

Fire Blight of Apple and Pear

Erwinia amylovora

Hosts: Apple (*Malus* spp.); pear (*Pyrus* spp.). This pathogen has a very wide host range, including quince (*Cydonia oblonga*) and other rosaceous plants, such as crabapple (*Malus sylvestris*), hawthorn (*Crataegus aestivalis*), pyracantha (*Pyracantha* spp.), plum (*Prunus domestica*), Japanese plum (*Prunus salicina*), and cotoneaster (*Cotoneaster* spp.).

Disease common name: Fire blight.

Pathogen: *Erwinia amylovora*.

Disease Cycle

Inoculum: A major source of inoculum is bacterial ooze from overwintering infections.

Transmission: The pathogen is spread by wind, water, insects, and mechanical means.

Infection: Bacteria enter plants through natural openings and can systemically invade all plant parts. Shoot blight (Figs. 1 and 2) may occur on actively growing vegetative shoots; bacteria can enter directly through stomata on young shoots during periods of rain. Flower infection is the most common method of bacterial invasion. Bacteria gain entry of flower parts through nectaries (nectarthodes), lenticels, and stomata. Flower infections usually lead to infection of shoots and stems as bacteria travel downward (Figs. 3–5). Immature fruit may be infected in orchards, but mature fruit also can be infected postharvest. Infection of fruit occurs through lenticels, wounds, and infected flower spurs (pedicels). However, open wounds, caused by hail, frost, or severe wind, also serve as entry points for the pathogen. Infections typically begin at these sites, and the disease then travels downward (Fig. 6) to major limbs and sometimes into roots, causing death of the tree.

Symptoms and signs: Infected flowers become wilted, shriveled, and eventually turn dark brown or black (Figs. 3 and 4). The severity of disease varies greatly among years, and the number of strikes (infection sites) can vary from several per tree to almost total infection of most twigs and branches (Fig. 7). Infected shoots are characterized by a shepherd's crook (Fig. 1) resulting from wilting of the growing tips. As bacteria move down the shoot, midveins of leaves darken and eventually develop a "burnt" appearance. Infected trees can be spotted in winter since leaves may remain at infected sites (Fig. 8). Symptoms on fruit appear as water-soaked lesions that later expand to large areas that turn dark brown (Fig. 9). Copious ooze is commonly seen on twigs and fruit at various stages of development. In morning hours under certain climatic conditions, strands of bacterial ooze are visible on diseased and mummified fruit (Figs. 10–13).

Survival: Bacteria overwinter in cankers (Figs. 14 and 15). In the spring, bacteria multiply at canker margins and in adjacent bark tissues, giving rise to inoculum that may be spread by rain or insects to flowers and shoots.

Disease Management

Control of fire blight includes cultural practices and application of bactericides. Caution must be used to avoid spreading bacteria when pruning diseased branches. Pruning should be done only in dry weather, and tools must be disinfected frequently. Inoculum is removed by excising diseased twigs and branches with holdover cankers. Diseased branches are generally removed 8–12 inches below the visual symptoms. It is especially important to remove active infections. The most important horticultural practice is to avoid the use of highly susceptible cultivars and rootstocks. Proper fertilization practices should be used since

high levels of nitrogen promotes excess vigor, increasing susceptibility of the shoots. Fixed copper compounds, several biological control agents, and several antibiotics, mainly streptomycin, are used to protect flowers from blight. However, widespread resistance to streptomycin has been reported. It is important to coordinate application of these materials with forecasting systems that predict or specify optimal periods for bacterial spread and infectivity.

References

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- Jones, A. L., and Aldwinkle, H. S., eds. 1990. *Compendium of Apple and Pear Diseases*. American Phytopathological Society, St. Paul, MN.
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- van der Zwet, T., and Keil, H. L. 1979. Fire blight: A bacterial disease of rosaceous plants. U.S. Dep. Agric. Agric. Handb. 510.



Figure 1. Pear twig exhibiting typical shepherd's crook with yellowish orange bacterial ooze. (Courtesy M. Schroth)



Figure 2. Twig blight of crabapple. (Courtesy W. Sinclair)

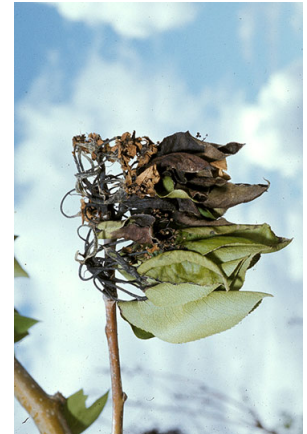


Figure 3. Pear blossom and twig blight. (Courtesy M. Schroth)



Figure 4. Twig blight of pyracantha; ingress probably through the flowers. (Courtesy W. Sinclair)



Figure 5. Pear blossom blight. (Courtesy S. Thomson)



Figure 6. Disease progresses from tips of pear twigs downward. (Courtesy M. Schroth)



Figure 7. Severe symptoms of blight on apple tree. (Courtesy S. Thomson)



Figure 8. Leaves remain on infected branches of pear during California winters. (Courtesy M. Schroth)



Figure 9. Infected pear fruit. (Courtesy M. Schroth)



Figure 10. Pear blossom with bacterial strands. (Courtesy S. Thomson)



Figure 11. Young pear fruit with strands of bacterial ooze. (Courtesy M. Schroth)



Figure 12. Mummified pear fruit with strands of bacterial ooze. (Courtesy M. Schroth)

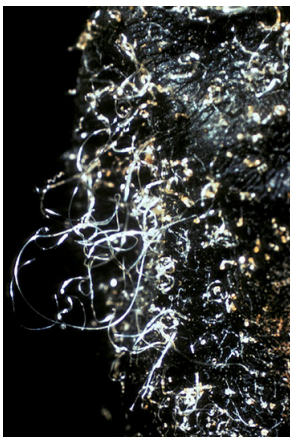


Figure 13. Close-up of bacterial strands on mummified pear fruit. (Courtesy M. Schroth)



Figure 14. Canker on pear tree trunk. (Courtesy M. Schroth)



Figure 15. Bacterial ooze from active canker on apple tree trunk. (Courtesy S. Thomson)