

2 PEST MANAGEMENT OPTIONS FOR HOME AND GARDEN

Always make sure that the pest in question has been correctly identified as described in Chapter 1. In addition, determine whether the pest problem is severe enough to warrant treatment. Then examine the many alternatives for pest management.

CULTURAL CONTROLS

Pests can often be managed using sanitation, crop rotation, weed control, prevention of injury, appropriate variety selection, resistant varieties, site preparation, and soil sterilization.

Sanitation

Cleanliness in and around the home is an excellent way to manage pests. Many infestations can be avoided by keeping cupboards clean; the house free of lint, hair, and food particles; and the yard and garden area free of litter and plant debris. Well-pruned, recommended varieties of plants are less likely to develop problems. Diseased or infested plants can be trimmed or removed. Weeds can be pulled or hoed and discarded.

Crop Rotation

Planting the same crop (or related crops) in the same place year after year enables some insects and pathogens to build up and can result in depletion of nutrients. Rotating crops—changing their location on a regular basis—helps fight pest buildup and depletion of soil nutrients.

Weed Control

Keep weeds under control by roguing out young ones by hand. Weeds compete with plants for water and nutrients and can also harbor diseases and insects.

Prevention of Injury

Wounding plants with lawn mowers, string trimmers, or dull pruning tools invites secondary invaders. Many pathogens infect plants through wounded tissue.

Variety Selection

Purchase only healthy, disease- and insect-free transplants, plants, and nursery stock from a reputable supplier. Shop early in the season for the best selection. Choose recommended varieties for your area and, if possible, ones that are resistant to local pests.

Resistant Varieties

Resistant plants are those that repel pests or do not sustain them. Some varieties are tolerant of pests and will yield a good harvest in spite of pest infestation. Although few home and garden plants are bred for insect resistance, many are bred for resistance to certain diseases. Disease-resistant varieties are listed in this bulletin (see commonly used codes in box, page 6), in seed catalogs, and on seed package labels. Your Cooperative Extension office or a reliable nursery can recommend species and cultivars of trees and shrubs resistant to specific diseases.

Site Preparation

Plant at the recommended time and follow recommended procedures for soil preparation (including proper pH and organic matter content), size of hole for transplanting, and proper spacing and light requirements for plants being considered. Unfavorable environmental conditions may stress plants and make them more susceptible to pest attack. Delayed planting may enable some plants to avoid attack by certain pests. Do not plant in a monoculture (large groups of the same plants together) but mix up the plantings in a garden or yard to lessen the chance of total destruction of a particular crop or plant. Thin stands

or seedlings to proper spacing, allowing for more vigorous growth.

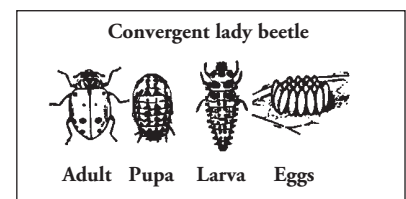
Soil Sterilization

Sterilized soil or soilless mixes are recommended for potted and container plants in and around homes and for germination of seedlings. Sterilized soil is free of weed seeds, plant-parasitic nematodes, insects, mites, and disease-causing organisms. Most important is the absence of organisms that can cause damping-off of seedlings and root rot and vascular wilt of potted plants. All of these diseases can ultimately kill infected plants. Sterilized soil can be purchased from greenhouses, nurseries, and garden stores. Soilless or peat-lite mixes, formulated with peat moss and vermiculite or perlite, are generally considered sterile.

Although it is not highly recommended, garden soil can also be used. Mix the soil with equal parts of sand, vermiculite, or perlite. Then sterilize this mixture by placing it in a shallow pan and baking it in a preheated oven for one hour at 200° F. The soil must remain at 160° F for at least 30 minutes. The sterilizing operation may give off a strong odor, which may linger in the oven.

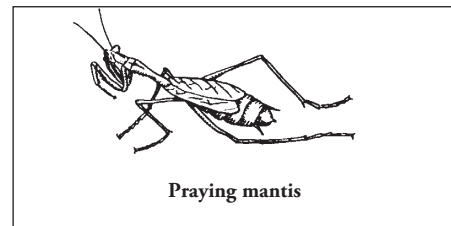
NATURAL ENEMIES—BIOLOGICAL CONTROL

Most insect and mite populations are held in check by a complex of natural enemies, including predators, parasites, and diseases. A primary concern in choosing a particular pest management program is to conserve *natural enemies* that are already present or to attract those that are nearby. To attract and maintain beneficial species some of their prey must be present. Otherwise the beneficial spe-



DISEASE RESISTANCE OR TOLERANCE CODES

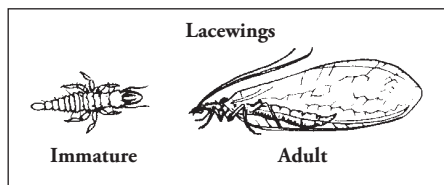
A	anthracnose resistant or tolerant
AFR	anthracnose and Fusarium wilt resistant
AL	angular leaf spot resistant or tolerant
ALSR	angular leaf spot resistant
AR	anthracnose resistant
AT	anthracnose tolerant
BR	black rot tolerant
BWMS	bacterial wilt moderately susceptible
BWR	bacterial wilt resistant
BV-1	bean common mosaic virus (type strain) resistant or tolerant
BV-2	bean yellow mosaic virus resistant or tolerant
DM	downy mildew resistant or tolerant
DMR	downy mildew resistant
EV	enation virus resistant or tolerant
F	Fusarium wilt resistant or tolerant
FR	Fusarium wilt resistant
FT	Fusarium wilt tolerant
LBR	leaf blight resistant
MDMR	maize dwarf mosaic virus resistant
MMR	mildew and mosaic resistant
MR	mosaic resistant
MT	partial mosaic resistance or mosaic tolerant
N	root knot nematode resistant or tolerant
NY-15	bean common virus (NY-15 strain) resistant or tolerant
PM	powdery mildew resistant or tolerant
PMR	powdery mildew resistant
R	rust resistant or tolerant
RR	rust resistant
RSR	red stele resistant
SmR	smut resistant
SMR	scab and mosaic resistant
SR	scab resistant
SWI	Stewart's wilt intermediate resistant
SWR	Stewart's wilt resistant
TBR	tipburn resistant
V	Verticillium wilt resistant or tolerant
VF	Verticillium and Fusarium wilt resistant
VFN	Verticillium, Fusarium, and nematode resistant
VR	Verticillium wilt resistant
YR	yellowings resistant or tolerant



ing periods are attractive to beneficial insects that visit them for nectar, a food source. Limited and careful use of recommended pesticides, applied only when needed and with precision, will help conserve beneficial insects.

Many horticultural merchandisers now advertise predators, such as ladybugs, praying mantids, and green lacewings, for augmentative releases as nature's way of controlling pest species. Several parasitoids are also available. Some of the predators need careful handling and will eat only certain kinds of insects.

The common green lacewing is an often-used natural enemy of many different aphids, mites, caterpillars, and moth and butterfly eggs that occur in both farm and garden. Natural populations may be sufficient to provide good control, but if you decide to augment natural populations with purchased insects, you should know that the predator larvae feed for only about three weeks before becoming adults. You may need to make additional releases during the growing season if pest populations have not been sufficiently reduced by the first release.



The purchase of praying mantids alone for use as biological control agents around the house and garden may not give adequate results. Although they do feed on other insects, they do not discriminate between pests and beneficial insects. Ladybugs obtained in the spring usually have been collected during their winter hibernation and, unless given

LADYBUG AND LARVA FEEDING ON APHIDS-FPO

Ladybug and larva feeding on aphids

special treatment, will soon fly away from the release site.

Insect parasitoids differ from predators in that they grow and develop within their insect host. Parasitoids may be almost the same size as their hosts and their development kills the host. Some are readily available to home gardeners. Care and understanding of the biological systems determines their success or failure. A tiny parasitic wasp, *Encarsia formosa*, is available for control of whiteflies in greenhouses. Success depends on temperature. In the case of *Encarsia*, temperatures of 70° F or above are needed for parasitoids to survive and reproduce. For commercial growers multiple releases (usually three at two-week intervals) are recommended. Tiny wasps, usually *Trichogramma* sp. (insect egg parasitoids), are available, but multiple releases are usually necessary.



Minute trichogramma wasp on insect egg



Small braconid wasp stinging an aphid

Mite predators (often other species of mites) are also available for use in homes or greenhouses and for use in fruit orchards. Use for pests of ornamentals is being investigated. Choose the one that best meets the temperature and humidity conditions in your growing area.

Achieving success with natural enemies takes time, and you should have realistic expectations. Using parasitoids and predators is a good alternative to pesticides in some situations. Commercial fruit growers are now successfully using predatory mites to control European red mite in apple orchards. Naturally occurring beneficial insects should be encouraged and conserved. If you use pesticides, choose those that are selective and least damaging to natural enemies.

PESTICIDES

Pesticides may be the choice in certain instances using an IPM approach to pest management. The Environmental Protection Agency defines a pesticide as “**any substance or mixture of substances intended to prevent, destroy, or mitigate any insects, rodents, nematodes, fungi, or weeds, or other forms of life declared to be pests and any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.**” This definition includes biorational and chemical pesticides. Biorational pesticides include biochemical products (pheromones, hormones, and enzymes) and microbial products (viruses, bacteria, protozoa, nematodes, and fungi). In turn, the microbials consist of two groups: products whose active ingredients occur in nature and those whose active ingredients are genetically engineered.

Chemical pesticides 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.

Pesticides differ in their effectiveness on the pest species and may also differ in their effects on natural enemies. The “softer pesticides” have less effect on natural enemy populations.

Additional information on pesticides and pesticide guidelines is found in Part II of this publication.

FURTHER READING

- Integrated Pest Management Around the House and Garden*. November 1999. BCERF Fact Sheet 31. Cornell University, Ithaca, N.Y.
- Reducing Pesticide Exposure in the Home and Garden*. October 1999. BCERF Fact Sheet 4 (revised). Cornell University, Ithaca, N.Y.
- Resources for Information on the Health Effects of Pesticides and Responding to Pesticide Poisonings*. September 1999. BCERF Fact Sheet 32. Cornell University, Ithaca, N.Y.