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Fire Blight on Pome Fruit

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Fire blight is a major bacterial disease of pome fruit (apple and pear) caused by *Erwina amylovora*. The disease can infect and kill the entire plant. Most bacteria enter through the blossom and then spread into the vascular system of the shoots and limbs, potentially leading to infection of the entire tree. Depending on the availability of an infection source, susceptibility of the variety and weather conditions in the early spring, damage can range from minimal to extremely severe. In general, it is not uncommon to see some disease incidence in every orchard or backyard in the Mid-Atlantic region.

Identifying the disease:

Symptoms of fire blight can be observed on all above-ground tissues including blossoms, fruits, shoots, branches, limbs and on the rootstock near the graft union on the lower trunk. Fire blight infections may be localized, only affecting the flower or flower clusters, or may extend into the twigs and branches. Blossom blight is the first symptom that may appear within one to two weeks after blooming. The entire blossom cluster may die and turn brown or black on apple and pear trees, respectively (Figure 1A, B).

Figure 1A (left). Apple blossom blight. Photo- Dave Rosenberger. Figure 1B (right). Pear blossom blight. Photo- Robert Burns, Texas AgriLife Extension.

The spur bearing the blossom cluster will also die, which can allow the infection to spread into, and kill, portions of the supporting limb. The tips of young, infected shoots dry up to form a very typical "shepherd's crook" or candy cane symptom (Figure 2). Under warm and humid weather conditions, small droplets of sticky bacterial ooze can often be seen on the surface of infected blossoms or blighted shoots. Older shoots that become infected after developing about 20 leaves may wilt without showing the typical hook-like symptom at the tip. An infected tree with numerous wilted shoots that bear shriveled, brown or black leaves takes on the appearance of being scorched by fire. As infection progresses towards woody tissues of twigs and branches, dark cankers with depressed bark and raised, cracked margins may form where bacteria survive from one season to another (Figure 3). In addition to producing surface ooze in the spring, overwintering bacteria from these cankers can occasionally systemically move to nearby

shoots to cause canker blight, which produces a characteristic yellow-orange color in the wilting shoot during the early post-bloom (petal fall) period (Figure 4).

Figure 2. Typical shephard's crook symptom on blighted shoot. Photo- MM Rahman.

Figure 3. Canker on the main trunk of an apple tree. Photo- MM Rahman.

Source and spread of the disease:

Cankers on limbs from the previous season are the primary sources of the pathogen. During the early spring, bacteria at canker margins begin multiplying rapidly in response to warmer temperatures, and produce a thick, yellowish to white ooze. Many insect species, but predominantly flies, and splashing rain can disperse the bacteria throughout the tree during early blossom. After spreading, the bacteria can rapidly grow under favorable weather conditions. Subsequent spread to other flowers can be facilitated by pollinating insects such as honey or bumble bees. The bacterium can also be spread to tender shoots through wounds caused by hail or strong winds, or through natural crevices on the tree, which contributes to rapid multiplication of shoot blight.

Figure 4. Canker blight of the shoot. Photo- MM Rahman.

Managing the disease:

Removal of primary infection source:

Pruning out cankered limbs and branches while the infection lays dormant during winter plays an important role in a fire blight management program. Cuts should be made at least 8 to 12 inches (20 to 30 cm) below any signs of dead bark. Application of a copper-containing fungicide and bactericide at, or shortly after, green tip will further reduce the risk of infection by lowering the number of new fire blight bacteria produced from overwintering cankers.

Removal of early-season blighted shoots:

It is very important to carefully monitor every tree to locate blighted limbs early in the season and remove them as soon as possible before extensive necrosis develops, especially those that threaten the main stem. Removing early strikes (dead shoots with typical symptoms) from the tops of the trees can significantly reduce the chance of later infections of shoots and sprouts on lower limbs or root stocks, thereby preventing a spread to the main trunk and loss of the whole tree. This is most effective if practiced rigorously during the first few weeks after bloom.

Cultural practices and resistant varieties:

Management systems that promote early cessation of tree growth without adversely affecting overall vigor can minimize shoot blight severity. Base nitrogen fertilization on an analysis of foliage nitrogen levels to avoid excessive and prolonged shoot growth.

Susceptibility of the scion and rootstock can affect blight severity. For small scale production, select a variety such as Empire, Enterprise, Jamba, Liberty or Red Delicious which have a resistance to fire blight. A combination of highly susceptible apple cultivars on highly susceptible rootstocks (Mark, M.9 and M.26) should always be avoided. Rootstocks from the Geneva series have an acceptable level of resistance.

Chemical control:

As most infection takes place through nectary of a flower, antibiotic sprays such as streptomycin (Agrimycin, Fertilome) are highly effective against the blossom blight phase of the disease. This measure can also prevent the disease from becoming established in a tree or orchard. However, it is critical to time spray application following a prediction model such as Maryblyt (http://www.caf.wvu.edu/kearneysville/Maryblyt/index.html) to have optimum coverage during an active infection period, usually when daily average temperature exceeds 60°F with a wetting event caused by rain or heavy dew. It is important to have continuous coverage for open flowers from early bloom to petal fall, spraying every 4 to 5 days if a favorable environmental condition for infection exists. In addition, Apogee (prohexadione calcium) can be mixed with an antibiotic for application during late bloom when active shoot growth is 1 to 3 inches long. This can reduce the threat of shoot blight on vigorous trees that are of a susceptible variety. Apogee causes shoots to start hardening approximately 10 to 14 days after application, resulting in reduced susceptibility to shoot blight. Organic growers may apply a copper-based product, however, it is not as effective as antibiotics and may cause russeting of the fruit surface.

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