Texas A&M AgriLife Extension

ENTO-087
12/18



Insect and Disease Pests of Peaches, Plums, and Blackberries in a Small Fruit Orchard

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Peaches, plums, and blackberries are among the most commonly grown small fruits in Texas landscapes and small fruit orchards. However, insects and diseases reduce fruit production and quality and threaten the plants' health. Identifying these pests and understanding their life cycles and damage can help you choose the most effective control practices. Pests of peaches and plums are especially difficult to control because the fruit are susceptible to many kinds of pests over a long period, from petal fall through harvest (Table 1).

This guide explains how to identify and manage some of the most damaging insects and diseases that attack peaches, plums, and blackberries. The focus is on integrated pest management practices for backyard and small, noncommercial orchards.

Fortunately, not all of the pests listed in this publication will increase to damaging levels every year in every orchard. Identify the pest problems in your planting and select the appropriate controls. To reduce the risk of pests, follow the cultural practices listed below and then monitor your plants for diseases and insect pests.

To be most effective, pesticides for some insects and diseases must be applied at specific stages of crop development (Table 2).

Table 1. Stages of fruit development in peaches and plums

Stage	Timing
Dormant	Late fall to early spring, before bud swell
Budbreak	Buds begin to swell.
Bud swell	Buds are noticeably swollen, but no green tissue is present.
Pink	Just before the flower buds open
Bloom	Flowers open
Petal fall	Last petals are falling
Shuck-split	Most of the developing fruit have split away from the remains of the dried flower

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Cultural control practices

Healthy plants can survive insect and disease attacks better than plants that are stressed. Plant the fruit varieties that are adapted to your region of the state and, if available, those that have resistance to diseases. Plant them in a suitable site, follow a well-balanced fertility program, and irrigate and prune as needed.

Guidelines for selecting adapted varieties and cultural practices for growing fruit crops in Texas are available in online publications at https://aggie-horticulture.tamu.edu/fruit-nut/.

Reduce pest problems by removing diseased and infested fruit as well as properly pruning and removing diseased limbs and canes. Many pests can remain on infested plant parts from one growing season to the next. As examples, the fungi responsible for brown rot spend the winter (*overwinter*) in diseased fruit, and plum curculio larvae develop in fallen fruit. To remove these sources of pests, collect and destroy the infested fruit. When properly composted, crop residues can be recycled as mulch or organic material. Other cultural controls include proper pruning practices to discourage borer infestations.

Most plant diseases require that the leaf, fruit, or bark remain wet for a certain period before infection can occur. The following precautions reduce the length of time that the trees are wet after dew or rainfall and, therefore, suppress disease development:

- When planting, space the trees to allow air to circulate among them.
- Plant them in an area that receives early-morning sun and is away from buildings or other plants that would block air circulation.
- Avoid wetting the trees during irrigation.
- Prune the trees properly to open the canopy and promote rapid drying of fruit, leaves, and limbs.

Mechanical control: Bagging to protect peach fruit from pests

Clemson University has developed special paper bags (Fig. 1) to protect individual fruits from attack by brown rot fungi, plum curculio, and other insect pests while allowing the airflow and light needed for normal fruit development. As a result, bagging reduces the need for pesticides. Fruit bags can be purchased from Clemson University at https://tinyurl.com/Clemson-fruit-bags.

Figure 1. Peach protected from insect and disease pests by a paper bag that also allows the airflow and light needed for normal fruit development

To use a Clemson fruit bag:

1. Thin the fruit 4 to 6 weeks after bloom (when it is about thumbnail size), leaving one fruit every 6 to 8 inches. Then bag the fruit.
2. One day before bagging, spray a combination product of fungicide plus insecticide on the fruit. Examples of these products are Bonide Fruit Tree Spray with captan, malathion, and carbaryl; and Bonide Fruit Tree and Plant Guard with lambda cyhalothrin, pyraclostrobin, and boscalid (Tables 2 and 3). This application helps control disease and insects that may already be present.
3. Slide a bag over each fruit so that the branch fits into the V-shaped notch in the bag.
4. Tightly cinch together the two sides next to the notch around the branch until the bag is closed.
5. Wrap the twist tie firmly around the cinched top of the bag.

Because the fruit will be susceptible to insects and disease before bagging, you may need to spray pesticide immediately after petal fall and again at 10- to 14-day intervals. The timing and number of applications depend on when the fruit is bagged and how many pests are present. Once the fruit are bagged, no other pesticide applications should be needed. Leave the bags on the fruit until harvest.

Pesticide options

Pesticides may be needed because cultural controls alone cannot control many pest species. The decision to use pesticides will depend on the

severity of the pest attack and your tolerance of pest damage.

However, some of the pesticides available to home fruit growers are less effective than those used by commercial growers. They must be reapplied because of their short residual (the length of time that a pesticide remains effective after it has been applied). For several pests, no effective pesticides are packaged in small quantities and marketed to backyard growers. Many of the most effective pesticides are expensive and available only in commercial-size packages.

For backyard growers, a good option may be the combination (insecticide plus fungicide) products available at nursery and garden centers (Tables 2 and 3). If you have more than a few trees, consider buying commercial-size packages for a greater variety of effective pesticides.

Pesticides available to commercial growers are listed in the University of Georgia publication *Southeastern Peach, Nectarine, and Plum Pest Management and Culture Guide* available online at https://tinyurl.com/southeastern-pest-management.

Product names and labels change often. When buying a pesticide, make sure that the product label lists the fruit tree or berry you intend to treat.

Pesticide safety

Before using any pesticide, carefully read all the instructions on the container. Note the instructions for wearing protective clothing while mixing or spraying. Take the necessary precautions to avoid being exposed to chemicals when applying pesticides. Mix pesticides outdoors or in a well-ventilated area. Avoid chemical contact with your skin, and do not breathe chemical vapors. Store chemicals in a secure area away from children and pets.

Apply the pesticides at the proper rate. If you use less chemical than is prescribed, it may not control the pests well. If you use more than recommended, you may damage the plant or leave too much residue on the fruit. Prepare only the amount required for one application. Properly dispose of any unused, diluted sprays and empty pesticide containers. Store pesticides in their original containers.

The pesticides suggested in this guide are registered and labeled for use by the U.S. Environmental Protection Agency and the Texas Department of Agriculture. Regulations on pesticides are subject to change and may have changed since this publication was created. The user is always responsible for the effects of pesticide residues on livestock and crops as well as for problems caused when a pesticide drifts or moves to another landowner's property.

Organic pest management

Cultural controls and mechanical methods are vital for organic production. Some fungicides and insecticides are made of naturally occurring ingredients and are considered acceptable for organic production under USDA guidelines. The Organic Materials Research Institute certifies which products can be used for organic production, and the statement *OMRI Approved* will appear on the product label.

Some sulfur fungicides are approved for disease control in organically produced peaches, plums, nectarines, and apricots. Apply sulfur fungicides at the shortest interval allowed, especially during the late-bloom, shuck-split, first-cover, and preharvest periods. Fruit diseases are the most damaging during these periods. Some formulations of spinosad are approved for insect control in organic production systems (Tables 2 and 3).

Protecting bees and other pollinators

Fruit production requires pollination by honeybees and other insects. Insecticides can pose risks to these beneficial insects if used improperly. Do not apply insecticides to plants when flowers are present. Apply insecticides late in the evening or at night when bees are not foraging. For directions and restrictions on protecting bees and other insect pollinators, read the bee advisory box, highlighted by the bee icon, on the product label (Fig. 2).

Figure 2: Icon on pesticide labels indicating the steps to protect bees and other pollinators

Insect pests of peach and plum

Many insects and diseases attack fruit of peaches, nectarines, and plums, and pests can be present throughout fruit development. Also, many pests are difficult to detect in the orchard. Because of these factors, pesticides are most effective if they are applied on a schedule based on the development stage of the fruit, the life cycle of the pest, and the residual control of the pesticide. The optimum number of applications and their frequency will depend on the level of damage from the previous year, the abundance of insect pests, and weather conditions such as rain and high humidity that favor certain diseases.

Fruit-feeding insects

Plum curculio: The plum curculio larva feeds inside the fruit. Full-grown grubs lack legs and are dirty white to yellow and about ½ inch long. The adult is a small beetle, ¼ inch long, with a short, curved snout (Fig. 3). It overwinters in wooded areas and flies into fruit orchards in the spring. Female curculio adults chew holes in the fruit when feeding and when creating holes for depositing eggs. Infested fruit falls or, if it remains on the tree, is deformed and misshapen (*catfaced*) and unmarketable (Fig. 4).

Figure 3. Plum curculio larva (top) and adult

Feeding and egg-laying sites open the fruit to infection by brown rot fungus. Two generations of curculio develop each year, and the fruit is susceptible to infestation from bloom through early summer.

Plum curculio larvae develop in fallen fruit and emerge as adults that infest fruit later in the spring and summer. To eliminate this source of infestation, collect and destroy fallen fruit often. If plum curculio is present in your orchard, apply an effective insecticide (Table 2) at shuck-split, and make the second and third applications at 10- to 14-day intervals and about 30 days before harvest. For plums and nectarines, you may need to begin these treatments at 90 percent petal fall. These scheduled treatments are necessary to kill the adults before they can feed on and deposit eggs in the fruit.

Figure 4. Catfacing damage by plant bugs

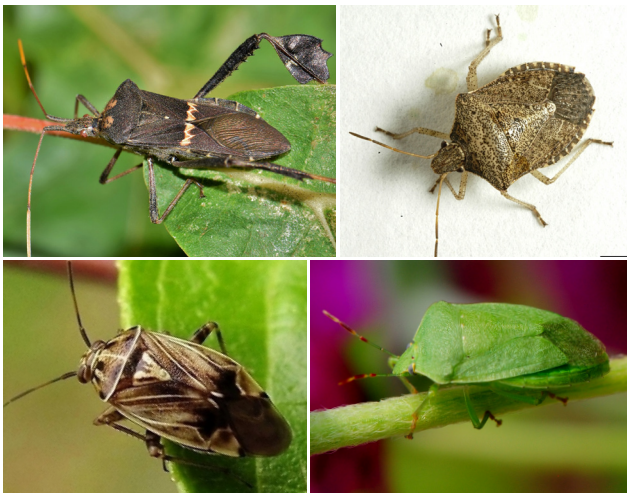

Figure 5. Clockwise from top left: leaffooted bug, brown stinkbug, southern green stinkbug, and lygus bug

Catfacing insects—stinkbugs, leaffooted bugs, lygus bugs: Green and brown stinkbugs, lygus bugs, and leaffooted bugs use their needle-like mouthparts to penetrate fruit and then suck juices (Fig. 5). Feeding results in deformed and misshapen fruit (Fig. 4). In some cases, feeding causes water-soaked areas, and gum may exude from the feeding sites on the fruit. These bugs feed on many weeds and cultivated crops before flying into fruit orchards.

Oriental fruit moth: The Oriental fruit moth (Fig. 6) infests late-maturing peach varieties as well as apples and pears. The larva feeds in growing shoots in the spring, and later generations feed in the fruit. Fruit infestations typically occur once the peaches begin to color. Because the larvae often enter the peach through the stem, there is no external evidence of damage.

Full-grown larvae are pinkish, have a brown head, and are about ½ inch long. Unlike plum curculio larvae, they have distinct legs and crawl quickly when disturbed. To reduce infestations, apply insecticides at shuck-split and reapply them 2 weeks later.

Figure 6. Oriental fruit moth larva (from top), shoot damage (flagging) caused by larvae feeding in the shoot, and damage by a larva feeding on a peach

Green June beetles, grasshoppers: The green June beetle (Fig. 7) is a large, metallic green beetle that feeds on ripening peaches, pears, plums, grapes, and other thin-skinned fruit just before harvest. Green June beetles, commonly found in pastures and hayfields, develop as grubs that feed on decomposing manure and organic matter.

Figure 7. Green June beetle

Once you see green June beetles feeding on fruit, apply an insecticide immediately to reduce crop loss and avoid attracting additional beetles into the orchard. Because these beetles feed on fruit just before harvest, follow the directions on the product label regarding the waiting period between insecticide application and harvest. Insecticides containing permethrin or malathion can reduce June beetle populations. These chemicals have a 7-day waiting period.

Grasshoppers feed on fruit, leaves, tender bark, and stems. Insecticides that control grasshoppers must be reapplied often to control reinvasion. Treating around the orchard provides an insecticide barrier that limits grasshopper movement into the orchard.

San Jose scale: San Jose scales (Fig. 8) are tiny insects that feed on fruit and cause reddish-purple blemishes on it. They feed primarily on small twigs and branches (discussion below).

Figure 8. San Jose scales (left) and a branch infested with them

Peach twig borer: Larvae of the peach twig borer (Fig. 9) feed inside peach and plum fruit. The full-grown larva is about ½ inch long and has alternating bands of light and dark brown. The head is black, and six legs are clearly visible. The larvae push excrement (*frass*) from their tunnels onto the surface of the fruit, where it is readily visible. See the borer section for control information.

Figure 9. Peach twig borer

Insects feeding on the bark of branches

Scale insects: Scales are tiny insects that suck plant sap from branches, twigs, and fruit. Infested branches drop leaves prematurely, the bark becomes rough, and the branches die. Because they are small and their population can increase rapidly, scale infestations often go undetected until limbs or the entire tree begins to die.

Adult female scales feed beneath a wax cover and do not move. Immature scales, called crawlers, move about until they find a suitable feeding site. Once settled, they secrete a waxy cover that expands as the scale grows. Two common scales of fruit trees are the San Jose scale and white peach scale.

San Jose scales (Fig. 8) feed on peaches, plums, pears, and apples. They secrete a rounded, dark gray waxy cover under which they feed. As the

insects feed, they inject a toxin that causes reddish-purple halos to form around the feeding site. The halos are especially visible on the fruit. Infested branches appear as if dusted with wood ash.

White peach scales (Fig. 10) feed on peaches and many woody ornamentals. The covers of female scales are round and white. Male scales are white and elongate—masses of them give twigs a fluffy appearance.

Figure 10. White peach scales

Tree stress can favor scale infestations. Keep the trees healthy by irrigating and fertilizing properly. If the trees are infested, apply a dormant oil in late winter or very early spring, just before budbreak. Spray the entire tree thoroughly because the oil kills the scales by suffocating them, and some scales are hidden in bark crevices. Applying dormant oil every year will help prevent scale infestations. The applications are especially important for peaches.

Scales are difficult to kill with other insecticide sprays because of the protection from their waxy covering. However, insecticides can be effective if applied when the crawlers are active. To determine when crawlers are active, wrap double-sided tape around infested twigs in the spring. Several days later, use a magnifier to look for crawlers stuck to the tape. Apply a contact insecticide when crawlers are present, and repeat if crawlers continue to be present. In addition to applying dormant oil every year, you may be able to bring a scale infestation under control by using an insecticide targeted at crawlers.

Insects that attack scales include tiny parasitic wasps and small lady beetles. If you apply a broad-spectrum insecticide, it can kill these natural enemies and result in scale outbreaks.

Borers: Insects tunneling into branches and trunks

Peach tree borer: Peach tree borer is a serious pest of peaches, plums, and other stone fruits. The larvae tunnel into the tree trunk at or just below the soil line and can severely weaken and even kill trees. Look for frass, tree gum, and chewed wood fragments that accumulate at the base of infested trunks. Full-grown larvae are up to 1¼ inches long, appear pinkish white, and have a brown head (Fig. 11). The adult, a day-flying moth, deposits eggs on the lower trunk. Hatching larvae enter the sapwood through wounds and cracks in the bark. There is only one generation per year. Although insecticide cannot kill the larvae that are already infesting the trees, it can prevent reinfestation if you apply it to the bark before small larvae tunnel into the tree.

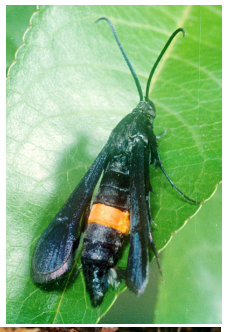

Figure 11. Peach tree borer adult (top) and larva

Where peach tree borers are present, apply the insecticide every year in late August to early September. Thoroughly wet the entire trunk with the insecticide spray from the scaffold limbs (the main branches that form the framework of the tree) to the soil. Insecticides containing permethrin or zeta-cypermethrin (Table 2) provide some control but may need to be reapplied to maintain control during the egg-laying period. You can sometimes reach and kill the larvae by inserting a wire into the tunnels.

Lesser peach tree borer: This borer tunnels under the bark of large branches and the upper trunk, causing tree decline. The presence of gum mixed with frass is evidence of borer activity (Fig. 12). Trees susceptible to attack are those with freeze damage, sunscald, or cracked bark. To minimize infestations, avoid injuring the tree

bark, prune out dead limbs, maintain tree vigor, and do not leave pruning stubs, which are attractive egg-laying sites.

Figure 12. Lesser peach tree borer adult (top) and damage

Peach twig borer: The peach twig borer (Fig. 9) feeds in the fruit (see the discussion under fruit-feeding insects) and tunnels into shoots. It causes the shoots to wilt and die, a process called *flagging.* Full-grown larvae are ½-inch long, have a dark head, and have alternating white and dark bands around their body. The larvae feed in the fruit by tunneling just under the skin. Larvae overwinter under thin bark in branch crotches, in pruning wounds, and in deep cracks. These sites are marked with chewed wood and frass. Remove and destroy these larvae.

Applying insecticides such as spinosad (Table 2) at petal fall and again at shuck-split can help control peach twig borer. Spinosad or permethrin mixed with a dormant oil applied during the winter can also be effective for peach twig borer and scales.

Borer or bacterial canker? Insect borers and the bacteria that cause canker disease both result in sap or gum appearing on the bark or fruit. To identify the cause as borers, look for accumulations of waste and woodchips mixed with the gum (Fig. 13). Cutting into these areas will reveal tunnels and often the white larval stage of the borer.

Figure 13. Characteristic gum from damage caused by the lesser peach tree borer

In contrast, cankers are elongated depressions that form at the base of dead buds. A clear gum, free of woodchips, can exude from these cankers. Removing the bark above a canker reveals a brown margin separating the diseased area and healthy wood.

Diseases of peaches and plums

Brown rot of peach: Brown rot is the most destructive disease of peaches. Its cause is a fungus that infects the blossoms, shoots, and fruit before and after harvest. On fruit, the fungus causes a brown, spreading, rotted area (Fig. 14). Infected fruit eventually become shriveled and covered with a mat of fungal growth that produces spores. These infested fruit, called *mummies,* are sources of fungal spores; remove them from the orchard. Wind and rain transport the spores, which then germinate and infect the plant when the leaves remain wet for 3 to 5 hours and temperatures are 65 to 70°F.

Figure 14. Brown rot

To help suppress brown rot, prune the trees properly to improve air circulation and thus enable the fruit and leaves to dry quickly. Fungicides containing chlorothalonil (Table 3) are effective but can be applied only before shuck-split. After shuck-split, control brown rot by applying fungicide sprays containing captan or sulfur.

Peach scab: Peach scab is another common fungal disease that infects leaves, shoots, and fruit. The skin of infected fruit has velvety brown spots that are less than ¼ inch in diameter (Fig. 15). Moderate levels of spotting can be ignored because they do not affect fruit development or quality.

Figure 15. Peach scab

Under heavy infection, sunken lesions (abnormal tissue growths) can develop, and the skin may crack, allowing other pathogens, such as brown

rot fungus, to invade the fruit. The fruit is most susceptible to infection during the first 30 days after petal fall. As with other fungal diseases, infection is more common in higher-rainfall areas. The fungicides listed above for brown rot can also control peach scab.

Bacterial spot: Bacterial spot infects stems, leaves (Fig. 16), and fruit. Symptoms on leaves appear first as small, pale green lesions that are circular or irregularly shaped. During early development, the lesions are often concentrated near the leaf tip. In advanced stages, the inner part of the lesion falls out, giving the leaf a ragged or "shot hole" appearance. Heavily infected leaves often turn yellow and drop. On the fruit, the symptoms appear first as small, circular, olive brown spots. As the bacteria develop, the spots darken and sink slightly. The lesions scatter over the fruit surface, and tiny cracks develop in the center of the spots.


Figure 16. Bacterial spot symptoms

Planting varieties with resistance to bacterial spot minimizes infection. Pruning the interior of the tree speeds drying time after rain and reduces infection. Another tactic is to apply one or two foliar sprays of a copper-based fungicide (Table 3) after all of the leaves have fallen in the fall but before tree dormancy, and again before buds swell in the early spring.

Bacterial canker: This disease attacks the scaffold limbs (Fig. 17) and may kill large limbs and the entire tree. The pathogen enters the tree through the leaves or wounds created by pruning cuts, freeze damage, or other injury. The shoots and limbs begin to die. As the weather turns hot and dry, large numbers of sticky gum deposits appear on the bark of infected limbs and trunks.


Figure 17. Bacterial canker of peach

This sap can be confused with that caused by wood-boring insects. Confirm bacterial canker by cutting away the bark beneath these gummy sites and looking for black longitudinal streaks on the wood.

To reduce disease incidence, delay pruning until late winter, paint large cuts with pruning paint, and sterilize the pruning equipment. Prune out and destroy infected limbs.

Other diseases: Post oak (mushroom) root rot and cotton root rot are fungal diseases that attack the woody tissue and roots of peach trees. Post oak root rot causes tree decline and death; a white mass of fungal growth often appears at the base of infected trees. Symptoms of cotton root rot infection are the sudden onset and rapid tree death with leaves remaining on the tree.

Blackberries

Diseases: Minimize diseases by keeping the blackberry plants trellised properly, pruned meticulously, and spaced widely. Prune the branches near the ground to promote airflow, enable the leaves to dry faster, and reduce the incidence of diseases. Diseases that affect blackberries include anthracnose, double blossom (also called rosette or witches broom), orange rust, crown gall, and white drupelets.

Descriptions of these diseases and their prevention and control are detailed in the Texas A&M AgriLife publication *Blackberries,* which is available at https://tinyurl.com/aggie-hort-blackberries.

Leaffooted bugs and stinkbugs: Brown and green stinkbugs and leaffooted bugs use their needlelike mouthparts to pierce and feed on the fruit (Fig. 5). The damaged fruit becomes deformed and develops an unpleasant taste. Stinkbugs and leaffooted bugs feed on many crops and weeds.

Adult leaffooted bugs and stinkbugs are difficult to kill with insecticides. Destroy the egg masses and treat the nymphs with insecticide. PyGanic insecticide, a pyrethrin formulation, is labeled for control of stinkbugs and leaffooted bugs on blackberries and other small fruit. It is

OMRI approved for organic production. Insecticides containing bifenthrin or zeta-cypermethrin (Table 2) are also labeled for stinkbug control in blackberries. Follow the product label directions to minimize risk to honey bees and pollinators.

Rednecked cane borer: Red-necked cane borer larvae are white, slender, legless, and about ½ to ¾ inch long when fully grown. The larvae tunnel in the primocanes (first-year canes), causing the bark to split and the cane to swell at the initial feeding site (Fig. 18). These swollen areas (*galls*) can measure about ½ inch thick and several inches long. Most of these swollen areas occur just above the soil surface but some may be found anywhere on the primocane. Infested canes die or fail to produce.

Figure 18. Swelling on blackberry canes caused by rednecked cane borers

The adult cane borer is a metallic blue-black beetle about ¼ inch long. The beetles lay eggs on canes in the summer. The larvae overwinter inside the cane. In the winter if 5 to 10 percent of the primocanes have galls, prune out and burn all those with galls before the buds begin to swell. Insecticide helps control infestations if applied when the adult beetles are active.

Strawberry clipper or strawberry bud weevil: The adult is a tiny, dark brown snout weevil about 1/10 inch long (Fig 19). The female weevil deposits eggs in the flower buds of blackberries and strawberries when they first begin to swell in the spring. It then girdles or clips the stem of the flower bud, which causes the bud to break over and soon fall to the ground, reducing yields. Look for weevils by beating the bud clusters onto a white paper plate. If you see weevils or newly clipped buds, apply an insecticide to kill the weevils.

Figure 19. Strawberry bud weevil

Spider mites: Spider mites are tiny mites that feed on the underside of leaves, producing a fine webbing (Fig. 20) and causing the leaves to discolor, eventually die, and drop. The mites increase on water-stressed plants during hot, dry weather. Infestations may increase when broad-spectrum insecticides are applied often. Several applications of an insecticidal soap (such as Safer Insect Killing Concentrate, Table 2) can suppress mite infestations. Because soaps kill by contact, the spray must be applied to the underside of leaves, where the mites feed.

Figure 20. Spider mite infestation and webbing

Fire ant management

Fire ants can be severe problems in small fruit production by inflicting painful stings, which can lead to medical emergencies. Fire ants may damage electric motors and irrigation systems. Although many insecticides are marketed to control fire ants in lawns and landscapes, only a few are labeled and approved for use in small fruit orchards.

Reduce fire ant numbers by broadcasting a fire ant bait across the orchard. Fire ants collect the bait particles and carry them back to the colony. The ants eventually feed the insecticide to the queens, which become sterile or die. The ant colony dies within weeks or months, depending on the bait product used.

Fire ant baits containing methoprene (Extinguish) can be applied to orchards, vineyards, and other fruit-production areas. Do not apply them if rain or irrigation is expected within 6 hours. For heavy infestations, repeat the application within 10 to 12 weeks.

Pyriproxyfen (Esteem) is labeled for use in berries, stone fruit, and pomes (fleshy fruit such as apples or pears that usually have five seeds in the core). Broadcast (scatter) the bait in early spring or summer when the ants are actively foraging

and temperatures exceed 60°F. Do not apply the bait if rain is expected within 4 to 6 hours. Do not water the treated area for 24 hours after application. Repeat the application in 12 to 16 weeks if the area is heavily infested or if some mounds remain active. Do not apply within 24 hours of harvest.

Hydramethylnon (AmdroPro®) fire ant bait can be applied only to nonbearing orchards. All of these baits can also be applied around (not on top of) individual fire ant mounds.

To improve bait effectiveness, follow these recommendations:

- Always use fresh bait. Packages that have a rancid odor are probably spoiled, and the bait will not attract the ants.
- Store unused bait in a sealed container set in a cool, dry place.
- Before baiting a large area, conduct a pre-bait test by placing a small amount of bait in an area near some mounds. Check the baited area after 1 hour to see if ants are gathering the bait. If not, the bait has spoiled or the soil is too cool for the ants to forage.

For more information on fire ants, visit the Texas A&M Entomology website at https://www.texasinsects.org/

Policy statement for pest management suggestions

The information and suggestions in this publication reflect the opinions of Extension entomologists based on research and experience. However, it is impossible to eliminate all risk. Conditions or circumstances that are unforeseen or unexpected may result in less than satisfactory results even when these suggestions are used. Texas A&M AgriLife Extension Service will not assume responsibility of risks. The user of this publication shall assume such risks.

Suggested pesticides must be registered and labeled for used by the U.S. EPA and the Texas Department of Agriculture. The status of pesticide label clearances is subject to change and may have changed since this publication was produced.

The users are always responsible for the effects of pesticide residues on their livestock and crops, as well as for problems that could arise from drift or movement of the pesticide from their property to that of others. Always read and carefully follow the instructions on the container label.

Table 2. Products available in small packages for insect control on small fruits. See the product label for specific fruits and use restrictions.[1]

Active ingredient	Product name	Distributor	Remarks (read the label before using)
bifenthrin and zeta-cypermethrin	Bug B Gone Insect Killer for Lawns and Gardens (bifenthrin 0.3% and zeta-cypermethrin 0.075%)	Ortho	Labeled to control stinkbugs, leaffooted bugs, grasshoppers, San Jose scales, and others on blackberry and pear but not peach or plum
captan, carbaryl, and malathion	Bonide Fruit Tree Spray with Captan (11.76%), malathion (6%), and carbaryl (0.3%)	Bonide	Combination of 2 insecticides and a fungicide. Labeled to control plum curculio and brown rot in peach
dormant oil	Horticultural Oil Spray (petroleum oil 98%)	Bonide	Labeled to control scale insects and mites on peach and nectarine
	Dormant Spray (98.8% mineral oil)	Hi-Yield	Labeled to control San Jose scales on peach and plum. Apply during the dormant period and before bud swell. See label directions.
	Horticultural Oil Spray (80% mineral oil)	Ferti-lome	Labeled to control scale insects and mites on peach and plum. Can be applied during dormant and growing seasons
gamma-cyhalothrin	Triazicide Insect Killer for Lawns & Landscapes Concentrate (0.07% gamma-cyhalothrin)	Spectracide	Labeled to control plum curculio, peach tree borer, Oriental fruit moth, plant bugs and stinkbugs on peach and plum. Wait 14 days after application before harvest.
lambda cyhalothrin plus pyraclostrobin plus boscalid	Fruit Tree and Plant Guard	Bonide	Combination of an insecticide and 2 fungicides. Labeled for peach, plum, and others but not blackberry to control June beetle, Oriental fruit moth, peach tree borer, plum curculio, stinkbugs, and other insects, and brown rot, leafspot, shot hole, and other diseases
malathion	Martin's Malathion (57%)	Control Solutions Inc.	Labeled to control plum curculio and other insect pests on peach and nectarine. Wait 7 days after application before harvest. Maximum of 3 applications per year. Wait 24 hours before entering treated area.
	Ortho Malathion (50%)	Ortho	Labeled to control plum curculio, tarnished plant bug, and other insect pests on peach. Wait 7 days after application before harvest.
	Malathion (55%)	High-Yield	Labeled to control plum curculio on peach
	Malathion (50%)	Spectracide	Labeled to control plum curculio and plant bugs on peach. Wait 7 days after application before harvest
permethrin	Bonide Eight Vegetable, Fruit and Flower Concentrate (2.5% permethrin)	Bonide	All three products are labeled to control borers, plum curculio, Oriental fruit moth, and tarnished plant bug on peach. Do not apply within 7 days of harvest. Not labeled for blackberry or plum
	Borer Miner Killer Concentrate (permethrin 2.5%)	Bonide	
	Martin's Vegetable Plus (10.0% permethrin)	Control Solutions Inc.	
	Lawn, Garden, Pet and Livestock Insect Control (10.0% permethrin)	Hi-Yield	Labeled to control lesser peach tree borer, peach twig borer, plum curculio, Oriental fruit moth, and tarnished plant bug on peach

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Table 2 *continued*

Active ingredient	Product name	Distributor	Remarks (read the label before using)
potassium salts of fatty acids	Insect Killing Soap Concentrate	Safer	Labeled for small fruit and berries. Suppresses mites. Apply to underside of leaves. Good coverage is essential. Wait 1 day after application before harvest.
pyrethrins	PyGanic (1.4% pyrethrins)	Valent	Labeled to control a wide variety of insect pests on peach, plum, nectarine, and blackberry. OMRI[2] approved for organic production. Can be used on day of harvest.
	Tree and Shrub Fruit Tree Spray (0.25% pyrethrins)	Ortho	Labeled to control scales and other insects on fruit
spinosad	Borer, Bagworm, Leafminer and Tent Caterpillar Spray (0.5% spinosad)	Ferti-lome	Most effective on caterpillar pests. Labeled for peach, plum, and nectarine. Wait 14 days after application before harvesting peach, 7 days for plum. OMRI[2] approved for organic production
	Captain Jacks Dead Bug Brew (0.5% spinosad)	Bonide	Labeled for use on blackberry, peach, and plum. Wait 1 day after application before harvesting peach and blackberry, 7 days for plum.
	Conserve Naturalyte Insect Control (0.5% spinosad)	Southern Ag	Labeled to control borers and Oriental fruit moth. Wait 7 days after application before harvesting plum, 1 day before peach.
	Lawn and Garden Spray with Spinosad (0.5% spinosad)	Green Light	Labeled for peach, plum, and nectarine. Wait 14 days after application before harvest for peach, 7 days for plums. Most effective on caterpillar pests. OMRI[2] approved for organic production
	Monterey Garden Insect Spray (0.5% spinosad)	Monterey Lawn and Garden Products	Labeled for Oriental fruit moth and other pests. Wait 7 days after application before harvesting plum, 1 day for peach. OMRI[2] approved for organic production
	Spinosad (0.5% spinosad)	Natural Guard by Fertilome	Do not apply within 14 days of harvesting peach, 7 days for plum. OMRI[2] approved for organic production
zeta-cypermethrin	Sevin Insect Killer[3] (0.35% zeta-cypermethrin)	GardenTech	Labeled for use on peach, nectarine, plum, and blackberry. Wait 1 day after application before harvesting blackberry, 14 days after application before harvesting peach and plum.

1: The effectiveness of many of these products has not been fully evaluated in university trials.
2: OMRI: Organic Materials Review Institute
3: The active ingredient of GardenTech Sevin has been changed from carbaryl to zeta-cypermethrin.

Table 3. Products available in small packages for disease control on small fruits. See label for specific fruits, days to wait after application and before harvest, and other use restrictions.

Pesticide	Trade Name	Distributor	Remarks (Read label before using)
captan	Captan Fruit & Ornamental WP	Bonide	Stone fruit: Brown rot, scab, blossom blight. Blackberry: Anthracnose and botrytis
	Captan Fungicide	Southern Ag	Not labeled for blackberry
	Captan 50W Fungicide	Hi-Yield	Stone fruit: Brown rot, scab, blossom blight. Blackberry: Anthracnose and botrytis
captan, carbaryl, and malathion	Bonide Fruit Tree Spray with Captan (11.76%), malathion (6%) and carbaryl (0.3%)	Bonide	Combination of 2 insecticides and a fungicide. Labeled to control plum curculio and brown rot in peach
chlorothalonil	Broad Spectrum Landscape & Garden Fungicide	Fertilome	Do not apply after shuck-split. Not labeled for blackberry
	Fruit Tree, Vegetable & Ornamental Fungicide	Monterey	Do not apply after shuck-split. Not labeled for blackberry
	Fung-onil	Bonide	Brown rot and others. Apply at budbreak and repeat as per label. Do not apply after shuck-split. Not labeled for blackberry
copper fungicide: copper complex	Liqui-Cop	Monterey	Do not apply after full bloom. Not labeled for blackberry. Wait 14 days before harvest.
	Liquid Copper Fungicide	Southern Ag	Do not apply after full bloom. Not labeled for blackberry
copper fungicide	Copper Octanoate	Bonide	Labeled for peach, plum, and blackberry
lambda cyhalothrin + pyraclostrobin + boscalid	Fruit Tree and Plant Guard	Bonide	Combination of an insecticide and 2 fungicides. Labeled for peach, plum, and others but not blackberry to control June beetle, Oriental fruit moth, peach tree borer, plum curculio, stinkbugs, and other insects, and brown rot, leafspot, shot hole, and other diseases
myclobutanil	Fungi-Max	Monterey	Start at the red bud stage. No more than 7 applications/ season (stone fruit), No more than 4 times/season (blackberry). No waiting period after application before harvest
	Immunox Multi-Purpose Fungicide	Spectracide	Start at the red bud stage. No more than 7 applications/ season (stone fruit). No more than 4 times/season (blackberry)
neem oil	Neem Oil	Bonide	Labeled to control rust, scab, and other fungal diseases on fruit. See label.
	Fruit Tree Spray Plus	Monterey	Labeled to control rust, scab, and some other fungal diseases on fruit. OMRI approved. No waiting period after application before harvest
	Triple Action Neem Oil	Southern Ag	Labeled to control rust, scab, and some other fungal diseases on fruits. OMRI approved
	Ferti-lome Triple Action (79% neem and pyrethrins 0.25%)	Ferti-lome	Labeled to control rust, scab, and some other fungal diseases on fruits
phosphoric acids	Garden Phos	Monterey	Labeled to control phytophthora
potassium bicarbonate	Bi-Carb	Monterey	Labeled to control powdery mildew, especially on blackberry

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Table 3 *continued*

Pesticide	Trade Name	Distributor	Remarks (Read label before using)
propiconazole	Infuse	Bonide	No more than 4 applications/season
sulfur	Sulfur Plant Fungicide (90% sulfur)	Bonide	Labeled for use on peaches, plums, nectarines and other fruit for control of brown rot, powdery mildew, and other disease. Labeled to control brown rot on peach and powdery mildew on blackberries. Also labeled for plums. No waiting period after application before harvest

1: OMRI: Organic Materials Review Institute

Acknowledgment

Wizzie Brown, Extension Program Specialist–IPM, reviewed the manuscript for this publication.

Photo credits

Figure 1. Peach bag by Guido Schnabel, Clemson University. Used by permission

3. (from top) Plum curculio (*Conotrachelus nenuphar*) (Herbst, 1797) and plum curculio (*Conotrachelus nenuphar*) (Herbst, 1797), both by Clemson University - USDA Cooperative Extension Slide Series (CC BY 3.0)
4. Plant bugs by Clemson University - USDA Cooperative Extension Slide Series (CC BY 3.0)
5. Brown stink bug (*Euschistus servus*) (Say) by Herb Pilcher, USDA Agricultural Research Service, Bugwood.org (CC BY-NC 3.0 US); leaffooted bug by Bill Ree, Texas A&M AgriLife Extension Service; lygus bug (*Lygus* sp.) by Kurt Andreas (CC BY-NC-SA 2.0); southern green stink bug by Manjith Kainickara (CC BY 2.0)
6. (from top) Oriental fruit moth *Grapholita molesta* (Busck) by Lesley Ingram, Bugwood.org (CC BY-NC 3.0 US), Oriental fruit moth *Grapholita molesta* (Busck) by Clemson University - USDA Cooperative Extension Slide Series (CC BY 3.0), and Oriental fruit moth *Grapholita molesta* (Busck) by Jonas Janner Hamann, Universidade Federal de Santa Maria (UFSM), Bugwood.org (CC BY 3.0)
7. Green June beetle (*Cotinis nitida*) (Linnaeus, 1764) by Clemson University - USDA Cooperative Extension Slide Series (CC BY 3.0)
8. (from left) San Jose scale (*Diaspidiotus perniciosus*) (Comstock) and San Jose scale (*Diaspidiotus perniciosus*) (Comstock), both by United States National Collection of Scale Insects Photographs, USDA Agricultural Research Service, Bugwood.org (CC BY-NC 3.0 US)
9. Peach twig borer (*Anarsia lineatella*) Zeller by H. Audemard, INRA, Montfavet, Bugwood.org (CC BY-NC 3.0 US)
10. White peach scale by J. A. Davidson, Univ. Md, College Pk, Bugwood.org (CC BY-NC 3.0 US) and white peach scale *Pseudaulacaspis pentagona*) (Targioni Tozzetti) by Eric R. Day, Virginia Polytechnic Institute and State University, Bugwood.org (CC BY 3.0)
11. Peachtree borer (*Synanthedon exitiosa*) (Say), peachtree borer (*Synanthedon exitiosa*) (Say) (CC BY 3.0), both by Clemson University - USDA Cooperative Extension Slide Series (CC BY 3.0)
12. (from top) Bug of the day by Jenn Forman Orth (CC BY-NC-SA 2.0), and lesser peachtree borer (*Synanthedon pictipes*) (Grote & Robinson) by Carroll E. Younce, USDA Agricultural Research Service, Bugwood.org (CC BY 3.0 US)
13. Synanthedon pictipes damage by Carroll E. Younce, USDA Agricultural Research Service, Bugwood.org (CC BY 3.0 US)
14. Brown rot (*Monilinia fructicola*) (G. Wint.) by Rebecca A. Melanson, Mississippi State University Extension, Bugwood.org (CC BY-NC 3.0 US)
15. Peach scab (*Venturia carpophila*) E. E. Fisher by Clemson University - USDA Cooperative Extension Slide Series (CC BY 3.0)

16. Bacterial spot of stone fruits (*Xanthomonas arboricola pv. pruni*) (Smith 1903) Vauterin et al. 1995 by University of Georgia Plant Pathology, University of Georgia, Bugwood.org (CC BY 3.0)
17. Canker by Penn State Department of Plant Pathology & Environmental Microbiology Archives, Penn State University, Bugwood.org (CC BY-NC 3.0 US)
18. Rednecked cane borer (*Agrilus ruficollis*) (Fabricius, 1787) by James Solomon, USDA Forest Service, Bugwood.org (CC BY 3.0)
19. Strawberry bud weevil (*Anthonomus signatus*) Say, 1831 by University of Georgia Plant Pathology, University of Georgia, Bugwood.org (CC BY 3.0)
20. Tetranychidae by Paramecium (CC-BY-SA-3.0)

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