

A STUDY GUIDE FOR NURSERYMEN

GENERAL INSECT INFORMATION

There are a large number of insect pests that can occur on a wide variety of ornamental plants. You cannot possibly identify all the insects you encounter, so you will need the assistance of your county Extension agent, Extension entomologist, and others.

Ornamental pests may be divided into two groups, according to the way they feed: (1) insects with sucking mouthparts (i.e. aphids, scales, mealybugs, thrips, mites, whitefly) and (2) insects with chewing mouthparts (i.e. caterpillars, cutworms).

Damage by pests with sucking mouthparts is similar because they use these mouthparts to pierce the plant tissue and suck the plant juices. Damaged foliage is usually mottled. Eventually, plants may wilt due to excessive loss of plant juices.

Damage by pests with chewing mouthparts is similar; portions of the plant eaten by these pests are bitten off and consumed. The insects may feed on leaves, flowers, stems, or roots.

GENERAL DISEASE INFORMATION

Plant diseases are difficult to diagnose and control due to the size of the pathogenic organisms involved. Because of their size, disease diagnosis requires the identification of symptoms or the reaction of plants affected by these organisms. These symptoms may include leaf spotting, mottling, chlorosis, canker, galls on roots and stems, and root discoloration.

Environmental factors may cause conditions that may be mistaken for plant diseases. Such things as frost injury, dog urine burn, and nutrient deficiencies, for example, will not be corrected by pesticide applications.

Unless the pathogenic organism is known, the chemical or cultural practice used to control the symptom may not work. Identifying a root problem as root rot when it actually is a nematode problem will not be cured by applying a fungicide -- a nematicide is required.

Diseases may be classified into four general groups according to the basic causal organism: fungi, bacteria, viruses (viroids and mycoplasmas), and nematodes.

INSECTS

MITES (RED SPIDER)

<http://www.grassrootslawncare.com/spider.html>

Mites may be distinguished from insects by the absence of discernible body segmentations and the presence of eight, rather than six, legs. Many are so small that they cannot be detected (1/64

inch) without the use of a hand lens or magnifying glass. They vary widely in color, but most of the ones found in the greenhouse are reddish. Often, their presence is not detected until they become very numerous, and cause obvious plant damage. Frequently, the mite damage appears as bronzing on the foliage. A thin webbing in which mites may be seen may be associated with mite infestation.

Reproduction usually is continuous on greenhouse crops, increasing as the temperature rises. Because of rapid reproduction, mites need to be quickly managed. There are specific chemicals called miticides that are effective in management.

MEALYBUGS

<http://entweb.clemson.edu/cuentres/cesheets/ornament/ce65.htm>

Mealybugs are soft-bodied insects usually covered with a powdery or cottony wax-like covering. They vary in length from 1/5 to 1/3 inch. Although mealybugs can move about, they tend to stay put.

The life history of most mealybugs is about the same. The mature female deposits her eggs in a waxy sac beneath the rear end of her body. The eggs hatch in about 10 days and the young crawlers (without the covering) begin to feed by inserting their mouthparts into the plant tissue and sucking out the sap.

Mealybugs among the most serious of greenhouse pests--injure plants by sucking sap. The masses of wax from their bodies and their egg sacs render the plant unsightly. The honeydew they excrete serves as a medium for the growth of sooty mold.

Mealybugs may be very troublesome on foliage plants; control is difficult because of their cottony covering. They are easiest to control when in the young crawler stage.

SCALES

<http://search.ipm.iastate.edu/>

Scale insects constitute a very large group of plant feeders, and may occur in the greenhouse or on outdoor ornamentals. They have sucking mouthparts, feed on plant juices, and are 4-5 mm in length. Armored scale insects are most common in the greenhouse.

Scale insects pass through three stages: egg, nymph, and adult. During part of the nymph stage, the scales move about on the plant. This period is generally referred to as the crawling stage. Once the crawlers insert their mouthparts into the plant, they cannot move again.

Scales damage plants by sucking the plant juices from the leaves and stem, causing dead areas to appear. If left uncontrolled, defoliation occurs, and the plant may die. The insect can be extremely prevalent on foliage plants. They are much easier to control when young, especially

in the crawler stage.

APHIDS

http://ipmwww.ncsu.edu/AG295/html/pea_aphid.htm

Aphids or plant lice, are small (2-4 mm), soft-bodied sucking insects infesting nearly all types of plants. Their color varies from green to reddish to black. Usually, they cluster in colonies on the underside of leaves and on new growing points or buds. Adults are either winged or wingless.

Reproduction may be continuous on greenhouse crops. Both nymphs and adults suck the sap from the plant, causing discoloration and curling of the leaves. Severe damage may cause stunting or the death of the plant. Aphids secrete a honeydew, which may make a plant unsightly because of the soft mold fungus that develops in the substance. Because of repeated generations, repeated use of a suitable insecticide is necessary.

BIRCH LEAF MINER

<http://www.msue.msu.edu/msue/imp/mod03/01701252.html>

The adult birch leaf miner is a tiny, black, four-winged insect approximately 1/8 inch long. The larvae or miners are flattened, white in color, and have three pairs of legs. When mature, they are almost 1/4 inch long. After wintering as a pupa in the soil, the adults begin to emerge in May and June. Females lay their eggs in newly developing terminal leaves, and the larvae feed or mine the plant tissue between the upper and lower surfaces of the leaves. As the larvae grow, feeding increases and the serpentine mines often run together to form characteristic blotches or blisters. When mature, the larvae drop to the ground and enter the soil to pupate.

Damage is confined to the leaves where the larvae feed. At first, injury is noticeable as small, irregular, blotch-shaped brown blisters on the surface of the leaves. Infested trees have a scorched or blistered appearance. Repeated leaf losses weaken the trees, making them susceptible to attack from other insects. Spray when leaves are nearly full size. A repeated application is needed for the second generation (June – July).

WHITE PINE WEEVIL

<http://willow.ncfes.umn.edu/fidl-wpw/weevil.htm>

The adult white pine weevil is a reddish-brown snout beetle about 1/4 inch long, marked irregularly with white scales. Tiny, glistening drops of resin on the bark or leader indicate adult feeding or egg-laying.

The adults over winter in litter on the ground, resuming activity in May. In the spring, the adults go to the terminal shoots and feed on the bark tissue. Eggs are deposited in small punctures in the bark of the leader. The eggs hatch and the legless grubs feed on the inner bark and tissues

that produce tree growth. When several larvae are feeding, the shoot is soon girdled and then dies. The grubs mature and pupate inside the leaders. Adult beetles emerge from July to September.

Grubs girdle the leader, causing it to curl, turn brown, and die. Crooked trunks and trees with two leaders develop, making the trees unsaleable. Most pine and spruce species are affected. Cut off and burn infested shoots as detected. In early spring when the buds are swelling, spray terminal buds with insecticide.

EASTERN TENT CATERPILLAR

<http://agweb.clemson.edu/hort/HomeHort/OIETentc.htm>

This insect causes defoliation in early spring and summer. In the fall, egg masses are deposited in bands around small branches.

The egg masses are about 1/2 inch long, rounded at the ends, and protected with a varnish-like covering. Eggs hatch and larvae begin feeding as soon as leaf buds start to open. An ugly, white, silken tent is constructed in the crotch of the tree; the immature larvae return to the nest at night.

The adult caterpillar is about 2 inches long, and has a dark head with a light stripe on its dark back. There are large blue blotches on each side of its body.

During winter and early spring, destruction of egg masses is effective on small plants. Also, destruction of wild cherry trees in the vicinity will do much toward controlling tent caterpillars. Spraying at the first sign of attack is a good control method. Burning of nests, a common practice, however, is undesirable since it is likely to damage trees.

DISEASES

CROWN GALL

<http://www.cas.psu.edu/docs/CASDEPT/PLANT/ext/crowngal.html>

Crown gall is a bacterial disease affecting many plant species. It is characterized by the formation of rough-surfaced, knobby galls usually found near the soil line. The galls may be hard or soft and spongy and up to several inches or more in diameter. They occur on roots, but also may appear on the crown and upper stems of some plants. Infected plants gradually decline and appear stunted. Foliage is often chlorotic, and the plant may fail to produce flowers.

Infection takes place only through plant wounds. In most cases, infected or contaminated plants introduce the crown gall bacterium into an area. The infection is capable of persisting in the soil for many years. This disease should not be confused with the aphid or mite galls that appear higher up on some plants.

APPLE SCAB

http://www.caf.wvu.edu/kearneysville/disease_descriptions/omapscab.html

Olive drab spots 1/4 inch in diameter appear on the leaves and the smaller leaves on the fruits. Leaves may drop prematurely and the fruits might become disfigured. The fungus, which may over winter on the twigs, is common on eating apples and many flowering crabapple varieties. Some flowering crabapples are resistant to the disease.

BLACK ROSE SPOT

<http://www.cas.psu.edu/docs/CASDEPT/PLANT/ext/blackspt.html>

Black rose spot probably is the most widely distributed and best-known rose disease. It is confined to roses and may affect practically all varieties, although all are not susceptible. The primary symptoms are circular spots up to 1/2 inch in diameter with fringed margins. This fringed margin is a diagnostic symptom, and differentiates black spot from other leaf spots. The spots vary from one to two to a dozen or more a leaf, usually on the upper surface. In susceptible varieties, the appearance of black spots is soon followed by yellowing of a portion of all of the leaflets and defoliation.

POWDERY MILDEW

<http://aggie-horticulture.tamu.edu/plantanswers/turf/publications/powderymild.html>

Several different species of fungi cause powdery mildew. The disease appears as a white to light-grayish powdery coating on the surface of leaves, stems, and fruits. Infected leaves may be curled or twisted, or turn yellow and die. Small spots may enlarge and cover the entire leaf or bud.

Unlike those of most other fungi, powdery mildew spores do not require free water for germination. High humidity at the leaf surface is sufficient. This occurs when cold nights change to warm days, when plants are crowded or grown without sufficient air circulation.

LEAF SPOTS IN GENERAL

<http://www.cas.psu.edu/docs/CASDEPT/PLANT/ext/fact.html#greenhouse>

http://www.ag.ohio-state.edu/~ohioline/b614/b614_24.html

Various fungi and bacteria cause leaf spots, the most common disease of plants. In general, the size, shape, and color of spots are rather specific to the causal agent. The spots often have a definite margin, and may have conspicuous concentric zones. If numerous, the spots may coalesce, forming blotches.

Most leaf spot diseases flourish during wet, cloudy weather, or when the foliage is kept syringed during cloudy periods. Some may be serious enough to call for control measures other than general sanitation and good cultural practices.

HERBICIDES

Based on use, herbicides are grouped into selective and non-selective, and based on contact, translocated and sterilant chemicals.

SELECTIVE AND NONSELECTIVE HERBICIDES

Selective herbicides kill certain weeds without seriously injuring desirable plants. The reasons for selectivity in some combinations of weeds and desirable plants are known; in other situations, they are unknown.

Nonselective herbicides, on the other hand, kill vegetation with little discrimination. However, certain species of plants may be physiologically resistant to the chemical or may escape through a particular growth habit. Some escapees are perennials that have part of their root system below treated layers of soil; others are annuals and shallow rooted perennials that reinfest an area after the chemical has leached below the surface layer.

CONTACT, TRANSLOCATED, AND SOIL STERILANT CHEMICALS

Contact herbicides kill the tissues wetted with the spray. Whether the plant dies or recovers depends on whether it has a protected growing point. Usually, perennials have underground buds that will regrow.

Translocated chemicals are absorbed by leaves, and stems or roots, and move through the vascular system to leaves, buds, and root tips. When absorbed by the leaves and stems, the chemical is commonly moved with the food materials that were manufactured in the leaves and stems. When absorbed by the roots, it moves through the water-conducting tissue. The growth regulator type of translocated herbicide is a synthetic compound that behaves like a plant hormone. It accumulates most in areas of rapidly dividing cells, upsetting the normal metabolism of the plant and causing the death of the cells.

A soil-sterilant herbicide makes soil incapable of supporting higher plant life, but it does not necessarily kill all life in the soil, such as fungi, bacteria, and other microorganisms. Its toxic effects may remain for only a short time, or for years.

Additional References

Johnson, W.T. & Lyon, H.H. Insects That Feed On Trees and Shrubs, An Illustrated Practical Guide. 1976. Cornell University Press. Ithaca, N.Y.

Sinclair, W.A., Lyon, H.H., & Johnson, W.T. Diseases of Trees and Shrubs. 1987. Cornell University Press. Ithaca, N.Y.

Alford, D.V. A Color Atlas of Pests of Ornamental Trees, Shrubs, and Flowers. 1995. Halsted Press. New York, N.Y.

Chase, A.R. Compendium of Ornamental Foliage Plant Diseases. 1988. The American Phytopathological Society. St. Paul, Minn.

Chatfield, J.A., Rose, M.A., & Shetlar, D.J. Disease Control in the Landscape. 1996. Ohio State University Extension. Columbus, Ohio.