

Insect Management in the Home Garden¹

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This publication provides information to aid homeowners in managing insect pests in a vegetable garden. Growing vegetables at home reduces food bills and provides recreation for many homeowners each year. This is especially true in Florida where warm temperatures and long growing seasons make gardening possible year-round.

Unfortunately, the same climate which is so ideal for gardening also provides conditions in which insects thrive. Many different insects attack vegetable crops and it is impossible to know from one season to the next which of these pests will cause problems. Some cause problems every year while others rarely appear. There are also many insects which are beneficial, and in some instances essential, to producing vegetables.

To grow a highly productive garden it is important to have an insect management program. This should include frequent surveys of the garden to detect problems at an early stage. For the survey to be effective, however, the homeowner must know where to look for insects and be able to identify those that are found. Without proper identification, management or control is impossible.

Insects attack plant roots, stems, leaves, flowers, and fruits. They also attack at any stage of growth from seedling to mature plant. The insects described in this manual are divided into groups according to the plant part that they attack. For example, the first section deals with those pests which attack underground plant parts. Descriptions of each insect are given along with information about the group as

a whole. Control measures from sanitation, hand-picking, and other cultural practices to the use of pesticide sprays, granules, and baits are provided.

Insects That Attack Underground Plant Parts

Almost all soil insects build to high populations on grass roots and most new home gardens are grown in plots covered previously with grass. In order to help combat the pests discussed in this section, it is important to plan the location of the garden well in advance of planting. The plot must be thoroughly tilled or spaded and should be kept clean and free of grass for 30 or more days before planting.

Wireworms

Wireworms range from ½ to 1½ inches in length, are yellowish-brown, and have slender, shiny, segmented bodies. The adult form is the familiar “click” beetle (Figure 1). Wireworms attack a wide variety of vegetables. Living deep in the soil, they move up quickly to attack seeds or young plants. Wireworms drill holes in the seeds and feed inside them or they bore holes into the taproot of the plant.

Control measures for wireworms include rotation of garden plots and tilling the soil several months before planting. In areas where wireworms are known to be a problem, it may be necessary to apply a granular insecticide to the prepared soil, “rototill” or spade it in to a depth of 6 inches, and water the plot thoroughly.

1. This document is ENY-476, one of a series of the Entomology and Nematology Department, UF/IFAS Extension. Original publication date March 1990. Revised May 1992 and November 2006. Reviewed February 2016. Visit the EDIS website at <http://edis.ifas.ufl.edu>.

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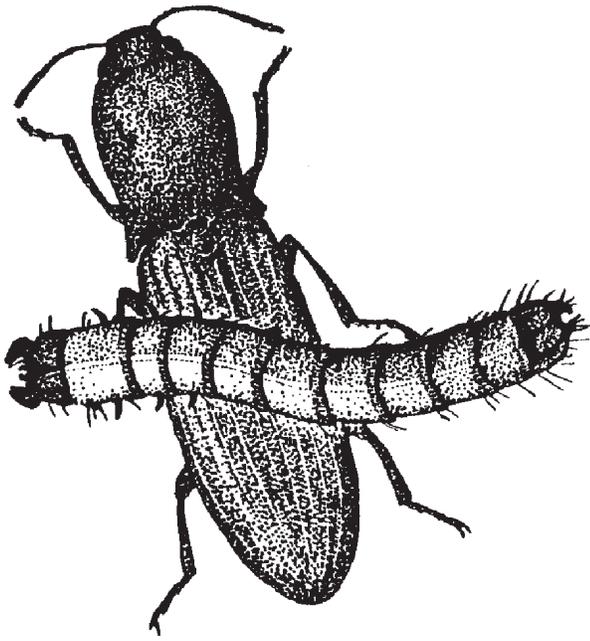


Figure 1. Wireworm (actual mature larva size ranges from ½ to 1½ inches).

Cutworms

Cutworms are stout, gray to almost black caterpillars that may reach almost 2 inches in length. They have a “slick” appearance and curl up if disturbed. Cutworms are active only at night. During the day they remain below the soil surface. At night they emerge to feed on leaves and stems of young seedling and transplants. The stems are frequently cut so that the plant falls over (Figure 2).

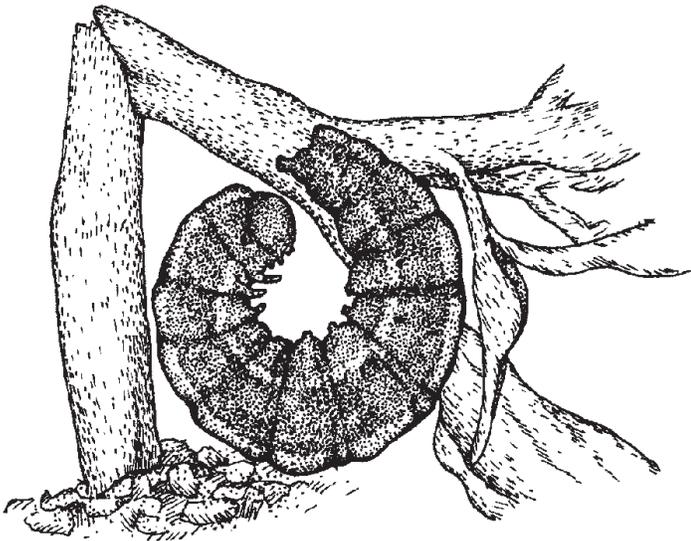


Figure 2. Cutworm (actual size of older worm or caterpillar is approx. 2 inches).

Control measures include removing grass and plowing the soil well in advance of planting. Small “sleeves” made from paper cups with the bottoms removed provide a mechanical barrier to the caterpillar when slipped over the

plant and the bottom edge pressed into the soil. Baits may also be used, but should be applied late in the afternoon so they will be fresh when the cutworms come out to feed at night. Insecticide sprays will provide satisfactory control of cutworms if the spray is directed at the base of the plant where it emerges from the soil. Care should be taken to wet the soil with spray in an area extending 3 to 5 inches from the stem.

Mole Crickets

Mole crickets are light brown insects, about 2 inches long (Figure 3). The front legs are large and resemble small shovels. Mole crickets tunnel under the soil and feed on plant roots. They also disrupt and dislodge plants by their digging. Like cutworms, mole crickets are active only at night and hide in their tunnels during the day. The tunnels are approximately 1/2-inch in diameter and the soil surface appears loosened and raised as if a miniature mole (the mammal) had tunneled.



Figure 3. Mole cricket (actual size approx. 2 inches).

Mole crickets are best controlled by applying baits late in the afternoon on warm days and after the garden has been watered thoroughly. Follow label directions carefully.

Grubs

Grubs are “C”-shaped and dirty white with the tip of their abdomen purplish-black. Their heads are hard, blunt, and reddish-brown (Figure 4). Grubs range in size from 1/4 to 2 1/2 inches long. Like mole crickets, grubs feed on plant roots and tubers and also cause damage by tunnelling in the root zone.

Grub populations can be reduced by preparing the garden soil well in advance of planting. Granulated insecticide applied for wireworms will also control grubs.

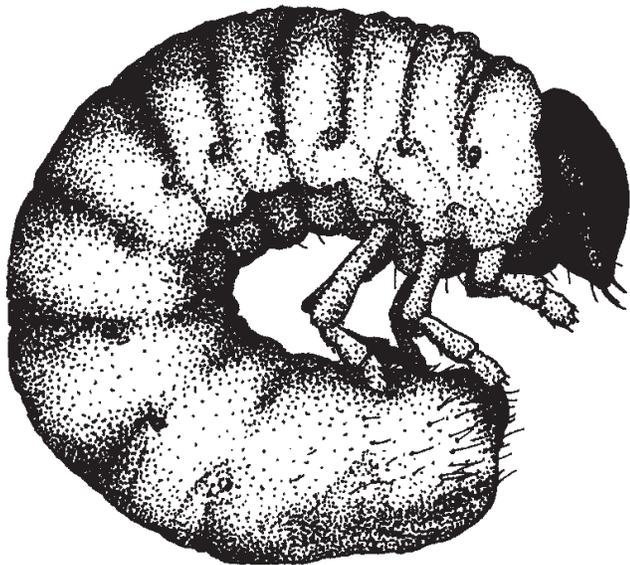


Figure 4. Grub (actual size is ¼ to 2½ inches long).

Lesser Cornstalk Borers

Lesser cornstalk borers (<http://edis.ifas.ufl.edu/in312>) are small caterpillars, ranging from ¼ to ¾ inch in length. Their bodies are alternately banded with aqua and wine-colored bands (Figure 5). These caterpillars attack and feed in the roots of corn, peas, and beans. They construct fragile silk-like tubes that are attached to the roots just below the soil surface.

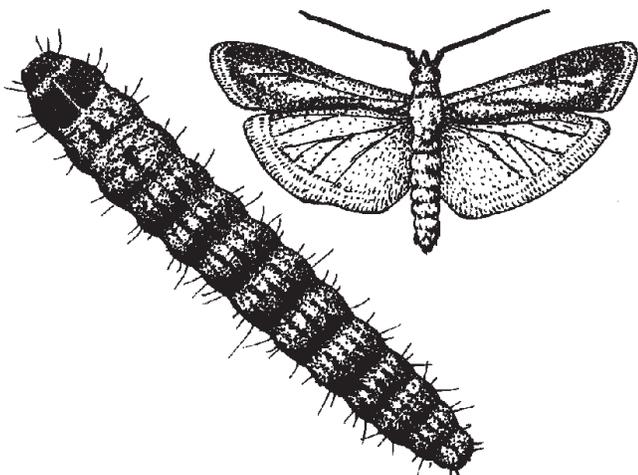


Figure 5. Lesser cornstalk borer (actual size of caterpillar is from ¼ to ¾ inch).

Addition of organic matter to the soil and regular irrigation can reduce the activity of this caterpillar. Do not allow the garden to undergo periods of drought. Plant as early as possible.

Chewing Insects That Feed On Leaves And Stems

Caterpillars are the primary leaf feeders. They consume large amounts of plant tissue after reaching a length of ½ inch or longer. Moths and butterflies, which are the adult forms of caterpillars, do not feed on or damage the plant. Caterpillars have three pairs of true legs (jointed) located just behind the head. They also have a pair of prolegs (fleshy, non-jointed) located at the extreme rear end of the body and, in addition, may have one to four pairs of prolegs further forward (see Figures 6-9).

Armyworms

There are several types of armyworms, similar in appearance, that attack plants in the home garden: beet armyworm, fall armyworm, southern armyworm, and yellowstriped armyworm.

Armyworms are generally migratory species that may fly great distances when the weather begins to warm up. It is wise to plant crops like corn, beans, peas, potatoes, and tomatoes as early in the spring as possible to avoid large infestations. Once armyworms have invaded a crop then applications of recommended insecticides must be made. *Bacillus thuringiensis* formulations are generally effective only on very young and/or small armyworms. Once worms have exceeded 1/2 inch in length they become more difficult to control with *Bacillus thuringiensis* and other recommended insecticides must be used.

FALL ARMYWORMS

Fall armyworms (<http://edis.ifas.ufl.edu/in255>) are about 1½ inches long when fully grown. They usually have dark heads with a light inverted Y-shaped mark on the front part. They are usually tan to green in color and are found feeding in young corn whorls or in the ears (Figure 6).

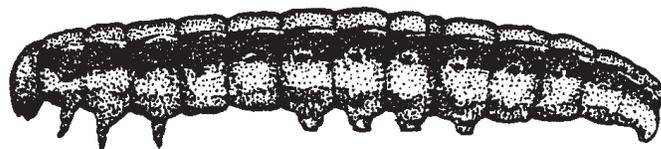


Figure 6. Fall armyworm (actual length of mature approx. 1½ inches).

BEET ARMYWORMS

Beet armyworms (<http://edis.ifas.ufl.edu/in262>) are predominately green and have dark stripes on their sides and a single prominent black spot on each side of their bodies just above the second pair of true legs. They seldom exceed 1¼ inches in length (Figure 7).

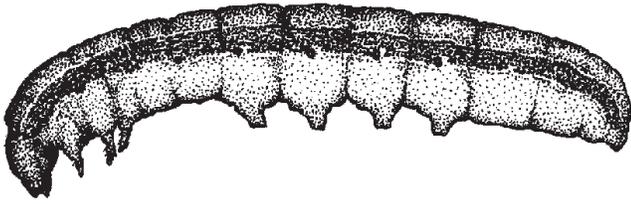


Figure 7. Beet armyworm (actual length of mature caterpillar is approx. 1¼ inches).

SOUTHERN ARMYWORMS

Southern armyworms (<http://edis.ifas.ufl.edu/in263>) are also called climbing cutworms. The larvae are dark gray to nearly black in color and are marked with yellow stripes on their sides. The southern armyworm may reach almost 2 inches in length when full grown (Figure 8).

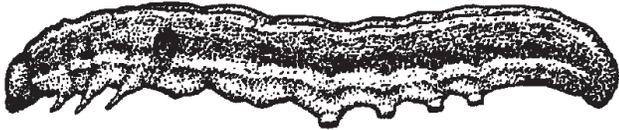


Figure 8. Southern armyworm (actual length of mature caterpillar is approx. 2 inches).

YELLOWSTRIPED ARMYWORMS

Yellowstriped armyworms (<http://edis.ifas.ufl.edu/in373>) have a pair of triangular black markings on most of the segments of the upper back and often possess a bright orange stripe bordering the outside of these markings. They may reach a length of 2 inches when full grown (Figure 9).

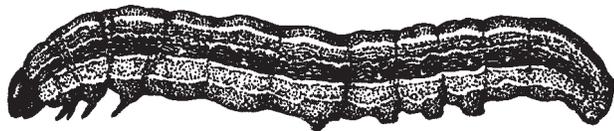


Figure 9. Yellow striped armyworm (actual length of mature caterpillar is approx. 2 inches).

Cabbage Loopers

Cabbage loopers (<http://edis.ifas.ufl.edu/in273>) are very common and feed on many plants, particularly cole crops (cabbage, collards, cauliflower, broccoli). They are smooth and green with white stripes and are shaped somewhat like a baseball bat, with the head being the smaller end (Figure 10). The caterpillars move in a looping fashion, bringing their back prolegs up close to their front legs, before stretching out with their front legs again. They can be up to 1½ inches long when fully grown. The adult moth is a mottled brown color with silver or white figure eights on its wings.

Loopers generally feed on the undersides of older leaves. To find them, the plant must be shaken or the leaves turned to expose the pest.

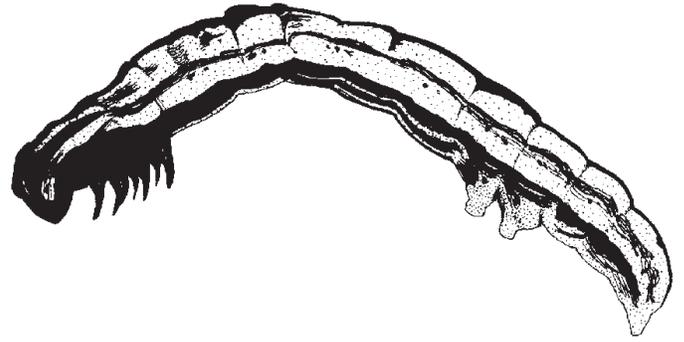


Figure 10. Looper (actual length of mature caterpillar is approx. 1½ inches).

Control measures for loopers include hand picking if they are not too numerous or use of sprays. If a spray is used, care must be taken to cover the entire plant as well as the upper and lower leaf surfaces. *Bacillus thuringiensis* formulations usually perform satisfactorily, however, loopers are difficult to control with most insecticides available to the home gardener.

Tomato Hornworms

Tomato hornworms (<http://edis.ifas.ufl.edu/in158>) (Figure 11) are occasional garden pests which may feed on eggplants as well as tomatoes.

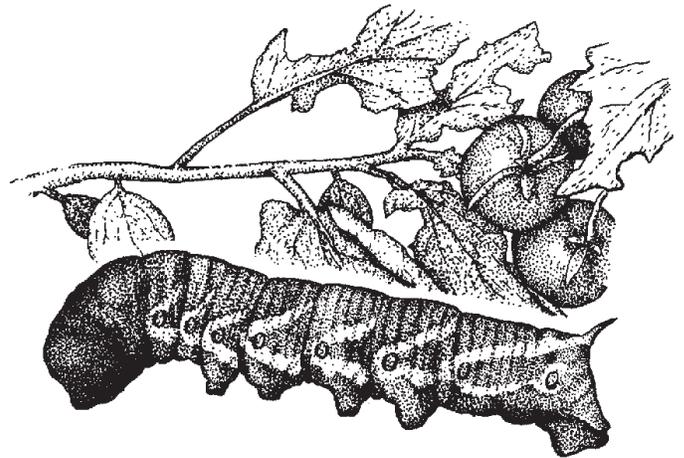


Figure 11. Tomato hornworm (actual length of mature caterpillar is approx. 3½ to 4 inches).

The hornworms may reach 3½ to 4 inches in length when fully grown. They are green in color with white oblique lines on their sides. The worms also have a horn-like projection on the upper end of their bodies.

Hornworms can be easily removed by hand and destroyed. They are usually eaten by paper wasps. However, if they become large they will strip a plant of foliage in a short period of time. Hornworms can be detected by the presence of relatively large fecal pellets or droppings. *Bacillus*

thuringiensis as well as most broad spectrum insecticides give good control.

Bean Leafrollers

The bean leafroller (<http://edis.ifas.ufl.edu/in127>) (Figure 12) feeds on members of the bean family. The adult, a skipper butterfly, deposits eggs on the lower leaf surface, either singly or in clusters of two to six. The caterpillars cut triangles or semi-circles from the edge of the leaf and fold them over to make individual shelters. They leave the shelter only at night to feed. The mature caterpillar also pupates in its shelter. The caterpillars are bright yellow and green and grow to be about 1 1/2 inches long. The head is large and dark and the neck is constricted. The caterpillars may be controlled by picking them off the leaves and drowning them in soapy water or by sprays of Bt (*Bacillus thuringiensis*).

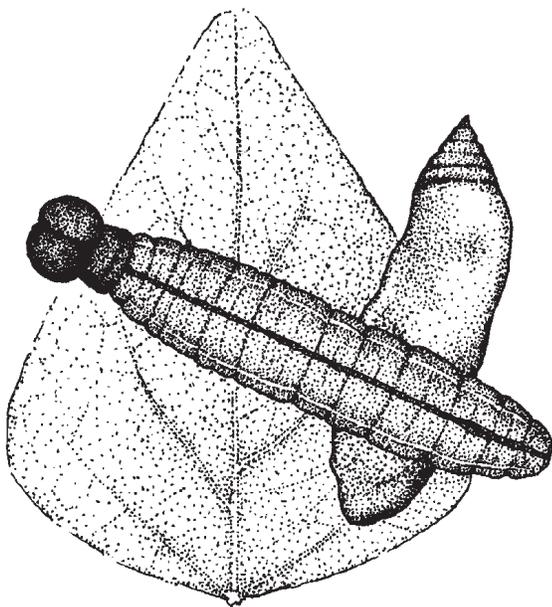


Figure 12. Bean leafroller (actual length of mature caterpillar is approx. 1 1/2 inches).

Beetles

Beetles generally feed on leaves in their adult stage and on roots in the immature or larval stage. Most of the damage is caused by the root feeding forms. Only when populations become large will the adults eat enough leaves to cause major damage.

COLORADO POTATO BEETLE

Colorado potato beetles (<http://edis.ifas.ufl.edu/in303>) (Figure 13) are primarily pests of potatoes but also feed on eggplants, tomatoes, and peppers. They may be found anywhere in Florida north of the Tampa Bay area.

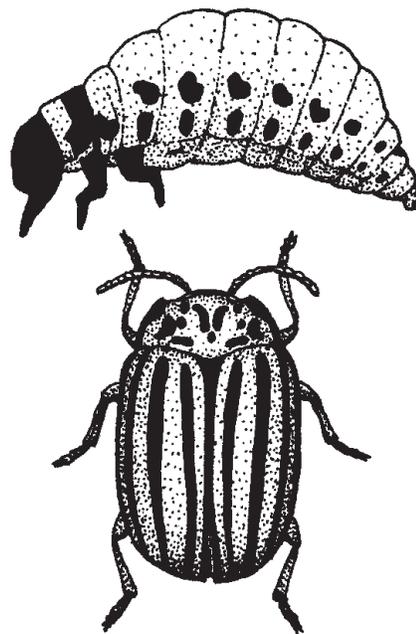


Figure 13. Colorado potato beetle (actual size: adult 3/8 inch, larvae 1/2 inch).

The adults are about 3/8 of an inch long with alternating black and yellow stripes running lengthwise on their backs. The larvae are smooth-skinned, hump-backed and light pink in color with two rows of black spots on each side. Larvae are about 1/2 inch long when fully grown.

Both the adults and larvae feed on the leaves and terminal growth of the plant. Larvae usually feed in groups while adults are scattered. The beetles and larvae may be controlled through continuous hand picking. The yellowish-orange colored egg masses should also be destroyed. Severe infestations of the beetles must be treated with recommended insecticides.

MEXICAN BEAN BEETLE

Mexican bean beetles (<http://edis.ifas.ufl.edu/in141>) are primarily restricted to the northern-most part of Florida where they feed on the leaves of bean plants (Figure 14).

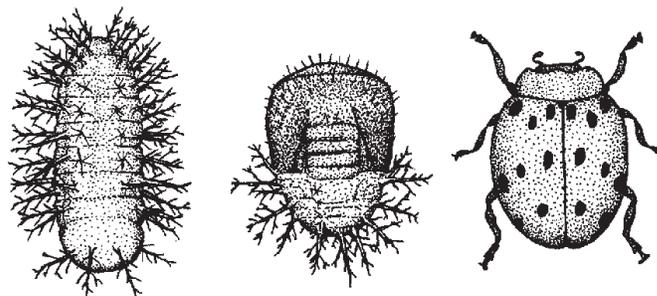


Figure 14. Mexican bean beetle (actual size of mature beetle is approx. 1/4 to 1/3 inch).

The adults are about ½ to 1/3 inch long, and bronze in color with 16 black spots on their backs. They are members of the lady beetle family and closely resemble the “lady bugs.”

The larvae are yellow with rows of black-tipped branched spines growing from their backs. The larvae reach about 1/3 inch in length.

Both adults and larvae feed on the underside of the leaves eating away the tissue between the veins and leaving a lacy, skeletonized leaf.

If beetle populations become heavy they must be controlled by applying recommended insecticides.

Adults and larvae also may be easily hand-picked from plants, but if this measure is to be used it must be thorough and continuous.

FLEA BEETLE

Flea beetles are tiny (1/16 inch long) bronze, black, or brown beetles (Figure 15) which attack young tomatoes, peppers, eggplants and other garden plants. They can jump rapidly for great distances when approached and they resemble large “fleas” in appearance and habit.

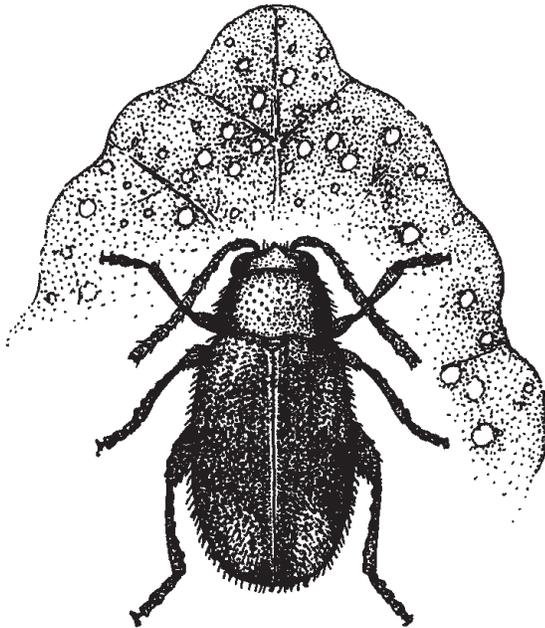


Figure 15. Flea beetle (actual size of mature beetle 1/16 inch).

Flea beetles eat numerous small portions of tissue from a leaf thus leaving tiny “shot hole” patterns in it. The larvae feed on underground plant parts and are seldom observed. Often it is necessary to apply recommended insecticides particularly when the pest is attacking young plants. Older plants are able to tolerate more damage and don't seem to be preferred by flea beetles.

CUCUMBER BEETLE

Cucumber beetles (<http://edis.ifas.ufl.edu/in250>) can be found on most crops and occasionally consume enough foliage as adults to become a problem. Most damage results from the fragile, cream-colored larvae feeding on plant roots.

There are two types of cucumber beetles. The spotted cucumber beetle is found primarily in the northern half of the state. It is greenish or yellow with 12 dark colored spots on the back and is ¼ inch in length (Figure 16).

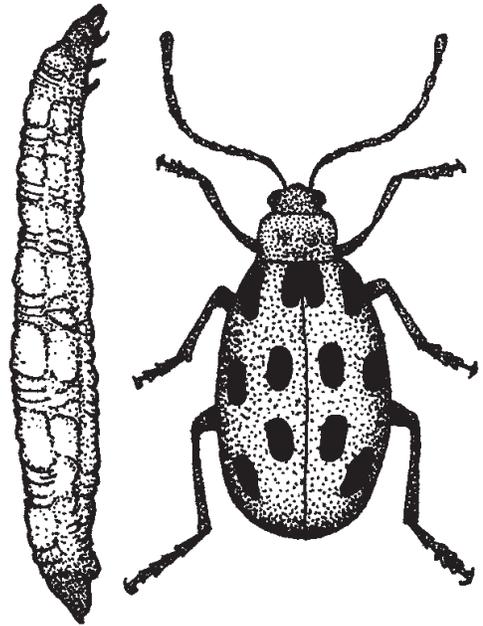


Figure 16. Cucumber beetle (actual size mature beetle is ¼ inch).

The banded cucumber beetle is found mainly in southern Florida. It is green with yellow spots on the back. These spots are very close together giving the appearance of yellow bands running across the back. Adults are ¼ inch in length.

Thorough destruction of weeds and grass from the garden plot well in advance of planting (preferably 30 days) helps control beetles. Recommended insecticides may be applied to the soil at seeding time to further reduce damage.

Miners

Miners are so called because they tunnel and mine in the leaf tissue. In the immature stage (caterpillar or maggot) they feed between the upper and lower leaf surfaces eating the green chlorophyll bearing tissue leaving clear or white winding trails or blotches. There are two miners which cause problems for home gardeners: tomato pinworms and serpentine leafminers.

Both pinworms and miners are difficult to control as they are protected by the upper and lower leaf surfaces. Overuse of insecticide for other insects seems to result in extraordinarily large populations of leafminers. The use of pest-specific insecticides like *Bacillus thuringiensis* for worm or caterpillar control helps to save the beneficial wasp parasites and predators of leafminers which are killed by broad spectrum insecticides. Leafminers also are very difficult to control with any insecticide and currently there is not an acceptable material available to the homeowner that provides satisfactory control.

TOMATO PINWORMS

Tomato pinworms (<http://edis.ifas.ufl.edu/in231>) (Figure 17) are members of the moth order and are serious pests of tomatoes, eggplants, and potatoes. The larvae are small, yellowish-gray or green purple-spotted caterpillars about ¼ inch long. The caterpillars roll and tie leaf tips together as well as tunneling inside the leaf. The pest is most severe on greenhouse-grown plants.

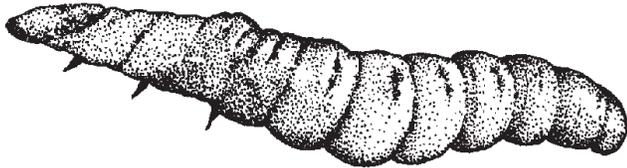


Figure 17. Tomato pinworm (actual size at maturity, ¼ inch).

Control measures should include seeking pest-free transplants. Once infestations are established regular applications of recommended insecticides are necessary.

SERPENTINE LEAFMINERS

Serpentine leafminers (<http://edis.ifas.ufl.edu/in506>) (Figure 18) are members of the fly order and get their name from their serpentine or snake-like tunneling patterns.

The female deposits eggs in the leaf tissue of almost all types of vegetables. The female flies are similar in size and appearance to the common eye gnat.

Small (1/10-1/18 inch) yellow maggots grow in size as they tunnel through the leaf, leaving tunnels of increasing size. The maggots leave a trail of black fecal material in the tunnels. When ready for pupation, they cut a hole in the leaf and drop to the soil.

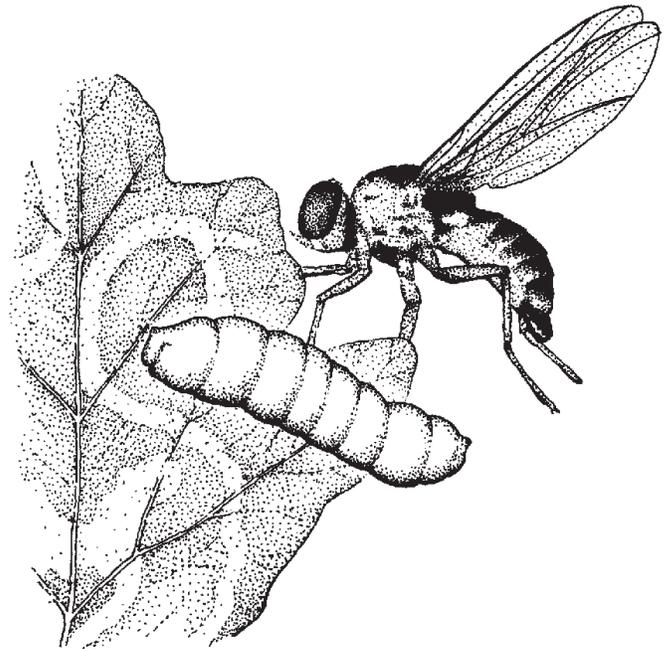


Figure 18. Serpentine leafminer (actual size at maturity, 1/10 to 1/8 inch).

Piercing and Sucking Insects That Feed On Leaves and Stems

These insects have highly modified, needle-like mouthparts which they insert into the plant to remove plant sap. Some of the insects in this group transmit plant viruses and diseases from plant to plant as they feed. These insects often release enzymes and toxins into the plant as they feed. These chemicals can cause a plant to grow abnormally; for example, aphid-infested cantaloupe or watermelon leaves will look crumpled.

Aphids

Aphids or plant lice are some of the most common insects of this group. They feed on almost all garden crops. Aphids are 1/32 to 1/8 inch in length and may be brown, green, yellow, pink, or black (Figure 19). They generally feed on the lower surface of leaves or on young stems and buds. They can spread viruses to tomatoes, squash, and cucumbers. Their feeding often causes leaves to curl and the plant to become distorted in growth.

Ants feed on the sticky, sugary-sweet honeydew excreted by the aphids. The honeydew also serves as food for the fungus known as “sooty mold.” This fungus will cover the leaves and turn them black.

Aphids generally build up in numbers during cool weather since the parasites and predators that feed on them seem to become more numerous in warm weather. Aphid

populations can often be reduced by directing water under pressure from a garden hose at the infested plant. Also mixing a mild soap solution (1 tablespoon of detergent or soap per gallon of water) and applying to the infested plants will help. If insecticides are used care should be taken to direct the spray so that all parts of the plant, as well as lower leaf surfaces are covered. Often ants will protect aphids and move them from plant to plant in order to receive the honeydew given off by aphids. The presence of ants crawling on the plants often indicates an aphid population. Control of the ants frequently reduces the aphid outbreaks. Many predatory insects feed on aphids.

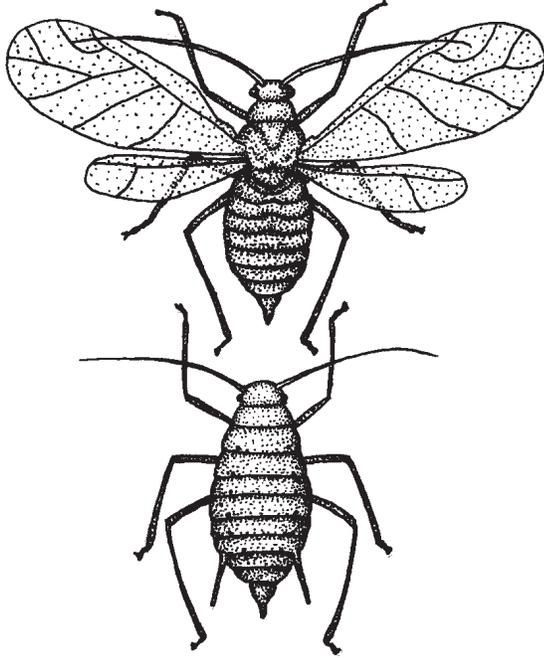


Figure 19. Aphids (actual size at maturity, 1/32 to 1/8 inch).

Leafhoppers

Leafhoppers attack nearly all garden plants. They are 1/20 to 1/4 inch long and may be green, brown, tan, or grayish-black. Leafhoppers are wedge-shaped with the head being broad and the rear end narrow (Figure 20). Being strong fliers, the insects will quickly move short distances when disturbed, giving them the appearance of hopping. In most cases leafhoppers do not require control. However, if they become so numerous as to cause leaf discoloration or marginal leaf burns, use of a recommended insecticide may be necessary.

Stinkbugs

Stinkbugs (Figure 21) are common pests of most all plants and are generally solitary feeders in the adult stage. Immature nymphs, which do not fly, may be found in groups. All stinkbugs give off a characteristic foul smell as a defensive weapon when disturbed. Green stinkbugs are also known

as “pumpkin” bugs and are probably the most common of the stinkbugs. Full-grown stinkbugs may reach 2/3 inch in length and are pale to medium green. Adults are strong fliers. Nymphs (immature forms) range in size from 1/8 to 1/2 inch long and are green with red, white, and black spots on their backs. Eggs are laid generally in masses of 10 to 50 and resemble miniature barrels.



Figure 20. Leafhopper (actual size at maturity, 1/20 to 1/4 inch).

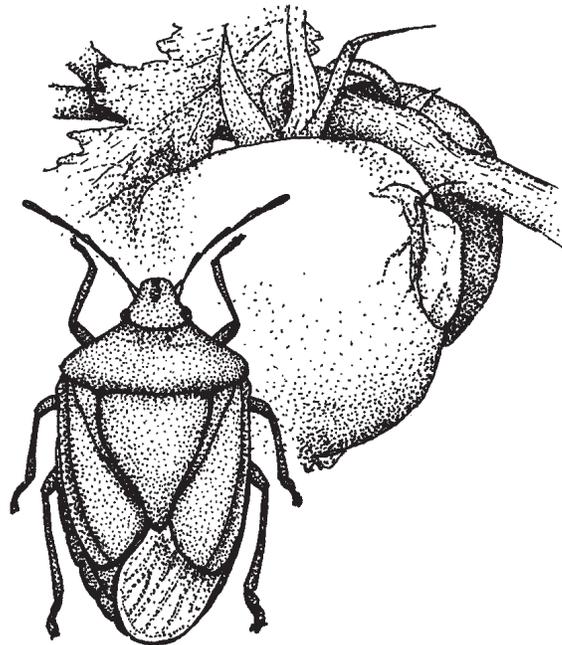


Figure 21. Green stinkbug (actual size at maturity, 2/3 inch).

Stinkbugs do not usually cause enough damage to merit control unless they start feeding on the pods, fruit, or seed parts of a plant. They can be very damaging to tomato fruit, for example. However if stinkbugs become numerous, and

their feeding causes the leaves to wilt, a recommended insecticide may be necessary.

Brown stinkbugs (Figure 22) are not as prevalent as the green species. They are light brown to buff in color and somewhat smaller than the green forms when fully grown.

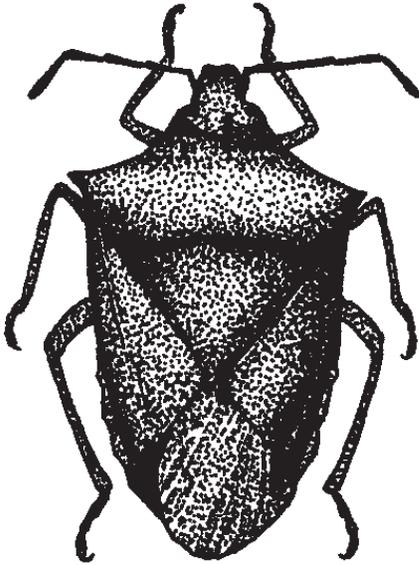


Figure 22. Brown stinkbug (actual size at maturity, 2/3 inch).

Leaffooted Plant Bugs

The leaffooted bug (Figure 23) gets its name from the appearance of its hind legs which are large and flattened in a leaf-like shape near the feet. It is generally dark or chestnut brown with a white cross bar about halfway down its body. The adult bug is between 5/8 to 3/4 inch long. Leaffooted bugs are common on many garden plants throughout Florida but are usually minor pests unless they are extremely abundant.

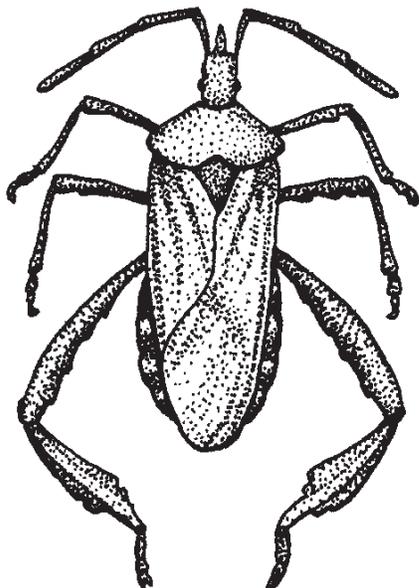


Figure 23. Leaffooted plant bug (actual size at maturity, 5/8 to 3/4 inch).

The immature stage or nymph looks much like the adult but does not have wings and its legs are not as leaf-like as the adult. Handpicking into a container of soapy water may help control them.

Thrips

Thrips are a nuisance pest to most gardeners and are found feeding in and on the blossoms and on the young leaves. Even though their feeding causes leaves to curl, spot, and distort, they rarely cause significant damage. A species that is relatively new to Florida, the melon thrips (Figure 24), may cause serious damage to vegetables in south Florida.

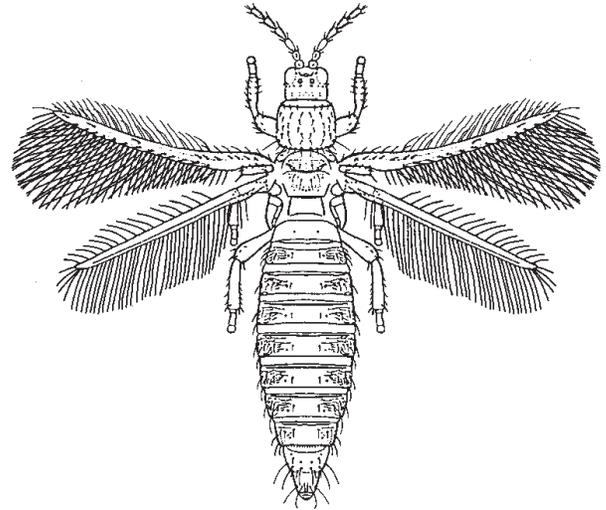


Figure 24. Melon thrips.

Thrips are small, slender, and rarely over 1/8 inch long. They are black, brown, tan or yellow and may be collected by shaking or striking the infested plant across a piece of white paper. If control is necessary it is usually when the plants are young (the first 5 or 6 weeks of age). Directed water sprays and soap solutions discussed under aphid control may help. Most insecticides will control thrips if the plants are thoroughly covered with the spray. Melon thrips (<http://edis.ifas.ufl.edu/in292>), however can be difficult to control with insecticides.

Using general purpose insecticides may kill the beneficial insects that help keep thrips, especially melon thrips, under control. A tiny bug, called the minute or insidious pirate bug, attacks thrips. A predator mite, *Neoseiulus cucumeris*, which can be purchased from garden and pest management supply companies, may also control thrips if released over a period of several weeks.

Spider Mites

Spider mites are not insects but are closely related to spiders. They have no wings and have 8 functional legs

whereas mature insects have 6 legs. Mites have piercing-sucking mouthparts like thrips and damage plants by rupturing the cells of the leaf and consuming the juices.

Mites are very small, ranging from 1/60 to 1/50 inch long (Figure 25). They are usually red (red mite) or greenish (2-spotted mite) in color. Most mites feed along the midrib or lateral veins of lower and upper surfaces of the leaves. Infested leaves become pale or dusty in appearance and webs may be visible on the plant.

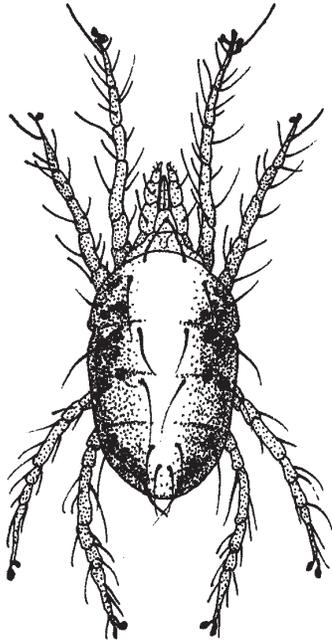


Figure 25. Spider mite (actual size at maturity, 1/60 to 1/50 inch).

Mites prefer hot, dry weather. Keeping the plants moist and also directing a stream of water from the garden hose onto the infested plant will aid in control. Mild soapy-water solution also will reduce mite problems. Mites are attacked by other mites that do not feed on plants. These often work very well and can be purchased from pest management supply and garden supply companies. Some species to try are *Phytoseiulus persimilis* and *Neoseiulus californicus*. A mixture of the two may work better than either one alone. If mites become a problem it may be necessary to use a recommended miticide. It is generally necessary to make a second application no later than 5 days from the first in order to disrupt their very short life cycle.

Silverleaf Whitefly

The most common whitefly found on Florida vegetables is called the silverleaf whitefly (<http://edis.ifas.ufl.edu/in286>) because of the effect its feeding has on squash leaves. Feeding by the immature stages or nymphs can also result in white areas in tomato fruits, streaking of pepper fruits, and blanching of broccoli stems. Whiteflies are not flies

but are distant relatives of aphids and leafhoppers and, like them, feed on plant sap with piercing-sucking mouthparts. Also like aphids, whiteflies produce a sugary waste product called honeydew. Leaves will be sticky if there are many whiteflies feeding on the leaves above them and may turn black with sooty mold which grows on the honeydew. Whiteflies can spread some plant viruses, such as tomato yellow leaf curl virus and bean golden mosaic virus.

The adult is a very small (less than 1/16 inch long) and has white wings dusted with a waxy substance. It holds its wings like a tent over its yellow body (Figure 26). It lays its eggs on the lower surface of leaves of many plants, including tomatoes, eggplant, melons, cucumbers, squash, okra, beans, cabbage, and broccoli. Except for a very brief time after hatching, the nymphs cannot move on the plant and look like clear or pale yellow scales (Figure 26).

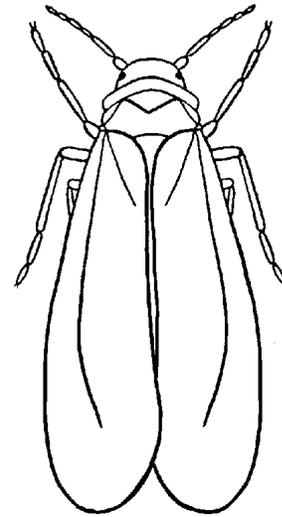


Figure 26. Silverleaf whitefly (actual size at maturity less than 1/16 inch long).

Regular applications of insecticidal soap may help keep whiteflies under control. Tiny wasps also attack the whiteflies. Flowers planted around and in the garden may help these wasps and other beneficial insects survive by providing a source of nectar. Other general purpose garden insecticides that kill on contact may also be helpful but will harm the beneficial insects. Because the insects are found on the lower leaf surface, sprays must be directed there in order to be effective.

Insects That Feed On Seeds, Pods, or Fruits

This group of insects is probably the most damaging of those discussed thus far. If healthy, most plants can overcome some root or leaf damage, but damage to the edible

parts of a plant results in a smaller harvest. For this reason careful observation should be given to the garden when the fruit, seed, and pods are setting and maturing. Leafy vegetables and cabbage should also be examined carefully.

Corn Earworms

Corn earworms (<http://edis.ifas.ufl.edu/in302>) (Figure 27) are also called cotton bollworms, tomato fruitworms, and soybean podworms. They require higher amounts of protein in their diets than most worms; therefore, they feed on protein rich pods, seed, and fruit. They also feed on leaves.

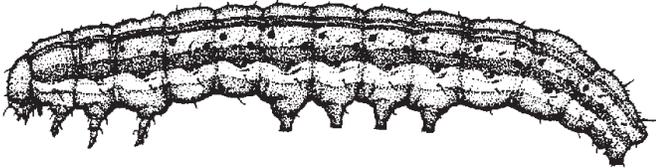


Figure 27. Corn earworm (actual length of mature worm is 1½ inches).

The worms vary in color from green to brown, pink, yellow, and black with yellow heads and dark legs. Their skin is coarse with many black tubercles (spot-like projections). Corn earworms reach 1½ inches or more when fully mature. They bore into tomato fruit and the silk end of corn ears.

The largest number of corn earworms are encountered in the late spring and throughout the summer. Crops that are planted early often escape these warm weather caterpillars. Once infestations become established recommended insecticides are needed.

Sweetcorn is a favorite host and the silking stage is when it is most susceptible to corn earworm attack. When corn earworms become active they can require daily to every other day application of a protective insecticide until the silk begins to dry. Corn earworms also attack tomato fruit, beans, and peas (pod stages) where they bore into and partially consume the inside parts.

Pickleworms

Pickleworms (<http://edis.ifas.ufl.edu/in321>) restrict their feeding to members of the cucurbit family and feed primarily on squash and cucumbers. The small caterpillars feed on the plant, often in blossoms, until they are large enough (¼ inch long) to bore into the fruit. The larvae are pale yellow and are marked with small black spots (Figure 28) until they reach ½ inch or longer, when they lose the spots and become a clear, pale green.

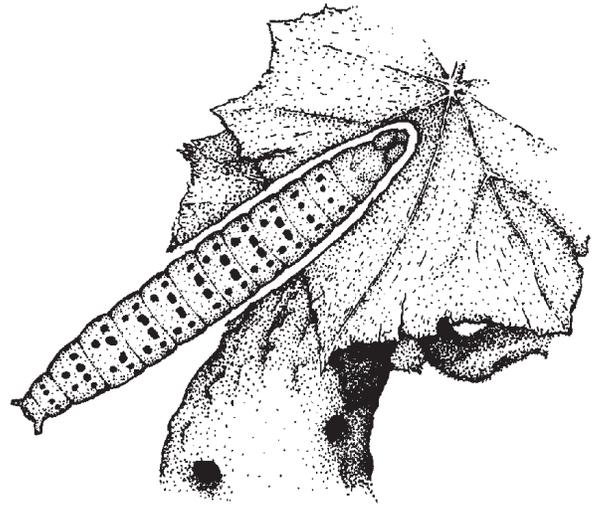


Figure 28. Pickleworm (actual length of mature worm is ¾ to 7/8 inch).

The worms feed inside the fruit until they reach ¾ to 7/8 inch in length. Small masses of moist green gummy-like excrement are pushed out from round holes in the fruit. Worms emerge from the fruit to pupate on leaves. The adult form is a small moth. Control is difficult and preventive spray applications must be made to protect the fruit, particularly in late summer and early fall crops. *Bacillus thuringiensis*, which is specific for caterpillar pests, will provide reasonably good control if applied often, beginning when blossoms first appear.

Cowpea Curculios

Cowpea curculios (<http://edis.ifas.ufl.edu/in380>) are small dark weevils about 1/8 to 1/6 inch long with snout-like mouthparts. They are often the limiting factor in growing field or southern peas. The female feeds by drilling a hole through the pod into a developing pea. An egg is inserted into the feeding site where it hatches and develops into a tiny, white, grub-like larva which feeds inside the pea (Figure 29).

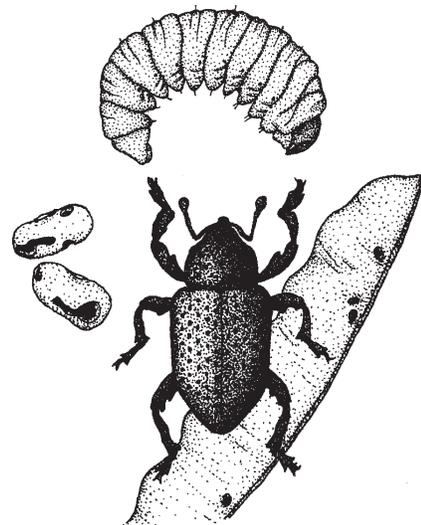


Figure 29. Cowpea curculio (actual size 1/8 to 1/6 inch long).

Infested peas can be identified by a small brown spot on the pod just above a developing seed. If the pod is carefully torn apart, the grub will often be found.

Preventive insecticide controls must be used before the female has fed and laid eggs within the seed.

Pepper Weevils

Pepper weevils (<http://edis.ifas.ufl.edu/in555>) are similar to curculios and are a severe pest of peppers. Adults are shiny, brownish-black, and about 1/8 inch long (Figure 30). Eggs are laid in the flower bud or fruit, and the small, white, brown-headed grubs tunnel through the seed.

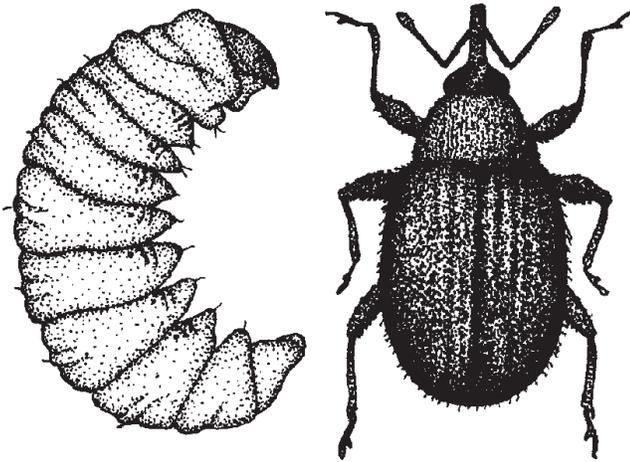


Figure 30. Pepper weevil (adults approx. 1/8 inch long).

Control of this pest must also be preventive. The peppers should be sprayed at bloom time and approximately once weekly thereafter to prevent weevil build-up. Never purchase plants for transplanting that have blooms because these may contain weevil eggs.

Tomato Pinworm

Tomato pinworm (<http://edis.ifas.ufl.edu/in231>) larvae will tunnel and attack fruit particularly around the calyx and stem end. (See description and control under leaf feeders.)

Wireworms

Wireworms feed on potato tubers, sweet potato roots, carrots, radishes, turnips, and other vegetables with underground edible parts. (See control under root feeders.)

Potato Tuberworms

Potato tuberworms are the larval form (Figure 31) of small moths (Figure 32). The adult moth lays eggs on exposed Irish potato tubers as well as on the underside of leaves. The caterpillars are dark-headed and are pinkish-white or greenish in color and their bodies reach $\frac{3}{4}$ inch in length

when mature. The pest attack tubers in the field and in storage. Infested potatoes are riddled with slender, dirty-looking, silk-lined burrows and the outside of the potato may have “crusty-like” spots on them.

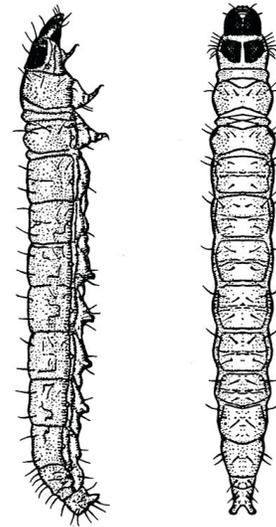


Figure 31. Potato tuberworm larva (actual length at maturity is approx. $\frac{3}{4}$ inch).

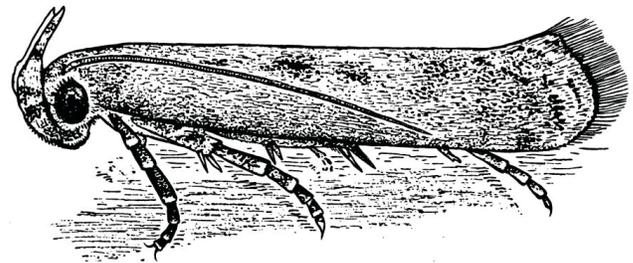


Figure 32. Potato tuberworm moth.

Prevention includes planting early and harvesting as soon as potatoes mature. Delayed harvest may result in more pest damage in hot dry weather. Potatoes should be stored in a cool dry place that is screened or enclosed so that the moth cannot lay eggs on the stored potatoes.

Stinkbugs

Stinkbugs have been discussed under leaf feeders, but they also feed on edible seeds and fruit. This feeding often results in pitted or distorted fruit. This pest is particularly damaging to pods of okra, beans, and peas.

Management and Control

There are many ways to control or reduce insect populations so that vegetable gardens can be grown more efficiently. Some of the practices that can be used are:

- Rotate the individual crops or families of crops within the garden so that the same vegetable is not grown in the same location more than once every three years.

- Till or plow the soil well in advance of planting and pay particular attention to a plot that has previously been in grass. The garden should be well plowed and free of weeds, grass, etc., at least 30 days prior to planting. Add organic matter in the form of compost.
- Seeds should be planted at proper and uniform depths so that rapid germination is insured.
- Transplants should be purchased from a reputable dealer, and should be free of insects and diseases at the time of planting. Avoid transplants that are already flowering.
- Every effort should be made to keep the plants vigorously growing and in a state of good health, by supplying appropriate amounts of water and fertilizer. A healthy plant is often able to survive insect attack. Too much nitrogen can make plants more inviting to aphids, however.
- Randomly select plants and monitor or scout the garden twice weekly. This includes inspecting the plants from the bud to the soil including both upper and lower leaf surface.
- Often large insects can be removed by hand and destroyed without use of chemicals; this should be practiced if possible. They will sink and drown if put in a container of soapy water.
- Learn to identify beneficial insects (praying mantis, spiders, big-eyed bugs/assassin bugs, lady beetles, and all wasps). Often chemicals are used in error against these beneficials.
- Learn to properly identify garden pests and use chemicals only when a serious pest problem exists. Carefully follow all directions on labels.
- Most plants that produce fruits, pods, ears, etc., can stand 10 to 15% loss of leaves without loss of potential yields. Do not panic and start spray programs at the first sign of leaf feeding. This rule would not apply to plants whose edible parts are the leaves, such as greens.
- Insecticides should be carefully selected to control the pest in question or to reduce its numbers so that the garden will efficiently produce. Do not expect any insecticide to kill 100% of the pest in question and do not keep spraying or adding insecticide to accomplish this false goal.
- When a chemical is used, be sure to spray the plant thoroughly so as to contact all tissue surface.
- In order to reduce bee and other pollinator mortality, sprays are best applied late in the afternoon or early evening hours. Also, many garden pests are night feeders so this spraying schedule often accomplishes more. To reduce spray burn, make sure the plants are not under moisture stress. It is best to irrigate the garden thoroughly before spraying.
- When baits are used they should be applied late in the afternoon since most insects (cutworms, crickets, etc.) that respond to baits are night feeders.
- Sprays usually give better results than dusts. In many cases dusts will drift and kill many beneficial arthropods. Also, dusts are easily washed off by rain and irrigation, or blown off by wind, and it usually requires more actual insecticide in the dust form than in the spray form to accomplish the same degree of control.
- Harvest the fruits, seeds, leaves, etc., as soon as they are ripe. Allowing over-ripe fruits to remain on the plants often invites additional insect, rat, and/or mice problems.
- As soon as a plant is no longer productive remove it from the garden and destroy it. Do not pull it up and leave it in the garden area.
- When the entire gardening project is over, cut down all remaining plants and plow them into the soil.
- Do not use garden vegetable plants in any form to add to a mulch bed or compost bin. Vegetable plants can harbor insects, disease organisms, and nematodes that can easily survive organic decomposition.