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HOME & GARDEN INFORMATION CENTER

Tomato Insect Pests

Tomato Fruitworm

The tomato fruitworm (*Helicoverpa zea*) is the most damaging tomato insect pest in South Carolina. Fruitworms occur throughout the Western Hemisphere extending as far north as Canada and as far south as Argentina.

Tomato fruitworm larva
Clemson University - USDA Cooperative Extension Slide Series, www.insectimages.org

The tomato fruitworm feeds on tomato, corn and cotton and is also called the corn earworm or the cotton bollworm. It also attacks soybeans, peppers, tobacco, beans, okra and eggplant.

The adult tomato fruitworm is a moth. It is usually light yellowish-olive with a single dark spot near the center of each forewing. It lays eggs singly, usually on the lower sides of leaflets close to the flower or fruits. The eggs are creamy white when laid but develop a reddish-brown band just prior to hatching. Larvae (caterpillars) hatch from the eggs. The larvae are yellowish-white with a brown head. The color of older larvae varies from greenish-yellow to brown or even black with paler stripes running lengthwise on the body. Larvae grow to a size of about 1½ inches in length.

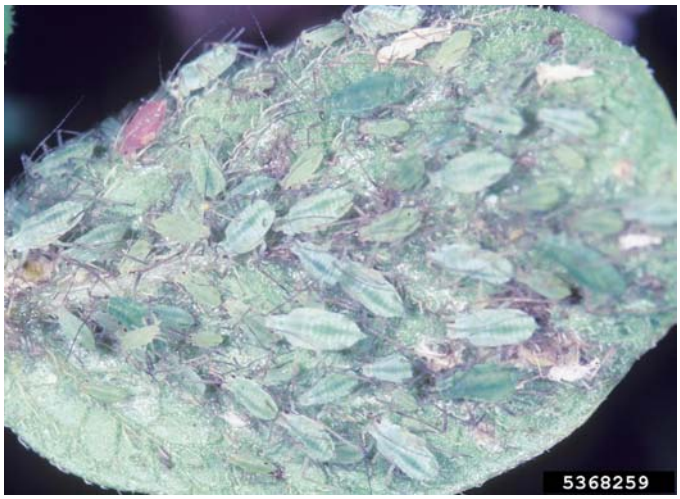
Fruitworms feed on tomato leaves and fruit. Distorted leaves often result when they feed upon the tips of the leaves in the developing bud. Larvae may also bore into stalks or midribs. When fruit is present, larvae enter it soon after hatching. They prefer green fruit and will enter it usually at the stem end, causing extensive direct damage and promoting decay. The larvae are cannibalistic, so there is rarely more than one larva per fruit. Larvae usually complete development in a single fruit, but when fruits are small they may feed in several.

Tomato fruitworm pupa
Whitney Cranshaw, Colorado State University, www.insectimages.org

Fruitworms overwinter (survive the winter) as pupae (the non-feeding stage where the larva changes to an adult) in the top 2 inches of soil. Adults emerge from early May to early June. Fruitworms have four to five generations per year in South Carolina.

Potato Aphid

Potato aphids (*Macrosiphum euphorbiae*) occur throughout North America. They are common visitors to home vegetable gardens in South Carolina.



Potato aphid infestation
Merle Shepard, Gerald R.Carner, and P.A.C Ooi, Insects and their Natural Enemies Associated with Vegetables and Soybean in Southeast Asia, www.insectimages.org

Potato aphids infest a wide range of host plants. Some important cultivated hosts include potato, tomato, eggplant, sunflower, pepper, pea, bean, apple, turnip, corn, sweet potato, asparagus, clover and rose. Weeds such as ragweed, lambsquarters, jimsonweed, pigweed, shepherdspurse and wild lettuce are also common food plants.

This soft-bodied, pear-shaped insect may be solid pink, green and pink mottled, or light green with a dark stripe. Usually wingless, it is about ⅛ inch long and has a pair of long, slender tailpipe-like appendages known as cornicles. The egg stage does not occur in South Carolina. Adult females give birth to live young, called nymphs. Although slightly smaller than adults, nymphs are similar in color and shape.

Sporadic in occurrence, potato aphid infestations are rarely severe enough to kill plants. Aphids pierce veins, stems, growing tips and blossoms with their needlelike mouthparts. As a result, blossoms are shed and yield is reduced. New growth becomes stunted and curled. Heavily infested plants turn brown and die from the top down. Aphids tend to spread rapidly from field to field transmitting a number of viral diseases. These include various mosaics, leaf roll, spindle tuber and unmottled curly dwarf.

In South Carolina, female potato aphids feed and reproduce year round. No eggs or males are produced. Without mating, wingless females give birth to about 50 live nymphs. During warm weather, each of these nymphs matures in two or three weeks. The life cycle continues in this manner until overcrowding occurs or food becomes scarce. At this time nymphs develop into winged adults and migrate to new host plants. Once settled, these aphids begin reproducing and the life cycle continues as before. During the winter, feeding and reproduction occur at a much slower rate. Many generations are produced each year.

Stink Bugs & Leaf-footed Bugs

Several species of stink bugs as well as leaf-footed bugs are serious pests of tomatoes and various other vegetable crops in South Carolina. Brown (*Euschistus servus*) and green stink bugs (Acrosternum hilare) have been reported as far north as Quebec; however, in the United States, they are more injurious in the South. Although more common in the South, leaf-footed bugs (*Leptoglossus phyllopus*) occur as far west as Arizona.

Brown stinkbug
Herb Pilcher, USDA Agricultural Research Service, www.insectimages.org

Green stinkbug
Frank Peairs, Colorado State University, www.insectimages.org

Stink bugs feed on over 52 plants, including native and ornamental trees, shrubs, vines, weeds and many cultivated crops. The preferred hosts are nearly all wild plants. Stink bugs build up their numbers on these hosts and move to cultivated hosts as their preferred food becomes overly mature. Among vegetable crops, stink bugs attack bean and cowpea seeds, okra pods, ripening tomato fruit, and stems of melons and asparagus. Bean, cowpea, sorghum, eggplant, potato, tomato, peach, strawberry, okra and watermelon are only a few of the leaf-footed bug's many host plants.

All adult stink bugs are shield-shaped. Green stink bugs are about $^{9}/_{16}$ to ¾ inch in length. They are bright green with a narrow orange-yellow line bordering the major body regions. Brown stink bugs are dull grayish yellow and ½ to ⅝ inch long. Leaf-footed bugs are about $^{13}/_{16}$ inch long. They have dark brown bodies, a narrow cream colored stripe across the back and flattened leaf-like hind legs.

When first laid, the barrel-shaped eggs of the green stink bugs are yellow to green, later turning pink to gray. The white kettle-shaped eggs of the brown stink bug are slightly smaller than those of the green stink bug. Leaf-footed bug eggs are slightly keg-shaped.

Nymphs of all three bugs are similar in shape to the adults but smaller. Green stink bug nymphs are mainly black when small, but as they mature, they become green with orange and black markings. Nymphs of the brown stink bug are light green. Leaf-footed bug nymphs are bright red.

Nymphs and adults of both kinds of bugs pierce plants with their needlelike mouthparts and suck sap from pods, buds, blossoms and seeds. The degree of damage depends, to some extent, on the developmental stage of the plant when the stink bug pierces it. Immature fruits and pods punctured by bugs become deformed as they develop. Seeds are often flattened and shriveled, and germination is reduced.

Stink bugs overwinter as adults in ditch banks, along fence rows, on roadsides and in other similar places. They become active in spring when temperatures rise above 70 °F. Each female deposits up to several hundred eggs, usually in mid- or late June. These eggs are laid in clusters, mainly on leaves and stems, but also on pods. Nymphs hatch from these eggs. Two generations per year occur in South Carolina. Stink bugs usually reach high population levels in July through early October.

Leaf-footed bug
Russ Ottens, University of Georgia, www.insectimages.org

The biology of leaf-footed bugs is not well-documented. They overwinter as adults and have been collected all months of the year. They are most common from May to the fall months.

Hornworms

The tobacco hornworm (*Manduca sexta*) ranges from southern Canada to Argentina. The range of the tomato hornworm (*Manduca quinquemaculata*), however, extends only from southern Canada through the southern United States.

Tobacco hornworm larva
Eddie McGriff, University of Georgia, www.insectimages.org

Hornworms feed primarily on solanaceous plants (those in the potato family). They include tobacco, tomato, eggplant, pepper and some weedy plants. Tobacco and tomato plants are preferred. Hornworm eggs are smooth, spherical and about

$^{1}/_{16}$ inch in diameter. Light green at first, they turn white before hatching. Mature tobacco hornworm larvae (caterpillars) usually have green bodies with fine white hairs and seven diagonal white stripes on each side. The hornlike structure that gives them their name projects from a posterior abdominal segment and is usually curved and red. Tomato hornworm larvae have eight V-shaped markings on each side; the horn is straight and black. Both species are about 3 to 3½ inches long when fully grown.

Hornworms strip leaves from tomato vines. If a heavy infestation develops, these caterpillars also feed on developing fruit. Rather than bore into the fruit, they feed on the surface leaving large, open scars. Fruit damage, however, is much less common than loss of leaves. Hornworm damage usually begins to occur in midsummer and continues throughout the remainder of the growing season.

Hornworms overwinter in the soil as pupae (the non-feeding stage where the larva changes to an adult). Moths of this overwintering generation begin to emerge in early June and may continue to emerge as late as August. Hornworm moths frequently can be seen hovering over plants at dusk. At night, they lay eggs on the underside of leaves. Each moth deposits one to five eggs per plant visit.

Hornworms emerge from eggs in about four days, depending upon temperature. After feeding for three weeks, hornworms burrow into the soil to pupate (to transform to the non-feeding stage where the larva changes to an adult form). In summer, the pupal period lasts three weeks, after which a new generation of moths emerges. Heavy egg deposition is common in August and early September. At least two generations occur each year in South Carolina.

Natural parasitism often occurs, where Brachonid wasps oviposit eggs into the hornworms, the larvae feed inside, and then pupate on the backs of the hornworms. These pupal cases are seen as white projections on the back of the hornworm. If parasitized hornworms are found on the crop, feeding will have ceased, so leave it for the next generation of beneficial wasps to hatch.

Actively feeding hornworms may be handpicked from the plants.

Parasitized tobacco hornworm.
If this is left in place, parasitic wasps will hatch to infest more hornworms. Clemson University - USDA Cooperative Extension Slide Series, www.insectimages.org

Silverleaf Whitefly

Silverleaf whitefly (*Bemisia argentifolii*) occurs around the world in tropical and subtropical areas and in greenhouses in temperate areas. It has been reported from all southeastern states. Additionally, it has been reported from Arizona, California, the District of Columbia, Maryland and Texas.

Silverleaf whiteflies
Scott Bauer, USDA Agricultural Research Service, www.insectimages.org

This pest feeds on many different kinds of plants. The most frequently reported hosts in the southeastern U.S. are poinsettia, gerbera daisy, tomato, squash, cucumbers, melons and cotton.

The silverleaf whitefly is small, about $^{1}/_{32}$ inch long and whitish yellow. The head is broad at the antennae and narrow toward the mouthparts. The wings are held roof-like at about a 45-degree angle, whereas other whiteflies usually hold the wings nearly flat over the body. As a result, the silverleaf whitefly appears more slender than other common whiteflies.

The eggs are whitish to light beige. They are inserted on end in the undersides of new leaves. Nymphs (immature stage) hatch from the eggs. The nymphal stage appears glassy to opaque yellow. Its body is flattened and scale-like with the edge of the body relatively near the leaf surface. The pupa or fourth nymphal instar will be somewhat darker beige-yellow and opaque.

Silverleaf whiteflies damage plants in two ways: directly and indirectly. Direct damage results from their feeding activity, which involves them sucking plant sap. Both the adults and nymphs contribute to direct damage. Chlorotic (yellow) spots sometimes appear at the feeding sites on leaves. Heavy infestations cause leaf wilting. In addition, as they feed they excrete honeydew (a sugary substance), which the sooty mold fungi feed on. The resulting dark splotches on the leaves may reduce photosynthesis and other physiological functions of the plant. Indirect damage results from their activity as disease vectors (carriers). The silverleaf whitefly carries and spreads several important viral diseases of tomatoes, lettuce and melons in the southeastern United States.

The number of eggs laid by each female over her lifetime varies considerably but appears to be around 80 to 100. Nymphs that hatch from the eggs are called "crawlers" because they crawl about until they insert thread-like mouthparts into the undersides of leaves to feed. Once they begin feeding, they tuck their legs and antennae underneath their bodies and settle down closely to the leaf surface and do not move again.

Crawlers molt into scale-like nymphs that also suck out sap. Nymphs molt a second and third time. The fourth stage eventually becomes a nonfeeding pupa.

The adult whitefly develops within the pupa. Adults emerge from the pupa through a T-shaped slit about a month from the time the egg was laid. Females live about two weeks.

Control of Insect Pests of Home-Grown Tomatoes

Cultural practices are helpful in avoiding many insect infestations. Tomatoes should be planted in well-prepared, fertile beds, mulched and properly watered to promote vigorous growth. Stressed plants tend to attract more insect pests than healthy plants.

In a home garden, handpicking and destroying many pests is an effective control measure. In addition, beneficial insects are very helpful in controlling insects such as aphids, leafminers and hornworms. To avoid killing these beneficials, use insecticides only when necessary.

Insecticides such as permethrin, cyfluthrin or esfenvalerate are effective in controlling stink bugs, leaf-footed bugs, aphids, fruitworms and hornworms (See Tables 1 and 2). Do not use permethrin on tomato varieties with fruit less than one inch in diameter. Carbaryl will control cutworms, fruitworms and hornworms.

Bacillus thuringiensis (*B.t.*) products are natural insecticides that contains spores of this bacterium and are used to only control caterpillars (the smaller the better) when they feed on leaves with the spores. *B.t.* products such as Dipel (dust) and Thuricide (liquid concentrate) are effective in the control of hornworms and tomato fruitworms. Sprays give better coverage and stay on the plants longer than dusts.

Spinosad is a natural product for the control of caterpillars and thrips. Pyrethrin is a natural product for the control of aphids and caterpillars. Neem oil extract and insecticidal soap are less toxic options for control of aphids and whiteflies. Adequate coverage of upper and lower leaf surfaces with these insecticides is important for good pest control.

Source:

1. Sorensen, K.A. and J.R. Baker. 1983. *Insects and Related Pests of Vegetables*. The North Carolina Agricultural Extension Service. Publication AG-295, 173 pp.
2. *Southeastern United States 2009 Vegetable Crop Handbook.* Clemson University.

Table 1. Insecticides for Control of Insect Pests of Tomatoes.

Insect Pest	Natural, Less Toxic Insecticides	Contact Insecticides for Tomatoes	Contact Insecticides for Grape & Cherry Tomatoes
Aphids	insecticidal soap neem oil extract	permethrin bifenthrin cyhalothrin malathion	bifenthrin cyhalothrin malathion
Tomato Fruitworms & Hornworms	*Bacillus thuringiensis (B.t.)* spinosad pyrethrin neem oil extract	carbaryl permethrin bifenthrin cyfluthrin	carbaryl bifenthrin cyfluthrin
Leaf-footed Bugs & Stink Bugs	horticultural oil	permethrin bifenthrin cyfluthrin malathion	bifenthrin cyfluthrin malathion
Flea Beetles	insecticidal soap neem oil extract horticultural oil pyrethrin	carbaryl permethrin bifenthrin cyfluthrin cyhalothrin	carbaryl bifenthrin cyfluthrin cyhalothrin
Whiteflies	insecticidal soap neem oil extract pyrethrin horticultural oil	cyfluthrin bifenthrin cyhalothrin	cyfluthrin bifenthrin cyhalothrin
Thrips	spinosad	cyhalothrin	cyhalothrin
Spider Mites	insecticidal soap horticultural oil	malathion	malathion
Cutworms	protective collars or *B.t.* mixed with molasses & grain as a bait	carbaryl cyhalothrin	carbaryl cyhalothrin

Table 2. Insecticide Products Labeled to Control Tomato Insect Pests.

Insecticides & Fungicides	Days PHI	Examples of Brand Names & Products
Bacillus thuringiensis (B.t.)	0	American Brand Thuricide Concentrate Bonide Thuricide *Bt* Concentrate Green Light Worm Killer Concentrate Safer Caterpillar Killer Concentrate Southern Ag Thuricide *Bt* Caterpillar Control Concentrate
Bifenthrin	7	Ortho Bug-B-Gon MAX Lawn & Garden Insect Killer Concentrate
Carbaryl	1	Garden Tech Sevin Bug Killer Concentrate Ferti-lome Liquid Carbaryl Garden Spray
Cyfluthrin	1	Bayer Advanced Garden Power Force Multi Insect Killer Conc. Bonide Beetle Killer RTS Bonide Caterpillar Killer RTS
Cyhalothrin	1	Spectracide Triazicide Once & Done Insect Killer Concentrate
Horticultural Oil	0	Bonide All Seasons Spray Oil Concentrate Ferti-lome Scalecide Green Light Horticultural Oil Spray Concentrate Ortho Volck oil Spray Concentrate Southern Ag Parafine Horticultural Oil SunSpray Horticultural Oil
Insecticidal Soap	0	Bonide Multi-Purpose Insect Control Soap Concentrate Safer Rose & Flower Insect Killer Concentrate Bonide Bon-Neem Insecticidal Soap Concentrate (with Neem Oil)
Malathion	1	Ortho Malathion Insect Spray Concentrate Green Light Malathion Insect Spray Concentrate Spectracide Malathion Insect Spray Concentrate Bonide Malathion Concentrate
Neem Oil Extract	0	Ferti-lome Triple Action Plus: Neem Oil Concentrate Ferti-lome Rose, Flower & Vegetable Spray Concentrate Garden Safe Fungicide 3 Green Light Neem Concentrate Green Light Rose Defense Concentrate Green Light Fruit Tree Spray Concentrate (with Pyrethrin) Natural Guard Neem PY Concentrate (with Pyrethrin) Southern Ag Triple Action Neem Oil Concentrate
Permethrin	1	Bonide Eight Insect Control Vegetable Fruit & Flower Conc. Bonide Borer-Miner Killer Concentrate Bonide Total Control – Outdoor Concentrate Hi-Yield Kill-A-Bug II Concentrate Southern Ag Permetrol Rose Flower Fruit & Vegetable Insecticide
Pyrethrin	0	Southern Ag Natural Pyrethrin Concentrate Spectracide Garden Insect Killer Concentrate; & RTS
Spinosad	1	Bonide Captain Jack's Dead Bug Brew Concentrate; & RTS Bonide Colorado Beetle Beater Concentrate Green Light Lawn & Garden Spray Spinosad Concentrate
Notes: The PHI (pre-harvest interval) is time to wait in days between spraying and harvesting, and is listed after each active ingredient above. Apply soaps or oils in the evening or early morning.		

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Clemson University Cooperating with U.S. Department of Agriculture, South Carolina Counties, Extension Service, Clemson, South Carolina. Issued in Furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of May 8 and June 30, 1914
Public Service Activities