Bacterial Leaf Scorch of Shade trees

Ann B. Gould, Ph.D., Specialist in Plant Pathology

Look for bacterial leaf scorch of shade trees in New Jersey oaks this September!

Trees in New Jersey landscapes may exhibit symptoms of leaf scorch as they become further affected by the current long-term drought. Leaf scorching in landscape trees and shrubs occurs when leaves lose water faster than the roots can supply it. When moisture is lacking, the margins tend to try out first, hence, the marginal scorch pattern typically associated with stressed plants. Symptoms of scorch may become evident any time water flow is disrupted within a plant.

Leaf scorching in plants is usually attributed to both biotic (living) and abiotic (environmental) agents. Abiotic (or environmental) agents that can cause scorching in leaves include drought, dehydrating winds, salt, flooding, chemicals, air pollutants, toxic metals, and nutrient extremes. Scorching can also occur when plants are placed in sites where roots do not develop normally (such as in planting islands or in soils with a hard pan layer), or when roots are physically damaged (such as occurs during construction). In most cases, this type of scorching is fairly uniform around leaf edges, affects newer leaves as well as older leaves, and will appear on vast expanses of the canopy. In addition, scorch symptoms may develop soon after a known stress (such as drought or an application of de-icing salt0 occurs.

On the other hand, scorching can also occur in plants affected by living or biotic agents. Organisms that can cause this symptom include fungi, bacteria, nematodes, viruses and insects. Leaf scorching due to biotic agents is not clearly defined. The scorch symptoms on leaves are often irregular in shape, and frequently a yellow or red “band” will appear between green and scorched tissues. In addition, symptoms may appear first on the older tree leaves of one or more branches, and then spread to other parts of the tree.

Certain New Jersey trees planted in landscapes and on golf courses are affected by a disease (a biotic agent) that causes leaves to scorch and is known as **bacterial leaf scorch of shade trees** or **bacterial leaf scorch.** This disease, caused by the bacterium *Xylella fastidiosa*, occurs in regions throughout the eastern, southeastern, and mid-western United States. Tree hosts affected by *Xylella* include American elm, oak, sycamore, London plane, red mulberry, red maple and sweet gum. *Xylella* also causes diseases in grapes, peaches, plums, citrus, almonds, and coffee. In addition, the bacterium infects a wide variety of other plants (alternative hosts), many of them weeds, without causing visible symptoms of disease.

Of all the shade trees affected by Xylella, the hosts most familiar to land managers throughout the southwestern counties of New Jersey are pin and red oak. This disease on oak is specifically known as **bacterial leaf scorch of oak** or **oak leaf scorch**. Thus far, pin and red oaks are the species primarily affected by this disease in New Jersey; incidence on other shade trees and other species of oak is rare. Refer to Table 1 for a list of oaks that have been identified with this disease in different parts of the United States.

At this time, oak leaf scorch is most prevalent in certain sections of Burlington, Camden, Gloucester, Salem, and Mercer Counties (Figure 1). For example, the disease affects 20% of approximately 1000 trees in Moorestown, NJ (C.Pfleider, Department of Parks and Shade Trees, personal communication). The incidence of this disease is increasing in other parts of the State, however; small populations of diseased trees have been identified in most counties in New Jersey.

Symptoms

Like leaf scorching due to other biotic agents, leaf scorch caused by *Xylella* is not clearly defined and is easily confused with scorching due to other causes. On oaks, scorch symptoms are often irregular in shape, and frequently a dull red or yellow band is apparent between healthy and scorched (necrotic) tissues. These symptoms usually occur in mid-to-late summer on leaves of one or more branches in the canopy. Affected leaves may curl and drop prematurely. As the infection progresses over several years, branches die and the tree declines. Affected trees eventually decline to the point where thy must be removed. The process of tree decline may occur quickly or slowly depending on the tree or the environment.

Disease Development

Xylella lives and multiplies within the xylem (or water conducting) vessels of infected plants, thus its classification as a vascular wilt. The bacterium induces moisture stress in the tree by inducing the production of gums that block xylem vessels.

The bacterium is carried from tree to tree (or vectored by xylem-feeding insects such as **sharpshooter leafhoppers** and **treehoppers**. These insects subsist on the fluid within xylem vessels and pick up bacteria when feeding on infected trees. When an insect carrying the bacterium subsequently feeds on a healthy tree, the new tree becomes infected. Once an adult insect acquires the bacterium, it can continue to infect trees throughout the remained of the insect's life. The particular species of insects that spread *Xylella* to oaks and other shade trees is currently unknown.

Diagnosis

Xylella was not recognized as a pathogen of landscape trees until the early 1980's, and its symptoms are very similar to those caused by other agents. It is not surprising, therefore, that the disease is frequently misdiagnosed. When trees are suspected of being infected with the leaf scorch bacterium, it is best to submit a small branch specimen (pencil-width in diameter), with scorched leaves attached, to the Rutgers Plant Diagnostic Laboratory for analysis. Diagnosticians will identity this disease by looking for the bacterium in xylem fluid or through the use of selective antibody techniques. Proper sampling is necessary for an accurate diagnosis; the best samples have leaves that are symptomatic for the disease.

Management

Residents, landscaper, arborists, and golf course superintendents in New Jersey should be on the lookout for oak leaf scorch from late August until mid-October. Since there is no cure for this disease, proper management strategy includes the maintenance of tree vigor for as long as possible. If possible, water affected trees during times of water stress to reduce the debilitating affects of this disease. In addition, other diseases, insects, and environmental stresses (including drought) enhance the development of bacterial leaf scorch. This disease may also predispose infected trees to other disease and insect problems. Branches and infected trees in a severe state of decline should be routinely removed, as they are potential hazards. Expensive tree injections reduce symptom development, but do not cure the disease and must be repeated. In areas known to be affected by this disease, plant trees that are not known hosts of the bacterium.

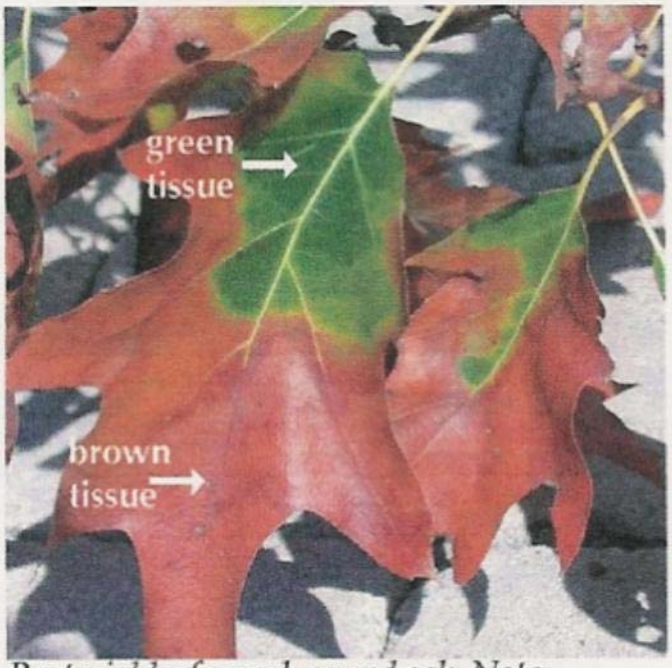
Source: Sherald JL. 2001. Xylella fastidiosa, a bacterial pathogen of landscape trees. In Shade Tree Wilt Diseases, ed. CL Ash, pp 191-202. St. Paul: APS Press.

Table 1. Oaks affected by bacterial leaf scorch

Host	**Location**
Black oak (Quercus velutina)	New Jersey *
Bluejack oak (Q. incana)	Florida
Bur oak (Q. macrocarpa)	Kentucky
Chestnut oak (Q.prinus)	Tennessee, New Jersey**
Laurel oak (Q.laurifolia)	Florida
Live Oak (Q.virginiana)	Florida
Northern red oak (Q.rubra)	Mid-west, mid-Atlantic, and northeastern states
Pin oak (Q.palustris)	Kentucky, Tennessee, and northeastern states
Post oak (Q.stellata)	Tennessee, New Jersey*
Scarlet oak (Q.coccinea)	Tennessee, northeastern and mid-Atlantic states
Shingle oak (Q.imbricaria)	Pennsylvania
Shumard oak (Q.shumardii)	Florida, Pennsylvania, New Jersey**
Southern red oak (Q.falcata)	Florida
Swamp white oak (Q.bicolor)	Tennessee, New Jersey *
Turkey oak (Q.laevis)	Florida
Water oak (Q.nigra)	Florida, Tennessee
White oak (Q.alba)	Tennessee
Willow (Q.phellos)	Tennessee

*Buckley, R.J., Rutgers Plant Diagnostic Laboratory

** New Jersey Forest Service-Community Forestry Program. 2001. The New Jersey Bacterial Leaf Scorch Survey Report (P.L. 2001, c.8). Department of Environmental Protection, Division of Parks and Forestry, Community Forestry Program.



Bacterial leaf scorch on red oak. Note: symptoms of this disease can be easily confused with scorching due to drought stress. Credit: Ann B. Gould