

Pesticide Certification Information

#24

CHAPTER XXIV

PESTS

WEST VIRGINIA UNIVERSITY
EXTENSION SERVICE
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CHAPTER XXIV: PESTS

There are many kinds of pests. Each crop or animal has some. You must recognize or be able to identify the common pests that you work with and their hosts. Otherwise you may use the wrong method of control, choose the wrong pesticide, or treat too late and do more harm than good.

If you know the general pattern of the pest's life (life cycle), the damage it does, and when it does the damage, it will help you to:

- * Know the best time to control the pest.
- * Use less pesticide, or use other methods of control.
- * Avoid injury to the host (plant or animal).
- * Avoid injury to non-targeted areas.

Do not guess at your pest problems. The first step in solving any problem is to understand what is causing it. So the first step in your job is to recognize the pests you need to control.

We favor certain plants and animals that provide us with food and fiber. But we also provide good growing conditions for other plants and animals that harm them. These living things that compete with us for food and fiber, or attack us directly, are *pests*. The living plant or animal a pest depends on for survival is called the *host*. Pests can be put into five main groups:

- * Insects (plus mites, ticks, and spiders)
- * Snails and slugs
- * Vertebrates
- * Weeds
- * Plant disease agents

Most applicators know most of the pests they see on the job. But sometimes unfamiliar pests may appear. You can get identification aids, publications, and pictures to help find out what they are. But the best thing to do is contact local experts. Ask the cooperative extension service or a competent consultant to help you.

INSECTS

Insects thrive in more environments than any other group of animals. They live not only on the earth's surface but within the soil and in water. They are at home in deserts, rain forests, hot springs, snow fields, and dark caves. They eat the choicest foods off man's table. They can even eat the table.

Many types of insects affect crops. They cause damage in a variety of ways. They may:

- * Feed on leaves.
- * Tunnel or bore in stems, stalks, and branches.
- * Feed on and tunnel in roots.
- * Feed on and in seeds and nuts.
- * Suck the sap from leaves, stems, roots, fruits, and flowers.
- * Carry plant disease agents.

The plants are damaged, weakened, or killed. This causes reduced yields, lowered quality, and ugly plants or plant products that cannot be sold. Even after harvest, insects continue their damage in the stored or processed products. Insects also feed on and in man and other animals. Some of these pests carry disease agents which have caused millions of deaths to man and livestock.

Not all insects are pests. Some help man by doing such things as pollinating plants or feeding on other insects that are pests.

RECOGNIZING COMMON FEATURES IN INSECTS

All adult insects have two things in common --they have six jointed legs and three body regions. But how do you tell one insect from another? The most important parts to look at are *wings* and *mouthparts*. Some insects have no wings. Others have two or four. The wings vary in shape, size, thickness, and structure. Insects with chewing mouthparts have toothed jaws that bite and tear the food. Insects with piercing-sucking mouthparts have a long beak which they force into a plant or animal to suck out fluids or blood.

Almost all insects change in shape, form, and size during their lives. This change is called metamorphosis.

Some insects change only in size as they develop. The adult lays eggs. A nymph which looks like a tiny adult hatches from the egg and goes through several stages. These nymphs change into wingless adults.

Some insects change form slightly. Their nymphs hatch from eggs. These nymphs, which have no wings, go through several growing stages. They change into winged adults.

Other insects change completely. They go through four stages. The *larva* hatch from an egg. It is a worm, caterpillar, grub, or maggot. This is the stage in which these insects grow the most and do the most damage. When full-grown, the larva changes into a *pupa*. During this stage it changes into the *adult*. The adult stage usually has wings.

Here are the insect groups that include most of the insects which man considers pests. You should be familiar with the characteristics of each group that you control and the type of damage each group does.

BRISTLETAILS

- * No wings.
- * Chewing mouthparts.
- * Usually have two or three long tails.
- * Young and adult look alike (no change in form).
- * Usually found in houses and other buildings.
- * Feed on plant fiber cloth and all starches.
- * Silverfish and firebrats belong in this group.

CHEWING LICE

- * No wings.
- * Chewing mouthparts.
- * Broad head.
- * Young and adult look alike.
- * Usually found on birds. They cause skin irritation and reduced weight gain and egg production.

SUCKING LICE

- * No wings.
- * Piercing-sucking mouthparts.
- * Narrow head.
- * Young and adults look alike.
- * Some feed on livestock.
- * Some carry diseased agents.
- * Their bites may be painful and cause itching
- * Human body, head, and pubic (crab) lice belong in this group.

THRIPS

- * Some have fringed wings; others have no wings.
- * Combination of chewing (rasping) and sucking mouthparts.
- * Young and adults look alike.
- * Usually found in flowers or buds of plants.
- * May cause misshapen or poorly developed flowers, buds, fruits, and leaves.

TERMITES

- * Swarming termites have four wings of equal size and shape; others are white and have no wings.
- * Chewing mouthparts.
- * Young and adults look alike.
- * Usually feed on wood products such as fence posts, timbers, and flooring.
- * Damage to the wood in homes and other structures is common.

GRASSHOPPERS, CRICKETS, AND COCKROACHES

- * Some have wings; some do not have fully developed wings. Top pair of wings is leathery.
- * Chewing mouthparts.
- * Young and adults look alike, but young lack wings.
- * Grasshoppers usually feed on plant leaves and stems.
- * Crickets are found in the field or indoors. They eat almost anything made from plants.
- * Cockroaches often occur in restaurants, houses, stores, and offices. They eat the same foods that man does.

TRUE BUGS

- * Some have wings; some do not. Top pair of wings is part leathery and part transparent.
- * Piercing-sucking mouthparts.
- * Young and adults look alike, but young lack wings. Sucks the juice from plants and blood from man and animals.
- * Reduce the vitality and yield of plants and animals, and may carry plant and animal disease agents.
- * Bedbugs are in this group.

APHIDS, LEAFHOPPERS, SPITTLEBUGS, AND SCALE INSECTS

- * Some have wings; some do not.
- * Piercing-sucking mouthparts.
- * Young aphids, leafhoppers, and spittlebugs look like the adults.
- * Adult scale insects are scale-covered and stay in one place on the plant.
- * Sucks the juices from plants.
- * Reduce the vitality and yield of plants.
- * Some carry plant disease agents.

MOTHS AND BUTTERFLIES

- * Most adults have four large wings with many scales that rub off easily.
- * Most moths are a dull brown color; butterflies are brightly colored.
- * Mouthparts of some adults are lacking or are a coiled tube used for sucking.
- * Larvae are caterpillars, usually with six jointed legs and ten soft, fleshy legs.
- * Larvae have chewing mouthparts.
- * Larval stages are important pests on many crops. They damage leaves, stems, tubers, fruit, and cloth.
- * Clothes moths are in this group.

BEETLES

- * Adults with the two top wings usually hard and shiny and the bottom wings transparent.
- * Chewing mouthparts.
- * Young are grubs or worms. Some have no legs; others have six.
- * Young and adults are found on plants, in soil, and in wood in buildings.
- * Both the adult and larval stages may damage stored food products, plants, and in some cases, animals and animal products.

FLIES AND MOSQUITOES

- * Adults have only two wings (other winged insects have four).
- * Mouthparts of adults piercing-sucking, but may be slightly modified for sponging rasping, or cutting.
- * Young (except mosquitoes) are maggots.
- * Head of young usually not well-defined; mouthparts are small, dark, and hook-like.
- * Young mosquitoes live in water. They have a well-developed head with chewing mouthparts.
- * Maggots usually feed on plant seedlings and roots, in organic matter, in water, and in other damp places.
- * Some maggots feed on animals.
- * Some adults carry disease agents.
- * Some flies or mosquitoes in large numbers reduce the production efficiency of animals.

BEEES, WASPS, ANTS, AND SAWFLIES

- * Most adults have a narrow waist; sawflies are an exception.
- * Some have four wings; some have none.
- * Chewing mouthparts.
- * Most young wormlike with no legs. The young of sawflies are caterpillar-like.
- * Young usually in nests in soil, or made of mud, paper, or wax.
- * Painful sting of many adults makes some of these a pest. Others may damage wood products.

RECOGNIZING COMMON FEATURES OF MITES, TICKS, AND SPIDERS

Mites, ticks, and spiders are closely related to insects. The main differences are that the adults have eight jointed legs instead of six and have two body regions. They do not have wings.

MITES

- * Adults and nymphs have eight legs; larvae have six.
- * Very small -- about the size of the period at the end of this line.
- * No wings.
- * Sucking mouthparts.
- * Soft-bodied.
- * Injury they cause usually is noticed before the mites are found.
- * When present on plants in large numbers, their feeding turns foliage and buds whitish, reddish, or brown. Some may scar fruit.
- * Some mites make thin webs on plants.
- * On animals, they cause severe skin irritation, redness, scabs, and scaliness.
- * Chiggers (also called jiggers and red bugs) that attack man are mites.

TICKS

- * Adults and nymphs have eight legs; larvae have six.
- * Leathery or soft (sometimes colored) body without a distinct head.
- * Piercing-sucking mouthparts with which they firmly attach themselves to the host animal.
- * Parasitic on animals, including man.
- * Must have blood to complete their life cycle.
- * Some carry disease agents to man and animals.

SPIDERS

- * Eight legs.
- * Biting mouthparts.
- * Vary length from a fraction of an inch to 5 or 6 inches.
- * Useful to man because they eat insects, but webs and excretions may be a nuisance.
- * Black widow and brown recluse bites are dangerous to man.

SNAILS AND SLUGS

Snails and slugs are members of a large group of animals called mollusks. Snails have a hard shell; slugs have no shell. They feed on plant foliage. They are pests in lawns, landscape plantings, and greenhouses.

RECOGNIZING COMMON FEATURES OF VERTEBRATES

All vertebrate animals have a jointed backbone. They include fish, snakes, turtles, alligators, lizards, frogs, toads, salamanders, birds, and mammals. What may be a pest animal in some situations may be highly desirable in others. A muskrat, for instance, is a fur-bearing animal, but its burrows may weaken man-made earthen dams.

FISH

Man has caused most fish problems. We have put some kinds where they normally would not have been. We think some fish are undesirable because they are not useful for sport or for food. Others compete with more desirable species. Some fish are intermediate hosts for parasites of man.

REPTILES AND AMPHIBIANS

Reptiles (snakes, lizards, turtles, and alligators) and amphibians (frogs, toads, and salamanders) may cause local problems. Although most of them do little damage, many people fear or dislike them. Poisonous snakes can be a real problem; so can snakes and turtles in fish hatcheries or waterfowl production areas.

BIRDS

Bird damage can be quite varied. It includes:

- * Structural damage by woodpeckers.
- * Destruction of feed and of fruit, nut, grain, timber, and vegetable crops by seed- and fruit-eating birds.
- * Hazards to animal and human health caused by birds like pigeons and parakeets.
- * Annoyance caused by birds roosting near dwellings.

Peck marks, location of damage, tracks, feathers, and droppings are signs of bird damage.

MAMMALS

Damage by mammals is varied. Some cause serious health problems to livestock and humans. Disease agents mammals transmit to man cause rabies, plague, food poisoning, and tularemia. Killing of other animals by mammals is costly. Some damage fruit, vegetable, nut, grain, range, and tree crops. The damage they do to dams and ditches can be very costly. They damage such things as lawns, clothing, furniture, and buildings by gnawing and burrowing. Mice and rats annoy man by living in our homes, offices, and factories. How do you tell what mammal caused the damage? You can eliminate some suspects if you know:

- * Which animals are found in your part of the country.
- * What kinds of places they live in.
- * What their habits are.

Animal signs (tracks, droppings, toothmarks, diggings, burrows, hair, and scent) plus the type of damage will give you further clues.

WEEDS

A weed is simply “a plant out of place.” Weeds are a problem because:

- * They reduce crop yields.
- * They increase costs of production.
- * They reduce quality of crop and livestock products.
- * Some cause skin irritation and hay fever. Some are poisonous to man, his livestock, and wildlife.
- * They spoil the beauty of turf and landscape plants.

RECOGNIZING COMMON FEATURES OF WEEDS

Before you can control weeds, you need to know something about how they grow. One important feature is the length of their life cycle.

ANNUALS

Plants with one-year life cycle are *annuals*. They grow from seed, mature, and produce seed for the next generation in one year or less. They may be grasslike (crabgrass and foxtail) or broad-leaved (pigweed and cocklebur).

Summer annuals are plants that result from seeds which sprout in the spring. They grow, mature, produce seed, and die before winter. Examples: crabgrass, foxtail, cocklebur, pigweed, and lamb's-quarters.

Winter annuals are plants that grow from seeds which sprout in the fall. They grow, mature, produce seed, and die before summer. Examples: cheat, henbit, and annual bluegrass.

BIENNIALS

Plants with a two-year life cycle are *biennials*. They grow from seed and develop a heavy root and compact cluster of leaves the first year. In the second year they mature, produce seed, and die. Examples: mullein, burdock, and bull thistle.

PERENNIALS

Plants which live more than two years and may live indefinitely are *perennials*. During the winter, many lose their foliage and the stems of others may die back to the ground. Some grow from seed. Others produce tubers, bulbs, rhizomes (below-ground rootlike stems), or stolons (above-ground stems that produce roots). Examples: Johnson grass, field bindweed, dandelion, and plantain.

Creeping perennials produce seeds but also produce rhizomes and stolons. Examples: Bermuda grass, Johnson grass, and field bindweed.

Simple perennials normally reproduce by seeds. But root pieces may produce new plants following mechanical injury during cultivation. Examples: dandelions, plantain, trees, and shrubs.

Bulbous perennials may reproduce by seed, bulblets, or bulbs. Wild garlic, for example, produces seed and bulblets above ground and bulbs below ground.

PLANT DISEASES

RECOGNIZING COMMON FEATURES OF PLANT DISEASES

A plant disease is any harmful condition that makes a plant different from a normal plant in its appearance or function. Plant diseases are divided into two groups based on their cause.

NON-PARASITIC PLANT DISEASES

These are caused by nonliving agents. The causes can include such things as:

- * Nutrient deficiency.
- * Extreme cold or heat.
- * Toxic chemicals (air pollutants, some pesticides, salts, too much fertilizer).
- * Mechanical injury.
- * Lack of or too much water.

These diseases cannot be passed from one plant to another.

PARASITIC PLANT DISEASES

These are caused by living agents which live and feed on or in plants. They can be passed from one plant to another. The most common causes of parasitic diseases are:

- * Fungi
- * Bacteria
- * Viruses (viroids and mycoplasmas)
- * Nematodes

Insects, which were discussed earlier, can be another cause. A few seed-producing plants and some microbes can cause plant diseases, too. Three things are required before a parasitic disease can develop:

- * A susceptible host plant
- * A parasitic agent
- * An environment favorable for parasite development

FUNGI

Fungi are plants that lack green color (chlorophyll). They cannot make their own food. There are more than 100,000 kinds of fungi of many types and sizes. Not all are harmful, and many are helpful to man. Many are microscopic, but some, such as the mushrooms, may become quite large. Most fungi reproduce by spores, which function about the same way seeds do. Fungi may attack a plant both above and below the soil surface.

BACTERIA

Fungus diseases include apple scab, anthracnose of beans, smut in corn, and powdery mildew on landscape plants.

Bacteria are microscopic, one-celled plants. They usually reproduce by simply dividing in half. Each half becomes a fully developed bacterium. Bacteria can build up fast under ideal conditions. Some can divide every 30 minutes. Fireblight of pears, halo blight of beans, and bacterial leaf spot on peaches are caused by bacteria.

VIRUSES

Viruses are so small that they cannot be seen with the unaided eye or even with an ordinary microscope. They are generally recognized by their effects on plants. Many viruses that cause plant disease are carried by insects, usually aphids or leafhoppers. Viruses are easily carried along in bulbs, roots, cuttings, and seeds. Some viruses are transmitted when machines or men touch healthy plants after touching diseased plants. A few are transmitted in pollen. At least one virus is transmitted by a fungus. A few are transmitted by nematodes. Wheat streak mosaic, tobacco mosaic, and corn dwarf are diseases caused by viruses.

NEMATODES

Nematodes are small, usually microscopic, roundworms, also called eelworms. Many nematodes are harmless. Others may attack crops planted for food, fiber, or landscape purposes. Some species attack the above-ground plant parts, such as leaves, stems, and seeds. But most species feed on or in the roots. They may feed in one location, or they may constantly move through the

roots. Nematodes usually do not kill plants, but reduce growth and plant health. They may weaken the plant and make it susceptible to other disease agents.

All nematodes that are parasites on plants have a hollow feeding spear. They use it to puncture plant cells and feed on the cell contents. Nematodes may develop and feed either inside or outside of a plant. Their life cycle includes an egg, four larval stages, and an adult. Most larvae look like adults, but are smaller. The females of some, such as root knot and cyst nematodes, become fixed in the plant tissue. Their bodies become swollen and rounded. The root knot nematode deposits its eggs in a mass outside of its body. The cyst nematode keeps part of its eggs inside its body after death. They may survive there for many years.

DEVELOPMENT OF PLANT DISEASES

A parasitic disease depends on the life cycle of the parasite. The environment affects this cycle greatly. Temperature and moisture are especially important. They affect:

- * The activity of the parasite.
- * The ease with which a plant becomes diseased.
- * The way the disease develops.

The disease process starts when the parasite arrives at a part of a plant where infection can occur. This step is called *inoculation*. If environmental conditions are good, the parasite will begin to develop. This stage before injury develops is called *incubation*. If the parasite can get into the plant, the stage called *infection* starts. The plant is diseased when it responds to the parasite. The three main ways a plant responds are:

- * Overdevelopment of tissue, such as galls, swellings, and leaf curls.
- * Underdevelopment of tissue, such as stunting, lack of chlorophyll, and incomplete development of organs.
- * Death of tissue, such as blights, leaf spots, wilting, and cankers.

IDENTIFYING PLANT DISEASES

You cannot always tell one plant disease from another just by looking at the plant itself. Because many disease agents cause similar injury, you need other evidence. Identifying the cause is a better way to identify the disease. You usually need a microscope or magnifying lens to see such things as fungus spores, nematodes or their eggs, and bacteria. You need more training to find and identify the cause of a disease than you need to observe the effects.

PEST CONTROL

To solve pest problems, you must:

- * Identify the pest.
- * Know what control methods are available.
- * Evaluate the benefits and risks of each method or combination of methods.
- * Choose the methods that are most effective and will cause the least harm to you and the environment.
- * Know the correct use of the methods.
- * Know local, state, and federal regulations that apply to the situations.

PRINCIPLES OF PEST CONTROL

We often talk about the “war” against insects, plant diseases, weeds, and rats. In a war between countries, would a national leader use only the Army? Wouldn’t he also use other tools, such as the Navy, the Air Force, and propaganda?

Yet, in our struggle against pests, how often do we forget to consider other methods or combinations of methods? How often do we forget about effects on the environment? It may be too often. The use of a combination of methods to control pests is basic to all pest control. Modern pest control is:

- * Using all available methods to keep pests below economically harmful levels.
- * Damaging the environment as little as possible in the process.

The challenge lies in our ability:

- * To control pests so that injury caused by them is held to a minimum.
- * To recognize when direct action, such as a pesticide application, is necessary.

PEST CONTROL METHODS

Many pest control methods have been known and used for years. But some methods, what we call them, and the way we put them together are new. Here are the most important pest control methods:

RESISTANT VARIETIES

Some crops, animals, and woods resist pests better than others. Some crops and woods are immune to certain pests. By using resistant types, we make the environment less favorable for pests. This makes it easier to keep pests below harmful levels.

BIOLOGICAL CONTROL

Biological control is most common for insects, mites, and some weeds. Biological control occurs naturally. Releasing more of a pest's natural enemies --parasites, predators, and disease agents-- into the target area can increase this natural control. Many pests come from other countries. Bringing in their natural enemies often helps control them.

CULTURAL CONTROL

Planting, growing, harvesting, and tillage practices may help or harm pests. Cultivating is harmful to weeds but may result in the spread of diseases and nematodes. Other practices such as crop rotation, methods of construction, time of planting, and proper fertilization all affect pests.

MECHANICAL-PHYSICAL CONTROL

Some physical methods and examples of their use are:

- * Traps for rats, mice, and birds.
- * Barriers to protect against termites, rodents, and flies.
- * Light to attract or repel pests.
- * Sound to kill, attract, or repel pests.
- * Heat to kill pests.
- * Cold to kill pests.
- * Radiation to sterilize or kill pests.
- * Electrocution to kill pests.

SANITATION

Removing the source of food helps control some types of pests. Cockroach, rat, and fly control is often hard unless you remove the food or filth they feed on.

LEGAL CONTROL

Legal controls result from federal, state, or local laws and regulations. They include such things as:

- * Quarantines
- * Inspections
- * Embargoes
- * Compulsory crop or product destruction

PESTICIDES

Pesticides often must be used. Other methods cannot always prevent harmful pest levels. Use pesticides:

- * Where they are needed.
- * Where they can be used safely.

Select and use them as they work with other methods. Be careful not to harm yourself or the environment. Using pesticides along with other methods is often better than using any one method by itself.

PUTTING IT ALL TOGETHER

The combination of methods you choose will depend on the *kind* and *amount* of control you need. The three main types of controls are:

PREVENTION

Keeping a pest from becoming a problem. Includes use of such things as:

- * Sanitation
- * Resistant plants, animals, or wood
- * Treated seed
- * Pesticides
- * Cultural controls
- * Quarantines
- * Seed certification

SUPPRESSION

Reducing pest numbers or damage to an acceptable level. Includes use of such things as:

- * Sanitation
- * Resistant plants, animals, or wood
- * Pesticides
- * Cultural controls

ERADICATION

Destroying or removing a pest completely from a crop, an area, or a geographic region. Remember, the most important principle of pest control is:

- * Use a pest control method only when that method will prevent the pest from causing more damage than is reasonable to accept.

Even though a pest is present, it may not do very much harm. It could cost more to control the pest than would have been lost because of the pest's damage.