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Plant Pathology Fact Sheet

Fire Blight

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Introduction

Fire blight is a highly destructive disease of apple and pear that can occur in commercial orchards and home plantings. Many landscape trees and shrubs in the rose family are also susceptible to this disease (Table 1). Fire blight can cause severe damage (Figure 1) in a very short period of time. Because precise conditions are needed for infection, disease appearance is erratic from year to year.

Symptoms

Blossom and Spur Blight

The earliest disease symptoms are observed on infected spurs when the bases of individual flowers or pedicels (flower stems) wilt and darken. As blooms collapse, infection spreads rapidly into other flowers in the cluster, causing the entire spur to wilt suddenly and die (Figure 2). Diseased tissues usually remain attached to the tree.

Cankers

Infections frequently spread from blossoms to supporting spurs and branches, resulting in stem lesions or cankers (Figure 3). Fire blight cankers appear shrunken with a dark brown to purple color. As cankers increase in size, they can girdle stems or branches; as a result, tissues above these infection sites die.

Shoot Blight

Bacterial cells can build up during the blossom and spur blight phases of fire blight and infect rapidly-growing shoots. Blighted shoots wilt from the tip and develop a crook or bend at the growing point, commonly referred to as a 'shepherd's crook' (Figure 4). This phase occurs after bloom.

Figure 1. Fire Blight symptoms in an apple orchard.

Trunk/Rootstock Blight

Trunk and rootstock infections can occur from the internal movement of the fire blight bacterium through water conducting-tissue or from infected water sprouts.

Cause and Spread

The fire blight organism, *Erwinia amylovora*, survives from one year to the next at the margins of previously formed branch and trunk cankers. In most years, fire blight begins during the bloom period and, as long as the environment is

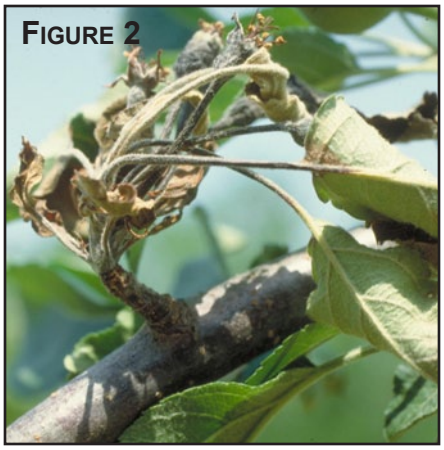

Figure 2. Spur blight. **Figure 3**. A canker has formed at the base of an infected spur. **Figure 4**. Shepherd's crook symptom.

favorable, it will continue through petal fall and/or until shoot elongation stops.

Conditions Favoring Disease

Fire blight is generally favored by:

- High relative humidity or rainy conditions.
- Temperatures between 65°F and 70°F.

Under favorable conditions, bacterial populations can build-up rapidly. At 70°F, numbers of bacterial cells double every 20 minutes; one cell can become one billion cells overnight, each capable of causing a new infection.

Primary Infections

The first new tissues to become infected are the flowers. Splashing rain and insects carry the pathogen from overwintering cankers to blossoms. Once infected, blossoms serve as the source of inoculum for shoot infections.

Secondary Infections

As fire blight progresses and disease symptoms develop, bacterial populations continue to multiply. These bacteria are then spread to other susceptible tissues and young succulent growth.

Trauma Blight

High impact events, such as wind driven rain and hail, can result in an increase in disease incidence. These events result in wounds which serve as portals of entry for the fire blight bacterium. Symptoms may appear within 1 to 2 weeks of the event.

Disease Management

The key to fire blight management is preventing the infection of flowers. Once flowers become infected, they serve as a source of inoculum for the rest of the tree. Management of fire blight requires an integrated approach that relies primarily on cultural practices and is supported by the judicious use of bactericides.

Resistant Cultivars

While few cultivars of apple, pear, and the various ornamental host species are immune to fire blight, some cultivars are more resistant or tolerant than others. Whenever possible, plant resistant cultivars and resistant cultivar/rootstock combinations. For information on fire blight tolerant apple and pear cultivars, consult the *Midwest Tree Fruit Pest Management Handbook*, ID-93.

Cultural Practices

Implementing the following cultural practices is important in managing this disease:

- Avoid any cultural practice which stimulates rapid tree growth; young succulent tissue is susceptible to infection.
- Fertilization, especially nitrogen application, should be adequate for tree health without promoting rapid growth and prolonged succulence.
- Prune trees to improve air circulation and to promote rapid drying of foliage. Aggressive pruning will stimulate growth, so selective pruning is recommended.

Figure 5. Shoot blight in an apple orchard.

Pruning Infected Tissue

Pruning can play an important role in a comprehensive fire blight management program, and when done properly, should reduce inoculum and tree damage. However, while removal of sources of the pathogen is desirable, pruning when the disease is active can further spread the pathogen. Thus, pruning out fire blight strikes during the growing season is a controversial issue. Currently UK recommends that pruning blighted twigs and cankered branches be delayed until winter.

Pruning during dormancy

Diseased limbs should be flagged or painted during the growing season so they can be easily identified during winter. During late winter or early spring:

- Prune carefully, so that ALL infected branches are removed.
- Blighted twigs should be pruned at least 6 to 8 inches below cankers and infected areas.
- Remove and destroy pruned material to eliminate potential sources of inoculum for subsequent epidemics.

Pruning during the growing season

Due to the high risk of bacterial spread, infected trees should be pruned during the dormant season. If growers choose to prune actively growing trees, only young vigorous trees should be considered. Additionally, several precautions should be taken:

- Prune or break out twigs at least 6 to 12 inches below visible symptoms.
- Always disinfest cutting blades between cuts with a commercial sanitizer, 10% Lysol disinfectant, 10% bleach, or rubbing alcohol. Fire blight can inadvertently be spread to previously unaffected areas by tools such as pruners.
- If large, dead limbs are to be removed for aesthetic reasons, growers may leave stubs several inches long so that pruned branches are easier to identify in the winter when stubs can be safely removed.
- Never prune when trees are wet, as bacterial cells are easily carried through films of water.
- Immediately remove and burn, bury, or otherwise dispose of diseased material.

Bactericides and Growth Regulators

Timely chemical sprays may be used as preventative measures to control fire blight during the spring when the pathogen is at the surface of cankers and on flowers. After the bacterium has invaded tissues, bactericides are not effective. Fungicides will not control fire blight. Refer to the *Midwest Tree Fruit Spray Guide* (ID-92) for application rates and other details.

Sprays include:

- Copper sulfate: applied during late dormancy to active cankers, twigs, and branches to help reduce overwintering populations of the fire blight bacterium.
- Streptomycin: effective for controlling the blossom blight and shoot blight stages of fire blight in commercial orchards. The use of streptomycin in urban landscapes is discouraged due to the high risk for resistance.
- Oxytetracycline: often used in rotations with streptomycin to help discourage resistance development; it is not as effective as streptomycin.
- Apogee (prohexadione calcium): growth hormone that reduces terminal growth, thereby making plants less succulent and less susceptible to infection.

Disease Forecasting

Disease prediction models utilize local weather data during bloom to determine the risk of fire blight infection. Because sprays are applied only during periods of high risk, bactericide applications are eliminated when conditions are unfavorable for disease development (e.g. cold or dry weather). Most universities have predictive systems in place; Kentucky growers should refer to the UK Ag Weather Center site.

Figure 6. Fire blight symptoms on Cotoneaster.

Additional Resources

- Ag Weather Center Disease Prediction Models (University of Kentucky) http://wwwagwx.ca.uky.edu/plant_disease.html
- Backyard Apple IPM Manual, IPM-9 (University of Kentucky, 1994) http://www.uky.edu/Ag/IPM/manuals/ipm9hmap.pdf
- Disease and Insect Control Programs for Homegrown Fruit in Kentucky, ID-21 (University of Kentucky, 2012) http://www.ca.uky.edu/agc/pubs/id/id21/id21.pdf
- Fungicides for Management of Landscape Woody Ornamental Diseases, PPFS-OR-W-14 (University of Kentucky, 2011) http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-OR-W-14.pdf
- Fungicides for Tree Fruits (University of Kentucky, 2012) http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-FR-T-11.pdf
- Homeowner's Guide to Fungicides (University of Kentucky, 2011) http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-MISC-7.pdf
- IPM for Select Deciduous Trees in Southeastern US Nursery Production (Southern Nursery IPM Working Group, 2012) http://wiki.bugwood.org/IPM_book

Table 1. Hosts of fire blight

Common hosts	
Apple	*Malus domestica*
Cotoneaster	*Cotoneaster* spp.
Crabapple, flowering	*Malus* spp.
Hawthorn	*Crataegus* spp.
Mountain ash	*Sorbus* spp.
Pear	*Pyrus* spp.
Pear, callery	*Pyrus callaryana*

Additional Hosts	
Blackberry, thornless	*Rubus* spp.
Christmas berry	*Photinia villosa*
Firethorn	*Pyracantha coccinea*
Plum, flowering	*Prunus triloba* var. *plena*
Quince, cultivated	*Cydonia vulgaris*
Quince, flowering	*Chaenomeles japonica*
Raspberry, red & black	*Rubus* spp.
Rose	*Rosa* spp.
Serviceberry	*Amelanchier canadensis*
Spirea	*Spirea vanhouttei*
Stransvaesia	*Stransvaesia davidiana*

- Midwest Tree Fruit Pest Management Handbook, ID-93 (University of Kentucky, 2012) http://www.ca.uky.edu/agc/pubs/id/id93/id93.htm
- Midwest Tree Fruit Spray Guide, ID-92 (University of Kentucky et al.) *2 MB file* http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/MwTreeFruitSprayGuideID92.pdf
- Woody Plant Disease Management Guide for Nurseries and Landscapes, ID-88 (University of Kentucky, 2012) http://www.ca.uky.edu/agc/pubs/id/id88/id88.pdf

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Photos by Rebekah D. Wallace, University of Georgia (Figure 1), Florida Division of Plant Industry Archive, Florida Department of Agriculture and Consumer Services (Figure 4); R. Grimm (Figure 6), Bugwood.org; and John R. Hartman (Figures 2 & 5) and Nicole A. Ward (Figure 3), University of Kentucky

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