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UTAH PESTS QUARTERLY

Utah Plant Pest
Diagnostic Laboratory

USU Extension

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Be on the Lookout for Japanese Beetle

In 2006, a small population of Japanese beetles (JB) was detected in Orem, Utah. An aggressive multi-year eradication program directed by the Utah Department of Agriculture and Food (UDAF) eliminated JB from the state by 2012. A trapping program in subsequent years yielded just 11 beetles through 2018. However, in 2019, 36 beetles were captured in Salt Lake County and seven in Davis County – the highest in more than a decade. UDAF declared an emergency in 2020 and is now working once again to eradicate this pest.

Japanese beetle is an invasive pest that can be highly destructive to ornamental trees and shrubs, turf grass, and some fruits and vegetables. It was likely introduced from Japan into the eastern U.S. in 1916 in shipments of ornamental plants. It is now established in most eastern and some Midwestern states.

JB attacks over 300 plant species, including rose, apple, peach, plum, cherry, grape,

willow, birch, maple, horse chestnut, asparagus, and sycamore. Both the adults and grubs (immatures) cause plant damage. Adults skeletonize leaves and chew holes in flower buds and petals, soft fruits, and corn silks. Grubs that feed on turf roots cause discolored patches that feels spongy and pulls easily from the soil. Grubs feeding on roots of other plants may cause yellow and brown leaves and stems. Adults can be found individually or clustered together on plants, whereas grubs can be clumped under the soil of turf grass.

Adults are oval, metallic green with bronze-colored wings, and about ½ inch long. Males are slightly smaller than females. Adults have six white tufts of hair along each side of the body (i.e., 5 pairs along each side of the abdomen and another pair on the last abdominal segment) and prominent spines on their legs. Grubs are creamy white, C-shaped, and 1 inch-long when fully grown.

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Japanese Beetle, continued

Regardless of the recent detections of JB in Utah, the state is currently recognized by the National Plant Board as a “Category 1” non-infested state. This status is granted as a result of the state’s quarantine regulations and annual monitoring efforts. Therefore, Utah residents are advised not to use any pesticides against JB.

Instead, JB sightings should be reported to the Utah Department of Agriculture and Food or Utah Plant Pest Diagnostic Lab at Utah State University. However, Utah residents can protect their plants from future JB infestations by implementing the following strategies:

Keep plants healthy by following recommended irrigation and fertilization schedules.

Include a mix of plants that adult JB avoid such as lilac, dogwood, and magnolia to discourage adult aggregations.

Encourage natural enemies, such as parasitic wasps, flies, ground beetles, and birds, by planting a diversity of flowering plants that produce pollen and nectar.

——— Lori Spears, USU CAPS
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Adult beetles have a metallic green head and copper wing covers (**top**).

Grubs form a “C” shape when at rest (**middle**).

Grub feeding can cause patches of discolored turf, and skunks cause additional damage by digging them up (**bottom**).

Identifying Fox Squirrels and Their Damage in Your Yard

Dr. Shandra Nicole Frey is an Extension Associate Professor in [Wildlife Biology](#) at USU Extension. Based out of Cedar City, she has a special interest in the field of Human-Wildlife Conflict.

Jessica Tegt is the Engagement and Outreach Coordinator for the [Berryman Institute](#) in Logan, UT, whose mission is to reduce wildlife damage and resolve human-wildlife conflicts through teaching, research, and extension.



Joseph Berger, Bugwood.org

Native to the eastern United States, fox squirrels (*Sciurus niger*) were first documented in Utah in 2011, and have since been causing plant and landscape damage, particularly along the Wasatch Front. It is unknown how fox squirrels made their way into Utah; however, it is possible they followed riparian corridors through Colorado and were only detected once their populations grew in number.

Fox squirrels are the largest tree squirrel in the U.S., at 17 to 28 inches long and 17.5 to 37.5 oz in weight. They are easily distinguished from our native red squirrels (*Tamiasciurus hudsonicus*), by their larger size and orange-red fur on their tails and undersides. Red squirrel is the smallest tree squirrel in the U.S. (at 10 to 15 inches long and 5 to 8 oz in weight), with a grayish-red body and tail, and white belly.

Fox squirrels are similar in size to our native rock squirrels (*Spermophilus variegatus*); however, rock squirrels are grayish-brown and are usually found in rocky terrain and canyons.

Unlike rock squirrels, fox squirrels are primarily arboreal. Although fox squirrels can be found foraging on the ground, they will usually run up into a tree when threatened.



Shandra Nicole Frey, Utah State University



Shandra Nicole Frey, Utah State University

The fox squirrel (*top*) has orange-red fur on its tail and underside and is much larger than Utah's native squirrels, including the smallest tree squirrel, the red squirrel (*middle*) and the grayish-brown rock squirrel (*bottom*).

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Whitney Cramshaw, Colorado State University, Bugwood.org

Fox squirrels may feed on fruits, such as pear (*left*). In winter, they chew bark away and feed on the subsequent sap flow (*middle*).

The bark damage is identified by the chew marks (*right*).



Whitney Cramshaw, Colorado State University, Bugwood.org



Whitney Cramshaw, Colorado State University, Bugwood.org

Damage Caused by Fox Squirrels

Along the urban Wasatch Front, fox squirrels have found a home among urban trees such as oaks, hickories, and maples that provide storable food. Coniferous trees such as pine and spruce provide shelter and food throughout the winter. Fox squirrels prefer to nest in tree cavities; however, when none are available they build nests using cut branches of the tree in which they occur.

Because fox squirrels readily adapt to living among structures such as housing, farms, and orchards, they can become pests. They harvest nuts, berries, and fruit from residential trees and commercial operations. Also, squirrels may strip large areas of bark from trees during the winter, sometimes causing serious damage to shade trees. In residential areas, fox squirrels can damage lawns when they bury and subsequently dig up nuts they have stored during the winter. Other chewing damage has been reported on sprinkler heads, utility boxes, and cable wires, damaging residential and agricultural irrigation systems.

Management Options

Methods to manage squirrels to minimize their damage fall under the following categories: exclusion, habitat modification, repellents, trapping, shooting, and hunting.

Exclusion from Gardens: Fox squirrels may be excluded from garden boxes by installing a wire mesh fence around the plot. Another option is to create a wire mesh box 'cover' that can be temporarily placed over your garden crops when the vegetables are ripening.

Exclusion from Crop Trees: Exclusion from trees is virtually impossible because of squirrels' ability to climb and jump from trees and man-made structures, including telephone and power lines. To reduce damage to tree branches, you can wrap branches with a fabric tree wrap. To reduce access to trees, trim branches away from power lines or houses, thus restricting squirrel movement. To temporarily exclude a squirrel from a fruit tree, cover the tree with bird netting during the fruit ripening period. Squirrels can chew through the netting, but if there is other food available they may be temporarily dissuaded from the fruit. If you have a tree that is isolated, and there is no way for a squirrel to access it from above, you could install a metallic skirt around the trunk of the tree to discourage squirrels from climbing the tree.

Trap and Relocate: This is illegal because fox squirrels carry diseases that may be spread into neighboring areas. Also, fox squirrels are agricultural pests, and thus they should not be transported to agricultural land.

Repellents and Frightening Devices: Repellents, frightening devices, and similar products may succeed in reducing squirrel activity around houses or gardens for a limited time. However, research suggests that like birds, squirrels will acclimate to these devices and return to their initial behavior.

Lethal Traps: Fox squirrels are not native to Utah and therefore are not a regulated game species at this time. Therefore, it is legal to use lethal traps to control squirrels. However, one must be careful to set the trap in such a way that no native squirrel species will be captured. There

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are many squirrel traps commercially available, and it is best to use a trap specifically designed to kill squirrels, particularly large-bodied squirrels like the fox squirrel. For more information on lethal traps please contact Dr. Nicki Frey, nicki.frey@usu.edu.

Poisons: There are no poisons registered for use against fox squirrels in Utah. Do not use poisons registered for use on another species to attempt to lethally control fox squirrels. You may be able to buy products online that state that they are suitable for use, but they are not legal in the state of Utah. Please read all pesticide labels carefully prior to purchase or use.

Have you seen fox squirrels around your home? Aid the Natural Heritage Program's initiative to document and map fox squirrel distribution by following this link: nhmu.utah.edu/programs/utah-fox-squirrels.

Need help identifying or controlling fox squirrels in your yard? Contact Utah State University's wildlife biologists for more detailed information. Nicki Frey (nicki.frey@usu.edu) or Jessica Tegt (jesscia.tegt@usu.edu).

PLANT PATHOLOGY NEWS AND INFORMATION

Bacterial Wilt of Geranium

A strain of *Ralstonia solanacearum* called race 3 biovar 2 that causes bacterial wilt of geranium has been classified as a quarantine pathogen and is on the select agent list for bioterrorism because it can also affect potato production. So far, outbreaks of this strain in the U.S. have been quickly contained and eradicated. A new introduction occurred recently on geranium cuttings imported by a nursery in Michigan. Utah nurseries were among the recipients of some of the rooted cuttings. After being notified, the Utah nurseries removed the plants and USDA-APHIS collected and destroyed them.

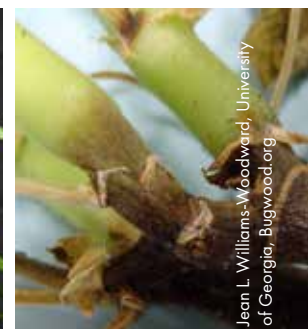
R. solanacearum is bacterial pathogen that has great variability within the species. Therefore, it is classified into races and biovars based on host range and other factors. The bacterium is commonly found in tropical, subtropical, and temperate climates. Race 1 is endemic to the U.S., but is not cold-tolerant. It frequently causes disease in geranium and vegetables in tropical and subtropical regions. In contrast, race 3 biovar 2 is more cold-tolerant. It is endemic to tropical and some temperate regions where most geranium cuttings are produced. This results in the occasional introduction into the U.S. Race 3 biovar 2 causes a serious disease of potato and because it is more cold-tolerant, it is a threat to potato production in the northern U.S.

Early symptoms caused by *R. solanacearum* on geranium are chlorosis and wilting usually of older leaves. In some cases, leaf margins are curled upwards. As with many other wilt diseases, wilted plants seem to recover overnight when temperatures cool. However, after a few days the plants wilt permanently and the leaves turn brown and die. Leaf necrosis may occur as a wedge-shaped pattern. The stems turn brown and the plant collapses and dies.

The symptoms of both strains are identical and can only be distinguished through specific testing. If you discover a symptomatic geranium, you can send it to the UPPDL. We will do the initial screening and if positive, will send it to specialized testing facilities.



Dr. Norman, Mid-FL Research and Education Center, University of Florida



Jean L. Williams-Woodward, University of Georgia, Bugwood.org



Margery Daughtrey, Cornell University, Bugwood.org

Wilting of geranium caused by *Ralstonia solanacearum* (**top left**). The base of infected plants will collapse and turn necrotic (**top right**). Foliar necrosis may occur in a wedge-shaped pattern (**bottom**).

— Claudia Nischwitz, Extension Plant Pathologist

Options for Weed Barriers



Pailis Plastique Vue Bas Bio

A variety of options can be used for physically blocking weeds from gardens, fields, or other landscapes including synthetic or organic. They each have their pros and cons.

A variety of synthetic products are available for agricultural production that are impermeable, including polyethylene films ("plastic mulch"). The primary benefits of plastic mulches are water and heat retention plus weed control. The standard plastic mulch is black, but other colors and compositions are available with added benefits. Aluminized or silver mulches have been shown to also repel certain pests like aphids and thrips. In cloudy situations, red mulches can reflect more light toward the plant which increases growth. White mulches reflect some heat and allow soils to stay cooler.

Plastic mulches are sold in 3 to 4 foot-wide rolls and laid with a tractor bedder attachment that moves dirt to the side to keep the plastic in place. Drip irrigation tape may also be laid at the same time. Plastic mulches are typically only used once, then removed from the field at the end of the growing season. Higher quality plastic mulches may successfully be used in back to back seasons.

Synthetic mesh weed fabrics and barriers are laid by hand and secured with landscape staples. These are used more for ornamental situations in that they are durable and last many years. They allow for moisture and fertilizer to pass through.

Biodegradable and photo-degradable mulches are another option. They cost more than plastic films and weed fabric but are more environmentally friendly as they are degradable. Sunlight causes photo-degradable mulches to become brittle and break down over time. At the end of the season, these degradable mulches can be incorporated into the soil.

Organic mulches such as bark, sawdust, straw, etc. may improve soil moisture, reduce soil temperatures, and help



Types of weed barriers:

- black plastic (*top*)
- mesh fabric with row cover (*middle*)
- mesh fabric (*right*)

reduce soil erosion from wind or water. Organic mulches that are applied thickly (more than 2 inches) may allow for stronger weed control. The disadvantages are that organic mulches may include weed seeds, require more labor to apply and maintain, and could be difficult to source.



— Nick Volesky, Vegetable IPM Associate

More Information

[Mulches for Home Gardens](#) (CSU Extension)

[Weed Control Options for the Home Vegetable Gardener](#) (University of Georgia Extension)

[Should I use Landscape Fabric to Keep Weeds out of my Perennial Garden?](#) (University of New Hampshire Extension)

Murder Hornet Madness

On December 8, 2019 the Asian giant hornet (*Vespa mandarinia*) was detected in Blaine, Washington. That detection was preceded by a detection in mid-August in Nanaimo on Vancouver Island, British Columbia (USDA APHIS-PPQ, 2020). Media reports about this insect, using the term “murder hornet,” have unnecessarily put Utahns on high alert, and the Utah Pests team has received multiple false reports of sightings.

Let’s put this hornet into context through a historic perspective of other arthropods with intimidating nicknames, where their actual danger was inflated. In the 90’s when the hobo spider—initially called the “aggressive house spider” due to a misinterpretation of its scientific name—was found in Utah, people were very alarmed. Despite the fact that it does not produce a necrotic bite, it became the most frequently-submitted arthropod to the UPPDL. In 2008, Africanized honey bees (“killer bees”) were found in southern Utah, causing much alarm. Since then, very little has been reported about them despite their spread northward into the lower third of the state (UDAF, 2020). Kissing bugs momentarily took the stage, but the reality is that the risk of being bitten by the Utah species (*Triatoma protracta*) is very low and the risk of contracting *Trypanosoma cruzi* (the causal agent of Chagas disease) from a kissing bug in Utah is even lower. And finally, false reports of brown recluse spiders incite fear in Utah residents (only the desert recluse spider, found in Washington County, exists in Utah).

Reports from Japan state that up to 50 people per year die from Asian giant hornet stings. Most deaths come in the form of anaphylaxis and sudden cardiac arrest; other sting victims succumb to rare complications (Yanagawa et al., 2007). While this is an intimidating number on its own, consider these other statistics. In the U.S., dogs account for an average of 34 deaths per year and other animals (cats,



WA Dept of Ag, Bugwood.org



Hanna Royals, USDA APHIS PPQ, Bugwood.org

horses, cows, pigs, raccoons, others) are responsible for an average of 72 deaths (Forrester et al., 2018). Comparatively, hornets, wasps, and bees account for 60 deaths.

Concerning the sting of the Asian giant hornet, which is reported to be one of the worst, it is interesting to know that Utah has some of its own wasps with nasty stings. The most tolerable are from bees, the European paper wasp, and native yellowjackets. But Utah also has the tarantula hawk (*Pepsis* spp.) and some species of velvet ants that have some of the most painful stings in the world. Certain species of velvet ants have even been dubbed “cow killers” due to the pain of their sting! The fear of bites or stings does have merit, especially for those who are allergic, but statistically, the risk is low.

By comparison of a single insect sting, consider the young men in the Amazonian Satere’-Mawe’ culture, where they must wear gloves that contain dozens of bullet ants—whose venom is 30 times more painful than a honey bee—for 10 minutes or longer to become a warrior. Not only do they have to do this once, but 20 times (Penn State Cultures and Customs, 2013). For more, watch [this video from National Geographic](#).

The intimidating nickname for the Asian giant hornet—murder hornet—was given because of its ability to quickly massacre bees (not humans). The hornets hunt many other insects, including yellowjackets and paper wasps, to feed their developing young, and their hunting becomes more noticeable in late summer.

For now, we urge Utahns to sit back and wait to see if Washington and Canada officials eradicate this insect. If eradication is not possible, will the giant Asian hornet make it to Utah and survive? To answer this question,

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Johnny N. Dell, Bugwood.org



Whitney Craftshaw, Colorado State University, Bugwood.org



PA Dept of Conservation and Natural Resources, Bugwood.org

Insects possibly mistaken for the Asian giant hornet: bald-faced hornet (**top left**), giant ichneumon wasp (**top middle**), western yellowjacket (**top right**), European paper wasp (**lower left**), cicada killer (**lower middle**), pigeon tremex (**lower right**).

the best we can do is compare habitats and other environmental parameters from Asia to Utah's.

The natural distribution of Asian giant hornet includes certain parts of southern China, northern India, Bhutan, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, eastern Russia along the Sea of Japan, Taiwan, and Thailand (USDA APHIS-PPQ, 2020). Elevation tolerance for this insect have not been studied, but it seems to be more closely associated with lowlands rather than high elevations (USDA APHIS-PPQ, 2020). There have been a few high-elevation collections, including at about 7,000 ft. in Myanmar and about 3,800 ft. in Pakistan. At these high elevations, the wasps are rare and populations appear to occur at low densities. Almost all of the Asian giant hornet collections that have elevation information occur below 2,300 ft. Given these data, this species is not typically associated with high elevations (USDA APHIS-PPQ, 2020).

USDA APHIS-PPQ (2020) compared plant hardiness zones found within the native range of Asian giant hornet and compared those to U.S. zones. The distribution of Asian giant hornet in its native range occurs within zone 3 to 13. In the U.S., all states in the lower 48 fall within this range, and specifically, zones 3 to 9 occur in Utah. That said, the authors of the USDA APHIS-PPQ paper also state that the hornets collected from the Russian Primor'ye region (along the Sea of Japan) are limited to zone 7 and above, and records from northern Japan do not include specimens from zone 5 or below. Although the plant hardiness zones in Utah would allow for survival of this hornet, the elevation and arid climate likely lies at the limits of what

this insect withstands ecologically. In short, we know little about how this insect will move and survive in the U.S.

The Asian giant hornet has not been detected anywhere in the U.S. outside of the limited area of western Washington. Utah does have a number of larger wasps that could be mistaken for it, including the tarantula hawk wasp (*Pepsis* spp.), western cicada killer (*Sphecius grandis*), sand wasps (*Bembix* spp.), mud dauber wasps, pigeon tremex (*Tremex columba*), giant ichneumon (*Megarhyssa* spp.), European and native paper wasps (*Polistes* spp.), ground- and aerial-nesting yellowjackets including the bald-faced "hornet" (not a true hornet, but an aerial yellowjacket) (*Vespula* spp., *Dolichovespula maculata*), great golden sand digger (*Sphex ichneumoneus*), and scoliid wasps.

——— Ryan Davis, Arthropod Diagnostician

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The Utah Pests Team Says Farewell to a Friend

After almost 13 years with USU Extension, we say good-bye to Ryan Davis. Ryan was the Arthropod Diagnostician for the Utah Plant Pest Diagnostic Lab and also initiated and ran the Utah School IPM program.

Ryan was dedicated to providing excellent service, and we estimate that he diagnosed almost 17,000 arthropod samples! He was instrumental in helping to solve issues with the invasive elm seed bug, pear fruit sawfly, hobo spiders and other spiders, ticks, bed bugs, bark beetles, ants, chinch bugs, and more.

Utah schools now have fewer pest issues and use fewer pesticides thanks to Ryan and his involvement with the Utah Coalition for IPM in Schools. He has provided IPM training to almost every school district in the state.

We wish Ryan all the best in his new position with the U.S. Forest Service!



ENTOMOLOGY NEWS AND INFORMATION

Grasshoppers and Crickets in Central Utah

2020 is a year of many firsts, and the farmers and ranchers of central Utah have had to add pest problems to their plate. The current grasshopper outbreak is said by some to be the worst in a decade, especially in Wayne, Sanpete, and Piute counties. Add to that, an outbreak of Mormon crickets (shown at right), and the situation is worse, in fact, dire, for some. There are reports of rangeland, wheat, oats, alfalfa, and grass pastures eaten down to the dirt. Ranchers are unsure of how they are going to feed their livestock and horses not only now, but for the coming winter.

Casey Seber is a Utah Dept of Agriculture Compliance Officer in Sevier County and has spent long days taking calls and visiting farms in the region. If he finds a grasshopper density of eight or more per square yard, then UDAF will reimburse 25% of the control costs. This program has been in existence for eight years and initially, the reimbursement was 100%, but to spread the funds out for multiple years, Utah cut the reimbursement rate to 50%, and now 25%. Seber helps farmers in making a decision on whether to treat based on the reimbursement amount, grasshopper density, crop type, and other factors.

UDAF reported that in 2019, over 230,000 acres of farm land were infested, and that number is higher in 2020. Grasshopper and Mormon cricket infestations run on an approximately 7-year cycle where the populations rise



and fall. Currently, both insects are peaking in central Utah, in about year four of the cycle. In additions, the warm, dry conditions of spring 2020, and warmer winters, favor the survival of grasshopper nymphs in spring.

UDAF officers and USU Extension work to train farmers to look for nymphs early in the season and treat before they form wings. Farmers are also encouraged to work together to treat as wide an area as possible.

—— Marion Murray, IPM Project Leader

IPM In The News

Importance of Allogroomer Bees

Within a honey bee hive, a specialized group of worker bees are called allogroomers. These bees use their mouth to remove debris, parasites, and other pathogens from the body of other bees within the colony. Scientists in England and Italy investigated the behavior and physiology of these allogroomers. Their study, published in *Scientific Reports*, found that the immune system of allogroomer bees were stronger than other bees, and that because they occupy central role within the social network, their grooming habits benefit a large number of bees. The scientists conclude that an understanding of allogrooming practices may be used to develop strategies to promote allogrooming behavior and increase resilience to bee parasites and pathogens.

Breeding Ash for Resistance to EAB

Emerald ash borer has killed hundreds of millions of ash trees in North America over the last 10 years, and an important long-term solution is planting ash trees with resistance to EAB. An international team from the U.S., Ireland, and England report significant findings on ash breeding in *Nature Ecology & Evolution*. The U.S. team (U.S. Forest Service and ARS, Ohio) tested resistance of over 20 ash species by hatching EAB eggs attached to the bark, and following the fate of the beetle larvae. Resistant ash trees generally killed the larvae when they burrowed into their stems, but susceptible ones did not. The U.K. team sequenced the genomes of resistant trees, and developed 53 resistance genes, several of which are involved in making chemicals that are likely to be harmful to insects. The findings will contribute to breeding or gene editing practices to get these resistance

genes into ash species, and thus could facilitate restoration of ash woodlands in areas which have already been invaded.

Changes in Global Insect Populations

The largest-ever review of insect population studies by researchers from Germany confirms that the worldwide number of land-dwelling insects is in decline. The study, published in *Science*, analyzed data from 166 long-term surveys across 1,676 sites to show that insect populations are going down by 0.92% per year, amounting to 9% per decade. Although this is lower than many other published rates, the authors stress that it is still substantial. The losses were strongest in the U.S. West and Midwest and in Europe, especially in Germany. The study also showed that insects living in fresh water have increased on average by 1.08% each year, possibly due to effective water protection policies. The authors suggest that for land-dwelling insects, destruction of natural habitats due to urbanization is a key driver, and the increase in freshwater insects makes for a hopeful future for other insects if the right types of legislation are put into place.

Invasive Tick Contributes to Spread of Rocky Mountain Spotted Fever

The Asian longhorned tick (*Haemaphysalis longicornis*) was first discovered in some U.S. states in 2017. Since then, health reports have shown that the incidence of Rocky Mountain spotted fever (caused by the bacteria, *Rickettsia rickettsii*) is highest in nine of the twelve states where the invasive tick occurs. Researchers at the U.S. Centers for Disease Control tested whether the longhorned ticks could transmit the

parasite as well as native ticks such as American dog tick and lone star tick. They found that the invasive tick was able to obtain *R. rickettsii* at any stage of their development, and then pass it to healthy guinea pigs as well as their own offspring, at similar rates to that of the native ticks.

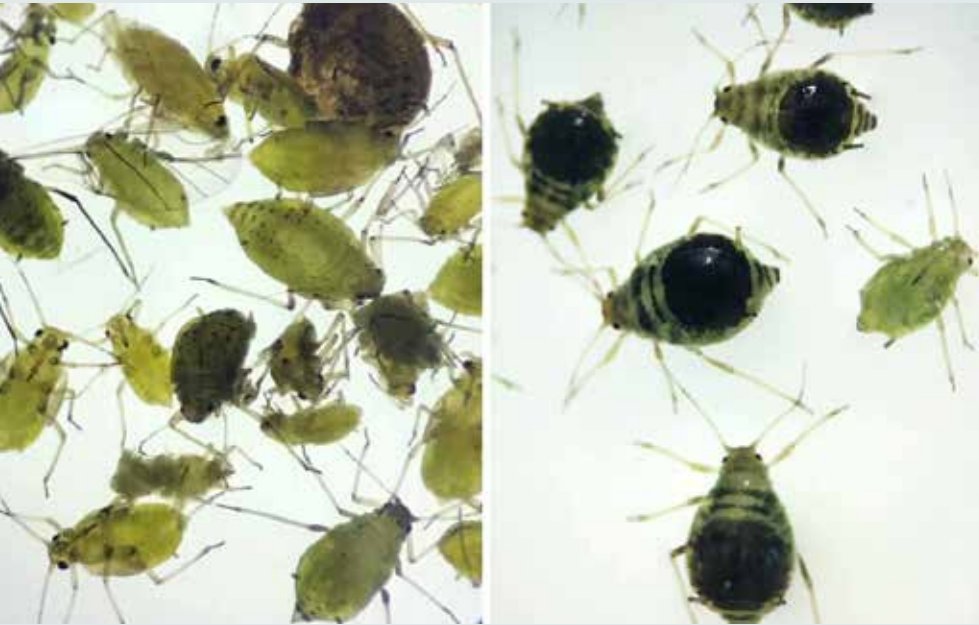
Economics of Pest-Control Systems

A study published in *HortTechnology* compared the economic benefits of using a calendar spray schedule versus an IPM program for managing tomato pests. Over two years, scientists compared costs for three management options: calendar-based conventional pest control, threshold-based organic pest control, and threshold-based conventional pest control. They found that the calendar-based conventional plan produced the lowest total tomato yields. Yields for the threshold-based organic plan were slightly higher while the threshold-based conventional plan resulted in the highest yields.

Gypsy Moth Larvae may Prefer Fungi

A study by German scientists, published in *Ecology Letters*, found that when gypsy moth larvae were given the choice to feed on healthy or fungal-diseased poplar leaves, they preferred the diseased leaves, and would actually feed on the fungal spores before feeding on the leaf tissues. It was found that leaves that were infected had higher levels of nitrogen, amino acid, and vitamin B, causing the larvae that fed on them to grow faster and pupate earlier than larvae that fed on healthy leaves. The study shows that insects that were thought to simply be herbivores can also be fungivores in their larval stage.

Featured Picture of the Quarter



A closer perspective of aphids (cabbage aphid on left, *Brevicoryne brassicae*, and plum-thistle aphid on right, *Brachycaudus cardui*) reveals their appearance without any waxy/powdery covering.

These images were taken through a microscope, and show adults (some with wings) and nymphs from above and below. Notice the stylet (the piercing-sucking mouthpart) is visible along the underside of the body, as well as the cornicles (tailpipe-like appendages that excrete defensive compounds like waxes and alarm pheromones) at the end of the abdomen.

— Images by Nick Volesky,
Vegetable IPM Associate

New Publications, Websites, Apps

The [Western IPM Center](#) is hosting the [IPM Hour](#), a monthly online seminar covering a variety of IPM-related topics and research. It is held the second Wednesday of each month at noon Pacific Time and features two 20-minute presentations followed by 10 minutes of discussion each. All past presentations are posted on the website.

The Oregon IPM Center has published a list of [Low-Risk Pesticides](#) to help

where personal protective equipment shortages prevent application of some conventional pesticides.

[Basics of Organic Farming](#) is an online course created by Organic Farming Research Foundation (OFRF), the University of California Sustainable Agriculture Research and Education Program, and California Polytechnic State University in San Luis Obispo covers six modules on organic farming. The Soil Health and Weed

Management modules are available for free online, and OFRF is asking for feedback from farmers in a brief survey to help them develop the last four modules.

[StopPests.org](#) has created guides on cockroaches, mice, and bed bugs for multi-family housing that are available in both Spanish and English. They also provide an [IPM Guide for Affordable Housing](#).

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