# Pesticide Certification Information #20

**A STUDY MANUAL**

**FOR**

**NURSERYMEN**

**WEST VIRGINIA UNIVERSITY**
**EXTENSION SERVICE**
**AN EQUAL OPPORTUNITY/**
**AFFIRMATIVE ACTION INSTITUTION**

# A STUDY MANUAL FOR NURSERYMEN

## GENERAL INSECT INFORMATION

Because of the wide diversity of ornamental plants, there are a large number of insect pests that may require control. You cannot possibly identify all of the insects you will encounter so you will need the assistance of your county extension agent, extension entomologist and others. However, there are certain kinds of insects that attack a large number of plants, and therefore should be recognized by the commercial pesticide applicator.

Pests of ornamentals may be divided into two groups by the way they feed: (1) insects and sucking mouthparts (i.e. aphids, scales, mealybugs, thrip, mites, whitefly) and (2) insects with chewing mouthparts (i.e. caterpillars, cutworms).

Damage by pests with sucking mouthparts is basically similar in that beak-like mouthparts are used to pierce the plant tissue and suck the plant juices. Damaged foliage is usually mottled. Plants may eventually wilt due to excessive loss of plant juices.

Damage by pests with chewing mouthparts is basically similar, in that portions of the plant 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 the size of the organisms involved, 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 discoloration of roots.

There are environmental conditions which may also simulate plant diseases so they must be distinguished from actual pathogens. Such things as frost injury, dog urine burn, and nutrient deficiencies are not 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 a root rot when it is actually 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. Diseases caused by fungi are the most common, and the easiest to control. Bacteria, virus and nematodes are the other three causal agents.

## INSECTS

### MITES (RED SPIDER)

Description

Mites may be distinguished from insects by the absence of discernible body segmentations and presence of eight, rather than six legs. Many are so small that they cannot be detected 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. The mite damage frequently appears as bronzing on the foliage. A thin webbing in which mites may be seen may be associated with mite infestation.

Life History

Reproduction is usually continuous on greenhouse crops, and increases as the temperature goes up.

Control

Chemical control needs to be at frequent intervals because of rapid reproduction. There are specific chemicals, called miticides, that are effective, along with certain systemics.

## MEALYBUGS

Description

Mealybugs are soft-bodied insects which are usually covered with a powdery or cottony, wax-like covering. They vary in length from 1/5 to 1/3 inch. Mealybugs are able to move about throughout their lives, but tend to stay put.

Life History

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.

Damage

Mealybugs are among the most serious of greenhouse pests. They 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. They may be very troublesome on foliage plants.

Control

Control is difficult because of the cottony covering. Best control is secured when they are in the young crawler stage.

## SCALE

Description

Scale insects constitute a very large group of plant feeders and may occur as a greenhouse pest or on outdoor ornamentals. They have sucking mouthparts and feed on plant juices. Most that are encountered in the greenhouse are the armored scale.

Life History

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.

Damage

Scales damage plants by sucking the plant juices from leaves and stems causing dead areas to appear. If left uncontrolled, defoliation occurs and the plant may die. Very prevalent on foliage plants.

Control

They are much easier to control when young, especially in the crawler stage.

## APHIDS

Description

Aphids or plant lice, are small, soft-bodied sucking insects that infest nearly all types of plants. Their color varies from green to reddish to black. They usually cluster in colonies on the underside of leaves and on new growing points or buds. Adults may be either winged or wingless.

Life History

Reproduction may be continuous on greenhouse crops. Green peach aphid will overwinter on the Canadian plum out-of-doors.

Damage

Both nymphs and adults suck the sap from the plant, causing discoloration and curling of the leaves. Severe damage may cause stunting or death of the plant. Aphids secrete a honeydew which may make a plant unsightly because of the development of soft mold fungus. Green peach aphid may transmit disease to potato plants.

Control

Frequent use of a suitable insecticide is necessary because of repeated generations.

## BIRCH LEAF MINER

Description

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.

Life History

The birch leaf miner overwinters as a pupa in the soil and the adults begin to emerge in May/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. There are two generations a year in Maine.

Damage

Damage is confined to the leaves where the larvae feed. Injury is noticeable first 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 the attack of other insects.

Control

Spray when leaves are nearly full size. Repeat in July for the second generation.

## WHITE PINE WEEVIL

Description

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.

Life History

The adults overwinter in litter on the ground and resume 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 early July to early September.

Damage

Grubs girdle the leader, causing it to curl, turn brown and die. Crooked trunks and trees with two leaders develop, making the trees unsaleable. It may be a problem on most species of pine and spruce.

Control

Cut off and burn infested shoots as detected. Spray terminal buds in early spring when the buds are swelling.

### EASTERN TENT CATERPILLAR

Description - Life History

Defoliation of the foliage, in early spring-summer. Egg masses are deposited in bands around small branches in the fall. 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. A white, silken tent is constructed in the crotch of the tree, and the immature larvae return to the tent at night. These tents alone are unpleasant sights along country roads. 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.

Control

Destruction of egg masses during winter and early spring is effective on small plants. Destruction of wild cherry trees in the vicinity will do much toward controlling tent caterpillars. Spraying or dusting at first sign of attack will give control. Burning of nests, a common practice, is likely to damage desirable trees.

## DISEASES

### CROWN GALL

Crown gall is a bacterial disease which can affect many species of plants. It is characterized by rough-surfaced, knobby galls that are 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 may also 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 wounds on the plant. In most cases introduction of the crown gall bacterium into an area is by way of infected or contaminated plants. The infection is capable of persisting in the soil for many years. This should not be confused with the aphid or mite galls that appear higher up on some plants.

### APPLE SCAB

Olive drab spots 1/4 inch in diameter appear on the leaves and smaller ones on the fruits. Leaves may drop prematurely and the fruits might become disfigured. The fungus may overwinter on the twigs.

Common on eating apples and many varieties of flowering crabapples. Some flowering crabapples are resistant to the disease. It may be controlled by frequent spraying with the proper fungicide.

### BLACK SPOT OF ROSE

Black spot is probably 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 which have fringed margins. This fringed margin is a diagnostic character, differentiating 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 spot is soon followed by yellowing of a portion of all of the leaflets and their defoliation. Best control is with an all-purpose rose spray.

### POWDERY MILDEW

Powdery mildew is caused by several different species of fungi. 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

Leaf spots are the most common disease of plants. They are caused by various fungi and bacteria. The size, shape and color of the spot being generally rather constant for 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

Herbicides are grouped on the basis of use into selectives and non-selectives and on the basis of mode of action into contact, translocated, and sterilant chemicals.

SELECTIVE AND NON-SELECTIVE HERBICIDES

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

Non-selective herbicides 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 that are wetted with the spray. Whether the plant dies or recovers depends on whether it as a protected growing point. Perennials usually have underground buds that will regrow.

Translocated chemicals are absorbed by the leaves and stems or by the 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 in 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 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 micro-organisms. Its toxic effects may remain for only a short time or for years.