



Spring 2017 /
Vol. XI

UTAH PESTS QUARTERLY

N E W S L E T T E R

Utah Plant Pest
Diagnostic Laboratory

USU Extension

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NEW WEBSITE DESIGN

Utah Pests, CAPS, IPM

IPM Pest Advisories

EXTENSION 
UtahStateUniversity

Utah Pests News Turns 10: A Decade in Review



Japanese beetles, cankerworms, black pineleaf scale, small hive beetles, hobo spiders, and more.

Ten years ago, the extension entomologists, plant pathologists, and members of the Utah Plant Pest Diagnostic Lab formed the group, Utah Pests, to serve the citizens of Utah. The work of this group, including the initiation of Utah Pests News, led to ongoing state funding of the UPPDL. Below are some of the highlights from the past decade. Two common themes are weather issues, and invasive pests.

Spring 2007 - Japanese Beetle: Not Just Another Pretty Beetle

Japanese beetle was identified for the first time in Utah by a Utah County Master Gardener in July 2006. It was feeding on wisteria. Update: by 2015, it was declared eradicated from the state.

Summer 2007 - Hot Topic: Hobo Spiders

Dozens of hobo spiders were submitted to the diagnostic lab in 2007 amid internet stories of "necrotic bites". Update: in 2015, the Centers for Disease Control removed hobo spiders from the list of medically significant spiders.

Fall 2007 - Summer Temperatures Affect Fruit Pests

The hot summer of 2007 resulted in higher-than-average pest problems in Utah fruits and vegetables. During the months of March through August, 306 records were set in the state for high temperatures.

Summer 2008 - Unusual Spring Weather Presents Unusual Pest: Winter Grain Mite

In April 2008, winter grain mite was identified for the first time in Utah, in wheat from Box Elder County. The mite causes damage to small grains, vegetables, legumes, ornamental flowers, and various weeds.

Spring 2009 - Surge in Black Pineleaf Scale in Northern Utah

The incidence of black pineleaf scale exploded in northern Utah (excluding Cache county) on Scotch, Austrian, and ponderosa pines. Although a major contributing factor was drought and poor soils, arborists and homeowners looked to a new insecticide (Safari) to alleviate the outbreak.

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Diane Alston

Entomologist
 diane.alston@usu.edu
 435-797-2516

Ryan Davis

Arthropod Diagnostician
 School IPM Associate
 ryan.davis@usu.edu
 435-797-2435

Marion Murray

IPM Project Leader
 Utah Pests Quarterly Editor
 marion.murray@usu.edu
 435-797-0776

Cami Cannon

Vegetable IPM Associate
 Graphic Design, Utah Pests
 Quarterly Newsletter
 cami.cannon@usu.edu
 435-797-2435

Claudia Nischwitz

Plant Pathologist
 claudia.nischwitz@usu.edu
 435-797-7569

Ricardo Ramirez

Entomologist
 ricardo.ramirez@usu.edu
 435-797-8088

Lori Spears

USU CAPS Coordinator
 lori.spears@usu.edu
 801-668-4056

Utah Plant Pest Diagnostic Lab

BNR Room 203
 Utah State University
 5305 Old Main Hill
 Logan, UT 84322

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Winter 2010 - Hot Topic: Bed Bugs

Due to the increase in bed bug submissions to the UPPDL, this article was written to explain bed bugs' resurgence, and considerations for selecting a pest control company.

Fall 2010 - New Pest: Spotted Wing Drosophila

In August 2010, spotted wing drosophila was detected for the first time in Utah from a trap in Kaysville. Maggots feed inside many varieties of ripening fruits and vegetables.

Spring 2011 - Killing Stations for Western Cherry Fruit Fly

Cherry fruit fly is the primary pest of cherries in Utah. Research on the use of "killing stations" found that they could keep fruit infestation at or below 0.3%. Killing stations are yellow plant pot saucers that are hung from tree limbs, and sprayed with the insecticide, GF-120.

Spring 2012 - Hot Topic: Lyme Disease and Ticks

Lyme disease is vectored in the western U.S. by the western black-legged tick. An extensive tick-collecting effort across a variety of habitats in Utah was unsuccessful in finding any ticks harboring the pathogen that causes Lyme disease.

Fall 2013 - Emerging Diseases of Tomato

Two bacterial diseases of tomato were identified in summer 2013: bacterial speck and bacterial canker. Bacterial speck was somewhat common, causing black spots on fruit. Bacterial canker was not as common, causing white, raised spots with a dark brown center on fruit.

Spring 2014 - Progress on School IPM in Utah and Colorado

Utah and Colorado join the EPA to expand the use of IPM in schools. Today, implementation by Utah school districts is growing.

Fall 2014 - Summary of Raspberry Horntail Research

A 6-year research program defined horntail biology, developed a model to predict adult activity, assessed biological control, tested insecticides, and evaluated susceptibility of raspberry cultivars.

Winter 2015 - New Turf Insect

In 2014, the common crane fly, introduced from Europe, was detected for the first time in Utah turf in Salt Lake and Tooele counties. This new find was surprising given that arid habitats are not favorable for this insect.

Summer 2015 - New Aphid on Grains

The hedgehog grain aphid was found on volunteer wheat just south of Monticello in San Juan County, Utah in spring 2015. It is native to Europe, Asia, the Middle East, and parts of Africa, and feeds on grasses.

Summer 2015 - Update on Brown Marmorated Stink Bug

This pest was first detected in Utah in 2012 and for the first time, nymphs and a few egg masses were found in Salt Lake City in 2015.

Winter 2016 - Zebra Chip and Other Diseases

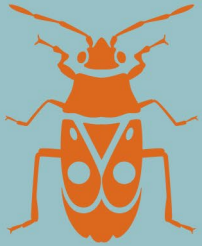
Zebra chip was detected for the first time in potato in 2013, and there were several outbreaks in the summer of 2015. New diagnoses included pinyon blister rust on currant, tobacco streak virus in zucchini, and alfalfa mosaic virus in tomato and potato.

Summer 2016 - New Honeybee Pest Detected in Utah

In April 2016, small hive beetle was identified from Washington County. This insect, native to sub-Saharan Africa, can be a major pest of European honey bees.

UPPDL DIAGNOSTICS

SUMMARY FROM 2007-2017



THE RED FIRE BUG IS NEW TO THE U.S. AND WAS IDENTIFIED IN UTAH AT THE UPPDL

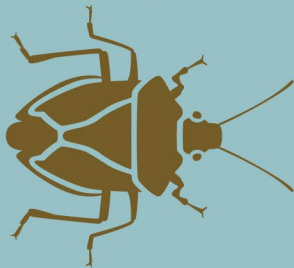
The Utah Plant Pest Diagnostic Lab is the only lab of its kind in the state, serving as the leader in providing insect and plant disease diagnoses and management recommendations. Over the past 10 years, many diagnosed pests were new to the state, some of them were never seen again, and others became significant pests.

26

NEW PESTS WERE CONFIRMED AS NEW TO UTAH
13 ARTHROPODS
13 DISEASES

BROWN MARMORATED STINK BUG
 2012 SALT LAKE COUNTY

IN OTHER STATES, THIS INSECT CAUSES DAMAGE TO MANY AGRICULTURAL CROPS, BUT IN UTAH, IT IS MAINLY BECOMING A NUISANCE PEST

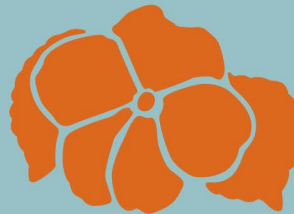


THOUSAND CANKERS
 2008 CACHE COUNTY

THIS DISEASE, WHICH HAS KILLED MOST MATURE BLACK WALNUTS IN UTAH, IS SPREAD BY WALNUT TWIG BEETLE AND WAS IDENTIFIED BY DR. NED TISSERAT, COLORADO

IMPATIENS DOWNY MILDEW
 2012 WEBER COUNTY

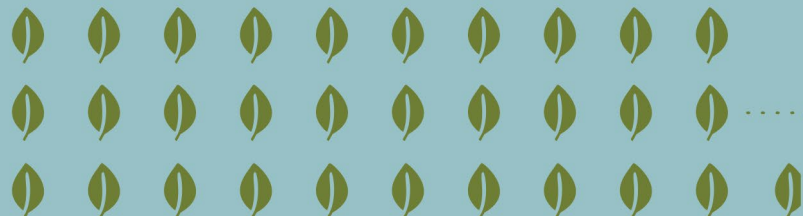
THIS DISEASE CAN WIPE OUT ORNAMENTAL OR GREENHOUSE IMPATIENS, AS IT HAS BEEN DOING THROUGHOUT THE MORE HUMID EASTERN U.S. SINCE 2009



ELM SEED BUG
 2014 SALT LAKE COUNTY

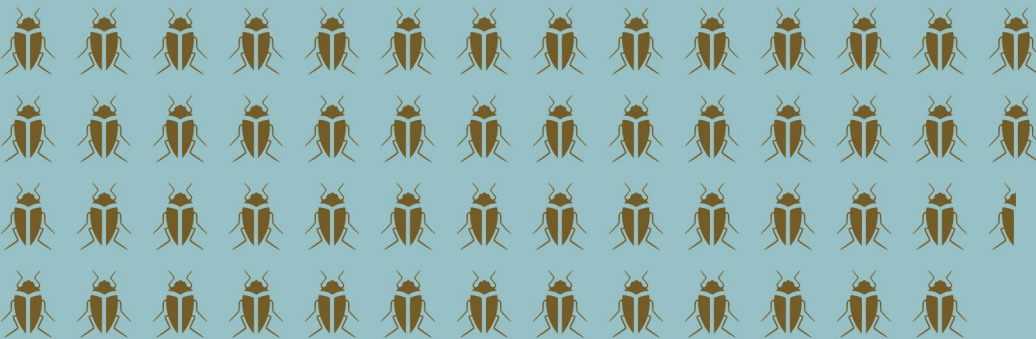
THIS INSECT IS A NUISANCE PEST LIKE BOX-ELDER BUGS, THAT CAN BE ACTIVE IN OR ON HOMES IN THE SPRING, MID-SUMMER, AND FALL

④ ④ ④ ④



121
 ABIOTIC

1,083
 DISEASES



1,663
 ARTHROPODS

2,867
 TOTAL DIAGNOSES

④ = 30 🍃 = 30 🐞 = 30

— Marion Murray, IPM Project Leader
 — Ryan Davis, Arthropod Diagnostician

New Russian Nesting Dolls Affecting Grain on the Horizon

Aphids give birth to live young and reproduce exponentially. Think of their reproduction as similar to opening Russian nesting dolls. Female aphids produce female nymphs, and the nymphs have female young developing inside them. Because of this, populations start small but can reach damaging levels quickly if left unmanaged. Russian wheat aphid, English grain aphid, and bird-cherry oat aphid are commonly encountered in small grains. Two new aphids, the sugarcane and hedgehog aphid are at the fringes of Utah's grain production. Concern over these new aphids include their ability to inject toxins from their saliva into plants or to transmit plant viruses, such as barley yellow dwarf virus.

Sugarcane Aphid

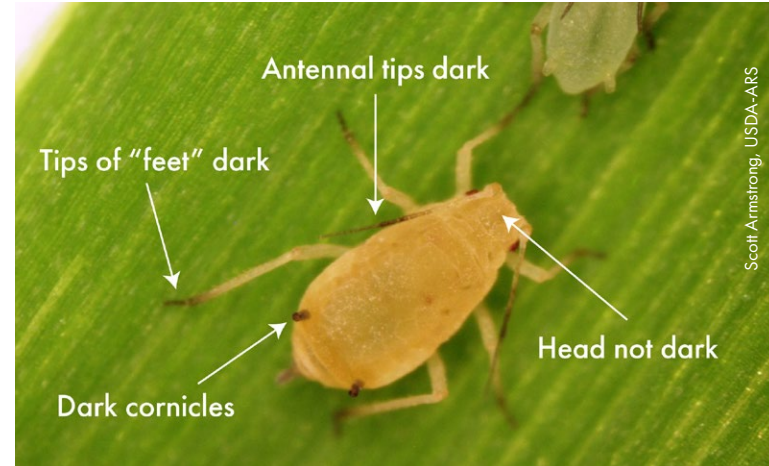
The sugarcane aphid, *Melanaphis sacchari*, has been a pest of sugarcane in parts of Africa, Asia, Australia, and South America. From the late-1970's when it was discovered in the U.S. until recently, it had only been a minor pest of sugarcane in the southeastern U.S. So why should growers in Utah care about an aphid that attacks sugarcane? Sugarcane aphid is also a pest of sorghum outside of the U.S. It wasn't until 2013 that the aphid shifted hosts and started attacking sorghum in the U.S. (Texas and Louisiana).

Since then, sugarcane aphid has spread through most sorghum-producing areas of the southeastern U.S. and Mexico. By 2016, there were pockets of sugarcane aphid causing damage in Arizona, California, and New Mexico sorghum, exhibiting its establishment in the West. Heavy infestations cause desiccation of leaves, stunting, and reduced size and quality of grain. Aphids also excrete honeydew, a sugar substrate suitable for sooty mold growth. Together, these effects can reduce plant productivity and the efficiency of harvest equipment because of gumming caused by sticky plants.

Sorghum production in Utah is not extensive but it is important to be proactive in monitoring this aphid. In addition to sorghum, sugarcane aphids also feed on sudangrass, sorghum-sudangrass hybrids, and Johnsongrass weeds. There is no evidence of sugarcane aphid affecting corn or other grains but these plants may host sugarcane aphids without damage.

Current management includes selecting tolerant plant varieties, scouting for first signs of honeydew production by aphids, using a threshold (25% of plants infested

with a minimum of 50 aphids per leaf for management), and insecticides (Sivanto and if available, Transform). Conservation of predatory insects is a component of sugarcane aphid suppression, so avoiding broad-spectrum insecticides like pyrethroids assists in long-term aphid management during the season.



Sugarcane aphids are easily identified because of their yellow color and distinct black colored antennal tips, cornicles (rear-end tail pipes), and tarsi (feet).

Hedgehog Grain Aphid

An aphid that we have less knowledge about is the hedgehog grain aphid, *Sipha maydis*. In 2015, this aphid was detected in San Juan County, Utah on volunteer wheat just south of Monticello. Since its detection in California on giant wild rice in 2007, it has spread to Georgia and Alabama, Texas (sorghum), New Mexico (oats), and Colorado (annual wheatgrass, wheat and barley). The hedgehog grain aphid hosts include 30 different grasses, but preferred hosts are wheat and barley.

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Hedgehog grain aphids are also distinct in that they are black with white spikey hair on their body.

Of particular concern is that this aphid can transmit barley yellow dwarf virus. Despite its detection in several states, population levels do not appear to have been damaging. Its spread and damage potential, however, has been seen outside of the U.S. in Argentina.

Based on observations in Argentina, New Mexico, and Colorado, we are able to piece together that feeding by this aphid causes leaf chlorosis, rolling with eventual desiccation, and particularly damages mature small grains in late spring by reducing seed head growth. Hedgehog grain aphid occurs on new leaves of plants in the fall, and in Mesa County, CO, aphids were observed overwintering on downy brome, hare barley, and annual wheatgrass.

For management of hedgehog grain aphid, research is directed at developing resistant plant varieties and an evaluation of current aphid insecticide strategies in small grains.

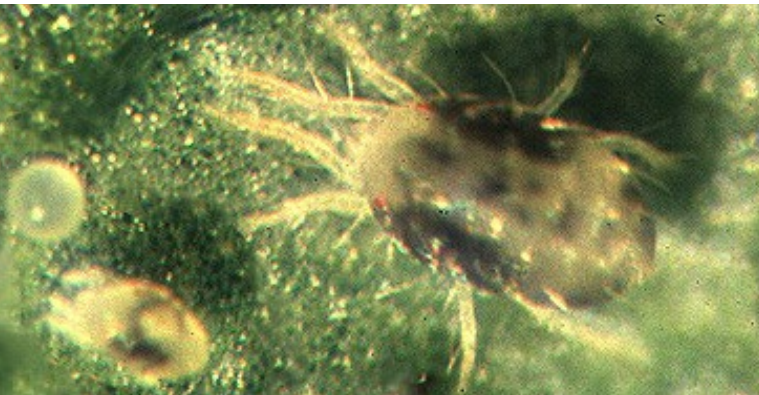
— Ricardo Ramirez, Extension Entomologist

References

Knutson, A., et. al. 2016. The Surgarcane Aphid: Management Guidelines for Grain and Forage Sorghum in Texas. *Ento-035*. 4/16.

Hammon, B. 2015. *Sipha maydis*: a potential threat to Colorado wheat production. Colorado State University Extension.

'Mite Burn' in Raspberry



Twospotted spider mite adult, egg, and nymph.



'Mite burn' on lower raspberry leaves.

Spider mites can be a challenging pest to manage in raspberries. The twospotted spider mite (*Tetranychus urticae* Koch) is the most common plant-feeding mite species in Utah. They are very small, eight-legged arthropods (adults are only 1/10 inch long), but populations can build to high numbers during hot, dry conditions. Spider mites typically feed on the undersides of leaves and form colonies with webbing to protect the eggs and nymphs. They overwinter as females (dormant females are orange in color) at the base of canes, under organic duff, and on adjacent weeds and ground cover plants. Mites suck the sap from leaves which causes a fine, gray stippling (very fine dots), and they can complete a generation in as little as 10 to 14 days during the summer.

The hot, dry summer conditions of Utah promote spider mite populations that can cause 'mite burn', a golden bronzing, typically seen on the lower leaves first. Mites begin feeding on ground vegetation in the spring, and then move up into the raspberry plants as the ground cover dries out and the mite numbers increase. Raspberry leaves are highly sensitive to mite feeding. Mites cause damage to raspberry through reduced cane vigor and berry yield, and weakened primocanes that are predisposed to winter injury.

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'Mite Burn' in Raspberry, continued

An integrated approach combines cultural, biological and chemical control methods to prevent crop loss and keep canes healthy. Key cultural practices include:

1. plant a hardy grass or vegetation mix in alleyways (spaces between rows) to minimize broadleaf weeds (spider mites particularly like field bindweed, common mallow and knotweed)
2. install overhead sprinklers to cool and moisten foliage and berries during hot periods to reduce mite populations
3. avoid disturbing ground cover and spreading dust onto foliage which promote mite dispersal onto raspberry plants
4. avoid plant stress, including water and nutrient stress, as stressed plants are more susceptible to mites
5. select cultivars with hairy leaves to deter mites
6. if growing raspberries in macro-tunnels, provide good ventilation and temperature management to avoid hot, dry conditions

There are natural predators that regulate spider mite populations. The most important natural enemy is the western predatory mite, *Galendromus (Typhlodromus) occidentalis* (Nesbitt). Additional generalist predators include thrips, minute pirate bug, big-eyed bug, ladybeetles, and lacewings. Avoid toxic insecticides and miticides to protect natural enemies. In addition, supplemental releases of insectary-reared predators can reduce mites, but is generally better suited to enclosed production systems, such as tunnels and greenhouses.



Common spider mite predators (clockwise from top left): western predatory mite, western flower thrips, minute pirate bug, and spider mite destroyer ladybeetle.

It is important to scout for mite and predator populations during the season to determine if chemical control is necessary, and if so, to optimally time treatments. Sampling should begin when mites first climb into canes. Effective methods include shaking lower canes and leaves (where mites show up first) over a light-colored sheet or tray. Look for 'moving specks'. Use a hand lens (10-30× magnification) to observe mites and natural enemies. Scout for early leaf bronzing on lower canes.

Chemical options for spider mites in raspberry include those that are less disruptive and those with organic formulations, such as

- neem (azadirachtin) oil, horticultural oil, insecticidal soap and sulfur (do not use above 80°F and within one month of an oil spray);

and commercial miticides, such as

- etoxazole (Zeal), hexythiazox (Savey), acequinocyl (Kanemite), bifenazate (Acramite), and fenbutatin-oxide (Vendex).

Savey and Zeal are mite growth inhibitors, and only effective against mite eggs and nymphs. Apply these products at the first sign of adults laying eggs. They are not effective as 'rescue treatments'. Acramite, Kanemite and Vendex are active against adults as well as nymphs. Vendex is toxic to predators; avoid it when predators are active. Spider mites are notorious for developing resistance to miticides; read the label for the mode of action group, and rotate among modes of action (MOAs) between earlier and later season miticide applications. Also, check the label for the pre-harvest interval (time required between application and crop harvest), re-entry interval (time required between application and re-entry to the field), and the number of applications allowed per season. When raspberry fruit are ready for harvest, it is critical to select products that are appropriate for the picking schedule.

In summary, an integrated mite management program uses multiple tactics and relies on frequent scouting to detect building populations before they cause harm to plants and yield. Some useful pest management resources for raspberry include the Utah State University Extension Fruit IPM Advisory ([sign up here for a free subscription](#)), Utah Pests IPM website: [Raspberry Pests](#), and the [Pacific Northwest Insect Management Handbook](#).

— Diane Alston, Entomologist

Recluse Spiders in Utah

Recently, I had the pleasure of presenting master gardener classes along the Wasatch Front. For fun, I showed a picture and asked, “is this a spider that we have in Utah?” Most thought that the spider—a brown recluse—is common in Utah. But the reality is that it is not.



Brown Recluse Spider

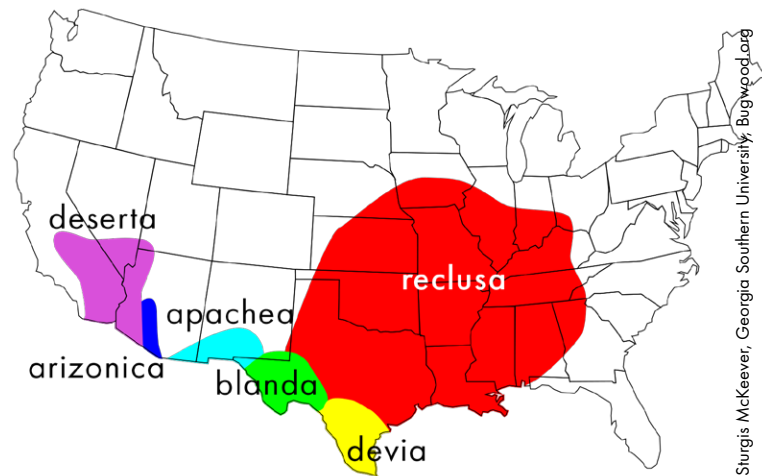
In the last 30 years, the UPPDL has identified four individual brown recluse spiders (*Loxosceles reclusa*). In each case, the spiders were found in packing materials originating from the brown recluse’s native range. In comparison, the established hobo spider has been submitted to the lab over 650 times!



Hobo Spider

In 2016, we received an unknown *Loxosceles* spider submitted by a client that had just moved from California to Utah. We submitted the sample to Dr. Paula Cushing at the Denver Museum of Nature & Science. She identified it as a Mediterranean recluse (*L. rufescens*), which has been

introduced into California and other locations around the country. In this case, the client had moved from an area in California where this spider occurs, and brought it with him.



Distribution of *Loxosceles* species in the United States.

There is a native *Loxosceles* in Utah, the desert recluse (*L. deserta*). It occurs in the southern portion of Washington County. Unlike the brown recluse spider, the desert recluse is an outdoor spider typically associated with dense vegetation and rodent burrows. In the last 30 years, the UPPDL has identified this spider just three times.

Individuals in Utah who develop necrotic skin lesions often point to the brown recluse, but the cause is likely to be something else. Hobo spider bites have also been blamed for causing necrotic lesions, however [scientific evidence debunking that belief](#) is mounting. In fact, the CDC removed the hobo spider from its list of medically significant spiders. There are many possible causes of necrotic lesions other than spider bites and those are nicely summarized in Rick Vetter’s article “[Causes of Necrotic Wounds Other Than Brown Recluse Spider Bites](#)”.

If the brown recluse spider were present in Utah, it would be more frequently collected and submitted for identification, but it is not. It is our conclusion that brown recluse spiders have not established a reproducing population in Utah. The primary spider of medical concern in Utah remains the female western black widow spider (*Latrodectus hesperus*).

— Ryan Davis, Arthropod Diagnostician

Western X-Disease

Western X-disease is caused by a phytoplasma. Phytoplasmas are bacteria lacking a cell wall. The phytoplasma causing Western X-disease is transmitted by leafhoppers. There are two species that occur in Utah that can spread phytoplasmas: the mountain leafhopper and the cherry leafhopper.



UC Statewide IPM Project © 2000 Regents, University of California

Mountain leafhopper (top) and cherry leafhopper (bottom).

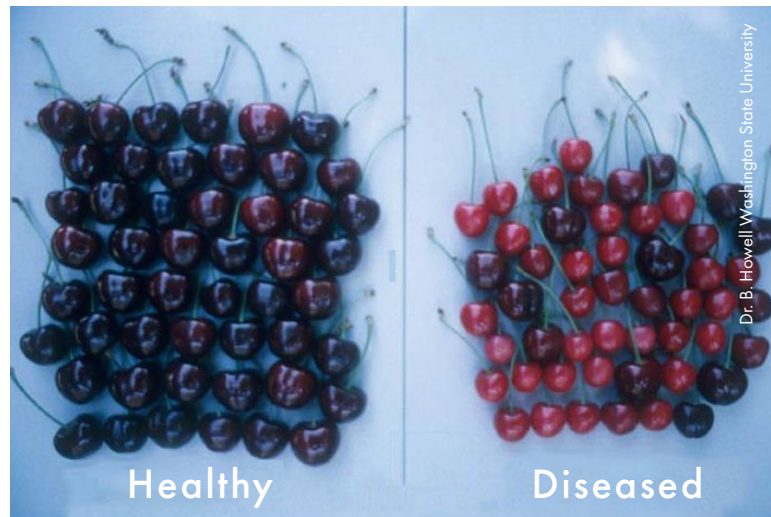
The phytoplasma infects stone fruit trees and causes symptoms that are especially noticeable on peach and cherry trees. Symptoms are not visible until June of the year after infection occurs, and may start out on only one branch. By early fall, the foliage will color up early, and leaves may drop prematurely. The cherry fruits are small, pale, leathery-skinned and unmarketable. Trees that are not removed usually die within 3-4 years after infection. Tart cherries on 'Mahaleb' root stock do not show any early fall coloring. Trees with Western X-disease look fine and healthy but suddenly wilt before harvest and die above the graft union.

In the summer of 2017, our diagnostic lab received sections of tart cherry tree trunks suspected of having *Phytophthora* crown rot. We were not able to detect *Phytophthora*, but we did notice that the symptoms appeared similar to Western X-disease. Unfortunately, phytoplasmas cannot be isolated and grown on artificial media. Testing is usually done by using molecular testing on leaf tissue.



Scaffolds Fruit Journal, Cornell University

Early symptoms of Western X-disease on peach.



Dr. B. Howell Washington State University

Tart cherries from a healthy tree and infected tree.

Management for Western X-disease includes removing infected trees and controlling leafhoppers in the orchards. Annual surveys of orchards allow for early detection before a new generation of leafhoppers can acquire the phytoplasma in the orchard. The x-disease phytoplasma can survive on wild hosts including dandelions and all clover species. The leafhoppers reproduce, for example, on hawthorn, crabapple, boxwood, lilac and pyracantha (firethorn). To reduce chances of infection, cover crops consisting of clover species should be avoided. If trees in an orchard have been infected, insecticides can be applied post-harvest to control leafhoppers on trees.

— Claudia Nischwitz, Extension Plant Pathologist

















Organic Options for Insect Pests of Vegetables

Organic insect management relies primarily on preventive, cultural, and integrated methods. Many organic materials complement and support these approaches. Below is a summary of organic options for common insect pests of vegetables in Utah.

Other resources include: [USU IPM Advisories](#); [Utah Pests Fact Sheets](#); [Intermountain Tree Fruit Production Guide](#); [Vegetable Production and Pest Management Guide](#); [Organic Pest Control, WSU](#); [Organic Insect and Disease Management Guide, Cornell University](#); [Insect Pest Management for Organic Crops, UC Davis](#)



Row covers **exclude** pests such as flea beetles, beet leafhoppers, diamondback moth, cabbage looper, imported cabbageworm, and more.

Year 1	Area 1 	Area 2 	Area 3 	Area 4 
Year 2	Area 1 	Area 2 	Area 3 	Area 4 
Year 3	Area 1 	Area 2 	Area 3 	Area 4 
Year 4	Area 1 	Area 2 	Area 3 	Area 4 



Sanitation includes eliminating weeds, volunteer plants, and crop residue (right after harvest), and keeping the farm and garden clear of old pots, stakes, bags, etc. that may serve as protection sites for insect pests. Sanitation helps control pests like cabbage looper, Colorado potato beetle, and sap beetle.

Crop rotations help avoid the buildup of host specific insects (e.g. flea beetle, squash bug, Colorado potato beetle, wireworm) in the same place year after year.

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Timing of organic practices that are effective in reducing common vegetable insect pests in Utah

Pest	Crops	Organic Options	Timing
Beet leafhopper	Tomato	Plant beet curly top virus-resistant tomato varieties	At planting; See varieties here
	Pepper	Plant higher than normal density	At planting
		Floating row covers or reemay fabric	Early to mid-season until air temperature inside covers exceeds 80°F
		Shade plants with shade cloth	After row cover is removed or after planting until the end of the season
		Destroy and remove infected plants and plant debris	As they are detected and after final harvest
Flea beetles	Cole crops	Crop rotation	At planting
		Avoid planting susceptible crops after potatoes	At planting
	Potato	Good seedbed preparation to accelerate seedling growth (raised, good drainage)	At planting
		High seeding rate	At planting
		Floating row covers	Seedling establishment
		Thick mulch or diatomaceous earth at base of plants	Mid- to late- spring and throughout season
		Control weeds around planting sites	Throughout the season
		Azadirachtin (Aza-Direct), kaolin (Surround), spinosad (Entrust)	When adults are active
		Eliminate old crop debris and other surface trash	Fall; after final harvest
Diamondback moth (DBM), cabbage looper (CL), imported cabbageworm (ICW)	Cole crops	Use tolerant varieties	At planting; See varieties here
		Start with clean transplants	At planting
		Monitor - look for larvae/feeding damage and/or use traps with pheromone lures for DBM & CL	Throughout the season
		Hand pick and destroy larvae	Spring and early summer until the end of the season
		Floating row covers	Throughout the season; remove covers during flowering for pollination
		Spinosad (Entrust), pyrethrins (Pyganic), <i>Bacillus thuringiensis</i> (Dipel)	When larvae thresholds are observed but before they move into crop heads or buds
		Remove plant debris	Fall; after final harvest
Corn earworm (CEW)	Corn	Plant resistant corn varieties	At planting; See varieties here
		Plant corn early	Before 1300 DD50* (~ Jul 20-Aug 5)
		Monitor with heliothis trap + pheromone lure	Start in early June; move to different areas to keep near fresh corn silk
		Place clothes pins at point where silk enters the ear	Soon after first silk emerges, leave until ear has filled and ready for harvest
		Encourage natural enemies	Throughout the season; See natural enemies here
		Pyrethrins (Pyganic), pyrethrins + azadirachtin (Aza), spinosad (Entrust), <i>Chromobacterium subtsugae</i> (Grandevo), <i>Bacillus thuringiensis</i> (Dipel)	Time in relation to moth trap catches
		Till in areas where CEW overwinters (primarily central & southern UT)	Fall; after final harvest

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Organic Options for Insect Pests of Vegetables, continued

Pest	Crops	Organic Options	Timing
Spider mites	Beans	Keep plants healthy and unstressed, especially by drought	Throughout the season
	Cucurbits	Use a slow-release nitrogen fertilizer	At fertilization
		Use a strong stream of water from a hose-end nozzle to wash mites off infested plants	When mites are observed
	Peas	Avoid using broad-spectrum insecticides and miticides	Throughout the season
		Avoid applications of malathion, carbamate, and pyrethroid insecticides for squash and pumpkin insect pests (e.g. squash bug)	Throughout the season
		Pyrethrins + azadirachtin (Azera), <i>Chromobacterium subtsugae</i> (Grandevo), oils (Ecotec), insecticidal soap (M-Pede)	When mites are observed
Squash bugs	Cucurbits	Crop rotation	At planting
		Resistant varieties	At planting; See varieties here
		Trap crops	At planting; apply insecticide or destroy once adults are present but before eggs begin to hatch
		Monitor for adults and eggs at base of plants and undersides of leaves	Spring and throughout the season
		Remove debris at base of plants; no mulch	Throughout the season
		Crush eggs and hand-pick adults and nymphs	May and June; 1-2 times per week
		Kaolin clay (Surround) or diatomaceous earth at base of plants, insecticidal soap on young nymphs (Safer)	Once per week when nymphs are active
		Pyrethrins (Pyganic), pyrethrins + azadirachtin (Azera)	Shortly after egg hatch, targeting nymphs
		Remove or till under plant debris and keep fields free of trash or wood	Fall; after final harvest
Tomato russet mite	Tomato Pepper	Use clean transplants	At planting
		Avoid planting during hot dry periods	At planting
		Promptly remove or destroy infested plant debris	As it is detected
		Sanitize equipment	After tools or equipment are used on infested plants
		Pyrethrin (Pyganic), <i>Chromobacterium subtsugae</i> (Grandevo)	Once russet mites are present on plants
Thrips (onion, western flower)	Onion	Tospovirus-free transplants	At planting
		Tolerant varieties	At planting; See varieties here
		Weed control	Throughout the season
		Reduce nitrogen rates	At fertilization
		Remove plants infected with tospovirus	When detected
		Pyrethrins (Pyganic), pyrethrins + azadirachtin (Azera), spinosad (Entrust), azadirachtin (Azera), kaolin clay (Surround), oil (Ecotec)	At early bulb growth stage when there are: 15 thrips per plant (less tolerant varieties) or 30 thrips per plant (more tolerant varieties)

*DD₅₀ = degree-days with a baseline temperature of 50°F; heat units based on cumulative daily temperatures above insect's lower threshold (50°F in this case) for development used to time critical insect activity periods for optimal pest management.

— Cami Cannon, Vegetable IPM Associate

IPM In The News

Novel Method of Disease Control on Turf

Rhizoctonia is a group of pathogenic, soil-dwelling fungi that cause plant diseases on a broad range of hosts. University of Florida plant pathologists observed that bacterial species were always growing in association with certain *R. solani* from diseased turf. This led them to investigate the impact of that symbiotic bacteria on brown patch disease. Their first finding was that disease symptoms were greater when the bacterium was present. Killing the bacterium by antibiotic treatment resulted in a significant decrease in disease incidence. Their finding raises important questions about the distribution and significance of microorganism relationships, and our understanding and management of pathogenic fungi.

Why the Green Peach Aphid is Such a Successful Pest

The green peach aphid is one of the most destructive pests to many important crops worldwide. They can colonize over four hundred plant species, are resistant to over 70 different pesticides, and transmit over one hundred different plant viruses. A team of researchers led by the Earlham Institute found that rapid changes in gene expression involved in host adjustment were vital for the green peach aphid's generalist lifestyle. Those genes rapidly turn up or down in single aphids in just two days upon transfer to a new host plant. Given that a single aphid can produce her own offspring, infestations of a new host may start with just a single aphid.



Repelling Beetles from Avocado Trees

Redbay ambrosia beetles transmit the deadly laurel wilt fungus to avocado and redbay trees. University of Florida researchers have found that redbay trees will emit methyl salicylate to repel ambrosia beetles, but only after they've been infected with the fungus. They found that trees painted with a mix of methyl salicylate and a related chemical, verbenone, caused a reduction in beetle trap capture by 95 percent, and the number of boring holes by 90 percent. The hope for the future is to use a push-pull system, where the repellent paint is applied within avocado groves, and attractive killing traps are used on the edges.

Heat Sinks Affect Scale Reproduction

Research from North Carolina and Florida has found that a native scale insect (*Melanaspis tenebricosa*, gloomy scale) thrives in urban environments. Focusing on red maple, they compared scale fecundity and survivorship on trees in cool versus hot environments, and on irrigated versus drought-stressed trees. Egg production of the scale was greatest on maples grown under hotter and drier conditions. The discovery that this insect has adapted to a changing climate has been important in helping urban planners to build resilient landscapes.

March Madness to Find BMSM

Cornell University and USDA entomologists teamed up to launch a citizen science project to map the location and population density of brown marmorated stink bug. They invited elementary schools across the nation to participate in the "March

Madness Citizen Science Project to Find Stinky the BMSB." Students can search for the stink bugs, upload their findings, and see the [changes in the national map](#).

Rove Beetles as Army Ant Parasites

Predatory rove beetles' successful infiltration of army ant colonies around the world proves that evolution has the capacity to repeat itself in a predictable way. The beetles evolved ways to disguise themselves as army ants through dramatic changes in body shape, behavior, and pheromone chemistry; all to gain their hosts' acceptance so they can feast on the colony's brood. Researchers at Columbia University and American Museum of Natural History published in *Current Biology* that this type of evolutionary behavior has actually happened at least a dozen distinct times.

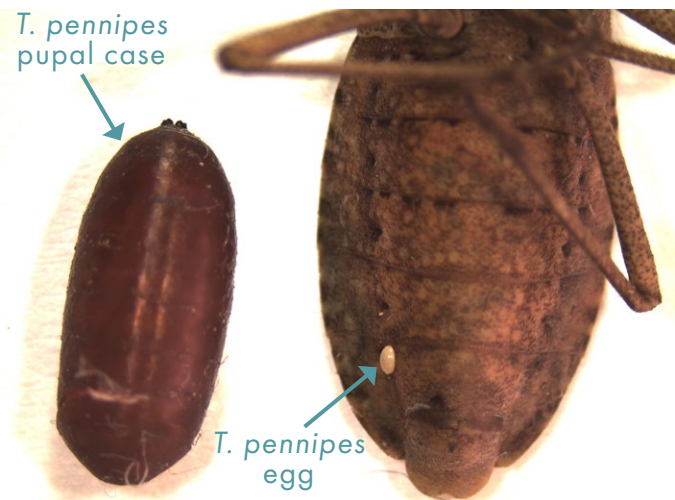
Improving Phosphate Absorption

Phosphate as a plant nutrient is in danger of reaching its peak – when supply fails to keep up with demand – in just 30 years, potentially decreasing the rate of crop yield and damaging the global food supply. Scientists at the University of North Carolina published a discovery in *Nature* describing how a genetic shift in plants relates to phosphate absorption. They found that plants that have a symbiotic relationship with certain soil bacteria are unaffected by low-phosphate conditions. The researchers concluded that it could be possible to harness this relationship—via probiotic or related crop treatments—to enable plants to thrive with less phosphate.

New Publications, Podcasts, Recordings, and Videos

- Annual Conference Multimedia from the [Practical Farmers Conference in Iowa](#). Videos of key sessions and presentations made at the Iowa Annual Practical Farmers Conference.
- [Growing Organic: Expanding Opportunities for U.S. Farmers](#) is a publication focused on expanding organic production in the U.S.
- [Voices from the Field](#) podcast covers agricultural production practices from across the country. Produced by [ATTRA NCAT](#) and available through iTunes and Google Play.
- Recordings from the [2017 Organicology Conference](#) in Portland, OR include three sessions on organic seed production, including ways to trial varieties on-farm.
- View the process of organic farm inspections through this scenario-based, interactive video. [The Path to Sound and Sensible Organic Inspections](#) was produced by USDA's Agricultural Marketing Service, National Organic Program.

Featured Picture of the Quarter



Trichopoda pennipes, or “feather-legged fly”, is a tachinid fly that parasitizes squash bugs. These brightly colored flies can be seen hovering over squash plants in search of squash bug prey. The fly will lay an egg on a large nymph or adult squash bug. A young larva then hatches from the egg, bores into the host body, and develops to a third instar which kills its host by emerging from the bug to pupate in the soil.

Although parasitism rates can be as high as 80% on squash bugs, *T. pennipes* cannot keep this pest at low densities. The fly is most effective when it parasitizes nymphs, as 50% of parasitized nymphs will die before becoming overwintering and egg-laying adults. An image of the adult fly was also featured in 2014.

— Images by Cami Cannon, Vegetable IPM Associate

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