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INSECTS

Fungus Gnats

Fungus gnats are a major greenhouse pest in many crop production systems. The two most common species of fungus gnats found in greenhouses are *Bradysia coprophila* and *Bradysia impatiens*. Fungus gnats are one of the few greenhouse pests who go through their damaging stage within the growing medium. They are generally a problem under moist conditions, especially during propagation, and before plants develop well-established root systems.

Fungus gnats are a problem in crop production systems for the following reasons. Large populations of adults flying around are a nuisance, which may affect salability. Both the adult and larval stages are capable of disseminating and transmitting diseases. The larvae cause direct plant injury to roots and create wounds that may allow secondary soilborne pathogens such as Pythium to enter. Finally, larvae tunnel into cuttings and stems, which makes management with insecticides or biological controls very difficult. Greenhouse managers can better implement pest management strategies by understanding the life cycle of fungus gnats and the conditions that promote them.

Fungus gnat adults are winged insects with long legs and antennae. They tend to fly around the surface of the growing medium, and they live for seven to ten days. Females deposit 100 to 200 eggs in the cracks and crevices of the growing medium. They are highly attracted to growing medium that contains peat moss and pine bark.

The eggs hatch into white, transparent or slightly translucent, and legless larvae that grow to approximately 1/4 inch long. Fungus gnat larvae have a black head capsule, a characteristic that distinguishes them from shore fly larvae. Larvae are generally located within the top 1 to 2 inches of the growing medium surface, but they have also been found in the bottom of containers near drainage holes. They are highly attracted to cuttings before callous formation. Fungus gnat larvae undergo four larval instars before entering a pupae stage. Adults emerge from the pupae after approximately four to seven days. A generation from egg to adult can be completed in 20 to 28 days, depending on temperature.

The best approach to minimizing fungus gnat problems is to understand the conditions that favor these insects. Several conditions in the greenhouse may lead to fungus gnat problems. These include overwatering plants and/or irrigation leaks so that there is excessive moisture; fertilizing plants with high levels of nitrogen, promoting algae growth, which provides breeding sites for fungus gnats; using fresh (new) growing medium, which is very attractive to fungus gnat adults for egg laying; spacing plants tightly together, which retains moist conditions that favor fungus gnat development; and, finally, using gravel or dirt floors, which may accumulate or retain moisture for long periods of time allowing algae to build up.

Greenhouse managers who understand the conditions that favor fungus gnats can implement the necessary cultural management strategies. First, avoid overfertilizing plants. This prevents the growth of algae in containers and underneath benches, and it minimizes root damage from excessive fertilizer salts. Next, reduce excess moisture by locating the sources of moisture and fixing irrigation leaks. Check to be sure that cool-pad distribution tubes are not leaking. Third, allow the top 1 to 2 inches of the growing medium to dry out. This may reduce egg hatch, and it may force the fungus gnat larvae to migrate deeper into the growing medium where they are easier to control. Fourth, remove old plant and medium debris. Maintain clean areas underneath greenhouse benches and floors. The last step in fungus gnat management is to control weeds in containers and underneath benches. This practice helps reduce moist conditions, which may lead to lower fungus gnat populations. I will discuss chemical and biological management of fungus gnats in a later issue of this newsletter.
(Raymond Cloyd)

Bagworms

Bagworms are very numerous in central Illinois as well as in other areas of the state. Heavy populations have been noticed on arborvitae, spruce, honey locust, and linden. Although stripped branches of deciduous trees such as honey locust and linden will releaf later this year or next, defoliated branches of arborvitae, spruce, junipers, and other needled evergreens usually die. If enough branches die, the entire tree or shrub may die.

Many of the bagworms being seen are still relatively small, 3/4 to 1 inch long. Although many insecticides are not effective at this size, bagworms should be controllable with sprays of *Bacillus thuringiensis kurstaki* (Dipel, Thuricide) or cyfluthrin (Tempo). Other synthetic pyrethroids besides Tempo should also be effective. Be sure to get thorough coverage of the foliage, particularly if using *B.t.k.* Caterpillars should be most numerous at the top of the tree. *(Phil Nixon)*

Potato Leafhoppers

Potato leafhoppers continue to be very numerous throughout the state. The 1/8-inch-long, green, wedge-shaped adults are a nuisance in the evening flying around lights and coming indoors. Make sure that the synthetic pyrethroid or other insecticide that you may have applied to red maple or other affected ornamentals is still effective. *(Phil Nixon)*

PLANT DISEASES

Diagnosing Tree Root Problems

Diagnosing disease and insect problems can really be fun. The task becomes more difficult when the problem is not something infectious or related to insects. It takes time to wade through all of the site, environmental, and cultural factors involved, and often this sort of information is not provided. Here are some tips on diagnosing tree root problems—things to look for *before* you send a sample to the Plant Clinic.

There are, of course, many belowground reasons for the decline of a tree. Drought, flooding, compaction of the root zone, poor soils, planting too deeply, inadequate space for roots, and many more factors could be involved. Often, diagnosing such a problem involves a process of elimination, ruling out possibilities that might cause similar symptoms. One of the more difficult possibilities to eliminate is root rot. Most gardeners believe that they cannot possibly know the health of a mature tree's roots.

The first sign of any root problem is top decline. Look for a few clues to determine whether a tree is growing well. You can see a tree's annual growth by looking at the trunk cross-section. Most of us have done this as children. We counted the number of rings to tell us how old a tree was when it died. We have also looked at the thickness of these rings to compare growth between years. A less destructive way to determine the amount of growth is to look at the stems. Follow the stem tip back to the first set of closely aligned rings (about 1/8 inch apart) around the stem. That is one year's growth. Continue down the stem to the next set of rings for the next year's growth. Most trees grow anywhere from 6 to 18 inches of twig length in one year. Of course, this varies with the species and whether you are looking at a shady or sunny part of the tree. If the tree has only grown 1 inch of twig for the last two years and 8 inches three years ago, it is safe to say that the tree is under stress and that the stress began two years ago. Cankers on the stems, stem tip dieback, off-color foliage, early fall color, and early defoliation are also clues that a tree may be stressed by underground causes.

To detect pathogenic wood rots and root rots, look for mushroomlike fungi growing at the base of the tree or shrub. In the case of wood rot fungi, the conks (also called shelf fungi or fruiting bodies) may be found growing aerially on the trunk or main branches. These are signs of the pathogen. The actual mycelia of the fungus is probably growing in or on the roots or internally in the wood. One of the most common examples is Ganoderma root rot, which produces a shelf type of fungal structure at the base of many trees, especially honey locust. The structure is reddish brown and appears to have been varnished. Its presence indicates that a root rot has invaded. Other fungi may indicate wood rots. Wet weather often triggers the formation of these structures. They could easily be confused with fungi growing on dead organic debris near a tree. If, however, they are growing from the tree itself, they are excellent signs of wood rot or root rot.

You can also do some careful digging in the root zone of a tree to try to determine the health of the roots. Do this near the drip line at two or three spots.

Healthy roots are brown on the outside but white internally or at the very tips of the roots. If the roots have a soft, brown outer layer that easily pulls off the center of the root, a root rot may be involved.

Some experts say that the presence of conks on a tree or root rot in the root system means that a tree will soon die. That may be the case, but trees and shrubs may survive for many years with wood or root rots. Do not remove a tree simply because it has a conk. Instead, use this as a diagnostic tool in determining the true problem with the tree. If the tree becomes a threat to life or property because of its potential to fall or blow over, remove it as soon as possible.

No chemicals will help a tree in decline. Use approved cultural practices to improve tree vitality, including weekly waterings of 1 to 2 inches of water in periods of extended drought. Also, cut out dead branches in the dormant season, fertilize in late fall or early spring, and keep traffic off the root system. For very old or very large trees, fertilization and watering may have no benefit. On most trees, these measures may help the tree continue to live for many years. Wood rot and decline fungi do not have to be fatal. *(Nancy Pataky)*

Blackening of Arborvitae

This is not a devastating disease of arborvitae, but it is a condition we see often enough to be bothersome. Leaves and stems on the inside of plants are often affected, but we see it most often on branches that overlap from one arborvitae to the next. We have tried to isolate and identify pathogens associated with this tissue to no avail. It is not any of the commonly found pathogens of arborvitae, and it is not the common internal browning of arborvitae that occurs in late winter. The condition we are seeing is not browning and drying of leaves but a blackening of leaves, often with leaves still firm, not rotted. We have not found any insects, mites, or related creatures associated with this blackening.

We cannot tell you with certainty what is causing this condition. We surmise that heat, poor air circulation, and possibly humidity are to blame.The condition does not spread but appears more or less all at once. It is most likely weather and site related, so chemicals are no help. Remove affected tissue in dry weather, water the plants in periods of extended drought, and fertilize in the fall to help plant vitality. Prune surrounding plants to enhance air flow in the area. *(Nancy Pataky)*

Bacterial Wetwood and Slime Flux of Trees

Lately, we have had many questions at the Plant Clinic about liquid oozing from trees. Often, trees have seepage coming from a major crotch or wound in the trunk. This condition is called bacterial wetwood.

Wetwood causes a water-soaked condition of wood in the trunk, branches, and roots of many shade and ornamental trees, especially old street trees. Elms, poplars, cottonwoods, and maples seem most commonly affected in Illinois, but probably any tree is susceptible. Bacterial wetwood is a chronic, rarely serious, disease of trees that can contribute to general decline in tree vitality but is not known to cause tree death.

Wetwood is most visible externally as a bubbling seepage of bacteria and toxins from wounded tissue in V-shaped branch crotches, pruning wounds, injection holes, and trunk cracks. You cannot always see the wound, but you can see the liquid. Bacteria in the inner sapwood and heartwood of the tree ferment, causing internal gas pressure. This pressure commonly reopens old wounds, and the sour liquid flows down the bark. As it dries, a light gray to white encrustation called slime flux is left. The liquid commonly causes localized death of the cambium. The fluxing occurs from April to December but is most conspicuous in the summer.

There is no cure for this condition, but the following practices may be helpful. Fertilize stressed trees in the spring to stimulate vigorous growth. Some persons like to install perforated plastic or iron drain tubes in the tree to relieve the gas pressure and to allow continual drainage away from the tree. The idea is to keep the liquid off the trunk so that the cambium is not killed. A disadvantage of drain tubes is that another deep wound is made, breaking the “compartment” that the tree has made to encompass the wetwood, thereby allowing the internal discoloration and any future decay to spread outside the wetwood-affected area. Removing dead or weak branches, plus promptly pruning and shaping bark wounds, is helpful. Consult *Report on Plant Disease* No. 656 for more on this condition. *(Nancy Pataky)*

Ash Yellows

Ash yellows primarily infects white and green ash in the north-central and northeastern parts of the United

States. It is a problem in Illinois, but one that is difficult to quantify, because its presence is difficult to confirm. Ash yellows is caused by a phytoplasma (formerly called mycoplasma-like organisms). These pathogens are somewhat like virus particles, cannot be cultured in a lab, and are thought to be spread by phloem-feeding insects.

This disease is characterized by a loss of vigor over a period of two to ten years before the trees die. Symptoms include short internodes and tufting of foliage at branch ends. Leaves become pale green to chlorotic and might develop fall colors prematurely. The tree might defoliate, and the canopy appears sparse. Cankers form on branches and the trunk, and twigs and branches die back. Witches'-broom sprouts of growth might appear on some branches but are more common on the trunk near the ground. Cracks in the trunk may appear in this area as well. Ash trees seldom recover from ash yellows.

Ash decline is a term that is often used loosely to refer to more than one condition. This term most commonly refers to the ash yellows disease, but it is often used to indicate any decline of ash for which a cause has not been identified. A great percentage of the ash trees in our landscapes are green ash. They do not show ash yellows symptoms as clearly as white ash. It is very likely that this disease is more common than we realize because the typical witches'-brooms and yellowing are not always seen with green ash. Instead, we see only the cankers and stem dieback. To complicate matters, Verticillium wilt on ash also results in cankers and dieback and does not cause the typical vascular discoloration of most Verticillium infections. It is difficult and time consuming to distinguish between ash yellows, Verticillium wilt, and "ash decline" on our green ash trees in Illinois. Diagnosis of these ash problems depends almost entirely on symptoms that could be caused by a variety of other problems.

There are no cures for any of these maladies of ash. Suggested management to slow disease progression includes removing trees with severe dieback, watering the trees in periods of extended drought, and fertilizing in the fall with a general tree fertilizer. Removal of dead limbs may help as well. *(Nancy Pataky)*

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