

Pest Management and Pesticide Safety



LESSON SEVEN

What's Ahead

In this lesson, you'll learn:

- how to prevent pests in your garden;
- which crops to rotate;
- nontoxic pest controls; and
- how to use pesticides safely.

What's a Pest?¹

Pests are organisms we don't like: plant, insect or animal. When most people think of pests they think of insects, but fungi, viruses, bacteria, weeds, rodents and other organisms can be as destructive as insects. They may all compete with us for food, inflict injury or just be annoying. Fortunately, we can control pests without damage to our environment.

Insects and other creatures are an important part of a healthy ecosystem. A pest-free garden is expensive, impractical and actually undesirable. Your goal should be to keep pest populations below the level at which they cause unacceptable damage. If you allow a low level of pests to survive, some of their natural enemies will also survive.

Home gardeners often use more pesticides per square foot in their gardens than farmers do in their fields, thinking that if a little is good, more will be better. This is a mistake, and a serious misuse of pesticides!

Overuse of pesticides can have bad effects: it may leave harmful pesticide residues on the food; it may make handling the plants more hazardous; and it may harm beneficial

insects, earthworms, birds and even pets. In addition:

- Each time you spray, you could inhale or absorb the poison.
- Pesticides improperly used near water may contaminate the water supply.
- Constant use of the same pesticides may cause resistance in pest populations, so that chemicals no longer work.
- Some pesticides do not break down easily and can remain in the environment for a long time.

Growing public concern over the use and misuse of pesticides has led home gardeners to look for other pest management strategies. Although some people do not have the time or knowledge to practice all alternative methods, there are many cultural practices that will help reduce losses.

Since most home gardeners do not have to grow perfect market produce, they can limit pesticide use to a minimum. Plants can withstand a fair amount of damage and still produce a good crop.

Know Your Garden

Smart gardeners know what is happening in their gardens and regularly inspect the plants for insect damage and disease often. You will learn a lot about what goes on in your garden by getting on your hands and knees and looking closely. Using a flashlight at night will help you spot nocturnal pests, like slugs, cutworms and rabbits.

Most insects are helpful; few are harmful. The home garden certainly can tolerate some harmful insects without significant damage.

¹ Some material for this lesson is taken from "Sound Gardening," a publication of Washington State University Cooperative Extension.

KEY POINT 1:
Have a healthy garden first. Use pesticides only as a last resort.

KEY POINT 2:
A pesticide is used to prevent, repel or destroy a pest, whether it's an insect, rodent, nematode, fungi or weed.

Smart gardening is based on understanding nature's interactions. Don't turn to chemicals at the first sign of a pest. The more often we use garden chemicals, the greater the risk we have of running into health, environmental or resistance problems.

By looking at the pest problem realistically, you can:

- Save money by buying fewer pesticides.
- Save time by treating only what needs to be treated.
- Protect nature by introducing less pesticides into our environment.

Steps to a Healthy Garden

Here are some ways to make your garden a healthy place for your plants and an unattractive place for pests.

Choose the right plant species. Planting disease- and insect-resistant cultivars is one of the best ways to prevent disease and insect damage. Plants that are resistant are either not attractive to pests or they do not sustain the growth and development of the pest. Very few vegetables are bred for insect resistance, but many are bred for disease resistance. Seed catalogs and seed packet labels will state plants that have disease resistance.

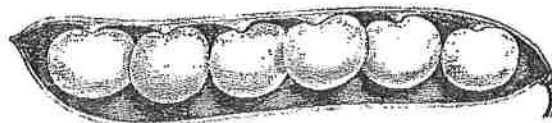
Provide the right amount of moisture. Water enough to keep plants healthy. Over-watering can cause problems with plant growth and disease.

Maintain correct fertility levels. Test your soil. Don't over or under fertilize. Healthy plants can resist many kinds of pests.

Rotate vegetables so that you don't grow the same or a related plant in the same area every year. Rotations can reduce build-up of diseases. Alternate leaf and root crop sections.

Keep your garden clean. Rocks, wood, weeds

Rotation Crop Chart	
Crops Susceptible to the Same Diseases and Insects	
Gourd family (Cucurbitaceae)	Cucumber Muskmelon Pumpkin Squash Watermelon
Mustard family (Cruciferae)	Broccoli Brussels sprout Cabbage Cauliflower Collard Mustard Radish Rutabaga Turnip
Nightshade family (Solanaceae)	Eggplant Okra Pepper Potato Tomato
Root & bulb family	Beet Carrot Garlic Onion Parsnip Shallot
Pea family (legume)	Bean Pea



Lesson 7

Pest Management and Pesticide Safety

and debris provide great hiding places for slugs and insects. Last year's garden debris can harbor many types of pests and should be removed at the end of every growing season.

Time plantings to avoid peak insect infestations. Sometimes, the most destructive phases of an insect's life are brief and predictable. Plant so that you avoid pest attacks.

Encourage naturally occurring beneficial insects and other animals. These are your garden's best friends. Certain insects cause no damage and are beneficial. They destroy other insects that injure plants. Lady beetles, lace wings, certain mites, praying mantids, Braconid wasps, assassin bugs and minute pirate bugs are all "good bugs." *Bacillus thuringiensis* (Bt) is a good bacterium that can be used to control many insects in the larval or caterpillar stage without harming beneficials.

Identify the problem. Don't jump to conclusions. Read up on the specific pest or take a sample to your county Extension office. Think back. Did a past experience with this pest require control? Did you have trouble with this pest last year?

Determine the problem potential. Decide whether the current problem is likely to become serious enough to justify some kind of treatment. Often, the problem has already run its course and no further damage may occur. Sometimes the damage will be minimal. Decide what you and your garden can tolerate.

Select the least toxic approach. Try the simplest and safest control first.

Observe results. Record your results for future reference. Include information on what you did

and what the outcome was, what the pest was and what plants were attacked.

Controlling Pests the Non-Toxic Way

Pests can be controlled in two ways: using non-toxic control methods and using pesticides. Here is a list of non-toxic methods:

Insects:

- Prune out insect-infested areas of plants.
- Cover susceptible crops with floating row cover or nylon screen. This will protect them from insects that are difficult to control by other means.
- Use insect traps where appropriate.
- Dislodge insects with a stream of water or a brush.
- Hand-pick insects off plants.

Disease:

- Plant disease-resistant cultivars.
- Rotate annual plants.
- Allow adequate space between plants, and prune for good air circulation.
- Time watering so that foliage dries by nightfall.
- Remove diseased plants.
- Keep garden clean of plant debris.

Slugs:

- Place beer or yeast and water in shallow containers to effectively attract and kill slugs.
- Overturn clay pots or place flat boards next to the plants to lure slugs. Check frequently and kill collected slugs.

▶ **KEY POINT 3:**

Pesticide labels tell you what chemicals are in the mixture, how toxic it is and what safety equipment you need to apply it. The label is the law.

For Weeds

- Hand pull; cultivate with a hoe where appropriate.
- Use mulches generously!

Controlling Pests Using Pesticides

What are pesticides? A pesticide is any substance or mixture of substances used to prevent, destroy or repel any insects, rodents, nematodes, fungi, weeds or other forms of life that are pests. This definition includes chemical pesticides and biorational pesticides.

Categories of Pesticides

Insect repellents. Repellents are fragrances that keep certain insects out of an area. Repellents are often used for mosquitoes and flies.

Biorational pesticides. Biorational pesticides are either chemical forms of naturally occurring biological chemicals or are agents (viruses, bacteria, protozoa, nematodes, or fungi) that are parasitic on pests.

Insecticidal soaps. Soap solutions that smother insects and dry out weeds.

Horticultural oils. Horticultural oils are highly refined petroleum oils that kill insects by suffocation. Insects breathe through their exoskeleton. If pores are clogged, the insect dies.

Botanicals and minerals. Botanicals are pesticides made from plants and can be more toxic than many of the synthetic chemical pesticides. Mineral pesticides such as copper dust and sulfur are commonly used. They form a protective coating over plant parts.

Synthetic chemicals. Synthetic chemicals are made by humans. They are chemicals, of either

natural or synthetic origin, that kill or protect against pests — insects, weeds, plant pathogens, rodents and other kinds of animal and plant life. Some gardeners choose these because they are fairly inexpensive and easy to use.

Organisms Affected by Pesticides

- Bactericides** kill bacteria (disease-causing agents)
- Fungicides** kill fungi (disease-causing agents)
- Herbicides** kill vegetation (weeds or unwanted plants)
- Insecticides** kill insects
- Miticides or acaracides** kill mites (eight-legged pests)
- Molluscicides** kill snails and slugs
- Nematicides** control nematodes (microscopic worms)
- Rodenticides** kill rats, mice and other rodents

Kinds of Formulations

- Dusts
- Wettable powders
- Soluble powders
- Pressurized cans or aerosols
- Granules
- Baits
- Multi-purpose mixtures

Pesticides can have an impact beyond their intended target. Nothing is absolutely safe. Some products are toxic even in small quantities. Others of moderate toxicity could build up to higher levels in the environment. The accumulation and combination of small amounts of

Lesson 7: Pest Management and Pesticide Safety

▶ KEY POINT 4:

Smart gardeners limit the amount of pesticides they use, apply them properly and don't permit them to leave the garden.

these toxic substances in your garden could create serious problems.

Pests are more likely to become resistant to pesticides when they are repeatedly exposed to them. There is still a lot we do not know. Synthetic chemical pesticides should be the last alternative to control pests.

A smart gardening strategy is to: 1) limit the amount of pesticides introduced into the garden; 2) apply them properly if needed; and 3) not permit them to leave your garden.

The smart gardener times treatments so they're most effective on the target pest but least disruptive to natural predators of the pest. Here are some more tips for smart pesticide use:

Choose the right pesticide. If you are unsure, seek good advice. Choose the least toxic alternative. Some examples of less toxic pesticides are pyrethrins, insecticidal soaps, horticultural oils and *Bacillus thuringiensis* (Bt). Buy the smallest quantity needed.

Check the label. The label identifies the chemicals in the container and uses signal words to state the toxicity of the pesticide to humans. The label also lists the protective equipment you need to use the chemical. This may include coveralls, gloves and respirators.

Do not take chances with your health! Follow the safety requirements on the label. **The label is the law!** Pesticide users are forbidden to use a pesticide in a way contrary to its labeling.

The instructions on the label are like a prescription: they state how much pesticide to mix, where to apply it, when to apply it and the precautions to be observed. The label also lists specific organisms to be protected — bees, fish

and pets, etc. Be aware of sensitive areas that must be protected from pesticide drift. Reread the label each time you use a pesticide. It is your responsibility, as the user, to follow all this information. Do not rely on your memory!

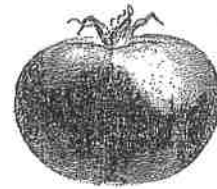
Mix correctly. Don't use rough estimates. Follow label recommendations. More is not better; it can hurt your plants, your family and the environment. Extra dosage does not mean extra effectiveness and, in fact, it may give poorer results. Excessive amounts may even damage or kill plants. Do not mix more than you need.

Do not ignore the possibility of spills. Clean up spills right away. Your pesticide storage area should have a non-porous floor, without a drain, so spills can be easily cleaned up and properly disposed of. Set up a barrier to contain spills. Never flush down with a hose. Do not allow pesticide to go down a drain. Soak up liquid spills with clean cat litter, rags or newspaper. Carefully sweep up spilled powders. Scrub wood, cement or tile surfaces with a small amount of a mixture of water and strong household detergent. Place all contaminated materials into a plastic bag, seal and then dispose of properly. If you have any concerns or questions, call the Board of Pesticides Control in Augusta (207-287-2731).

Apply thoughtfully. Take safety precautions as recommended on the label. Don't apply pesticides:

- When it is windy or raining.
- Where it is likely to go into any body of water, channel or drain.

Dispose of leftover pesticide mix safely. Managing leftover pesticides is extremely difficult and must be done with care. Use it up as directed on the label. Do not pour down any



drain or storm sewer. Try to mix only the amount needed to do the job!

Store properly. Store in original, closed, labeled containers. Keep on strong, secure shelves in a locked cabinet. Always put the purchase date on your pesticide containers. Avoid keeping pesticides whenever possible; buy only what you need.

Treat empty containers properly. Triple-rinse or pressure-rinse empty containers, and use the rinse water to mix with your pesticide. Do not pour pesticide-contaminated rinsewater down the drain.

REMEMBER:

- Your choices about pest control can impact our water quality.
- Smart garden management is the best way to control pests.
- Most insects are not harmful to your garden.



Summary

In this lesson, we've learned about pest management and using pesticides safely. Try to answer the **Study Questions** and do a **Study Activity**. In the next lesson, we'll learn about garden insects.

Study Questions

1. Define a pesticide.
2. List non-toxic control methods for weeds, slugs, diseases and insects.
3. List what information is found on pesticide labels.
4. Match the pest with the type of pesticide that controls it.

1. aphid	a. herbicide
2. slug	b. fungicide
3. nematode	c. rodenticide
4. carrot weevil	d. miticide
5. mexican bean beetle	e. bactericide
6. powdery mildew (fungus)	f. nematicide
7. mice	g. insecticide
8. thistle	h. molluscicide
9. crabgrass	
10. spider mites	

(Check your answers against those that appear on the bottom of the next page.)

Study Activities

Pesticide Field Trip

Visit a garden shop or farm store and study the various pesticide products and equipment available to the home vegetable gardener. Read and study the labels. Use the Garden Visit—Pesticides Chart on page 45.

Lesson 7 Pest Management and Pesticide Safety

Pesticide Diary

Record all the pesticides you use this year and keep the information with your garden records.

What's Your Safety Readiness?

Inventory your garden safety equipment (goggles, respirator, rubber gloves), your leftover pesticides and equipment. Make sure the equipment is in good working condition. Determine which pesticide needs to be used this year before purchasing new ones. **READ THE LABELS AGAIN!**

Other Resources

Visit your local library for insect, weed and disease garden books.

Check with your county Extension office for these bulletins:

- Bulletin #5045, Soil Insects of Vegetables
- Bulletin #2182, Spray Drift and Your Neighbor
- Bulletin #7101, Best Management Practices for the Home, Part 2: Home Gardening
- Bulletin #2189, Vegetable Insect and Disease Control
- Bulletin #5039, Sucking Insects that Affect Vegetables

-
- Study Question Answers
1. Any substance or mixture of substances used to prevent, destroy or repel any insects, rodents, nematodes, fungi, weeds or other forms of life that are pests.
 2. Weeds
Hand pull; cultivate with a hoe where appropriate.
Use mulches generously!
Slugs
Place beer or yeast and water in containers to effectively attract and kill slugs.
Check frequently and kill collected slugs.
Disease
Plant disease-resistant cultivars.
Rotate annual plants.
Allow adequate space between plants, and prune for good air circulation.
Time watering so that foliage dries by nightfall.
Prune off diseased areas of plants.
Insects:
Prune out insect-infested areas of plants.
Cover susceptible crops with floating row cover or nylon screen. This will protect them from insects that are difficult to control by other means.
Use insect traps where appropriate.
Dislodge insects with a stream of water or a brush.
Hand-pick insects off plants.
3. Identifies chemicals in the pesticide, toxicity of pesticide and safety equipment needed to apply it.
4. 1. g; 2. h; 3. f; 4. g; 5. g; 6. b; 7. c; 8. a; 9. a; 10. d.

GARDEN STORE VISIT



Learning More
About Pesticides

PESTICIDES

Pesticide Name	Type	Crops	Analysis	Package Size	Cost