

BMP Strawberry Insect Pests

Best Management Practices for insect and mite pests begin with being able to recognize the pests affecting strawberry, their damage symptoms, and understanding a little about their life cycle. Indeed, proper identification of the pest causing the damage is critical to making the most appropriate management decision.

Several insect and mite pests attack strawberry in Wisconsin, and, in general, damage is relatively minimal. However, sporadic outbreaks of some pests happen during some years or at some locations and, if not properly managed, can cause serious damage to the crop. Strawberry pests attack the fruit, flowers, buds, leaves, roots and other parts of the plant. Feeding by insects and mites can also increase the susceptibility of strawberry plants to diseases and other pests. Not all insects and mites found in strawberry plantings are pests though. Many, such as lady beetles, spiders, and predatory mites, are beneficial as they feed on pest insects and mites.

Fruit- or flower-feeding pests

Tarnished plant bug, *Lygus lineolaris* (Hemiptera: Miridae)



Tarnished plant bug is the most important insect pest of strawberry in Wisconsin. It has 2-3 generations per year. The adult is ~1/4" long, oval and flattened, bronze in color with yellow and black markings on the wings. They overwinter as adults in protected areas in and around strawberry. The adults emerge in the spring when temperatures reach and remain around 49°F.

Damage occurs on the fruit from adults and nymphs feeding on the flower buds, developing fruit, and receptacle. Feeding on the berries can result in deformed and stunted berries with a concentration of seeds at the tip, called button berries or cat-faced berries.



Top photo: Tarnished plant bug adult, Daniel Mahr, UW Extension
Bottom photo: Cat-faced berries
www.omafra.gov.on.ca

Monitoring and Control. Tarnished plant bug feeds on many different plants. Controlling weeds in and around strawberry fields can reduce overwintering populations in strawberry plantings and remove sources of attractive flowering plants in the spring. Avoid mowing weeds when strawberry buds are swelling, flowers are beginning to open, or early fruit set. Monitoring can be done with sweep sampling (economic threshold at 2 adults per 10 sweeps) and tapping flower clusters over a white pan or paper (economic threshold at 1 adult or nymph per 4 clusters). If economic thresholds are reached, application of an insecticide is warranted and should be applied soon after blossom buds become visible and again towards the end of flowering if needed.

Strawberry bud weevil, *Anthonomus signatus* (Coleoptera: Curculionidae)



Top photo: Strawberry clipper adult, Tom Murray, BugGuide
Bottom photo: Clipped flower bud, Daniel Mahr, UW Extension

Strawberry bud weevil, aka strawberry clipper, is a pest of strawberry. The adult beetle is ~1/10" long, dark, reddish/brown, with 2 large black spots, and a head prolonged into a snout. Strawberry clipper has 1 generation per year. They overwinter as adults in wooded areas and fence-rows and move to strawberry fields once temperatures reach 60°F, just before strawberry blossom time.

Damage is caused by the adult female beetle. Females puncture flower buds with their mouthparts and insert eggs in the punctures. After the eggs are laid, the female girdles or clips the bud stem, causing the bud to hang limp or fall to the ground. Eggs hatch about 1 week later and adults emerge 3-4 weeks thereafter (late June-July).

Monitoring and Control. Visual inspections of flowers for the presence of adults and clipped flower buds should be done as soon as flower trusses are visible. Because strawberry bud weevil move into strawberry fields in the spring, monitoring should focus on field edges. At the first sign of bud damage and when 1 clipped bud per 2 ft. of row is found, treatments should be applied.

Sap beetles: Strawberry sap beetle, *Stelidota geminate*, and picnic beetle, *Glischrochilus quadrisignatus* (Coleoptera: Nitidulidae)



Top left photo: strawberry sap beetle; top right photo: picnic beetle; Michele Price, University of Wisconsin
Bottom photo: Fruit damaged by sap beetles; Kristen Rutherford, Iowa State University

Strawberry sap beetles and picnic beetles are both sap beetles that may be found in strawberry plantings. Strawberry sap beetles are small, 1/10" long, oval, and dark brown (top left photo). Picnic beetles are ~2/10" long, oval, black with four orange markings on the back (top right photo). Both species have one generation per year and overwinter as adults in organic matter in protected areas.

Damage occurs from direct feeding by adults on damaged ripe fruit or overripe fruit and from their introduction of fungal pathogens into the fruit. Adults can be found tunneling in the berries during harvest.

Monitoring and Control. Since sap beetles are attracted to overripe fruit and fermenting plant fluids, remove overripe, damaged, or diseased fruit regularly. Avoid placing compost piles near the planting. Trapping can be accomplished by placing containers baited with stale beer, molasses-water-yeast mixtures, vinegar, or any overripe fruit a few feet outside the edge of the strawberry planting. Since sap beetles occur when fruit is ripe, chemical control is discouraged.

Slugs, *Deroceras* (*Agriolimax*) species (Limacidae) and *Arion* species (Arionidae)



Slug feeding inside a strawberry;
<http://msfruitextension.wordpress.com/2012/04/17/strawberry-slugs/>

Slugs are not insects but are common pests of many vegetable and fruit in North America. Various species of slugs can be found in strawberry. Slugs are soft-bodied, slimy molluscs that do not have a shell. They are usually mottled gray, brown, yellow, or black, and measure 0.5” to 5” long. Slugs overwinter as eggs laid the previous fall in the soil or plant debris. Slugs prefer plantings covered with continuous straw mulches. Slugs feed at night on berries and leaves, leaving a glistening trail of slime behind.

Damage occurs when slugs feed on ripe berries, eating large irregular areas out of berries. Often, damage is minimal.

Monitoring and control. Slug presence and activity may be detected by the presence of slime trails on leaves and the ground nearby. Slug baits are commercially available and should be placed between rows. Homemade traps made of shallow dishes baited with beer can also be used.

Eastern flower thrips, *Frankliniella tritici* (Thysanoptera: Thripidae)



Top photo:
http://bioweb.uwlax.edu/bio210/s2012/peterson_ama3/facts.htm

Bottom photo: Daniel Mahr,
UW-Extension

Eastern flower thrips are occasional pests in Wisconsin, as they do not overwinter here. Adults migrate on air currents each year from the south and population densities vary each year. Adults are very small, ~1/25” long, from yellow to brown with feathery wings.

Damage results from thrips feeding on blossoms causing premature wilting of flower parts and blossom drop. During fruit development, the rasping feeding by thrips may cause russetting and deformities on the fruit. Thrip damage may ultimately result in brown, small, tough, seedy berries with little flavor.

Monitoring and Control. Sample when earliest flowers of earliest varieties begin to open. Shake or tap blossoms in a white bowl or a Ziploc bag. Treatments should be applied when 2-10 thrips per blossom or small berry are found. Yellow sticky cards can also be used to detect thrips presence. To protect pollinators, treatments should be applied before bloom or before 10% of plants have open blossoms. Because thrips do not overwinter in Wisconsin, preventative sprays based on prior year’s infestation levels are not relevant.

Spotted wing drosophila, *Drosophila suzukii* (Diptera: Drosophilidae)



Top photo: spotted wing drosophila male on left, female on right. Beverly Gerdeman, WSU NWREC
Bottom photo: Larvae feeding inside berry; Hannah Burrack, NC State, Bugwood

Spotted wing drosophila is an invasive vinegar fly that is a major pest of small fruit in North America. It has not yet been reported as a pest of strawberry in Wisconsin, but, as it is a significant pest of strawberry in southern states and is present in Wisconsin, it is important for strawberry growers to know about this pest. Several generations probably occur in Wisconsin from late June until November. Spotted wing drosophila is 1/16 to 1/8" long. Males have a single dark spot on each wing. Females have a serrated ovipositor that allows them to lay eggs under the skin of ripening and ripe fruit. Larvae are creamy-white legless maggots ~1/10" long when mature.

Damage occurs from the larvae feeding inside ripening or ripe fruit. Larvae feed on the flesh of the fruit, causing the flesh to turn brown and soft, resulting in a small depression around the oviposition hole. Damage by spotted wing drosophila compromises the fruit, allowing common vinegar flies to oviposit in the fruit and providing an entry site for secondary fungal and bacterial pathogens.

Monitoring and Control. Monitoring should be conducted with clear plastic deli cups and bait made of apple cider vinegar or a yeast, sugar and water mixture. As soon as a spotted wing

drosophila is detected in traps and the fruit is at a susceptible stage (ripening or ripe), control measures should be applied on a weekly basis until harvest is completed. Timely harvest of ripe berries should be performed. Removing overripe, damaged and fallen berries can help reduce populations. Damaged fruit should be buried or solarized to kill the larvae. Do not compost damaged fruit.

Foliage- or stem-feeding pests

Meadow spittle bug, *Philaenus spumarius* (Hemiptera: Cercopidae)



Spittlebug is a very common insect that feeds on many different plants and can be a pest of strawberry. Adults are 1/4" long, bright green when they first emerge and then turn dull brown to mottled gray. They overwinter as egg masses in strawberry stubble and other hosts such as field crops. They have one generation per year. Nymphs emerge in April-May and produce a frothy spittle in which they remain protected for 5-8 weeks until they become adults.

Top photo: Adult spittle bug;
Dana Fazzino, BugGuide
Bottom photo: Spittle mass
on strawberry;
www.fruit.cornell.edu

Damage occurs when nymphs feed by piercing the plant and sucking on plant juices. This feeding may result in reduced plant vigor, stunted berries, and reduced yield. Populations are usually larger in weedy plantings and throughout the summer. Leaves do not recover after the insects leave the plant.

Monitoring and control. Although spittlebugs usually do not cause significant yield loss, the spittle masses tend to bother pickers, especially in Pick-Your-Own operations. Visual inspections for spittle masses should be performed. One spittle mass or more per square foot of canopy may warrant the use of an insecticide. Removing weeds in plantings may reduce spittlebug populations. Often, spittle masses can be washed off by heavy rains or irrigation.

Strawberry rootworm, *Paria fragariae* (Coleoptera: Chrysomelidae)



Strawberry rootworm is a pest of strawberry and other plants. The adult is 1/8" long, oblong, shiny, brown to black, with four dark blotches on the back. They overwinter as adults in plant debris and there is one generation per year. The immatures are creamy-white grubs that feed on strawberry roots from late spring to early summer, but they do not usually cause significant damage to the plant.



Damage could occur from adult feeding on the leaves, causing small holes on the leaves. Feeding by adults occurs primarily at night. Some damage occurs in early spring from the overwintering adults. Most damage will occur in August from the new generation of adults. Heavy infestations can result in reduced plant growth and may kill plants.

Monitoring and control. Yellow sticky cards can be used to monitor strawberry rootworm. Visual inspections for adults should be done after dark with a flashlight. Populations of 10-20 beetles per square foot is considered high and may warrant the use of an insecticide.

Top photo: Adult strawberry
rootworm; Ilona L,
BugGuide
Bottom photo: Damaged
strawberry leaves; Pam
Fisher - Berry
Specialist/OMAFRA

Two-spotted spider mite, *Tetranychus urticae* (Acari: Tetranychidae)



Two-spotted spider mites are the most common mites that can damage strawberry plantings in Wisconsin. Mites are not insects; they have eight legs and are related to ticks. Two-spotted spider mite adults are 1/50" long and are barely visible without a hand lens. They vary in color from pale yellow, green, to red with two



Top photo: Two-spotted spider mite adult; Chad Smith, Coastal Research & Education Center, Clemson University
 Bottom photo: Discolored, damaged leaf (left leaf); Surendra Dara, University of California-Extension

large dark spots on the back. They have many generations per season and overwinter as mated adult females. Two-spotted spider mites make webs on the underside of leaves.

Damage is caused by mites feeding on plant sap on the underside of leaves, in a fine tangle of webbing. Feeding can cause discoloration of the leaves, which can turn coppery-bronze, starting on the underside of the leaves. Severely damaged leaves will die and drop, resulting in reduced plant vigor, fruit size, and yield. Mite populations tend to increase in prolonged periods of hot, dry weather.

Monitoring and control. Annual renovation of strawberry beds helps in reducing potential mite outbreaks the following season. Predatory mites are often effective at keeping two-spotted spider mite populations under control. Predatory mites move around much faster than two-spotted spiders and a ratio of 1 predatory

mite to 10 two-spotted spiders is adequate for biological control. If two-spotted spider populations reach infestations of 25% or more of leaflets sampled, the use of a miticide may be warranted.

Cyclamen mite, *Phytonemus pallidus* (Acari: Tarsonemidae)



Photo of a damaged, distorted leaf; K. Lynch, New Brunswick Department of Agriculture and Aquaculture

Cyclamen mites are smaller than two spotted spider mite, only 1/100" long, and are almost not visible with the naked eye. Adult cyclamen mites vary in color from pinkish-orange to white or green.

Damage symptoms consist of discolored distorted leaves, blossoms, and fruit, and result from feeding by cyclamen mites on young unfolding leaves in the plant crown and on blossoms. Cyclamen mites are more often found on greenhouse plants and can be seriously damaging when infested plants are transplanted to new plantings. During bloom, cyclamen mite populations increase and reach a peak during fruit development. Severe infestations will result in small, leathery, off-color fruit.

Monitoring and Control. Cyclamen mites are difficult to control once established. The best approach is to insure that mite-free transplants are planted. When an infestation is detected, use a registered pesticide one to two days prior to bloom and again 10-14 days later.

Strawberry leafroller, *Ancylis comptana fragariae* (Lepidoptera: Tortricidae)



Several leafroller species may occur in strawberry in Wisconsin. Adult strawberry leafrollers are moths that are specific to strawberry, raspberry, and blackberry. Adult moths are rusty red with distinctive brown and white markings. Their wingspan is about 1/2". Larvae are green with a brown head and are about 1/2"



Top photo: Adult strawberry leafroller; Ruedi Bryner, http://www.lepiforum.de/2_forum.pl?md=read;id=40415
Bottom photo: Rolled leaf with strawberry leafroller larva feeding inside. T. McCamant, Northland Comm. College

long at maturity. There are two to three generations per year and they overwinter as mature larvae or pupae in folded leaves or leaf litter. Adults emerge in April and May and lay translucent eggs usually on the underside of leaves.

Damage is caused by larvae feeding on the leaves, after folding, rolling, and tying leaflets together around them with silken threads. Feeding may result in leaflets turning brown. First-generation larvae occur in May and June, and second-generation larvae in late July and August.

Monitoring and Control. Low levels of infestations (10-20% leaflets rolled, especially after harvest) do not cause reduction in plant vigor or yield, and thus, do not warrant control. At the early stage of infestation, rolled leaves can be removed and destroyed. Several registered insecticides as well as products

containing *Bacillus thuringiensis* (*Bt*) provide effective control.

Aphids (Hemiptera: Aphididae)



Top Photo: Strawberry aphid. Jeffrey W. Lotz, Florida Department of Agriculture and Consumer Services, Bugwood.org - See more at: <http://www.forestryimages.org/browse/detail.cfm?imgnum=5385151#sthash.7CHqMneD.dpuf>

Several species of aphids can be found on strawberry plants in Wisconsin. Aphids usually occur along the veins on the underside of leaves, on new shoots, and on buds in the crown of the plant. Aphids are small, 1/16" long, soft-bodied insects. They vary in color from yellow, orange to green.

Damage occurs from the feeding of aphids on plant juices. High infestations can weaken the plant. Aphids also produce large amounts of honeydew, which promotes the growth of black sooty mold and can reduce the marketability of strawberries. Aphids are also vectors for several virus diseases.

Monitoring and Control. Examine the back of new leaves which have not yet uncurled for the presence of aphids. Registered insecticides are available to control aphids.

Potato leafhopper, *Empoasca fabae* (Hemiptera: Cicadellidae)



Many species of leafhoppers can be found in strawberry in Wisconsin. Potato leafhoppers are the most damaging leafhopper in strawberry. Potato leafhoppers do not overwinter in Wisconsin; they migrate in air currents from the south each year. Adults are bullet-shaped, bright green and about 1/8" long. When disturbed, adults take flight quickly, and nymphs, who cannot fly, quickly walk in a distinctive sideways

movement across the leaf.



Top photo: potato leafhopper adult; <http://entomology.k-state.edu/extension/insect-information/crop-pests/alfalfa/potato-leafhopper.html>
 Bottom photo: Damaged leaves; http://msue.anr.msu.edu/news/regional_reports_on_michigan_fruit_august_9_2011

Damage is caused by adults and nymphs feeding, primarily on the underside of leaves. They suck plant juices and inject a toxin into the plant. Damage results in yellowing of the leaves between the veins, curling and distorting of the leaves. Most damage occurs in late spring to early summer to new plantings.

Monitoring and Control. There is no threshold established for potato leafhopper. Insecticides may be applied when leaf curl is evident and nymphs are found.

Cutworms: variegated cutworm, *Peridroma saucia*; black cutworm, *Agrotis ipsilon*; dingy cutworm, *Feltia ducens*; and darksided cutworm, *Euxoa messoria*; (Lepidoptera: Noctuidae)



Top photo: Variegated cutworm adult
http://mint.ippc.orst.edu/vcadult_lg.htm
 Bottom photo: Variegated cutworm larva
<http://extension.entm.purdue.edu/pestcrop/2011/issue5/>

Several species of cutworms can occur in strawberry plantings. Adult variegated cutworms are brownish moths with faintly outlined spots. They have a wingspan of 1¾". Cutworm larvae are stout, smooth, hairless, greasy looking and 3/8" long when mature. Larvae usually curl up when disturbed.

Damage occurs at night when larvae feed on the plant. They can cut off plants at or below ground level and feed on foliage and fruit. During the day, larvae hide in the soil.

Monitoring and Control. There is no specific threshold for applying control measures against cutworms. Monitoring at night with a flashlight could help confirm the presence of cutworms. Controlling weeds in and around strawberry plantings will help prevent serious cutworm infestations. Several insecticides and *Bt* formulations are effective at controlling cutworms in strawberry. Because damage is often localized, spot treating is recommended when foliar sprays are used.

Root- or crown-feeding pests

White grubs, Japanese beetle, *Popillia japonica*, May beetle, *Phyllophaga* species, and June beetle, *Cotinis nitida* (Coleoptera: Scarabaeidae)



Top left photo: June beetle adult; Copyright © 2009 David A. Copeland.
Top right photo: Japanese beetle adult, Marlin E. Rice
Bottom photo: White grub feeding on strawberry roots.
<http://www.omafra.gov.on.ca/IPM/english/strawberries/insects/white-grubs.html>

White grubs are the larvae of several species of beetle pests that may occur in strawberry. White grubs are characteristically C-shaped, $\frac{3}{4}$ to 1" long, cream colored with brown heads. Grubs feed on plant roots. Adult beetles range from a little less than $\frac{1}{2}$ " to $1\frac{1}{2}$ " long and are green, tan, or brown. Adult females lay eggs in the soil and larvae will develop in the soil.

Damage occurs primarily from the feeding by grubs on roots. Adults also feed on strawberry plants, feeding on leaves between the veins (skeletonized leaves). Feeding by grubs will result in reduced plant vigor and provide an entry site for root diseases.

Monitoring and Control. Avoid planting strawberries on newly plowed sod or other grasses and avoid planting next to large grassy fields. Check roots of wilting plants for presence of grubs. Registered insecticides are available to control white grubs.

Strawberry root weevil, *Otiorhynchus ovatus* and black vine weevil, *Otiorhynchus sulcatus* (Coleoptera: Curculionidae)



Top photo: copyright © 2014 Tom Murray
<http://www.pbbase.com/tmurray74/image/90767448>

Strawberry root weevil and black vine weevil may be found in strawberry in Wisconsin. Strawberry root weevil adults are $\frac{1}{5}$ " long, shiny black to light brown with rows of small pits along their back, and a prominent blunt snout. Black vine weevil adults are a little less than $\frac{1}{2}$ " long, dull black with yellow small flecks on the back. Larvae of both weevils are C-shaped cream-colored grubs with a brown head. Adult females lay eggs in the soil where larvae develop, feeding on plant roots.

Damage is caused primarily by the larvae feeding on roots in early spring. Damage plants are weakened, stunted, and more susceptible to winter injury and diseases. While adult weevils chew notches from the edges of leaves, their feeding usually does not result in economic loss.

Monitoring and Control. Look at plantings in the spring for smaller, less vigorous plants and examine the roots for grub presence. If grubs are found, insecticides should be applied after harvest, when the adult weevils emerge.