

Beneficial Insects and Mites



Assassin bug - *Reduviidae* - The assassin bug feeds mainly on aphids, caterpillars, Colorado potato beetles, Japanese beetles, leafhoppers, and Mexican bean beetles.



Damsel bug - *Nabidae* - The damsel bug feeds on aphids, leafhoppers, mites, and caterpillars.



Big-eyed bug - *Lygaeidae* - Big-eyed bugs feed on aphids, caterpillar eggs and larvae, immature bugs, leafhoppers, and spider mites.



Predacious stink bug - *Pentatomidae* - Predacious stink bugs feed on Colorado potato beetles and various caterpillar larvae.



Syrphid fly larvae - *Syrphidae* - Fly larvae of this species feed on aphids and mealybugs.



Lady beetle - *Hippodamia convergens* - The lady beetle feeds mainly on aphids and other soft-bodied insects, such as mealybugs and spider mites.



Green lacewing larvae - *Chrysopa carnea* - Lacewing larvae, known as aphid lions, feed on insect eggs, aphids, spider mites, thrips, leafhopper nymphs, and small caterpillar larvae. Adult lacewings are not predacious.



Predatory mites - *Phytoseiulus persimilis* and several other species feed on many mite pests, including the two-spotted spider mite.



Trichogramma wasp - *Trichogrammatidae* - This tiny wasp attacks eggs of more than 200 pest species, including cutworms, corn borers, corn earworms, armyworms, codling moths, and cabbage moths.

Release time is critical for their effectiveness since they only attack pest eggs.



Encarsia formosa - *Encyrtidae* - The greenhouse whitefly is parasitized by this wasp in third and fourth larval instars when *Encarsia* lay their eggs inside the whitefly scale.

Chemical Controls

If a pest problem requires chemical control, use the least toxic, yet effective, materials and follow label directions. A certified nursery and landscape professional or Extension professional can help you identify the proper pesticide and the method to use it.



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... and justice for all

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Integrated Pest Management for Vegetable Gardens



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The best way to control insects and disease problems is to prevent them.

Soil Preparation

Maintain a slightly acid soil (around pH 6.5). If in doubt, have a soil analysis done through your local Extension office, by a private lab, or with a commercial soil test kit.

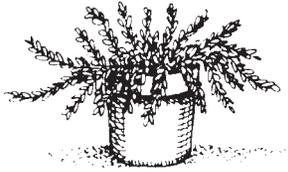
Build a biologically active, healthy soil through regular addition of organic matter, such as yard waste, compost, and manure.

Grow winter annual cover crops, such as clover or rye grass, to provide additional organic matter.

Till the soil in the fall to expose pests living near the surface to natural enemies and weather, and to destroy insects in crop residues.

Plant Selection

Plant crops that are suited to the soil and climate in your area. If you plant vegetables or fruits that are not commonly grown in your area, provide them with the appropriate growing conditions.



Use disease-free, certified seed, if available.

Select insect- and disease-resistant vegetable and fruit varieties, when available.

Select sturdy plants with well-developed root systems. Diseases and insects in young seedlings may start in greenhouses and result in plant death in the garden.

Buy plants from a reputable grower who can assure you that they are disease- and insect-free, or grow your own from seed.

Cultural Practices

The most effective and most important of all practices is to observe what is going on in the garden. Many serious disease or insect problems can be halted or

brought under control early by the gardener who knows what to look for and regularly inspects the garden.

Water in the morning so plants have time to dry before the cool evening. Drip irrigation systems prevent foliage from getting wet at all when watering.

Use interplantings in the vegetable garden as opposed to solid plantings of a crop. This can slow the spread of diseases and insects, giving you more time to deal with them if they occur.

Space plants properly and thin young vegetables to a proper stand. Overcrowding causes weak growth and subsequent insect and disease problems.

Keep down weeds and grass. They often harbor pests and compete for nutrients and water. Mulches are extremely effective for weed control.

Use a mulch to reduce soil splash, which brings soil-borne diseases into contact with lower leaves.

Rotate your garden plot, if you can. Do not grow the same kind of produce in the same place each year. Use related crops in one site only once every three or four years.

Avoid injury to plants. Broken branches, cuts, bruises, cracks, and insect damage are often the site for infection by disease-causing organisms.

Stay out of the garden when the plants are wet with rain or dew to prevent spreading diseases.

Do not use tobacco products, such as cigarettes or cigars, when working in the vegetable garden. Tomato, pepper, and eggplant are susceptible to a mosaic virus disease common in tobacco and may be spread by handling the plants.

Remove and dispose of infected leaves from diseased plants as soon as you observe them. Remove severely diseased plants before they contaminate others.

Clean up and remove crop refuse as soon as plants are through producing in the garden.

Keep old sacks, baskets, decaying vegetables, and other rubbish, which may harbor insects and diseases, out of the garden.

Staking tall flower and vegetable plants or planting them in wire cages prevents the blossoms or fruit from coming in contact with the soil.

Time plantings in such a way that the majority of your crop will avoid the peak of insect infestations. For example, plant squash later in June to avoid squash vine borers, which lay eggs in early June. Keep a record of the dates insect problems occur.

Plant warm-weather crops after the soil has warmed to avoid problems with seed and root rots; growth will be more vigorous, as well.

Frequently inspect plants for egg clusters, beetles, caterpillars, and other insects. Hand-pick as many pests as you can. Avoid sprays until the population of insects has reached a critical level.

Where slugs are a problem, use traps and try to create drier conditions. Heavy mulches may sometimes encourage slugs. Spread crushed eggshells or hydrated lime around affected plants.

Enlist the aid of birds in your garden. Overall, they do more good than harm. Consider planting shrubs and trees with fruits that attract them. Keep in mind, however, if you attract wild birds, you will have to protect ripening fruit (and even some vegetables) by using bird netting or scare devices (aluminum pans banging in the breeze are fairly effective).

Encourage Beneficial Insects

Naturally occurring predators and parasites are found in gardens, orchards, and fields. Learn to properly identify these species as benefits of your environment. Avoid using pesticides around them. They are as susceptible to insecticides as the pests.