RESEARCH LABORATORY TECHNICAL REPORT

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Bacterial Leaf Scorch

Bruce R. Fraedrich, PhD, Plant Pathology

Bacterial Leaf Scorch (BLS) is a chronic disease caused by the bacterium, *Xylella fastidiosa,* which infects the vascular system of many woody landscape plants. The disease restricts water transport within the plant causing a slow but progressive decline in plant health eventually resulting in death. Both frequently reported hosts and species that are infrequently infected with this disease are listed in Table 1. This pathogen was first discovered in grapes and causes a disease known as Pierce's Disease.

Figure 1: Bacterial leaf scorch symptoms on red oak

BLS is prevalent in the eastern United States from New Jersey south through Florida and west to Texas and California. Isolated occurrences have been reported in several Midwestern States including Indiana, Illinois, Ohio and Nebraska. There are numerous species that are infrequently infected with this disease. Some plant species are symptomless hosts; *Xylella* can colonize the plant without causing scorch. These plants can go unnoticed in a landscape but serve as sources of new infections.

Symptoms

The key diagnostic symptom is browning (scorching) of leaf margins. Scorch symptoms are very irregular on the leaf blade with browning extending deeply toward the mid-vein (Figure 1). Often, there is a yellow,

Figure 2: Declining pin oaks from bacterial leaf scorch

Table 1: Bacterial Leaf Scorch Hosts

Common Hosts
Red, pin, black, scarlet and southern red oaks
Sycamore and London plane
American elm
Oleander
Mulberry
Occassional Hosts
Red and sugar maples
Sweetgum
Dogwood
Olive
Pecan
White, swamp white, bur and willow oaks

orange or red halo at the margin of the scorch. Scorch develops rapidly in August and early September and is soon followed by defoliation. Symptoms usually exhibit first on a few branches and then spread in subsequent years until the entire crown is involved (Figure 2). Portions of the crown impacted by *Xylella* may leaf out later in spring than the rest of the canopy and have lighter green leaves. In later stages of the disease, branches die and death occurs. Decline usually occurs slowly over a period of ten years or more from the first onset of symptoms but in young trees and in species sensitive to moisture stress, such as sycamore, death can occur sooner.

Symptoms of BLS can be confused with environmental leaf scorch caused by water deficits due to drought, poor soils (compacted, sandy, shallow or limited volume) or root loss. Table 2 highlights key diagnostic differences between environmental and bacterial leaf scorch.

Table 2: Key Diagnostic Differences

Bacterial Leaf Scorch	Environmental Leaf Scorch
Scorch on blade is irregular with browning extending to mid-vein.	Scorch on blade is irregular with browning extending to mid-vein.
Yellow to red halo often present at margin of scorch.	Halo usually absent.
Symptoms reoccur and worsen each year, even during periods of normal rainfall or irrigation.	Symptoms occur during periods of drought and can be prevented with irrigation.

Disease Biology

Xylella is an obligate pathogen that grows in the vascular system of living plants. As weather warms in late spring, the bacterium multiplies rapidly and by late summer, it is occluding the xylem vessels in the stem and branches and in the leaf petiole of the infected host. Gums/gels produced by *Xylella* are likely contributing to the vascular occlusion and the development of water stress and scorch symptoms. The bacterium is spread by xylem-feeding insects including leafhoppers (Cicadellidae), spittlebugs (Cercopidae) and treehoppers (Membracidae). These insects acquire the pathogen when feeding on infested plants and then move on to healthy ones.

Diagnosis

The presence or absence of *Xylella* is determined by analysis of symptomatic leaves and associated twigs through Polymerase Chain Reaction (PCR) or Enzyme-Linked Immunosorbent Assay (ELISA). Sample quality and quantity is critical to achieve accurate results. The sample should be composed of twigs with scorched leaves attached. Samples should be placed in sealed plastic bags and shipped to a plant diagnostic laboratory that is capable of performing the analysis.

Management

There is no reliable preventative treatment for BLS. Remove diseased trees with advanced decline to reduce the likelihood of the pathogen spreading to healthy plants. If diseased trees are to be retained among healthy susceptible species, the diseased tree should be treated with a registered systemic insecticide that will control the insect vectors and reduce the likelihood of disease spread. Currently, systemic insecticides are available that can be applied to the soil or injected into the stem to provide suppression of the insect vectors for an entire growing season.

For diseased trees, antibiotics injected directly into the root flare will suppress development of the bacterium in the current year's xylem thereby suppressing

symptoms in the year of treatment. Treatments must be applied annually or symptoms will return.

Antibiotic injections should be combined with cultural practices to maintain the health of the tree. Appropriately mulching the critical root zone and providing supplemental irrigation during periods of drought are critical to the health of the tree. Fertilization should be based on soil analysis results. Monitor for outbreaks of secondary pests, including canker diseases, borers and bark beetles, and provide treatments as needed. Pruning diseased limbs as a means of eradicating the infection is not effective.

Founded in 1926, The Bartlett Tree Research Laboratories is the research wing of Bartlett Tree Experts. Scientists here develop guidelines for all of the Company's services. The Lab also houses a state-of-the-art plant diagnostic clinic and provides vital technical support to Bartlett arborists and field staff for the benefit of our clients.