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PLANT DISEASES

Remember Those Rudbeckias

Rudbeckias have always been one of my favorite perennials, but they have taken a beating in the last few years. One particularly unappealing disease of this species is Septoria leaf spot, caused by a fungus, *Septoria rudbeckiae*. I have not yet seen it in the landscape this year, but I want to remind growers of this disease so they can prepare for the battle. The dark brown leaf spots are hard to miss, starting as 1/8-inch-diameter spots that quickly merge to cause large, brown areas on otherwise dark green leaves. Disease begins on lower leaves and progresses up the plant.

One of the few problems that might look like Septoria leaf spot is a bacterial disease called angular leaf spot. A plant lab can easily distinguish between the two. Angular leaf spot produces bacterial streaming from sections observed with a microscope. Septoria leaf spot produces fruiting bodies that are embedded in the spots. Diagnostic, long, narrow spores are produced in the fruiting bodies.

Disease spread depends on leaf moisture. Rainfall splashes spores and helps spread the disease. You can help prevent further disease spread by watering the soil, as opposed to syringing the foliage. Also try to prevent overcrowding of plants and keep weeds under control. Preventive fungicide applications protect new growth from Septoria leaf spot. These sprays should be initiated before symptoms begin. Copper-based fungicides have some effect against both *Septoria* and the bacterium causing angular leaf spot. The copper products have protective-contact activity. A systemic product registered for this use for commercial applications is Heritage. The active ingredient is azoxystrobin. Consult the *Home, Yard & Garden Pest Guide* or the *Illinois Commercial Landscape & Turfgrass Pest Management Handbook* for details. The University of Minnesota has a fact sheet about rudbeckia diseases online at http://www.extension.umn.edu/projects/yardandgarden/ygbriefs/p154rudbeckiadisease.html. This fact sheet has images that can help you diagnose the problem with your rudbeckias. *(Nancy Pataky)*

Chlorosis of Trees

Iron chlorosis, or just chlorosis, has begun to show on pin oaks in the state. Chlorosis is another word for yellowing. It usually refers to leaves or needles that are light green or yellow rather than a healthy, dark green. Often the leaf veins remain dark green, while the rest of the blade is lighter in color. This condition is very common in Illinois on pin oaks, silver maple, red maple, sweetgum, and birch.

In Illinois landscape areas, the soils typically have a high (alkaline) pH level. Where irrigation is done, 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. These higher-pH soils may cause problems to trees. Minor nutrients are often tied up or bound within the soil chemistry, making them unavailable to the tree. In fact, these nutrients might be present in the soil, but they cannot be absorbed by roots. Iron or manganese seem to be the most limiting nutrients in a high-soil-pH system in Illinois. The symptoms caused by iron or manganese deficiency are very similar. Manganese deficiency is most likely if symptoms are worse on older leaves. Iron deficiency is often more a problem on new leaves first. An Illinois Extension report discussing iron and manganese chlorosis *(Report on Plant Disease,* no. 603, "Iron Chlorosis of Woody Plants: Cause and Control") can be accessed from this site, http://www.ag.uiuc.edu/%7Evista/horticul.htm.

We have seen a few cases of chlorosis at the Plant Clinic this season and expect more. Whenever roots are injured, stressed, or growing poorly, absorption is limited. It follows that symptoms intensify in wet periods. Soils with high clay content or poor drainage also aggravate the problem.

The question is how do we treat trees that are deficient because of the pH of the soil? Start by determining the soil pH. Consult your local soil-testing lab for this service. Determine the soil pH at which your tree thrives. Michael Dirr, in *Manual of Woody Landscape Plants*, often lists the desired pH for trees and shrubs discussed. Soils that have a pH below 6.7 seem to be ideal pH levels for red maples. Birches thrive at a pH of 6.5 or lower. Illinois landscape soils usually have a

pH of about 7.4. Changing the soil pH around an established tree is not a quick process.

If a tree is severely affected, you might consider spraying the foliage with a chelated iron or manganese product available at garden centers. By spraying only a small area with one of these products, and watching for plant response, you may determine which element is limiting. During the growing season, the leaves should become darker green within a week or two of foliar applications. Such treatment works only on the leaves sprayed, so effects are very temporary and benefit only the leaves currently expanded. New leaves emerging after the spray do not turn darker green unless a more permanent solution is used.

Adjusting the soil pH has long-lasting efficacy but is the slowest treatment in terms of plant response. One such method is to add sulfur to holes dug 12 to 15 inches deep and at 2- to 3-foot intervals in a series of parallel lines 2 feet apart under the complete spread of the branches and extending just beyond the drip line of the tree. Details are discussed in *Report on Plant Disease*, no. 603. This process may take several years to change the soil pH.

A short-term alternative that lasts for a couple of years is to inject chelated iron or manganese into the soil in the same holes that you dug for the sulfur. Actually, combining the two processes may give you the longest control. The chelates can be injected directly into the trunk but many horticulture specialists would rather avoid wounding the tree in this manner. Soil treatment is best done when the soil is moist in April, May, or early June. *(Nancy Pataky)*

Rose Rosette

Rose rosette has appeared in Illinois this year. It is a viruslike disease that causes the plant to form very thick, redder than normal stems with many times the normal number of thorns. Multiple stems at the ends of branches produce a witches'-broom growth. Symptoms are very obvious. You might think that your plants have been affected by a herbicide, but other nearby nonrose species are not affected. The disease seems to show in spurts, possibly related to increases in population of the eriophyid mite vector. Infected plants cannot be cured and must be removed from the garden, roots and all.

Rose rosette is caused by a double-stranded RNA, which means that it is a viruslike disease. It cannot be cultured in a lab; but, fortunately, symptoms are very distinct. The new growth usually appears deep red, on both leaves and stems. On some cultivars, the infected growth is an odd green color, as with a nutrient stress. Stems are stubby, soft, and brittle, with deformed leaves that may show crinkling, distortion, or a mosaic of green, yellow, and red. An infected plant produces numerous lateral shoots that grow in different directions, giving the plant a witches'-broom appearance. These shoots are typically deep red and much larger in diameter than the canes from which they grow. Thorns on these stems are more numerous than normal, giving the stem an almost hairy appearance. Plants usually die within 22 months of infection.

The vector of this disease is an eriophyid mite, a mite so small that 20 could fit on a pinhead. Eriophyid mites are much smaller than red spider mites, which are commonly seen on plants. You can see these with a 10X- or stronger-power magnifying glass. Grafting can also spread rose rosette disease. This Texas Web site, http://froebuck.home.texas.net/newpage2.htm, shows some symptoms of rose rosette, as well as an image of the mite vector.

Multiflore, climbers, hybrid teas, floribundas, miniatures, and some old variety roses have been infected with rose rosette. Hybrid teas typically show a color that is more yellow than red. So far, no other host besides rose has been found. Our clinic has seen a few cases of this disease on hybrid roses in recent years.

Currently, infected plants cannot be salvaged. Plants with symptoms should be dug up and destroyed (including roots) when first noticed. It is strongly suggested that multiflora and garden roses be separated as far as possible from each other. The efficacy of mite control has been questioned in control of this disease; but if miticides are used, research suggests that the critical mite transmission time is May and June, so concentrate your efforts in those months. For details, consult *Report on Plant Disease*, no. 666, "Rose Rosette Disease." *(Nancy Pataky)*

INSECTS

Scouting Watch

Bagworms have hatched in southern Illinois and are hatching in central Illinois. This timing is somewhat earlier than normal, as hatch typically occurs in central Illinois in mid-June. Realize that young bagworm larvae balloon from tree to tree on long silk strands for the first 2 to 3 weeks after hatch and that hatching is spread out over a period of a week or more. For these reasons, we do not recommend control until at least 2 weeks after hatch. The amount of damage caused by these young caterpillars is relatively small. Treatment for bagworms in southern Illinois should be delayed until mid-June and in central Illinois until late June or early July.

Periodical cicadas have emerged in the Washington, D.C., area and emerged earlier farther south. Adults should emerge in Vermilion, Clark, and Edgar counties in Illinois, as well as throughout Indiana dur-

ing the last week of May. You will know when they are out by the song (noise) the males produce, as well as by the brown, nymphal skins on tree trunks. Egg-laying, which causes tree and shrub injury, will not be heavy for at least a couple of weeks. At that time, protect tree trunks less than 1-1/2 inch in diameter with netting or screening that keeps the insects from getting to the trunk. This protection should remain in place through mid-July.

Gypsy moth was treated in locations of northern Illinois during the week of May 17. Treatment will continue through the last week of May, possibly into the first week of June. These are applications to control the young larvae. Typically, *Bacillus thuringiensis kurstaki* is applied by helicopter. Each area is sprayed twice, 1 to 2 weeks apart, to obtain a high level of control or eradication. In late June to early July, some areas will be treated with pheromone flakes to confuse the males, reducing mating and subsequent fertile egg-laying. *(Phil Nixon)*

Soft and Hard Scales: How Do They Differ?

Scales are common insect pests on ornamental trees and shrubs in landscapes. Scales may be a problem in urban environments due to the absence of natural enemies, and plants may be under physiological stress. Scales feed, with their tubelike mouthparts, within the vascular system, where nutrients and fluids are transported. Scales may resemble galls on plants. The best way to distinguish scales from plant galls is to use a fingernail and flip scales over. Galls, when removed with a fingernail, usually break off with bark attached.

Some scales are host specific, feeding on only certain plant species, whereas other scales feed on a wide range of plant species. Scales rarely kill a plant by themselves but may predispose plants to attack from wood-boring insects or secondary pathogens.

There are two types of scales: soft, or bark, scales and hard, or armored, scales. Characteristics of soft scales include (1) generally one generation per year; (2) produce honeydew; (3) typically overwinter as immature fertilized females; (4) appear convex in shape or resemble a helmet; (5) highly active crawlers; and (6) have a protective body wall. Characteristics of hard scales include (1) generally, two or more generations per year; (2) do not produce honeydew; (3) typically overwinter as eggs underneath the body of the dead female; (4) appear circular or rounded in shape; (5) crawlers are less active, compared to soft scale crawlers; and 6) separate protective covering.

There are several exceptions to these characteristics that are likely to be confusing. For example, obscure and euonymus scale, which are hard scales, do not overwinter as eggs. Oystershell and pine needle scale, which are hard scales, are not rounded but are more elliptical. Common scales are listed in Table 1.

Table 1. Common scales found in landscapes.

Soft scales
Cottony maple scale *(Pulvinaria innumerabilis)*
European elm scale *(Gossyparia spuria)*
Fletcher's scale *(Parthenolecanium fletcheri)*
Magnolia scale *(Neolecanium cornuparvum)*
Pine tortoise scale *(Toumeyella parvicornus)*
Tuliptree scale *(Toumeyella liriodendrii)*
Spruce bud scale *(Physokermes piceae)*
Hard scales
Hemlock scale *(Abragallaspis ithacae)*
Obscure scale *(Melanaspis obscura)*
Oystershell scale *(Lepidosaphes ulmi)*
San Jose scale *(Quadraspidiatus perniciousus)*
Euonymus scale *(Unaspis euonymi)*
Pine needle scale *(Chionaspis pinifoliae)*
Scurfy scale *(Chionaspis furfura)*
Juniper scale *(Carulaspis juniperi)*

Eggs are laid underneath the female scale cover. Hard scales can reproduce either sexually or asexually, and females can lay eggs or produce live offspring. Depending on the species, up to 2,000 eggs can be produced from a single female. Eggs hatch into oval, flat active (mobile) crawlers that vary in color (orange, yellow, gray, or brown), depending on the species. Scales disperse by means of the mobile first instar or crawler stage. Crawlers are generally located on the undersides of branches and leaves and on the sides of tree trunks that provide protection from direct sunlight, wind, and rain. Crawlers eventually settle down and begin feeding by inserting their mouthparts into plant tissue and withdrawing plant fluids.

Hard scales do not produce honeydew because they feed differently than soft scales. Instead, hard scales rupture and destroy plant cells they are feeding on and oftentimes bypass the plant vascular bundles that transport nutrients through the plant. In contrast, soft scales, which produce honeydew, feed on plant fluids that move through the vascular system. These plant fluids, after passing through the scale, are the basis for honeydew. Honeydew is a clear sticky liquid that serves as a growing medium for sooty mold fungi, which produces a black coating on leaves. This coating interferes with the plant's ability to manufacture food through photosynthesis.

Scales, when feeding, may inject salvia that can be toxic to plants. Also, feeding by scales opens up wounds that provide entry sites for plant pathogens. Males eventually molt into very small, winged, gnat-like insects that live for about 2 weeks. Their primary function is to fertilize females (for soft scales). Hard scale females continue to molt and later lose their legs

and cannot move (remaining sessile for the rest of their life). In contrast, soft scale females retain their legs. Both hard and soft scale females ultimately die, and their bodies form a protective covering over the eggs and for emerging crawlers.

Systemic insecticides are effective in controlling soft scales because they feed on plant fluids containing these insecticides that are transported through the plant vascular system. However, they are less effective on hard scales because these scales do not feed exclusively on plant fluids. *(Raymond A. Cloyd)*

Flea Beetles

Flea beetles are being reported in various areas of the state on roses, flowers, and other herbaceous plants. Frequently, they are described by the public as looking like tiny Japanese beetles. In reality, they are metallic black, blue, or greenish beetles that are 1/16 to 1/8 inch long. They jump and fly when disturbed.

Damage appears as pinheadsized holes in leaves or window-feeding. Window-feeding occurs as the insect eats through one epidermis, usually the lower epidermis, and the mesophyll, leaving the remaining epidermis intact. The remaining leaf surface, or epidermis, is initially light-colored but soon turns brown as the tissue dry and die. These insects overwinter as adults and are most numerous after less severe winters.

There is a large number of flea beetle species, and they typically feed on only a few plant genera or maybe one family of plants. Thus, damaged weeds or other nearby plants usually do not result in their moving to other, more important plants later. The adult flea beetles are present for a few weeks until they lay their eggs and die. A few species' larvae appear as elongate, black, spiny larvae up to 1/2 inch long, feeding on the undersides of leaves. Most species' larvae live on the roots of plants, frequently a different plant species than the ones fed upon by the adults. It is uncommon for this larval feeding to require control.

Light feeding damage can usually be ignored. Plants with heavier flea beetle numbers or those experiencing heavy damage can be treated with carbaryl (Sevin), rotenone, or various pyrethroids labeled for the plant. Be sure to avoid getting insecticide on the blossoms so that butterflies, bees, and other pollinating insects are not killed. *(Phil Nixon)*

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