



What's Eating My Plants?

Recognizing and controlling common vegetable insect pests and diseases

by Nick Novick

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Insect pests and diseases are facts of life for vegetable growers. The severity and types of pest problems can vary from year to year, but some are more common than others. The pest problems mentioned below are ones you can expect to encounter most years in the garden.

INSECTS

Don't automatically assume that any insect you see is a pest. Most insects are neutral or beneficial in terms of how they affect us and our garden plants. Only a handful are a problem for the garden.

Knowing which pests to expect and when they are active, and learning to recognize what they look like and the damage they cause will help you catch any problems early, before much damage can be done. Try to scout for problems whenever you're in the garden.

Keeping plants healthy and growing strong will help plants avoid or fend off many insects and diseases. Diseased or stressed plants actually give off certain chemicals that can attract insect pests, and weak plants are less able to resist disease infection.

The insecticide treatments mentioned are organic, *but* should be used judiciously *only when* insects have been correctly identified and are numerous enough to require treatment.

It's also important to note that the stronger, "natural" insecticides, such as rotenone, can be irritants to the user, so avoid skin contact, especially with the concentrated solution, and avoid applying when it's hot, so that the spray doesn't volatilize in the air.

If you can anticipate when particular insects may begin to become active, applying a spray mix of garlic and pepper may be an effective repellent or deterrent. There are commercial products available (Garlic Barrier, Hot Pepper wax are two available brands). These and the products mentioned below are available at most garden centers or online at www.extremelygreen.com.

Aphids: Tiny (1/16"), soft-bodied insects that can be almost any color, depending on the species. They can be winged, or wingless, depending on stage of life. They puncture plant tissue and draw liquids out of the vascular system of the plant. They also inject a toxin into the plant, which causes further damage. There can be hundreds or thousands on a heavily infected plant.

Plants affected: Most plants are susceptible to aphid damage.

Active: Most of the growing season

Signs of damage: Serious infections cause leaves, stems, and shoots to discolor, wilt, or appear stunted. Aphids also produce a sticky substance that coats leaves, and feeds the growth of a black, sooty mold fungus. Aphids can also transmit diseases from plant to plant.

A few aphids here and there are nothing to worry about, but if you begin to notice large masses, it's time to consider action. Aphids tend to like new, tender growth, so look for them on the newest growth, and on undersides of leaves.

Controls: Beneficial insects can be quite effective in controlling aphids. Lady beetles, lacewing larvae, and syrphid fly larvae prey on aphids. These beneficials are usually present in our gardens, so it's important to try not to harm these by indiscriminate use of pesticides.

Insecticidal soap is effective, and will not harm most of the beneficials. Stronger insecticides are usually not necessary. Mix according to label directions, and apply thoroughly to affected areas of the plant. A follow up spray or two, 5–8 days apart may be necessary.

You'll find some recommendations that aphids can be dislodged by a strong spray of water, but this is likely damage plants.

More info:

<http://www.uri.edu/ce/factsheets/sheets/aphids.html>,

<http://ipm.illinois.edu/vegetables/insects/aphids/>

Cabbage loopers: Light-green caterpillars about 1 1/4 inch long and 1/16 inch in diameter. These are the larval stage of a mottled, brown moth with a wingspan of about 1 1/2 inches. There can be 1–3 generations per season. Cabbage worms—the larvae of similar-size white butterfly—are slightly larger than loopers in all dimensions, but their life cycle, the damage they do, and control measures are the same as for the looper.

Plants affected: All plants in the Brassica family—broccoli, cabbage, kale, cauliflower, collards, Brussels sprouts; also occasionally turnips, radish, mustard, lettuce, and others.

Active: Throughout the season, numbers are usually greatest mid-summer. Both insects can have 1–3 generations per season.

Signs of damage: Irregular holes on leaves, quickly growing in size. Black, fecal pellets often noticeable on foliage.

Controls: Several naturally occurring, parasitic wasps prey on eggs and young larvae. Having plants in the garden that support such beneficial insects can help reduce pest populations. Outbreaks can be treated with insecticides containing Bt (*Bacillus thuringiensis*), such as Dipel or Thurcide. Spinosad-based insecticides such as Monterey Garden Insect Spray are also effective. These products only affect lepidopteran pests (larvae of butterflies and moths), and not other insects.

More info:

<http://www.uri.edu/ce/factsheets/sheets/importcabbageworm.html>,
<http://www.nysaes.cornell.edu/ent/factsheets/pests/cabl.html>

Cucumber beetles: Come in a striped and spotted version; the striped is usually more common here. An elongated beetle about 1/4 inch or so long with three distinct black and four longitudinal yellow stripes. Larvae are slender, white caterpillars about an inch or so long, with a brownish red head. Larvae feed on roots, adults feed on leaves and other plant parts. In addition to feeding damage, adults can also transmit certain diseases.

Plants affected: Mostly cucurbit family (cucumbers, melons, squash, pumpkins); the less-common spotted beetle can affect a wider range of plants.

Active: Early to mid-summer, then again in late summer/early fall.

Signs of damage: Edges of leaves chewed, holes in leaves, severe infestations can skeletonize leaves.

Controls: Cucumber beetles can be difficult to control. Hand picking can make a sizable dent if the numbers are small to begin with. Fairly easy to catch, especially in the morning when they seem slower to take flight when disturbed. Morning is also the time they feed, so there are more of them out and about.

Applying beneficial nematodes to the soil in the spring can help control larvae that hatch from eggs laid in the soil. For adults, stronger insecticides such as pyrethrins and rotenone are necessary. Since these can kill a wide range of insects, they need to be applied carefully. Both are toxic to bees, so they should not be applied to plants when they are flowering.

More info: <http://www.uri.edu/ce/factsheets/sheets/cucbeetles.html>

Cutworms: Fat (1/4-inch diameter), brown or gray caterpillars, 1–2 inches long, curl up when disturbed. Mostly active at night, rarely seen during the day. They lurk just below the soil surface during the day. Adults are brownish gray moths.

Plants affected: Pretty much anything. Seedlings are especially vulnerable.

Active: There can be one or two generations per season. First generation is active May through June. In years with a warm autumn, a second generation can be active mid-autumn.

Signs of damage: Young seedlings are cut off at soil level. The plant may be left lying on the ground, or may be partially or totally consumed.

Controls: Soak a grain like bran or oatmeal with Bt and spread it on the ground a week or so before setting out seedlings. Or apply beneficial nematodes to the soil a week or two before planting. A collar, wrapped around the seedling stems will block the cutworm from getting to the plant. Plastic or cardboard cups, with the bottoms removed and slit up the side, work well for this. Push the bottom of the collar about an inch into the soil. Neem products applied to seedling may have some deterrent effect.

More info: <http://www.uri.edu/ce/factsheets/sheets/cutworms.html>

Flea beetles: Tiny, black beetles (about 1/16 inch) that hop quickly like fleas when disturbed. There are different species, but they all look similar, and control is the same for all types.

Plants affected: Tomatoes, eggplants, radishes, brassicas (broccoli, cauliflower, cabbage, etc.), peppers

Active: mid- to late spring through most of the summer

Signs of damage: initially, small holes on leaves, 1/16–1/8 inch in diameter; can coalesce into larger holes as feeding continues. Look carefully for small, black dots on leaves. Left uncontrolled, a serious infestation will destroy small plants.

Controls: Younger plants are most susceptible, older plants can sustain some damage. Fleas beetles can be tricky to control. Covering young plants with row cover material, before beetles appear, can be effective, but covers need to be installed so beetles can't get in, and tears must be sealed. Removing covers to tend plants can let beetles in and covering larger plants can be unwieldy.

Spraying with insecticides containing pyrethrins (such as Pyganic) or spinosad (Monterey Garden Insect Spray) can be effective. Follow-up applications a week or so apart may be needed.

More info: <http://www.uvm.edu/vtvegandberry/factsheets/fleabeetle.html>

Leafminers: Pale, small (1/16 inch), green, stubby larvae that tunnel between the upper and lower surfaces of the leaves of a number of plants. Adults are small, black or black and yellow flies, about 1/16 of an inch long. There can be 2–3 generations per year.

Plants affected: Most often beets, chard, and spinach; occasionally peas, peppers, tomatoes, cabbages, lettuce, other greens.

Active: Throughout most of the growing season.

Signs of damage: Leaf tissue turns brown or white where miners have tunneled through leaves. The trails are easily noticeable.

Controls: Hard to control with insecticides. Row covers to exclude the adult flies can be very effective, but the covers must be maintained for the whole season on the crops that are most susceptible (beets, spinach, chard). This often isn't practical where these plants are mixed in with other crops. Picking off and destroying affected leaves can significantly reduce the population numbers later in the season. Products containing neem, spinosad, or pyrethrins, applied at the first signs of infection, may work to control miners, if applied before eggs hatch.

More info:

http://www.umassvegetable.org/soil_crop_pest_mgt/insect_mgt/beet_leafminer.html,
<http://www.ipm.ucdavis.edu/PMG/r732300311.html>

Slugs: Land-based relatives of clams and mussels, common slugs are 1/4–1 inch long. Banana slugs found in coastal areas are as big as, well, bananas. Slugs feed primarily on dead and decaying plant material, but they'll eat young leaves of living plants, too.

Plants affected: Most anything, especially lettuce and younger plants of all types.

Active: All season. The numbers increase during periods of damp weather.

Signs of damage: Small, newly emerging seedlings may be completely consumed overnight. On larger plants, leaves will have smooth-edged holes of varying sizes. Leaves may be mostly consumed if numbers are high.

Controls: Slugs have a number of natural predators, including birds, snakes, and toads. Ground beetles and fireflies prey on slug eggs. Slugs feed at night, and take cover in cool, damp places during the day. If you put out a board, raised up an inch or so off the ground, you'll often find slugs gathered there during the day. Night hunting with a flashlight can be effective. Products containing iron phosphate mixed with a bait—such as Sluggo and Escar-Go—are safe and

effective for slug control. They are also attracted to yeast, so some yeast mixed with water and sugar, placed in a jar on its side, with the opening at soil level, will draw slugs to a watery death.

More info: <http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7427.html>

Squash bugs: Ominous-looking insects 1/2–3/4 inch long, with black legs, gray body, and long antenna. When young, they have green bodies and reddish legs and head. Eggs are shiny yellow, turning brick red when mature, laid in groups on undersides of leaves.

Plants affected: All cucurbits, especially pumpkins and squash.

Active: One generation per year, adults feed mid-summer; adults and nymphs may both feed on fruit later in the fall.

Signs of damage: They suck sap out of plants, and inject a toxin, causing leaves to blacken, wilt, and eventually die back. Symptoms can appear similar to those of wilt diseases.

Control: Row covers can be effective in keeping bugs off plants, but they must be in place before the insects appear. Diligent hand picking can be effective for small infestations. Squash bugs will look for hiding places on the ground at night. They will gather under small boards put out on the ground and can be gathered and destroyed.

Squash bugs are hard to control with insecticides. Neem-based products may have some deterrent effect if applied when bugs are young. Stronger organic insecticides such as pyrethrins, or rotenone may be needed when the insects are older.

More info:

<http://extension.usu.edu/files/publications/factsheet/ENT-120-08.pdf>,
<http://www.uri.edu/ce/factsheets/sheets/squashbug.html>

Squash vine borers: In spring, adult moths emerge from overwintered pupae in the soil and deposit eggs on plants. Eggs hatch in summer, grow into fat, white caterpillars, an inch or so long when mature, which bore and tunnel into stems of plants at ground level and tunnel.

Plants affected: All cucurbits, especially squashes and gourds.

Active: One generation per year, borers usually show up beginning early summer. Begin scouting for signs of borer in June.

Signs of damage: Most visible symptom is wilting of leaves, sometimes beginning with lower leaves, but entire runners may suddenly die back. Looking carefully at the base of the stem, you'll find small globs of "frass," which appears as a slimy mass of sawdust.

Controls: Careful "surgery" can sometimes extract the borer from the stem of newly infected plants, and if the damage is not too bad, soil can be mounded over the damaged stem, and new roots will grow from the stem above the damaged area, and the plant will survive. Row covers can exclude the adults from laying eggs in the soil, but must be in place well before the time of egg-laying.

Beneficial nematodes, applied to the soil in the spring, can reduce the numbers of larvae as they hatch.

Diatomaceous earth, spread on the soil around the base of vines may prevent some borers from reaching the plant, but the material needs to be reapplied after rainfall or watering. Insecticides that may be effective are spinosad and pyrethrins, but these would need to be applied repeatedly (every week or so) to the base of susceptible plants for a month or so when borer activity is expected.

More info:

http://attra.ncat.org/attra-pub/PDF/squash_pest.pdf,

http://ipm.illinois.edu/vegetables/insects/squash_vine_borer/index.html

Tomato hornworm: The hornworm is the larval stage of the sphinx or hawk moth, a large (3–4 inch), gray-brown moth, which are actually kind of cool, since their flight habit resembles that of humminbirds. Hornworms can grow to 3–4 inches long, are light green with white and black markings, and a distinctive "horn" protruding from the top of its head. They can blend in with plant foliage, and can be hard to spot.

Plants affected: Mostly tomatoes, occasionally others in the same (Solinaceae) family (eggplants, peppers, potatoes).

Active: One generation per year. Adults lay eggs on undersides leaves in the spring. Caterpillars hatch and feed on plants during the summer.

Signs of damage: Leaves are chewed, leaving large holes or only the midribs and veins. Heavy infestations can quickly defoliate plants.

Controls: Once you learn to find them, handpicking minor infestations can be very effective. Parasitic wasps prey on hornworms, and sometimes you'll find hornworms with the white wasp cocoons on their backs.

Effective insecticides include: spinosad, Bt kurstaki, or, when caterpillars are young, Neem products.

More info:

<http://www.uri.edu/ce/factsheets/sheets/tomhornworm.html>,
<http://insects.tamu.edu/fieldguide/cimg308.html>, <http://www.ipm.ucdavis.edu/PMG/r>

DISEASES

Good plant care practices can help prevent diseases from taking hold on plants. Diseases are encouraged by high humidity, so maintaining good air circulation around plants (don't let plants get too crowded), and proper watering (don't get leaves wet, water in the morning so things dry out during the day) are very helpful.

It's important to remember that most fungicides only work to prevent or block diseases from taking hold, and do not "cure" them once they are already established. Sprays are best applied before diseases get established, or when the very first signs and symptoms are noticed. Severely affected plants or parts of plants should be removed and disposed of in the trash (not composted).

Powdery mildew: Many species of fungi cause this disease and each species affects a particular plant. Leaves, flowers, and shoots. Fungal spores blow in on the wind, and can infect plants far from the source.

Plants affected: Many vegetables, especially beans and cucurbits (squash family), but also lettuce, radishes, turnips, and others. It also infects many ornamentals including phlox, roses, lilacs among others.

Active: Any time during the growing season, but serious infections are more likely from early to mid-summer on.

Signs of infection: First appears as white, powdery spots that may form on both sides of leaves, and sometimes on other parts of plants. Infected leaves eventually turn yellow and die.

Controls: As with all diseases, prevention is the best strategy. Check seed catalogue descriptions for varieties that are resistant to the disease. Be sure plants have good exposure to the sun. Water in the morning so excess moisture evaporates during the day. Avoid over fertilizing, which can make plants more susceptible to infection.

A number of least-toxic fungicides are available to help control powdery mildew. Horticultural oil (a highly refined oil specially formulated for use on plants; also known as dormant oil) either alone, or in combination with a bicarbonate product, is effective in controlling powdery mildew. Bicarbonate alone is not effective. For the oil/bicarbonate combination, mix 1–2 tablespoons of horticultural oil, 1 heaping tablespoon of either sodium bicarbonate (baking soda) or potassium

bicarbonate (sold as a plant fungicide under the brand name of Kaligreen), and 1/2 teaspoon insecticidal soap in one gallon of water. Shake vigorously before and during use and be sure to thoroughly cover all plant surfaces.

Neem-based products may also be effective in controlling this disease. Both neem and oil can act as eradicants as well as preventatives.

Studies have shown that diluted milk is effective in controlling powdery mildew, and there are numerous anecdotal reports that confirm this. Mix a 10% solution (13 ounces of skim milk plus enough water to make one gallon), shake well, and spray thoroughly. Using milk with higher fat content may leave a lingering, unpleasant odor as the fats go rancid.

Any of these treatments will need to be repeated at 5–10 day intervals throughout the season. Perhaps rotating treatments is best, as overuse of any one fungicide may cause unexpected problems. Avoid spraying when temperatures are above 85° or so.

More info:

<http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7406.html>, <http://attra.ncat.org/attra-pub/bakingsoda.html>, <http://www.ext.colostate.edu/ptlk/1833.html>,
<http://www.gardenguides.com/779-using-milk-control-powdery-mildew-garden-pest-tip.html>

Tomato diseases

Blossom-end rot: Caused by physiological problems (sudden changes in temperature, root disturbance, lack of calcium, among others) and not bacteria or fungi.

Signs of damage: Affects fruit beginning when about half its full size. A small, water-soaked spot grows larger and darkens.

Active: Mid- to late season

Control: Maintaining good soil conditions, and good plant care will prevent this disease. Try to maintain even soil moisture. Mulch around plants. Avoid disturbing roots of mature plants. Avoid too much nitrogen as plants mature. Modest additions of a soil supplement providing calcium may be helpful.

More info: http://vegetablemdonline.ppath.cornell.edu/factsheets/Tomato_BlossRt.htm

Fusarium wilt: A fungus disease. The soil-dwelling fungus can enter plants through wounds in plant tissues, especially on roots or stems and leaves close to the soil. The fungus enters the vascular system of the plant, and blocks movement of water. More prevalent in warmer climates than in New England . May also affect eggplant, potato, pepper.

Active: Much of the season

Signs of damage: Older leaves turn yellow, usually starting at the top of the plant. Often only one branch may be affected. Entire plant may eventually wilt.

Control: Remove and destroy infected plant material. Plant resistant varieties. Maintain good plant vigor. Rotate crops (avoid planting plants in the same family in the same spot in successive years).

Early blight: Affects leaves and fruits. Fungus overwinters on seeds and crop debris left on the soil surface. Spores form in the spring and are dispersed by wind, rain, tools, and some insects.

Active: Late spring onward

Signs of damage: On leaves, target-like, brown spots usually appear on oldest/lowest leaves first. On fruit, infections begin at the stem end, and causes a dark-colored rot inside the fruit.

Control: Clean up beds at the end of the season. Rotate crops. Copper fungicide, applied at 7–10 day intervals beginning at the first sign of infection may stop its spread. Biological fungicides such as Serenade may also be effective.

Late blight: Nasty fungus that can wipe out entire fields. We had it in the garden last year. It only overwinters on living plant material (such as buried potato tubers), so it is unlikely that any of the disease will have carried over from last year. It can, however, arrive in gardens on infected nursery plants, and spores can be transported by the wind from infected plants in the area, so we still need to be on alert. High humidity is ideal for the development and spread of late blight.

Signs of damage: Lower leaves tend to infect first, and will have large, irregular spots at tips and edges. A week or so later, whitish mold appears around the spots on the undersides of leaves. Brown lesions, sometimes accompanied by a whitish mold, appear on stems. Fruit is also affected, beginning before they ripen.

Active: Generally begins just before blossoming, continues through season

Control: Plant resistant varieties. Get plants from reliable sources. Remove and destroy infected plants. Control with fungicide is not practical, as it must be applied before symptoms appear and continue throughout the season.

More info:

http://www.hort.cornell.edu/departments/Facilities/lihrec/vegpath/photos/lateblight_tomato.htm

<http://gardening.wsu.edu/column/06-16-01.htm>



Septoria leaf spot: Yet another fungus disease. Affects older, lower leaves first. The disease can overwinter on infected plants that remain on the soil.

Signs of damage: First appears as small, circular spots on undersides of leaves, eventually growing larger and sometimes coalescing. Spots may appear on other parts of the plant, but rarely on fruit.

Active: From seedling stage on

Control: Get plants from reliable sources. Plant far enough apart, and prune out some vines to maintain good air circulation. Clean up well at season's end. Avoid working with and around plants when wet to avoid spreading disease. Remove infected leaflets and dispose of (don't compost).

More info: http://vegetablemndonline.ppath.cornell.edu/factsheets/Tomato_Septoria.htm

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