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PLANT DISEASES

Why Is "Iron" Chlorosis So Severe Now?

Chlorosis of trees has been particularly intense in Illinois in recent weeks. Before we can address possible causes, let's review the chlorosis facts. Chlorosis is another word for yellowing. With chlorosis of trees we generally see yellowing of the foliage, but veins remain green. A chlorosis due to lack of iron is called iron chlorosis, but in Illinois we also see chlorosis involving manganese deficiency. As a rule, iron chlorosis usually causes symptoms most intensely on the newest leaves, whereas manganese chlorosis symptoms appear on older leaves first. If left untreated, chlorosis progresses to brown speckling of the foliage, branch tip dieback, and eventually branch death.

Chlorosis is a common problem in Illinois on several tree species, including pinoak, sweetgum, maple (especially red and silver), and birch. In most cases the soil has plenty of macro- and micronutrients for tree growth, but high pH soils bind up the iron or manganese, making it unavailable to the roots. No pathogen is involved in this noninfectious problem, although secondary leaf-spotting fungi often invade the weakened tissues. Soil conditions are the cause of the chlorosis.

So why are we seeing more chlorosis than usual? There is a good chance iron and manganese are in the soil, but they are bound to the soil. Some iron and some manganese are absorbed by roots, but less than needed by the tree. If roots are compromised, even less absorption takes place. Whenever roots are injured, stressed, or growing poorly, absorption is limited. Most of Illinois is currently in moderate to severe drought status, adding to root injury and limiting absorption of nutrients. Soils with high clay content or poor drainage aggravate the problem. Some growers have been watering trees, especially shallow-rooted trees such as birch. This is helpful, but the pH of the water is also an issue. City water often has a very high pH level and can influence the soil pH where supplemental watering is frequent. Any and all of these factors may explain the increased appearance of this noninfectious problem in 2005.

You may have observed that often a tree is not affected with chlorosis until it is about 15 to 20 years old. Chlorosis seems to occur when roots grow into an area of high pH soil, such as the foundation of a building, the area under a sidewalk, a gravel parking lot or driveway, or one of many naturally alkaline sites. This may explain why many older trees seem to acquire this problem with age.

What can be done to remedy the situation? For older trees there may be nothing to be done to help. Prune out dead wood to avoid secondary wood rots. Try to improve drainage from the site to areas away from the tree. Consider treating the tree for chlorosis and possibly using an acid fertilizer in spring or fall. It might be wise to start with a pH test of the soil to determine the extent of that problem. Look for a local soil-testing lab in the advertising pages of the phone book. An Extension Web site lists some soil testing labs (http://www.urbanext.uiuc.edu/soiltest/index.html). The several types of treatment that can be used for chlorosis are discussed in RPD No. 603, *Iron Chlorosis of Woody Plants: Cause and Control*, which addresses both manganese and iron deficiency. The treatment method you choose will depend on the intensity of the problem, the age of the tree, the pH of the soil, and site restrictions. The RPD can be found in Illinois Extension offices and online (http://www.ag.uiuc.edu/%7Evista/horticul.htm). (*Nancy Pataky*)

Leucostoma (Cytospora) Canker of Spruce

Here is another disease that has been appearing frequently in the stress of 2005. Most landscape professionals probably know this disease as Cytospora canker. Although that is still a valid name, the current name for the causal fungus is *Leucostoma*, and thus the disease name is Leucostoma canker. The perfect stage of the fungus is *Valsa kunzei*. You may have heard of Valsa cankers on other woody hosts as well.

Leucostoma canker is probably the most common and damaging infectious disease of spruce in Illinois. Colorado blue and Norway spruces are very susceptible, especially trees 10 to 20 years old. The disease appears on spruces as dead or dying branches,

usually starting at the base of the tree and moving upward. Occasionally the affected branches are scattered throughout the tree. Needles may drop early from affected branches or hang on for several months, leaving dry, brittle twigs. An important diagnostic feature is that *Leucostoma* causes entire branches to die, including branch tips. A girdling canker forms at the base of the branch, and symptoms show first as a branch tip death. *Leucostoma* can continue to spread until all the branches on the tree are dead, but this process may take many years. Conspicuous patches of white resin commonly form on the bark in cankered areas at the base of dead branches, usually next to the trunk. The diseased tissue is brown under the thin layer of outer bark. Black pinhead-sized fruiting bodies of the fungus (pycnidia) form in the inner bark, often embedded in the resin. They can be hard to find, even with the aid of a dissecting microscope.

I think Leucostoma canker gets blamed for many site problems; don't be fooled when diagnosing it. The mere presence of dead branches does not confirm the disease. Look for resin areas at the base of the dead branches, then look more closely for the black pycnidia. We have seen so much damage to spruce from environmental stress over the past several years that injury may have nothing to do with an infectious agent. On the other hand, stressed spruce trees are more susceptible to Leucostoma canker, and it is highly likely that the disease will eventually invade the stressed tree as a secondary pathogen. This disease is found in most Illinois communities with older spruce trees.

There are no chemical controls to prevent or eradicate Leucostoma canker. Remove dead branches as they occur. Try to improve tree vitality by watering in drought stress periods. It may be helpful to apply organic mulch, such as shredded bark, under the full spread of the branches, but not up against the trunk. Mulch will help retain moisture and maintain a more even temperature and moisture environment for the roots. For more information on Leucostoma (cytospora) canker of spruce, consult RPD No.604, available at http://www.ag.uiuc.edu/%7Evista/horticul.htm or through a University of Illinois Extension office. (*Nancy Pataky*)

BLS Warning

BLS is short for bacterial leaf scorch, a disease that has been in the news in Illinois since 2001. Symptoms include scorching of foliage in mid- to late summer. Each spring the tree leafs out normally, but by midsummer the symptoms spread further in the tree. Although this scorching seems harmless at first, the disease becomes worse each year and can kill a mature tree in 4 to 6 years. Look for scorch symptoms that appear on older leaves first and late in the growing season to help distinguish this infectious disease from environmental scorch, which occurs in spring or early summer and affects newest growth first. BLS has been reported and confirmed on elm, hackberry, maple, mulberry, oak, sweetgum, sycamore, and planetree. To date in Illinois we have confirmed BLS only on oaks, but this includes positives on pin, shingle, bur, red, and white oaks. In 2004 we found seven more positive cases of BLS on oaks, but no new species were involved.

The bacterial pathogen causing bacterial leaf scorch is *Xylella fastidiosa*. It is found only in xylem tissue. Xylem-feeding leafhoppers and spittlebugs are thought to spread the bacterium in landscape trees. It can also be transmitted between trees through root grafts. The transmission methods must not be very effective, though, because we do not see rapid spread of the disease from tree to tree.

The bacterial pathogen cannot be seen in standard lab sections or isolated in the lab like most other bacteria. It can be confirmed using serological techniques. We cannot test for this bacterium at the Plant Clinic, so we send our samples to a private lab such as AGDIA with a serological (polyclonal antibody) test for the bacterium that can be done on young twigs and leaves. Consult AGDIA at http://www.agdia.com, 219-264-2014, or 800-62-AGDIA. If you prefer to go through the Plant Clinic with your sample, we can test for other problems but would have to bill for AGDIA testing as well. Call if you have questions.

What can you do if bacterial scorch is present? There is probably no way to keep the tree from dying, but you can help by pruning out dead wood as it appears. Start thinking of replacement options and plant a tree that is not known to host this disease. Pick a species that does well in the site you have in mind. Investigate drainage pattern, soil type, amount of sunlight, and any oddities about the location. I do not have any new information on treatment of this disease. There are no fungicides, insecticides, or bactericides that can be sprayed on a tree to positively, effectively prevent or cure it. An antibiotic called oxytetracycline is present in some commercially available injectable products intended to combat *Xylella*. There is not a great deal of research in this area, but work shows that in some cases oxytetracycline will suppress *Xylella* and may provide temporary symptom suppression when injected into trees. Researchers in

Kentucky have tried such injections and do not see any benefit. National Park Service researchers have seen only short-term benefits. Injections may need to be repeated as frequently as every year, can be costly, and afford no guarantees.

The best advice I can give concerning BLS is to become familiar with the symptoms. The National Arboretum has an excellent Web site with images and information at http://www.usna.usda.gov/Research/BacterialLeafScorch.html. (*Nancy Pataky*)

INSECTS

White Grubs

It is time to apply insecticides to control white grubs. The pattern of emergence of Japanese beetles is variable this year around the state. In many parts of the Champaign-Urbana area, numbers are small even though the first beetles were seen a month ago. The Bloomington area has had large numbers since mid-June. The early emergence may be due to the unusually early hot weather in May and June. Similar patterns of few or many beetles seem to be occurring in patches throughout the state. Be prepared for many more beetles to emerge later in July or perhaps even in August.

We may be seeing a developing pattern of the delayed emergence that has been reported in Ohio and other states east of Illinois. There, many beetles are emerging later in July or even in August, resulting in very small young grubs mixed with much larger ones in early fall. The smaller grubs overwinter, take longer to develop in spring, and emerge as adult beetles later in summer, perpetuating the longer adult emergence and larval hatching period. In Illinois, there appeared to be a somewhat extended adult emergence pattern into late July of 2004, but two different size classes of white grubs were not readily apparent.

Masked chafers (annual white grub adults) emerged as is typical in early July. The first adult that I know about was seen on July 2 in central Illinois. Apparently, the warm spring did not cause an early emergence of these species. The number of masked chafers appears to be low this year.

Regardless of the emergence pattern of the adult stages of various white grubs, the dry weather pattern over most of the state will result in increased egg-laying in irrigated turf. Even recent widespread rainfall from Hurricane Dennis is unlikely to change that pattern. Application of imidacloprid (Merit) or halofenozide (Mach 2) during July to irrigated turf should provide control. Both of these insecticides last long enough to control any late-hatching Japanese beetle grubs. Mach 2 is more water soluble and will flush down into the root zone if irrigation or rainfall occurs within 3 days after application. After 3 days, ultraviolet light apparently breaks down enough of the exposed chemical on the grass blades to reduce grub control. Merit should be watered in with at least 1/2 inch of water immediately after application to move it into the root zone where the grubs will contact it. (*Phil Nixon*)

Sod Webworm

With the dry weather throughout the state, we have received reports of lawns damaged by sod webworm. In Illinois, sod webworm is typically controlled by a naturally occurring microsporidian, a microorganism with characteristics of both bacteria and fungi. As with other disease organisms that we are familiar with on plants, microsporidia are more likely to be effective in moist situations. As a result, irrigated turf is unlikely to have sod webworm problems. However, golf course roughs, unwatered or irregularly watered lawns, and nonirrigated park areas are all likely during dry periods to be damaged by sod webworms. Because there are three generations of sod webworms in much of Illinois and the generations tend to overlap, damage by sod webworm larvae is possible any time during the growing season.

Damaged turf areas initially appear as small, irregularly shaped areas 1 foot to a few feet across in which the turf appears thin, with more brown thatch showing through than normal. These rapidly develop into completely brown areas that coalesce to areas that may be several hundred square feet in size. Close examination will reveal that the grass blades are not brown, they are gone, with the area appearing brown from the thatch. Large numbers of starlings, brown-headed cowbirds, robins, or other insectivorous birds feeding in the turf are another sign that sod webworms may be numerous.

Sod webworm is verified by flushing 1 square foot of turf with a gallon of water containing either a teaspoon of 5% pyrethrin or a tablespoon of dishwashing detergent. This will irritate any caterpillars in the turf, bringing them up onto the turf surface for a minute or two. Sod webworm larvae are slender, 1 inch long or less, and covered with small brown spots. The base color may be whitish, gray, tan, or light green. Two to three larvae per square foot are enough to cause turf injury.

Sod webworm larvae live in a silk-lined tunnel in the thatch and emerge at night to feed on the grass.

Grass blades are eaten off at the crown. When full grown, the caterpillars pupate in their tunnels. When the moths emerge from the pupae, the brown empty pupal shells commonly protrude from the turf. Several people have called recently about finding these pupal shells, which are less than 1 inch long, in damaged turf areas. The adults are slender tan moths up to 3/4 inch long. The moths appear tubelike because they hold their wings tightly against the body. They also have long palps that stick out in front of the head, appearing like a snout. They sit crosswise on grass blades, and when disturbed fly erratically in an up-and-down motion close to the turf. They settle back into the turf within about 30 feet, allowing one to sneak up to look at them. The moths are strongly attracted to light at night, so checking lighted windows at night is another good survey method. If sod webworm moths are numerous and the turf stays dry, an insecticide can be applied about 2 weeks after moth emergence to control newly hatching larvae.

Control can be achieved on older, feeding larvae or on newly hatched larvae with bifenthrin (Talstar), carbaryl (Sevin), halofenozide (Mach 2), spinosad (Conserve), *Steinernema carpocapsae* insecticidal nematodes (Biosafe), or trichlorfon (Dylox). The insecticidal nematodes need to be immediately watered into the turf after application. If you use a granular insecticide formulation, water with about 1/4 inch of water, enough to activate the insecticide off of the granule but not to flush it out of the thatch. Sprayed insecticides should be allowed to dry on the grass blades. (*Phil Nixon*)

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