



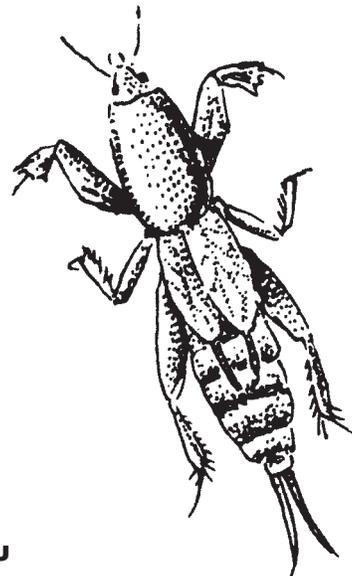
Alabama A&M and
Auburn Universities



Garden Bugs

Insect Pest Management
in the Home Vegetable Garden

- Q.** *How can I keep "bad bugs" out of my garden?*
- Q.** *How can I attract "good bugs" to my garden?*
- Q.** *How can I control slugs and other soil insect pests?*
- Q.** *What insect pests are common to Alabama?*
- Q.** *How can I control insect pests without insecticides?*





Garden Bugs

Insect Pest Management in the Home Vegetable Garden

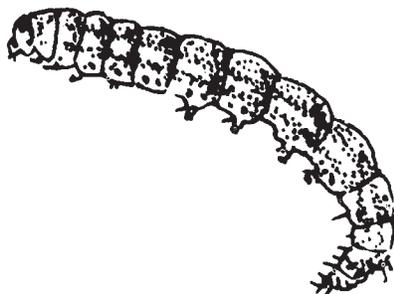
The best way to manage insect pests in the home vegetable garden is to use a combination of strategies, including cultural, mechanical, and biological controls. Organic gardeners rely totally on nonchemical methods. Most home gardeners can tolerate some insect damage on their vegetables; consequently, they are able to use many nonchemical control strategies that can reduce, but not always eliminate, insect damage. Home gardeners not opposed to using chemicals may use chemical controls when nonchemical methods do not provide sufficient levels of control.

Modern pest management relies on “planning before planting” rather than responding to a pest problem after it has occurred. For example, you can prevent many insect pest problems by using what you know about the pest to make the vegetable planting less suitable for pest development. This could mean planting early to avoid high pest numbers that occur late in the season.

Correct identification of insect pests infesting the vegetable garden is critical so you can develop a management plan. Equally important is recognition of beneficial insects. Your county Extension agent can help you identify pests and develop management strategies for specific pest and crop situations.

This publication provides:

- Tips on making your garden vegetables less susceptible to insect damage.
- General recommendations for managing soil pests.
- General recommendations for managing above-ground pests.



Making Your Garden Vegetables Less Susceptible to Insect Damage

In home vegetable gardens, insecticides should be used only as a last resort to prevent serious insect damage. Insecticides kill beneficial insects as well as harmful insects. You may not even notice that these “good” insects are present, but if they are destroyed, pest insect populations can increase to very high numbers.

You can reduce or eliminate the need for insecticides in your garden by using a variety of techniques. The best approach to successfully control garden pests is to use a combination of techniques.

Healthy Soil

Healthy soil will produce plants better able to resist insects and disease. Before planting your garden, turn over the soil and add organic matter such as manure or compost to supply essential nutrients. Organic nutrients are released slowly, in contrast to synthetic fertilizers which provide “quick-fix” nutrients.

It’s a good idea to have your garden soil tested to determine if soil nutrients and pH are suitable for growing vigorous plants. Soil testing can be done for a nominal fee; contact your county Extension agent for more information.

Companion Planting

Some plants contain or give off compounds that repel insects. Companion planting is the practice of strategically placing insect-repelling plants next to crops that will benefit from their repellent effects. For example, planting garlic among vegetables helps to deter Japanese beetles, aphids, vegetable weevils, and spider mites; basil planted near tomatoes repels tomato hornworms; and marigolds interplanted with squash or cucumber repel cucumber beetles and nematodes. Check the organic gardening section in your library or bookstore for books on companion plants.

Crop Rotation

Planting different kinds of vegetables in a different section of your garden each year will help reduce pest infestation. Some insect pests overwinter in the garden soil and emerge in the spring and begin searching for food. If the plant they prefer to eat is located several yards away, the insect must move to the source. Many will die along the way or fall prey to birds and other insects.

Also, many vegetables may absorb a particular nutrient from the soil. By rotating your vegetable crops each year, the soil in a particular section of the garden will have the opportunity to rest and regenerate. In general, avoid planting crops in the same plant family in the same location in consecutive years. For example, potato, eggplant, and tomato are all in the Solanaceae family, so these crops should be rotated with vegetables in another plant family, such as the squash or cucurbit family, the bean or legume family, etc.

Diversified Planting

A common practice among home gardeners is to plant a single crop in a straight row. This encourages pests because it makes it easy for them to travel from one host plant to another. If different plants are intermingled and not planted in straight rows, an insect is forced to search for a new host plant thus exposing it to predators. Diversified planting also works well with companion planting.

Trap Plants

If given a choice, some insects will opt to feed on one plant type over another. For example, pickleworms prefer squash to cucumber, and some tomato worms prefer dill over tomatoes. With a little knowledge of host preferences, you can take advantage of this by placing certain plants where they can lure harmful insects away from the plants you wish to protect. Once the “trap plants” have become infested, the target insect can be picked off and dropped in soapy water or the entire plant can be disposed of.

Barriers and Traps

Barriers and traps can be employed to capture or impede movement of pests. A collar made of thick paper or cardboard which is placed around the stem of a plant and pressed into the soil an inch or so deep will prevent cutworms and other burrowing insects from getting into the soil around your plants. A board or thick piece of paper painted yellow and coated with a sticky substance, such as Tanglefoot, will attract and intercept aphids, whiteflies, and other small flying insects.

Mulch

Mulching is the spreading of organic matter in the garden and around plants. It is an effective method to control weeds and also serves as a refuge for predatory insects like ground beetles. Mulch also helps the soil to retain moisture and stay cool, which promotes plant vigor and tolerance to insect attack.

Add mulch to the garden when plants are 4 to 6 inches high. Grass clippings, leaves, hay, sawdust, wood chips, and compost make excellent mulches. One drawback of using mulch may be increased numbers of slugs that may feed on young and succulent plants.

Compost

Fertile soil is the foundation of a healthy garden. One of the most effective ways to enhance soil fertility is to add compost. Compost is made by mixing organic matter and allowing it to decay through a natural process. The end product is a dark, rich substance called humus which can be added directly to the soil.

The first step in composting is to build a holding bin or composter. Construct the bin from chicken wire, scrap wood, or cinder blocks. The dimensions should be at least 3 × 3 × 3 feet but can vary depending on your needs. Place the bin in a convenient location. Add leaves, grass clippings, and household vegetable food waste. Do not add animal residues as they may attract rats and raccoons. Turn the pile to aerate the material. If you turn the pile every month, humus will be ready in about 6 months.

Beneficial Insects

Not all insects are “bad bugs.” Your garden and surroundings contain many insects that are actually beneficial because they feed on harmful insects. Therefore, as a gardener, you should be able to identify garden insects and determine whether they are harmful or beneficial. Many organic gardening books provide pictures of the most common beneficial and pest insects and information on how to encourage populations of beneficial insects. Another good reference book with pictures of beneficial insects is *Natural Enemies of Vegetable Insect Pests* by Michael Hoffman and Anne Frodsham. This book may be ordered by phone (607-255-2080) from Cornell University Resource Center. Your county Extension agent can also assist you with insect identification.

Table 1. Attracting Beneficial Insects

Name of Beneficial Insect	Prey	Methods to Attract
Ladybugs	Adults and larvae eat aphids, scales, mites, and eggs of some pest insects.	Grow pollen and nectar plants like dill, goldenrod, yarrow, cosmos, sweet alyssum. Spray non-crop plants with sugar water. Provide water in a pan filled with gravel during dry periods.
Hover flies	Larvae feed on aphids and small caterpillars.	Grow pollen and nectar plants in the Umbelliferae family. Allow some broccoli to flower. Plant tall plants like sunflower so flies can hover.
Robber flies	Adults capture flying insects. Larvae live in soil and feed on soil pests like grubs.	Plant flowering plants as a nectar source.
Ground beetles	Feed on snails, slugs, cutworms and other caterpillars, and on potato beetle eggs and larvae.	Grow pollen-providing plants. Grow dense cover crops to provide shelter. Incorporate grass or stone walkways between garden beds.
Big-eyed bugs, flower bugs	Adults eat aphids, small caterpillars, mites, turf pests, thrips, and other small insects.	Grow pollen and nectar plants like sweet alyssum, alfalfa, goldenrod, and cosmos.
Assassin bugs	Both nymphs and adults use their needle-like stylets to suck fluids from and kill aphids and other small insects and their eggs. Larger wheel bugs attack large caterpillars.	Grow perennials to provide permanent shelter plantings.
Lacewings (green and brown)	Larvae eat aphids, scales, thrips, mites, and eggs of some pest insects.	Plant dill, sunflowers, caraway, cosmos, sweet alyssum, and goldenrod flowers. Spray sugar water on non-crop plants to attract adults.
Tachinid flies	Larvae are parasites of squash bugs, cutworms, Japanese beetles, and many caterpillars.	Grow plants in the Umbelliferae family and other small-flowered plants like sweet alyssum and spearmint.
Wasp parasites (non-stinging to humans)	Adults inject eggs inside caterpillar prey; wasp larvae develop, eventually killing the host. Some species parasitize insect pest eggs.	Grow pollen and nectar plants in the Umbelliferae family, also mints and herbs. White clover and other legume cover crops planted adjacent to garden beds also attract parasites. Provide shelter with tall plants like sunflowers. Let some broccoli and radishes flower.

A good way to attract beneficial insects into the garden is to incorporate plants inside or adjacent to the garden that will supply alternative sources of food, such as pollen and nectar, and shelter for beneficial insects. Remember that application of synthetic insecticides can destroy the natural balance by eliminating beneficial insects. Table 1 presents a partial listing of methods to attract some of the more common beneficial insects.

Managing Soil Pests in the Garden

General Recommendations

Many soil insect pest populations reach high numbers in grass or turf, and home gardens are often established in areas previously covered with grass. To reduce soil insect problems, thoroughly till or spade the area well in advance of planting (30 days or more) and again just before planting.

This will bring up soil pests near the surface where their chances of mortality are increased. In most cases, tilling the soil or sod in fall and early spring will sufficiently control soil insects without the need for a soil insecticide.

If tilling is not an option, apply a broadcast soil insecticide 2 weeks before planting to help control some soil insects like cutworms, wireworms, and white grubs. Check with your local Extension System office for available insecticides.

Slugs

Slugs like to feed on young seedlings and succulent parts of plants. They leave a trail of mucus on the surfaces on which they crawl. Moist, humid environments favor slug development, and slugs usually overwinter in sheltered locations outdoors. They deposit their eggs in moist areas and require a year or more to mature.

- Spade or till garden area in the fall and again in the spring before planting

- Pick slugs by hand. Using a flashlight, check the garden around 10:00 p.m. for active slugs. If you find any, pick them up with an old teaspoon. Place captured slugs in a container of salt which will kill them. Continue this activity for 3 to 4 nights in a row to greatly reduce damage.

- Place stale beer in small cups or pans sunken in the soil so the lip of the container is slightly below ground level. Slugs are attracted to the beer, fall into the container, and drown. For best results, replace the stale beer about every 3 days. Setting out enough containers early in the spring can greatly reduce slug populations.

- Use diatomaceous earth, lime, or sawdust as a barrier; replace after each rain.

- Pesticide baits are minimally to moderately effective against slugs. To increase their effectiveness, apply them late in the afternoon. Bait in the fall after the first fall rains to target slugs before they can lay eggs. Check with your local Extension System office for available pesticide baits.



SLUG
0.5-4.0 IN.

Cutworms

Cutworms are active only at night and remain buried below the soil surface near food plants during the day. They emerge to feed at night and often cut seedlings or small stems, causing the plants to fall over.

- Because grass and many weeds are preferred hosts, remove grass and weeds in the garden, and plow the soil well in advance of planting.

- You can also prevent damage by placing a paper or plastic “sleeve” over the plant and pressing the bottom into the soil. Place sleeves around newly set transplants or newly emerged seedlings so that 1 inch is below ground and 3 inches above ground. Paper cups with the bottoms removed or 4 inch high sections of ½ gallon paper milk cartons are ideal. Tuna cans with the bottoms removed may also work.

- Check with your local Extension System office for available insecticides.

- Use Sevin bait after plant emergence. Apply Sevin according to label directions late in the afternoon so the bait will be fresh when the worms come out to feed at night.



Wireworms

Wireworms are the slender, yellowish brown, hard-bodied larvae of click beetles. They can survive deep in the soil for up to 5 years and can move up to attack seed or young plants. Several wireworm species prefer plants in the grass family and are usually not a problem unless the garden is planted into land that previously contained grasses in the grass family.

- Turn over the soil in the fall, and again in the spring well in advance of planting, to help reduce wireworm populations.

- Use a granular insecticide. Apply granules according to label directions, and work then into the soil to a depth of 4 to 6 inches, followed by a good watering.



PACIFIC
COAST
WIREWORM
0.4 IN.

White Grubs

White grubs are Japanese, May, and June beetle larvae that are dirty white in color. The tip of their abdomen is a blue-black color. They roll into a **C** shape when disturbed. Mature grubs may reach 2 inches in length. They live in the soil and sometimes feed on plant roots and tubers. About the only time they are troublesome is when parts of the lawn or sod are turned under in the spring for garden use.

- If you must plant in previously grassy areas, prepare the garden well in advance of planting. As sod is turned over, raked, and prepared for planting, pick up the grubs by hand for the best control.

- Check with your local Extension System office for available insecticides.

Mole Crickets

Mole crickets have brown, velvety bodies with broad front legs for digging in the soil. They have large eyes and are about 1 inch long when mature. As mole crickets tunnel through the soil, they can disrupt the root system of vegetables. They may also feed on plant root and underground stem tissue.

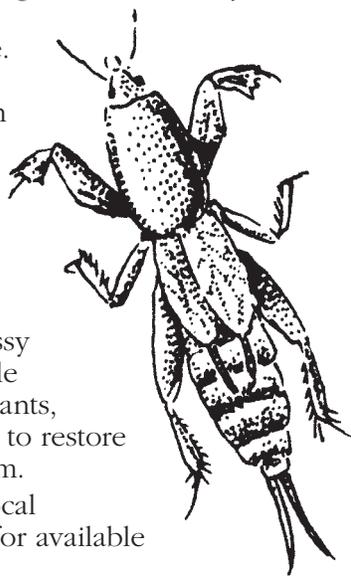
- Avoid planting the garden in previously grassy areas. If you observe mole cricket tunnels around plants, tamp the soil back down to restore support to the root system.

- Check with your local Extension System office for available insecticides.



LARVA
0.5-2.0 IN.

LINED JUNE BEETLE
0.9-1.1 IN.



MOLE CRICKET
0.8-1.2 IN.

Managing Above-Ground Pests in the Garden

Nonchemical methods for managing garden pests that feed on the foliage and fruit of garden vegetables are presented here.

Aphids

- To repel aphids, anchor aluminum foil to the soil for 1 foot around transplants. Slope soil away from plant so rain water and mud do not obscure reflective surface. You may remove foil after plants flower.

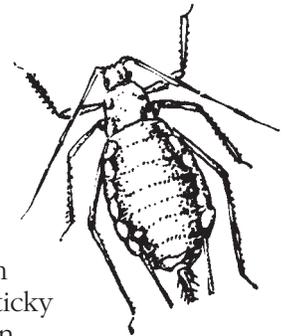
- Make a water trap by painting a small, shallow pan bright yellow and filling it with soapy water. Place several pans in the garden and refill them after each rain. Use bright yellow-painted (Rust-Oleum 659 or Safety Yellow) 6- x 8-inch cards or pieces of plywood as sticky traps. Anchor vertically to garden stakes and spray with Tanglefoot or other sticky substance. Replace Tanglefoot weekly.

- Hand remove and destroy aphid colonies on plant leaves.

- Use a strong spray of water from the hose to knock aphids from plants.

- Spray plants with RTU insecticidal soap or horticultural oil (RTU = ready to use). Test tender plants first to ensure they are not burned by the soap or oil solution. Follow all label directions if using a concentrated product.

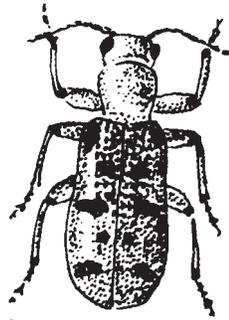
- Because aphids can transmit plant virus disease, remove and destroy diseased plants to delay spread of virus to healthy plants.



PEA APHID
0.12-0.17 IN.

Asparagus Beetles

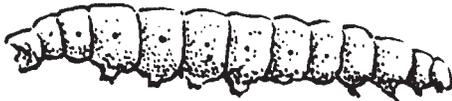
- Plant marigolds near asparagus to repel beetles.
- Destroy and bury plant refuse in the fall to remove overwintering sites.
- Handpick and destroy eggs, larvae, and adults in the morning before they become active.
- Spray asparagus ferns with pyrethrin or rotenone in late summer so fewer beetles will overwinter.
- Cut foliage off at the ground as soon as it begins to die back.



SPOTTED
ASPARGAGUS
BEETLE 0.25-
0.3 IN.

Cabbage Loopers and Cabbageworms

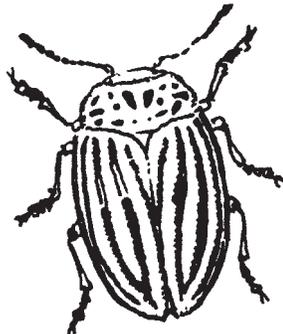
- Cover plants with cheesecloth or floating row cover to prevent egg-laying.
- Handpick. The green worms are much easier to spot on red-leaf varieties.
- Spray plants with *Bacillus thuringiensis* when worms are still small.
- Remove alternate host weeds, such as wild mustard and shepherd's purse, from the garden.
- Interplant a hot pepper plant between every two cabbage plants.



IMPORTED
CABBAGEWORM
1.25-2.0 IN.

Colorado Potato Beetle

- Potato beetles prefer to feed on potato, eggplant, and tomato. Rotate these preferred hosts with other crops in alternate years.
- Interplant nonhost crops, such as beans, with preferred host crops.
- Handpick orange egg masses, reddish brown larvae, and yellow-and-black striped adults and destroy.
- Place straw mulch around plants as a barrier to beetle colonization of plants in the spring.



COLORADO
POTATO
BEETLE
0.4 IN.

Corn Earworm (Tomato Fruitworm)

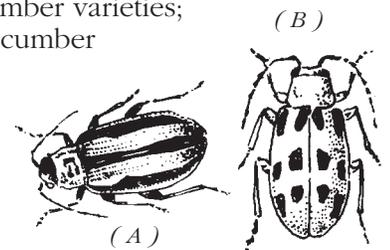
- With no controls applied, earworms usually damage only the tip of the ear. Cut off the damaged tips and you can eat the rest.
- If possible, avoid planting other vegetables near corn, a favorite food of corn earworm.
- Plant and harvest corn as early in the season as possible to avoid heavy infestations.
- Drop ¼ teaspoon of mineral oil on the silks of each corn ear after the silks have wilted but before they begin to dry; this helps to repel moths and egg-laying.
- Select tight-husked corn varieties for planting. Tight husks inhibit worm movement into the ear.
- Beginning at the flower stage, check upper tomato leaves once a week for small, round, white fruitworm eggs. Spray plants with *Bacillus thuringiensis* weekly as long as you detect eggs.



CORN EARWORM
1.5 IN.

Cucumber Beetles

- Plant nonbitter cucumber varieties; the bitter compound in cucumber attracts beetles.
- Cover young plants with cheesecloth or floating row covers until just before bloom.
- Interplant cucumber with radishes; radish seems to repel cucumber beetles. Tansy, marigolds, and nasturtiums also repel beetles.
- Eliminate weeds in and around the garden; some weeds are hosts for bacterial wilt disease that is spread by cucumber beetles.



STRIPED (A)
AND SPOTTED
(B) CUCUMBER
BEETLES
0.2-0.25 IN.

Flea Beetles

- Unless flea beetle populations are heavy, their feeding will not kill plants or reduce yields; control is usually unnecessary.
- Flea beetles are most numerous in the spring; plant susceptible crops like eggplant and radish later in the season.
- Weeds bordering the garden may serve as alternate hosts; removing weeds will reduce flea beetle populations.



POTATO
FLEA BEETLE
0.05-0.08 IN.

False Chinch Bugs

False chinch bugs are weed-feeding insects that may build up in large numbers in arid conditions. They migrate in huge numbers that may overwhelm any control efforts.

- Early-season control of cruciferous weed hosts may help reduce numbers.
- If damage from false chinch bugs reaches unacceptable levels, treatments to field edges will help control this pest.
- False chinch bugs are easily drowned. Heavy watering or use of a strong hose spray will drown many. Trenches or pans of water may be put around plants during periods of insect migration.



DIFFERENTIAL GRASSHOPPER
1.5-2.0 IN.

Grasshoppers

- Trap grasshoppers by using a 1 quart container half filled with a 10% molasses and water mixture.
- Grasshopper populations are most damaging in late summer. Use a floating row cover to protect late-season plantings.
- Plow the garden in the fall to expose grasshopper eggs to the weather and insect predators. Be sure to plow fence rows and garden borders too.

Japanese Beetles

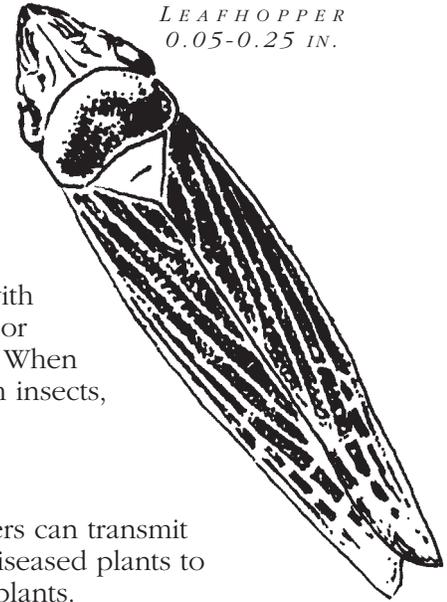
- Avoid planting garden near lawns or in land previously containing lawn.
- Purchase a Japanese beetle pheromone trap to reduce beetle numbers. Locate trap at least 30 feet away from crop plants.
- Protect plants with floating row covers.
- Apply milky spore powder to surrounding lawn or pasture. Milky spore powder is generally available on the Internet.



JAPANESE BEETLE
0.3-0.5 IN.

Leafhoppers

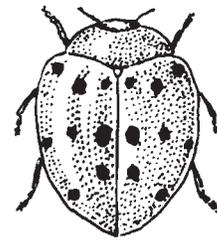
- Protect plants with cheesecloth or other fine mesh row covering.
- Hang bright yellow (Rust-Oleum 659 or Safety Yellow) 6- x 8-inch boards covered with a thin coat of Tack Trap or Tanglefoot at crop level. When the boards are filled with insects, wash them and repeat.
- Spray plants with insecticidal soap.
- Because leafhoppers can transmit virus diseases, remove diseased plants to delay spread to healthy plants.



LEAFHOPPER
0.05-0.25 IN.

Mexican Bean Beetles

- Handpick and destroy egg masses and beetles in early morning before they become active.
- Interplant nonhost crops like potatoes among bean plants to disrupt egg-laying.
- Use soybeans as a trap cover. Bean beetles prefer soybeans planted nearby over snap or lima beans.



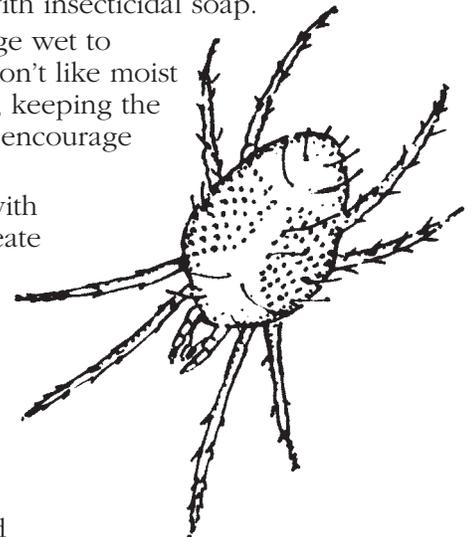
MEXICAN BEAN BEETLE
0.25-0.33 IN.



LARVA
0.33 IN.

Spider Mites

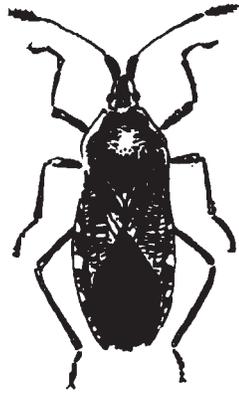
- Spray plants with insecticidal soap.
- Keep the foliage wet to deter mites, which don't like moist conditions; however, keeping the foliage wet can also encourage plant diseases.
- Cover plants with an old blanket to create a cool, moist environment that deters mites.
- Spray plants with water or insecticidal soap; then cover infested plants for 3 days and follow with a second soap spray.



TWOSPOTTED SPIDER MITE
0.01-0.02 IN.

Squash Bugs

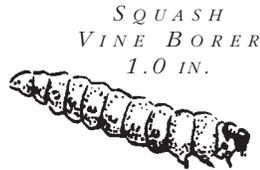
- Remove and destroy clusters of oval, orange-brown squash bug eggs.
- Remove and destroy vines and unused fruit after harvest to eliminate overwintering sites.
- Place shingles or boards near squash or pumpkin plants in spring or early summer to attract squash bugs; then collect and destroy adult bugs under the boards each morning.
- Plant nasturtiums and marigolds near squash plants to deter squash bugs.



SQUASH BUG
0.7 IN.

Squash Vine Borers

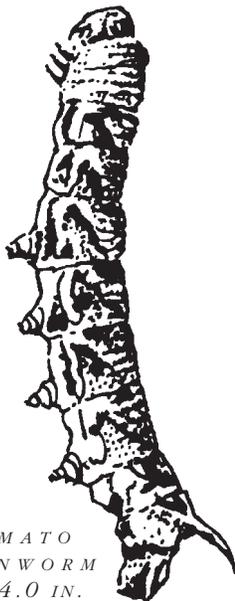
- Cover plants with fine mesh cloth or row cover until female flowers appear. Female flowers have a bulge between flower and stem that is absent in male flowers.
- Plant squash varieties with long vines. These varieties of squash may continue to grow despite borer damage.
- Plant in late summer or fall to avoid heavy vine borer infestations.
- Cut open borer entry holes in the stem with a knife; then remove the worm and pack moist earth around the stem.



SQUASH VINE BORER
1.0 IN.

Tomato Hornworms

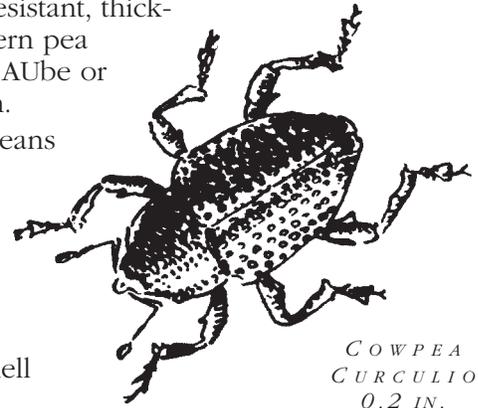
- Handpick worms from plants; check plants in the evening with a flashlight.
- Spray *Bacillus thuringiensis* when the worms are still small.
- Plant dill next to tomatoes as a preferred trap crop; hand-pick worms off the dill.
- Do not destroy hornworms with small, white cocoons attached to their body. These are parasite cocoons from which small, parasitic wasps (beneficial) will emerge.
- Turn the soil in the fall to expose hornworm pupae to weather and predators.



TOMATO HORNWORM
3.0-4.0 IN.

Weevils (Bean Weevil or Cowpea Curculio)

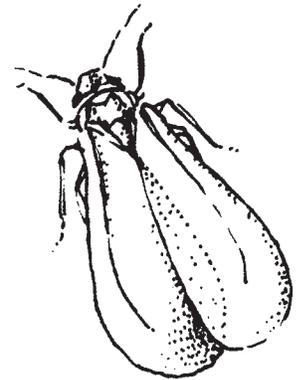
- Plant resistant, thick-hulled southern pea varieties like AUbe or Freeze-Green.
- Plant beans as early as possible, and turn plants under after harvest.
- Pick shell beans when somewhat green; then blanch before freezing; this will kill weevil eggs and larvae which are seldom seen in the frozen beans.
- Before storing, heat beans in a 175°F oven for an hour. Cool beans; then bag and freeze them for a week to kill any weevil larvae or eggs. After this, store beans at room temperature.



COWPEA CURCULIO
0.2 IN.

Whiteflies

- Whiteflies are rarely a problem in outdoor gardens. Make sure purchased transplants are not infested with whiteflies or other insects.
- Hang bright yellow (Rust-Oleum 659 or Safety Yellow) 6- x 8-inch boards, covered with a thin coat of mineral oil, Tack Trap, or Tanglefoot at crop level.
- Spray plants with insecticidal soap.

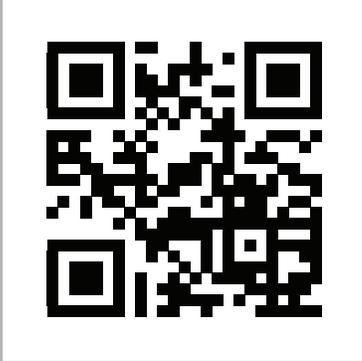


GREENHOUSE WHITEFLY
0.06 IN.

Chemical Control of Garden Pests

Check with your local Extension System office for available insecticides and the proper application rates.

Use this quick reference to find more practical problem-solving tips for your home, lawn, and garden. Scan the symbol below using the code-reading app on a smart-phone or tablet equipped with a camera.



Charles Ray, *Extension Research Fellow*, Entomology and Plant Pathology, and **Kerry Smith**, *Extension Home Grounds, Gardens & Home Pests Co-Coordinator*, both with Auburn University. Originally prepared by **Geoff Zehnder**, former *Extension Entomologist*.

Use chemicals only according to the directions on the label. Follow all directions, precautions, and restrictions that are listed.

Before you apply any pesticide, check with your county Extension agent for the latest information.

Trade names are used **only** to give specific information. The Alabama Cooperative Extension System does not endorse or guarantee any product and does not recommend one product instead of another that might be similar.

For more information, contact your county Extension office. Visit www.aces.edu/directory.

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