

# **FIRE BLIGHT AND OTHER DISEASES OF *MALUS***

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Fire blight is a very serious disease. On young trees, an infection can rapidly lead to the complete loss of the plant. When the initial infection is not removed in a nursery, dozens of trees can be lost in a matter of weeks.

The situation is not unique to Alberta. Since 1997, many nurseries in British Columbia, Washington State and Oregon have suffered losses to fire blight, mostly because of the unusually warm weather in the springs of 1997 and 1998, and because commercial apple growers are replanting with apple varieties more susceptible to fire blight.

In 1998 and 1999, CropHealth Advising & Research has worked with nurseries in Alberta where crabapples are showing poor growth. Two important observations were made in the field:

- First, nursery growers and their senior personnel must recognize the very early symptoms of fire blight. The successful management of this problem depends on a rapid intervention.
- Second, fire blight is only one of four disease problems affecting *Malus* plants. In some situations, the disease apple scab causes more damage than fire blight. Two other problems seen in nurseries are dieback from poor pruning and stress from nutrient deficiencies.

This presentation will review the disease fire blight, with a focus on recognition of early symptoms and different approaches of management.

## **I. THE SYMPTOMS OF FIRE BLIGHT INFECTION**

The most common image of fire blight infection is a young branch with a “shepherd’s crook” appearance: the branch tip is wilting, the leaves remain attached but look as if they were “scorched” by fire, thus the name *fire blight*.

This “wilted shoot” is a useful symptom of fire blight in the field, but for nursery growers, it may be too late for action. The actual infection will happen 4 weeks before the “strike” becomes visible in the spring, and 2 weeks in the summer. During that period, the disease will progress inside of the tree and cause important, permanent damage.

The very earliest symptom of fire blight infection is the blackening of leaf veins and leaf petioles. Think of fire blight as a disease that infects from the inside-out: the first visible infection is in the veins, then the leaf tissue becomes discolored and turns brown.

There are other ways to confirm a fire blight infection:

- On flower heads and fruit spurs, the stems first appear water-soaked, then turn brown or black.
- A small droplet of amber-colored “ooze” can form on the infected part or under wet conditions.
- For the most accurate diagnostic, send an infected branch to a laboratory for culturing.

## **II. THE SEASONAL DEVELOPMENT OF FIRE BLIGHT**

Fire blight is a disease caused by the bacteria *Erwinia amylovora*. It is most common on apples and crabapples, but is also seen on mountain ash, hawthorns and pears.

Fire blight cannot be controlled. There is no pesticide on the market that will eliminate the problem from an infected tree. At best, the problem is “managed” to cause as little damage as possible. Good management comes from understanding the disease and its development.

### **Winter: branch cankers**

The bacteria overwinters in cankers on limbs infected the previous season.

The cankers are most common on small branches and around pruning cuts made the previous year on infected branches. Typical cankers have a depressed center with a rough margin between the infected area and the healthy part of the branch. With warm temperatures in early spring, the bacteria in the canker will multiply and be spread around by wind or flying insects.

In the eastern United States, researchers have found that cold damage to the tree and spread of fire blight bacteria are at the lowest between January 15 and March 15.

### **Spring: infection of flowers**

Four conditions must be present for a fire blight infection to occur in the spring:

- 1- The disease was present in the area in the previous 2 years. The bacteria can survive on weeds and non-susceptible trees and travel up to 250 meters with wind.
- 2- The flowers are open. The bacteria responsible for fire blight must find a point of entry into the tree to successfully establish and grow. Open flowers are a perfect “open door” into the tree.
- 3- The temperature is warm. The bacteria becomes active at temperatures above 18°C (64°F). Warmer temperatures result in more rapid development, with a disease explosion at 24°C.
- 4- There is a wetting event, such as rainfall, overhead irrigation or heavy dew. This water will move the bacteria down into the flower.

In Alberta nurseries, growers should pay particular attention to the newly-planted *Malus* trees. Typically, these trees are planted in late May or early June in the field and in containers. They will bloom in mid to late June, when day-time temperatures can be above 18°C. Any rainfall at this time may trigger an infection, and the infected tree will carry the bacteria for years to come.

Pesticides currently registered for fire blight include fixed copper compounds and streptomycin. Streptomycin is very effective to prevent bloom infection, but it has stopped working in many areas of North American because of resistance development in the bacteria.

Many fixed copper products are available in commercial formulations. They contain copper oxychloride and are registered for use on crabapples, pears and ornamentals. Copper will not kill the fire blight bacteria, but will reduce its ability to survive and reproduce on the plant surface. If there was fire blight on the property the previous year, the grower should consider a preventative measure and apply fixed copper between the green tip and pink bud stages.

## **Summer: infection of shoots**

Fire blight strikes become more obvious during the summer.

When flowers are infected in the spring, but not removed, the bacteria will progress into the supporting branch, eventually killing cell tissues and girdling the branch. Bacteria from infected flowers can be transported to growing shoots and trigger infections throughout the summer. Any “trauma” that will open the tree bark, such as hail or pruning, can result in new strikes.

One word can describe the most effective treatment for fire blight: pruning. When a new strike is seen, it should be pruned out, the faster the better. Making a cut 12 inches below the visible part of the strike is generally sufficient. However, note that researchers in Virginia have found the bacteria in the internal bark tissues of branches 3 to 9 feet below any visible symptom!

After pruning out a fire blight strike, it is common for the bacteria to colonize the pruning cut and create a canker. If the cut is made close to the main trunk, the canker will infect the whole tree. Thus, it is better to leave an “ugly stub”, up to 12 inches long. The bacteria will travel down a few inches but will not enter the trunk. The stub can be removed the following winter.

Researchers in California have compared various products to disinfect pruning tools from the fire blight bacteria. Clorox (bleach), PineSol and Lysol gave “consistent protection” but not 100% control when the blades were soaked in the products for one minute, or the blades were sprayed with the products. Clorox (bleach) and PineSol caused the blades to rust or discolor.

### **Recommendations for the management of fire blight**

*If there was no fire blight on the property the year before:*

- Be alert. An outbreak of fire blight can happen any year when all conditions are present.
- Scout the *Malus* blocks once a week during bloom and for one month afterwards.
- As soon as a strike is seen, prune, prune, prune. Cut about 12 inches below the visible part of the strike, using the “ugly stub” method, and disinfect the tool with Lysol, PineSol or bleach.

*If there was fire blight on the property the year before:*

- Assume you will have fire blight strikes again this year. Make this problem a priority.
- In late winter, but before March 15, prune out all cankers and “ugly stubs” from the year before. Cut about 4 inches below any sign of dead bark, and remove the branch from the site.
- Before green tip and pink stage, make an application of fixed copper 50WP, 2 kg in 500 liters of water. This application will reduce the viability of the fire blight bacteria.
- During the bloom period, avoid overhead irrigation, which could trigger an infection. Pay attention to weather conditions: 4 days in a row of 18°C or more can trigger an outbreak.
- Scout the *Malus* blocks twice a week for one month after bloom. As soon as new strikes appear, prune, prune, prune. Use the “ugly stub” method and disinfect the pruning tool.
- In the summer, following hail or pruning, immediately spray with fixed copper 50WP, 1 kg in 500 liters of water. Note that fixed copper will cause damage to apple and pear fruit.

*When using pesticides, always read the label for rate of application and safety instructions*

### **III. OTHER DISEASES OF *MALUS***

#### **Apple scab**

This disease will cause circular spots on the leaves, at first with a velvety-olive appearance, later becoming almost black. On very susceptible *Malus* cultivars, the leaves are so infected they fall from the tree in August and September. The branch is bare in the fall, is more susceptible to cold damage during the winter, and will be invaded by secondary diseases the following spring.

Apple scab is caused by a fungus, *Venturia inaequalis*. It overwinters on fallen leaves on the ground. During rainy periods in the spring, spores are ejected from the leaves on the ground and are transported to the new growth on the tree, causing an infection. During the summer, infected leaves on the tree will trigger new infections with each significant rainy period.

Management of this problem can take two approaches. First, the leaves are raked away in the fall or mowed into small pieces. This will reduce the pressure the following spring and works for residential sites with only a few trees. Second, the new growth must be protected in the spring with the application of a fungicide *before* any extended rainy period. Many products are available and give good results, including wettable sulphur, a product used by organic growers.

#### **Dieback from pruning**

Inexperienced pruners often make poor cuts that leave “stubs” on the tree. The stubs, a few inches long, are susceptible to infection from secondary diseases such as *Cytospora*. These diseases can grow into healthy tissue and cause dieback of major limbs.

Pruning is a beautiful art. For best results, the cut should be made close to another branch, while retaining the branch collar (swelling at the junction of two branches). This type of cut will allow the tree to rapidly heal the pruning wound and defend against disease infection.

#### **Nutrient deficiencies**

Some soils in Alberta nurseries have a pH of 7.2 to 7.9. In these alkaline soils, some nutrients enter into a reaction and become less available for uptake by plant roots. The trees can exhibit deficiencies of sulphur, magnesium, boron or zinc. A deficiency of sulphur will give the new growth a light green appearance. Deficiencies of boron and zinc will contribute to poor bud break in the spring. A leaf analysis will indicate whether corrective fertilization is required.

### **IV. FOR MORE INFORMATION**

- “Fire blight – Its nature, prevention and control”. By T. van der Zwet and S.V. Beer, revised 1999. U.S. Department of Agriculture, Agriculture Information Bulletin no. 631. An excellent reference publication on all aspects of fire blight. Sold by the U.S. Government Printing Office, SSOP, Washington, D.C., 20402-9328.
- “Fire blight, *Erwinia amylovora*”. By P.W. Steiner and A.R. Biggs, 1998. Available from West Virginia University, at the internet Web site <[http://www.caf.wvu.edu/kearneysville/disease\\_month/fireblight.html](http://www.caf.wvu.edu/kearneysville/disease_month/fireblight.html)>.
- “Fire blight of apple and pear”. By G. Jespersen, 1995. B.C. Ministry of Agriculture, Fisheries and Food, Pest Management Note 95-02. An excellent summary of management practices for Canadian apple growers.
- “Principles of Fire Blight Control in the Pacific Northwest”. By T.J. Smith, 1998. This article, and others on pruning, are available from the University of Washington, Web site <<http://www.ncw.wsu.edu/fireblt6.htm>>.
- “Compendium of Apple and Pear Diseases”. Edited by A.L. Jones and H.S. Aldwinckle, 1997. A technical review of all important diseases of *Malus* and *Pyrus*. Sold by the American Phytopathological Society, 3340 Pilot Knob Road, St.Paul, Minnesota, 55121-2097.



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