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Fire Blight of Pears and Apples

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What You Should Know

- Fire blight is the most important bacterial disease for apple and pear growers in Utah.
- The disease is caused by the bacterium Erwinia amylovora.
- The bacteria overwinter within infected twigs and branches in the orchard. As temperatures rise, and the needed weather conditions are present, it is spread to opened flowers by insects and rain.
- The optimum temperatures for disease development are 70-81°F, with little growth below 50°F or above 95°F.
- Fire blight can be managed by cultural and chemical means. Pruning out fire blight infections is the most important strategy to prevent future infection.

INTRODUCTION

Fire blight, caused by the bacterium Erwinia amylovora, causes devastating losses in multiple fruit and ornamental crops of family Rosaceae worldwide. Fire blight was first observed in the late 1700s in the North Eastern United States. The disease occurs now worldwide and is found in at least 46 countries (Sundin, 2014). It is the most important disease for apple and pear growers in Utah. The severity of fire blight outbreaks varies year to year, influenced by weather, cultivar susceptibility, and tree age. The disease can kill blossoms, fruit, shoots, twigs, branches and entire trees if weather conditions are favorable. Highly susceptible and younger trees may be killed in a single season, while older trees can survive several years, even with continuous dieback and their structure damaged. Pear and apple trees are most susceptible to fire blight at flowering, but infection can develop through the season and is categorized according to the initial infection site.

SYMPTOMS

Fire blight symptoms vary depending on the tissue affected. The characteristic symptom of fire blight is the browning (apple) or blackening (pear) of the dead plant tissue. This gives the appearance that the tissue was burned by fire–hence the name, fire blight. Small, amber colored ooze can also be found on infected flowers, leaves, twigs, fruit, and cankers.

Fig. 1. Apple tree with fire blight.

Fig. 2. Blossom blight on one blossom in this cluster.

The first symptom observed in the growing season is Blossom Blight (Fig.2). Appearing in spring, the bacteria enter the tree through the blossoms and succulent new shoots. Infecting a single flower, the bacteria spread quickly to other flowers in the cluster and then move on, infecting the spur. The blighted spurs turn black on the pear and brown on the apple.

If weather conditions remain favorable for disease development, the infection moves down the tree to the growing tips of the shoots. From there, the infections move to the older portions of the twig. Leaf/shoot blight turns twigs dark brown or black. As the twigs wilt, they bend, creating the characteristic shepherd's crook (Figure 3 The "Shephard's Crook").

DISEASE CYCLE

The bacteria overwinter on the margins of cankers. In spring, as the weather warms the bacteria multiply and begin to ooze out of the bark (Fig. 4). The emerging bacteria invade the open flowers with the help of insects attracted to the ooze and by splashing rain. The bacteria can infect any succulent growth on the plant. Bees attracted to the flowers will help spread bacteria to new infection sites. Once in the flower, the bacteria multiply. Infection will take place when the bacteria is washed by rain or heavy dew from the flower stigma into the floral cup. Depending on temperatures, it will take from a few days to a week for the blossoms to show evidence of infection. Throughout the summer, during warm, moist weather periods, shoot and fruit infection can sometimes occur if bacteria are able to enter leaves or fruit through the tiny wounds caused by hail or insects. The infected fruit will have droplets of ooze on the surface (Fig. 5) that will attract sucking insects and cause further spread of the bacteria. Trees remain susceptible to infection until new growth stops.

MANAGEMENT

For the orchard, an effective management and control program for fire blight should include both cultural and spraying. Use sprays as preventative.

Cultural Practices

Remove other hosts. Reduce fire blight inoculum by removing other hosts such as pyracantha, hawthorn, cotoneaster and wild crabapple growing near the orchard.

Control bacteria habitat. Control succulent root sprouts on which the bacteria can build up throughout the growing season. Sucking insects create wounds though which fire blight can enter. To protect bees, do not apply insecticides during bloom.

Do not overfertilize. Fertilize to promote good health but overfertilization with nitrogen or applying too late in the season can cause too much new growth.

Plant resistant cultivars. Disease can be minimized by using resistant cultivars and resistant rootstocks. Resistant rootstocks will only prevent the death of the tree from rootstock infections. The resistance is not transferred to the scion. No cultivars are completely resistant to fire blight, but some are moderately resistant such as Red Delicious or Liberty. If fire blight is a common problem in your area, contact your local county Extension agent for a list of less susceptible varieties. Use adequate tree spacing to minimize stress and improve air circulation. For further information about planning the home orchard, access the following Utah PESTS fact sheet "Apple Production and Variety Recommendations for the Utah Home Garden" 2012.

Pruning. Regular inspection of the trees and pruning out infection is the most effective method to reduce the spread of fire blight.

Fig. 3. The "Shephard's Crook".

For further information about pruning apple trees, access the following Utah PESTS fact sheet "Training and Pruning Apple Trees" 2017.

Winter Pruning. Prune only in dry weather, while the trees are dormant during winter and early spring. Heavy pruning is most effective. Remove dead or severely infected trees, overwintering cankers, diseased tissue and any suckers growing up from the roots or from the trunk. During the dormant season, tools do not need to be disinfected between cuts and debris does not need to be burned or chipped.

Spring Pruning. If feasible, prune only in dry weather. The greatest spread of bacteria through an orchard is when temperatures rise above 65°F for several days and there is rain, or the relative humidity is above 65%.

Check trees regularly (weekly if fire blight has been present in the past) for cankers, any open blooms, abundant succulent shoot growth or fruit with insect injury showing the presence of ooze.

Remove any diseased blossoms and twigs as soon as they are evident. Heavy pruning should be avoided since it stimulates the succulent growth susceptible to fire blight. Cut infected twigs off 8-12 inches below the end of visible symptoms.

Remove any oozing cankers found during bloom promptly. Remove the outer bark down to the cambial layer and out one inch beyond the canker margin.

Cleaning pruners between cuts. When using pruners, disinfect the tools between cuts. Dip in a 10% bleach solution (1 part household bleach:9 parts water) or an alcohol solution (7 parts alcohol + 3 parts water) for at least 30 seconds, or spray tools and cuts with disinfectant spray or wipe with disinfecting wipes. Solutions should be made fresh daily and changed at least every 4 hours. The alcohol solution and disinfectant spray are less corrosive to pruning tools.

Remove or burn all diseased material and canker residues from the orchard.

Summer Pruning. Prune out any new fire blight infections and scrape cankers in hot, dry weather to minimize possible reinfection. If infection is severe and older wood is affected, it is best to wait until the tree is dormant in

MANAGEMENT (CONTINUED)

winter and a more thorough pruning can be done. Heavy pruning during the growing season can increase the spread within trees.

Scrape cankers in hot, dry weather to minimize possible reinfection.

Chemical Control - spraying. The growth regulator Apogee (prohexadione calcium) can be applied to stop or slow shoot blight. It should be applied at late bloom or early petal fall.

Cougarblight is a forecasting model that predicts infection risk. It is available on the Utah TRAPs website or mobile app, check with your local county Extension office. If temperatures remain between 65 and 86°F for a day or more during flower bloom, and there is rainfall or humidity above 65% for 24 hours, expect blossom infections. When infections are predicted, apply a suitable antibiotic (streptomycin or oxytetracycline). Blossom sprays are effective for 3-5 days because new blossoms open and need protection if conditions continue to favor disease development. The model is located on the USU Climate Center website at: climate.usu.edu/pest

Antibiotic Sprays. Containing streptomycin, oxytetracycline and kasugamycin are approved for use in Utah. Follow the labels with regard to application times and rates. Unfortunately, in many regions the bacteria are resistant to streptomycin (Nischwitz and Dhiman, 2013). Contact your county Extension agents or the USU IPM Program (utahpests.usu.edu/ipm) for assistance in verifying the resistance and further information on recommendations for your area.

Copper Spray. In orchards with a history of severe blight it is advisable to apply a copper spray in early spring, just before buds swell. This treatment will slow the bacterial growth on plant surfaces. Do not use copper every year, as it can affect soil organisms or wash into the groundwater. Bordeaux mixture or copper materials such as fixed copper should be used with caution as some are phytotoxic to pear and growers should check for updated spray rates and related information."

Fig. 4. Oozing canker.

Fig. 5. Oozing bacteria- fruit blight.

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[2]Images courtesy of Mark Longstroth, Michigan State University Extension