UNIVERSITY OF ILLINOIS EXTENSION
HOME, YARD & GARDEN PEST NEWSLETTER
College of Agricultural, Consumer and Environmental Sciences, University of Illinois at Urbana-Champaign
Illinois Natural History Survey, Champaign

No. 11 • June 30, 2004

PLANT DISEASES

Downy Mildew of Rudbeckia

Downy mildew initially causes light green spots on the upper leaf surface of infected plants. Spots may appear darkened or water-soaked with time. The diagnostic feature of downy mildew is the underside of these lesions. There, you see a grayish white, downy growth composed of hyphae and spores. The sporulation is distinct, and most labs can observe this growth with a compound microscope for rapid, positive identification of the disease. Usually oldest leaves are affected first. Infected leaves may become necrotic and drop from the plant.

The downy mildew fungus *(Plasmopora* sp.) overwinters as oospores in dead plant material or in the soil. In the spring, these spores are splashed to lower leaves. Another type of spore (sporangia) forms in the downy material on the leaves. These spores are spread by wind and water. To minimize disease spread, space plants properly, control weeds, and water early in the day to minimize periods when leaves are wet. Fungicides can be used as preventives.

Downy mildew development occurs in cool, wet weather. Recently, the Plant Clinic received samples of downy mildew on rudbeckia, geranium, and salvia. Downy mildews may occur on other garden plants, such as Artemisia, aster, cornflower, geranium, lupine, potentilla, rose, salvia, snapdragons, veronica, and pansy. An article on rose downy mildew can be found in issue no. 6 of this newsletter. There are two nice images of rudbeckia with downy mildew on the Internet at http://www.ipm.msu.edu/grnhouse04/G01-03-04downymildew.htm. This is a Michigan State University greenhouse alert page. There is also a University of Illinois *Report on Plant Disease* that may be helpful: no. 657, "Downy Mildew of Snapdragons," available on the Extension site http://www.ag.uiuc.edu/%7Evista/horticul.htm. *(Nancy Pataky)*

Pine Wilt

At this time of year, it is easy to spot trees affected with pine wilt. The disease causes sudden appearance of off-color needles or a quick change from green to brown needles on pines. Usually older trees are affected, with 15- to 20-year-old trees being the norm. In most cases, there are healthy trees of similar species around an affected tree. The affected tree sticks out like a sore thumb. Pine wilt might be confused with Sphaeropsis blight, but pine wilt affects the entire tree rather quickly. Salt injury can appear similar, but that injury is one-sided (exposed side of tree) and injures tips of branches first. Drought stress, root injury, and construction damage might also resemble pine wilt.

The "pine wilt" name appropriately describes the sudden gray–green, wilted appearance of mature pine trees. There is no recovery, and trees quickly turn brown in heat. Watering does not help because the plant cannot absorb the water. In Illinois, we see pine wilt on all pine species except white pine.

Pinewood nematodes are vectored (spread) by Sawyer beetles and a few related long-horned beetles. The nematode lives in the wood of the tree. The nematode is microscopic and causes blockage of the water-conducting tissues, resulting in a wilt symptom. The nematodes are not visible with the naked eye, but symptoms are quite apparent.

Samples to be tested for pine wilt should be sent to the Plant Clinic or another lab where a nematologist is available. Our fee is $18.75. Branch samples should be 1 to 2 inches in diameter and long enough to put into a vise so that wood discs can be cut from both ends of the branch. The pinewood nematode is not uniformly distributed within a tree. We find that the most reliable samples are from branches that have brown needles still attached. When sampling Austrian pine, also include the terminal 12 inches of a stem with brown needles attached.

There are no known effective chemical controls for pine wilt or its vector. Affected trees should be burned or buried to reduce reservoirs of infection. (Recent research shows that it is probably safe to chip the trees for mulch. Still, you might want to compost the mulch before use or spread it out to dry before placing it near pines.) Prune dead branches from live trees to minimize attractiveness to beetle feeding. Beetles that emerge from the dead wood may carry the nematode and fly to healthy pines several miles away. When the beetle feeds on a healthy pine, it may transmit the nematode to the tree through feeding wounds. The nematode enters the resin canal and eventually clogs the water-transport system of the tree.

All pines grown in Illinois except white pine are susceptible to pine wilt. Because white pines have many problems of their own (see issue no. 6 of this newsletter), that species would not be encouraged as a replacement species unless the site has been carefully selected to avoid stress problems. Replace dead pines with Norway or blue spruce, Douglas-fir, fir, cedar, hemlock, or other nonhost species. Consider the site, soil, and space when selecting a replacement. Consult *Report on Plant Disease (RPD)*, no. 1104, "Pine Wilt Disease," for details. *RPDs* are available in Extension offices and on the Web at http://www.ag.uiuc.edu/%7Evista/horticul.htm. *(Nancy Pataky)*

What's Wrong with My Red maple?

Many red maples have recently shown stress symptoms throughout Illinois. We've seen red leaves near the top of the tree, smaller than normal leaves, some branch decline, and overall poor appearance on Plant Clinic samples. There are many possible causes of decline, and here are a few to consider.

Verticillium wilt is a possibility. That fungal pathogen can infect any maple and cause decline, dieback, wilting, and branch death. Verticillium wilt was discussed in issue no. 8 of this newsletter. Vascular streaking of the branches is a quick diagnostic tool for identifying this disease. Laboratory cultures take about 10 days but can prove the fungus is present.

Many samples contain small leaves with a red cast. The amount of stem growth on these samples is only about 1 inch annually for the last 3 years—a clear indication of stressed conditions. Michael Dirr in *Manual of Woody Landscape Plants* says that red maple has a moderate growth rate and grows 10 to 12 feet in 5 to 7 years. He adds that it is very tolerant of soils but prefers slightly acidic, moist soils. He states that chlorosis shows on foliage of trees in high-pH soils. The actual limiting element may be iron or manganese, but the cause is the high-pH soil that ties up these elements.

Another problem some may be seeing on this species is potato leafhopper feeding injury. In issue 10 of this newsletter, Raymond Cloyd discussed this insect and the injury it can cause on many species, especially red maple. Feeding, especially on maples, results in stunted tree shoots and leaves that curl downward, with brown edges. There are three to five generations per year, so damage still may be occurring.

What do you do if your red maple is showing stress? Look for potato leafhoppers on the newest leaves. Look for vascular streaking of the wood; and, if it's present, send to a lab for confirmation of Verticillium wilt. Have a soil pH test run to determine whether your tree is in an appropriate site and whether you need to supplement nutrients. Refer to *Report on Plant Disease (RPD)*, no. 603, "Iron Chlorosis of Woody Plants," for information on how to do this. Sometimes spraying an iron or manganese chelate (available at garden centers) on the foliage quickly answers the question of which element is limiting. Try to provide additional water to this species in periods of drought stress. The tree does best on moist sites. Consider a general tree fertilizer in the fall. By then, you will know whether to use an acidic fertilizer, based on your soil test.

Rapid decline of an entire red maple tree could be caused by a graft incompatibility. Red maples available in the trade now are usually produced on their own roots, eliminating this possibility. *(Nancy Pataky)*

INSECTS

Japanese Beetle

Japanese beetle adults have emerged in central and southern Illinois. Emergence is expected in northern Illinois during the first week of July. We have reports of a very heavy emergence in the Belleville area of southwestern Illinois. In east-central Illinois, they are apparently still emerging on June 25, with most damage being reported on grapes, but are also being seen on willow and other preferred plants.

Adult Japanese beetles are stocky, 3/8- to 1/2-inch-long, metallic green beetles with copper-colored wing covers. They are present in high numbers for about 6 weeks. They feed on the foliage and flowers of a wide range of plants, most commonly on smartweed, crabapple, linden, birch, willow, rose, grape, apple, peach, and brambles. They do not feed heavily on needled evergreens, ashes, magnolias, oaks, and maples other than Japanese maple. They feed during the day at the top of the plant on the leaf's upperside—they appear to like sunshine. Individuals typically fly to another food plant every 3 days. These flights tend to be long, from 3/4 to 1-1/2 miles.

Beetles mate, and the females tunnel into the turf to lay eggs. These eggs hatch into white grubs that feed on the turf's roots, resulting in browning and dieback of the turf in late summer and fall. Female beetles are strongly attracted to moist, actively growing turf, so stopping or reducing irrigation during July results in reduced egg-laying, with fewer grubs. The beetles go to the neighbors' moister, greener lawns to lay their eggs. Typically, unwatered lawns do not have enough white grubs to warrant insecticide application.

The adults feed through the upper epidermis and mesophyll, leaving the lower epidermis intact. Initially, damaged leaves are whitish but soon turn brown as the exposed lower epidermis dries and turns brown.

This type of damage is called window feeding. Heavy feeding results in holes in the leaves and can progress on favored hosts to skeletonization, leaving only the major leaf veins. As apples, peaches, plums, berries, and other fruit ripen, the beetles attack them, completely covering the fruit. Apples are eaten to the core, whereas the skin of peaches is commonly left uneaten, leaving a dry, empty shell where fruit once was.

Beetles are attracted to previously attacked plants. Homeowners can greatly reduce damage by handpicking, particularly for the first week or two after beetle emergence. Use a widemouthed jar (such as a peanut butter jar) containing rubbing alcohol or a detergent and water mixture. Hold the jar under a beetle; poke it; and the beetle will fold its legs and fall into the jar, being killed by the alcohol or drowning in the soapy water. Doing this daily or every other day for the first couple of weeks results in plants with little damage compared to the neighbors' plants. Throughout the rest of the season, beetles will be more attracted to the plants next door.

Heavily attacked ornamental plants in obvious locations in the landscape can be sprayed with carbaryl (sold as Sevin), cyfluthrin (sold as Tempo, Bayer Advanced Garden Insect Killer), or other pyrethroid. An application typically controls the beetles for about 2 weeks. Because they are out for about 6 weeks, three applications are needed. Due to the repeated applications and large plants that are commonly attacked, insecticide use can be reduced by spraying only plants where the damage is very noticeable. Plants in less obvious locations and large trees can go untreated because the damage is less noticeable. The beetles are so numerous and mobile that those on the untreated plants make little difference in the number attacking treated plants or the amount of turf injury by the subsequent white grubs. *(Phil Nixon)*

Scouting Watch

Bagworms should be treated at this time throughout Illinois. We recommend waiting for a couple of weeks after egg hatch for the larvae to stop ballooning and settle down to feed. In central Illinois, the bagworms are about 3/8 inch long, but little damage has occurred. Egg hatch occurred up to a month ago. *Bacillus thuringiensis kurstaki* (Dipel, Thuricide), spinosad (Conserve), cyfluthrin (Tempo), or other labeled pyrethroid should be effective against the larvae. Realize that these insects tend to feed heaviest at the top of the tree and work their way down, so be sure that the top of the tree is treated.

Gypsy moth pheromone flakes were applied in Carroll, Cook, DuPage, Kane, Will, and Winnebago counties in northern Illinois during the fourth week of June, weather permitting. Inclement weather may result in the applications' being finished in the next week. Maps of northeastern Illinois application sites can be viewed at http://www.urbanext.uiuc.edu/gypsymoth. Pheromone flakes are applied by airplane in areas where gypsy moth populations are low. Gypsy moth males follow a pheromone emitted by the female to find her for mating. When pheromone flakes are applied, the area is saturated, so that male moths are unable to find females for mating. Unmated females lay unfertilized eggs that do not hatch. In areas with higher infestations, male gypsy moths blindly encounter females often enough that there is little reduction in caterpillar numbers the following spring

Fall webworms are numerous in southern Illinois. These are gregarious, yellowish caterpillars that live in a silk web spun over the end of a branch. There are two generations per year in the southern half of the state, with the second generation appearing in August and September. Because the caterpillars are always in the web, pruning out the web is an effective control. *Bacillus thuringiensis kurstaki* (Dipel, Thuricide), spinosad (Conserve), cyfluthrin (Tempo), or other labeled pyrethroid should be effective, but high spray pressure is needed to penetrate the silk tent. *(Phil Nixon)*

Flea Weevils

Flea weevils are being reported by the Morton Arboretum, and we are receiving calls of leaf tatter symptoms on Siberian elms elsewhere in the state. Because these insects overwinter as adults, control involves preventively spraying the emerging leaves in the spring with acephate (Orthene) or imidacloprid (Merit). These same insecticides should be effective at this time against the adult beetles, but much of the damage is already caused by the leafmining larvae.

The following is from the Morton Arboretum's *Plant Health Care Monitoring Report* at http://www.mortonarb.org/plantinfo/plantclinic/phc/index.htm. The adults are 3-mm (1/8-inch)-long, gray–brown to black, oval beetles with a small, snoutlike mouthpart typical of weevils and enlarged hind legs used for jumping. The weevils eat one side of the leaf, leaving the thin epidermis intact. This feeding results in "window pane" symptoms on the leaf. Eventually, the epidermis dries out and pulls away, leaving 3-mm (1/8-inch), irregular holes in the leaves. Flea weevil damage can be differentiated from leaf tatter by the "window pane" symptoms and because the former occurs on newly emerging leaves and the leaf tatter is present on older leaves. *(Phil Nixon and Morton Arboretum)*

Research Update: Are Fertilized Plants More Resistant to Plant-Feeding Arthropods?

There is a longstanding belief that healthy, vigorously growing trees and shrubs are better able to tolerate or repel plant-feeding arthropods (insects and mites). However, a critical review of the evidence finds little support for this claim. In fact, fertilization, particularly with nitrogen-based fertilizers, actually decreases woody plant resistance to piercing–sucking and wood-boring insects by increasing the nutritional quality of plants and decreasing the production of secondary metabolic compounds that are responsible for the production of chemical defenses against insect and mite pests. The fertilization of woody plants has been shown to increase susceptibility to a number of different insect and mite pests, including aphids, adelgids, scales, plant bugs, lace bugs, spider mites, caterpillars, sawflies, leaf beetles, leafminers, white pine weevil, and Nantucket pine tip moth.

Growth and reproduction of plant-feeding insects and mites is limited by the nutritional quality of the hosts that they are feeding on and generally increases as the plant's nitrogen content increases. Thus, fertilization benefits plant-feeding insects and mites by increasing the nutritional quality of the host plants. In addition, fertilization may decrease the concentration of secondary metabolic compounds in plants. This is a result of a resource-based physiological tradeoff between the primary and secondary metabolic pathways. For example, fertilization of loblolly pine, *Pinus taeda*, increased growth and decreased concentrations of foliar phenolic compounds, which resulted in decreasing resistance to the Nantucket pine tip moth.

When fertilization stimulates growth, this may result in plant resources being diverted away from other processes such as secondary metabolism. In addition, rapidly growing plants may have lower levels of carbon available to support other processes. To avoid dealing with plant-feeding insects and mites during the season, apply only the proper amount of fertilizer. In addition, send a soil sample to a laboratory that can analyze the nutritional content of the soil in which trees and shrubs are growing and provide recommendations on *what should be added* and *what should not be added* to the soil. *(Raymond A. Cloyd)*

Source: Herms, D.A. 2002. Effects of fertilization on insect resistance of woody ornamental plants: reassessing an entrenched paradigm. *Environmental Entomology* 31(6): 923–933.

Home, Yard, and Garden Pest Newsletter is prepared by Extension specialists from the University of Illinois at Urbana-Champaign and the Illinois Natural History Survey. Information for this newsletter is gathered with the help of staff members, Extension field staff, and others. Karel Jacobs and Donna Danielson of The Morton Arboretum also provide information and articles.

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