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INSECTS

Rose Pests

Roses are widely planted in gardens and landscapes for their beautiful floral display and scent. However, they are susceptible to a variety of insect and mite pests, one reason roses are considered a high-maintenance plant. This article discusses some of the major rose pests, including aphid, Japanese beetle, two-spotted spider mite, rose midge, and rose sawfly.

Aphid. The predominant aphid species that attacks roses is the rose aphid, *Macrosiphum rosae*. However, many others also attack roses. Aphids are soft-bodied, pear-shaped insects, generally less than 1/4-inch long; they vary in color (green, pink, and red). Two tubes, cornicles, stick out from the end of the abdomen.

Aphids don't have to mate to reproduce, and they can give birth to live offspring. Aphids are generally found feeding on roses early in the season. They remove plant fluids with their piercing-sucking mouthparts. Aphids tend to congregate in large numbers, feeding on terminal growth (leaf and flower buds) and on leaf undersides. Their feeding causes leaves to curl upward and deforms flower buds. In fact, flower buds may abort (fall off) before opening. In addition, aphids produce honeydew, which attracts ants and serves as a growing medium for black sooty mold fungi. Aphids don't normally cause direct plant harm to roses unless they are present in high numbers.

Aphids are susceptible to a variety of natural enemies (predators and parasitoids), which in sufficient numbers can provide some control. A hard stream of water removes aphids from plants without harming their natural enemies. This technique is effective as long as it doesn't promote diseases such as black spot. If needed, pest-control materials for aphids include acephate (Orthene), diazinon, imidacloprid (Merit), and insecticidal soap. When using systemic insecticides such as imidacloprid, apply them early enough so that the active ingredient is present in new growth just as aphids start feeding.

Japanese beetle, adults of *Popilla japonica*, which was discussed in issue no. 10, is a major pest of roses. Japanese beetle adults are 3/8-inch-long, metallic

green beetles with coppery brown wing covers. They have tufts of white hair at the end of the abdomen.

Adults are typically present from late June to early July. Japanese beetle adults congregate in large numbers on rose flowers. They mainly feed on flowers but also on leaves. They chew holes in flowers, which causes them to not open or to drop petals prematurely. They also feed on the petals and pollen of fully opened flowers. Adult feeding on leaves gives a skeletonized appearance.

Japanese beetle adults can be managed in small rose plantings by handpicking or placing a fine netting over the plants. In larger plantings, pest-control materials—including carbaryl (Sevin) and cyfluthrin (Tempo)—are generally effective in killing Japanese beetle adults. Repeat applications are necessary. Sevin should not be used when bees are active, as it is extremely toxic to bees. Apply Sevin in early morning or late evening. Avoid using Japanese beetle traps, which tend to lure more beetles into an area than would normally be present.

Two-spotted spider mite, *Tetranychus urticae*, is orange, green, or yellow, with two dark spots on the sides of the body. Spider mites tend to feed on the underside of rose leaves, especially older leaves. They remove chlorophyll (green pigment) from rose leaves with their styletlike mouthparts. Their feeding causes leaves to appear bronze-colored and stippled. From a distance, leaves look yellow and dusty. Also, silken webbing may be present on leaf undersides. Heavily infested rose leaves turn brown, curl, and fall off.

Infestations of two-spotted spider mite normally occur under dry, hot conditions (above 70°F). During summer, spider mite populations can build up to tremendous numbers. Roses experiencing drought stress are more susceptible to spider mites. Two-spotted spider mites overwinter in protected areas such as on weeds, ground litter, or fallen leaves. They do not overwinter on roses, which means dormant oils are not effective. Spider mites can be detected on roses by holding a sheet of white paper underneath leaves and tapping the leaves sharply. Minute green, red, or yellow specks about the size of pepper grains drop on the paper and crawl around.

A hard spray of water removes spider mites from roses and preserves populations of natural enemies.

Remove any fallen leaves or branches, as well as weeds, which may serve as a host for spider mites. Keep plants well watered and apply mulch to rose plants during drought conditions to minimize stress. Pest-control materials include abamectin (Avid), bifenthrin (Talstar), dicofol (Kelthane), hexythiazox (Hexygon), insecticidal soap, and summer oil.

Rose midge, *Disineura rhodophaga*, can be a destructive rose pest. Adult midges are small (1/20-inch long), red to yellow-brown in color. Females lay tiny yellow eggs on new growth, beneath the sepals of flower buds, in leaf buds, or in shoots. Eggs hatch into small (1/12-inch long) white larvae (maggots) that eventually turn bright orange. The larvae possess sickle-shaped mouthparts, which they use to create deep gouges in plant tissue; and then they feed on the exuding sap. They generally feed at the base of flower buds or on the upper leaf surface and leaf petioles. A large number of larvae (10 to 25) may be present in a single bud. Their feeding causes leaf axils and buds to become twisted, deformed, and blackened; this eventually kills new shoots. The larvae fall to the ground to pupate in small, white cocoons. Rose midge overwinters as a pupa. Adults emerge in about 5 to 7 days. The adults are rarely seen and do not feed, living for only 1 to 2 days. The life cycle from egg to adult, depending on temperature, takes 16 to 22 days.

Managing rose midge initially involves removing and destroying infected plant parts. If necessary, pest-control materials including acephate (Orthene), diazinon, and malathion can be used.

Rose sawfly. Three species of sawflies attack roses: the rose slug, *Endelomyia aethiops*; the bristly rose slug, *Cladius difformis*; and the curled rose sawfly, *Allantus cinctus*.

The rose slug females create slits or pockets along the edges of rose leaves with the sawlike ovipositor and insert individual eggs. The eggs hatch into larvae resembling slugs. The larvae are 1/2-inch long when fully grown and yellow-green, with an orange head. They feed on the upper leaf surface, giving the leaf a skeletonized appearance. Eventually, the larvae drop to the ground to pupate. Rose slug overwinters as a pupa. There is one generation per year.

Bristly rose slug larvae are pale green and 5/8-inch long. The body is covered with many bristlelike hairs. The larvae feed on the underside of leaves, similar to rose slug, giving the leaf a skeletonized appearance. There may be several generations per year.

The curled rose sawfly larvae are green, with white markings on the thorax and abdomen. The head is yellow, with black eye spots. This sawfly differs from the other two in that the larvae may consume an entire leaf and then bore into pruned twigs. The larvae initi-

ally skeletonize leaves, but they eventually eat the entire leaf except for the main vein. The larvae then tunnel into twigs to pupate. This leads to death of stems and creates wounds, which serve as entry sites for fungal pathogens. Two generations per year may occur in Illinois.

To manage rose sawflies, clean up all debris and remove weeds. A hard spray of water knocks sawfly larvae from plants; and they are unable to crawl back onto roses. The three species of rose sawflies are susceptible to natural enemies, including predators and parasitoids; but they may not occur in numbers sufficient to prevent damage. If necessary, pest-control materials including carbaryl (Sevin) and insecticidal soap may be used. (*Raymond Cloyd*)

PLANT DISEASES

Hackberry Woes

Hackberry trees are "tough old birds" that rarely express many problems. In fact, the two most common are really not problems at all. These include witches'-brooms and island chlorosis. The third problem reported to the Plant Clinic is a fairly heavy leaf drop.

Witches'-brooms are a proliferation of shoots from one point—making the stem appear to have a broom-like growth at the end. Common hackberries (*Celtis occidentalis*) in Illinois have this condition so frequently that we tend to think this symptom is part of the normal growth habit. Many of the twigs in a broom die back in the winter. The overall appearance of the tree is many clumps of thick growth throughout the canopy, with dead twigs interspersed. The brooms may be unpleasant to see but do not kill the tree.

These brooms are caused by a powdery mildew fungus in association with an eriophyid mite. Still, control measures are usually ineffective, and most people accept the brooming as the character of this species. If you are going to plant a new hackberry, consider Jesso hackberry, *Celtis jessoensis*, or sugar hackberry, *Celtis laevigata*. Sugarberry is less frequently affected with brooms, and Jesso is considered resistant. *Report on Plant Disease (RPD)* no. 662, "Witches' Broom of Hackberry," discusses this condition.

Island chlorosis is a disease that appears on hackberry leaves as yellow spots. These are very blocky because they are delineated by veins. With green areas around the yellow spots, affected leaves appear as yellow islands in a sea of green, thus the name island chlorosis. The disease is thought to be caused by a virus. As far as we have been able to determine, the disease is a curiosity but does not cause any damage.

The Plant Clinic has also received a few calls this year complaining about massive leaf drop from hackberry trees. This condition was also reported in 1998, but I have no idea if the same trees are involved. In 1998, a few samples were submitted, and staff found no infectious disease or insect problem on the foliage. Contact chemical burn was suspect, as was cold injury when leaves were in the bud. Affected trees developed healthy new leaves. No callers this year have made a sample submission. If you have problems with hackberry leaf drop, give us a call.

One suspect is root rot. Two common root pathogens, *Ganoderma* and *Armillaria*, may infect hackberry. I would expect to see these diseases on stressed trees, so look for root or trunk injury, evidence of a grade change or construction nearby, or some change since symptoms appeared. A mature, healthy hackberry is not going to be seriously injured by cold snaps, drought stress, or lack of fertilizer. Look for major site changes. *Report on Plant Disease RPD* no. 641, "Decline and Dieback of Trees and Shrubs," may present some possible causes of stress. (Nancy Pataky)

Rose Rosette

Rosarians know this disease is a problem as soon as they see it. Rose rosette causes plants to form very thick, redder-than-normal stems with four or five times the normal number of thorns. If you miss these symptoms, you are not looking at your roses. When I first heard about the disease, I was told that it would not get into the retail market because it was so obvious that infected plants would be pulled by wholesalers. In fact, this disease is becoming far too common. Infected plants cannot be cured and must be removed from the garden, roots and all. Here's the facts.

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 appears deep red, both on leaves and stems. Leaves may show crinkling, distortion, or a mosaic of green, yellow, and red. An infected plant produces numerous lateral shoots growing in different directions, giving the plant a witches'-broom appearance (described in hackberry article, this issue). 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 about 22 months of infection. Because of the way roses are propagated, rose rosette is often identified in the nursery, and infected plants are rogued before they get into the retail market. Sometimes there are escapes, or plants are infected in the garden.

The vector of this disease is an eriophyid 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 would need a strong magnifying glass to see these mites. Grafting can also spread rose rosette disease.

Multiflora rose is the most common host of this disease, but it has been reported on cultivated flowering varieties as well. Climbers, hybrid teas, floribundas, miniatures, and a number of old-variety roses have been infected. 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 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 of this disease, consult *Report on Plant Disease RPD* no. 666, "Rose Rosette Disease." (Nancy Pataky)

Phloem Necrosis, or Elm Yellows

You thought you had Dutch elm disease in your tree, but lab results say you don't? The Dutch elm disease fungus is the easiest of the vascular pathogens to isolate. It survives in heated twigs and can be isolated from even small-diameter wood. If you are certain you sampled a live section of the tree exhibiting vascular discoloration, then maybe your tree has a similar-appearing disease called elm yellows, or phloem necrosis.

Refer to issue no. 7 to review Dutch elm disease. Dutch elm disease is still with us, but another problem elm disease is elm yellows, also known as phloem necrosis. It is caused by a phytoplasma (type of pathogen) that is found only in phloem tissue. This fact, along with the infected phloem's turning brown, gives the disease the alternative name of phloem necrosis. Because elm yellows and Dutch elm disease can be similar in appearance, it is important to know the differences.

Symptoms of elm yellows may appear anytime during the summer but are most common in mid- to late summer. Look for symptoms to start soon—including yellowing and drooping of foliage, followed by leaf drop and death of branches. This pattern may occur on one or a few branches or may quickly involve the entire tree. Susceptible trees may show symptoms over the entire tree in only a few weeks.

Tolerant trees become stunted and may develop bumpy, prolific growth at the tips of branches (another example of witches'-brooms) or on the trunk. The inner bark tissues of infected trees often exhibit a butterscotch or light brown discoloration in small streaks or flecks. Although trees infected with the Dutch elm disease fungus usually show vascular discoloration in symptomatic branches, discoloration from elm yellows is not usually in the branches: It is more commonly found in the trunk. A simple field test to help diagnose this disease involves taking a few chips of the stained phloem tissue, placing them in a closed container for a few minutes, and then checking for a wintergreen odor.

Elm yellows is caused by a phytoplasma (formerly called a mycoplasma-like organism). Phytoplasmas are bacterial-like organisms that have no cell wall, are too small to be seen with a compound microscope, and cannot be cultured in plant diagnostic labs. Generally, diagnosis is based on symptoms in the field. For this reason, no confirmed cases have been reported by our clinic, but confirmation has come from several knowledgeable tree specialists in the state. The disease is believed to be spread by such phloem-feeding insects as leafhoppers. The phytoplasma overwinters in infected tree roots and witches'-brooms on elms.

What is the fate of infected trees? Some may live for several years, but most infected elms die within 1 or 2 years of developing symptoms. There is no cure. The good news is that elm yellows does not move into new areas as quickly as Dutch elm disease. Removing

infected trees is advised to eliminate inoculum sources from the area. Siberian elm seems resistant to this disease. Watch for the development and release of resistant Asiatic or European elms. For more information, consult *Report on Plant Disease RPD* no. 660 or the book *Diseases of Trees and Shrubs* by Sinclair, Lyon, and Johnson, as well as many Web sites discussing elm yellows. There is a publication available from the US Forest Service called *How to Differentiate Dutch Elm Disease From Elm Phloem Necrosis*. Check this out on the Web at http://willow.ncfes.umn.edu/ht_dednecr/ht_dednecrosis.htm. (Nancy Pataky)

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