.
- Avoid overhead irrigation.
- Use low to moderate amounts of nitrogen, preferably in a slow release formulation to reduce succulent twig development. One half the recommended nitrogen can be applied one month before growth begins. The other half can be applied as a foliar spray or ground application after petal

fall if the infestation is not severe or has been removed.

- Avoid cultivation and pruning late in the season. It promotes susceptible new growth.

TABLE 1. SOME FIRE BLIGHT RESISTANT ORNAMENTALS IN THE ROSE FAMILY

<i>Cercocarpus montanus</i>	Mountain mahogany
<i>Fragaria chiloensis</i>	Beach strawberry
<i>Photinia serrulata</i>	Chinese photinia
<i>Potentilla</i>	Bush cinquefoil
<i>Rosa californica</i>	California wild rose
<i>Rosa gymnocarpa</i>	Wood rose
<i>Spiraea prunifolia plena</i>	Bridal wreath

TABLE 2. SOME GENERA IN NEVADA SUSCEPTIBLE TO FIRE BLIGHT:

<i>Amelanchier</i> - serviceberry
<i>Aronia</i> - chokeberry
<i>Chaenomeles</i> – flowering quince
<i>Cotoneaster</i> - cotoneaster
<i>Cowania</i> – cliff rose
<i>Crataegus</i> - hawthorn
<i>Cydonia</i> - quince
<i>Fragaria</i> - strawberry
<i>Geum</i> -
<i>Holodiscus</i> - creambush
<i>Malus</i> – apple, crabapple
<i>Photinia</i> - photinia
<i>Physocarpus</i> - ninebark
<i>Potentilla</i> - cinquefoil
<i>Prunus</i> – apricot, cherry, plum
<i>Pyracantha</i> - firethorn
<i>Pyrus</i> - pear
<i>Rosa</i> - rose
<i>Rubus</i> - brambles
<i>Sorbus</i> – mountain ash
<i>Spiraea</i> – spirea

Table 3. Fire Blight Resistance of Apple and Pear Varieties and Rootstocks

	Most Resistant	Moderately Resistant	Susceptible
Apple	Red Delicious Liberty Enterprise Freedom Arkansas Black Red Astrachan	Golden Delicious Granny Smith McIntosh Mutsu Spartan Summerred GoldRush Nova Easygro Red Delicious, Gravenstein	Braeburn Fuji Gala Ginger Gold Idared Jonagold Rome Winter Banana Jonathan Lodi
Apple Rootstock	M.7	MM.106 MM.111 M.4	M.9 M.26 M.27 Mark
Pear	Surecrop, Kieffer	Seckel	Anjour Bartlett Bosc Cascade Flemish Beauty Starkrimson
Asian Pear	Seuri Shinko Singo	Kosui Chojoro Shinsui	Hosui Shinseiki 20th Century

Chemical treatments:

It is important to apply pesticides correctly, or they are ineffective. Delayed dormant sprays of copper compounds plus oil can slow down inoculum production. Diluted copper fungicides during bloom work as a preventative spray. Care should be taken to apply copper sprays when they can dry quickly, as they may otherwise cause fruit russetting.

Bactericidal sprays during open bloom are of benefit although resistance to certain bactericides has been reported. Alternate bactericides to avoid developing resistant bacteria. Bactericides work well if sprayed within 24 hours of severe spring storms. Do not apply before heavy rains as they will be washed off the tissue. These products usually contain streptomycin or terramycin. They are costly. Control insect vectors with dormant oil treatments.

Biological:

The bacteria *Pseudomonas fluorescens* competes with *Erwinia amylovora*. Use of *P. fluorescens* is not a cure, but can be integrated into a regular antibiotic schedule and may reduce infestation by 40-50 percent.

REFERENCES

Agrios, G. 1988. Plant Pathology. Academic Press, San Diego.

Oregon State University, Washington State University, and University of Idaho. 2000. Pacific Northwest plant disease management handbook.

Sinclair, W.A., H.H. Lyon, W.T. Johnson. 1987. Diseases of trees and shrubs. Cornell University Press. Ithaca.

Statewide Integrated Pest Mangement Proj. 1994. Pests of landscape trees and shrubs – an integrated pest management guide. Publ 3359. UC Davis.

Van der Zwet, T. and S.V. Beer. 1992. Fire blight – its nature, prevention and control. A practical guide to integrated disease management. USDA.