Introduction to Insects and Diseases

One frustration of raising a home garden is damage, loss, and annoyance caused by insects and plant diseases. It is a normal part of the intricate world of living communities that plants are attacked by insects and plant diseases. There are thousands of insects and diseases that may attack growing things. But it is unlikely the home gardener will encounter more than a few of them during a season.

The yard and garden have the same cycles and changes experienced in all of nature. The plants, insects, and diseases all are influenced by each other and by other factors, such as rainfall, humidity, temperatures, parasites, and pathogens. One of the major determinants in garden production and pest problems is our own activity. Often, we can be our garden's worst enemy by inadvertently limiting the health and vigor of our plants or by promoting pests through the wrong practices. However, we can also work with nature and manage the garden ecosystem for a successful harvest.

One of the first lessons is not to panic at the sight of pests. Many of us have a low tolerance for pests (especially insects) and will take hasty--and often inappropriate--actions. The loss of a portion of the leaf or the root system does not usually kill the plant and will probably not significantly reduce the harvest. Gardeners with a wise attitude about insect pests and diseases adopt the philosophy of "planting a little extra for the bugs!"

Garden Pests

Pest management encompasses all activities for reducing damage and losses caused by insects, plant diseases, weeds, and nematodes. It is an attitude about pests and pest control in the garden that reflects an understanding of the interrelationships of factors in the environment. As experienced gardeners know, it's impractical to eradicate every pest.

Many factors determine the number of pests and the damage they will cause. The aim of pest management is to use gardening techniques that will reduce their numbers. This way, loss and inconvenience are limited, while yield and enjoyment are increased.

Pest management helps to prevent and cure insect and disease problems. Often, the preventive portion of the program is the most important. But sometimes early detection of problems is just as critical. A regular inspection of the garden and yard is the surest way to discover a problem in time to try effective controls. Know what to look for, when specific problems may appear, and how to recognize signs of damage. Consider alternatives and evaluate consequences.

Many of the problems attributed to insects or diseases are not caused by them at all. Yellowing, discoloration, wilting, stunting, and curling or deformation of the plant foliage *may*

be symptoms of another common problem, such as nutrient deficiency; toxic chemicals (air pollution, some pesticides, salts, or too much fertilizer); lack of water or too much water; too much sunlight or not enough; or frost damage. Of course, there is no response to usual pest treatment. Some can be corrected (with more water, for example), but others can't. Yield may be reduced or the garden ruined.

Pest management activities can be divided into chemical and non-chemical categories. Some people interpret pest management to mean "pesticide elimination." Although one goal of a home garden pest management program is to reduce the use of pesticides as much as possible, insecticides and fungicides will likely remain a part of any pest management system.

Non-chemical control

Non-chemical control (both prevention and cure) includes cultural, biological, and mechanical activities. Cultural control involves our manipulation of the plants' environment to reduce the chance of pests surviving and reproducing. It also means limiting the amount of damage caused by their attack. First, though, cultural control requires maintaining good plant health and vigor. Plant health is dependent on many factors. Moisture (proper watering conservation techniques, such as mulching) and available soil nutrients (proper fertilization) are under our control.

Selection of proper plant varieties can reduce pest problems. Plant only species and varieties adapted to your area, climate, and soil type. Where possible, choose varieties labeled as resistant to insect and disease attack. When buying plants for transplanting, carefully inspect for insects and diseases. Look for certified disease-free seeds and plants.

Other gardening activities can influence pest populations, too. For example, plant rotation is an important way to prevent build-up of insects and disease organisms. In most cases, allow three years between plantings of a certain vegetable in any one spot.

Sanitation and weed control can influence pest numbers. Many insects survive on weeds and tall grasses in and around the garden, then attack the growing crops. Garden residues, such as stems, leaves, or unusable fruit, may harbor insects or disease and should be plowed under, composted, or burned as soon as the harvest is complete. If they've been treated with insecticide, burn the refuse or bag it for garbage pickup.

Interplanting, or growing certain plants next to each other, can sometimes reduce pest problems. Certain planting combinations or companion plantings tend to have fewer problems. For example, chives and garlic planted near lettuce and peas may discourage aphids, while radishes in cucumber hills are unpleasant for striped or spotted cucumber beetles.

Biological control.

Use natural enemies to eliminate part of the pest population. Natural enemies of insects include predators, parasites, and pathogens. Some birds, toads, mantids, and lady beetles are well-known predators. Lesser-known predators include the lacewings, ground beetles, syrphid flies, and spiders.

Learning to recognize them and promote their existence is an important step in pest management.

A parasite is an insect that lives part of its life inside another insect, eventually killing the host. Often, there is no external evidence of the parasite until the host-pest dies. Some parasites leave clues; the braconid wasps, for example, leave white, egg-shaped wasp cocoons attached to the back of the parasitized caterpillar.

Other parasitic wasps include the trichogramma wasps (tiny, but effective, parasites of insect eggs) and the ichneumonid wasps. The stinger of these small wasps is used only to insert the eggs into the host. They do not sting people, as do the more familiar paper and mud dauber wasps. But even these stinging wasps are beneficial in the yard and garden; the females capture and paralyze caterpillars to provide food for their offspring. Many flies, such as the tachinids, are valuable as parasites of insects, too.

Use of pathogens.

Pathogens are another part of pest management. There are many disease-causing organisms occurring in nature that work to our benefit. Among the bacteria, fungi, viruses, and nematodes are many that attack garden pests, especially insects, causing them to sicken or die. This type of biological or natural control is often referred to as microbial control.

There are a few commercially available pathogens that can supplement the naturally existing controls of some pests. For example, the bacterium, *Bacillus thuringiensis*, causes disease in moth and butterfly caterpillars. The material is effective after caterpillars eat foliage coated with the bacteria spores. Another bacteria product causes milky spore disease in white grubs.

Mechanical control.

Mechanical control is simply attacking the pest directly. In our fascination with technology, we often overlook the simplicity of picking off insect pests with our fingers, or using traps and barriers to stop them. When only a few plants are involved and when infestations are not too heavy, remove insects or diseased leaves with your fingers, and discard the pest. To prevent transmitting plant disease pathogens, wash your hands and avoid touching healthy plants. For many insect problems, a stream of water from the hose will dislodge enough insects to reduce the population.

By knowing the habits of insect pests, you may be able to keep them away from your crop or capture them before they do much damage. Barriers, such as screens or coverings, are other ways to keep insects from reaching the plants.

Chemical control

Sooner or later, you may have to apply pesticides to get the yield you want. However, you can reduce their use if you follow the techniques described above.

When you do use pesticides, be careful to use the proper material for the problem. The pesticides currently available are safe and effective when used as directed. Carefully follow the directions on the label to mix and apply them.

The directions will specify the plants that can be treated, the rate of mixing and application, safety precautions to follow, and the time you need to wait between application and harvest. Read and follow the directions each time the pesticide is used.

Specific recommendations on particular insecticides and fungicides are not included in this section's descriptions of insects and diseases or their control. Garden pest management is a rapidly changing scene, due to changes in legislation, regulations, and registrations relating to pesticides; development of new products and techniques; breeding of new pest-resistant plant varieties; and discovery of non-chemical control activities

practical for use in the home garden. The gardener has to stay abreast of these rapid changes.

Sources of current garden pest control recommendations and information about pests and pest management include: Federal and State Departments of Agriculture, the Cooperative Extension Service (headquartered at your state land-grant university, with local offices in nearly every county), newspaper and magazine gardening columns, and garden supply stores.

Dragonflies

Dragonflies are both lovely and beneficial. As they fly, their legs form basket-like nets to capture small insects. Young dragonflies also consume vast quantities of mosquitoes and other water insects.

Lady beetles

Probably the best-known of the garden benefactors is the lady beetle, ladybug, or ladybird. One of the more common varieties has 12 or 13 spots on its reddish back. Both the adult and larva eat large amounts of soft-bodied insects, such as aphids, mealybugs, leafhoppers, and scale insects.

Controlling Foliage Diseases

Leaf blight

Leaf blights are caused by a wide variety of pathogens. They are characterized by a sudden and conspicuous wilting and death of leaves and shoots. Blights progress more rapidly in humid, wet weather.

Control is the same as for leaf spots. Thorough application of fungicide spray is essential, especially to undersides of leaves.

Leaf spots

Leaf spot diseases attack practically all plants, especially those in more humid regions. Spots appear on lower leaves and progress upward. Spots may later enlarge and run together, forming leaf blights. Spots usually have light centers and dark margins. Infected leaves may be killed or drop early.

Control with general sanitation, such as collecting and burning fallen leaves. Plant rotation is also useful. Use of recommended fungicides must begin soon after the disease strikes.

Rusts

Rust diseases are caused by highly specialized fungi. Some complete their life cycle on one plant (for example, hollyhock rust, raspberry rust, and asparagus rust). Other rusts require two different and alternating hosts (such as white pines and currants or junipers and apples).

Rusts are not reddish discolorations of the leaf but are, instead, the rust-colored spores present in powdery pustules or gelatinous-like horns. The rusts appear on the leaves, twigs, or fruits, causing the leaves to deform or drop off prematurely.

Control by repeated application of recommended fungicides, beginning at the first sign of rust. Destroy alternate hosts that you don't need, and you may be able to stop the cycle. Plant resistant varieties when available.

Shot hole

Shot hole occurs when leaf spots drop out, giving the leaf a ragged appearance. It's common on stone fruits and may be caused by fungi, bacteria, or viruses. Control as for leaf spots.

Leaf and bud nematodes

Leaf and bud nematodes are microscopic roundworms that attack many plant species--especially strawberries, ferns, chrysanthemums, and lilies. Nematode injury may occur on flowers, leaves, stems, and roots. It appears as malformation, stunting, or galls.

Control by purchasing disease-free plants and resistant varieties. Destroy infected plant parts and rotate plantings

Leaf galls and curls

Leaf galls are swellings caused by bacteria, fungi, viruses, and insects. They're common on azaleas, rhododendrons, and camellias. Handpick and burn the affected plant parts.

Leaf curl, also called leaf blister, is a yellow to red arched, curled, puckered, or distorted leaf that will drop early. The curls are common on peach and plum trees where fruits become swollen and bladder-like. Dormant oil spray and other recommended sprays are often effective. Remove and destroy affected leaves.

Smuts

Smuts generally produce dusty, irregular, sooty black spore masses on leaves, stems, flowers, and seeds. They are common on corn, onions, and certain grasses. Plants may be stunted, with withering of affected parts.

To control, cut and destroy infected plants. Do not use diseased material in compost. On onions, start with disease-free transplants, and rotate from areas where disease has occurred. Use resistant sweet corn hybrids and maintain plant vigor.

Controlling Foliage Diseases

Mosaics

Mottled leaves of yellow and light or dark green are the symptoms of mosaics. Plants are often stunted. Flowering and fruiting are reduced. Leaves often are cupped or distorted. Hundreds of different plants are attacked.

Control the virus-transmitting insects (such as aphids and leafhoppers), and destroy infected plants. Plant certified, virus-free seed or resistant varieties.

Powdery or downy mildews

Powdery or downy mildews are flour-like patches on the surface of leaves, buds, young stems, and fruits. They cause dwarfing, stunting, and deformation. The mildews are

common on roses, zinnias, phlox, lilacs, cucurbits, apples, and grapes in shaded, crowded areas.

To control, avoid crowding to improve air circulation and reduce shade. Control weeds that harbor the disease. Apply recommended fungicides.

Sooty mold

Sooty mold shows as black blotches on surface of leaves, stems, and fruits, following attack by sap-feeding insects (see "Leaf and Sap-feeding Insects," pages 530 to 533). Mold grows on the honeydew secreted by these insects, and control is directed at the insects, rather than the resulting mold.

Ring spot

Ring spot is a virus disease characterized by rings, spots, or irregular patterns on young foliage. Plant growth and fruit set are often reduced. Ring spot is common on dahlia, delphinium, tomato, peony, and cabbage plants. Spotted wilt--a virus common in western states--is found on many vegetables and ornamentals. Control as for mosaics.

Yellows

Yellows are due to various causes, including lack of soil nutrients, crown or root rot, insects, fungi, and viruses. Virus-yellows cause plants to be stunted and to have yellow, bunchy growth. Flowers may be greenish, aborted, or lacking altogether.

Yellows occur frequently on asters, chrysanthemums, lettuce, and carrots. Control by using healthy plants and by limiting insects and weeds. Use crop rotation and destroy infected plants.

Wilts

Wilts cause part or all of the plant to droop, often yellow, wither, and die. The plant may die gradually or rapidly. Water-conducting tissues often become discolored and non-functional, causing permanent wilting and death. Wilts may be the result of insect damage (borers or root feeders) or may be caused by certain viruses, bacteria, or fungi.

To control, use disease-free planting stock, and destroy infected plants. Control wilts by controlling insect vectors (those playing a part in the spread of wilt, such as flea beetles or cucumber beetles). Use wilt-resistant varieties and a three- or four-year plant rotation. Avoid wounding the plant. Destroy plant residue.

Leaf and Sap-feeding Insects

Gall makers

Psyllids, other insects, and mites attack leaves or stems, causing the formation of galls that house the insects. Such galls are unsightly but relatively harmless. Control is usually unnecessary.

Leaf feeders

Leaf feeders have chewing mouth parts they use to remove portions of the leaf tissue. All or part of the leaf may be consumed, and the remainder may be ragged or filled with holes. The symptoms always consist of missing leaf material.

Many different groups of insects are leaf feeders. These include caterpillars of moths and butterflies, beetle adults and larvae, the immature stage of certain wasps, and grasshoppers. All have chewing mouth parts and cause defoliation. Many of the common garden pests are leaf feeders: tomato hornworms: cabbageworms (the imported cabbageworm, the cabbage looper, and the diamondback moth); flea beetle adults; roseslugs; and Colorado potato beetles (both as larvae and adults).

Many different ways can be used to control leaf feeders. Cabbageworms can be handpicked: treated with the pathogenic bacterial spray, *Bacillus thuringiensis;* or sprayed with one of several garden insecticides. Flea beetle populations are reduced by eliminating weeds in and around the garden, where adult beetles spend the winter.

Another set of leaf feeders, hornworms, are seldom a problem because of parasitic wasps that attack these caterpillars. As with all efforts at controlling pests, effectiveness comes with early detection and timely application of controls.

Leafrollers and leaftiers

Leafrollers are caterpillars that roll a leaf into a tube held by silk strands, or they may tie several leaves together. The well-protected larvae then feed within the tied leaves. In addition to defoliation, twig tips may be destroyed or fruits deeply scarred. To be effective, insecticide must be applied before the leaves are tied.

Snails and slugs

Snails and slugs abound in moist environments, often feeding at night or on cloudy days. A shiny, iridescent trail and irregular feeding holes mark their presence. Control with snail and slug baits, or trap under boards or in shallow pans of stale beer.

Bagworms

Bagworms overwinter as eggs inside tough silken bags constructed of bits of stem and leaf. Larvae hatching in early summer form new bags as they feed. Control bagworms by handpicking bags during the winter or by spraying when new bags appear.

Sap feeders

To get their food, sap feeders pierce the plant with needle-like mouth parts and suck out the juices. Loss of sap and the damage caused by piercing the plant cells do not create holes in the leaves. Instead, injury can result in stunting, deformation (such as curling), twisted foliage, and discoloration, often in the form of speckles. Another major consequence of sap-feeding insects is the spread of organisms causing diseases in plants.

Leafhoppers

Leafhoppers are small, active insects, typically wedge-shaped and green. Blight-like browning and curling of foliage, called "hopperburn," is a symptom on potatoes. Other attacked plants will show loss of color, often in a dotted or spotted pattern. Reduced plant vigor and lower yields result from severe loss of sap.

Effective control requires early detection of the leafhoppers before severe damage occurs. Frequent, thorough applications of common garden insecticides may be needed.

Leafminers

Leafminers are immature stages of flies, wasps, beetles, or moths. The larvae make winding or large blotch mines on the foliage of broad-leaved plants. Or they may tunnel into evergreen needles.

Plants commonly infested with leafminers include hawthorn, holly, locust, birch, elm, and vegetables, such as spinach, beets, and tomatoes. Control by picking and destroying infested leaves. Or thoroughly spray the foliage at times recommended for your area.

Spider mites

Mites are close relatives of spiders and ticks and are not true insects. Most are too small to see with the naked eye.

Their feeding causes reduced plant vigor and discoloration or bronzing of the foliage. Use a recommended miticide (mite-controlling pesticide) at times recommended for your area.

Aphids

Aphids, or plant lice, are small round, soft-bodied sap feeders commonly found on foliage and stems. Different species are variously colored: green, white, pink, black. Besides reduced vigor, damage often appears as wilting or curling of foliage or stunting and deformation of buds and flowers. Aphids reproduce rapidly, making early detection and frequent monitoring important.

Aphids can be controlled naturally in several ways: parasitic wasps, predators, pathogenic fungi, rain, and wind. Aluminum foil stretched under the plants may repel aphids from the plants. If insecticides are needed to control aphids, spray thoroughly, starting when aphids appear to be increasing; repeat as needed.

Whiteflies

Whiteflies are common pests of greenhouse vegetables and flowers. In warmer climates, they attack citrus and many ornamentals. Nymphs--

found on lower leaf surfaces--are oval, flat insects with short, sucking beaks. Sweet, sticky honeydew dropped by nymphs attracts ants and may lead to the growth of sooty mold.

Carefully inspect purchased plants grown in greenhouses. Combat with thorough coverage of insecticides labeled for use in controlling white flies.

Plant bugs

The rapid plant bug, tarnished plant bug, and related pests suck plant juices and inject substances toxic to plants. The substance interferes with development, causing one-sided strawberries, cat-faced peaches or apples, and lopsided flowers. Regularly apply insecticides labeled for use in controlling plant bugs.

How to Prevent Stem Diseases

Stem canker and dieback

Stem canker and dieback cause discolored, often slightly sunken, lesions on stems, twigs, and branches. Cankers kill water-conducting tissues, so dieback (wilting and death of foliage) spreads beyond the canker. The entire plant may be killed.

Canker and dieback are common on many shrubs, flowers, and trees. Prune dead and weakened branches several inches below the affected area. Disinfect shears between cuts. Burn the prunings. Destroy badly affected plants.

Damping off and seed rot

Just before or after seedlings emerge, the seeds may rot or seedlings weaken and wilt or collapse because of decay at the soil line or below. This is most common in cold, wet, poorly drained soil.

To control, plant disease-free, fungicide-treated seeds. Start seeds in a sterile medium indoors, or outdoors in well-drained soil. Avoid overwatering, crowding, and poor air circulation.

Crown rots

If the base of a stem, petiole, rhizome, or tuber rots (becomes slimy and soft or hard and dry), the problem may be crown rot. Many kinds of plants are attacked and often collapse and die.

To control, plant disease-free stock at the correct depth in clean, well-drained soil. Avoid wounding, overfertilization, and heavy, wet mulch. Control stem borers, stem- and root-feeding insects, and nematodes. Practice crop rotation. Remove and destroy diseased plants.

Galls

Round, rough-surfaced overgrowths near soil line or graft of plants are crown galls. They are often caused by a bacterium.

Control by using disease-free stock. Avoid plant injuries. Cut galls and infected branches, then burn them.

Cedar-apple galls appear on junipers as orange tentacles attached to a brown ball. The disease does little harm to junipers but causes a rust on apple trees. The results: deformed fruit and leaf loss. To prevent, don't grow junipers near apple trees.

How to Control Stem Insects

Treehoppers and pruners

Treehoppers, cicadas, and tree crickets insert eggs inside woody stems, twigs, or canes, causing unsightly scars and split or broken twigs. Cicada nymphs drop to the ground and burrow to tree roots, where they feed on sap--some for as long as 17 years. Treehopper nymphs drop from twigs to feed on legumes and grasses.

Control with recommended insecticide or dormant oil sprays. Tree crickets may damage berry fruits but are easily killed with insecticide sprays early in the season.

Cutworms

These moth caterpillars feed at night, chewing on plant stems at soil surface. Control by handpicking or by using a recommended insecticide. Prevent damage to tomato transplants by placing paper collar around stem.

Scale insects

Scale insects are sap feeders that live under a shell-like covering on the stems, twigs, and branches of many different plants. The scale may be hard and shellac-like, soft and waxy, or cottony.

Scale crawlers can move for a short time after hatching before they settle down to feed and secrete a new cover. During this time, crawlers are vulnerable to insecticide sprays and are more easily killed. A spray of superior oil during the dormant season will also control scale insects. Prune heavily infested stems and branches. Destroy prunings.

Stalk, vine, and wood borers

Borers cause damage by weakening the structure supporting the plant. They also prevent fluids from moving between roots and leaves. European corn borer is a common insect pest that tunnels in corn stalks and ears. This reduces yields as stalks break off or ears fall off. Lilac, dogwood, and rhododendron borers (caterpillars of clearwing moths) frequently weaken or kill host plants.

A similar insect tunnels into squash stems, killing portions of the vine. Sometimes a vine can be rescued if the borer is removed and the damaged part of the vine covered with soil.

Flatheaded and roundheaded wood borers (beetle larvae) attack apple, poplar, locust, and other trees, especially unhealthy ones or trees

under stress. Bronze birch borers persistently kill white bark birch trees planted as ornamentals.

To reduce problems caused by wood-boring insects, maintain the health and vigor of trees. Wrap young transplants with a high-quality tree wrap. Spray tree bark, squash plants, and sweet corn when adults are laying eggs. Use a yard and garden insecticide labeled for controlling plant boring insects.

Flower and Fruit Diseases

Scab

This appears as an overgrowth, sunken area, or spot on fruit (apple, pear, peach, citrus, pecan); vegetables (potato, beet, peas, cucurbits); and leaves of many plants.

Follow recommended program of spraying for fruits. For other plants, treat same as for leaf spots and blights. Control weeds and insects in and around the garden. Destroy plant refuse, and rotate non-wood plants at three-year intervals.

Spots and rots

A wide variety of flower and fruit spots and rots attacks almost all plants during wet, humid weather. Azalea, camellia, gladiolus, and many vegetables and fruits suffer most. Spots are small, black, scabby patches. Rots are decay, decomposition, or disintegration of plant tissue. Flowers may be blighted or not set fruit.

Spray or dust plants regularly during flowering. Collect and destroy affected parts. Avoid overcrowding and overfertilization. Plant crops on a four-year rotation in well-drained soil.

Mold and botrytis blight

These diseases are widespread in humid areas, especially on strawberry, peony, lily, tulip, rose, dogwood, and geranium plants. They attack flowers, buds, fruit, and tender shoot growth. Molds grow profusely on plant surfaces, similar to rots. Botrytis is common on soft, ripe fruits, especially after they're picked. But they may appear before harvest in humid weather.

Flower breaking

Abnormally streaked or striped flower petals are a symptom of flower breaking. The problem is common on tulips, gladiolus, and lilies. It is caused by viruses that may also produce mosaic, stunting, and other symptoms. The virus is spread by insects (especially aphids); by diseased stock; and by the handling of a healthy plant after working with a diseased one. The health of the plant is not frequently damaged, though appearance is affected. Plant disease-free stock, and control insects and weeds. Destroy infected plants.

Insects Infesting Flowers and Fruits

Thrips

Thrips are tiny insects that lacerate or rasp plant cells and suck the juices.

Fruit, flowers, and foliage may be attacked, producing colorless streaks. To control, remove infested flower buds and all blossoms that have begun to fade. Recommended sprays for thrips will give some protection but must be repeated frequently. Rotate planting, if possible, and maintain sufficient moisture by proper watering and mulching.

Stink bugs and curculios

Stink bugs are sap feeders that feed on developing flowers, berries, or fruits, thus causing them to grow unevenly or become deformed.

Curculios (snout beetles) chew into developing fruits of apple, pear, quince, and stone fruits. The hole made is used for feeding or as a site for eggs. Curculio larvae develop inside the attacked fruits, often causing premature fruit drop.

The number of curculios in succeeding years can be reduced by gathering and destroying dropped fruit daily. Otherwise, spray to control curculio and stink bug by following a schedule developed for your state.

Aphids

Aphids, commonly found on leaves and stems, may also feed on flowers and blossoms. This sap-feeding in buds or flowers sometimes causes distorted shapes or discoloration and may affect blossoms so no fruit sets. Aphids also frequently transmit diseases to healthy plants. Sooty mold may grow on the sweet, sticky honeydew secreted by the aphids.

Despite many natural controls, such as parasites and predators, chemical control is sometimes necessary. Treat aphids when you notice they're increasing rapidly. Use an insecticide labeled for use in controlling them.

Japanese and cucumber beetles

These beetles are flower and fruit feeders. The larvae feed underground on roots. Control is difficult. Applying insecticide frequently to infested foliage may be required. Protect small trees, roses, and vegetables by covering with plastic or cloth netting as soon as beetles begin to appear.

Codling moths, fruit flies, and fruit maggots

Wormy fruit is inevitable after an invasion by larvae of codling moth, oriental fruit moth, and the like. Apple maggots and cherry fruit fly maggots are larvae of flies. Eggs of these pests are laid on, in, or near the fruit. The immature insects feed and develop inside the fruit, often ruining it and causing the fruit to drop off prematurely.

Thorough covering sprays, begun when the insects first become active and repeated frequently, are usually needed for control. Collecting dropped fruits may reduce apple maggot populations for the following year. Banding tree trunks with several thicknesses of corrugated paper is a way to trap many codling moth larvae as they move down the tree trunks to their pupation sites. Remove and destroy the bands in late fall.

Root Diseases

Root rots

Affected plants show decline in vigor; are stunted or discolored; and later wilt, die back, or die completely. Roots rot away or change color and small plants are easily pulled up. Nearly all plants can be attacked by this disease. The disease is caused by fungi common in most soils.

Plant disease-free stock of resistant varieties in well-drained soil. Avoid injuries to roots from deep cultivations. Rotate plantings.

Root knot, clubroot

Nearly all kinds of plants in northern greenhouses and outdoors in southern states are attacked by root knot. Plants are stunted, often wilt, yellow, and die. Round nodules or long, irregular, highly branched swellings on roots are caused by nematodes and block the flow of water and nutrients. To control root knot, plant nematode-free plants using a four-year rotation. Use sterilized soil in greenhouses. Plant resistant varieties.

Clubroot has symptoms similar to root knot, but roots become a mass of club-shaped galls caused by a fungus. Affected plants have yellowed leaves and may wilt during the day. All plants in the cabbage family are attacked. To control clubroot, use healthy transplants and seedlings of a resistant variety in soil corrected to a non-acidic pH.

Root and Root Crown Insects

White grubs

The C-shaped larvae or grubs of many beetles develop from eggs laid in the soil. These grubs feed on fibrous roots of grasses, strawberries, or other plants.

Greatest garden infestations occur when planting follows sod. If sod cannot be avoided, treat soil before planting with an insecticide labeled for use in controlling grubs. In turf areas, an application of milky spore disease provides a biological control.

Root weevils and crown borers

Root weevils and crown borers feed on the main roots and plant crown. Infested plants are weakened or killed. Certain mites find the dense crowns of plants ideal habitats. There they feed on the plant sap, causing stunting and distorted growth.

An insecticide labeled for use to control your plant's problem may be required. Rotate planting locations, and use pest-free planting stock. Maintain plant health and vigor.

Root maggots

Root maggots, the immature stage of flies, tunnel in the roots or underground parts of cabbage, radishes, and similar vegetables. Damage may cause the plant to wilt or die or make the produce unusable. Use a

soil insecticide prior to planting.

Webworms

Webworms, larvae of small moths, construct silken channels leading to shelter in the soil. They feed close to crowns of grasses and certain vegetables and flowers. Control by spraying a recommended turf grass insecticide timed to the hatch of moth eggs.

Wireworms

The larvae of click beetles, or wireworms, are able to locate germinating seeds in the soil. They chew into softened seeds or destroy seedlings. Use a soil insecticide before planting.

Mole crickets

Mole crickets are brownish, hairy insects with flat, shovel-like forelegs. They tunnel into roots and seedlings. To prevent damage, apply insecticide labeled for use in controlling soil insects.