AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF MINNESOTA

PLANT PATHOLOGY
FACT SHEET No. 17--Revised 1983

WARD C. STEINSTRA

Fire Blight

Fire blight, a bacterial disease, was first reported in the United States in 1780. The disease is still a major threat to apples and pears. In Minnesota, fire blight is most often seen on apple, crabapple, pear, and mountain ash. Occasionally it is found on cotoneaster, hawthorn, quince and pyracantha. Besides these important genera there are 33 additional genera in the Rosaceae family with plants reportedly susceptible to fire blight. Most of them are ornamental shrubs or trees.

SYMPTOMS

Fire blight derives its name from the symptoms produced. Infected blossoms and leaves are typically dark brown or black as if scorched by fire. Usually the terminal 6-18 inches of a branch are affected. The extreme tip curls over like the shepherd's staff (Figure 1). Dead leaves remain on the tree throughout the summer.

Blossom blight is usually the first symptom and is found in early spring. A single flower or an entire cluster may be affected. Blossoms first appear water-soaked, then wilt, shrivel and turn brownish to black. The blight progresses into the base of the flower which also may appear water-soaked becoming dark green and finally turning black. During warm humid weather ooze droplets sometimes extrude from this part of the plant. Bacteral ooze can occur during wet conditions. Young fruit often become infected, turning black, dry and shrivel, and usually remain attached to the tree.

After the blossom, the succulent twigs, shoots, water sprouts and suckers are the next most susceptible part of the plant. Twig blight symptoms are similar to those found in blossoms except that infection usually progresses more rapidly. In a few days, infection can move 15-30 cm or more into the twig. Infected shoots, bark and leaves usually appear light to dark brown in apple and dark brown to black in pears. Blighted twigs forming the shepherd's staff at their tips are characteristic of fire blight. Twig blight may also result from girdling below the shoot tip after invasion through spurs or previously blighted twigs or leaves.

Fire blight is most common following a severe summer hail storm. In blight susceptible hosts the disease may advance downward from the blossoms, shoots or fruits, through the larger branches to older branches causing localized stem cankers. It may continue into the scaffold limbs and main body of the tree often accompanied by ooze running along the bark surface. Cankers formed at the base of blighted fruit spurs or water sprouts serve as sites where the bacteria may live over winter. Cankers develop when progress of the infection is slowing down. They may be slightly sunken, varying in size and surrounded by irregular cracks in the bark. An active fire blight canker has a dark, watersoaked appearance. The margin is indefinite, raised and sometimes blistered. The surface of infected bark becomes sunken and remains smooth.

Figure 1. Twig blight phase of fire blight.

Sometimes cankers, not identified by cracks or blisters, can be recognized by the outward discoloration of the bark, often purplish. Cankers, especially small ones formed early in the season are usually surrounded by callus. The fire blight bacteria can move through the vascular tissue from small twigs to larger branches thereby killing large sections of a tree or the entire tree. The bacteria lives in tissue over winter at the margins of the large cankers and these are the sources of new infection the following spring.

DISEASE CYLCLE

As far as is known, Erwinia amylovora passes its entire active life in direct association with the living host. The disease cycle starts with the primary infection in the spring (blossom), continues throughout the summer and ends with the

formation of cankers in the fall. The origin of primary infection in the spring was believed to be from bacterial ooze. In addition to ooze from overwintering cankers, other sources of inoculum are now known, i.e. resident bacteria in tree tissue. Primary blossom blight may originate, 1) as internal extension of previous year's blight, 2) bud infection in which the buds, though infected the year before remained alive through the winter, 3) infections resulting from bacterial exudates produced from the previous growing season, or 4) the common twig blight induced by inoculum from overwintering cankers.

After killing the blossom, blight infection goes into the flower stem and then into the peduncle and spur where it invades the leaves and finally the branch. At this time the infection, if walled off, produces a canker or it penetrates further into the branch and then into the main scaffle limbs and trunk. Secondary infections may continue throughout the growing season. Sources of inoculum may be bacterial ooze or strands produced on shoots, leaves, fruits, and larger branches. The ooze can be disseminated by rain, wind, insects, or birds. In addition, man may also spread the pathogen by means of contaminated pruning tools. Secondary infections are usually far more numerous than primary ones and generally caused more serious injury to the trees.

CONTROL

Fire blight cannot be controlled by any one measure alone. Every attempt must be made to keep fire blight out of the orchard. If this serious disease gets into the orchard, make every effort to eliminate or contain it so that trees are not lost. Experience shows that the best control results when the grower follows an integrated program of chemical control combined with sanitation, pruning, eradication, tree nutrition and insect control.

Sometimes if fire blight is not too severe, especially when only a few twigs are blighted, the blighted parts can be pruned out without further spread of the disease. Pruning tools must be dipped in a disinfectant between cuts to prevent spread of the bacteria. The common household bleach-sodium hypochoride has been successful in decontaminating pruning tools. A 5-second dip in a freshly made 10% solution (one part bleach, 9 parts water) kills the causal oranism. Sodium hypo-chloride unfortunately also corrodes metal. Pruning tools should be rinsed and oiled after each use.

Cultural practices that stimulate growth make the plant vulnerable to serious fire blight infeciton. One such factor is the production of vigorous growth by applying high levels of nitrogen fertilizer. Nitrogen applications should be managed to provide for reduced tree growth during the last part of the season. Nitrate fertilizers are preferred because they are quickly used up by the trees and other vegetation. Various slow release forms of nitrogen including organic forms should be avoided during years when fire blight is present. One half of the nitrogen should be applied in the spring and the second half shortly after bloom. The total amount of nitrogen should be reduced from the rate used in the absence of fire blight.

A higher incidence of fire blight has been found to be associated with fine textured soils, poor drainage and highly acidic soils. These soil conditions should be avoided as planting sites or corrected before planting. Select soils with medium to heavy texture, areas that have good drainage and sufficient lime should be applied and worked into the soil to give several years of a pH of 6 to 6.5.

CHEMICAL CONTROL

Current chemical programs for fire blight control are based principally on protective schedules with repeated applications required to keep the new growth protected especially when environmental conditions are optimal for infection. Supplemental applications should be made one day following storms that case tree injury.

Antibiotics (streptomycin) are effective only when applied repeatedly. The first application must be made after the first green top. The second application is made at tight cluster to 1st pink, the third at full pink and another at bloom and again at petal fall. The periods between these applications can be as short as one day or as long as a week, but follow the schedule according to blossom opening. Antibiotics are generally effective for 3 to 5 days so additional applications may be needed during long bloom periods.

Apply antibiotic spray within 24 hours following hail. Hail wounds are very susceptible to infection. Driving rains that often occur with hail are likely to drive fire blight bacteria into the wounds. The restriction of antibiotic application not later than 50 day before harvest must be

If fire blight is a serious problem remember to 1) avoid excessive pruning because it promotes the development of succulent new growth that is very susceptible, 2) avoid excessive nitrogen fertilization because it also promotes the development of succulent new growth and 3) prune young trees annually as this practice provides for small cuts. Large cuts are often followed by the growth of fire blight susceptible suckers. Root sprouts and suckers should be cut off at short distance above the soil line during the dormant season. Always disinfect pruning tools between cuts during the growing season and 4) before buying new planting, consider varieties with resistance to fire blight.

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Norman A. Brown, Director of Agricultural Extension Service, University of Minnesota, St. Paul, Minnesota 55108. The University of Minnesota, including the Agricultural Extension Service, is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, creed, color, sex, national origin, or handicap.