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Fire Blight on Fruit Trees in the Home Orchard

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Fire blight, caused by the bacterium *Erwinia amylovora*, attacks more than 70 members of the Rose (Rosaceae) family, and is a devastating disease of apples and pears.

Symptoms

Fire blight produces several different symptoms depending on the host and site of infection. The most commonly observed symptom is the characteristic "shepherd's crook" that develops on wilting twigs, shoots, and leaders (Figure 1). The name "fire blight" aptly describes the blackened leaves characteristic of infections on pears (Figure 2). In apple, infected branches turn reddish brown to brown (Figure 3).

Photo by Janna Beckerman

Figure 1. *Young shoot tips wilt when infected, resulting in a characteristic "shepherd's crook."*

Photo by Janna Beckerman

Figure 2. *Pear shoots infected with fire blight turn black, giving the disease its name.*

Cankers develop, and the margins become raised and blistered, eventually cracking (Figure 4). When the bark is removed, the cankered area may show red-brown streaking. Dead branches scattered throughout the canopy are common, and trees can die if infections spread into the main stem. The younger the tree, the more likely it will die following infection.

Common apple varieties are regularly grafted onto dwarfing rootstock to reduce tree height. Many dwarfing rootstocks result in trees that are more susceptible to fire blight. Dwarfing rootstocks M.9 and M.26 on apples are particularly susceptible to collar and rootstock blight. The above-ground portions of the tree may not develop symptoms, while the susceptible rootstock is cankered. As the canker girdles the rootstock, the upper portion of the tree will develop symptoms of decline (smaller leaves, weak growth, early fall coloration). These infections are difficult to distinguish from another disease, *Phytophthora* collar rot.

Photo by Janna Beckerman

Figure 3. *In apples, fire blight turns infected branches reddish brown to brown. The disease can quickly spread through the canopy of susceptible varieties.*

During wet weather, honey-colored liquid teeming with bacteria may exude from cankers, flowers, or infected fruit.

Disease Cycle

The fire blight bacterium overwinters in the cankers of infected plants. During early spring, bacteria ooze from cankers. Insects, birds, wind, and rain spread these bacteria to flowers, new leaves, small wounds, and natural openings on succulent new growth.

This disease is most severe during flowering, when warm spring weather (70-81°F, 21-27°C), coupled with rainfall and hail, provide optimum conditions for fire blight development. Outbreaks of this disease occur sporadically throughout Indiana, but with greater frequency and severity in the southern part of the state. The incidence and severity of this disease changed greatly with the adoption of the high yielding, but fire blight susceptible rootstocks M.9 and M.26.

Management

Fire blight can result in severe crop losses and tree death. Unfortunately, reliable control methods have not been developed, and this disease responds poorly to the few available treatments. For these reasons, prevention through the use of resistant varieties, and resistant rootstocks are the best possible management practice.

Resistant Plants

An extensive list of fire blight-resistant apple varieties can be found in Purdue Extension publication BP-132-W *Disease Susceptibility of Common Apple Cultivars* (www.ces.purdue.edu/extmedia/BP/BP-132-W.pdf). See Table 1.

Photo by Janna Beckerman

Figure 4. *The bacterium that causes fire blight overwinters in cankers and oozes out the following spring to re-infect the plant.*

Cultural Practices

Disease can be minimized, and even prevented, by good horticultural practices (namely, the use of resistant cultivars and resistant rootstocks). Additional cultural practices should include:

- Proper site selection that provides more than six hours of sunlight per day.
- Careful nitrogen fertilization, thereby reducing succulent, susceptible growth.
- Adequate tree spacing to minimize stress.
- Proper pruning practices. Remember the following:
  - Prune in late winter while trees are dormant to minimize the risk of infection. Avoid excessive winter pruning which otherwise stimulates vegetative growth the following season.
  - Never prune to shape the tree at the same time disease management is taking place.
  - Prune only in dry weather, and make cuts at least 12 inches away from the site of infection and into healthy plant tissue. Delay summer pruning until the terminal bud has set and growth has ceased.
  - Dispose of all infected material and sterilize pruning equipment between cuts by dipping in a solution of 10 percent bleach with a few drops of detergent. Plants that have more than 50 percent of their canopy infected should be removed.

Table 1. Fire Blight Resistance of Apple and Pear Varieties

Resistance	Varieties
Apples	
Highly Resistant	Jonafree, Melrose, Northwestern Greening, Nova EasyGro, Prima, Priscilla, Quinte, RedFree, Sir Prize, Winesap
Resistant	Dutchess, Empire, Red Delicious, Goldrush, Haralson, Honeycrisp, Jonagold, Jonamac, Libery, McIntosh, Northern Spy, Novamac, Spartan
Susceptible	Beacon, Cortland, Fuji, Gala, Golden Delicious, Granny Smith, Honeygold, Idared, Jonathan, Lodi, Monroe, Mutsu (Crispin), Paulared, Rome Beauty, Wayne, Wealthy, Yellow Transparent, Zesta!
Apple Rootstocks	
Resistant	B.9* Geneva 11 Geneva 30 Geneva 65 M.7 M.27* Novole Robusta
Susceptible	Alnarp 2, Bemali, Bud. 9*, Bud. 118, Bud. 140, C.6 (interstem) M.9, M.9 (interstem), M.26, M.27* MM.106, MM.111, Mark, Ottawa 3, P.2, P.16, P.22
Asian Pears	
Resistant	Chojuro Kosui, Olympic (Korean Giant), Seuri, Shinko, Shinsui, Singo, Tse Li, Ya Li*
Susceptible	Hosui, Kikusui, Okusankichi, Seigyoku, 20th Century(Nijisseki), New Century (Shinseiki) Ya Li*
Pears	
Highly Resistant	Honeysweet, Kieffer, LaConte, Magness, Moonglow, Old Home
Resistant	Seckel, Maxine
Susceptible	D'Anjou, Aurora, Bartlett, Bosc, Comice, Clapp's Favorite, Dutchess
Pear Rootstocks	
Resistant	Old Home (OH) Old Home x Farmingdale (except OHxF 51), *P. calleryana*, *P. betulifolaefolia* seedlings
Susceptible	Bartlett Seedling, Quince seedling

*There are studies that provide contradicting data, suggesting that this cultivar, rootstock, or species is susceptible.

Chemical Management

For plants with a history of infection, apply a copper based pesticide like Bordeaux mixture or another dormant spray mixture before bud break (see Table 2). Agri-Strep® (streptomycin), is acceptable for home use, but may be difficult to obtain. To prevent spread after bud break, and to prevent spread, apply a combination of mancozeb and copper and/or streptomycin to protect new growth until petal fall. Chemical management is not recommended after petal fall.

If you are managing fire blight with streptomycin, it is imperative to reduce the risk of antibiotic resistance from developing. Do not use streptomycin after symptoms have developed or to control shoot blight. Using streptomycin in those cases is not only ineffective, but it increases the risk that the bacterium will become resistant to streptomycin. Streptomycin can be used to prevent infection after a traumatic event (hail, winds storm, etc.) has occurred.

When using streptomycin:

- Make no more than three to four applications per season to decrease selection pressure and slow the development of resistance.
- Confine antibiotic sprays to the bloom through petal fall period to prevent infection from occurring.

Table 2. Pesticides Labeled for Control of Fire Blight

Common Name	Trade Name
copper	Phyton 27®, Nu-Cop®, Camelot®, Kocide®
mancozeb	Mancozeb Flowable®, Dithane®, Penncozeb®
mancozeb + copper	Junction®, ManKocide®
streptomycin	Agri-Strep®

References

Van der Zwet, T., S. V. and Beer. 1995. "Fire blight: Its nature, prevention, and control." *USDA Information Bulletin* No. 631. 83 pp.

Purdue Extension Publication ID-93, *Midwest Tree Fruit Pest Management Handbook*, www.ca.uky.edu/agc/pubs/id/id93/id93.htm.

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