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Testing for Bacterial Leaf Scorch

Bacterial Leaf Scorch (BLS) is a serious infectious disease with a wide host range of trees and shrubs. The disease causes the slow decline of the host, resulting in host death. It is caused by the bacterium *Xylella fastidiosa* which is also responsible for Pierce's Disease in grapes and is currently causing widespread damage to the Italian olive industry.

In Illinois, it affects a wide number of trees. The most common hosts in our state are oak (red oak group), elm, sycamore, London plane, sweet gum, hackberry, ginkgo, and maple (sugar and red). Many other woody and herbaceous plants can be susceptible to the pathogen. The bacteria is found only in the xylem (water-conducting) tissue of the plants, and is spread from host to host by root grafts. Xylem-feeding leafhoppers, treehoppers, and spittlebugs are also thought to act as vectors for the pathogen. The disease does not spread quickly between hosts.

Scorch symptoms appear on leaves in early to midsummer, and gradually intensify as the season progresses. Affected leaves may turn a yellow/green color and then turn brown, usually from the margin of the leaf inwards (see picture). Older leaves are often affected first, and an individual branch or section of branches usually become discolored at the same time. Symptoms are generally

not scattered throughout the crown. Branches will leaf out the following spring, but symptoms will re-appear and slowly spread through the crown of the tree over the course of subsequent seasons. Except in oaks, leaves generally do not drop until autumn.

The symptoms are easily confused with drought stress, cultural problems, cankers, and, in oak trees, oak wilt. It can also be confused with Verticillium wilt in some trees. Submitting a sample to a plant diagnostic laboratory is the only way to definitively diagnose the disease. At the University of Illinois Plant Clinic, we use an antibody test to determine the presence or absence of the pathogen in symptomatic tissue. Testing is performed once a year, in late August or early September. This is because the population of bacteria within the affected tissue increases as the season progresses, so testing in late summer is most accurate due to the increased pathogen numbers. A test conducted in spring or early summer may result in a false negative due to the population of bacteria being too low.

If you suspect that a tree or shrub is affected by BLS, you may submit a sample to the University of Illinois Plant Clinic starting in August. We will store the samples until we perform the test. Samples should consist of symptomatic leaves complete with petiole (the structure that attaches the leaf to the branch). Ideally, at

least a few of the leaves would be transitioning from green to brown. There is a \$25 fee for this test. To download a sample submission form, please visit the Plant Clinic's website at www.web.extension.illinois.edu/plantclinic and click on the "Sample Forms" tab. Please indicate that you wish the sample to be tested for BLS.

Management for trees affected with BLS consists of increasing tree vitality by mulching the base of the tree to retain moisture, watering during periods of dryness lasting more than 2 weeks, pruning out dead branches, and fertilizing when appropriate. While trunk injections with antibiotics have been shown to be effective at delaying symptom development, they do not cure the tree and the injection sites open new paths of entry for organisms that decay wood. Over time, repeated treatments can severely weaken the tree. Choosing non-susceptible hosts to plant near affected trees is also recommended to prevent the spread of disease. (*Diane Plewa and Travis Cleveland*)

Bur Oak Blight and Look-alike Diseases

The U of I Plant Clinic has received many samples and questions regarding diseased bur oak trees. Most clients were concerned about possible Bur Oak Blight or Oak Wilt infections. This article will address some of the key diagnostic symptoms for Bur Oak Blight and some of its look-alikes.

Bur Oak Blight

Bur Oak Blight (BOB) is a fungal disease caused by the pathogen *Tubakia iowensis*. An important characteristic of

BOB is that it is a late season leaf blight. The most notable symptoms first appear in late July and August. Leaf blight symptoms appearing earlier than that are not likely to be related to BOB. Initially, infections are limited to foliage in the lower canopy. Infections progressively expand upwards, throughout the canopy from year to year as disease inoculum (fungal spores) within the tree builds. When scouting for BOB look for diseased leaves with a characteristic wedge shaped necrotic lesion near the apex of the leaf blade. Coalescing lesions and expanding vein necrosis causes the leaves to die and results in extensive defoliation. A more important phase of the disease, especially in terms of the pathogen's ability to overwinter, involves an early season infection of expanding shoots, followed by necrosis of the petioles several months later, usually in late July. Leaves killed by this phase of the disease remain attached to the tree into the winter, well after healthy bur oaks have dropped their leaves. Diseased leaf retention is currently one of the best ways to identify suspect trees. The leaf blade eventually breaks off, but the petiole remains attached. Look for petioles attached from the previous growing season. Infected petioles will have black pustules or scars from previously attached pustules. The diseased petioles produce the spores responsible for primary infections. The U of I Plant Clinic looks for combination of three symptoms and signs when diagnosing BOB: 1) wedge-shaped necrosis on the leaf blade, 2) *Tubakia* spp. on the leaf blade (microscope needed), and 3) a branch with diseased petioles still attached from the previous growing season. Refer to [Issue 16, September 16, 2015](#) for more information on *Bur Oak Blight*.

Tubakia Leaf Spot

Tubakia Leaf Spot is a common late season (July and August) leaf disease caused by the pathogen *Tubakia dryina*, which is closely related to that of Bur Oak Blight. The disease is more common on members of the red oak group, but does cause frequent infections to bur oak. Unlike Bur Oak Blight, Tubakia Leaf Spot is considered a minor disease. Tubakia leaf spot lesions will vary with host susceptibility and environmental conditions. The lesions start as small water soaked areas. They become evident as they enlarge and transition to a reddish brown color. Severe infections can cause premature leaf drop. The Tubakia pathogen is fairly easy to confirm in a diagnostic laboratory with the aid of a microscope. Tubakia Leaf Spot is not associated with tree mortality and is not known to infect or produce overwintering pustules on petiole tissues. *Refer to [Issue 13, August 3 2015](#) for more information on Tubakia Leaf Spot.*

Oak Wilt

Oak Wilt was covered in [Issue 12 of this year's newsletter](#). As a review, bur oak, and other members of the white oak group, are less susceptible to Oak Wilt. In fact, the plant clinic rarely confirms oak wilt on members of the white oak group. Infections on this group typically are slow to progress, and are confined to scattered branches of the canopy. This may help differentiate from Bur Oak Blight, which is initially concentrated on the lower canopy. Leaves on oak wilt infected branches appear wilted and have a light brown or straw-colored discoloration that moves inward from the leaf margin. While infected leaves may remain attached to the branches, they lack

the leaf vein and petiole symptoms seen with *Tubakia* spp. (*Travis Cleveland*)

Fall Webworm

Fall webworm is numerous in the state, particularly southern Illinois. It lives as a group of caterpillars that spin a communal silk web. This silk nest typically encloses the end of the branch and associated leaves. The caterpillars remain in the webbing, feeding on these enclosed leaves. When the leaves inside the web are eaten, the silk webbing is expanded to include more leaves. Webs of mature caterpillars are typically 2 to 3 feet long.

This insect has an extremely large host range, being found on almost any deciduous tree and some shrubs. It is most commonly found in Illinois landscapes on crabapple, walnut, hickory, pecan, redbud, sweet gum, maple, and oak.

Loss of leaves from caterpillar feeding at this time of year has little impact on tree health as long as their loss does not trigger new bud break. As long as damage is limited to a few branches, new leaf production is unlikely to occur. Control at this time of year is primarily recommended to reduce aesthetic damage so fall webworm colonies at the tops of tall trees and in other less obvious locations can be ignored, depending on client preferences.

Pruning off the branch with its webbing and disposing of it is an effective control. Many insecticides are effective in controlling fall webworm. *Bacillus thuringiensis kurstaki* (Dipel, Thuricide), carbaryl (Sevin), pyrethroids, and other labeled insecticides are effective. However, the webbing is waterproof, making

it spray resistant. Enough spray pressure is needed to break into the web and get the insecticide onto the leaves within the nest. Nest webs are typically expanded only every week or so, so insecticide deposited on leaves outside the webs is likely to break down before the caterpillars expand the webbing over treated leaves. (*Phil Nixon*)

Zimmerman Pine Moth

Zimmerman pine moth is a common trunk and scaffold branch borer in Scotch, Austrian, and red pine in Illinois. It is a shoot tip borer in Eastern white pine. Although it is difficult to control once inside the tree, its life cycle makes it relatively easy to control while on the outside of the tree.

Trunk damage appears as white, crusted areas of pitch an inch or two wide at branch whorls. Sometimes this also appears as whitish cones of pitch about one inch in length along with oozing pitch at the branch whorl. The caterpillars are located in the trunk underneath this pitch. They tunnel under the bark as well as deeper into the trunk and base of branches.

Commonly, associated branches will die. The death and flagging of these branches allows easy identification of attacked trees. Closer inspection for masses of pitch determines whether the damage is due to Zimmerman pine moth or other cause. Tunneling into the trunk for several years weakens the trunk to where it snaps off at that location, causing the loss of the upper part of the tree. The tree survives this loss as lateral buds will break and produce new trunks. However, without pruning, the

tree usually becomes multi-trunked from that point upward. This changes the overall appearance of the tree from that of a tall, telephone pole shape into a squatty candelabra shape.

The location of pitch at the branch whorl is important. Pine pitch moth can cause similar damage, but the pitch is located just under the branch whorl rather than between the branches. Yellow-bellied sapsucker feeding also results in large exudation of pitch, but occurs on the trunk between branch whorls. These woodpeckers require an open stretch of trunk to perch, resulting in their attack between the whorls.

Tip damage to Eastern white pine causes two or more inches of dieback. The needles turn brown and the tip usually bends downwards. Slicing open the shoot longitudinally during the summer reveals the feeding larva. The loss of the shoot results in lateral bud break and subsequent bushier foliage but not as much longitudinal growth. Generally, lateral shoots are attacked. Attack of the apical shoot on the tree causes a multiple-trunked tree if pruning and shoot training does not occur.

Full grown caterpillars are about one inch long and whitish to tan or greenish with dark brown spots. They pupate in or below the exuded pitch, emerging as one-half inch long light to dark gray moths. Emergence of the moths varies from mid-July in southern Illinois to mid-August in northern Illinois. Mating and egg-laying occurs soon after emergence. With egg hatch occurring a couple of weeks after moth emergence, this ranges from early to late August from southern to northern Illinois, respectively.

The young caterpillars on trunk-attacked trees feed on bark and crawl around on the bark for several weeks in the late summer before forming a hibernaculum under a piece of bark to spend the winter. A hibernaculum is a cocoon of silk that the larva spins around itself. After spending the winter in the hibernaculum, it emerges in the spring and roams across the bark for several days before tunneling under it. This behavior provides time periods in the late summer into early fall and early spring when the caterpillar is susceptible to exterior insecticide application.

On Eastern white pine and other shoot-attacked trees, the caterpillars feed on

terminal bud scales and form their hibernacula under the bud scales. Roaming activity and exposure to insecticide application occurs at the same time as trunk-attacking caterpillars.

This is the time of year to spray Scotch, Austrian, and red pine trunks and major branches with bifenthrin (Onyx), cyfluthrin (Tempo), permethrin (Astro), or other labeled insecticide to control Zimmerman pine moth. Spraying can be confined to the lower ten to twelve feet of pines under eight inches in diameter as this moth rarely attacks higher in the tree. It is not a trunk problem on larger trees, although scaffold branches can be attacked. Spray the ends of the branches on Eastern white pine. (*Phil Nixon*)